CTR2-Micro

Operation Manual

v1.07.02

<mark>Revised sections for this version are highlighted in yellow</mark>

Contents

Introduction

CTR2-*Micro* (herein referred to as the *Micro*) is a fourth generation CTR2 radio controller. In this iteration every effort has been made to reduce the size, complexity, and cost of the unit. The end result is a small controller that almost anyone can afford, fits in your pocket, and includes more features than CTR2-Mini. The *Micro* supports all of the radios (including the Flex 6000 series radios) found in the Mini for not much more than the Seeed Studios Wio Terminal that is used on the CTR2-Mini.

The *Micro* supports several accessibility options for blind and sight limited radio operators including a line item text report to a terminal display for screen readers and support for **CTR2-Voice**, a new standalone voice synthesizer that allows anyone to control the *Micro* and their radio without a display.

The *Micro* is available in two forms.

1. **Kit**: A complete kit of components to build your *Micro*. The kit includes everything you need to assemble the unit including a CNC machined enclosure, labels, and a nice aluminum knob with a finger dimple. **The *Micro* is easy to build and would make a great club build project.**
2. **Fully assembled**: If you don't want to, or can't build a kit I can build it for you for a reasonable cost.

Legal Notice

What would a manual be without a legal notice? Here goes…

- This is a hobby endeavor, not a commercial enterprise. Nothing is guaranteed! Use this device at your own risk!
- I will do my best to make sure you receive functioning hardware if you buy the assembled unit and will work with you if there is a problem with your unit on arrival.
- I cannot guarantee or warranty the hardware supplied in the kit.
- I make no warranty that the firmware provided for the *Micro* will perform up to your expectations or be suitable for your application. Software bugs are a fact of life and I try to find and correct all bug reports to the best of my ability ASAP.
- Many of the features in the firmware are experimental. If you find a problem with any of them let me know.

How to use this manual

This manual should be used as a reference manual. An expanded Help system if you will. Items in the Table of Contents link to their write up in the manual. The main categories have short write ups describing the functions available in that section. I've tried to group things logically and have added hyperlinks so you can quickly jump to other sections.

As this document evolves, sections that have changed since the last update will be highlighted in yellow.

The version number of this manual will follow the latest released version number of the firmware.

Feel free to contact me if you have question about a certain feature or have ideas for future improvements. I love to get feedback on my work. My email address is good on QRZ.com.

Change Log

v1.07.02 – March 5, 2026

- Fixed bug in RIT code that was always forcing XIT freq to 0 on Yaesu radios
- Added support for XIT and XIT/RIT On/Off
- Allow the XIT/RIT page to be opened when the *Micro* is not connected to a terminal so you can use the *Micro* in standalone mode
- Updated Appendix B to include information on using ESPConnect to flash the firmware to the *Micro*. I highly recommend using **ESPConnect** instead of the EspressIF Flash Download Tool, or the script file.

v1.07.01- November 10, 2025

- Added paddle release debounce to fix issues with cheaper paddles adding extra code elements
- Improved keyer Bug mode so it works properly now

v1.07.00 – October 31, 2025

- Bumped minor rev# to 1.07
- Changed firmware distribution from 4 individual BIN files to a single BIN file – See Appendix B: Updating the Firmware
- Updated the Appendix B: Updating the Firmware section to include the new browser based EspressIF Flash Download tool.
- Added Export and Import Settings options to *Configure -> Manage Files* menu
  - WiFi and Radio IP credentials are encrypted in the exported setting files
- Tag line displays BTN1, 2, and 3 functions unless user overrides it
- Fixed a major bug that was causing the program to go into a continuous reset mode if the Voice or Display Report modes was unmuted and WiFi was not online (or failed to connect).
- Replaced the term **MFB** (for Multi-Function Button) with **BTN** (i.e. **MFB1** is now **BTN1**, etc.)
- Replaced the term **encoder** with **knob**. Not everyone knows what an encoder is!
- Replaced the term **Tx Msg** with **CW Msg**
- Swapping Main/Sub receivers with a BTN doesn't take you to the Radio menu

Changes to previous versions can be found in Appendix K.

The *Micro* Environment

The *Micro* is part of the CTR2 radio control
ecosystem.

Its primary design goals were to reduce the
size, complexity, and cost of **CTR2-Mini**
while providing an enhanced feature set.

The *Micro* gives up the built-in display of the
Micro but in return it offers an extremely
small (60x60x20mm) multi-function control
that can serve multiple needs.

This drawing shows how the *Micro*
interfaces to your station. It is powered by a
USB-C connection to a USB port on your
computer (or any other USB power source).

A serial terminal program runs on the station computer and provides a display to configure the *Micro* for
your needs. Once the WiFi link is configured you can use a network based Telnet terminal program or a
web browser on your cell phone or tablet to view and control the *Micro*.

The *Micro* features a built-in keyer so your paddles plug into the left 3.5mm (1/8") jack on the *Micro*.
The right 3.5mm jack interfaces to the Key and PTT inputs of your radio. The Paddle PTT option in the
Keyer menu allows you to use your paddles or a straight key to key PTT on your radio when using voice
modes.

The center 3.5mm jack on the *Micro* connects to your radio's serial CAT port. An external DIP switch or
an internal jumper header is used to configure the CAT signal polarity.

The *Micro* was designed to run in standalone mode. It can provide frequency and mode updates in
addition to menu navigation updates using Morse code or it can send unformatted text to a terminal
program for a screen reader to announce. You can also use **CTR2-Voice** and **CTR2-Display** when
operating standalone and **CTR2-Voice** can be setup as an access point so no external router is needed.
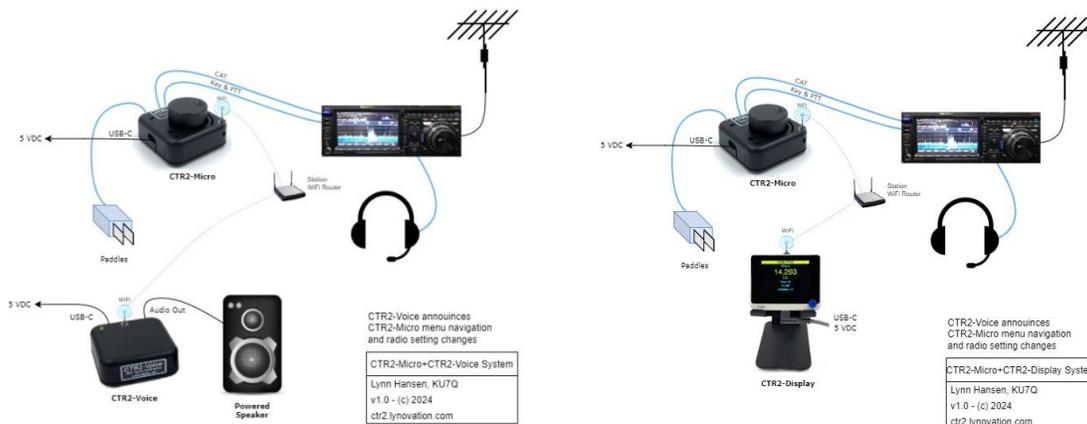
You can find more information about report modes in the [Configure – Report Menu](#) section. A full description of the menu system can be found in [Appendix G: Menu Structure](#).

A full text description of the *Micro's* hardware can be found in [Appendix H: Accessibility](#).

The *Micro's* small size and ruggedness means you can find a place for it on the busiest operator desk and easily take it with you for POTA operations.

Works with Flex

Using the *Micro* on a Flex radio couldn't be easier. The *Micro* supports the Flex Network API for radio control (CAT). It primarily functions is a physical tuning knob but has the ability to send Key and PTT over the network so it makes and ideal companion for SmartSDR for Windows or iOS on an Apple device.

You can even deploy multiple *Micros* on your Flex with each controlling a different slice receiver, or each having a dedicated function like volume, AGC-T, Power Out, NR, etc.

If you have another radio that uses serial CAT you can create separate Radio Profiles for each radio and instantly switch between the Flex and the other radio. You can even create a profile for each slice on your Flex radio.

Remote Flex Operation
Many users control their remote Flex radio with the *Micro*. While the *Micro* doesn't support SmartLink you can forward port 4992 through your station's router to connect to your radio from the internet. The *Micro* supports network control of both PTT and Key functions on your radio so you can use the *Micro* and a set of paddles for CW and for keying PTT when the [Keyer->Paddle PTT](#) option is enabled.

This is a security risk because port 4992 is open to anyone that wants to use it. To minimize this risk it is recommended that you only forward this port when you want to connect to your radio. This can be achieve by using a VPN to access your router remotely or by using a program such as SplashTop to connect a remote computer to your station's computer. Running SmartSDR on your station's computer and accessing it remotely has the added benefit of not requiring SmartLink to operate remotely.

Another option is to use an internet power switch to power down your radio when you aren't using it. This eliminates any security risk of having port 4992 forwarded through your router because there's not device to connect to.

One Controller, Many Radios

The *Micro* supports up to 10 radio profiles. You can create a profile for every radio in your shack and use the *Micro* to control each of them. With serial based CAT controlled radios, I recommend ordering OPTION2B, the external DIP switch for CAT polarity configuration shown in the diagram below. This allows you to change the CAT polarity without opening the case when changing radios. This diagram shows how to use [4-port 3.5mm (1/8") stereo switch boxes](#) to route the CAT and PTT/Key signals to each radio. Blue cables are CAT cables and green cables are PTT/Key cables. Cables are identified by part #. You can build them yourself or order them from the [Radio Interface Cables](#) page.
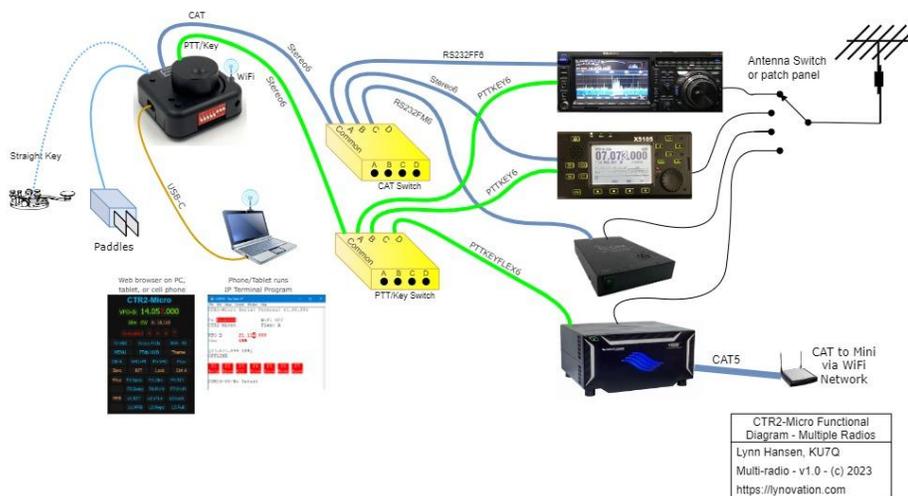
Micro Hardware

The *Micro* is based on the Seeed Studios Xiao ESP32C3 microcontroller. This tiny processor supports all of the *Micros* I/O and includes WiFi. The *Micro* includes a radio I/O circuit that supports TTL (Normal), Inverted (RS232), and Icom CI-V CAT levels. Three 3.5mm (1/8") stereo jacks across the top of the *Micro* provide connections for your paddles, radio CAT I/O, and Key/PTT. The WiFi antenna is under the PCB. Even though it's compact, it's easy to build because all for the SMT components are pre-installed and the through-hole components all mount on the top of the PCB.

Operator controls include a knob and three small pushbuttons. These are programmable multi-function buttons and they are referred to as BTN1, BTN2, and BTN3. BTN1 and BTN2 are grouped together at the bottom left and BTN3 is by itself at the top left. The sidetone volume can be changed by inserting a small screwdriver into the hole in the bottom right corner of the unit.

If you ordered the external DIP switch option the DIP switch is found on the bottom edge of the unit next to the volume control. Instructions for setting the DIP switches (or internal CAT strapping) can be found [here](#).

For those that has limited sight, a full description of the *Micro* can be found in Appendix H.

An LED provides a visual indication of *Micro's* state as shown in the table below.

Flash Sequence		Meaning
Single flash – WiFi is Off	2 second rate	Tx interlock DISABLED
	1 second rate	Tx interlock ENABLED
	.25 second rate	Radio is KEYED
Double flash – WiFi is On	2 second rate	Tx interlock DISABLED
	1 second rate	Tx interlock is ENABLED
	.25 second rate	Radio is KEYED

You'll need interface cables to connect the CAT I/O and Key/PTT outputs to your radio. You can either build your own or I can supply them. My blog has the information you'll need on cable options. Cable diagrams can be found in Appendix J.

Where's the Display?

There is no display on the *Micro*. This saves a lot of money and allows the unit to be much smaller. It also makes the *Micro* pretty rugged. The entire controller fits in an inexpensive 60mm x 60mm x 20mm (2-3/8" x 2-3/8" x 7/8") snap together Hammond enclosure.

There are several methods for interacting with the *Micro* including terminal mode, web page, or Code, Voice, or Print reports. To initially configure the *Micro* you'll need to connect it to your computer's USB port and use a serial terminal program such as Tera Term or Putty. See Appendix D for information on Tera Term and Appendix E for information on Putty. Once you have the WiFi port configured you can use Putty or a web browser to connect to the *Micro* over the network with your cell phone or tablet. Better yet, redeploy that old cell phone that's been sitting in your sock drawer since your last phone upgrade as a permanent display.

Morse to the Rescue!

Once configured, a display isn't required for the *Micro* for simple functions like tuning your radio, setting the tuning step, or adjusting the keyer's speed. For more advanced functions the *Micro* has the unique ability to communicate with you using Morse code. There are several levels of code reporting that can be enabled that send frequency, tuning step, radio mode, menu, and setting information. **Even if you're not currently proficient with code, you'll find this is a great incentive to improve your code skills. Because the code report runs at a minimum of 15 wpm (with adjustable spacing down to 5 wpm) you'll quickly increase your code speed and proficiency.** *Besides, what could be more 'ham radio' than a radio interface that you can build yourself and talks to you in code*!

Screen Reader Support

Blind and limited sight operators typically rely on screen readers such a Microsoft **Navigator** or **NVDA** to read the text on the display. While these work well, they can be a problem on busy displays or on displays that update frequently. The *Micro* provides a **Text Report** mode that sends a single line of text to the terminal to optimize screen reader output. For example, when you change the frequency on your radio with either the *Micro's* knob or the radio's dial, the new frequency will be sent to the terminal for

the screen reader to announce. In this mode, when you open a menu the entire menu is not displayed, only the menu's name and the selected menu item will be sent to the terminal. The new line appears at the bottom of the terminal window and previous lines move up the page, similar to how a command line interface works.

> **NOTE:** While in **Text Report** mode think of your screen reader as just a speech synthesizer. There is no need to navigate around the screen. Just keep the terminal program in focus.

 Once you understand the menu structure of the *Micro* you'll be able to easily navigate around the program using the screen reader. A complete listing of all the *Micro's* menus can be found in Appendix G: Menu Structure.

If you get lost at any time just press the [F1] key and a help screen will be displayed with a description of the current state of the program.

Voice Synthesizer and Remote Display Support

CTR2-Voice and CTR2-Display have recently been added to the CTR2 product line. **CTR2-Voice** can be used instead of using a screen reader. **CTR2-Voice** announces radio parameters as they change and selected menu items when you have a menu open. **CTR2-Voice** could be used in a mobile situation where you need to keep your eyes on the road. **CTR2-Display** is a software solution that runs on a Seeed Studios Wio Terminal. It simply displays the text that would be sent to **CTR2-Voice**. Both units connect to the *Micro* using WiFi UDP and can be used at the same time by selecting **Display+Voice** in the **Configure -> Report -> Report Type** menu.

See Appendix H for more information on accessibility.

Options

There are four options that allow you to personalize your *Micro* to fit your needs.

Knob Options (OPTION1A or OPTION1B)

The rotary encoder used for the knob comes in two styles, smooth and with detents. Most prefer smooth knobs for tuning radios and detent knobs for volume controls and the like. The *Micro* does both, so you can order either style. I recommend going with **Option1A**, the detent knob, especially if you plan on using the *Micro* without a display (i.e. in Morse reporting modes). When running without a display you'll get very familiar with the menu structure and a detent knob makes it much easier to 'count' the tuning steps or menu items using the 'detent bumps' in the knob.

A smooth knob (no-detents) will be supplied if you order **Option1B.** With the smooth knob you'll need to change the **Knob Type** to **No-Detent (slow)** in the **Config->Calibrations** menu. This change slows the knob down by ½ while you're in the menu system so it's easier to select a menu. The smooth knob is great if you plan on using a display with your *Micro*.

Some have asked why an optical encoder isn't offered as an option. Quite simply, it is due to the cost of the optical encoder. You can easily spend more for the encoder that you pay for the *Micro* kit so it just doesn't make sense for this device.

CAT Polarity Strapping Options (OPTION2A or OPTION2B)

Option2A specifies an internal 16-pin dual-row header with jumpers to configure the serial CAT polarity. This provides the cleanest exterior but requires the *Micro* to be disassembled to change the jumpers.

Option2B, shown here, replaces this header with an externally accessible 8-position DIP switch. The DIP switch allows you to change the CAT polarity without opening the *Micro's* case. I recommend ordering the DIP switch option if you have several radios that use different CAT configurations and you want to use **Radio Profiles** as shown here. If you're a Flex user, have only one radio, or all of your radios use the same CAT configuration you don't need the DIP switch option.

Instructions for setting the DIP switches, or internal headers, for the proper CAT polarity can be found in the CAT Polarity Jumpers/DIP Switch Settings section.

NOTE: Regardless of which jumper option you choose you should always configure the serial CAT port jumpers/switches for one of the polarity options to provide the required pull-up voltages to the processor's input pins.

Micro Features

Even though it's called a *Micro*, there is nothing small about its feature set. At its core, the *Micro* is a radio controller with an integrated keyer. It does almost everything its larger sibling, CTR2-Mini, does but at a greatly reduce price.

If all you want is a remote tuning knob for your radio (especially if you have a Flex radio or other SDR radio), or a memory keyer, just configure the *Micro* once, set it on your desk, and just use it without a display. See the Standalone Configurations section for a few suggestions.

But if that's all you use your *Micro* for, you're missing the fun! The *Micro* offers many other features including:

- It can control a wide variety of radios using serial or IP CAT including Flex, Anan or Hermes Lite 2 (using Thetis or phHPSDR protocols), most Icoms, Kenwoods, newer model Yaesu radios in the

FTdx line (and other Yaesu models running the Kenwood protocol), Yaesu FT-817 and FT-100, Elecraft, Xiegu, QCX, and even the trusty old Icom PCR1000.

- Flex users can use one *Micro* for each slice on their radio , each with its own settings and favorite frequency list – even for SmartSDR v2 users
- The Code Report sends radio settings changes, and menu item text in code for standalone operation – great for blind or limited sight operators or those wishing to increase their code proficiency
- The Text Report leverages the **Code Report** features to provide enhanced support for screen readers
- The Voice Report sends program status and radio parameters to **CTR2-Voice**, a WiFi speech synthesizer, allowing blind and sight limited users to control the *Micro* and their radios
- Easy frequency tuning resolution setting – just press and hold then turn the knob to change
- Two VFOs even on radios with only one VFO (like the Flex) or on dual-receivers (like the FTdx101)
- Control A VFO and B VFO on your radio with the *Micro's* VFO-A and VFO-B. Instantly switch between the two, or use both of the *Micro's* VFO's on your radio's A VFO.
- 10 radio profiles allow you to save settings for different radios and instantly recall them.
- 100 favorite frequencies/mode settings for each VFO and BTN settings are saved in each radio profile
- A shared frequency/mode database that is accessible from any radio profile.
- Memory tuning makes it easy to check the frequencies in your favorite frequency list
- Range tuning allows you to stay within the contest or satellite transponder range
- The last 25 frequencies/modes you visited can be instantly recalled. You can also lock previously visited frequencies so they remain on the Previous Frequency list.
- Zeroing the digits below the tuning digit makes it easy to get on an exact frequency
- Transmit and Receive Incremental Tuning (XIT/RIT) on radios that support it
- Easy access to many radio functions – assign them to the FKeys on your keyboard or the BTNs
- Commonly used menus and features are assigned to Shortcut keys for easy access
- External tuner mode (automatically sets power and mode for an external tuner then resets it when you're done)
- Fourteen 75 character CW messages with prosigns for inserting your call, contact serial #, contest exchange, a long 'T' for 0, or temporarily increasing speed 50% for those 599 reports. 10 messages are permanently assigned to the terminal keyboard's FKeys, 5 messages can be assigned to the BTNs on the *Micro*.
- Prosigns based on the K1EL v3.0 standard
- Code Practice mode sends random character groups, calls, and Q-signals using the Koch method
- Control of your radio over the internet from your PC, cell phone, tablet, a CTR2-Mini, or another *Micro*
- 3rd party programs are supported (WSJT-X, logging programs, etc) – the *Micro* emulates the Kenwood TS-2000 on its USB serial port. CAT PTT is supported so there is no need for another keying interface.
- Control your radio remotely using a terminal program or a web browser on your cell phone or tablet, or use another *Micro* or a CTR2-Mini connected to the CTR2-*Micro* in your shack

- **Beacon** control mode allows the *Micro* to be used as a browser enabled beacon controller when you're not using it.
- Use the **Paddle Input** jack for a remote PTT switch in voice modes
- Use the *Micro* with **CTR2-Display** and/or **CTR2-Voice** for standalone operation

See Appendix A for an exhaustive list of features.

Out of the Box

When you receive your *Micro* you'll need to provide a **USB-A to USB-C** cable to connect it to your PC. Some USB cables only support power and not data. Make sure you are using a data cable. If a new virtual serial port isn't created on your PC when you plug the *Micro* in for the first time, you're probably using a power-only USB cable.

Since the USB-C connector is on the side of the *Micro* consider using a cable with a 90 degree USB-C connector so the USB cable follows the same route as the other cables plugged into the *Micro*.

Assembled units and kits ordered after December 1, 2023 will have firmware pre-loaded on the processor. You should check for updated firmware here and periodically update your *Micro* so you can get the latest feature enhancements and bug fixes. Instructions for programming your *Micro* can be found in Appendix B: Updating the Firmware.

 When you first connect your *Micro* you'll need to initialize it. Instructions for this are contained in the Appendix C: First Time Configuration section.

Quick Start Guide

You're probably eager to start using your *Micro* running after you've completed the First Time Configuration. This section will give you the basic methods of operation so you can start exploring the *Micro's* features.

The Knob Rules!

The *Micro* was designed to be operated with just the knob. The multi-function buttons (described next) were added to give you quick access to the features you use the most. You'll need to connect a Telnet terminal or web browser to you *Micro* in order to see the menus. You can find detailed information on doing this in Appendix D and E. The web server is described in Appendix F.

The knob was chosen as the main control for the *Micro* so you don't have to have the Telnet terminal or web browser "in focus" on the PC in order to control your radio with the *Micro*. You can do everything you need to with just the knob even while the terminal or web page is out of focus. You only need to bring the terminal or browser "in focus" to use the keyboard keyer or use the controls on the web page.

The knob is used to change frequency, select the tuning digit, navigate the menu system, and edit text and numerical parameters. To change frequency, just turn the knob. To change the tuning digit, just press and hold the knob then turn it.

To open the menu system, quickly press and release the knob (known as a "short-press"). Once the menu is open, turn the knob to scroll the selection bar. Press the knob to select an item on the menu or press and turn the knob to the left to exit the menu.

These knob functions can also be performed using the keyboard if you've connected your computer to the *Micro* with a Telnet terminal such as Tera Term or Putty. To change frequency, press the [Up] and [Down] cursor control keys. To change the frequency step, press the [Left] and [Right] cursor control keys. To open the menus just press the [Enter] key.

There are a host of shortcut keys and other keyboard function you can use in a terminal session. These are described in the Terminal Keyboard Controls section.

Other Features You Will Want to Know About

There are a few features you'll want to access right away. They will be described here.

Menu Timeout
By default the *Micro's* menus (with the exception of the Radio and Practice menus) timeout and return to the Home page after 10 seconds. This helps keep you from getting lost in the menus. You may want to disable this while you're learning the *Micro's* menu structure. Disable it in the **Config->Calibration->Menu Timeout** menu item.

Radio CAT, Baud Rate, and CAT Polarity
You need to tell the *Micro* which radio you will be using it with. This is done in the **Config->CAT** menu. If your radio uses serial CAT control do the following:

- Open the **Config->Connection** menu and select the baud rate your radio is set up to use.
- Verify the CAT polarity strapping is correct on your *Micro*. If you ordered the external DIP switch, set the DIP switches to match the polarity your radio uses. You can select Normal (TTL) levels (switches 1, 2, and 3 ON/Up), Inverted (RS232) levels (switches 4, 5, 6, and 7 ON/Up), or Icom CI-V (switches 1, 2, 3, and 8 ON/Up). Switches are numbered from the left. If you didn't order the external DIP switch option you'll need to open the *Micro's* case and change the internal straps. I generally set the internal straps on assembled units to Inverted (RS232) unless you specify another setting. Strapping should be marked on the white label on the bottom.
- Connect the appropriate CAT cable to the CAT I/O jack (center 3.5mm (1/8") jack) on the top edge of the *Micro*.

  NOTE: Even if you don't plan on using serial CAT to connect to your radio the CAT the polarity jumpers must be set to one of the polarities shown on the bottom sticker in order to provide the proper pull-ups for the microprocessor's input pins.

If you'll be using the *Micro* with an IP based radio like the Flex, you'll want to get the *Micro* connected to your WiFi network.

- Select the Flex radio protocol at **Config->CAT->Flex**
- Set the address of your radio in the **Config->Connection->IP Adrs** menu. Your radio's IP address can be found in SmartSDR on the **Settings…->Radio Setup->Network** tab.
- Set the IP port # for your radio in the **Config->Connection->IP Port** menu. The default IP port for the Flex is 4992.
- Open the **Config->WiFi** menu and enter your router's SSID and password then select **Connect WiFi**. After about 5 seconds you should be connected to your radio.
- You can connect to other radios or programs (like Thetis) that support IP CAT control. Just enter the correct IP address and IP port # in the **Config->Connection** menu.

Multi-Function Buttons

The terminal's FKeys and the *Micro's* BTNs are initialized with the settings found in the Terminal Keyboard Controls and Multi-Function Buttons sections. **You can modify these settings in the Quick Key->Configure menu.**

Each BTN supports two functions. These are accessed using a short-press (< 1 second) for the first function and a long-press (> 1 second) for the second function.

With the default settings applied to the BTNs, the *Micro* can be used in standalone mode out of the box as shown in the table below. (The buttons are listed as they are laid out on the *Micro*.) You will need to open a terminal session or web browser to change the BTN functions (long-press BTN1).

Button	Short-press Function	Long-Press Function
BTN3	Zero the digits below the Tuning Digit	Toggle the Tx Interlock
BTN2	S-meter report	Open Previous Frequency list
BTN1	Report – see note below	Help (same as F1 on terminal keyboard) Plays the Full Report when on the Home page and the report is *unmuted*. Short-press BTN1 to cancel.

NOTE: The **Report** BTN functions as follows:

- If a **Report Type** has been selected and the report is *Muted*, pressing **Report** will temporarily unmute the report and output the short report. The report stays unmuted until you press the **Report** BTN again, or mute it by long-pressing the knob.
- If the report is *Unmuted* pressing the **Report** BTN just outputs the short report.

Display Options

The primary method of interacting with the *Micro* is with the knob and three multi-function buttons (BTNs). To 'see' what you're changing with these controls you need to connect the *Micro* to a terminal program or a web browser to display the various screens the *Micro* generates.

I use Putty and Tera Term for Windows for the Telnet terminal. Putty is available for Linux and Mac. For iOS and Android, use Google to find one that works for you. The *Micro* contains a web server so most browsers can connect to it. When using the Telnet terminal, you'll want to set the baud rate to at least 115.2k.

Instructions for connecting to the *Micro* to a Telnet terminal program can be found in Appendix D and E. Once you're connected, you will be presented with a title page. Press any key to open the Home page.

When using a web browser, connect your *Micro* to your network using WiFi then enter the *Micro's* IP address in the browser's address bar. You may need to preface it with **HTTP://** if your browser tries to find a secure address (**HTTPS://**). The web server in the *Micro* does not use encryption.

Standalone Configurations

Most *Micro* users (especially Flex users) will probably just want to use the *Micro* as a remote tuning knob for their radio with no display. While the *Micro* can do much more than this, it will be perfectly happy to serve in this roll. But there's no reason you can't set the multi-function buttons (BTNs) to add additional functionality to your remote knob.

I've put together a few configuration examples to get you started. These should give you a feel for what's available. You'll need to use a terminal program to map **Function Button Options** to the three BTNs on the *Micro*. You can map three short-press functions and two long-press functions. Explore the *Micro's* options and come up with settings that work for you. Let me know what combinations you find most useful and I'll add them here.

FKey and BTN configurations are stored in the Radio Profile. There's no reason you can't have several profiles set up for the same radio with different FKey and BTN settings for each profile.

CW Speedster
For CW operators that just want their *Micro* to be a memory keyer. Edit each transmit message for your needs then assign them to the BTNs

- Set BTN1 short-press to **Speed**
- Set BTN2 short-press to **RIT** (if your radio supports it)
- Set BTN3 short-press to send the **CW Msg2** buffer
- Set BTN1 long-press to **Help**
- Set BTN2 long-press to send the **CW Msg3** buffer
- Set BTN3 long-press to send the **CW Msg4** buffer

FT Deluxe

For Yaesu FT owners that hate digging into the menu system to find controls they use all the time:

- Set BTN1 short-press to **Tx Power**
- Set BTN2 short-press to **Pan Level** (adjusts panadapter gain)
- Set BTN3 short-press to **External Tuner** (if you use an external tuner)
- Set BTN2 long-press to **Swap A/B** to swap the *Micro's* A/B VFOs
- Set BTN3 long-press to **RX M/S** to toggle control to the Main or Sub receiver

PCR1000 Deluxe

For Icom PCR-1000 owners that just want a basic controller for their blank faced radio:

- Set BTN1 short-press to **Volume**
- Set BTN2 short-press to **Squelch**
- Set BTN3 short-press to **NR** (Noise Reduction)
- Set BTN3 long-press to toggle **Tx Enable** – this is the power control on the radio

Flex-ible Options

Here are a couple of options for Flex users. You can connect two Micros to your Flex at the same time and have one set up for Flex Deluxe 1 and one setup for Flex Deluxe 2 on one slice. Or have one *Micro* setup to control Slice A and one to control Slice B. If you have a radio with 8 slices you could have a *Micro* connected to each slice (at least in theory – I don't have 6600 or 6700 so I've never tried it!) You can choose from any of the available function options for the Flex radio. Experiment with your options and see what works best for you.

Flex Deluxe 1

- Set BTN1 short-press to **Volume**
- Set BTN2 short-press to **ACG-T**
- Set BTN3 short-press to **Gain (RF)**
- Set BTN2 long-press to **ATU** if you have an internal tuner
- Set BTN3 long-press to **xTune** if you have an external tuner

Flex Deluxe 2

- Set BTN1 short-press to **NR Level** (Noise Reduction)
- Set BTN2 short-press to **ANF/APF** (Automatic Notch Filter for SSB, Automatic Peaking Filter for CW)
- Set BTN3 short-press to **AGC-T,** AGC Threshold
- Set BTN2 long-press to **NB**, Noise Blanker
- Set BTN3 long-press to **Gain** to control the RF gain

Power Up Options

You can set any function option as the **Power Up** option. When **Power** Up is set the *Micro* goes directly to that mode when you apply power. For instance, if you select **Volume** as the power up mode, the *Micro* will boot with the volume setting of your radio in the value editor. Just turn the knob to change your radio's volume

You should also set the same setting in one of the BTN short-press events.

Home Page – Telnet Terminal

When connected with a terminal program, the Home page is the base operating location for the *Micro*. Think of it as the radio control panel. Here, turning the knob changes the radio's frequency by the selected frequency step (i.e. the highlighted digits in the frequency display). To change the frequency step, press and hold the knob then turn it. One highlighted digit means that the knob changes that digit. Two highlighted digits means that the knob tunes ½ of the left digit. For example, if the 1 KHz and 100 Hz digits are highlighted the tuning step is 500 Hz.

```
COM14 - Tera Term VT                        —    □    ×
File  Edit  Setup  Control  Window  Help
FTdx101              Yaesu FTdx [38400]
 Tx Off              WiFi -40  Voice Rpt
||||||||||||||||||||||S+10

VFO-A        28.109.370
10 mtr       USB

[B=28.136.500]

MAIN v=29 bw=3.0 g=99 a=6 Pwr=14
 F1   F2   F3   F4   F5   F6   F7
Help Repo Swap Band Mode BW/S Radi

CTR2-Micro by KU7Q
```
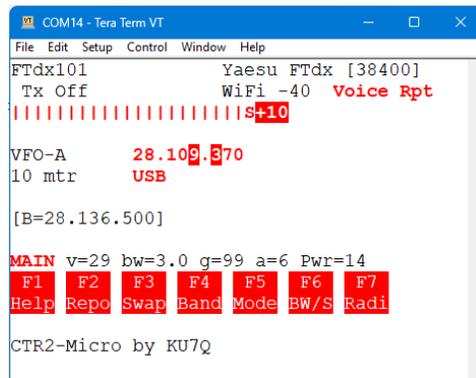
If your radio supports reading the S-meter over CAT an S-meter graph will be displayed on the second line of the Home page. In this example the S-meter is reading 10dB over S9. The S-meter is not supported in the browser.

To change other parameters on the radio or in the *Micro* configuration, press the knob or the [Enter] key to open the *Micro's* menu system. It will begin at the **Main** menu. You can also press and hold the Ctrl key then press the first letter if any of the menus in the **Main** menu to jump directly to that menu.

> **NOTE:** The *Micro* will reboot when the terminal connection is shut down. If you want WiFi active in standalone mode (no terminal connected) enable <u>Auto Connect</u> in the <u>WiFi</u> menu.

The terminal displays will be used throughout this manual. The browser displays are similar and mostly have the same functions.

Home Page – Web Browser

As of v1.02.00 the *Micro* includes a built-in web server that is described in <u>Appendix F</u>. The Home page on the server has more controls and detail than the Home page on the terminal program. These controls give you instant access to many of the *Micro's* and radio's features.

To use the browser interface, first connect your *Micro* to your network with WiFi. Next, enter your *Micro's* IP address in your browser's address bar. The *Micro's* IP address can be found on the <u>WiFi</u> menu or in the <u>Main->About…</u> menu.

The current version of the web server is fully functional and works just like the terminal program, but it has one limitation: There is no support for menu *hotkeys*.

```
              Flex 6400
VFO-A:  28.502.103
     10m  CW  B: 21.058.860
     Tx Enabled   <   >   v   ^

  MENU         FLEX-A         Theme
         Flex       KEY     WiFi -36
  Zero      RIT        Lock      Ctrl A
  DB-R     VFO>M     M>VFO       Prev
  FKey  F2:Spee   F3:RIT    F4:Prev
  Tgl   F5:Zero   F6:VFO    F7:Band
  MSG   1:de K    2:CQ C    3:= Tn
   *    4:= Na    5:= So    6:de^

         Keyboard Keyer

```
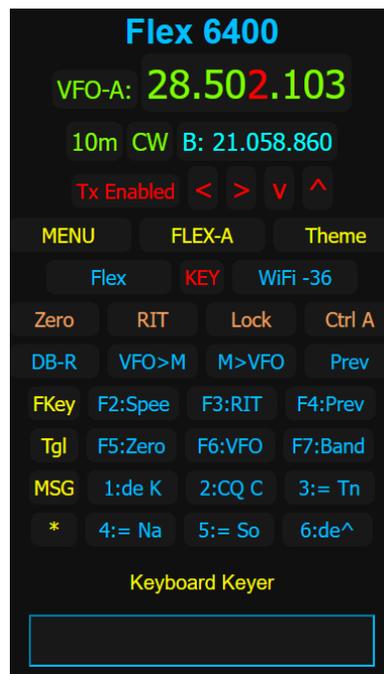
Common Controls

Terminal Keyboard Controls

When the **Home** page is displayed you can use the *Micro* as a keyboard keyer if it is underlined enabled. Just start typing characters on the keyboard and press [Enter] to send them. You can create another string of characters as the *Micro* sends the current string. Enable the transmitter interlock (press [Home] to toggle) if you want to transmit over the air, or disable it to use the *Micro* for code practice.

> **NOTE:** In order to use the keyboard keyer feature, or control the *Micro* using the terminal keyboard, the terminal program must be *in focus* on your PC (i.e. it must be the active window). You can control the *Micro* using the knob and BTNs while the terminal is not in focus on your PC.

Terminal Key Functions
The following functions are only available on the terminal interface.

Key	Page	Function
Enter	All	Home page: opens the Menu system, other pages: execute the selected item. Pressing the knob does the same.
Esc	All	Home page: deletes the CW message being sent. Menus: Exits the current menu and returns to the Home page. Editors: Returns to the calling menu or to the Home page.
Up Arrow	Home	Increments frequency by the tuning digit
	Menu	Moves up to the next menu item
	Text Editor	Increments the current character
	Value Editor	Increments the current value by 1
Down Arrow	Home	Decrements frequency by the tuning digit
	Menu	Moves down to the next menu item
	Text Editor	Decrements the current character
	Value Editor	Decrements the current value by 1
Left Arrow	Home	Increments the tuning digit
	Menu	Return to the previous menu
	Text Editor	Move to the previous character
	Value Editor	Increments the current value by 1
Right Arrow	Home	Decrements the tuning digit
	Menu	Move to the sub menu if there is one – same as pressing [Enter]
	Text Editor	Move to the next character
	Value Editor	Decrements the current value by 1
F1	All	Opens the Help page for the selected item
F2-F7	Home	Executes the function programmed for these keys. See the Quick Key Configuration topic.
F8	Home	Sends the #1 CW message – this buffer always holds the last message buffer sent
F9	Home	Sends the #2 CW message
F10	Home	Sends your call sign (if it is set in the Keyer menu)
F11	Home	Sends *and increments* the Contact Serial Number
F12	Home	Sends the Contest Exchange (if it is set in the Keyer menu)

Key	Page	Function
Shift+F3 to Shift+F10	Home	Sends CW message buffers #3 to #10
Insert	Home	Pause the CW message if active
Delete	Home	Stop and delete the CW message
Home	Home	Toggle Tx Enable (transmit interlock)
End	Home	Zero the digits below the tuning digit
Page Up	Home	Direct Frequency Entry
	Load/Save/ Rename Memory	Move to the previous page of memories
Page Down	Home	Toggle Key (in CW or CW-R mode) or PTT (in all other modes)
	Load/Save/ Rename Memory	Move to the next page of memories

Terminal Shortcut Keys

Many menus and features can be accessed directly from the Home page by using control keys when operating the *Micro* with a terminal program connected. To access these items, press and hold the **Ctrl** key then press the designated key. Most of the keys are mapped to the first character of the function they control so they're easy to remember. The exceptions are **Ctrl+a**, **Ctrl+o**, and **Ctrl+u**. **Shortcut keys are not available in the browser interface.**

Ctrl+Key	Function
a	Swaps VFO-**A** and VFO-B
b	Opens the **B**and menu
c	Opens the **C**onfiguration menu
d	Opens the **D**irect Frequency Entry window
e	Opens the **E**dit CW Message menu
f	Opens the **F**requency menu
g	Plays the S-Meter Report if the Report is *unmuted*
i	Plays the Frequency, mode, tuning resolution, and transmit interlock Report
k	Opens the **K**eyer menu
l	Opens the **L**oad from Memory menu
m	Opens the **M**ain menu (same as [Enter])
o	Opens the M**o**de menu
p	Opens the **P**revious Frequency/Mode menu
q	Opens the **Q**uick Key menu
r	Opens the **R**adio menu (if the selected radio supports it)
s	Opens the **S**ave to Memory menu
t	Opens the **CW Message** menu (previous versions called this Tx Message)
u	Opens the Keyer Speed window
v	Opens the **V**FO menu
w	Opens the **W**iFi menu
z	**Zero**'s the digits below the tuning digit

HINT: You can use the control keys above and the menu *hotkeys* to quickly navigate to menu items. For example, pressing [Ctrl + k] [a] opens the Keyer Speed window. Pressing [Ctrl + d] [c] sets the radio's mode to LSB. Once you are familiar with the *Micro's* menu structure you'll be able to easily manage the *Micro* and your radio from your keyboard.

Multi-Function Buttons

The three multi-function buttons (BTNs) to the left of the knob have different functions depending on the *Micro's* operating mode. (Previous versions of this manual referred to these as MFBs). They have programmable functions in the Home page and preset functions when a menu, text editor, or value editor is being displayed. Programmable functions can be set in the **Quick Key Configuration** menu.

Button Short-Press and Long-Press

A button 'short-press' is a button press and release within 1.5 seconds. A button 'long-press' is a button press and release after 1.5 seconds but before 5 seconds.

BTN Audio Feedback
When you press a BTN, the buzzer will sound beeps correlating to the BTN #. One beep for BTN1, two for BTN2, and 3 for BTN3. Release the button when you hear the beep(s). If you hold the button past the short-press time period an additional longer beep will be sounded to indicate a long-press function will be executed on release. If you continue to hold the button for longer than 5 seconds another longer beep will be sounded to inform you that no function will be executed.
NOTE: Use the volume control to change the beep volume.

Btn	Home-Short Press	Home-Long Press	Menu-Short Press	Menu-Long Press
BTN3	**Default**: Zero Digits below Tuning Digi	**Default**: **Toggle Tx Interlock**	Play the current Menu Item if the Report is unmuted	Play the current Menu Item if the Report is unmuted
BTN2	**Default**: Report the S-meter value if reporting is unmuted.	**Default**: Open the Previous Frequency menu	Return to the previous menu*	Return to the Home page
BTN1	**Default**: Play the short report if reporting is unmuted	Default: Opens the **Help** window. Plays the Full Report in the Home page if reporting is unmuted	Return to the previous menu	Return to the Home page

NOTE: Buttons in the table above are listed the way they are laid out on the *Micro* with BTN3 on top.

* Toggles Tx Interlock when in the Radio menu

Standalone Menu Block

When the *Micro* is used without a display (no terminal or browser connected) access to the menu system is blocked unless a Report is unmuted and one of the menu report options are active. This prevents the operator from inadvertently changing menu settings without knowing it.

Pressing the knob to open the main menu or a pressing a BTN that opens a menu will cause an error beep (the LED flashes and the buzzer sounds 8 fast Dits) to indicate the blockage. This occurs after the knob or button is released.

To override the block and access the menu, select the **Code Report** in the **Configure->Report** menu. You can then toggle the mute function on and off by long-pressing the knob in the Home page. This allows you to navigate the menu with code. Once you are finished using the menu, long-press the knob again to mute the **Code Report**.

A couple of notes about menu blocking:

- This block is also applied to any multi-function button (BTN) that has been programmed to open a menu.
- Many functions do not open a menu when called from the BTN but they will try to bring a menu up after you've set the parameter's value. This will cause an error beep mentioned above even though the function succeeded because the menu is ignored and the program returns to the Home page. This is normal.

Menu System

The *Micro* uses a menu structure very similar to the one employed in CTR2-Mini. The menu system provides a convenient way to interact with the *Micro* using either the knob or the terminal keyboard. All configuration settings and many radio settings are done using the menus.

Accessing the Menu System

Accessing the menu system can be done in several ways. The two main methods are to press and release the knob or press the [Enter] key in the terminal program. You can also jump straight to one of the menus on the **Main Menu** from the Home page by pressing and holding the [Ctrl] key then pressing the first letter of the desired menu. For instance, to open the **Keyer** menu, press **Ctrl+k.** Press **Ctrl+c** for the **Config** menu, etc. A complete list of short-keys can be found in the Shortcut Keys section. The full menu structure can be found in Appendix G: Menu Structure.
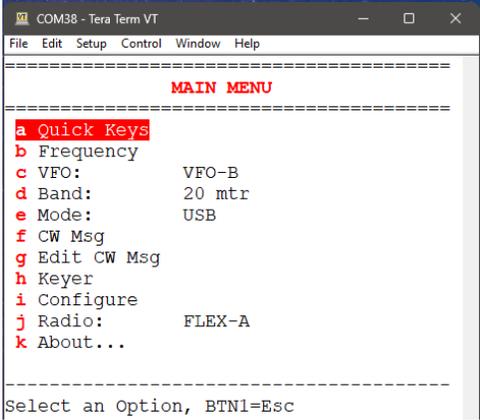
Menu Timeout

A menu timeout option can be enabled in the **Config->Calibrations->Menu Timeout** menu. The timeout timer helps if you get lost in a menu or forget to go 'Home', especially if you're running the *Micro* without a display. To return to the Home page from any location press and hold the knob and turn it LEFT. The text and value editors always stay active until you close them. This allows you to open a parameter and leave it open.

Menu Navigation

Once the menu is open use the knob or [Up] and [Down] cursor keys on the keyboard to scroll the menu selection. Press the knob or [Enter] to execute the selected item. You can also press the highlighted **hotkey** on the left of each entry to execute a menu item directly.

If these aren't enough options, enable **Keyer->Nav/Edit** and you can use your paddles to key in the **hotkey** character to execute that item. With **Reporting** enabled you actually control the *Micro* (and your radio) with no display using just your paddles.

> **NOTE**: To silence a running code report, quickly tap the Dah paddle or turn the knob.

Some items will open a submenu. Others will open a text editor that allows you to edit a text field. Still others will open a value editor where you can change a value. Finally, some items just toggle the selected setting.

Text Editor

When a parameter is text base (i.e. the radio profile name, tag line, message buffers, etc) a simple text editor will open where you can edit that parameter. There are several ways to edit the text string. The easiest of course is with the terminal keyboard or browser interface. Just type in the new text or use the cursor left or right keys to move the character selection left or right. You can also use the knob to edit characters. Press and turn the knob to move the selection cursor to the left or right. Release the knob then turn it to change the selected character. You can even use your paddles to enter text. To do this you must enable the **Edit** mode in the **Keyer->Nav/Edit** menu. There are special rules for using your paddle. They can be found here.

Moving to the left of the first character with the left cursor control key or the knob in the terminal interface will exit the text editor without making any changes. This is the same as pressing the [Esc] key.

In the browser interface, edit text as you would in any web site. Your phone and tablet will display a virtual keyboard when you click on the text box. The edit cursor used in the terminal interface is not shown in the browser interface but turning the knob will change the first letter of the text.

> **NOTE:** Frequencies are entered in MHz. Enter only one period! When editing a frequency the available digits are limited to 0 to 9, period, and *Space*. Inserting [Space] for a digit truncates the frequency at that digit. If you don't insert a [Space] all digits past the selected digit will be returned intact. This allows you to change just one or two digits in the frequency.
>
> NOTE: When editing a frequency enter only one period to denote the MHz location.

Value Editor

When a parameter is numerical (i.e. keyer speed, sidetone frequency, etc.) the value editor will be displayed. The value in the editor is changed by either rotating the knob or by using the cursor control keys on the terminal keyboard. You can also use your paddles to increment or decrement the value. To do this you have to enable the **Edit** mode in the **Keyer->Nav/Edit** menu. Like the text editor, there are special rules for using your paddle. They can be found here.

> **NOTE:** The value editor in the terminal interface does not accept numerical keys from your keyboard. It was designed to use the knob to change values.

> **NOTE:** When using the browser interface edit the number as normal. Phone and tablet browsers will display a virtual keyboard when you click on the text box. You can turn the knob to change the value displayed.

Menu Code Reports

When using the **Code Report** feature, the first five letters of the menu title are sent followed by a comma (,) when you first open a menu. This is followed by the *hotkey* then 1 to 4 characters, or all of the select menu item's description. After the initial report only the *hotkey* and menu item is reported when you scroll the menu. This allows you to quickly identify which menu and menu item is selected when not using a display. Once you get use to the menus and their *hotkeys* you'll be able to navigate quickly by listening for just the *hotkey.*

Context Sensitive Help

Context sensitive help is available for every menu item. Just select an item and press [F1]. Press [Esc] or turn the knob to close the help window. By default, **Help** is assigned to long-press BTN1.

Main Menu

The **Main Menu** is the base menu. From here you can access the other menus that control the *Micro*.

As discussed in Menu Navigation there are various ways to access the items on menus. The knob is the best way. If you're using a terminal program to display the menu, you'll need to have that program *in focus* on your PC for key strokes to be recognized. This is also true if you want to use the keyboard keyer function.

You can access these menus directly from the Home page by using the Short cut keys. *Short cut keys are not available on the web browser interface.*
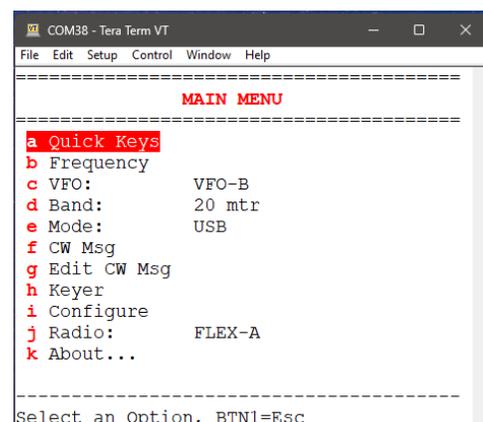
Each menu is described in this manual. You can jump to that section by clicking one of the names below.

[Quick Keys](#)   [Frequency](#)   [VFO](#)   [Band](#)   [Mode](#)   [CW Msg](#)   [Edit CW Msg](#)   [Keyer](#)   [Config](#)   [Radio](#)

Quick Key Menu

This menu allows you to access the functions assigned to the terminal's FKeys (F2 through F7) and the BTN short and long press functions. BTNs starting with "**s**" are short-press functions. Those starting with "**l**" are long-press functions.

Power Up Function

In addition, you can define a function that will run when you first power up the *Micro*. For instance, you can set **Power Up** to **Radio** and the *Micro* will start in the **Radio** menu when booted up. With **Code Reporting** enabled you can run the *Micro* without a terminal display.

```
COM13 - Tera Term VT                    —    □    ×
File  Edit  Setup  Control  Window  Help
========================================
              QUICK KEY MENU
========================================
a F2=         Speed     | n Pwr Up=  ----
b F3=         TxEnable  |
c F4=         Direct    | p Configure
d F5=         RIT       |
e F6=         Lock      |
f F7=         M->V      |
g sMFB1= ------         |
h sMFB2= Report         |
i sMFB3= Scan           |
j lMFB1= MFB Config     |
k lMFB2= ------         |
l lMFB3= V->M           |
                        |
----------------------------------------
Select an Option
```
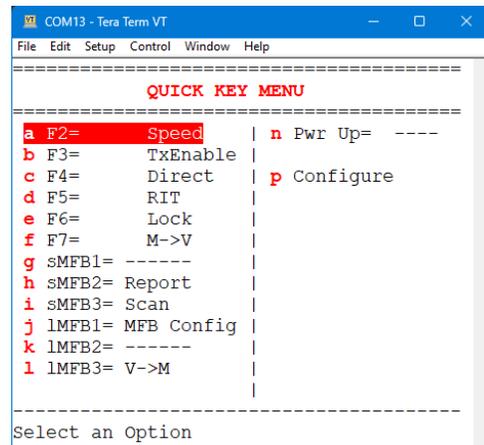
Selecting **Configure** opens the **Quick Key Configuration Menu** where you can change these settings.

Quick Key Configuration Menu

This menu is accessed from the **Quick Key Menu** above by selecting the **Configure** item.

To change a function assigned to one of these controls simply select it by pressing its *hotkey* or by scrolling to it and pressing the knob or [Enter]. This will open one of the **Function Options Menus.**

NOTE: This menu looks like the **Quick Key** menu above. The only difference is there is no **p Configure** option.

```
COM12 - Tera Term VT                    —    □    ×
File  Edit  Setup  Control  Window  Help
----------------------------------------
           QKEY CONFIGURATION MENU
----------------------------------------
a F2=         Speed     | n Pwr Up=  Radio
b F3=         RIT       |
c F4=         Prev      |
d F5=         Zero      |
e F6=         Mode      |
f F7=         Band      |
g sMFBtn1= Lock         |
h sMFBtn2= VFOA/B       |
i sMFBtn3= Radio        |
  lMFBtn1= MFB Confi|
k lMFBtn2= Full Rpt     |
l lMFBtn3= TxEnable     |
                        |
----------------------------------------
Select a Function Button to Edit
```
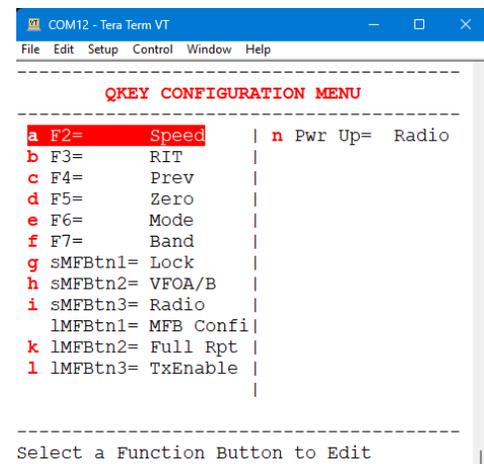
Function Buttons Option Menus

There are two menus that contain functions available to the FKeys, BTNs, and [Power Up](). **PG1 Function Option Menu** contains functions that are available regardless of the radio you are controlling.

Press the **F1** key or the BTN assigned to **Help** to open a help window describing the selected option.

The following functions are available when the report is unmuted.

```
COM14 - Tera Term VT                    —    □    ×
File  Edit  Setup  Control  Window  Help
========================================
          PG1 FUNC OPTION MENU
========================================
a ------          | n Database
b Tx Mode         | o xTuner
c Speed           | p Report
d Direct          | q S-Mtr
e Zero            | r Help
f Prev            | s Msg1
g RIT             | t Msg2
h Lock            | u Msg3
i Scan            | v Msg4
j M>V             | w Key
k V>M             | x PTT
l SwapAB          | y More >
m RVFO            | z Exit >
----------------------------------------
Select a Function, MFB1=Esc
```

- **Report** announces the current frequency, mode, tuning resolution, transmit interlock status, and S-meter.
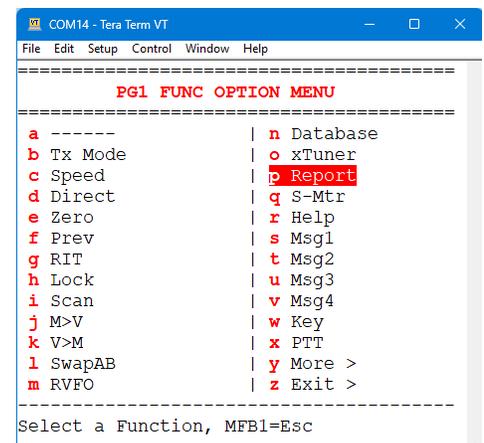
- **S-Mtr** announces the current s-meter reading. It can also be used to cancel a running report.
- **Help** when pressed in the Home page plays the **Full Report**, in essence, it report the contents of the Home page. When **Help** is pressed in a menu it displays (or announces) the help screen for that menu item.

Report features are useful for blind or limited sight operators that have difficulty reading their radio's displays or when operating the *Micro* in standalone mode with CTR2-Voice.

To navigate to **Pg2 Function Option** menu, press the **Y** *hotkey* or select **More >**. To exit this page without making changes, press **Z**, select **Exit >**, or just press BTN1. This will return you to the **Quick Key Configuration Menu**. Pressing [Esc] will return you to the Home page.

NOTE: Not all functions make sense for **Power Up**. For example, a function that toggles a parameter on and off like **TxEnable**, **PTT**, **Key**, etc. shouldn't be used.

```
🖳 COM14 - Tera Term VT              —  □  ×
File  Edit  Setup  Control  Window  Help
=========================================
         PG2 FUNC OPTION MENU
=========================================
 a Slice            | n ------
 b Volume           | o ------
 c BdWdth           | p ------
 d NBlnkr           | q Quick
 e NReduc           | r Freq
 f Filter           | s VFO
 g RFGain           | t Band
 h AGC              | u Mode
 i AGC-T            | v TxMsg
 j VOX              | w EdtMsg
 k PwrOut           | x Radio
 l TunOut           | y More >
 m Tuner            | z Exit >
-----------------------------------------
Select a Function, MFB1=Esc
```

The left column of the **Pg2 Function Option** menu contains radio specific functions that vary depending on the selected radio and shortcuts to various menus. *Hotkeys* **Y** and **Z**, and [Esc] provide the same functionality as they do on Page 1.

The right column from *hotkey q to x* are used to set an FKey or BTN to open one of these menus.

Frequency Menu

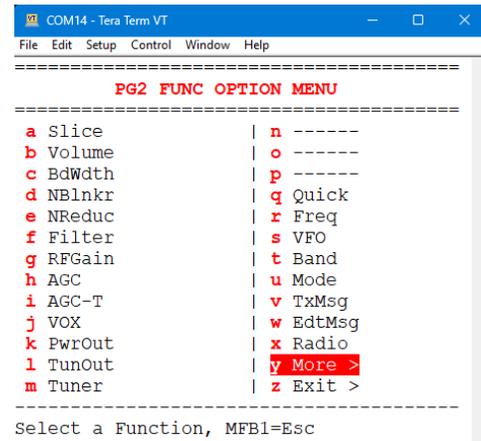The **Frequency Menu** provides access to the frequency options available on the *Micro*. These include direct frequency entry, zeroing the digits below the tuning digit, opening the Previous Freq/Mode menu, opening the RIT value editor, toggling the favorite frequency database, loading and saving VFO-A and VFO-B from/to memory, renaming or erasing a memory slot.

Many functions can be accessed using **Ctrl+** keys. These are shown on the menu in the brackets **[^_]**

```
🖳 COM18 - Tera Term VT              —  □  ×
File  Edit  Setup  Control  Window  Help
=========================================
            FREQUENCY MENU
=========================================
 a Direct Freq Entry [^d]
 b Zero Low Digits    [^z]
 c Prev Freq/Mode     [^p]
 d RIT=       off

 f Database= Radio
 g Load from Memory   [^l]
 h Save to Memory     [^s]
 i Rename / Erase Memory

 k Report Freq / Mode

-----------------------------------------
Select a Frequency Option, MFB1=Esc
```
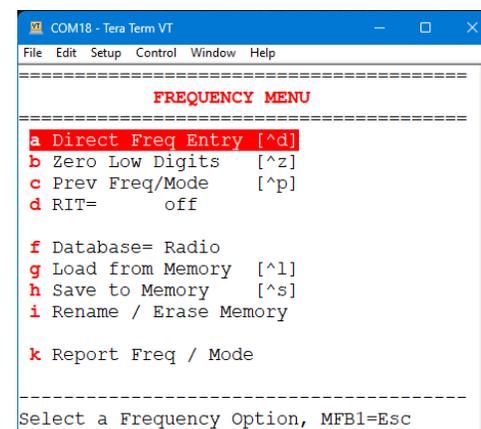
This menu can be accessed by pressing **Ctrl+f** in the **Home** page and it can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Freq** option.

Direct Frequency Entry

Selecting his item allows you to enter a frequency directly from the keyboard or by using the knob to set each digit.

This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Direct** option. **Ctrl+d** is the shortcut for this function.

Zero Low Digits

Selecting this item zeros the digits below the tuning digit. This is helpful when you want to set an exact frequency.

This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Zero** option. **Ctrl+z** is the shortcut for this function.

Previous Frequency/Mode Menu

Selecting this option opens the **Previous Freq/Mode** menu. This menu displays the current frequency plus the last 25 frequencies you have visited. If you remain on a frequency for longer than 15 seconds it will be added to this list. This list is maintained through power cycles.

Scrolling to one of the entries on this list temporarily sets your radio to that frequency and mode. To stay on that frequency and mode press the knob or [Enter]. Pressing BTN1 or [Esc] returns you to the original frequency and mode (as does *hotkey A*).
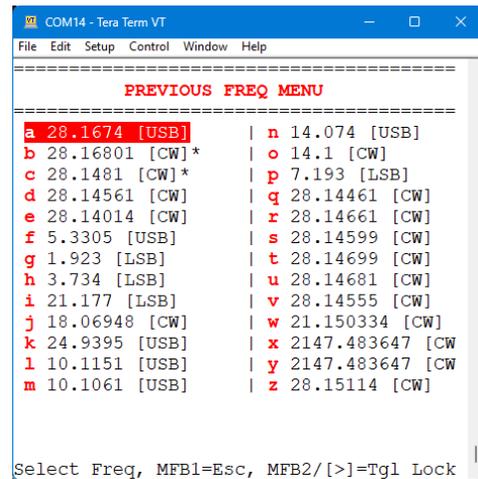
Pressing the *hotkey* for an entry on the list instantly takes you to that frequency and mode.

This menu can be assigned to an FKey or BTN in the Quick Key Function Option menu using the **Prev** option. **Ctrl+p** is the shortcut for this menu.

Lock Mode

You can lock one or more entries to keep them on the top of the list so they don't scroll off. In effect, this becomes your quick list of favorite frequencies. To toggle the lock on an entry, press the BTN2 button on the *Micro* or the [Right] cursor control key on the terminal keyboard.

Locked frequencies have an asterisk next to the mode.

Selecting this item allows you to set the Transmit or Receiver Increment Tuning (XIT/RIT) offset on your radio. To return to 0 Hz offset change the frequency of the radio or long-press the knob when setting this value.

RIT xxxx will be displayed to the right of the frequency in the Home page when **RIT** is enabled.

XIT xxxx will be displayed to the right of the frequency in the Home page when **XIT** is enabled.

X/RIT xxxx will be displayed to the right of the frequency in the Home page when both **RIT** and **XIT** are enabled.

> **NOTE: If your** radio's protocol doesn't support X/RIT this option will not be visible.

By default, this option is assigned to BTN1 short-press. This allows you to open the X/RIT page without connecting a terminal to CTR2-Micro. This option can be assigned other FKeys or BTNs in **the Quick Key Function Option** menu using the **RIT** option.

Database

This option allows you to choose between the selected **Radio** profile's favorite frequency database and the **Shared** database.

The shared database is available to all radio profiles.

Load from Memory Menu

This option opens the favorite frequency list for the current active VFO. The list will contain entries from the selected database. You can select either the selected profile's database or the shared database by changing the **Database** option.

Up to 100 frequencies can be saved to this list for each VFO.

Each memory slot holds the name of that memory, frequency, and mode. The memory name is displayed under the frequency on the Home page when you are tuned to that frequency.

Use the [Up] and [Down] arrow keys or the knob to scroll to a memory slot. The [PgUp] and [PgDown] keys move to the next page. Press the knob or [Enter] to load the selected memory into the active VFO and return to the Home page.

Both the A and B memory frequencies are displayed at the bottom of the list. The active VFO is highlighted. Press BTN2, the [Right] arrow key, or press and hold the knob then turn it to the RIGHT to switch the active VFO.
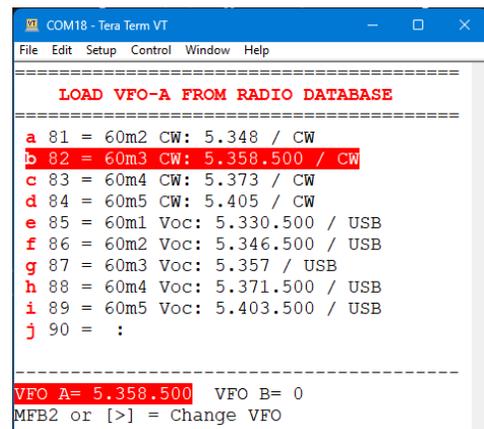
This menu can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **M->V** option. **Ctrl+l** is the shortcut for this function.

Save to Memory Menu

This option allows you to save the active VFO's frequency and mode to the favorite frequency list in the selected **Database**. Navigation is the same as described above.

The frequencies in the active VFO's list are displayed. To change the active VFO press BTN2, the [Right] arrow key, or press and hold the knob then turn it to the RIGHT.

Once you save the frequency a text editor will open where you can edit or add a label for this memory slot.

```
COM18 - Tera Term VT                    —  □  ×
File  Edit  Setup  Control  Window  Help
========================================
     SAVE VFO-A TO RADIO DATABASE
========================================
a  81 = 60m2 CW: 5.348 / CW
b  82 = 60m3 CW: 5.358.500 / CW
c  83 = 60m4 CW: 5.373 / CW
d  84 = 60m5 CW: 5.405 / CW
e  85 = 60m1 Voc: 5.330.500 / USB
f  86 = 60m2 Voc: 5.346.500 / USB
g  87 = 60m3 Voc: 5.357 / USB
h  88 = 60m4 Voc: 5.371.500 / USB
i  89 = 60m5 Voc: 5.403.500 / USB
j  90 =  :

------------------------------------
Save 5.358.500 to Memory A
MFB2 or [>] = Change Memory A/B
```

This menu can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **V->M** option. **Ctrl+s** is the shortcut for this function.

Rename/Erase Memory Menu

This option allows you to rename or erase a memory slot in the selected **Database**. The frequencies in the active VFO's list are displayed. To change the active VFO press the [Right] cursor key or press and hold the knob then turn it to the RIGHT.

To rename a memory slot just select it and press [Enter] or the knob to edit it.

To erase (delete) a memory slot open it in the text editor then enter a [Space] character as the first character in the name. Erasing it will clear the name, frequency, and mode.

```
COM18 - Tera Term VT                    —  □  ×
File  Edit  Setup  Control  Window  Help
========================================
     RENAME/ERASE VFO-A MEMORY SLOT
========================================
a  81 = 60m2 CW: 5.348 / CW
b  82 = 60m3 CW: 5.358.500 / CW
c  83 = 60m4 CW: 5.373 / CW
d  84 = 60m5 CW: 5.405 / CW
e  85 = 60m1 Voc: 5.330.500 / USB
f  86 = 60m2 Voc: 5.346.500 / USB
g  87 = 60m3 Voc: 5.357 / USB
h  88 = 60m4 Voc: 5.371.500 / USB
i  89 = 60m5 Voc: 5.403.500 / USB
j  90 =  :

------------------------------------
Rename Memory A Slot: 82
MFB2 or [>] = Change Memory A/B
```

Report Frequency/Mode

This option reports the current VFO, frequency, mode, tuning resolution, transmit interlock state, and s-meter value when using the selected **Report** , This function can be programmed to one of the BTN functions.
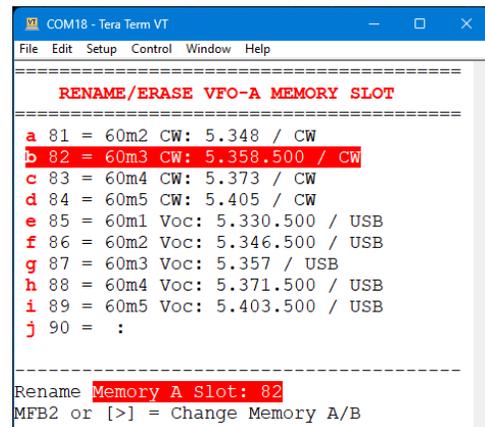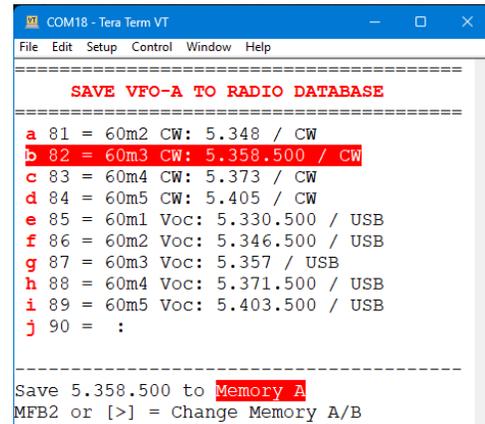
VFO Menu

The **VFO Mode and Options Menu** gives you access to the five VFO modes and several options the *Micro* supports.

This menu can be accessed by pressing **Ctrl+v** in the **Home** page and it can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **VFO** option.

```
COM14 - Tera Term VT                        —   □   ×
File  Edit  Setup  Control  Window  Help
=========================================
              VFO MODE MENU
=========================================
a VFO-A=           28.168.010
b VFO-B=           10.105.100
c Memory Tuning= VFO-A
d Range Tuning
   -----OPTIONS-----
f Ctrl VFO=        A
g VFO Lock=        off
h Start Scan
i A to B
j B to A
k Swap A/B         [^a]

-----------------------------------------
Select a VFO Mode, MFB1=Esc
```

VFO-A/VFO-B

The *Micro* supports two VFOs. They will be independent of the VFOs on the radio if the **Ctrl VFO** option is set to **A**. Select **Ctrl VFO = A&B** if you want the *Micro's* VFO-B to control the B VFO on the radio.

Memory Tuning

This mode allows you to tune through the memories saved on the *Micro* using the knob or cursor [Up] and [Down] keys. This is great if you're looking for activity on a certain set of frequencies.

> **NOTE:** The active VFO will be used as the memory source for **Memory Tuning**.

Range Tuning

This mode allows you to define a low and high frequency range tuning band. This is handy if you're in a contest where you need to stay within a certain bandwidth, or if you're tuning linear transponders on a satellite. To set the range, program a memory slot with the low frequency in VFO-A and the high frequency in VFO-B. Once you'd done this, simply select that memory location and enter **Range Tuning** mode.

The tuning range defaults to the selected band when a low/high range hasn't been defined.

The following **Options** are available in the **VFO** menu:

Ctrl VFO

The *Micro* maintains two VFOs (A and B) that normally control only the A VFO on your radio. This allows you to use the *Micro's* two VFOs on radios that only have one VFO, such as the Flex or dual-receiver radios like the FTdx101. Select VFO-A or VFO-B in the *Micro's* **VFO** menu to switch which *Micro* VFO controls the radio's A VFO.

You can override this by setting **Ctrl VFO=A&B** instead of **Ctrl VFO=A**. In this mode, selecting VFO-B on the *Micro* switches the radio to *its B VFO*. The *Micro's* VFO-A still controls the radio's A VFO. This is useful when operating your radio in split mode. The *Micro* automatically returns the radio to its A VFO when you return to **Ctrl VFO=A**.
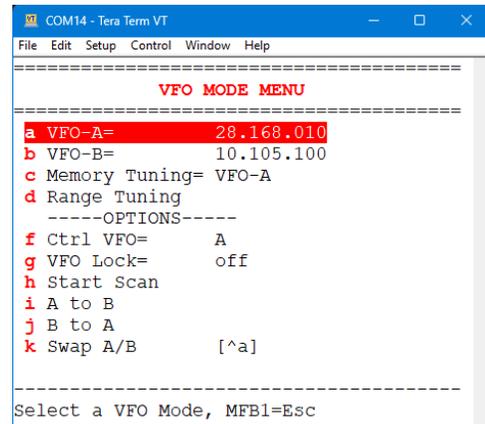
This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **CtlVFO** option.

NOTE: Not all radio protocols support controlling the A and B VFOs on the radio and some don't switch the active VFO to the main display. The **A&B** mode isn't available on dual-receiver radios. These receivers are controlled by selecting the **Main** or **Sub** receiver in the **Radio** menu, which can also be assigned to an FKey or BTN. You can use the *Micro's* VFO-A and B on dual-receiver radios and Flex slices.

NOTE: The Icom and Xiegu CAT protocols don't steer frequency commands to a specific VFO on the radio (like the Kenwood FA and FB commands do). Therefore, on these radios when the *Micro* is powered up it will force the radio's VFO to the last radio VFO that was selected on the *Micro* before power down. This may override the VFO you may have selected manually.

VFO Lock

This option toggles the frequency/mode lock on the *Micro*. When locked, you can't change either with the knob or keyboard, but you CAN change them on the radio.

This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Lock** option.

Start Scan

Selecting this option starts scanning at the current frequency. The frequency increment is determined by the tuning digit. You can change the tuning digit during scan by pressing and turning the knob. You can also change the direction of the scan by just turning the knob to the left or right during scan. Clicking the knob or any key on the terminal keyboard stops the scan.

This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Scan** option.

A to B

This option copies the *Micro's* VFO-A frequency and mode to VFO-B. To reverse this action, select VFO-B then reload its original frequency from the Frequency->Previous Freq/Mode menu.

B to A

This option copies the *Micro's* VFO-B frequency and mode to VFO-A. If VFO-B is open (i.e. not set), VFO-A frequency and mode will be copied to VFO-B. To reverse this action, select VFO-A then reload its original frequency from the Frequency->Previous Freq/Mode menu.
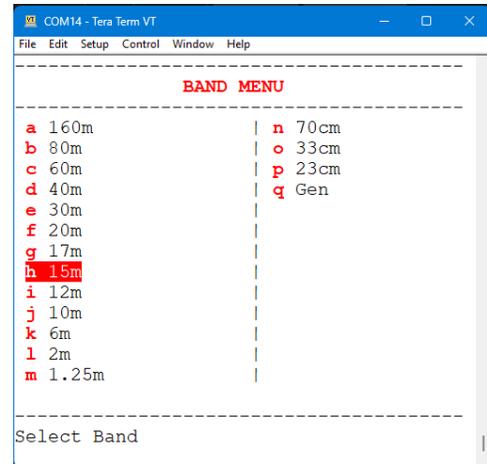
Swap A/B

This option switches the active VFO.

This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **SwapAB** option. **Ctrl+a** is the shortcut for this function.

Band Menu

The **Band Menu** allows you to instantly jump to a band. The last frequency and mode on the previous band are saved in the band stacking register and will be restored when you return to that band.

This menu can be accessed by pressing **Ctrl+b** in the **Home** page and it can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Band** option.

```
COM14 - Tera Term VT                        —    □    ×
File  Edit  Setup  Control  Window  Help
-----------------------------------------
               BAND MENU
-----------------------------------------
a  160m                  |  n  70cm
b  80m                   |  o  33cm
c  60m                   |  p  23cm
d  40m                   |  q  Gen
e  30m                   |
f  20m                   |
g  17m                   |
h  15m                   |
i  12m                   |
j  10m                   |
k  6m                    |
l  2m                    |
m  1.25m                 |

-----------------------------------------
Select Band                              |
```

Mode Menu

The **Mode Menu** allows you to select a mode for your radio.

> NOTE: **DigL** and **DigH** modes are specific to the selected radio and may not map in the *Micro* correctly.

This menu can be accessed by pressing **Ctrl+o** in the **Home** page and it can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Mode** option.
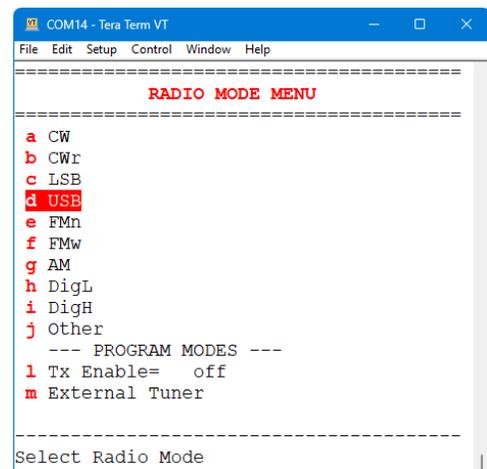
The **Other** mode is displayed when you select an advanced mode on the radio that is not supported in the *Micro*.

There are also two special modes in this menu.

```
COM14 - Tera Term VT                        —    □    ×
File  Edit  Setup  Control  Window  Help
=========================================
             RADIO MODE MENU
=========================================
a  CW
b  CWr
c  LSB
d  USB
e  FMn
f  FMw
g  AM
h  DigL
i  DigH
j  Other
   --- PROGRAM MODES ---
l  Tx Enable=    off
m  External Tuner
-----------------------------------------
Select Radio Mode                        |
```

Tx Enable (Transmitter Interlock)

This option controls the transmitter interlock. When **Tx Enable** is OFF the PTT and KEY outputs on the *Micro* are disabled. This prevents inadvertent keying of your radio and allows you to use the *Micro* for code practice.

When using the *Micro* as a [beacon controller](), disabling **Tx Enable** (i.e. **Tx Off**) pauses the beacon. Re-enabling **Tx Enable** will cause the beacon to restart.

This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **TxEnable** option.

External Tuner Mode

When you enter **External Tuner** mode the *Micro* saves the current power and mode on your radio then resets them to the power and mode you have chosen to tune your external tuner. Key the radio using the [Pg Down] key on the keyboard or by short-pressing **BTN3** to toggle the Key latch. When you exit this mode the *Micro* restores your radio back to the original settings.
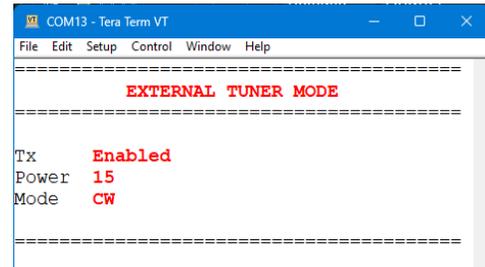
This option can be assigned to an FKey or BTN in the **Quick Key Function Option** menu using the **xTuner** option.

The following buttons and keys can be used to control **External Tuner** mode:

Key or BTN	Function
BTN3 or [Pg Down]	Latching output - Keys the radio on the first press, unkeys it on the second press. You can also touch the Dit paddle to unlatch the output. If CW is selected, KEY Out is active. If AM or FMn is selected, PTT Out is active. If any other mode is selected, mode switches to CW before key up.
BTN2 or [Home]	Toggles the transmit interlock
BTN1 or [Esc]	Restores normal operation and returns to the Home page
Dit Paddle	Non-latching – It acts like a straight key in that it keys KEY Out to the radio while held and unkeys when released. It also resets the Key or PTT latched output from BTN3 or [Pg Down] if it is active.
Key or BTN	Function
Up/Down Cursor Control keys	Increments or decrements the Tx Output Power
Left/Right Cursor Control keys	Decrement or increment the radio's mode

NOTE: Your radio must support Tx power control via CAT for the power setting to work. If it doesn't, you'll need to manually adjust the power on your radio for your external tuner.

CW Message Menu

The **CW Message Menu** allows you to select one of fourteen 75-character messages. Messages start transmitting immediately after selection. From the Home page you can easily send any message by pressing **Ctrl+t** to open this menu then press the **hotkey** of the message you want to send.

Only buffers that contain text will be displayed.

The first buffer always holds the last message sent. This allows you to repeat a contest exchange without incrementing the contact serial number.

You can embed CW prosigns in the buffer text. The information represented by the prosign will be sent when the keyer encounters the prosign.

This menu can be accessed by pressing **Ctrl+t** in the **Home** page and it can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **CW Msg** option.

NOTE: The transmit interlock must be enabled for messages to be transmitted by the radio.
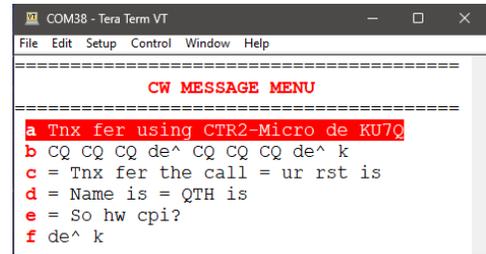
Edit CW Message Menu

The **Edit CW Message Menu** allows you to edit each message buffer.

NOTE: The first message is the repeat buffer and always holds the last message sent. You can edit it here, but it will be overwritten by the next message.

This menu can be accessed by pressing **Ctrl+e** in the **Home** page and it can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **EdtMsg** option.
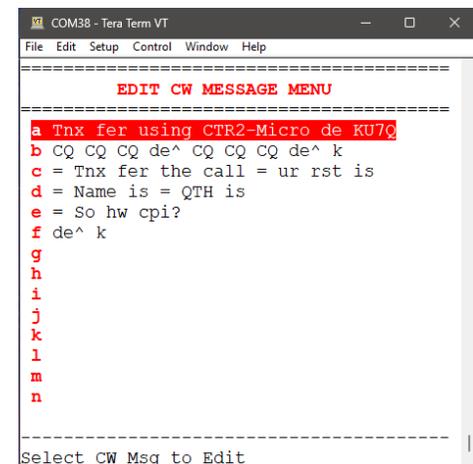
Message Prosigns

Prosigns follow the K1EL keyer 3.0 standard and can be embedded in each message buffer. There are four special prosigns that send your call [**^**], Contact Serial Number [**#**], Contest Exchange [**%**], and toggle sending speed by 150% [*****]. Your call, contact SN, and exchange can be edited in the **Keyer** menu. A "long-DAH" can be sent with the underscore character [_]. The table below contains the available prosigns and their Morse equivalents.

Prosign	Morse	Prosign	Morse	Prosign	Morse	Prosign	Morse
^	{Ur Call}	\	DN	[	AS	@	AC
#	{Serial#}	=	BT	(:]	KN	"	RR
%	{Exchange}	-	DU	$	SX	'	WG
*	{Speed}	+ <	AR	;	AA		
_	Long DAH	>	SK	)	KK		

Keyer Menu

The **Keyer Menu** gives you access to the various keyer settings and modes.

This menu can be accessed by pressing **Ctrl+k** in the **Home** page.

Speed

Adjust the keyer's speed here. The spacing will match the speed as it's changed. On most radios, adjusting the *Micro's* keyer speed will change the speed on the radio's keyer too.

```
COM14 - Tera Term VT                          —   □   ×
File  Edit  Setup  Control  Window  Help
========================================
                KEYER MENU
========================================
a Speed=     20  [^u]| n Call= wa7qyg
b Spacing=   20      | o SN=    2
c KeySTone= Micro    | p Exch=
d Sidetone= 700 Hz   |
e Type=      Iambic-B|
f Paddles=   Norm    |
g Pdl PTT=   OFF     |
h Kybd Kyr= off      |
i Beacon=    off     |
j Nav/Edit= off      |
k Practice           |
                     |
                     |
----------------------------------------
Select a Keyer Option, MFB1=Esc
```

This option can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Speed** option. **Ctrl+u** is the shortcut for this option.

Spacing

Use this control to adjust the Farnsworth spacing (distance in wpm) between characters when sending a CW message buffer. You control the character spacing when sending with the paddles.

KeySTone (Key Out Sidetone)

This option determines the sidetone source when keying the radio. When set to *Micro* the buzzer on the *Micro* is active when the radio is transmitting. Select the **Radio** option to mute the *Micro's* buzzer if you want to use the radio's sidetone.

> **NOTE:** The *Micro's* buzzer is used for all code reports and when keying the *Micro* with the transmitter interlock disabled (i.e. when not keying the radio).

NOTE: When keying the Flex radio using the **CW= Net** option (network keying) set the **Key Sidetone** to *Micro* as the radio will not generate sidetone when keyed over the network.

Sidetone (Frequency)

This option allows you to adjust the frequency of the *Micro's* sidetone buzzer. The buzzer used in the *Micro* doesn't have a linear frequency response so you'll probably want to adjust the frequency to find a pitch that sounds the best for you.

NOTE: The sidetone range is 120 Hz to 1200 Hz. Changing the frequency to 0 Hz mutes the sidetone for both keying and the **Code Report**.

NOTE: You can also adjust the volume control on the *Micro* down to mute the sidetone.

Type

The (**Keyer**) **Type** menu allows you to select the keyer type you prefer.

None

This option turns off the paddle input.

Straight

Use this option if you want to plug a straight key into the *Micro*. Wire it to the TIP of the 3.5mm (1/8") stereo plug.

Passthru

This is a special mode that forwards the Dit and Dah paddle inputs directly to the **Key/PTT** output jack on the *Micro*. The Dit paddle controls the **Key** output and the Dah paddle controls the **PTT** output. This allows you to connect the **Key/PTT** jack on the *Micro* to either your radio's paddle input jack, or to an external keyer if you prefer to use them. This isn't as important on the *Micro* as it was with the Mini because the Mini can connect to many different radios through an RS232 switch but I included it in case it's something useful.

Iambic A and Iambic B

These modes interleave Dit and Dah when both paddles are pressed at the same time. You need to use an Iambic (dual paddle) key to use these modes. The modes are similar with just a subtle difference on how the keyer reacts to the paddle timing at the end of a character. I prefer the A mode but if you're use to the B mode, use it.
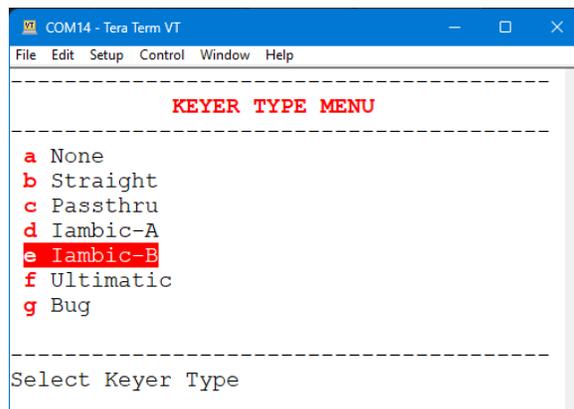
NOTE: Iambic-B didn't work properly in firmware versions before v1.06.02. If you use Iambic-B mode you should update your firmware to the latest version.

Ultimatic

This mode is similar to Iambic in that it requires a dual-paddle key. The only difference is that the keyer repeats the last element pressed. For example, if you press Dit first, then Dah, and hold them closed the keyer sends one Dit then a stream of Dahs. A dual-paddle bug if you will. Some operators prefer this mode so I've included it.

Bug

This mode simulates the old bug keys where only the Dit input repeats. Pressing the Dah paddle is the same as using a straight key.

Paddles (Reverse)

This option allows you to swap the Dit and Dah wiring on your paddles. This is handy if you have more than one set of paddles with different wiring.

Pdl PTT (Use *Paddle In* Jack for PTT)

Enabling this option allows you to use the **Paddle In** jack on the *Micro* as a remote PTT switch input when the radio is in a voice mode (LSB, USB, AM, FM, DigH, DigL).

The Dit paddle input controls Latching PTT. Press once to key PTT, press again to unkey PTT. The Dah paddle input controls Momentary PTT. Press and hold to key PTT, release to unkey PTT. This will also unkey PTT if the latching PTT is enabled.

You can swap the functions of the paddles by setting **Paddles= REV**.

When this mode is disabled the **Paddle In** jack controls the keyer in every mode.

> **NOTE:** When **Pdl PTT** is *enabled* the *Micro's* **PTT Output** is only active when the radio is in a voice mode, one of the paddle inputs is active, and the Tx Interlock is *enabled*. When the **Tx Interlock** is *disabled* the paddles can be used for code practice in any mode.

Kybd Kyr (Keyboard Keyer)

This option allows you to enable or disable the keyboard keyer function. When enabled and your radio is in CW mode you can use your keyboard to transmit CW.

When enabled when using the Telnet terminal interface go to the Home page and simply key in the text you want to transmit. The text you entered will be displayed at the bottom of the page. Press the [Enter] key to

`Sending:` q cq de ku7q cq cq cq de ku7q k
[Insert]=pause/resume, [Del]=stop

---

send it. The transmitting text will be displayed at the bottom of the page. Press [Ins] to pause transmission or [Del] to stop.

When using the browser (web) interface you need to select the **Keyboard Keyer** text box at the bottom of the page and enter text to transmit there. Press [Enter] to send the text. Once transmission starts the text you entered will be displayed in the title area of the keyer text box. Press the **Pause** or **Stop** buttons under the text box to control the transmission.

Once transmission starts you can add additional text add to what's already being sent by just typing (in the terminal) or entering more text in the **Keyboard Keyer** text box on the browser.

Beacon Mode

Beacon mode was added in v1.03.00. This mode allows you to use the *Micro* as a beacon controller. Use this menu to configure the beacon and enable or disable it.

When beacon mode is enabled its status will be displayed in the Tx Interlock status field. You can pause the beacon by toggling the Tx Interlock to **Tx Off** with the [Home] key on the terminal or by selecting it in the web interface. You can also program a BTN to control the Tx Interlock. Toggling it again will restart the beacon.
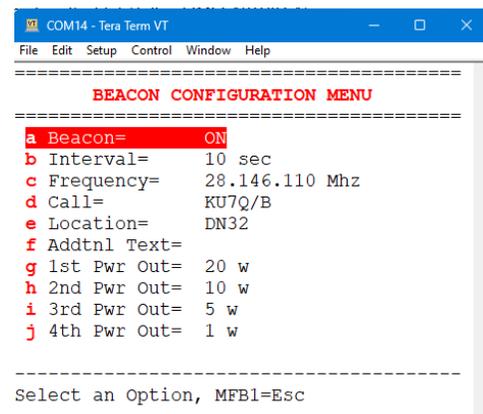
To quickly turn beacon mode off press the [Esc] key in the terminal or **Stop Beacon** in the web interface.

When the *Micro* is operating in standalone beacon mode (no terminal or browser connected) the LED will flash at ½ second intervals while the *Micro* is keying the radio.

You can monitor the status of the beacon on the Home page. The **Tx Interlock** will display **<< TX CW >>** when the beacon is transmitting and **Beacon Enab** when it is not. The red bar across the middle of the page indicates whether the beacon is active or paused. The beacon's CW speed is displayed directly below the bar along with a hint to press [Esc] to stop. The text being sent will be displayed at the bottom of the page.
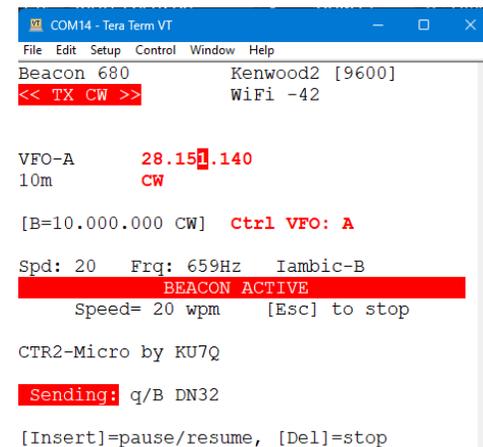
NOTE: To mute the *Micro's* sidetone either turn the volume down or select <u>Key Sidetone= Radio</u> in the <u>Keyer</u> menu.

Enable

This option toggles the beacon on and off. Before you can enable it you must set the interval, frequency, and call. You'll also want to include your transmitter's Maidenhead grid coordinate for others monitoring your beacon. When you enable the beacon the radio's mode will automatically be set to CW and the 1st Power Out level will be set. If you haven't set the 1st Power Out level, or your radio doesn't support CAT power control, the beacon will transmit at the power level set on the radio.

Interval

This option sets the interval between transmissions in seconds.

Frequency

This option sets the frequency the beacon will transmit on. The frequency will default to the current frequency on the *Micro* the first time you configure the beacon. If you change the frequency of the radio while the beacon is paused it will reset the radio to this frequency before it transmits again.

> **NOTE:** Enter frequency in MHz. If you enter the frequency to the Hz, the Hz digit will be rounded up due to floating point rounding errors – example: 28.150001 will round up to 28.150002. It's best to just enter frequency to the 10 Hz.
> **NOTE:** To set the beacon to the current frequency on the radio, edit this field and enter a single [Space] as the first character to delete the stored frequency.

Call (up to 12 characters)

Enter the call sign you wish to use on your beacon in this field. It will default to the **Call** setting in the **Keyer** menu the first time you configure the beacon. You can add additional text to the call such as 'v v v de' if you want.
NOTE: /B will be automatically appended to the call sign entered here.

Location (up to 24 characters)

Enter your transmitter's Maidenhead grid coordinate in this field. You can find you grid using many tools available on the internet. Most beacons use just the first four digits of the Maidenhead grid descriptor. You can find your Maidenhead here: <u>https://www.karhukoti.com/Maidenhead-Grid-Square-Locator/</u>

Additional Text (up to 70 characters)

This field allows you to add addition text to your beacon's message. It is added to the end of the Call and Location message.

Power Out

The last four fields allow you to define four different power output settings on your radio. This helps the listener determine the receive signal strength at each power setting. When just the first power output is defined the *Micro* will send the entire beacon message and end with sending the power followed by "w" using the first power

output setting. If two or more power levels are defined the *Micro* will send the beacon message at the first power level as described above. It will then wait one second then set the radio to the second power level and send that power level followed with a "w". If the third and/or forth power levels are set the *Micro* changes the radio's power level again then sends those power levels followed by "w".

> **NOTE:** You must set the power out settings in sequence (1, 2, 3, and then 4). The sequence resets after all four have been sent or the *Micro* finds the next power out setting set to 0 (off).
> **NOTE:** Your radio must support CAT power settings for the power level options to work.

After the power out sequence completes the beacon waits for the **Interval** time period and then starts the process over again.

Navigation/Edit (Paddles)

The **Navigation/Edit** option allows you to select whether or not you want to use the paddles for menu navigation and/or for editing text or values. You might want to enable navigation, editing, or both if you are using the *Micro* for code practice. The *Micro* makes a great code practice buddy.

NOTE: *Hotkeys* are not available in the browser interface. They are only displayed and accessible from the paddles if the paddle **Navigation** mode is enabled.

> *OFF*
> This is the default. In this mode the paddles will key the radio in both the menus and the text and value editors if the transmit interlock is enabled.

> *NAV ON*
> When **NAV** is **ON** the paddles can be used to select menu items by keying in the ***hotkey*** for the desired menu item.
>
>> **NOTE:** The *Micro's* keyer won't key the radio in menu mode if this option is enabled.

> *EDIT ON*
> When **EDIT** is **ON** the paddles can be used to enter text or values using the **Paddle Input Rules**.
>
>> **NOTE:** The *Micro's* keyer won't key the radio in the text or value editor if this option is enabled.

> *NAV & EDIT ON*
> When **NAV** and **EDIT** are **ON** the paddles can be used for both navigation and edition. This makes a great way to practice code.

Paddle Input Rules

When using your paddles to edit text or values the **Keyer Type** temporarily switches to **Iambic B** mode and the following rules apply. It switches back to the mode you had set when you exit the editor.

Text Input (direct frequency input, CW message buffers, call sign, etc)
- Send a character using the paddles – it will overwrite the current character at that position and increment to next character
- Send 8 Dits to backspace – this deletes the current character and moves left to the previous character. If you backspace to the first character and send 8 Dits again you will exit the field without modifying it (same as pressing [Esc]).
- Send 8 Dahs to move to the next character to the right. To insert a space send two 8 Dah sequences to move past the current character, leaving a space.
- Capital letters cannot be added using the paddles
- Press the knob to accept the current field and exit
- Characters starting at and past the current selection will be deleted
- Start the string with a [Space] to delete the entire string

  NOTE: When editing a frequency inserting a [Space] in the frequency truncates the frequency returned from the [Space] on. If you don't enter a [Space] the entire frequency will be returned. This allows you to edit an individual digit.

Value Entry (numerical values for keyer speed, sidetone freq, etc) is slightly different.
- Press the Dah key to increment the value. One Dah ('t') increments by 1, two Dahs ('m') increments by 2, up to five Dahs ('0') to increment by 5.
- Press the Dit key to decrement the value. One Dit ('e') decrements by 1, two Dits ('I') decrements by 2, up to 5 Dits ('5') to decrement by 5.
- Send 8 Dits or 8 Dahs to exit the value window. Values are saved as you change them.

Navigation (selecting menu items)
- Key in the *hotkey* character to select and execute that entry
- Key in 8 Dahs for **Ok** (same as entering the *hotkey*)
- Key in 8 Dits for **Esc**

Practice Menu

Practice mode is not a full featured code practice system. It's just a simple, easy to use way to practice Morse code. If you really want to find a full featured Morse trying system checkout Kurt Zoglmann's site at https://morsecode.ninja

(Practice) MODE

There are three practice modes.

- **Send Continuously**
- **Send 1 Chr and Wait**
- **Send Group and Wait**

Send Continuously sends groups of characters based on the selected session without stopping. This mode is best when you are recording what you are copying. Run the session then check your copy against the *Micro's* display.

Send 1 Chr and Wait sends a single random character then waits for you to enter it on the keyboard. This mode works well if you want to improve your decoding skills using a keyboard. This mode includes a character counter, a % of Good keystrokes, a % of Errors keystrokes, and an average of time from the end of the character until you press a key. It doesn't matter which session you choose, this mode always sends a single random character.

Press [Enter] to pause and reset the counters or [Space] to repeat the last character.

Send Group and Wait sends the selected session group of characters and waits for you to enter that group on the keyboard. This mode works well for training you to decode the code in your head then enter that data into the computer, similar to what you would do in a contest. If you make a mistake the original text and what you entered will be displayed and another group will be sent.

Press [Enter] to pause and reset the counters or [Space] to repeat the last group.

NOTE: The **Send and Wait** modes are not available in the web server (browser interface) because the keyboard isn't active in that mode.
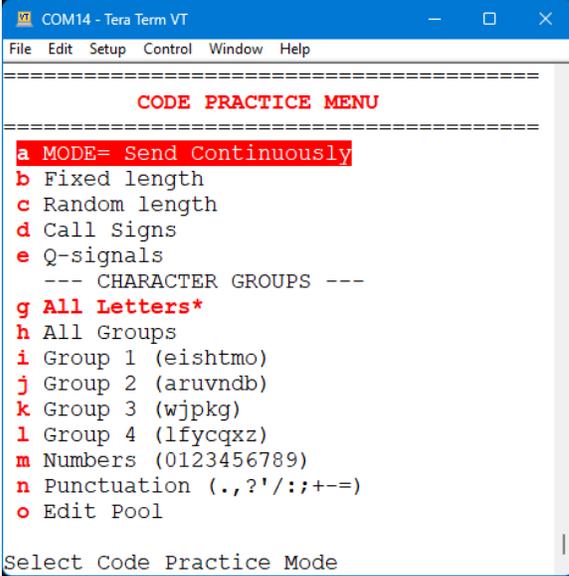
Practice Sessions

There are four practice sessions that help mix your code practice up.

Fixed length sends random five-character groups from the selected character pool. Random length varies the number of characters sent in each group between 1 and 10 characters.
Call Signs sends randomly generated callsigns using a combination of the letters in the

character pool and number 0 to 9. Formats vary from a#aa to aa##aaa.

Q-Signals sends real Q-signals in a random order.

Character Groups

The *Micro* uses the Koch method, a proven method of learning Morse code. If you've never heard of this method there are many links in Google for it. These web resources explain its virtues (and some say vices). Basically, it involves learning the code at 'full speed', or at least 15 wpm, from day one. This helps overcome the tendency of new learners to 'count the Dits and Dahs'. You start with the basic characters with one or two elements, e, t, m, etc. Once you've become 90% proficient in copying them, add more complex characters to the mix.

The *Micro* allows you to select from several groups of increasing complexity. You can also practice numbers or punctuation groups. The **All Letters** option creates a character pool using all of the letters. **All Groups** puts all of the letters, numbers, and punctuation in the pool. Selecting a group replaces the current characters in the character pool with the new group. You can also select **Edit Pool** and create your own group of characters to practice.

The selected group will be marked with '<----SELECTED' on the menu. If you edit the character pool the selected mark will move to the **Edit Pool** menu item. The selected group will be saved when you power down the *Micro*.

Practice Session – Continuous Mode

When you select one of the practice modes a code practice session opens. To start the session, press the [Enter] or the knob. To pause it and check your work, press [Enter] or the knob again. To erase the current practice session and return to the **Practice Menu** press [Esc], BTN1, or BTN2.

This screen shot is of a fixed length session using Group 1 characters.

To change the speed of the practice code, turn the knob. To change the Farnsworth spacing (space between characters in wpm), press and hold the knob then turn it.

The bottom line will show the state of the transmitter interlock, speed, and Farnsworth spacing.
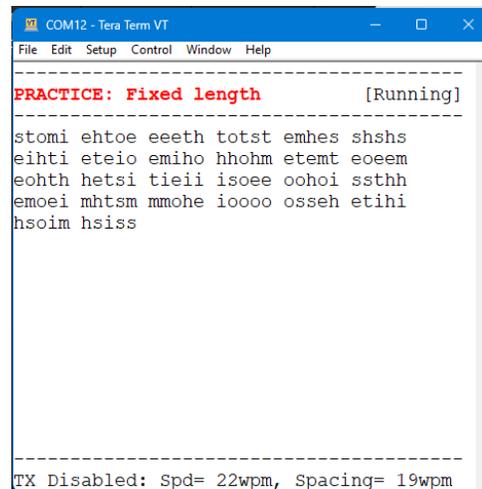
```
COM12 - Tera Term VT                      —   □   ×
File  Edit  Setup  Control  Window  Help
----------------------------------------
PRACTICE: Fixed length            [Running]
----------------------------------------
stomi ehtoe eeeth totst emhes shshs
eihti eteio emiho hhohm etemt eoeem
eohth hetsi tieii isoee oohoi ssthh
emoei mhtsm mmohe ioooo osseh etihi
hsoim hsiss



----------------------------------------  |
TX Disabled: Spd= 22wpm, Spacing= 19wpm
```
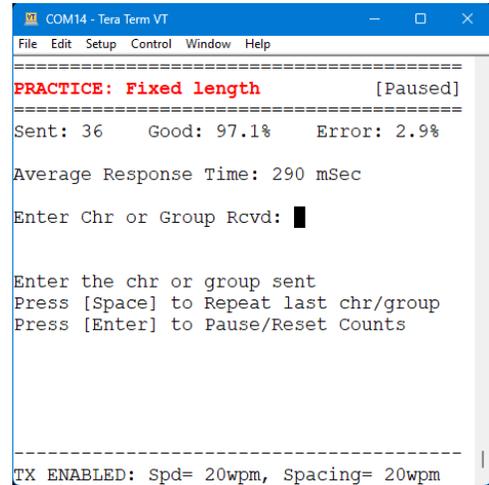
Practice Session – Send and Wait Modes

When you select one of the Send and Wait modes only the # of characters sent, % of Good, % of Errors, and your Average Response time is displayed.

When you hear the character or group being sent, enter it on the keyboard as quickly as possible. The lower your response time the better.

If you enter the wrong character or group the *Micro* will send a error (8 Dits) then resend that character or group. If you still enter the wrong character or group the *Micro* will increment the Error % and move to the next character.

```
COM14 - Tera Term VT                       —    □    ×
File  Edit  Setup  Control  Window  Help
========================================
PRACTICE: Fixed length            [Paused]
========================================
Sent: 36     Good: 97.1%     Error: 2.9%

Average Response Time: 290 mSec

Enter Chr or Group Rcvd: █


Enter the chr or group sent
Press [Space] to Repeat last chr/group
Press [Enter] to Pause/Reset Counts



----------------------------------------  |
TX ENABLED: Spd= 20wpm, Spacing= 20wpm
```

Press [Space] to repeat the last character or group (without penalty).

Press [Enter] to toggle Run and Pause mode. This also resets the counters.

WARNING!
If the transmitter interlock is enabled, the practice session will be sent to the *Micro's* Key Out jack and your radio can broadcast your practice session.

One other thing…
The random character generator doesn't filter the words it generates! This opens the possibility that inappropriate words may be generated. Sometimes this might add some spice to your practice session!

If this offends you in any way, please DO NOT USE Practice Mode in the Micro.

Call

Enter your call sign here. This field will be used to populate the CW message buffer with your call when you insert the *call prosign* [^] in the buffer. This is useful for CQ messages, contest exchanges, etc.

NOTE: Your call also serves as the Telnet unlock key when you enable **Telnet Login** in the **WiFi** menu. With the Telnet login option enabled you must enter your call to enable a Telnet session. This helps prevent unauthorized access to your *Micro* and radio by bad actors if you forward the *Micro's* Telnet port (IP Port 7950) through your router for internet access. More information on this option can be found in the **WiFi Menu** section.

Serial Number

This field holds the current contact serial number for the contest keyer. You can edit it here as needed. You can insert the current contact serial number into a CW message buffer by entering the *SN prosign*, [#]. The current serial number will be inserted into that message in place of the prosign when that message buffer is sent. To repeat a contest message without incrementing the SN send CW message #1 (the repeat buffer).
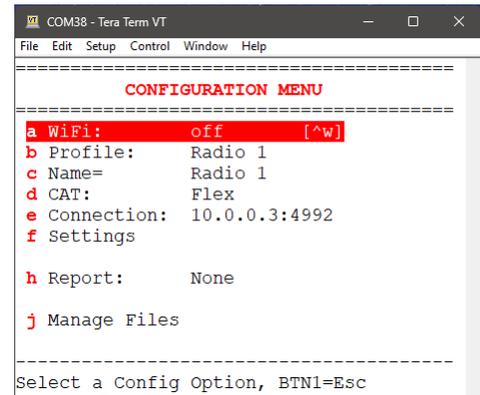
Exchange

This field holds the contest exchange. Edit it here as needed. You can insert the contest exchange into a CW message buffer by entering the *Exchange prosign*, [%]. The exchange field will be inserted into that message in place of the prosign when that message buffer is sent.

Configuration Menu

The **Configuration Menu** provides easy access to the *Micro's* settings.

From here you can manage the *Micro's* WiFi system, change profiles, change the selected profiles name, select the type of radio connected to the *Micro*, define the CAT connection type, change the tag line for the Home page, recalibrate several interfaces, change the **Code Report** options, and manage the configuration files that are saved in non-volatile RAM on the *Micro*.

```
COM38 - Tera Term VT                    —   □   ×
File  Edit  Setup  Control  Window  Help
========================================
            CONFIGURATION MENU
========================================
a WiFi:          off        [^w]
b Profile:       Radio 1
c Name=          Radio 1
d CAT:           Flex
e Connection:    10.0.0.3:4992
f Settings

h Report:        None

j Manage Files

----------------------------------------
Select a Config Option, BTN1=Esc
```

This option can be accessed by pressing **Ctrl+c** in the **Home** page assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Config** option.
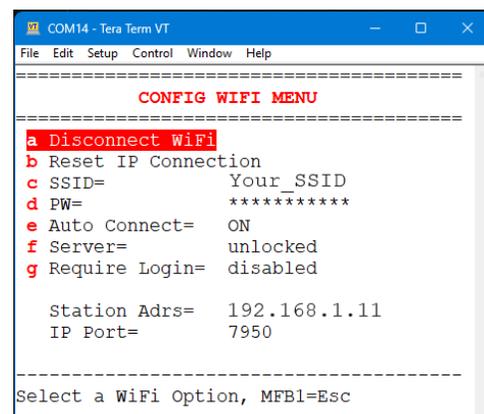
WiFi Menu

The **WiFi Menu** allows you to manage the WiFi network connection on your *Micro*.

This menu can be accessed by pressing **Ctrl+w** in the **Home** page.

Connect/Disconnect WiFi

This option allows you to toggle the connection status. You must have the SSID and Password for your router set before you can connect.

```
COM14 - Tera Term VT                    —   □   ×
File  Edit  Setup  Control  Window  Help
========================================
            CONFIG WIFI MENU
========================================
a Disconnect WiFi
b Reset IP Connection
c SSID=           Your_SSID
d PW=             ***********
e Auto Connect=   ON
f Server=         unlocked
g Require Login=  disabled

  Station Adrs=   192.168.1.11
  IP Port=        7950

----------------------------------------
Select a WiFi Option, MFB1=Esc
```

Reset IP Connection

This option is available when the *Micro* is connected to your WiFi network. It allows you to reset the TCP connection without disconnecting the WiFi connection. This is handy to cycle the connection to your Flex or browser if they're not paying attention to the *Micro*.

SSID

Enter your router's SSID here. The SSID is may be case sensitive so enter it exactly as shown on your router just to make sure.

> **NOTE:** If using **CTR2-Voice** as an access point, enter its SSID, *CTR2-Voice*, here.

Password

This is sometimes referred to as the Passkey. Enter your router's password here. This field is always case sensitive. The text if blocked with 11 asterisks on this page. The actual password will be visible in the text editor. The *Micro* supports WPA/WPA2 Personal and WPA3 encryption.

> **NOTE:** If using **CTR2-Voice** as an access point, enter its password, *ctr2-voice*, in all lower-case characters, here.

Auto Connect

This option allows you to set the *Micro* so that it connects to WiFi when it powers up. This is great if you're running a Flex radio or any other IP CAT controlled radio. If you're running SmartSDR v2.xx make sure it is running before you power the *Micro* up or the *Micro* connection will block SmartSDR from opening.

> **NOTE:** You can override the **Auto Connect** feature by pressing and holding BTN1 during power up.

> **NOTE:** When a terminal program is connected to the *Micro's* USB serial port, the *Micro* will reboot when the terminal program disconnects. If you want the WiFi to reconnect after this reboot, set **Auto Connect=ON.**

Server Lock/Unlock/Off

In a perfect world all web browsers would work the same way. Unfortunately, they don't. Desktop browsers and mobile browsers are completely different. Some browsers will accept frequency updates from the *Micro* on a connection that has been closed. Others won't. To help the *Micro's* server work with the greatest number of browsers I added the **Server Lock/Unlock/OFF** option. The **Lock** option tells the *Micro* to keep the client/server connection open continually after the browser initiates the first connection. The **Unlock** options allows the *Micro* to stop the connection to the client after it sends the response and then send frequency updates to the browser on the closed connection.

The option defaults to **Unlocked**. If you have problems with your browser updating the frequency toggle it to **Locked**.

You can turn the web server entirely **OFF** if you want to disable it for security reasons (the web server doesn't require a log in). Wifi must be disconnected before you can turn the web server off. This prevents inadvertently turning it off while you are controlling the *Micro* with the web server.

See the Browser Issues section for helpful hints if you run into problems on your browser.

Telnet Login

This option allows you to enable a basic login scheme on the *Micro*. This helps protect the *Micro* and your radio against unauthorized activity by internet bad actors. The login IS NOT a true Telnet login. Instead, when you connect a terminal program to the *Micro's* address and IP port the *Micro* will not respond to the connection. It will wait until the correct password is entered by the connecting computer. In this scheme, your call sign is password if you've set it, or the word micro if your call sign hasn't been set. The password is case sensitive. Once you enter the correct password the port will unlock until the power is cycled on the *Micro*.

> **NOTE:** You will be given three tries in two minutes to enter the correct password. If the wrong password is entered the *Micro* disconnects. Reconnect and try again. After three tries the *Micro* will lock out the connection for two minutes and the cycle repeats. A note will be placed at the bottom of the Home page if logins fail.

Station Address and Telnet Port

These will be populated when the *Micro* is connected to a network. This is the IP address and IP port # it uses for IP Telnet connections (7950) to the *Micro*. Enter the IP address and port # into your Telnet terminal program to connect to the *Micro*.

NOTE: The *Micro* doesn't use the standard Telnet port. Refer to IP Session in Appendix E for more information.
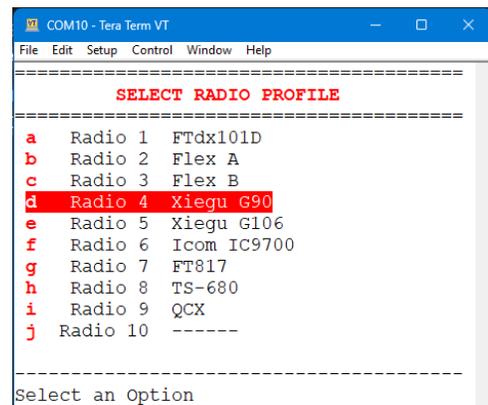

Radio Profile Menu

The *Micro* supports up to 10 radio profiles. These are similar to the **Radio Ports** in the Mini but on the *Micro* serial CAT polarity strapping changes must be done manually.

Flex radio users can create a profile for different slices then easily switch between them using this menu.

Edit the name associated with a profile in the Name menu.

Each profile contains all of the settings for that radio in

```
COM10 - Tera Term VT                    —    □    ×
File  Edit  Setup  Control  Window  Help
========================================
          SELECT RADIO PROFILE
========================================
a    Radio 1   FTdx101D
b    Radio 2   Flex A
c    Radio 3   Flex B
d    Radio 4   Xiegu G90
e    Radio 5   Xiegu G106
f    Radio 6   Icom IC9700
g    Radio 7   FT817
h    Radio 8   TS-680
i    Radio 9   QCX
j    Radio 10  ------

----------------------------------------
Select an Option
```

addition to a favorite frequency list for that radio. You can share a common favorite frequency list among all of the radios on this list by selecting **Shared Database** in the **Frequency** menu.

Radio profiles also include the **WiFi** and **Report** settings. This allows you to setup different profiles for various operating scenarios.

Here are two examples:

1) When you use the *Micro* and **CTR2-Voice** at home, save one profile with the WiFi credentials for your station's WiFi router and the IP address of **CTR2-Voice** when it's connected as a WiFi Station to your station router.
2) When you use the *Micro* and **CTR2-Voice** in a portable scenario, save another profile with the WiFi credentials for the **CTR2-Voice** in access point mode (SSID=*CTR2-Voice*, password=*ctr2-voice*) and the IP address of **CTR2-Voice** in this mode (192.168.4.1).

Name (Radio Profile)

This option allows you to edit the name used to identify the selected radio profile. The name is displayed in the top-left corner of the Home page in the terminal interface and as the top header in the browser interface to help you keep track of which profile you have selected.


CAT Menu

The **CAT** item opens the **CAT Menu** where you select the radio model the *Micro* is connected to. CAT is an acronym for 'Computer Aided Transceiver'. Some manufactures have different names for this such as 'Control Port', or Icom's 'CI-V'. They all mean the same thing.

The *Micro* supports a wide range of modern transceivers. If your radio isn't on the list it may still be supported. You can contact me and I'll check your radio's protocol and let you know if the *Micro* will work with it.

Bridge

Bridge is a special mode allows you use the *Micro* as a WiFi/Serial interface. Data coming into the *Micro's* WiFi UDP port is forwarded to the serial CAT port and data coming from the radio's serial CAT port is forwarded to the UDP port and on the remote PC. No formatting is done on the data. When **Bridge** mode is selected most of the *Micro's* options are turned off.

This is similar to using an RS-232 IP/Serial Terminal interface however the *Micro* supports several serial interfaces.
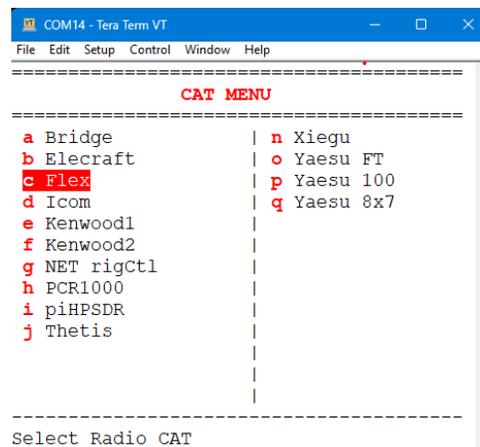
If you are connecting to your radio using serial CAT control you will also need to set the CAT polarity jumpers or DIP switch settings for that radio. More information on this can be found in the CAT Polarity Jumpers/DIP Switch Settings section in Appendix C.

Connection Menu

The **Connection Menu** allows you to select either the baud rate for the serial CAT port or the IP address and IP Port # if using WiFi to connect to your radio (i.e. Flex radio, K4, etc).

Baud Rate

The first eight items in this menu set the baud rate from 1200 to 115200 baud for the serial CAT port on the *Micro* (i.e. the CAT I/O jack on the back of the unit). The *Micro's* baud rate must match the baud setting on your radio and you must strap the *Micro's* CAT polarity to match your radio's CAT interface.

*IP Address, IP Port #, Port Type*

If you're connecting to an IP based radio like the Flex, K4, Thetis, or piHPSDR, enter its IP address and IP port here. The *Micro* will insert the default TCP port # for the selected radio. You can change the port # if you have changed the default port on your radio. You can also change the IP port type between TCP and UDP if your radio uses the UDP port type instead of TCP.

By entering the IP address of a remote Mini or *Micro*, and using UDP port 7951 you can create an ad hoc network to connect two devices together for remote operation. This allows you have a *Micro* in your shack connected to your radio's serial CAT port and control it remotely with a Mini or another *Micro*. You can even have two or more devices located in your shack with one device (or more) dedicated to a certain function like Speed, Volume, or RIT. This allows you to use one device to tune the radio and the other to change keyer speed, RIT, volume, etc.) The Expanded Options section explains these configurations in more detail.

NOTE: You can't use the hotspot on your tablet or cell phone to create a remote ad hoc network because these hotspots use Carrier Grade Network Address Translation (CGNAT) which doesn't allow port forwarding or UDP traffic.

Reset IP

The **Reset IP** option on this page quickly resets the IP connection without going through a full disconnect sequence. This is useful if you need to get the attention of an IP radio. This option is also included in the **WiFi Menu**.
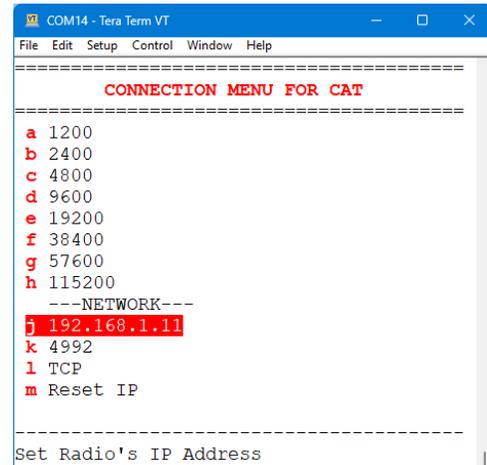
Settings Menu

The **Settings Menu** allows you to change several settings on the *Micro*.

```
COM14 - Tera Term VT                    —    □    ×
File  Edit  Setup  Control  Window  Help
========================================
              SETTINGS MENU
========================================
a  Tag Line=        CTR2-Micro by KU7Q
b  S-Meter Cal=     1.00
c  Encoder Type=    Detent (fast)
d  Encoder Dir=     Normal
e  Menu Timeout=    DISABLED
f  LED State=       Active

h  Multi-Func Btn Calibration

----------------------------------------
CTR2-Micro by KU7Q
```

Tag Line
Edit this field to change the tag line displayed at the bottom of the terminal display.

S-Meter Calibration
This option allows you to calibrate the S-meter on the *Micro's* Home page to match the radio's meter. The calibration value represents a ratio between the received meter value and the value displayed on the screen. This is a floating point number so fractional values are acceptable. Adjust this as needed.

> **NOTE:** Set the S-meter calibration to 0 to disable the S-meter.

Knob Type
There are two knob types available for the *Micro*. A detent knob has feedback as you turn the dial (i.e. small 'bumps'). A no-detent knob is smooth, with no feedback. You can choose the one that fits your preference when you order your *Micro*, but I recommend that you go with the detent knob if you will be using the *Micro* in **Code Report** mode with no display or with the browser interface. This is because it gives you feedback as you move between the menus. Another advantage is that inadvertently bumping the knob on the detent knob doesn't change your radio's frequency.

When set to the **No-Detent (slow)** option the knob slows to ½ speed when navigating menus.

Knob Direction
The **Knob Direction** allows you to reverse the knob.

The *Micro's* design allows the knob and pushbuttons to be mounted on the back of the PCB. This configuration allows you to mount the *Micro* to a panel or in another device in your shack. If you mount the *Micro* this way, **Reverse** the knob's direction here.

Menu Timeout
This option allows you to disable the 10 second menu timeout feature if you're using a screen reader or other assisted method to run your *Micro*. I suggest leaving it enabled if you run your *Micro* in standalone mode so the *Micro* will exit most menus if you get lost.

LED State
This option allows you to stop the LED from flashing the program's state. Some may find the flashing distracting. When flashing is OFF press BTN1 to check for power (LED will light if unit is on). **NOTE:** This will also activate the function assigned the MBF1.
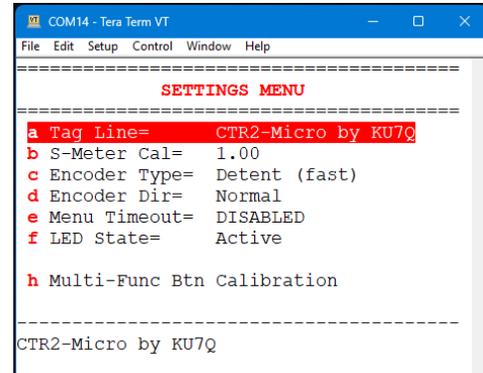
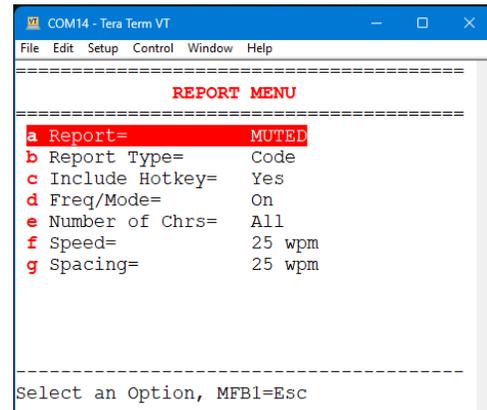*Multi-Function Button Calibration*

The *Micro* uses a resistive ladder to read the state of the multi-function buttons (BTNs). The range is narrow because the buttons share the same input as the LED output.

The buttons where calibrated during the initial startup of the *Micro*. This menu item gives you to opportunity to repeat that process if you find the first calibration isn't responding properly.

Report Menu

Since the *Micro* doesn't have a built-in display, several alternative interfaces are provided. When a computer is available the terminal and web browser user interfaces are available. For standalone operation, or when the operator is blind or sight-limited, the **Report** menu provides additional ways to interact with the *Micro*.

The following reports are available. They can be used in conjunction with the terminal and browser interfaces.

```
COM14 - Tera Term VT                    —   □   ×
File  Edit  Setup  Control  Window  Help
========================================
              REPORT MENU
========================================
a  Report=              MUTED
b  Report Type=         Code
c  Include Hotkey=      Yes
d  Freq/Mode=           On
e  Number of Chrs=      All
f  Speed=               25 wpm
g  Spacing=             25 wpm


----------------------------------------
Select an Option, MFB1=Esc
```

- The **Code** report sends program changes to the *Micro's* keyer where they are sent in Morse code. The menu allows you to change different settings that are specific to the **Code** report.
- The **Text** report is optimized for the screen readers used by blind and sight-limited hams. This mode sends unformatted lines of text to the terminal.
- The **Voice** report works with **CTR2-Voice**. This report is similar to the **Text** report in that it sends optimized text to the **CTR2-Voice** speech synthesizer via WiFi. No terminal program or screen reader is required.
- The **Display** report is also similar to the **Text** report. This mode works with **CTR2-Display** firmware running on a Seeed Studios Wio Terminal. The Wio Terminal becomes a simple WiFi connected display for the *Micro*.

    NOTE: **CTR2-Voice** and **CTR2-Display** can be used together and multiple Micros can share these interfaces at the same time.

There are several BTN functions you can use with the **Report** mode. Use the **Quick Key Function Option** menu to assign these functions to a BTN.

- **Report** plays the short report consisting of the selected VFO and its frequency, RIT offset (if on) and mode. In addition, the tuning resolution, Tx interlock state, and S-meter value. It normally reports just items that have changed state since the last report, like the S-meter value. Press the BTN again within 10 seconds to hear the entire report. By default this is assigned to short-press BTN1.
- **Full Rpt** (Full Report) plays the settings on the Home page including the Radio Profile name, selected CAT protocol and connection (baud or IP address), Tx interlock, WiFi state (off or RSSI), active VFO and its frequency, RIT offset, mode, tuning resolution, Tx interlock state, S-meter

value, offline VFO and its frequency, and the radio parameters listed above the FKey labels. By default, this is assigned to long-press BTN2.

- **Repeat** replays the last report. This is handy in case you missed something. By default this is assigned to short-press BTN2.
- **Help** plays the currently selected item's Help page. This is handy if you're not sure where you are in the menu system. You can also press and hold the knob then turn it to the left to return to the Home page. By default, **Help** is assigned to long-press BTN1.

NOTE: Short-press **Report** BTN within 5 seconds of starting a **Voice** report to cancel it.

There are several items in the **Report** menu. Available options change depending on the **Report Type** selected.

Report On/Mute
This item enables or disables the selected report. When unmuted the report type will be displayed in bold text on the Home page next to the WiFi status.

> **HINT:** Long press (> 2 seconds) the knob in the **Home** page to toggle **Report Mute** on and off.

Report Type
Press the knob or [Enter] to step through the report types available. Options include **None, Code**, **Text**, **Display**, **Voice**, **Display+Voice**. Additional options may appear on the menu depending on the selected report type.
> **NOTE:** Changing the report type will mute the report.

Include Hotkeys
This option allows you to choose whether or not you want the menu *hotkeys* added to the report output.

For the **Code Report**, the following options are also available:

Freq/Mode On/Off
When this mode is ON the *Micro* will report frequency, tuning digit, and radio mode changes in code when they change. This is helpful for visually impaired hams that may have trouble seeing their radio's display, or when operating the *Micro* without a display.

Number of Characters
You can choose from 1 to all menu characters to be reported when you change a menu selection. You may want to start with reporting all characters then reduce it down as you get to know the *Micro's* menu structure.

> **NOTE:** Setting the number of characters to 0 disables menu reports. Setting it to 10 will enable reporting all menu item characters.

Report Speed and Spacing

Report CW speed and spacing are separate from the keyer's normal speed and spacing. The **Code** report's minimum speed is set to 15 wpm. This allows you to learn the code as a string of sounds instead of counting individual Dits and Dahs. The spacing can be set down to 5 wpm.

There are no additional options for **Text Report**.

For the **Display Report** the **CTR2-Display IP** field allows you to enter the IP address of the Wio Terminal running the **CTR2-Display** firmware. Report text will be sent to this address using UDP packets. This allows multiple Micros to use the same display unit.

For the **Voice Report**, the following options are also available:

CTR2-Voice IP
This field allows you to enter the IP address of your **CTR2-Voice** unit. It will announce its IP address when it boots. Report text will be sent to this unit using UDP packets. This allows multiple Micros to use the same voice unit.

Voice Settings
This option opens the **Voice Settings** menu where you can make the following changes to the settings on **CTR2-Voice:**
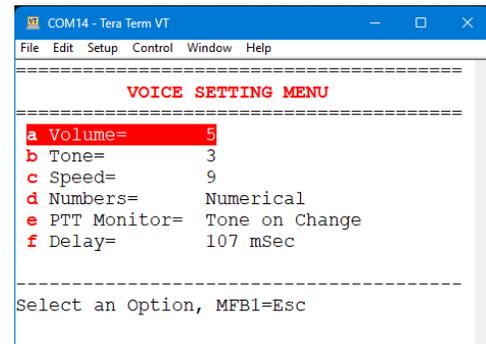
Volume adjusts the output volume. The range is 0 to 9, default is 5.
Tone adjusts the tone of the voice. Then range is 0 to 9, default is 3.
Speed adjusts the speed of the voice. The range is 0 to 9, default is 9.
Numbers allows you to choose how numbers are pronounced.

- **Digits** - Individual digits are pronounced. Example: 14.150040 is pronounced as "One Four dot One Five Zero Zero Four Zero".
- **Numerical** – Numbers are pronounced numerically. Example: 14.150040 is pronounced as "Fourteen dot One Hundred Fifty Thousand Forty".

PTT Monitor provides several options for monitoring the state of PTT on the *Micro*. This allows blind and sight-limited users to confirm when PTT is activated and deactivated.

- **None** – no PTT monitoring
- **Tone on Change** – A short high-pitched tone is emitted when PTT is keyed. A short low-pitched tone is emitted when PTT is released.
- **Voice on Change** – "PTT On" is pronounced when PTT is keyed. "PTT Off" is pronounced when PTT is released.

Delay allows you to adjust the amount of time before changes are sent to **CTR2-Voice**. If you find the voice starts sooner than you would like you can increase this time.

> **NOTE:** This delay is in addition to the 700 milliseconds the speech processor takes to convert text to speech.

Station/Access Point Mode
CTR2-Voice can be configured as either a WiFi Station (to connect to your station's WiFi router) or as a WiFi Access Point (to provide its own WiFi network). To change the unit's WiFi mode you must connect to its virtual USB serial port with a terminal program. More information on these options can be found in the **CTR2-Voice Operation Manual**.

Manage Files

This option opens a menu where you can select various file management options.

Backup Files
This option backs up all of the *Micro's* configuration files for the selected **Radio Profile**. This allows you to restore the *Micro* to a previous configuration if for some reason the file system misbehaves. I recommend backing up your files after you have set up your *Micro's* configuration.

Restore Files
This option restores you *Micro* back to the configuration it had the last time you backed up your files. You may wish to make temporary changes in your configuration to try them out. Restoring your files will remove those changes if you didn't back them up.

This option will not be visible in the menu until you execute **Backup Files**.

Export Settings to a PC
This feature allows you to backup all of the setting files (including all frequency, band, and radio profile files) on your unit to a single file using **Tera Term's** *File -> XModem -> Receive…* function. The *XModem Receive* function <u>receives</u> data from the *Micro.* To restore these settings back to your unit, use the *Import Settings from a PC* feature described below.

To start the export, select *Configure -> Manage Files -> Export Settings to a PC.* Follow the directions in the order given.

Tera Term will open a file dialog box. Navigate to the folder you want to save your export file to and enter a name for your file. You should also enter a file extension. I recommend using the **.txt** extension because the exported file is a text file you can view in a text editor.

Once you have selected a file to save your settings to (I named the file *Micro_test.txt*), Tera Term opens this window and waits for the transfer to start.

To start the transfer, press and release the knob on the *Micro*.

Once the transfer completes the program will return to the *Manage File* screen.

Import Settings from a PC
This feature allows you to restore all of the setting files (including all frequency, band, and radio profile files) from a file and exported file that previously saved on you PC using the *Export Settings to a PC* feature described above.
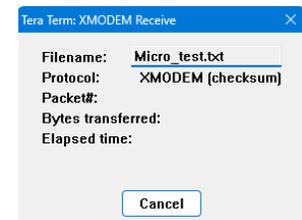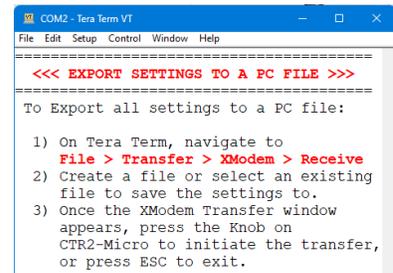
Use the following process to import your exported data back into the *Micro.*

In the *Micro,* open the *Configure -> Manage Files -> Import Settings from a PC* menu. Follow the instructions listed in this screen.
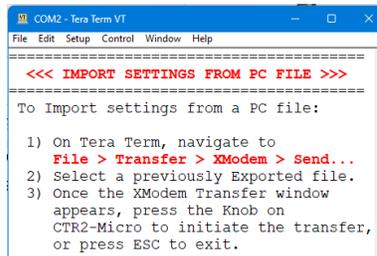
On Tera Term, open the *File -> Transfer -> XModem -> Send…* menu option. The *XModem -> Send* function <u>sends</u> data to the *Micro. A* file dialog box will appear. Select a previously exported file from the list. In this example, I've selected *Micro_test.txt.*

The *XModem Send* window appears and XModem is waiting for you to start the transfer.
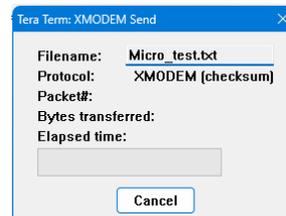
To start the transfer, press and release the knob on the *Micro.*

If the transfer is successful the following screen will appear on the terminal showing which files were successfully updated.
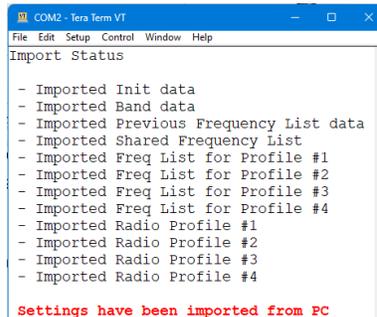
NOTE: The settings contained in the files listed will be overwritten on the *Micro*. If you have other frequency lists or radio profiles on your unit, they will not be overwritten.

NOTE: If you have a radio profile that you want to remove permanently, select the radio profile you want to remove in *Configure -> Profile* then use the *Reset this Profile to Factory* option to clear the current profile and return you to *Profile 1*.

Reset this Profile to Factory
This is the 'if all else fails' option. If something happens to your configuration that can't be undone for some reason, or you just want to start over with default settings, this is the option you're looking for.

This option deletes the common initialization files and all files associated with the selected **Radio Profile**. Other radio profiles will not be deleted.

NOTE: You will need to recalibrate the BTNs after resetting a profile to factory settings.

Radio Menus

Like the CTR2-Mini the *Micro* offers expanded control for many radio models. Others may be added in the future as time and need dictate. I'll update this manual as changes are made.

When selecting one of the **Radio CAT** protocols that support enhanced control, a menu for that radio appears as the second to last item on the **Main** menu (above the **About…** item). Opening that menu gives you access to the various functions I've included for these radios.

This menu will remain active until you press [Esc], press and turn the knob LEFT, or long-press the knob to exit it.

This menu can be accessed by pressing **Ctrl+r** in the **Home** page and it can be assigned to an FKey or BTN in **the Quick Key Function Option** menu using the **Radio** option.

Radio Menu Special Features

To use the keyer to key your radio while you are in the **Radio** menu the Paddle Navigation and Edit modes must be turned off.

BTN Functions in the Radio Menu
The BTN short-press functions change when you enter the **Radio** menu. These provide an easy way to exit the menu, change the transmit interlock, or toggle the active VFO.

- Short-press BTN1 to exit the menu
- Short-press BTN2 to toggle the **transmit interlock**
- Short-press BTN3 to toggle the active VFO

Quick Access to Radio Functions
The **Radio** menu can be assigned to an FKey or BTN in the **Quick Key Function Option** menu using the **Radio** option. In addition, you can choose from 16 of the radio functions to assign to an FKey or BTN. They appear in the left column on Page 2 of the **Quick Key Function Option** menu.

Muting the Radio's Rx
To quickly mute the radio's receiver, select the **Volume** item. When the volume edit window opens, long-press the knob to zero the value and mute the receiver. Long-press the knob again to return to the original volume setting.

Elecraft Menu

The Elecraft menu is also styled after the layout used in the FTdx menu described above. Refer to that section for detailed explanations of each function.

If your radio doesn't have two receivers, use the VFO->Ctrl VFO menu option to select which VFO the *Micro* controls. If you select **RX=B** on this menu, **VFO Ctrl** will be set to **VFO Ctrl=A** so each *Micro* VFO controls the correct receiver.

The **Comp** control allows you to adjust the Speech Compressor on the transmitter. K3 radios have a 0 to 40 dB range where K4 radios have a 0 to 30 dB range.

The **Tuner** option just toggles the radio's tuner between **Bypass** and **Auto** mode.

The K4 has network CAT control built in so you can enter the radio's IP address and TCP port **9200** in the Config->Connection menu then connect using WiFi instead of using a wired RS-232 connection between the *Micro* and the radio. The K4 also support a Panadapter Level control that is not shown on this screenshot.

> NOTE: The Elecraft menu in this example has asterisk (*) next to many of the options because I don't have an Elecraft radio to connect to so these are shown as off-line.

Flex 6000 Menu

The **Flex** menu is visible in the main menu when you select the **Flex Radio Protocol.** This menu gives you control over enough of the features of this radio that you can operate it without the SmartSDR software. You may want to do this if you're monitoring a band for activity and don't want or need SmartSDR running. Or maybe you just want to operate your Flex as a P.O.R. (Plain Old Radio).

But even with SmartSDR running the *Micro* adds significantly to the operation of this radio by providing a smart tuning knob for the radio and function button access to the features you use the most.

You have the option of connecting to your Flex as a **GUI client** or **non-GUI client** (*hotkey u*). Running as a **GUI client** on the *Micro* allows you to see the radio's transmit and tune power settings. These aren't updated when running **non-GUI client** mode without SmartSDR running.
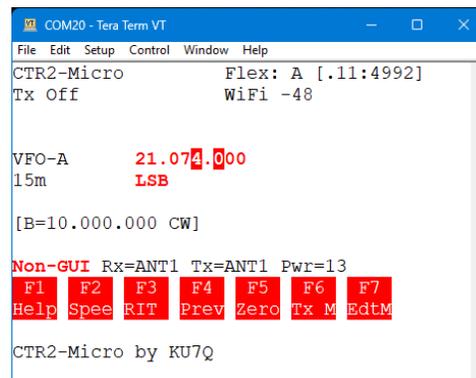
If you're running v1.xx or v2.xx of SmartSDR you won't be able to connect to your radio as a GUI client if SmartSDR is running because older versions of SmartSDR don't support multiple clients. The connection type is shown in bold text in the options line just above the FKey labels.

```
COM20 - Tera Term VT                  —    □    ×
File  Edit  Setup  Control  Window  Help
CTR2-Micro           Flex: A [.11:4992]
Tx Off               WiFi -48


VFO-A       21.074.000
15m         LSB

[B=10.000.000 CW]

Non-GUI Rx=ANT1 Tx=ANT1 Pwr=13
 F1   F2   F3   F4   F5   F6   F7
Help Spee RIT  Prev Zero Tx M EdtM

CTR2-Micro by KU7Q
```

If you connect to your radio as a GUI client then decide to switch to a non-GUI client, use the **Reset IP Connection** command on the **WiFi** menu to release the connection and reconnect as a non-GUI client. If you're running SmartSDR 3.xx there's no worries because it supports multiple GUI clients.

NOTE: If a GUI client connection attempt fails the Mini will connect as a non-GUI client.

RIT is set on the slice from the **Frequency** menu. This menu gives you access to additional features on the radio.

Panadapter
The **Pan** option allows you to specify if you want to **CREATE** a panadapter or use the **Existing** panadapter when you connect to the radio with the selected *Slice.* You may want to create a new panadapter if you're connecting two Micros to your radio and want the second *Micro's* slice in a separate panadapter.

Slice #
Slice allows you to specify which slice you want to connect this *Micro* to on the radio. You can specify slice A through H depending on your radio's capacity. In theory you can have up to eight Micros and/or Mini's connected to one radio, each controlling one slice.

If the slice you have selected in the **Flex** menu doesn't exist on the radio it will be created in the first available panadapter. If no panadapters are running, a new panadapter will be created for the new slice if you select **Pan=CREATE** before you select a new slice.

You can connect more than one *Micro* to the same slice and configure each one for separate options.

> **NOTE:** Changing the **Slice** when the *Micro* is online with the radio will refresh the IP connection to the radio and switch the *Micro* to the new slice. If the **Pan=** option has been set to **CREATE**, a new panadapter will be opened for the new slice if one is available.

Rx (Antenna)
This option allows you to select ANT1, ANT2, RX A, RX B, or XVTA for this slice.

Tx (Antenna)

This option allows you to select ANT1, ANT2, or XVTA for the transmitter.

Power Out (PO)

Use this option to set the transmit power on the radio. The transmit power is common to all slices.

Tune Power Out

Use this option to set the tuning power level on the radio.

ATU (Tuner)

This option shows the status of the built-in antenna tuner if it's installed. To start the antenna tuning sequence, select this option and press [Enter] or the knob.

Vol

This option allows you to control the volume on the slice this *Micro* is controlling. A quick way to mute this slice is to long-press the knob (>1 second). This sets the volume to 0. Long-pressing the knob again returns you to the original setting.

> **NOTE:** This setting only controls the analog speaker/headphone output on the rear of the radio. It does not change the volume on the DAX. To change the DAX volume, adjust it on your PC's sound mixer.

BW (Bandwidth)

The **Bandwidth** option allows you to step through the available bandwidths for the current mode. Bandwidth decreases with each click of this control until you reach the lowest bandwidth setting. Clicking this control again starts over at the widest bandwidth.

Filters (WNBlnker, NBlnker, NR, ANF/APF)

The various filters on the radio can be adjusted using these options. Setting a filter to 0 disables that filter. A quick way to toggle a filter on and off is to long-press (> 1 second) the knob.

Gain (RF Gain)

This control allows you to select the gain applied in the slice's RF section. The available gain settings depend on the model of the radio. Older 6300 and 6500 radios offer -10, 0, 10, and 20 dB of gain. Newer 6400, 6600, and 6700 radios offer -8, 0, 8, 16, 24, and 32 dB of gain.

> **NOTE:** Gain selection is numbered -1 to 2 for older radios and -1 to 4 for newer radios. This correlates to the gain positions. The actual gain will be shown on the menu.

AGC

This control allows you to step through the **AGC** settings on this slice. Options are **Fast**, **Med**, **Slow**, and **Off.**

AGC-T (Threshold)

This control allows you to adjust the **AGC-Threshold** level. Flex recommends setting this level after you have set the **Mode**, **RF Gain,** and **AGC.** Tune to a quiet spot on the band then lower the **AGC-T** control until you hear the noise level decrease slightly. This is the 'knee' of the control and means the **AGC** is not applying gain to the noise but signals you want to hear will be amplified. More information on this control can be found here.

VOX Level

This control allows you to enable or disable VOX on your radio. To enable VOX, set this control to any level above 0 (the range is 0 to 100). To disable VOX, set this control to 0.

> **NOTE:** You can toggle between the set level and 0 by long-pressing the knob while in the value editor screen. The set level will be remembered when you toggle it to 0. Long-press the knob again to enable VOX and return to the set level.

PTT

This option allows you to select between *Hardware* and *Network* control of the radio's PTT. Use the *Hardware* option if you've wired **PTT Output** on the *Micro* to the radio's PTT input on the DB15 connector (or to the RCA PTT connector) on the back of the radio. Use the *Network* option to key the radio over the WiFi connection.

Key

Like the **PTT** option above this option allows you to specify *Hardware* or *Network* control of the radio's **Key** input. Use the *Hardware* setting if you have wired the **Key Output** on the *Micro* to the Key Input on the radio. Use the *Network* setting to send the *Micro's* keyer output over the WiFi network to the radio. This allows you to operate real CW when you're operating your radio remotely. See Flex Network CW Keying and PTT below.

If you have selected any of the *Micro's* [**Keyer Types**](Keyer Types) with the exception of **None** or **Passthru** the *Micro* will automatically select **Breakin** on the radio's *P/CW* window and disable the Iambic keyer in the radio when you enable the Tx interlock on the *Micro*. If you're using the network for CW keying you'll need to [enable sidetone on the *Micro*](enable sidetone on the Micro) so you can hear the *Micro's* key output. The radio doesn't generate sidetone when keyed from the network. Even if it did, the network delay would make it unusable. You may need to adjust the **CW Delay** to get good timing.

CW Delay

The final option on the *Flex* menu is the **CW Delay**. You'll need to adjust this value to compensate for network latency when using *Network Keying*. Depending on your network's latency you may need 100 to 250 milliseconds of delay to get good code across the network.

Flex Network CW Keying and PTT

The Flex radio supports CW keying and PTT over the network. This eliminates the need for a physical cable connection between the *Micro's* PTT/Key Out jack and the radio. The big advantage of this is that you can take your *Micro* out of your shack and still operate CW or voice remotely. Many find it convenient to run SmartSDR on their iPad with the *Micro's* browser interface open in a split screen as shown here.

There are, as always, some caveats to operating this way.

Connection Sequence
If you are going to use network keying, always start SmartSDR first, before powering up the *Micro*, even when using v3.xx SmartSDR firmware. Once SmartSDR is running, power up the *Micro* and connect it to WiFi. You can enable the **Auto Connect** option in the **WiFi** menu so the *Micro* connects to WiFi on power up. When powering down SmartSDR, always disconnect the *Micro* from WiFi too.

If the *Micro* is left connected to the radio after SmartSDR closes, the next time you open SmartSDR the *Micro* connection confuses the radio and it goes into a zombie state when you try to key it using network keying on the *Micro*. The radio will go into transmit mode, the "TX Ready" icon in the bottom-right corner of SmartSDR will turn red, the MOX button will turn red, and the power button on the front of the radio will turn red, **BUT THE RADIO WILL NOT GENERATE A CW CARRIER**. Other modes like SSB, AM, and FM still work, but CW is dead. The only remedy to this condition is to shut down SmartSDR, power down the *Micro*, then power cycle the radio.

Network Latency and Congestion
A slow or congested network is the #1 problem encountered when using network keying. This includes traffic on the normal Ethernet connections and most importantly, on the WiFi connection. In order to get reliable keying your network must pass the Flex API keying commands as quickly as possible. Any delay will cause a noticeable delay in your CW signal. If you have a lot of WiFi devices on your network you may need to install a separate Access Point router. Also, make sure that you have unique SSIDs for the 2 and 5 GHz radios in your network. The *Micro* only supports 2 GHz WiFi.

Using the Micro with SmartSDR on the iPad
The iOS version of SmartSDR makes a great portable control console for the Flex radio. The *Micro* can supplement its operation by providing a physical tuning knob, a paddle interface for network keying, and a web browser control pad for quick access to the FKey and BTN functions. This setup is shown in the photo at the top of this section.

To open both SmartSDR and the browser in split screen mode, open SmartSDR first. Once the panadapter opens connect the *Micro* to WiFi. Next press the three dots (…) at the top of the iPad screen and select **Slide Over**. The iPad will prompt you to open another app. Open your browser app. It will slide to the right and SmartSDR will be displayed on the left. On the browser, enter your *Micro's* IP address in the address bar to connect to the *Micro's* web server.

When you finish operating, disconnect the *Micro* from WiFi first then close SmartSDR.

NOTE: If you will only be using the *Micro* with SmartSDR for iOS or MacOS for remote access you might consider purchasing a CTR2-MIDI instead. This device connects directly to the Apple device using Bluetooth-LE or USB. For remote operation, the SmartSDR app can connect to your radio using SmartLink thereby eliminating the need to open port 4992 through your station's router to allow the *Micro* to control your radio directly.

Icom Menu

The functions on this menu follow the layout of the Yaesu FTdx menu and operate similar to those described above. The Icom menu doesn't support antenna selection or panadapter scope levels since those aren't documented in the Icom CAT protocol document. I'll add them if and when I find the CAT descriptions for them.

If your radio doesn't have two receivers, use the VFO->Ctrl VFO menu option to select which VFO the *Micro* controls. If you select **RX=SUB** on this menu, **VFO Ctrl** will be set to **VFO Ctrl=A** so each *Micro* VFO controls the correct receiver.

RX

To switch to the Sub receiver on a dual-receiver radios (7610 or 9700), select **RX: A** and press the knob. The settings on this page will update to show the **B** receiver's settings.

TX

To use the **B** receiver's VFO for transmit on the 7610 select **TX: A** and press the knob to toggle to **TX: B**. In this mode the radio goes into Split mode where the radio's B VFO is used to control the transmit frequency and mode.

PTT

Select this option to toggle PTT between Hardware and CAT control.

Adrs

This option allows you to change the CI-V address assigned to this radio. Initially the address is set to 00 and the Mini determines the radio's address when it replies to the first command. For this to happen the CAT mode in the radio must be set to **Transceiver** mode. You can manually enter this address.

NOTE: When you select the Icom protocol you'll be asked for the radio's CI-V address. If you leave it set to 0 the *Micro* will use the address the radio returns after the first command.

NOTES on the IC-9700

The IC-9700 has separate receivers for each band. This means that you can't tune outside of the selected band and you can't have the same band selected for both receivers.

Kenwood Menu

The Kenwood menu is available when you select the **Kenwood1** protocol. This menu provides advanced control features for newer Kenwood radios such as the TS-480 and TS-2000. I used the TS-2000 protocol document to create this menu so not all of these features will be available on every Kenwood radio.

> **NOTE:** Older Kenwood radios using the **Kenwood2** protocol (4800 baud, 2 stop bits) only allow control of frequency, mode, and RIT therefore this menu is not available.

If your radio doesn't have two receivers, use the **VFO->Ctrl VFO** menu option to select which VFO the *Micro* controls. If you select **RX=SUB** on this menu, **VFO Ctrl** will be set to **VFO Ctrl=A** so each *Micro* VFO controls the correct receiver.

The options on the Kenwood menu are pretty straight forward, with a couple of oddities.

- If your radio doesn't have a Sub receiver (such as the TS-480) the **Sub Rx** options obviously won't work. Enabling the **Sub Rx** turns off **VFO->Ctrl A & B** mode if it was on.

- The **Bandwidth** control adjustment is shown in Hz in the *Value Input* window. The radio however has discrete frequencies for this mode. When you accept the new value the actual frequency the radio is using will be shown on the menu.

- The **Tuner** menu option opens the **Tuner** menu. On this menu you can choose to route the receiver and/or transmitter RF path through the tuner. Click the **Tuner Status** option to start or stop the tuner.

- The **APO** (Automatic Power Off) on your radio will not work when the *Micro* is connected to it because the CAT activity will keep the radio awake.

NOTE: The Kenwood menu in this example has an asterisk (*) next to most of the options because I don't have a newer Kenwood radio to connect to so these are shown as off-line.

Hamlib NET rigCtl Menu

Some radios support Hamlib's **rigCtl** IP based CAT control. This protocol allows you to control your radio over the IP network without using a serial CAT connection.

SDR radios in particular seem to favor this protocol. Generally, with SDR radios, the program controlling the radio provides the rigCtl service for the radio so you would set the CAT IP address to match the host PC's address and set the IP Port for the port the app uses.

Radios supporting NET rigCtl typically use IP port 4532 but not all radios use this port. Most radio control apps use an IP port unique to them. For instance, SparkSDR uses IP port 51111. Check your app's specification to find the IP port it uses.

Not all radios support all of the rigCtl commands and this is a work in progress. Commands that don't respond to polling are hidden in the **Radio** menu.

NOTE: Even though the **piHPSDR** software shows **RigCtl** as the protocol it uses for CAT control, it actually uses an odd combination of Kenwood TS-2000 and PowerSDR (extended Kenwood commands). There is a separate protocol option in the **Configure -> CAT** menu to control **piHPSDR**.

PCR1000 Menu

I created a special menu for the Icom PCR1000 radio mostly because I had one gathering dust. It's not the best radio by today's standards but it is wideband and still has value in my shack. At least one Mini user uses his PCR1000 to monitor for 1296 MHz beacons in his area.

There are a couple of differences between the PCR1000 implementation and all the other radios.

First, that the PCR1000 uses the transmit interlock to control the control the power to the radio. You can control the power from this menu, with the [Home] key on the terminal keyboard, or with a BTN that is assigned to the transmit interlock.
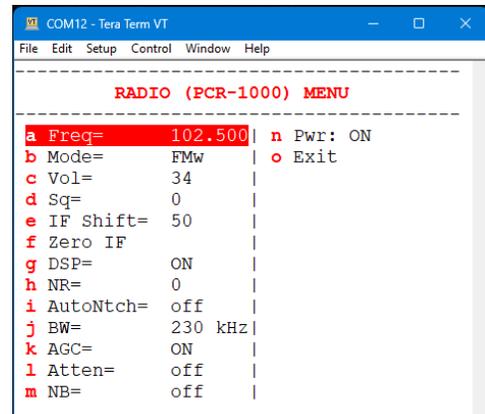
```
COM12 - Tera Term VT                    □  ×
File  Edit  Setup  Control  Window  Help
------------------------------------------
        RADIO (PCR-1000) MENU
------------------------------------------
a Freq=        102.500| n Pwr: ON
b Mode=        FMw     | o Exit
c Vol=         34      |
d Sq=          0       |
e IF Shift=    50      |
f Zero IF             |
g DSP=         ON      |
h NR=          0       |
i AutoNtch=    off     |
j BW=          230 kHz|
k AGC=         ON      |
l Atten=       off     |
m NB=          off     |
```

Second, the radio has no physical controls and doesn't have CAT commands to read its settings. The settings on the *Micro* are applied to the radio when you turn it on. One of the drawbacks to this is that if you use a remote *Micro* to control a PCR1000 in your shack using an ad hoc network connection, the two Micros won't stay in sync. Changes on one *Micro* won't be reflected on the other *Micro*. This isn't normally a problem unless you have an operator at each *Micro* making changes at the same time. It also means that you'll need to set every parameter on the *Micro* you're using for control to make sure they haven't been changed.

The menu for the PCR1000 is shown here. The controls are pretty straight forward so I won't go into detail on each one.

Frequency, band, and mode are set by the *Micro* just as they are on any other radio. This menu gives you control over the other parameters on the radio.

One thing to be aware of is that DSP is always enabled even if the radio doesn't have the DSP module. I set it this way because the radio doesn't reliably report if the DSP board is installed. The radio will just ignore it if there's no DSP board in it.

The **BW (Bandwidth)** control cycles through the available bandwidths. Different modes have different bandwidths available. For instance CW, LSB, and USB are restricted to 3 and 6 kHz. AM and Narrowband FM use 3, 6, and 15 kHz, and Wideband FM uses 15, 150, and 230 kHz bandwidths.

The **Pwr** control toggles the power on the receiver on and off. You must have the physical power switch in the ON mode for this to work.

piHPSDR Menu

Connecting to piHPSDR

Support for **piHPSDR** was added in v1.06.00 firmware.

To use a serial CAT connection, configure the **piHPSDR** *RIGCTL* server (under the *Menu* button) to use a serial port then configure the *Micro* to use *Normal* CAT polarity (DIP switches 1, 2, and 3 = ON, all others OFF) and connect the *Micro's* CAT jack to the pins on the Raspberry Pi used by the selected serial port. On the *Micro's* CAT jack, TIP is transmit and RING is receive.

If you choose to use a network (IP) connection you'll need to have the *Micro* on the same network as the Raspberry Pi running **piHPSDR** and enter the IP address of the Raspberry Pi in the Configure->Connection->IP Address menu.

In **piHPSDR**, select *RIGCTL* from the *Menu* and check the *Rigctl Enable* checkbox to start the server. Enter the *Rigctl Port Number* (usually 19090) in the IP port field in the *Micro's* Configure->Connection menu and select **TCP** as the IP Port Type.

NOTE: You may need to Reset the IP connection to start polling.

Menu Options

The options for **piHPSDR** allow you to control many, but not all, of the features of your radio.

Most of these options are standard. There are a couple of exceptions to note.

- Turning *Split* ON sets the radio to use VFO-B for transmit. To control the frequency of VFO-B you must enable Ctrl VFO=A&B in the VFO menu.
- The *BW* (Bandwidth) option displays the current filter selection, but <u>does not change</u> the filter setting when you change it on the *Micro*. This is a bug in the **piHPSDR** firmware.
- The *Monitor* function changes the *Monitor* mode on the radio but there is no indication on the **piHPSDR** display showing its state.

```
COM14 - Tera Term VT                    —    □    ×
File  Edit  Setup  Control  Window  Help
 Tx Enabled    ========================
        RADIO (piHPSDR) MENU
==========================================
a VFO-A=      10.126.5| n Pwr Out=     51%
b Mode=       CW       |
c Split=      off      |
                       | q AGC=        long
e Vol=        5%       | r AGC Gain=   115
f Sq=         12%      | s Monitor=    off
g BW=         150      |
h Attn=       0 dB     |
                       |
j NB=         off      |
k SNB=        off      |
l NR=         off      |
m Notch=      off      |
------------------------------------------
Select a Radio Option
MFB1=Esc, MFB2=Tgl TxEnab, MFB3=Tgl VFO
```

Thetis Menu

Connecting to Thetis

Support for **Thetis** was added in v1.06.00 firmware. This protocol requires a network connection so you'll need to have the *Micro* on the same network as the computer that's running **Thetis**.

On the *Micro*, enter the IP address of the computer running **Thetis** in the Configure->Connection->IP Address menu and set the *IP Port #* to 13013.

 In **Thetis**, start the radio by pressing the power button in the top-left corner. Next, open the *Setup* menu and check *Network* tab. Enter the computer's IP address and IP port number in the *Bind IP Port* text box in the *TCP/IP CAT Server* box. Finally, check the *Server Running* checkbox to start the server.
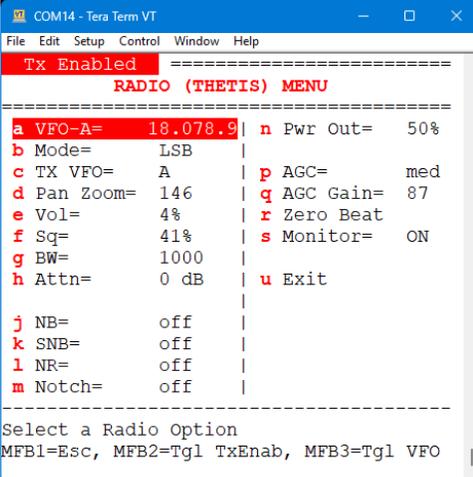
NOTE: You may need to Reset the IP connection to start polling.

Menu Options

The options for **Thetis** allow you to control many, but not all, of the features of your radio.

Most of these options are standard. There are a couple of exceptions to note.

- Setting *TX VFO= B* sets the radio to use VFO-B for transmit. To control the frequency of VFO-B you must enable Ctrl VFO=A&B in the VFO menu. This is the same as the *Split* function on other radios.
- The *Pan Zoom* control adjusts the span of the panadapter. Increase the value to decrease the span.
- The *Zero Beat* function is suppose to click the *0 Beat* button on the VFO in **Thetis**. The command is going out as shown in the documentation but the program doesn't execute the action. Bug?

Xiegu Menu

The Xiegu radio, according to the G90 spec published by RadioOddity supports only a small subset of the Icom CAT controls. These are shown on the menu to the right.

With the exception of the volume and Tx power, these controls are toggled by selecting them and pressing the knob.

NOTE: These CAT controls work on the G90 but only the volume and AGC controls work on the G106. I don't have an X5105 to try so I'm unsure on what works and what doesn't work on that radio. The X6100 isn't supported at the present time by the *Micro*.
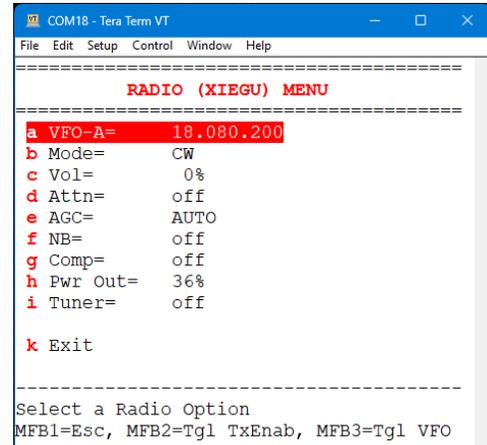
NOTE: The radio's display doesn't update when you change many of these settings with the Mini. This is a Xiegu bug.

Yaesu FT Menu

The Yaesu FT provides quite a bit of control over this radio. This menu can be used with many FT models including the FTdx series, however not all radios support all of these options (i.e. the FTdx10 only has one Rx so Sub Rx options don't work).

The VFO->Ctrl VFO menu is hidden when the FTdx101 or FTdx5000 radio is selected because these radios have two receivers. Use the **RX=** option to select which receiver is under the *Micro's* control. The *Micro's* two VFOs are available for either receiver.
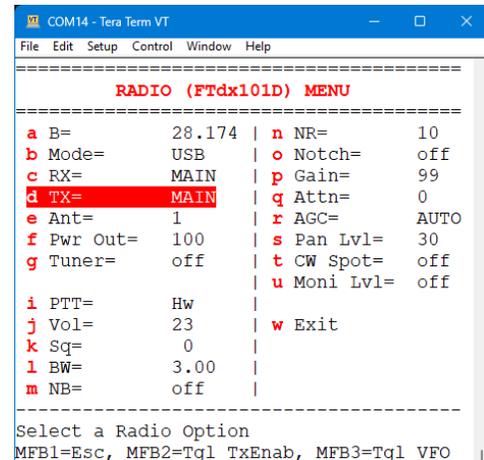
> *RX*
> When your radio has two receivers use this option to select the active receiver. The other receiver controls on this menu update to show the selected receiver's settings.

> *TX*
> This menu option toggles the transmitter between the MAIN and SUB VFO.

> *Ant (Antenna)*
> Each receiver can operate on either antenna port 1, 2, or 3. This allows you to easily setup a receiver diversity system. These menu options allow you to choose the antenna for each receiver. Not all antenna ports are available on all radios.

> *Power Out*
> This menu item allows you to set the output power of the transmitter.

Tuner
This menu item opens the *Tuner* menu where to can turn the internal tuner *ON* and *OFF.* When the tuner is *ON* you can *START* and *STOP* it from this menu.

PTT (Hw/CAT)
The FTdx radio has the ability to have PTT keyed either by a normal hardware connection or by a CAT command (**TXn;**). Keying the radio using the CAT command eliminates the requirement of connecting a custom cable from the Mini to your Radio's PTT input. It also allows you to control the radio remotely if you connect it to a serial terminal server.

Vol
This control brings up a *Value Edit* display where you can adjust the selected receiver's volume. This display will stay open until you press the knob to close it. You can also long-press (> 1 second) the knob to 0. Long-pressing the knob again restores the volume to its previous value.

BW (Bandwidth)
This control allows you to adjust the audio filter on the selected receiver.

NB (Noise Blanker Level)
This control allows you to enable the noise blanker and set its level. To disable the noise blanker set the level to 0.

NR (Noise Reduction Level)
This control allows you to enable DSP noise reduction and set its level. To disable noise reduction set the level to 0.

Notch (Auto Notch)
Click this control to toggle the auto notch filter on and off.

Gain (RF Gain)
Use this control to adjust the RF gain on the selected receiver.

Attn (RF Attenuation)
Click the knob to step through the RF attenuator settings on the radio. These include **OFF**, **6 dB**, **12 dB**, and **18 dB**.

AGC
Click the knob to step through the AGC settings on the selected receiver. Options are **OFF**, **FAST**, **MID**, **SLOW**, and **AUTO**.
NOTE: When the AGC is turned **OFF** the receiver's audio is not limited. Loud signals can be hazardous to your ear's health!

Pan Lvl
This control allows you to adjust the reference level on the active receiver's panadapter.

CW Spot
This control enables or disables the radio's **CW Spot** feature in CW mode.

> *Moni Lvl*
>
> This control allows you to adjust the level of the Tx Monitor. The range is 0 to 100. Setting the level to 0 turns off the Tx Monitor.

Advanced Configurations

Operation with WSJT-X, N1MM Logger, and 3rd Party Apps

The *Micro* emulates the Kenwood TS-2000 on its USB virtual serial port. This allows it to be used with WSJT-X, N1MM Logger+, and other 3rd party apps that need to control or monitor the radio.

The TS-2000 emulator supports the basic parameters most apps need like A & B Frequency (FA; and FB;), Mode (MD;), Tx/Rx switching (TX; and RX;), and information (IF;) replies. If the app asks for a parameter the emulator doesn't support it replies with a ?.

The emulator uses the same USB serial port as the serial terminal, therefore only one can be active at a time.

To use the emulator:

- Connect the *Micro* to a USB port on your computer – the computer will register a new COM port and assign it to the *Micro*
- Wait for the *Micro* to boot – the red LED will flash once per second
- <u>Do not</u> connect a terminal program to the *Micro's* USB serial port
- Start your 3rd party app and configure it to connect to the COM port created for the *Micro*
- The *Micro* will enter emulation mode once your app polls the TS-2000 with a Kenwood command

NOTE: If your *Micro* is controlling an IP based radio (Flex, Hamlib rigCtl, Thetis, etc.) set the **AutoConnect** option in the **WiFi** menu to **ON** so the *Micro* will automatically connect to the radio when it boots.

NOTE: Once the *Micro* enters TS-2000 emulation mode you must cycle the power on it to revert back to normal serial port mode to use the terminal interface. You can use the web browser in emulation mode.

The following settings should be used for N1MM+ and WSJT-X. Other apps should have similar settings.

Connecting to N1MM+

On N1MM+ open the *Config -> Configure Ports, Mode Control, WinKey, etc* menu and set the *Hardware* tab as follows:

Hardware	Function Keys	Digital Modes	Other	Winkey	Mode Control	Antennas	Score Reporting	Broadcast Data	WSJT/JTDX Setup

Port	Radio	Digi	CW/Other	Details	IP Addr:Port	○ SO1V ○ SO2V ○ SO2R
COM3	TS-2000	☐	☐	Set		38400,N,8,1,DTR=Always Off,RTS=Always
COM4	None	☐	☑	Set		DTR=Always Off,RTS=Always Off,Tx=1

COM3 is the port assigned to the *Micro.* You can use any baud rate since it's a USB port. I chose 38400 here. If you have problems try 9600. Make sure both **DTR** and **RTS** are set to **Always Off**. If everything is setup properly you should see the frequency appear in the N1MM+ caption.


COM4 is connected to a USB-Serial dongle to provide CW keying. Select the *CW/Other* checkbox and set **DTR** and **RTS** to **Always Off**.

To key your radio using N1MM's CW keyer, follow the instructions on the N1MM Interfacing Basics webpage to build a keying interface circuit. This will require a USB serial adapter with a keying interface circuit wired to its RTS output. Connect the output of the keying interface circuit to your radio's Key input jack. It can be wired in parallel to the **Key Output** of the *Micro.* With this setup you can control your radio using the *Micro* or N1MM Logger+ and use keyboard keying in N1MM Logger+ or the internal keyer in the *Micro.*

Connecting to WSJT-X

Connecting to WSJT-X is similar to N1MM+. Open the *File -> Settings… -> Radio* tab and select the following settings:
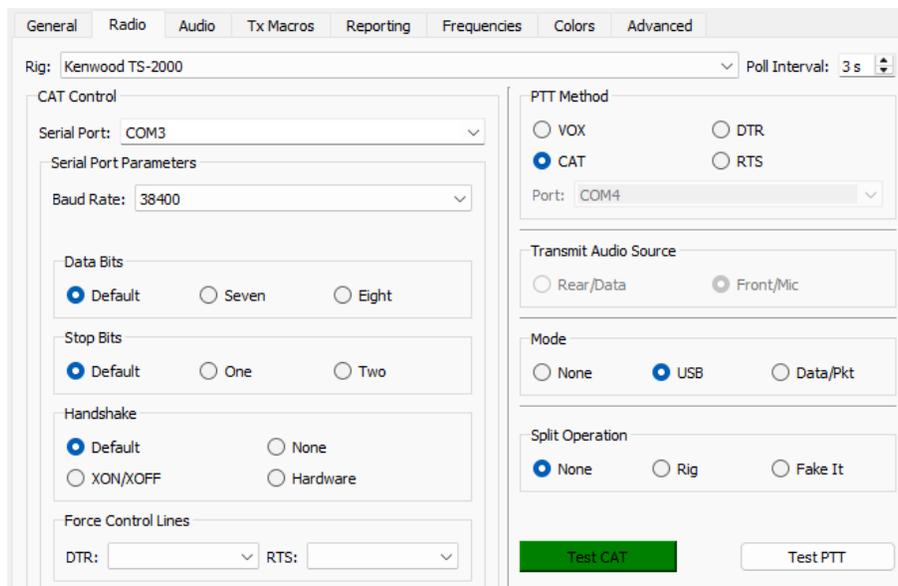
Again, COM3 is the USB serial port assigned to the *Micro.* The **Baud Rate** isn't critical. Leave the **DTR** and **RTS** settings blank. You can use the CAT PTT Method to key the radio. Press the **Test CAT** and **Test PTT** buttons to verify the settings are correct. I lower the **Polling Interval** to 3 seconds

Connecting Multiple Micros

Micros have an interesting ability to connect to each other and share information. They can also connect to a CTR2-Mini so you can use the Mini as a display instead of a terminal.

This ability opens new configuration modes that have never been possible before. For instance, you can connect one *Micro* to your radio in your shack and use another *Micro* or Mini in another part of your house (or anywhere you have an internet connection) to control it. Audio can be transported over WiFi using an audio server such as SonoBus or Mumble. The current *Micro* firmware does not support sending CW between units, as it does with the Flex.

Do you want to operate your radio full time this way? Probably not. There are many other full-feature options out there for remote control. The *Micro* gives you the opportunity to try remote control out, experiment with it, and see if it works for you.

By far the best radio for remote control is the Flex radio because it does remote out of the box. The *Micro* works great with it and provides a physical tuning knob if you like to run your Flex using an iPad and SmartSDR for iOS. It also provides a means to send PTT and KEY controls over the internet so you can use your paddles with the *Micro* and have your iPad running SmartSDR.

NOTE: You can't use the hotspot on your tablet, cell phone, or a StarLink connection to connect your *Micro* to a remote Flex radio even with a VPN because these systems use Carrier Grade Network Address Translation (CGNAT) that blocks port forwarding.

Linking Micros and Minis

The *Micro* has the ability to link to other Micros or Minis using the UDP network protocol. The UDP protocol is a 'connectionless' protocol, meaning the two ends don't form a solid connection between each other. They just listen on a pre-defined UDP port (IP port 7951 on the *Micro* and Mini) and respond if someone wants to talk to them. This allows multiple devices to talk to each other on a shared line.

NOTE: This is an experimental mode and hasn't been fully vetted.

Whenever you connect your *Micro* to a WiFi system it starts listening to port 7951. When it receives data from this port it decodes it and sends it the radio. When the radio connected to the *Micro* responds the *Micro* forwards that data to any other units that it has heard.

This ad hoc exchange of information makes it possible for one *Micro* to be connected to your radio and allows other Micros or Mini to control that same radio as shown in the drawing below.
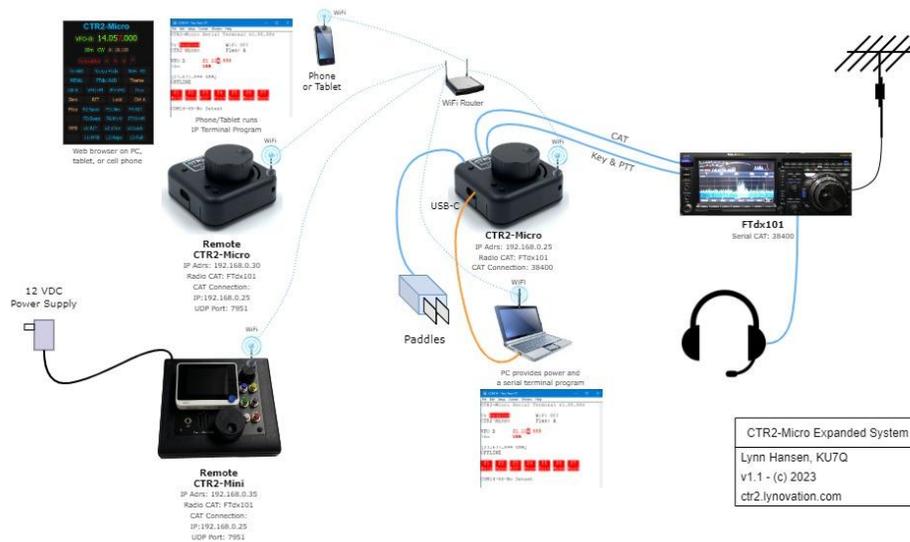
Setting up an ad hoc network

NOTE: If you are using your *Micro* to control a network based radio such as a Flex or Elecraft K4 the ad hoc network feature is not available. In addition, if you are using a tablet or cell phone hotspot, or a StarLink connection, you will not be able to connect the *Micro* to a remote radio over the network (even with a VPN) because these systems block port forwarding and UDP packets.

NOTE: Ad hoc networking is an experimental mode and hasn't been fully vetted. I will work with you if you find issues that need to be fixed.

To enable this exchange of information you need to do the following in the **Config->Connection** menu:

1. Set all units in the network to the same radio CAT.
2. On the *Micro* (or Mini) that's connected to the radio's serial port (address 192.168.0.25 in the drawing), navigate to the **Config->Connection** menu and set it to the IP Address of one of the remote units (192.168.0.30 or 192.168.0.35) and IP Port to 7951. The port will show [**Using UDP**] when set to this port # and tells this unit to broadcast its address on the UDP network. **Select the baud rate for the serial CAT port before you exit this menu so the unit uses the serial port for CAT.**
3. On the remote Micros or Mini (addresses 192.168.0.30 and 192.168.0.35 in the drawing) navigate to the **Config->Connection** menu and enter the IP address of the *Micro* connected to the radio's serial CAT port (IP address 192.168.0.25) and set the IP port to 7951. The *Micro* will show this as **[Using UDP]** in the menu. Do not select a baud rate. The unit will send its CAT requests over UDP to the unit connected to the radio.

NOTE: Ad hoc UDP networks are only available when one unit is connected to the radio's serial CAT port. It is not available (or needed) for network based CAT control used on the Flex or K4 radios.

With the radios, just connect all of your Micros or Minis to the radio using its IP address and TCP port. Its server will act as the hub and share its settings and control with all of the devices connected to it.

Possible Workaround for the Cell Phone Hotspot CGNAT Block

The following is provided for information purposes only. I make no claim that it should be used by anyone or that it will even work on your router!

If you're a Flex user the first thing you'll probably want to do is take your *Micro* on the road so you can use it as a physical knob and keyer for your remote radio over the internet. This *should* work if you connect your *Micro* to a normal WiFi network at the remote location using a VPN, however, it *will not* work if you try to connect your *Micro* to your cell phone's hotspot, even with a VPN. The reason is that cell providers and other services like StarLink use Carrier Grade Network Address Translation (CGNAT) that blocks the port forwarding required by VPNs.

You *can* connect the *Micro* to your radio using your cell phone's hotspot if you forward port 4992 from your radio to the internet. Just enter your home router's internet address in the *Micro* as the radio's IP address and set the *Micro's* IP port to the forwarded port # on your router. *This is highly discouraged by anyone that knows anything about internet security because port 4992 is an 'unauthenticated port' meaning that anyone that knows the port # you forwarded it to on your router can access and control your radio without your knowledge.*

Another option is to use an internet power switch to power down your radio when you aren't using it. This eliminates any security risk of having port 4992 forwarded through your router because there's not device to connect to.

You might also consider using CTR2-MIDI with SmartSDR for iOS instead. This app can use SmartLink so there is no need to forward ports through your radio.

PCR-1000 Receiver Remote Control Oddities

If you run a remote *Micro* to control a *Micro* connected to a PCR-1000 receiver the two *Micro's* won't stay in sync. This is because the PCR-1000 receiver only acknowledges CAT commands, it doesn't echo the new setting. For example, if you change the frequency it doesn't return the new frequency. Therefore, the local and remote Micros won't know what the other one is doing. This means that when you use either *Micro* to control the radio you'll need to set the frequency, mode, etc. to make sure it's operating where you want it.

CAT Oddities

Not every radio responds to CAT commands as the original designer of the CAT protocol intended. This is especially true with radios that borrow another manufacturer's protocol. While I've tried to resolve these conflicts the best I can, there are some things I can't do anything about. This section lists these issues.

Active VFO Control on Older Kenwood Radios

Older Kenwood radios use the **Kenwood2** protocol in the *Micro*. They require 2-stop bits and usually run at 4800 baud. They do not have an extensive CAT protocol. Most of them only support changing frequency, mode, and possibly RIT. On these radios the *Micro* always follows the radio's selected VFO when you select the **Ctlr VFO=A&B** mode. *You cannot switch radio VFO's from the Micro.* If you try to switch the *Micro* to its offline VFO it will return to the radio's VFO.

If you want to use the *Micro's* VFOs to switch the radio's frequency and mode use the **Ctrl VFO=A** mode. In this mode the *Micro's* VFOs are sent only to the radio's A VFO. This leaves the radio's B VFO free for you to use without the *Micro* interacting with it.

Appendix A: Detailed List of *Micro* Features

The *Micro* makes up for its diminutive size with a long list of features.

- It can control a wide variety of radios using serial or IP CAT including Flex, Anan and Hermes Light 2 (in Thesis or piHPSDR mode), most Icoms, Kenwoods, newer model Yaesu radios in the FTdx line (and other Yaesu models running the Kenwood protocol with serial CAT ports), Yaesu FT-817 and FT-100, Elecraft, Xiegu, QCX, NET rigCtl from Hamlib, and even the trusty old Icom PCR1000.
- USB powered from either your PC, a phone charge, battery pack, or a OTG adapter on your tablet or cell phone
- A remote frequency control knob that can be placed next to your mic or key for instant frequency changes
- User programmable power up mode – configure the *Micro* to power up in speed control, RIT, volume, or any other mode.
- Support for 10 radio profiles. Each profile contains all of the settings for that radio including the favorite frequency list and FKey and BTN programming.
- Share a common favorite frequency list with every radio profile
- Multiple Micros can be linked together via WiFi with each *Micro* can have its own power up mode – have one *Micro* set for keyer speed, one for RIT, one for volume, etc.
- Control it using a Telnet terminal program or from a web browser.
- User defined frequency steps. Easily change the step by pressing and tuning the knob or pressing the left/right arrow keys on your keyboard when connected to a Telnet terminal program.
- Keyboard control of your radio from anywhere via internet Telnet
- Keyboard CW memory/contest keyer
- Bridge mode allows the *Micro* to be used as a IP/Serial Terminal interface with support for TTL, RS-232, and CI-V serial ports
- Six programmable keyboard function keys (F2 to F7)
- Keyboard function keys provide instant access to 10 programmable 75 character CW buffers (F8, F9, Shift+F3 to Shift+F10)
- Shortcut keys take you from the Home page directly to the menus and features you use the most when in Telnet terminal control.
- Three multi-function buttons on the *Micro* – assign the functions you use most to them
- The Code Report outputs the current menu item, radio parameter changes, etc. in code. This allows you to control the *Micro* and radio without a display. Independent report CW speed and spacing lets you set it where you're comfortable. This is great for blind and limited sight operators or for increasing your code proficiency.
- The Text Report leverages the **Code Report** features to provide enhanced support for screen readers
- Supports both CTR2-Display and CTR2-Voice for additional accessibility
- Use your paddles to navigate menu items, input parameters, change frequency, etc. Have a code conversation with your radio!
- Frequency Controls

- o Direct frequency entry from your keyboard
- o Zero digits below the selected frequency step
- o RIT
- o 100 favorite frequencies/mode settings for each VFO in each Radio Profile
- o Instantly return to the last 25 frequencies you visited from the Previous Freq/Mode list
- o Lock previous frequencies so they don't scroll off the **Previous Freq/Mode** list
- o Code reporting of frequency, tuning step, and mode
- o Two VFOs are managed by the *Micro*. In **Ctrl VFO=A** mode both VFOs on the *Micro* use VFO-A on your radio. This allows you to use your radio's VFO-B without the *Micro's* control. Switch to **Ctrl VFO=A&B** mode and you can individually control A VFO and B VFO on your radio with the *Micro's* VFO-A and VFO-B.
- o A shared frequency/mode database that is accessible from any **Radio Profile**
- o Memory tuning makes it easy to check the frequencies in your favorite frequency list
- o Range tuning allows you to define the lower and upper edges of the frequency range you want to stay within (say for a contest or a satellite transponder). Ranges are set in the frequency memory so you can have up to 100 ranges if needed.
- o Band stacking registers allow you to return to the last frequency and mode used on each band
- • Select the radio's band or mode from the *Micro*
- • Transmit interlock allows you to disable radio keying so you can use the *Micro* for code practice
- • External Tuner mode instantly switches your radio to the mode and power you define for your external tuner then returns to the original mode and power when you leave this mode.
- • Keyer options include:
  - o Keyer speeds from 5 to 99 wpm
  - o Farnsworth spacing can be used with CW messages, CW reports, and practice modes
  - o Use the radio's sidetone or the *Micro's* sidetone for keying
  - o Adjustable sidetone frequency and volume
  - o Straight, Pass-thru, Iambic-A, Iambic-B, Ultimatic, and Bug modes
    - ▪ Pass-thru allows you to control Key and PTT Outputs with your paddles. Connect these to the key input on your radio or to an external keyer if you want to use those keyers.
  - o Use the Paddle Input jack for a remote PTT switch in voice modes
  - o Paddle reverse to reverse paddle wiring
  - o Prosigns (embed in CW buffers or press these keys on the keyboard)
    - ▪ '^' sends your call
    - ▪ '#' sends the current contact serial # - automatically increments after each use
    - ▪ '%' sends the contest exchange
    - ▪ '*' increases keying speed by 50%
    - ▪ '_' sends a long DAH
    - ▪ Other K1EL v3 prosigns are supported
  - o Interactive Code Practice mode
- • WiFi Options
  - o Auto Connect allows the *Micro* to connect to your WiFi system on power up. Great for the Flex radio

- o IP Telnet Login option protects your *Micro* from bad actors by requiring a login password when connecting through a forwarded port on your router.
- o Connect multiple Micros together to provide dedicated knobs programmed for different features on your radio
- o The *Micro* can connect to the Mini or another *Micro* using an ad hoc network and either of them can control your radio. This allows you to leave the *Micro* in the shack connected to your radio and use the other unit as a remote control.
- Control your radio remotely using a terminal program or a web browser on your cell phone or tablet, or use another *Micro* or a CTR2-Mini connected to the CTR2-*Micro* in your shack
- A new Beacon control mode allows the *Micro* to be used as a browser enabled beacon controller when you're not using it for other operations.
- Export and Import all of the settings on the *Micro* to a single file on your PC to backup and restore your setting.

Appendix B: Updating the Firmware

All *Micros* are shipped with the latest firmware installed. However, firmware updates are periodically released, so you'll want to update you unit to stay current.

NOTE: Many USB cables only provide power to the device, not data. If a new virtual serial port is not created when you plug your *Micro* into you PC make sure you are using a USB-A to USB-C cable that supports data.

The current version of the firmware on your *Micro* is displayed on the **Title Page** and in the **Main->About…** menu when you connect to the *Micro* with a terminal program or web browser.

You can find the latest firmware on my blog at https://ctr2.lynovation.com/download-ctr2-micro-firmware/. I also post update alerts on the CTR2 group at https://groups.io/g/CTR2 . I encourage all CTR2 owners to join that group to get the latest update alerts, post bug reports, and share ideas they would like to see in CTR2 products. I keep previous versions of the firmware on my blog in case the current version doesn't play well, or you decide you don't need the new features it includes.

The source code for CTR2-*Micro* is closed source so there is no need for you to install and learn the Arduino programming environment in order to compile and update your *Micro*.

As of v1.07.00, the *Micro's* firmware is distributed as a single BIN file. This simplifies the installation process and reduces the possibilities of entering the wrong offset address for individual BIN files. The address of the single BIN file always starts at **0x0**.

There are three methods you can use to flash the BIN file to the ESP32C3.

Installing Firmware using ESPConnect (Recommended Method)

By far, the easiest, and recommended method to install or update firmware on an ESP32 processor is with ESPConnect, an open source ESP32 management project.

ESPConnect is a browser-based tool that must be opened on a Chromium-based browser that supports Web Serial, such as Chrome, Edge, Brave, or Opera. It will run on a Windows PC or an Apple Mac. Unfortunately, Linux doesn't support Web Serial in any browser.

To start, open **ESPConnect** here: https://thelastoutpostworkshop.github.io/ESPConnect/
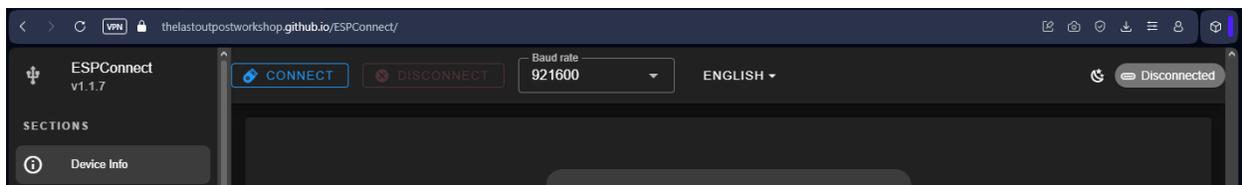
Next, plug your **CTR2** unit into a USB port on your computer.

NOTE: Do not connect it to an unpowered USB hub and make sure you don't have a terminal session open and connected to your *Micro*.

Click the **Connect** button.

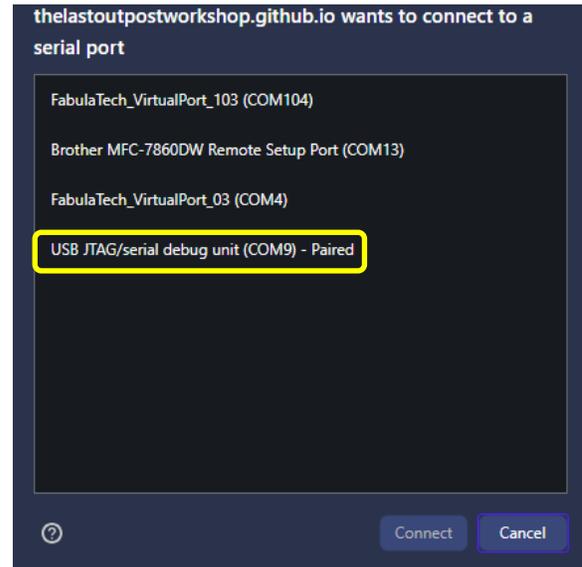A device list will pop up showing the available USB devices on your computer.

Select the **USB JTAG/serial debug unit** device then click **Connect**.

Once you're connected to your **CTR2** unit, the left menu items on the page will be enabled.
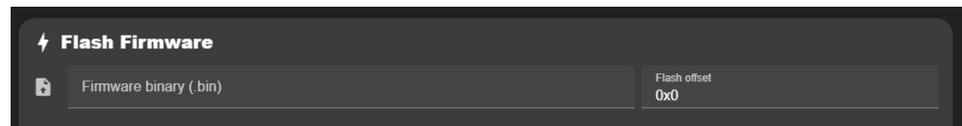
<<< WARNING >>>
ESPConnect is a powerful device editor. Many of the functions can cause problems with **CTR2** firmware if you change them. If you don't know what a functions does, DON'T CHANGE IT!

Click on the **Flash Tools** menu item and scroll down to the **Flash Firmware** section.

A file navigation screen will appear. Navigate to where you unzipped the firmware zip file from the firmware update page and click on the **CTR2-Micro.bin** file.

Click the **Firmware binary (.bin)** text box.

Your display should now look like this:

Leave the **Flash offset** set to **0x0**.

NOTE: Checking the **Erase entire flash before writing** checkbox will reset your *Micro* back to factory defaults.

Click the **FLASH FIRMWARE** button to start the flash process.
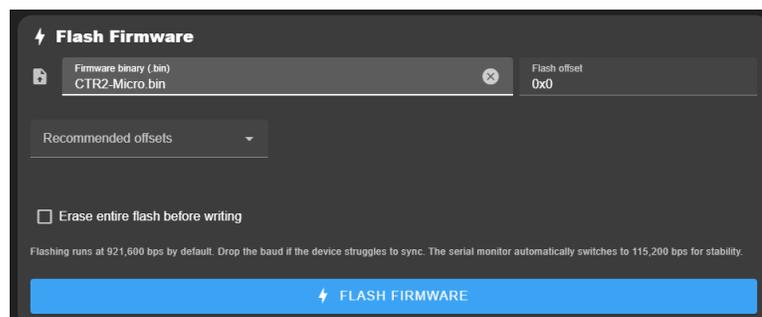
Once the process completes, cycle the power on your **CTR2** unit. The version # will be displayed when the unit boots. The version # should match the version # from the firmware zip file.

This completes the firmware update process.

Flashing Firmware using the EspressIF Flash Download Tool

If you're a Windows user and prefer to use EspressIF's own **Flash Download Tool**, you can download the tool at https://www.espressif.com/en/support/download/other-tools. Click the checkbox on the **Flash Download Tools** item then click **Download selected**.

Run Flash Download Tools

Once you have downloaded the zip file, right-click on it and select **Extract All…** to unzip it. In the unzipped folder, navigate to the **flash_download_tool_x.x.x** folder (x.x.x is the current version of the program. It is 3.9.5 as of 6/12/2023). Once in this folder just double-click on the **flash_download_tool_x.x.x.exe** application to open the program. There is no need to install the program, just run it.

It will open a small window where you need to select the ChipType and LoadMode. Set them to **ESP32-C3** and **USB** as shown below then click **OK**.
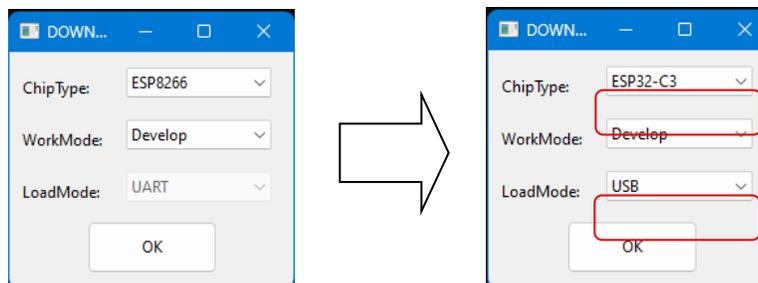
The first time you run the program it opens as shown here.

To configure it for the *Micro* you'll need to add links to the firmware .BIN (binary) files I distribute and select the virtual COM port assigned by your PC to the *Micro*.

Leave the button settings set as shown.

<mark>Unzip the CTR2-*Micro* Firmware Update File</mark>

The *Micro's* firmware file is distributed in a zip file. The title of the file will contain the firmware version # (i.e. **CTR2-*Micro*_v10700.zip** for version 1.07.00). There is a single BIN file in the .zip file and it will always be named **CTR2-Micro.bin**.
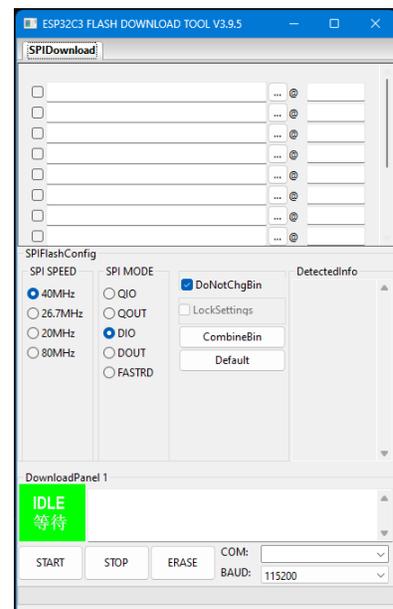
I *highly recommend* that you always extract the **CTR2-Micro.bin** file from the update zip file to the same folder on your PC every time you update so once you've mapped the BIN file in the download tool you won't need to change the mapping for the next update. I created a **c:_CTR2_Micro** folder on my PC for these files. I also put the EspressIF Download Tool in this folder so that everything is in one place.

> **NOTE:** Save a copy of the **CTR2-Micro_v1xxxx.zip** file in the same folder as the BIN file. This way you'll know the version # of the firmware in that folder.

Map the CTR2-Micro.bin file in the Download Tool

Once you've downloaded and unzipped the firmware file from my blog, populate the mapping in the **Download Tool** as shown here.

Only one BIN file is needed for *Micro*. To map the file, click the [...] button on the first line and navigate to the folder where you unzipped the firmware file. Double-click on the **CTR2-Micro.bin** file to add it to the **Download Tool**. Click on the checkbox to the left of the file name field to include it in the download.

The **Download Tool** needs to know the starting memory location for this file. This is entered in the field following the *@ sign*. Enter **0x0** as shown here.

When you're done the **Download Tool** should look like this screenshot with your folder's name instead of **C:_CTR2_Micro**
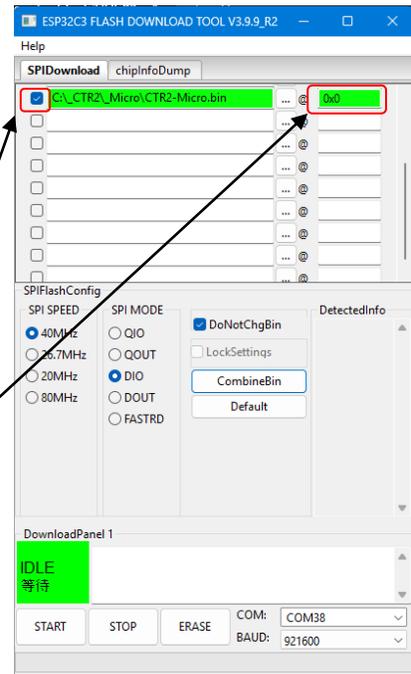
Select the *Micro's* COM Port

To select the *Micro's* COM port, first look at the **COM:** list in the bottom right corner of the screen and note the COM ports your PC already has assigned without your *Micro* connected. Next, plug your *Micro* into a USB port on your PC. It will automatically assign a virtual COM to it.

Now, drop down the **COM:** dropdown box again. The new port on the **COM:** list is assigned to your *Micro*. Select that port.

Set the **Baud:** to 921600 baud for the fastest download. If the download fails try a lower baud rate.

Download the Firmware

The final step involves downloading the firmware. To do this, simply click the **Start** button. The download tool will show the download status and display *Finish* above the **Start** button when it's complete.

If the *Micro* doesn't automatically reboot after the flash process completes, cycle the power on it to reboot it.

> **NOTE:** If you want to **reset the *Micro* to the factory settings**, click the **Erase** button before you download the firmware. This clears the non-volatile RAM used for the *Micro's* configuration files. Once the erase process completes, click the **Start** button to start the download. When you boot the *Micro* after a full erase, you'll need to go through the First Time Configuration procedure shown in Appendix C.

Flashing Firmware using a Script (Linux users)

If you run Linux, you'll need to use **ESPTools.py** to download the .BIN files. Mac users can also use the script method.

To do this you must have **Python3** and **pip** installed on your machine. It is already installed on most Linux distros. Type **Python3 –V** and **pip –V** on the command line to see if they're installed. If it's not, you can find them on the internet.

Download the **CTR2-*Micro*_v1xxxx.zip** file from https://ctr2.lynovation.com/download-ctr2-micro-firmware and unzip that file into a folder on your PC.

CTR2-*Micro*-Single_BIN_Install.zip script file is included in the *Micro's* firmware zip file. It will unzip to the same folder you unzip the *Micro's* BIN files to.

NOTE: Always unzip subsequent firmware update files to the same folder so you don't have to edit the script file again.

Find the USB Port Assigned to the *Micro*

The instructions to find the serial port assigned to the *Micro* can be found in Appendix C below.

Make Sure You Have Privileges to the dialout Group

Linux is a very secure operating system. Sometimes it seems that it's too secure. The **dialout** group is one example. Once you find the serial port the machine is using for the USB connection to the *Micro* you need to make sure you have permission to use that port. You'll need this permission to download the .BIN files and to use a terminal program on this port.

On a Debian machine, use the command ***sudo usermod –a –G dialout $USER*** to add yourself to this group. Other distros and Apple macOS may use required different syntax.

Once you've been added to the **dialout** group, reboot the machine.

Edit the CTR2-Micro-Single_BIN_Install.sh Script File

Next, you'll need to edit the script file so that it knows which serial port to use and where to find the .BIN files.

A complete copy of the install script is shown below. Change settings of the **PORT=** and **DIR=** entries to match your configuration. Color and bold text have been added here for clarity. You can edit the script with any text editor.

Make the Script Executable

In order to run the script it has to be set as an "executable" file. To do this, open the command line interface and navigate to the folder the script is in. Execute the following line:

> *chmod +x CTR2-Micro-Install.sh*

Python Script

_____

```
# CTR2-MICRO Programmer for Linux and Mac.  Should also work on MSWindows
# MUST have python3 and pip installed
# Lou Scalpati KI5FTY

PYTHON=python3
CHIP=esp32c3

#-------------------------------------------
# Replace the PORT and DIR variables below to fit your system
#-------------------------------------------
# Begin Edit

PORT=/dev/<YOUR-USB-DEVICE>
DIR=<DIRECTORY-CONTAINING-CTR2-MICRO.BIN-FILES>

# End Edit
#-------------------------------------------

pip -q install esptool

read -rsn1 -p "Hold down ENCODER (knob) and press any key to continue"

$PYTHON -m esptool --chip $CHIP --port $PORT write_flash -z 0x0 $DIR/CTR2-Micro.bin
```

_____

Once you have edited the script save it. As long as you always extract the new updates into the same folder you won't need to edit this file again.

Execute the Script

To execute the script, open the command line interface and navigate to the folder where you saved the script. To execute the script, enter the following command: ***./CTR2-Micro-Single_BIN_Install.sh***

> **NOTE:** The './' preceding the file name tells Linux to execute the file.

The script will download **ESPTools.py** and then prompt you to **Hold down ENCODER (knob) and press any key to continue.** Pressing the knob on the *Micro* is the same as pressing the **Boot/Flash** button on the ESP32C3, which would require you to open the case.

Press any key and the download should start.

Once programming has completed cycle the power on the *Micro* to restart the program.

Appendix C: First Time Configuration

You should periodically check <u>here</u> for firmware updates. The procedure for updating the firmware can be found in the <u>Appendix B: Loading and Updating Firmware</u> section.

When you receive your *Micro* you must configure it for your station. This must be done using a terminal program connected to the *Micro's* <u>USB serial port</u>.

Finding the *Micro's* Serial Port in Windows

The first time you connect the *Micro* to your PC it will create a virtual serial port assigned to the *Micro's* USB serial port. This can be found in the Windows Device Manager. An example is shown here. I've highlighted the *Micro's* port in yellow. If you have multiple USB Serial Devices on your PC, unplug the *Micro* and see which device drops off this list. Plug the *Micro* back in and it should reappear.

Finding the *Micro's* Serial Port in the Mac or Linux

The Apple Mac and Linux have built-in terminal programs so there is no need to install a separate app. To connect to the *Micro* use the following process.

First, list your current serial ports without the *Micro* plugged in.

- On the Mac open **Applications/Utilities/Terminal.app**. On Linux open the terminal program supplied by your distro.
- On the Mac, enter **ls -l /dev/tty.usb***, on Linux, enter **ls /dev/tty*** This will return a list of all known serial ports.
- Next, plug the *Micro* into the computer's serial port and execute the command above again. This is easily done by pressing the *Up* arrow key.
- Compare the new list with the old list. The *Micro's* serial port ID will appear on just the new list. For Mac users the serial port ID format will be **/dev/tty.usbserialxxxxx** where **xxxxx** is a unique device ID #. Linux users will see something like **/dev/ttyACMx** or **/dev/ttyUSBx**, where **x** is a unique # for that port.

NOTE: If a new virtual serial port is not created when you plug your *Micro* into your PC make sure you are using a USB-C cable that supports data. Many USB-C cables only provide power to the remote device.

Once you know the *Micro's* USB serial port ID, write it on the label on the bottom of the unit using a fine-tipped permanent marker for future reference. Put a piece of transparent tape over the label to seal the ink so it doesn't rub off (it's not as permanent as you think). You can always remove the tape if you want to change what's written on the label.

Once you have the serial port ID, enter the following: **screen {serial port ID} 9600**. Include the complete device description (i.e. **/dev/ttyxxxxxxx**) for the **serial port ID**. This will open the serial port using 9600 baud in a terminal session. The following screenshots demonstrate these steps.

1. Get the list of serial devices on your computer. We're looking for the **usb** device
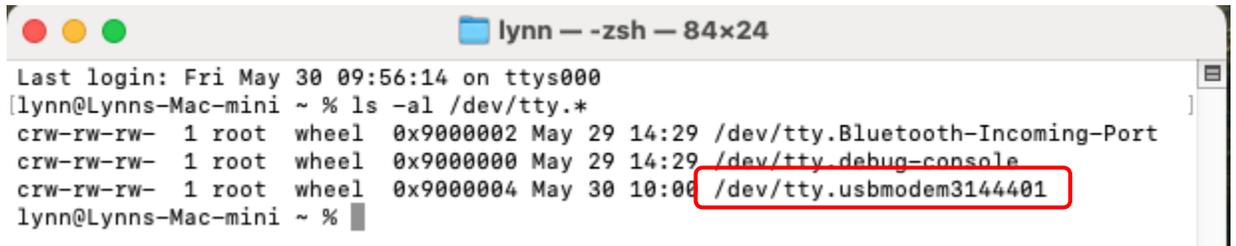
2. Open the **screen** utility using the **usbmodem31444-1** device. Your USB device will have a different descriptor.
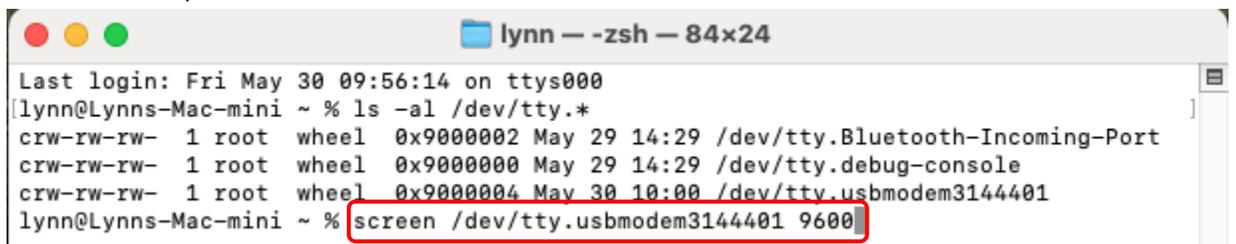
3. This is the *Micro's* terminal display. Press *Enter* to open the main menu.

The *Micro* has a built-in web server that supports a browser interface but you will always need to connect with a serial terminal to configure it for the first time. A serial connection is faster and doesn't require a WiFi network, so it makes sense to get a serial terminal session set up.

Calibrate the BTNs

When you connect to the *Micro* for the first time you will be prompted to go through the calibration routine for the multi-function buttons (BTNs). Simply press each BTN1, 2, and 3, in that order, so the *Micro* can record each button's voltage.

> **NOTE:** The BTNs are numbered from the bottom up with BTN1 being on the bottom-left.

Calibration is a one-time procedure but if you find the *Micro* incorrectly executing buttons you can repeat this procedure in the **Config->Calibrations->Multi-Func Btn Calibration** menu.

The three BTNs use a resistive ladder to present different voltage levels to the processor's ADC when each is pressed. The processor identifies the button by reading this voltage on its analog/digital converter (ADC). Due to the small number of I/Os on the ESP32C3 the *Micro* shares port 0 with the LED. When the LED is idle (which it is most of the time) the *Micro* can detect a button press. The only problem with this scheme is that because the LED is part of the pull-up voltage for the ADC every *Micro* generates different voltages for their BTNs. This calibration resolves this issue.

Once calibration has been completed you'll be taken to the Home page where you can configure the following options to set up your *Micro*.

Configure the Keyer

The next thing you'll want to do is configure the keyer. Open the **Keyer** menu by pressing **Ctrl+k** on the Home page, or press [Enter] to open the main menu then press *hotkey* **h** to open the keyer menu. The **Keyer** section describes the options available here. At the minimum you'll want to set the keyer speed and enter your call sign.

If you also want to use a remote PTT switch with the *Micro*, enable the **Pdl PTT** option in the **Keyer** menu and connect your remote PTT switch in parallel with one of the paddle contacts (either on). With **Pdl PTT** enabled pressing either paddle or the remote PTT switch will key PTT if the radio is in a voice mode and the Tx Interlock is enabled.

CAT Polarity Jumpers/DIP Switch Settings

You'll need to set the CAT polarity using the internal jumpers or DIP switch *even if you plan on using WiFi to connect to your radio*. Setting the jumpers provides the necessary pull-up or pull-down voltages to the processor's input to keep noise from affecting the *Micro's* operation. If you're not using serial CAT install jumpers or set DIP switch for S1, S2, and S3.

The *Micro* support **Normal** TTL levels (Mark = 5 volts, Space = 0 volts), **Inverted** levels (Mark = 0 volts, Space = 5 volts), and the Icom **CI-V** 2-wire bus that uses TTL levels on a single pair of wires. Every manufacturer determines the format of their CAT port, there is no universal standard. Check your radio's user manual to find out which one you need.

The **Inverted** setting is used for radios that have RS-232 CAT ports.

To configure the *Micro's* CAT port, use the following table. If your unit has the internal headers, the [X] means to install a header at that location. If your unit has the external DIP switch option, the [X] means to turn that switch ON.

Format	S1	S2	S3	S4	S5	S6	S7	S8
Normal	X	X	X					
Inverted				X	X	X	X	
CI-V	X	X	X					X

Select the Radio CAT Protocol

For the *Micro* to control your radio it must know which radio it's connected to. This is handled in the **Config->CAT** menu.

Set the CAT Baud or IP Address

The **Config->Connection** menu allows you to determine how the *Micro* communicates with your radio. To use the serial **CAT I/O** port (center jack) on the *Micro* you must first set the CAT Polarity straps to match the format your radio uses and then set the baud rate of the *Micro* to match the baud rate of your radio in this menu.

If you will be connecting to your radio over the network (i.e. Flex or Elecraft K4), you will set the radio's IP address and IP port # in this menu.

> **NOTE:** If you connect to your radio using the IP network the ad hoc network sharing feature is not available.

Startup Title Page

Once you've completed the initial setup of the *Micro* you'll be presented with a **Title Page** each time you connect a terminal to the *Micro*. The **firmware version #** will be listed here along with a counter that shows the number of seconds since power up.

You can find the **version #** and **IP address** of the *Micro* in the **Main->About…** menu.
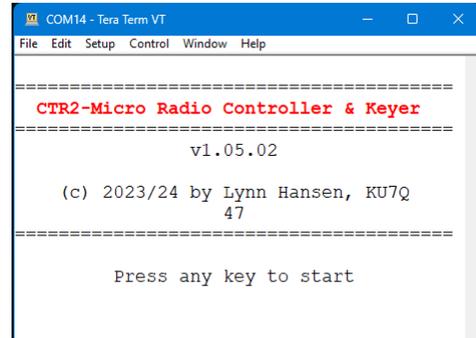
Press any key on the keyboard to tell the *Micro* you're connected.

> **NOTE:** For the *Micro* will be fully functional in standalone mode you must have a terminal session, browser session, or report enabled. If no external interfaces are operational you will be blocked from opening the *Micro's* menu system and an error beep will sound so you don't inadvertently changes settings without knowing it.

Appendix D: Configuring Tera Term

Tera Term is the simplest terminal program to get running for a serial connection.

NOTE: Apple and Linux operating systems include a built-in terminal so there is no need to install a separate terminal program. Learn more about using the built-in terminal here.

If you search for Tera Term you find a lot of garbage with malware attached to it. I've downloaded a clean copy of Tera Term v4.106 and posted it in the CTR2 Group IO files section. You can download it here. As far as I know, Tera Term is only available for Windows.

When you first open Tera Term you'll be presented with the **Tera Term New connection** window. Simply select the **Serial** radio button, select the COM port Window's assigned to your *Micro* when you plugged it in, and click the **OK** button.
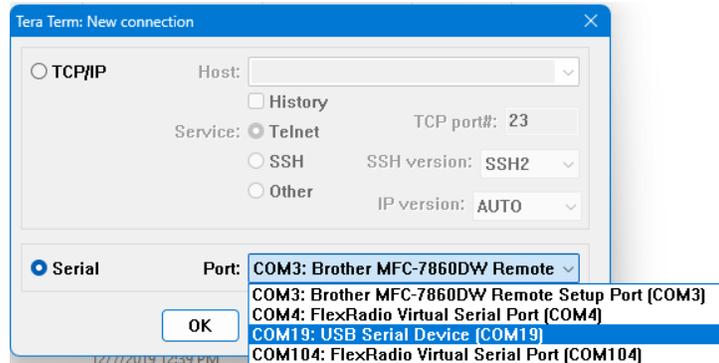
Since you are connecting to a USB serial port there is no need to set the baud rate. It will run at USB speed regardless of the baud setting.

That's it! Tera Term will open showing the *Micro's* Title page. Press any key to open the Home page.

When you first open Tera Term the display will look like this.

When you first connect, open Tera Term's **Setup** menu and select **Terminal…** Set the **Terminal Size** to *41 x 20.* The *Micro's* terminal interface was designed for this size. You can make the display wider (greater than 41) but keep the display height set to 20.
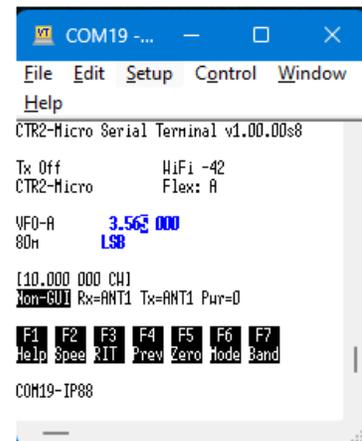
While in the **Terminal…** settings verify the **New-line** options are set to *CR* for both **Transmit** and **Receive** and the **Terminal ID** is set to *VT100*.

You'll probably want to change the font size and colors. These are also changed in Tera Term's **Setup** menu. Select **Display** to change the font and background colors to your liking. Select **Font** to change the font and font size. I like *Courier New*, *Regular*, and *14 point size*. You're preferences may differ.

Once you have the program configured the way you like, select the **Setup->Save Setup…** menu and save your configuration. If you use the default file name, TERATERM.INI the program will automatically start a Telnet session using the COM port you selected above when it opens. This provides one-click access to your *Micro*.

While Tera Term can connect to the *Micro* using a network TCP/IP connection, it doesn't appear to support the 'raw socket' interface used on the *Micro*. It seems to be looking for Telnet or SSH handshaking which the *Micro* doesn't support. If you want to connect to your *Micro* using IP, consider using Putty. The next section provides details on connecting using IP with Putty.

Appendix E: Configuring Putty

NOTE: Apple and Linux operating systems include a built-in terminal so there is no need to install a separate terminal program. Learn more about using the built-in terminal [here](#).

Putty is a terminal program that can be configured for a variety of needs. The *Micro* supports both serial and "raw socket" IP connections. The *Micro* does not support SSH or Telnet handshaking. Putty works well with the *Micro*. This section describes how to configure the program to interface with the *Micro*.

Download Putty for Windows from https://www.putty.org/. It's also available for Linux at https://www.ssh.com/academy/ssh/putty/linux and for Mac at https://www.ssh.com/academy/ssh/putty/mac.

You'll need to connect to the *Micro* using its USB serial port in order to initially configure it. Once you've configured it to connect to your WiFi network you can use Putty to connect to it using IP. This section describes how to configure Putty for both serial and IP connections.

Serial Session

Select **Serial** then set the **Serial Line** to the COM port you found in the Device Manager and set **Speed** (Baud Rate) to 115200.

NOTE: Since this is a USB serial port the **Speed** (baud rate) doesn't matter. Data will be sent at USB speeds regardless of the **Speed** setting.

Basic options for your PuTTY session
Specify the destination you want to connect to

Serial line: COM19 Speed: 115200

Connection type:
○ Raw ○ Telnet ○ Rlogin ○ SSH ● Serial
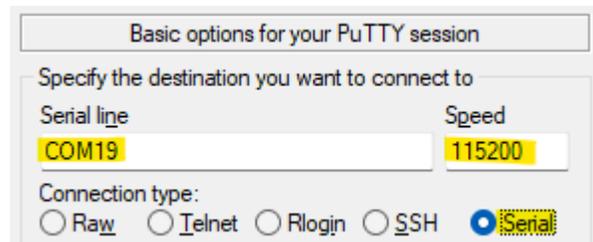
Next, select the **Terminal** item and set the **Implicit LF in Every CR** to on, and **Local Echo,** and **Local Line Editing** to **Force Off**.

Under the **Window** item, set the **Columns** to *41* and the **Rows** to *20*. The number of **Columns** can be set above 41 but the number of **Rows** must be set to 20 for *Micro* to display pages properly. This is especially important if you use the Text Report with a screen reader.
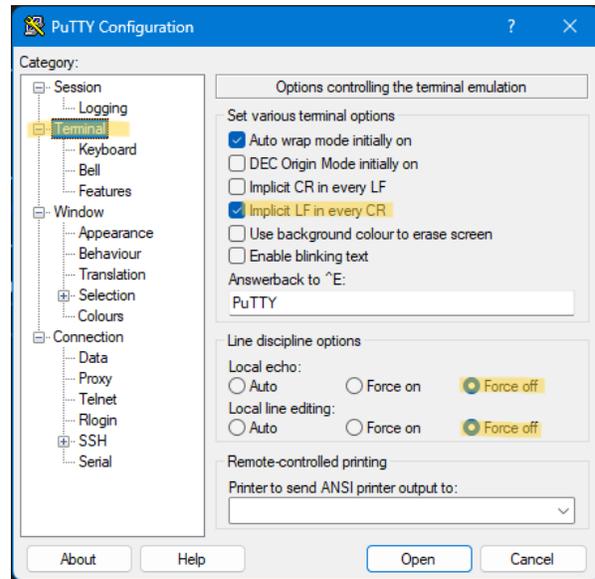
Once this has been done, return to the **Session** menu item, enter a name for this session and click the **Save** button. This allows you to easily re-open this session with just a couple of clicks.

If you right-click on the Putty icon in the Windows toolbar the last few sessions you had open will be displayed. Just select the one you want to open it.
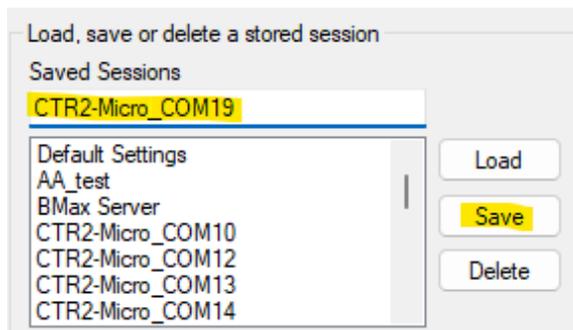
You can adjust the display colors on the **Windows->Colours** menu item. The *Micro* uses the **Bold** attribute to highlight the *hotkeys* and other items. I like to set the **Background** color to blue and the **Bold** color to yellow but you can find the colors that work for you. After you get a color combination you like return to the **Session** menu and **Save** the session.

IP Session

Once you have the *Micro* connected to your WiFi network you can connect to it using an IP session. This connection is a little slower but it's useful if you want to power your *Micro* from a battery, phone charger, or from an OTG port on your phone or tablet.

Find your *Micro's* IP Address

First, you need to know the IP address your router assigned to your *Micro*. This is found in the *Micro's* **WiFi** menu after you have connected the *Micro* to your WiFi network.
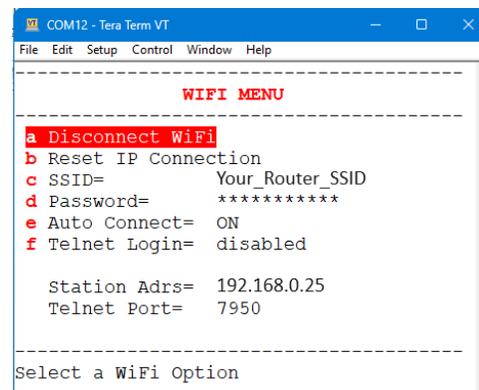
Micro's Telnet Port

The *Micro* always uses IP port 7950 for Telnet connections.

Configure the IP Session

Next, open Putty and **Load** the serial session you created above. This allows you to use the same colors and terminal settings for your IP session.

Click on the **Raw** radio button (the *Micro* uses 'raw' IP sockets in its terminal mode). Next, enter the *Micro's* IP address found above in the **Host Name** field and set the **Port** to **7950**.

Change the name of the session to whatever you want to call it and click the **Save** button.

Click the **Open** button to open this session.
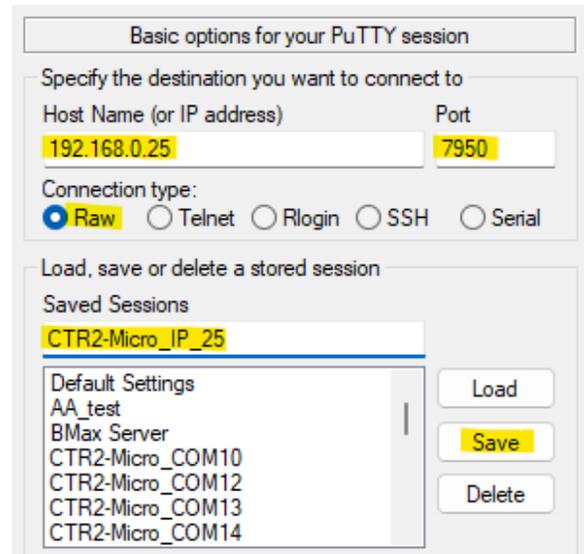
Appendix F: Web Server

A web server was added to the *Micro* starting with v1.02.00. This web server is pretty basic and displays most of the functions of the Telnet terminal screens shown in this manual. The web browser provides single press access to many of the *Micro's* and radio functions

To use the web server you must have the *Micro* connected to your WiFi network and a browser running on a PC, tablet, or cell phone. The web server will work with older browsers so you can use a retired cell phone from your sock drawer as a standalone display for your *Micro*.

NOTE: It is recommended that you enable WiFi Auto-Connect if you plan on leaving the *Micro* running at a remote location so that it can reconnect to your network after a power outage.

Connecting to the Web Server

Enter the *Micro's* IP address in the address bar in your browser. You can find the *Micro's* IP address on the WiFi page or in Main->About… after the *Micro* is connected to the network. The web server on the *Micro* is not encrypted so if your browser tries to open it using HTTPS:// it will not work. Replace HTTPS:// with HTTP:// and try again.
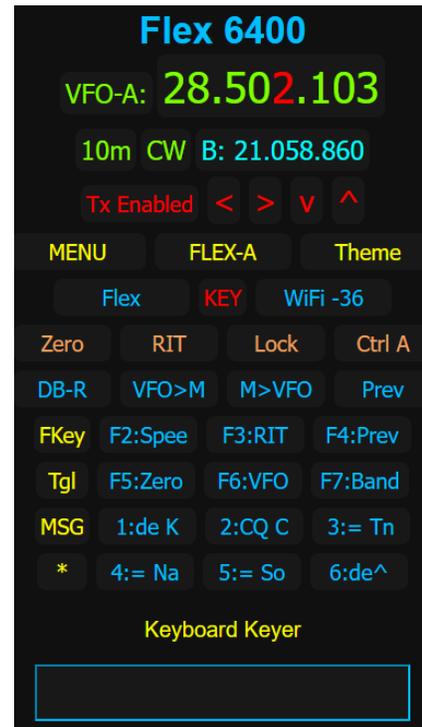
Home Page Description

An example of the browser's **Home** page is shown here. The name of the selected Radio Profile is displayed at the top of the page. You can click on this if you want to change the profile. You can set the name of each profile to make it easier to know which radio you're connected to.

The active VFO (VFO A: 28.502.103) is shown in green at the top of the page. The frequency changes as you turn the knob. You can click on this frequency to edit it in the text editor.

The band (**10m**) and mode (**CW**) are shown next. They are the same color as the active VFO. The font color of the band changes to yellow in General (non-ham) mode.

The offline VFO (B: 21.058860) is shown in cyan color next to the Mode. This color will be used in the main frequency display when you change to VFO-B. Clicking on this button moves the offline VFO to the online VFO.

The state of the transmit inhibitor (**Tx Enabled)** is shown on the third line along with arrows that control the tuning step (< and >) and tuning digit (v and ^). They use red font like the tuning digit to signify that they control it.

Almost every element on this page is a button. Clicking on (or pressing) them executes that function. For example, pressing the active VFO label (**VFO-A**) opens the VFO menu. Pressing the Band button (**10m**) opens the Band menu, etc.

The rest of the buttons are listed below by their function followed by the label on that button in ( ). Buttons that open menus are shown in blue. Buttons that execute a function are shown in orange, and special functions are shown in yellow.

MENU
This button opens the Main menu just like pressing the knob. It's highlighted in yellow because it is a control you'll use a lot.

Radio Menu (FLEX-A)
This button opens the **Radio** menu. The label indicates the Flex menu will open and we are controlling Slice A. Other radios may have their model # listed here.

Theme
This button steps through the various color schemes built into the web server. four dark themes.

> **NOTE:** Changing themes doesn't always change the theme colors due to browser caching issues. Click the ***** button or any of the other buttons to refresh the display.

Radio CAT (Flex)
This button opens the **Config-Radio CAT** menu. The label contains the currently selected CAT protocol.

KEY (or PTT)

This button controls either the KEY Output or the PTT Output of the *Micro* depending on the radio's mode. The label on this button changes to PTT when non-CW modes are selected.

The color of this button follows the Tx Interlock indication. **Tx** must be **Enabled** to use this button.

This is a latching function. Press once to turn it on and press again to turn it off. This action is the same as using the [PgDown] key on the terminal keyboard.

> **NOTE:** The **Keyboard Keyer**, when enabled, is shown at the bottom of the Home page *only when the radio is in a CW mode*.

WiFi

The status of the WiFi connection and the RSSI is shown here. For the fastest page updates the RSSI should be lower than -50.

Zero

Pressing this button zeros the digits below the tuning digit.

RIT

This button opens the **RIT** offset window.

Lock

This button toggles the VFO/Mode **Lock** feature. When locked, the frequency is not displayed and this button's text turns red. You will not be able to change the radio's frequency or mode when locked, **but you can change them on the radio**.

VFO Control (Ctrl VFO A)

This button toggles the *Micro's* VFO control mode. In **Ctrl VFO A** mode both VFO-A and VFO-B on the *Micro* control the radio's A VFO. When set to **Ctrl VFO A&B** the *Micro's* VFO-A controls the radio's A VFO and the *Micro's* VFO-B controls the radio's B VFO.

Selected Database (DB-R)

This button toggles the selected database used for the favorite frequency list. **DB-R** indicates that the currently selected radio profile's frequency database is selected. **DB-S** indicates that the shared favorite frequency database is selected.

VFO>M

This button opens the **Freq->Save to Memory** menu so you can save the active VFO to a memory slot.

M>VFO

This button opens the **Freq->Load from Memory** menu so you can set the active VFO from a memory slot.

This button opens the **Freq->Previous Freq/Mode** menu where you can select from the last 25 frequency/modes that you have tuned to.

Function Button Banks (FKey, BTN, MSG)

There are two banks of six buttons at the bottom of the Home page. These banks contain the user programmable buttons available on the *Micro*. To step through the available banks press the yellow button next to each six-button bank. You can choose from the **FKey** functions (F2 to F7), the **BTN** functions (short-press 1 to 3 and Long-press 1 to 3), the first six **CW message** buffers (not shown), or **Off** (no buttons shown). When a bank is turned off, **Bank{x}-Off** will appear. Press this button to rotate to the **FKey** bank view.

The **Tgl** button appears below the first bank's label. Pressing this button toggles the current bank of buttons in the first bank with the inactive button bank (**MSG** in this example).

*The * Button*

The ***** button in the bottom left corner under Bank #2's label. This button refreshes the page and makes that browser the active browser when you have two or more devices connected to the *Micro's* web server. While multiple devices can connect to the server, only the last device that sent commands to the server will receive updates when you make changes on the radio. The simple web server in the *Micro* cannot support multiple clients simultaneously.

Keyboard Keyer

The Keyboard Keyer is shown on the Home page in this example. It's available when it has been enabled in the Keyer menu *and the radio is in CW or CW-R mode*.

To use it, simply enter text in the keyer text box then press the [Enter] key. Once the transmission starts the text to be transmitted will be displayed in place of the *Keyboard Keyer* title. You can add additional text to the buffer while the current buffer is being sent. Just enter the additional text into the text box and press [Enter] again.

Menu Page

When you click the **MENU** button or click the knob, the browser displays the Main menu. Simply click the menu item with your mouse or use the knob to scroll down the list and press the knob to select an item. The cursor control keys on the keyboard don't work in the menus.

You can also use the **^** and **v** buttons at the bottom of the page to move the next item and press **Ok** to select the item. Pressing **Esc** exits back to the Home page and pressing **Help** opens a help window that describes the currently selected item.

```
                   RADIO MENU
VFO-A= 7.213.400        NR= off
Mode= CW                APF= off
Pan= Existing           Gain= 24
Slice= A                AGC= med
Rx= ANT1                AGC-T= 65
Tx= ANT1                VOX Level= off
Pwr Out= 22w
Tune Out= 5w            Non-GUI
Start ATU               PTT= Hw
Vol= 10                 Key= Hw
BW= 400Hz               CW Delay= 51mS
WNBlnker= off
NBlnker= off
         Help    ^      v     Ok    Esc
```
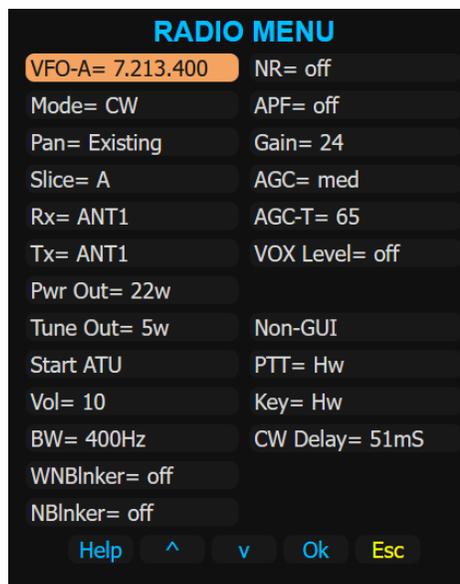
Browser Issues

The web server is very simple and with that simplicity comes a few issues.

Keyboard Entry

The current version of the web server does not support the keyboard cursor controls keys, [Enter] or [Esc] or mouse scroll wheel to select items. Neither does it support shortcut keys. You can use the keyboard as a Keyboard Keyer and to enter text and numbers in the Text and Value editors.

On most browsers you can use the [Tab] key on the keyboard to move to each item on this page and use the [Enter] key to select the item highlighted by the [Tab] key.

NOTE: When using the [Tab] key, each item requires two key presses. The first press selects the *hyperlink element* and the second press highlights the *button.* To execute an item, press [Enter] when the *button* is outlined.

Keyer Navigation

You can use the Keyer->Paddle Navigation and Edit options to navigate menus and enter text and numerical data. When Paddle Navigation is enabled the *hotkeys* will be displayed as shown here. To select an option just input the *hotkey* using the paddles. Iambic B mode it automatically enabled in menus when **Paddle Navigation** is enabled. *Hotkeys* are not available on the keyboard when using the browser interface.

NOTE: The paddles will not key the radio while in the menus or editors if **Paddle Navigation** and/or **Paddle Editing** are enabled. Return to the Home page to key your radio with the paddles.

```
         RADIO (FLEX-A) MENU
 a: VFO-A= 7.213.400    n: NR= off
 b: Mode= CW            o: APF= off
 c: Pan= Existing       p: Gain= 24
 d: Slice= A            q: AGC= med
 e: Rx= ANT1            r: AGC-T= 65
 f: Tx= ANT1            s: VOX Level= off
 g: Pwr Out= 22w
 h: Tune Out= 5w        u: Non-GUI
 i: Start ATU           v: PTT= Hw
 j: Vol= 10             w: Key= Hw
 k: BW= 400Hz           x: CW Delay= 51mS
 l: WNBlnker= off
 m: NBlnker= off
     Help    ^    v    Ok    Esc
```
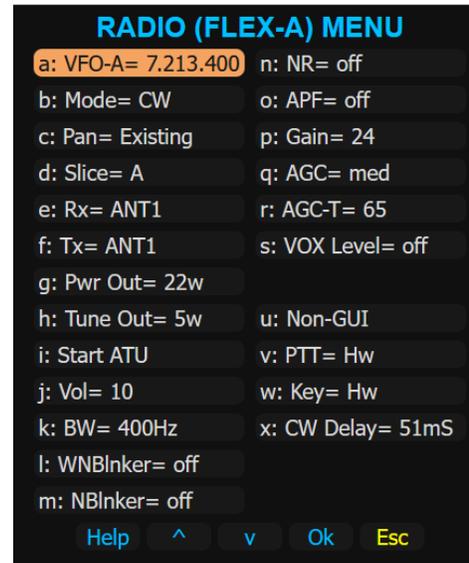
Menu Selection

To select an item in a menu click on it with the mouse, press it on the touch screen, or use the knob to scroll down to it then press the knob to execute it. The mouse scroll wheel and keyboard cursor control keys won't move the selection on the menu. You can use the **v** and **^** and **Ok** button at the bottom of the menu to select and execute an item. To exit the menu press the **Esc** button at the bottom of the menu or press and hold the knob then turn it to the right.

Multiple Devices Controlling the *Micro*

The *Micro's* server can support more than one browser using it. For instance, you could have your PC browser and your cell phone browser connected at the same time. However, only the last one to issue a command will receive updates when you tune your radio. To switch between the two browsers click the ***** button on the one you want to use. That browser will now get tuning updates from the *Micro*. The other browser will not get updates. You must have **Config->WiFi->Server= unlocked** in order for this to work.

NOTE: You can have a Telnet terminal and a browser connected to your *Micro* at the same time.

Server Locked vs Server Unlocked

In order to support the greatest number of browsers possible I added a **Server= Locked/Unlocked** option to the **WiFi** menu.

In the default **Unlocked** mode the *Micro* will disconnect from the browser after it responds to a page request. It will then send unsolicited page updates (frequency changes) to the browser using the last connection settings. Most desktop and some cell phone browsers work fine this way.

If your browser doesn't respond to frequency updates but receives pages from the server try setting the **Server=** mode to **Locked**. In this mode the *Micro's* server doesn't disconnect from the browser. This allows the frequency updates to be processed by the browser.

Frequency Updates Appending to the Bottom of the Home Page

Some browsers, particularly those running on Apple devices append frequency updates to the bottom of the Home page when you turn the knob on the *Micro* and just keep on adding them to the bottom of the page.

In order to stop this action, when you first connect to the *Micro's* server click the **MENU** button to open the Main menu then press **Esc** to return to the Home page. The browser will now update the frequency properly.

I don't know why it does that and haven't found anything online explaining this behavior. I'm 90% sure I'm not sending something it's looking for. Eventually this might get resolved but for now, opening the menu after connecting to the *Micro* seems to fix the problem.

Appendix G: Menu Structure

The *Micro's* menus contains list of items to control and configure the *Micro* and your radio. The title of each menu is located at the top of the display. Menus with 13 or less items are displayed in one column. Menus with more than 13 items are displayed in two columns, with items 1 to 13 in the left column and 14 to the end in the second column. This can be confusing when using a screen reader.

Each menu item is assigned a unique *hotkey* starting at "a" on the first item. *Hotkeys* are assigned sequentially (a, b, c, d, etc). If a menu position is blank the *hotkey* for that position is skipped.

Use the knob to scroll up and down the menu items. If you have the terminal connected you can use the cursor control UP and DOWN keys to scroll the menu. When using the web interface the mouse is used to select an item. Cursor control keys and *hotkeys* do not work in the web interface.

When using the knob to navigate menus, pressing it and turning to the left steps you back to the previous menu or back to Home page if you're on the Main menu. Pressing the LEFT cursor control key on the keyboard does the same.

To execute a menu item, press and release the knob or press the Enter key on the terminal. Click the button on the web interface to execute it.

Menu items react differently when executed depending on their function.

- Some just perform their function and return to the Home page. The Zero Low Digits in the Frequency menu is an example of this action.
- Some toggle or step through the available options. The Paddles item in the Keyer menu is an example of this. Executing this option toggles the paddle mapping between Normal and Reversed.
- Some open the Value or Text editors so you can change their numerical value or text string. The Speed item in the Keyer menu is an example of a value edit where the Call item is an example of the text edit.
- Other items will open a sub menu offering additional options. Most of the items in the Main menu open sub menus.
- Finally, some items are just for information purposes. They have no executable function. These items don't have a *hotkey* assigned to them. The Station Address in the Configure – WiFi menu is an example of an information item.

Menu Lists

This section lists the menus in the *Micro*. They are listed sequentially instead of in columns as they are displayed in the *Micro's* terminal and web displays. A hyperlink to the parent menu is listed below the menu name. You can use this hyperlink to navigate to the parent menu's listing.

Each row starts with the *hotkey*. If there is a "Control Plus" shortcut key to access this function or menu directly from the Home page it will be shown in parenthesis. To use the short cut key, press and hold the Control key then press the indicated key.

The second column lists the item's title on the menu. Items that open sub menus are linked to the table for that sub menu.

The third column describes what the item does.

Main Menu
Parent: None – returns to the Home page

Hotkey/Shortcut	Item	Description
a, (**Ctrl+q**)	Quick Keys	Opens the Quick Key menu where you can execute a quick key or program the function assigned to quick keys.
b, (**Ctrl+f**)	Frequency	Opens the Frequency menu where you can change various frequency settings and manage the favorite frequency database.
c, (**Ctrl+v**)	VFO	Opens the VFO menu where you can select which VFO is active in addition to other VFO settings.
d, (**Ctrl+d**)	Band	Opens the Band menu where you can select the operating band of the radio.
e, (**Ctrl+o**)	Mode	Opens the Mode menu where you can select the operating mode of the radio. You can also enable or disable the transmit interlock or open the External Tuner mode here.
f, (**Ctrl+t**)	CW Msg	Opens the list of 14 transmit menu buffers. Executing a buffer will play it through the keyer and send it to the radio if the transmit interlock is enabled.
g, (**Ctrl+e**)	Edit CW Msg	Opens the Edit Transmit Message menu where you can edit the CW messages.
h, (**Ctrl+k**)	Keyer	Opens the Keyer menu.
i, (**Ctrl+c**)	Configure	Opens the Configure menu. Here you can change many options and settings.
j, (**Ctrl+r**)	Radio	Opens the active radio's custom menu. Each menu is specific to the selected radio.
k	About…	Opens the About window. The program's version and IP address (if WiFi is online) are displayed here along with links to the Lynovation web site and Group IO group.

Quick Keys Menu

Parent: Main Menu

Use (**Ctrl+q**) to open this menu from the Home page

Hotkey	Item	Description
A	F2	Executes the function assigned to Terminal Keyboard F2
B	F3	Executes the function assigned to Terminal Keyboard F3
C	F4	Executes the function assigned to Terminal Keyboard F4
D	F5	Executes the function assigned to Terminal Keyboard F5
E	F6	Executes the function assigned to Terminal Keyboard F6
F	F7	Executes the function assigned to Terminal Keyboard F7
G	sBTN1	Executes the function assigned to short press BTN1
H	sBTN2	Executes the function assigned to short press BTN2
I	sBTN3	Executes the function assigned to short press BTN3
J	lBTN1	Executes the function assigned to long press BTN1
k	lBTN2	Executes the function assigned to long press BTN2
l	lBTN3	Executes the function assigned to long press BTN3
m	Pwr Up	Function to be executed on power up
p	Configure	Opens the Function Button Configuration menu

QKey Configure Menu

Parent: Quick Keys Menu

Executing one of these items opens the **Function Key Option Menu** (Page 1 or Page 2)

NOTE: This menu is identical to the Quick Key menu but has not **Configure** option

Hotkey	Item	Description
a	F2	Set the function assigned to Terminal Keyboard F2
b	F3	Set the function assigned to Terminal Keyboard F3
c	F4	Set the function assigned to Terminal Keyboard F4
d	F5	Set the function assigned to Terminal Keyboard F5
e	F6	Set the function assigned to Terminal Keyboard F6
f	F7	Set the function assigned to Terminal Keyboard F7
g	sBTN1	Set the function assigned to short press BTN1
h	sBTN2	Set the function assigned to short press BTN2
i	sBTN3	Set the function assigned to short press BTN3
j	lBTN1	Set the function assigned to long press BTN1
k	lBTN2	Set the function assigned to long press BTN2
l	lBTN3	Set the function assigned to long press BTN3
m	Pwr Up	Set the function to be executed on power up

Page 1 – Function Key Option Menu
Parent: QKey Configuration Menu

Hotkey	Item	Description
a	------	No function
b	TxEnable	Toggles the transmit interlock – when enabled the *Micro* keys the radio.
c	Speed	Opens the Keyer Speed value editor
d	Direct	Opens the Direct Frequency Input window
e	Zero	Zeroes the digits below the selected tuning digit
f	Prev	Opens the Previous Frequency/Mode menu
g	RIT	Opens the RIT value editor
h	Lock	Toggles the Frequency and Mode lock on the *Micro* – you can still change the frequency and mode on the radio.
i	Scan	Enables scanning if the VFO is in the Range mode
j	M>V	Copies the selected memory slot to the VFO
k	V>M	Saves the current VFO frequency and mode to memory slot
l	SwapAB	Swaps the A and B VFOs
m	CtlVFO	Toggles the Radio VFO control option between A only (both *Micro* VFOs control the Radio's A VFO), or A/B mode where the *Micro's* VFO-A controls the radio's A VFO and the *Micro's* VFO-B controls the radio's B VFO.
n	Database	Toggles between the Radio's favorite frequency database and the Common database.
o	xTuner	Opens the External Tuner mode
p	Report	Sends the radio's frequency, mode, tuning digit, and transmit interlock state to the Report even if it's muted.
q	Full Rpt	Sends the full report from the Home page to the Report, even if it's muted.
r	Msg1	Sends Transmit Message #1 to the keyer. Message #1 always holds a copy of the last message sent.
s	Msg2	Sends Transmit Message #2 to the keyer
t	Msg3	Sends Transmit Message #3 to the keyer
u	Msg4	Sends Transmit Message #4 to the keyer
v	Msg5	Sends Transmit Message #5 to the keyer
w	Key	Activates the Key output of the *Micro* if the transmit interlock is enabled. This is a latching control. Press once to turn on, press again to turn off.
x	PTT	Activates the PTT output of the *Micro* if the transmit interlock is enabled. This is a latching control. Press once to turn on, press again to turn off.
y	More >	Opens Page 2 of the Function Key Options menu.
z	Exit >	Returns to the QKey Configuration Menu.

Page 2 – Function Key Option Menu
Parent Menu: QKey Configuration

Hotkey	Item	Description
a to p	Custom radio parameter	Sets the function key to the custom parameters available for each radio.
q	Quick	Opens the Quick Key menu
r	Freq	Opens the Frequency menu
s	VFO	Opens the VFO menu
t	Band	Opens the Band menu
u	Mode	Opens the Mode menu
v	CWMsg	Opens the CW Message menu
w	EdtMsg	Opens the Edit CW Message menu
x	Radio	Opens the Radio menu
y	More >	Opens Page 1 of the Function Key Options menu.
z	Exit >	Returns to the QKey Configuration Menu.

Frequency Menu

Parent: Main Menu

Use (**Ctrl+f**) to open this menu from the Home page

Hotkey/Shortcut	Item	Description
a, (**Ctrl+d**)	Direct Freq Entry	Opens the current frequency in the text editor (Control +d)
b, (**Ctrl+z**)	Zero Low Digits	Zeros the digits below the tuning digit
c, (**Ctrl+p**)	Prev Freq/Mode	Opens the Previous Frequency menu where you can return to the last 25 frequencies and mode pairs
d	RIT	Opens the RIT frequency value editor
f	Database	Toggles between the radio's frequency and CW Msg database and the Common database shared with all Radio Profiles
g, (**Ctrl+l**)	Load from Memory	Opens the Favorite Frequency list to load the selected VFO
h, (**Ctrl+s**)	Save to Memory	Saves the current frequency and mode to the select memory slot. Add a label to that slot once it has been saved.
I	Rename or Erase Memory	Rename a memory slot or enter a single space at the first of the slot's label to erase the data in that slot.
k, (**Ctrl+i**)	Report Freq/Mode	Play the frequency, mode, tuning resolution, and transmit interlock state to the selected Report even if it's muted.

Previous Freq Menu
Parent: Frequency Menu

Use (Ctrl+p) to open this menu from the Home page

Hotkey	Item	Description
a to y	Previously visited Frequency and Mode pairs	Displays the last 25 frequency and mode pairs. Changing the selected item tunes the radio to that frequency and mode. Press [Enter] or the knob to keep the new frequency on the radio or press [Esc] or press and turn the knob to the left to return to the original freq/mode.

Load from Memory Menu

Parent: [Frequency Menu](#)

Use (Ctrl+l) to open this menu from the Home page

Hotkey	Item	Description
a to j	Displays 10 out of the 100 memory slots	Use the keyboard Up and Down arrow keys or knob to navigate the list. The list automatically increments or decrements when you move past the top or bottom item. Press [Enter] or press the knob to load the currently selected memory slot into the radio's VFO. Press the [>] key or press and turn the knob to the <u>right</u> to toggle between *Micro* VFOs A and B. Press [Esc] or press and turn the knob to the <u>left</u> to exit the menu without selecting a memory slot.

Save to Memory Menu

Parent: [Frequency Menu](#)

Use (Ctrl+s) to open this menu from the Home page

Hotkey	Item	Description
a to j	Displays 10 out of the 100 memory slots	Use the keyboard Up and Down arrow keys or knob to select the memory slot to save the current frequency and mode. The list automatically increments or decrements when you move past the top or bottom item. Press [Enter] or press the knob to save the frequency and mode to the selected memory slot. Press the [>] key or press and turn the knob to the <u>right</u> to toggle between memory slots A and B. Once the memory slot has been updated a text edit window will appear where you can add a label for this memory slot. Press [Esc] or press and turn the knob to the <u>left</u> to exit the menu without selecting a memory slot.

Rename or Erase Memory

Parent: [Frequency Menu](#)

Hotkey	Item	Description
a to j	Displays 10 out of the 100 memory slots	Use the keyboard Up and Down arrow keys or knob to navigate the list. The list automatically increments or decrements when you move past the top or bottom item. Press the [>] key or press and turn the knob to the <u>right</u> to toggle between memory slot A and B. Press [Enter] or press the knob to load the currently selected memory slot's label into the [text editor](#). Edit the label here. **Enter a single space in the first character to erase all data in this memory slot.** Press [Esc] or press and turn the knob to the <u>left</u> to exit the menu without selecting a memory slot.

VFO Menu

Parent: Main Menu

Use (**Ctrl+v**) to open this menu from the Home page

Hotkey/Shortcut	Item	Description
a, (Ctrl + a)	VFO-A	Select VFO-A. Ctrl+a swaps VFO-A and VFO-B
b, (Ctrl + a)	VFO-B	Select VFO-B. Ctrl+a swaps VFO-A and VFO-B
c	Memory Tuning	When selected the knob or keyboard Up and Down keys step through the programmed memory slots.
d	Range Tuning	When selected tuning will be limited to the current band. To restrict tuning even more, program VFO-A on a memory slot for the low range limit and VFO-B on the same slot for the high range limit then load this memory slot.
f	Ctrl VFO A or A/B	When set to Ctrl VFO=A the *Micro's* A and B VFOs control the radio's A VFO. When set to Ctrl VFO=A/B the *Micro's* VFO-A controls the radio's A VFO and the *Micro's* VFO-B controls the radio's B VFO.
g	VFO Lock	When ON the *Micro's* frequency and mode change functions are locked. You can still change frequency and mode using the controls on the radio.
h	Start Scan	When enabled the *Micro* will scan the selected frequency range. By default this is the selected band but you can change the range by loading a memory slot as described in **Range Tuning** above. Adjust the tuning resolution to speed up or slow down the tuning rate. The *Micro* <u>will not stop</u> on an active frequency.
i	A to B	Copies VFO-A frequency and Mode to VFO-B
J	B to A	Copies VFO-B frequency and Mode to VFO-A
k	Swap A/B	Swaps the frequencies and modes in VFO-A and VFO-B

Band Menu

Parent: Main Menu

Use (**Ctrl+b**) to open this menu from the Home page

Hotkey	Item	Description
a to q	Bands	Displays each band. Use the *hotkey* or select the desired band with the knob or keyboard Up and Down keys. Press the knob or [Enter] to move to that band. The frequency and mode used on the band you move from will be saved and restored when you return to that band.

Mode Menu

Parent: Main Menu

Use (**Ctrl+o**) to open this menu from the Home page (Ctrl+m is the [Enter] key)

Hotkey	Item	Description
a to i	Modes	Displays the available radio modes. Use the *hotkey* or select the desired mode with the knob or keyboard Up and Down keys. Press the knob or [Enter] to switch the radio to that mode.
k, (Home)	Tx Enable	Toggles the transmit interlock from OFF (disables Key and PTT outputs) to ON (enables Key and PTT outputs). Press the [Home] button on the keyboard to toggle.
l	External Tuner	Opens the External Tuner control mode. This option can be assigned to a BTN using the **xTune** function.

CW Message Menu

Parent: Main Menu

Use (**Ctrl+t**) to open this menu from the Home page

Hotkey	Item	Description
a to n	Transmit Message Buffers 1 to 14	Displays the transmit message buffers that contain text. Use the *hotkey* or select the desired message buffer with the knob or keyboard Up and Down keys. Press the knob or [Enter] to begin transmitting the selected buffer. **NOTE:** If the transmit interlock is enabled (**Tx Enab**) the keyer will key the radio. **NOTE:** Message #1 always contains a copy of the last message sent. Use message #1 to retransmit a contest exchange without incrementing the Contact Serial Number.

Edit CW Message Menu

Parent: Main Menu

Use (**Ctrl+e**) to open this menu from the Home page

Hotkey	Item	Description
a to n	Transmit Message Buffers 1 to 14	Edit a message buffer by selecting it with the *hotkey,* the knob, or keyboard Up and Down keys. Press the knob or [Enter] to open the text editor to edit the message. Messages are limited to 74 characters.

Keyer Menu

Parent: Main Menu

Use (**Ctrl+k**) to open this menu from the Home page

Hotkey/Shortcut	Item	Description
a, (Ctrl + u)	Speed	Edit the keyer speed in the value editor
b	Spacing	Edit the keyer's Farnsworth spacing
c	KeySTone	This item determines if the radio's sidetone or the *Micro's* sidetone will be used <u>when the radio is transmitting</u>. The *Micro's* sidetone is always used when the transmit interlock is disabled (**Tx Off**).
d	Sidetone	Adjust the frequency of the *Micro's* sidetone here.
e	Type	Opens the Keyer Type menu.
f	Paddles	Select **Normal** or **Reverse** to match how your paddle is wired
g	Pdl PTT	When **Paddle PTT** is enabled the Paddle Input jack on the *Micro* can be used to control the radio's PTT Input when the *Micro* is in a voice mode. The paddles work as normal in CW and CWr modes. **NOTE:** The DIT paddle input latches PTT. Press once to key PTT, press either paddle to unkey. **NOTE:** The DAH paddle input provides momentary PTT.
h	Kybd Kyr	This option toggles the Keyboard Keyer on the *Micro*. When enabled simply start typing in the terminal then press [Enter] to send the text you entered. In the web interface you must click on the Keyboard Keyer text box on the Home page to enter text to transmit.
i	Beacon	Opens the Beacon Menu.
J	Nav/Edit	Allows you to use the paddles for menu navigation and editing. Best used with Report set to Code and unmuted. **NOTE:** The *Micro* won't key the radio when a menu or edit screen is active if this option is enabled.
k	Practice	Opens the Practice Menu.
n	Call	Enter your call sign here then us the ^ prosign to insert your call into transmit message buffers.
o	Serial Number	Edit the contact serial number here for contest. Insert the serial number in a transmit message buffer using the # prosign. This value increments each time the buffer is sent. Edit this field to reset it. **NOTE:** Use buffer #1 to repeat a contest message without incrementing the serial number.
p	Exchange	Edit the contest exchange here then use the % prosign the exchange into a transmit message buffer.

Keyer Type Menu
Parent: Keyer Menu

Hotkey	Item	Description
a	None	Disables the Paddle Input jack on the *Micro*
b	Straight	Connect your straight key to the TIP and SHIELD of the Paddle Input jack.
c	Passthru	This option maps the Paddle Input jack TIP and RING to the Key/PTT Output jack TIP and RING. This allows you to "pass through" the keying input to the *Micro* to an external keyer or directly to the radio's keyer.
d	Iambic-A	Enables Iambic-A keyer mode
e	Iambic-B	Enables Iambic-B keyer mode
f	Ultimatic	Enable Ultimatic keyer mode
g	Bug	Enables Bug keyer mode

Beacon Menu
Parent: Keyer Menu

Hotkey	Item	Description
a	Beacon	Enable or disable the beacon. To quickly disable it press [Esc] in the Home page while the beacon is active.
b	Interval	Set the beacon's repeat interval here in milliseconds.
c	Frequency	Set the frequency the beacon operates on here. This setting will override the radio's frequency if it has been changed during the beacon interval.
d	Call	Enter the call sign for the beacon. If you have programmed in your call sign into the Keyer menu's Call field it will be inserted here to start. **NOTE:** Do not add "/b" to your call. The beacon will automatically add this for you.
e	Location	Enter the Maidenhead coordinates for your transmitter here. These can be found online.
f	Additional Text	Enter any additional text you want to broadcast here.
g	1st Power Out	Enter the power level to use for the beacon message. **NOTE:** Your radio's CAT must support transmit power level adjustment for power settings to work.
h	2nd Power Out	If you want to transmit short power messages after the initial message is sent, enter the power level for the second transmission here. **NOTE:** Power outputs must be sequential starting with the 1st Power Out level.
i	3rd Power Out	Enter the third power output level here.
j	4th Power Out	Enter the forth power output level here.

Code Practice Menu

**Parent: **

Hotkey	Item	Description
a	MODE	Select from the following practice modes: • Send continuously o Continually sends from the pool • Send 1 Character and Wait o Useful for keyboard training. Sends one character then waits for that key to be pressed • Send a Group of Characters and Wait o Useful for "in head" training. Sends a group of characters then waits for them to be entered on the keyboard
b	Fixed Length	Sends group of 5 characters from the pool
c	Random Length	Sends random length groups of 1 to 10 characters from the pool
d	Call Signs	Sends random call signs base on international call sign formats
e	Q-Signals	Randomly sends Q-signals
g	All Letters	Loads the pool with all letters, A to Z
h	All Groups	Loads the pool with all of the groups below
i	Group 1	Loads the pool with e, I s, h, t, m, o
j	Group 2	Loads the pool with a, r, u , v, n, d, b
k	Group 3	Loads the pool with w, j, p, k, g
l	Group 4	Loads the pool with l, f, y, c, q, x, z
m	Numbers	Loads the pool with 0, 1, 2, 3, 4 , 5, 6, 7, 8, 9
n	Punctuation	Loads the pool with . , ? ' / : ; + - =
o	Edit Pool	Opens the text editor so you can change the pool characters

Configure Menu

Parent: Main Menu

Use (**Ctrl+c**) to open this menu from the Home page

Hotkey/Shortcut	Item	Description
a, (**Ctrl+w**)	WiFi	Opens the WiFi menu
c	Profile	Opens the Radio Profile menu where you can choose from a list of 10 profiles.
d	Name	Edit the name of the selected Radio Profile. The name will be displayed at the top of the Home page.
e	CAT	Select the CAT protocol here
f	Connection	Change the baud rate or IP address used to connect to the radio's CAT port
g	Settings	Opens the Settings menu
i	Report	Opens the Report menu
k	Manage Files	Provides file management functions

WiFi Menu

Parent: Configure Menu

Hotkey	Item	Description
a	Connect/Disconnect WiFi	Toggles the WiFi on and offline
c	SSID	Enter your WiFi routers' SSID here
d	PW	Enter your WiFi router's password here **NOTE:** It will always be shown as eleven asterisks on this page
e	Auto Connect	Enable Auto Connect if you want the *Micro* to connect to your WiFi system on power up. **NOTE:** Disconnecting a terminal session cause the *Micro* to reboot. If you want to have WiFi enabled when it reboots enable this setting.
f	Server	This setting locks and unlocks the server connection when using the web browser connections. Some browsers require the connection to the *Micro* to be maintained (Locked) while other don't care. If you have problems getting your browser to stay connected to the *Micro* set this to Lock.
g	Require Login	When enabled this option will require you to log into the *Micro* when connecting using an IP terminal session. You only need to enter the password to enable the connection. If you haven't set the Call sign in the Keyer menu the password is "micro", all small letters. I you have set the call the password is you call, all small letters.

Profile Menu
Parent: Configure Menu

Hotkey	Item	Description
a to j	Radio 1 to Radio 10	Lists 10 radio profiles that you can choose from. Each profile contains that radio's CAT settings, favorite frequency list, and band settings. You can have multiple profiles set up for one radio or you can have several radios set up. To use multiple radios with the *Micro* you may need to change the CAT polarity jumpers or DIP switch..

CAT Menu
Parent: Configure Menu

Hotkey	Item	Description
a	Bridge	In Bridge mode the *Micro* becomes an IP to Serial adapter. It receives IP CAT controls on UDP port 7951 and forwards them to the serial CAT port. When it receives a reply from the radio on the serial CAT port it forwards that message to the UDP port 7951 on the remote device. The remote device can be another *Micro*, a CTR2-Mini, or a software program using IP CAT.
b	Flex	Selecting this CAT protocol enables the *Micro* to control a Flex 6000 series radio. You must set the radio's IP address and IP port in the Connections menu. For older Flex radios use the Kenwood1 protocol with an IP connection.
c	PCR1000	Select this protocol to control an Icom PCR-1000 wideband receiver. In this protocol the transmit interlock is used to control the power on the radio.
d	Icom	Select this protocol for Icom radios. You will be asked for the Hex address of the radio. Leaving this field set to 0 will cause the *Micro* to automatically detect the address of the radio. If you have multiple Icom radios on the same CI-V bus (using a CI-V hub) set this address manually. The default CI-V baud rate is 19200 baud. Set the CAT polarity switches for CI-V, switches 1, 2, 3, and 8 ON (DIP switches UP) and 4, 5, 6, and 7 OFF (DIP switches DOWN).
e	Elecraft	Select this protocol for Elecraft K2, K3, K4, KX2, and KX3 radios.
f	Kenwood1	This is for newer Kenwood radios using adjustable baud rate and 8 data bits, 1 stop bit, and no parity bits. The Kenwood menu will be available on the Main menu when this protocol is selected. Set the baud rate to match your radio. Newer Kenwoods typically use RS-232 serial so set the CAT polarity switches to 1, 2, 3, and 8 OFF (DOWN) and 4, 5, 6, and 7 ON (UP).
g	Kenwood2	This protocol is for older Kenwood radios that use 4800 baud, 2 stop bits, no parity. The Kenwood menu will not be available on the Main menu.

Hotkey	Item	Description
h	Xiegu	Select this protocol for Xiegu G90, G106, and X5105 radios. Sorry, the *Micro* doesn't support the X6100 because it doesn't have a serial CAT port. Use TTL CAT levels with these radios. Set the polarity to 1, 2, and 3 ON (UP) and 4, 5, 6, 7, and 8 OFF (DOWN). The baud rate is set for 19200 baud. Use a 3.5mm (1/8") stereo patch cable to connect the *Micro's* CAT port to the radio's CAT port.
I	Yaesu FTdx	Select this protocol for Yaesu FTdx models. It also works with the FT991. Sorry, the *Micro* doesn't support the FT1000 or FT890 models. Set the CAT polarity for inverted TTL (RS232) levels by setting switches 1, 2, 3, and 8 OFF (DOWN) and 4, 5, 6, and 7 ON (UP). Set the baud rate to match your radio's setting. Use a 3.5mm (1/8") stereo plug to DB9 connector cable with a DB9 null modem adapter to connect the *Micro's* CAT port to the radio.
j	Yaesu FT100	Use this protocol for the older FT100 radio. A special cable is required to connect the *Micro's* CAT jack to the radio's mini-DIN 8 pin connector.
k	Yaesu FT8x7	Use this protocol for the FT817, FT818, FT857, and FT897 radios. A special cable is required to connect the *Micro's* CAT jack to the radio's mini-DIN 8 pin connector.
l	NET rigCtl	This protocol is used for radios that support Hamlib NET rigCtl over IP. You must set the radio's IP address in the Connections menu.

Connection Menu

Parent: Configure Menu

Hotkey	Item	Description
a	1200	Set the serial CAT baud to 1200. I'm not aware of any radio using this rate.
b	2400	Set the serial CAT baud to 2400. I'm not aware of any radio using this rate.
c	4800	Set the serial CAT baud to 4800. Older Kenwood radios using the Kenwood2 protocol are fixed to this rate.
d	9600	Set the serial CAT baud to 9600. Many radios use this rate.
e	19200	Set the serial CAT baud to 19200. The Icom CI-V bus runs at this rate. It's also used by Xiegu radios.
f	38400	Set the serial CAT baud to 38400. This is a common rate with newer radios using RS232 CAT interfaces.
g	57600	Set the serial CAT baud to 57600. This is too fast for the *Micro's* CAT port. Don't use it.
h	115200	Set the serial CAT baud to 115200. This is too fast for the *Micro's* CAT port. Don't use it.
j	IP Address	When using a network enabled protocol like the Flex, Elecraft K4, or NET rigCtl enter the radio's IP address here
k	IP Port #	Set the IP port the radio uses here. For Flex radios this is typically 4992.
l	IP Port Type	Toggles the IP Port Type between UDP and TCP. Most radios use TCP for CAT ports.

Settings Menu

Parent: Configure Menu

Hotkey	Item	Description
a	Tag Line	Edit the tag line at the bottom of the terminal screen here.
b	S-Meter Cal	Calibrate the S-meter reading by changing this value. The value is a decimal value with the range of .01 to 9.99. To disable the S-Meter output set this to .01.
c	Knob Type	This item allows you to changes the sensitivity of the knob when navigating the menus. Smooth knobs (with not detents) are too sensitive in normal mode. Set this option to **No-Detent (slow)** for these knobs. Select **Detent (fast)** for detent knobs.
d	Knob Direction	This option allows you to reverse the direction of the knob. This would be useful if you mounted the knob and pushbuttons on the bottom of the *Micro's* PCB so the PCB could be mounted in a different enclosure.
e	Menu Timeout	This option allows you to disable the 10 second timeout for the menu system. The timeout insures you never get lost in a menu. Micros are shipped by default with the timeout disabled.
f	LED State	Disables LED flashing to indicate the program state. Press BTN1 to check if power is on or off. Default is ON.
h	Multi-Func Btn Calibration	Select this option to recalibrate the resistive ladder used for the pushbuttons on the *Micro*. You may need to do this if you notice the *Micro* is not accurately responding to button presses.

Report Menu

Parent: Configure Menu

Hotkey	Item	Description
a	Report (mute state)	Mute and Unmute the report output here.
b	Report Type	Select from **Code, Text, Display, Voice,** or **Display+Voice** report output here.
c	Include Hotkey	Enable this option if you want to include the *hotkey* in every report. Once you are familiar with the menu structure the *hotkey* may be all you need to listen for to select a menu item.
Code Report Menu Options		
d	Freq/Mode	Enable this option if you want the frequency, mode, tuning resolution, and transmit interlock state reported when any of these items change and Report is unmuted.
e	Number of Chrs	Set the number of menu item characters you want the report to contain. Setting this to 0 disables menu item report. Setting it to 10 enables reporting all menu item characters.
f	Speed	When Code Report is selected this option allows you to set the code speed used in the report. Speed range is 15 to 99 wpm.
g	Spacing	When Code Report is selected this option allows you to set the Farnsworth spacing used in the report. Spacing range is 5 to 99 wpm.
Text Report – No additional configuration options		

Display Report Menu Options		
h	CTR2-Display IP	Enter the IP address of CTR2-Display here
Voice Report Menu Options		
I	CTR2-Voice IP	Enter the IP address of CTR2-Voice here
J	Voice Settings	Opens the **Voice Settings** menu

Voice Settings Menu
Parent: Report Menu

Hotkey	Item	Description
a	Volume	Sets the volume of the voice on CTR2-Voice Range 0-9
b	Tone	Sets the tone of the voice on CTR2-Voice – Range 0-9
c	Speed	Sets the speed of the voice on CTR2-Voice – Range 0-9
d	Numbers	Determines how numbers are pronounced **Digits** pronounces individual digits of a number **Numerical** pronounces numbers numerically
e	PTT Monitor	Enables or disables audio indication of PTT activity **None** – not audible notification **Tone on Change** – high tone on PTT press, low tone on PTT release **Voice on Change** – say "PTT On" or "PTT Off" to indicate PTT state
f	Delay	Adds additional delay to voice announcements. This value is added to the 700 milliseconds the speech synthesizer takes to convert text to speech.

Manage Files Menu
Parent: Configure Menu

Hotkey	Item	Description
a	Backup Files	Backs up all configuration and data files on the unit for the selected Radio Profile. **NOTE:** Backup files will be deleted if you **Erase the Flash** when you flash a new version of firmware to the unit.
b	Restore Files	Restores previously backed up files for the selected Radio Profile
c	Export Settings to a PC	Saves all setting files (including all frequency, band, and radio profile files) to a single file on your PC. This function uses the **XModem Receive** feature in **Tera Term's** *File* menu.
d	Import Settings from a PC	Imports all setting files (including all frequency, band, and radio profile files) that were previously **Exported** to a file on your PC. This function uses the **XModem Send** feature in **Tera Term's** *File* menu.
e	Reset this Profile to Factory	Erases all configuration and data files for the selected Radio Profile. You can restore the backup files using the **Restore Files** option above.

Radio Menu

Parent: Main Menu

Use (**Ctrl+r**) to open this menu from the Home page

The **Radio** menu displays parameters specific to the selected CAT protocol. The first two items (VFO Frequency and Mode) are common to all radio menus. Other items change based on the radio selected.

Hotkey/Shortcut	Item	Description
a	Selected VFO Freq	This item displays the current frequency for the selected VFO. Executing it opens the Direct Frequency text editor.
b	Mode	This item shows the current mode of the radio. Executing it opens the Mode menu.
c to z	Radio Parameters	Specific to the selected radio.

Appendix H: Accessibility

The decision to not include a display on the *Micro* provided several challenges in its design. To be anything more than a simple remote turning knob for your radio the operator needs to interact with it. To that end, the *Micro* provides multiple user interface options.

Both Telnet terminal (serial and network) and web browser interfaces are supported. These provide the operator with visual interfaces similar to many other radio control programs. The *Micro* also includes audio reporting options that allow it to communicate with the operator using Morse code or with simple text reports that screen readers can use to announce frequency changes and navigation. A standalone speech synthesizer is also in development that will allow the *Micro* to be used without a computer.

The Code Report option provides non-visual operation. This mode sends short reports in code to the operator using the *Micro's* keyer and sidetone oscillator when anything is changed in the program. However, not everyone knows, or wants to know, Morse code.

Blind or operators with limited vision use screen readers such as NVDA to navigate their computer's screens. By their very nature, busy displays or displays with a lot of changing values are difficult for screen readers (and the operator) to keep up with. The Text Report option was designed specifically for screen readers. When operating in this mode, only a single line of text is sent to the terminal display when the operator changes the radio's operating parameters (i.e. parameters that are monitored by the *Micro*), changes the tuning resolution (tuning digit), changes the transmit interlock state, or opens the *Micro's* menu system to change a parameter. Once the operator is familiar with the *Micro's* menu structure this mode makes operating the *Micro* and your radio quite easy without a display. For a full list and description of the menus offered by the *Micro* refer to Appendix G: Menu Structure.

Additional accessibility options are planned for the future. These include a standalone speech synthesizer with a small LED display and a small standalone display.

Why This Appendix?

This manual uses diagrams, photos, and screenshots of the menus to describe the features and control of the *Micro*. These are not useful for blind or operators with limited vision. This appendix aims to correct this by providing text descriptions of the *Micro's* physical controls. In addition, the complete menu structure is included in text format in Appendix G. This appendix is a good reference for any operator learning to use the *Micro*.

Hardware Walk Around

The *Micro* is a small device measuring 60mm square and 20mm high (without the knob). In inches it's almost 2.5 inches square and 1 inch high. The *Micro* has an knob, three push buttons, one LED, one USB-C connector, and three 3.5mm (1/8 inch) stereo jacks for paddle and radio interfacing.

Orientation

Hold the *Micro* in your hand with the knob facing up and the three buttons on the top face positioned to the left. You'll notice the knob is slightly off-center towards the bottom right. Just to the right of the knob there are two curved slots that follow the contour of the knob cut into the enclosure. These constitute the speak grill.

Multi-Function Buttons (BTNs) and LED

Continuing clockwise around the knob knob you'll find three small pushbuttons on the left side of the knob. These are the multi-function buttons, or BTNs. BTN1 is found in the lower left corner about 12mm (1/2 inch) from the bottom edge. MDB2 is about 12mm above it. MBF3 is mounted away from the first two buttons. It's about 12mm from the top of the enclosure. Continuing clockwise you'll find the status LED in the top right corner, also about 12mm from the top edge.

Volume Control

With the *Micro* still in your hand with the buttons positioned to the left of the knob you'll find a hole for the volume control on the far right of the bottom edge. It's in the middle of the bottom edge (top to bottom) and about 9mm (3/8") from the right edge of the enclosure. The actual volume control pot is inside the enclosure about 9mm so you'll need to use a small Philips head screwdriver to adjust the volume. It ships in the full volume position which isn't very loud so you'll probably never need to adjust it.

CAT Polarity Settings

Continuing clockwise around the bottom edge you'll find the external DIP switch if you ordered that option. The switches are numbered 1 to 8, left to right. You'll use these switches to set the CAT polarity on the *Micro*. If you ordered the *Micro* with the internal CAT polarity header you'll need to open the enclosure to change the strapping.

- For TTL CAT levels (used on many older Yaesu radios and some newer radios) set switches 1, 2, and 3 to the ON position (UP). Set switches 4 to 8 OFF (DOWN).

- For inverted TTL CAT levels (RS-232) set switches 1, 2, 3, and 8 OFF (DOWN) and 4, 5, 6, and 7 ON (UP).
- For Icom radios using CI-V CAT control set switches 1, 2, 3, and 8 ON (UP) and 4, 5, 6 and 7 OFF (DOWN).

USB-C Connector

Continuing around the enclosure to the left edge you'll find the USB-C connector in the center. This connector is used to plug your *Micro* into you computer. It provides power for the unit and the computer will create a virtual serial port for the *Micro* when it connects.

NOTE: You must use a USB-C <u>data</u> cable. Many USB-C cables are <u>charge only</u> cables. The *Micro* <u>will not work with charge only cables</u>.

NOTE: I recommend purchasing a right-angle USB-C cable. This allows the USB cable to route away from the *Micro* in the same direction as the paddle and radio I/O cables. An example of this cable can be found [here](#) on Amazon.

Paddle and Radio I/O Jacks

Continuing clockwise around the enclosure you'll find three 3.5mm (1/8 inch) stereo jacks on the top edge. The first jack on the left is the Paddle Input jack. Connect your paddles or straight key to this jack.

In the middle you'll find the CAT I/O jack. Connect the CAT cable for your radio to this jack. If your radio is an Icom or similar or has a 3.5mm stereo CAT connector you can just use a 3.5mm stereo patch cable to connect the *Micro* to your radio. Other radios use DB9 connectors or mini-DIN8 connectors for CAT. I carry custom built cables for most radios on my web site. [Click this link to visit the cable page](#).

On the right side of the top edge you'll find the Key and PTT output jack. You can use a 3.5mm stereo patch cable to connect this jack to your radio's Key input but if you want to use PTT on the *Micro* too you'll need a custom breakout cable. I carry these on my cable page, cable model PTTKEY6. It comes with a 3.5mm stereo plug on one end and two plugs on the other. The stereo plug goes to your radio's Key input and the other plug has an inline 3.5mm mono adapter on it. You'll need to wire this adapter to the PTT input on your radio.

The right face of the *Micro* doesn't have any connectors on it.

Using the *Micro* with a Screen Reader

The [Text Report](#) mode in the [Configure – Report](#) menu is optimized to support screen reader programs used by blind and sight limited operators. <u>A terminal connection is required to use this mode.</u> It is not supported in the web interface.

When you enter this mode the *Micro* only sends short text messages to the terminal display, similar to the [Code Report](#), but more verbose. The screen reader reads those messages so the operator knows

what changes are being made to the radio. Changes made on the radio to one of the monitored parameters on the radio (i.e. frequency, mode, VFO, volume, AGC, etc), are also announced.

The CTR2-Voice Speech Synthesizer

Version v1.05 brings support for the new **CTR2-Vocie** speech synthesizer. This unit allows you to use the *Micro* without any display. Radio control and *Micro* menu navigation are announced to the operator in English.

A separate operation manual for **CTR2-Voice** can be downloaded here.

The voice unit connects to the *Micro* using WiFi. It requires 5 VDC from a USB-C cable. This can be supplied by a computer, cell phone charger, or battery. No computer connection data is required.

The voice unit has a single 3.5mm (1/8") phone jack on its back panel. Connect a set of powered speakers, headphones, or an input to your station's audio mixer here. There is a level pot on the side of the unit near the phone jack. This pot can be used to reduce the output in case you want to drive the microphone input on your computers sound card.

CTR2-Voice can connect to your station's WiFi router as a WiFi Station as shown in this diagram. Enter the IP address of **CTR2-Voice** in the **Configure -> Report -> CTR2-Voice IP** menu field then enable **Voice** as the **Report Type** and unmute the report.

It can also be set up as a WiFi access point. This eliminates the need for an external router. The *Micro* connects directly to **CTR2-Voice** using SSID *CTR2-Voice* and password *ctr2-voice*. Set the **CTR2-Voice IP** address in the **Configure -> Report** menu to *192.168.4.1* and unmute the report.

This is a great option for portable operation where an external router may not be available.

CTR2-Display Firmware

A firmware-only remote display option is available that uses the Wio Terminal from Seeed Studios. **CTR2-Display** is a free program that you can use to create a remote, WiFi connected display for the *Micro*. Since it links to the *Micro* using WiFi ou can position the display anywhere in your station. You can download it here.

CTR2-Display displays the report text that would normally be sent to **CTR2-Voice** or the **Code** report. In fact, you can link **CTR2-Display** and **CTR2-Voice** to the *Micro* at the same time. Just enter their IP addresses into the **CTR2-Display IP=** and **CTR2-Voice IP=** fields in the **Configure->Report** menu and select the *Display+Voice* **Report Type.**

This diagram shows how **CTR2-Display** is integrated into you station.

Appendix I: Connecting to Other Programs

The *Micro* can serve as a physical control interface for a variety of radio control programs. This section describes how to connect the *Micro* to Thetis, piHPSDR, and wfview. There are several other radio control programs out there. The guidelines here can be used with many of the others.

Connecting to Thetis

Thetis is a powerful, easy to use interface for radios based on PowerSDR, originally used on Flex radios prior to SmartSDR. It's still in development and can support Apache Labs ANAN and Hermes Lite 2 radios.


Connecting to piHPSDR

piHPSDR is a "skinny" version of openHPSDR designed to be run on the Raspberry Pi and other small micro processors running Linux. It hasn't been recently updated and contains several small bugs, but if you want a control program for your Pi, this is the one to get.

Connecting to wfview

wfview is a fairly recent addition to the open source radio control space. It's designed for the Icom radios and recently Xiegu added support for it in their latest update for the X6100. Linking the *Micro* to this program allows you to control the IC-705 and the X6100.

To connect *wfview* to your radio, on the *Settings* tab at the top of the screen, select the *Radio* Access menu, select **Network** under the *Radio Connection* block and enter your radio's IP address (i.e. **Hostname**) and login credentials.

Next, click on the *External Control* menu, click the **Enable RigCtld** box and enter the IP *Port* number you want it to use. The default is 4532.
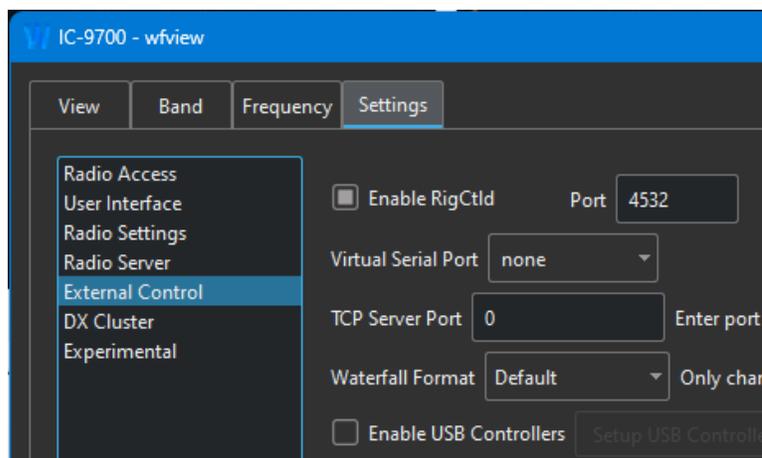
On the *Micro*, select the **Configure -> CAT** menu and select *NET rigCtl.* Next, select the **Configure -> Connection** menu and enter the IP address of the computer that *wfview* is running on, enter the *IP Port* you selected in *wfview's* **Settings -> External Control -> Port** window (4532 in this example), and make sure *TCP* is selected as the *Port Type*.
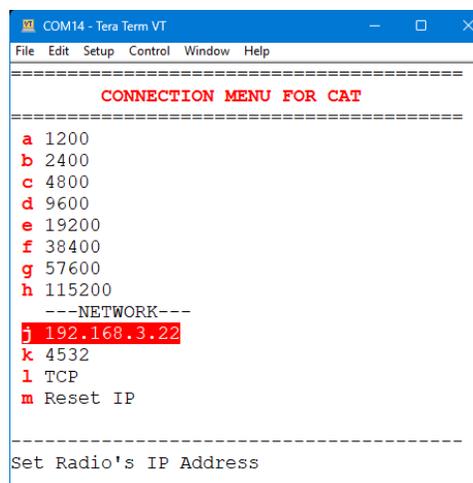
The **Connection** menu should look like this when you're done.

> **NOTE:** You may need to <u>Reset the IP Connection</u> on the *Micro* to start polling.
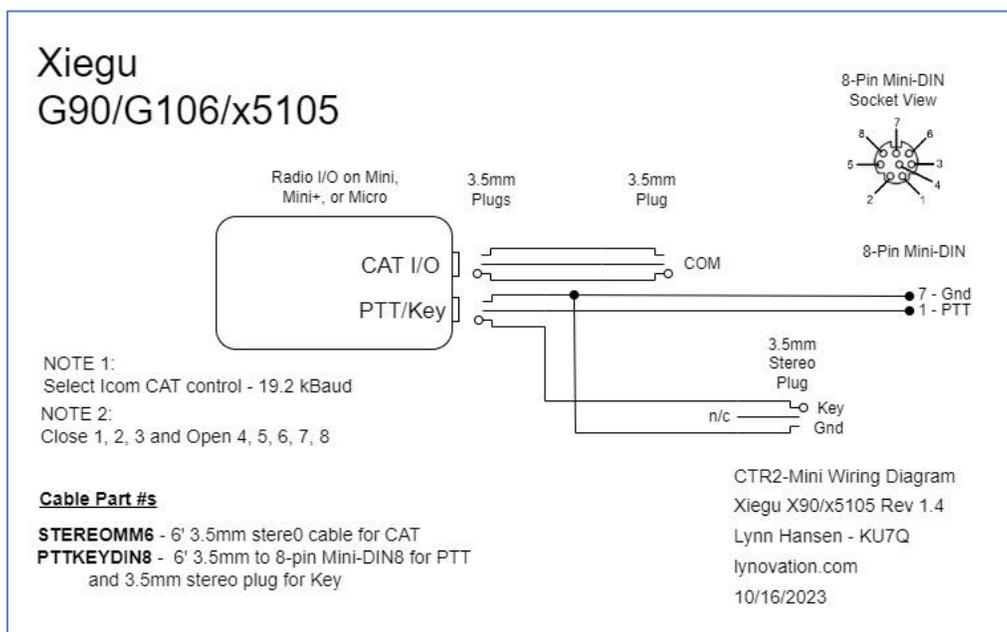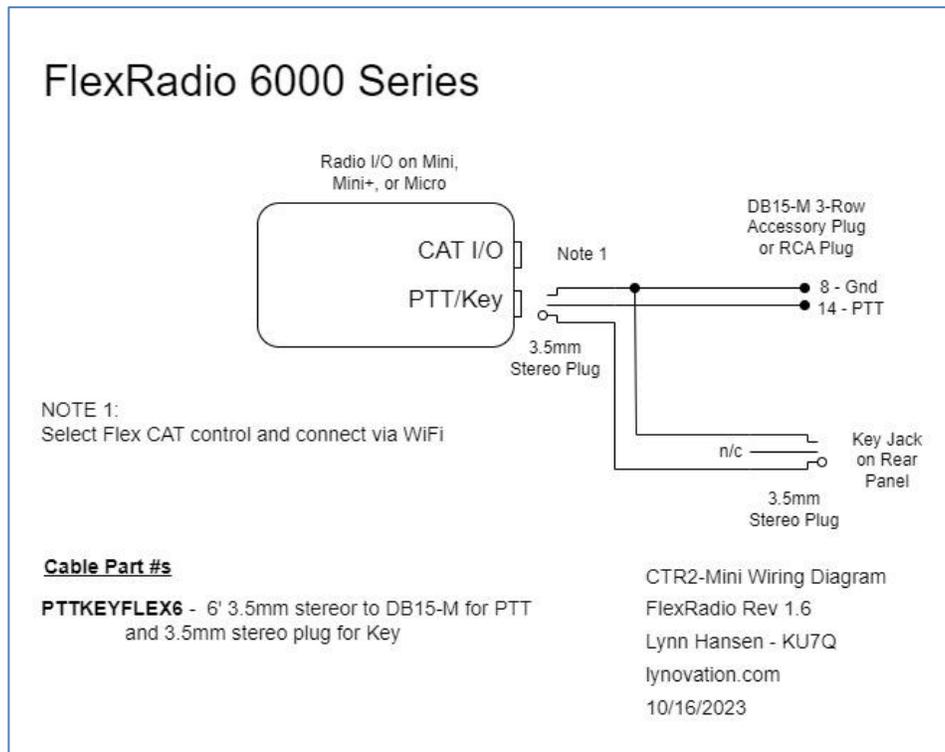

Bugs in wfview
The current version of *wfview* (v1.64) has a bug in it.
- The panadapter doesn't follow if I switch from VHF to UHF on my IC-9700.

Appendix J: Radio I/O Wiring Diagrams

This section contains the wiring diagrams you'll need to connect the *Micro* to your radio. Many of them are simple mono or stereo 1/8" (3.5mm) to 1/8" cables. Others require a custom connector to be added to a factory built stereo to mono adapter such as a DB9, or a 6 or8-pin mini-DIN. None of them are difficult to build. These can be found on the Radio Interface Cable page on my blog.

I can supply pre-built cables for your radios. The drawings below have cable part #s. Use these part #s on the CTR2-Mini Order Form to order the cables you need.

Kenwood/Elecraft

CTR2-Mini Wiring Diagram
Kenwood/Elecraft Rev 1.1
Lynn Hansen - KU7Q
lynovation.com
10/18/2023
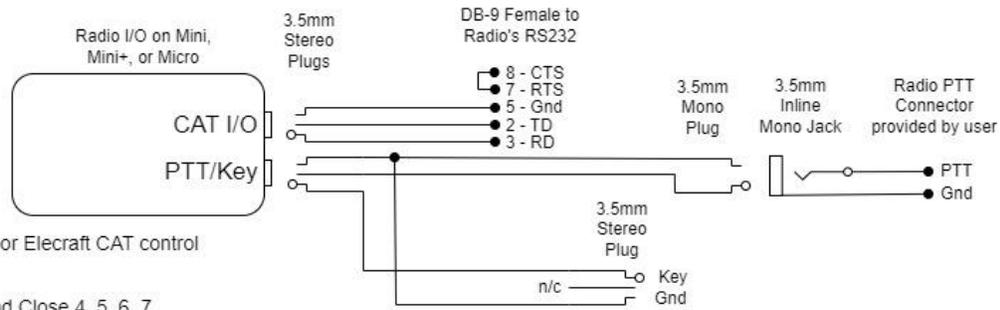
NOTE 1:
Select Kenwood1 or Elecraft CAT control

NOTE 2:
Open 1, 2, 3, 8 and Close 4, 5, 6, 7

NOTE 3:
Jumper pin 7 to 8 on DB-9F for hardware handshaking

Cable Part #s
RS232FF6 - 6' 3.5mm to DB9-Female for CAT
PTTKEY6 - 6' 3.5mm to dual 3.5mm for PTT and Key
         NOTE: 3.5mm inline mono jack suppled.
         User supplies 6-pin Mini-DIN

Yaesu FTdx101

CTR2-Mini Wiring Diagram
Yaesu FTdx101 Rev 1.3
Lynn Hansen - KU7Q
lynovation.com
10/16/2023
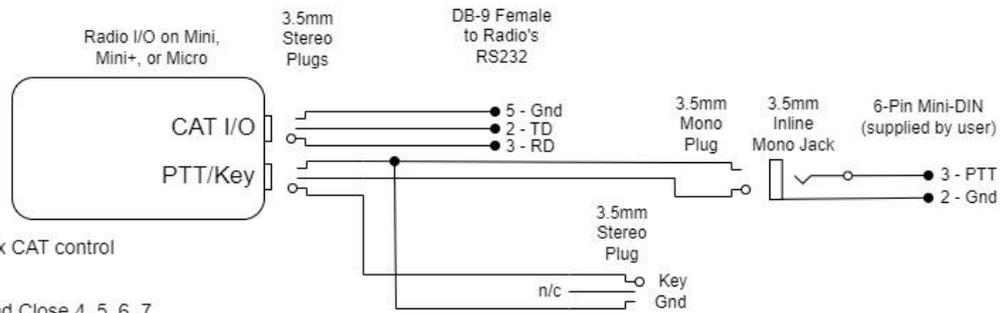
NOTE 1:
Select Yaesu FTdx CAT control

NOTE 2:
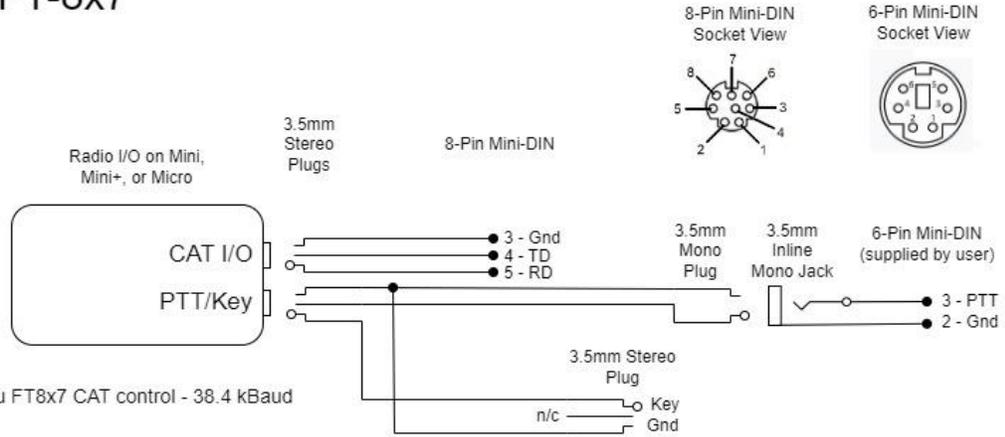Open 1, 2, 3, 8 and Close 4, 5, 6, 7

Cable Part #s
RS232FF6 - 6' 3.5mm to DB9-Female for CAT
PTTKEY6 - 6' 3.5mm to dual 3.5mm for PTT and Key
         NOTE: 3.5mm inline mono jack suppled.
         User supplies 6-pin Mini-DIN

Yaesu FT-8x7

8-Pin Mini-DIN Socket View
6-Pin Mini-DIN Socket View

Radio I/O on Mini, Mini+, or Micro

3.5mm Stereo Plugs

8-Pin Mini-DIN

CAT I/O

PTT/Key

3 - Gnd
4 - TD
5 - RD

3.5mm Mono Plug
3.5mm Inline Mono Jack
6-Pin Mini-DIN (supplied by user)

3 - PTT
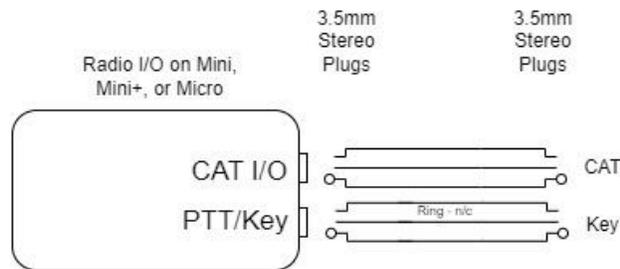2 - Gnd

3.5mm Stereo Plug

n/c

Key
Gnd

NOTE 1:
Select Yaesu FT8x7 CAT control - 38.4 kBaud
NOTE 2:
Close 1, 2, 3 and Open 4, 5, 6, 7, 8

Cable Part #s

FT8X7DIN8 - 6' 3.5mm to 8-pin Mini-DIN for CAT
PTTKEY6 -   6' 3.5mm to dual 3.5mm for PTT and Key
NOTE: 3.5mm inline mono jack suppled.
User supplies 6-pin Mini-DIN

CTR2-Mini Wiring Diagram
Yaesu FT-8x7 Rev 1.3
Lynn Hansen - KU7Q
lynovation.com
10/16/2023

QRP-Labs QCX

Radio I/O on Mini, Mini+, or Micro

3.5mm Stereo Plugs

3.5mm Stereo Plugs

CAT I/O
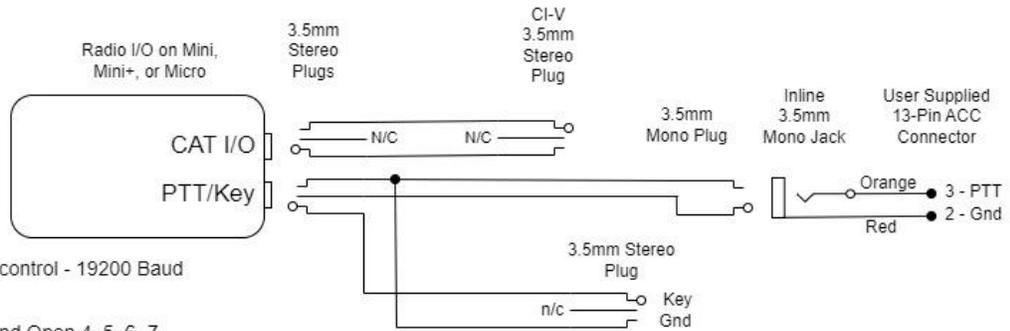
PTT/Key

CAT

Ring - n/c

Key

NOTE 1:
Select Kenwood1 CAT control - 38.4 kBaud
NOTE 2:
Close 1, 2, 3 and Open 4, 5, 6, 7, 8

Cable Part #s

STEREOMM6 - 6' 3.5mm stereo cable for CAT and Key
(2 required)

CTR2-Mini Wiring Diagram
QRP-Labs QCX Rev 1.3
Lynn Hansen - KU7Q
lynovation.com
10/16/2023

Icom Radio

Radio I/O on Mini, Mini+, or Micro

3.5mm Stereo Plugs

CI-V 3.5mm Stereo Plug

3.5mm Mono Plug

Inline 3.5mm Mono Jack

User Supplied 13-Pin ACC Connector

CAT I/O

PTT/Key

N/C   N/C

3.5mm Stereo Plug

n/c   Key
       Gnd

Orange   3 - PTT
Red   2 - Gnd

NOTE 1:
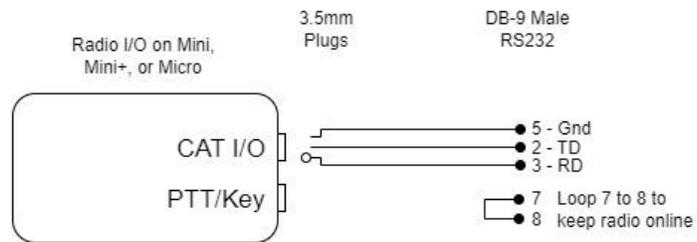Select Icom CAT control - 19200 Baud

NOTE 2:
Close 1, 2, 3, 8 and Open 4, 5, 6, 7

Cable Part #s

STEREOMM6 - 6' 3.5mm to 3.5mm stereo cable for CI-V
PTTKEY6 -   6' 3.5mm to dual 3.5mm for PTT and Key
                 NOTE: 3.5mm inline mono jack supplied.
                 User supplies 13-pin accessory plug

CTR2-Mini Wiring Diagram
Icom Radio - Rev 1.4
Lynn Hansen - KU7Q
lynovation.com
10/16/2023

Icom PCR-1000

Radio I/O on Mini, Mini+, or Micro

3.5mm Plugs

DB-9 Male RS232

CAT I/O

PTT/Key

5 - Gnd
2 - TD
3 - RD

7   Loop 7 to 8 to
8   keep radio online

NOTE 1:
Select PCR-1000 CAT control - 9600 Baud

NOTE 2:
Open 1, 2, 3, 8 and Close 4, 5, 6, 7

Cable Part #s
RS232FM6 - 6' 3.5mm stereo to DB9-Male cable

CTR2-Mini Wiring Diagram
Icom PCR-1000 Rev 1.2
Lynn Hansen - KU7Q
lynovation.com
10/16/2023

Appendix K: Previous Revision Changes

v1.06.06 – September 29, 2025

- Increased # of characters allowed for the WiFi router SSID and password from 30 to 60 and added character number enforcement. In previous versions, SSIDs or passwords over 30 characters crashed the program.
- Fixed bug that was not checking if BTN1 is being held down during boot to bypass WiFi Auto-Connect.

v1.06.05 – September 24, 2025

- Added a new option to turn off the web server. This allows you to turn if off for added security when operating the *Micro* in a public place.
- Fixed a bug in the Flex radio disconnect sequence that could cause the radio to lock up when running SmartSDR v3.09 or v3.10

v1.06.04 – August 8, 2025

- Added a new link to download Tera Term. Get it from the CTR2 Group IO File folder here.

v1.06.04 – July 16, 2025

- Updated Hamlib rigCtl for better protocol support
- Update Keyer Speed and Spacing if changed on Flex radio
- Improved the TS2000 emulation for 3rd party programs such as WSJT-X and N1MM and added additional information to the manual for setting up these apps

v1.06.03a – May 30, 2025

- Added information on using the **screen** command in Mac and Linux for a terminal interface

v1.06.03 – December 1, 2024

- Fixed a bug in the Thetis protocol that was causing the Zero Beat command to be sent every 10 seconds when polling status on the radio.

v1.06.02 – October 7, 2024

- Fixed the NET rigCtl protocol so it works with sBitx radios now.
- Fixed timing in keyer Iambic-B mode – wasn't inserting extra element properly
- Debugged **Thetis** and **piHDR** protocols
- Don't turn **Tx Enable** off when switching between slices or in Split mode on Flex
- Added some minor enhancements for CTR2-Voice support

v1.06.01 – April 24, 2024

- Fixed bug that blocked changing how CTR2-Voice pronounces numbers until a power cycle
- Reformatted **Help** text so it appears properly on Putty terminal sessions
- Added the Operation with N1MM Logger+ section

v1.06.00 – April 9, 2024

- Added Appendix I describing how to connect to other programs such as Thetis, piHPSDR, and wfview

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- Added the Thetis and piHPSDR protocols
- Re-ordered the CAT menu into alphabetical order
- Renamed the **Yaesu FTdx** CAT protocol to **Yaesu FT** since this protocol supports many of the **FT** models such as the FT-450, **FT-710**, and **FT-991**.
- Changed how the **Report** BTN works
  - If a **Report Type** is selected and **Report** is muted pressing this button unmutes the report and reports the frequency and mode
    - The **Report** stays unmuted until you press **Report** again.
  - If **Report** is unmuted with long-press on knob or in the **Configure -> Report** menu this button plays the short report (freq, mode, tuning digit, Tx Enable status, and S-meter) and does not mute the report.

v1.05.05 – March 28, 2024

- Added **Other** to the **Radio Mode** menu. This is displayed when you select a mode on the radio that is not supported by CTR2-*Micro* (i.e. DV, SAM, and other advanced modes)
- Fixed bug in Flex protocol that was sending incremental parameter changes to CTR2-Voice
- Fixed bug introduced in v1.05.04 that was causing CTR2-Voice to randomly mute
- Fixed inconsistencies with S-meter display when using CTR2-Voice

v1.05.04 – March 27, 2024

- Fixed bug in FTdx decoding for older Yaesu radios (FTdx3000, FTdx5000, etc) – encode and decode 8 frequency digits not 9
- Recoded multi-function button read routines to use lowest ADC value instead of average value
- Moved Report type label from S-meter line to after WiFi status in Home page
- Removed Repeat and Full Report BTN functions
  - **NOTE:** This will change BTN mapping if you have Repeat or Full Report mapped
- Pressing the **Help** BTN on the Home page will play the Full Report if a report is enabled. Press BTN1 to cancel it.
- Added S-Meter BTN function – just reports the s-meter
- Fixed bug causing processor reset when changing Radio Profiles while WiFi is online

v1.05.03 – March 18, 2024

- Fixed frequency encoding and decoding for Yaesu FT-1200, FT-3000, and FT-5000 and added support for FT-710, FT-450, and FT-950
- Erase the displayed string in the text editor if [space] is entered as the first character

v1.05.02 – February 28, 2024

- Moved **CTR2-Voice** and **CTR2-Display** settings from the initialization file to the radio profile. This allows you to set up different profiles for different voice and display scenarios (home, portable, mobile, etc).
- Revert to Home page if link to CTR2-Voice or CTR2-Display fails during operation.
- Sound error beeps (8 Dits) when trying to access the menu system without a terminal, web page, or report active.
- Added **None** to the **Configure -> Report -> Report Type** options.
- Removed the redundant **Tx Enable** status announcement in the long report.
- Added additional documentation on using **CTR2-Voice in access point mode.**

v1.05.01- February 20, 2024

- Save WiFi settings in the **Radio Profile**. This allows you to set up different profiles for different operating scenarios.
- Fixed a bug with the Bandwidth control in the Icom radio protocol. The bandwidth was reverting back to its default settings a long as the *Micro* was connected to the radio.
- Fixed a bug that was blocking the web theme from being saved properly
- Allow the **Report Type** to be changed while the report is unmuted
- Added radio change voice announcements while on the Home page. Previously they were only announced when the **Radio** menu was active.
- Pressing the **Report** function button when no report is running starts the short report (VFO, Frequency, Mode, Tuning resolution, Tx enable state, and S-Meter). Pressing it again within 10 seconds of the short report will just speak the s-meter reading (or silence if there is not s-meter value)
- Press the **Report** function button while a report is announcing mutes that report and says the s-meter value.

v1.05.00 – February 14, 2024

- Added support for the new **CTR2-Voice** speech synthesizer
    - Added **CTR2-Voice IP Adrs and a Voice Settings** menu to the **Report** menu when **Voice** report mode is selected.
- Added support for the new **CTR2-Display** remote display for the *Micro*.
- When **Voice** report is enabled radio changes are monitored and reported on the Home page
- WiFi and web page settings are now saved in the Radio Profile in addition to the initialization file
    - This allows you to create profiles for operation at different locations
- Added **Repeat Message (Repeat)** to the BTN button function options and keyboard shortcut **(Ctrl+g)**. This option repeats the last report message.
- Added **Help** to the BTN button function options. This option works in any window and opens the **Help** screen for the currently selected item, the same as if you pressed F1 in terminal mode. This is extremely helpful when using **CTR2-Voice** as it gives you an instant verification of the current state of the program. This function is assigned to long-press BTN1 by default.
- Moved the file management options from the **Configure** menu to the **Manage Files** submenu within the **Configure** menu.

- Added the LED State option to the Configure->Settings menu. This option allows you to stop the LED from flashing program status if you find the flashing distracting.

v1.04.03 – January 22, 2024

- Release to fix bug that blocked control of the Flex radio if *Micro* was in standalone mode. Install this version instead of v1.04.00, v1.04.01, or v1.04.02.

v1.04.02 – January 21, 2024

- Release to fix bug that blocked web server from updating menu page if *Micro* was not connected to a terminal session.
- Do not use this version. Use version 1.04.03.

v1.04.01 – January 20, 2024

- Optimized the text editor so it works better with the Text Report option.
- Added [Space] to the digits available when editing frequencies with the knob. Inserting [Space] truncates the frequency starting at that digit. If you do not insert a [Space] all of the frequency digits will be returned. This allows you to change just one or two digits to fine-tune your frequency.
- Fixed a bug that was keeping the *Micro* from booting without the terminal if the report mode was unmuted when it was last shutdown. This prevented standalone mode from working.
- Fixed a bug that kept the Code Report from reporting if you were in a voice mode on the radio and transmit was enabled.
- Fixed a bug that kept the **Code Report** from reporting in the **text editor**.
- Added additional setup information to the Tera Term and Putty configurations.
- Do not use this version. Use version 1.04.03.

v1.04.00 – January 18, 2024

- This version includes new features that blind and limited sight users will find helpful.
  - A new Text Report option has been added to assist standalone, blind, and limited sight operators. This mode sends one line to the terminal when the user changes frequency, tuning resolution, or enters the menu mode. This report mode minimizes updates sent to the terminal screen so that screen readers are more responsive.
  - Added a new Include Hotkeys option to the Report menu. When this option of turned off menu hotkeys are not sent to the report output when a report is active.
  - Added shortcut key **Ctrl + i** to play the Frequency/Mode report even if the report is muted.
  - Moved revision history to Appendix J and created two new appendixes, Appendix G: Menu Structure and Appendix H: Limited Vision Accessibility. **Appendix G** includes a complete listing of the menu system with descriptions of each menu item. **Appendix H**

includes a hardware walkthrough for those with limited vision that can't see the diagrams and screenshots in the manual.

- BTN1 long press can now to be programmed to any function. Previously it was hard coded to open the Function Button Options menu.
- Fixed bugs in the watchdog timers for Key and PTT outputs. Key output is now limited to 30 seconds and PTT output is now limited to 2.5 minutes. Release the Key or PTT input to reset the timer.
- Fixed a bug in the Reset to Factory option. Was resetting the wrong radio profile.
- Added a note in the Mac/Linux Firmware Download section about setting the script as an executable file.
- Do not use this version. Use version 1.04.03.

v1.03.06 – December 31, 2023

- Fixes a bug causing the PTT to pulse when activated with the Dah paddle

v1.03.05– December 31, 2023

- Renamed **Config->Calibrations** menu to **Settings**
  - Moved **Tag Line** item from **Config** menu to **Settings** menu
- Added instructions to this manual to find Apple and Linux serial port assignments in **Appendix B: Loading and Updating Firmware**.
- Added Latching and Momentary PTT to Paddle Input when Paddle PTT is enabled.

v1.03.04 – December 16, 2023

- Added the Pdl PTT option in Keyer menu to allow paddle input to be used as PTT in voice modes
- Added interactive code practice mode to Practice menu
- Fixed bug in Flex Bandwidth setting – it was reporting "Quick Key not set" even though it was
- Moved CW Spot on FTdx menu to under Pan menu item

v1.03.03 – December 2, 2023

- Redesigned Flex network keying code for more accurate timing
- Poll for all available commands when **Radio** menu is open
- Added Monitor command to Kenwood, Elecraft, and FTdx radio menus

v1.03.02 – November 29, 2023

- Added new section to the manual describing the process of using the *Micro* with Flex network CW keying enabled.
- Optimized web server to make it more responsive
  - Embedded the button control inside the <a href> tag so the entire button is now clickable in the browser
- Optimized radio CAT polling
  - Hide non-responsive CAT commands on **Radio** menu and only check them periodically so they don't slow down polling for parameters the radio supports
- Fixed bug that was resetting paddle type back to Iambic-B

- Added expanded **rigCtl** menu and tested with SparkDSR on a Hermes Lite 2 radio

v1.03.01 – November 24, 2023
- Block Flex network CW output if code report is running so we don't tx it
- Changed 'long-T' to just 't' in place of 0s in freq code reports
- Fixed bug causing short key output when stopping code report

v1.03.00 – November 18, 2023
- Added a new **Beacon** mode to the **Keyer** menu
- Going back to simple Major.Minor.Sub version notation instead of Release Candidate #
    - Minor version # will increment as features are added/changed
    - Sub version # will increment as bug fixes are applied

v1.02.00 RC3– November 10, 2023

- Removed the XON/XOFF option because it didn't solve the handshaking problem with the Kenwood TS-590SG. Only hardware handshaking works. You must use an RS232 cable with pins 7 and 8 jumpered facing the radio in order for the *Micro* to talk to it. See the Kenwood cable drawing in Appendix J.
- Added new text and value editor pages to the web server. You can now directly edit text and numerical data in your browser.
- The web server's Home page has been rearranged to make it more useable. The header now displays the select **Radio Profile**. You can click on it to change the selected profile.
- Added a new **Keyboard Keyer** option to the **Keyer** menu. This option allows you to enable and disable the keyboard keyer feature on both the terminal and browser interfaces.
- Added new Text and Value editors to the browser – you can now enter parameters using the keyboard or the knob on the *Micro*.
- Removed light themes from web server
- Added **Split** mode option to Kenwood radio menu

v1.02.00 RC2 – November 5, 2023

v1.02.00 RC1 had a bug in the keyer timing when sending CW message buffers so it was removed from the blog almost as soon as it was published.

V1.02.00 RC2 fixes the keyer timing issue and adds a new **Server Lock/Unlock** option to the **WiFi** menu. This option allows the *Micro* server to be used with most web browsers.

v1.02.00 RC1 – November 4, 2023

v1.02.00 RC1 is a somewhat major release in that it adds a new web server to the *Micro*. This allows you to monitor and control the *Micro* and your radio using most web browsers on PCs, tablets, and cell phones. This version also fixes a few tuning issues with Kenwood radios and add a few other features.

- The new **web server** lets you interact with the *Micro* and your radio using most web browsers. The interface is simple and the home page provides single click access to many of the *Micro's* and your radio's features. In addition, you can view and control two groups of six buttons giving you direct access to the FKeys, BTNs, or CW message buffers. You can also use the Telnet terminal at the same time.
- I'm working on improving the user interface to provide a better experience for blind and sight impaired hams. This will be an ongoing effort and your input is welcomed.
- Added a new **Ctrl VFO** option to the VFO menu. When set to **Ctrl VFO=A** both VFO-A and VFO-B on the *Micro* control the radio's A VFO leaving the B VFO available for other non-*Micro* uses. When set to **Ctrl VFO=A&B** the *Micro's* VFO-B controls the radio's B VFO.
- Added a new **Menu Timeout** option has been added to the **Calibration** menu. This option allows you to disable the 10 second menu timeout if needed.
- Added a **CW Tuning** option to the Kenwood and FTdx menus. This option allows you to toggle the CW tuning/spotting feature on these radios.
- Added a new **About...** menu item to the Main menu. This page displays the firmware version and the IP address of the *Micro* (if it's connected to your network).
- Reworked the logic on controlling the Flex's internal keyer. The *Micro* now only turns off the radio's keyer if you have a *Micro* keyer type selected and the Tx interlock is enabled (**Tx Enabled**). The logic also now controls the radio's **Breakin** setting properly too.
- Added additional Ctrl+ shortcut keys to the Telnet terminal. The Shortcut Keys section lists of all shortcut keys.
- Added three more radio function option slots for custom radio options

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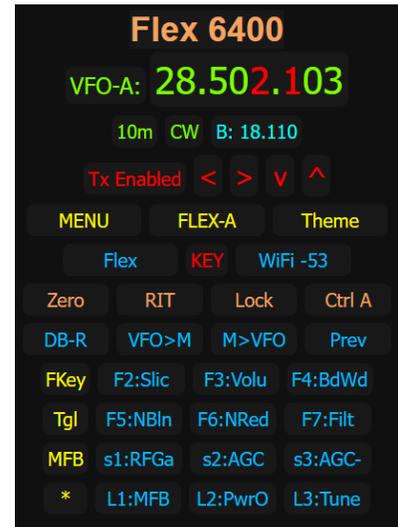
v1.01.00 RC3 – October 23, 2023
Release candidate #3 fixes several bug found in RC2 and adds a couple of new features.

- Bug: Not controlling CW **BREAKIN** on the Flex radio when the **Transmit Inhibit** is toggled. **BREAKIN** now follows the state of the transmit inhibit setting.
- Bug: Network keying on the Flex radio was poorly timed and intermittent. Reworked the code to resolve timing issues. Timing is much better now but is still sensitive to network delays.
- Bug: Erasing a CW message leaves a space in that buffer. This was being seen by the CW Msg menu as a valid message.
- Added a new **About...** menu item to the Main menu to display the firmware version and helpful web sites.

- Started working on a web server. You can try it by connecting to your browser to the *Micro's* IP address using **HTTP://** (it will not be a secure server). Only the frequency and mode are currently tracked. I'll be refining this feature over the next month or so.

v1.01.00 RC2 – October 20, 2023
Release candidate #2 fixes a couple of bugs that slipped through on release candidate #1.

- **VFO->Ctrl VFO=A&B** didn't control the B VFO on the radio when selected. It does now.
- Coding error that blocked being able to select a blank message in the **Edit CW Msg** menu has been fixed.
- Added Shortcut keys to access many functions from the **Home** page
- Added BTN3 to Radio menu to toggle the active VFO
- Added a **VOX** control to the Flex menu
- Removed **Rx Ant** and **Tx Ant** options from the Flex function button option list. Replaced them with **Slice** and **VOX**.

v1.01.00 RC1 – October 14, 2023
Release candidate #1 includes many changes and additions from v1.00.01.

- Moved **WiFi** menu to **Config** menu to clean up the **Main** menu – **Ctrl+w** still opens the **WiFi** menu from Home page.
- Added **Vox Level** to the Flex radio menu. Set to 0 to turn off. Any other level turns it on.
- Fixed bugs in the Flex **Panadapter= Existing/Create** option. A new panadapter is opened only when you select **Pan=CREATE** then select a Slice, otherwise the new slice will be added to the existing panadapter.
- Changed how the text editor works. It now removes all of the characters in the edited text past the edit cursor, except when editing a frequency in Direct Frequency Entry.
- Removed **Split** from the **VFO** menu and added the **VFO->Ctrl VFO** menu option to select between controlling just the radio's A VFO with both *Micro* VFOs or controlling the radio's B VFO with the *Micro's* VFO-B.
- Added short beeps to BTN presses to indicate which button is pressed and for how long. An additional longer beep indicates when the long-press function has be selected.
- Blocked menu navigation if a terminal is not connected (i.e. no display) and Code Report is muted. This blocks the operator from making changes in the menus without knowing it. Pressing the knob will flash the LED and sound the buzzer for 8 quick Dits to notify the operator of the error. You can override this block by long-pressing the knob to enable **Code Reporting**.
- Added a new **Radio Profile** option that allows you to save up to 10 radio profiles and recall them to control different radios. Each profile contains all the settings for that radio (including FKey and BTN configurations) in addition to its own favorite frequency list. Multiple profiles can be used with the same radio.

- Added the ability to choose between the favorite frequency list attached to the selected **Radio Profile** and the favorite frequency list stored in the **Shared** database that is available to all radio profiles.
- Added a locking feature to the Previous Freq list. This allows you to lock a frequency and mode to the top of the list so it doesn't scroll off as new frequencies are added. This allows the Previous Frequency list to become a quick favorite frequency list.

v1.00.01 – October 6, 2023
- Added a new **XON/XOFF** option to the **Connection** menu. Use this option to enable software handshaking on radios that require it.
- Added **Msg1** to **Msg5** to **Page** 1 of the **Quick Key Function Menu**. This allows you to assign these buffers to the MF Buttons.
- Cleaned up timing issues on the MF Buttons. They respond much faster now.

v1.00.00 – September 30, 2023
- Initial firmware release

Added the Set the CAT Polarity Jumpers/Switches section