



Brandon Amateur Radio Society, P.O. Box 2307, Brandon, FL, 33509-2307

- Officers -

Pres: Doris Haskell
WB9VDT
V.P: Bernie Hulth
W4BGH
Sec: Scott Irwin
W8UFO
Tres: Jim Moorehead
WF4AC
Trust: Tony Stone
W4TAS
Editor: Mark Haskell
WB9UJS

**- Repeaters -
K4TN**

2 Meters VHF
147.165 MHz (+) PI=136.5
w/EchoLink Node 22440
via K4PPK-R

1-1/4 Meters UHF
443.500 MHz (+) PI=127.3

- Nets -

2M: Mon, 8 PM
147.165 (+) PI=136.5
6M: Tues, 7 PM
50.2 MHz USB
10M: Tues, 8 PM
28.365 MHz USB

-Web Page-

www.brandonhamradio.org

- Meetings -

Monthly: 3rd Thursday
Time: 7:30 PM
Location:
The Brandon Assembly
of God Church
710 South Kings Ave.
Brandon, FL 33511

CLUB MEETING... *Reminder for 5/19/2016, 7:30 PM*

Navigate on over to Brandon Assembly of God, 710 South Kings Avenue; Hitch up your pony anywhere in the lot; zip on into the Annex (friendly familiar faces). 7:30 p.m. sharp—Doris (WB9VDT) sounds the gavel and hushes the crowd.



The meeting program: Hank Billings, **KJ4PVX**, a presentation on Broadband-Hamnet. Broadband-Hamnet™ (formerly called HSM-Mesh™) is a high speed, self discovering, self configuring, fault tolerant wireless computer network created from Linksys and Ubiquiti WiFi equipment. These typically run in the 2.4 GHz band, and are being designed, developed and deployed as an amateur radio broadband communications system.



QRA

- Meeting Plan
- VE Testing
- Murder Mystery
- Emergency Rations
- Dummy Load
- Spy-Cam
- Calendar

Bring a friend!

Coffee & Donuts
...available with a contribution to the kitty.



VOLUNTEER EXAMINER... *Testing Report for 5/7/2016*

The "Team" reports that 5 tested, resulting in: 1 new Technician, 3 new Generals—one of the takers had a perfect score. **Congratulations!**

New or upgrade... Bill's team can help you realize your next Amateur License Grade achievement. There are plenty of willing

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Elmer mentor types who would willingly assist you in understanding almost anything too—just ask! Contact: Bill Johnson's (WJ4G) team of VE faithful servants by email to: moo.bill@verison.net.



The publicized monthly B.A.R.S. opportunity is:

First Saturday of Each Month

11:30 AM

**Brandon Assembly of God
710 South Kings Avenue**

Walk in Amateur applications are gladly accepted, but prior notification of attendance intention is always appreciated as the best method.

MURDER MYSTERY...

Headline: Cell warden charged with murder! -



Mille Amp convicted of negative treatment, crystalline torture, and the systematic murderous termination of Nicholas Cadmium in his confinement cell, at the local energy storage facility. The coroner's office reported that he died of depletion, in series with internal complications of suffocation.

This is both confession and indictment folks. Humor aside, there is so much we don't know. What follows is only a touch of nice-to-know and a challenge to dig deeper if needed.

Oh(!) and the shame! An abundant collection of expired battery pack components can be found in many a Ham's closet in that dusty "I haven't properly disposed of this stuff yet" shoebox.

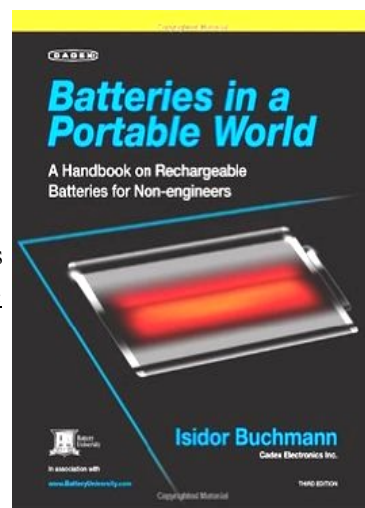


Batteries; You need them to power your portable radios. Then, 15 years later, you find that you probably spent almost as much on replacement batteries as you did initially for the entire radio's purchase. Maybe some rectification is needed here.

Battery life is a complicated function of size, use, storage, temperature, and charge. Your handi-talkie (HT) may provide "up to" 5 watts of intermittent QSO power, get some recharge treatment, and set on the shelf until next time. Or, simply used a lot, and regularly plopped into the good-old charger caddy for monitoring and electron refreshment - forever. Usable life becomes just so many cycles until failed performance comes unexpectedly. Much like the local grave stone mason's sign - Drive carefully, we can wait. It's inevitable.

So, deep dive right in, the electrolyte is warm! The secret to our "controllable" battery life dilemma is mainly in the recharging environment. Sadly, most car adapters, wall-warts, and basic charging docks are just battery murders. Depending upon the battery type, different and very specific criteria applies. i.e.) Flooded cell, Sealed Lead Acid (SLA), NiCad, NiMH, Li-ION.

For those of you who wish to be more intense, there is Isidor Buchmann's wonderful offering: A **free** detailed chronology into battery technologies. Use the hypertext to visit his web site and examine the [18 chapter novel](#)—while enjoying some tea and a crumpet. Extra credit awarded if you discover what *Negative Delta V Detection* is. For some Li-ION engineering science perspective, consider the 38 page .PDF document called [Lithium Ion Rechargeable Batteries Technical Handbook](#)... a must visit.



For the rest of us, and our casual overview dip into the knowledge pool, let's start by acknowledging that bat-

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teries are at best, a perishable commodity. So, buy fresh and resist stocking-up for a too long-range future. Then, replenish when end-of-service-life occurs. Of course, if able, consider rebuilding that failed pack your self. Oh, and if you do, don't forget to reuse the temperature and over-current protection devices. Store batteries in a cool dry location - refrigeration is actually an option, to limit resting self-discharge (NO FREEZING!). Don't charge too fast or too slow!



Set your expectation for up to approximately 500 cycles and *maybe* 5 years of service. Know what your mAh capacity rating is. This current value is called "C", so now you can control your charging at or below that value in stages, for time = x hours. This is typically 0.6C to 0.8C during a full charging stage, 0.1C for finishing, and 0.01C for trickle (if allowed). Don't even get me started on the marketing term "Fast Charge!" A typical best effort time averages about 2.5 hours minimum. Voltage control must be applied, monitored, and limited to a set maximum, per manufacturer's specification. Plan for the proper stage sequence and amount of charging time. Know that heat is your enemy, and that operational temps, starting just above room temperature, progressively bring deterioration and shorten those life cycles. 113 degrees Fahrenheit (45C) is the typical safe limit. Think CAUTION if leaving a battery pack in a hot 135F automobile! Batteries vent when heat causes internal pressure build up (in excess of 100psi).



Long term "cooking" in the charger dock fosters over-charging and can chemically render unwanted internal composition changes and crystalline structures that reduce capacity. Excessive discharge depth causes the weakest cell/s in the series to exhaust first and then reverse polarity - not battery healthy. Ok, considering the above, now doesn't it sim-

ply amaze you to see so many hams at the hamfest with a working HT; Or, those garden battery/LED walkway lights - on every night; Or just how wonderful the portable electric drill and camera functions; We even have battery powered lawn mowers. Is anyone up for an electric car yet? (Humm... guess you didn't see the fine print calling out the \$15,000 battery pack replacement every couple of 3-5 years).

Latest Li-ION technologies require very close (millivolts) adherence to specifications and if not followed exactly can lead to safety issues - have you seen any powered skateboard melt-down news stories lately? Oh, and just FYI, if you must store Li-ION batteries for a prolonged time, they should be discharged to their near lower limit first—opposite of what you might think. Just where is all this portable consumption going... it's unbelievable how technology is advancing! Does anyone need a 160,000 lumens LED flashlight? (output equal to qty=186, 100W light bulbs)

Ok, let's be fair. Knowledge can be a wonderful thing! If you purpose to become more creative and resourceful, you can certainly have a well powered home-brew horseless carriage for a lot less than the \$105K Li-ION Tesla Motorcar—how about this Amish buggy? Zero to 5 MPH in 2 sec.

The roof has the photo voltaic, the electronics and batteries are pretty much concealed, and there is still lots of room for the HF rig and a screwdriver antenna on the rear appendage. Just imagine picking up your



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friends on-the-way to a B.A.R.S. Club Meeting. See [Larry Yoder's creativity](#) and the neighborhood brag. Then, just try and resist spending too many hours nodding around looking at YouTube episodes and Google threads. Sorry for wandering off topic, I was having a mobile/battery fantasy moment.

The most common cell in use, for most of us, is the single AA size. NiMH offers more capacity and fewer issues than NiCAD, so for all your rechargeable battery hungry items that use this type cell, I highly recommend:

Battery: Panasonic, #[HHR-210AAB](#), Ni-MH, 2000 mAh, and **Charger:** MAHA Energy Corp, PowerX [MH-C9000 -WizardOne](#)



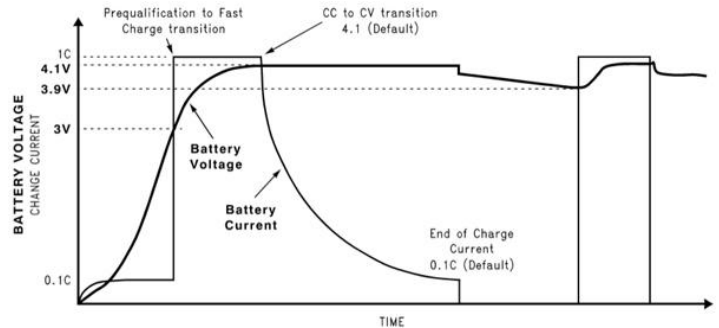
Oh if only we could just

get the Radio manufactures to up the quality of their battery charger technology.

We're not alone; A significant European cell phone manufacturer had 18 tons of batteries returned under warranty in just 9 months last year—a full third completely restorable with a custom conditioning charger. Maybe ACE Hardware will have those devices on the shelf by Christmas time.

Best practice: Size wisely; operate correctly (you get more utilization from a battery if it goes into service immediately after a top charge); don't skimp on the charger technology! That do-all processor-controlled custom-chip charger unit looks great(!) about now. Don't store and forget. Know that you WILL be replacing the battery pack at some point. Qty-3 Li-ION cells make up a 11.4V pack. With nominal voltage being 3.78 volts/cell, usable down to 3 volts/cell; never descend below 2.5 volts/cell or attempt to charge above 4.2 volts/cell. I'm intentionally limiting more micro details, but do allow me to offer the following Li-

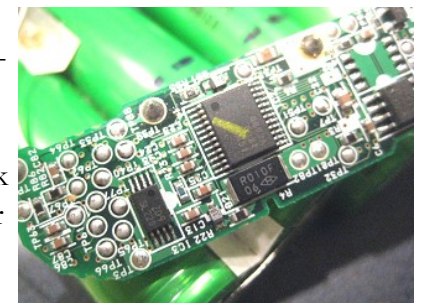
ION graph. It illustrates a prestart stage, a constant current stage, a constant voltage stage, and a finishing float maintenance state.



There is so much more you can know... For all inquisitive specifics, I again highly recommend the Isidor Buchmann's reference. Chapter #4, on "Charging." It can help you resolve many scenario questions.

If you're the hands-on home-brew type, Maxium Integrated Corporation designed a chip set years ago, just for you. Check out the [Maxim712/713](#). Also Linear Technology offers the [LTC4056-4.2](#) single cell intelligent charger chip. Texas Instruments, and others, offer competing solutions.

Your cell phone has this technology already built into the heart of its power management, as do laptops for their tortured world. Hidden in almost every battery pack is a complete computer chip power management system—Yikes(!)



components for which I must squint to even see. The board shown (major component populations on each side) is the same dimension as a AA battery!

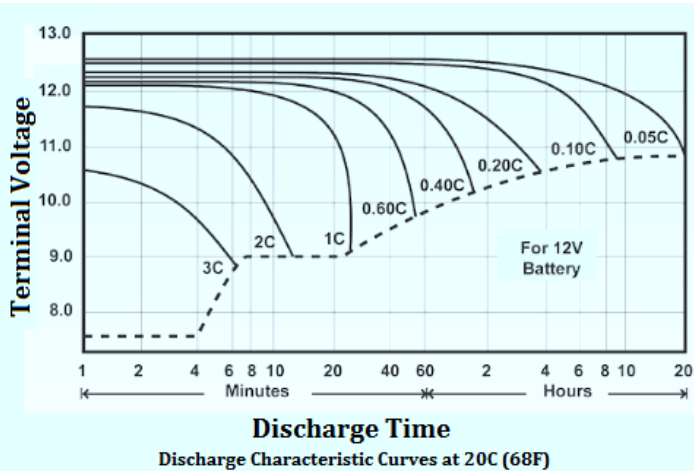
You don't have to know how the carburetor works to drive the car, but some times it helps. *A Notable Quote:* "We wouldn't even need to worry about plugging these devices in so much if they'd just stay charged a little longer." Happy battery trails to you!

Finally, don't forget to contribute to the Millie Amp rehabilitation fund!

EMERGENCY RATIONS:

Gel-Cell Batteries: a.k.a. Sealed-Lead-Acid (SLA) Type with Absorbent Glass Mat (AGM) technology can be your “Emergency Preparedness” power source solution. **Size Matters**... let’s examine a popular item.

Capacity: Like the utility meter on your home, think that battery capacity is essentially Watt-Hours of energy. However, in batteries this capacity is unfortunately skewed based upon how much current you draw. The available amount (usable) is roughly inversely proportional to current draw. The more you draw, the less watt-Hours of energy you can enjoy.



Now that you have the basic picture, Batteries are NOT rated in watt-hours, rather Amp-Hours. Manufacturer's rating of nearly all sealed-lead acid batteries, is based on a 20-hour (0.05C) discharge rate. "C" being the Amp-Hour rating of the battery.

Rating: For our typical 7AH battery, that's 350ma for 20 hours - from full charge to the a depletion limit of 11 volts—the discharge point. OK, but if you drain at a full 1xC (7A), your battery usage will end in just over 20 minutes. Doing the math, that's 84 vs. only 28 Watt-Hours; a big difference! Knowing this helps us "SIZE" the correct battery for our need and anticipated use - well at least properly set the expectation.

Example: Your rig draws 1.4A (~9 watts RF out) on transmit and 200ma on receive. Your expected duty cycle use is say 20% (TX of 12 seconds per minute). That’s consumption of 2.4 watts on receive and 16.8 watts on transmit. At 20% duty cycle, that all becomes an average of 440 ma per every minute, or 5.28 watt hours. Consulting the handy 7AH manufactures performance chart, that amount falls below 0.1C and so it's determined the expectation is about 10 hours of operation. (52.8 total Watt-hours). Another battery in parallel would give 2X this, or 20 hours operating time.

Some Phenomena Rules:

- Do not store or use in an airtight enclosure - Explosive gas safety issue
- Do not operate at temperatures outside the range of 41F to 95F. Excessive heat shortens life - just a 5 degree increase shortens life 16-25%
- Do not discharge completely or below 10V - reduces recovery capacity and useful cycles
- discharge depth of 30% Number of cycles = 1100
- discharge depth of 50% Number of cycles = 500
- Never-Never store in an uncharged condition - Sulfating occurs and is death to your battery
- Do not exceed manufacturers' **charge** or **discharge** current max ratings
- Expect 3-5 years of service life (battery falling to 80% capacity)

The Charging Cycle:

- Manufacturers specifications are for 68F (20C) Adjust for ambient temperatures above or below 68F (20C)
- Charge: +6 mV/cell/degree below 20C
- Charge: -6 mV/cell/degree above 20C
- Float: +2 mV/cell/degree below 20C
- Float: -2 mV/cell/degree above 20C
- Know the batteries' "C" value: Amp-Hour rating and respect the max charging current
- Charge using a constant voltage regulated source
- This is 14.4 to 14.7 volts for a 12-volt battery

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- Limit charging current to $(0.20 \times C)$ or less
- Charge until current drops to $(0.01 \times C)$ indication of full charge or plateaus at some value based upon age and number of cycles.
- Switch to a float maintenance charge environment when the charging cycle completes

Standby Service:

- Use a constant voltage source at 13.5 to 13.8 VDC - ideal for 77F (25C) - Batteries may be left in this mode for extended periods



To keep your Gel-Cell fresh and at the ready, consider an intelligent controller. The [CM20D](#) (under \$20) is actually a intelligent solar controller / GelCell charge-management system, but easily accepts power from any DC power source—like an 18VDC laptop computer power cube, for instance. And, if you decide to add a few solar panels to complete your emergency readiness, just add a blocking diode in the feed from each source. AC fails; then the solar, wind, or pedal exercise bike generator can take over. BE PREPARED as the Boy Scout Motto commands!

Recycle:

SLA's are NOT A LANDFILL ITEM!!! Exhausted and unloved batteries can find suitable rest for their cells, freely accepted at BatteriesPlus, Home Depot, and Lowes.

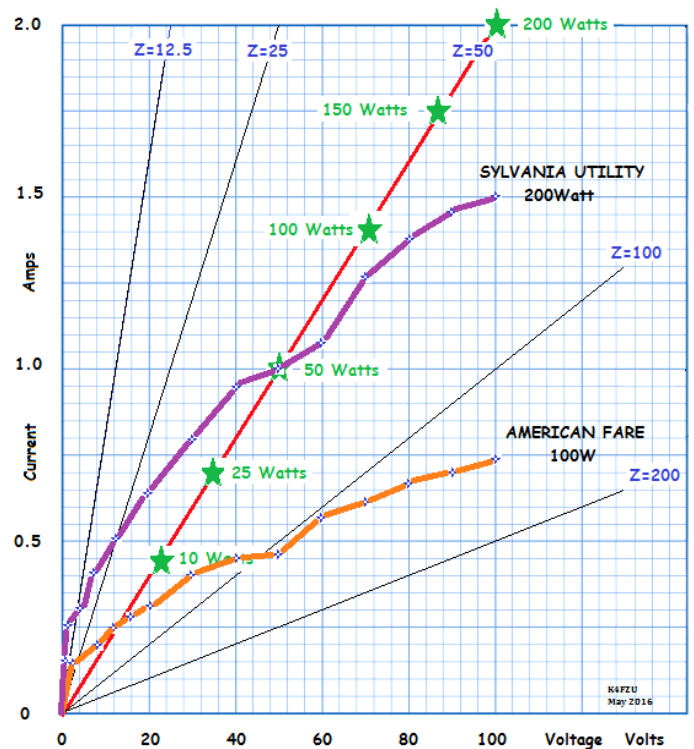
Want More Information:

Visit manufacture "[Power Sonic's](#)" web site. Their extensive free downloadable [literature library](#) is great.

DUMMY LOAD...

Tier-1: Using a light bulb as an RF load—Watts up with that? Well, who has not used a 120v 100w light bulb as a dummy load, observing the tune-up process of your HF rig - just testing to see if there is anything coming out the connector. (am I really *that* olde?) Perhaps it's reassuring to see the filament glow or impressive to show your friends, but your rig is anything but impedance happy. This is due to the fact that a Tungsten filament has a changing resistance characteristic that... closely follows a near 5th Order Polynomial Curve; *oops*, I mean is NOT linear by more than 2:1.

For Amateur Radio purposes, a tungsten lamp unfortunately exhibits rising resistance as the voltage across it is increased - mostly because the wire is heating up, right? Cold resistance of <28 becomes 68 ohms, and soon becomes over 144 ohms. Below is a response graph of both a 100W and 200W lamp.



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Knowing that 100 Watts into a RF perfect $Z=50$ ohm load produces a terminal voltage of 70.71 volts, [$E = \text{square root of } (PxR)$] we determine the 120v light bulb is, at best, a major mismatch. But wait, there's more!

OK, so all you observant calculating science and math types out there, as well as experienced Elmers, already can see that a 200W lamp might give a better (relative term) average match. We see that the VSWR for the 200W lamp stays within the 2:1 range from just after 10 watts to just under 150 watts. That's probably close enough for fine quality home-brew test equipment! Pretty cool for on-the-cheap—I mean budget-minded!

Unfortunately there is one last rub: Where as the old dip-n-load pi-network rigs, like say a DX-60, tolerated this arrangement, the low cold-start resistance may flag an excessive VSWR to your modern-day solid state rig, and that fast acting fold-back AGC protection circuit will leap into action and prevent any output. So, there you have it, a poor-mans dummy load (with issues). *No photons were harmed in the process of this research!*

Tier-2: For those more aggressively perfectionistic, here is a easy build homebrew CanTenna dummy load - it's an perfect $Z=50$ and usable to over 100W. This is my personal new-Novice-on-a-budget design from 1962, but now wonderfully reinvented and documented by K4EAA. (I should have applied for that patent).



A pint paint can, connector, and qty-20 1K ohm, 5 watt resistors in parallel - all dunked into oil. See [Ken's craftsmanship](#) and

download his complete construction .PDF using the hyper-text link. For acquiring resistors, there is a perfect [eBay Store](#) resource with free shipping from China - 20 PCS 1K ohm 1000R 5W Carbon Film Resistor for \$5.59

How can you beat that? The paint can, connector, mineral oil, and local travel expenses; maybe \$15.

Tier-3: Shop the hamfest tables, net swap-n-shops, or eBay, for a nice used [Bird 8135 TermaLine Load](#) .OR. buy something new, like the [MFJ 260-C](#) dry-load unit.



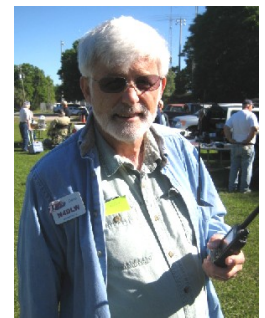
A REAL FLARE... Captured Electrons

On Mother's Day (May 8th) there was a significant Solar Geomagnetic Storm—Did you think your radio was dead, feel the burn, or see some aurora? The A-Index went crazy high above 70! Wow!

HAMFEST SPY-CAM:



Club members Rod (KC4MMR) and Dave (N4DLW) were ob-



served deal-hunting and managing tail gate opportunities at the recent area Hamfest events.



CALENDAR... *Upcoming of Interest*

- May 19: Hurricane Activation Drill**
 Brandon Regional Hospital
 Contact: Bernie (W4BGH)
- May 19: B.A.R.S. Club Meeting**
- May 20: Dayton Hamvention 3-days (20-21-22)**
[Hamvention Web Site](#)
[Live Coverage Feeds](#)
- June 01: Hurricane season begins**
- June 04: VE Testing—Amateur Exams**
 Contact Bill (WJ4G)
- June 25: Field Day 2016, 2-days (25th-26th)**
- July 04: Independence Day Parade—Brandon**
 Volunteer prospecting...
 Contact Fred Hendershot (N3BUL)
fred.hendershot@verizon.net
- July 12: Maritime Radio—Night of Nights**
- Sept 16: ARRL/TAPR (16-17-18th)**
 Digital Communications Conference
 St. Petersburg, FL



*Nothing in the mail bag
 except Dark Matter...*