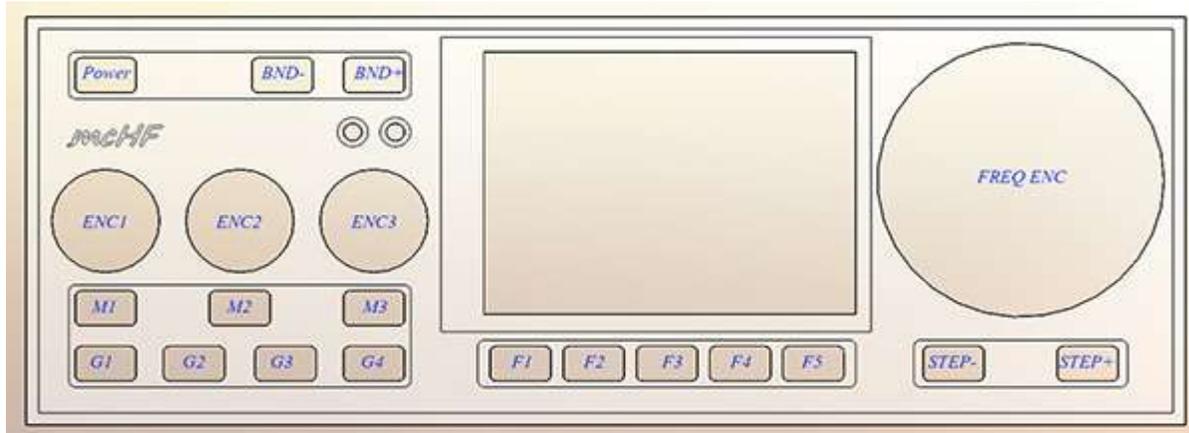


Using the mcHF transceiver – brief overview:

For f/w Ver. 0.0.219.26



Front panel controls of the mcHF transceiver

NOTE:

If you are unfamiliar with the mcHF, please refer to the section: “**Before you get on the air - Initial set-up of the mcHF transceiver**” in the “Operator's Manual”.

To turn on the transceiver, press the **POWER** button briefly and the display should light up, go through its attribution and boot-up screen and display the frequency and spectrum scope *or* waterfall display.

Receive:

- Adjust volume using the **ENC1** control.
- Tune the frequency using **FREQ ENC** knob. Select the step size using the **STEP-** and **STEP+** buttons.
 - Pressing-and-holding the **STEP-** or **STEP+** button will *temporarily* decrease/increase the step size while tuning, the step size display changing colour while this is in effect.
 - Pressing-and-holding both the **STEP-** and **STEP+** buttons at the same time will enable/disable the “Frequency Lock” mode. The main frequency display will turn grey when “Frequency Lock” is enabled. *The RIT is still enabled when the frequency is locked.*
- Change the band using the **BND-** and **BND+** buttons.
- Press-and-hold the **BND-** and **BND+** buttons simultaneously for >2 seconds to toggle between Spectrum Scope and waterfall display modes
- Change the mode (*USB, LSB, CW, etc.*) using button **G1**.
- Button **G4** selects the receiver bandwidth. In FM transmit, pressing-and-holding will generate a tone burst.
- Pressing button **G2** will select the mode of DSP noise reduction - *Not available in FM mode.*
 - **Pressing and holding** button **G2** will turn DSP off, saving the current settings while pressing and holding again will restore the last-used mode. The available DSP modes are:
 - **NR** = Noise reduction only
 - **NOTCH** = Automatic notch (tone) filter only
 - **NR+NOT** = Both Noise reduction *and* Automatic notch filter.
- If **RIT** is desired, use **ENC3** to shift the receive frequency: The *small* frequency display will show **actual** receive frequency display when **RIT** is set to non-zero, but the large display will show the **transmit** frequency.

Important note: It is *strongly* recommended that “Frequency Translation” (*menu item “RX/TX Freq Xlate”*) be activated for best receiver performance – *see the complete manual for more information on this setting.*

Transmit:

Set the receive frequency and mode, setting the desired output power using button **G3**. *Note that it is recommended that for voice modes that “full” power not be used unless you have carefully configured for clean, linear output power.*

Initial SSB transmit audio set-up:

- Connect the mcHF transceiver to a 50 ohm dummy load capable of handling at least 10 watts. Alternatively, you may tune to a **clear** frequency while connected to an antenna with a **known-good** 50 ohm match.
- Use button **G1** to select LSB or USB mode as desired.
- Press button **F2** to select the **AUDio** meter.
- For testing, press button **G3** to select the 0.5 watt setting: The power setting does not matter for this configuration.
- Connect the microphone to connector **J3**: This is the one just above the speaker connector on the right side of the UI board, below and to the right of the **FREQ ENC** control. The mcHF is typically used with an electret-type microphone element and power for the microphone element is supplied by the radio.
- Press button **M3** to switch from **RIT** to **MIC**. If the box to the right-hand side of **RIT** shows “**LIN**” which indicates that line-input mode is active, press-and-hold button **M3** to change it to **MIC**. Press button **M3** as necessary to highlight **MIC** on the display: This allows the adjustment of the microphone gain.
- Now, key the radio using the Push-to-Talk (PTT) button on the microphone: The spectrum display should freeze.
- **Speak normally** into the microphone. You should see the indicator on the **AUDio** meter bounce upwards. While speaking, adjust the **ENC3**, which adjust the **MIC** parameter, so that the **AUDio** meter indication peaks up to +4 or so (*in the red*) on peaks. Occasional, higher, higher peaks are permissible, but avoid settings that cause full-scale indications which could imply distortion.
- Release the PTT button and press button **F2** to select the **ALC** meter.
- Press button **M1** to highlight the **CMP** on the display: This will allow the adjustment of the compression level of the speech processor.
- Press the PTT button and speak normally again. You should see the **ALC** meter indicate upwards on voice peaks occasionally: If it does not, increase the **MIC**rophone gain slightly.
- Adjusting **CMP** to a higher value will increase the aggressiveness of the speech processor: A value of **2** is a nice, modest value and a value of **12**, while very “punchy” and can be used to maximize “talk power” will likely sound very “processed” and may be unpleasant for normal, casual QSOs. *The value of “SV” will allow the selection of custom settings – see the full manual for additional information.*
- Once you have configured the settings to your satisfaction, press-and-hold button **F1** to store them in memory.

Comment:

AM transmission operates the same way as SSB, but **frequency translation mode must be activated.**

Remember also that the unmodulated carrier in AM will be $\frac{1}{4}$ that of the PEP power in SSB! Because of this the power setting in AM is automatically limited to a maximum of 2 watts.

What to do if you notice that the ALC or AUDio meters jump when you key your microphone:

In a quiet room with an antenna or dummy load connected to the mcHF, set the **METER** mode to **ALC** and key the microphone/transmitter without talking and note if **ALC** meter jumps at the instant that you key the transmitter and goes down again. Next, switch the **METER** mode to **AUD** and key the microphone/transmitter again, watching the **AUDio** meter.

If you notice that either meter jumps upwards when you key the transmitter and drops down again your keying the transmitter may be causing either an electronic “click” or mechanical “clunk”, “de-sensing” the transmitter's ALC. This can be caused by the the powering-up of the electret element in the microphone when the radio is keyed and/or by the (noisy!) mechanical action of the switch – but the result can be the same in either case: A temporary “desense” when you start talking and/or an annoying sound heard by the station receiving you!

To minimize this adjust menu item “**TX Mute Delay**” which will keep the microphone audio muted for a short period after keying up. The parameters are adjustable from 0 (off) to 25, which keeps the audio muted for a full 250 milliseconds (one-quarter of a second) after the microphone is keyed.

It is recommended that one finds the minimum value to reliably suppress the appearance of the microphone key-up noise and then increase it by 50%.

If this does not work, it may be that your microphone is taking too long to “power up”. In this case disconnect the end of R8 that connects to U1 and, instead, connect it to the 3.3 volt supply at C10-C13.

Using the mcHF with computer “Sound Card” modes via the Line-Input and Line-Output connections:

The mcHF may be connected to a computer, tablet or smart phone via audio cables and the PTT line on the Microphone cable to allow modes such as SSTV, PSK31, WSPR or other digital “Sound Card” mode. To do this, configure the transceiver as follows:

- Using button **G1**, select **USB** mode: All digital modes are operated using USB, *regardless of band*. In this way the audio frequency of the digital signal may be added to the frequency display to calculate the *actual* transmit/receive frequency.
- Set **RIT** to zero using **ENC3**: Press button **M3** as necessary to highlight **RIT** to allow adjustment. When using a digital mode the RIT *MUST* be disabled or else you will have difficulty making contacts!
- Set **CMP** to zero using **ENC1**: Press button **M1** as necessary to highlight **CMP** to allow adjustment. When using a digital mode, the audio compressor must be set to *MINIMUM* or else it may degrade the digital signal!
- Before connecting the external device (*Computer, tablet, phone*) set the audio output level to mid-scale. Also set the audio input gain to approximately mid-scale as well.
- For receive, one may use any of the available receive audio filters, but it is recommended that the 10 kHz filter *not* be used! If narrow (300Hz, 500Hz or 1.8 kHz) filters are used, one may shift the center frequency of that filter in the menu to suit the passband for that mode, but be aware that it is possible to run *too narrow* a filter for some of the “wider” digital modes! In the vast majority of cases the 2.3kHz filter will be adequate.

Connect the Line-Input jack (J2) of the mcHF to the audio output of the device you are using to generate the audio and connect the Line-Output jack (J1) of the mcHF to the audio input of that same device.

To key the transceiver, you will need also to connect a cable the Microphone jack (*J3 on the UI board*) *or* the Key jack (*J2 on the RF board*) and the PTT/Key line on either of those jacks (*the “ring”*) would be grounded to key the transceiver: Typical rig-computer interfaces will easily accommodate this connection.

- Preferably, connect the mcHF transceiver to a 50 ohm dummy load capable of handling at least 10 watts. Alternatively, you may tune to a clear frequency while connected to an antenna with a *known-good* 50 ohm match.
- Using button **M3**, select **LIN** mode. You may need to press-and-hold this button to change from **MIC** to **LIN**. Press button **M3** as necessary to highlight **LIN**.
- Using button **F2** select the **AUD**io meter.
- Using button **G3** set the mcHF to 0.5 watts for this setup.

- Using the program running on the external device, key the computer using the selected mode. If the program has a “test” mode, use it for this.
- Adjust the **LIN** setting via **ENC3** for a reading on the **AUDio** meter of +2 to +4.
- **Make sure that you have set “CMP” to 0 as noted above!**
- Un-key the transceiver.
- Make a note of the settings that you have used for future reference.
- Find a signal on the bands representative of the mode and adjust the audio input level of the external device for approximately “mid-scale”. **The Line Output level on the mcHF on this version of firmware is fixed.**
- It should be noted the the **LINE OUT** jack will contain the *transmit* audio. This is an artifact of the hardware configuration.
- Once you have configured the settings to your satisfaction, press-and-hold button **F1** to store them in memory.

TUNE mode:

The **TUNE** button may be used to send an unmodulated (CW) carrier for brief testing, such as checking the RF power output or the VSWR/matching. The **TUNE** function is also used for initial adjustment of various parameters (*TX Gain, Phase*) as described elsewhere in detail.

The operation of the **TUNE** mode is very simple:

- Press the **TUNE** button: The mcHF transmits and the indicator turns red.
- Press the **TUNE** button again: The mcHF stops transmitting and the indicator turns white.
- Pressing-and-holding the **TUNE** button will disable/enable transmit: The on-screen “**TUNE**” indicator will turn grey when transmit is disabled. *This is the same function as the “Transmit Disable” menu item.*

Comments about the TUNE mode:

- When set to CW mode, when **TUNE** is activated the mcHF will produce a carrier *above* the dial frequency by the amount of the setting of the “**CW Side/Off Freq**” (e.g. sidetone frequency).
- When set to SSB mode, when **TUNE** is activated the mcHF will produce a carrier that is offset from the dial frequency by 750 Hz – the same as the audible sidetone. This carrier will be below the dial frequency in LSB mode and above it in USB mode.
 - **Note:** There will be no tone in SSB-TUNE mode when frequency translation is active.
- Pressing-and-holding the **TUNE** button will toggle the **TRANSMIT DISABLE** function. If this mode is on, the **TUNE** indicator will turn grey and all transmit capabilities of the mcHF will be disabled. *This is the same as the parameter “Transmit Disable” in the configuration menu.*
- **TUNE** mode does not function in **AM** mode.

Additional information:

- Refer to the main manual for additional information about the “**Freq. Calibrate**” menu item which is used to calibrate the frequency display of the radio so that it reads accurately!

Configuration of the mcHF for CW operation:

- Connect a key or paddle to jack **J2** on the RF board: This is the connector next to the DC power input.

For connecting a paddle for Iambic keying:

- The **TIP** of the connector is **DIT**.
- The **RING** of the connector is **DAH**.

For connecting a straight key, mechanical semi-automatic key (e.g. a “bug”) or an external keyer/computer:

- The **RING** of the connector keys the transmitter.

Note that the DAH/Straight Key connection is the same as the “PTT” line on the Microphone connector.

Now, press the **MENU** button (**F1**) and use the **NEXT** and **PREV** buttons (**F4** and **F3**, respectively) to navigate to the screen containing the menu item “**CW Keyer Mode**”, noting the setting to the right of it. The three possible settings are:

- **IAM_A** – Iambic mode “A”. Using paddles, alternate dots and dashes are sent with both paddles are depressed, stopping with the last dot or dash that was sent while the appropriate paddle was depressed.
- **IAM_B** – Iambic mode “B”. The same as mode “A” except that keying continues by sending one more element – a dot if the paddles were released during a dash and vice-versa.
- **STR_K** – Straight Key. This would be used for a straight key, a “bug” or external keyer/computer.

Additional items on this menu (you may need to scroll to another screen using **ENC2**) include:

- **CW Paddle Reverse** – This reverses the DIT and DAH positions of the paddle, affecting **ONLY** the IAMBIC modes when using the built-in keyer and has no effect when using a straight key.
- **CW TX->RX Delay** – This sets the delay, after the last CW element, before the transceiver returns to receive mode.
- **CW Side/Off Freq** – This sets the offset frequency and sidetone in CW operation, adjustable in 10 Hz steps.
 - **Important Note:** If the sidetone frequency is adjusted, the center frequencies of the narrow (300 Hz and 500 Hz) filters should be adjusted to keep the frequencies within the filter passband!
- **CW TX/RX Offset** – This selects whether USB or LSB is used for CW reception or if LSB is automatically selected below 10 MHz. This also selects whether the displayed frequency is that of the transmit frequency *or* that of the signal being received and whether a frequency shift occurs when switching between SSB and CW mode: *See the main manual for more information!*
- The parameters **CW Keyer Speed** and **CW Sidetone Gain** are also adjustable from the main display. (“WPM” and “STG”, respectively)

To configure for CW operation:

- Press button **G1** to select the CW mode.
- Press button **G4** to select the desired receive audio bandwidth.
- Press button **G3** to set the power to 0.5 watts: The power has little effect on this adjustment.
- Press button **M3** to highlight the **WPM** parameter: Use **ENC3** to set the desired sending speed in words-per-minute. *This parameter has no effect if set to straight-key mode.*
- Press button **M1** to highlight the **STG** parameter: **ENC1** is used to adjust this parameter.
- Press the paddle/key to cause the mcHF to transmit: Use **ENC1** to adjust the volume of the sidetone. *Note that the volume control (“AFG”) setting has no effect on the level of the sidetone.*
- *Once you have configured the settings to your satisfaction, press-and-hold button **F1** to store them in memory.*

Miscellaneous notes and tips:

- The DSP “NR” (Noise Reduction) mode may be used to advantage when in CW mode, but note that the DSP “NOTCH” mode is always disabled because it would “kill” CW signals!
- The sidetone frequency is always *exactly* that of the amount of transmit offset from the dial frequency.

Whether or not the transmit frequency is offset from the displayed frequency or not depends on the “**CW TX/RX Offset**” menu parameter.

- If the parameter “**CW Side/Off Freq**” is changed - which changes the sidetone/offset frequency - remember to change the the center frequencies of the 300Hz and 500Hz filters so that the center of your receive filter passband will match your transmit frequency. If you do not do this a station that returns to you *on your frequency* may do so outside the passband of your receive filter!
- There is a slight interaction between the power setting, the perceived loudness of the sidetone gain and the sidetone gain setting. This is a known issue, but it has not been a cause of complaints.
- Pressing-and-holding button **G3** when in CW, LSB or USB mode will generate a tone that is equal in frequency to the CW sidetone and transmit-receive offset. This may be used to “spot” the frequency so that you can transmit on the same frequency as the station with which you are communicating. The loudness of this tone may be adjusted using the “Adjustment Menu” option “**Beep Volume**”.

For a more thorough explanation of the many features of the mcHF transceiver – particularly the items in the menu – refer to the “mcHF Operators Manual” that is found on the mcHF Yahoo Group in the KA7OEI folder of the FILES section.

In this same folder you will also find:

- **Release notes for the various software versions**
- “**mcHF_board_modifications**” files with the recommended hardware modifications!
- **Binary files**
- **Source code**

Notes and tips about AM operation:

- AM transmit is possible only if Frequency Translate is active. If Frequency Translate is off, AM receive is possible only if the signal is slightly “off-tuned” to avoid the “zero Hertz” hole: There are no such restrictions when Frequency Translate is on.
- Output power is automatically limited to the “2 watt” setting when in AM mode.
- When using a “wide” filter, some DSP functions may be disabled.
- Remember that AM is a continuous-carrier mode: Your final transistor heat-sinking and power supply must be able to dissipate the power!

Notes and tips about FM operation:

- FM is disabled by default: You must enable it in the “Configuration” menu.
- FM transmit or receive is possible only if Frequency Translate is active.
- When in FM mode all DSP functions are disabled.
- When in FM mode the “**RFG**” control changes to “**SQL**” (squelch).
- Remember that FM is a continuous-carrier mode: Your final transistor heat-sinking and power supply must be able to dissipate the power! *It is recommended that power be reduced to the minimum required for communications.*
- If it is enabled, pressing-and-holding button **G4** during FM transmit will cause a tone burst to be sent.
- The “FM” indicator will turn white when the squelch is open. If tone decode is enabled, the “FM” indicator will turn red, unless the squelch is still closed (e.g. signal noisy, squelch too “tight”, etc.)

mcHF Key function matrix

Button(s)	Brief press	Press-and-hold >1 second
Power	Change display brightness	Power on and power off/save settings to memory
M1	Select AFG and CMP or STG	
M2	Select RFG and DSP or NB	Switch between DSP and NB
M3	Select RIT and MIC or LIN	Switch between MIC or LIN
G1	Change operational mode	Change operational mode - including disabled mode(s)
G2	Change DSP mode	Enable/Disable DSP without changing mode
G3	Change transmit power level	Generate CW Sidetone reference (CW/LSB/USB modes only)
G4	Change receive bandwidth (except in FM mode)	Change receive bandwidth – including disabled bandwidth(s) Generate tone burst (FM TX only)
BAND-	Change to different band	
BAND+	Change to different band	
STEP-	Change step size	Temporarily change to smaller tuning step size
STEP+	Change step size	Temporarily change to larger tuning step size
STEP- & STEP+		Lock/Unlock tuning knob
POWER & BAND-		Toggle display backlight auto-off
BAND- & BAND+		Toggle Spectrum Scope and Waterfall modes

Main operational (receive/transmit) mode:

F1	Enter MENU mode	Save settings to memory
F2	Change meter mode	
F3	Toggle SPLIT mode on/off	
F4	Toggle VFO A/B	Copy active VFO to inactive VFO (A=B or B=A)
F5	Toggle TUNE mode	Enable/Disable transmit toggle

Menu mode:

F1	Exit MENU mode	Save settings to memory
F2	Set selected menu item to default	
F3	Move to previous menu screen	Move to beginning of current menu
F4	Move to next menu screen	Move to end of current menu
F5	Toggle TUNE mode	Enable/Disable transmit toggle

- Pressing-and-holding **F1**, **F3** and **F5** simultaneously while powering up the radio will cause defaults to be loaded. The user must either disconnect power to retain the old settings *or* press-and-hold the **POWER** button to overwrite them with defaults. **All configurations, adjustments, frequencies and mode settings will be lost!**
- Pressing-and-holding a button (*other than POWER*) while powering up the radio will cause it to enter a “button test” mode. If multiple keys are pressed, only the name of the button with the highest precedence will be displayed. In decreasing order, the precedence is: M2, G3, G2, BNDM, G4, M3, STEPM, STEPP, M1, M3, F1, F2, F4, BNDP, F5, G1 and **POWER**
- The “**Band-**” and “**Band+**” and the “**Step-**” and “**Step+**” functions may be swapped using menu selections.