CTR2-Max

Flex WiFi Mode Manual

v1.01.03

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Updated to firmware v1.01.03

Revised sections for this version are highlighted in yellow

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Introduction

CTR2-Max (referred to as simply **Max** in this document) is the descendant of a long line of microcontroller-based radio controllers from Lynovation. If you're interested in its background, you can read the QEX and QST articles about the **CTR** series here.

Max, like other **CTR2** controllers, supports both **Flex WiFi** and **MIDI** modes. You can easily switch between the two modes in the **Settings** menu to fit your operating needs. You should refer to the CTR2-Max MIDI Mode Manual for information about MIDI operation.

The **Max** firmware only runs on **CTR2-Max** hardware with the ESP32-S3 2.8" touchscreen.

Max will be available in three versions. **Max-5** is the only version currently shipping.

Max-1 has a single large aluminum knob, a single pushbutton, and a CW paddle jack. Both the knob and pushbutton are dual-function.

Max-2 has two dual-function knobs but no pushbuttons. The CW paddle jack is shared with the switches on the knobs. If the paddle jack is enabled the knobs become single-function.

Max-5 is the most capable of all **CTR2** controllers. It has five dual-function knobs, four dual-function pushbuttons, a paddle jack, a Key/PTT jack, and an optional Sidetone audio interface board that allows you to patch the keyer's sidetone in **Flex WiFi** mode into your headphones, powered speaker, or PC sound card.

MIDI Mode

When operating in **MIDI** mode, each knob, knob switch, and button function are hardwired to specific MIDI commands, not radio control functions. For instance, the first virtual dial control sends MIDI Change Command (CC) #100. The second dial control sends CC #101, etc. You can change the label assigned to each control and you can change the physical knob or switch each control is assigned to in the **Controls** menu. The real magic happens when you connect **Max** to a radio control app. Each MIDI command is mapped in that app to execute a certain function. For instance, CC #100 is mapped to the VFO control in the app, and the VFO control is assigned to knob E (large knob) on the controller.

MIDI is a one-way protocol, so when using this mode, the radio control app provides the radio information.

Many apps are capable of receiving MIDI commands. These include Marcus' (DL8MRE) excellent SmartSDR/SDR-Control/FT-Control, TS-Control, and K4-Control for iOS and MacOS, AetherSDR, and RimuSDR, SDRoxide, SDR-Console, and SparkSDR, to name a few. **MIDI** mode is also compatible with browser control apps like Remote Ham Radio, Online Remote Radio, and RemoteTx.

Flex WiFi Mode

Flex WiFi mode creates a custom WiFi controller specifically designed for the Flex 6000, 8000, and Aurora SDR radios. It is based on the popular **CTR2-Micro** controller's firmware. It utilizes the Flex Network API to monitor and control the Flex radio over an IP network connection. In addition, it provides real-time CW keying and PTT control over the network.

The Flex API is a two-way protocol, unlike **MIDI** mode, so **Flex WiFi** mode is aware of the radio's operating state (frequency, mode, band, etc.) A **Dashboard** display provides easy access to many of the radio's functions.

When used as the only controller connected to the radio, **GUI** mode can be enabled in the **Settings** menu to display a mini-panadapter in the **Dashboard**, as show here. Note that in order to run in **GUI** mode, no other control software (SmartSDR, etc.) can be connected to the radio, and the radio must be on the same physical network (LAN) as the radio. You also must use the radio's speaker/headphone output and mic input as **CTR2-Max GUI** mode does not support DAX or CAT.

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. 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.

Legal Notice

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

- This is a hobby endeavor. Nothing is guaranteed! Use this device at your own risk!
- I will do my best to make sure you receive functioning hardware. I will work with you if there is a problem with your unit on arrival.
- Each **Max** is hand-built and uses a 3D printed enclosure. This means that there may be small cosmetic flaws on your unit.
- Units are not "plug and play". Be prepared for a learning curve, especially when mapping MIDI commands to your radio control app for the first time. There are videos on my YouTube channel that can help with this.
- I make no warranty that the firmware provided will perform up to your expectations or be suitable for your application. A lot of compromises had to be made to fit the small display so review this manual to be sure you're comfortable with the user interface.
- Software bugs are a fact of life and I try to find and correct all bug reports ASAP to the best of my ability.
- **Max** requires a license key to be fully functional. A license key is included with your purchase of a **Max** controller from Lynovation.com.
- License keys are tied to your call sign. This allows you to use the same registration key on as many CTR2 devices as you own. You are not allowed to include your license key on units you build to sell or give to others. They will need to purchase their own key.
- Contact me if you sell your **CTR2** unit. I will create a new key from call sign of the new owner.

Change Log

v1.01.03 – September 30, 2026

- Fixed a bug I injected into v1.01.01 that erased the map name in **MIDI** mode

v1.01.02 – September 29, 2026

- Removed RADE mode that was added yesterday in v1.01.01. It cannot be selected via Flex API commands. It must be selected manually in AetherSDR.
- Added the UNKN label for modes the radio reports that **Max** doesn't support
- Removed processing for API *transmit frequency* reply. This is typically the repeater offset frequency and isn't currently used in **Max**. It's only valid during transmit when the controller's turning is blocked.

v1.01.01 – September 28, 2026

- Fixed RTTY bug – **Max** was not decoding the RTTY mode from the radio – instead it was staying in CW mode. This caused the frequency to jump when tuning **Max** because it had the carrier frequency, not the RTTY Mark frequency.
- Added support for NFM and RADE modes along with default filter options for these modes
    - These new modes were added to the Buttons menu, replacing the functions that opened the **Dial**, **Button**, and **Dashboard** displays.
- Added the "&" character to the supported character list for users that have this character in the WiFi router's password
- Added better detection for transverters
- Added AutoCenter option to Pan1 page. This option allows you to toggle whether the panadapter auto-centers while tuning

v1.01.00 – September 14, 2026

- Replaced the **Knobs** menu with a new **Controls** menu
- Changed the recommended file extension for **CTR2** configuration files from **.txt** to **.ctr2**. They are still text files; this just makes the easier to identify.

v1.00.02 – August 15, 2026

- Renamed the **Mode: non-GUI/GUI** to **Client: non-GUI/GUI**
- Added additional information on using the Sidetone Audio Interface board
- Other minor bug fixes in **MIDI** mode – these are covered in its manual

v1.00.01 - August 9, 2026

- Initial product release

Changes to previous firmware versions can be found in Appendix F

System Overview

CTR2-Max (is a custom-built radio controller that is designed specifically for the needs of amateur radio operators. It includes a large, 2.8” color touchscreen with up to 5 knobs and 4 buttons that are dual-mode (turn and push-and-turn knob functions and short-press and long-press button actions) for a total of 18 physical controls. These can be assigned to any of the virtual dial and button controls.

Knob and switch functions are displayed on the **Controls** menu. This page graphically represents the controls on the unit. The function assigned to each control can be easily changed to fit your operating situation.

Unlike generic MIDI controllers, all **Max** controllers include a 3.5mm (1/8”) CW paddle input jack. The **Max-5** also includes a 3.5mm key/PTT input jack.

For **Flex WiFi** mode users, a transformer-coupled sidetone audio interface board is available that allows you to patch **Max’s** keyer sidetone into the receive audio from your radio. The sidetone from the keyer is sinusoidal and is generated by a codec. A 1.2-watt amplifier drives a large speaker, giving you plenty of sidetone volume.

More information on the sidetone audio interface and internal battery options can be found in the CTR2-Max Hardware manual.

NOTE: The CW keyer, sidetone, and **Sidetone Audio Interface** board are not used in **MIDI** mode.

Flex WiFi mode is compatible with Flex 6000, 8000, and Aurora model radios. It uses WiFi to connect directly to the radio’s server over your IP network using the Flex API and provides a small but flexible control surface for your radio. Unlike controlling SmartSDR with a mouse, SmartSDR doesn’t need to be “in focus” on your computer to use your **CTR2** controller. In addition, its small size allows you to conveniently locate it anywhere on your operating desk.

The unit can be powered by any clean USB power source. **DO NOT** power the unit from an unpowered USB hub. A user-installed 3.7-volt Lithium-Polymer battery can also be used to power the unit. Batteries up to 10mm x 35mm x 55mm can be accommodated. A 2000 mAH battery will power the unit for about 12-hours. The built-in charge controller automatically ramps down the charge current as it approaches full-charge. A battery icon can be displayed that shows the estimated state of charge.

Since it connects directly to the radio it works with any Flex control app including SmartSDR for Windows and SmartSDR for iOS/MacOS, and the new AetherSDR, RimuSDR, and SDROxide control apps.

Flex WiFi mode provides the essential controls you need to operate your radio without any other control app. This is ideal if you just want to monitor a band or operate your radio in POR mode (i.e. Plain Old Radio) without booting your computer or iPad to use SmartSDR. When operating with just a **Max** connected to your radio, switching to **Client: GUI** mode in the **Settings** menu enables a small “touch tunable” panadapter in the **Dashboard**.

Flex WiFi mode includes a built-in keyer that produces a sidetone. It can also send both key and PTT inputs to the radio over the IP network. Using *Straight Key* keyer mode allows you to connect an external keyer or an app such as N1MM to the controller's **Key/PTT** jack (**Max-5**) to key the radio. A virtual PTT switch can be configured for momentary or latched PTT and you can assign any physical button as a PTT switch.

Flex WiFi mode has two user interfaces. You can use the one that works best for you.

The **Quick Start Guide** will help you quickly configure **Max WiFi** mode.

Quick Start Guide

If you're like most hams, when you receive a new tool for your shack, you just want to plug it in and start using it.

*Your **CTR2-Max** controller is not one of those tools!*

As discussed in the previous section, your controller can run in two different modes, so you'll need to decide how you're going to use it.

When **CTR2-Max** is in **MIDI** mode, it uses Bluetooth or USB MIDI to control a 3rd-party app. The app controls your radio. The radio that you can control, and the functions you have available, are determined by the 3rd-party app. There is a separate manual available for **MIDI** mode**.** It has a its own **Quick Start Guide** to get you going in that mode.

Flex WiFi mode, the subject of this manual, on the other hand, works exclusively with Flex 6000, 8000, and Aurora radios. Unlike **MIDI** mode, **Flex WiFi** mode provides a full-featured radio control system that is capable of controlling your radio without a 3rd-party app. The goal of this section is to give you a basic understanding of how **Flex WiFi** mode works, and get you connected so you can start learning about your **CTR2-Max** unit.

Basic Concepts

Let's start with how **Flex WiFi** mode works with the Flex radio.

CTR2-Max Controller

All of the dial and button controls are predefined in the firmware. Unlike **MIDI** mode, here is no need to map control functions to a 3rd-party app.

In addition, unlike **MIDI** mode, **Flex WiFi** mode monitors your radio's settings. When it first connects to your radio, if loads and displays the radio's settings. This allows it to run in parallel with any version of SmartSDR, AetherSDR, RimuSDR, or SDROxide you may be using. If you change anything in the control app, it will be reflected in the **CTR2** controller, and visa-versa. If **CTR2-Max** is the only controller connected to your radio, you can enable **GUI client** mode

(Graphical User Interface) in the **Settings** menu. In this mode. a small panadapter is displayed in the **Dashboard**. The panadapter is not available in **non-GUI** mode

Flex 6000/8000/Aurora Series Radios

Flex radios are basically computers with an RF interface. The computer-side has a built-in IP server that supports multiple IP device connections. Information about the RF interface is shared with all connected devices and each device can control the RF interface. Most control interfaces, like SmartSDR, are classified as GUI devices. These devices are the primary control interface. Other devices, such as **CTR2** units running in **Flex WiFi** mode, are classified as non-GUI devices. Non-GUI devices are *bound* to a GUI device, and basically work in parallel with the GUI device.

Initial Setup

There are a few tasks you must perform before the **Flex WiFi** mode will be ready to control your radio.

The first order of business is to power up your **CTR2-Max**. This is generally done by plugging it into a USB port on your computer. It can also be powered by a 5-volt phone charger, a USB battery, an optional internal battery, or by your iPhone or iPad (Apple devices with Lightning ports require an OTG adapter). **Do not** plug it into an unpowered USB hub. Unpowered hubs cannot provide the current the unit requires when it's using the WiFi radio.

When the unit boots, the flash screen will show the firmware title and version number. If your unit boots into **MIDI** mode, open the **Settings** menu, navigate to the last page and select **Run Flex WiFi Mode** on the menu. The unit will reboot into **Flex WiFi** mode.

Enter your Call and Registration Key

If your unit doesn't start in Demo mode, skip to the next section.

Your unit will start in Demo mode if you erased the flash when you re-flashed the firmware. In this case, you'll need to enter your call sign and registration key before configuring your unit. Your call and registration key are written on the label on the bottom of the unit.

NOTE: The registration key is an 8-digit Hex number. It only uses characters 0-9 and A-F. If your unit refuses to register your key, verify you are entering the correct digits. Sometimes my handwriting can be questionable!

There are two ways to enter your registration credentials.

1. Connect your unit to a terminal program such as Tera Term or Putty (see Appendix B or C, or to use the terminal in your Mac, Appendix D). Once connected, press any key to start the terminal server on the unit. Next, press the **Del** or **Backspace** key on the keyboard. Enter the call sign you registered and the registration key you received from me.
2. Use the on-screen editor to enter your registration credentials. Select **Enter Call & Key** on the last page in the **Settings** menu. Use the [^] and [v] buttons to change the letter and the [<] and

[>] buttons to advance to the next letter position. [Ins] and [Del] allow you to add or delete characters. Press the [OK] button to accept. The input sequence starts with your call and advances to your registration key once your call has been entered.

Once registered, your call sign will appear on the splash screen at boot up, the program won't shut down after 15 minutes, and you'll be able to save changes in the maps and import or export backup files. Your call will can also be automatically inserted into a CW macro using the **^** prosign.

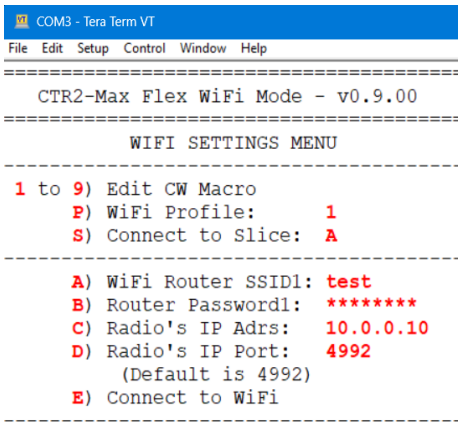
Connecting to your radio

CTR2-Max Flex WiFi mode connects directly to your radio. **Max** and your Flex radio must be on the same network, and the network must have a WiFi router. Network credentials (router SSID and password) can be entered from a terminal or directly by selecting **SSID:** and **PW:** on page 4 of the **Settings** menu.

In the on-screen editor, use the < and > buttons to change the selected character. Use the ^ and v buttons to change the character. *Ins* inserts a new character at the current position, and *Del* removes the selected character.

You will also need to set **Flex Adrs:** on the same page of the **Settings** menu. This can be found on the **Settings -> Radio Setup -> Network** tab in SmartSDR for Windows or on the **Available Radios** popup window in SmartSDR for iOS/MacOS. The default IP port for the Flex radio is 4992. You can change this if it has been changed on your radio with the **Flex Port:** option.

CAUTION: The 3.5mm jack(s) on CTR2 units are for paddle, key, and PTT inputs only. They are not designed for output. Do not connect these jacks to your radio as this may damage the unit.



You can also use a dumb terminal such as Putty or Tera Term connected to the unit to edit text fields. This screen shot shows the WiFi settings menu.

Press **1** to **9** to edit CW macros.

Press **P** to select one of three WiFi profiles

Press **S** to select the slice to control

Select **A** through **D** to edit your WiFi credentials and radio IP settings. The SSID and password are case-sensitive.

If you would like **Flex WiFi** mode to automatically connect to your radio when it boots, turn **AutoConn: ON** in the **Settings** menu. You can temporarily disable auto-connect by holding button 1, 2, 3, or 4 down during boot.

Once your WiFi credentials and the radio's IP address have been entered, select **Connect WiFi** on page 4 of the **Settings** menu to connect **CTR2-Max** to your WiFi system. Once connected, **CTR2-Max** can be used as a control surface for SmartSDR or it can operate your radio as a standalone controller.

NOTE: Max is only capable of connecting to a 2.4 GHz WiFi router channel. It does not support 5 GHz channels. Because of this, if your router supports both bands, each band's SSID must be different. Otherwise, the router will try to transfer the connection to the 5 GHz radio if it decides the 2.4 GHz channel is too busy, and the connection will fail.

The firmware connects to **Slice A** by default. Once connected you can change the **Slice** by touching the *Slice* caption in the Dashboard display. The firmware will then connect to the new slice setting each time you connect until you change the Slice setting again.

NOTE: Always connect **CTR2-Max** to your radio after starting SmartSDR so it binds to SmartSDR as a non-GUI client. If you connect it before starting SmartSDR v3.xx with **multiFlex** enabled, it will create a second GUI client and will work separately from SmartSDR. SmartSDR 2.xx will not be able to connect to your radio if **CTR2-Max** is already connected.

Multiple Clients

The server in your Flex radio supports multiple clients. This means that you can have several clients connected to, and controlling it, all at the same time. For instance, you can have SmartSDR for iOS connected as a GUI client and one or more **CTR2** unit running in **Flex WiFi** mode connected to the radio as non-GUI clients. **CTR2** units running in **Flex WiFi** mode can be connected to the same slice or to different slices. Any change on any of the connected devices will be sent to all the other clients subscribed to that slice.

TX Enable

Flex radios support multiple slices, but only one slice can be designated as the transmit slice. On SmartSDR this is done by clicking on the **TX** button in the slice flag.

Flex WiFi mode allows you to toggle the transmit state of the slice using one of these methods.

- Touch the bottom-left **TX** button on the Dashboard's **TX** page.
- Touch the **Tx Enbl** button on page 2 of the **Buttons** menu
- Assign the **Tx Enbl** button to one of the knob switch functions or to one of the pushbutton actions.

When transmit is enabled on the slice that **Flex WiFi** mode is controlling, the caption on all pages will be displayed in red font.

When using multiple **CTR2-Max** controllers on different slices, this allows you to easily identify which controller is controlling the transmitter on your radio.

Configure the Keyer

Flex WiFi mode provides a CW keyer that keys your radio over the WiFi network. You can edit the keyer's type, sidetone pitch, and input jack wiring on page 2 of the **Settings** menu. Keyer speed, delay timing, sidetone frequency, sidetone volume, keyer type and breakin mode can be set in the **Keyer** page in the Dashboard. Speed, volume, frequency, and delay timing are also available in the **Dial** menu. These can be assigned to knob functions in the **Knob** menu.

> **NOTE:** The keyer and sidetone in **CTR2-Max** are separate from the keyer and sidetone in the radio. The latency across the WiFi network makes it impossible for the radio to generate sidetone in real time. Because of this, the radio doesn't provide sidetone when it's keyed over the network. The **Speed, Sidetone, Monitor**, and **Delay Timing** adjustments in **CTR2-Max** do control these parameters on the radio if you choose to connect your paddles directly to the radio.
>
> **NOTE:** By default, the **CTR2** keyer overrides the radio's internal keyer. To release this override so you can use the radio's keyer instead of the CTR2 unit's keyer, set the keyer **Type** to **OFF** on page 2 of the **Settings** menu, or on the **Keyer** page in the Dashboard**.**

Configure the Input Jack Modes

CAUTION: The 3.5mm jack(s) are for paddle, key, and PTT inputs only. They are not designed for output. Do not connect these jacks to your radio as this may damage the unit.

Max-5 units have separate **PDL** and **KEY/PTT** jacks. On these units, touching the **PDLS:** option in the **Settings** menu controls the normal and reverse wiring on these jacks as follows:

> **PDLS & KEY: Norm** – both jacks are wired normally
> **PDLS: Reversed** – The **PDLS** jack wiring is reversed and the **KEY/PTT** jack is normal
> **KEY/PTT: Reversed** – The **KEY/PTT** jack wiring is reversed and the **PDLS** jack is normal
> **PDLS & KEY: Rev** – Both the **PDLS** and **KEY/PTT** jack wiring are reversed

Using an External Keyer and/or Hardware PTT Switch

Many users may want to use an external keyer and/or an external PTT switch with their **CTR2-Max**. If your external keyer has a built-in sidetone you use the **TonVol** control on the Dashboard's **Keyer** page to turn the sidetone volume on **CTR2-Max** down.

On **Max-5**, simply plug you straight-key, keyer, or PTT switch into the **Key/PTT** 3.5mm jack on the back of the unit. Wire the **Key** input to *TIP and SHIELD* and your **PTT** switch to *RING and SHIELD* of the plug.

> **NOTE:** The *RING* on **Max's Key/PTT** jack is hardwired to Switch 2 on the front panel. This means, that in order to use an external PTT switch with **CTR2-Max**, you must assign Switch 2 to PTT (see **SWx set to PTT** on page 5 in the **Settings** menu). Otherwise, your external switch will control the functions assigned to Switch 2.

Now that you have your hardware wired, configure the firmware as follows:

- Enable **TX** on the slice you're controlling – this can be done in the **Button** menu or in the **TX** page in the Dashboard
- To enable CW keying, select CW mode and enable **Breakin** in the dashboard's **Keyer** menu
- To enable PTT, select a voice mode in the dashboard's **Mode** menu

Time to Play!

With the basic configuration done, the best way to learn about the **Flex WiFi** mode is to use it. There are two user interfaces. The basic interface is similar to the user interface in other **CTR2** unit. It has separate menus for the **Dial control**, **Buttons**, **Knob(s)**, and **PTT** controls. You can find more about this interface here.

The second user interface utilizes a dashboard where you can view and control most of the functions with a minimum of touch gestures. You can find out more about this interface here.

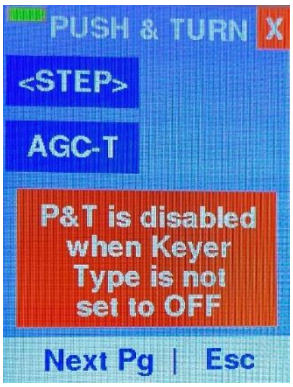
Hardware

Max's hardware, including the sidetone interface board and internal battery options are covered in a separate manual. The hardware manual can be found here.

3.5mm Jacks on Max

CAUTION: The 3.5mm jack(s) on Maxs are for paddle, key, and PTT inputs only. They are not designed for output. Do not connect these jacks to your radio as this may damage the unit.

Shared Inputs for Paddles and Knob Switches on Max-2



Due to the limited I/O on the two-knob version of Max (**Max-2**), the paddle jack and the knob switches share the same processor inputs. This means that if the keyer is enabled (Keyer **Type** is not **OFF**), the push-and-turn functions of the knobs are disabled. To use the push-and-turn functions, set Keyer **Type** to **OFF** in the **Settings** menu.

If the keyer is enabled, this warning will appear in the **Knob Push & Turn** page of **Max-2**. This limitation does not affect the **Max-1** and **Max-5** units.

Internal Battery Option

Max is designed to support an internal 3.7-volt Lithium Polymer battery. I do not ship batteries with any **CTR2** unit, primarily due to postal regulations. You can purchase them from many suppliers. The CTR2-Max Hardware manual provides instructions for installing it.

Battery Operation

The ESP32-S3 2.8" display used in **Max** was not designed for ultra-low power operation. The display and the screen touch sensor remain powered up, even when the processor is put into deep-sleep mode. Because of this, the unit draws 35 mA from the USB power or internal battery while powered down. This will discharge a 1100 mA battery in about 30 hours.

The workaround to this problem is to add a battery isolation switch. This switch is mounted on the side of the unit and is in series with the internal battery.

With the **Battery** switch In the ON position, the internal battery is connected to the display board. In this state, the unit will run on the battery, and the battery will be charged if the unit is plugged into a USB power source. A battery icon can be enabled in the **Settings** menu to monitor the battery's relative state of charge.

NOTE: If you power down the unit from the **Settings** menu, and leave the battery switch ON, the unit will discharge the battery if the unit is not connected to USB power.

With the **Battery** in the OFF position, the internal battery is isolated from the unit and the unit will turn completely off when USB power is removed. The battery will not charge and no current is drawn from the battery. With the **Battery** switch OFF you can store **Max** for long periods of time.

Sidetone Audio Interface Option

An optional interface is available that provides a transformer-isolated Line-Out level output from the sidetone oscillator. This output can be connected to your headphones, amplified speaker, mixer, or your computer's soundcard input. It has DIP switches that allow you to choose which ear to send the audio to

(Tip or Ring of the output stereo connector). You can also enable or disable the line-output or internal speaker output as needed.

To use the sidetone Line-Out, connect it in parallel to audio source you want to add the sidetone too. This is easily done using a "Y" cable with the appropriate connectors, such as the cable shown here. Connect one plug to the Amplified Speaker jack on your Flex, and the other plug to **Max's Line-Out** jack. Plug your speakers, headphone, mixer, or PC sound card into the jack on the cable.

These cables are readily available on Amazon and other online suppliers.
This one can be found here. You can choose others with the connectors to fit your needs.

Multiple Controllers / Two Modes

Max can be used in parallel with any of the other **CTR2** controllers. If you have an older **CTR2** unit, you can continue to use it with **Max**. You can use multiple **CTR2** controllers in **Flex WiFi** mode, and if your app allows MIDI control, you can have one controller in **Flex WiFi** mode and the other in **MIDI** mode. You can never have too many knobs!

Switching Operating Modes

To switch operating modes, open the **Settings** menu and navigate to the last page and select **Run Flex WiFi Mode** or **Run MIDI mode**, depending on which mode is enabled.

When using the **Flex WiFi** mode, the controller connects to, and directly controls the radio through the IP network using WiFi and the Flex Network API.

CTR2-Max Controlling Flex Radio using Flex Wifi Mode

CTR2-Max's Flex WiFi Mode Features

CTR2-Max runs on a 2.8" capacitive touchscreen display with an integrated ESP32-S3 processor. The firmware includes the following features for **Flex WiFi** mode:

- WiFi connectivity – connects directly to the radio (both must be on the same LAN)
- Three WiFi profiles can be set up for users that operate from multiple networks.
- Multiple **CTR2** units running in **Flex WiFi** mode can be connected to the same radio, to the same slice or different to a different slice
- Works with any version of SmartSDR (Windows, iOS, MacOS, or Linux)
- **CTR2** controllers running in **MIDI** mode can be used at the same time in SmartSDR for iOS/MacOS apps while a **CTR2** unit running **Flex WiFi** mode is connected
- Works in standalone mode without SmartSDR – if **GUI** mode is enabled in the **Settings** menu, a panadapter will be displayed on the Dashboard. You can touch-tune the radio from the panadapter.
- Two user interface modes
    - Menu pages provide easy to use that can be assigned to the physical knobs and buttons.
    - Dashboard pages provide a small control surface for your radio with easy access to all functions
- 60 pre-defined virtual button controls for modes/bands/filters or page selection
- 30 pre-defined virtual Dial (wheel/slider) controls for tuning frequency, volume, RIT, XIT, etc.
- Five physical encoders (referred to as **Knobs**)
    - Knobs can be programmed in the **Controls** menu for two functions (turn and push-and-turn)
    - Selecting **<Dial>** for a knob function in the **Controls** menu allows that knob to be used to control the selected dial function in the **Dial control** and the selected control in the Dashboard page
    - Knob push switches can be mapped to two virtual button functions using short and long-press
- Four pushbuttons are provided – each of these can be programmed for any two button functions (using short and long-press) or be dedicated to control PTT.
- VFO Lock control
- 3.5mm (1/8") stereo input jacks allow you to use your paddles to control the keyer, straight key, or PTT over the network connection
- Nine CW macros
- Swipe to change parameters in the **Dashboard** pages
- Panadapter control – if connected to the radio in **GUI** mode, a panadapter is displayed in the Dashboard. You can touch-tune using the panadapter.
- Control any slice, A through H, depending on radio's capacity
- Adjustable filter controls – adjust low-cut, high-cut, and offset independently
- Speaker with volume control for sidetone

- A virtual PTT switch or hardware PTT switch. You can select any pushbutton (but not knob switches) as a dedicated PTT switch.
  NOTE: Pushbutton #2 is hardwired to the RING input on the **Key/PTT** input jack.
- Keypad for direct frequency entry - press **Freq** on the Dashboard's **Home** page
- Favorite frequency lists for each band – press **Fav** on the Dashboard's Home page
- Speed sensitive frequency tuning controls
- Adjustable virtual **Dial** sensitivity
- Seven color themes and backlight control
- Sleep and power down timers to save battery power
- Press and hold two pushbuttons to initiate a power down sequence.
- Backup **CTR2-Max'** settings using the **Import** and **Export Settings** option
- Easily switch between **Flex WiFi** mode and **MIDI** mode
- Multiple Power options
- Support for an internal 3.7-volt Lithium-Polymer battery – optional battery charge state icon can be enabled in the **Settings** menu
- Sinusoidal sidetone with a 1.2-watt amp and speaker
- An optional sidetone audio interface with Line-Out level control allows you to bridge the sidetone output from **Max** to your PC's sound card or high-impedance powered speaker.
- Multiple Power options

User Interfaces

Flex WiFi mode supports two user interface models. The **Basic User Interface** (left screenshot) uses simple menus to select controls and buttons, similar to the **CTR2-Dial** firmware running on M5Dial based **CTR2** controllers. It will be described in the next section. Use this interface when you just want to use **Max** to control one or two parameters. The second user interface (right screenshot) is a fully functional dashboard that allows you to easily select and modify parameters with one or two screen touches. Go to the Dashboard UI section for a full description of this user interface.

NOTE: When using either UI, a knob should be set the **<DIAL>** in the **Knob** menu. This knob is then used to change the selected parameter on the **Dial** control and in the Dashboard.

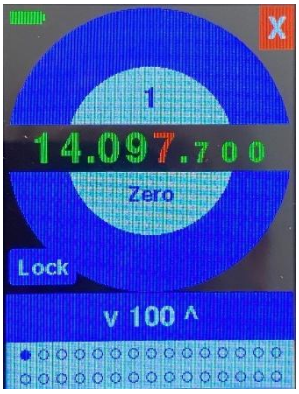
Basic UI Dashboard UI

Basic User Interface

Max's Home page allows you to open the control pages in the basic user interface. This interface is the similar to the interface used on M5Dial based **CTR2** controllers.

- **Dial** opens the **Dial** control. This is a virtual dial where you can select from 30 different parameters to control. Once selected, just swipe your finger around the perimeter of the virtual dial to change the parameter. To change the selected parameter, touch the control # above the center label, or touch dots on the bottom button to open the **Dial** menu.
- **Buttons** opens the **Buttons** menu where you can select from 60 functions on five menu pages. Touch the page dot on the bottom button to move to that page.
    - You can assign a button function to any of the knob push switches or pushbuttons. To do this, find the button action you want to assign in the **Buttons** menu. Press and hold the knob switch or pushbutton you want control that action, then touch the button action on the menu to assign to that switch. The knob or button # will appear in the button's label. The first touch assigns it to the switch's short-press. Touch the button action on the menu, (while still holding the switch down) to set the long-press function. When set as the long-press function, the knob or switch # will be displayed with a "*****" next to the button number.
- **Knob** opens the **Knob** menu. Here, you can assign **Dial** functions to the knobs. This menu allows you to quickly change the **Dial** function assigned to a knob.
  You can assign a turn and push-and-turn **Dial** function to each knob.
    - Knobs assigned to **<Dial>** will control the current **Dial** control. It will also adjust the selected control on the Dashboard.
    - A knob assigned to **<Nav>** can be used to change menu pages (similar to how the gray knob on **CTR2-Quad** works).
    - A knob assigned to **<Step>** will change the tuning step when the VFO is selected
- **Dashboard** opens the Dashboard user interface that is described in this section.
- **PTT** opens the virtual PTT page. Here you can control PTT on your radio by simply touching the display. There are three modes on this page. They can be controlled by touching the bottom button in this display or in the **PTT** option in the **Settings** menu.
    - **Off** disables PTT control from this page, and from the external PTT input. It also disables PTT control on the **CTR2-Quad** if PTT is assigned to one of the pushbutton switches.
    - **Momentary** enables momentary PTT control. PTT is key up as long as you press the PTT switch and drops off when you release the switch.
    - **Latched** enabled latched PTT. Touch and release the screen (or PTT switch) to key PTT. It will stay keyed until you touch and release PTT again.
- **Settings** opens the Settings menu where you can change the configuration of many of **Max's** parameters.

Dial Control



The virtual **Dial** control supports 30 controls. Swipe your finger around the outer ring to adjust the control.

If a knob is set to **<DIAL>** in the **Knob** setting menu, turning that knob will adjust the value of the currently select control in the **Dial** control regardless of the page you're on.

Control options, if any, will be displayed at the bottom. In this VFO example, **v 100 ^** controls the frequency tuning step. Touch to the left or right of **100** to change the tuning step. In addition, you can touch a frequency digit to change the tuning step. Double-touch it to switch to ½ steps. You can also assign a knob in the **Knob** menu as **<Step>** and use that knob to adjust the tuning step when the VFO is visible.

The VFO display also has a **Zero** button just below the frequency display. Touch this button to zero the digits below the tuning digit.

Other controls such as **Volume**, **NB**, **NR**, **RIT**, and others have On/Off options. Touch the control at the bottom of the display twice to toggle the option.

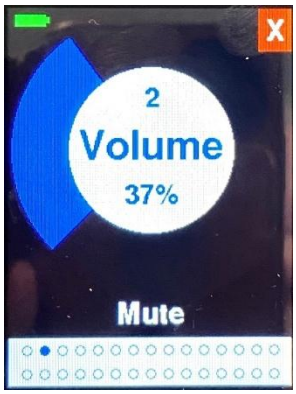
The dots at the bottom of the display indicate which dial control is active. Touch this bar to open the **Dial** menu and select another dial control.

Dial Graphics

The **Dial's** image depends on the selected control.

The lead photo in the **Dial Control** section shows a *tuning* control. Tuning controls are continuously variable and used for VFO tuning. The tuning ring is the background color of the selected theme. The label in the middle (in this case **VFO**) indicates the control function. Unlike **MIDI** mode, you cannot edit the control labels, these are fixed in firmware.

There are two other control displays. These controls are similar to potentiometers and have a minimum and maximum range.



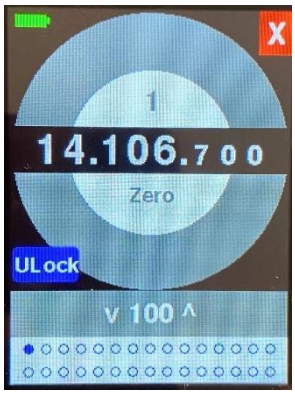
For most controls like volume, squelch, etc., the outer touch ring on the **Dial** control represents a gauge with the level indicated by the filled portion. Like a potentiometer, the gauge starts at 0% on the lower left and progresses around the display to 100% on the lower right. The **Volume** control to the right is set to 37%.

Controls with positive and negative offsets, like **RIT**, **XIT**, **Hi Cut**, **Lo Cut**, and **Balance** use a slightly different display. The **Dial** graphic for this control displays the +/- offset referenced to the top of the dial. For negative offsets it grows to the left and for positive offsets it grows to the right from center. The amount of offset (in this case RIT frequency) is shown under the label. When the control is offset, touch the label to reset it to 0 offset. If a control has an enable/disable or zero option it will be displayed at the bottom of the dial. Touch this button to operate that control.

Shortcut: Touch the top of the display twice to open the **Buttons** menu.

VFO Lock

Touch the **Lock** button on the VFO control to lock VFO tuning. When the VFO is locked, the frequency will be "grayed out" as shown here. Adjusting the tuning, or turning a knob assigned to the VFO, will post a message with instructions to reset the lock.



To unlock the frequency control, touch the **ULock** button.

Dial Menu

Touching the dial # or the bottom button bar on the **Dial** control will open the **Dial** menu. The current dial setting will be highlighted (**VFO** in this example). Touch a button to select that function and return to the **Dial** control page.

Touch the selected function or the caption to return to the **Dial** control without changing the selection. To switch pages, touch one of the dots on the bottom button.

Dial functions are listed in the table below.

Page 1		Page 2		Page 3	
VFO	Slice freq control	ANF/APF	Auto Notch/Peaking	Speed	Keyer Speed
Volume	Slice volume	RIT Frq	Rx Increment Tuning	Pitch	Sidetone freq
Squelch	Slice squelch	XIT Frq	Tx Increment Tuning	Delay	CW Dropout Delay
AGC-T	AGC-Threshold	PwrOut	Tx Power Out	Zoom	Panadapter Zoom
Moni	Monitor level	TunOut	Tune Power Out	PanMax	Panadptr Max Level
Balance	Left/Right balance	VOX	VOX Level	PanMin	Panadptr Min Level
Hi-Cut	Filter high cut freq	Mic-Gn	Mic Gain	PanAvg	Panadptr Average

Lo-Cut	Filter low cut freq	LnO-Gn	LineOut (Spkr) Gain	PanGn	Panadptr Gain
Offset	Filter high/low offset	HPh-Gn	Headphone Gain	PanBlk	Panadptr Black Lvl
WNB-Lv	Wide Noise Blanker				
NB-Lv	Noise Blanker Lvl				
NR-Lv	Noise Reduction Lvl				

Controls Menu

Max supports dual-function knobs and switches. Each knob has a *turn* and a *push-an-turn* function and each switch (knob switches and pushbuttons) have a short-press and a long-press function.

The **Controls** menu provides a graphical representation of the physical controls on **Max**. The function assigned to each knob and switch are displayed.

The caption indicates which mode is displayed. The **Turn/Short-Press** mode is displayed here. Touch the caption to switch to the **P&T/Long-Press** (Press & Turn) mode.

Changing any control will bring up a temporary display showing that control's operation.

Labels in the circles show the function of each knob. The switches are displayed as label buttons.

The exception is the button under the **<DIAL>** label. This button displays the dial currently selected **Dial Control** function. You can edit this setting on this page.

Control States

Each control has two states. For knobs, it's either **Turn** or **Push & Turn**. For knob switches and pushbuttons, it's either **short-press** or **long-press**.

To switch which state is displayed on the **Controls** menu, touch the caption of the page.

NOTE: While the **Controls** menu is displayed, the controls respond based on the selected page. If the **Turn/Short-press** page is displayed, the controls work as normal. If the **P&T/Long-Press** page is displayed, the control state is inverted… i.e. turning a knob executes its **P&T** function, and pressing and turning a knob executes its **Turn** function. The same is true for the switches. Short-pressing a switch executes its **Long-Press** function, and long-pressing a switch executes its **Short-Press** function.

Editing Knob and Button Assignments

You can easily edit the control assigned to each knob or switch.

To do this, simple touch the control you want to change. The control's background will turn red and **DELETE** will be displayed in the center of the display. This example shows **Knob A** selected for editing.

To change the assignment, simple turn any of the knobs on the unit until you reach the control function you want. Touch the control again to accept the change. **Edit** mode will time out after 3-seconds.

PTT Assignment

If a pushbutton is assigned to PTT (pushbutton 2 in this example), you cannot change or delete its assignment on this page. This must be done on page 3 in the **Settings** menu.

Deleting an Assignment

To delete the assignment on the highlighted control, touch **DELETE**. The label on the control will go blank, indicating this control is no longer active. To re-assign a function to this control, touch it again to enter **Edit** mode, then turn a knob.

NOTE: The **DELETE** function is not available for the **<DIAL>** function.

<DIAL> Function

The **<DIAL>** function can be selected for any knob. When a knob is set to **<DIAL>** (as is Knob D in this example), it will control whatever dial function is selected in the **Dial Control**, regardless of the page that is being displayed. **<DIAL>** can be assigned to more than one knob.

<NAV> Function

The **<NAV>** function can also be assigned to any knob. When a knob is set to **<NAV>** it acts as a navigation control, and can be used to switch pages in the **Settings** menu or select another dial control in the **Dial Control** page.

<STEP> Function

The **<STEP>** function can be assigned to any knob. This function changes the frequency step used by the VFO tuning control. Typically, this function is assigned to the **Press & Turn** function of the knob assigned to the VFO.

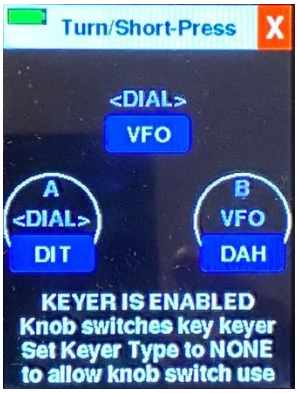
Max-2 Knob Switches

Two-knob units (**Max-2**) share the knob switches with the CW paddle jack.

To use the push-and-turn functions on this unit, you must set the Keyer **Type** to **OFF**.

If the keyer is enabled, the knob switches control the left and right paddle inputs.

This warning will be displayed if the keyer is enabled on a **Max-2** unit.

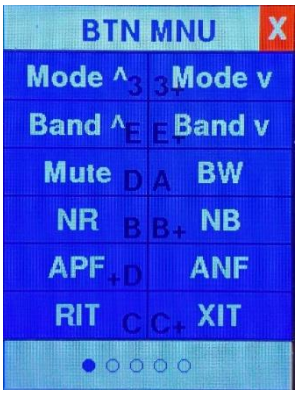


Buttons Menu

Open the **Buttons** menu to select from 60 button actions. Touching a button immediately sends that control to the radio (if the controller is online).

There are 5 pages of buttons with 12 buttons on each page. If a knob is set for **<NAV>**, turning it will switch menu pages. You can also touch a dot on the bottom button bar to jump to a page.

Assigning knob switches and pushbuttons is best done in the Controls menu.



Button Actions

Each button in the **Buttons** menu is pre-assigned to a specific action. These assignments cannot be changed. The table below list each menu page along with the button's on that page.

Page	Caption	Function		Caption	Function
1	Mode ^	Step to next mode		Mode v	Step to previous mode
	Band ^	Step to next band		Band v	Step to previous band
	Mute	Mute Rx		BW	Change bandwidth
	NR	Noise Reduction On/Off		NB	Noise Blanker On/Off
	APF	Auto-Peaking Filter On/Off		ANF	Auto-Notch Filter On/Off
	RIT	RIT On/Off		XIT	XIT On/Off
2	Tx Enab	Toggle Slice Tx Enable		TUNE	Tune Output On/Off
	ATU Tun	Start ATU		ATU Byp	Bypass ATU
	RxAnt:x	Change Rx antenna		TxAnt:x	Change Tx antenna
	WNB	Wide Noise Blnkr On/Off		Proc	Step Tx Processor
	AGC	Change AGC		RF Gn	Step RF Gain
	*KeyPad	Open Frequency Keypad		*FavFrq	Open Favorite Freq page
3	CW	CW mode		FM	FM mode
	LSB	Lower sideband mode		NFM	Narrow FM mode
	USB	Upper sideband mode		DFM	DFM mode
	AM	AM mode		DIGL	Digital Lower Sideband mode
	SAM	Synchronous AM mode		DIGU	Digital Upper Sideband mode
	RTTY	RTTY mode		Future	
4	160m	160 meters		17m	17 meters
	80m	80 meters		15m	15 meters
	60m	60 meters		12m	12 meters
	40m	40 meters		10m	10 meters
	30m	30 meters		6m	6 meters
	20m	20 meters		Gen	General Coverage
5	2m	2 meters **		M1:	Send CW Macro #1
	1.25	1.25 meters **		M2:	Send CW Macro #2
	70c	70 centimeters **		M3:	Send CW Macro #3
	33c	33 centimeters **		M4:	Send CW Macro #4
	23c	23 centimeters **		M5:	Send CW Macro #5
				<STOP>	Stop sending macro

* These actions open pages

** These bands require a transverter

Assigning a Knob Switch or Pushbutton to a Button Action

The **Controls** menu provides the easiest way to assign knob switches or pushbuttons to button functions. This can also be done in the **Buttons** menu, as outlined below.

Knob switches and pushbuttons have two actions: a short-press (less than 1 second) and a long-press (greater than 1 second).

Switch Short-Press Action

To assign a short-press action to a knob's push switch or pushbutton, do the following:

- Open the **Buttons** menu and navigate to the page with the action you want to assign
- Press and Hold the knob or pushbutton switch you want to set
- Touch and release the virtual button you want that switch or pushbutton to execute

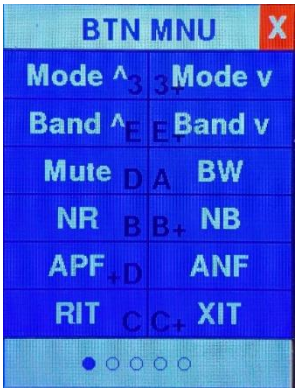
Once you have assigned a virtual button to a knob switch or pushbutton, the knob's letter or switch # will appear in that button's label. That function will be sent to the radio anytime you press that knob or pushbutton.

Switch Long-Press Action

To assign a long-press action to a knob's push switch or pushbutton, follow the steps above for setting the short-press action, then while still holding the knob or pushbutton down, touch the desired virtual button a second time. Virtual buttons set to long-press actions will have a **+** appended to label on that virtual button.

Switch Assignments

This photo shows the **Buttons** menu on **Max.** Knob C's short-press action is set to the **RIT** virtual button and its long-press action is set to the **XIT** virtual button. Pushbutton 3's short-press action is set to **Mode ^** and its long-press action is set to **Mode v**.



Clearing Button Assignments

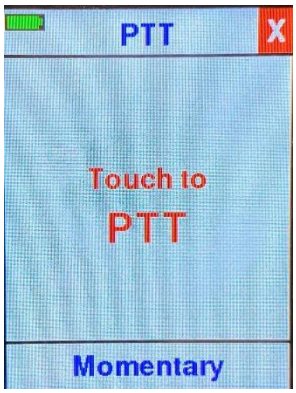
To clear a knob or pushbutton assignment, hold the knob switch or pushbutton down and touch the selected virtual button assigned to it again.

NOTE: You must clear the switch or pushbutton assigned to a virtual button before you can assign that virtual button to another knob or pushbutton.

NOTE: Changing the PTT assignment on **CTR2-Max's** pushbuttons (on page 4 of the **Settings** menu) automatically cancels all virtual button assignments to all pushbuttons.

NOTE: Virtual button knob/switch assignments are preset in the factory default. Feel free to edit them to fit your operating requirements.

PTT Page



The **PTT** page offers a virtual PTT button. There are three options to choose from on this page. Touch the bottom button to step from **PTT Off**, **PTT Momentary**, and **PTT Latch** modes.

When PTT is **Off** or the unit is offline, touching the screen, or operating an external PTT switch just pops up a warning.

When PTT is set to **Momentary,** touching the screen or operating an external PTT switch (if pushbutton #2 is assigned to PTT) keys the radio's PTT over the network. Lifting your touch or releasing the external PTT switch unkeys the radio.

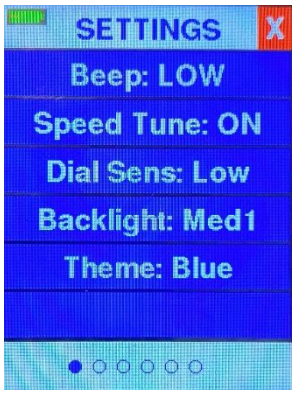
When PTT is set to **Latch**, touching and releasing the touch keys the radio over the network. It will remain keyed until you touch and release the screen again or the three-minute timer expires.

NOTE: A pushbutton assigned to PTT will control PTT in any page or menu.

To use the external PTT input on **Max-5** you must assign pushbutton #2 to PTT, otherwise, the external input will execute the button action assigned to pushbutton #2.

To use an external PTT switch on **Max-1** and **Max-2** units, select the **Passthru** keyer **Type** and wire your PTT switch to the RING and SHIELD terminals of a 3.5mm (1/8") stereo plug and insert it into the **Paddle** jack on the unit.

Settings Page



To enter the **Settings** menu, press the **Settings** button at the bottom of the **Home** page.

The settings menu is divided into 6 pages with six buttons on each page. You must press a settings button twice to change its setting.

Touch the **SETTINGS** caption or the red [**X**] to return to the **Home** page**.**

This table summarizes each setting.

Page	Btn	Function	Description
1	1	**Beep Mode**	Changes the volume of **CTR2-Max's** button beeps. Range: Off, Low, Medium, and High.
	2	**Speed Tune**	When enabled, touch and hold the outer ring on the **Flex** for > 1 second to enter speed tuning mode. Valid for VFO control only.
	3	**Dial Sens**	Changes the sensitivity of the virtual Dial. Range: Low, Medium, High. Default is Medium.

1	4	**Backlight**	Adjusts the backlight. Range: **Low**, **Medium1**, **Medium2**, and **High**. Lower settings reduce current draw on the unit.
	5	**Theme**	Select the color theme for the selected Map. Options include Dark, Light, Blue, Orange, Green, Cyan, and Violet
	6	**Future**	.
2	1	**(Keyer) Type**	Selects the internal *keyer type*. Options are **OFF**, **Straight**, **PassThru**, **Iambic A**, **Iambic B**, **Ultimatic**, and **Bug** – *does not change the radio keyer type*. Use **Passthru** for external keyers or PTT switches. Set to **OFF** to use the radio's keyer. **NOTE: Max** units have a separate *Key/PTT* input jack so there is no need to set the keyer to **Passthru** on these units. **NOTE:** On two-knob **Max** units, turning the **Keyer Type** to **Off** allows you to use the push-and-turn functions on the knobs.
	2	**Speed**	Sets the keyer's speed. Also sets the keyer speed in the radio if it is online. Steps: 5, 10, 15, 20, 25, 30. Precise speed can be controlled in the **Dial** control.
	3	**Sidetone**	Adjusts the volume of the keyer's sidetone. Also sets the sidetone level on the radio if it is online. Steps Off, Low, Med1, Med2, and Loud. Precise volume can be controlled in the **Dial** control.
	4	**Pitch**	Selects the sidetone frequency for the sidetone. Also sets the sidetone frequency on the radio if it is online. Frequency range is from **500 Hz** to **1000 Hz** in 50 Hz steps. **NOTE:** This setting also affects the radio's audio bandpass filter in CW mode.
	5	**Paddles**	Selects **Normal** or **Reverse** wiring for the **Paddle** and **Key/PTT** 3.5mm jacks. Steps through each combination.
	6	**Future**	
3	1	**Fav Mode**	Switches the Favorite Frequency list between all bands and the selected band.
	2	**Export Settings**	Backup **CTR2-Max's** settings by exporting them to a file on your computer. To do this, in Tera Term select *File->Transfer->XMODEM->Receive* then enter the name of the file you wish to save. Next, touch **Export Settings** to start the transfer. Once this file has been saved you can recover from a unintended memory erase when flashing new firmware by using the **Import Settings** option above. **NOTE:** You can select to export just your unit's basic settings or the basic settings and all of the favorite frequency lists.
	3	**Import Settings**	Import settings from a previously exported setting file using XModem. In Tera Term select *File->Transfer->XMODEM->Send* and select a previously saved settings file on your computer. Next, touch **Import Settings** to start the transfer. See the Backing Up and Restoring Setting section for more information.
	4	**WiFi Profile**	This option allows you select one of three WiFi configurations. This is useful when you have more than one WiFi network that you use your **CTR2** controller on. Profiles are numbered 1, 2, 3.

3	**5**	**AutoConnect**	Enable or disable WiFi auto connect. When enabled, **CTR2-Max** will try to connect to the WiFi network when it is first powered up. *You can override this setting by pressing and holding any button during boot.*
	6	**Client**	Toggles between **GUI** and **non-GUI** client mode. The **GUI** client is only available when **Max** is the only connection to the radio. The **GUI** client provides a panadapter in the Dashboard. Normally you connect as a **non-GUI** client when using **Max** with another control app like SmartSDR. The radio does not send panadapter data to **non-GUI** clients.
4	**1**	**Connect/ Disconnect WiFi**	Connects or disconnects WiFi. You must have the router's SSID and password and the radio's IP address and IP port # set before connecting to the radio.
	2	**SSIDx**	Set router's SSID of the selected **WiFi Profile**. Touch to open the screen editor or use a terminal program connected to **Max** to set the SSID. **NOTE:** x= the profile # selected.
	3	**PWx**	Set router's password of the selected **WiFi Profile**. Touch to open a screen editor or use a terminal program connected to **Max** to set the password. **NOTE:** x= the profile # selected.
	4	**Flex Adrs**	Set the radio's IP Address. Touch to open the screen editor or use a terminal program connected to **CTR2-Max** to set the IP address. The address can be found in the *Settings -> Radio Setup… ->Network* tab in SmartSDR.
	5	**Flex Port**	Set the radio's IP Port. Touch to open the screen editor or use a terminal program connected to **CTR2-Max** to set the IP port #. This is normally **4992** but you can change if you're changed it on the radio or are connecting to the radio from outside your LAN.
	6	**Flex Slice**	Select the slice to connect to. Slices are numbered A to H. Not all radios support all slices.
5	**1**	**# Knobs**	On one and two-knob **Max** units, the option allows you to specify the number on knobs on your unit because they cannot be auto-detected. On five-knob **Max** units, this is fixed to 5 and cannot be changed.
	2	**PTT**	Changes the PTT mode from **Off** -> **Momentary** -> **Latch**. This can also be changed on the **PTT** page by touching the bottom button.
	3	**SW# set to PTT**	This option steps through the four pushbutton switches to assign one of them to PTT. **NOTE:** Pushbutton #2 is wired to the Ring terminal of the external PTT jack so #2 must be selected for PTT if you plan on using an external PTT switch. **NOTE:** Changing this setting deletes the button actions assignments for *all* buttons. **NOTE:** On single-knob **Max** units, only Switch 1 is available for PTT. The two-knob **Max** does not have a switch available for PTT.
	4	**Future**	

5	**5**	**Rotate Screen**	Rotates the screen 180 degrees for each selection. This allows for future **CTR2-Max** configurations.
	6	**Battery Icon**	Enables or disable the battery icon display. If you don't use an internal Li-Po battery, you can leave this turned off.
6	**1**	**Sleep**	Sets a timer that turns off the display backlight after no activity for the set number of minutes to reduce current draw. Sleep mode does not close USB or Bluetooth connections. Range: **Never**, **1**, **5**, **10**, **30**, and **60** minutes.
	2	**Pwr Off**	Sets a timer to turn off the unit after no activity for the set number of minutes. Pwr Off mode reduces current draw to 14 microamps and closes USB and Bluetooth connections. Range: **Never**, **10**, **30**, **60**, **120**, and **180** minutes.
	3	**Power Down**	Immediately closes the WiFi connection and puts the unit to sleep, reducing current draw to 35 milliamperes. Touch the display to wake up the unit. You can trigger a power down sequence by pressing and holding any two pushbuttons. **NOTE:** If you are powering your **CTR2-Max** with an internal 3.7-volt battery, turn off the **Battery switch** to conserve battery power when you power down. Due to the display's design, there is no way to put the unit into ultra-low power mode – *it always draws 35 mA when powered off*.
	4	**Run MIDI Mode**	Select this option to switch to **MIDI** mode. This mode uses Bluetooth or USB MIDI to control a 3rd party app such as Marcus' (DL8MRE) SmartSDR for iOS/Mac. It is not compatible with SmartSDR for Windows, but will work with RimuSDR and AetherSDR. For more information on **MIDI** mode refer to the CTR2-Max MIDI Mode Operation Manual.
	5	**Restore to Start Up**	This option allows you to reset your settings to what they were when you first booted **CTR2-Max**, *if you didn't choose to reset your call and registration key in* ***Reset to Factory***. This is handy in case you want to "roll back" changes you made during the current session.
	6	**Demo Mode: Edit Call & Key** ---------- **Normal Mode: Reset to Factory**	**In Demo Mode:** This option allows you to enter your call and registration key without using a terminal program. The text editor is covered here. ---------- **In Normal Mode:** This option resets **CTR2-Max's** configuration back to the original factory settings. **NOTE:** You have the option of resetting your call sign and firmware registration key. **NOTE:** If you reset the configuration by mistake, and didn't choose to reset your call and registration key, execute the **Restore to Start Up** option to restore your settings before powering the unit down.

Dashboard UI

Flex WiFi mode includes a second user interface to control the radio called the **Dashboard**. To enter this mode, select **Dashboard** from the **Home** menu.

Dashboard Home Page

The Dashboard's **Home** page displays the frequency along with buttons to select various command groups.

The small inverted triangle above the red [**X**] in the top-right corner indicates that **Flex WiFi** mode is connected to WiFi and to the radio.

When online the caption will display the active slice. It will be displayed in red font, as shown here, if this slice is enabled for transmit. Touch the caption to open the Panadapter menu to change the active slice.

NOTE: In this example, **Max** is connected to the radio in **GUI** mode. This mode displays a mini-panadapter at the bottom of the page. You to touch-tune by touching a signal on the panadapter. *In order to operate in **GUI** mode, no other radio control software (SmartSDR, etc.) can be connected to the radio.*

Touch any element on this page to select or execute that item or open its associated menu.

You can lock the VFO frequency by touching the **Lock** button. Its caption will change to **ULock**. Touch it again to unlock the VFO.

The VFO frequency is always selected on the **Home** page as shown here. Turning the knob assigned to **<DAIL>** or **VFO** in the **Controls** menu changes the frequency by the selected step digit (the red digit, 100 Hz in this example). You can change the step simply by *double-touching* another digit in the frequency. To select the ½ step (5, 50, 500, 5000, etc.) using the touch method, touch the selected step digit again. You can also assign a knob to **<STEP>** to control the tuning step.

Knob Control

Any selected parameter in the **Dashboard** pages can be adjusted by either the swipe method (explained next), or by turning a knob assigned to the **<DIAL>** function.

Swipe Method

When you touch an adjustable parameter in a Dashboard page, the selection indicator around that parameter turns red indicating that swipe adjustment is enabled. To change the parameter's value, simply swipe your finger to the *left* or to the *right* anywhere on the display. On the Dashboard **Home** page, swiping below the frequency is recommended so you can see the frequency as you swipe. You can raise your finger and swipe again as long as the select indicator is red. Swipe mode will automatically turn off after 3 seconds of inactivity.

To zero the digits below the selected tuning digit on the dashboard **Home** page, touch the **Zero** button.

NOTE: If the VFO is locked, all frequency digits will be "grayed out" and the **Zero** function will be blocked. To unlock the VFO, touch the **ULock** button.

To return to the controller's **Home** page, press red [**X]** in the top-right corner.

Touching the other buttons on this page will open their page. These pages will be described next.

Keypad Frequency Entry

CTR2-Max has a built-in keypad for direct frequency entry. To open the keypad, press **Freq** button on the bottom row of the Dashboard's **Home** page.

The current frequency will be displayed on the top of the display in Hertz,

You can change the current frequency by just entering a new frequency. To just change the lower digits, touch the [**<**] button.

Touch the [**x**] button in the lower-left to clear the current frequency. You can enter the frequency in MHz, kHz, or Hz. Once you've entered the new frequency press the [**M]**, [**K]**, or [**H**] button to accept it.

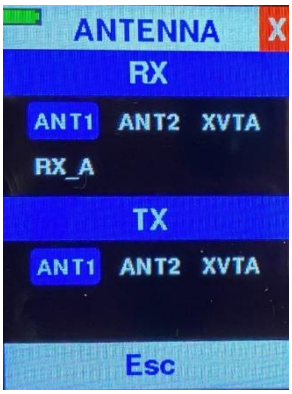
Here are a few examples:

- Entering **10M** sets the frequency to 10 MHz.
- Entering **28.074M** sets the frequency to 28.074 MHz.
- Entering **28074K** also sets the frequency to 28.074 MHz (28074 kHz).
- Entering **2807400H** sets the frequency to 2.807400 MHz. Add another trailing 0 to make it 28.074 MHz.
- Entering **28074020H** sets the frequency to 28.074020 MHz.

Touch **Fav** on the bottom-left button to open the Favorite Frequency page from this page, or touch **Esc** to exit without saving the new frequency.

NOTE: If the VFO is locked, this page is not available. Unlock the VFO by touching the **ULock** button on a frequency display page.

Antenna Page



The **Antenna** page allows you to select the antenna configuration on your radio. Simply touch the antenna option you want to use.

Selecting **XVTA** (or **XVTB** on dual SCU radios) enables **Transverter** mode. This mode adds the 2m, 1.25m, 70cm, 33cm, and 23cm bands to the **Band** page and compresses the frequency display to accommodate the additional digits.

NOTE: Max does not support frequencies above 4 GHz.

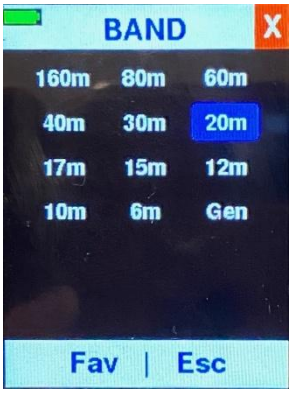
The top half of this page displays the receive antenna options and the bottom half displays the transmit antenna options. Touch a button to select an option.

When you're done, touch the **Esc** button at the bottom of the page to return to the dashboard's **Home** page.

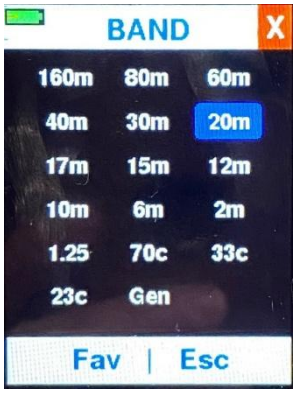
Band Page

The **Band** button (top-center of the dashboard's **Home** page) displays the current band setting on the radio. Touch this button to open the **Band** page.

When either the **XVTA** or **XVTB** transverter options are selected in the **Antenna** page the 2m, 1.25m, 70cm, 33cm, and 23cm bands are added to the **Band** page.



Normal Band Options



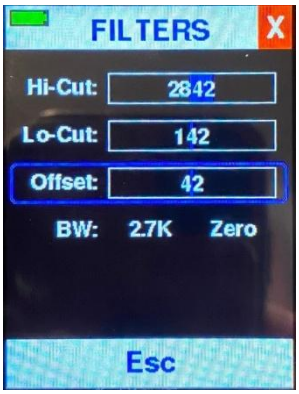
Additional Transverter Bands

Touch **Fav** on the bottom-left button to open the Favorite Frequency page from this page.

Touch the **Esc** button at the bottom of the page to return to the dashboard's **Home** page.

NOTE: If the VFO is locked this page is not available. Unlock the VFO by touching the **ULock** button.

Filter Page

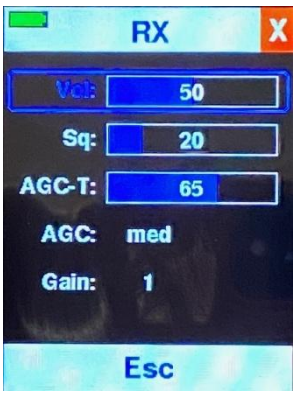


The current bandwidth is displayed in the top-right corner of the Dashboard's **Home** page. Touch this button to open the **Filter** page.

On this page you can change the **Hi-Cut** and **Lo-Cut** frequencies independently and change the filter **Offset** to move the filter within the pass band. The total bandwidth (**2.7K**) is indicated on a button at the center of the 4th row. Touch this button to step the bandwidth down to the next standard bandwidth for the selected mode. If the filter offset has been moved off-center (+42 Hz in this example) the **Zero** button will be displayed. Touch this button to remove the offset and reset the filter to its default settings.

The selected control (with the blue square) can be adjusted with the knob assigned to **<DIAL>**. You can also enable swipe control by touching the selected control. The select indicator will turn red while swipe is enabled. In swipe mode, simply swipe your finger on the display either to the *left* or to the *right* to change the control.

RX Page



The **RX** page allows you to change several parameters related to the receiver.

Touch any control to select it. For variable controls, turn the knob assigned to **<DIAL>** to change the setting. You can also touch the selected control to enable swipe mode, then swipe your finger *left* or *right* to change the parameter. The select indicator will turn red while swipe is enabled. You can continue to swipe until swipe mode times out (in 3 seconds).

Touch the **AGC** or **Gain** settings to step through the settings for those controls.

The Volume control has a Mute function. Touch the **Vol** label to toggle mute on and off (Mute is off in this photo).

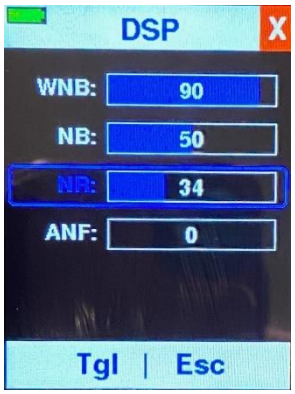
Touch **ESC** to return to the dashboard's **Home** page.

Mode Page

The **Mode** button (center of the dashboard's **Home** page, below the frequency) displays the mode setting on the radio. Touch this button to open the **Mode** page.

In the **Mode** page, touch a mode to switch the radio to that mode and return you to the dashboard's **Home** page. Touch **Esc** or the selected mode to return without changing the mode.

DSP Page



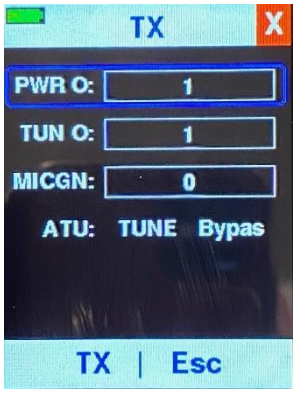
The DSP page allows you to adjust and enable or disable each DSP setting on the radio.

To adjust a setting, touch its gauge to select it then turn the knob assigned to **<DIAL>**. You can also use the touch to select then swipe method described earlier.

To enable or disable a control, touch the control's label. When enabled the control text will be inverted. **Noise Reduction** is enabled in this example. You can also select the control's gauge then touch the **Tgl** button to enable or disable that control.

Touch **Esc** to return to the dashboard's **Home** page.

TX Page



Controls associated with the transmitter are accessed by touching the **TX** button on the **Home** page.

You can adjust the Power Out, Tune Out, and Mic Gain by selecting those gauges.

The knob assigned to **<DIAL>** can be used to adjust the selected parameter or you can enable swipe method to change it.

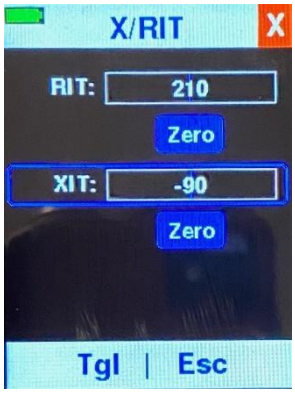
Both **ATU** buttons require one touch to select the tune function then a second touch (or **EXEC**) on the left-bottom button to execute it.

To toggle the **TX** enabled mode on the current slice, touch **TX** on the left-bottom button. The state of the **TX** mode is indicated by the caption of the page (**TX** is off in this example). When **TX** is enabled the caption on all pages will be red. When **TX** is disabled the caption on all pages will be the default background color as shown in this example.

You can also open the **Buttons** menu to change **TX** mode on the radio. If you use it a lot you can assign the **Tx Enbl** button on the **Buttons** menu to one of the knob switches or pushbuttons.

Touch **Esc** to return to the dashboard's **Home** page.

X/RIT Page



Enter the **X/RIT** page by touching the **X/RIT** button on the dashboard's **Home** page.

As with the other control pages, select a control then use the knob assigned to **<DIAL>** or the touch to select then swipe method to change the control's value.

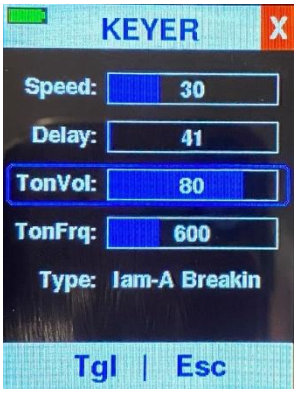
Enable and disable the selected control by touching the control's label or by touching **Tgl** on the bottom button while **RIT** or **XIT** are selected.

When a control is not set at 0 Hz, a **Zero** button will appear below its gauge. Touching this button sets the control to 0 Hz.

Touch **Esc** to return to the dashboard's **Home** page.

NOTE: If the VFO is locked this page is not available. Touch the **ULock** button to unlock the VFO.

Keyer Setting Page



Touch the **Keyer** button to open the keyer's settings page. As in the other dashboard pages you either use the knob assigned to **<DIAL>** or touch to select it then use the swipe method to change the value. Changing the **Speed, Delay**, side**TonVol**, and side**TonFrq** settings change these settings for both the internal keyer on the radio and the keyer in **CTR2-Max**.

NOTE: The radio's keyer is disabled when a keyer **Type** other than **OFF** is selected. To release this override so you can use your radio's keyer, set the keyer **Type** to **OFF** on this page, or on page 2 of the **Settings** menu.

The radio's sidetone can be enabled or disabled by touching the **TonVol** label or the **Tgl** label on the bottom button when **TonVol** is selected.

> **NOTE:** The radio's sidetone is only available when your paddles are connected directly to the radio and you are using the radio's internal keyer. It is not available when keying the radio with **Max** over the network.

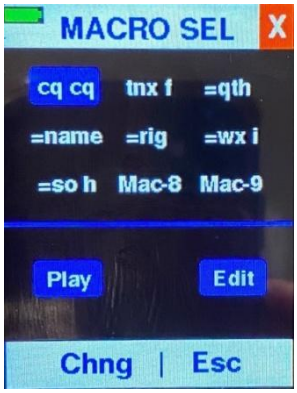
The **Breakin** button controls the radio's breakin mode.

NOTE: To key the radio, you must have **Breakin** enabled (as shown in photo above), the radio in CW mode, and the controlled slice must have **TX** enabled. The caption will be red when **TX** is enabled.

The knob assigned to **<DIAL>** can be used to adjust the selected parameter or you can enable swipe mode to change it.

You can step through the keyer **Type** by selecting **Type** then pressing the **Chng** label on the bottom button or by pressing the **Type** label again once it is selected.

Marco Select Page

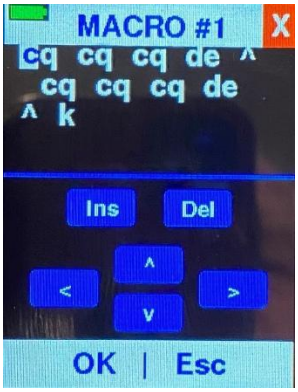


This page allows you to select, play, and edit one of the nine CW macros. Macros are listed using the first 5 characters of each buffer. Touch a macro to select it then touch **Play** to start it or **Edit** to edit it.

Once you start a macro the button options change to **Pause**, **Stop**, and **Add**. Touch each button as required. Once a macro has started you can leave this page and let it run.

Touch **Esc** to return to the Dashboard's **Home** page.

Macro Edit Page

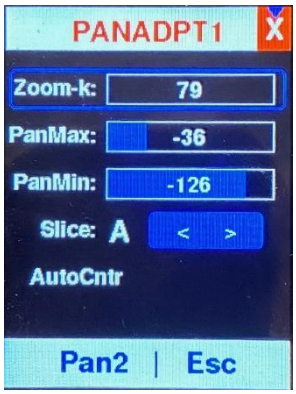


Pressing the **Edit** button on the **Macro Select** page opens the editing page for the selected macro.

- Use the [^] and [v] buttons to change the selected character
- Touch the screen or use the [<] and [>] buttons to move the cursor to a new location
- Enter the **^** character in the buffer to automatically insert your registered call into the buffer
- Use the **Ins** and **Del** buttons to insert or delete a character
- Touch **OK** to accept the changes or touch **Esc** to exit without changing the buffer

NOTE: You can also edit the macros using a dumb terminal such as Putty or Tera Term on a Windows PC or the built-in terminal program in a Mac or Linux. Simply press the # of the buffer to edit (1 to 9) in the terminal.

Panadpt1/Slice Page



The **Panadpt1/Slice** page allows you to change the ranges used on the panadapter and select which slice you want **CTR2-Max** to control.

You can access this page directly from the Dashboard's **Home** page by touching the caption on the **Home** page or by touching the **Pan** button. The normal methods to change the selected value are available, i.e. turn the knob assigned to **<DIAL>** or touch then swipe.

Zoom-k adjusts the bandwidth of the panadapter.

PanMax adjusts the top level of the panadapter. Raising the (-) value of this setting increases the sensitivity of the panadapter display.

PanMin adjusts the reference for the bottom of the panadapter. Lowering the (-) value of this setting reduces the noise floor of the panadapter.

To change the **Slice**, touch either the [**<**] or [**>**] button. The new **Slice** character will be displayed inverted. To accept the change touch **Chng** on the bottom button. The controller will disconnect from the radio and then reconnect to the new slice.

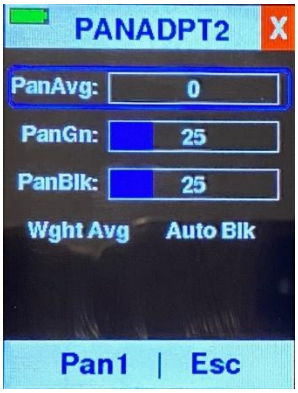
AutoCtnr toggles the panadapter auto-center while tuning feature. When auto-center is enabled, tuning may appear choppy because the panadapter recenters on every tuning step.

NOTE: Max cannot control two slices at the same time.

To move to the **Panadpt2** page touch the **Pan2** button on the bottom-left button.

Touch **Esc** to return to the dashboard's **Home** page.

Panadpt2 Page



The second panadapter page allows you to control the **Average**, **Gain**, and **Black** levels on the panadapter and waterfall.

The two buttons on the 4th row allow you to toggle **Weighted Average** and **Auto-Black** functions.

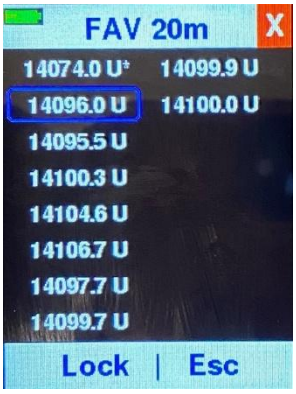
PanAvg adjusts the sample average time. The higher the number the more samples are averaged and the response of the panadapter slows down.

The other functions on this page control the panadapter in SmartSDR.

These functions are also available on the virtual **Dial** control.

Touch **Esc** to return to the dashboard's **Home** page.

Favorite Frequency Page



The **Favorite Frequency** displays the last 16 frequencies you have recently visited.

Access this page by pressing **Fav** on the Home page, Keypad, or Band page.

In the **Settings** menu you can select to save frequencies for individual bands (20m is shown in this screenshot) or you can select a common favorite frequency list for all bands.

Frequency and modes are automatically added to the first unlocked bin on this list when you stop on a frequency for longer than 15 seconds. Modes are represented by their first letter, U=USB, C=CW, etc.

Lock a frequency bin by selecting it then touching **Lock** on the bottom-left button. Locked bins have an asterisk to the right of the mode character. Once locked the bin will not be overwritten by new frequency or mode data. This allows you to freeze your favorite frequencies and quickly return to them. Unlock the selected bin by touching **ULock** on the bottom button.

Touching any frequency bin will highlight that bin and automatically tune the radio to that frequency and mode (if **Max** is online). The bin will be highlighted with a red outline for 3 seconds and **Move** will appear on the bottom left button. During this time, touching **Move** will move the selected bin to the top left position. This allows you to organize your frequency list.

Turn the knob assigned to **<DIAL>** to move to another bin. Favorite frequencies will be restored after a power cycle. Once all of the bins have been locked the list will not accept new frequencies.

Touching a frequency twice will return you to the dashboard's **Home** page.

Press **Esc** to return to the dashboard's **Home** page.

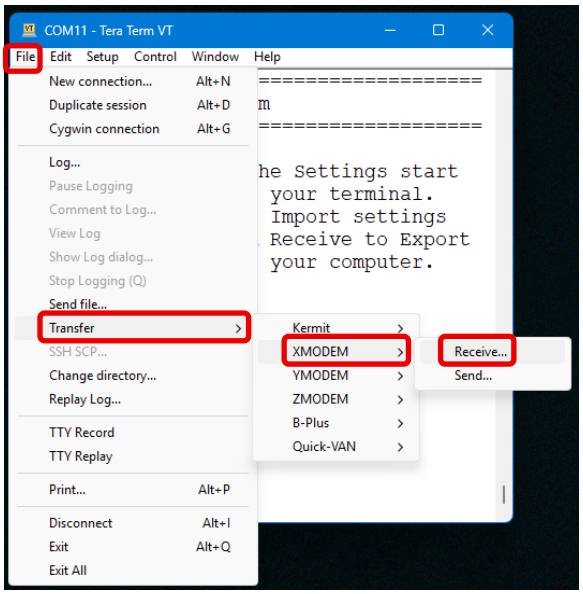
Backing Up and Restoring your Settings

Once you have your **Max** setup you'll want to backup your settings to your PC.

Max uses the XModem file transfer protocol to transport settings to and from backup files on your computer. XModem is an older protocol and not many dumb terminal programs support it nowadays. Tera Term does and I'll use it in the document. Putty does not. To get XModem functionality with Putty you need to download and install ExtraPutty. This program is a branch of Putty. You can download it from here.

Before you can use the **Import Settings** option you must export the settings on **Max** once you've made changes. If you want to just return to factory settings, select the **Reset to FACTORY** option in the **Settings** menu.

Export Settings



To export the current settings, connect Tera Term to **Max** then open its XModem transfer utility. This can be found at *Files->Transfer->XMODEM->Receive…* option shown here.

When you select this option Tera Term will ask you to enter the file name for the file you want to create. Navigate to the folder you want to save it in then give it a name. *I prefer to use the **.ctr2** extension but you can use any extension you want.*

NOTE: If you don't enter an extension, your file will not have one, which can confuse Windows.

When you click [OK] Tera Term will open the XModem transfer window and wait for the transfer to start. At this point, touch the **Export Settings** option in the **Settings** menu.

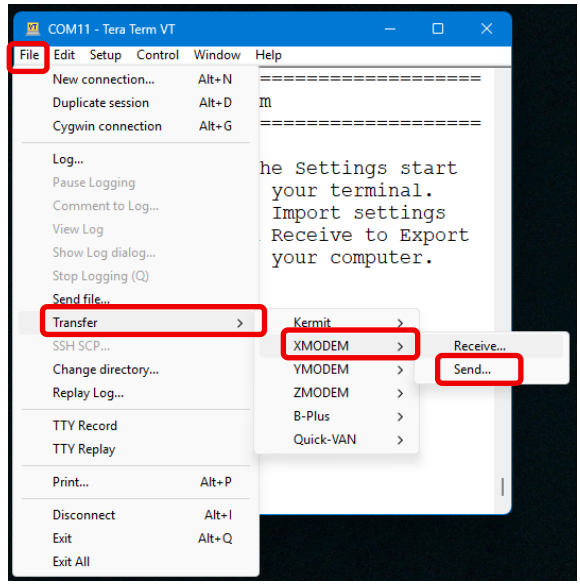
You can select whether to send just the basic configuration of you unit, or a full system backup that includes all of the radio and frequency information (including your WiFi credentials and radio address). <u>If you plan on sharing your configuration with others, I recommend saving just the basic configuration.</u>

The transfer should complete in a second or two and you should have a new file in your backup folder. You can view this file with a text editor. I don't recommend editing the values in this file because invalid values may cause problems with **Max's** boot process.

Import Settings

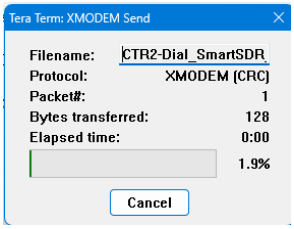
Now that you have a backup file of your settings (or have downloaded a configuration file from the Lynovation web site) you can import them using the **Import Settings** option.

To start an import, touch the **Import Setting** button in the **Settings** menu. Next, in Tera Term, navigate to the *File->Transfer->XModem* and select the *Send* option. Tera Term will ask you to select a file. Select one of the files you previously exported, or a file from the [CTR2-Max Configuration File] zip file. Tera Term will then open the file transfer window and transfer the file.



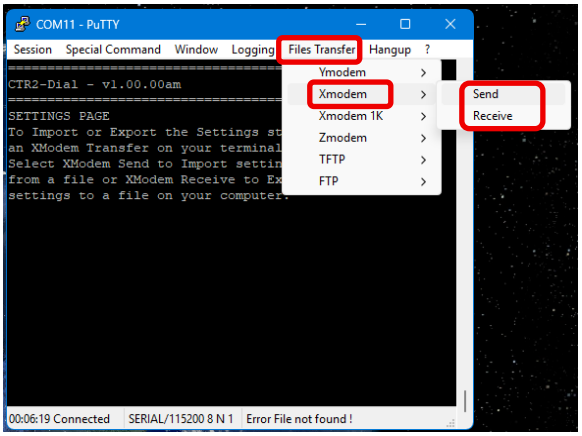
HINT: You can use the export and import settings functions to save and reload multiple versions of your settings. Perhaps you use **Max** on more than two apps and have each app configured differently. You can export the settings for each of your apps then import them back in when you want to change apps. This is also handy if you have more than one **CTR2** controller, or if you want to share your configuration with other users.

NOTE: If the file transfer stalls (as shown here), cancel the transfer in Tera Term and run it again. This seems to be a random bug in Tera Term as it doesn't happen all the time. The import function in **Max** will timeout after 30 seconds if the transfer doesn't complete.



Using ExtraPutty

If you use the XModem transfer option in ExtraPutty as shown here, use the *Xmodem* option, not the *Xmodem 1K* option.



Flex Radio CW Zombie Mode

Occasionally the Flex radio exhibits an odd problem when keying over the network. The radio can go into what I call **CW zombie** mode. This happens occasionally when connecting and disconnecting multiple clients to the radio that send remote keying commands (at least I think that's what causes it).

In **zombie** mode the radio looks like it is transmitting CW, the light on the front panel turns red, the TX icon turns red, the MOX button turns blue *but **no RF carrier is generated** or displayed on the panadapter.* The only way I have found to get the radio out of zombie mode is to disconnect all clients and power cycle the radio.

Appendix A: Installing or Updating CTR2-Max Firmware

CTR2-Max firmware is pre-installed and tested on your unit prior to shipping. You will want to occasionally update the firmware to keep current with bug fixes and new features.

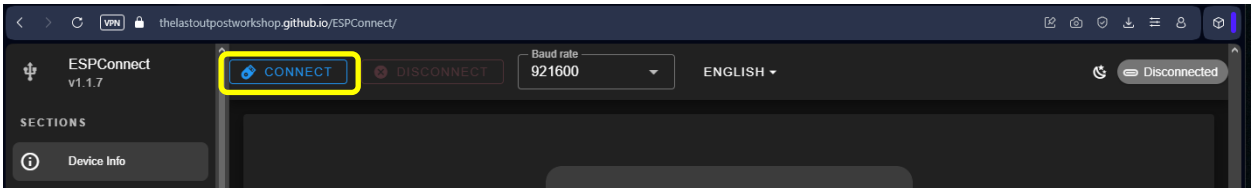
Before you begin, download the latest **CTR2-Max** firmware from my web site. Unzip the firmware distribution zip file into a folder.

Installing Firmware using ESPConnect

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, Firefox, Safari, and all Linux browsers don't support Web Serial.

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.

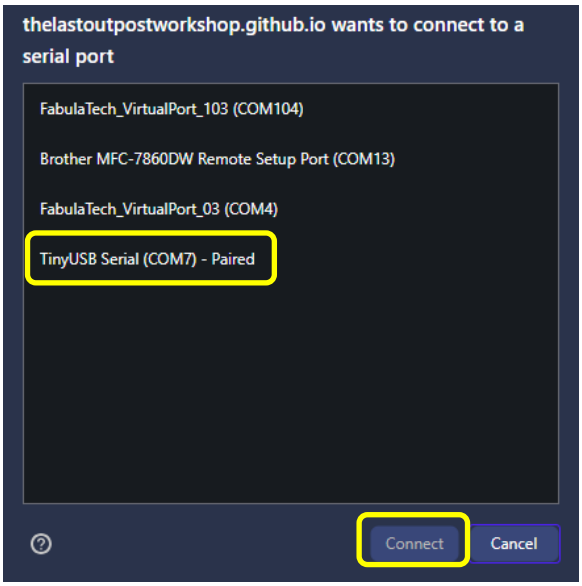
Click the **Connect** button.

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

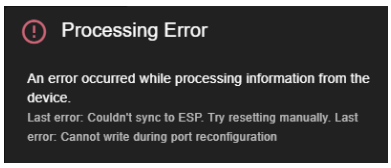
On a Windows PCs, all **CTR2** units will be shown as a **TinyUSB Serial** device, as shown here.

On Macs, **Max** will be listed as an **ESP32-S3-DEV** device.

Select the **Max** device and click the **Connect** button.



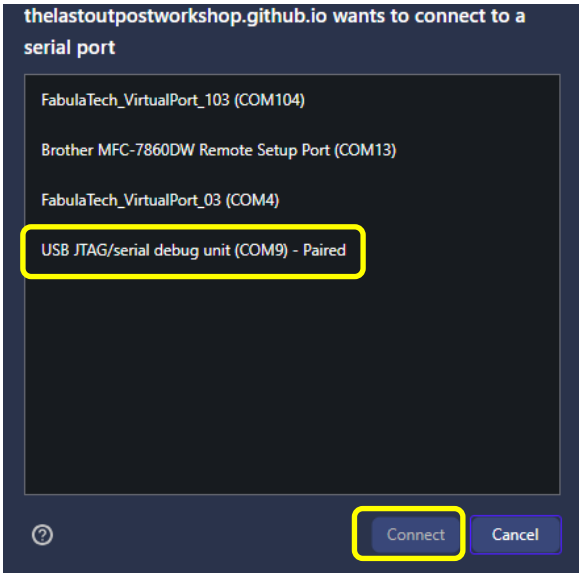
A popup warning will appear telling you that an error occurred. Some errors may tell you to press the BOOT button on the processor to put it into bootloader mode. You do not need to do this.



This is the normal response when trying to connect to a **Tiny USB serial** device. You'll notice that **Max** is frozen at this point because it acutally did enter boot mode!

Do not power cycle your unit. Click the **Connect** button on the home page again.

This time, the **TinyUSB serial** (or **ESP32S3_DEV** on Macs) will not be shown on the list. Instead, a new device, **USB JTAG/serial debug unit** will be shown (on both PCs and the Mac).



This is the bootloader port and the unit is now ready to program.

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

NOTE: Apparently, not all ESP32-S3 processors will enable the **USB JTAG** port automatically. If your's doesn't, you'll need to force it into boot mode. Do this by pressing and holding the **Boot** button on the back of **Max**, then press and release the **Reset** button.

Once you're connected to **Max** in Boot mode, 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 **Max's** 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.

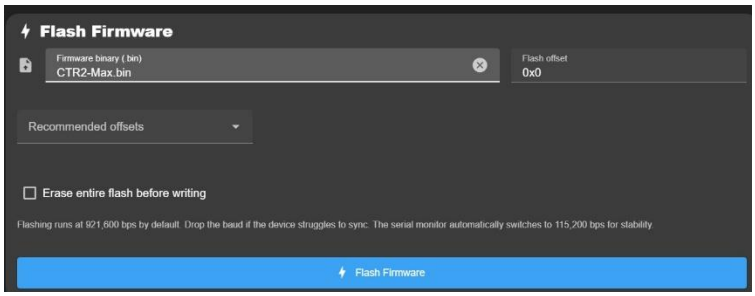
Click the **Firmware binary (.bin)** text box.

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-Max_v1.01.xx.bin** file (the version # is now part of the .BIN file's name).

Your browser's display should now look like this:

Leave the **Flash offset** set to **0x0** and uncheck the **Erase entire flash before writing** checkbox.

WARNING: If you check the erase box, you'll need to re-enter your call and registration key and reconfigure your unit.



Click the **FLASH FIRMWARE** button to start the flash process.

Once the process completes, cycle the power on **Max**. If your unit has an internal battery, turn the **Battery** switch OFF then disconnect **Max** from the computer's USB port. Next, plug it back into the computer. The version # will be displayed when the unit boots. The version # should match the version # from the firmware zip file.

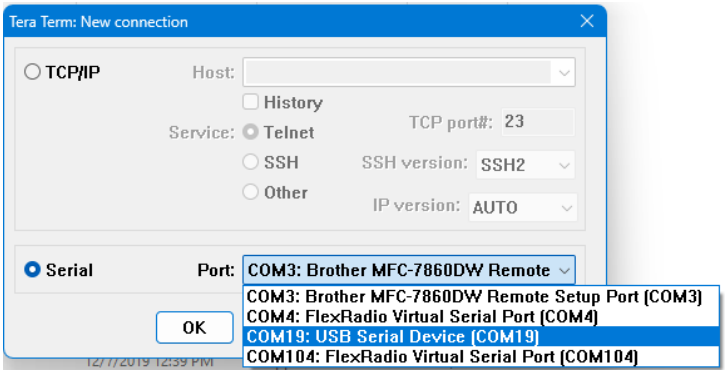
This completes the firmware update process.

Appendix B: Configuring Tera Term

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

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 connect to **Max**. Press any key to start **Max's** terminal server.

You can change the terminal size in the **Setup** menu. Select **Terminal…** Set the **Terminal Size** to at least *41 x 20.* **Max's** terminal interface was designed for this size.

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*. Your 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 **Max**.

Appendix C: Configuring Putty

Putty is a terminal program that can be configured for a variety of needs. **CTR2** controllers only support serial connections. This section describes how to configure the program to interface with **Max**.

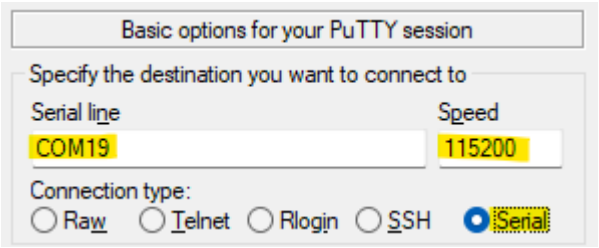
NOTE: Putty does not have XModem transfer capability. If you want to export and import backup files for **Max's** settings consider using Tera Term or install ExtraPutty.

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 **Max** using its USB serial port in order to configure it.

Serial Session

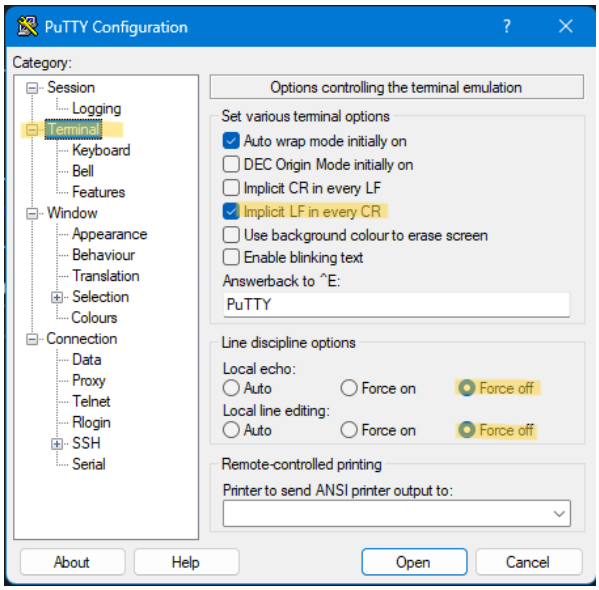
Select **Serial** then set the **Serial Line** to the COM port you found in the Device Manager and set **Speed** (Baud Rate) to 115200.



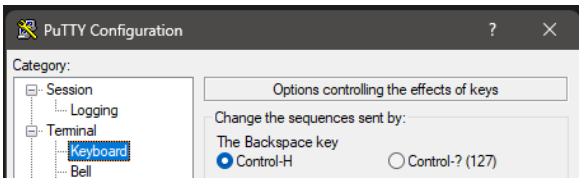
NOTE: Since this is a USB serial port the **Speed** (baud rate) doesn't matter. Data will be sent at USB speeds regardless of the **Speed** setting.

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**.

You can change the window size under the **Window** item. Set the **Columns** to *41* and the **Rows** to *20*.



Next, select the **Keyboard** menu option and note the setting for the **Backspace key.** If **Control-H** is selected you will need to press **Ctrl+Backspace** to send the **Del** key (ASCII 127). If **Control-? (127)** is selected, press the **Backspace** key to send the **Del** key code.



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.

Appendix D: Apple or Linux Terminal Programs

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

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

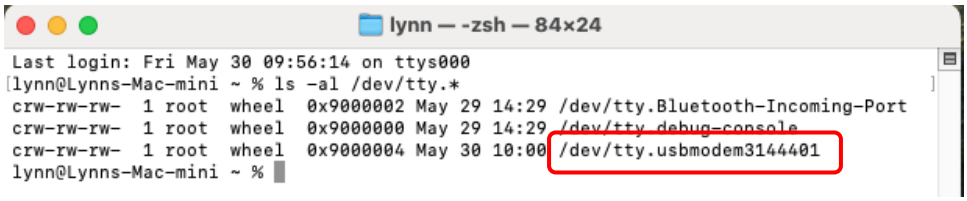
- On the Mac open **Applications/Utilities/Terminal.app**. On Linux open the terminal program supplied by your distro.
- On the Mac, enter ***ls -l /dev/tty.usb****, on Linux, enter ***ls /dev/tty**** This will return a list of all known serial ports.
- Next, plug the *Flex* into the computer's serial 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 *Flex'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 **Max** into your PC, make sure you are using a USB-C cable that supports data. Many USB-C cables that come with consumer electronics only provide power to the device.

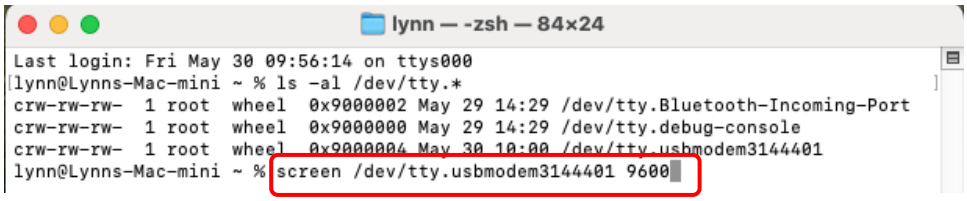
Once you know **Max's** USB serial port ID, write it on the label on the bottom of the unit using a fine-tipped permanent marker for future reference. Put a piece of transparent tape over the label to seal the ink so it doesn't rub off (it's not as permanent as you think). You can always remove the tape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



This is **Max's** terminal display. Select a dial control or button to edit that control's label.

```
File  Edit  Setup  Control  Window  Help
========================================
   CTR2-Max Flex WiFi Mode - v0.9.00
========================================
            WIFI SETTINGS MENU
----------------------------------------
 1 to 9) Edit CW Macro
      P) WiFi Profile:       1
      S) Connect to Slice:   A
----------------------------------------
      A) WiFi Router SSID1: test
      B) Router Password1:  ********
      C) Radio's IP Adrs:   10.0.0.10
      D) Radio's IP Port:   4992
          (Default is 4992)
      E) Connect to WiFi
----------------------------------------
 Press macro # or hilighted key to chng
SaveInit save time= 742 mSec
```

Appendix E: Internal Battery

Max is designed to support an internal 3.7-volt Lithium-Polymer battery. The display board has a charge controller that will charge at approximately 300 mA until the battery reaches 4.2 volts, then it will reduce to 0 mA. The unit can monitor the approximate battery voltage. This is used to provide a relative state-of-charge via a battery icon that can be enabled on page 5 of the **Settings** menu.

On a **Max-5** unit, the battery mounts in the base of the unit and has a strap to secure it. The enclosure fits a battery up to 55mm L x 35mm W x 10mm H. This allows a 2000 mAH battery to be installed. This battery will power the unit for about 12 hours.

Max-1 and **Max-2** units support a smaller 1100 mAH battery, up to 50mm L x 30mm W x 7mm H. This battery will power the unit for approximately 5 hours.

Battery installation is covered in the **CTR2-Max Hardware Manual** available on my website.

Appendix F: Change Log

Changes applied to older firmware versions are documented here.