

2024-01-3 Hamlet Net - RTTY

Announcements:

- Test Session Info
 - Next VE session is Saturday, February 24th in the Clover Building at the Boulder County Fairgrounds, and starts at 10 am. It is an ARRL session, so there is a \$15 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.
 - We had a large test session last Saturday - 15 candidates showed up to test. The session was handled by Kat (W0UM), Lynn (K0CLM), Mike (AE0MS) and Chuck (K0ITP), and everyone ended up passing the exam they came for.
 - There were 10 new Technicians, 4 new Generals, and one upgrade from Technician to Extra Class.
 - If any of them are listening in, congratulations, and for the newly-licensed hams, please check in to the net once your license appears in the FCC database!
- 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
- There are several Board positions that will be available in October. Currently, the President, Treasurer and Secretary are planning to make this their last year of service. If you are interested in serving on the board of a 501(c)3 non-profit, please consider running for one of these positions. The current members would be more than happy to "show you the ropes" during the year, so you wouldn't start with zero experience.
- If you are an ARRL member, remember that unless you are paying extra for the printed magazine, you will not receive any issues after January. The February QST is available on the ARRL web site.
- Did 24 hours for Winter Field Day from 12pm Sat to 12pm Sunday. Put up the big antenna for the ICOM 7300, and had the IC-7000 on a 10 meter antenna. Thanks to everyone who participated in this event!
- Also looking for volunteers to help with LARCFest on April 6. If interested, please check out web site and contact Bob Smith (N0OM) for more information. Tables are also being sold if you have stuff to get rid of.
- Our sister club up in Nederland is looking for some help with events they are running. They have a weekly Monday night net with no predetermined agenda, so you can lead it

however you want. They are also planning a Field Day site at Golden Gate State Park and are welcoming anyone who wants to participate. Finally, they are looking for operators for the Ned Gravel run on July 8th. They have signup links for all these events, so head over to their web site <https://w0ned.org/> for more information!

- You can start earning your 2024 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 2024. 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: RTTY Mode

- Before we had FT8, PSK31, and even JT65, hams were able to use a data mode called RTTY
- RTTY actually stands for "radioteletype" and is a communications system originally used to connect mechanical teleprinters at two sites via radio
 - a. Prior to RTTY, teletype machines operated over landlines - the initial systems came into being in the mid 1800s
- Around the 1980s, the bulky machines were replaced with emulator software running on PCs
- The output of the mechanical machines was either at digital logic levels (with +5 V representing a logical 1 and 0 V representing a logical 0), or at line levels where -80 V signifies a 1 and +80 V a zero)
- The ones and zeros were also referred to as "mark" and "space" respectively

- a. These names come from devices where a pen made marks on a moving strip of paper in response to telegraph signals
- Each five-bit character is prefixed by a start bit and ended by a stop bit
 - a. The start bit is a logical 0 or space
 - b. The stop bit is a logical 1 or mark, and can last for 1, 1.5, or 2 bits duration
- These bits are sent serially one at a time - the start and stop bits allow the receiving device to synchronize with the stream of marks and spaces from the sending device

Baudot Code

- Characters are represented by 5 bits using a system called Baudot code after its inventor Emile Baudot, who invented the code back in the 1870s
- Those of you who are familiar with binary numbers may realize that 5 bits can represent a total of 32 characters (2 raised to the 5th power)
 - a. The uppercase and lowercase alphabet plus ten numbers would require a total of 62 characters - far more than can be represented in 5 bits!
- Baudot cuts down on the potential number of characters by using only uppercase characters for letters
 - a. Nowadays, "all caps" in a message usually denotes shouting, so perhaps this is appropriate as you have a bunch of old hams who are hard of hearing and yelling at newer hams because they didn't have to learn Morse code and drive uphill to the FCC office in the snow to get their licenses!
 - b. This still leaves us with 36 characters and we only have 32 bit combinations
- The other trick used is to have two different banks of characters and a method to switch between them
 - a. One is called LETTERS and the other FIGURES
 - LETTERS includes the full alphabet while FIGURES includes numbers, space, punctuation and symbol characters
 - b. There are codes to switch between the two banks, called LTRS (lima-tango-romeo-sierra) and FIGS (foxtrot-india-golf-sierra)
 - c. This is similar to how the shift key works on a standard keyboard

- Pressing the 5 key will enter the number 5, while holding shift and pressing 5 will enter the percent sign
- d. There are also various 5-bit combinations that represent control characters for things like carriage return, line feed, space which are assigned to both the LETTERS and FIGURES character sets so they can be sent directly in either mode
- e. There is one big problem here - when you initially tune into an RTTY exchange, how do you know if the sending station is using the LETTERS or FIGURES bank?
- The answer is that you don't, so your software may initially decode characters incorrectly until you either change the bank on your software or the sending side switches banks
 - There is a method for minimizing this issue called "Unshift on Space" (or USOS - uniform-sierra-oscar-sierra)
 - When using this policy, the receiver interprets a received space character to mean both "receive a space character" and "shift to LETTERS bank"
 - Of course, this means that the sender will have to insert FIGS codes if there is a sequence that includes numbers separated by spaces.
 - This system will not fully eliminate the issue - there is still the possibility of improperly decoding characters until either a LETTERS or FIGURES code is sent or a space
 - Many RTTY applications have a feature to decode received characters using the "other" bank for just this situation

Modulation

- Ok, so now we have a stream of ones and zeros - how does that get sent over the radio?
- RTTY is transmitted using AFSK (audio frequency shift keying) or FSK (frequency shift keying)
 - a. A continuous carrier is transmitted on one of two frequencies - one representing "mark" and the other "space"
 - b. There is no amplitude modulation - only as pure carrier similar to CW

- c. With AFSK, the "marks" and "spaces" are represented by different audio tones which are then fed to the transmitter - this is similar to how digital protocols such as FT8 work
- d. With FSK, the transmitter actually shifts its carrier frequency back and forth between the "mark" and "space" frequencies
- e. The lower RF frequency is the "space", while the upper is the "mark"
- f. It is customary to refer to the higher "mark" frequency as the frequency you are operating on, although commercial and military operation specifies the operating frequency as the frequency midway between the "mark" and "space" frequencies
- g. Amateur RTTY is transmitted in LSB
 - If one of the stations is using USB by mistake, the other station will not be able to decode them properly unless the RTTY software supports the ability to reverse the received signals
 - USB is used in some other parts of the world, notably Europe
- For amateur radio, the shift is typically 170 Hz, but some stations use a shift of 200 Hz and some weather stations use 450 Hz
- There is also a baud rate associated with RTTY
 - a. Amateurs typically use 45.45 baud, or about 60 words per minute
 - b. Other rates are 50 and 75 baud
- Some transmitters support FSK or frequency-shift keying
 - a. The sending device specifies a "mark" or "space" by providing a signal, typically using 5 volt TTL directly to the radio, which then transmits using the specified frequency

Tuning

- The split is very easy to see on a waterfall display which is usually presented by your RTTY software
- In addition to the waterfall, software may provide a mark/space tuning indicator which consists of two intersecting ellipses
 - a. One of the ellipses tracks the "mark" signal and the other the "space" signal

- b. A properly-tuned signal will appear as two ellipses in a vertical-horizontal cross pattern
- Many applications will show you two lines on the waterfall display, representing the "mark" and "space" frequencies
 - a. RTTY signals will appear as two lines running down the waterfall - just line up the two lines with the lines on the waterfall and you're all tuned in
- Some RTTY software also supports "automatic frequency control" and will attempt to adjust the settings to match the closest RTTY signal
 - a. This is helpful for getting exactly on frequency and for staying on frequency if the sending station drifts.

Software

- So speaking of software, what applications support RTTY?
- One multi-platform tool that I've covered recently is fldigi (<http://www.w1hkj.com/>) - there are versions for Windows, Mac and Linux
- MMTTY from Hamsoft (<https://hamsoft.ca/pages/mmtty.php>) is another Windows application
- There are also apps for Android and IOS to allow you to run from a phone or tablet
- Note that you might not even need software to operate RTTY - some radios such as the Icom IC-7300 have a built-in RTTY decoder and it also supports transmissions from memories
- One feature that is used and perhaps abused is the ability to send macros using your software application
 - a. For example, a single click on a macro key could transmit an entire contest CQ
 - b. Some applications will even automatically scan incoming RTTY data for the other station's call sign and automatically add it to your macros

Summary

- RTTY was the first digital mode to gain widespread acceptance, and while it has perhaps been overshadowed by PSK31 for keyboard-to-keyboard chatting, it's still a very robust, easy-to-use mode

Questions:

- **The question for the week is:** Have you heard of RTTY before and have you used it for amateur radio (and if so, what software did you use)?
- **In my case,** I've done very little RTTY. I tried both fldigi and MMTTY - I preferred the interface for MMTTY. I pretty much just used both pieces of software to decode RTTY QSOs that were on the air, and to make one or two contacts myself during contests.

WINTER FIELD DAY EXPERIENCES!!!! If didn't attend, why not?

More Info:

- ARRL RTTY Roundup: <http://www.arrl.org/rtty-roundup>
 - ARRL Contest Club Competition: <http://arrl.org/contest-club-tools>
 - ASCII, Baudot and the Radio Amateur: <https://www.digigrup.org/ccdd/rtty.htm>
 - BAUDOT Code on Wikipedia: https://en.wikipedia.org/wiki/Baudot_code
 - RTTY: https://www.nonstopsystems.com/radio/frank_radio_rtty.htm
 - RTTY signals: [https://www.sigidwiki.com/wiki/Radio_Teletype_\(RTTY\)](https://www.sigidwiki.com/wiki/Radio_Teletype_(RTTY))
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- 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. K0ITP - Chuck - Firestone
2. AF0W - Bryan - El Paso via Echolink
3. AE0KZ - Alan - Louisville
4. KF0OVB - Vinton - Lafayette
5. KM6SJA - Steve - Longmont
6. KF0MXH - Art - Longmont,
7. WA0JJC - Bob - Boulder
8. KE0PSR - John - Frederick
9. KC0CT - Joe - Broomfield
10. W0UM - Kat - Longmont

End: 8:00pm