WEST MOUNTAIN RADIO

The Beacon

QUARTERLY NEWSLETTER

Summer • 2013

INSIDE THIS ISSUE:

CARC Trailer Saves the Day

Jack Sabo, N8XUA
CARC Radio Officer

Conneaut Amateur Radio Club(CARC) was founded in 1947 in the extreme Northeast Corner of Ohio. Like most clubs, it has had its share of ups and downs. Unfortunately, over the past few years, the club was on a downward trend. If left to go its course, the club could have went extinct. A major jolt, to try and get it going in the right direction again, was very much needed. In comes the trailer idea!

A few other members and I discussed putting together a communications trailer not just for Emergency use, but for general amateur radio promotion. We needed something that would bring attention to our hobby - more of an all-around communications trailer. We wanted a unit that we could take to schools, and events, to do a demonstration, or work a special event station. Fortunately between two other members, and myself, communications trailers and vehicles was nothing new.

"Team Trailer" consisted of CARC members, Ed Bihlajama KB8YSX, who still works for a local radio shop; Brian Wedekind N3KQE, a county radio tech; and myself. I have worked for various Two-Way Radio shops and built several of them over the years before moving on to a different part of the industry. In May of 2013 I put together a proposal for acquiring a trailer and the necessary accessories. Our club members were very enthusiastic about the prospect of having something that we could use to promote our hobby and our club. The motion to start the project was approved.

A lot of time and thought was put into the construction of the trailer. We wanted to make it something that could be used over a long duration event, was easy to use, and able to be changed with little modifications. So in less than two months with a lot of hard work and many hours, our trailer was roughly 80% completed. The trailer accommodates up to three operators and all the equipment is rack mounted in what used to be an equipment rack that was modified for use as shown.

CARC TRAILER

Each position is fed with a 35A Switching supply and employs the use West Mountain's Super PWRGate PG40S on each supply. The battery bank consists of (4) 70AH Gel Cells. Therefore when the trailer is connected to an AC source the batteries are being safely charged and the operating positions are given ample power. The battery box is equipped with forced air cooling and ventilation that comes on when the power supplies are in service. This not only provides cooling for the enclosed power supplies and PWRGates, it also allows any gasses that could be generated from the batteries to escape safely to the outside.

While the trailer has a 30A 4 Pole Generator Receptacle that feeds a breaker box, everything in the trailer including the LED lighting runs on DC. So having a solid DC system was a must. The trailer is equipped with the following radios: Yaesu FT-8800, Alinco DR-135 with AEA PK88 TNC, Kenwood TS-440 with West Mountain RIGblaster Advantage, Motorola MCS2000 both UHF and 800Mhz, GM300, Syntor X9000, M1225, Kenwood TK-880H and a Cobra CB. It is also equipped with a Motorola R1225 UHF Repeater with VHF remote base. It is a total communications unit. We also built a 30 foot fold over tower that stores on the top of the trailer when not in use. Below is a picture of the trailer deployed at a recent local EMCOMM training event.

With the addition of our new trailer, our club is now beginning to thrive again. With West Mountain's outstanding products we able to create a DC distribution system that are not only rock solid, but safe. With the Super PWRGate's we will get the maximum life out of our Gel Cell Batteries and never overcharge them. The RIGblaster Advantage allows us to work all the digital modes on HF with very little setup time. We have already used our trailer on two public service events and for ARRL's Field Day. Having the trailer made setup and tear down a whole lot easier than years past. Lastly we now have place to proudly display our original charter that was issued in 1947 from the ARRL. For more information on CARC please visit us at www.qsl.net/w8bhz.

To the left, the trailer accommodates three operators and the equipment is rack mounted.

To the right, the battery bank consists of (4) 70AH Gel Cells. Each employs the use of West Mountain's Super PWRGate PG40S and is fed with a 35A Switching supply.

SUMMER EVENTS

CONTESTS

August

3-4 August UHF
17-18 10 GHz & Up – Round 1
18 Rookie Roundup – RTTY

September

14-16 September VHF
21-22 10 GHz & Up– Round 2
28-29 EME Contest – 2.3 GHz & Up

HAMFESTS

August

*17 Huntsville Hamfest (AL)
31-1 Shelby Hamfest (NC)

*West Mountain Radio will be attending these Hamfests

September

*7 Radio Expo (Belvidere, IL)
21-22 Peoria Superfest (IL)

What other HAMS have said about West Mountain Radio

"Loved seeing your guys' products at SeaPac! :)"
-June 4, 2013

"Glad I could reach your technical support person to answer questions about USB connection from RB to laptop. Very helpful. Talked me into the Advantage over the RB Plus II."
-June 27, 2013

"Many thanks to WMR for your fine Nomic product and very responsive support. Best regards."
-John

"Thank you, I will be ordering the "nomic" later this week. The price is much better than the competition. Reitred and fixed income, everything helps." -Mike

"Excellent. Perfect answer. i am interested in the Advantage due to the on-board sound card."
-Larry

PRODUCT SPOTLIGHT

RIGblaster Advantage

Jay Townsend, WS7I
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I have had an interest in West Mountain Radio products since 2006 when they signed on as the principal sponsor for the RTTY Roundup plaques. I typically have built my own interfaces and keying circuits, but with all the changes in my lifestyle over the last couple of years, I wanted to get my hands on a RIGblaster Advantage. http://www.westmountainradio.com/rbadv

Army MARS (Military Auxiliary Radio Service) has expanded from the common sound card modes of MT-63, Olivia, and others, to more exotic and demanding modes like MS-DMT (Military Standard M110 modes). In MARS we use many different programs: FLDigi, DM-780, MS-DMT and RMS Express are just several that I use on a nearly daily basis. Even more modes are used in my normal ham radio activities. RTTY and JT-65 are primary modes in my home shack. Remotely I use a lot of PSK31. I thought an interface with a full internal sound-card would be the best solution and a good idea to research further and implement.

At the recent ARRL convention in Seaside, Oregon I visited and examined the various devices and wares in the West Mountain Radio display. At the show I met their support specialist, Sholto(K7TMG). He's quite the famous customer support guy, according to everyone that I visited with, who fixes problems they often encounter when hooking up digital devices. A number of locals swear he is a computer and radio guru!

I purchased the RIGblaster after the Seaside convention. My package arrived from West Mountain Radio containing everything that I would need to hook the RIGblaster Advantage to both my Yaesu FT-1000D and my Icom 706Mk2G(which I normally have on my remote site). The headers for each radio type were a breeze to install and use. A couple years ago, upon retiring, I received an Apple MacBook laptop as a retirement gift. Having the ability to support Apple OSX was another factor in my decision. The MacBook is my portable, deployable digital computer. The drivers loaded with no difficulty. (My Apple report will have to wait a bit as I have little digital software on it currently.) I have most of my digital node software on a second Apple "Bootcamp partition" which runs Windows 7. I also loaded the drivers on my main radio computer, a Windows XP model, with no problems. Loading drivers was quite easy with the well written and colored 50 page RIGblaster Advantage manual.

So the fun began! Hooked up the 4-pin Din cable to the Yaesu FT-1000D for RTTY and for the fixed audio. Ran the RJ-45 cable from the Advantage to the front Mic jack on the FT-1000D. Then I began the tests. Winmor using RMS Express was the first. I changed the PTT port to Com12, which is where the Advantage is installed to its USB com-port. I changed the Winmor capture and playback device to use the Advantage with my default setting of 90 for drive level. I used the transmit level test to adjust the Xmit level control on the front panel so that ALC was correct. Turned out to be about 9 o'clock. All was extremely easy to do and quite apparent. I didn't refer to the manual much, except on the FLDigi program, which in the past I had trouble getting it to work at times—but not with the RIGblaster Advantage.

Well in short order I had all of the modes working on all of my programs mentioned above. Also checked it out with a few of my regular ham programs like Writelog using both MMTTY and the new 2Tone program. That looks like it will take a bit more time to investigate. I did get MMTTY working with with EXTFSK on a stand alone basis. Writelog also works great with MMTTY using EXTFSK to key the radio with FSK through the RIGblaster Advantage. Then it was off to the Icom 706Mk2G - for a look at how it will all work - with the RIGblaster Advantage. I use this radio on my remote site. Just had to replace an old power supply so I had the radio on the bench to test with. Just bought a new switcher so that will cut down on the size of the package. I use Ham Radio Deluxe and DM-780 at the remote. I also use IZ2BKT for rig control and am thinking about switching to N4PY if it will control my Icom tuner remotely.

Remote operation is a bit of a challenge and I wanted to get some ideas of what the RIGblaster Advantage could and couldn't do. Looks like RTTY will be a piece of cake. All the other modes seem fine. Since HRD(on the version I was using) took over the port, it looks like I will have to use a separate serial port for radio control. At least that's what K7TMG and I decided briefly over the phone. However, I need to do more extensive testing.

When in doubt I found that the VOX operation was very useful and could get you running without nearly any problems and then after a bit of trouble shooting and configuration you could get the serial side transmit to also work. Never thought VOX would save the day. This might also be true in my remote SSB operations. Really looks like the RIGblaster Advantage has met my operational requirements in several areas for MARS and for my normal hamming.

ANTENNA SERIES

The Antenna: Part 4 of Series

UHF Antenna

Michael Martin, W9TSQ

Directional Antennas

With vintage transmitters that can be setup and dedicated for operating a single band, or with modern radios with several antenna ports, there is the opportunity to build remote controllable flexibility into your station and still use a different antenna designed specifically for a favorite band. With new radios, this could even be several fixed directional antennas for a single band or several bands as well.

Yagi Antennas: When Performance Matters

For those that want and can afford the best of the best, there is a variety of nice Mono Band Yagi Antennas. From three or four element monster beams for 40 Meters, to six element beams for 20, 15 and 10 meters. It can be all about performance. Gains from 6dB to 8.6dB are not uncommon. Another 3dB gain can be realized on top of all this if you stack and phase these flame thrower antennas. The advantage of an antenna with significant gain is that some gain is spared for the received signal. These antennas can have significant front to back ratios of 25dB or even more when the nulls in the sides are taken into account. This can be advantageous to null out that interfering station that we all dread. In most cases, a Tower and an Antenna Rotor is required to be able to redirect the antenna. The larger antennas will require several Star Guy Wire Mounts on the tower with multiple guy wires at several levels to control the stresses of tower twisting.

At lower frequencies, if you have trees in the right places, a Wire Yagi can be aimed toward your favorite part of the country.

Phased Tower Arrays: Like Those Used By The AM Broadcasters

Multi Tower Arrays are the steerable beam antennas for 75, 80 and 160 Meters. With the towers setup and spaced in a 4 Square Pattern, and with the signal phased differently to them, the signal pattern can be directed in most directions. Switchable Phasing Networks are used to redirect the signal from the array of towers. Multiple Ground Radials and Phase Matching are the keys to getting a system like this to work well. There are many technical articles published in the ARRL Handbook and real life installations publicized on the internet for antennas of this sort.

VHF and UHF Antennas: Much of the same technology, but smaller.

There is a variety of nice Yagi Antennas for the VHF and UHF bands. These antennas are much smaller than their HF counterparts and can be mounted on a rooftop tripod with a TV Grade Antenna Rotor. They are available from three to eleven elements for most any of the bands. Again, it is all about performance. Gains from 6dB to 11dB are not uncommon. Like their bigger brothers, another 3dB gain can be realized if you can stack and phase these antennas. This is very common and easy to do on the VHF and UHF Bands because of the smaller sizes. Again, the advantage of antennas with significant gain is that the gain is also there for the received signal. These antennas can have significant front to back ratios as well. 25dB or more can be realized when the nulls in the sides are taken into account, but the directivity is the best advantage of these antennas.

The Corner Reflector antenna is great for providing a tight beam of signal and a lot of front to back rejection from one fixed point to another. They are good for Point to Point, a base station control, or for talking into a distant repeater. Corner Reflector antennas are very practical and are available for 440 MHz and above.

C Band Parabolic Satellite Dishes: Beyond 440 MHz

With the many "C Band" parabolic satellite dishes being taken out of service there is an opportunity to reuse these for amateur service. The original "C Band" feed horn can be replaced with a simple 3 Element Yagi Antenna or Helical Feed. It is possible that feeds of several other types can be placed in the focal point of the dish. The result is a very directional antenna with a lot of gain. Feeds for the amateur bands in the 902 MHz to 3500 MHz range can use these former "C-Band" parabolic reflector antennas very effectively for long point to point signal paths.

ANTENNA SERIES

Patch Antennas: More Practical For Higher Frequencies

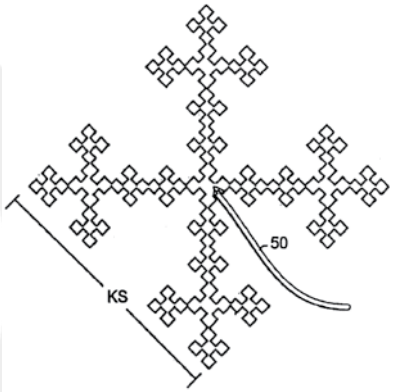
The Patch Antenna is simply a near half wavelength square plate spaced over a larger ground plane. Spacing between the plate and ground plane can be much less that a quarter wavelength. With GPS Receiver Antennas, the element is placed on a ceramic substrate along with a Low Noise RF Preamp to overcome feedline losses. A partial slot in the half wavelength plate can permit the antenna to be adjusted to resonate at two relatively close frequencies such as a Transmit / Receive pair. This technique can also be used to broaden the resonator for acceptable SWR across a wider bandwidth. There are several methods of matching into the plate that looks like a high impedance at the edges and has a current point in the middle. The 50 Ohm feed point can be found at some point between the two. Other methods using "1/4 Wave Matching Sections" of feedline can also be used. There is a lot on the Internet on Patch antennas.

Fractal Antennas: Today's Cutting-Edge Technology

A fractal antenna is an antenna of self-similar design elements designed to maximize the length, or increase the perimeter of the active elements that can receive or transmit in a given total surface area or volume. As such, fractal antennas also can have multilevel and space filling curves, but the key aspect lies in their repetition of an element pattern over two or more scales of sizes, or "iterations". For this reason, fractal antennas are very compact, and can be wideband or multiband. They are having applications in cellular telephones that cover several UHF and Microwave service bands. A good example of a fractal antenna is a space filling curve where each segment of the copper total element is just a small fraction of a wavelength. A fractal antenna's tuning and response differs markedly from traditional antenna designs, in that it is capable of operating with good-to-excellent performance at many different frequencies simultaneously. Normally, standard antennas have to be tuned for the frequency for which they are to be used, and thus the standard antenna designs only work well at that frequency. This makes the fractal antenna an excellent design for wideband UHF and multiband Microwave applications.

Log Periodic Antenna: An Early De-facto Fractal Design

The first fractal antennas were in fact "Log Periodic Arrays" with a fractal arrangement of antenna elements. Log-periodic antennas are arrays that have been around since the 1950's. They were a common form used for TV multiband antennas and were the arrowhead shape antennas that are seen on many rural homes. These were not recognized initially as having the self-similarity as an attribute of Fractal Math until 1988 when Dr. Nathan Cohen, and math as a design tool, was applied to antenna design. There is much more on Fractal Math, and its application to designing Fractal Antennas on the Internet.



Fractal Antenna

Battery Back-up for Your Shack

Steve Blankinship, AG4SO

In this project we will learn a few basics of safely installing a battery backup for D.C. powered equipment in your ham shack. Technology has evolved in both battery technology and controlling the system. While it may appear to be straight forward to add a battery backup for emergency radio operation in the ham shack there are several considerations the foremost being safety.

Objective:

Provide backup D.C. power to communications equipment with automatic switching between power supply and battery while float charging the battery to maintain a state of readiness for emergencies.

Project Requirements:

We will need a regulated power supply, battery with safety fuses, proper sized wiring, switching circuit between the battery and primary power supply, and a regulator to provide a float charge to the battery. Since I am powering more than one piece of equipment I also need a fused distribution panel; Universal connectors and the ability for quick exchange of equipment in the event of a failure or upgrade. For this I am also incorporating Anderson Powerpole® connectors.

This project while straight forward for the experienced ham may be full of unknowns for the inexperienced. Let's look at some basics for the various items we will need for the project.

Power Supply: Which should I use?

There are several types of power supplies on the market from general purpose to specialized units.

For this project we will need a fixed voltage with sufficient current capacity for the project. If you are looking at surplus power supplies make sure it is a 60 cycle power supply, the wrong frequency power supply such as a 400Hz type used in avionics can damage equipment real fast. A 50Hz will not operate well either.

We need 12V right? Well not exactly, in the specifications portion of manual for your equipment you should find the recommended operating voltage. This is normally the lowest voltage for the radio to operate correctly. Modern D.C. powered ham radios operate at 13.8V +/- 10 to 15 percent depending on the manufacture. Most mobile transmitters will not produce full RF power at 12V and can become unstable below 12V. Never go above 14V it can damage equipment.

Let's look at two of the A.C. to D.C. power supplies common to hams today: Analog: Consist basically a transformer, rectifier, regulator and filter; they are the time tested, heavy beast most of us have used for years. They are commonly used for fixed voltage applications and heavy duty operations such as repeaters.

Switching: A switching power supply generates a square wave, samples its output voltage then compares it to a reference voltage to regulate its output. It contains a good filter to eliminate internally generated spurious signals. This type of power supply is lighter since it does not contain the heavy transformer traditional analog power supplies rely on. This makes it particle for GO Kits for use when AC power is available. Be careful not to remove the cover unless you are qualified, these power supplies contain dangerous voltages inside.

Voltage and current needs:

Research the manuals of the various pieces of equipment you plan to operate with this backup system. Plan for worse case which is 34 Amps in this case, realistically I will not be transmitting on two radios at one time. This system will handle 35 Amps maximum from the power supply. I am also installing a 50 Amp safety fuse on the battery in case of a catastrophic short, we will discuss why as we talk about fusing the battery for safety.

Batteries:

Warning: *These batteries contain highly corrosive sulfuric acid, and can explode if mistreated.*

Always use caution working with high current batteries, use safety glasses, rubber gloves when handling acid and always safety goggles when making electrical connections. Keep battery in a plastic container in the shack in case of an acid leak. Never make the last connection not the battery, this could draw a spark and cause an explosion in the presence of vented gasses. Ensure you are properly charging the battery; overcharging charging can cause the battery to overheat and explode. Never short a battery it can explode.

Which type of battery to use? The standard automotive or marine led-acid was the choice for many hams since it was rugged and cheep. It required outside ventilation when it charged and regular checking of the acid/ water level.

Today's technology has made improvements; today's choice is the Valve Regulated Led-Acid Battery. (VRLA) The VRLA battery is commonly known as a sealed battery; they do not require regular service of the water/acid and vent far less gas than the old style flooded lead-acid battery. Among these are the Gel Cell and AGM batteries. They are designed for use in confined and poorly vented spaces.

In a lead-acid battery the internal reaction breaks down water, oxygen is produced by the positive plates, in a conventional flooded-led- battery it escapes into air through the vents along with hydrogen gas. This depletion of gases on is the reason for water loss.

NOTE: Use distilled water only when servicing flooded batteries, impieties in faucet water will contaminate the cells and shorten the batteries life.

VRLA batteries are really recombinant batteries this means the oxygen generated by the positive plates will primarily re-combine with the hydrogen on the negative plates reducing water loss. Gel-Cell: The electrolyte is mixed with silica dust to form a gel reducing the possibility of a spill AGM: the AGM or Absorbed Glass Mat battery has its electrolyte impregnated in a fiber glass mat separator installed between the led plates. Though these batteries are called "sealed" they always include a pressure relief valve for safety. Unlike the old style flooded battery they cannot spill their electrolyte if inverted or knocked over. VRLA batteries also contain much less acid than the flooded battery, hence their other name "Acid Starved". Check out this "AGM / Gel Cell Battery Capacity Calculator" for a fast determination of AGM & Gel- Cell battery capacity vs. load. http://www.westmountainradio.com/capacity_calculator.php

BATTERY BACK-UP

Charging:

The requirement for charge voltage varies by battery type; some chargers are intelligent and can determine the type of battery you are using, and the proper charge state needed. Some need to be manually programmed and others are dedicated to the particular battery type. For AGM 14.5V is typically for a charge and for Gel 14.1V is the norm. Either way when floating a battery, the output voltage should be maintained around 13.8V to the equipment being powered. This is why we need a charging circuit that includes a regulator.

Any deep cycle AGM or Gel-Cell that meets our voltage and current requirements will be suitable for our needs. They are available from several sources local, Ham fest and on line.

I am using a HR12-350 AGM by Energy Storage Technologies. The battery is a storage pull from a company that services UPS systems for major cooperation's. They can only keep spare batteries on the shelf for a limited time than has to discard them even if never used. Most cities have these companies and they are often willing to donate these batteries to local hams for EMCOM purposes if asked nicely. You can also purchase suitable batteries from West Mountain Radio: http://www.westmountainradio.com/batteries

Controller/Regulator:

Basically all you need to switch between a battery and power supply is a pair of switching diodes of proper voltage and sufficient current capacity configured in to an OR gate. We also want to properly charge the battery. For this project I chose the Super PWRgate PG40S.

Distribution:

There are many ways to distribute the output of the power gate to the radios. Building your own cables using Powerpole® connectors is not hard; if you are not familiar with them take a look at this link for information on how it is done. http://www.westmountainradio.com/videos

For correctly installing Powerpole® connectors with ease consider the PWRcrimp Crimping Tool. An inexpensive tool that works well. I have purchased additional dyes for use crimping RF connectors making it a more valuable addition to my Powerpole® connector kit. http://www.westmountainradio.com/PWRcrimp

I also selected the RIGrunner 4012 it has a fused 40A input and fused outputs varying from 20A to 1A. I can add additional equipment and can increase the capacity of any output by changeling the fuse sizes including the primary just keep in mind the maximum current limit of the system. For the radio connections do not double fuse by using fused factory power cables doing so will increase the delay time in protecting a circuit. Instead purchase or build non fused power cables.

Wiring:

It is important to have to proper size and type of wire for the current draw and voltage. In the US we typically use the American Wire Gauge or AWG for measuring wire size. Look on the jacket for the AWG # for example 8AWG this is the wire size. If you are trying to determine the wire gauge physically do not include the wires insulating jacket as part of the wire size. The insulation jacket thickness can vary by manufacture and intended application. The safest way is to identify by the jacket markings or the spool if one.

Should we use stranded or solid wire?

If a wire is made up of several small strands of wire instead of one large wire it has a larger surface area allowing the capability to carry more power than a solid wire. This also results in less heat dissipation of the power in the wire. It also allows more surface contact with a connection in comparison to a solid wire. It is more flexible than solid and therefore fewer tendencies for breakage from movement. This is why good automotive battery jumper cables and wielding cables are commonly made of fine stranded wire. Some stranded wire will have less and larger strands depending on the intended capability of the wire to handle a given load and physical size. In our application we are using red/black zip cord. Beware of discount wire that has fewer strands.

West Mountain Radio is a good source for quality zip cord. See their site recommendations of wire size with Powerpole® connectors. When using a wire capacity chart remember automotive and other D.C. wire is stranded and home and A.C. wiring is typically solid. Keep in mind the length of the wire run as well as the current load and of course voltage.

Here is a very useful calculator to aid in determining the correct stranded wire size for a 12v D.C. system. http://www.westmountainradio.com/cable

I have found in the ham world the size of your factory power cable will vary typically eight to ten feet in length and be of varying gauge depending on the radios current needs.

Starting to put it together:

It is good to start any installation by performing a survey of the area to be used, locate the power receptacle and identify where to locate the best places for the components such as battery, distribution panel and Super PWRgate PG40S to be installed. How long will wiring runs need to be and how you will keep them away from feet and so on. Keep in mind accessibility for maintenance, especially the battery and fuses. Use the calculator above to ascertain the correct wire sizes. I need a 3' wire between the PWRgate PG40S and battery then between the power supply and PWRgate PG40S then to the RIGrunner 4012. #16 AWG is sufficient. The manual for the Super PWRgate PG40S recommends #10 AWG for the battery wire which would give you plenty of capacity for the 40 amps it is capable of and could encounter in a recharge of the battery. If in doubt use a heavier gauge wire for safety and efficiency.

I need a six foot wire between each radio and the power gate, #14 is sufficient. For a computer Interface #24 AWG was correct for one half amps on a six foot run. Remember you can always go up in size but never go down below the load rated size for safety sakes.

I mounted the PWRgate PG40S on the top of a plastic marine battery box and the RIGrunner 4012 under my radio bench. Be sure to not create a potential short with in the box between the battery and hardware. The same goes for any hardware that might rub or puncture the battery case. There are preassembled versions of DC Battery Back-up Boxes available by following this link. http://www.westmountainradio.com/dc-power

BATTERY BACK-UP

Fusing the Battery for Safety:

I chose to use a standard automotive ATC type blade fuse for the battery. These are easy to obtain and DC rated. Resettable D.C. breakers can be used instead of fuses they are however expensive, your choice.

CAUTION: Use only D.C. rated circuit breakers.

Everything that is true for fusing A.C. circuits is true in D.C. circuits; but with the addition of one important consideration. D.C. voltages do not go through zero volts twice a cycle like A.C. voltages. What this means is they will not break a D.C. circuit as easily as an AC circuit. What happens is the current wants to keep flowing and sustain the arc that exists when a fuse blows. A fuse will sometimes have two voltage ratings, one for A.C. current, and one for D.C. current. The D.C. current voltage rating is typically lower for these dual rated fuses. Not only does the voltage not go through zero volts, but the inductive load will want to keep the current flowing whenever the circuit is opened.

An overload is an over current condition where the current exceeds the normal full load capability of the circuit and no short-circuit present. A momentary overload condition (known as in rush currents) often occur when a circuit is first initialized due to capacitors charging and/or motor-start up. This is especially common when you start up your vehicle with the radio on.

A short circuit is when a low-resistive path is suddenly created which will cause the circuit current to increase as the circuit resistance is decreased. When this occurs the current can exceed 1000 times the normal current of the circuit. When this happens to a battery it rapidly overheats, swells and can explode and or catch fire. Even if it holds the case integrity it often damages the plates beyond further use.

Remember you want to fuse above the maximum current you expect from the battery but still protect it from a dead short. I chose to use a 50 amp fuse however a 75 amp would work just as well.

Hint: keep spare fuses handy for all the values used in the system. It would be a bad day to blow one during an emergency or training net.

Conclusion:

I measured at the battery input as well as the output of the Super PWRgate PG40S. There is a good device for testing and recording parameters from West Mountain Radio. I would suggest: PWRcheck. It handles 8 display modes including voltage, current flow in either direction, wattage or amp-hours measuring 0V to 60V, 40A continuous load. I measured voltage and current at with all equipment on in receive mode as well as transmit first with individual transceivers one at a time then with both transceivers simultaneously operating in full power transmit in to dummy loads, the V/U radios in FM and the HF rig in AM mode and modulating the audio. The voltage held at 13.11V and worse case for the current was 21.6A. Add the computer interface the power demands at a half of an amp, the system is well within or needs.

Like any project this has been fun, remember such projects can be a learning experience while adding to your resources. Technology is always evolving so there is always something new to learn. I hope you found this useful.

Have fun and be safe.

If you would like to submit an article for consideration in future newsletters please contact *marketing@westmountainradio.com*

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