CERT and Emergency Communication Basic Battery Box

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This Project is intended to provide CERT, EmComm teams and amateur radio clubs with a basic low cost Emergency Battery Box project that is simple to build and requires minimal tools. The article is designed to inspire a few ideas on what is possible by providing a Club/ Group activity that all members can participate in. The building process provides the builder with both comradery and pride of ownership in building their own (emergency) equipment (the fundamentals of Amateur Radio).

The battery Box is a quick, fun and inexpensive project for individuals and groups. If you have the components, the build can be completed in just a few hours or an afternoon. You start with the basic box and add your accessories and ideas as you go. The ultimate project you decide to build is determined by the skills of the group and your own imagination.

This project is not the high-end Mega EmComm box that many amateur radio operators often build! It is not designed to replace critical pieces of equipment either, but to supplement them. This project is designed for most people who want to be better prepared, and may not have the resources to build one of these so called Mega EmComm boxes.

Some of the advantages of the Battery Box project are;

1. The box is easily transported in the back of your car
2. It can be installed in your home/office
3. It can easily be taken in the field for EmComm or QRP operations.

A single box can provide limited emergency power during critical times but if the boxes are connected together the user can effectively add more battery capacity and air time when needed.
The unit is capable of supplying emergency 12 volt DC power in the field to charge most phones, HT radios, small HT repeaters, mobile radios operating on low power (QRP), and assorted led lighting.

A well-constructed EmComm box can provide temporary power for those running HamNet Wi-Fi Mesh Nodes, etc. What type of box you decide to build is based on your resources, skills and creative imagination. This article primarily focuses on building on the Cheap, building more Basic boxes, and for those that can afford to build the Cadillac box! The foundational design becomes the building block for the other designs. It only differs in the type of accessories that you decide incorporate.

Key advantages of this battery box design is that it can be customized, expanded, added on to as you need which makes it affordable and easy on your resources. The recommended procedures for building the different types of boxes are the same, but the addition of optional accessories can increase the unit's functionality and overall cost of the project.

An important consideration is that this design also lends itself to incorporating different battery sizes and types based on budget and availability. The build also attempts to incorporate a simple design to allow for quick battery replacement and for future upgrades potentially to the new LiPo4 light high capacity batteries (see Cadillac EmComm boxes).

The Build

I wanted to build a quick, fun and inexpensive project that can be shared with others and that was one of the primary reasons why I designed the box. It provides emergency 12 volt DC power in a small light-weight waterproof case. Various types of batteries are plentiful and often recycled batteries can be found for free or for just a few bucks.

The building process has been simplified for non-technical people. The build begins with readily available 7 ah AGM UPS batteries which are inexpensive and available in most electronics surplus stores or from an older UPS unit. Another source of batteries may come from larger UPS systems. Depending on the type of UPS system if and when a battery pack fails there are often still a few usable batteries remaining. The 7ah battery which is typical in these UPS packs is a deep cycle battery which lends itself extremely well to these smaller types of projects.

Figure 1. Cadillac Box

Figure 2. Basic Box

Figure 3. Basic Box with USB Charge Adapter and Phone Cable

Section I

Safety

Battery Safety is an important consideration before you get started!
For example:

- Never disassemble a battery under any circumstances. The materials in a battery are often toxic and can cause severe burns and can damage your clothing.
- **Red wire goes to the Positive**
- **Black wire goes to the Negative**
- Never use a fuse larger than one that is rated or recommended for this project
  (Keep some spare fuses in your box)
- Do not short circuit a battery by crossing the positive and negative terminals as you can damage the battery and other electrical equipment components. It can also cause burns and/or injury to you.
- Never throw batteries into a fire as they can split, cause toxic fumes and leak acid.
- Don't reverse the polarity of the battery or you can damage your equipment and the battery.

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- Don't use old and new batteries together. This can degrade the batteries.
- Always charge the battery at the correct voltage and amperage after use. Don't over-charge the battery as this can damage the battery and cause it to leak. Follow the charging procedures from the manufacturer.
- Store batteries in a sealed cool dry place when not in use (battery box).

Now let's have some fun!

Section II

Battery Box Construction

This project is based off of the readily available (used but in good condition) 7 ah (amp hour) AGM UPS batteries and a plastic 30 cal ammo box available at most Harbor Freight stores or online at www.Amazon.com . The 7 ah AGM battery's typical size measures 5.9 x 2.5 x 3.7 inches which is a good fit for this small (30 cal) Ammo box.

Building the Basic Box

- Place battery box on a sturdy table
- Inventory your materials from the build sheet
- Carefully remove the lid from the ammo box and place it to the side

Figure 4 Empty Ammo Box

- Measure about 5 inches from the front handle and mark the bottom of the battery box
- Install two cable tie mounts on the bottom of the ammo box or if you are installing a nylon strap hot melt glue the strap to the bottom of the box
- Insert the reusable tie into the mounts before securing the foam pad
- Use hot melt glue to install the foam padding on the bottom of the ammo box to hold down the nylon strap/ tie wrap and to protect the battery
- Glue some ½" foam on the front of the box by the handle

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Figure 5 Front Battery Foam Pad

- Insert the battery in the box and tighten up the tie wrap or nylon strap
- Place the foam padding on both sides of the box
- Cut ½ inch foam for the front of the battery and hot glue this to the foam on the side of the battery

To continue Basic Box Build proceed to Section IV

Building the Cadillac Box

- Place battery box on a sturdy table

Figure 6 Empty Ammo Box

- Inventory your materials from the build sheet checklist (see below)
- Carefully remove the lid from the ammo box and place it to the side
- Measure up about 5 inches from the front and mark the bottom of the ammo box
- Glue nylon strap, with the clips, in the bottom of the ammo box about 5” from the front. (pic)

Figure 7 Glue Battery Hold-down Strap

- Measure the inside of the ammo box and cut piece ½" dense foam to fit the bottom of the ammo box to provide support for the battery.
- Drape the battery straps over the side of the box while you install the foam pad
- Hot glue this foam (with straps underneath – see image below) to the bottom of the battery box and place the battery on top of the foam until the hot melt glue sets.

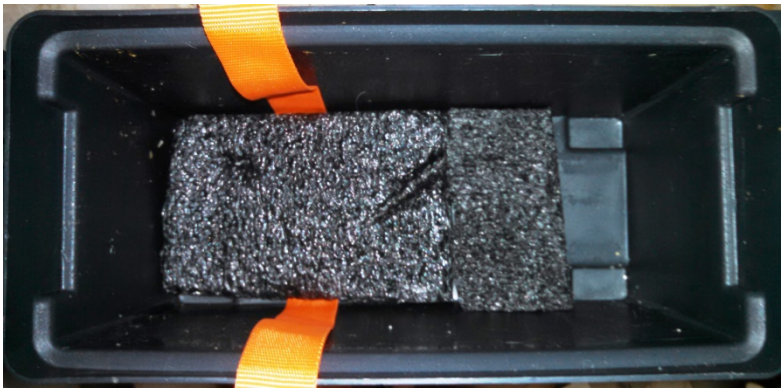

Figure 8 Glue Down Bottom Foam Padding

- In an effort to protect the battery from damage and side to side movement measure and place ½ inch foam pad on the interior front side (closest to the latch) of the ammo box.
- Hot melt glue this to the front interior side of the box

Figure 9 Installing Back Foam Padding

- Measure and cut two ½" pieces foam one for each side of the battery to secure it into the box

Figure 10 Installing Side Foam Padding

- Cut one ½" foam for the front of the battery

Figure 11 Glue in Front Foam Padding

Section III

- Select the terminal block (or similar) as indicated in the parts checklist. Carefully remove the clear plastic cover from the terminal block

Figure 12 Terminal Strip

- Using a screwdriver loosen the 8 terminal screws on one side of the block
- Select red bridge jumper clips and install the red jumper clips on the left 4 terminal screws and tighten them down (see image below)
- Then install the black jumpers clips on the right 4 terminals screws and tighten them down (pic)

Figure 13 Terminal Block with Bridge Jumpers

- Apply a small dab of hot melt glue on the bottom of the terminal block enough to install it to the center of the top of the interior of the ammo box. (pic) This allows room for connections on both sides of the terminal block and enough room to insert additional power accessories.

Section IV

Installing the Power Connectors

- Now set the battery box lid on the table on top of a block of wood.
- Now tape the template (See Template Section)to the top of the battery box and use it to mark the location of the 12v power jack
- (Option) Meter, USB Charger and Anderson connections (plus any optional devices)(pic)

Figure 14 Drilling Holes for Accessories

Note: You should mark the potential placement of, but don't drill the extra holes required if you are not going to be installing the additional accessories at this time. This will maintain the box's moisture resistance until which time you modify the ammo box. Once you're ready to being installing the components you have on hand:

- Using the 1/8" drill, make a pilot hole for each device location you will be installing. Do not drill extra holes if you are not installing the other devices.
- Using the step bit, drill a hole in the lid for the power jack and clean up any debris with a razor knife

Figure 15 Step Bit for Drilling Holes for Accessories

- In the example above, make a second hole for the Anderson connectors (optional)
    - Optional: Mark and install the triple hole face plate on the top of the box.
    - Optional: Drill the 3 holes for the volt meter, USB charger, and 12v power outlet
    - Optional: Drill a hole for the power switch to power the volt meter and USB charger
- Insert the 12v power socket in the box lid and tighten the locking ring.
- Insert the Anderson module and tighten the locking ring, the pins and wires will be installed later
- Insert the optional volt meter, USB charger, and power switch, for the meter and USB charger, into the lid and tighten down the locking rings.

Figure 15 Box with Accessories Installed

- If any of the connector housings are loose, apply a little Hot Melt Glue (or silicone) to seal and secure the housing in place

Wiring Instructions:

- Gently place the lid back onto the battery box
- Push on the precut and terminated red wire into the 12v power jack and attach the wire to terminal 1 on the red terminal block.
- Insert the precut and terminated red wire to the Anderson connector and attach the wire to terminal 2 on the red terminal block.
- Push on the precut and terminated Black wire to the 12v power jack and attach the wire to terminal 5 on the red terminal block.
- Insert the precut and terminated Black wire to the Anderson connector and attach the wire to terminal 6 on the red terminal block.
- If you are using the USB charger and Meter:
    - Connect the switch red wire with 2 connections to the + side of the meter and + side of the USB connector.
    - Connect the other Red wire on the switch to terminal block 3
    - Connect the black wire on the switch to terminal 5
    - Connect a black wire from the USB module to terminal 4
    - Connect a black wire from the Meter – to terminal 5 (2 wires will go to this terminal)
- Loosen terminal 6 on the black terminal block and connect the black battery wire to the terminal block and then connect it to the black, Negative -, terminal on the battery.
- Loosen terminal 2 on the Red terminal block and connect the red battery wire. **With the fuse removed** install the red wire to the red battery terminal.

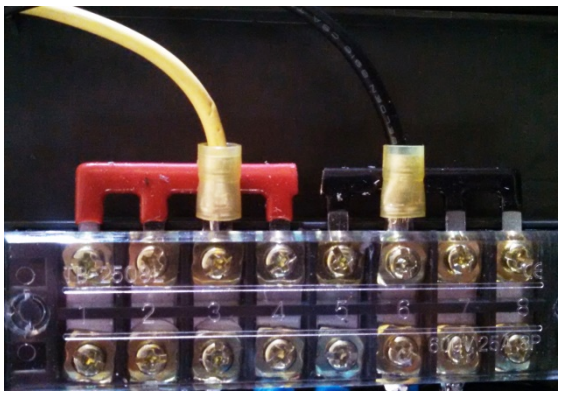
Figure 16 Attaching the Battery Wire to the Terminal Block

- **Note**: Before you insert the fuse, recheck you wiring making sure every connection is terminating into the correct position on the terminal block, and that every connection is fully seated
- Insert the fuse and check the polarity and voltage on each of the accessory jacks.
- Tape a spare fuse or two inside of the battery box

Notes:

Build Sheet

- Plastic 30 cal ammo box
- ½” Dense foam padding
- Anderson 30 amp Power Pole connectors
    - 1 Red and 1 Black Anderson 12-14 awg wire
- 12v Power plug
    - 1 Red and 1 Black wire
- Battery
    - 1 Red and 1 Black Battery jumper wire with fuse
- Terminal block 8 terminal
- Nylon battery strap with clip or reusable tie wrap
- Battery box Templates
    - Bottom box
    - Top Cover

Tools

- Drill
    - 1/8” pilot hole drill bit
    - Step drill bit
- Hot melt glue or silicone sealer
- Voltage and polarity testers
- Razor knife

Parts list

1	30 Cal plastic ammo box
1	7 Ah AGM battery
1	Piece of ½” inch foam for the bottom
2	Pieces of ½” inch foam for the sides
2	Pieces of ½ inch foam for the front and back
1	Inline ATC fuse holder 12 AWG
1	15 Amp ATC fuse
1	Marine 12v power adapter
1	Anderson power pole adapter
1	8 positon terminal block
1	4 position Red Jumper
1	4 position Black Jumper
6	Spade connectors
2	Butt connectors
2	Push on Battery connectors
6	8” 12-14 AWG red and black zip wire

Optional Items

1 Marine USB charger (recommended – Additional information forth coming)
1 Digital Volt Meter
1 Waterproof switch
1 Buck power supply
1 Solar panel
1 Float battery charger

Additional Accessories Possibilities

- Larger battery
- Larger Case / Dual Batteries
- Lithium ion Phosphate Battery
- Second 7 ah battery
- Additional Anderson connectors
- Additional 12V power plugs
- AES cable for camping and RV use
- Solar, wind, generator
- Anderson daisy chain cable

Figure 17 Daisy Chain Cable

Templates (Pending) this is a work in process

Note: All information contained in the article is *subject to change without notice.*

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