2025-01-14 Hamlet Net - Power Supplies

Announcements:

- Test Session Info
    - Next VE session is January 25 in the Clover Building at the Boulder County Fairgrounds, and starts at 9 am. It is a PVET session, so there is no fee to test. For more info, and to pre-register, see the Licensing/Testing page on the club web site, https://w0eno.org/, under the Education menu.
- The antenna building event this past weekend was attended by 8 people. We got the tape measure elements constructed, the PVC booms put together, and some of the coax cut. We ran into a snag with the SMA connectors and some RG-58 with a stranded center conductor. There may be another session to finish the kits, if needed.
- Antenna takedown event on Feb 1 in Lafayette to remove some antennas for a silent key. There's a signup sheet for this event on the web site.
- NCARC's Winter Hamfest is coming up this Saturday, January 18th at the Larimer County Fairgrounds and Special Events Center from 8am to 1pm. Admission is $7. They've got some really good raffle prizes this year - an ICOM IC-2730A and a Yaesu FTM-300DR dual-band mobile radios, as well as a Yaesu FT-891 HF plus 6m 100 watt mobile radio and two Yaesu HTs. There is a free licensing exam starting at 9:30 as well as three tracks of technical forums covering topics such as Callum McCormick presenting "Three Easy Wire Antennas Everyone Should Build," and Ron Sherwood discussing "Portable VHF/UHF Setups for Camping and Events."

  For more information, see the NCARC web site at: https://ncarc.co/hamfest-2025/
- Chuck has made some changes to the web site, so please check it out and provide him any feedback. Web site is at: https://w0eno.org/
- Upcoming Club Volunteer Opportunities:
    - Winter Field Day (Jan 25-26, 2025): https://w0eno.org/other-clubs-and-radio-organizations/?sheet_id=16

      Not running 24 hrs at fairgrounds. Will start at 9am to 5pm at the Clover BUilding at the Boulder County Fairgrounds. The goal is to get people on the air. There will be one station for digital/CW and another for SSB. Will have chili dogs around 4:30 - everyone is welcome.

      Joining with RMHAM at Doug Sharp's house in Mead on Sunday. They will be working from the RMHAM vans and trailer.

    - LARCFest (April 5, 2025): https://w0eno.org/other-clubs-and-radio-organizations/?sheet_id=15 or contact Chuck at: k0itp@w0eno.org
    - DMR Go Box
    - HAMCON Colorado 2025 for Rocky Mountain Division. For more information, see their web site at: hamconcolorado.com

- The ARRL is running a year-long "Dream Station Sweepstakes" drawing during 2025. The winner will receive a "dream station" consisting of an ICOM IC-7760 HF/50 MHz 200 watt transceiver, and IC-PW2 1 kW linear amplifier, and an SM-50 advanced desktop microphone. The radio and amp look very interesting - they each have separate faceplate or head, and radio deck, which are connected either directly with a LAN cable, or via a network.

  Looks like the 7760 hasn't been released yet, but GigaParts is showing a price of $6300 for the radio. The IC-PW2 is also not yet out, but has a price of $5500, while the SM-50 cost is just a rounding error at $290.

  Looks like participants can earn up to 6 chances in the drawing. You get one for joining the ARRL or renewing your membership, 2 for setting up auto-renewal, and 1 point for each $50 donation to the ARRL Diamond Club.

- If you are an ARRL member, remember that you have digital access to four magazines - QST, On the Air, QEX, and National Contest Journal.

- We have a new net on the LARC repeaters. It's run by Timothy Moss, KFØLAR, on the 22nd of every month at 6pm - that's this Sunday. The 22nd was chosen to highlight the average of 22 vets who commit suicide each day. While the purpose of the net is to connect veterans, non-vets are welcome to participate as most all of us have friends or family who are or have served.

- The ARRL Colorado Section Net occurs on the second Monday of the month from 7 to 8pm. The net is run by Amanda Alden, K1DDN, our Colorado ARRL section manager, and is open to hams and non-hams alike. This net is a place where Colorado hams can ask questions of ARRL leadership and request help, guidance, club support, and technical support. This net meets on the second Monday of each month at 7:00 pm Mountain time. The net is on the Colorado Connection, Rocky Mountain Ham Radio DMR Talk Group 700, The Fun Machine, WE0FUN, and the NCARC Buckhorn Repeater 447.700 – with 100 Hz tone.

- We have some volunteer opportunities available where you can help out LARC:

    - Photographer / videographer - record team activities and upload to web site / YouTube
    - Newsletter Editor - put together the monthly Splatter newsletter
    - Event Coordinator

- Time's up for this year, but you can earn your 2026 membership or future renewal by acting as NCS for at least 5 nets next year. You can run either this Tuesday night net or the Thursday night net (or both). We have scripts available for both, so all you need is a good connection into the repeater, and somewhere to keep track of names and call signs as people check in. If you're going to be on the net anyway, why not save some dough at the same time!

- Chuck has set a goal for the Club of running at least one activity a month. This can be a hands-on construction activity, an operating activity like Field Day, a fox hunt, or a special event station. The goal is to get people together to have fun with amateur radio! We have multiple locations at our disposal, as well as lots of Club equipment, so if you have an idea for something you think others hams would like to do, please let us know, and if you're willing to run it, even better!

- The Club is also looking for presentation topics for 2025. If you have any ideas, or better yet, would like to present, please let Chuck know and we'll get you on the schedule! We would like to get some presentations from club embers on stuff they've been doing, projects they're working on, or just things that interest them.

- All club activities are open to anyone - members and non-members. If you have questions, ask them on a net or **send email to elmer@w0eno.org**

Presenter: Bryan, AF0W

Topic: Power Supplies

- If you are using a mobile or larger base station type of HF station in your shack, you are very likely using a power supply

- In this case, a power supply is a device that converts the 110 volts AC from a wall outlet into 12 volts DC that is required by your radio

- There are numerous options out there, so how do you find out which one is right for you?

- The first thing you need to consider are the power requirements of your station.

- For most gear, you can find power requirements in the manual. There are typically multiple currents specified, such as when receiving and when transmitting.

    - Unless you plan only on listening, you need to take into account the maximum current required by your device, which will be when transmitting at full power.

- In the case of my Kenwood TS-440S, the manual specifies 1.9 amps in receive with no signal, and 20 amps in transmit mode, so I would require a power supply capable of supplying at least 20 amps

- It also specifies a voltage requirement of 12 to 16 volts DC, with a reference voltage of 13.8 volts, which is a common average voltage of a vehicle's battery while being charged by an alternator.

- That brings up the specifications of the power supply itself

- A common linear power supply, the Astron RS-35A is rated at 13.8 volts DC with two current ratings:

    - 25 amps continuous duty

    - 35 amps peak

- You should make sure that the total current draw of all your station equipment is below the continuous current rating of your power supply, as the peak rating is specified for a very short duration

    - Operating it for long periods at the peak level will likely damage the power supply due to overheating

Linear vs Switching

- I mentioned that this is a linear power supply, but what does that mean?

    - You may also see them referred to as analog power supplies

- At a very high level, they have large, heavy iron transformers to lower the voltage followed by a rectifier to convert the lowered voltage from AC to DC

- You may have heard the "wall warts" people use to charge their cell phones referred to as "transformers," but this is not technically correct

    - The devices typically play two main roles - one of which is converting the voltage from the wall outlet (110 volts) to that required by the device (5 volts, in many cases)

    - The other main role is to convert the AC (alternating current) voltage from the wall outlet to DC (direct current), this conversion is referred to as rectification

- There is another type of power supply is called a switching or switch-mode power supply

- In this design, circuitry such as a MOSFET is quickly turned on and off at a high frequency connected to a small transformer with capacitors and inductors used to fill in the voltage during the times the MOSFETS are turned off
- There are tradeoffs to each design:
- The first is RFI or interference
    - Due to the way it operates, the switching supply generates high frequency signals which, if the supply is not designed properly, this can cause interference with your radio equipment
    - The linear supply does not have this issue, as it does not have any high-frequency signals in it's operation
    - Some switching power supplies have a control to adjust the internal operating frequency if interference is encountered
    - I believe Chuck may have had an RFI issue with one of his power supplies
- Next is the overall size and weight of the power supply
    - Because of the large and heavy transformer, a linear supply is going to be much larger and heavier than a switching supply of the same capacity
    - You may remember older wall wart power supplies that were much larger and heavier than the current small switching supplies that come with you iPhone or Android device - those were linear power supplies
- Efficiency is another difference
    - The efficiency of a power supply is essentially reflects how much power is wasted (typically to heat) by the device when performing its function
    - It is usually expressed as a percentage and is calculated by dividing the output power in watts by the input power, also in watts
    - A typical efficiency for a linear power supply is around 77%, while a switching power supply will be closer to 80-90%
- Due to their designs, linear power supplies typically run hotter than switching power supplies
- Both types of power supplies also include components to regulate the output voltage
    - Regulation indicates how well the power supply can maintain a steady output as the current demanded by the load increases

        - It is expressed as a percentage.
    - For our sample power supplies, the linear power supply has a 0.08% deviation (so 99% regulation), and the switching supply has a 2% deviation, or 98% regulation
    - With low regulation, your power supply may put out 13.8 volts when connected to a very small load, but drop to 11 volts when operating near its maximum capacity.
    - We ran into this issue with the battery in the club's GoBox. If both the HF and VHF/UHF radios were turned on, the HF radio would reboot itself when transmitting
    - We solved the issue by using a battery booster device. This device contains circuitry that holds the output voltage steady at 13.8 volts even if the input sags.
    - The box is not magic, however. It consumes extra current to make this happen, so the battery charge will not last as long, but it will power both radios simultaneously.
- Other features of some supplies are voltage and/or amperage meters, cigarette lighter sockets, PowerPole connectors, and USB charging sockets
- Some hams have used power supplies from computers - usually servers - to run their stations.
    - One of the voltages supplied to modern computers is 12 volts, so these power supplies can be an inexpensive way to power your station. They are typically fairly well shielded, so most do not cause additional RFI.
- Note that while your radio may be the biggest consumer of 12 volt power in your station, it may not be the only one
    - Many pieces of equipment such as SWR meters have a 12 volt input for lighting for the meters or circuitry inside the meter
    - Automatic antenna tuners also frequently run off of 12 volts
    - Many LED strip lights run off of 12 volts as well
    - Some hams have added accessories such as USB chargers to their stations - these can also be powered off of 12 volts
    - Unfortunately, most HT chargers do not operate on 12 volts, so you likely still need their wall wart power supplies

- An example of a linear power supply is the Astron RS-35A, rated at 25 amps continuous, and weighs 27 pounds and costs $225.
- An example of a switching power supply is the Samlex SEC-1235M, rated at 30 amps continuous and only weighs 3.4 pounds and costs $180.
- Meters can be useful - I had an issue with my HF antenna, and when I tried to transmit into a high SWR antenna, my radio drew a lot more current than usual. I even saw my LED strip lights dim a bit. My power supply didn't have meters, but I had built an external power distribution box with a bunch of PowerPoles and a combination digital volt amp meter from eBay. I was able to look at it and see it pulling a lot more current than usual, which led me to troubleshoot my antenna and found that squirrels had chewed through one of the support wires, and half of my dipole was on the ground
- You may wonder why ham radios don't just plug directly into the wall. Some theories I've heard is that requiring an external supply reduces cost and weight (and therefore shipping). Also that the radio manufacturer doesn't have to worry about providing different cords or supporting different voltages or frequencies for sales to different countries. Many radios are made to operate in vehicles - even my gigantic Kenwood TS-440S has a mobile mounting bracket, so 12 volt power capability is a big plus. It's also common that hams have more than one radio - in my case, I've currently got my one power supply running 4 radios, and will be adding two more once I get DC power jacks added to them. Most hams don't transmit on multiple radios simultaneously, so you don't need to size your power supply to drive all your radios at maximum current.
- First dit problem - cheap switchers don't store a lot of energy, and will ramp up quickly when needed, but may not have enough power for the first dit (until power supply catches up)

Questions:

- **The question for the week is:** Do you have a power supply in your station, and if so, is it linear or switching?
- **In my case,** for my own station, I started with a switching power supply I ordered from ebay. It was a bare-bones power supply, not something designed for ham radio use. I believe it was made by MegaWatt - MeanWell is another common name (and of course there are chinese clones)

  I didn't notice that it generated any RFI, but when I saw a used Astron linear power supply, I bought it and now use it in conjunction with a battery and a device called a Super PWRGate from West Mountain Radio to allow it and the power supply to function as a sort of interruptible power supply.

When there is AC power, the power supply runs the radio equipment and charges the battery. If AC power goes away, then the battery will take over.

More Info:

- Astron linear power supplies: https://www.astroncorp.com/linear-desktop
- Samlex switching power supplies: https://samlexamerica.com/product-category/ac-dc-power-supplies/
- MFJ-4416C battery voltage booster: https://mfjenterprises.com/products/mfj-4416c
- MFJ-4418 advanced battery voltage booster: https://mfjenterprises.com/products/mfj-4418

Notes:

- If you have ideas for net topics or general meeting topics / presenters, please let us know! Tell us on a net, or send email to k0itp@w0eno.org

Email to elmer@w0eno.org

1. KØDBL - Don - Have a 30 AMP MFJ switching power supply. Bought before he knew anything about power supplies. Have not noticed any RFI. Have HF, dual-band, and antenna tuner hooked up to it.
2. WAØJJC - Bob - Boulder - Have same power supply as Don. Powers 100w ICOM HF radio plus 2m/70cm radio. Also have a linear power supply - 600W Ameritron amp that comes with it.
3. AEØDO - John - N of Longmont - Not aware that some switching power supplies have adjustment know. Have a medium size lead-acid battery that is charged with a battery maintainer (2-3 amps). Battery takes over for transmitting. Another reason for not including a power supply could be regulatory (so don't have to worry about meeting various countries regulations)
4. WB4FAW - Charlie - E Longmont - 2 linears Astron RS-35A and RS-20A and MFJ RS-4230MV.
5. W7PGF - Philip - Frederick - (no response)
6. AFØW - Bryan - Longmont -
7. KFØQMP -Aki - Longmont - Have an Astron RS-20M but not really hooked up right now. Has been running his G90 from an adjustable bench power supply.
8. KEØRWV - John - Johnstown (mobile) - Just moved to Johnstown. Setting up his shack now. Have an Astron (not sure of Model) as well as a Bluetti. Eventually would like to do SOTA and POTA, and figured Bluetti would be a good way to take power with him.
9. ADØUF - David - Loveland -

End: 7:55pm

How to get more people involved in HF - if you are not currently doing HF, is there anything the Club could do to help (help with equipment selection, antennas, etc.)?

KFØQMP - Motorola firmware update 2.09.01

K2AD - Doug Sharpe - Link our repeaters to COLCONN for Hamlet net. They have a standing weekly net that runs to 7:30.