2022-01-03 Hamlet Net

Announcements:

- Test Session Info
    - Next scheduled test session is Sunday, January 15th at 350 Terry Street
        - Patriot VE team session, so no fee to take the test
    - To test before this (or online), go to hamstudy.org -> Find a Session (make sure you search for online sessions!

- Bob, N0ZFV, is helping Dick out with special events. They are planning to put together a LARC Winter Field Day site at noon, Sat Jan. 28th in the Clover Building. Come join the fun, and if you haven't made an HF contact yet, this would be a perfect opportunity, as there will be a lot of activity on the bands, as well as experienced hams to help you out. You don't even have to be licensed (or be a General or Extra Class licensee) to use the radio - we will have plenty of licensed control operators on site.

- 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!

- January 21st is the NCARC Winter Hamfest at the Larimer County fairgrounds at The Ranch in Loveland. Doors open to the public at 8am, and admission is only $7. There is a free license test session at 9:30am as well as three tracks of technical forums, exhibits and demonstrations and of course, prizes. They are looking for volunteers to help out - you'll get in for only $4 as a volunteer. Additionally, Chuck is looking for volunteers to help with the LARC tables we'll have where we are selling silent key and some donated equipment. For more information on the hamfest, go to ncarc.net (november-charlie-alpha-romeo-charlie) and click on the "Hamfest 2023" link on the top menu bar.

- This hamfest will be followed up by the ARA Swapfest on February 19th at the Adams County Fairgrounds from 9am to 1pm.

- 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!

- 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**
- Club breakfast Saturday mornings at 8am at the Hidden Cafe in Longmont
    - Come meet other Club members and discuss amateur radio

Misc:

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Presenter: Bryan, AF0W

Topic: RTTY

- This weekend is the ARRL RTTY (that's romeo-tango-tango-yankee) Roundup
- This is an HF contest using the contest bands except for 160 meters
- Technicians are able to participate, as they have privileges on the entire data portion of the 10 meter band from 28.0 to 28.3 MHz
- The objective of the contest is to exchange QSO information using only the RTTY mode - no other digital modes like FT8 or PSK31 are allowed in this contest
    a. This is the first year that digital contacts are being restricted to RTTY only - the ARRL has created a new contest called the ARRL International Digital Contest that allows all digital modes except RTTY
- RTTY is a "conversational" mode in which transmissions are free-form text as opposed to a regimented mode such as FT8, where the exchanges are highly scripted
- The contest exchange is simple -
    a. North American stations send an RST signal report plus their state or province
    b. All others send an RST report plus a serial number
    c. Note that like many contests, you're likely to receive mostly 599 signal reports
        - This is because in contests, the focus of the majority of the operators is to complete as many QSOs as possible in the shortest amount of time.
        - Determining the actual RST takes time, as does sending it (versus pressing a macro key to return a 599 report)

        - It also slows down the receiving station, as they have to record the actual RST for their log (rather than accepting the default of 599 which is likely supplied by their logging program)

- All exchanges must be triggered manually - no automatic operation is allowed

    a. This does not mean that you can't use the macro capabilities of your digital program to help out

- As of February 2022, the ARRL has a program where operators can specify a club when uploading their results so they can be included in aggregated club totals.

    a. If someone is interested in taking on the duties of getting this set up for LARC, please let the Board know (or mention it on the net)

    b. It doesn't look too difficult, but just is something that has to be taken care of

RTTY Mode

- Ok, so this sounds interesting - but what is 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 were either at digital logic levels (with +5 V representing a logical 1 and 0V representing a logical 0), or at line levels where -80V signifies a 1 and +80V 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

- The 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 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 (bo-do) 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
    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
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- Some transmitters support FSK or frequency-shift keying
    a. The sending device specifies a "mark" or "space" signal 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
- 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 the entire RTTY Roundup 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
- Even if you're not interested in the contest itself, you can still use this as an opportunity to try your hand at receiving and decoding RTTY transmissions, and experimenting with your radio's filtering capabilities to isolate and "clean up" incoming signals

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)?

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)

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

Participants

1. AF0W - Bryan - Longmont
2. N0FTI - Steve - Longmont
3. AE0DO - John - North of Longmont
4. AE0CF - Ben - Ft. Collins
5. WT0RJ - Trevor - Boulder
6. WA7EM - Ed - Erie
7. KK2R - Andy - Longmont
8. N0CTO - Rich - Mobile (Dacono)
9. WB4FAW - Charlie - East Longmont
10. KH6HTV - Jim - East of Loveland (?)

Questions

- KK2R - Looking for info on local D-STAR repeaters (no one on net had any info) - sent email to Toshen to see if I could get an answer for him
- N0FTI - Greyline - familiar with what it is, but how does it apply to amateur radio?