

2023-05-02 Hamlet Net - Test Equipment - Dummy Load and Multimeter

Announcements:

- May 27th - Doug Sharp (K2AD) has invited the club to his house in Firestone to participate in the W1AW/0 event. This is part of the ARRL VOTA (volunteers on the air) event that is going on all year. Doug will have one of the RMHAM vans and other setups for hams to participate. Please contact Doug at doug@dougsharp.com for more info and to RSVP.
- The ARRL is running a survey regarding increasing their dues. If you are an ARRL member, you can provide your input at: <https://www.arrl.org/take-dues-survey>
- Field Day is coming up in June, and the club is starting to work on planning for this event. See the Club website for more information.
- Antenna building class on 2nd weekend in May (May 13) at the Clover Building at the Boulder Fairgrounds. There will be two classes - one for building your own Yagi antenna (there will be \$10 charge for this, but you will go home with your very own handmade antenna), and the second for wire antennas to be used by the club for Field Day.
- You can start earning your 2023 membership or future renewal by acting as NCS for at least 5 nets this 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! There are four free memberships available for 2023, so don't wait to get started!
- 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 2023. If you have any ideas, or better yet, would like to present, please let Chuck know and we'll get you on the schedule!
- 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: Test Equipment - Dummy Load and Multimeter

- Have you bought all the radios and antennas you need, but still have money to spend? This week, I'm going to talk about some basic test equipment that can be useful for ham radio.

Dummy Load

- The first is the simplest - a dummy load.
- A dummy load consists of a 50 ohm non-inductive resistor that is used in place of an antenna system for troubleshooting and performing adjustments, as well as a heatsink to dissipate the power absorbed by the resistor
 - a. The heatsink might just be air (or convection cooling), forced air (via a fan), or "wet", which typically involves immersing the resistor in a non-conductive substance like oil, and is used to dissipate the heat generated by the resistor
- Use of a dummy load prevents (or at least seriously diminishes) the transmission of RF
- Some potential uses include:
 - a. Troubleshooting a sudden high SWR when transmitting
 - If a visual inspection of your antenna system does not reveal any issues, you can connect your feedline to the dummy load - in effect replacing the antenna, and try transmitting.
 - If the SWR is still too high, you can keep moving back towards the transmitter, replacing each successive component with the dummy load to isolate the problem.
 - For example, you could connect your dummy load to the lightning protector, which would remove the feedline to the antenna, then next to the other side of the lightning protector to remove it, etc.
 - When the SWR returns to normal, you know the element you just removed is likely the problem.
 - b. Tuning an amplifier without actually transmitting a signal
 - Assuming your antenna system (which may include an antenna tuner or matching device) presents a 50 ohm load to the amplifier, you can tune the amp into a dummy load (to prevent causing QRM on the airwaves) and then switch to your antenna system to operate.
- Note that dummy loads will have a power rating associated with them, and that the power limit will include a time component.

- a. For example, the MFJ-260C 300 watt 50 ohm dry dummy load is only rated to handle 300 watts for 30 seconds - after which, it requires a 2 minute cooldown period.
- b. It will, however, handle 25 watts continuously.
- c. If these power limits are exceeded, the resistor can be physically damaged.
- When choosing a dummy load, be aware that there may also be frequency-related restrictions on various models (for example, only covering HF, but not VHF/UHF, etc.)
 - a. The reason is likely that there is some inductance in the device, and while it is not significant at HF, it will result in an impedance other than 50 ohms at the higher frequencies
- Finally, note that dummy loads aren't perfect, and many hams have had QSOs while mistakenly using their dummy loads. You should still follow the "every 10 and at the end" station ID regulations, even when transmitting into a dummy load.

Multimeter

- The next piece of test equipment is a multimeter
- These devices typically measure voltage, current and resistance, but can include other measurements such as frequency, and capacitance, and even include the ability to test transistors
- I have come across meters that don't measure certain things - one didn't measure resistance, and another did not measure AC current - so make sure to verify the meter's capabilities before purchasing
- There are endless uses for such a device in the ham shack, such as:
 - a. Testing for continuity between ends of a cable to make sure there are no breaks in it
 - b. Testing antenna cables to make sure there is not a short between the center conductor and the outside shield (especially handy when making homemade cables)
 - c. Testing the power provided to a radio to make sure it's at least 12 volts
 - d. Testing a CW key to make sure it is making good electrical contact when pressed
 - e. Testing a fuse to see whether it is good or blown

- f. Checking an unknown outlet to make sure it is working and supplying 120 volts (such as in a park)
 - g. Measuring the power draw (in amps) of a mobile radio while transmitting
 - h. Measuring the value of a resistor while assembling a kit
- Meters and their test leads and probes will all have maximum ratings - for example, a meter designed for home hobbyist use would not be adequate for a lineman working on the electrical grid!
 - One obvious difference in various meters is whether they are manual or auto-ranging. A manual meter will have a large rotary switch where the user will select both the measurement (voltage, current, resistance) as well as the expected range (i.e. amps, milliamps, microamps). An autoranging meter will only require setting the measurement - it will automatically scale the display to the necessary value.
 - Another difference is the method of indicating the reading. Originally multimeters used analog meters, but nowadays, most use digital readouts.
 - a. While digital may seem more advanced, an analog meter is easier to use when you need to find a peak or a minimum value. It's far easier to see the meter pointer change direction when such a point occurs.
 - Many meters will have different sockets into which the probes must be plugged when making different measurements
 - a. For example, you may have to move the positive lead to a different socket to measure current
 - Meters vary widely in capabilities and cost, but relatively basic meters will satisfy most amateur radio-related needs

Example Situation

- What if you thought you might have a problem with your coax feedline which runs between your shack and outdoor antenna.
- Since the feedline is attached to your house and your multimeter leads are only about a foot long, what can you do?
- You can check for shorts between the shield and center pin on both ends, but what about continuity from one end to the other?
- If you also have a dummy load, you can connect it to the antenna side of your feed line, then measure the resistance between shield and center pin on the radio side - if you get

something drastically different than 50 ohms, then there is a problem somewhere along the cable

Summary

- These are two very useful devices to have for things like troubleshooting your station, building cables, and building kits, but they are not the only ones available.
- Another test device which has become very cheaply available is an antenna analyzer, but this is a more involved topic, so I'll cover it in a future presentation.

Questions:

- **The question for the week is:** What measurement or test equipment do you have and how have you used it?
- **In my case,** I've got about five dummy loads and a few multimeters. One is an old analog meter from Radio Shack that I've had forever.

I've primarily used the meters for building kits or troubleshooting some power issues. One also came in handy at a LARC operating event in a park. We were supposed to have city power available on a lamp post, but our power supply did not seem to be getting any power.

Luckily, I had one of those used-to-be-free Harbor Freight meters, and could see that the outlet was not energized.

More Info:

- Multimeter: <https://en.wikipedia.org/wiki/Multimeter>
- Dummy Load: https://en.wikipedia.org/wiki/Dummy_load
- Pocket sized meter/oscilloscope - <https://www.pokitinnovations.com/>

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. KN6CFI - John Bennett - Longmont
2. KF0LHV - Jonathan - Longmont
3. KN6SJA - Steve - Longmont
4. WA7EM - Ed - Erie
5. AF0W - Bryan - Echolink from El Paso -
6. KC0RRT - Liz - S. Longmont

7. AE0DO - John - N of Longmont
8. W0CSL - Kurt - N Longmont
9. WA0JJC - Bob - Boulder
10. W0DRZ - Chris - Lyons