



Learning N1MM Logger+ Software

A Beginner's Guide to RTTY w/ the Icom 7300

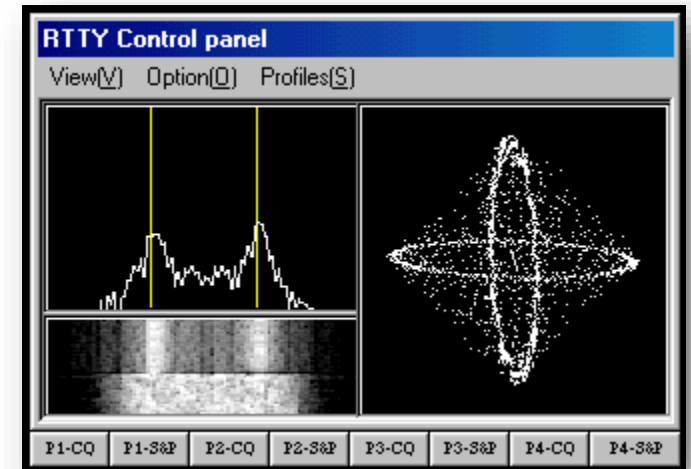
Edited: 2-29-2024

What is N1MM Logger+?

- The world's most popular ham radio contest logging program!
- All major and many minor HF Contests supported.
- General DX logging, DXpedition, DXSatellite and VHF DX
- SSB, CW and Digital support
- Radio interface supports radios from Alinco, Elecraft, FlexRadio, Icom, Kenwood, Orion, TenTec and Yaesu.
- Website: <https://n1mmwp.hamdocs.com/>

What Is Radio Teletype (RTTY)?

- During WWII, the military connected teletype machines to HF-radios.
- Signal consists of two RF carriers switching on and off.
- The redundancy lowers the error rate of the decoder.
- The “shift” is the 170 Hz fixed frequency difference.
- Uses “Frequency Shift Keying” or FSK
- Since 2000, almost all decoding / encoding has been done using software on a PC. RTTY software is usually integrated with logging software such as N1MM+.



- Source: <https://www.onallbands.com/getting-started-in-rtty%EF%BB%BF/>
- Source: <https://www.arrl.org/files/file/Technology/tis/info/pdf/59241.pdf>

General Concepts

- The IC-7300 has a soundcard and can decode RTTY independent of any software directly from its front console. You can program MACRO presets, log sessions, and transmit all from the receiver by itself.
- However, this does not integrate well into contesting, as there is no way to enter the recipient's call sign without going back into settings, and manually changing your MACRO.
- Thus, logging programs and decoding/encoding software have been developed to help expedite the process, and control multiple facets of running your rig during a contest.

General Concepts

- There are two available modes:
 - FSK – “Frequency-Shift Keying” – Transmits using your radio’s built-in FSK modulator, w/ reception being decoded by a sound card/software.
 - AFSK – “Audio Frequency-Shift Keying” – Utilizes an audio oscillator, and does not need a FSK modulator. Everything is done w/ a soundcard & software.

To keep things simple, I will be focusing on **FSK**. Both have advantages and disadvantages. See: “Pro Tips” section at the end.

What do I need?

• Hardware

- Radio (Icom IC-7300)
- PC w/ Windows
- USB-B to USB-A Cable
- CI-V Cable



• Software

- Hardware Drivers
 - 7300 Data Driver (USB-B to USB-A)
 - 7300 Serial Interface Driver (CI-V)
- N1MM Plus+ Logging Software
- MMTTY (RTTY Decoder)
- 2Tone (2nd RTTY Decoder) *

** Optional: A second RTTY decoder algorithm allows for a different interpretation of the same signal, often catching data the other may have missed.*

Questions! (already?)

- Q. But, I have USB-C (Thunderbolt) connectors...

A. Yes, this will also work. It's just an updated (faster) version of USB-A. They make adapters, if you want to use a USB-A to USB-C connector.

- Q. Why the two cables? Can't I use just one?

A. It is my understanding that you need to utilize two separate COM ports to get the job done. Each cable is assigned a separate COM port by Windows. CI-V handles the radio control + PTT, while the USB controls the digital modes. Most USB serial adapters do not work for FSK because they do not support 45 baud rate, which is too slow. The Icom IC-7610 connects through one cable, but it utilizes two internal circuits, and thus has two available COM ports.

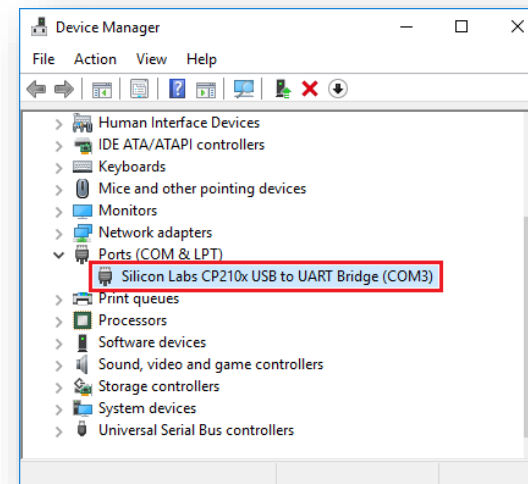
Download Links

- Icom 7300 Data Driver (USB Cable)
https://www.icomjapan.com/support/firmware_driver/1974/
- Icom 7300 Serial Driver (CI-V Cable)
<https://www.rtsystems.us/drivers/other/Windows.html>
- N1MM Logger Plus+ -
<https://n1mmwp.hamdocs.com/downloads/n1mm-full-install/>
- MMTTY (w/ EXTFSK64)
<https://hamsoft.ca/pages/mmtty.php>
- 2Tone – 2nd RTTY Decoder
<https://www.rttycontesting.com/downloads/2tone/>



Step 1 - Connect Radio

- First, we want to make sure Windows can interface with your radio. Before attaching the radio, install both the USB and CI-V cable drivers.
- Next, plug both cables into the back of the radio, and then the computer. Windows should associate each with a COM port number.



It will look like this, only you will see another port listed for the CI-V cable.

Step 2 - Install Software

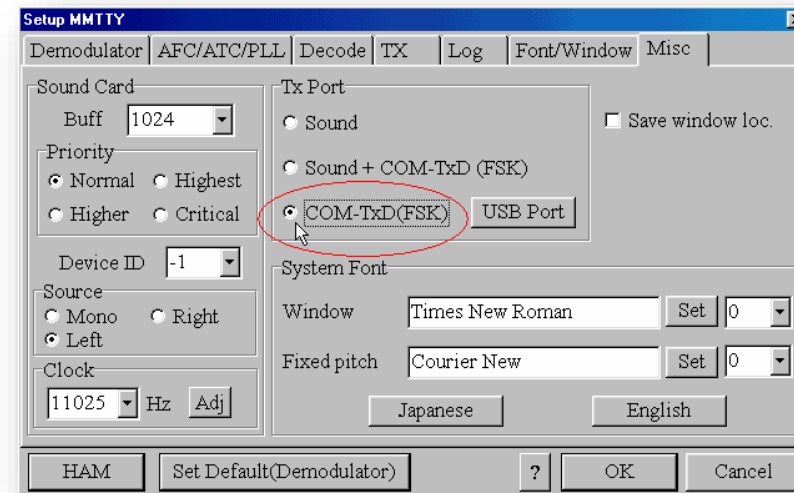
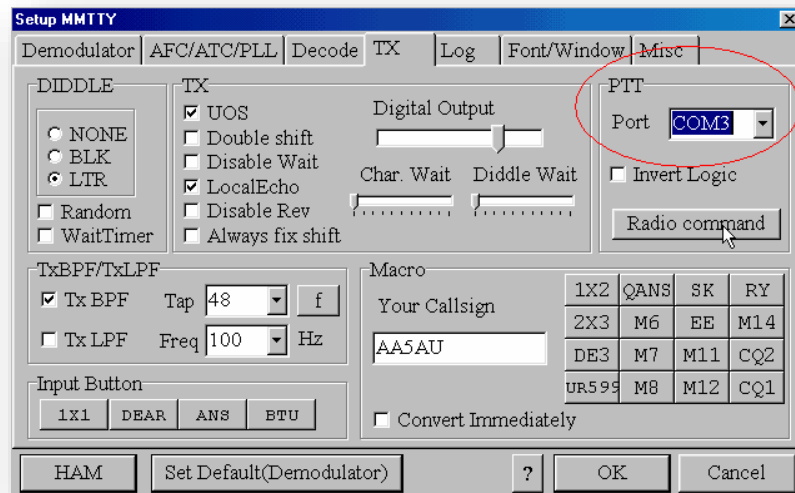
- Install N1MM Logger Plus+ software, but don't run it.
 - This will be the umbrella program that you will use to log, control your radio, and communicate w/ the MMTTY decoding software.
- Install MMTTY Decoder software, but don't run it.
 - This software can run independent of N1MM Logger Plus+, and should be setup & running before integrating into N1MM+ Logger Plus+.
 - *MMTTY already should include the latest version of EXTFSK64.*

Step 3 - Radio Settings

- Turn your radio on, and switch to “**RTTY**” mode by tapping on the mode selection button (upper left) on the touch screen.
- You should hear “**crickets**” chirping, if it worked.
- Now, push the multi-function button (upper right) to bring up your monitor options. Set your monitor to “**MONITOR ON**”.
- **Rationale:** *The monitor needs to be on in order to hear if your radio is actually transmitting. Test by hitting the “**TRANSMIT**” button. You should hear a carrier wave. Tap again, to stop.*

Step 3 - MMTTY Setup

- Start MMTTY, enter your call sign.
- Click OPTION > SETUP MMTTY > Select the TX tab
- Under PTT > Select the COM# of your USB Data COM Port
- Click Misc > Under Tx Port, select COM-TxD(FSK)



Step 3 - What did we just do?

- Basically, we told MMTTY how to find your radio (which COM port), and that we will be transmitting using FSK.
- You should be able to both transmit & receive RTTY using this program. Having access to a keyboard has also increased your ability to transmit longer & more specific messages.
- **Q. Why the USB Data Cable and not the Serial Cable?**
 - A. Good question. If you do try to hook up the Serial Cable for data transfer, you get an error that it doesn't support the Baud rate. EXTFSK64 allows you to get around this w/ a serial cable, but requires extra setup & CPU resources.*

Step 4 - Troubleshooting

- If you are having issues, don't panic.
- Chances are that somewhere within the radio is a incorrect setting that is preventing you from enjoying the rest of your life.
- Remember, N1MM+ has not been setup yet, so it shouldn't even be a factor at this point. *We are only dealing with the radio + MMTTY.*
- The following page will have detailed information on my current settings, and where to adjust them on your IC-7300.

Step 4 - Radio Settings

- MENU > SET > **Connectors**
 - DATA MOD – USB
 - USB Serial Function – CI-V
 - RTTY Decode Baud Rate – 9600
 - PTT Port Function – PTT Input + SEND Output
 - MENU > SET > Connectors > **USB SEND/Keying**
 - USB SEND - DTR
 - USB Keying (CW) - RTS
 - USB Keying (RTTY) - RTS
 - Inhibit Timer at USB Connection - ON
 - MENU > SET > Connectors > **CI-V**
 - CI-V Baud Rate – Auto
 - CI-V Address – 94h
 - CI-V Transceive – Off
 - CI-V USB – REMOTE Transceive Address – 00h
 - CI-V Output (for ANT) – Off
 - CI-V USB Port – Unlink from [REMOTE]
 - CI-V USB Baud Rate – 115200
 - CI-V USB Echo Back – ON
- Remember!** - *Your radio should to be in RTTY mode in order to decode.*

Step 5 - N1MM+ Setup

- Upon starting, N1MM+ will ask you to “Create a New N1MM Logger Plus+ Database” and enter your station information.

Call

Name

Address

Address

City State Zip

Country

Grid Square CQ Zone ITU Zone

License Latitude Longitude

Station TX/RX Power

Antenna Ant. Height a.s.l.

ARRL Section Packet Node

Rover QTH

Club

email address

Tip: You need to fill out this form or the program will not perform properly... Also, make sure your computer date and time are set to the LOCAL date and time zone for your

Ok Help Cancel

[QRZ Grid Square Mapper](#) – Will help find your Grid Square and Longitude and Latitude.

[CQ / ITU Zone Check](#) – Will help you find your CQ and ITU zones, as well as your Grid Square.

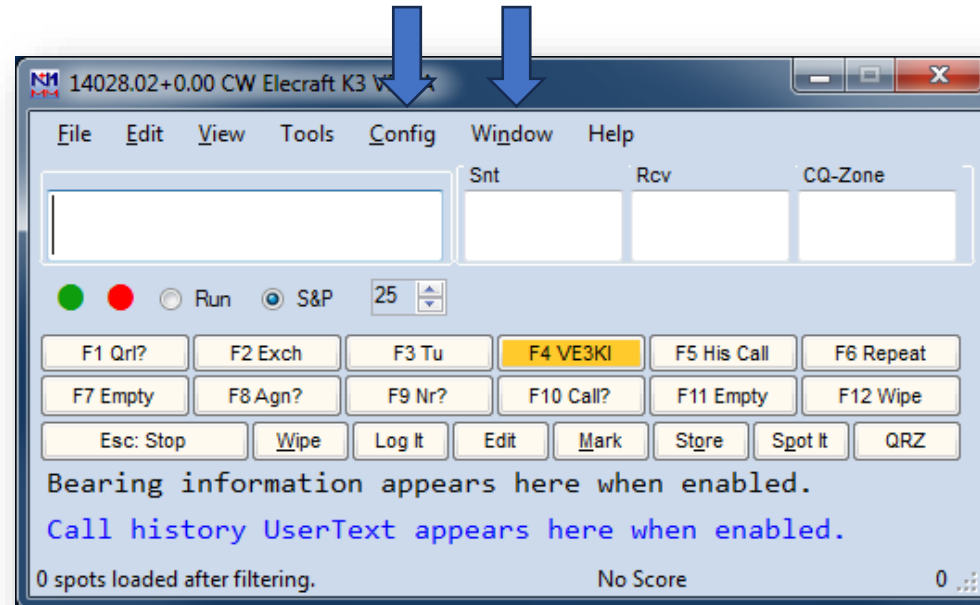
A.S.L. – Simply means Height “Above Sea Level”

[ARRL Section Code](#) – Find your ARRL Section Abbreviation

Club – Your Affiliated Ham Radio Club

Step 5 - N1MM+ Setup

- N1MM+ has a main window, but many sub-windows, so it can be a little confusing. “**Config**” allows us to configure the main setup, while “**Window**” allows us to access multiple other features.



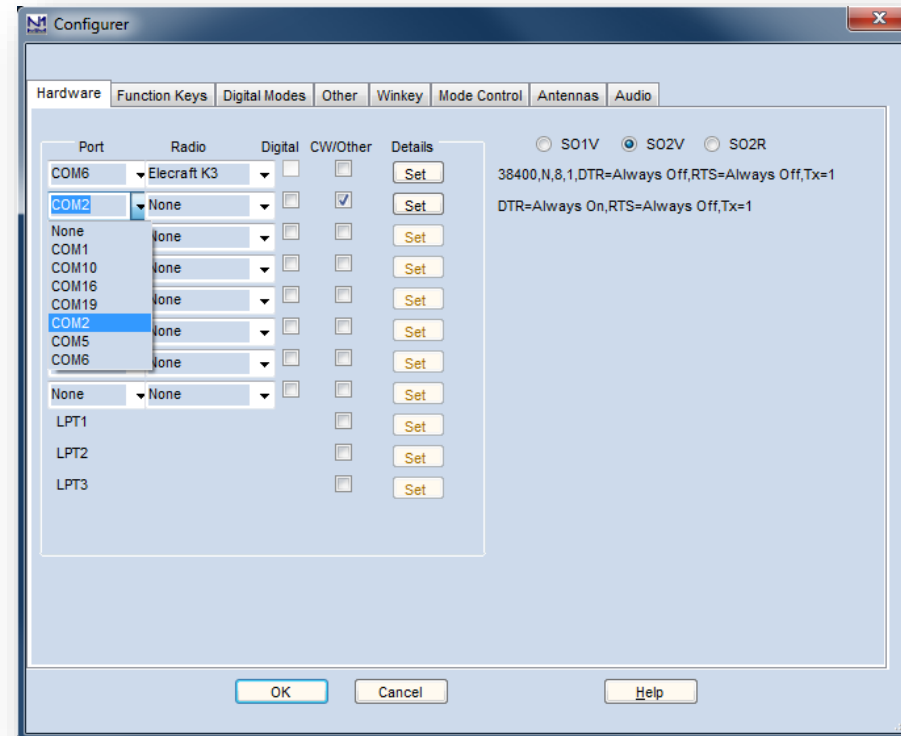
Step 5 - N1MM+ Setup

- Config > **Configure Ports, Mode Control, Audio, Other**

Hardware - Select your radio from the list, and then select the Serial cable COM port (not the USB data cable port).

This will be what N1MM Logger Plus+ uses to communicate with your radio, and allows it to accurately log your real-time QSO frequencies.

SET – Allows you to enter details specific to your radio. Leave at default or use the recommended settings.



Step 5 - N1MM+ Setup

- Config > **Configure Ports, Mode Control, Audio, Other**

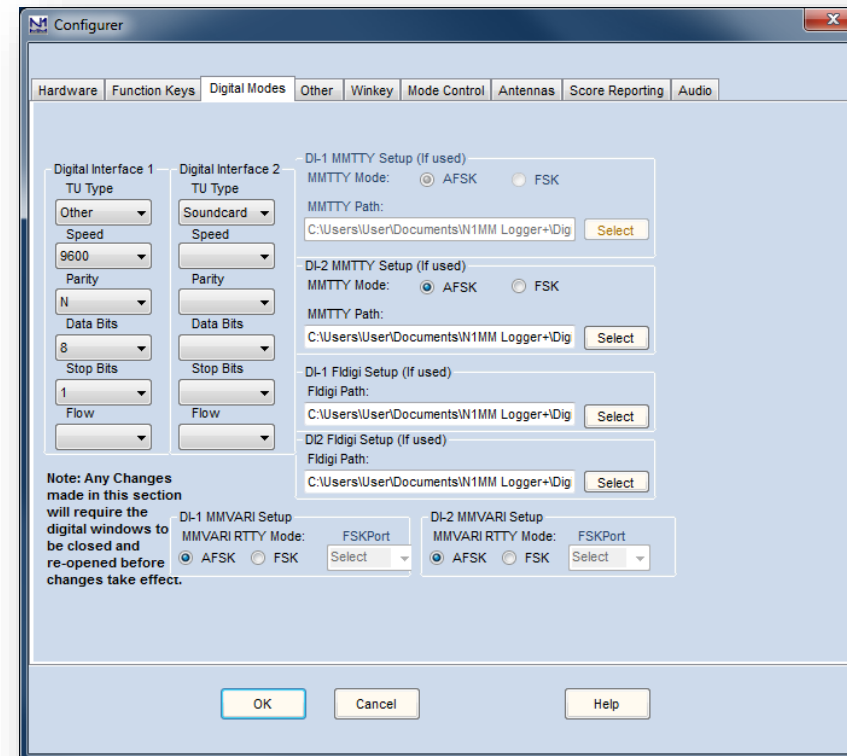
Digital Modes – Here is where you let N1MM+ know where to find MMTTY decoding software.

MMTTY Mode – Select “FSK”

MMTTY Path – Path to MMTTY Software

TU Type – Soundcard

DI-2 MMTTY Setup – Allows you to define the path to a second decoder (2Tone).



Step 6 - Setup Testing

- At this point, you're probably wondering, "How do I know if it's working?" Remember, the software will continue to function even if it's unplugged from the radio. Our goal is to make sure everything is working together, not just the software.

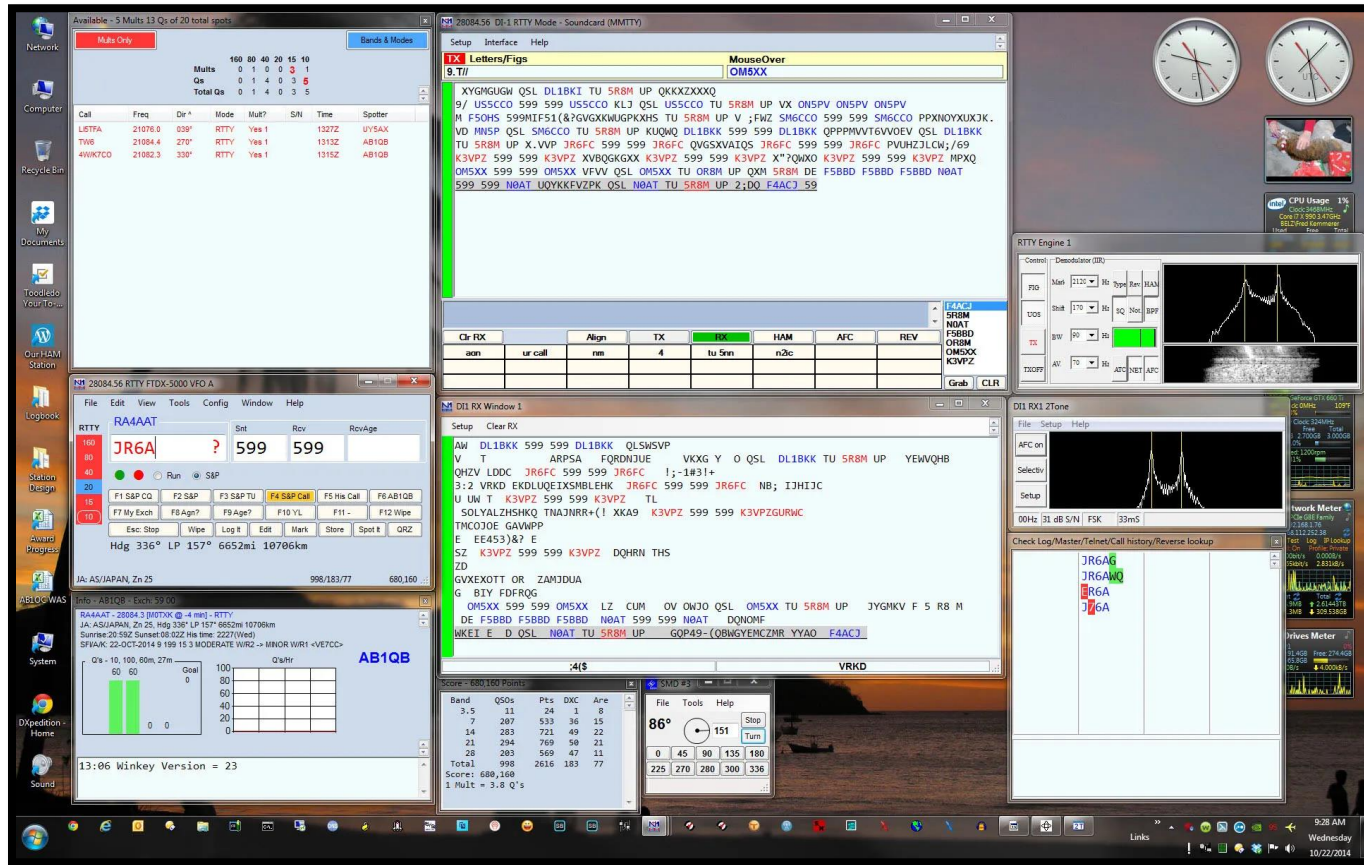
Here's a list of what we are trying to do...

- We want to decode/transmit RTTY signals successfully.
- We want N1MM Logger Plus+ to control the radio.
- We want N1MM Logger Plus+ to correctly log the QSO information.
- We want 2Tone to give us a second look at the decode.

Step 6 - Order of Operation

- Turn your radio on. Switch to RTTY mode (on the radio).
- Open N1MM Logger Plus+
 - Windows I typically open & their function :
 - Main Entry Window – Allows you to log your QSO.
 - Digital – Opens RTTY Digital Mode Window (Starts MMTTY Engine)
 - Log – Shows you all of your logged contacts.
 - Check (Super Check Partial) – Checks call signs / partials for accuracy.
 - Band Map – Shows the band your are on and maps call signs.
 - Additional Windows / Features – Pick your favorite. Totally customizable.
- Once everything is open, proceed to the next page.

Step 6 - Screenshot



This is an example pulled from the internet of one particular ham's setup.

You can customize the location, size, and number of tools opened from the **Window** option on the **Main Entry Window**.

Make it your own!

Note: This screenshot does not include everything in N1MM+.

Step 6 - Testing

- Test #1 - Can N1MM+ see the frequency?
 - Turn the dial on your radio. You should see the frequency change and match the radio on the top of the band map in N1MM+.
- Test #2 - Is MMTTY (digital window) receiving decoding signal?
 - You should see “hash” (garbled characters) scrolling across the window. If no signal is present, you will just see “hash” generated by noise. When a signal is present, it will decode the message.
- Test #3 – Can you transmit (encode) a RTTY signal?
 - Click on one of the MACROS (preset messages) and see if it transmits. If it is transmitting, you should see it decoded in the MMTTY (digital window), and you will see a elliptical cross hair form in the MMTTY (engine window).
 - **Important!** – *Make sure you listen for your radio to key up. The software will show a cross hair regardless of whether the radio gets the signal or not. – Listen for the radio to key up!*
- Test #4 – Is N1MM+ logging QSO’s accurately?
 - Type a real or fake call sign main data entry window – hit enter. See if it records the frequency from the radio. You should see the QSO appear in the Log Window.
- Test #5 – Is Your 2nd Decoder (2Tone, MMVARI, etc.) working?
 - Not difficult to setup. See the N1MM Logger Plus+ website for setting up a 2nd decoder. This splits the digital window into two separate decoders for your interpretation.

Contest Setup

- **Example:** Setting Up For NAQP RTTY Contest
 - Click “**File**” in the N1MM logging window, then “**New Log In Database.**”
 - Select “**NAQPRTTY**” from the drop-down list.
 - Dialog Box - Select “**Single Op**”, “**Low Power (100 watts)**”, “**Assisted**” (if you plan to use the DX cluster), and “**One Transmitter.**”
 - In the same dialog box, click “**Associated Files.**”
 - Under **Digital Function Filename**, click “**Change**”, then “**Default Digital Messages.**” This sets your default MACROS (preset messages).
 - Click “**Change**” for **Call History File**. Accept.
- N1MM should open set up set for NAQP RTTY.

MACROS - Recommended

Running Is Always **F1**, **F2**, **F3**

- **F1** is CQ
- **F2** is the exchange
- **F3** is TU W3GH CQ (TU is short for “Thank You”)

Searching & Pouncing Are Always **F5** and **F6**

- **F5** is our callsign W3GH (or your callsign in this case)
- **F6** is always the S&P exchange R BOB PA (R is short for Roger, or to confirm)

Repeat Questions are **F8**, **F9** and **F10**

- **F8** AGN? (Again)
- **F9** NUMBER? (Repeat Your Exchange)
- **F10** UR CALL? (Repeat Your Callsign)

F11 is your exchange 3 times (This is used when the other station is having a hard time copying your exchange).

F12 is always WIPE, or clear everything out of the logging window. You can also do this with **ALT-W**.

MACROS - Saving / Loading

The macros are simply a text file. Open N1MM+ & load the default RTTY macro set.

- After N1MM+ is running, **Right-Click** over the macro buttons in the main logging window. A dialog box will open and show you the actual default macros. Delete ALL of the macros so that you are left with a blank page.
- Select All, then **Copy & Paste** the code on the next page.
- Click **FILE**, then "[Save these Messages to a Different Function Key .MC File Name](#)".
- Call them whatever you like. They will land up as a generic text .MC file.

Now, back in N1MM+ click on **FILE** in the main logging window.

- Click on "[Open Log in Database](#)".
- Click on the "[Associated Files](#)" tab.
- Go to "[Digital Function Key Filename](#)" and click "**Change**".
- In the list of macros you will see your CUSTOM_RTTY.MC file. Click on that & back-out.

You will now have these macros active.

MACROS - Actual Code

```
F1 Run CQ, {TX}{ENTER} CQ {MYCALL} {MYCALL} CQ {ENTER}{RX}
F2 Run Exch, {TX}{ENTER} ! {EXCH} {ENTER} {RX}
F3 Run TU, {TX}{ENTER} TU {MYCALL} CQ {LOG}{RX}
F4 Now...POP, {TX}{ENTER} {LOGTHENPOP} TU NOW... {F2}{RX}
F5 Call, {TX}{ENTER} {MYCALL} {MYCALL} {RX}
F6 EXCH, {TX}{ENTER} R {EXCH} {LOG} {RX}
F7 BLANK,
F8 Agn?, {TX}{ENTER} AGN? {ENTER}{RX}
F9 Number?, {TX}{ENTER} Number? {ENTER}{RX}
F10 CALL?, {TX}{ENTER} UR CALL? {ENTER}{RX}
F11 EXCH3, {TX}{ENTER} {EXCH} {EXCH} {EXCH} {ENTER}{RX}
F12 Wipe, {WIPE}
```

ALWAYS! - Make Sure You add a SPACE character after your Call. Ex: W3GH <space bar>

(This will insure that the hash characters will not be attached to your call!)

No Space Will Look Like : W3GHK\$%sl4 vs W3GH K\$%sl4

MACROS - Code Reference

- * - Send this station's callsign
- ! - Send the callsign entered in the Callsign field
- # - Send serial number for this QSO
- {CALL} - Send the previous or uncorrected call from the Callsign field of the Entry window
- {EXCH} - Sent Exchange
- {LOG} - Logs the current contact. Same as the Log It button in the Entry Window
- {MYCALL} - My Call from Station info dialog
- {SPACE} - Equivalent to pressing the spacebar key
- {TX} - Keys PTT from a function key
- {SENTRST} - Sends the RST as entered in Entry window Snt field
- {F1} – {F12} - Sends function keys F1 through F12

Digital file messages generally begin with {TX} and end with {RX}, except for program control macros.

Additional Info: <https://n1mmwp.hamdocs.com/setup/function-keys/>

Pro Tips - AC3Q

- **Difference Between DTR & RTS**

- Electrically they are both the same. The difference is their purpose.
- **DTR** – “Data Terminal Ready” indicates that the connected device is ready to receive data. Data Terminal Ready (DTR) is a control signal in RS-232 serial communications, transmitted from data terminal equipment (DTE), such as a computer, to data communications equipment (DCE), to indicate that the terminal is ready for communications and the hardware may initiate a communications channel.
- **RTS** – “Request to Send” indicates to the connected device that it wants to send data. Basically, DTR is used to indicate the presence of some equipment, and RTS is one half of hardware flow control (along with CTS) to start and stop communication.
- On USB communication (e.g., using FT232 USB to UART adapter, etc.) the meaning is less clear. DTR is asserted when the port is opened (usually) and RTS is most likely not asserted at all. It's at the whim of the operating system and/or the driver whether DTR is automatically asserted or not, and whether RTS is even implemented.

Pro Tips - KC3SDJ

- You can do RTTY with one cable, but this limits you to AFSK RTTY, UNLESS you use a COM port emulator. I use VPSE setup in splitter mode with a baud rate of 115,200. This splits COM 3 into a second port, COM 4. I do this since my old computer is severely limited on USB ports.
- One thing to note - true FSK RTTY may be friendlier to use, as it allows you to use the tighter/narrower filters in the RTTY mode of the 7300, versus having to use the SSB filters if you went with AFSK.
- Also, audio level settings are critical with AFSK so that you can get full output power, but also not have any ALC voltage generated in the radio. ALC with AFSK can cause "splatter" and will make it hard for others to decode you. It is normal to see an ALC response in RTTY mode using full FSK, but you shouldn't see any (or very little) ALC if using audio FSK (AFSK).
- The reason you can do FT8 with one cable and no COM port emulator is because FT8 and WSJT use AFSK for those tones. AFSK RTTY would only require one cable, with audio settings being set in a similar manner to how you set them for FT8. True FSK RTTY; however, requires either the second cable OR the COM port emulator, and true FSK provides you with the added benefits of not having to fuss with audio levels at all AND also being able to use the narrower filters in the radio.

Pro Tips - K3RWN

- If you roll your mouse wheel while the cursor is in the logging window you can shift frequency like you are turning the VFO knob.
- If someone comes back to you off freq while you're running and you use the RIT to tune in to them, it is easy to forget that the RIT is off-freq, and you are now listening off freq and don't realize it. If you use {CLEARRIT} after your TU resonance (For us F3) N1MM will automatically reset your RIT back to zero.
- Also if you use {LOG} in your TU response it will log the Q automatically, unless you don't have the exchange filled in yet. In which case you don't want it to log the q until you fill in the exchange.
- For newbies: Roll your mouse wheel while your cursor is in the Bandmap window and you can shrink or spread the spots on the map.
- If you are running and decide to go S&P or work a mult, keying ALT-Q will bring you back to your CQ freq.
- TPF Consideration – If a person answering your CQ who is a bit off freq will not decode well. A filter at 500hz with TPF off is what is typically recommended by the big boys.

Pro Tips - WC30

- Use Fine Tuning Mode. - On the touch screen, touch and hold the last two frequency digits on the right. Those two digits will turn into three digits. The tuning rate has now been reduced by a factor of 10, making it MUCH easier to tune in RTTY signals. Just remember to turn fine tune OFF after the contest. Again, touch and hold those last, now three digits and it will go back to normal. Most all other radio have this feature, you just have to figure out how to do it.
- ICOM has a feature called a Twin Peak Filter. It is a custom filter designed specifically for the two tones of RTTY. There is some debate about the effectiveness of this filter, but by my experience, it works pretty damn well. While the 7300 is in RTTY mode push the Multi knob. TPF is in that menu.
- Enter Sends Message - You'll notice that the key strokes during QSO's are repetitive & predictable. With ESM, if there is no callsign in the logging window, hitting **Enter** will send CQ (**F1**). Once there is a callsign in the slot, hitting **Enter** sends the exchange (**F2**). Once the exchange is in its slot hitting **Enter** sends TU W3GH CQ (**F3**) and the cycle starts over. Same when you're working S&P. N1MM+ will know when you are in S&P mode when the frequency changes.
- Another thing I do is use a Stream Deck programmed with my F-Keys. This way you can have the Stream Deck on your leg, and hit the F-Keys from there. Works real nice-like.

Pro Tips - WOYK

- Jitter is variation in the bit timing of a RTTY signal. It is real and has existed since Windows has been used to generate FSK timing. When the FSK timing is done outside of Windows in a hardware UART on a Serial I/O card, there is no jitter. Jitter is generally not an issue with AFSK transmission.
- Jitter will increase the error rate experienced by stations copying the signal. Since many things can cause error rate deterioration, it is rare that the receiving station will know that jitter is increasing their error rate. In fact, their decoder may tolerate some level of jitter and still print accurately. In very few situations would the receiving station know, and complain, that your jittery signal was causing them to not copy you adequately.
- Over the course of a contest period, a reduced error rate will have a positive, though probably marginal, impact on your score. Certainly, if you have a slow PC with lots of other Windows apps running, etc. the jitter may be high enough to really be noticeable via the trouble people have copying your signal.
- The remedy for FSK jitter is to move the bit timing outside of Windows or use AFSK instead of FSK. MORTTY is a stand-alone Arduino microprocessor which has no other job to do than keying the radio. Since it's dedicated to that task there is no variation in timing, eliminating jitter.

Pro Tips - Hardware



- MORTTY CW / RTTY Keyer - <https://www.mortty.net/>
- Stream Deck - <https://www.elgato.com/us/en/p/stream-deck-mini>

Additional Resources

- [Icom IC-7300 - User's PDF Manual](#)
- [Icom "Tips for Port Settings" - PDF Document](#)
- [On All Bands - "Getting Started In RTTY" – Article](#)
- [AA5AU's "Getting Started On RTTY" - Tutorial PDF Document](#)
- [Ham Radio Deluxe - Icom IC-7300 USB Configuration](#)

Special Thanks...

K3RWN, WC3O, KC3SDJ, and W0YK