W0EB/W2CTX Software Operating Manual for the
MicroBITX Transceiver Using
A Teensy 3.6 Micro-Controller

Manual Version 1.02

One of the MicroBITX transceivers constructed by Jim, W0EB

INTRO:

This software operating documentation will be somewhat different than our other offerings. Since changing to the Teensy 3.6 MPU from the Arduino Nano, we will assume the user has the ability to download the files and program the MPU using the Arduino IDE with the "TeensyDuino" add-ons installed. We will no longer include those instructions in these documents and the published manual's version# will not necessarily reflect the version # of the software it refers to.

New revisions of this document will be issued only when sufficient changes to the normal operation of the software defined herein have been made to warrant such changes. Minor revisions to the software will be documented in a "change log" README file that will be included in the ZIP archive for a particular version and will be available as soon as practical in the Documentation download directory of the files link at www.w0eb.com.

Every effort will be made to ensure that website has the latest versions of our software available for download within a reasonable time after release.

Hardware considerations and items necessary for operation.

The original encoder and function switch (may be on the encoder or installed as a separate pushbutton) are still connected to the card via the uBITX's 8 pin "Digital" connector. They will be used mainly for tuning the frequency of the uBITX (encoder) and selecting the tuning rate cursor (function button). They also may be used for tuning and selection during the Alignment phase of the Configuration menu (covered later in this document).

Two additional encoders and four additional pushbutton switches (minimum) will be required for operation of the Teensy software and more may be added in future releases. You will also need a 1 gigabyte or larger micro SD card (formatted as FAT32) inserted in the Teensy's micro SD slot prior to continuing at least for the first time you run any of the Teensy

The first additional encoder (connected to Teensy digital I/O pins D24(Enc-B)m D25(Enc-A) and the encoder common to ground is used for paging through the menu selections which are called up by a medium press on the menu's "Enter/Exit button (connected to input D26 and ground). The menu's "Choose" button (connected to input D27 and ground) is used to select the desired menu item.

Using the buttons and Menu System:
Buttons:

1. FREQ_INCR/RIT button:

This button controls frequency increment and RIT.

A short press will decrease the frequency increment value used by the Tuning encoder. When the frequency increment reaches the lowest increment available then it will move to the highest increment.

A long press will control RIT operation. If RIT is currently OFF then "RIT ON" will be displayed and upon release RIT will be turned ON. However, if SPLIT is currently activated, this action will be ignored and SPLIT will remain active. If RIT is currently ON then "RIT OFF" will be displayed and upon release of the button RIT will be turned off.

Menu System operation:

The menu system is controlled by two buttons and an encoder. There is a "Menu

Enter/Exit" button and a "Menu Choose" button. To move between menu items use the "Menu Select" encoder.

1. 0   The menu system has two major menu items: MENU and CONFIGURATION. There is a last option which is "EXIT" to allow getting out of the menu without changing anything. Pressing and holding the "Menu Enter/Exit" button will cycle through the three options and will stop at "Exit". Releasing the button will select the option currently being displayed. Having selected "MENU" or CONFIGURATION" you can still exit the menu by depressing of the "Menu Enter/Exit" button.

2.0   Having selected "Menu", two lines are displayed representing your choices. The cursor will be placed on the last selected choice allowing faster access to that item. For example if the last item selected was MEM(LMC) then the next time you get into the menu the cursor will still be there so you can repeat changing the memory channel. Using the Menu Select encoder move the cursor to the item you want to change. To select the item the cursor is under, press "Menu Choose" until "change" is displayed. Then release the button.

You will notice that as you use the "Menu Select" encoder some of the menu items might be skipped based on the current "mode".

2.1 Menu item Mode:

Having selected this menu item you can move thru the modes available with the use of the "Menu Select" encoder. After selecting the mode you want depress the "Menu Enter/Exit" button until "change is displayed then release the button. The selected mode will be entered.

2.2 Menu item Paddle State:

This menu item is a "toggle" menu item. Press the "Menu Choose" button until "change" is displayed then release the button.   The paddle state will toggle between normal(N) and reverse(R).

2.3 Menu item Iambic Mode:

This menu item is a "toggle" menu item. Press the "Menu Choose" button until "change" is displayed then release the button.   The iambic mode will toggle between iambic A and iambic B.

2.4 Menu item CW Sidetone:

This menu item sets the CW sidetone frequency. Press the "Menu Choose" button until "change" is displayed then release the button. Now using the "Menu Select" encoder change to the desired frequency. Then depress the "Menu Enter/Exit" button.

2.5 Menu item CW Keyer Speed:

This menu item sets the CW keyer speed. Pressing the "Menu Choose" button until "change" is displayed then release the button. Now using the "Menu Select" encoder change to the desired speed. Then depress the "Menu Enter/Exit" button.

2.6 Menu item Memory Channels:

There are ten memory channels available to the user, numbers 0 – 9, that consist of mode and frequency.

There are four GROUPS of Memory Channels. They are CW, SSB, DIG, and USER. The USER GROUP is the only group that channels can be saved in the microSD and is backed up in EEPROM. The system maintains a working copy of the loaded channels during operations. The contents of these channels can be saved only into the USER group. Any changes to the working copy will be lost upon powering down the radio.

2.6.1   The system provide three fixed Memory Channel GROUPS that can be loaded into the working channel table. The fixed GROUP's can only be changed in the source code. Once any GROUP is loaded, each of the 10 channels can be loaded into the "active" VFO. There is a menu item that allows you to change any one of the loaded channels. This change is only active until you power down. If you load and or modify a set of channels that you like, you can save them permanently into the USER GROUP. During power on the USER GROUP is

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automatically loaded into the working copy.

2.6.2　　　　LMC (Load Memory Channel) provides a way for the user to load one of the ten loaded Memory Channels from the working copy group into the "active" VFO. Push the "Menu Choose" button until "change" is displayed and then release the button. A new display will appear. Use the "Menu Select" encoder until the Memory Channel you want to load is displayed. Use the "Menu Choose" button to load the contents of the selected memory channel into the "active" VFO. To exit without changing anything, press the "Menu Enter/Exit" button.

2.6.3　　　　SMC (Store Memory Channel) provide a way for the user to store the "active" VFO's mode and frequency. Push the "Menu Choose" button until "change" is displayed and then release the button. A new display will appear. Use the "Menu Select" encoder until the Memory Channel you want to store into is displayed. Again depress "Menu Choose" to store or to exit without changing anything depress the "Menu Enter/Exit" button.

2.6.4　　　　LMG (Load Memory Group) provides a way for the user to load one of the four Memory Channel Groups. Push the "Menu Choose" button until "change" is displayed and then release the button. A new display will appear. Use the "Menu Select" encoder until the Memory Channel you want to Using the "Menu Select" encoder to select the Memory Channel Group you want to load into the working group copy. Doing this will destroy the contents that are in the working group. Use the "Menu Select" encoder to select the GROUP you want to load. Then depress the "Menu Choose" button to load the selected group or depress the "Menu Enter/Exit" button to exit without loading anything.

2.6.5　　　　SUG (Store USER Group) provides a way for the user to store the channels he likes into the USER GROUP. The GROUP will be saved into microSD and EEPROM. During power on the USER GROUP will be loaded into the working group copy.　Push the "Menu Choose" button until "change" is displayed and then release the button. A new display will appear. It will ask you if you want to

store new values into the USER GROUP. To store the values depress the "Menu Choose" button. To exit without changing anything depress the "Menu Enter/Exit" button.

3.0   CONFIGURATION. Having selected the CONFIGURATION menu there are currently 9 available configuration items.

CONFIGURATION allows the user to tailor his uBITX based on hardware he has added to the base system.

To enter the CONFIGURATION menu depress the "Menu Enter/Exit" button until "CONFIGURATION" is displayed. Then release the button. Once in the configuration menus you can exit anytime by depressing the "Menu Enter/Exit" button. Use the "Menu Select" encoder to select the option you want to change. Then use the "Menu Choose" button to enter the selection.

3.1   OSC LOAD XTAL allows the user to select the load capacitance of the crystal. Press "Menu Choose" to enter this item. Use the "Menu Select" encoder to select the value proper for your radio. On the BITeensio card, the crystal has a load capacitance of 10pF but others may have different values. If your oscillator crystal has a load capacitance value other than the 3 (6, 8 or 10pF) provided values, use the one closest to an available selection. To save your selection depress "Menu Choose" button.

3.2   CALIBRATE allows the user to calibrate the accuracy of the radio. Each item in the "Calibrate" selection will prompt you with the correct action needed for that step.

3.3   VOLTS DISPLAY allows the user to turn the voltage monitor display on or off. The proper hardware must be installed for this to work on the RadI2Cino card but is built in on the newer BITeensio. To save your selection press the "Menu Choose" button.

3.4   CALIBRATE VOLTMETER allows the user to change a constant that is used to calculate the displayed voltage. Use the "Menu Select" encoder to adjust the bottom displayed voltage to match the supply voltage that you are using to power

the radio. Then press the "Menu Choose" button to save this value. The voltage displayed should now reflect the voltage applied to the radio.

3.5   AUDIO DSP allows the user to turn on or off the usage of DSP Audio Filtering. The appropriate hardware must be installed.   Use the "Menu Select" encoder to select the value proper for your radio. To save you selection press the "Menu Choose" button.

3.6   S-METER DISPLAY allows the user to turn on or off the S-meter display. The appropriate hardware must be installed.   Use the "Menu Select" encoder to select the value proper for your radio. To save your selection press the "Menu Choose" button.

3.7   CAT BAUD RATE allows user to select baud rate for serial connection to external control software. The radio must be power cycled to have new baud rate take effect. Use the "Menu select" encoder to pick the baud rate you want. Depress the "Menu Choose" button to save the selection and turn the radio off then back on to complete the save. The serial port defaults to 8 bits, no parity, and one stop bit.

3.8   BACKUP EEPROM DATA allows the user to save current values in EEPROM into microSD. This allows the user to initialize a new microSD. Once selected the data will be automatically move to microSD. Success or failure is presented to the user. To exit press "Menu Choose" button.

3.9   SET TIME allows the user to set the real-time clock in the Teensy 3.6 MPU. (The CR2032 coin cell "Backup" battery needs to be installed to keep the clock running when power is removed from the radio, otherwise you will have to set the time every time you use it.) When selected, this item uses the "Menu Select" encoder to step through the available choices. The first is "Select Month". Use the encoder to select the current month and press the "Menu Choose" button to save it and move to "Select Day". Use the encoder to set and the "Menu Chose" button to save it. The same procedure is used to step through and select the year, hour, and minute. Once you have all the selections properly selected, press the "Menu

Chose" button again to set the clock and exit the CONFIGURATION menu If you accidentally enter the Set Time menu and don't need to set the time, simply press the "Menu Select" button again and you will return to the radio's operational mode with the date and time unchanged.

Credits:

This document and subsequent versions will be available in the W0EB/W2CTX uBITX Files section of the http://www.w0eb.com website.

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