

Operating the FX-4CR Transceiver on macOS

A Complete Blueprint: Hardware Quirks, WSJT-X Configuration, Audio Calibration, RF Power Monitoring, and Active Cooling for FT8

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Abstract

This technical document provides an exhaustive, step-by-step blueprint for operating the **FX-4CR QRP HF Transceiver** on **macOS (Apple Silicon M-series)** for digital modes (FT8 via WSJT-X). It integrates all physical hardware quirks (USB-C negotiation bug, Bluetooth disabling), driver architecture details, terminal serial port mapping, complete WSJT-X software settings (**v3.0.1 c04dd8**), resolution of the HamLib Protocol Error, precise RX/TX audio gain calibration (using macOS **Audio MIDI Setup**), real-time RF power monitoring with a **NISSEI DG-503 MAX** wattmeter, and practical thermal management methods (ice-cooling technique) for continuous operation. Additionally, the configuration procedures, audio calibrations, and CAT control principles detailed in this document are equally applicable across the entire family of WSJT-X derivative software, including WSJT-X Improved, JTDX, and other related digital mode applications.

1 Introduction

The FX-4CR is a highly compact, feature-packed portable QRP SDR transceiver. While macOS natively handles its USB audio codec and CDC-ACM serial interface, successful operation requires understanding specific hardware quirks and exact software configurations in WSJT-X to prevent CAT communication errors and ensure clean, calibrated RF transmissions.

2 Hardware Prerequisites & Cable Requirements

2.1 Important: USB Cable Selection & Hardware Bug

Before attempting any software setup, select the appropriate cable interface.

Hardware Bug: USB-C to USB-C Negotiation Failure

The FX-4CR hardware contains a known negotiation bug on its USB-C port. The transceiver **WILL NOT communicate** or enumerate when connected directly using a **USB-C to USB-C** cable.

To connect the FX-4CR to a Mac:

- **Required Cable Type:** You must use a **USB-C to USB-A** cable (plugging the USB-C side into the radio and the USB-A side into a standard USB hub or USB-A to USB-C adapter connected to your Mac).

- **Data-Capable Cable:** Verify that the cable is a dedicated **Data Cable** and not a power-only charging cable.



(a) USB-C to USB-A Data Cable

(b) USB-C to USB-A Mac Adapter

Figure 1: *Required cabling setup: FX-4CR connected via USB-C to USB-A Data Cable into a Mac USB-C adapter. (necessary for Apple Silicon Macs lacking native USB-A ports)*

2.2 Disabling Internal Bluetooth (Mandatory Setting)

A critical prerequisite for digital mode operation with the FX-4CR is disabling its built-in Bluetooth controller. Leaving Bluetooth active causes internal serial routing conflicts and port enumeration errors.

1. Turn on the FX-4CR transceiver.
2. Press the **MENU** button on the front panel.
3. Scroll through menu options to locate **Bluetooth**.
4. Change the Bluetooth setting value from 1 (On) to 0 (Off).
5. Exit the menu to save settings.

Why is this step required?

If Bluetooth remains set to 1, internal serial routing conflicts occur, leading to persistent connection failures and configuration timeouts in WSJT-X.

3 macOS Driver Architecture & Device Verification

3.1 Debunking the CM108AH Driver Myth

The FX-4CR utilizes the **C-Media CM108AH** USB audio chipset. A frequent point of confusion among operators migrating from Windows is attempting to find dedicated macOS drivers.



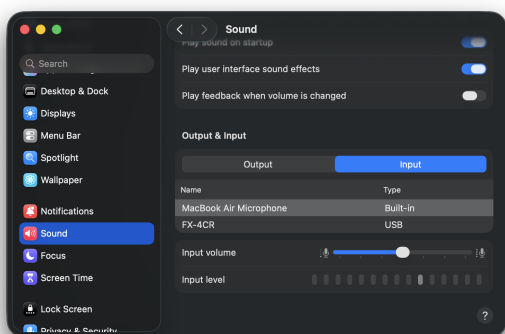
Figure 2: FX-4CR display showing the Bluetooth menu parameter set to 0.

macOS natively supports USB Audio Class 1.0/2.0 specifications. The CM108AH chipset is **USB Audio Class Compliant**; therefore, no external kernel extensions or drivers are required.

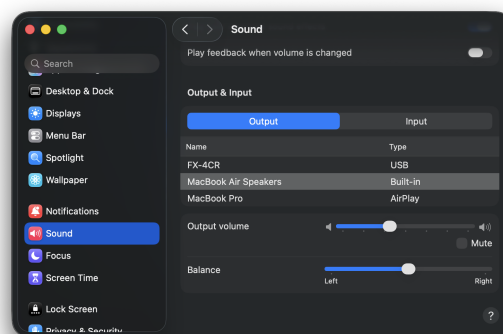
3.2 Verifying System Recognition

With the correct cable connected and Bluetooth turned off:

1. Go to **System Settings** → **Sound**.
2. Under both **Input** and **Output** tabs, confirm the presence of USB Audio Device (or FX-4CR).



(a) Sound Input Tab



(b) Sound Output Tab

Figure 3: macOS System Settings → Sound section displaying the recognized USB Audio Device under both Input and Output tabs.

4 Serial Port Mapping for CAT Control

To identify the exact serial device node created by macOS for CAT control:

Open **Terminal** and execute:

```
ls -al /dev/tty.*
```

Note down the resulting node path (e.g., /dev/tty.usbserial-11140 or /dev/tty.usbmodem111206).

```
crw-rw-rw-  1 root  wheel  0x9000002 Jul 25 19:20 /dev/tty.Bluetooth-Incoming-Port
crw-rw-rw-  1 root  wheel  0x9000000 Jul 25 19:20 /dev/tty.debug-console
crw-rw-rw-  1 root  wheel  0x9000006 Jul 30 14:13 /dev/tty.usbmodem111206
crw-rw-rw-  1 root  wheel  0x9000004 Jul 30 14:13 /dev/tty.usbserial-11140
```

Figure 4: macOS Terminal displaying active USB serial device nodes.

5 WSJT-X Environment & Exact Software Configuration

To reproduce all error testing and verify a fully functional environment, **WSJT-X version v3.0.1 c04dd8** was deployed.

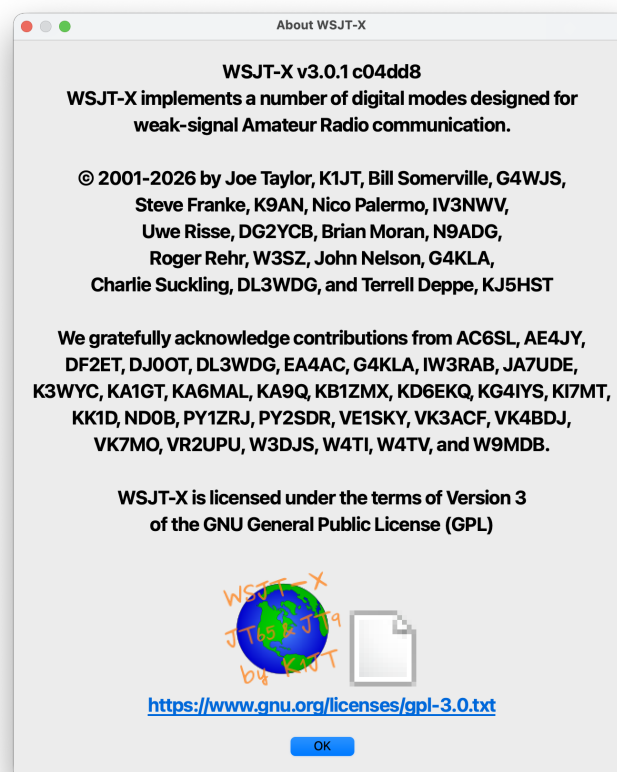


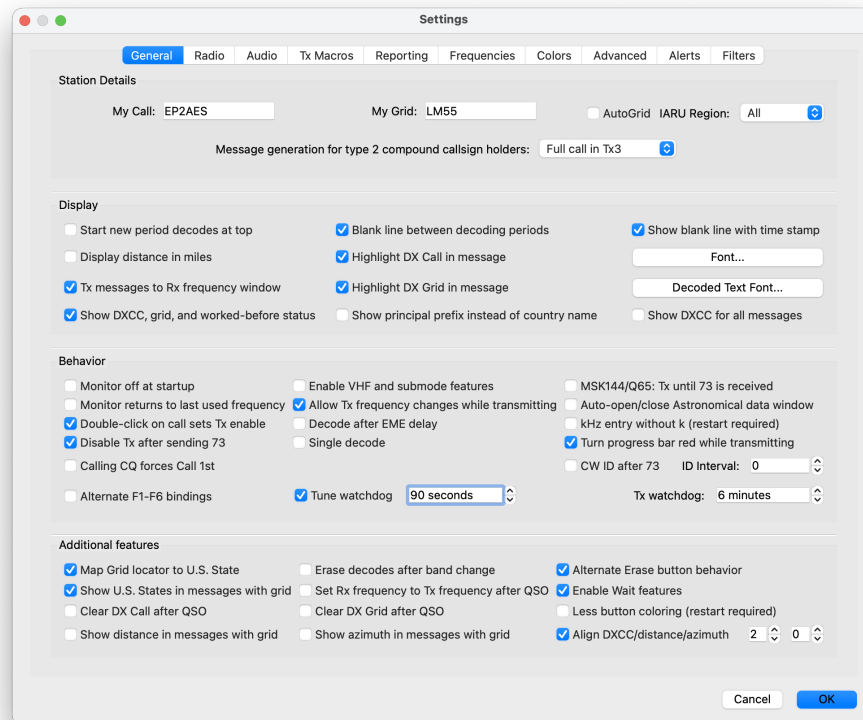
Figure 5: About WSJT-X window confirming version v3.0.1 c04dd8.

Software Compatibility Note

While this guide specifically demonstrates setup using standard WSJT-X, the core configuration procedures, audio gain calibrations, and CAT control settings are equally applicable to the entire family of derivative software packages, including **WSJT-X Improved**, **JTDX**, and other related digital mode suites.

5.1 Settings – General Tab

The **General** tab configures station callsign (EP2AES), grid locator (LM55), and core UI behaviors.

Figure 6: *WSJT-X Settings – General Tab.*

5.2 Settings – Radio Tab & Protocol Error Resolution

When configuring CAT control under **Settings** → **Radio**, selecting Data/Pkt mode triggers a critical Hamlib Protocol Error (-8):

Hamlib Protocol Error Output Log

```
Hamlib error: read_string_generic(): RX 4 characters, direct=1
0000 4d 44 32 3b MD2;
kenwood_transaction: read_string len=4 'MD2;'
kenwood_transaction: No data expected, checking ID; in MD2;
kenwood_transaction: wrong reply MD for command verification ID
kenwood.c(724):kenwood_transaction returning -8 Protocol error
rig_set_mode: targetable retcode after set_mode(PKTUSB)=-8
```

The Fix & Exact Configuration:

- **Rig:** Set to Kenwood TS-590S (Or Kenwood TS-480).
- **Serial Port:** Select your macOS serial node (/dev/cu.usbserial-11140).
- **Baud Rate:** 115200.
- **Transmit Audio Source:** Front/Mic.
- **Mode:** Select USB (Do NOT select Data/Pkt).
- **Split Operation:** Select Fake It.

- Click **Test CAT**; the indicator button will illuminate **Green**.

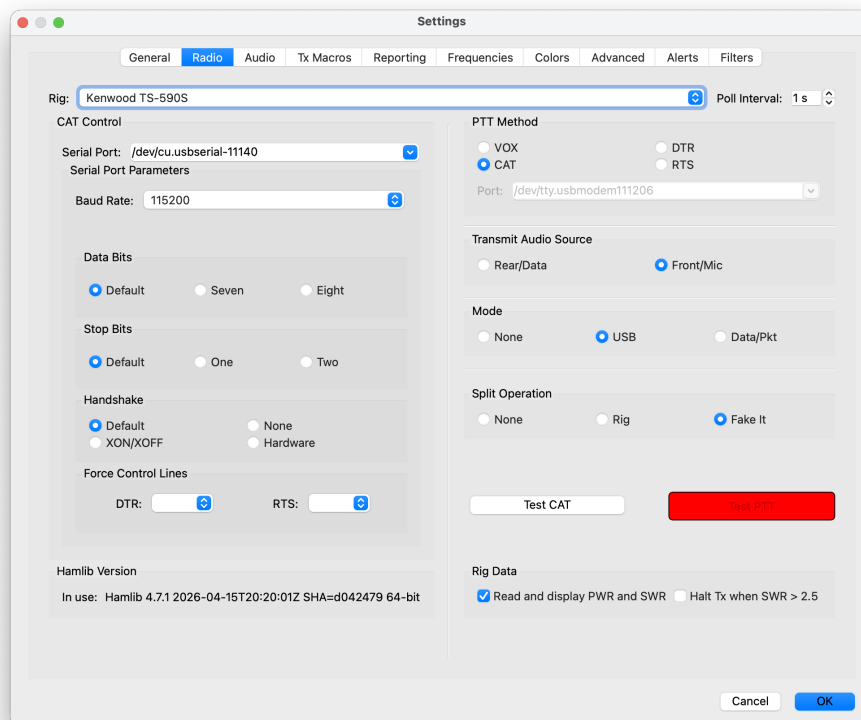


Figure 7: WSJT-X Settings – Radio Tab configured for FX-4CR.

5.3 Settings – Audio Tab

In the **Audio** tab, map both Input and Output soundcards to the internal FX-4CR codec (FX-4CR).

6 Audio Gain Calibration & ALC Control

Proper audio calibration is required for clean reception and distortion-free transmission.

6.1 RX Audio Level Adjustment (FX-4CR Volume Knob)

Adjust the physical volume knob on the **FX-4CR transceiver** to a setting between 18 and 24. This maintains the input signal level on the left-side vertical bar of WSJT-X within the optimal green range ($\approx 30\text{--}50\text{ dB}$).

6.2 TX Audio Level & ALC Calibration (Audio MIDI Setup)

To calibrate transmitter audio and prevent Automatic Level Control (ALC) clipping:

1. Launch **Audio MIDI Setup** on macOS (/Applications/Utilities/).
2. Select USB Audio Device / FX-4CR from the list of left devices.

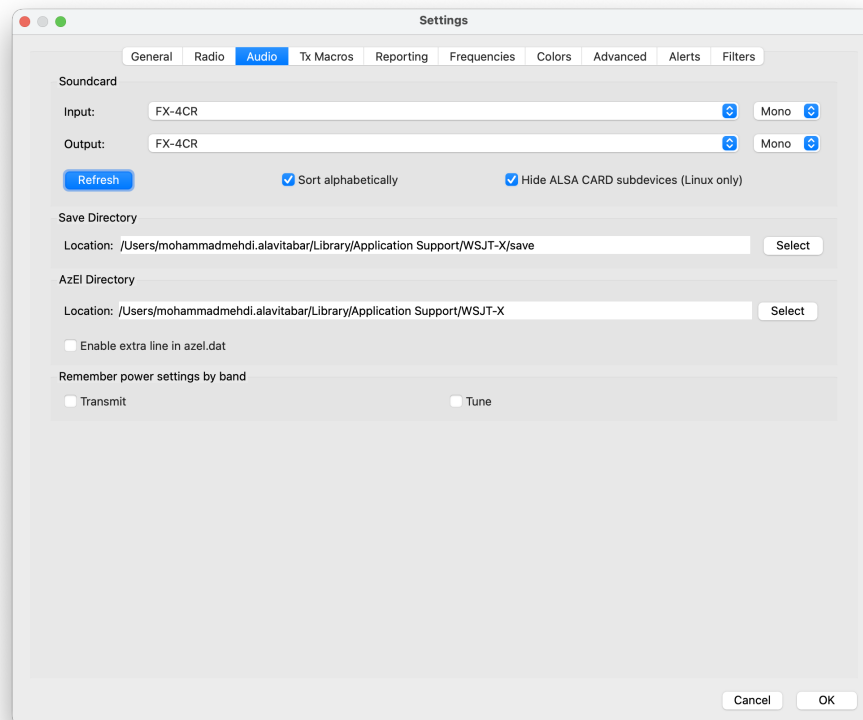


Figure 8: *WSJT-X Settings – Audio Tab mapped to FX-4CR soundcard.*



Figure 9: *FX-4CR volume knob set between 18–24 maintaining green input levels in WSJT-X.*

3. Open the **Output** tab.
4. Set the slider / numerical volume value between 450 and 650.
5. Observe the FX-4CR display during transmission to ensure that the ALC remains at zero or minimal levels.

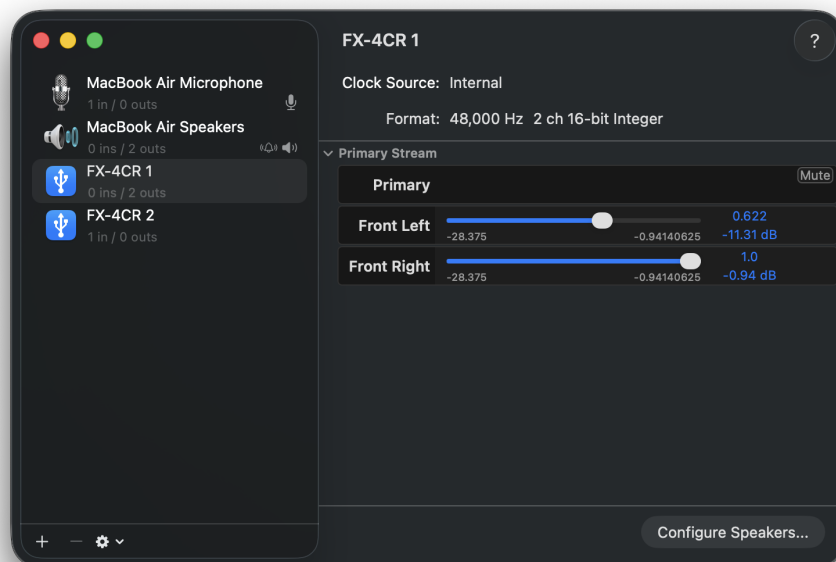


Figure 10: macOS Audio MIDI Setup utility showing output volume set between 450 and 600.

7 RF Power Output & Real-Time Monitoring

7.1 Power Settings & QRP Operating Considerations

The power level on the FX-4CR transceiver was configured to **10 W**, representing the maximum digital mode limit for this radio.

QRP Operating Note

The FX-4CR is fundamentally a **QRP (Low Power) transceiver**. If higher output power is required for difficult propagation paths, an appropriate external **Power Amplifier (PA)** must be added to the antenna chain.

7.2 Real-time Output Measurement with NISSEI Wattmeter

To accurately monitor the actual RF power delivered to the antenna load, a **NISSEI DG-503 MAX** digital SWR/Wattmeter was connected inline.

- **Observed Output Power:** Measured consistently between **6.5 W** and **7.0 W**.
- **WSJT-X Pwr Slider Interaction:** Output power is directly regulated by the P_{WR} slider on the right sidebar of the WSJT-X main window. Adjusting this slider allows fine power level adjustments.



Figure 11: RF Power monitoring setup using NISSEI DG-503 MAX Wattmeter and WSJT-X main window Pwr slider.

8 Thermal Management & Active Cooling Method

Due to the compact enclosure of the FX-4CR, high duty-cycle digital transmissions such as FT8 can generate significant heat, causing internal fans to spin up at high speed and potentially triggering thermal throttling.

8.1 Practical Passive/Active Ice Cooling Setup

To keep the transceiver operating quietly, efficiently, and completely responsive during extended digital mode sessions:

- **Preparation:** Prepare an ice pack or ice cubes wrapped securely inside a fully sealed, leak-proof freezer plastic bag (or alternatively, a dry ice pack wrapped in protective plastic).
- **Placement:** Place the sealed cooling bag directly underneath the bottom chassis of the FX-4CR transceiver.
- **Operational Impact:** Within a few seconds of placement, the internal heat dissipates rapidly into the cooling pad. The internal cooling fan immediately quiets down, and the transceiver operates smoothly, quietly, and stays fully responsive to all WSJT-X commands.

Condensation Warning

Ensure the plastic freezer bag is 100% leak-proof to avoid water ingress. Wipe any condensation from the exterior chassis periodically.

9 Conclusion

By adhering to correct hardware connections (USB-C to USB-A data cable), disabling Bluetooth, matching WSJT-X v3.0.1 settings (Kenwood TS-590S, USB Mode, Fake It), calibrating

RX volume (18–24) and TX Audio MIDI Setup (450–650), monitoring RF output via a NIS-SEI wattmeter, and utilizing an ice-pack cooling setup, the FX-4CR functions reliably for FT8 communications on macOS.

Feedback & Corrections

If you have any suggestions, corrections, or additional tips to improve this document, please send an email to EP2AES@asis.sh. Your feedback is highly appreciated!

73 and good DX!

