

Operating the FX-4CR Transceiver on macOS

A Practical Blueprint: WSJT-X and FX-Utility, CAT, Audio Calibration, and Safe FT8 Operation on macOS

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Abstract

This guide covers operating the FX-4CR for FT8 on Apple Silicon Macs with both WSJT-X and FX-Utility. It retains the tested USB, Bluetooth, serial-port, CAT, and audio-calibration procedures from version 2.2, and adds a practical introduction to FX-Utility’s integrated FT8/FT4 receive, transmit, waterfall, and logging workflow. It also records a field session of about 56 completed contacts over eight hours. Hardware, firmware, antenna, propagation, and power-amplifier behavior vary; use measured RF output and the equipment manuals when setting transmit levels.

Revision History & Acknowledgment

Version 3.0 – October 28, 2026 Added FX-Utility digital-mode workflow, feature overview, field notes, and macOS screenshots. Retained the version 2.2 WSJT-X and hardware setup guidance.

Version 2.2 – August 21, 2026 Replaced the legacy terminal screenshot with a corrected, date-stamped macOS Terminal image showing the recommended `/dev/cu.*` call-out device paths throughout.

Version 2.1 – August 21, 2026 Added the confirmed FX-4CR firmware version, replaced the legacy Radio-tab screenshot with the corrected **Mode: None** configuration, and restored the “I Love FT8” closing graphic.

Version 2.0 – October 28, 2026 Corrected serial-port discovery to use `/dev/cu.*`; added the recommendation to disable transmit-frequency changes while transmitting; changed the recommended WSJT-X radio mode from **USB** to **None**; replaced the near-zero-ALC target with an output-power calibration procedure; and documented firmware-dependent behavior.

Version 1.0 Initial public release.

Acknowledgment

Special thanks to Keith for his exceptionally detailed and practical feedback. His careful observations directly motivated the corrections in Version 3.0 and should make this guide clearer and more reliable for other FX-4CR operators.

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.



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

3 macOS Driver Architecture & Device Verification

3.1 Debunking the CM108AH Driver Myth

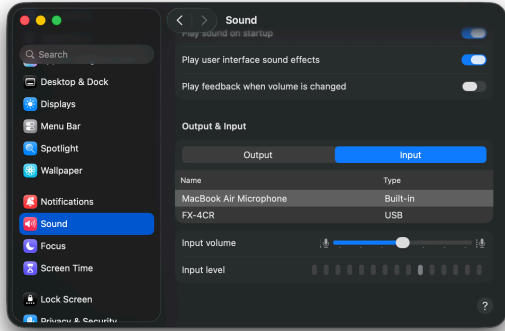
The FX-4CR utilizes the C-Media CM108AH USB audio chipset. A frequent point of confusion among operators migrating from Windows is attempting to find dedicated macOS drivers.

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.

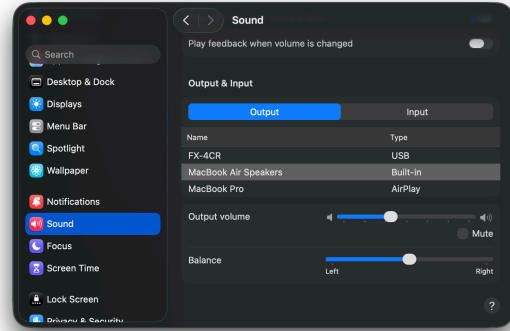
3.2 Verifying System Recognition

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/cu.*
```

Note down the resulting call-out device path (for example, `/dev/cu.usbserial-11140` or `/dev/cu.usbmodem111206`) and use that same path in WSJT-X.

Why use `/dev/cu.*` on macOS?

macOS normally exposes both `tty` and `cu` nodes for a serial interface. For an application such as WSJT-X that initiates the CAT connection, the `cu` (call-out) device is the appropriate and less confusing choice. The earlier Version 1 command listed `/dev/tty.*` even though its WSJT-X example used a `/dev/cu.*` path; Version 2 corrects that inconsistency.

```
crw-rw-rw-  1 root  wheel  0x9000002 Aug 21 19:20 /dev/cu.Bluetooth-Incoming-Port
crw-rw-rw-  1 root  wheel  0x9000000 Aug 21 19:20 /dev/cu.debug-console
crw-rw-rw-  1 root  wheel  0x9000006 Aug 21 14:13 /dev/cu.usbmodem111206
crw-rw-rw-  1 root  wheel  0x9000004 Aug 21 14:13 /dev/cu.usbserial-11140
```

Figure 4: macOS Terminal displaying call-out serial device nodes under `/dev/cu.*`, updated August 21, 2026.

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.

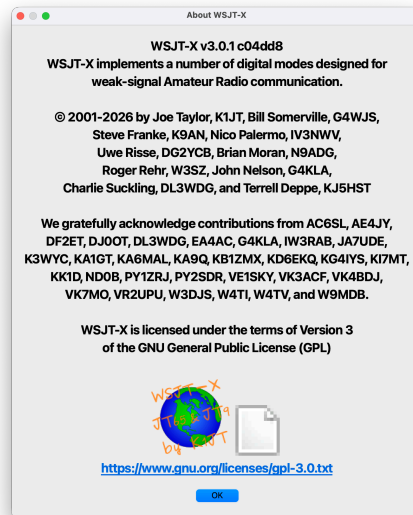


Figure 5: About WSJT-X window confirming version v3.0.1 c04dd8.

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. For reliable **Fake It** split operation, clear (uncheck) Allow Tx frequency changes while transmitting. On some systems, CAT frequency-change requests issued during transmission may be lost, after which the radio may not return to the intended frequency.

Version 2 Correction

The retained Version 1 screenshot below shows Allow Tx frequency changes while transmitting selected. In Version 2, this option should be unselected. Follow the written instruction rather than the old checkbox state in the screenshot.

5.2 Settings – Radio Tab & Protocol Error Resolution

When configuring CAT control under Settings → Radio, selecting **Data/Pkt** mode may trigger a critical **Hamlib Protocol Error (-8)**. Selecting **USB** can also cause some FX-4CR units to cycle among **USB-U**, **USB-L**, and their data variants because the radio may interpret Hamlib mode commands differently than expected. Therefore, Version 2 recommends **None**, allowing the operator to set and retain the appropriate USB mode on the radio itself.

The settings shown below were verified with firmware FX-4CR firmware 1.8.5 (released May 24, 2026).

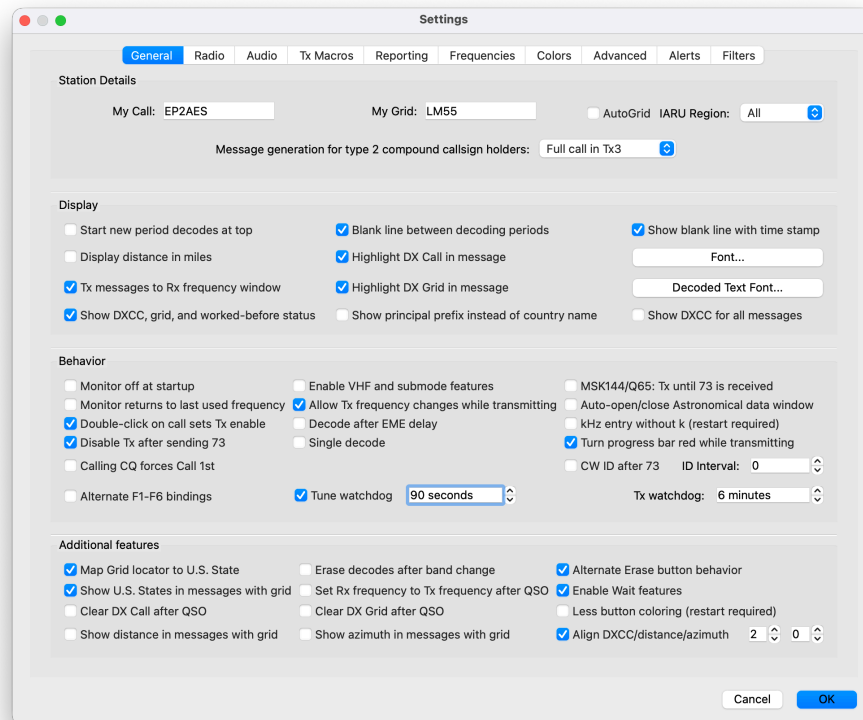


Figure 6: WSJT-X Settings – General Tab (legacy Version 1 screenshot retained to locate the option; in Version 2, clear “Allow Tx frequency changes while transmitting”).

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 **None**. Do not use USB or Data/Pkt unless testing confirms that your specific firmware handles those mode commands correctly.
- Split Operation: Select **Fake It**.
- Click Test CAT; the indicator button will illuminate Green.

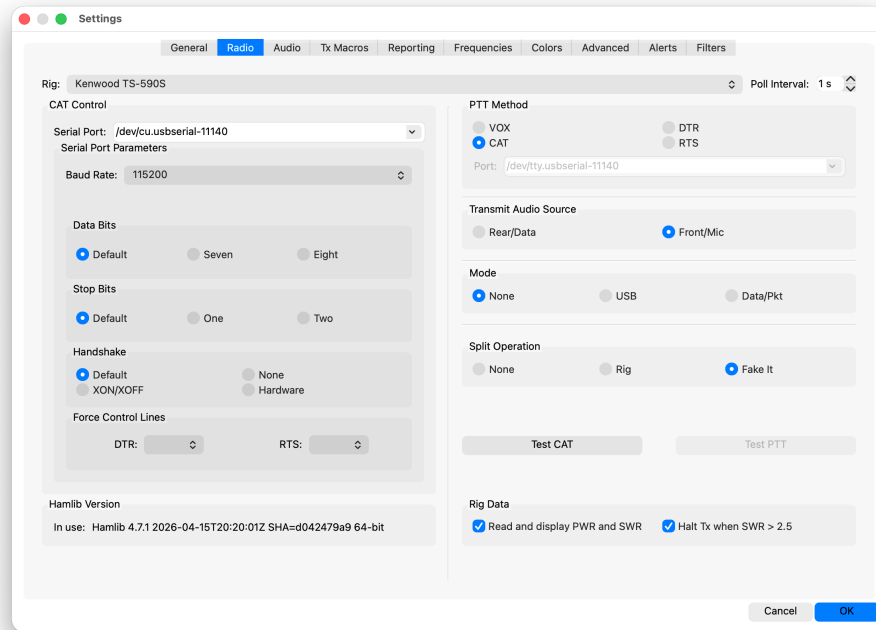


Figure 7: Corrected WSJT-X Settings – Radio Tab for FX-4CR, showing Mode None, Split Operation Fake It, CAT PTT, and the macOS `/dev/cu.*` serial node.

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)

There is no single universal macOS output value or ALC reading that is correct for every FX-4CR. Hardware and firmware revisions may behave differently. ALC does not necessarily need to remain at zero: field testing reported by Keith found that an ALC indication up to approximately 35 could be necessary to obtain an expected output of roughly 7–9 W, whereas near-zero ALC produced only 0–2 W on his unit. The original test unit produced approximately 6.5–7.0 W with the settings shown in this guide.

To calibrate transmitter audio using measured RF output rather than a fixed slider number:

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

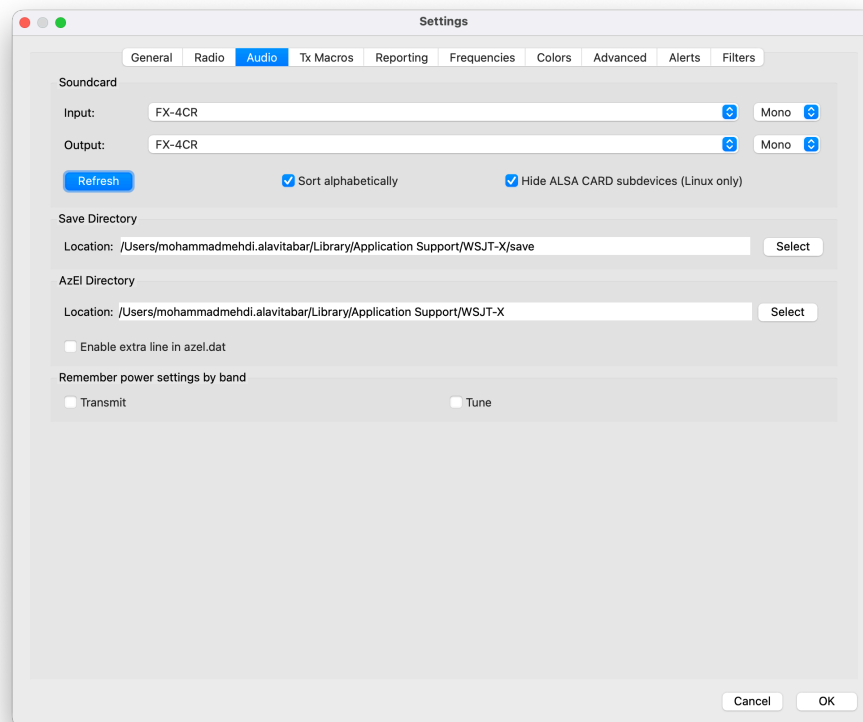


Figure 8: WSJT-X Settings – Audio Tab mapped to FX-4CR soundcard.



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

3. Open the Output tab.
4. Connect the radio to a suitable matched antenna system or dummy load through an inline wattmeter, and begin with a low output level.
5. Use the WSJT-X Tune function and increase the macOS output volume gradually while watching both RF output power and the FX-4CR ALC indication.
6. Continue until increasing the audio level no longer produces a meaningful increase in RF power, then reduce the audio output slightly.
7. Confirm that the transmitted signal remains clean and that neither the radio nor the audio path is being overdriven. Treat an ALC indication around 35 only as a reported reference point, not a universal target.

Starting Point - Not a Fixed Requirement

The approximately 0.45--0.65 normalized output range (displayed as values such as 0.622 in Audio MIDI Setup) can be used as an initial reference. Final calibration must be based on measured RF output and signal quality because units and firmware versions can differ.

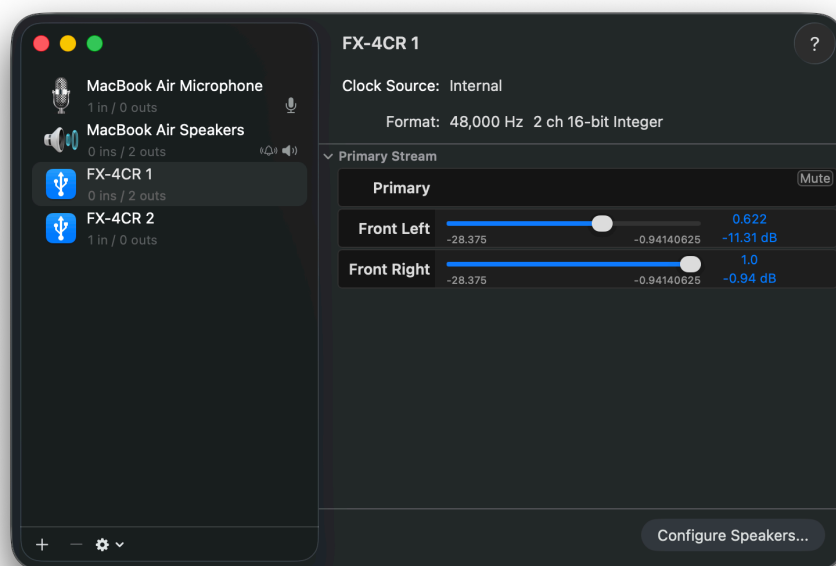


Figure 10: macOS Audio MIDI Setup utility showing an example output value of 0.622. Use this only as a starting point and complete calibration with an RF wattmeter.

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 on the original test unit: Measured consistently between 6.5 W and 7.0 W.
- Field report from Keith: Approximately 7–9 W with ALC up to about 35; near-zero ALC could produce only 0–2 W on his unit.
- WSJT-X Pwr Slider Interaction: Output power is directly regulated by the **Pwr** slider on the right sidebar of the WSJT-X main window. Adjusting this slider allows fine power level adjustments.

Firmware and Unit Variation

The test radio used the latest firmware available for this document: FX-4CR firmware 1.8.5 (released May 24, 2026). The exact release-package identifier is:

`FX-4CR_R_Latest_Firmware_1.8.5_(2026-05-24)`

Because behavior can vary among firmware versions and hardware revisions, record your radio's firmware version before testing and re-verify CAT mode handling, ALC behavior, and RF output after any firmware update.



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 FX-Utility: An Integrated macOS Option

WSJT-X remains a capable, well-established choice. FX-Utility grew from a different idea: for this compact radio, I wanted a focused macOS tool with radio control, live digital audio, and the operating log close together. The application is designed around the FX radio family and includes additional station, CAT, receive, firmware, and logbook workspaces.

9.1 What the digital workspace does

The Audio & FT8 workspace brings together the radio's USB audio input, CAT serial connection, and FT8/FT4 decoder. The main view includes a live audio waterfall, a UTC cycle indicator, decoded-station and transmitted-message tables, band and dial-frequency controls, selectable transmit tones, and controls for directed calls and CQ. A completed exchange can be saved to the local logbook and exported as ADIF. Optional settings include digital-call alerts and automatic replies; automatic transmit can key the radio, so enable it only when you intend to run unattended automation and keep the Stop TX control in view.

The receive-only view can show a live audio spectrum and group decodes by 15-second FT8 cycles. The waterfall represents the radio's audio passband, not an RF panadapter. Select the correct Mac audio input, start receive, then choose the radio's CAT serial port before relying on application-controlled tuning.

Completed contacts are kept in the Logbook, where they can be edited, searched, imported from or exported to ADIF, and queued for supported logbook services. Service uploads require the operator's own account credentials and may need configuration before use.

9.2 A field session and the engineering lessons

After roughly two months of development, the first complete digital-mode session ran for about eight hours and produced approximately 56 successful contacts. That result is a report from one station and one session, not a promise of a particular contact rate; propagation, antenna, band conditions, audio levels, and the other station all matter.

Getting from a working receive screen to reliable two-way QSOs took careful work in several areas:

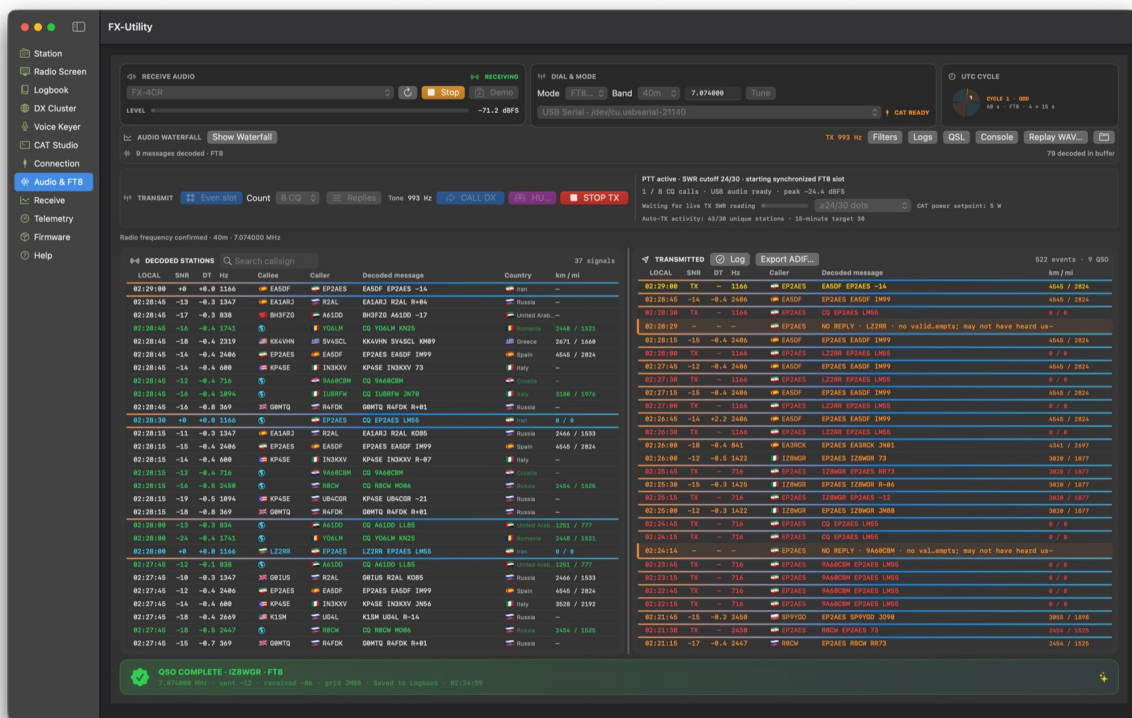


Figure 12: FX-Utility Audio & FT8 workspace during an operating session. The receive and transmit tables, CAT status, band, and active FT8 exchange are visible together.

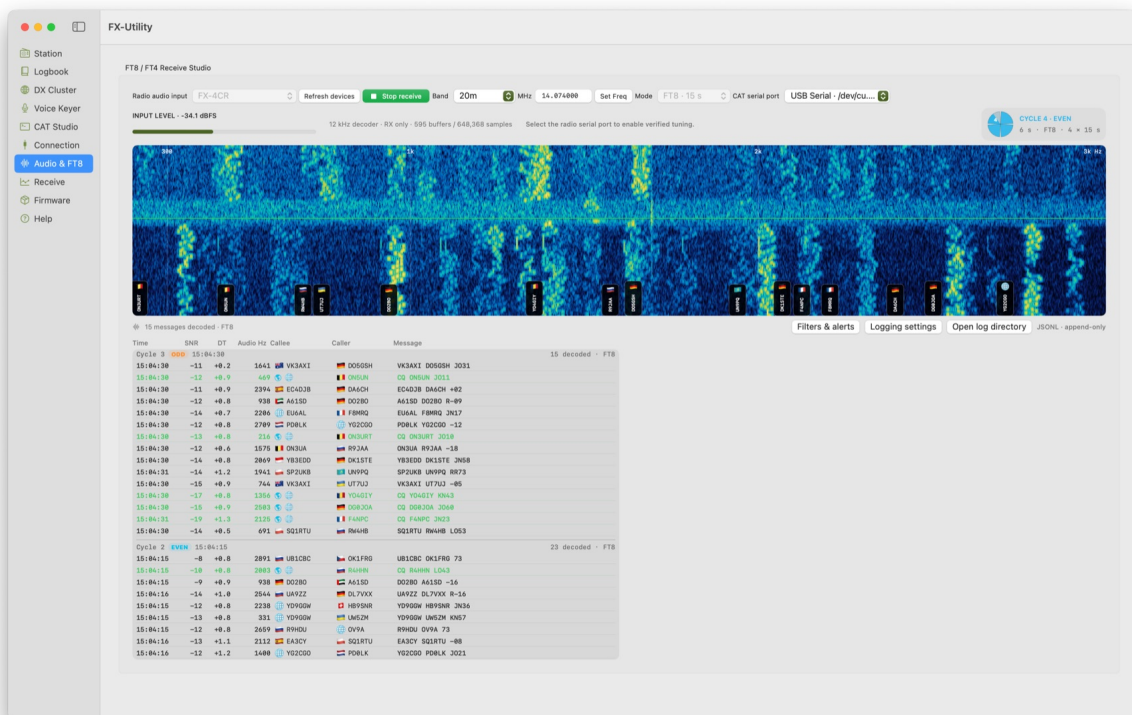


Figure 13: Receive Studio with the live audio waterfall and decoded FT8 traffic.

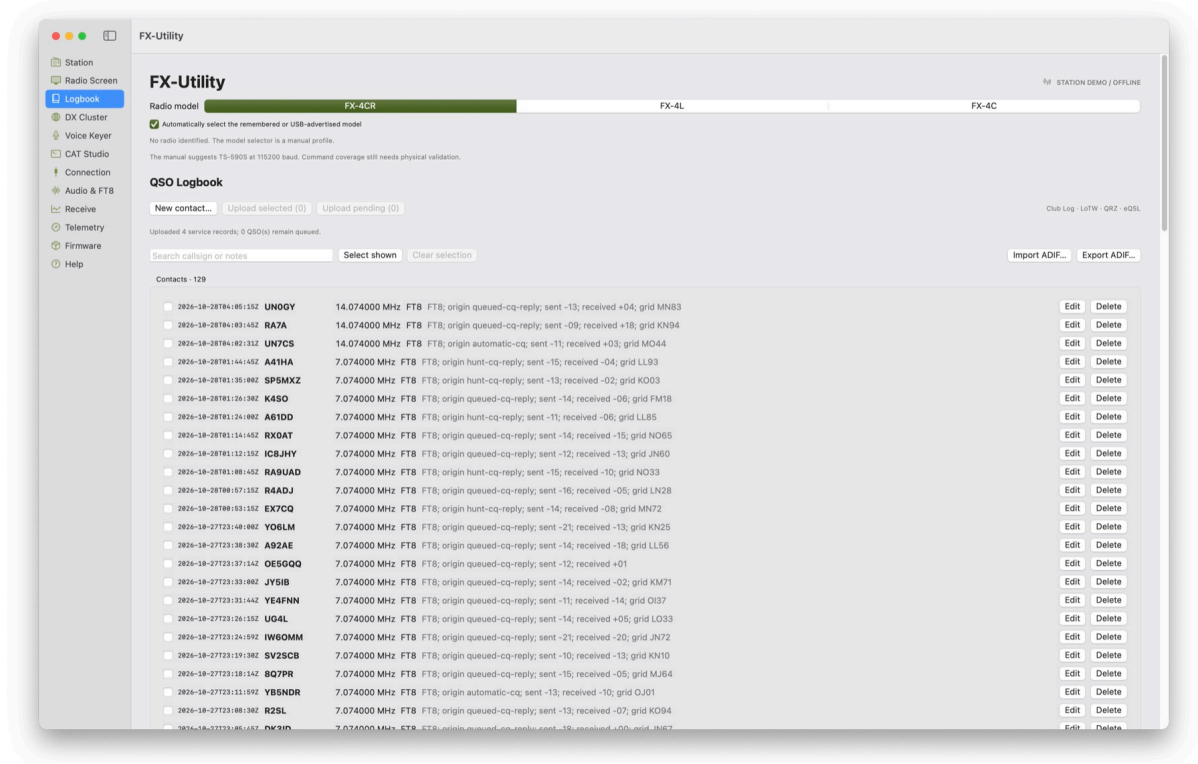


Figure 14: FX-Utility Logbook listing completed digital contacts and their signal reports.

- Audio and timing are separate paths. The Mac must receive clean USB audio while the radio's CAT port handles frequency and mode control. FT8 decoding and transmission must follow UTC cycle boundaries; a strong waterfall alone does not prove that audio is routed or timed correctly.
- CAT responses can be slower than expected. During development, a power readback used a 250 ms timeout, shorter than the 1.5 s timeout used by other CAT queries. A valid low-power setting could then appear unavailable and block transmit. Matching the query timeout fixed the false failure while keeping the transmit power check in place.
- Audio drive must be calibrated at the RF output. macOS output volume is not a wattmeter. Start at low drive, use a suitable antenna or dummy load and an inline RF wattmeter, and increase carefully while checking the radio's ALC and signal quality. Do not assume a numeric audio slider value is safe on every radio.
- An amplifier adds a control connection and a second power stage. In this station the Xiegu GPA100 was used with a separate PTT control lead from the FX-4CR. Confirm the particular radio and amplifier manuals, control-jack pinout, input-power limit, antenna match, and cabling before transmitting. A cable that physically fits does not by itself prove that its PTT wiring is correct.

The FX-4CR is a QRP radio and the GPA100 can produce much higher RF power. Respect the amplifier's maximum drive specification, tune into a suitable matched load, and verify output with an RF wattmeter. Start conservatively, monitor temperature and SWR, and never treat the software's CAT power setpoint as a measurement of actual RF output.

9.3 Try it and send field notes

FX-Utility is an evolving project. If you operate an FX-4CR on macOS, I would love to hear what works on your radio, which edge cases you encounter, and what should be improved. Please include macOS version, radio firmware, audio device, CAT port type, band, and a short CAT or application log when reporting a reproducible issue. The repository and access instructions are linked from the accompanying blog post; check its current availability before downloading.

10 Conclusion

With the tested USB and CAT setup, careful audio calibration, verified transmit-frequency behavior, and suitable RF monitoring, the FX-4CR can be used for FT8 on macOS. WSJT-X remains a familiar general-purpose option; FX-Utility offers an integrated workflow for operators who prefer a focused tool for this family of radios. Start with low drive, confirm the control wiring and RF path, and make changes one at a time.

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!

