



The Beacon

A monthly newsletter of the Albemarle Amateur Radio Club serving Central Virginia

Celebrating our 50th Anniversary

August

2013

Club Meeting Set for Tuesday, August 13, 7:30 pm

The Albemarle Amateur Radio Club will meet in the National Radio Astronomy Observatory, 520 Edgemont Road, Charlottesville, VA on August 13 at 7:30 pm. Jim Wilson K4BAV will give a presentation on his trip to Green Bank and his discovery of radio astronomy.

The president has called a board meeting for 7 pm. prior to the 7:30 General Membership Meeting.

President's Remarks

By Bob Pattison – K4DU

No Picnic – In August

Let me begin first with the news. Our summer picnic will be in September and it will be at the Elks Club. **So do not go to Darden Towe Park on August 13th.** Our August meeting will be at NRAO and Jim Wilson K4BAV will regale us with tales of his journey to Greenbank, WV and his discovery of Radio Astronomy.

Mentors

Alan Swinger K9MBQ sent me an email a few days ago about the mentor program at the Naval Academy. Alan suggested that it would be a good idea for the AARC to emulate this program for new hams that go through our classes and pass exams at the sessions that we offer. I agree. Amateur radio has always had a spirit of “Elmering”. Creating a mentor program within the AARC makes it more intentional. It is sad to note that more than one person has passed the exam, but never gotten on the air. The goal of this program should be not just to get these folks on the air, but to be a resource in an experience that shows the many facets of amateur radio.

Preparing for Winter

While it is still warm and before winter is upon us I suggest now is the time to do the planning and the work to prepare your station for winter. Do the antennas need work? How about those ropes holding up the G5RV or the Carolina Windom, will they make it through another winter, or should they be replaced. And while I am at it, how are you set for the loss of power? What kind of shape are your batteries or the generator in? Is your shack ready for a visit this fall from a Scout Troop for Jamboree on the Air? Now is the time to make those adjustments and get things the way you want them to be. Judging from the size of some of the caterpillars I have seen in the garden we may have a hard winter coming. Be prepared!

What is your Elevator Speech?

In recent days I have been thinking about the “Face” of Amateur Radio. Who is the face of our hobby and how are we promoting it. In the business world you are either growing or dying. Amateur Radio is growing, but not intentionally. I would bet if you stopped people on the street or went into schools and asked people what amateur radio is or if they knew someone who was a ham the response would be underwhelming. It is time for some guerilla marketing. We are each the “face” of ham radio. We each need to be prepared in three minutes or less to answer the questions: Why are you a ham radio operator? Why is ham radio important to you?

Are you prepared to tell about the joy this hobby brings you or are we keeping it a secret?

Think about it. Imagine that you are alone in an elevator with someone that you know of and highly respect. He or she turns to you and says, “I see you are a ham radio operator. Why is ham radio important to you, and what do you do as a ham? The elevator door has just closed. The elevator has just departed from the lobby and your friend is getting off at the fifth floor. You have two minutes. What is your answer? By the way unlike the FCC exams, there is no right or wrong answer. The only failure is to have no answer at all.

73 de K4DU

The Beacon

The Beacon is the official newsletter of the Albemarle Amateur Radio Club, Inc. It will strive to communicate with, enlighten, and entertain the members of the club in strict compliance with the official word of the club as set forth in the Articles of Incorporation and Bylaws. The newsletter shall be published monthly on or before the 1st day of the month of issue. The deadline for submissions shall be the 25th of the month preceding the month of publication. The primary role of the publication shall be to promote upcoming activities, report past activities and accomplishments of the club and its members, carry the minutes of the preceding month's meetings, as well as, become a recorded history of the club by the archival of all past issues.

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Amateur Radio Astronomy Conference

By Jim Wilson, K4BAV

It seemed like Field Day all over again on July 14-17th. This was my first experience attending the annual SARA conference, the Society of Amateur Radio Astronomers. This conference included three days of fascinating lectures with hands on experiences at operating a radio telescope 40 foot dish antenna, and seeing first hand cutting edge designs of electronic communications equipment at the futuristic Jansky Radio Laboratory. We even got to ascend 370 feet near the top of GBT, the world's largest steerable radio telescope. This was a wonderful platform for landscape photographs!



Did you know that MRI medical imaging and cell phone technology are direct spinoffs of radio astronomy research? These innovations came from the Jansky radio laboratory at Green Bank. We were privileged to see the newest technology at the Jansky Lab, amplifiers that magnify current rather than voltage. These are called "squid amplifiers." These new receivers detect and amplify currents as low as 10

to the minus 24th amps (.0000000000000000000000001 amperes).

Fifty-five amateur radio operators attended this event, held at the National Radio Astronomy Observatory in Greenbank, West Virginia. Wives and lady friends had the option of separate daily tours to nearby interesting places such as the luxurious Greenbrier Hotel, Luray Caverns, and the home of author Pearl S. Buck.



One couple came from Germany and another from England, but most attendees came from closer places such as Iowa, Wisconsin, New Mexico, North Carolina or Virginia. In talking with these hams, I found that many were electronics engineers, some were scientists, and a few were university professors. All appeared to be intelligent and curious people who were willing to share their enthusiasm and knowledge with me.

In the historical beginning, Grote Reber, an avid amateur radio enthusiast, was inspired by an accidental discovery made a decade earlier by Karl Jansky in 1932. Jansky discovered microwave radio background, transmitted by nature from sources beyond earth.

Reber continued Jansky's work by designing and building a large home brew radio telescope in his back yard. This was the beginning of radio astronomy. A replica of the Jansky antenna is on display at NRAO as is the actual antenna built by Grote Reber. The original ham station operated by Reber is also preserved behind glass at the Green Bank NRAO museum.



What is it that amateur radio astronomers enjoy or seek to accomplish? Obviously, calling CQ into space produces no response. Thus, these folks concentrate their attention on receivers, not transmitters. These people are good listeners. These hams design and build radio receivers to monitor Jupiter, the Sun, and our Milkyway galaxy. For more details, Google radiojove.gsfc.nasa.gov. These hams also explore very low frequency natural radio emissions and space weather. For additional details, Google image.gsfc.nasa.gov/poetry/inspire and solar-centered.Stanford.edu/SID.

To allow us more detailed study, a written summary of each lecture was included for each person attending the conference, so I have more reading to finish.

These amateur radio enthusiasts inspired me to come home and build a simple radio receiver. The next time you see me, ask how long the magic lasts.

For additional information on SARA, Google radio-astronomy.org.

Minutes of the July Meetings

Board of Directors Meeting

1. Meeting was called to order by K4DU at 7:03 PM
2. It was noted that Board Minutes required approval specifically by the Board, and the minutes of the June Board Meeting were approved by acclimation.
3. The spring picnic was approved for the second Tuesday in September. The third Tuesday would serve as backup. The meeting will be held at the Elks Club. Moved N4UVA, seconded W4BXG.
4. Field Day overspent its food budget to ~\$400, whereas \$225 had been previously approved by the Board. N4UVA suggested that approval for the total amount would need to be presented to the general membership (see General Meeting minutes per KI5LLB).
5. KA4JJD requested approval for the purchase of a new roll of raffle tickets. This was approved by K4DU.
6. K4DU presented his plan for a Central Virginia Repeater Century Club Award (I assume you can

get a copy of the proposal from Bob). Discussion centered on whether to include regional non-club repeaters (approved) and whether to include contacts through the 146.730 IRLP node.

Approval of the plan was moved by W4BXG and seconded by N0WP. Approved.

7. A budget of \$250 for food for the September picnic was moved by N4UVA and seconded by W4BXG. Discussion indicated that this would likely be far more than we would spend. Approved.

8. The meeting was adjourned at 7:25 PM

Respectfully submitted
KA4JJD

General Membership Meeting

The meeting was called to order around 7:35 by K4DU. Introductions of all those in attendance came next. K4DU asked all those who organized and participated in the "Best Field Day Yet" to stand and be recognized. An ovation followed.

A program titled "Smart Meters and WIFI" by Charles Battig, K4TY followed the introductions. K4TY gave a very thought provoking talk about Smart Meters and getting off the local smart meter grid. He referred to books and articles to prove his points. He gave evidence that power meters are collecting private personal information. He believes the possibility exists for some of that information to be broadcast into the hands of robbers or others collecting personal information for reasons that might prove harmful to the persons using these meters.

He gave compelling evidence that local power companies control these meters from neighborhood offices. Some reasons the power company gives for collecting personal information about how much power is used at certain times of the day or night is: this shows the power company when the demand for power usage is the highest, this information shows where abnormal demands for power usage are being made, and this information aids power conservation plans. This in turn, cuts down on power bills to the users of the power meters, but K4TY led us to question the truthfulness of their statement.

He explained how anyone using the new smart power meter could get out of using them and that they were even dangerous to users. The WIFI signals they use to communicate between the homes they are installed and the power company could inadvertently cause serious problems to the individuals living homes using these meters. He suggested ways to replace the smart meters with meters the company must come out and read. He asks us to consider turning off the WIFI systems in our homes when we are not using it and at night while we sleep. Charles, K4TY, has sent this presentation to the club for posting at www.albemarleradio.org if they want a copy.

The presentation was followed by a general business meeting. K4DU asked for a motion to approve the minutes of the previous meeting as published in the AARC Beacon. The motion was made and seconded. The motion passed unanimously. A motion was made by Joe W2PVY to approve applications for membership for Rodney Van Ausdall, KK4SHM, David Webber, KK4SHJ, and Andrew D. Wiley, KK4SHO. The motion was seconded by Michael KA4JJD and passed unanimously.

The club took up the matter of the additional monies spent on food for Field Day and approved a motion to reimburse the additional money spent. (See detail in the board minutes for the amounts.) Bill Pond N0WP provided an update on the ongoing work on the repeaters. Mostly we have to wait for some dry weather to get up to Marshall Manor. Joe Flamini W4BXG is looking for more bodies for the upcoming bike race. Jim Wilson K4BAV provided some additional detail on the promotional effort on Field Day. It was a job well done.

K4DU reminded everyone that the picnic will be held in the September time frame to take advantage of cooler weather. Michael conducted the raffle and the meeting adjourned at about 8:47 pm

(Presidents comment – Kudo’s to Linda KI5LLB for taking notes and substituting for Teri KT4UO who was enjoying the beach!)

Jamboree on the Air

Scouting’s 56th Jamboree on the Air (JOTA) 2013 takes place the weekend of October 19-20, from 0000 local time Saturday to 2400 local time Sunday. Held each year on the third weekend of October, JOTA provides an opportunity for members of the [Boy Scouts of America](http://www.bsa.org) to experience Amateur Radio firsthand, perhaps planting the seed for a lifetime of hamming. JOTA is the largest Scouting event in the world, with nearly 750,000 Scouts participating from 6000 stations in 150 countries around the world.

Not a contest, JOTA’s goal is to foster Scout-to-Scout communication across borders. “The idea is to contact other Scout stations and allow as many Scouts as possible to talk to other Scouts and learn about who they are and what they are doing,” the BSA says in its [JOTA guidelines](http://www.bsa.org), which offer suggested frequencies.

Licensed mentors often open their stations to Scouts on JOTA weekend, serving as control operators. Radio operation will be on 80 through 6 meters and 2 meters and 70 centimeters FM simplex, all modes. Through its Radio Scouting sponsorship, Icom America is providing stations for JOTA and other Scouting events, including the loan of five stations that will be on the air for JOTA 2013. In 2012 more than 18,500 US Scouts took part in JOTA from more than 200 stations, up by nearly 500 percent from a year earlier.

(Courtesy of ARRL News)

Classified Item Listing

To place an item in the Classified Listings just send an email to k4rka@juno.com

= NEW SWAPFEST ITEMS were not available for this issue however, the Swap Meet listings are always available on the Club Website: www.albemarleradio.org

Much Ado about Cell Phone Chargers

By Welsey Epperly, K4WLE

I can never find my cell phone charger when I need it. I have many. Some plug into the wall, and others plug into a cigarette lighter outlet. But what I really wanted was one that just charges my phone, tablet, small computer...whatever from a 12 volt battery or power supply using Anderson Power Poles. Oblivious to the fact that Powerwerx was selling just such a product; I set out to make one myself. I wanted to do two things... (1) learn how USB chargers worked, and (2) learn how to make a printed circuit board.

I learned the basics of why sometimes USB chargers do not work for certain devices and the basics of what is required for a USB charger from the following:

Ada Fruit: <http://learn.adafruit.com/minty-boost/icharging>

Wikipedia: <http://en.wikipedia.org/wiki/USB>

Basically all that is required is a 5 Volt supply and a couple of resistor to form a voltage divider circuit. So I quickly ordered some parts, waited, and built a prototype circuit using a high current (1.5 Amp) 7805 series linear regulator. I basically followed the example circuit from the datasheet, calculated some resistor values that would give me the voltages needed on the data pins of the USB connector, and soldered it up. (Look at the Ada Fruit and Wikipedia articles above for the USB interface specifics.)

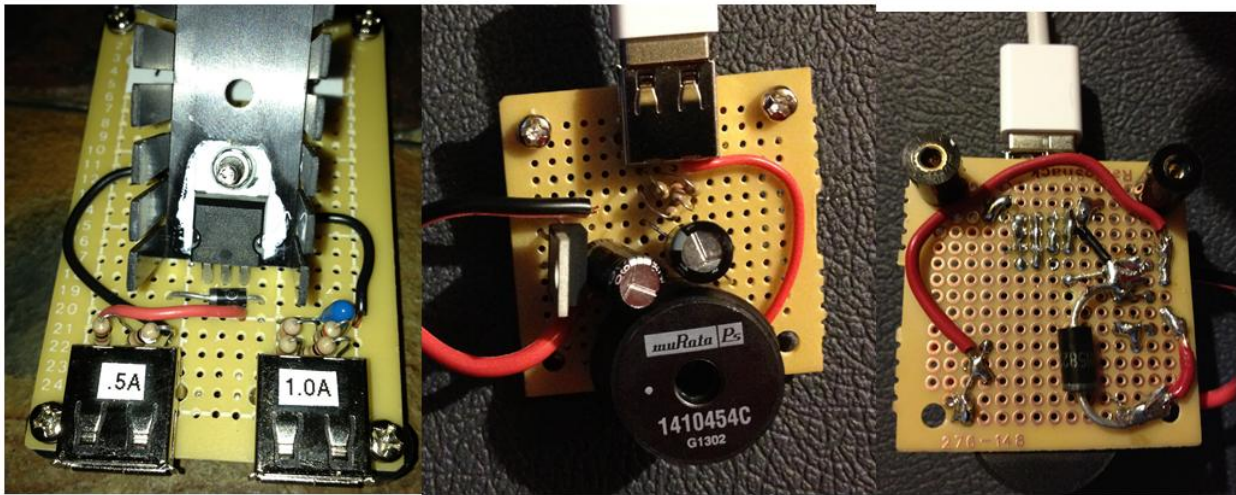


Figure 1 Linear Regulator, Switching Regulator top, Switching Regulator bottom Prototypes

Believe it or not it worked. It charged my cell phone, my Kindle Fire tablet, and powered my Raspberry Pi computer. But it was running kind of hot...I forget the actual numbers but in the 160 to 180 degree F range with the heat sink seen in Figure 1. Obviously this was not practical, and an alternative solution would need to be found. Meanwhile I had learned via a recent electronic Podcast (the Amp Hour) about an organization in Oregon that makes printed circuit boards for \$5 per square inch. This was unheard of to me. I always wanted to make my own circuit boards, but the design software was thousands of dollars and the boards typically cost \$300 to \$1000 to have the first one made.

So I investigated a bit further and found that the website processed native files from Eagle Cad PCB layout software (or generic Gerber files from other software), and Eagle Cad had a freeware version that could be used to design a small two layer board. So I downloaded the software from the Cadsoft USA (Website associated with the Distributer Newark. Cadsoft is a German company). I tried to use the software, but the process was slow and confusing. I then went to the source of all know-how...You Tube. There were several videos posted from Jason of RPC-Electronics on how to use Eagle Cad. Jason (KE4NYV) I had met in person several times before; once at a TAPR conference and I think at an ARRC event or two. His how-to videos can be found at the following address: <http://www.youtube.com/user/rpcelectronics>. Eagle Cad has a very large library of components, and Newark provides additional component libraries for many of the parts that they sell on their Element14 website. However, even with all the devices in their libraries, I still find myself making my own components in the software by capturing the schematic layout and physical dimensions from the manufactures datasheet. In general PCB design takes time and requires everything to be perfect....but there are you tube videos out there that can show you how to do it.

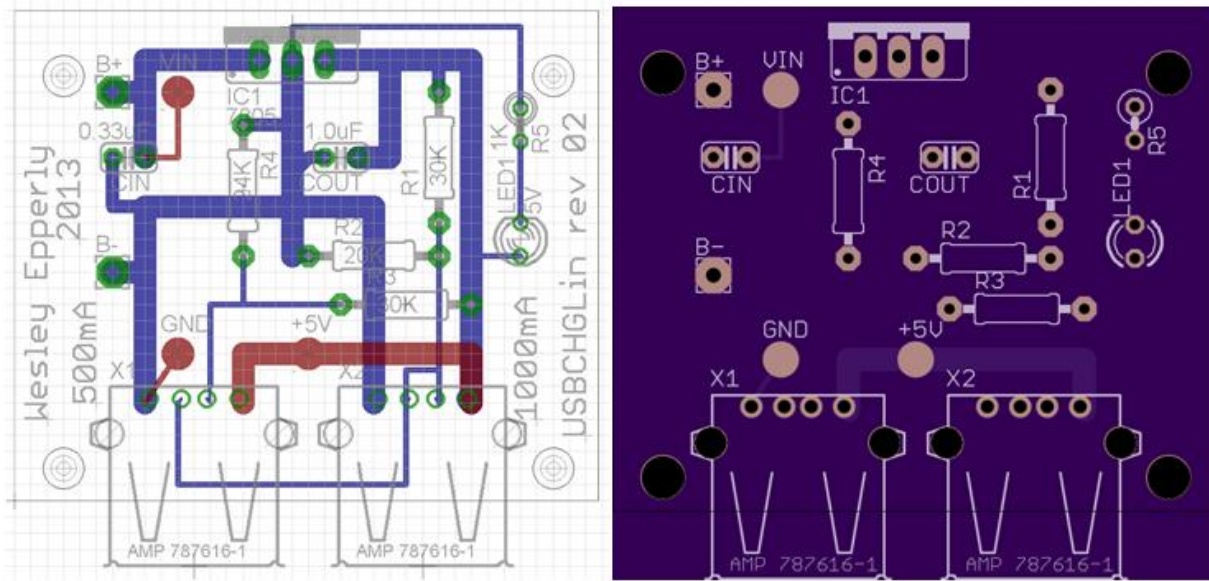


Figure 2 Eagle Cad PCB layout and OSHPark PCB Rendering

After watching several instructional videos, patience, attention to detail and failure... I had what looked like a Printed Circuit Board (PCB) design. So I then went to the <http://OSHPark.com> to create an account, and uploaded my files. The automated software provided me with detail renderings of my design and stated that it was approved for manufacture... and the cost for three boards was \$13.60 with free shipping. Okay, for that money I had to have these boards made; even if the result would not be usable because of the heat it generates. I would at least learn from the process, and see what I did wrong before I attempt a bigger, more complicated, and more expensive design. The operator of OSH Park wrote some software that combines multiple PCB designs, into one giant panel that is sent out to a fabricator in the United States to build. When the panel comes back from the fabricator, they snap the boards out from the larger panel and ship them off to their respective owners. I suspect they are doing this more as a service then to make money; but who knows. The boards are double sided fiberglass, solder masked, 1 ounce copper, gold plated solder pads, with silk screening on one side. I have since found cheaper deals on the internet... but not one with all of these features.

Meanwhile I needed to find a better more efficient design that could charge/power several devices at once and not feel like a nuclear pyre on my desk. I looked into switching regulators, and somehow stumbled across the TI simple switcher series of switching regulators. I used their example circuit from their datasheet, drew up the circuit in Eagle Cad which resulted with Figure 3.

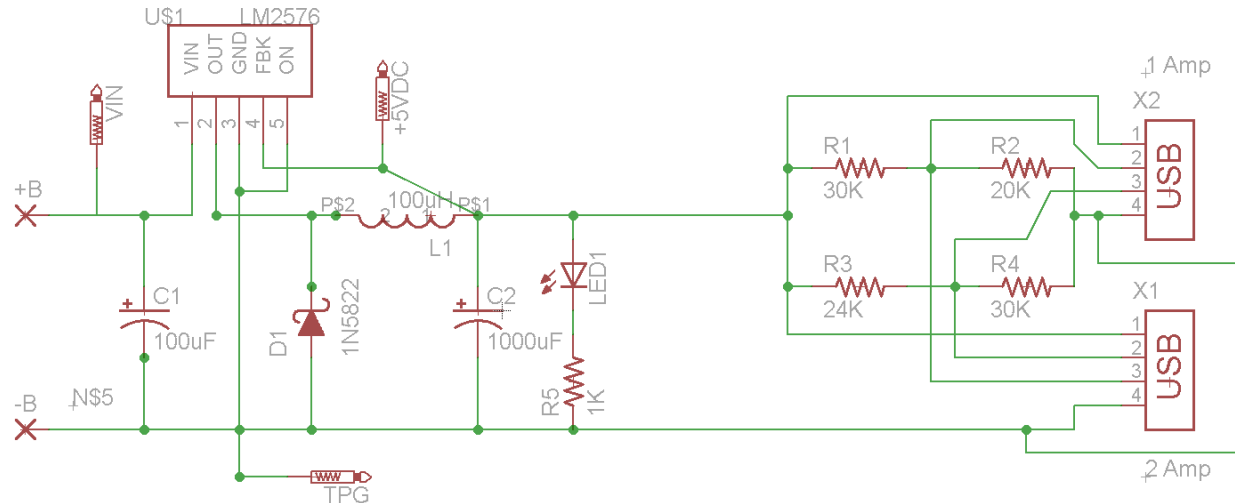


Figure 3 TI Simple Switcher based USB Charger

I then laid out a PCB that would fit an inexpensive case, and uploaded the design to OSH Park for manufacture. Being a bigger design this PCB cost me \$26.70 to have three made. A couple weeks later I got the boards in my mailbox. The board, populated with components, is shown in Figure 4.

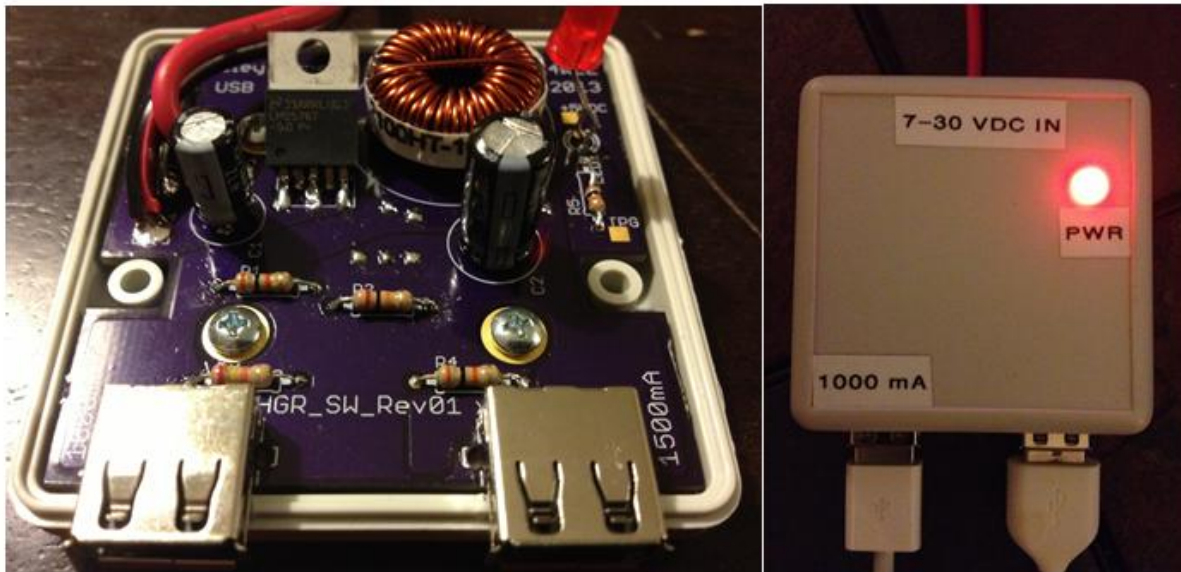


Figure 4 Final USB 3A Charger

I learned many things in the process of designing this project. The output capacitor of a switcher power supply is burdened with high ripple current (over 1 amp in this case). Initially I grabbed any-old capacitor, and later learned that it would eventually fail at high loads due to the ripple currents imposed by the regulator switching. I was not able to measure the ripple voltage or noise on the output of the power supply. After reading various white papers from power supply manufacturers I have learned that I need to use a capacitor coupled, impedance matched oscilloscope probe to measure the noise (my next project). I also should have added provisions for a ceramic capacitor in parallel with the large output filter capacitor to better reduce what HF noise is generated by the circuit (IE trick the noise into being shunted to ground with a low Equivalent Series Resistance (ESR) capacitor).

There are numerous improvements that could be made to this design, and there are plenty of more things for me to learn. I have done some testing, but have not pushed it to extremes yet. I have load tested it to 2.5 amps for 60 seconds, but had to stop the test due to my test load getting too hot. Under normal conditions it charges both my iPhone and my Kindle Fire at the same time with no observed issues. This was a fun little project where I got to learn about switching power supplies, USB interfaces, and PCB design. I also have the gratification of designing and building something myself that I use on a daily basis. Sure I spent more than \$45 in the process of designing and building this. It would cost me about \$20 each in parts to build these in quantities of three, but less than \$7 each in parts for quantities greater than 1000. But I guess I already learned in History class about Henry Ford and the power of mass production.

I have omitted many details regarding the circuits and things that I learned from this process. Feel free to contact me if you have any questions or comments regarding this project at K4WLE@arrl.net

Elected Leadership 2013

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