

About MMTTY

MMTTY Windows Help File Version 2.5.9 © 2001-Apr-12 Jan Ditzian, KX2A

What Is MMTTY?

MMTTY is a RTTY software program that uses a PC sound card, and does not need or use a terminal unit or tnc. Here are the features of MMTTY:

- Modulates (encodes for transmission) RTTY using the PC sound card
- Demodulates (decodes and prints) RTTY using the PC sound card
- Uses DSP to detect and demodulate RTTY signals, with numerous control options (choice of filter, notch)
- Generates AFSK for transmission through the microphone input of an SSB transceiver
- Generates FSK for transmission through a COM port to the FSK input of some transceivers
- Operates a push-to-talk switch using one pin of the FSK com port
- Provides 16 fully user-customizable macro buttons that can contain text and commands
- Stores up to 64 user-defined transmission messages, in addition to the macro buttons
- Has a simple logging program that automates some data entry operations
- Allows user-customization of demodulation schemes using DSP
- Displays input on a digital oscilloscope shown on the PC screen
- Records and replays RTTY signals
- Records decoded text
- Provides user-customizable shortcut keys to simplify operations
- Has a simple log with import/export capability
- Provides contest logging features using shortcuts
- Operates as a modem under the control of contest logging programs or other software that hosts for MMTTY
- Operates in remote mode as a plug-in to software designed to use MMTTY for RTTY encode/decode

What Equipment Does MMTTY Require?

MMTTY REQUIRES A PENTIUM-CLASS COMPUTER WITH WINDOWS 95, 98, NT, OR ME AS AN OPERATING SYSTEM. IT MAY RUN ON 486 MACHINES, BUT THAT IS NOT SURE. THERE IS INFORMATION IN THE TOPIC [COMPUTER TUNE-UP](#) THAT WILL HELP YOU TO GET A MARGINAL COMPUTER WORKING WITH MMTTY. THERE ARE CERTAIN DSP, DEMODULATION, AND DISPLAY FEATURES THAT OCCUPY THE CPU THAT YOU CAN AVOID. OF COURSE, YOU WILL LOSE SOME OF MMTTY'S BENEFITS IF YOU TURN THESE FEATURES OFF, BUT THIS IS BETTER THAN NOT HAVING MMTTY AT ALL.

YOU MUST HAVE A 640 X 480 PIXEL DISPLAY (AND HAVE THAT HIGH A SETTING IN YOUR CONFIGURATION) AND A 16-BIT SOUNDBLASTER-COMPATIBLE SOUND CARD.

How Does Someone Obtain MMTTY?

MMTTY is freeware. The copyright belongs to JE3HHT, Makoto (Mako) Mori. There is no restriction on copy or re-distribution; Mako trusts your good sense. MMTTY was released with no support and no warranty for any damage caused by the use of MMTTY.

Here is where you can find MMTTY and its Help files on the internet:

http://www.geocities.com/mmtty_rtty/

You can also go to yahoogroups.com and sign up for the MMTTY internet e-mail reflector.

yahoogroups.com

If you have questions or comments, please use this group. The group uses the English language for communication. Sign up for the reflector by going to yahoogroups.com, where you will see a way to subscribe to groups. Select MMTTY as the group and subscribe. Once you are a member, you will receive e-mail from MMTTY@yahoogroups.com. You can send e-mail to that same address and it will go to all members of the group.

Making MMTTY Part of Another Application

MMTTY can be used by both free and commercial applications in its remote mode, as an application under the other software. However, there are restrictions to this use. Please consult the MMTTY English web site for further information. Look for the Programmer's Page. In particular, please comply with the rules for distribution of MMTTY. Commercial programs can work with MMTTY, but may not distribute MMTTY code.

Who Wrote MMTTY?

Makoto Mori, JE3HHT, is the author of MMTTY. Here are his words.

I have been operating PSK31 since 1999, but I was very curious about the "piropiro" sound in the upper frequency ranges. I just wanted to receive the RTTY signal but unfortunately I had no modem. So, I began making a demodulator prototype, called RTTYDEM, and later started making this MMTTY for 2-way QSOs.

JARTS home page is available at <http://www.edsoftz.com/JARTS/index.html>

Special thanks to those who helped to develop MMTTY:

- Fumio JA1IQV has given many helpful comments.
- Nori JA1WSK has made great arrangements for the English version.
- Oba JA7UDE translated the Japanese Help file into English, starting the English Help file project.
- Bill KB4IJ made the group <http://www.yahoogroups.com/promote/mmtty>, where English language users can obtain and discuss MMTTY.
- Andy KE2EOQ has been writing an English language help document.
- Ken VE5KC made an English language home page for MMTTY at http://www.geocities.com/mmtty_rtty
- Ed K4SB, corrected the English of the Help files.
- Jan KX2A, conducted a project to rewrite the Help files in Windows Help format.
- Bill K5YG, corrected the English of the Help files and supported the English-language FAQ.
- Eddie W6/G0AZT, supports the English-language FAQ.
- Phil GU0SUP, helped create the English-language FAQ.
- Josef OK2WO, translated this Help into the Czech language
- Bill W7TI, provided a document about RTTY BASICS for this Help.
- Bob K4CY, proposed numerous ideas on the remote mode and gave examples of using Visual Basic.
- Eike DM3ML, created a German help document.
- Antonio EA1MV, created a Spanish help document.
- Edoardo I5PAC, created an Italian help document.

I really appreciate you guys.

Special Thanks to Jan, KX2A, who created the Windows Help file. The English Help file may be better than the Japanese Help file. Jan, I really appreciate you. Many thanks for your hard work.

This Help File

This Windows Help file was written by Jan, KX2A, based on previous help files from Mako, JE3HHT, translated by Oba, JA7UDE, who also provided direct guidance and further translation as new features were developed. Oba and Mori also provided daily help with more information and even pictures for these Help files.

A second Help file came from Andy, KE2EOQ, who was the initial spark for this effort.

Bill, KB4IJ, established the special egroup that was used for communication during development, and offered advice.

Ken, VE5KC handled the dissemination of this file to the ultimate users and also gave advice.

Bill, K5YG, did the work of refining and rewriting the Mako/Oba section on digital signal processing, and this exceptional work is found almost unchanged in [Advanced Receiving](#).

Jan, KX2A, thanks all of these people for their contribution to what has been an exciting and rewarding effort. I am proud to be associated with these hams who give of themselves to advance our hobby and the state of the art.

Using This Help File

At the top of the Help display, to the right, there are two sets of pointing brackets (<< >>). You can use these to browse (step through) the topics.

There is also a Table of Contents, and Index of topic titles, and a Find function that searches through every word in the Help files.

In the text itself there are some hyperlinks to other places in the Help file and to locations on the world wide web. When you go to another place in this Help file, you can return to where you were with the Back button.

A revision history for the Help file can be found at the bottom of the topic Revision History, which originally was for the MMTTY software itself. The MMTTY revisions are at the top of the page.

If you have comments or recommendations about this Help file, please send them to the MMTTY e-mail reflector noted above. The author, Jan, KX2A, can be e-mailed at ditzian@alltel.net, but information for, or comments about, the Help file should go through the MMTTY reflector.

A Bit of Philosophy

Makoto Mori, JE3HHT, wrote this software for his own enjoyment and the enjoyment of his friends. It has turned out that Mako's friends grew to include many thousands of hams over the world. Because of this, Mako wrote the software to be flexible, and, in fact, to be experimental. Consider these items as you begin to use MMTTY:

- The macro buttons can be changed from their defaults to contain any script that you can

- create using the macro language that is described in the Macro topic.
- The Group 1 macro buttons at the top of the display can be moved into a straight line below the top of the display.
- You have control over so many DSP parameters that it is hard to describe them all in this Help file.
- There are three demodulator algorithms available to you, and it may turn out that one or more are worthless in comparison to the others; or it may turn out that special conditions call for a different demodulator.
- You can put standard information on a macro button, on an item in a pulldown macro script, or in a file to be called for replay from the File menu item.
- You can use or eliminate one or all the tuning displays (XY, spectrum, waterfall).
- You can use MMTTY to ragchew, chase DX, contest, or SWL (this is why the baud rate was brought to the main window).
- You can reset almost any parameter, including the default mark/shift that comes up when you use the HAM button.

MMTTY is designed for flexibility. Sometimes it may be a bit clumsy, because a feature was not implemented until it was too late to make it very convenient; nonetheless, it is there. But remember, just because a feature is there does not mean that it is guaranteed to succeed for you. Perhaps you must adjust it, or maybe it is just not valuable for your operation. You make these decisions.

Makoto Mori has used advice from the MMTTY reflector to make many changes to the software, even after he had been using MMTTY for over a year. If you come up with good ideas, share them with the MMTTY community and with Mr. Mori over the reflector.

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System Requirements

Operating System

Windows 95, Windows 98, Windows NT, Windows ME.

Display

640 x 480 pixels or higher (higher is better).

Sound Card

16-bit Soundblaster or compatible (11025 Hz, 16 bits).

Since MMTTY uses the low level Windows API to control the sound card, it should work on most sound cards. If you have trouble, refer to [Computer Tune-Up](#) in this document.

CPU and Memory

All the digital signal processing (DSP) uses the floating-point calculation complex in the CPU. MMTTY works on a notebook PC (Pentium 133 MHz.) and desktop PC (Pentium 100 MHz.). This notebook has only 8 megabytes of RAM, so MMTTY is not very demanding of memory. MMTTY may not work on slower computers, however, there are tricks you can do if your processing power is near the lower limit. Refer to [Computer Tune-Up](#) in this document.

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Software Installation

Installing MMTTY

The version of MMTTY found at the English MMTTY website is in a self-extracting Zip format. Just execute (run) the file and follow the instructions that appear on the screen. Advanced users can use WinZip or a similar program to extract and install the program manually. For current information on the installation files and process, see the Readme.txt file available from the MMTTY Help menu or on the English MMTTY website.

If you already have an earlier version of MMTTY installed, just overwrite the old MMTTY. You do not have to erase the old MMTTY. Do not erase MMTTY.INI, which has all the macros, messages, and preferences, which you created so far. You may want to back up MMTTY.INI before you proceed with the installation. If you download the version of MMTTY that is specifically the UPGRADE, it should not overwrite MMTTY.INI, but back it up to be safe.

When you first install MMTTY, MMTTY.INI is created. You can have different setups for your macros and messages by renaming the MMTTY.INI file and saving it. When you need a different setup, just name that ini file as MMTTY.INI and it will take over. Make sure that you have backups (with different names) of all versions of MMTTY.INI so you won't accidentally lose one by overwriting it.

Uninstalling MMTTY

A thousand years have elapsed, and someone has come up with a better RTTY program than MMTTY, and you have decided to uninstall it. Just delete the MMTTY files. MMTTY does nothing to the Windows registry, so there is no need to use add/delete programs. You should also check for the shortcuts to MMTTY that are on your desktop and in the Start, Programs Menu, and delete these items. A simple way to find most MMTTY shortcuts is to use the Find function to look for the phrase MMTTY in the name of a file. It would be a good idea to delete the MMTTY directory.

Problems

If MMTTY generates unexpected unrecoverable failures, try erasing MMTTY.INI and start MMTTY again.

Language

You are reading this Help file in English, so Japanese is probably not your first language. However, MMTTY was developed in Japan, and used by Japanese amateur radio operators. To make it more useful for other amateurs, MMTTY automatically reads Windows country information upon the first startup. MMTTY initializes the fonts and messages according to the Windows country information.

If you want to start up in the Japanese language, but your computer language is English, go to **Option(O), Setup MMTTY, Misc** tab, and click the button at the bottom labeled "Japanese." Now restart MMTTY and it will start up in the Japanese mode next time. To return to English just press the "English" button and it will return immediately, if the Windows country language is English.

Changing Your Callsign

During the setup process, MMTTY will ask you for your callsign. If you later want to make a change, click **Option, Setup MMTTY, TX** Tab, and look in the lower center of the display for a

window that allows you to make the change.

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Sound Card Hookup

AFSK and FSK

You can use two different modes of operation to modulate your radio, AFSK and FSK. Review the section on [AFSK and FSK](#) to decide which mode you would like to use to modulate your radio. In either case, you will decode RTTY signals for display using AFSK.

How to Hook Up the Sound Card to the Radio

AFSK

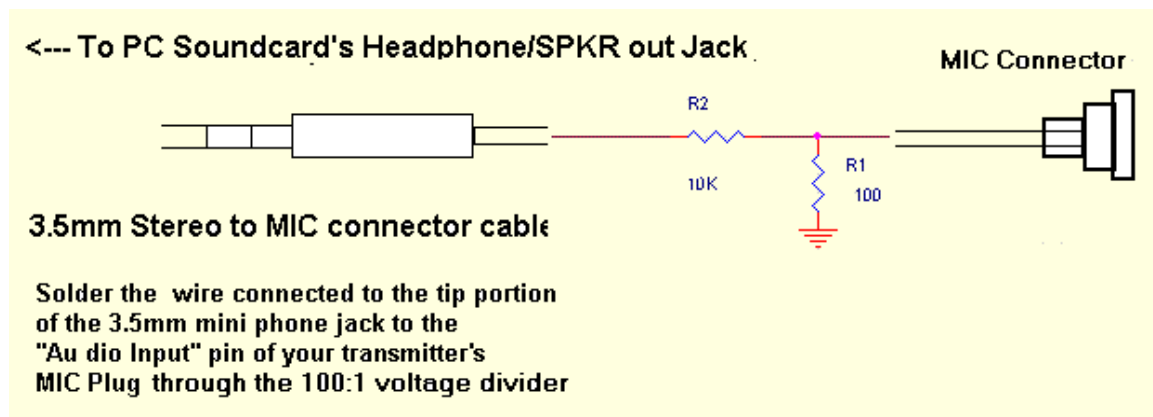
Hardware Setup

Use shielded leads.

- Connect the audio output from the radio to the line or mic input of the sound card. This will bring audio to MMTTY to decode RTTY.
- Connect the output of the sound card to the microphone, aux microphone, or data input of the radio. However, see the next section on attenuation

Transmit Attenuation

The second step above is the one that causes problems. You should insert an attenuator in the sound card output line to reduce the audio level or you may overdrive the audio stage of your transmitter. Some transmitters already have an attenuator or voltage divider, but even these often operate well with even more signal reduction in the line between the sound card output and the radio mic or audio input. Here is a picture of a 100:1 voltage divider to use as an attenuator. You can replace one or both resistors with potentiometers for more adjustment, but usually a 100:1 works fine.



Depending on your individual setup, you may want to add ferrite beads to the input and output leads, and possibly decoupling capacitors. Of course, these might be needed even without the attenuator. These components keep RFI from your rig from getting into your computer.

Receive Signal Strength

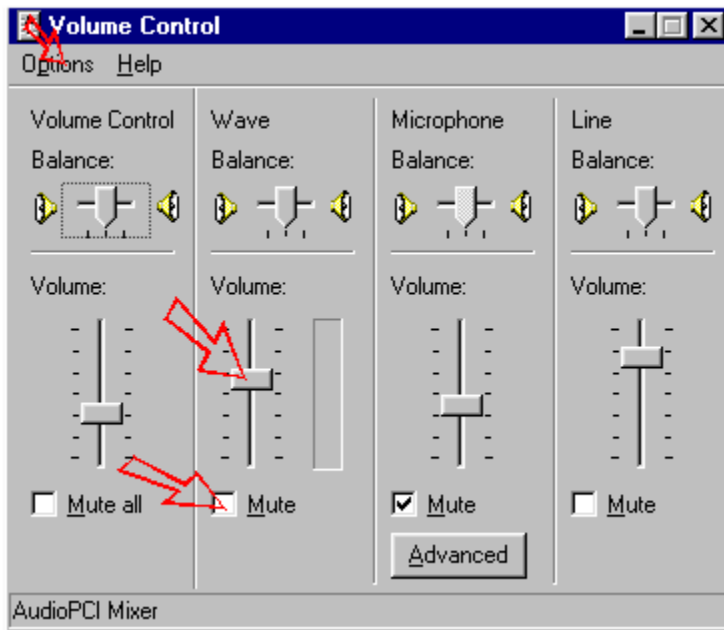
If you exceed 75% of MMTTY's capability of handling an input signal, you will see the word OVER appear in the Spectrum Display. If this happens only once in a while, you need not be concerned. However, if it happens frequently, you should reduce the signal input to MMTTY by using the audio mixer in Windows or by attenuating the signal from your radio to the sound card.

Software Setup

- Select **Option, Setup MMTTY, Misc** tab
- In the Tx Port area in the middle of the display, select "Sound" or "Sound+COM-TxD"
- If you are not using FSK for any reason, "Sound" is a better choice; no data will be sent through the COM port, but this port can still be used for PTT control

You may also have to turn on the volume controls for transmission and reception. Click **Option, Adjust Volume**. This will bring up a Windows display of Volume controls, called the Mixer. These volume controls will work during transmission and reception. You may have to use the Option menu or File menu at the far left of the display of volume controls to see all you may need. Move the sliders up until you see noise in the MMTTY Spectrum Display or on the waterfall. You may want to make further adjustments later. Note which slider(s) change the volume and turn all the others off, except those needed to generate a transmit tone. To check the transmission tone, go to transmit in MMTTY and move sliders until you have transmission. Now turn off all the volume sliders that are not needed for either transmitting or receiving tones.

It may be possible for you to leave on those volume controls that operate other pieces of hardware or software that you use, such as the CD or a wave program. However, if you use the line input on the sound card, and you turn on the mic input as well, this may interfere with using VOX to control your radio. The radio will generate a spike as it goes to receive which will be fed back to the radio and will trip the VOX, so the radio will cycle between transmit and receive until you turn off the vox. If all the unused sound card inputs are off, this will not happen.



Operating AFSK

Please refer to the section [AFSK and FSK](#) for instructions on how to operate AFSK.

Sound Card Options

Multiple Sound Cards

MMTTY allows you to have more than one sound card in your computer, and to select the correct one for MMTTY. In this way, you can have one sound card for sounds, and another for use by

MMTTY in decoding and encoding RTTY signals. Click **Option, Setup MMTTY, Misc** Tab. At the lower left there is a window labeled device ID. The default is -1, which means that MMTTY looks for any sound card. To choose a device ID, select another number. You will have to experiment to find the correct one for the sound card that you want to use, but there are only four choices.

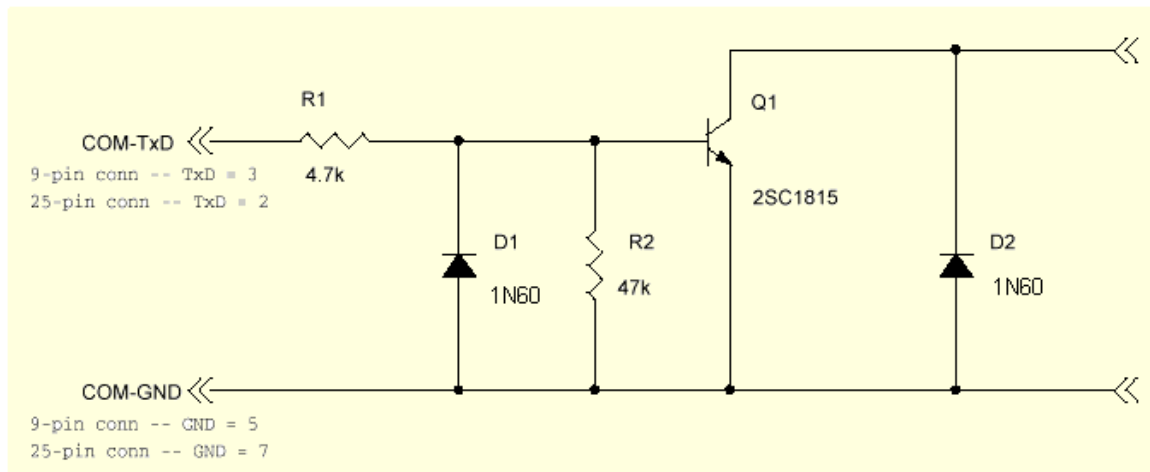
Stereo Sound Cards

By default, most sound cards work in monaural mode. However, some cards may have a problem. You can select which channel you want to use for receive by clicking **Option, Setup MMTTY, Misc** Tab. At the left is a box labeled Source, in which you can check mono, left, or right. Try all three to see if one works for you. This option is for receive only. MMTTY will send the AFSK signal out on both channels from the sound card, and you can hear this in the speakers.

FSK

Hardware Setup

Here is a picture of how to wire your radio to the computer COM port.



The COM port is at the left. The output of the UART is pin 3 on a DB-9 connector and pin 2 on a DB-25 connector. This is the FSK signal. The ground for this signal is pin 5 on a DB-9 and pin 7 on a DB-25. On the right is the switched output to the FSK input on the radio. With this circuit, when MMTTY sends a "space" (current off) the transistor switch is open and when it sends a "mark" (current on) the transistor switch is closed. This same circuit is used for push-to-talk, see [Transmit/Receive Control](#).

Software Setup

- Select **Option, Setup MMTTY, Misc** tab
- In the Tx Port area in the middle of the display, select "Sound+COM-TxD" or "COM-TxD"
- If the two FSK choices above are grayed out, go to the **TX** tab and select an output port for the FSK

Note: You **must** select a com port for FSK operation.

TxD is MMTTY's term for the COM port output of FSK via the UART. In FSK, Tx BPF and Tx LPF do not function. You can turn them off on the **Option, Setup MMTTY, TX** tab.

When you use FSK, the REV switch on the main MMTTY screen will not change the polarity of the output. You cannot reverse your shift with this key, but the receive will shift polarity, since you are still receiving via the audio tones.

Operating FSK

Please refer to the section [AFSK and FSK](#) for instructions on how to operate FSK. However, note that if you turn on AFC when you are wired to operate FSK, you may not be able to use the FFT display to tune to zero beat. The AFC will automatically change the mark frequency on receive to help tune in the signal. If you want to use the FFT display to tune to zero beat, just turn off AFC, reset the mark to what you are using for transmission (HAM button), and tune using the FFT display. You may turn AFC back on after you have established your transmitting frequency, since nothing MMTTY does can change your transmitting frequency in FSK mode.

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Transmit/Receive Control

MMTTY offers three ways to control the transmit/receive state of your transceiver: 1. VOX, 2. push-to-talk (PTT), and 3. direct software command to radios equipped to act on these commands.

1. VOX Control of T/R

Vox is the simplest way to control your transmitter. All you do is turn on the vox and adjust the vox control of your transceiver. However, there are some problems.

- If you like to use vox for voice transmission, you may find that the proper sensitivity and delay settings for MMTTY are not the same as those for voice.
- Windows sends sounds to the speakers, and these will all go to the audio input of the transceiver as long as you have it connected for input from MMTTY. This will cause you to key the transceiver without intending to do so.
- Some transceivers (some Yaesu radios at least) do not have vox enabled on the direct audio input that bypasses the microphone.
- Most transceivers do not have vox enabled on the FSK or data input, so if you use FSK mode you cannot use vox.

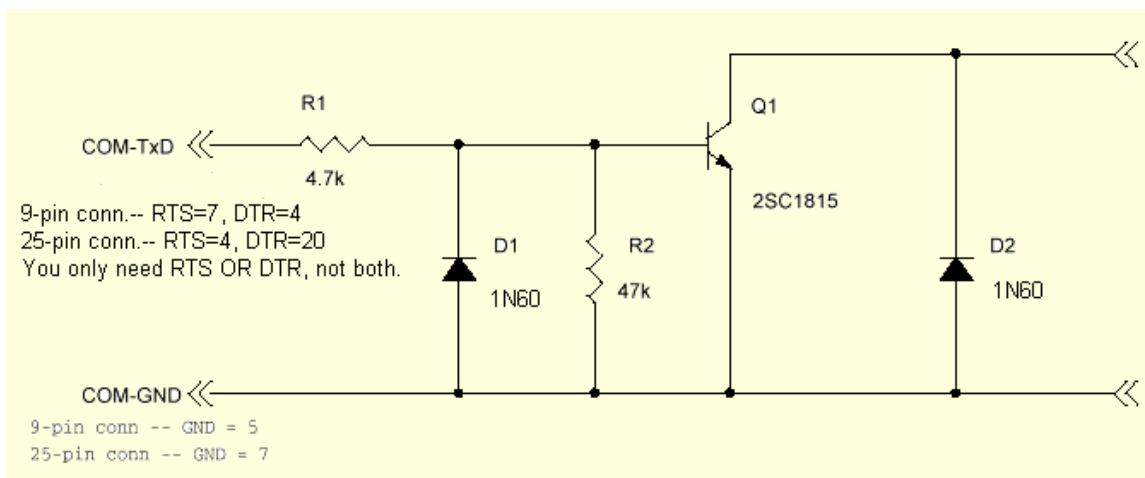
If you choose to use vox, turn it off when you are not actively in a qso, to stop the unintentional short transmissions.

2. PTT Control of T/R From a Serial (Com) Port

If you want to have your computer use push-to-talk control of your radio when you press the transmit button in MMTTY, MMTTY can key both RTS and DTR signals on the selected COM port. RTS and DTR make and break at the same time in the same polarity. Regular polarity is normally open during receive, closed on transmit.

To select the COM port, select **Option, Setup MMTTY, TX** Tab. The drop-down menu is at the far right. The list contains only COM 1 through COM 8, but you can get Windows to look for another COM port by typing in the word COM and the number you want it to use, such as COM 9. If there is no COM 9 on your computer, you will get an error message. At this point, you can also change the polarity of the RTS and DTR ports. Just below the port drop down menu is a check box to "Invert Logic." If you check this box, MMTTY will **close** the RTS and DTR ports on **receive** and **open** them on **transmit**. You should not need this unless you have a very strange PTT hookup or if you use a different transistor.

The circuit is the same as the one for sending FSK data to the transceiver's FSK input ([Sound Card Hookup](#)), but the pin connections are different. Here is a schematic of the PTT circuit, with the pin connections for push-to-talk.



You may need to add decoupling capacitors and/or ferrite beads or cores to reduce interference from the PTT line to the computer and to the radio.

PTT Control of T/R From a USB to Serial Port Converter

MMTTY will control PTT via a USB port, if you use a Xircom USB to serial converter as a virtual com port. Notebook users who cannot add extra serial ports may find this useful if they are using the real serial port for other purposes.

Not all USB converters appear to work the same. Some may not operate correctly with MMTTY.

Note: The information in this section was contributed by Bill, K5YG, and Mako, JE3HHT. If you find that other USB approaches work, please notify the Help file writer via the MMTTY discussion group at yahoogroups.com.

3. T/R Control Via Radio Command Over a Serial (Com) Port

If you have a radio that can communicate with a computer over a COM port by exchanging commands, then MMTTY can use this feature to put your radio into transmit and receive modes. Some radios are already supported, but MMTTY provides an open scripting opportunity for you to enter any codes that your radio might require, even if MMTTY does not know your radio.

Here is how you can implement the radio command feature.

- Connect your radio to a free serial port on your computer.
- Make sure that your radio and the computer port speed are compatible.
- Click **Option, Setup MMTTY, TX Tab**
- At the right side of this tab there is a button called Radio Command; push this button.

Above the Radio Command button is a PORT window. This window is to select a port for direct PTT keying. This should probably be set to NONE, if you are going to key via radio command. At any rate, this window does **not** set the port for radio command keying.

- In the Radio Command display that appears when you click the Radio Command button, set the COM port number, speed, data, stop, parity, and flow parameters to fit the port and the radio on the other end (this latter is mostly dependent on mutual speeds at the radio and the computer). At this point, you are telling the computer port how to operate.

- The radio port must be set at the radio, or it is already fixed by the manufacturer.
- At the bottom of the Radio Command display, click the down-arrow next to the window, and select your radio.
- **If your radio is not there**, simply enter the correct command sequence for Tx and Rx in the windows above. You can save this configuration under a name you select, by using the **Save** button after you have the strings entered. When you exit and return to MMTTY, simply go to this screen and **Load** the correct file and the Tx and Rx command windows will have the data you entered when you saved the profile.
- When you are done, and the correct strings are in the Tx and Rx windows, click **OK**.
- The **Char Wait** window at the top can be used to slow the transmission of the command sequence if you have problems communicating with the radio. This is not often the case, but if you are using a very slow port speed, it might be a problem. In most cases, you can leave this value at 0.

Note: If you are going to program a radio that is not in MMTTY's list, you must gather the correct information from the radio instruction manual or other sources.

Control of T/R via Radio Command Through Logger

It is possible to use the program Logger (copyright Bob Furzer, K4CY) to switch your radio from transmit to receive via radio command. In fact, if you use Logger, but also want to have MMTTY communicate via radio command, you **must** use the following procedure, otherwise only MMTTY or Logger can communicate with the radio, not both. The first program to get access to the port will keep it. The following procedure will let both programs get access to the information and control they need via the COM port.

You must set this up properly in Logger, which communicates with some radios via the serial port. This requires that you correctly configure Logger's PSK31 module to do PTT by Radio Command. Do this before you have started MMTTY. Consult the Logger Help for directions. When you have done this, and have closed the PSK31 module, start MMTTY.

With MMTTY running, click **Option, Setup MMTTY, TX Tab**, and click the **Radio Command** button at the far right of this tab. In the Radio Command window that appears, click the arrow next to **Port** (at the left) and select PSKGNR. There are no port settings, because Logger will handle the port command.

Close everything up with a series of **OK** clicks. Now, click **TX** on the main MMTTY screen and MMTTY will tell Logger to go to transmit, then Logger will pass the request to the radio via radio command. This feature will take effect as soon as you implement it, without restarting MMTTY or Logger.

Here are the drawbacks to this use of MMTTY and Logger:

- There is no automated transfer of callsign, name, QTH, or RST to Logger.
- The MMTTY frequency window will not read the radio frequency.

PTT Watchdog Timer

MMTTY incorporates a "watchdog timer" on transmit. This timer works for all methods of transmit/receive control because it operates at the software level. When the timer is exceeded, MMTTY leaves transmit mode, the Tx button pops up, and MMTTY is receiving. This should drop your vox, send the software command to put your radio in receive, and open (or close) the COM port connection you may be using for PTT control.

To set the timer, click **Option, PTT timer**, and put in the number of seconds that MMTTY can stay in transmit mode. A value of zero (0) turns off the timer and it will not operate. The default value is 60 seconds. If any value besides zero is selected, a check mark will appear next to the menu choice, PTT timer.

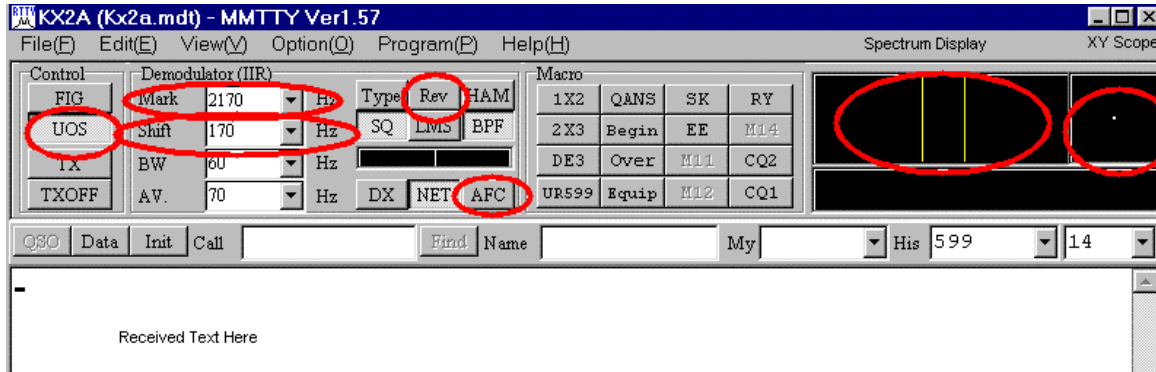
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Basic Receiving

Receiving RTTY with MMTTY is easy. We will start with the basics, and after you are able to tune in and decode RTTY signals, you can fine tune MMTTY and your radio to receive under more difficult conditions.

Here is a picture of the MMTTY display with some important receive items marked.



Setup

Here is a group of MMTTY and radio parameters that are sure to get you started with MMTTY. You can make changes later to suit your preferences.

- Set your radio to LSB or a digital mode.
- Click **View** on MMTTY's Main Menu to make sure that the following values are checked:
 - **Control Panel** (this allows you to see the other controls).
 - **FFT Display** (this shows a spectrum picture of the signals you will tune, at the top right of the MMTTY screen). The AFC will not operate unless the FFT Display is enabled.
 - **XY Scope** (this shows an XY picture of the mark and space signals, at the top right of the MMTTY screen). If you have problems with MMTTY freezing, or other indications of inadequate resources, turn this feature off.
- Set all the buttons on the MMTTY display to the "up" position, then press the **AFC** button down. MMTTY will help you tune RTTY signals.
- Press the **HAM** button on the MMTTY display, which should cause the Demodulator display to the left to show the following values:
 - Mark = 2125 Hz.
 - Shift = 170 Hz.
 - Do not worry about other settings at this time.

If you have already played around with some demodulator settings, go to **Option, Set Up MMTTY, Demodulator** Tab, and press the button at the bottom that says **Set Default** (Demodulator). This will restore things to the way they came.

Controls

MMTTY uses menus, buttons, and data entry windows to set parameters. You will discover that MMTTY gives the user a lot of control over parameters. Do not let this concern you; MMTTY comes to you ready to work in most situations.

Menus

At the top is the Main Menu. Next to the Main Menu choices there is a letter, and many menu selections also have a letter. You can go directly any command that you can see by pressing alt-letter. This means that to go to a command on a menu, you must first bring up the menu. For example, to change whether MMTTY sends letters, words, or sentences, you can type alt-o then alt-s (just hold down the alt key and press os). To start, it is recommended that you use the mouse cursor and left-click approach, rather than short-cut key presses.

Buttons

Many of MMTTY's buttons will stay pressed to show that you have turned the function on. Macro buttons do not stay pressed, but you can right-click on most macro buttons to edit their contents, their names, and even the shortcut keys that call them up.

Data Entry Windows

Data windows have numbers in them. You can select among a number of standard values with the down-arrow next to the window. In some cases, you can enter nonstandard values. To begin using MMTTY, there are no data window values that need to be changed. When you do make changes, stick with the standard alternatives at first.

Tuning a RTTY Signal

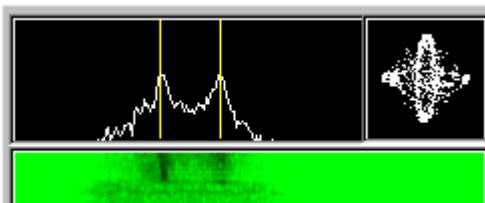
At this point, you should see noise displayed in the FFT Display at the right. This is a black display with two yellow lines that correspond to mark and space. Noise will be a wavy white line in this display, and a fuzzy circle on the XY Scope. You can check this by turning down your radio's RF gain control; the line should disappear.

Now tune in a signal. Tune your radio to 14.080 - 14.090 MHz. or 21.080 - 21.090 MHz. Slowly change the frequency on your radio, listening for the warbling RTTY sound on your receiver. You will try to tune in a signal of 2125 Hz., which is a high-sounding tone to most people. When you are close, you will see that the signal has two peaks; try to line up the left peak with the left yellow line; but don't try too hard, because you turned on AFC, and MMTTY will tune itself automatically to receive the signal.

You will see the Mark and Shift values in the Demodulator display change as MMTTY alters its parameters to match the received signal. MMTTY will change both the mark frequency (the left-hand line) and the shift (the distance between the lines) as long as you are in Free AFC Shift and the AFC is on. You should be in Free AFC Shift if you have not changed this parameter on the **Setup MMTTY, AFC/ATC/PLL** Tab.

When a signal is correctly tuned in, whether you got it just right or MMTTY fixed things up for you, the XY Scope should show two ellipses at right angles to each other, although there will be fuzz. The mark tone will generate one ellipse and the space will generate the other. At the same time, the two yellow lines should roughly line up with the two peaks of signal strength.

Here are the spectrum scope and XY scope displays for a signal tuned in properly by MMTTY's AFC. The signal was about S5 and the transceiver's filter was 1.8kHz.



Tuning With a Mouse

With MMTTY you can tune in any signal that is within your receive passband. When you see both peaks of a signal, just put the mouse cursor on the LEFT peak and click. MMTTY sets the left peak to the mark line. You can use the waterfall display for this as well.

Tuning Manually

If you turn off AFC and do not use the mouse, then first click HAM to make sure that the mark and shift values are the default values and then tune your radio so the left peak is directly underneath the left yellow line, the mark line.

Tuning With AFC

- Make sure that you are not in FSK AFC Shift mode. You should not be, if you have followed the instructions above. Click **Option, Setup MMTTY** (alt-oo), **AFC/ATC/PLL** Tab to check on this.
- Click the **AFC** button down on the main display.
- Sit back and smile while MMTTY tunes the signal in for perfect reception.
- Each time you tune in a new signal, first press the **HAM** button to restore the basic mark/shift parameters.

The Receive Window

When you are correctly tuned in, text will appear in the upper (receive) part of the large white display. When you have filled the window, the oldest text will scroll off the top of that window, while new text appears at the bottom. You can see older text by using the up/down arrow keys at the right of the receive window. If you use this feature while receiving, new text will be decoded but will not appear until you have scrolled down to the bottom of the window.

<p>Warning. Once you have used the up/down arrow keys on receive, you will not see the newest text until you scroll down to the very bottom of the receive display. If you do not scroll all the way to the bottom, new text will not appear.</p>
--

Shift and Case

If the print is garbage, but there is a strong signal (the XY display shows the two ellipses at right angles, and the spectrum scope shows the yellow lines lined up with the signal peaks) try pressing the Rev button in the top middle of the display. This reverses the polarity of the received signal. If this produces good copy, then either: (1) you forgot to set your radio on LSB; or (2) the station is transmitting in reverse polarity or reverse shift (not unheard of with many digital operators just starting out).

Shift

By convention, RTTY is received on LSB. Normal shift means that the mark signal is lower in frequency than the space signal. Reverse shift means that the mark signal is higher in frequency than the space signal. These conventions reverse when you are receiving on USB, so you have to press the Rev button to tell MMTTY to reverse its mark and space convention when it decodes the tones.

Case

All the printed characters will be upper case, which is standard for RTTY (Baudot) reception. However, RTTY does have two cases, called LTRS and FIGS, because the five-bit Baudot code

could not encode all the letters of the alphabet plus the figures 0-9 and a few extra punctuation and other characters. To shift case, a special character is sent, a LTRS/FIGS shift. When this is sent, the following characters will be in the new case, until a shift to the other case is sent.

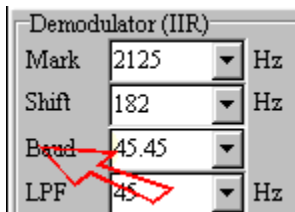
This creates a problem. You may miss a shift and then receive the next letters printed in the wrong case. There are two things you can do. The simplest is to press the button labeled UOS, for unshift on space. Since most of the text is letters (LTRS), the most likely situation is that, following a space, the sender is transmitting (LTRS), so an unshift (shift back to LTRS) after a space increases the likelihood you will see the correct print. Furthermore, almost all the newer TUs, TNCs, and software send a FIGS shift every time they send a number or other FIGS character. This means that even if you are back in LTRS case, you will receive the FIGS shift before the number and print it correctly. In the old days, with mechanical teletypewriters, this was not possible. The simplest thing to do is just to leave UOS on (pressed). This UOS button operates on the received signal. You can set your transmit to help others who are listening to you with UOS, see [Unshift on Receive \(UOS\)](#).

If you still have a problem, you can outline text that may be in the wrong case with your mouse cursor and right-click, and the text (from space to space) will be turned into the other case. Or you can learn that TOO means 599 but you missed a FIGS shift. The numbers are all Figs shift of the letter just below and to the right on the keyboard (QWERTYUIOP).

Since MMTTY cannot display "STOP" or "BELL" in the FIG case, it displays "h" or "s" respectively, for these characters.

Setting Baud Rate

MMTTY's default baud rate is the amateur radio standard of 45.5 baud, or about 60 wpm. The third window down from the demodulator label controls this parameter, but it may say something different (BW, Tap, or VCO). Left-click the label and it will change to the word Baud. Now the window will allow you to set the baud rate. Here is a picture.



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Transmitting

This topic covers the fundamental setup and operations needed to transmit RTTY with MMTTY.

Basic Setup and Adjustment When Transmitting

- Make sure that your sound card to microphone connection has a voltage attenuator (divider)
- Set your microphone gain so that you **do not see any ALC** activity
- Turn off your radio's speech processor

Note: These three points are very important. All three deal with distortion and overmodulation. Failing to follow these instructions will create interference to other stations without improving your ability to communicate.

What You Are Transmitting

When you transmit, you send a series of mark and space signals (two different tones). Different combinations of mark and space make up the Baudot code, which uses five mark/space signals in a binary code to make up characters.

When you transmit with AFSK output, MMTTY sends tones to your radio to create the mark and space signals. The lower tone is the mark, and the higher tone is the space. There is a danger when you transmit a low mark tone, because if you have distortion, harmonics of the tone can also be transmitted. A 500 Hz. mark tone can also cause a signal at 1000 Hz, 1500 Hz., 2000 Hz. This sequence does not continue forever because your transmitted SSB audio rolls off at about 3000 Hz., and higher signals are attenuated. If you transmit a mark frequency above 1800 Hz. then your second harmonic (3600 Hz.) must be greatly attenuated. MMTTY begins with the **HAM** default of 2125 Hz., but this can be changed if you let the AFC tune in a signal with a low mark frequency in your receiver passband.

The problem is that when you allow AFC to tune your radio, or if you set a low mark frequency, you can transmit a low mark tone without realizing it. It is better for you to keep your mark frequency high. If you use AFC, check your mark frequency. It is not easy to change things, since once MMTTY is tuned in, you would have to reset the mark frequency and retune the radio.

Where You Are Transmitting

In FSK mode, MMTTY transmits on the mark frequency set by your transmitter. If you want to transceive on one frequency, you must transmit and receive on that frequency.

In AFSK mode, if AFC is on, you will transmit and receive on the same frequency; if AFC is off, you will transmit on the default mark frequency.

How to Begin Transmission

Here are several ways that you can begin transmitting:

- Press the TX button on the top right of the MMTTY screen.
- Press F9 on your keyboard.
- Left-click a macro button with the cursor.
- Use a short-cut key combination to operate a macro button.



When you are transmitting, you will see a picture of a transmitted signal in the spectrum scope and the phase display at the upper right of the MMTTY screen. However, this is **not** a picture of your actual transmission, only a picture of what MMTTY is sending out the Txd (data port) or the AFSK output.

How to End Transmission

Before you begin to transmit, it would be a good idea to know how to turn off the transmitter. Here is how you can do that, and the results of different techniques.

- Press the **TXOFF** button just below the **TX** button on the top left of the MMTTY screen. This is an "abort" or "panic" button; it stops transmission immediately, whether or not there is text remaining to be transmitted.
- Press the F8 keyboard button and it works like the **TXOFF** button.
- Press the **TX** button while you are in transmit mode. The button will show the word WAIT, the text in the transmit buffer will be sent, and the program will leave transmit mode and turn off the push-to-talk.
- Press the F9 keyboard button while you are in transmit mode and it works like the **TX** button.
- Press a macro button that has the two characters in sequence `_ \` (underline followed by backslash), and that will end transmission when it reaches the point of being sent. If you are in receive when you do this, you will go to transmit, send, and go to receive. For more information, see the [Macros](#) topic.

How to Send Text From the Keyboard

Go to transmit mode (see directly above) and then begin typing. Everything will be in upper case, no matter how your keyboard is set. Characters will appear in the bottom window, the input (transmit) window, in black. When they have been sent, they will turn to red. If you type enough to fill the input window, it will scroll the old text off the top. You can retrieve past typing by using the up/down arrow keys at the right of the input window.

If you want to clear the input window, press the Clear button just above the input window. All text will disappear, untyped or already typed. When untyped text disappears, it will not be sent.



Type-Ahead

MMTTY has a "type-ahead buffer" to remember what you typed, even if you type it before beginning transmission, while the other ham is still sending and you are receiving his text in the receive window. This type-ahead text will appear in black in the input window. If you use a macro to begin transmission ("his callsign" de "your callsign") you can still type ahead. When you click the "Begin" macro it will be sent first, followed by the comments that you typed in the type-ahead buffer.

You can backspace with the Backspace key on your keyboard, and that will erase letters from the end. However, once a letter is transmitted, there is no Baudot code to erase it. It will remain on the screen of the receiving station. A RTTY convention is to type two or three Xs (e.g., HILLOXXX HELLO) to tell the receiving station to ignore a word or words that came before.

Sending By Letter, Word, or Line

A way has been provided to help you transmit cleaner text. If you go to the Main Menu and type **Option, Way to send**, you will see the choices **Character out, Word out, Line out**. If you are a RTTY purist, who once used the "green keys" on an old Teletype Model 28 teletypewriter, then you can select **Character out** and every letter will be typed as soon as you send it. However, for those more used to modern computers, **Word out** means that even if MMTTY has caught up with your typing, it will not send the last word until you have typed a space after that word. This gives you a chance to correct the spelling in the word, using the backspace key, without sending the wrong characters. **Line out** means that you must reach the end of a line or type a carriage return to send the characters.

Line out is probably not suitable for most operators. It means that your transmitter simply sends either a constant tone or a "diddle" while waiting for your line to be complete, and then you must wait for the last line to be transmitted before you can receive.

You can delete the last line of text with the Ctrl-Backspace combination.

There is a control slider just above the output text window at the far right. It says "Both wait." If you slide that to the right, it will slow the output of letters as you transmit from MMTTY. If you are a slow typist, this will give you a chance to correct your mistakes. You can operate this control during your transmit session, so you can send a brag file quickly, and then slow the output down when you are typing at the keyboard.



Controlling Letter Output Speed

You can control how fast MMTTY sends out letters by clicking **Option, Setup MMTTY, Tx Tab**, and moving the slider in the middle called Char. Wait. Moving it to the right will slow the output of letters. This control will not take effect until you click OK at the bottom of the window.

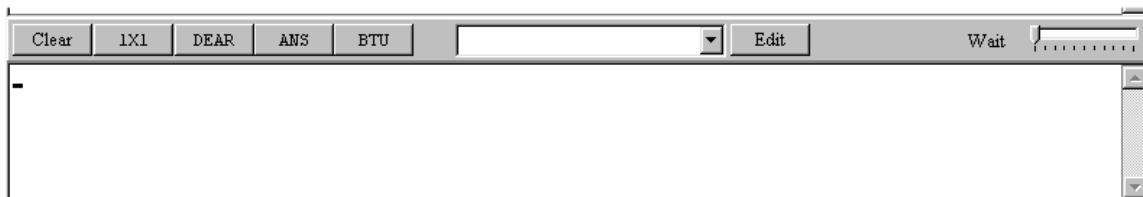
Sending Prepared Messages

Four Input Macro Buttons

Just above the input window are four macro buttons with prepared messages that you can use. You can edit these by right-clicking on them. The [macro commands](#) work with these buttons and with the window, to be described next.

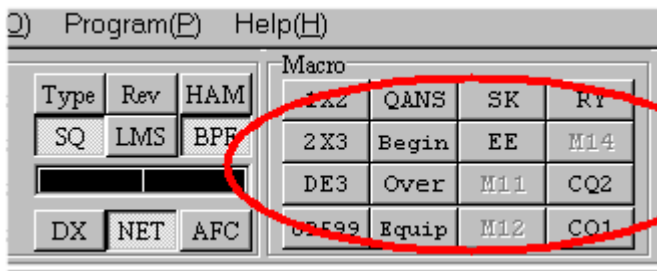
Message Window

Also above the input window is a small message window just to the right of the four macro buttons. This window contains more scripts that you can use and customize. To use a script, press the down arrow and select the script, and its text will immediately appear in the input window, to be transmitted. To edit these scripts simply select one in the window and press the edit button next to the window. A special edit dialog comes up. Clear this script from the input window when you are done.



Additional Macro Buttons

There are nine additional macro buttons at the top center of the MMTTY display.



Diddle

You have heard the burbling sound of an RTTY signal. Diddle is what you hear when you are not sending a character. It is possible for you to set different parameters for what will happen. You can send no diddle, which turns out to be a steady tone, or a block diddle, which is a special code, or you can send a LTRS shift, which has no effect on an electronic display but which provides the timing some programs use. It is recommended that you use LTRS.

To set the diddle, click **Option, Setup MMTTY (alt-oo), TX Tab** and look to the left for the Diddle option.

Unshift On Receive (UOS)

UOS During Receive

In the [Basic Receiving](#) topic, we discussed the fact that there is a benefit to using unshift on space (UOS) when receiving. The benefit comes from leaving FIGS shift as soon as there is a space, so your display does not print out garbage if you miss the LTRS shift.

UOS During Transmit (Considering the Other Ham)

When you transmit, you can help the other stations that use UOS by sending a FIGS shift character when you intend to transmit figures after sending a space. In other words, without doing this, you might send 599 599, and this would come out FIGS599 599, because you never went back to LTRS shift. If the other station is using UOS, this would print as 599 TOO.

However, if you click **Option, Setup MMTTY, Tx** Tab, you will see choices in the TX area in the middle; the top choice is UOS. Mark this choice on, and you will send FIGS599 FIGS599, when you type 599 599, and the receiving station that uses UOS will print 599 599. If the other ham is not using UOS, the extra FIGS will not change what he receives.

Mark and Shift Values On Transmit and Receive

NET Off

Using AFSK, with NET Off, you will always transmit with a mark and shift equal to what you set in the HAM default windows in **Option, Setup MMTTY, Demodulator** Tab. Whether AFC is on or off, you transmit the same.

NET On

Using AFSK, with NET On, mark and shift are free to change, and MMTTY will transmit at the last mark and shift values at which it received. With AFC off, there will be no change, but with AFC on, you will match the other station's mark and shift. You must select an AFC default (**Option, Setup MMTTY, AFC/ATC/PLL** Tab) that does what you want. See [Adjusting AFC](#) in the Advanced Receiving Topic. If you do not want to change shift, but you want to use NET and AFC to follow the other station's mark, then choose Fixed. If you only want to use standard shifts, choose HAM.

Test Transmission for FSK

If you click **Option, Test**, MMTTY will go to transmit mode and send a string of RY, followed by the entire BAUDOT character set. Press **TXOFF** to terminate this string. This function will not send to the sound card, only FSK will be activated.

Macros and Contesting

MMTTY provides a large number of macro commands that can make it easier to operate during a contest. You can program foreign language greetings and information, generate contest exchanges, and even use macros to simplify the standard identification and greeting as you go from transmit to receive and the reverse. You can use the repeat function to have MMTTY send a CQ, wait for a response, and then send the CQ again. You can use the contesting functions to send special macros without even pushing any macro buttons.

Please see the [Macro](#) topic and the [Contest Operation](#) topic.

Note: The developer of MMTTY is working on the macro labeled "Work the Contest," in which (1) the operator makes sure that MMTTY is working with the radio, (2) the operator tells MMTTY the contest exchange, (3) the operator starts the macro, and (4) the operator comes back 48 hours later to find out his score in the contest. Please do not inquire further about this macro, just QRX for an announcement.

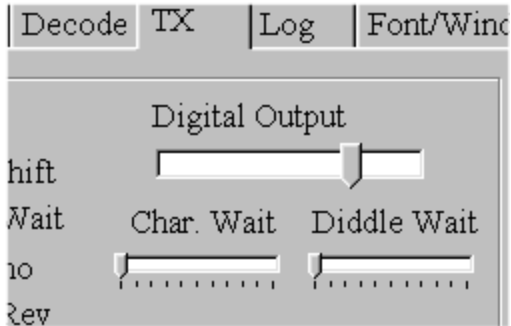
Controlling Sound Card Output

It is extremely important that you set the sound card output to be low enough not to cause distortion in the audio (modulator) stage of your transmitter, yet still be strong enough to operate the modulator.

You can control the strength of the audio coming out of the sound card and into the audio input of the transceiver in two ways. The first way is with the mixer software that came with Windows or with your sound card. To do this, click **Option, Adjust Volume** and move the microphone slider.

The volume slider will also work, but it will change the volume of other sounds that come out of your speakers. These changes take effect immediately.

The second way is to click **Option, Setup MMTTY, Tx** Tab, and adjust the Digital Output slider. The movement of the slider will not take effect until you click **OK** at the bottom of the window.



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Advanced Receiving

Section Written By Makoto Mori, JE3HHT

Translated by Nob Oba, JA7UDE

Revised by Bill Musa, K5YG; Jan Ditzian, KX2A

Introduction

At this time in the development of MMTTY, there are three demodulators available. Mr. Makoto Mori, who wrote MMTTY, thinks that IIR, the default demodulator, may be the best choice, but others have been included for the amateur radio community to test and evaluate. Perhaps under some operating or equipment conditions a different demodulator will be best. This is part of the spirit of ham radio. You can also control the AFC, and this is covered in this topic as well.

HAM Button

In the middle of the display is the **HAM** button. This button restores the values that are in the Demodulator group of windows. Here is what will be restored to default values if you press the **HAM** button.

- Mark frequency
- Shift width
- BW
- Baud rate
- LPF
- AV.
- Demodulator (IIR, FIR, PLL)

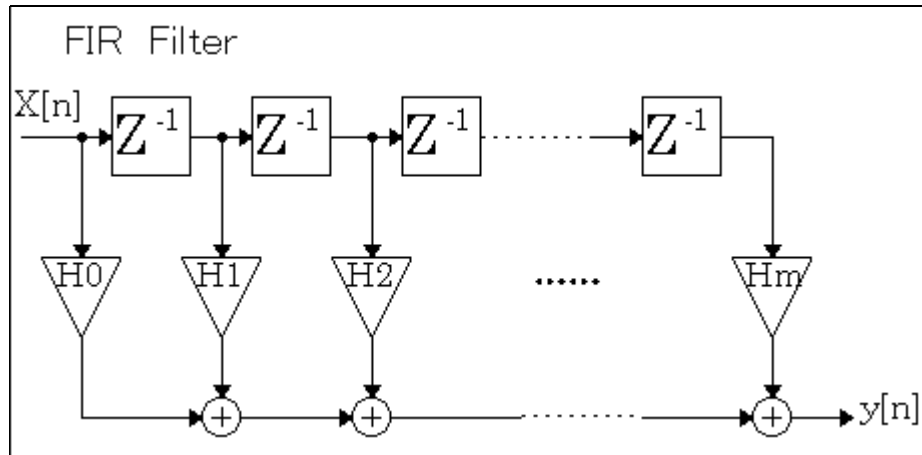
Many of these parameters are discussed below.

Digital Signal Processing Used in MMTTY

FIR filter

Finite Impulse Response (FIR) filter is the most basic architecture for digital signal processing. It periodically samples the input data stream, multiplies the sampled data by specific coefficients, and sums the results to make the output. The figure below shows a basic signal flow of the FIR filter.

To select the FIR filter in MMTTY, you can press the **Type** button until the term (FIR) appears next to Demodulator. When you select FIR, the third window in the Demodulator group will let you set the number of taps in this filter. Remember, if you click the word Taps, it will turn to Baud, and you can change the baud rate. You can also do all these actions by clicking **Option, Setup MMTTY, Demodulator** Tab.



In the figure, Z^{-1} is a delay node. $H_0 - H_n$ represent the coefficients, by which the captured signals are multiplied. This kind of calculation is called convolution (MAC calculation).

For instance, if the FIR filter multiplies the last ten signals by 0.1, and sums up them, the average of the last ten signals is obtained. The result, is a smoothing low pass filter (LPF).

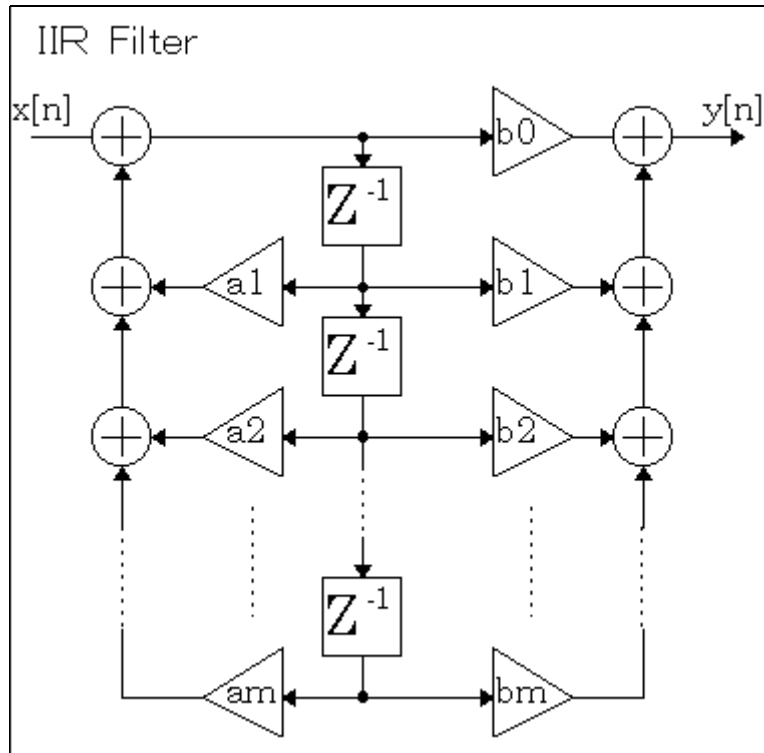
By giving values, which are computed from the impulse response of the specified frequency characteristics, to $H_0 - H_n$, you will be able to implement a wide variety of filters.

The FIR filter, as referred by its name, has a finite response to input, so that it is not degraded by oscillation. In addition, by giving symmetric coefficients, that is: $H_0=H_n, H_1=H_{n-1}, \dots$, the filter has linear phase characteristics. This is the most significant feature of FIR filters. However, if you need a very sharp filter, you have to increase the number of orders (taps). This also increases the delay.

The FIR filter is the most popular of the digital signal processing techniques.

IIR filter

Infinite Impulse Response (IIR) filter has a feed-back loop, as shown in the figure below, and has an infinite response to input. The operation is similar to analog filters, such as an LC filter or an active filter, so most should be familiar with it.



To design an IIR filter, designers design an analog filter with the specified characteristics first, and then calculate the coefficients of the IIR filter. Using this procedure, the IIR filter can have Butterworth or Chebyshev features just as analogue filters do.

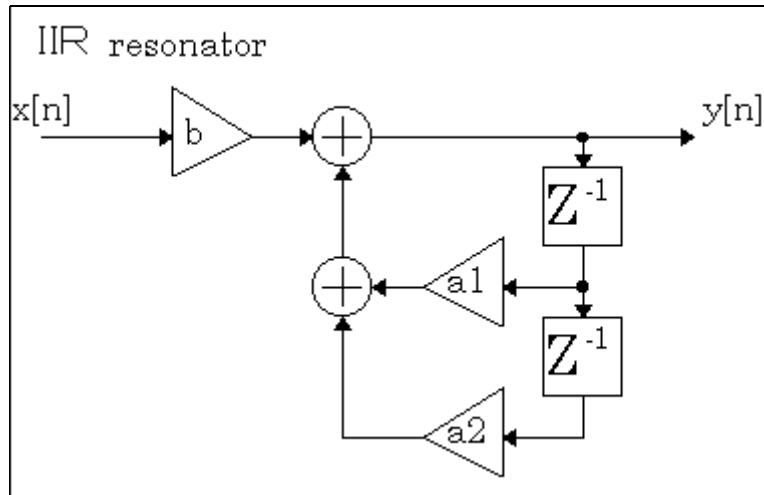
The most notable feature of the IIR filter is that it can realize narrow band , or sharp filters, even with small number of orders (taps). On the other hand, it has the non-linear phase response and the group-delay distortion of analog filters. In addition, it is affected by quantizing and rounding errors. For these reasons, the IIR filter is not commonly used in fixed-point digital signal processing.

In MMTTY, if you select the IIR demodulator, you can set the bandwidth of this demodulator by clicking **Option, Setup MMTTY, Demodulator Tab**. At the left side of this tab you can choose the type of discriminator. If you select IIR, then you can vary the bandwidth, which will be the third window below the Discriminator Type selection. You can do this same action on the MMTTY main screen. Use the **Type** button to select the IIR demodulator, and then use the BW window to change the bandwidth. This same label toggles to Baud if you click on it, so if you see Baud, click it and it will change back to BW.

The fourth window down lets you set the smoothing LPF (low pass frequency), which can also be set on the **Demodulator Tab**, along with the order of the LPF.

IIR resonator

As a sort of IIR filters, an IIR resonator can be designed. The figure below shows a simple example of the IIR Resonator. MMTTY makes use of the resonator in the frequency discriminator.



Coefficients a_1 , a_2 , and b can be straightforwardly computed by

$$a_1 = 2 \exp(-\pi BT) \mathbf{D} \cos(2\pi FT)$$

$$a_2 = -\exp(-2\pi BT)$$

$$b = A \mathbf{D} \sin(2\pi FT),$$

where

F: resonant frequency (Hz)

B: bandwidth (Hz)

T: sampling time(s) = $1/f_s$

A: gain.

If B is set to 0, the Q of the resonator is infinite and therefore the filter has no loss. If you assign an initial non-zero value to Z-1, it works as an oscillator.

Detector

In an analog circuit, a diode is used as a detector. In digital signal processing, on the other hand, just use a positive or absolute value.

Integrator

An integrator can be implemented with various methods. MMTTY uses either an FIR filter, which averages specified sequence of inputs, or an IIR filter, which works as a Butterworth filter.

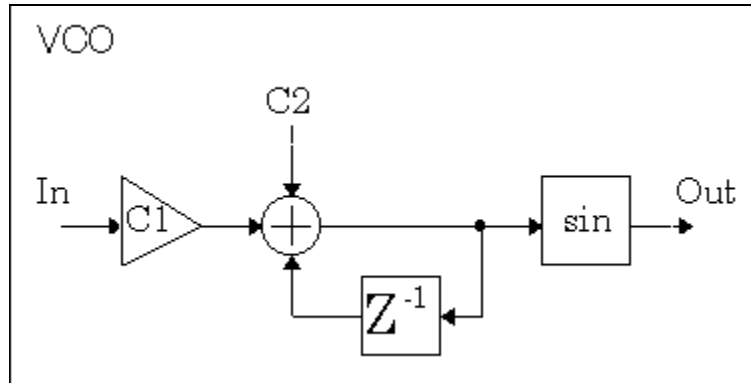
I have not calculated their significant differences, but I have seen a slight dissimilarity with respect to the characteristics of the input signal.

The smoothing frequency is given by: 1, the reciprocal number of time duration of averaging in the FIR filter or by: 2, the cut-off frequency in the IIR filter. It is necessary to set the cut-off frequency of the IIR filter less than the smoothing frequency of the FIR filter. It should be noted that in the case of an integrator, the smoothing frequency of the FIR filter is not the cut-off frequency of LPF but the reciprocal number of average duration.

By default, MMTTY uses the FIR filter. The IIR filter, however, uses far less CPU power than the FIR filter. Therefore, it may be OK to use the FIR filter. According to my limited experience, the cut-off frequency should be set to 40 Hz for the fifth order FIR filter, or to 30 Hz for a third order FIR filter. More comprehensive experiments are needed to determine the exact requirements.

VCO

VCO is used in a modulator of RTTY and in a demodulator of PLL type. The configuration of VCO is shown below.



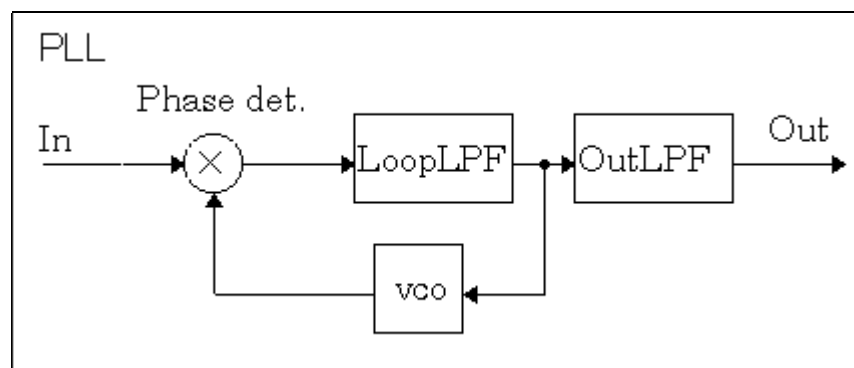
C1: VCO gain
C2: a value specifying the free-running frequency

Since Z^{-1} must be in the range of $0 - 2\pi$, you should get a remainder by dividing Z^{-1} by 2π or subtracting 2π from Z^{-1} , if Z^{-1} exceeds 2π . It is not feasible to calculate the sin of every sample, so a sin table, which has been calculated beforehand, is used to speed up the processing.

Because VCO has good frequency stability, it can be used as the Frequency Shift Keying (FSK) modulator.

PLL

MMTTY uses Phase Lock Loop (PLL) in the same way as the analog circuit PLL does. It is an easy job for digital signal processing to implement the phase detector, because it is essentially a multiplication.



The output of the phase detector contains both sum and difference of the input frequencies. In this case, only the difference is needed. To detect only the difference, LoopLPF, which is an IIR LPF, is provided. LoopLPF, however, is in the loop of the PLL and strongly affects the PLL response, so it cannot be very sharp. A one-order IIR filter is commonly used. Since the LoopLPF cannot completely eliminate the sum, another filter, that is, OutLPF is placed at the output of LoopLPF.

When the PLL is used as a RTTY demodulator, the cut-off frequency of the loop filter must be wider than the RTTY shift width.

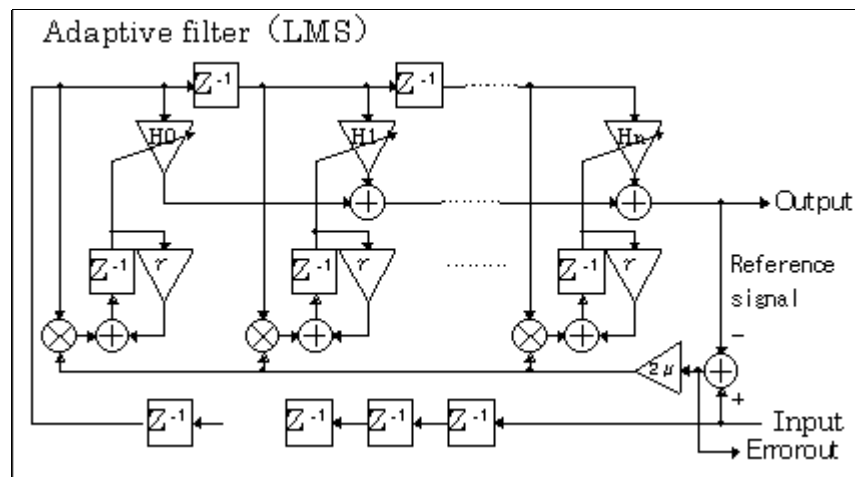
While the PLL demodulator is suited for fast decoding, I think that demodulators of the frequency discriminator types are more suited for RTTY, as RTTY has a low baud rate.

You can select the PLL demodulator with the **Type** button on the main display. Press **Type** until the term (PLL) appears next to the word Demodulator. When you do this, the third window will say VCO, and will let you change the VCO gain. You can also select the PLL by clicking **Option, Setup MMTTY, Demodulator Tab**. However, you will have to go to the **AFC/ATC/PLL tab** to change the VCO gain.

Tip: The PLL requires very low CPU power and even works with a low-speed CPU by increasing the number of taps of OutLPF and adding an integrator of IIR type.

Adaptive Filter (LMS)

The Adaptive filter is a star player of digital signal processing. Here is a simplified example.



The input signal goes to the transversal filter through a delay node. The coefficients are updated by comparing the output of the transversal filter with the input signal.

The autocorrelation of random signals, such as noise, can significantly be decreased by increasing the delay. In this manner, the correlation between the input and output becomes very small. On the other hand, the signal of the target frequency has larger autocorrelation. In the flow chart shown above, the coefficients are updated so that the mean square of the difference between the input and output is minimized. As a result, the components that have large autocorrelation are enhanced at the output.

Eventually, this circuit operates as a noise smoother, which enhances periodic components in the input signal. The error signal, on the other hand, can be used as an automatic notch filter.

The adaptive filter is suitable for, and used in MMTTY. It is not as suitable, however, for RTTY demodulation as I had expected. I anticipate that it will find use as an echo canceller by increasing the number of delay nodes, but I have not experimented with this hypothesis.

Notch Filter

To enable the notch, click **Option, Setup MMTTY, Demodulator Tab, LMS/Notch Tab**. Select

Notch. Adjust the amount of notch by increasing or decreasing the number of taps. Be sure to check the Notch box, otherwise only LMS will operate. There is a window in the **LMS/Notch** Tab called Tap. The larger the number you put here, the deeper and narrow will be the notch. You should experiment to find a value that is useful for you. If the notch is too deep and narrow, interference will not be completely blocked. If it is too wide, you may interfere with the received signal, especially if the interference is between your mark and space tones. Try a setting between 72 and 256.

Using One Notch

If you have only one notch selected, right-click in the waterfall or spectrum display to put the notch where you want it. At the same time, the Notch button in the middle of the display will go down. A red triangle marks the notch spot. To remove the notch, left-click the depressed Notch button and it will come up.

Using Two Notches

Select two notches at the **LMS/Notch** Tab; first select Notch and then select two notches. These notches can be at separate frequencies or they can overlap. Here is how to use two notches:

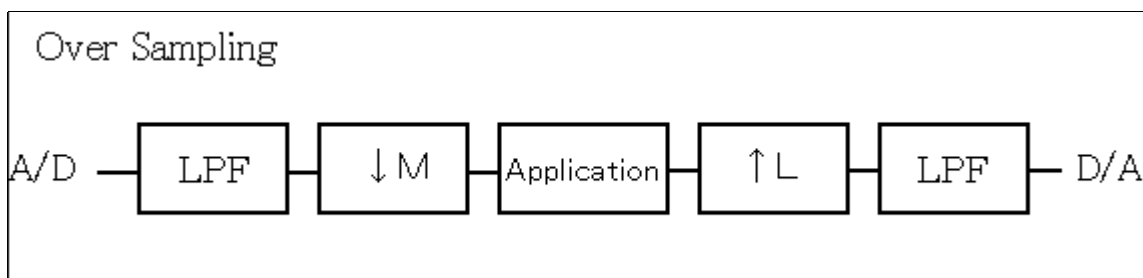
- Right-click in the spectrum display or the waterfall to put a notch where you click. A red triangle marks the spot.
- Right-click again to add a second notch. A second red triangle marks the second notch, and the first notch turns green.

To turn off the notches, left-click the **Notch** button on the main display so it goes back up.

If you have two notches enabled but really only want one at the moment, click off the notch button and right click where you want one notch. Remember, though, a second right-click will not move the single notch, it will begin a second notch.

Oversampling

In digital processing, the technique of oversampling (multi-rate system) is commonly used to boost the processing speed. MMTTY uses it as the demodulator. The following figure shows its configuration.



↓M (digimeter) decreases the sampling frequency. For example, to decrease the frequency by one half, just sample every two signal samples. It is equivalent to decreasing the sampling frequency of the input A/D, and will generate folding errors in the low frequency range. Therefore, a low pass filter is needed in front of the digimeter.

↑L (interpolator) increases the sampling frequency. It is difficult to create another point between sampling points. I assign the value of the point to zero, force the sampling frequency to be

doubled, and smooth it with a LPF.

By using double oversampling, the FIR filter can have the same sharpness even with half the number of orders (taps). It also increases margins in processing. However, the magnifier has a limit because the Nyquist frequency in the processor becomes half its original value.

Processing Frequency of the Limiter

By default, the MMTTY limiter works at a 11025-Hz sampling frequency, and causes a phase error. This error does not seem to have an impact on the demodulator, but shows up as a distortion in the XY scope.

If you check the OverSampling box on the Demodulator page in the Options menu, MMTTY uses a 44100Hz-sampling frequency just for the limiter, in order to reduce this distortion.

Sound --> $\uparrow L(4)$ -> LPF --> Limiter --> LPF -> $\downarrow M(1/4)$ --> LimitOut
11025Hz 44100Hz 11025Hz

If you have a powerful PC, check OverSampling. It will refine the XY scope presentation.

In addition to this, you can change the view quality of the XY scope by selecting XY scope Quality in View menu. MMTTY changes the sampling frequency for the XY scope.

Mark ---> $\uparrow L(N)$ -> LPF --> X
Space ---> $\uparrow L(N)$ -> LPF --> Y

This change does not affect the phase distortion in the limiter but increases the resolution of the XY scope.

Adjusting the Limiter

You can adjust the gain of the limiter, whether there will be oversampling, and whether to use AGC by clicking **Option, Setup MMTTY, Demodulator** tab. The Limiter options are at the top center of the display.

FFT

Since there are many good references about Fast Fourier Transform (FFT), I will not get into its details here. FFT is used to transfer signals from the time region to the frequency region, or vice versa. MMTTY uses FFT to display the Waterfall.

A straightforward Discrete Fourier Transform (DFT) should compute $N \cdot N$ points to analyze N -point signals. FFT reduces the number of points to be computed down to $N \cdot \log N$ by choosing N be a power of 2.

MMTTY uses DFT rather than FFT for the display of the FIR filter frequency characteristics.

The following books have sample programs on the subject, for example: There are many good reference books available on the subject, for example:

Basic program: Masaaki Mitani: "Digital filter design," Shokodo (comment by JA7UDE, this is a Japanese book, and I do not think it is available outside Japan).

Pascal program: Naoki Mikami: "Basics of Digital Signal Processing," CQ publishing (comment by

JA7UDE, this is a Japanese book, and I do not think it is available outside Japan).

Links to DSP projects and programs:

<http://www.mrccos.com/~jmagno/dsplinks.html>

Epilogue

Whatever others may say, I view digital signal processing as easy because I do not have to take impedance into account. Data can be copied unlimited times without inducing errors which is equivalent to connecting an output of 0 ohms with an input of infinity ohms (impedance mismatch).

FIR vs. IIR

To obtain the same filtering shape factor, the FIR filter requires more taps than the IIR filter. In other words, the FIR filter requires more floating-point calculations than the IIR. However, more taps means a sharper filter. This is one place that you may have to trade off filtering to reduce the calculation demand on the CPU.

Automatic Frequency Control (AFC)

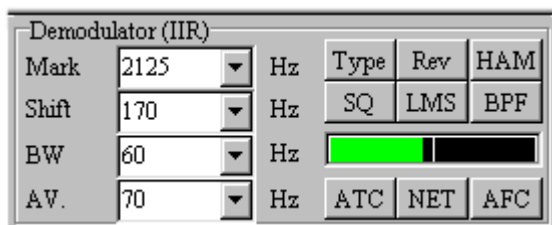
The RTTY discriminator in MMTTY has a very narrow band pass filter, so it is important for you to be tuned in very closely to the mark frequency of the station to which you are listening. If you are not very close, MMTTY will not decode the signal very well. To make it easier on the operator, MMTTY has an automatic frequency control (AFC) function. This is a receive function, and it will operate whether you transmit FSK or AFSK. The AFC will control the audio frequency that MMTTY uses for mark, and will also control the shift width.

MMTTY is one of the first programs to give the user full control over many parameters of the AFC. If you want to experiment with these values, you are welcome to do so, but it is part of the user's job to determine what works best.

How AFC Works

The AFC analyzes the signal using a fast Fourier transform (FFT), a mathematical approach that your computer can perform. The AFC is looking for two peaks (mark and space frequencies), and checks the received spectrum (whatever audio you feed into MMTTY) every 300 msec. looking for these twin peaks. You can see the AFC operate by watching the spectrum scope. The two yellow lines represent where MMTTY wants the mark (left) and space (right) to be. If you see the signal move underneath the yellow lines, this means that the AFC is changing the mark frequency so the left yellow line will be directly over the peak mark signal.

When this happens, you will also see the frequency in the Mark box (on the top of the main display, under the Demodulator label) change. For this to happen, you must enable the AFC. Do this by clicking the AFC button just to the right of the four small windows.



If you have used the AFC and want the mark and shift back where they belong before tuning your radio, just press the HAM button. Before tuning your radio, you may want to click the AFC button again to turn off the AFC.

HAM button defaults:

- Mark = 2125 Hz.
- Shift = 170 Hz.

The AFC checks the spectrum every 300 msec to detect twin peaks. It incrementally adjusts the frequency by calculating the difference between the recorded and real frequencies. In the FIR and IIR modes, the central frequency of the frequency discriminator is adjusted by changing the coefficients of the DSP calculation routine. In the PLL mode, this is done by changing the free running frequency of the VCO.

Adjusting AFC

In order to use the AFC, you **must enable the FFT Display**. Click **View, FFT Display**.

You can adjust the AFC by going to **Option, Set up MMTTY** (ctrl-oo), **AFC/ATC/PLL** Tab.

AFC On/Off

This is a check box on the **AFC/ATC/PLL** Tab, but you can also just push the **AFC** button in the middle of the main MMTTY display.

AFC Shift

There are four choices for AFC shift:

- Free: The AFC freely follows the signal. The mark and shift can both change.
- Fixed: The mark can change to tune in the signal; the shift cannot change from the value the user puts in the shift window.
- HAM: The mark can change, but the shift can only take the values of 170/200/220/240 Hz., whichever works for most letters copied. The mark changes only for receive. On transmit, it returns to the HAM value.
- FSK: The center frequency cannot change and the shift can only take the values of 170/200/220/240 Hz., whichever works for most letters decoded.

If you are using AFSK out, then Free is the most flexible setting, and lets you work the most stations most easily. HAM is next most flexible. Fixed lets the mark change, and FSK lets only the shift change.

No matter what setting you use, you can change the mark by clicking on the Spectrum Display. You can return to the default frequency by depressing the HAM button.

If you are operating with FSK output, FSK is the appropriate setting, if you want to transmit on top of the station that you receive (your mark on his mark). This setting will let MMTTY figure out the other station's shift, but you must tune the station in with your receiver. Once you have tuned him in, you can go to Free; if he drifts you will follow him on receive, but, of course, your transmit frequency will stay where it is.

For all AFC settings, when NET is off, when you transmit, mark and shift always take the values in the HAM default window on the **Option, Setup MMTTY, Demodulator** Tab. However, when

Net is On, the mark and shift values will be equal to what they are in the windows on the main display. You must select the AFC Shift choice you want. See [Transmitting](#).

AFC Time

The shorter the time, the faster the AFC works.

Squelch (SQ)

The squelch lowers the value that the AFC will accept to try to lock in. If you set SQ too high, you will not tune onto weak signals. If you set it too low, the AFC may tune into random noise or a weak signal or tone rather than a bigger signal in the passband. The receiver's bandpass filter tends to maximize the noise in the middle of the filter, so you will tend to converge to the middle. Turn the squelch on with the SQ button in the top center. Then click the display directly below, with the green signal strength bar. Click left to lower the squelch; this prints weaker signals but also prints more garbage characters. Click right to get clear print but possibly not print a weak station.

Sweep

This sets how far the AFC will follow the target signal (frequency = shift width x Sweep)

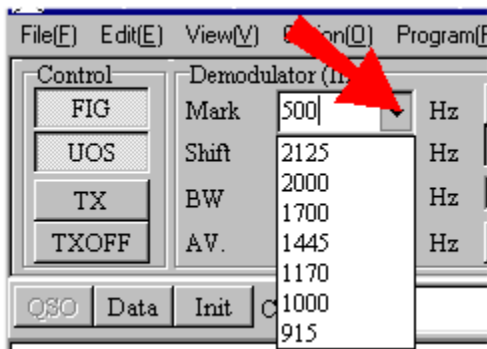
Mark and Shift

Mark Frequency

The mark frequency is the one denoted by the left yellow line on the Spectrum Scope.

You can set the mark frequency to any of a number of standard values using the down arrow and the Mark window on the main display. The mark frequency must be 300 Hz. or higher. Here is how to **set a custom mark value**:

- Click on the down arrow next to mark on the main display and **hold the left mouse button down**
- Press delete on your keyboard to erase the mark number
- Enter a legal mark value
- Release the left mouse button
- Click outside the mark window to close the window



The mark frequency can change if you use AFC, see AFC above.

Mr. Makoto Mori has found that for his radio in data mode, 2000 Hz. seems to be the best mark frequency to begin with. You may want to experiment.

Using AFSK output, you transmit your mark at the same frequency as the receive mark signal. However, if you transmit a low frequency mark signal, this increases the likelihood that you will transmit harmonics. If your mark frequency is above 1800 Hz, then your second harmonic will be at 3600 Hz., which is highly attenuated by your radio's audio stages. This reduces the amount of harmonic distortion that you can transmit

You can predefine the mark frequency in the Ham Default window and recall it by just pushing the HAM button. See below on how to predefine the mark and shift for HAM.

The radio generally displays the carrier frequency in the SSB mode. In the LSB mode, for instance, the real mark frequency is the displayed frequency minus MMTTY's mark frequency.

Shift

The shift sets the distance in Hz. from the mark that will be space. If the mark is 2125 Hz. , then a space frequency of 2295 Hz. is actually a shift of 170 Hz. Rather than specify mark and space frequencies, MMTTY uses the current convention of specifying mark and shift, but they are the same thing.

You can set any shift, but the mark frequency must be above 300 Hz. and the space must be below 2700 Hz. If you were to specify a mark of 2700 Hz., you could not set the shift greater than 100 Hz. If you try to set the mark too high and then reset the shift, MMTTY will automatically change the mark to a legal value.

Predefine HAM Mark and Shift

It has been mentioned that you can just push the **HAM** button on the main display to return to the predefined mark and shift frequencies. The MMTTY default values are mark = 2125 Hz. and shift = 170 Hz.

You can also change these values, so the HAM button will set different values. Click **Option, Setup MMTTY** (ctrl-oo), **Demodulator** Tab. In the bottom center are the HAM Default values, mark on the left, shift on the right. Just type in new values and they will take effect.

The setting of NET can cause the transmit values for mark and shift to be the same or different from the receive values. See [Transmitting](#).

Automatic Threshold Control (ATC)

In most cases, the limiter amplifier can adjust the signal input level to the comparator. However, for low quality signals, such as signals with echo, the limiter amplifier may not work well. Automatic Threshold Control (**ATC**), which is a button in the middle of the main display, automatically adjusts the input level to the comparator in accordance with the strength of the input signal.

There is one parameter that you can change for ATC. Click **Option, Setup MMTTY, AFC/ATC/PLL** Tab. In the ATC area at the bottom you can turn ATC on and off, but the button on the main display is easier. However, there is a time parameter that specifies how many recent signal samples are used to compute the threshold. The more samples, the more slowly will ATC change the input level. The default of 4 is a relatively small number of samples, and MMTTY will quickly respond to an echo. However, you may want to experiment with this value under different conditions.

If conditions are good, you may get better decoding with ATC off, and that can be done with the button.

Default Values For AFC/ATC/PLL Parameters

AFC Time = 8
SQ = 32
Sweep = 1
ATC Time = 4
VCO Gain = 3
Loop LPF Order = 2
Loop LPF FC = 250 Hz.
Output LPF Order = 4
Output FC = 200 Hz.

Baud Rate and Integrator Control

The Demodulator fields labeled BW and AV can be changed to Baud Rate and LPF for the integrator by clicking on the terms BW and AV. Standard RTTY operation is a 45.5 bauds. LPF and AV are parameters for the operation of the Integrator.

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Macros and Shortcut Keys

A macro is a script assigned to a key or a display "button" that does a number of things. Usually there is text to be transmitted, but there may also be special commands that tell the program to do something. For example, you might have a macro that uses the program's knowledge of the other station's callsign to identify him at the beginning of your transmission. Macros can control transmit and receive, so you can have a macro that begins transmissions with callsign identification.

MMTTY has several ways for you to store messages and commands so you can operate more efficiently in contests, DXpeditions, or regular operation.

First there are two groups of macro buttons, Group 1, sixteen macro buttons at the top center of the MMTTY display, and Group 2, four macro buttons just above the transmit window. In addition, there are nine Edit messages accessible through the small window just above the transmit window, to the right of the four Group 2 macro buttons.

Macro Buttons

The three types of macro procedures mentioned in the above paragraph (Group 1, Group 2, Edit messages) differ in three ways: (1) whether you can use them directly from the keyboard; (2) how the \ and # commands work in the macro; (3) how the macro works when you begin with text. We will look at each group separately. The macros were designed for certain functions, but they are so versatile that you may choose to use them differently.

Group 1 Macro Buttons (Top of Display)

There are 16 macro buttons at the top of the MMTTY window, which are intended for contest or DXpedition operation. To be exact, these macro buttons were intended to be used during a QSO.



- The command \ (backslash) at the **beginning** of a Group 1 macro copies the content of the macro to the transmit window and begins transmitting.
- The command \ (backslash) at the **end** of a Group 1 macro turns off transmitting and returns to receive.
- The command # (uppercase 3) at the **beginning** of a Group 1 macro copies the contents of the macro to the transmit window but does not begin transmission.
- The command # (uppercase 3) at the **end** of a Group 1 macro repeats the macro. The contents of the macro will continue to repeat until you press **TX** or **TXOFF**.
- If you do not use any command at the beginning of a Group 1 macro, but simply begin with text, the macro begins to transmit immediately and sends the text, but the text does not appear in the transmit window.

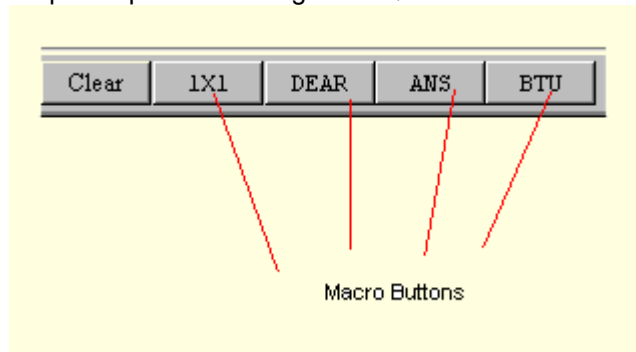
Group 1 macros are known as M1 through M16. By default, M1-M5, M13, M15, and M16 are "canned" messages, but the message can be changed (see Editing Macros, below).

By default, the following shortcut keys will operate these macro buttons:

M1	Ctrl+1	M5	Ctrl+5	M9	Ctrl+9		
M2	Ctrl+2	M6	Ctrl+6	M10	F10		
M3	Ctrl+3	M7	Ctrl+7	M11	F11	M15	F7
M4	Ctrl+4	M8	Ctrl+8	M12	F12	M16	F6

Group 2 Macro Buttons (Above Transmit Window)

These four macro buttons were put close to the transmit window because they were intended for frequent operation during most QSOs.



- The command \ (backslash) at the **beginning** of a Group 2 macro clears the transmit window.
- The command \ at the **end** of a Group 2 macro stops transmission and switches to receive.
- The command # at the **beginning** of a Group 2 macro begins transmission.
- If you do not use any command at the beginning of a Group 2 macro, but simply begin with text, the macro puts the text in the transmit window, but does not begin to transmit.
- All text that appears in a Group 2 macro first goes to the transmit window before it is transmitted.

By default, the four macros at the bottom use the shortcuts F2 through F5.

Edit Window Macros (Edit Window Messages)

These macros are on a dropdown list you can see when you press the down-arrow to the right of the window. Select the macro you want and the text will appear in the transmit window.

Commands for these window macros work the same as Group 2 macros.

- The command \ (backslash) at the **beginning** of a window macro clears the transmit window.
- The command \ at the **end** of a window macro stops transmission and switches to receive.
- The command # at the **beginning** of a window macro begins transmission.
- If you do not use any command at the beginning of a window macro, but simply begin with text, the macro puts the text in the transmit window, but does not begin to transmit.
- All text that appears in a window macro first goes to the transmit window before it is transmitted.

Window macros do not have default shortcuts.



How Might You Use These Different Macros

You are free to use the macros as you want, and flexibility has been built into the command structure.

The Group 2 macros, right near the transmit window, with one-button default shortcuts, might be best as your often-used beginning of transmission (Dear), end of transmission (BTU), call another station (1X1, and answer another station (ANS). You are free to change the macro content (perhaps you always give a 2X3 when you first call), macro name, and even the shortcut key. See Editing Macros, and Short-Cut Commands, below.

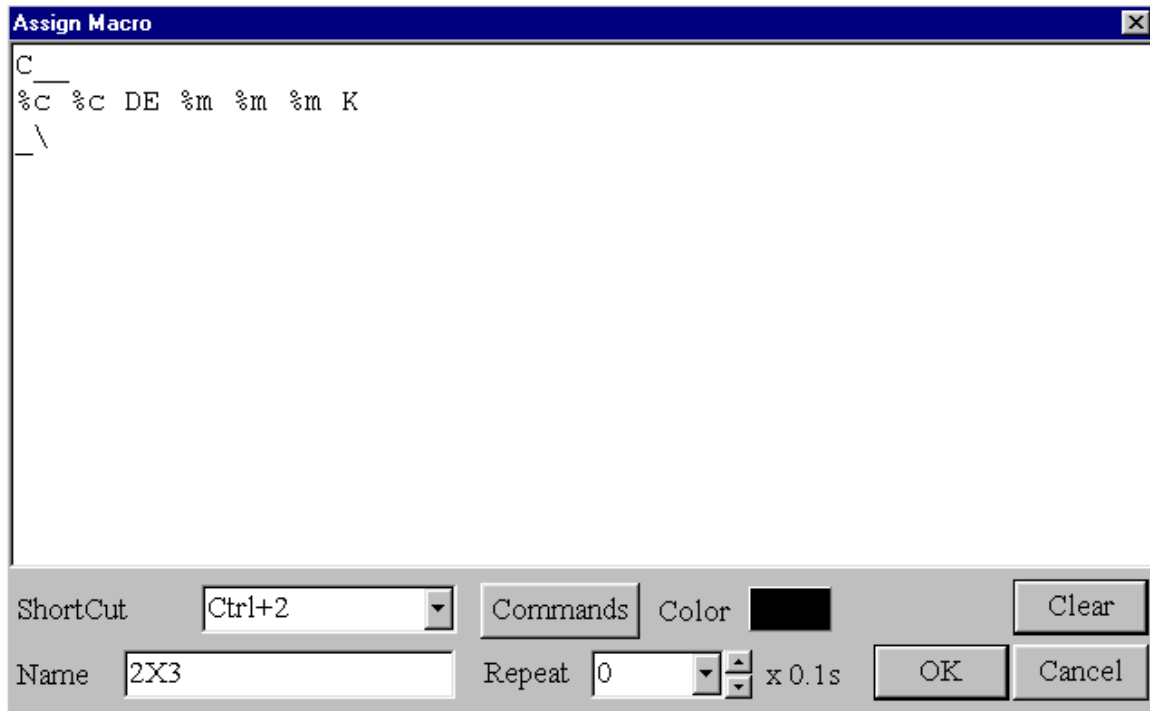
The Window macros might be useful for longer text that you put in the middle of a QSO, or for less frequently used text sequences.

The Group 1 macros might be useful to keep ready as contest macros, so you do not have to reprogram (and relearn) the bottom four macros. Or you might want to reprogram some of these macros to have one-button shortcuts, for really fast contest operation. You could even steal the shortcuts from Group 2 macros (give the Group 2 buttons other shortcut values first).

Editing Macros

One way to edit the script or the name of a button is to right-click on the button. You will see a place at the top to enter the script, and windows at the bottom to assign short-cut keys and to change the name on the button. If you operate the down-arrow next to the short-cut window, you will find that many shortcuts are possible, including alt- and ctrl-key combinations.

You can also click **Edit, Edit Macro Buttons** (alt-m) from the Main Menu at the top, and you will see the Edit MMTTY presentation, with the tab at TX, where you can simply left-click on the button that you want to edit, and you will see the same editing window mentioned above. Here is the window, called the Assign Macro Window.



You can see the following features:

- Macro text and commands in the white window.
- Shortcut key combination that will also invoke this macro. This field may be blank, and it can be edited.
- The name that appears on this key in the main display. You can edit this window.
- Commands key. If you press this key, you will see a list of all the commands legal for this macro key. This is the macro list above, tailored for this particular key.
- A key called color to let you change the foreground color of the key (the color of the letters on the key).
- A key called TX, that will go to transmit and send what you have in this macro. (Make sure you are on a dummy load or that your radio cannot transmit).
- A Repeat button that sets the time (in tenths of a second) between repeats of this transmitted macro. 0 means no repeats.
- A Clear button that clears everything in the large white window.
- The OK button to accept the changes that you made. On some buttons, this is the word Assign, but it does the same thing.

If a button is grayed out, it is still available for editing, but the right-click method will not work. You must use the menu command to edit. Once you have assigned a name to a button, it changes to black and it can be edited with the mouse right-click.

Macro Commands

Here are commands provided for you to use in developing macro scripts to make the job of sending easier:

- \ For Group 1 macros, \ at the beginning copies the message to the transmit window and puts MMTTY into transmit mode. If you do not use the \, Group 1 macros put MMTTY into transmit and are transmitted without appearing in the transmit window.
- \ For Group 2 macros and window macros, \ at the beginning clears the transmit window.

\	For Group 2 macros and window macros, \ at the end of the macro switches to receive.
#	For Group 1 macros, # at the beginning copies the message to the transmit window, but MMTTY does not go into transmit mode automatically.
#	For Group 1 macros, # at the end of the macro repeats the macro.
#	For Group 2 macros and window macros, # at the beginning puts MMTTY into transmit mode and begins transmitting the macro. If you do not use the #, you must put MMTTY into transmit mode with the TX button.
%c	The other ham's call sign from the Call window.
%f	GM/GA/GE (see note below)
%g	Greetings – HELLO/GOOD MORNING/GOOD AFTERNOON/GOOD EVENING (see note below)
%m	My call sign
%n	The other ham's name from the Name window.
%q	His/her QTH
%r	The other ham's RST from the RST window (it may include a contest number).
%s	My RST
%t	UTC time in 1234 format.
%D	Current UTC date (e.g., 2000-SEP-05)
%E	End of definition
%F	Force transmit FIG code
%L	Force transmit LTR code
%M	The contest number portion in My RST.
%N	Only the contest number part (after RST) of his/her RST from the RST window.
%R	Only the RST part of his/her RST from the RST window.
%T	Current UTC time (e.g., 17:44)
^	Wait for 1 second
~	Transmit a mark character
~	Stop transmitting mark (stop carrier)
[Disable diddle
]	Enable diddle

Note: %g and %f are dependent on the other station's local time. MMTTY figures out his time from his callsign.

To send a contest number, for example, you could define [%R-%N-%N].

Data Entry From the Receive Window to Data Fields In MMTTY

It is possible to click received data in the receive window, and have it automatically enter data windows above the receive window. This technique can speed QSOs.

One Click for Callsign and Name

If you put the mouse cursor over anything that looks like a callsign (letters, then a number), those data will be entered as the Callsign in the Call window above the receive window.

If you put the mouse cursor over any received text and left-click once, that text will be entered as the Name. A space terminates the Name.

If you put the mouse cursor over any received number beginning with 5 or lower, and having at least three digits, it will be recorded as My [RST]. This includes a number plus text, so a report that includes an ARRL section is OK (e.g., 599WPA is recorded as My [RST]). A space terminates the data entered into MY RST (e.g., 599 WPA is recorded as 599 in My [RST]).

Repeat Macro

There is a special macro that allows you to repeat a series of commands and text, and this can be used to program highly automated operation of MMTTY.

In both contest mode and general use, you may find it useful to repeat a particular macro. The macro becomes a continuous loop. This is particularly useful for calling CQ.

How to Use a Repeated Macro

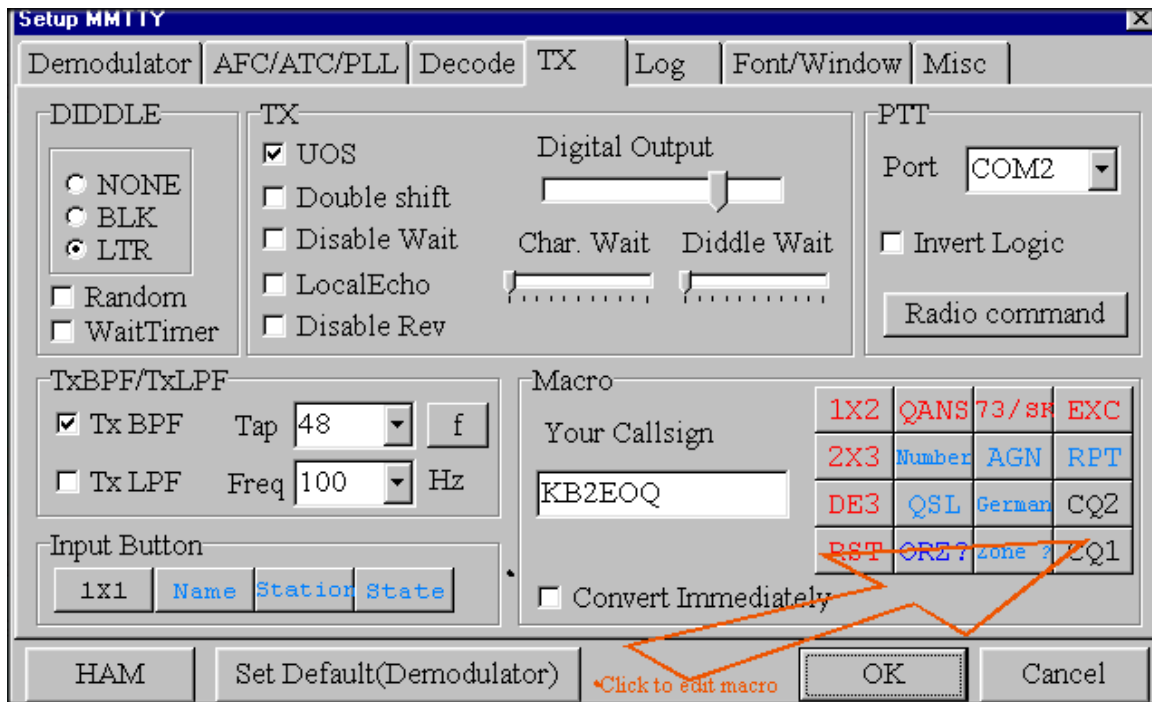
When you execute the repeated macro here is what happens:

- The contents of the macro are transmitted.
- The rig is unkeyed for a specified period.
- The macro is automatically repeated.

To stop the repeat function of the macro, simply click anywhere on the receive or transmit window. The execution of any other macro also ends the repeated macro.

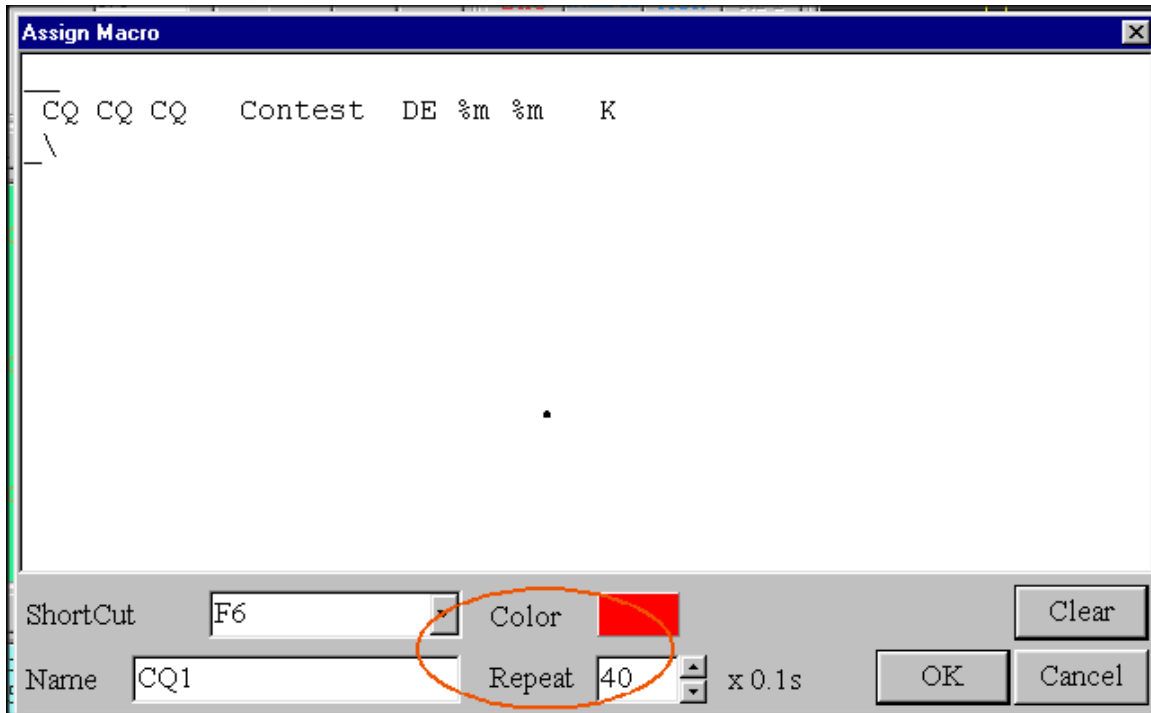
Programming a Repeated Macro

The repeat function is implemented by the following procedure; it does not use a single macro command like those in the list above. To program the repeat function, either right-click one of the Group One (top) macros, or click on SETUP MMTTY and then click on the TX tab. The dialog box is illustrated below.



In the above illustration the user is going to edit the button marked CQ1. The default label for this button is M16, but it is already renamed here. You can edit any of the 16 group 1 macros to add the repeat function.

When you right-click on your desired macro you will see the window illustrated below. This will enable you to edit the macro and program the timing of the REPEAT function.



Each increment is a tenth of a second, so the above value of 40 in the window labeled repeat will cause the macro to repeat every four seconds (40 x .1 s.).

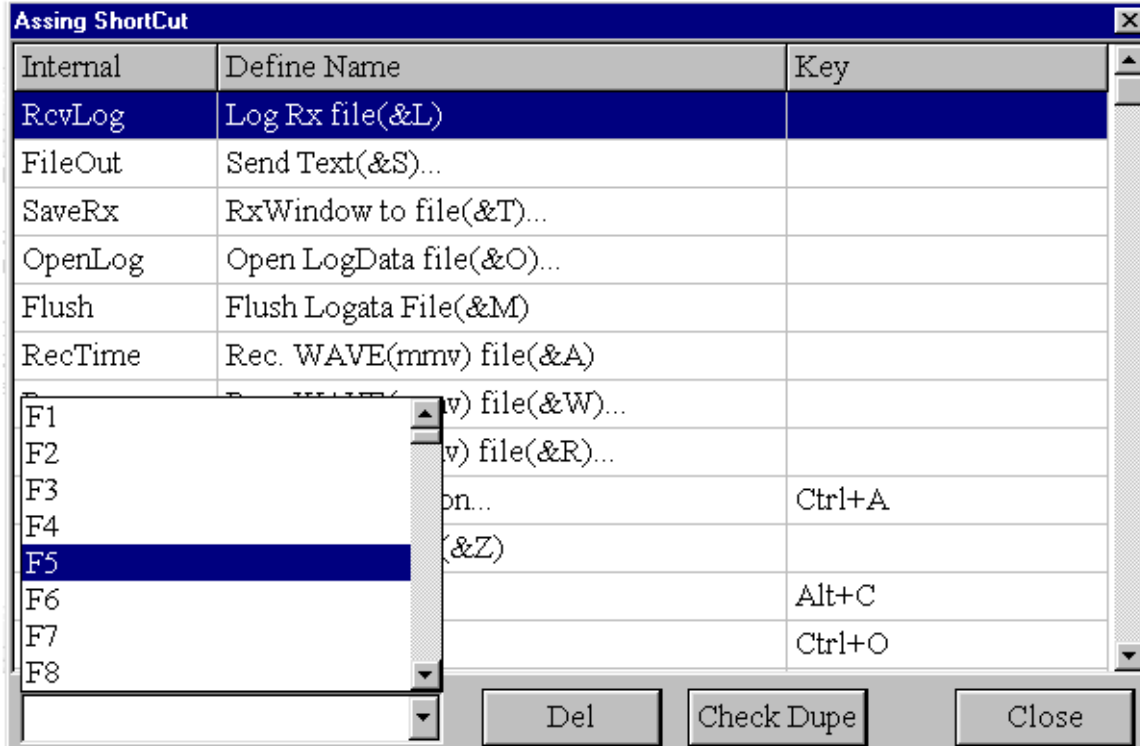
Remember, if you use the macro repeat function to call CQ, you will need to click anywhere on the receive or transmit text windows to end the macro. Clicking on the callsign of someone calling you and identifying himself will stop the CQ macro and enter his callsign into the call window. If you are in Run contest mode it will also begin the operations to work that station.

Shortcut Commands

Short-Cut Keys

MMTTY allows users to create a keyboard short-ut for almost any command. You can make MMTTY work like other programs that you use a lot. To assign a keyboard short-cut, go to **Edit, Assign ShortCut Keys** and you will see a table of functions. Use the drop-down menu at the bottom to see a list of the shortcuts and select one. Then use the **Dupe** button to see if you accidentally assign a shortcut that is already in use.

Here is a picture of the Assign ShortCut menu, in the process of assigning F5 to Log RxFile.



Some functions already have shortcuts assigned, but you can even change these. Click on the function you want to change and it will be highlighted. Now use the dupe button to remove the highlighted shortcut. You can now use that shortcut for another function, and you can give the old function a new short-cut.

Note: The Main Menu commands already have shortcuts assigned to them, alt-F, alt-E, alt-O, alt-V, alt-O, alt-P, alt-H. If you use one of these shortcuts for another function, then you will not be able to use it for the menu function. See the next section for more information

Command Short-Cuts

Many of the Main Menu commands already have shortcuts assigned to them, and you can call the menu by typing this short-cut. The **File** menu is alt-f. In addition, you can keep the alt button pressed and then press the second letter that corresponds to a choice on the menu. For example, to begin sound recording you can type alt-fa, which means hold down the alt key and type fa. This will begin recording. In this Help file, short-cuts like this will be shown as (alt-f).

List of Short-Cut Commands

Here are the short-cut commands you can assign to keys. Not all of these will be useful as short-cut key combinations, but the choice is yours. (toggle) means that the command switches back and forth each time you press the short-cut key. You can see the assignments by clicking **Edit, Assign ShortCut Keys**. The Group 1 and 2 macro buttons, and the window macros will show the names that you have assigned to them through right-click or other methods.

- | | |
|--------------------|--|
| Log Received File | Copy received text to a file (toggle). |
| Send Text | Send a text file. |
| Rx Data to File | Select the file that will get the received data. |
| Open Log Data File | Open a log data file. |
| Save Data Now | Save the log data to the selected file. |

Record Wave File	Record a file of the incoming raw audio signal data in wav format.
Play Wave File	Play a selected wav file through MMTTY for decoding.
Seek Play Position	During playback of a wav file, show the slider to adjust the segment to be played back.
Close Play/Record	Stop recording or playing a wav file.
Paste to Tx Window	Paste whatever is in the clipboard to the Tx window.
Control Panel	Expand the received text display and eliminate the top of the control panel (toggle).
Macro Buttons	Move the macro buttons from the 4x4 display to a line above the received text display (toggle).
Scope	Show the large scope display, used when playing back recorded wav files.
Clear Rx Window	Clear all text from the Rx window.
Log Data List	Show the Log data from past QSOs in list (summary) format.
Current QSO data	Show the current QSO full data display.
Auto Send CR/LF on Tx	Send a Carriage Return/Line Feed as soon as you press the Tx button (toggle).
Word wrap on keyboard	Wrap words in the Tx window, do not break them in the middle (toggle).
Running Mode	Go to run mode for contest operation.
TNC	Set up TNC emulation.
Setup MMTTY	Bring up the Setup MMTTY display (alt-o-o).
Setup Logging	Bring up the Setup Logging display (alt-o-l).
External Command 1	Suspend MMTTY and call up the first item in the Program command menu.
External Command 2	Suspend MMTTY and call up the second item in the Program command menu.
External Command 3	Suspend MMTTY and call up the third item in the Program command menu.
External Command 4	Suspend MMTTY and call up the fourth item in the Program command menu.
Resume	Return from Suspend.
Suspend	Go to the last program run in Windows.
Figs	Operate the Figures (Fig) button (toggle).
UOS	Operate the UOS button (toggle).
Tx	Operate the Tx button (toggle).
TxOff	Operate the TxOff button.
QSO	Operate the QSO button (for contest operation).
QSO on	Operate the QSO button for the first macro and do a capture operation if the Call window is empty.
QSO off	Operate the QSO button for the second macro and log the contact.
Capture	MMTTY searches for a callsign and puts it in the Call window. This function goes from callsign to callsign.
Init button	Operate the Init button (clear the current log data).
Call box	Put the cursor in the Call box.
Name box	Put the cursor in the Name box.
QTH box	Put the cursor in the QTH box.
His RST box	Put the cursor in the His RST box.
My RST box	Put the cursor in the My RST box.
Frequency box	Put the cursor in the Frequency box.
Find	Display the last QSO log data for the station in the Call box.
Clear	Clear the text in the Tx window.
Tx Up	Scroll up text in the Tx window.
Tx Down	Scroll down text in the Tx window.
Tx PUp	Page up text in the Tx window.
Tx PDown	Scroll down text in the Rx window.
Rx Up	Scroll up text in the Rx window.
Rx Down	Scroll down text in the Rx window.
Rx PUp	Page up text in the Rx window.
Rx PDown	Page down text in the Rx window.
Rx Home	Put the cursor at the top of the text in the Rx window.
Rx End	Put the cursor at the bottom of the text in the Rx window.
Left char. wait	Decrease character wait.
Right char. wait	Increase character wait.

Left diddle wait	Decrease diddle wait.
Right diddle wait	Increase diddle wait.
Tx height up	Raise the top of the Tx window by one line (and reduce the height of the Rx window).
Tx height down	Lower the top of the Tx window by one line (and increase the height of the Rx window).
Tx LTR	Transmit the LTR shift code.
Tx FIG	Transmit the FIG shift code.
Decrease shift	Increase shift width.
Increase shift	Decrease shift width.
Toggle shift	Toggle shift width between 170 and 200 Hz. (toggle).
IN1- IN4	Operate each Group 2 button, above the Tx window
IN2	Operate the second Group 2 button.
IN3	Operate the third Group 2 button.
IN4	Operate the fourth Group 2 button.
M1 - M16	Operate each Group 1 button.
ML1 - ML10	Operate each macro in the macro window.
QM1 - QM5	Start each QSO button macro.
MEdit 1 - MEdit 16	Edit each of the Group 1 macro buttons.

Shortcuts for Menu Items

The shortcut keys discussed above are reassignable, and you can select the key combination you want to bring up a particular function. There are also shortcuts to menu items that are permanent.

To see which commands have permanent shortcuts, look at the Main Menu at the top of the display. Each item has an underlined letter, which means that ALT-(letter) brings up that submenu. On the submenu, some items have underlined letters, which means that once the submenu is up, ALT-(letter) brings up that item.

If you just hold down the ALT key, you can press the two letters in rapid sequence and go directly to the display you want to use. For example, ALT-o-o calls up the Setup MMTTY display. Of course, you could also put this same action on a shortcut key in addition to the built-in shortcut.

When the short cut on a submenu is a CTRL-(letter) combination, it means that you do not have to bring up the submenu, the CTRL-(letter) combination is a short-cut key. Be careful, this is fast, but it means that you can reassign the key. Any assignment you make to a submenu item in the Edit Shortcut procedure will show up on the submenu.

An Example of Assigning Shortcut Keys to Menu Items to Create a Search

Set Ctrl-L as the assignment for Log Data List (show the whole logbook), Ctrl-S as the short cut for Find, Ctrl-T as the short cut for Go to the beginning of the log file, and Ctrl-F as the short cut for open the Find window. These should be the way MMTTY comes to you initially. Now, you can hold the Ctrl key down and type LSTF and this will open the log file and be ready to do a search from the beginning of the log file for a callsign that you enter. F3 will continue this search. This might be useful to check and record QSL status.

Of course, you can use the Find shortcut (it comes preprogrammed as Ctrl-F) to search for the first QSO with whatever callsign is in the Call window, then continue to search with F3. By the way, in this situation, F3 is hard coded to mean, "continue the search." It is also a shortcut key that can mean something else when used at the main display.

Note: If the shortcuts do not work, left-click on the Rx window and retry the shortcut.
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Additional Hints

Please read the [Contest Operation](#) topic for additional information and suggestions about using macros.

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AFSK and FSK

What Are AFSK and FSK?

AFSK stands for audio frequency-shift keying. AFSK is a method of sending frequency-shift keying by using audio tones instead of a modulator built into the radio. RTTY needs a mark and a space tone, and MMTTY generates these audio tones and sends them from the sound card to the audio input of your radio.

FSK stands for frequency-shift keying. Your radio must have an FSK modulator built into it, and you send it mark and space information by connecting a pin on the serial port to the modulator.

The reason that you must make a choice is that the two methods require different hookups (refer to [Sound Card Hookup](#)), and will cause you to operate differently.

What Are the Consequences of Using AFSK or FSK?

The station on the other end of the QSO will not be able to tell whether you are using FSK or AFSK, so how can you choose which way you want to set things up?

AFSK is the simplest way to connect your radio and the sound card, and gives you the most flexibility of operation. You can control your transmit frequency, within the receive passband of the radio, directly within MMTTY, without using any special computer interface to the radio.

When you use FSK, the radio uses its built-in modulator. Shift frequency and amplitude are all set in the radio. All the radio needs to know is whether to send a mark or a space. Many radios with this mode are properly set to display the mark frequency, and operate on LSB, which are conventions. However, while MMTTY can use its AFC (automatic frequency control) to tune in and chase after a signal, your transmitter will stay right on the preset mark frequency, over which MMTTY has no control. If you want to zero beat someone, you have to turn AFC off and tune them in manually, so your mark frequency matches theirs. With AFSK, since all operations result from tone generation and detection, there is more control over things.

Here are some of the results of hooking up either way. Some of these are summarized in Sound Card Hookup.

AFSK

- Connect the sound card output to either the microphone input or a rear panel audio input for the radio.
- MMTTY's AFC can track a drifting signal.
- Transmit shift width can change to match the received signal, or it can be fixed. See [AFC](#) in Advanced Receiving.
- All audio-generated digital modes (RTTY, PSK31, SSTV) use the same connection.
- If you use AFC to track a signal, you can call at zero-beat.
- Reverse receive and transmit shift to work reverse-shift stations on the reverse shift.

FSK

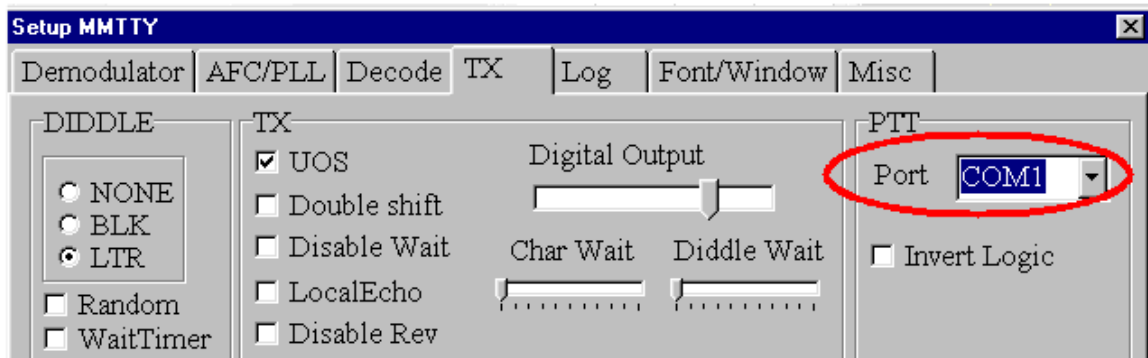
- Cannot overmodulate the transmitter (and you won't need an attenuator).
- Radio may have an FSK mode position that allows you to use special filters designed for FSK.
- Radio will read out the mark frequency directly on its dial.
- FSK bypasses the audio stage, so you can leave the microphone connected.

Setting MMTTY to Operate AFSK or FSK

The [Sound Card Hookup](#) topic tells you how to set MMTTY, but here is a review of that material.

AFSK

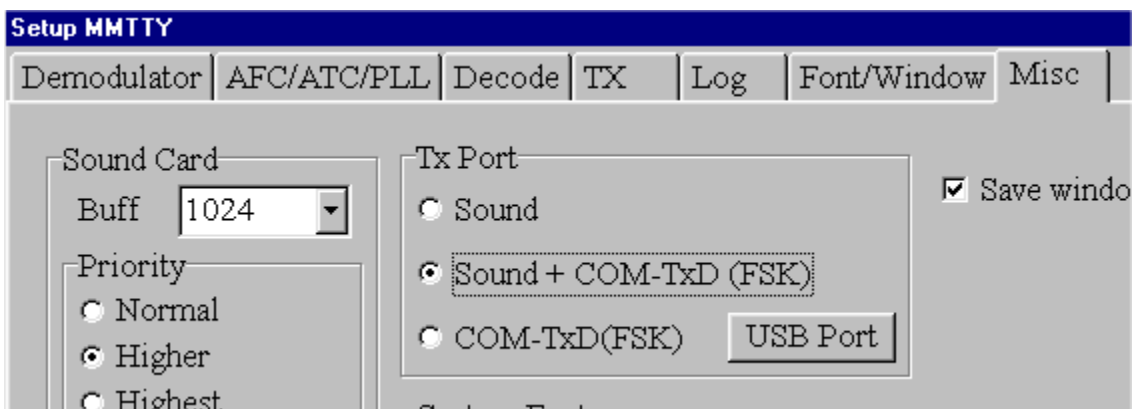
Once you have hooked up the sound card properly, all you need to do to operate AFSK is to click **Option, Setup MMTTY, Misc** Tab and then click either **Sound** or **Sound+Com-TxD**. If you know you are not going to operate FSK, click Sound, otherwise MMTTY will try to send FSK data to the COM port and this may cause a port conflict with another program. You may use the COM port for transmit/receive control, but that is another topic.



FSK

To operate FSK, first hook up the COM port for FSK (see the radio's manual and the [FSK](#) section of the Sound Card Hookup topic). Then select the COM port that has the wire going to your radio's FSK input. To do this select **Option, Setup MMTTY, TX** tab and look at the right side of the tab for PTT. Use the down-arrow to choose the correct COM port. Next, click **Option, Setup MMTTY, Misc** Tab and select **Sound+COM-TxD** or **COM-TxD**. If you know you are not going to use AFSK, just select **COM-TxD**, otherwise you will hear the modulating sound in the speakers. Of course, if you like to hear the sound, go ahead and put it there.

Note: You **must** choose a COM port on the TX tab before going to the Misc Tab, because if you don't, MMTTY will not allow you to select anything except Sound.



With Sound+COM-TxD mode, MMTTY transmits data based on the sound card timing, and sends both sound through the sound card and mark/space data through the UART on the COM port.

In COM-TxD mode, MMTTY sends only through the COM port UART, and uses UART timing, not sound card timing.

If you are using a USB port rather than a regular serial port, click the **USB Port** button. You will have to select among ways to process the FSK output, and this must be done experimentally for your setup. Here are the choices:

- Normal
- Polling -- Transmit characters without using Windows transmission events.
- Limiting speed -- Set a limit to the transmission speed to prevent the buffer from filling with diddle.
- Polling and limiting speed -- Both of the above.

Start with normal, and try the others if you have a problem. If you see an error message saying, "Cannot Open COM Port," this means that your USB does not support 5-bit, 45 baud mode, and you will not be able to use it for FSK modulation of your transceiver.

Zero-Beat

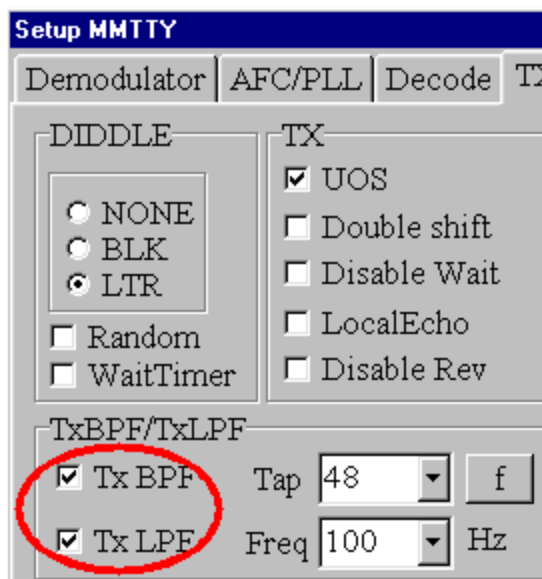
Because MMTTY cannot control the output frequency in FSK mode, but its receive frequency can vary, if you want to zero-beat a signal you must first turn off AFC and reset MMTTY's mark signal. Use the HAM button on the main screen to do this.

Shift-Width

When you use AFC, you can set the receive shift width to change to match the received signal (see the [AFC](#) section of Advanced Receiving). However, the transmit shift is set by the radio, and cannot be changed by MMTTY.

Transmit Filters

In FSK operation, there is no need for the Tx BPF (band-pass filter) and Tx LPF (low-pass filter), so go to **Option, Setup MMTTY, TX** tab, look for the TX BPF/TX LPF section at the bottom, and uncheck both **BPF** and **LPF**. This may help if you are low on resources.



Rev Button

With FSK, the Rev button on the main menu has no effect on the shift of TxD. You can receive someone who is using reverse-shift, but you cannot transmit reverse-shift. However, with so many people using AFSK, it is likely that this person is reversed because he doesn't realize that he should be on the other shift. Call anyway, and maybe he/she will realize that you are reversed and will press his/her reverse button to end up on your Tx shift. If this happens, you will have to go back to receiving regular shift, since he/she will now be operating properly.

Stop Bits

The official way to end each Baudot character is to send two stop bits. Because of the way the UART works, MMTTY cannot send two stop bits to indicate the end of each letter; it uses 1.5 stop bits instead. This will not affect copy.

Note: In the topic on transmit/receive control, and in the topic on Using MMTTY As a Modem, we mention that K5YG has found that you can use a Xircom USB-to-Serial converter for PTT control and as the MMTTY output device. However, it is not possible to use this device for FSK output, because MMTTY sets the baud rate to 9600 for PTT alone, but FSK+PTT requires a baud rate of 45.5. This conflict results in a "Com Port (n) not found" error message.
--

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Record and Replay

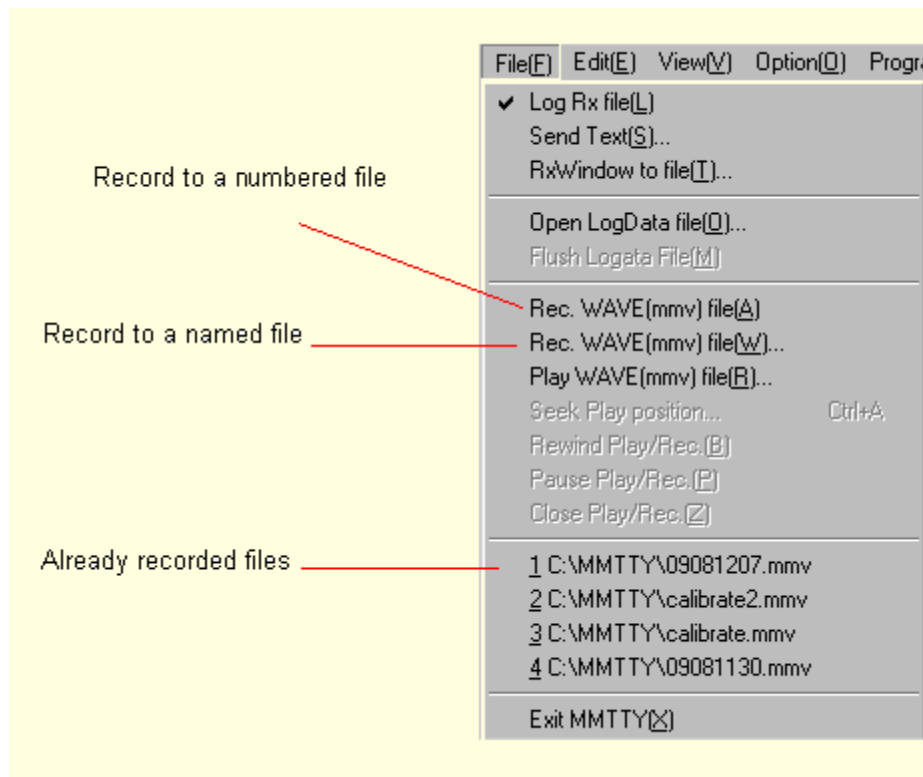
Recording RTTY Signals With MMTTY

There are two different ways to record signals with MMTTY. You can record the actual sounds, and play them back later for decoding again, or you can record the text that you have decoded. If you choose to record a sound file you can use it to determine the best settings for your demodulator. Just keep changing the decoding settings and replay the same signals. You can find out more about the demodulator in the topic [Advanced Receiving](#). The text recording is useful during a DX hunt or in a contest. You can go back over all the text that came through MMTTY's screen, to see if you have a busted callsign, dupe, or other correction to make.

Sound Recording of RTTY Signals

Here are the steps to record a sound file:

- Tune in a RTTY signal
- Go to **File** and select **Rec. WAVE file(A)** (alt-fa)
- MMTTY immediately begins recording the sound to a file



While recording, the letters REC will appear in the FFT Spectrum Scope. The recorded file will be named after the date and time (YYMMDDminuteminute).

To end recording, Go to **File** and select **Close Play/Rec.** (alt-fz) or **Pause Play/Rec.** (alt-fp). Pause will leave a check next to the pause command on the File menu. You can return to the **File** menu and uncheck **Pause Play/Rec.** (alt-fp again) to continue recording.

Note: If you pause a file, you must uncheck the pause before you can close the recorder.

There is another record command, **File, Rec. WAVE file(W)** (alt-fw), which does the same recording, but uses a default name of Recv.mmv. If you make this choice, you can rename the file before you begin. With the (A) choice, a new random number is selected each time you record.

Recording sound takes a lot of disk space. You should be careful about filling up your hard disk by making long recordings. However, long recordings are not entirely out of the realm of possibility at the present time, and the future will make it even easier. The amount of disk space for a sound file depends on the complexity of the received sound; signals take more space than noise. As a conservative estimate, it takes about 1.5 megabytes of memory to store a minute of recorded sound. One hour would use 90 megabytes, and two days of nonstop recording of RTTY signals would use 4.3 gigabytes of storage, which is within the reach of many hams. If your disk fills up completely, MMTTY will stop recording.

There is no indication of how much time you have been recording or how much storage you have used up while you are using the recorder. Once you have stopped the procedure you can check using Windows Explorer.

Note: MMTTY's mmv files are not playable as Windows wav files, and you cannot use MMTTY to decode sound recorded as wav files

Playing Back Recorded MMTTY Sound

Here is how to play back a file of recorded sound:

- Go to File and Select Play WAVE (mmv) file (alt-fr).
- Choose the file you want to play.

or

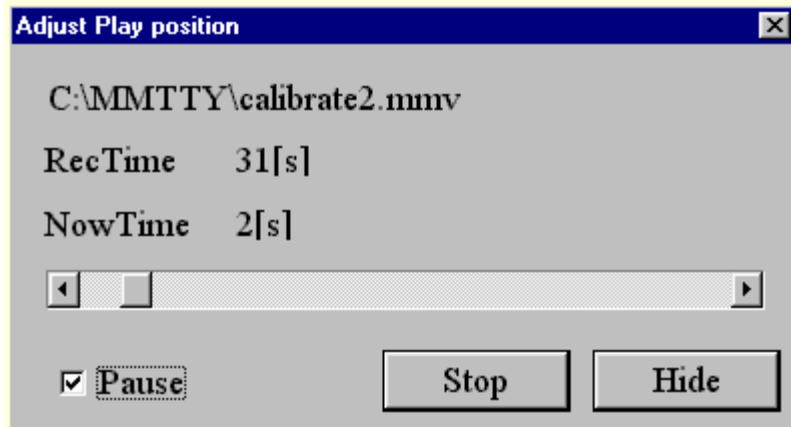
- Go to File and left-click on one of the files showing at the bottom of the File menu.

When you have begun playing, text will begin to appear on the display screen, if you recorded good RTTY data. At this time, you will see a display on your screen titled "Adjust Play Position." You can pause the playback, stop it, or move to another point in the recording. You will be able to see how much time the recording took.

While the Adjust Play Position window is open you cannot change MMTTY's controls. If you want to adjust MMTTY's controls during playback, just hide this window, and playback will continue. You can even pause the playback before you hide the window, and then go to the **File** menu to resume playback when you want.

MMTTY automatically stops replaying when the wave file runs out.

Here is a picture of the "Adjust Play Position" window.

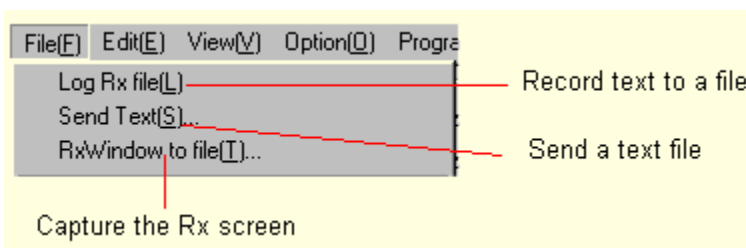


To end playback select **File, Close Play/Rec.** (alt-fz).

Recording Text

You can record the text that you receive to a file, and you can record what is currently in the receive buffer.

Here is a picture of the menu that contains the commands you need for these operations.



Recording Text to a File

To start recording all input text to a file, left-click **File, Log Rx file** (alt-fl) to turn on recording. A check mark will appear next to the menu command, and all text (transmitted and received) that appears in the receive window will be sent to a file with the name YYMMDD.txt. In other words, on February 5, 2001, the file 010205.txt is created, containing the text that appeared on the screen.

To view this file, you will need a simple editor like NotePad or WordPad, or you can even read this file in Microsoft Word. MMTTY has no

To stop recording to this file, repeat the operation **File, Log Rx file** (alt-fl) to toggle recording off.

Capturing the Rx Screen

If you are not recording to a file, but you realize that there is information on the receive screen that you would like to quickly capture to a file, select **File, RxWindow to file** (alt-ft). MMTTY will use the default name of recv.txt, but you will have a chance to change the file name if you want. For instance, say you are working P5TTY, and you press alt-ft, you can name the file p5tty and create p5tty.txt, with his short transmission captured in text format. **RxWindow to file** only records the data that are in the receive window when you use the command.

Sending a Text File

You can transmit any text file, including one that you recorded or captured, or another that you created in *.txt format, by clicking **File, Send Text** (alt-fs). MMTTY will ask you for the name of the file you want to send (the window will be titled "Open Text File for Tx"). You won't need to do this much, because you can make brag files and other support files and call them from macros or from the message window. See [Macros and Shortcut Keys](#).

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Adjusting the Display

Display Size

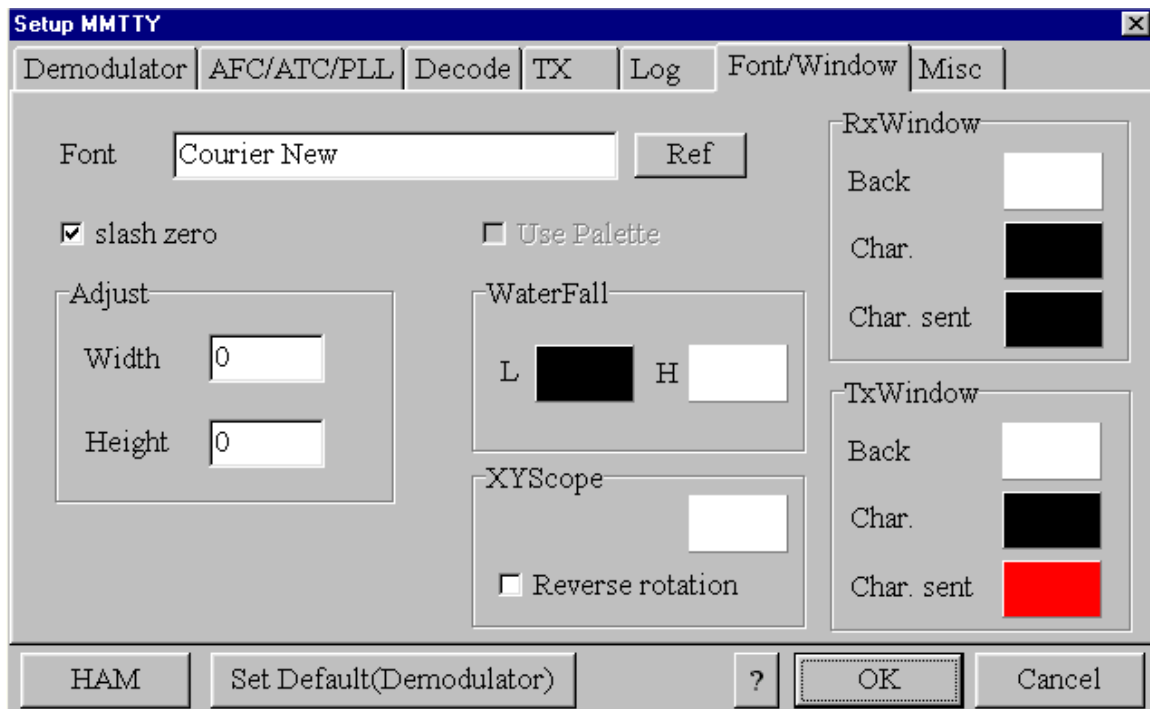
MMTTY can be a full-screen or a resizable window; use the Windows buttons at the far upper right. It is not possible to resize any of MMTTY's screens, but you can resize the entire MMTTY screen at the sides or top as long as you are in window mode (the middle box at the upper right shows a single window).

Characters Per Line

MMTTY sends a Baudot carriage return (CR) and line feed (LF) when it reaches the end of a line, so you do not have to press return. If you have a reason to send no more than a certain number of characters before a CRLF, then adjust the screen width to that number of characters, using the Windows size controls. Move the cursor to the edge of the window and it will turn into a double-sided arrow that allows you to click-and-hold to move the window edge.

Display Fonts and Colors

You can customize the fonts and colors by selecting **Option, Setup MMTTY** (alt-oo), **Font/Window** Tab. Here is a picture of that tab.



Font Style and Size

To set the font style and size press the **Ref** button at the top left of the **Font/Window** Tab to see a menu of available fonts. The same font and size are used in both the transmit and receive windows. The default is Courier New.

Character pitch is fixed even when a proportional font is selected.

Immediately below the **Ref** button on the **Font/Window** Tab is a check box for you to select slashed zero or regular zero.

Directly below the zero check box on the **Font/Window** Tab is an area labeled Adjust. This allows you to add blank pixels between letters (width) or between lines (height). In most cases, the regular fonts will be adequate, and these values may remain at zero. To make a change, just enter the new value. If you want to make the spacing smaller, use negative values.

Window and Font Colors

Adjust the receive and transmit backgrounds and font colors with the colored squares at the far right. Color choices are available for the following:

Rx Window:

- Background
- Characters received
- Characters sent and echoed in the Rx Window

Tx Window

- Background
- Characters typed
- Characters sent (changes color of typed characters as they are sent)

Waterfall Color

In the middle of the **Font/Window** Tab are the waterfall adjustments. The waterfall display is the one below the spectrum scope on the main MMTTY display. The slider adjusts the brightness of the display. The L square specifies the color of the lowest signal level, and the H specifies the color of the strongest signal level. The default is L = black and H = white. MMTTY generates 128 colors between the L and H extremes.

You can make the waterfall appear to be dark signal colors on a bright background instead of bright signal colors on a dark background. Start by setting L = white and H = black.

XY Scope

Change the color of the XY Scope display with the box directly below the one that adjusts the waterfall on the **Font/Window** Tab.

Change the direction of the XY scope tilt with a check box in this part of the tab.

Bandwidth of Tuning Indicators

To change the bandwidth of the Spectrum scope and the waterfall click **View, FFT WIDTH**, and select a value. Leave things at Auto for the simplest operation. The physical size of the display stays the same, and the XY display does not change.

Window Size, Location, Stay On Top

On the Misc tab (**Options, Setup MMTTY, Misc** Tab) there is a check box at the far right that says, "Save Window loc." Put an X in this box and MMTTY will come up next time as it was when you last exited it.

You can make MMTTY stay on top of other programs by clicking **Option, Setup TNC**, and clicking the **Stay On Top** box at the lower right. This works out best if you make MMTTY into a window at the top right, and resize it so you can see your log on part of the screen.

Top Macro Buttons

The top group of 16 macro buttons (Group 1), can be moved from their default location to be a row of buttons across the top of the receive window. Click **View, Macro Buttons** to toggle the change. In the row configuration there is less room on each button for its caption. When the buttons are in a row, the spectrum and waterfall displays will spread out to fill their old space, and the receive window will reduce from 15 rows to 13 rows.

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Computer Tune-Up

MMTTY is dependent on the computer to be able to do many operations very quickly. To be specific, MMTTY uses the floating-point calculation units in the CPU (your main computer chip) to do FFT (fast Fourier transform) waveform encoding and decoding, and DSP (digital signal processing) filtering. To put it simply, MMTTY needs a fast CPU, the faster, the better.

This topic will discuss many items that can be adjusted to free up the CPU on your computer. Many of these items involve trade-offs. You may lose a feature or some receive or transmit quality. MMTTY is flexible, so you can make these changes, but you do not have to do so. If MMTTY is working well for you, and you want all of its features, then do not make the compromises discussed here.

Check Computer Resources

To the extent that the computer is limited, you may have to settle for demodulation parameters that are not as good as those you might get with faster computation. Also, sometimes funny screen effects, such as a lost cursor, result from inadequate computer power. Well, your computer is what it is. We will not tell you to get a faster one with more memory, although that always helps, but there are ways to ensure that your computer is working at peak efficiency for MMTTY, and ways to adjust MMTTY to reduce its demands on your computer.

There is a program called System Monitor, that can give you a continuous picture of the CPU resources used. You may find it under Programs, Accessories, System Tools. If not, just search for Sysmon.exe and run it. It is probably in the Windows folder.

CPU Load

If there is not enough time to process the input signal, the word LOST will appear in the Spectrum Display. If this happens, it means that your computer is too slow or too busy (same thing) to do all the processing needed to decode RTTY. The first step to cure this is to close down other programs. You may have to reboot to regain system resources.

Adjustments to Your Computer

The simplest thing you can do with your computer is to run only MMTTY and any other program that you must run, such as a logging program. Of course, if MMTTY is running OK with other programs, then you do not need to stop them.

The other thing you can do is to check the computer resources. Click My Computer on your desktop just once to highlight it, then right-click the mouse on it to bring up a menu. Select Properties, then the Performance Tab. Look at the system resources. Do this right after you have done a restart (reboot) and note the number. If you have nothing else running and the number is lower, it is time for another restart of your computer. You can also see the effect of program removal by checking this number. If it is below 75% to begin with, you may want to consider removing some of the programs that begin when your computer starts up.

Adjustments to MMTTY to Help Your Computer

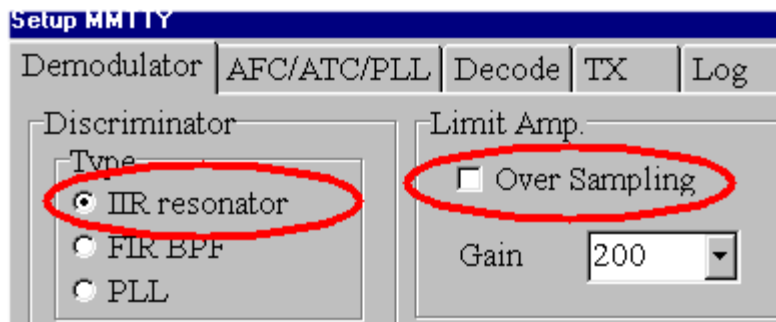
Here are some adjustments to MMTTY to help ease the load on your computer. Remember, though, that the cost of each reduction in load may be the loss of a feature or slightly poorer decoding. If there were another way, Mr. Makoto Mori would already have done it and saved you

the trouble.

Receive Adjustments

- Use the IIR-LPF low-pass filter (Click the Type button on the main screen or **Option, Setup MMTTY, Demodulator** Tab and select IIR resonator).
- Turn off TX-BPF transmit bandpass filter (**Option, Setup MMTTY** (alt-oo), **TX** Tab).
- Put the XY scope quality to lower (**View, XY Scope Quality**) (Hint: Some users like the low quality **better** than the high quality).
- Turn off the XY scope (**View, XY Scope**).
- Turn off the over sampling mode of the limiter **Option, Setup MMTTY, Demodulator** Tab and uncheck the Over Sampling box in the middle).
- Check LocalEcho (**Option, Setup MMTTY** (alt-oo), **TX** Tab).

Here is a picture of the Demodulator Tab with the two receive adjustments above marked on it.



Receive Signal Strength

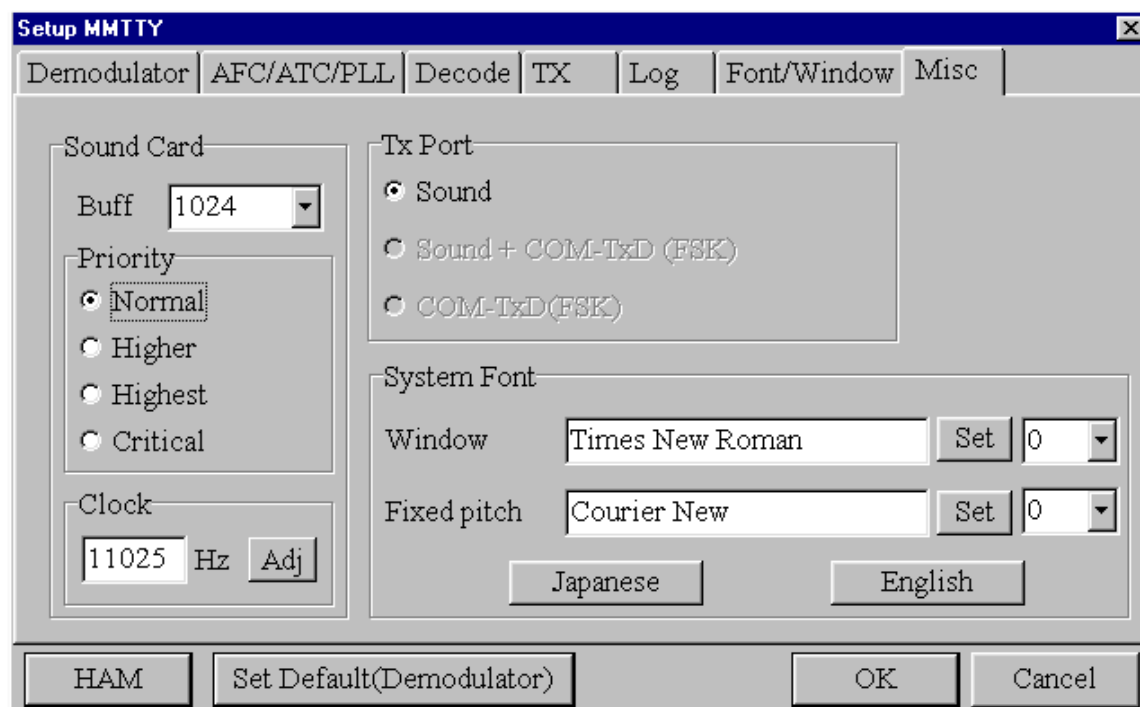
If you exceed 75% of MMTTY's capability of handling an input signal, you will see the word OVER appear in the Spectrum Display. If this happens only once in a while, you need not be concerned. However, if it happens frequently, you should reduce the signal input to MMTTY by using the audio mixer in Windows or by attenuating the signal from your radio to the sound card.

Transmit Adjustments

- Turn the local echo on (**Option, Setup MMTTY, TX** Tab and check Local Echo).
- Turn the Tx BPF off (**Option, Setup MMTTY, TX** Tab and uncheck Tx BPF at the left).
- Turn the Tx LPF off (**Option, Setup MMTTY, TX** Tab and uncheck Tx LPF at the left).

Sound Card Adjustments

Some of these controls affect both receive and transmit. Many of these adjustments will use the **Option, Setup MMTTY, Misc** tab, so here is a picture of that display.



Buffer Size

You can reduce the size of the sound card buffer as long as the transmit audio does not begin to break up. This is tricky to adjust. You will find this value at (**Option, Setup MMTTY, Misc Tab**, in a window to the left). The default is 1024 bytes. If you have transmitting quality problems, you may have to increase this number. MMTTY uses the most CPU power when it transmits RTTY data, and if the PC is busy on other jobs, this may chop up the transmit audio. Here are some related items:

- Do not run additional programs while running MMTTY.
- Use FSK rather than AFSK with very slow computers.

If you make buffer size too large, this may cause delays on receive. You can see this by setting the buffer to 8192. You can see the spectrum scope freeze. The buffer is so large that it takes a while to fill and send the data to MMTTY.

Sound Card Priority

MMTTY's default is to give high priority to sound processing. If this is too much for your computer, you will see that the main window will appear to operate slowly. Menu items will take a while to appear, and the cursor may lag. Go to **Option, Setup MMTTY, Misc Tab**, where Priority is at the left, and set it as low as you can without breaking up your transmit audio. The lowest is the Normal setting, and the priority gets higher as you go down the list.

Sound Card Sampling Frequency

You can calibrate your sound card so that you know exactly how fast its clock is running, and then put this setting into MMTTY so the program will operate more accurately. This procedure can be found in the topic [Sound Card Calibration](#).

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Execute Other Programs

You can suspend MMTTY operation to allow other programs to use the COM port and the sound card. The way to do this is to register your favorite programs, such as PSK31 and Hellschreiber, in the Program menu. You can also change the programs that are already registered, and register up to four programs of your own.

When you call one of these programs, MMTTY keeps running but releases its hold on the COM port and the sound card. This means that MMTTY will no longer key your radio via PTT, nor will it accept or send AFSK to and from the sound card.

While the names G3PLX PSK31SBW and IZ8BLY Hellschreiber are on the menu, MMTTY does not know where they are on YOUR computer, so you must actually register them before using them. See the next section on registering programs with MMTTY.

Registering Other Programs With MMTTY

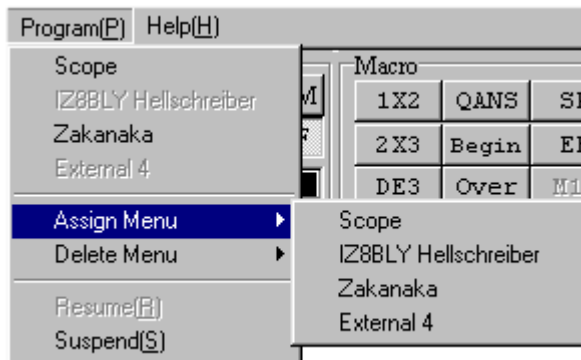
Register a Program

To register a program with MMTTY, do the following:

- Click **Program, Assign Menu**, and click on an unused name or one to be replaced by another program.
- Type in the name that you would like to see on the menu to call the new program to be registered (it does not need to be the name the computer uses) and click **OK**.
- This brings up a Windows Explorer box titled "Select External Program," which you use to navigate to the program that you want to be called up when you click this choice.
- Click on the name of the program to be called up, and click Open.

You should now see the new program name in the **Program** list and it can be called up that way.

Here is a picture of the menu used to register a program, but it also shows much of what you will see for the other operations discussed in this topic.



Delete a Registered Program

- You can delete a registered program (perhaps you decided to eliminate it from your computer). Click **Program, Delete Menu**, and the name of the program to be deleted. The old program name will appear grayed out in the menu.
- If you don't like the grayed out name, and you want to reassign External 1 or something like, that, you will also have to give MMTTY a real program name, just be sure not to call it up.

Executing Registered Programs From MMTTY

Starting a Program

To execute a program, click **Program** and then the name of the program that you want to start. When the program is selected, MMTTY releases the resources of the COM port and sound card, minimizes MMTTY itself, and executes the selected program.

If you want to execute a program which you did not register in the Program menu, you can use **Program, Suspend**. MMTTY releases the resources of the COM port and sound card, and then minimizes itself

Restarting MMTTY

To restart MMTTY:

- Quit the selected program using a legal Windows method (File or X).
- Click the MMTTY icon in the Windows task bar.

If you do not quit the program and still click the MMTTY icon, MMTTY will display an error message. In this particular case, MMTTY will not minimize itself again. To restart MMTTY, terminate the selected program and hit **Program, Resume** in MMTTY.

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RTTY BASICS

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RTTY is a fun and easy mode to operate, but there are a few things which may be puzzling to the newcomer. Please take a few minutes to read the following and you will probably save yourself some time and frustration, as well as becoming more knowledgeable about the basics of RTTY.

Mark and Space

A RTTY transmitter sends out a continuous carrier which shifts frequency back and forth between two distinct frequencies. There is no amplitude modulation, only a pure carrier similar to CW with the addition of a frequency shift. The lower RF frequency is known as the SPACE frequency and the upper RF frequency is known as the MARK frequency. The difference between the two is known as the SHIFT. For amateur radio, the SHIFT has been standardized at 170 Hz. It is customary to refer to the MARK frequency as the frequency you are operating on. For example, if you say you are transmitting on 14080.00 kHz, that means your MARK frequency is 14080.00 kHz and your SPACE frequency is 170 Hz lower, or 14079.83 kHz. While 170 Hz. is the standard shift, sometimes you will find stations using a shift of 200 Hz., but don't worry about it. MMTTY will copy either shift automatically, and the other station will copy your 170 Hz. shift as well. It is not that critical.

FSK and AFSK

You will often hear the terms FSK and AFSK when talking about RTTY. FSK means Frequency Shift Keying and AFSK means Audio Frequency Shift Keying. Here is an important point: Regardless of which method is used, the RF signal sent out over the air is identical. MARK is always the higher RF frequency and SPACE is always the lower RF frequency. The station receiving the RTTY signal cannot tell any difference at all. So what is the difference? The difference is the way your transmitter generates the RF signal.

With FSK, your transmitter receives a simple on-off signal which causes the carrier frequency to shift back and forth. Since you'll be using MMTTY, the on-off signal will come from a COM port on your computer. Other stations which do not have a sound card program like MMTTY would use a separate box called a TNC (Terminal Node Controller). The TNC does the same job that MMTTY does with your sound card. FSK is simpler, easier and more foolproof than AFSK and is highly recommended if your transmitter supports FSK input. Check your owner's manual if you're not sure.

Since not all transmitters support FSK input, there is another method available with MMTTY. You guessed it - AFSK. AFSK can be used with any SSB transmitter. AFSK is a bit trickier to set up and use, but when it is done correctly, it works just as well as FSK and will transmit a perfect RTTY signal. Also, AFSK can do some things FSK can not, such as Automatic Frequency Control (AFC) of the transmitter.

To operate with AFSK, you put your transmitter in the SSB mode instead of FSK mode, and you put an audio signal into the microphone input (some transceivers have a rear connector for data input). When you transmit, MMTTY causes your sound card to put out a pair of audio tones which cause your transmitter to send the required RF output. Sounds simple, right? Here's the tricky part: The tones are two sine waves - nothing fancy - but the frequency and amplitude of the tones is critical. Let's say you want to transmit on 14080 kHz, as in the previous example. Remember, your MARK signal has to be on 14080 kHz. How do you get there with AFSK? Here's how. With your transmitter in the LSB mode (Lower Side Band), whatever frequency goes into the microphone input will be subtracted from what your dial says and be transmitted on that

frequency. For example if your dial says 14080 kHz. and you put in a 1000 Hz. audio tone, your transmitter will put out an RF signal at 14079 kHz., exactly 1000 Hz. lower than your dial. So in this case, if the 1000 Hz. represented your MARK signal, you would have to set your transmitter to 14081 on the dial, and your MARK signal would be transmitted on 14080, just as you wanted. Ok so far? Now, what about SPACE? Remember, you want your SPACE signal to be transmitted 170 Hz. lower, on 14079.83 kHz. What audio tone will give you 14079.83? Simple - 14081 minus 14079.83, or 1170 Hz. So the MARK audio frequency is 1000 Hz. and SPACE is 1170 Hz.

There you have the basics of AFSK. MMTTY generates the two audio frequencies and your transmitter converts them into two RF frequencies. For technical reasons related to harmonic generation, audio frequencies of 1000 Hz. and 1170 Hz. are NOT recommended. They are used in this example just to keep the math simple. The recommended audio frequencies are 2125 Hz. for the MARK audio frequency and 2295 Hz. for the SPACE audio frequency. Making the frequencies higher like this will reduce any second harmonics which might be generated in your transmitter.

If you've been paying very close attention, you may have noticed the SPACE audio frequency is higher than the MARK audio frequency - just the opposite of the RF frequency you actually transmit. This happens because you're using lower sideband. If you happen to forget and set your transmitter to USB instead of LSB, two things will happen. Because your MARK and SPACE are now reversed in your receiver, any RTTY signals you hear will not print correctly. All you will see is random characters that make no sense at all. The other thing is that YOUR transmissions will also be nonsense to the other guy, so just remember - always use LSB. In the real world of course, sometimes USB gets selected accidentally. This is why MMTTY has a button marked REV. When you have a station tuned correctly but all you see is nonsense printing, click on REV and your transceiver will be reversed. Now you can print the other fellow and tell him he is "upside down", as it's commonly called. After he reverses himself, just click REV again and you will both be back to normal.

Note: By default when using AFSK, REV reverses both your receiver and transmitter. If you want REV to reverse only your receiver, go to Option/Setup MMTTY, click the TX tab and click "Disable REV". When using FSK, REV reverses only your receiver. If you want to reverse your transmitter and receiver with FSK, your transceiver should have a way of doing that. See your owner's manual.

Also, you should know that in some parts of the world, especially Europe, the standard is to use USB instead of LSB. This works fine as long as you also reverse the MARK audio frequency and the SPACE audio frequency. MMTTY defaults to LSB, and it is recommended to leave it there, even in Europe, since your signal will be identical. If you prefer to use USB, leave REV on all the time.

The really critical part about AFSK is the amplitude of the signal fed into the microphone connector (or rear panel connector), together with the microphone gain setting. You must NOT overdrive your transmitter or spurious signals will be transmitted. In general, keep the audio drive low enough that your transmitter does not generate any ALC voltage. Never try to drive your transmitter to maximum output. Around 80 to 90 percent of maximum is about right. Consult your owner's manual for more information on how to do this. If you ever hear a station at two or more frequencies at the same time, the cause is almost always overdrive. None of this applies to FSK, of course. With FSK, you can run full power and not worry about overdrive.

Figures Shift and Letters Shift

RTTY uses the Baudot code, invented before radio even existed, and still widely used throughout the world. The Baudot code uses data bits to represent letters, numbers and punctuation, much

like your computer does. Unlike your computer, which uses eight bits for each character, the Baudot code uses only five, plus a start bit and stop bit. Using fewer bits is good because it speeds up transmission and reduces the chance of errors, but there is a complication. Five data bits can only represent 32 different characters. Since there are 26 letters in the English alphabet plus ten numbers, plus some punctuation, 32 different characters is not enough, even if you only use capital letters, which Baudot does.

Mr. Baudot could have chosen to use six data bits or even more, but he found a better solution. He reasoned that most of what would be sent would be letters rather than numbers or punctuation, so he assigned all the letters to the basic 32. He then had six characters left over and he did a very clever thing with two of them. He made one of them a FIGURES SHIFT and another a LETTERS SHIFT. The way it works is this: When sending one of the basic 32 characters, nothing special happens. But when a number or punctuation is to be sent, a FIGURES SHIFT character is sent first (it's a non-printing character - you won't see it on your screen). Whatever follows will still be one of the basic 32 characters, but the receiver will interpret it differently. For example the letter Q uses the same five data bits as the number 1, but when the receiver gets a FIGURES SHIFT first, it prints the next character as a 1, not a Q. This continues until a LETTERS SHIFT character is received, at which time the receiver goes back to "normal" printing. All of this shifting is done by the system - there is no key marked LETTERS SHIFT or FIGURES SHIFT. It's all automatic and you will scarcely notice it happening.

In fact, the only reason to mention it at all is because we are using radio instead of wires, and radio is susceptible to interference from various sources such as lightning static, man-made noise, etc. If a burst of static should happen to wipe out a LETTERS SHIFT or FIGURES SHIFT character, the characters following will not print correctly until another LETTERS SHIFT or FIGURES SHIFT is received. For example, suppose you are sending a signal report of 599, but the FIGURES SHIFT character gets wiped out by a burst of static. Instead of printing 599, the other fellow's computer will print TOO. TOO is exactly the same as 599, without the FIGURES SHIFT. So how can he read what you intended to send? It's easy if he knows the secret. Here it is: Look at the top row of letter keys on your keyboard - QWERTYUIOP. Now look just above each key and to the left. Each of those number keys is the same as the letter key below and to the right, plus the FIGURES SHIFT. In our example, TOO = 599. Likewise, the word PIPE, if the LETTERS SHIFT were missed, would print as 0803. If 0803 lost its FIGURES SHIFT, it would print as PIPE.

Using MMTTY however, there is an easier way to read wrong-shifted characters. With the right mouse button, just click on the word and it is instantly changed to the opposite shift. Right-click again, and it's shifted back. Easy as can be.

Bandwidth and Filters

When the bands are nearly empty, you can use practically any receiver bandwidth with good success. Your SSB filters are probably between 2.1 and 3.0 kHz. wide and as long as no other stations are nearby, copy will be fine. For optimum performance however, less bandwidth is better, in fact MUCH better. 170 Hz. shift RTTY only needs about 250 Hz. for proper copy. If you don't have a 250 Hz. filter, 500 Hz. will do pretty well, but anything wider than that will not be satisfactory in the long run.

You may wonder why, if the shift is 170 Hz., do you need a 250 Hz. filter? Why not 170? The reason is that shifting the frequency generates sidebands adjacent to the actual signal and if the sidebands are attenuated, the signal will be degraded. RTTY is actually a form of FM, and if you'd like to understand more FM theory, there are a large number of books available. For amateurs, the ARRL handbook is a good source.

Depending on your transceiver, you may or may not be able to use a narrow filter for RTTY.

Some of the less expensive transceivers do not have an FSK mode, and also are unable to select a narrow filter while in the LSB mode. Some improvement can be made by using an outboard audio filter between the speaker output and the sound card input, but unfortunately, that will not prevent a strong adjacent signal from causing the receiver's AGC circuit to reduce gain, often to the point where the desired signal disappears. The best solution is to upgrade to a transceiver which has an FSK mode built in, AND which allows you to select a narrow filter while in that mode.

Band Plans

It's easy to remember the band plans for RTTY. Most activity will be found between 80 and 100 kHz. up from the bottom edge of the band, except for 80 meters which goes an additional 40 or 50 kHz. higher, and 160 meters. 160 meter RTTY activity is rare, but when found, it is usually between 1800 and 1820. Avoid the CW DX window between 1830 - 1840. At present, there is not much activity on the WARC bands, although 30 meters can be active at times.

Here is where you will find most of the RTTY activity:

80 meters: 3580 - 3650 (3520 - 3525 in Japan)
40 meters: 7080 - 7100 in the US (see note below)
30 meters: 10110 to top of band
20 meters: 14080 - 14099 (avoid the beacons at 14100)
15 meters: 21080 - 21100
10 meters: 28080 - 28100

RTTY allocations for 40 meters vary greatly all over the world. In the US, RTTY is permitted between 7000 and 7150, although most US activity is between 7080 and 7100. DX activity is often found between 7020 and 7040.

For US operators, remember that RTTY is not allowed in the phone portions of the HF bands except on 160 meters, where it is legal anywhere in the band.

RTTY DX

Chasing DX on RTTY is highly popular with the RTTY crowd. As you might guess, 20 meters is the premier DX band for RTTY, and most rare DX stations and especially DXpeditions operate on 14080. Just like with CW or phone, if the DX is calling CQ and getting no answers, you can feel safe in calling him right on his frequency. If things are busy however, he will often work split, which means you should call him on a different frequency, usually 2-10 kHz. higher. He will say "up 2-10" or something similar at the end of his transmission, and that's your clue. Your transceiver owner's manual will explain how to do "split".

RTTY Contests

RTTY contesting is a passion with a lot of operators. There are about a dozen major RTTY contests each year and when they are on, the bands will be full! Even if you don't care to compete, it's a great way to pick up new states or countries. Many of the rare DX stations are serious contest operators. A list of RTTY contest times and rules can be found on the web at:

<http://home.online.no/~janalme/RTTY.html>

or

<http://www.sk3bg.se/contest/>

Contesters are in a hurry, of course, so please don't send your name, QTH or anything except what is required by the contest. Plenty of time for chatting after it's over.

If you get serious about RTTY contesting, you will probably want to get a program designed specifically for it. In the meantime, MMTTY will let you try it out and see how you like it.

Your First RTTY QSO

Ok, you've learned a bunch of stuff and you're ready to get on the air! For your first time on RTTY, try the 20 meter band. 20 has the lion's share of RTTY activity and you can usually find someone, day or night. Try calling CQ between 14080 and 14087 kHz. A typical RTTY CQ would go like this: CQ CQ CQ CQ CQ CQ DE W7TI W7TI W7TI PSE K Practically all RTTYers add the "PSE" at the end. Kind of a friendly touch. Some will add their name and QTH, some will add the time and date. You'll find a lot of variety and it's all ok - just get on the air and try it out!

If you're familiar with CW procedures, you'll be right at home with RTTY. RTTYers use most of the Q-signals, as well as DE, K, KN, and all the rest. And if you accidentally find yourself "upside down", don't get embarrassed - we've all done it! RTTYers are some of the nicest people you'll ever meet, and things like jamming and profanity are almost unheard of.

RTTY Forever

In spite of the newer digital modes like PSK, Pactor, G-Tor and others, RTTY remains the favorite of contesters and DXers alike. RTTY does not use error correction, handshaking, or synchronizing, all of which slow things down. When quick back-and-forth exchanges are important, RTTY is the mode of choice. Roundtable discussions and nets which would be difficult or slow with other modes are a natural for RTTY, and RTTY is likely to be around for a long time to come.

So there you have most of what you need to know to become a proficient RTTY operator.

Welcome to RTTY!

Bill, W7TI

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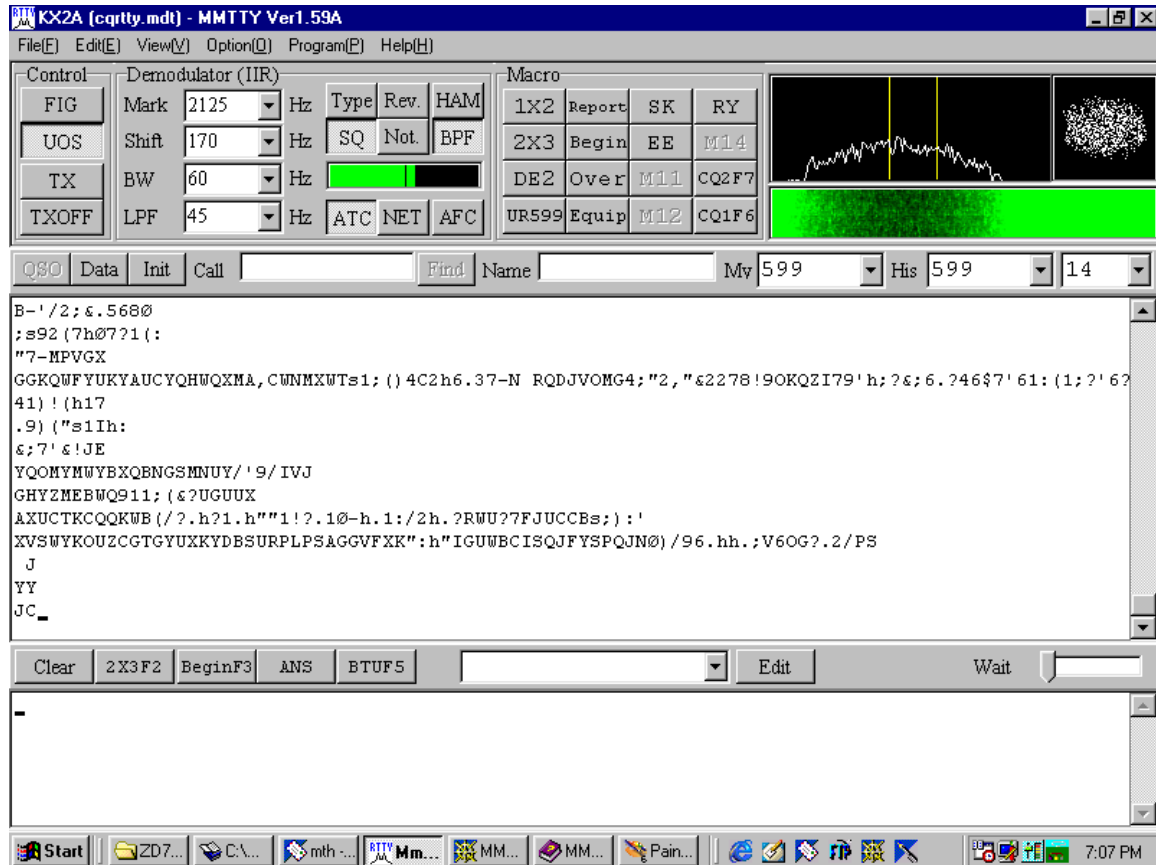
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Pictorial Overview

Here is a picture of MMTTY's main display. Orient yourself by noting the following;

- The main menu, many controls, and the auxiliary displays are at the top.
- Next down is the receive display screen that shows what you receive and what you sent.
- Below that is a divider bar with a few transmit controls.
- At the bottom is the transmit display screen, that shows what you type.

Some controls are also displays; if the program operates that function, the button will depress automatically.



Top Line (Title Window)

- At the very top left is the registered callsign and the name of the current log file (*.mdt). You enter these during installation, but they can be changed with **Option, Setup MMTTY, TX Tab** for callsign, and the **File** menu for log file.
- To the right of that is the Version of MMTTY that you are using, and the [contest log mode](#).

Main Menu

The main menu is the next item below the title.

Control Group

This is a column of four buttons at the far left. There are four controls in the control group:

- Fig is the [letters/figures shift](#) control/display.
- UOS is the [unshift-on-space](#) control/display.
- TX is the [transmit/receive](#) control.
- TXOFF is the [end transmit immediately](#) control, or "panic button."

Demodulator Group

- Directly next to the word Demodulator is a display of which [demodulator algorithm](#) (demodulator type) you are using.
- Mark is the [mark frequency](#).
- Shift is the [shift width frequency](#). If you click on the word "Shift," the shift will toggle between 170 Hz. and 200 Hz., the two most common shifts used in ham radio.
- BW is the bandwidth of the IIR Resonator, if you are using that demodulation type. If you click on the letters "BW," they will change to [Baud](#), and now the menu will list [baud rate](#). The ham radio standard is 45.5 baud.
- AV. is the smoothing frequency of the integrator. If you click on the letters AV, they will change to LPF and you can set the LPF for the integrator. See the [Integrator](#) section of the Advanced Receiving topic.

Demodulator Display and Controls

The demodulator controls are the buttons and display just to the right of the windows with mark and shift information.

- The Type button changes the [demodulator algorithm](#) (FIR, IIR, PLL).
- The Rev button switches mark and space transmit and receive AFSK frequencies. If you are on USB, MMTTY operates as if you were on LSB.
- The [HAM](#) button resets demodulator settings to preset values.

Note: If you have AFC on, MMTTY may change these values almost immediately, as it tries to tune in signals.

- The [SQ](#) button turns on the squelch. MMTTY will not print if the signal is not above the squelch line. Turn SQ on and click in the signal strength display directly below, with the green bar. Click to the left to move the squelch line lower, and print more.
- The [Not](#) button inserts a notch filter. You can move the mouse cursor into the spectrum display and right click and the notch will appear at the cursor location. You must use the Not. switch to turn it off.
- The BPF button inserts a bandpass filter on receive.
- The Signal strength window is just below the six buttons. See the squelch button above.
- The ATC button automatically adjusts the level of signal going to the limiter. Ordinarily, decoding is better with ATC off, but if there is echo, put it on. See [Automatic Threshold Control](#).
- [NET](#) makes your transmit frequency follow your receive frequency, on AFSK.
- [AFC](#) lets MMTTY track the receive signal within the receive passband.

Macro Group (Group 1)

These 16 buttons make up the [Group 1 Macro keys](#) that invoke scripts to operate MMTTY (go to transmit, send text, go to receive, etc.).

Receive and Transmit Displays

At the far right are three displays collected together.

- The [FFT Spectrum Scope](#) is at the upper left of this group of displays. It shows the receive signal in relation to the mark (left) and space (right) lines (the difference between these two is the shift). You can click in this window to tune in a signal. Remember, tuning a signal means that you are changing the mark frequency.
- The [XY Scope](#) is to the top right. This shows a classic display of mark and space, which will be at 90 degrees when the received signal is at the expected shift.
- At the bottom is the waterfall display, a continuous flow of signal from top to bottom.

Log Data

Directly above the receive window is a narrow bar with controls and displays that pertain to logging and contest operation.

- [QSO button](#) only operates when there are data to be recorded. It enters data into the log.
- Data brings up a screen with all the possible log data for the current QSO.
- Init resets all log data to initial values for the current QSO.
- [Call](#) is a label, a display, and a control.
 - It labels the small window next to it, which will show the other station's callsign.
 - It turns red if you are in Run [contest mode](#), and black in S&P contest mode.
 - Clicking on it toggles your contest mode between Run and S&P.
- Find searches the log for the callsign in the call window.
- Name is a label, a display, and a control.
 - The small window next to it shows the operator's name.
 - It shows whether you are capturing a name or a QTH.
 - Clicking it toggles the label to QTH, and the small window now shows or captures the QTH.
- My stands for My RST.
- His stands for His RST.
- The unlabeled window at the far right shows the band that will be logged for this QSO.

Receive Data Window

Received data print here, and data you have transmitted also appear here. You can use the scroll control at the right to scroll through past data, but you must be careful to return it all the way back to the bottom, or you will no longer see new receive data.

Transmit Controls and Displays

Between the receive and transmit windows is a narrow bar with some controls and displays that are particularly oriented to making it easy to perform QSO functions using MMTTY.

- Clear empties the transmit buffer.
- The next four buttons are [Group 2 macro](#) buttons. They can be programmed with scripts that you use regularly, such as btu to turn the QSO back to the other station, a beginning of a transmission button with basic identification information, and so forth.
- The small window and Edit button work with the transmit window. These are more macros, for use during a QSO.
- [Wait](#) is a control that regulates how rapidly MMTTY sends letters.

Transmit Window

Your transmit data appear here, and there is a [type-ahead](#) feature, so you can edit data in this window if you are fast enough.

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Shareware

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Revision History

MMTTY Program Revisions

- [V1.00 2000-06-30]
 - Released the initial version.
- [V1.01 2000-07-01]
 - Added the control of the buffer size for the sound card.
 - Revised manual.
- [V1.02 2000-07-01]
 - Got the input window size stored into the INI file.
 - Added a logging function
- [V1.03 2000-07-04]
 - Corrected the bug of the Water Fall, which would not be displayed in a certain 256-color video adapter.
- [V1.04 2000-07-05]
 - Added pre-filters.
 - Added the display of filtering shapes.
 - Revised minor points and added some functions.
- [V1.05 2000-07-06]
 - Placed the control box for the LPF in the main menu window.
 - Got the colors of the water fall, receive window, and transmit window be user customizable.
- [V1.06 2000-07-07]
 - Corrected the bug with respect to the search function of log files.
- [V1.07 2000-07-07]
 - Supported FSK transmission (thanks to JA7DHJ).
- [V1.08 2000-07-08]
 - Corrected minor bugs.
- [V1.09 2000-07-08]
 - Added an LMS filter in front of the demodulator.
- [V1.10 2000-07-08]
 - Corrected the bug of the order of FSK transmission bits (thanks to JA7DHJ).
- [V1.11 2000-07-10]
 - Added COM5-COM8 as a PTT control port.
 - Added %g and %f to the macro and predefined messages.
 - Added an export function for the QSO log.
- [V1.12 2000-07-10]
 - Added an import function for the QSO log from a text file.
 - Corrected the receive/transmit switching bug in the FSK mode (thanks to JA1FQI).
- [V1.13 2000-07-11]
 - Added character wait and diddle wait (thanks to JA1IQV).

- Added the receiver window clear button (thanks to JA3LGD).

[V1.14 2000-07-11]

- Improved the LMS function.

[V1.15 2000-07-11]

- Corrected the bug induced in Version 1.14. MMTTY could not be started.

[V1.16 2000-07-12]

- Added short-cut keys to the Macro buttons (thanks to JA1IQV).
- Modified the timing for automatic TX to RX switching.

[V1.17 2000-07-12]

- Added import/export function to LOG200 data file.
- Added an XY scope (thanks to JA1IQV).

[V1.18 2000-07-12]

- Changed the default of the frequency discriminator from FIR to IIR.

[V1.19 2000-07-12]

- Got the mark frequency displayed horizontally in the XY scope (thanks to JA1IQV).

[V1.20 2000-07-13]

- Improved the XY scope display.
- Added a limiter amplifier in the demodulator (thanks to 7L1CUH and JA1IQV).
- Removed an AGC from the demodulator.

[V1.21 2000-07-15]

- Added the sound recorder/player (thanks to 7L1CUH).

[V1.22 2000-07-15]

- Added the display of the frequency characteristics of the IIR resonator.
- Added the size options for the XY scope.
- Added the Inv output of the LMS.
- Improved the sound recorder/player function.

[V1.23 2000-07-16]

- Routed the output of the sound player to the sound card.
- Added the PLL demodulator.
- Added the menu for the player position.

[V1.24 2000-07-18]

- Changed the slider for character wait and diddle wait to an A-type volume.
- Added a play button to the oscilloscope.
- Uploaded the specifications of signal processing used in MMTTY (digital.txt).
- Revised minor items.

[V1.25 2000-07-19]

- Removed the output to DTR (it does not function).
- Added a data converter for Turbo Hamlog.
- Made short-cut keys customizable.

[V1.26 2000-07-20]

- Improved the logging facility.
- Corrected the bug, which did not record precedent and succeeding spaces in macro (thanks to 7L1CUH).

- Added the priority controller for sound processing (thanks to JH1SWD).

[V1.27 2000-07-21]

- Changed the priority default from Critical to Highest (thanks to JH1SWD).
- Corrected minor bugs.

[V1.28 2000-07-21]

- Revised the Turbo Hamlog MMTTY converter, which did not copy T (thanks to JH1SWD).

[V1.29 2000-07-22]

- Added a retry operation in opening a sound card (thanks to JA6VAG).
- Revised minor points.

[V1.30 2000-07-23]

- Change the default setting of RX-stop bit from 1.42 to 1.
- Corrected a bug in Turbo Hamlog to MMTTY converter (thanks to JH1SWD).
- Added an On/Off switch for the control panel display.
- Added control panel size options.

[V1.31 2000-07-23]

- Improved the conversion operation of log files (thanks to JH1SWD).

[V1.32 2000-07-23]

- Revised asking messages (thanks to JH1SWD).
- Added a program menu (thanks to JH1SWD and JA1IQV).

[V1.33 2000-07-23]

- Added a current directory for executing another program.
- Improved the squelch.

[V1.34 2000-07-26]

- Added an English mode (thanks to HL1AQ).
- Added the local echo option for a low-speed CPU.
- Added an option with which the macro text is transmitted through the input window.

[V1.35 2000-07-26]

- Corrected the bug that causes an error for the very first log data.

[V1.36 2000-07-27]

- Improved minor points.

[V1.37 2000-07-28]

- Added the UTC display in the log.
- Added an automatic language selection.

[V1.38 2000-07-28]

- Added an option which reverses the XY scope rotation (thanks to JA9AVA).
- Improved the squelch.
- Added the wait diddle out option.

[V1.39 2000-07-30]

- Removed Limit button.
- Added Net button.
- Change the default value of the DX button to 100.
- Added a contest mode for recording MyRST with a mouse.
- Added LARGE in the control panel size.

- [V1.40 2000-07-30]
- Got the squelch level displayed even when the squelch is turned off.
 - Added the HAM mode for AFC shift algorithm.
 - Corrected the NET button function.
 - Added short-cut keys for editing macro buttons (thanks to JA1IQV).
 - Added %s to macro.
- [V1.41 2000-08-01]
- Added the IIR LPF.
 - Added the frequency shape display for integrators.
 - Revised minor points.
- [V1.42 2000-08-02]
- Added an option for the XY scope quality.
 - Reduced the effect of phase distortion caused by the limiter in the XY scope.
- [V1.43 2000-08-02]
- Added the over sampling selection for the limiter.
- [V1.44 2000-08-04]
- Added the adjustment function of the sound card clock (thanks to JA1WSK).
- [V1.45 2000-08-04]
- Got the JJY tick sound usable for adjusting the sound card clock.
- [V1.46 2000-08-05]
- Added the option with which the FSK can send data in pace with UART.
 - Revised minor points.
- [V1.47 2000-08-06]
- Improved the timing of TX/RX switching when Diddle is on.
- [V1.48 2000-08-06]
- Added Wait Timer for Diddle (thanks to JA1IQV).
 - Added the force out option for LTR/FIG codes (thanks to JA1IQV).
- [V1.49 2000-08-07]
- Added ^ to predefine messages (thanks to JA1IQV).
 - Revised minor points.
- [V1.50 2000-08-08]
- Improved the asking message speed in a slow PC.
- [V1.51 2000-08-08]
- Improved the response in a Pentium 75-MHz PC.
 - Removed several switches that are no longer used.
 - Released more CPU power when suspended.
 - Added the description how to speed up the operation even in a slow PC.
- [V1.52 2000-08-10]
- Added the function with which the shift width can be changed by key (thanks to JA3KWZ).
 - Added an FSK algorithm to the AFC (thanks to JA3KWZ).
 - Added ~, [, and] to macro.
 - Stopped transmitting diddle 0.25 seconds after the switch to TX.

- Revised minor bugs.

[V1.53 2000-8-12]

- Added shift width options, 220Hz/240Hz, to the AFC.
- Added the gain control for FFT.
- Revised minor points.

[V1.54]

- Added a short-cut key "Ctrl+BS," which erases a not-transmitted line (thanks to JA1IQV).
- Added # to the macro (thanks to JH8WIG).
- Added %E to the macro (thanks to JA1IQV).
- Added an instant conversion function to the keyword reference (thanks to JG1GGU).

[V1.55]

- Changed the diddle default from NONE to LTR (thanks to K6STI).
- Added an option, which disables REV at transmitting (thanks to W6/G0AZT).
- Increased the number of drop list of the predefined message (thanks to JE4CIL).

[V1.56]

- Corrected the Dsub pin assignment in the MMTTY.TXT (thanks to MMTTY group).
- Changed the lower limit of the mark frequency to 300 Hz (thanks to MMTTY group).
- Added a short-cut to clear the receiving window (thanks to MMTTY group).
- Added ESC to the short-cut keys (thanks to MMTTY group).
- Added an export function to ADIF (thanks to JA5HRE and MMTTY group).
- Added the UTC option to the time stamp (thanks to MMTTY group).
- Corrected a bug in the UTC display in the QSO data (thanks to MMTTY group).
- Removed 599 button; instead added a band box.

[V1.57 2000-08-24]

- Changed the call search to be invoked immediately by clicking a call sign (thanks to MMTTY group)
- Added an option for WORD OUT.
- Added a running mode and an S&P mode for contests (thanks to MMTTY group)
- Added Setup Help and HTML Help menus (thanks to MMTTY group)

[V1.58 2000-09-07]

- Added a pointer to English Windows Help in the Help menu (thanks to KX2A)
- Added %D and %T to macro (thanks to MMTTY group)
- Boosted the speed of macro keywords "~" and "_" (thanks to MMTTY group)
- Deleted the DX button; added ATC instead
- Added # to predefine messages (thanks to MMTTY group)

[V1.59 2000-10-15]

- %f and %L macros are converted during TX even in the immediate conversion mode (thanks to JA1IQV)
- Added a help pointer to W7TI's RTTY BASIC in the Japanese mode (thanks to W7TI and JA7UDE)
- Added the CQ/RJ mode for mouse capturing (thanks to JA1IQV and K5YG)
- Added the mode definition option in Hamlog translation (thanks to JE4CIL and 7L1CUH)
- Changed the default RST format of the ADIF export (thanks to MMTTY group)
- Added the TNC emulation mode
- Removed the maximum limit of long text file transmission (thanks to MMTTY group)
- Added the remote mode (thanks to K4CY)
- Added the time offset option for logging (thanks to JR3KFX)
- Added the option that makes MMTTY record window size and location (thanks to MMTTY group)

- Made the color of each macro button customizable (thanks to MMTTY group)
- Added the option that automatically generates CR when TX button is pushed (thanks to JH1BIH)
- Added the option that hides/unhides the macro buttons
- Added Baud rate control button in the main window - push 'BW' (thanks to MMTTY group)
- Added the option that the user can select an ID number for the sound card in the setup MMTTY window.(Tnx to MMTTY-Group)
- Added the option that the user can select a date format in the setup Logging window.(Tnx to MMTTY-Group)
- Added the Radio Command to the PTT control. (Tnx to KB2EOQ, JA1WSK and MMTTY-Group)
- Added repeat function to macro commands
- Improved output timing of FSK As for older version, there was a bug, and the FSK signal output by Txd was 1 stop bit. Revised to 1.5 stop bits.
- In the Sound+Txd option, new method to take the same period of both.
- Added 2nd notch frequency. Two notch filters when you check "Two notches" into ON with a part setting Notch of the setup window.
- In this case of course CPU load becomes heavy.
- Added one line of macro buttons. ON/OFF of the macro buttons of an indication menu, you could turn macro button indication of OFF in the older version, but I added the feature to display the macro buttons under the Control Panel. It may be easier to use the large spectrum and Waterfall.
- Revised a bug with import text file.
- Revised a bug with YYYY format. Conversion of a date with QSO window did not work properly. Revised one point when you selected the YYYY format. In addition, it can change the output of the date by "%D" macro with the date format.

[V1.6 2000-12-18]

- Added the keyboard word-wrap function (thanks to JH1BIH). In the TX window, it reserves the right margin using a space key. It can be turned ON/OFF in the option menu. The default is ON.
- Added two options in the remote mode (thanks to K4CY and MMTTY group)
 - h option allows the user to specify the Windows handle at the startup.
 - n option makes the MMTTY sends the received characters without converting into Baudot (raw character mode).
- Added %M and %t keywords to the Macro (thanks to MMTTY group)
 - %M - the contest number portion in MyRST
 - %t - UTC time in 1234 format
 Added "Commands" button to the Macro definition window (thanks to MMTTY group). When "Commands" button in the Macro definition window is pushed, all the available keywords are listed and are ready for selection. Some keywords have different meanings in Macro groups 1 and 2. Since the Command button displays different keywords according to the situations, I hope it alleviates the confusion.
- Made the color of the transmitted characters customizable (thanks to MMTTY group). The user can define the color of the transmitted characters that are echoed in the TX window.
- Added the import filter for ADIF. The log data in the ADIF format can be imported to the MMTTY logging facility. Added the option for FSK-TXD to accommodate USB-COM port (thanks to MMTTY group). Some USB-COM adapters did not work in the FSK mode. To solve the problem, four options have been added to the FSK-TXD mode. Go along with [Option], [Setup MMTTY], [Misc], select "Sound+TXD" or "TxD," and push the USB port button to select one of the following options.
 - (A) Normal
 - (B) Polling - Transmit characters without using Windows transmission events.
 - (C) Limiting speed - Set limit to the transmission speed in order to prevent the buffer from

being filled with DIDDLE.

(D) Polling and limiting speed - Transmit characters without using Windows transmission events. Set limit to the transmission speed in order to prevent the buffer from being filled with DIDDLE.

- Use Normal for the legacy COM port. If you have a trouble in the USB-COM adapter, try the other three options. If you see an error message "Cannot open COMx," you would not be able to use the COM port for FSK. The COM port probably does not support the 5-bit 45-bps mode.
- Added shortcut definitions, OnQSO, OffQSO, and Capture (thanks to JA1WSK and MMTTY group). The user had to use the mouse to capture the call sign and start/end a QSO. The user can do these operations using short-cut keys. To activate this function, the user must assign the short-cut keys to OnQSO, OffQSO, and Capture by using [Assign ShortCut Keys] in the Edit option.
- Capture automatically captures the call sign, which MMTTY guesses it is, in the received text.
- OnQSO gets MMTTY in the starting QSO state. If the call sign has not been captured, it executes Capture at the same time. Even if the QSO has started, the automatic Macro sends the sentence for starting QSO.
- OffQSO gets MMTTY in the ending QSO state. Even if the QSO has already ended, the automatic Macro again sends the sentence that was sent at the previous QSO.
- Added the style option to the font. Bold and Italic can be applied to the font.
- Changed the JCC/JCG text from Japanese to English in the English mode (thanks to MMTTY group). In the English mode, the JCC/JCG are displayed not in Japanese but in the English alphabet.
- Added notch filter marker in the FFT window (thanks to MMTTY group) In the FFT window, markers are displayed at the center frequency of the notch filters.
- Added VFO polling function to the Radio Command (thanks to JA1WSK and MMTTY group). MMTTY logging facility can retrieve the VFO frequency through the Radio Command. When "VFO polling" is selected in the Radio Command pane, MMTTY reads the frequency of the radio and automatically updates the band information of the logging. Currently, MMTTY supports only several transceivers that have the Radio Command, but will support others as their command is revealed. The frequency is logged as follows:
- Added option to select mono, left, right sound card channel on receive
 - NONE freq = VFO
 - LSB freq = VFO - MarkFreq
 - USB freq = VFO + MarkFreq

[Version 1.61 2001-2-9]

- Added minutes settings to the time-offset. (Tnx MMTTY-Group)
- Improved remote mode (Tnx K4CY, Zakanaka-Group)
- Improved processing speed of DSP.
- Revised lock-up problem on WindowsNT/2000. (Tnx MMTTY-Group)
- Added 'Always fix shift' option in the TX settings. (Tnx K4CY)

- Added Kenwood for the VFO-polling function (Tnx MMTTY-Group)
- Added Profiles menu
- Improved the clock adjustment operation with a time standard radio wave.
- Added 'Baudot modem' in the TNC emulation. (Tnx MMTTY-Group)
- Added 'Ignore daylight saving' in the time offset option. (Tnx K4CY)
- Added 'Cabrillo file' in the export log files. (Tnx W6/G0AZT, MMTTY-Group)
- Added UserPara.ini file for user-specified parameters

[Version 1.61a 2001-3-23]

- Improved remote mode. (Tnx to K4CY, JK1IQK and MMTTY group)

- Added FT1000D selection in VFO polling.(Tnx to MMTTY group)
- Fixed some bugs and applied some improvements

[Version 1.61B 2001-3-31]

- Added AGC option in the Limiter of the Demodulator

Help File Revisions

[Version 2.2 2000-09-26]

Added Pictorial Overview topic (links not complete)

[Version 2.3 2000-09-28]

Added topic "Using MMTTY As a Modem"

Updated "System Requirements"

Links added to "Pictorial Overview"

[Version 2.3.1 2000-09-29]

Cleaned up Revision History

Cleaned up Table of Contents

Changes and additions to Pictorial Overview (new main screen picture)

Partial update of Use MMTTY as a Modem

[Version 2.3.2 2000-10-06]

Changes to Contest Operation

Receive Signal Strength added to Sound Card Hookup

Added a section on CPU Load and the LOST indication in the Spectrum Display to Computer

Tune-up

Changes to MMTTY Log Import function

Additions to Use MMTTY As A Modem (single computer operation)

[Version 2.4.1 2000-10-15]

Added a link to DSP internet sites in Advanced Receiving

Added information about how to use radio control commands via a COM port to control Tx/Rx

Added help for the repeat macro function

[Version 2.4.2 2000-10-16]

Corrected date on About MMTTY page

Added link to Baud Rate from Pictorial Overview

Added information on multiple sound cards to the Sound Card topic

[Version 2.4.3 2000-11-2]

Added specific information on WF1B setup to use MMTTY as a modem

Added note to Adjusting the Display about saving window size/location

Added information about how to vary IIR bandwidth to the IIR section of Advanced Receiving

Added information about how to vary FIR taps to the FIR section of Advanced Receiving

Added information about the meaning of VCO to the PLL section of Advanced Receiving

Replaced explanation of LMS with information on Not. in Pictorial overview

Added explanation of Digital Output and Char. Wait controls in Transmitting

Added information on how to use Notch to LMS section of Advanced Receiving

Added information on changing the sampling frequency of the sound card to Computer Tune-up

[Version 2.4.4 2000-11]

Added mention of Stay on Top to Adjusting the Display

Added section on USB port for Transmit/Receive control

Directed software authors to the Programmer's Page at the English web site in About MMTTY

Updated the list of features in About MMTTY
Added memory requirements to System Requirements
Added volume controls to Sound Card Hookup
Added information on using Logger to operate transmit/receive via radio command
Added information to Using MMTTY as a Modem, AFSK/FSK, and transmit/receive on the Xircom USB port converter
Clarified the operation of the QSO button in S&P contest operation
Added description of squelch operation to Pictorial Overview and Advanced Receiving
Added description of notch operation to Pictorial Overview.

[Version 2.5 2000-12-13]

Added macros and reordered macro table
Added import information to MMTTY Log
Added new topic, Radio Control
Added information to Notch Filter, in Advanced Receiving
Added list of short-cut key definitions to Macro topic

[Version 2.5.1 2000-12-14]

Corrected and expanded Notch Filter, in Advanced Receiving
Extended thanks to more friends who helped improve MMTTY in About MMTTY
Added remote mode to MMTTY features in About MMTTY

[Version 2.5.2 2000-12-14]

Corrected and expanded short-cut definitions and directions, in Macros
Made a recommendation about Tap value in LMS/Notch

[Version 2.5.3 2000-12-18]

Corrected current version number of MMTTY
Added information on sound card stereo mode to Sound Card Hookup

[Version 2.5.4 2000-12-19]

Added information on UOS in Transmitting and in Receiving (Case section) topics, both choices are explained
Small corrections from JA7UDE

[Version 2.5.5 2000-12-20]

Basic Transmitting changed to Transmitting
Small change to Test function write-up in Transmitting

[Version 2.5.6 2000-12-22]

Correction to Fixed AFC in Advanced Receiving
Addition to Transmitting to describe the transmit frequency
Added two sections to Computer Tuneup to describe two methods of sound card calibration
Revision of Macro topic to use tables
Addition of Profiles topic
Revision of Computer Tuneup to reflect new two-click approach and time-standard frequencies

[Version 2.5.7 2001-2-1]

Language corrections to many topics
Some photos updated
Calibration removed from Computer Tuneup topic and put in its own topic

[Version 2.5.8 2001-2-6]

Added information on PTT watchdog timer to Transmit/Receive Control
Added Cabrillo format information to Contest and to Log
Reformatted Revision History with bullets

[Version 2.5.9 2001-4-12]

Callsign warning in Contest Operation topic

Corrected the definition for the HAM AFC setting in Pictorial Overview

Added mention of the AGC option in Limiter section of Advanced Receiving topic

Added mention of shift frequency toggle on main screen to Pictorial Overview topic

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THE ABOVE MESSAGE WILL NOT APPEAR IN THE REGISTERED VERSION

MMTTY Log

Starting MMTTY Log

MMTTY Log is always operational when you run MMTTY. However, it normally occupies just a line above the receive window. Only when you add data to that line, record a QSO, or review the log do you actually see it working.

Using a Specific Log

You can have more than one log; each log has a name and the extension ".mdt." If you want to change the log you will use, select **File, Open LogData File** and select the log file that you want. To create a new log, just type in a new name in the Explorer window that opens up. You will be told that the file does not exist, and asked if you want to create a new one. Click yes and your new log is created. We suggest that your main log use your call letters, but you can decide.

Data Entry

There are a number of entries that you can make automatically. When you do the operation, you will see the data fill the appropriate data window above the receive window. For all windows, whether or not there is an automatic entry, you can simply type in the data.

There are two ways to enter data automatically. In the first method, specify the field you are going to fill, then click on the data. In the second, simply click on the data.

Field Specification Data Entry

To enter data automatically, first send a shortcut command to tell MMTTY what field you are going to populate, then click on the data that you want to enter. MMTTY uses the word you have clicked on, from beginning space to ending space, and puts it into the selected field.

Here are the shortcuts:

- Callsign is Ctrl-C. If you entered the last QSO and the data entry windows are clear, this is the default field for the first click you make. You need not send Ctrl-C unless you want to return to Call and make a change.
- My [RST] is Ctrl-R.
- His/her name is Ctrl-N.
- His/her QTH is Ctrl-M.

Note: Name and QTH data share the same window above the Receive data window. When you click a shortcut, that field label appears.

Note: You cannot enter your own callsign into the call field with a click. If you try to do this, MMTTY will not enter the data. This keeps you from accidentally clicking on your own callsign.
--

Fully Automatic Data Entry

Callsigns are printed data that have one or two letters followed by a number. Just click on one of these and it will fill the Call field. Names are all letters. Click on any letter combination and it will populate the name field. RST is a three-digit number of 599 or less. Click on such a number and it will fill the MYRST field.

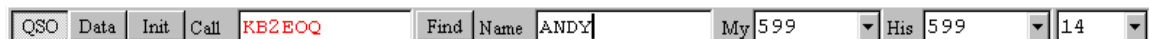
The Data Entry Procedure

Once you have data in the Call field, the **QSO** button will turn from gray to black, and the callsign will fill the Call data window. Push the **QSO** button to mark the start time of the QSO. You may want to wait to push **QSO** until you know that you are beginning the QSO. When you do this, the button stays pressed. This tells you that you are entering data for this QSO.

Now use the shortcuts as more data appear during the QSO. See the section below on Reviewing and Editing the Current QSO to find out how to enter more than the basic data.

The last window on the right is the band. You must enter this value by hand, but it stays the same from QSO to QSO until you change it.

Here is a picture of the log windows filled out, ready for you to end the QSO and enter the data.



Recording the QSO (Putting It Into the Log)

When the QSO is over, click on the depressed **QSO** button one more time, and the data will be entered into the logbook, all the windows will clear, and the **QSO** button will turn gray again, waiting for you to put a callsign in the Call field.

Note: Do not be too quick to enter a QSO with that last QSO button press. When you do this and clear the fields, any macros that use the data from these fields (his callsign, his name) are no longer available when you use a macro button. Make sure the QSO is really over. Remember, the QSO starting time will be entered when you press **QSO** that last time.

At any time you can also save the log data with the command **File, Save Data now**.

Clearing the Log

If you think that you are going to be in QSO, but you do not get a reply, or something happens to stop the QSO at the beginning, you can press the **Init** button to the left of the Call window and it will clear all the current QSO data.

Frequency Information

MMTTY can read the frequency from your radio if you have set it up correctly. See [Radio Control](#) for information on how to do this. MMTTY does not accept frequency data via Logger.

Reviewing and Editing the Current QSO

There are two ways to edit the current QSO data. If the data are in a window above the receive data window, click in that window and edit. To review and edit all the data for the current QSO, press the **Data** button to the left of the Call window. You will see a full log data entry page. There are a number of additional fields available, including mode, and QSL sent/receive fields.

Often you want to add data from the QSO, and it is a nuisance to switch off the log, go back to the receive window, find the data, write it down, then go back to editing the QSO. But MMTTY has a special function for you. At the bottom of the log data page for this QSO is a button labeled **Receive Window**. Just press this button and you will see the last 512 lines you have received. If you used more than 512 lines during the QSO, you have probably learned everything there is to know about the other guy, so if his daughter's cat's name is missing, you can get it next time

Here is a picture of the log data entry page.

Searching and Reviewing the Entire Log

To review and edit the entire log and its contents, go to **File, Open LogData File**. MMTTY will ask you to select the log you want to review. MMTTY will bring up the log file. Here is a picture:

There are a number of actions you can take while reviewing this file.

- Scroll up and down to look at entries.
- Scroll side to side to see all the data for each entry.
- Regenerate the index for the file.
- Search the file.
- Save a selected range of this file as another log file.
- Import and export data to and from this file.
- Edit entries in the file (change, delete).

For the following log operations, you must have the log data file open, as shown above.

Edit the Log

To remove an entry, click anywhere on the entry and then click **Edit, Cut**, and the entry is deleted. To edit any field, double-click anywhere on the entry and you will get the full window to edit all fields, as if this were the current QSO.

Search the Log

You can only search for a callsign or partial callsign. Select **Find**, and choose the direction that you want to search. You will get a window into which you can enter a callsign or partial callsign. Click OK to search. While the log is up, there are some special shortcuts that will work. Ctrl-F brings up the search forward box, F3 repeats the search forward from the first hit.

Export the Log

Use the cursor to select a subset of the log and then click **File, Export selected range** to save the outlined entries in text, ADIF, Log200, TurboHAMLOG formats, or Cabrillo formats. The ADIF format is widely used to exchange data among contest and log programs. For example, the free logging program Logger uses this format, and you can easily work and log contacts with MMTTY and then export your MMTTY log in ADIF format for import into Logger.

Log200 is a logging program by JH3GBD and TurboHAMLOG is written by JG1MOU. They run only on the Japanese Language Operating System, so they will probably not be of importance to most English-speaking hams.

Cabrillo format is used by many contests, especially the ARRL.

You can change the format of some of the data in the log before you export it in text format.

Import a Log

You can import a log to MMTTY in text, ADIF, Log200, or TurboHAMLOG formats. Click **File, Import**, and select the format you want. To determine the structure needed for the text format, export some data in this format and review the result. The text formats supported are comma-separated text (CSV), tab-separated text, and nonseparated text. When you do the import you will be asked to select the type.

Here is a picture of the screen that appears. You have a number of options you can implement from this screen.

Define Conversion

Conv.	Max	Ref.
%YYYY-MM-DD	0	2000-09-13
%HHMM	0	0106
%EHHMM	0	0106
%CALL	0	UY2UA
%HIS	0	599001
%MY	0	599
%FREQ	0	14
%MODE	0	RTTY
%POWER	0	
%NAME	0	

Delimiter Type
 comma(,) TAB NONE

Conv. %YYYY-MM-DD

UTC Double

Ref. < >

Buttons: OK, Cancel, All Del, Up, Down, Init Max

The screen displays the data for the **first record** that it sees. Each record is a number of fields, and each record **should** correspond to one log entry. Each field is on a separate line, and you can scroll down to see and work with each field separately.

- At the bottom is a window labeled "delimiter type." You must specify the **field delimiter** used by the original text or csv file. When you check one of these, MMTTY will do a quick operation on the first record and show you the results of applying that delimiter. In most cases, only the correct delimiter will define fields; all the others will result in no fields or only one field being defined.
- To the right of delimiter type is a check box for UTC. If your data are not UTC times, MMTTY assumes that they are JST. You are strongly urged to keep your logs in UTC if you do not live in Japan.
- To the right of the UTC check box is a field called Ref., with two buttons, < and >. If you press one of these, MMTTY will go to the next record, so you can check on what will happen with several records in the to-be-imported database.
- Below the delimiter type window is a window labeled Conv., which says what value in MMTTY's log these data will be assigned. You can reassign data here. For example, if MMTTY makes a mistake and says that the QTH data should be called Name, you can reassign this field to be QTH by clicking on the field to be reassigned, at the top, and then going to this window and making a change in the Conv. assignment.
- The **up** and **down** buttons also change the assignments of fields, like the Conv. window. they move the assignment in the highlighted field up or down one field. It may be simpler to use the Conv. window., rather than the buttons.
- You can highlight some data on each field and use the delete key to delete that **field** from the import. This means that, as the import goes along, when MMTTY comes to this field, it will not import the data. For example, if one of the fields that your old log kept was "Color of his socks," you might decide not to import these data into MMTTY's log.
- There is a place to set the length of each field, labeled Max at the top of the column. This value not matter if you are using a delimited text file, where there is a separator like a comma between fields. This is set at the bottom of the display, although comma is very

- common and that is the default. A CSV file is a file of "comma separated values."
- If you have nonseparated text, you must set the length of each field to what you expect it to be. For example, if you have set aside ten characters for callsigns, then you must set the length of the callsign field to ten. The Init Max. button sets this value to zero. It is probably best not to use this button, but to make the entry for each field, if you are using nondelimited data.

Make an Index

This is an emergency procedure. If the callsign index becomes corrupted, and you fail to find a callsign that is there, or MMTTY goes to the wrong record, click **File, Make Index** to recreate the index file.

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Use MMTTY As a Modem

Jan Ditzian, KX2A and Bill Musa, K5YG

MMTTY on One Computer and Contest Program on Another Computer

MMTTY can serve as a modem to other software, just as if it were a multimode like a KAM or MFJ 1278. However, it is necessary to use two computers to do this, one running the control software and the other running MMTTY. For example, you could run a RTTY contest program like WF1B on one computer, and use MMTTY as the modem on a second computer, or you could run Logger (which has an internal dumb terminal) on one computer and MMTTY on another.

RTTY by WF1B Contest Software is available from the WF1B website <http://www.wf1b.com/>

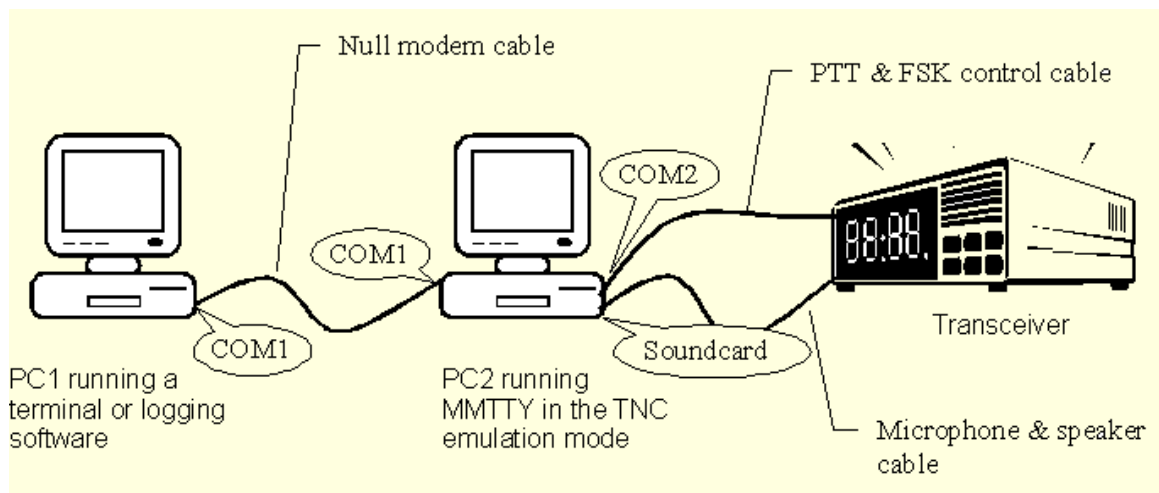
Setup Requirements

The computer that runs MMTTY we will call the modem computer. It must be capable of running MMTTY and receiving RTTY signals through its sound card. Hook this modem computer to your radio just as you would if this were your only computer. This computer needs a free COM port to communicate with the other computer.

The computer that has the other program we will call the control computer. It must be capable of running the other program (WF1B, Logger, Log-EQF, etc.). This computer needs a free COM port to communicate with the modem computer, and, if you are using some sort of rig control from the other program, it may need a COM port for that as well. The point is that one COM port on this control computer will be dedicated to communicating with the modem computer.

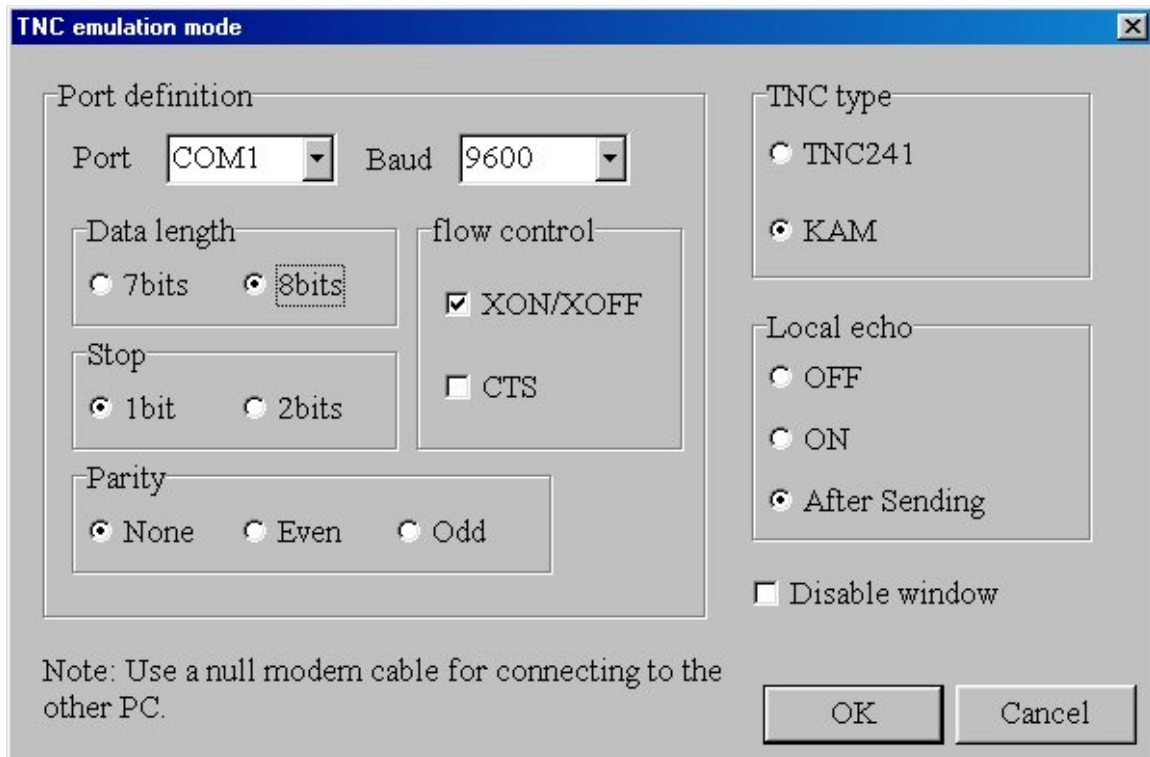
Setup Two Computers

Connect the COM port on each of the two machines (control and modem) with a NULL modem cable (one with the transmit and receive lines crossed). You can get Null modem cables, or conversion devices to make a regular cable into a null modem cable, from Radio Shack.



MMTTY Software Setup

In MMTTY, click **Option, TNC emulation**. You will see the following display.



Select the port in the TNC emulation mode display that is the one that this computer is using for communication. Select the type of TNC you would like to emulate. The KAM is well known worldwide, and most contest software packages have a setup to handle that modem.

Set Local Echo to "After Sending" as a first try, but you may have to experiment with this setting. Set Echo On if you want to see what you type on the screen of the computer running the contest software. Echo will cause MMTTY to send characters back to the host computer as it sends them out its sound card port. In fact, with Echo On you will see characters on both displays.

Note: Remember to set the other port parameters (baud rate, bit length, stop bits, parity, flow control) to be compatible with the port. A starting point is 8 bits, no parity, 1 stop bit, flowCTS (hardware flow control). Remember also that the two ports on the two computers must be set to the **exact same values** of Data Length, Stop Bits, and Parity, so that they can communicate.

Control Software Setup

Configure your control software to think that it is operating the type of TNC that you made MMTTY emulate (e.g., KAM). Choose the serial port that is the COM port this control computer is using to speak to the modem computer.

Operation

You should be able to operate the control computer as if you had a regular multimode TNC connected to it.

Example Port Settings

Here are some example port settings that worked for K5YG in an early test of MMTTY serving as a modem, with RTTY/WF1B running on a Dell 733 mHz. Pentium and MMTTY running on a Quantex 266 mHz. Pentium notebook.

RTTY/WF1B	MMTTY 1.58f
Com 1	Com 1
9600 Baud	9600 baud
Parity = None	Parity = none
Data Bits = 8	Data Bits = 8
Stop Bits = 1	Stop Bits = 1
Handshake = None	Local Echo = ON

In this test, both computers could be used to type text, receive text, and perform basic control (tx/rx).

MMTTY and RTTY/WF1B Operation on One Computer

Beta testing done by Bill, K5YG, has shown that MMTTY and RTTY/WF1B can be successfully run on the same computer. Testing was performed on a Quantex Pentium II 266Mhz processor with 128Mb RAM. Successful simultaneous operation of both programs on the same computer is machine dependent. Intercommunications between a DOS based program such as RTTY by WF1B and the windows based program MMTTY is not ideal, and is at best a compromise.

MMTTY was set up to emulate the Kantronics KAM TNC. RTTY by WF1B was set up to communicate with a KAM. In operation, RTTY/WF1B operates as if it were connected to a "real" KAM TNC.

Requirements

At least two COM (serial) ports are required to interface both programs on one computer. A third COM Port is needed if you intend to use the MMTTY PTT and FSK COM Port output lines. If you use a separate COM port for communication with a radio, then this could mean that you need four ports.

Setup

In the test setup, a Xircom USB to Serial Converter was used for the additional COM Port. In the demonstration FSK and PTT were not output to a COM Port, and no radio control was implemented. MMTTY AFSK modulated an Omni-6 Plus, utilizing the VOX circuit to key the transmitter.

Both programs were run simultaneously in Windows.

Hardware Setup

The Quantex USB/Serial Port Adapter (COM3) is connected to the COM1 port via a null modem cable. A null modem cable has the transmit and receive lines crossed. You can purchase such a cable or a device to make the crossing, at Radio Shack.

Software Setup

Set MMTTY to emulate the KAM TNC on COM 3. Set RTTY/WF1B to use COM1. Here is how to do this.

Click **Options, Setup MMTTY, Misc** Tab and set:

- Sound Card Buff[er] = 4096
- Priority = Higher.

Click **Option, Setup TNC emulation.**

- Check EmulationXon/Xoff
- Check TNC = KAM
- Set Data Length = 8 bits
- Set Stop = 1
- Set Parity = none
- Set Local Echo/after sending

Set RTTY/WF1B as follows:

- Xon/Xoff
- Data Length = 8 bits
- Stop = 1
- Parity = none

RTTY 4.5C

Properties/Misc

Idle Sensitivity (CPU Resources) 50%

Background: always suspend (checked)

If MMTTY displays "Lost" in the spectrum window, while running from RTTY/WF1B, try increasing the MMTTY Sound Card Buffer size -- If "Lost" is observed there will be breaks in your transmitted signal.

Exact Setup of WF1B

Bill offers this step-by-step setup procedure for WF1B to work with MMTTY.

- Start WF1B/RTTY.
- Enter a file name such as dxpedition, contest name, or something to identify the log file, or select a file you already set up. Press Enter.
- The RTTY Work Sheet will show up. Select the contest you want to use, or DXpedition mode; use the +/- keys to scroll.
- Enter personal data on the next page, using tab to go from field to field.
- When you get to the field for TNC types, select KAM. MMTTY will emulate the KAM. Press Ctrl-Enter to write these data to RTTY.INI and leave this page.
- The main RTTY page appears. At the upper left, click under the R in RTTY by WF1B to go to the system-wide menu.
- Set the RTTY communications settings to match the MMTTY settings on the System/Set Serial Ports page in the System-wide menu.
- Exit the System Menu/Set Serial Ports page with Ctrl-Enter. The new settings will be written to RTTY.INI and you will return to the main RTTY page.
- Go back to the System-wide menu (R in RTTY by WF1B) and select System. Use the down-arrow to highlight Reset Fkeys to default and press Enter. You must do this to select the default macros for the contest mode.
- Press Ctrl-Enter to go back to the main RTTY page and write the settings to the RTTY.INI file.

More WF1B/RTTY Suggestions

Bill further suggests that you check the RTTY.INI file with a text editor like NotePad to check settings. You can also enter your time offset, and latitude and longitude into this file.

In the RTTY.INI file, a semicolon (;) at the beginning of a line turns it into a comment, and it is not executed. The command for hour offset from UTC is: HoursFromUTC=x (For EST, x is 5). You can define specifics of your com port here as well.

The transmit buffers (macros) can be edited via the CTRL-F7 buffer screen, or directly in the rty.ini file.

Do not delete the first entry (call) in the RTTY bin file; it will become unusable.

Operating RTTY/WF1B

RTTY by WF1B will:

- capture calls
- send contest exchanges
- send short and long CQ macros
- send from the alt-k Keyboard Mode

It is also possible to switch between the MMTTY and RTTY/WF1B screens (windows) and send directly from MMTTY. Characters sent from MMTTY are echoed to the RTTY/WF1B screen only if the RTTY/WF1B screen is active.

When transmitting from RTTY/WF1B, the text string is displayed character by character on both screens. There is a slight delay between when a key is pressed and when the character is displayed on the RTTY/WF1B screen is present when using RTTY/WF1B in Keyboard Mode. This is the time it takes for MMTTY to echo back the transmit string.

<p>Note: Bill, K5YG, has found that the Xircom USB-to-Serial converter, mentioned in transmit/receive control, also works as an output device for MMTTY in modem mode when used with RTTY by WF1B. However, he has discovered that this converter will not work for FSK output due to a baud rate mismatch.</p>

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Contest Operation (Contest Mode)

Contest mode makes it easier to use MMTTY for contest operation. There are two modes of operation, Running mode and Search and Pounce (S&P) mode. The special benefit you get from MMTTY is called Auto Macro operation. With this feature, you store text and macro commands in special macro fields. When you push the **QSO** button the first time, it will not only start to do the logging that you expect, it will also send the first macro automatically. When you push it the second time it will record the QSO to the log permanently and send the second macro automatically. All you do is click his callsign and your report during the QSO, and click the QSO button twice, and you have completed a standard exchange.

The following will tell you how to prepare the log, how to prepare MMTTY for each mode, and how to use each mode during the contest.

Prepare the Log For the Contest

First, create a new log file for the contest, see [Starting MMTTY Log](#) in MMTTY Log . Then select **Option, Setup Logging, Input** Tab to specify how you want to send and record data.

- Specify a format for the HisRST exchange at the lower left.
- At the area titled Copy Band or Freq, check Band to put only the band data in the log.
- Specify UTC time zone.
- In the My [RST] box at the right, check Contest if you only want to capture and save the callsign and contest number.

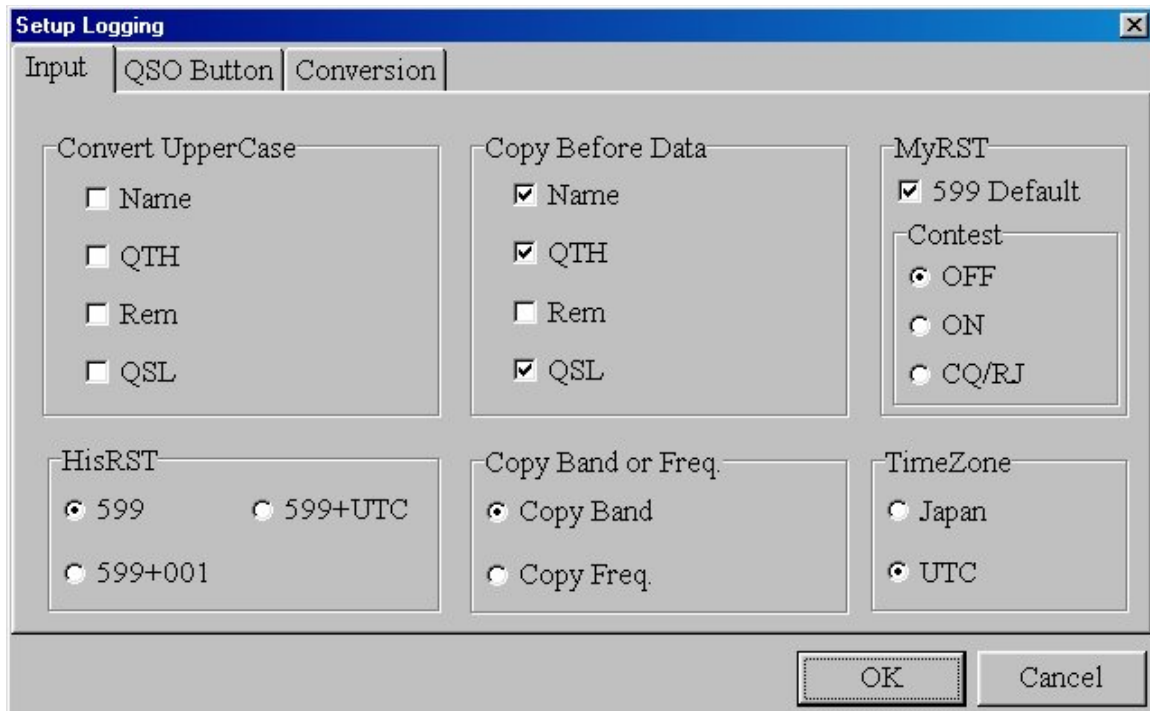
When you specify HisRST, 599+001 puts a serial number in the exchange.

MMTTY can usually tell the callsign and the contest number when you click on them. However, if someone is using a very unusual callsign or sends an unusual type of exchange, MMTTY may make a mistake. You have to be aware and manually edit the field. See [Data Entry](#), in the topic MMTTY Log for more information.

You may specify a special log for a contest. Click **File, Open Log Data File** and enter whatever name you want to use or select a previously used log file to add records to it. If you close MMTTY, it will open with the same log that you last used. Be careful that you do not log to the incorrect file. If you do add QSOs to the wrong log, MMTTY has the ability for you to export selected records in ADIF format so you can import them (using ADIF) to the correct log.

<p>Note: If you have not set up MMTTY to read frequency or band information from your radio, remember to tell MMTTY the band on which you are operating. Do this at the right side of the bar with log data.</p>

Here is the **Input** Tab. Use this to let MMTTY know how you want certain universal defaults to operate.



Contest Mode

There are two contest log modes, Running Mode and S&P Mode. Use Running mode when you call CQ and you expect to get people to call you. Use S&P Mode when you are copying CQs and responding to them. When you switch to one of these modes with the Auto Macro button, the contest mode will appear on the top line next to the MMTTY version number. Clicking on the word **Call** next to the callsign window will toggle back and forth between Running Mode and S&P Mode.

Running Mode

Prepare Running Mode for the Contest

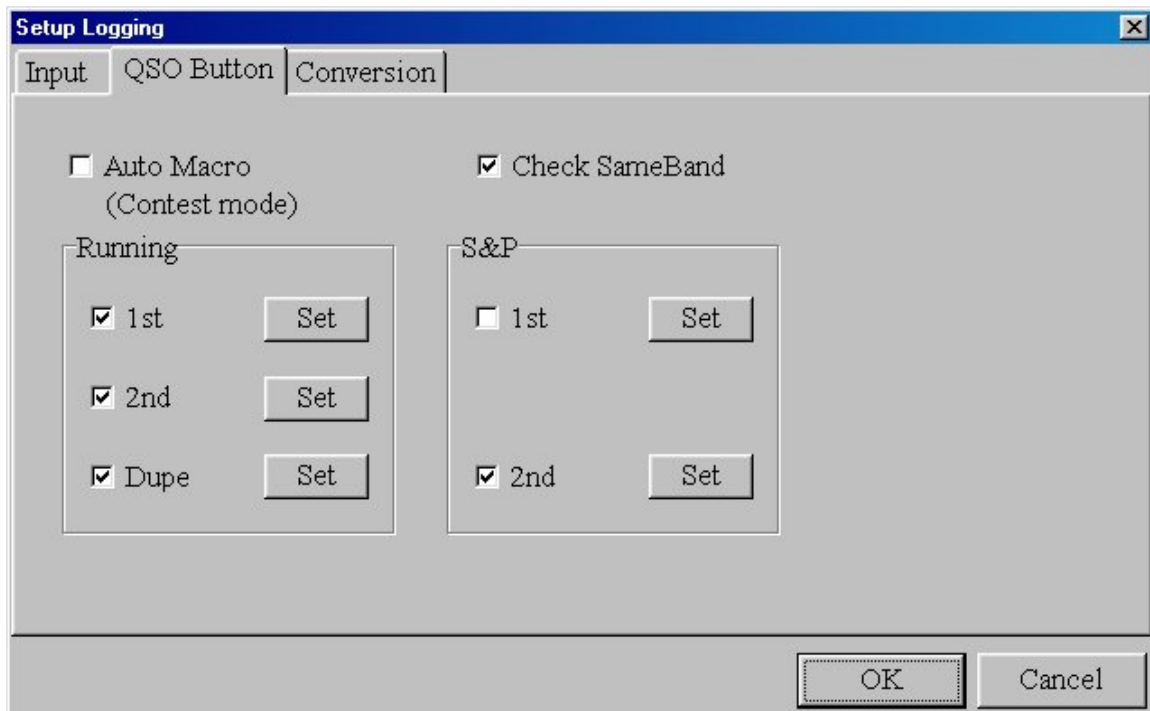
To set Running Mode either click **Option, Running mode** or click on the word Call in the area just above the Receive data window until it turns red. The word **Call** in red tells you that you are in Running mode.

Now select the **QSO Button** Tab. What you enter here will control how MMTTY automates your operation and checks the log. There are default entries in these macros when you get MMTTY. In the case of macros, you must check the box and make sure that the macro script is what you want to send.

- To have the **QSO** button send macros automatically you must check **Auto Macro** on the **QSO Button** Tab.
- Whatever macro is in the 1st macro position under Running is sent automatically when you first press the **QSO Button**. This should be your first contest exchange, for example: his call, his report, his number.
- Whatever is in the 2nd macro position under Running is sent automatically when you press the **QSO Button** the second time to log the QSO. This should end this QSO and look for another, for example, QSL, QRZ de your callsign.
- Whatever is in the Dupe macro position is sent automatically if the QSO is a dupe

- detected by MMTTY.
- If you only want the Dupe macro sent if you have worked the station on this band, but not if you have worked him on another band, put a check in the box next to Check Same Band.
- Be sure to check the box in front of each macro to enable it. It is possible to check only the second macro, and have the second macro work on the second push of the **QSO** button, even though no macro works on the first push. Some hams use the regular macros for calling in S&P mode, so they can call several times. When they get a response, they begin to use the QSO button to begin the logging process, and press it only one more time to QSL and send the exchange.

Here is a picture of the **QSO Button Tab**



In the above setup, both presses of the QSO button operate in Running Mode, along with the Dupe macro. In S&P mode, only the second press of the QSO button sends text, the first press just begins the logging process.

When you have done all of this, go back to the main screen and make sure that you have macros for CQ and any other special messages you may need (e.g., please work us on 7051; QRZ).

Use Running Mode During the Contest

- Click **Option** and check **Running mode** or click Call until it turns red. You do this once, and don't click again until you want to go to S&P mode.
- Call CQ using a macro button.
- When you get an answer, click on the call sign to put it in the callsign window.
- Push the **QSO** button and MMTTY sends the contents of Running 1st macro.
- When the station replies with a report and contest number, click the contest number to put it in the My {RST} box.
- Push the **QSO** button again to automatically (a)log the QSO, (b) send the final transmission, and (c) start the run again with a QRZ.
- If the callsign is a dupe, it will print in **red**; if you want to check to make sure, press the

- **Data** button to the left of the Call window.
- If MMTTY detects a dupe, it will send the Running Dupe macro contents instead of the contents of Running 1st macro, but it will not clear the QSO data. You must press **Init** to clear the log data.

When you are in Running mode you may want to turn NET off, so you will not move around on transmit. Press HAM after each QSO to restore your receive back to the default mark frequency.

Search and Pounce (S&P) Mode

Use S&P Mode when you are copying CQs and responding to them.

Prepare S&P Mode for the Contest

- As in Running mode, there are two macros, S&P 1st and 2nd, on the **QSO Button** Tab; these should contain text and commands that you want to send on the first and second presses of the **QSO** button when you are in S&P mode. The first might contain "his call de your call", the second would contain QSL and the contest exchange.
- Be sure to check the box in front of each macro. If you do not, MMTTY will not send this macro at the first or second **QSO** button press.
- You must also enable Auto Macro on the **QSO Button** Tab for any **QSO** button macro to work.
- Some hams find that they only want to use one of these scripts, because they are not sure that they will work the other station on the first call. Simply check the script you want to use (first or second) and uncheck the other script. For example, you might put the following in the 1st script and nothing in the 2nd script.

<pre> %c QSL 599 PA PA 5 5 de %m K \ </pre>	<p>Go to transmit mode and send a short series of mark tones. Give his call, the exchange, and my call Go to receive mode</p>
---	---

- Click the **QSO** button the first time to respond. Click the **QSO** button the second time to log the QSO, but not transmit.
- Remember, you can also use the regular macro buttons. You might put the following in a regular Group 1 macro button, and use it to call stations. No logging will occur, but you can call repeatedly until you break the pileup. If you use a Group 2 macro, consult the macro table. You will need a # to begin transmission.

```

%c de %m %m K
\

```

- Of course, you must remember to click on the other station's callsign before using these macros. This puts the callsign in the Call window, and tells the %c macro what callsign to use.

Use S&P Mode During the Contest

- Click **Option** and uncheck **Running mode** or click **Call** until it turns black. Do this once, and don't click again until you want to go to Running Mode.
- Click a callsign in the Receive window to put it in the Call window.
- You can check for dupes by pressing the **Find** button to the right of the callsign window to see all the logbook information.
- Click on the report to put it in the His [RST] window.
- You can use the **QSO** button as before; the first press will send what you have in S&P Mode 1st macro, and the second press will send what you have in S&P 2nd macro, or

- you may choose only to use the second click. In this case, you may want to use another macro key for more calls to the station.
- Click the contest number he sends you to put it in the My [RST] box.

Don't forget to turn off the Contest Mode Auto Macro (alt-om) **QSO Button** Tab when the contest is over. Otherwise, you will send a contest report every time you press the QSO button.

It is up to you to look over the macro commands and to consider the various types of macro buttons and scripts, and their location. MMTTY allows the contester to customize operation to his or her convenience. It does not present a fixed procedure for operating a contest.

Repeat a Macro

Once you are comfortable with the Run mode of contesting, you may want to consider using the [Repeat Macro](#) function discussed in the Macro topic. You could set up a macro to call CQ, pause, and call CQ again. When you get a response to your CQ, you left-click to begin the process that automatically enters the callsign and sends the contents of the first Run mode macro.

A Warning About Callsigns

When you use macros to sign your callsign during a contest, it is wise to put the letter K after your callsign, or to use it early in the macro. When the other station copies your transmission, there may be "garbage" characters that appear immediately after you end your transmission. This is because the receiving station's squelch may take a second or two to adjust to the no-signal condition. If your callsign only appears as the last item before you turn off the carrier, the other station may add some of the "garbage" characters to it. For example, "... de KX2A" may become "... de KX2AP" because a "garbage" P printed when the carrier went off. However, it is more difficult to make a mistake with "... de KX2A K" which may print as "...de KX2A KP." The receiving station will not make a mistake in the callsign.

Use MMTTY As a Modem

You can use regular contest software, such as the WF1B program, to operate the contest, and you can have MMTTY operate as a modem, as if it were a separate device like a KAM multimode. This can be done with one or two computers. To do this, see the topic entitled [Use MMTTY As a Modem](#).

Cabrillo Format

Many contests, especially ARRL, require that you submit software logs in Cabrillo format. MMTTY export provides Cabrillo format for log export. After the contest, click **View, Log Data List** to see the log. With the log in front of you, use the cursor to outline the entire log, or whatever portion you want to put into Cabrillo format, and then click **File, Export selected range, Cabrillo**. You will be asked for a name and location for the Cabrillo log.

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Audio Tone	Station	Minutes
500 Hz	WWV	0, 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 52, 54, 56, 58
500 Hz	WWVH	3, 5, 7, 11, 13, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43 to 45, 47 to 51, 53, 55, 57, 59
600 Hz	WWV	1, 3, 5, 7, 11, 13, 17, 19, 21, 23, 25, 27, 31, 33, 35, 37, 39, 41, 53, 55, 57
600 Hz	WWVH	2, 4, 6, 12, 20, 22, 24, 26, 28, 32, 34, 36, 38, 40, 42, 46, 52, 54, 56, 58
440 Hz	WWV	2
440 Hz	WWVH	1
None	WWV	29, 43 to 51, 59
None	WWVH	0, 8 to 10, 14 to 19, 30

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Troubleshooting

When I use vox to key my radio, the radio cycles on and off continuously at the end of a transmission.

- Turn off any unused sound card inputs at the audio mixer. If you are using line input, mute or set to zero the microphone input to the sound card. The problem with this solution is that it may turn off your speaker sounds.

MMTTY jumped out of transmit into receive mode while I was still typing.

- Check the setting of the watchdog timer. If you are long-winded, you must increase the time before it jumps to receive.

The frequency readout from the radio to MMTTY is incorrect.

- Try a different polling speed. Click **Option, Setup MMTTY, Tx Tab, Radio Command, Polling Interval**.
- Turn off flow control (**Option, Setup MMTTY, Tx Tab, Radio**, uncheck Xon/Xoff and CTS).

I am controlling transmit/receive via radio command, and sometimes the radio does not switch to transmit, even though MMTTY goes to transmit mode.

- Try a different polling speed.
- Turn off flow control.

I have a different problem relating to the communication between the radio and MMTTY.

- Try a different polling speed.
- Turn off flow control.

My chewing gum does not taste good any more.

- Try a different polling speed.
- Turn off flow control.

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Radio Control

MMTTY is able to communicate with modern radios through a serial or COM port. MMTTY can do several things through this port, as long as the radio is prepared to perform these functions

- Control transmit/receive via software command.
- Read the frequency in the radio and put it in the log.

Be sure to read the topic on [transmit/receive control](#), which is dealt with separately in this Help file.

Implement Radio Control

Here is how to set up the MMTTY software to interact with your radio.

- Click **Option, Setup MMTTY**, and select the **Tx** Tab.
- At the right of this tab is a button labeled **Radio Command**. Click this button. You will see the following display.

Radio command

Port definition

Port COM1 Baud 19200 Char. wait 0 ms

Data length: 7bits 8bits

Stop: 1bit 2bits

Parity: None Odd Even

flow control: XON/XOFF CTS

Commands

Init: xx= 04

Rx: \\\\$FEFExxE01602FD

Tx: \\\\$FEFExxE01601FD\\w10

VFO polling: Ten-Tec Omni VI Scan addr.

Frequency offset: OFF LSB USB

Polling interval: 1 s

Ten-Tec Omni VI xx=addr 00-64 Load Save OK Cancel

- Select the COM port to which your radio is connected.
- Set baud rate and other port parameters according to your radio's user manual.
- At the bottom of the display there is a drop-down box with names of radios. Select the one for your radio.
- If your radio has an internal address (e.g., Icom radios and Ten-Tec Omni VI), enter that in the box at the right middle of the display.
- Select a polling interval in the box at the bottom, to the right. Start by using 1 second, and try other intervals if this is a problem. It is possible to be either too fast or too slow for reliable polling, and transmit/receive will not operate properly.

Frequency Offset to Make the Radio Display the Correct Frequency in the Frequency Window

When you are in communication with a radio, the window at the far right will show your operating frequency. This display can be adjusted so you see the actual mark frequency in the window, rather than just the frequency sent by the radio.

MMTTY does not read USB or LSB from your radio, but most hams have a standard way that they operate, on USB or LSB. If you select the correct sideband in the Frequency Offset area at the lower left, MMTTY will read the frequency from the radio, and display according to the following plan:

- Off--display the frequency as it comes from the radio.
- LSB--display the VFO frequency minus the mark frequency.
- USB--display the VFO frequency plus the mark frequency.

In this way, you can see the actual RF frequency of your mark signal in the frequency window of the log data display, or you can just see the same data that your radio dial is displaying. It's your preference.

Nonsupported Radios

If your radio is not on the list of supported radios, you may still be able to get some of the functions to work. You can select Clear from the dropdown list, and that will clear all the radio-specific values. In the Rx and Tx windows, put the command sequence needed to put your radio into receive and transmit modes. This should enable this function. To try it, disable whatever mode of t/r switching you were using and see if clicking transmit causes the radio to go to transmit.

There is a good chance that, over time, MMTTY will support more radios. Join the MMTTY reflector (see [About MMTTY](#)), to keep up with developments. In fact, you may be the one to provide information about your radio to Makoto Mori, who can add this radio to the list.

Control of T/R via Radio Command Through Logger

If you are using Logger, it is possible to control your radio transmit/receive status through Logger, but you will not have any of the other functions of radio control, such as reading the radio frequency in MMTTY. However, if you control your radio directly from MMTTY, Logger will lose all its ability to read frequency and mode. If you are a Logger user, the decision is up to you. See the section on Using Logger with MMTTY in the [Transmit/Receive Control](#) topic.

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Profiles

The HAM default in MMTTY makes it easy to return to a basic set of RTTY operating parameters. However, new modes, contest conditions, and other situations make it valuable for the operator to be able to define different operating parameters. To make MMTTY flexible under these new and changing conditions, MMTTY has a feature called Profiles, which allows MMTTY to remember different sets of starting conditions.

The Profiles Concept

The idea behind the Profiles concept is to let the user control a number of parameters at one time.

When you define a **Profile**, new parameters become the default, and, in addition, if you or the AFC change these parameters, a click of the **HAM** button restores them to the values established for this **Profile**.

Defining a Profile

It is easy to define a Profile. Start MMTTY and then vary the parameters in any way you choose. For example, the new mode MTTY (no relation to MMTTY), is the same as RTTY but the shift width is 23 Hz. instead of 170 Hz. Here is the procedure to set up this new Profile.

- Start MMTTY.
- Turn off AFC so the parameters will not change as you set them, or turn your rig off or RF gain down so MMTTY will not adjust to noise.
- Set the Demodulator to IIR (click the Type button until IIR shows as the Demodulator).
- Change Shift to 23 Hz.
- Change BW to 20 Hz. for the XY Scope display. If Baud is showing, click the word Baud to change it to BW.
- Change the Demodulator to PLL (click the Type button).
- Change Loop to 40 Hz.
- Click **Profiles, Assign Menu**, and fill in a name for this Profile (maybe 23 Hz. RTTY, because MTTY is confusing).

That's it. MMTTY is now in the 23 Hz. RTTY Profile. If things vary, press the HAM button and you will restore all the Demodulator Group parameters. In this case everything will be the same as standard RTTY, except the Shift value will be 23 Hz. instead of 170 Hz.

You may define up to nine Profiles, although it is strongly recommended that you leave the first one, MMTTYdefault, alone, so you can get back to the standard RTTY parameters if you get lost.

When you want to change Profiles, just click **Profile** and select the one you want. You can go back to regular RTTY by clicking **Profile, MMTTY default**.

You may make as many changes as you want and incorporate them into a single Profile.

Removing a Profile

You can remove Profiles just as easily. Click **Profile, Delete**, and choose the one you want to delete. The label will return to Profile with a number, and will be grayed out, because there are no longer any data associated with it.

Tailoring a Profile

It is possible to preset every parameter in MMTTY except for the following, which are set only on the main display.

- FIG/LTR on/off
- Mark frequency

All values are stored in a file called UserPara.ini, in the MMTTY folder. You can edit this file with a **text editor**, such as Notepad, but it must be saved in txt format with exactly the same name. You can change any parameter to any legal value. Furthermore, if you do not want to save a parameter, but instead you want MMTTY to keep the parameter at whatever value it has before you make the profile change, simply delete the line for that parameter from UserPara.ini.

For example, if you want to define a new Profile to change the number of taps in the BPF, but you do not want the shift width to change (you intend to use this "on the fly" under QRM conditions), you can erase the line in that particular profile that reads "DefShift=1.700000e+02." This means that DefShift is no longer defined in this Profile, and it remains unchanged. When you set the new tap value in MMTTY, the following parameter, RXBPFTAP= , will change. The new value should stay in the Profile, because this value is the reason you are making this Profile.

Warning: At this time, there is no published lexicon of the names and definitions of the values. You should back up your original UserPara.ini in case you have a problem. You have to guess which parameter controls which actual MMTTY value if you try to work directly with UserPara.ini.

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Sound Card Calibration

There is a clock on the sound card, as well as one in the computer. It appears that many sound card clocks are not accurate. It is possible to tell MMTTY to make an adjustment in its frequencies and timing based on how far off the sound card clock is. When you make this adjustment, you will have to exit MMTTY and restart it (not the computer), to see the change.

There are two ways to calibrate the sound card. The most accurate method and easiest method is to use an audio frequency meter. However, if you do not have one of these instruments, there is a method that uses the 1-second ticks sent by time standard stations such as WWV or CHU.

Calibrating the Sound Card With a Frequency Meter

- Set the frequency meter to measure the audio frequency of the audio output from the sound card (the line that goes from the sound card to the audio input of the radio).
- Go to **Option, Set Up MMTTY, Misc** Tab and make sure that the clock at the lower left is set to 11025 Hz.
- Close this display.
- Set the mark frequency to 2000 Hz. on the main display.
- Push the TX button on the MMTTY main display. Do not put the transmitter on (turn off vox or disconnect the PTT line), and do not send characters. You want to transmit only the mark tone of 2000 Hz.
- Measure the frequency of the tone.

The actual default sampling frequency, which is supposed to be 11025 Hz., can be calculated from the measured tone. The proportion of error of the tone shows how far the frequency is off. For example, with a mark frequency of 2000 Hz., and a measured tone of 2010 Hz., the actual sampling frequency must be high. It is $(2010/2000) \times 11025$, which is 11080.125 Hz. A bit of simple algebra will allow you to do this for other sampling frequencies.

- Go to **Option, Set Up MMTTY, Misc** Tab and set the frequency to 11080, you will be very close to the correct value.
- Exit MMTTY and restart it to see the changes.

Calibrating the Sound Card with a Time Standard Broadcast Station

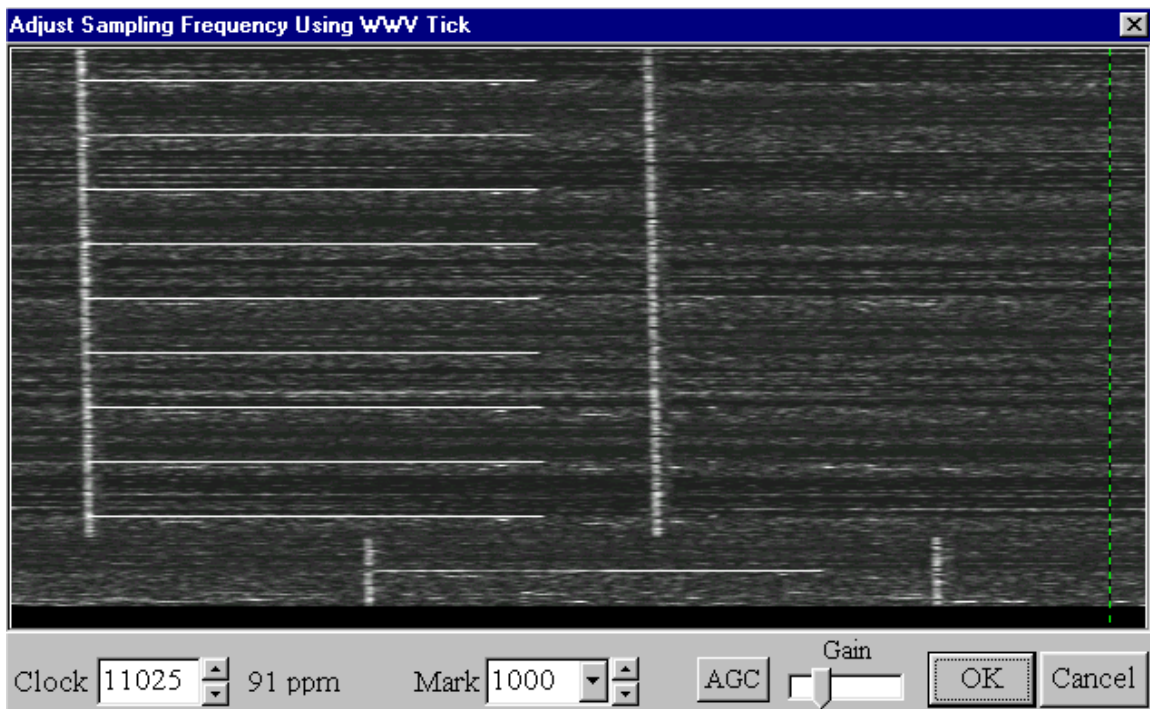
MMTTY has a special display that allows you to find the true clock frequency of the sound card using an accurate 1 second tick. Here are some stations around the world that broadcast ticks each second.

Station	Frequency (kHz.)
WWV/WWVH	2500.0
	5000.0
	10,000.0
GBR	60.0 (SSB)
RWM	4996.0 (SSB)
	9996.0 (SSB)
	14,996.0 (SSB)
?	77.5
CHU	3330.0
	7335.0
	14670.0

- **CLICK Option, Setup, Misc. TAB.**

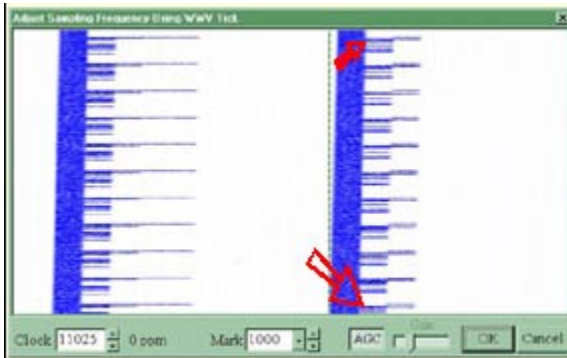
- TURN OFF THE AGC WITH THE BUTTON AT THE BOTTOM.
- TUNE YOUR RADIO TO WWV OR ANOTHER 1-SECOND TICK STANDARD. SET THE RADIO DISPLAY TO THE CARRIER FREQUENCY.
- WAIT FOR ABOUT THREE MINUTES. IF YOU ARE USING 11025 HZ. CALIBRATION, YOU SHOULD SEE TWO LINES OF MARKS (VERTICAL OR SLANTED), CORRESPONDING TO THE 1-SECOND TICK SOUND BURSTS TRANSMITTED BY THE TIME-STANDARD BROADCAST STATION. YOU WILL SEE ONLY ONE LINE WITH 8000 HZ. OR 6000 HZ.
- RIGHT-CLICK TO MOVE THE VERTICAL GREEN LINE TO THE TICK LINE. THIS ALLOWS YOU TO COMPARE THE TICK LINE TO VERTICAL.
- LEFT-CLICK A LOW TICK BURST MARK (BOTTOM ONE IF POSSIBLE), AND MOVE THE CURSOR TO THE TOP OF THE LINE. YOU WILL SEE A YELLOW LINE ON THE DISPLAY.
- OVERLAY THE YELLOW LINE WITH THE TICK MARK LINE, AND LEFT-CLICK A HIGH BURST MARK (TOP ONE IF POSSIBLE).
- THIS WILL AUTOMATICALLY PUT THE CORRECT CLOCK FREQUENCY IN THE ADJUST WINDOW.
- CLICK OK TO LEAVE THIS DISPLAY.
- CLICK OK TO LEAVE THE SETUP DISPLAY AND TO MEMORIZE THE NEW VALUE.
- RESTART MMTTY FOR THE NEW CLOCK VALUE TO TAKE EFFECT.

Here is a picture of the calibration display screen, showing a sound card that is pretty close to the correct frequency of 11025 Hz., using WWV as the time standard.

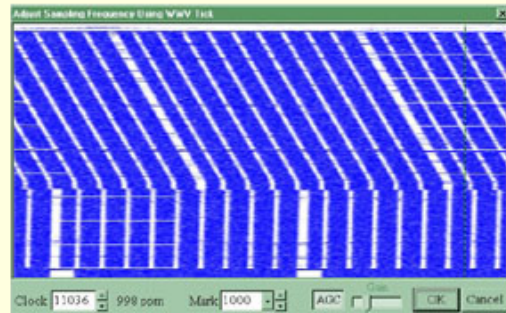
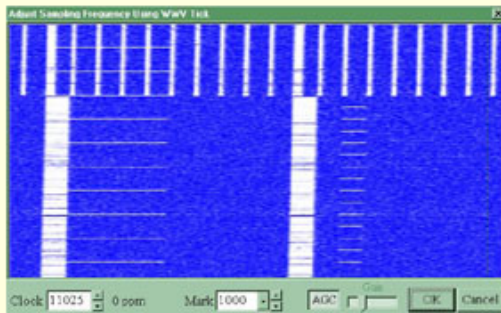


Here are pictures of some calibrations performed in Europe, using MMTTY and different time standard stations.

This is GBR, in Great Britain. The time ticks are wide, but you can pick any consistent spot on the time tick and use it as the focal point for clicking. The arrows show possibilities for the first and second clicks.



Here are two pictures of Russian time standard station RWM. The first shows a properly adjusted display. The second illustrates an error of 1000 ppm. Note the slanted lines. This will occur with any time standard if you have an error of 1000 ppm.



Hints

- The green and yellow lines are provided by MMTTY as a vertical reference to compare to the tick line.
- If the tick line is wide, reduce the sensitivity with the control at the bottom. If it is still wide, make sure to click at the same relative place on both top and bottom ticks (e.g., left edge).
- If the display is quite slanted at first, repeat this calibration two or three times. The last time should make only a small change.
- If the time standard station broadcasts a strong tone along with the ticks, and you have trouble seeing the tick line, it is possible to use manual or automatic notch to get rid of the steady tone. The automatic notch is probably too slow to remove the ticks.
- Right-click to move the vertical calibration reference line without beginning the procedure. This lets you look at the tick line in comparison with the vertical standard.

Note: European time standard station pictures courtesy of G3NPA.

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