Steve Jensen – KE7GXC -- AEC for special projects

Emergency power to support HAM radio emergency communications – most probably in conjunction with ARES.

Batteries come in a many varieties
As do portable generators.
Solar panels? Wind mills?
Power supplies plugged into sine wave power generators?

WHAT IS PRACTICAL?
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WHAT IS PRACTICAL?

Search eBay: 12V Briefcase Solar Panel Generator $68 + $17 s/h Nov-2008

Harbor Freight:
Batteries come in many varieties – including these surplus, slightly used donated UPS batteries:

Dynasty C&D Battery Johnson Control UPS12-370 -- AGM

UPS12-370
Valve Regulated Lead Acid Battery
for UPS standby power applications
12V 100 AH @ 20 hr rate,
12V 391 watts/cell @ 15 min. rate

FEATURES

Flame-arresting one-way pressure-relief vent for safety and long life.
Thermally welded case-to-cover bond to eliminate leakage.
Absorbent Glass Mat (AGM) technology for efficient gas recombination of up to 99% and freedom from electrolyte maintenance.
Computer-generated grid design optimized for high power density.
UL-recognized component.
Multicell design for economy of installation and maintenance.
Can be mounted in any orientation.
Batteries come in many varieties
As do portable generators.
Solar panels? Wind mills?
Power supplies plugged into sine wave power generators?

WHAT IS PRACTICAL?
Big batteries do last longer, but the weight becomes an issue.
Larger wiring size (smaller AWG numbers) is almost always better.
Safety… Safety… Safety…
Big batteries have enormous energy storage – treat them carefully and with respect.
Use plenty of appropriately sized fuses.
Larger wiring size (smaller AWG numbers) is almost always better.
Safety… Safety… Safety…
A monitor caught fire at a well known UK company’s test lab…

Electronics do fail, generally if UL / CSA / VDE recognized --- this sort of failure will not occur.
We’ve all heard of the flaming Dell laptop lithium battery problem a couple of years back.
Remember, if power supply capacity is small, then operate briefly each hour or each half hour.
Glossary of terms

- **AWG – American Wire Gauge** (bigger is better to a point. Flexible welder’s cable in a Sept-2007 QST magazine article)

- **Deep Cycle – sealed, un-sealed**
  - Sealed – non-spillable, vented. Does it leak?
  - Non-sealed – liquid sulfuric acid, require water maintenance – and ventilation!

Steve Jensen (KE7GXC), Asst. Emergency Coordinator, Clackamas County, Oregon ARES
Glossary of terms

- AGM – Absorbent Glass Mat technology
- GEL CELL – non-liquid electrolyte / acid
- Lithium Ion – Li-Ion
- Nickel Metal Hydride – Ni-MH
Battery Types

Types of lead acid batteries used by ARES:

- **Gel Cell**
  - Sealed. Can be mounted in any orientation
  - Have emergency vents

- **AGM**
  - Can be mounted in any orientation
  - Have emergency vents
  - Some are safe for air transportation as per IATA/ICAO A67
  - Some are classified as non-hazardous, non-restricted for surface transport material

Steve Jensen (KE7GXC), Asst. Emergency Coordinator, Clackamas County, Oregon ARES
Battery Types

- Lithium Ion – Li-Ion
- Nickel Metal Hydride – Ni-MH
- Nickel Cadmium – NiCad’s no longer in favor
- Conventional liquid acid batteries (i.e. automotive, etc.)
- Dry cells

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How much power for how long

- Power input is radio amps X radio volts
- Simple receive estimate is 1.0 amperes
- Simple needed power is 3 X transmit power
- How many hours of operation?
- Continuously?
- On the quarter hour for five minutes?
- LED lighting?

Steve Jensen (KE7GXC), Asst. Emergency Coordinator, Clackamas County, Oregon ARES
Radio power requirements

- Yaesu FT-1500M: 13.6 Volts DC
- 0.6 Amps receive
- 3 Amps transmit – 10 watts RF power
- 8 Amps transmit – 50 watts RF power

- Yaesu FT-9900
- 0.5 Amps receive
- 8.5 Amps transmit – 50 watts RF power

Steve Jensen (KE7GXC), Asst. Emergency Coordinator, Clackamas County, Oregon ARES
Radio power requirements

- Yaesu VX-170 2 meter HT
- 13.6 Volts DC
- 250mA receive
- 1.5 Amps transmit – 5 watts RF power
Power Requirements

- Yaesu FT-1500M: 13.6 Volts DC
- 0.6 Amps receive = 8.16 watts
- 3 Amps transmit - 10 watts RF power = 41 watts
- 8 Amps transmit - 50 watts RF power = 109 watts

- Duty cycle 10% transmit 90% receive?
Power supplies are not battery chargers but will maintain the battery charge.

Depleted batteries can draw huge amounts of current – especially at the start of recharging.

I showed a 1.5 Amp truck turn signal light as a current limiter.
Important notes: Battery type, Amp Hour rating, charge amps rate, float charge voltage.
How big a battery?

- Werker battery is 80Ah

- Charging -- Charge the battery after every use. Running this type of battery down completely rapidly decreases the battery life. Use the charger specifically designed for your type of battery.

- Do not use an automotive or wet-type charger on sealed gel batteries.

- Maintaining -- Always store your battery fully charged. A topping charge should be applied every six months to help keep the voltage from dropping. It is best to store the battery in a cool, dry place and disconnected when not in use. Avoid extreme hot or cold temperatures when storing.

- Werker WKA12-80C/FR 12V 80AH SLA AGM battery recommended float: 2.28 volts per cell * 6 = 13.68 volts

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Charging Batteries

- Must supply the battery with 13.5Vdc to 13.7Vdc with VERY low AC ripple
- Must limit charge current
- Must limit discharge to voltage specified by mfg.
- Batteries are often labeled with specs.
- Review mfg. specs on mfg. web site
- Use newer multi-charging mode chargers
- Modify -- Astron power supply used for floating battery. Or use isolation diodes to stop reverse current damage.

Steve Jensen (KE7GXC), Asst. Emergency Coordinator, Clackamas County, Oregon ARES

If you do not know or understand what to do speak with other club members!
Charging Batteries

- CARES recommended chargers:
  - Japlar-Schauer 12v 5 Amp Charger, Model: JAC0512P, $80 + s/h BatteryStuff.com

Allows recharge of the 80-100 Amp hour AGM batteries in 24-30 hours

www.batterystuff.com/battery-chargers/12-volt/gel-cell/BM12248.html

BatteryMINDER 12 Volt 2-4-8 Amp Charger/Maintainer/Conditioner now including FREE Battery Temp Sensor!

Part: BM12248
Price: $109.00

Dimensions: 5.5" L x 5.5" W x 2.25" H
Actual Weight (lb.): 2.2
Shipping Weight (lb.): 4
Output Banks: 1
Max Current, During Bulk Charge: 8A
Absorption Voltage: Variable
AC Input Volts: 120 V
AC Input Volts Freq.: 50/60 Hz
AC Input Volts Range: 90–140 V
AC Input Amps: 1.8A
Desulphation Pulse: 100 +/− 10 hz
Charging Batteries

- CARES recommended chargers:
  - Noco Genius 12v 3.5 Amp Charger, Model: G3500, $60 from Batteries and More in Molalla, OR

Allows recharge of the 80-100 Amp hour AGM batteries in 24-30 hours

$60 (Jan-2012)

www.facebook.com/batterieandmore

Available from:
Batteries and More
704 E Main St. (just to the east of downtown a few block)
Molalla, OR
503 829 4060
Charging Batteries

- CARES recommended chargers:
  - Deltran Battery Tender 12v 1 Amp Charger,
    Model:021-0156 (AGM), Model: 021-128 (Gel)

Allows recharge of the 80-100 Amp hour batteries in 100-150 hours.

The model 021-128 that G.I.Joes stocks is has a voltage of 13.2 for Gel Cell batteries. $50

The model 021-156 has a voltage of 13.4 for AGM batteries. $60

I have not yet purchases one of these for my testing & evaluation – but others in CARES have.

Battery Tender Plus Gel 12V 1.25A Battery Charger - Item number: DBT021-0156

p/n 021-156  float voltage is set at: 13.4 vdc

The Battery Tender Plus Gel 12V is a desktop, portable, 1.25 amp battery charger that is designed to fully charge and maintain gel and deep cycle batteries at proper storage voltage without the damaging effects caused by trickle chargers.

Primary Applications: AGM and Gel battery, deep cycle batteries, RV, Golf Carts & general use. Boats, Watercraft & outdoors, specialty, shop, industrial & Multi-Vehicle chargers & accessories.
Trickle charger only keeps a fully charged battery – fully charged – does not recharge a drained battery.

Harbor Freight -
www.harborfreight.com/cpi/ctaf/displayitem.taf?Itemnumber=42292  $7 --- NOT RECOMMENDED!

Harbor Freight -
Includes a battery charger and features automatic power switch over….
To use with Gel Cell or AGM batteries, from the PG40S manual:

“Note: Always use an accurate digital display voltmeter to assure accurate readings.”

**Gelled Cells**

To achieve optimum battery charging, the power supply should be adjusted to 14.10 volts dc. The charger will now permit the battery to reach a peak voltage of 13.8 volts during the peak voltage cycle. The float state will remain at 13.5 Volts.

**AGM Cells**

The charger can also be configured for an AGM type sealed battery. But to do this precisely, the power supply should be re-adjusted to provide 14.50 volts. In addition, a jumper must be installed at J1 inside the Super PWRgate. Take the top cover off. The small blue jumper block should be lifted off the pin and re-installed shorting out the two pins. The charger will now permit the battery...
Testing/Discharging Batteries

- The best tool on the market for the HAM is the West Mountain Radio battery automated tester!

- Must limit discharge to voltage specified by mfg.
- Load cells -- built from light bulbs?
- Voltmeter monitor?

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A great tool.
Wiring, Fusing and Isolation

- Fuse VERY close to positive terminal.
- Insulation boots at the battery terminals.
- Must have current limited power supply used for charging battery.
- Use large multi-strand wire (low AGW #)
- Heavy duty ring terminals
- Heavy duty fuse holders.
- Safety, safety, safety.

Steve Jensen (KE7GXC), Asst. Emergency Coordinator, Clackamas County, Oregon ARES
Wiring, Fusing and Isolation

- CARES recommended designs

Upper right – DCPwr.com - Power Splitter $21 + s/h
Lower right DCPwr.com – PowerCube $150 + s/h

Left – CARES design: $20 in parts


part number: 5709R  4 - 8 Gauge, Right Garden Tractor Protector, terminal cover - Positive $1.98
part number: 5710B  4 - 8 Gauge, Left Garden Tractor Protector, terminal cover - Negative $1.98

Radio Shack 30Amp in-line blade ATC fuse holder, 10 GA wire with weather boot. Part number 270-1234 -- $2.69
Wiring, Fusing and Isolation

- CARES recommended designs

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Wiring, Fusing and Isolation

- CARES recommended designs

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Wiring, Fusing and Isolation

- CARES recommended designs

CARES design: $20 in parts

5719B $2.60 -- PERFECT for the Werker batteries
5719R $2.60 -- PERFECT for the Werker batteries

Radio Shack 30Amp in-line blade ATC fuse holder, 10 GA wire with weather boot. Part number 270-1234 -- $2.69
Inverters, Converters

- Inverter – converts DC power to AC
  Q: Why are they called inverters?
  A: Originally converters were large rotating electromechanical devices. Essentially they combined a synchronous ac motor with a commutator so that the commutator reversed its connections to the ac line exactly twice per cycle. The results is ac-in dc-out. If you invert the connections to a converter you put dc in and get ac out. Hence an inverter is an inverted converter. For more information about such converters see http://www.nycsubway.org/tech/power/rotary.html

- 12, 24, 36 or 48 volts DC are common inputs voltages
- 120 VAC output
- Be sure which before connection…….
Some equipment will not operate with non-sine equipment.
Some equipment may “smoke” when powered with a non-size wave power source.
Radios, especially HF radios may not like non-sine wave inverters operating in the area.

Reference: Please read the articles regarding inverters in the April-2009 QST magazine!
Some equipment will not operate with non-sine equipment.
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Radios, especially HF radios may not like non-sine wave inverters operating in the area.
More Information…

- Other training sessions ??
- Consulting services, other sources
- ARRL Handbook 2006
- ARRL Emergency Power Handbook
- [www.BatteryUniversity.com](http://www.BatteryUniversity.com) – recommended by ICom support tech.
- [www.pcguide.com/ref/power/ext/ups/funcOutput-c.html](http://www.pcguide.com/ref/power/ext/ups/funcOutput-c.html)
- QST Sept-2007

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If you do not know or understand what to do speak with other club members!
Incandescent light bulbs are one of the oldest current limiting devices which are very useful to limit the initial charge current when charging depleted batteries from non-battery charger sources.
In closing

- Practical use of surplus batteries
- Practical charging equipment
- Questions….

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