Revision-3

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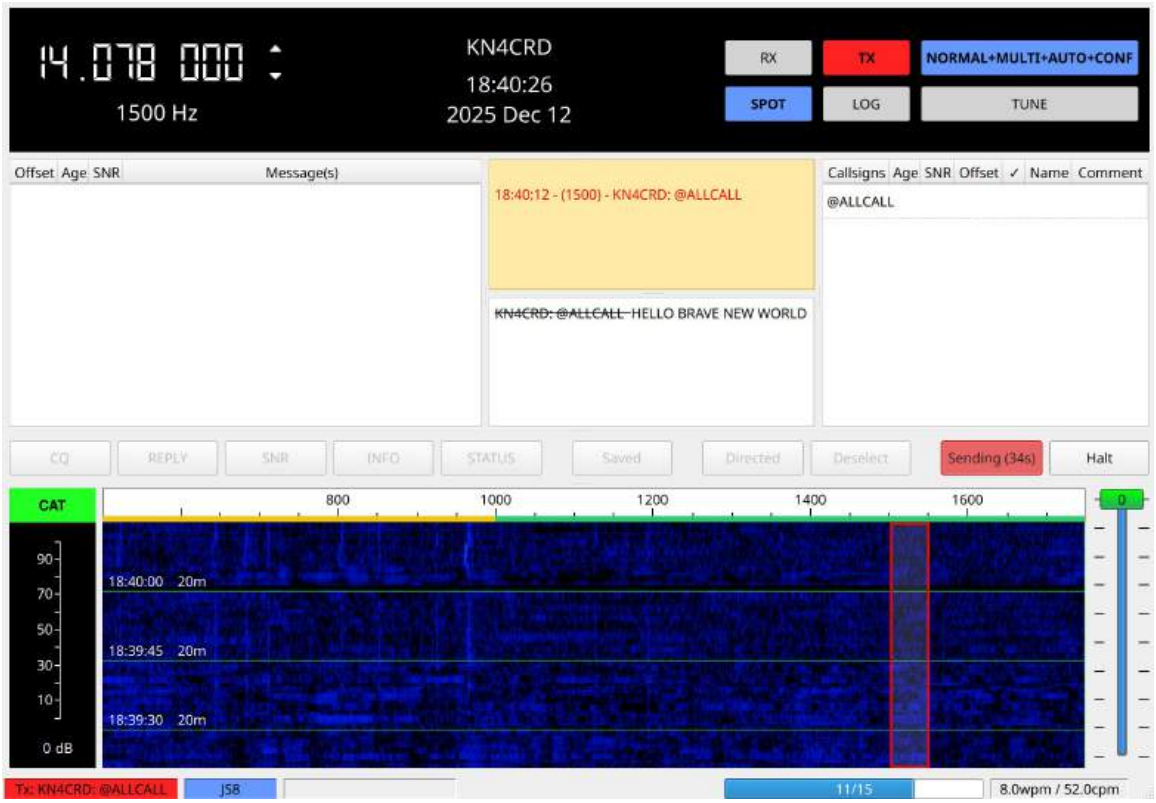
1 Motivation

Separated across town by eleven miles, KJ5MTI and W5AWS wanted a way to communicate wirelessly and without recourse to any civil infrastructure like the Internet, public-switched telephone network, or VHF/UHF radio repeaters.

We also wanted a way to communicate asynchronously, which limited us to JS8Call that has a store-and-forward mode of operation. JS8Call is a software application that is cross-platform compatible with any popular Operating System. Below JS8-Call, the hardware transmission layer can be any radio designed for amateur radio operator use.

Our intention with this document is to combine and reformat the operational parts of the official user guide with what we learned by doing and getting JS8Call to run on our computers and communicate with other stations. We removed dead links and included data stored elsewhere to guard against link-rot.

Objective overall is to make getting started with JS8Call as easy as possible for new and inexperienced operators.



2 Document Applicability

We validated this document against JS8Call v2.2.1-devel, used by both KJ5MTI and W5AWS.

Latest released version is v2.3.1, installation of which should happen after first removing v2.2.1. There shouldn't be any material differences in operation of the two versions that affect the contents of this document.

3 Background

JS8Call is an experiment in combining the robustness of FT8—a weak-signal mode by K1JT—with a messaging and network protocol layer for weak signal communication. Jordan Sherer, KN4CRD, designed JS8CAll as open source software for connecting amateur radio operators who are operating under weak signal conditions; it offers real-time keyboard-to-keyboard messaging, stored inbox-messaging, message relay, and automatic station announcements. JS8Call is heavily inspired by WSJT-X, Fldigi, and FSQCall and would not exist without the hard work and dedication of the many developers in the amateur radio community.[1]

4 Project Documents

See below for the project documentation.

- Project website: https://js8call.com/.
- Official repository: https://github.com/js8call/js8call.
- Development: https://github.com/JS8Call-improved/JS8Call-improved
- Downloads:
  - Official—https://github.com/js8call/js8call/releases
  - Improved—https://github.com/JS8Call-improved/JS8Call-improved/releases/tag/release%2F2.4.0
- Discussion group: https://groups.io/g/js8call
- Official user guide:

  https://docs.google.com/document/d/159S4wqMUVdMA7qBgaSWmU-iDl4C9wd4CuWnetN68O9U/edit?tab=t.0

5 Field Operations

We conducted our operations using computer systems running GNU Linux Mint and Fedora Ultramarine. In this guide, we assume the reader has JS8Call installed and working.

5.1 KJ5MTI Station

KJ5MTI has his station computer connected to a QMX+ via a USB serial interface that transfers audio, CAT commands, and status of the transceiver.

Antenna for the QMX+ is an EFHW under the second story eaves of the house.

5.2 W5AWS Station

W5AWS has a QMX+ but couldn't get it to work reliably despite extensive tests and adjustments. Eventually, he reverted to using a (tr)uSDX[2] connected to a Dell Inspiron Chromebook with re-flashed firmware running Fedora Ultramarine Linux.

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1 https://docs.google.com/document/d/159S4wqMUVdMA7qBgaSWmU-iDl4C9wd4CuWnetN68O9U/edit?tab=t.0

2 https://dl2man.de/ home of the (tr)uSDX transceiver.

Antenna for the (tr)uSDX is a Hustler RM40S resonator mounted on a 22-inch MO4 mobile mast mag-mounted to a 15.5- × 22.5-inch carbon steel baking tray from Target, connected the (tr)uSDX through an LDG RU-1:1 Unun.

Audio between the radio and the computer passes through a UGREEN USB 2.0 external stereo sound adapter, part number 30724.

A second USB cable provides connection for CAT commands to the (tr)uSDX and status reporting to the station computer.

6 JS8Call Guide

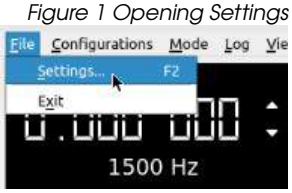
6.1 Initial Configuration

On first start of the JS8Call software, it will present you with a configuration Wizard for you to complete some critical information.

6.1.1 Settings

Go to the `Settings` menu item either by pressing the F2 key or by selecting menu item `File` and then the sub-item `Settings`, as shown in Figure 1.

Figure 1 Opening Settings



The Setting pop-up window contains a tabbed array of settings to optimize JS8Call for your operations, as shown in Figure 2.

6.1.1.1 General Tab

Figure 2: Settings, General, Station

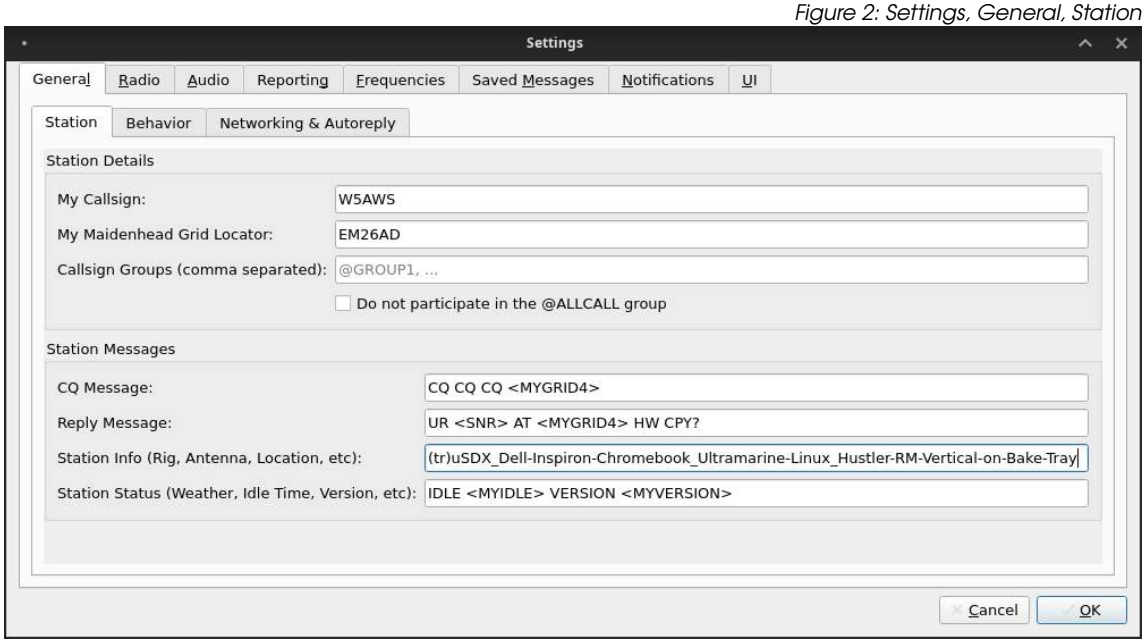


Figure 3: Settings, General, Behavior

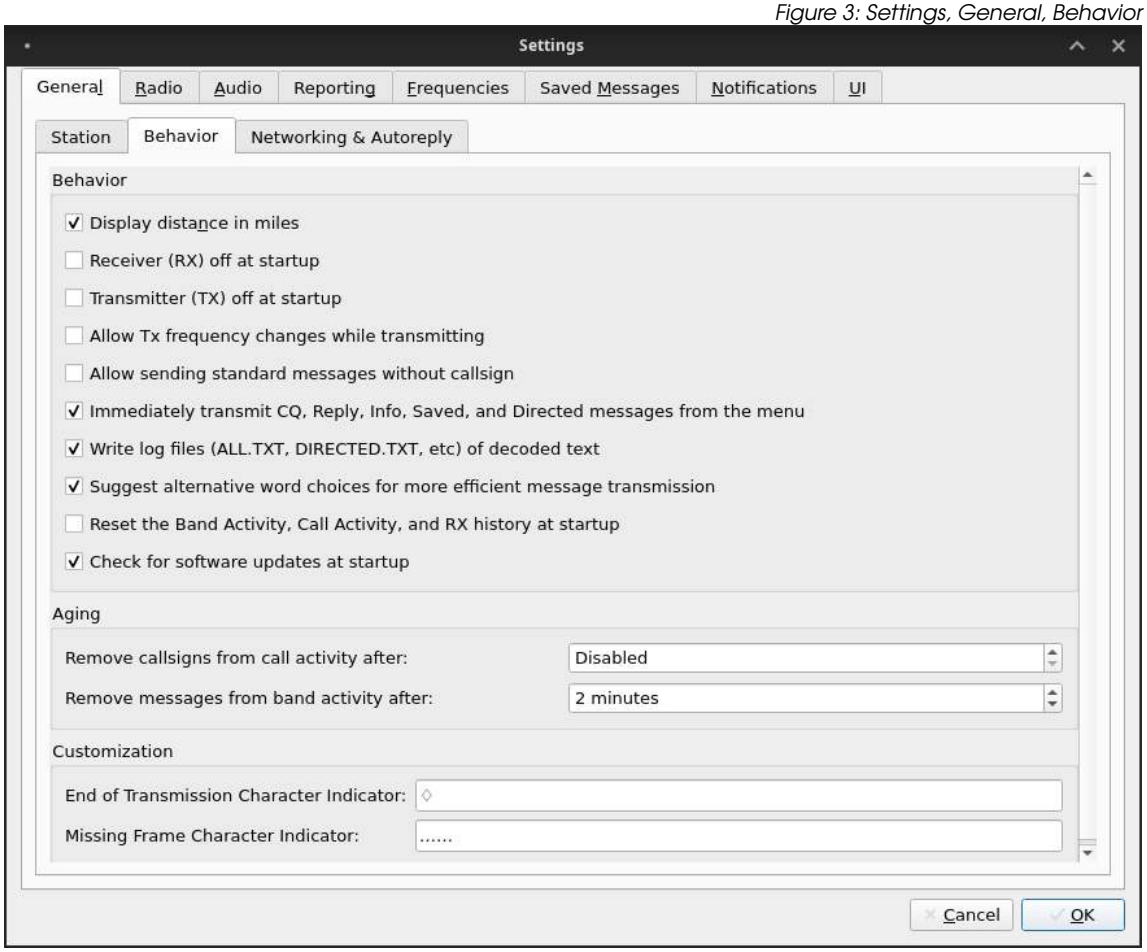
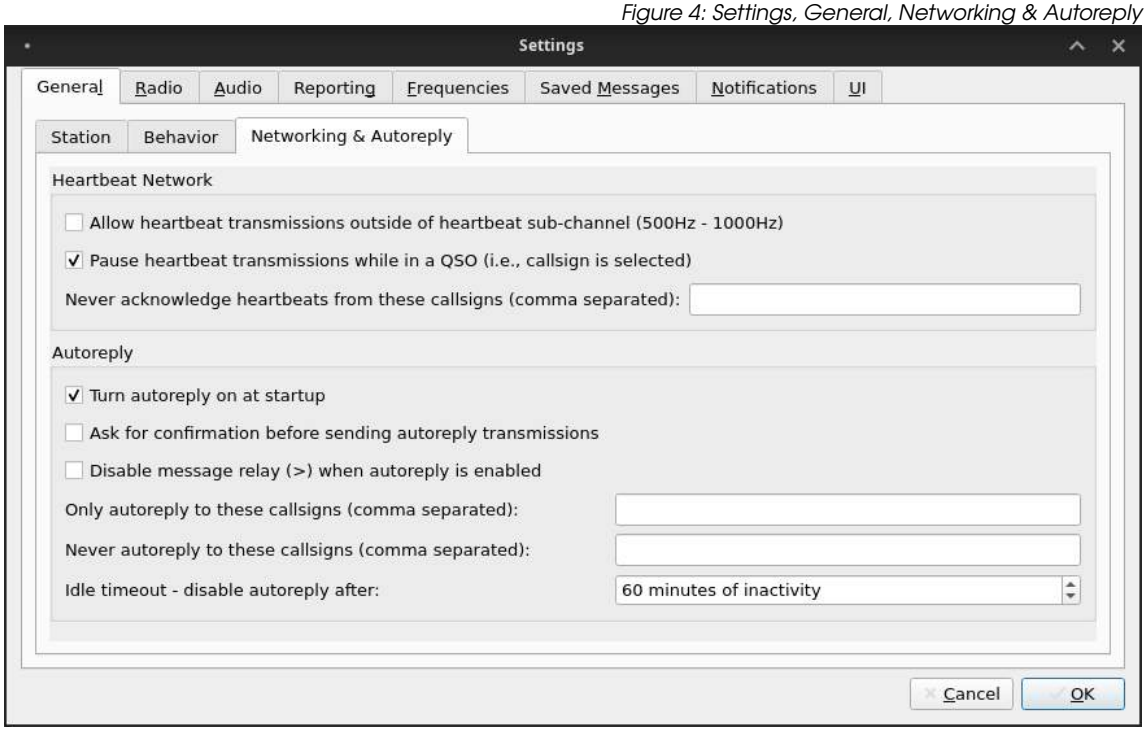


Figure 4: Settings, General, Networking & Autoreply



6.1.1.2 Radio Tab

Figure 5: Settings, Radio, CAT Control

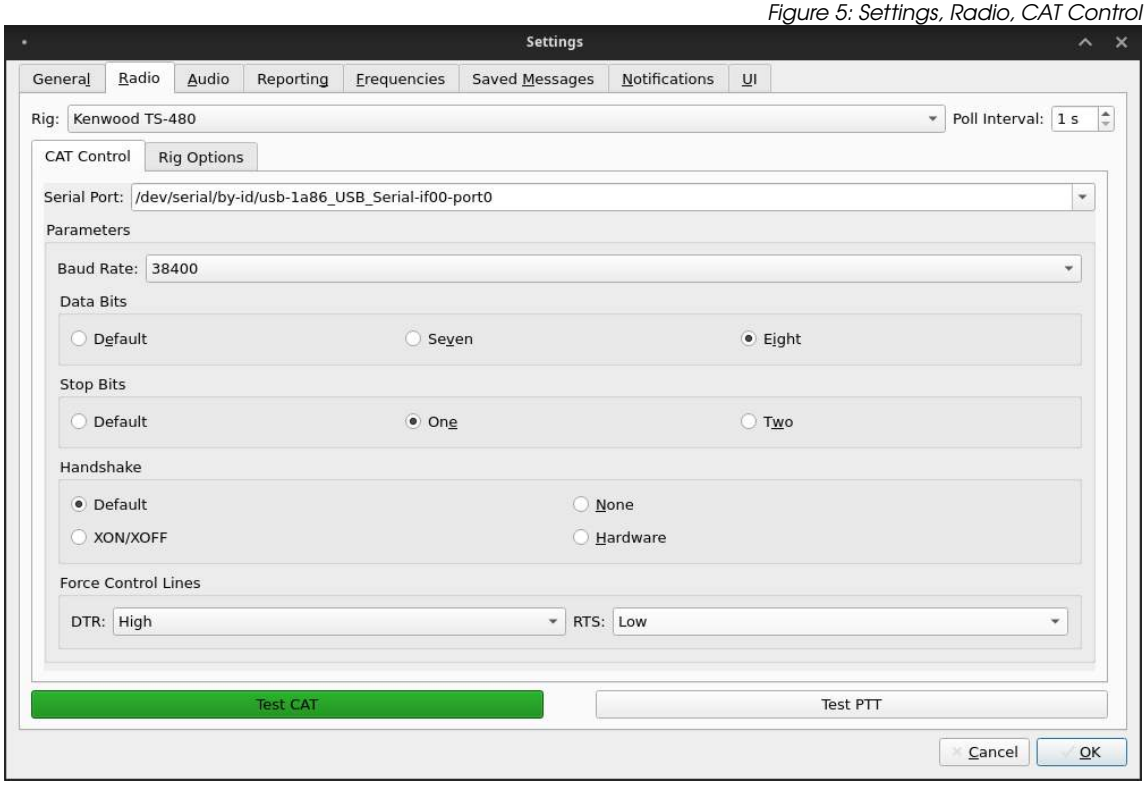
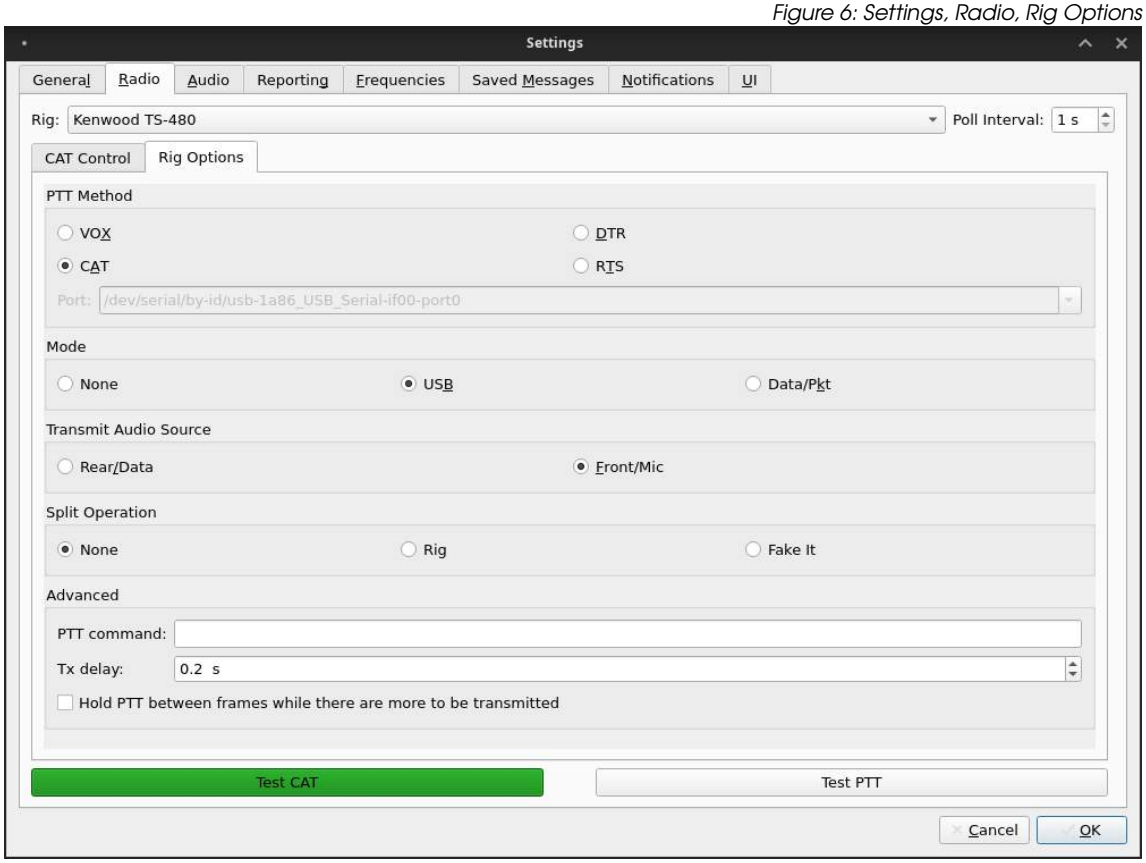


Figure 6: Settings, Radio, Rig Options



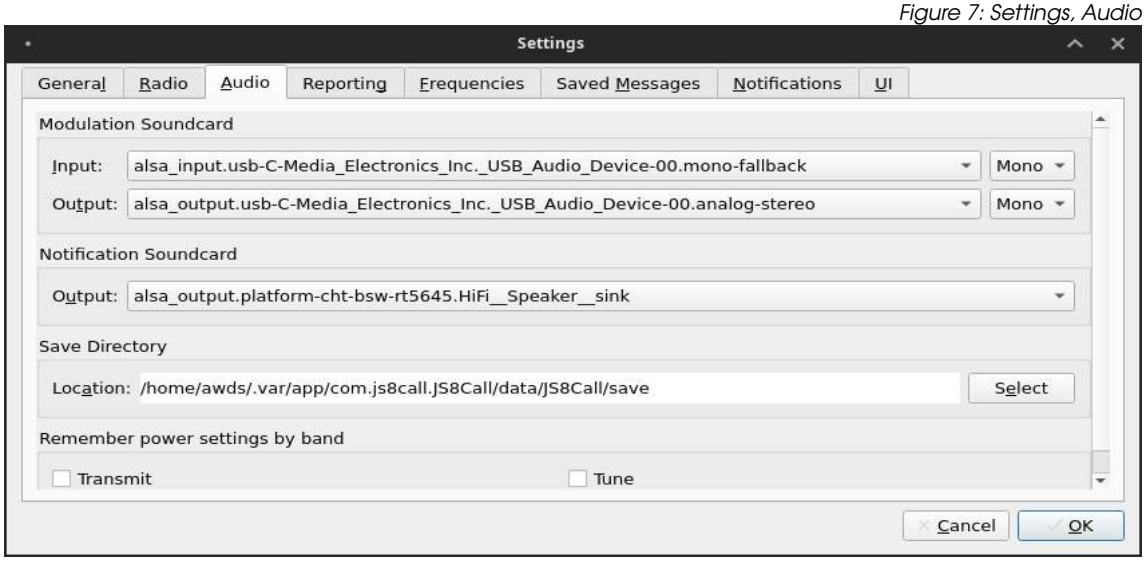
6.1.1.2.1 Serial Port

Note in Figure 5 that the `Serial Port` path points to the device **`by-id`**. Instead of the randomly assigned next-available serial port, ensuring it is found every time.

6.1.1.3 Audio Tab

Advantage of using an external USB sound card for the `Modulation Soundcard`, as shown in Figure 7, is that doing so explicitly separates the audio stream going to the rig from the computer system sounds going to the default audio-device, which prevents transmission on-air of the computer sounds and any Notification sounds that you allocate to the `Notification Soundard` under the `Notification` tab in Figure 11.

Figure 7: Settings, Audio

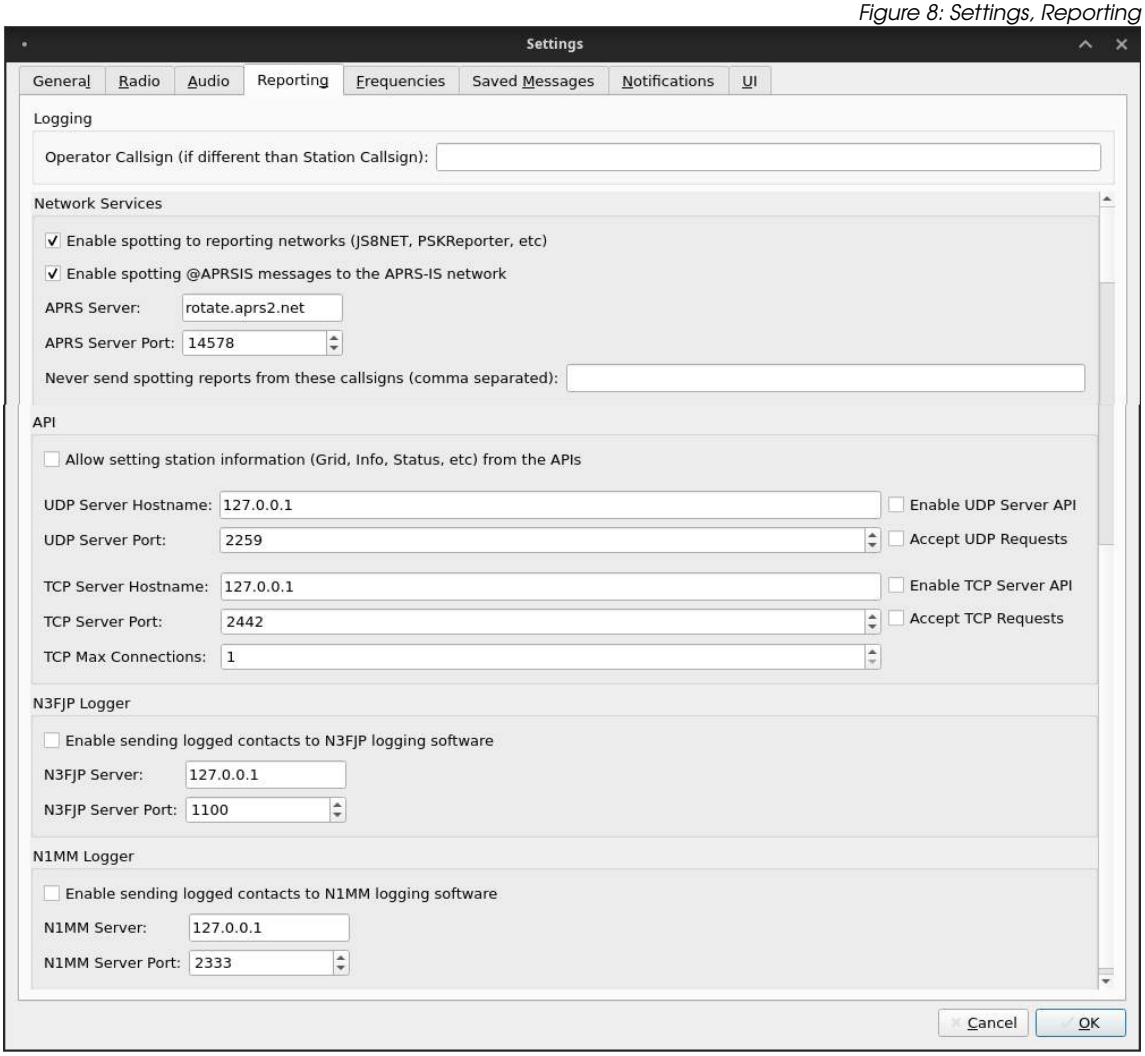


On your system your `Modulation Soundcard` and `Notification Soundcard` likely will be different to those shown in Figure 7. Just make sure you don't use the same one you're using for the radio. It may take several attempts to find the right card in the list.

6.1.1.4 Reporting Tab

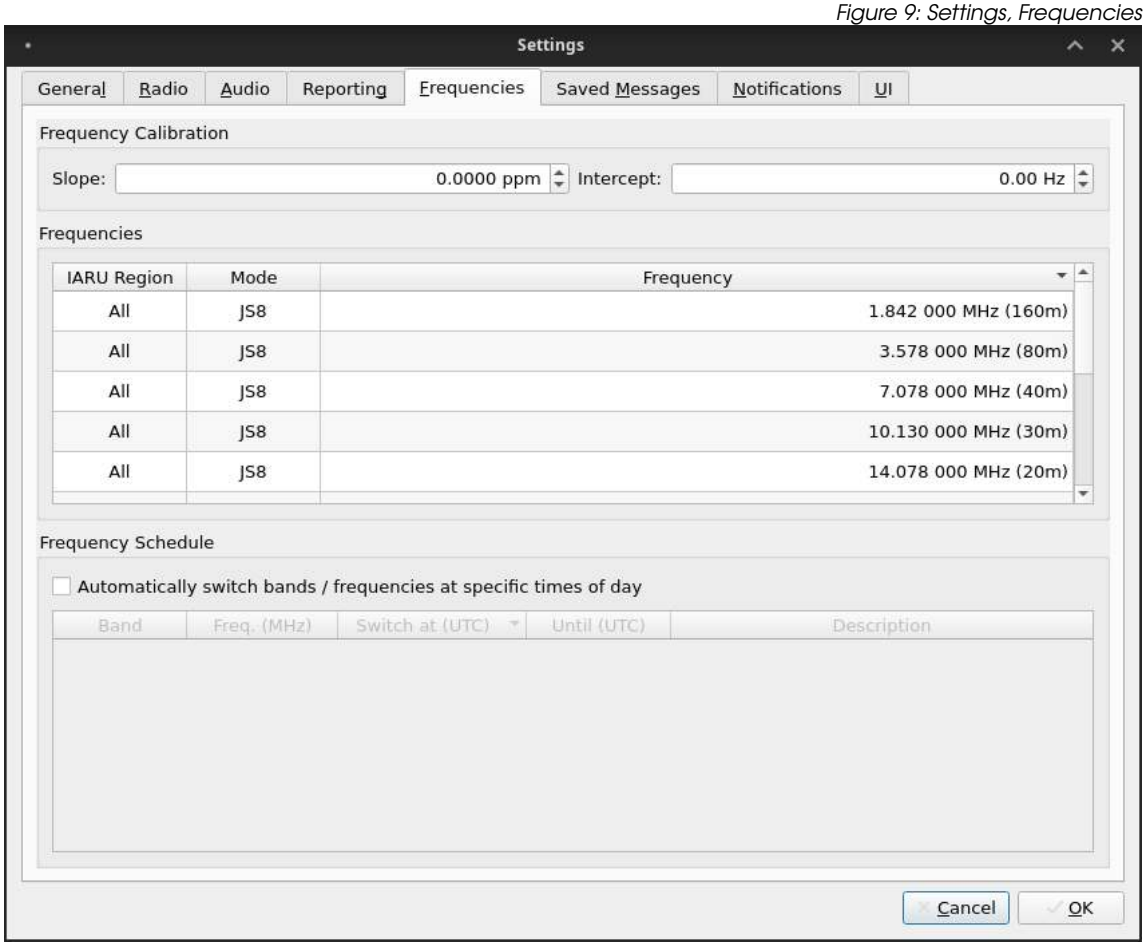
In the `Reporting` tab, you can connect to external network services, activate the Application Programming Interface, and connect to external logging programs.

Figure 8: Settings, Reporting



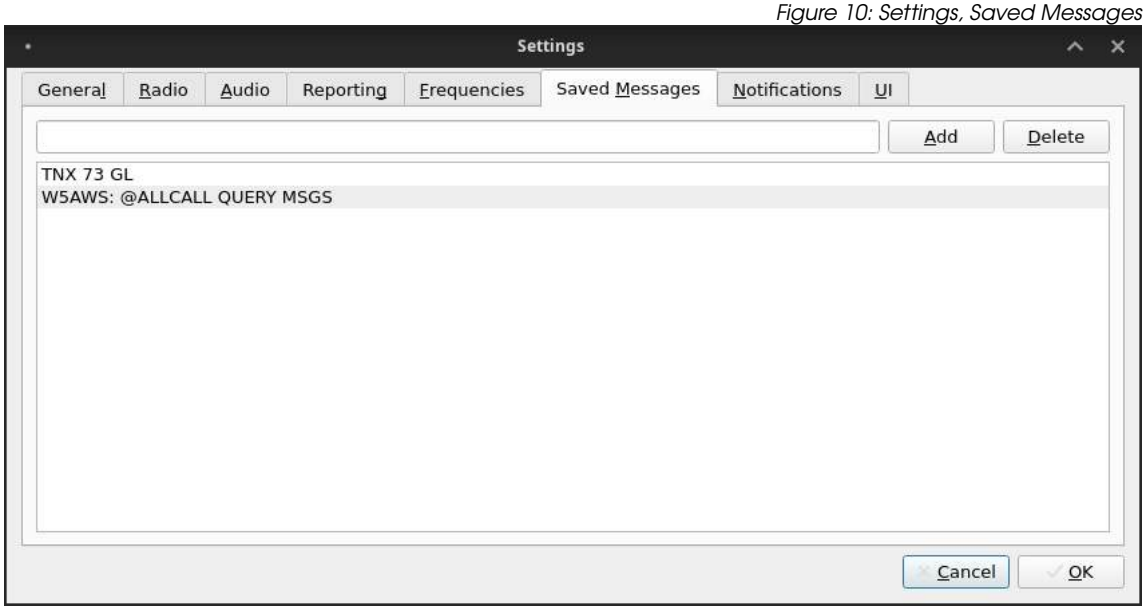
6.1.1.5 Frequencies Tab

Figure 9: Settings, Frequencies



6.1.1.6 Saved Messages Tab

Figure 10: Settings, Saved Messages



6.1.1.7 Notifications Tab

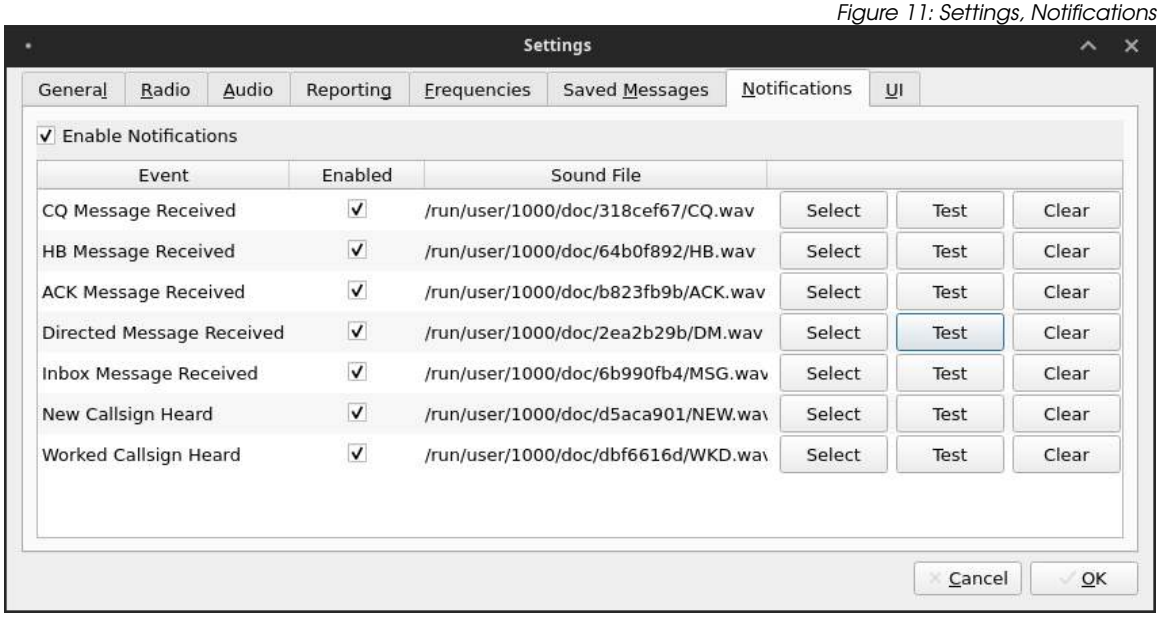
When enabled, the application directs notifications to the destination specified in the `Notification Soundcard Output` area of the `Settings Audio` tab, as shown in Figure 7.

It is important to distinguish between the audio stream going to the radio and that going to the computer-system audio, otherwise you could erroneously transmit computer-system audio over-the-air, which will make you a pariah to other operators. That is why the system defaults `Enable Notifications` of Figure 7 to uncheck.

On your system your sound-card likely will be different to that shown in Figure 7. Just make sure you don't use the same one you're using for the radio. It may take several attempts to find the right card in the list.

Figure 11 shows `Enable Notifications` actively checked and the sound files associated with each notification.

Figure 11: Settings, Notifications

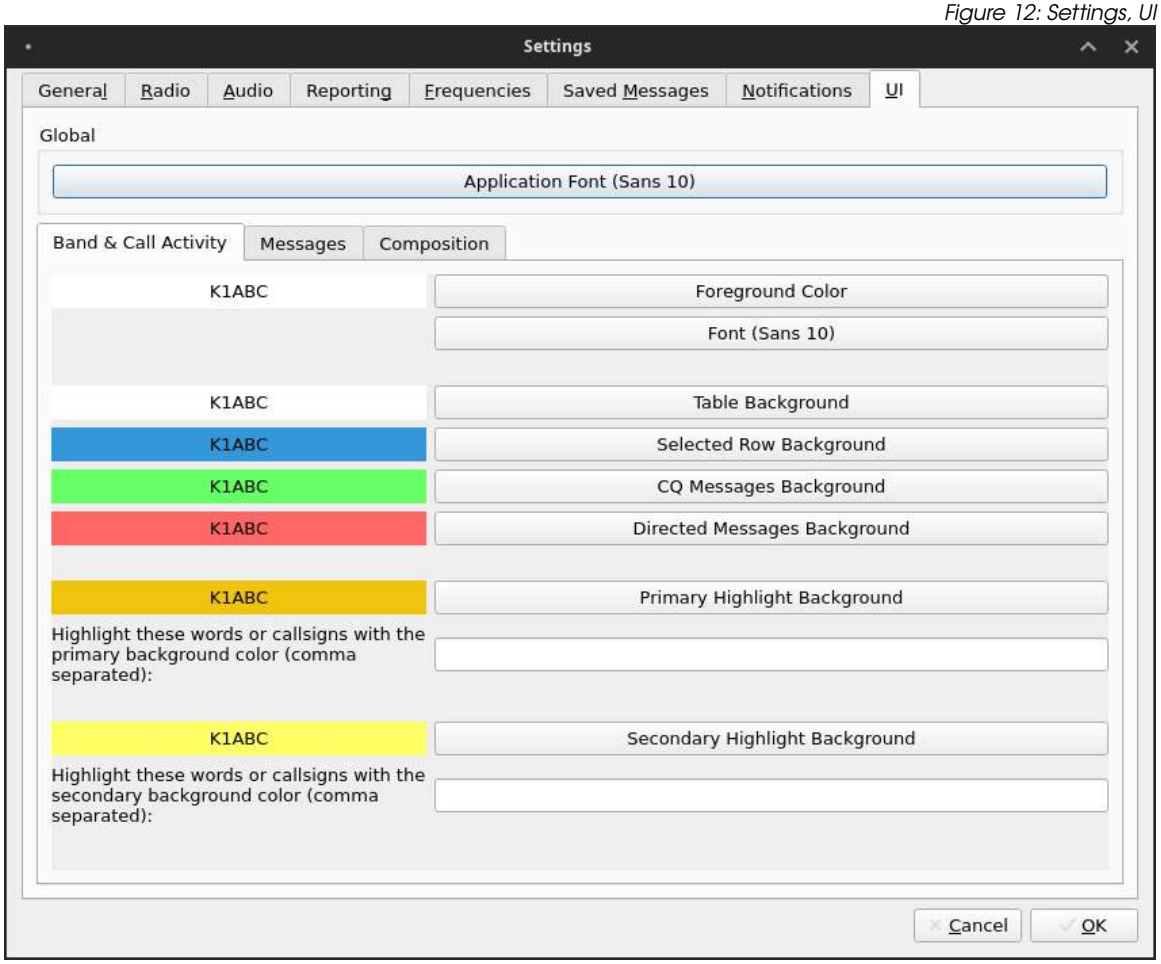


Note: You will have to close the settings and reopen each time to test a different card.

We included as an archive-file attachment to this PDF document, a Morse code audio file for each of the notifications. Save the .zip file to a convenient location, extract the files then select the appropriate file for each notification audio. You will become accustomed to hearing Morse code at 20 wpm.

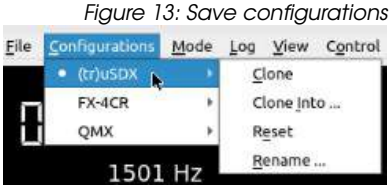
6.1.1.8 UI Tab

Figure 12: Settings, UI



6.1.2 Configuration Save

Figure 13: Save configurations



Save your transceiver-specific configuration to an appropriately named configuration file that you can restore when needed.

6.2 Clock Synchronization & Timing

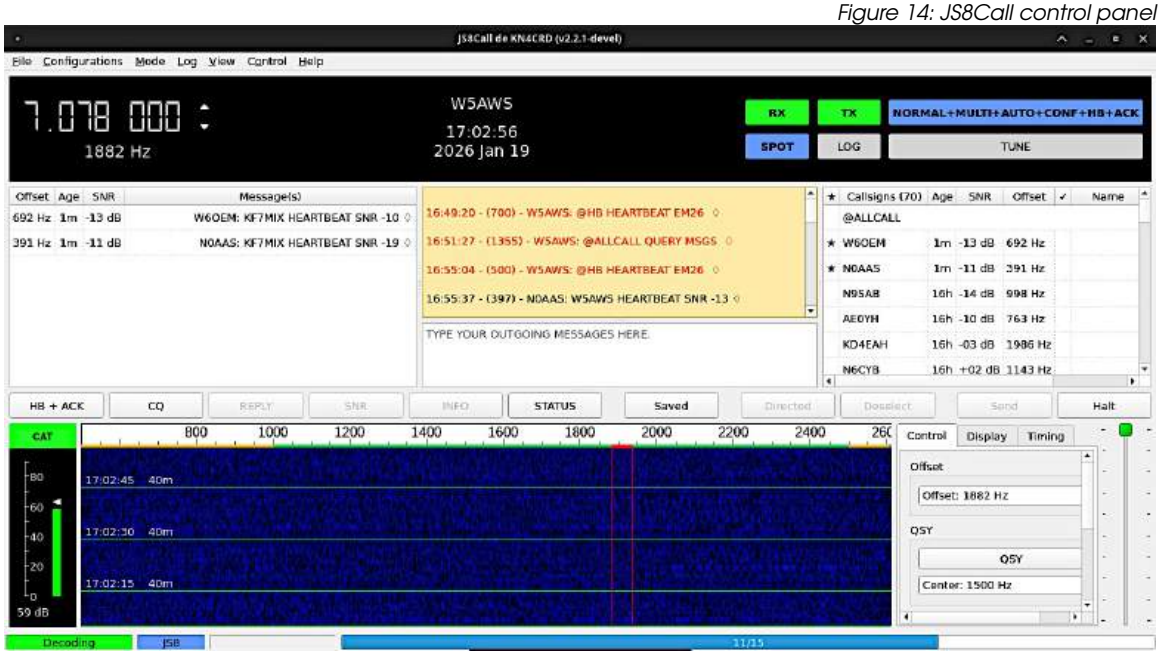


As with FT8, JS8Call requires an accurate clock that is synchronized to UTC. Your clock being off greater than 2 seconds from UTC can cause messages to not decode at your station. It is best to use an Internet, NTP or GPS time source for synchronizing your clock as accurately as possible.

JS8Call includes an automatic and manual clock drift tool that you can use to modify your application time to match signals you see or hear, or to an external time source like a Timex watch, a handheld GPS device, WWV, or a rooster crowing. Use the manual method as a fail-safe for when your synchronized time source is unavailable like it would if you were out portable, away from internet connectivity.

NOTE: You do not actually have to have the exact time synchronized…just synchronized to the start of a transmission window (15, 10, or 6 seconds), ±2 seconds. Many operators can manually synchronize their system clock based on signals in the waterfall and the time drift reported for each station.

Figure 14: JS8Call control panel



6.3 USB Mode Only

Ensure that you set your rig to transmit on upper sideband for every band. If you are running lower sideband, you'll likely see reversed signals you cannot decode.

6.4 Duty Cycle

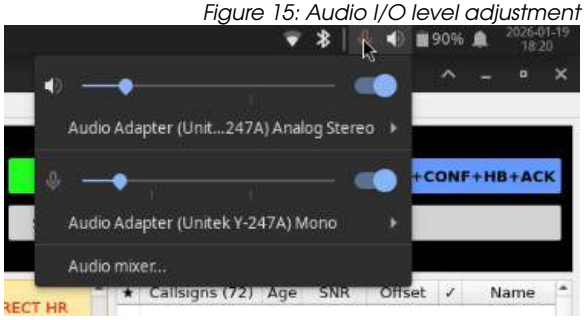
The JS8 modulator is a constant envelope, full-duty modulation that transmits in 12.6 second frames in normal speed. Because of the dead air between transmission frames, multi-frame messages can be classified as:

- 84% duty on a 15-second window:
  - Normal (12.6 / 15 = 0.84)
  - Slow (25.28 / 30 = 0.84)
- 79% on a 10-second window
  - Fast (7.9 / 10 = 0.79)
- 65% on a 6-second window
  - Turbo (3.95 / 6 = 0.653)

Note the power restrictions your transceiver manufacturer recommends for full-duty digital transmissions. When in doubt, use only a maximum of 50% of your transceiver power output to *save your finals*.

6.5 Audio Levels

Figure 15: Audio I/O level adjustment



Your input and output audio levels control how well you transmit and receive. Too high and the audio becomes distorted. Too low and you have no modulation or demodulation. Calibration is an important step to getting started.

Figure 15 shows the system-level audio adjustment. The external USB audio sound card makes life much easier; in this case the UGREEN Unitek Y-257A audio adapter.

6.5.1 Output and ALC

A rule of thumb is to set your output audio just high enough to drive your transmitter while not engaging your ALC. If you drive your audio too high, your ALC will distort the tones and many stations will not be able to decode your transmissions.

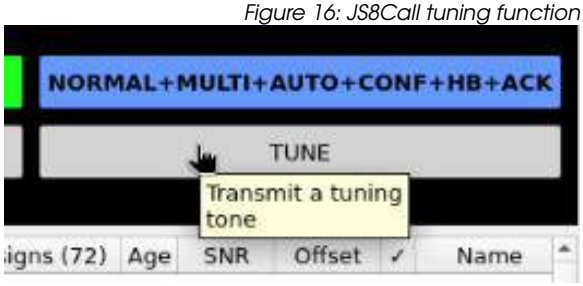
Some radios, like the (tr)uSDX, don't have Automatic Level Control of the input the RF stages. There are two ways in which to judge the audio level driving the transmitter: one by using a separate receiver to hear the quality of the transmitted signal, and another using a power meter.

6.5.1.1 Adjusting Audio by Ear

Tune your receiver to the JS8Call frequency you are using and listen to the audio reception. I have a Belka-DX receiver, so this is easy to do.

As described later in this document, move to a vacant area of the waterfall and activate the Tune function to inject audio. Listen to the tone while adjusting the computer audio-output until the received audio you hear is free from distortion. A clean, unclipped tone is absent any harsh buzzing noise.

Figure 16: JS8Call tuning function



6.5.1.2 Adjusting Audio Using a Power Meter

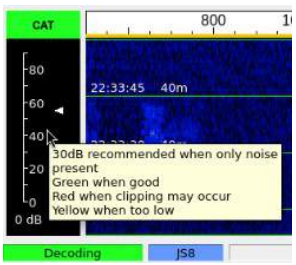
Another way to prevent the audio input to the radio from over-driving the RF stage is to use a power meter. I have a QRPoMeter[3], so this is easy to do.

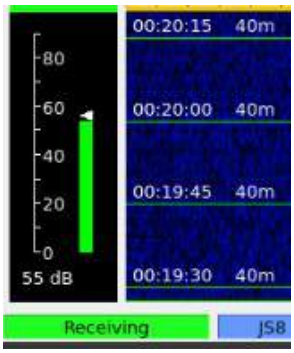
Since JS8Call operates on upper sideband, there is no power transmitted in the signal until there is audio into the front end of the radio.

As described later in this document, move to a vacant area of the waterfall and activate the Tune function to inject audio, as shown in Figure 16. Then adjust the gain of the computer audio-output until the reading on the power meter peaks then reduce the audio gain slightly until the meter reads slightly below maximum power.

6.5.2 Input and AGC

For best decodes, turn off your audio AGC, or set it to fast, and set your computer microphone-audio just high enough to read somewhere around 30–40dB on the signal meter in the lower left corner of the display window.





You might have to experiment with the settings that work best for your station, and you might also have to enable your attenuator for strong signals.

3 QRPoMeter: https://sites.google.com/nm0s.com/home/qrp-kits

There are two audio adjustment points:

One is the audio volume-control of the radio, assuming you connect to the Speaker or headphone port; the other is the computer microphone-audio input connected to the external UGREEN USB sound-card.

6.6 Audio Sound Card

When choosing your sound card, you have the option to set individual devices for input and output. You will need to find the device that matches what you've integrated with your rig. You can choose Mono or Stereo input & output, so try matching those with the capabilities of your device.

Using an external USB sound card makes it easier to identify the connected devices by simply seeing what's there before connection then looking to see what has appeared after connection.

For best decoding, when configuring your audio devices you need to apply the right input & output levels:



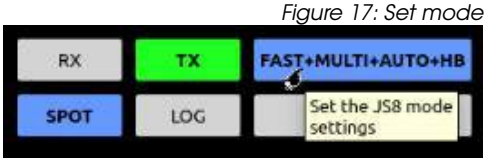
1. Make sure the sound card device you have chosen for input has no microphone amplification enabled. Usually you set this at the operating system level. Set the input to 100%.
2. Move your VFO to a quiet part of the band that has no signals present
3. Set your rig's AF Gain to its maximum value
4. Start adjusting your rig RF Gain to the point where the S-meter just starts to read 0
5. If RF Gain is not enough to bring down the rig S-meter, enable your rig attenuator. This is usual during noisy band conditions or RFI locally. Most attenuators apply a -10dB to -15dB signal attenuation, so you can usually bring RF Gain up just a touch to match.
6. If those adjustments are still not enough, you are likely operating under an extremely noisy condition. You might have luck at this point to start playing with AF Gain to bring the input levels even further down to that sweet spot of 30-60dB as read by the meter in the window of the JS8Call control panel.

6.7 How it Works

If you have used FSQ, Fldigi or WSJT-X before, you'll feel right at home with JS8Call. The premise is that JS8Call uses JS8 modulated messages, breaking up long free-text messages into multiple back-to-back transmission cycles with a few seconds of silence between "frames".

6.8 Mode Speed

Figure 17: Set mode



JS8Call 2.0 introduced two new faster modespeeds for QSOs and 2.1 introduced a slow mode. The four speeds now available in JS8 are:

- Slow: 30-second frames; 25 Hz bandwidth; around 8 wpm decoded down to -28dB
- Normal: 15-second frames; 50 Hz bandwidth; around 16 wpm decoded down to -24dB
- Fast: 10-second frames; 80 Hz bandwidth; around 24 wpm decoded down to -20dB
- Turbo: 6 second frames; 160 Hz bandwidth; around 40 wpm decoded down to -18dB

Figure 18: Select mode

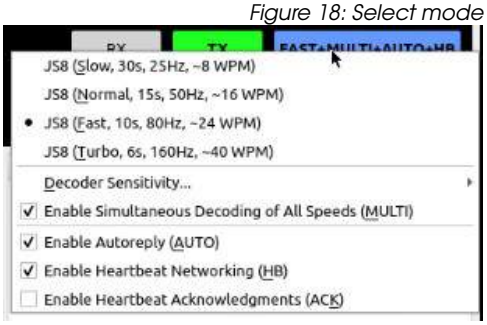
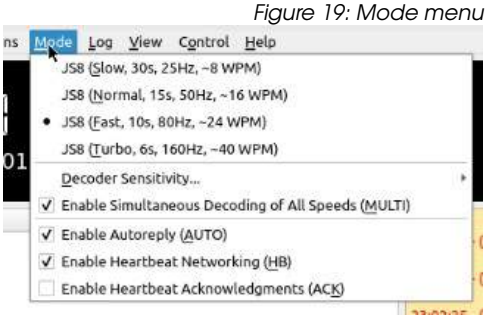


Figure 19: Mode menu

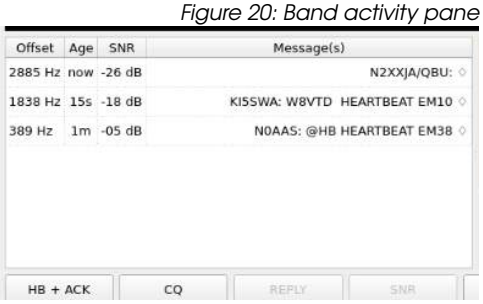


Intent of the faster speeds is to start your QSO in normal and "upgrade" to the faster speeds if conditions support it. If you have a modern PC with a fast enough CPU, you can optionally enable MULTI from the mode menu, allowing the decoder to decode all mode speeds at once.

6.9 Band Activity

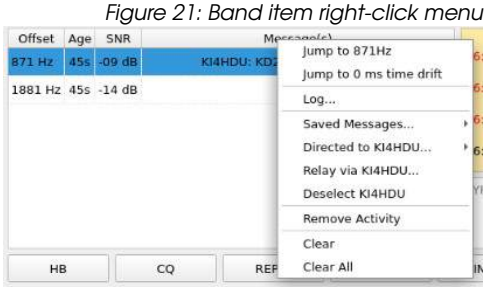
Displayed in the left-hand pane is Band activity, as shown in Figure 20.

Figure 20: Band activity pane



Right-clicking on an item will select the item and show a menu with an option to move your RX/TX offset to that audio frequency and send specific messages, as shown in Figure 21.

Figure 21: Band item right-click menu

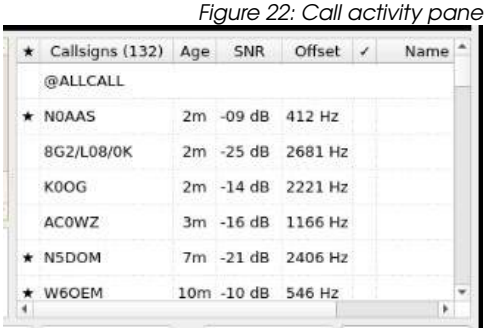


6.10 Call Activity

Callsigns you hear appear in the call-activity pane on the right side of the JS8Call window, as shown in Figure 22.

6.10.1 Indicators

Figure 22: Call activity pane



★ Appears next to a callsign that responded to you. This helps you find, at a glance, other operators who are confirmed able to hear you.

☏ Supposed to appear when a station is calling CQ according to the official guide, and display next to the caller callsign for five minutes. We haven't seen this yet. Instead, JS8Call highlights the CQ station with a green background, helping you find at a glance other operators who are looking to make contact.

- ⚑ Appears when a station has left you a message, displayed next to their callsign. You can read that message by right-clicking on the station and clicking `Show Message Inbox`.

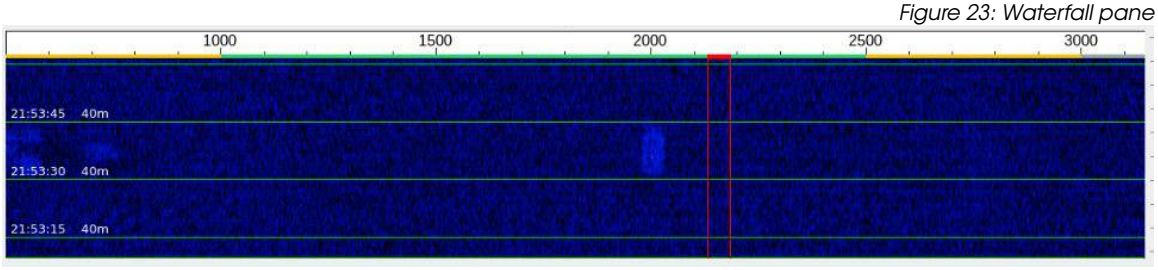
JS8Call computes station distance and azimuth from the first six digits of the maidenhead grid locators. This is an approximation describing a general area on the map, not an exact point. JS8Call supports up to twelve digit locators for greater precision, but even then, the calculation will always remain an approximation.

6.11 Waterfall

There is a waterfall, Figure 23, at the bottom of the screen to show you the signals in your audio passband. You can click on the waterfall to set your audio frequency offset.

There is also an option to change your VFO frequency (QSY) to center your selected audio offset to the rig passband center. This allows you to use narrow filters easily and is helpful for rigs with non-linear passbands.

Figure 23: Waterfall pane

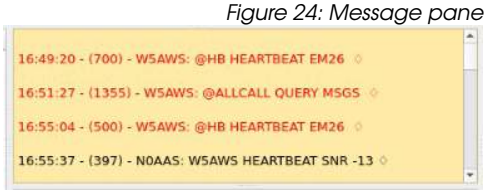


By opening the waterfall controls, `View⇒Show Waterfall Controls`, you can configure your waterfall display, access a filtering feature that limits which frequencies the decoder will try to decode, and the timing feature that allows you to drift your local time sync to match a station.

6.12 Messages

The yellow text box, Figure 24, shows you messages that are either on the frequency offset you are on or who have directed a message to you by sending a message that included your callsign.

Figure 24: Message pane



You type into the white box on the bottom to prepare a message for transmission.

Normal FT8 character restrictions do not apply, the extended character set includes all printable uppercase ASCII (A-Z 0-9 Space ./?+-`~!@#$%^&*()_=[]\{}|;':",<>) and Latin 1 (¡¿ÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏÐÑÒÓÔÕÖØÙÚÛÜÝÞ). The message structure is variable encoded, so the most common characters take the least amount of space, and special characters take longer to send.

As you type your message you will see the send button display the transmission time it will take to send your complete message. All you have to do is click send (or press enter to start transmitting on the next interval. Each frame transmits one after the other and the button updates with the amount of time left to transmit the remainder of the message. JS8Call 2.0 supports typeahead, so you can start trans-

mitting and continue typing your message while transmitting each frame. Check summed messages like MSG or Relays cannot use typeahead.

Because of this special variable encoding, messages in JS8Call cannot be decoded by WSJT-X. The same is also true that WSJT-X messages will not be shown in JS8-Call.

6.13 Message Types

Messages come in three forms:

1. Standard JS8Call free text messages
2. Directed JS8Call messages
3. Group messages

6.13.1 Standard Messages

Standard messages are free-text messages that do not start with a callsign or a directed command. These messages will only print at other station locations if they align their receive-offset within 10 Hz of your transmit offset. This operation is similar to other keyboard-to-keyboard digital modes, like Olivia, RTTY, and PSK.

This implies some sort of prior agreement between stations to tune to a specific frequency which rarely happens though it could be used as a sort of beacon or maybe for a digital NET for roll-call, etc.

6.13.2 Directed Messages

Directed messages are special JS8Call transmissions that automatically prefix your message with your callsign, similar to how FSQCall operates. Directed messages are useful for communicating in that you do not have to include your callsign in your message, allowing you to use more of the transmission frame or frames for actual message text, as well as alerting the recipient that a message is for them. As long as you are in the same passband, you do not have to be on the same frequency offset to receive a directed message.

To send a directed message, all you need to do is include the callsign of the receiving station as the first word in the message or select a callsign in your heard list to have it automatically prefixed.

♢ This symbol appears at the end of the message to indicate End of Transmission. JS8Call displays this after the last frame of the message completes transmissioin with nothing else to follow. This means you get a visual indicator that the transmission completed, and you can begin transmitting a reply. This character can be customized in the Configuration.

Directed messages to you and to @ALLCALL display in the top RX window. When in the middle of receiving a directed message, that is after the first directed frame received, your station will not respond automatically to commands, even with AUTO on, until the system completes reception or enough time has elapsed to move on one minute from the last frame decoded.

6.13.3 Group Messages

Group directed messages are JS8Call specially formatted transmissions that announce your station via CQ or Heartbeats (HB) to the @ALLCALL and @HB callsign groups. They are directed at a group destination, but not generally to an individual station.

6.13.3.1 @ALLCALL Callsign

There is a special "`@ALLCALL`" group callsign that you can use to send the message to anybody who is able to receive your message. Some examples:

- `@ALLCALL HELLO NET PSE QSY 14300`
  - Will be sent as: `KN4CRD: @ALLCALL HELLO NET PSE QSY 14300` ♢

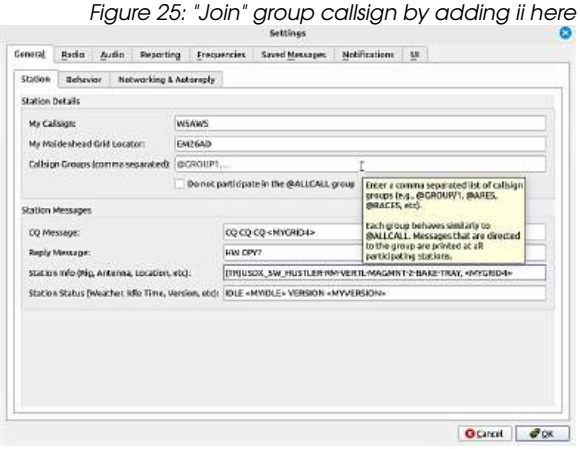
6.13.3.2 Group Callsigns

Group callsigns are a custom form of compound callsigns that begin with an "@" character, and can be up to 8 alpha-numeric (A-Z 0-9) characters in length. If you modeled that in a regular expression, that would be:

- `[@][A-Z0-9\/]{0,3}[\/]?[A-Z0-9\/]{0,3}[\/]?[A-Z0-9\/]{0,3}`

Group-callsign functionality allows you to direct your message to anybody who has "joined" the group. You join the group by adding the group name to your settings, as shown in Figure 25. All stations who want to receive group messages must add the group to their station configuration. Stations without the group will still be able to see the message received in the band activity, but those messages will not be directed to them.

Figure 25: "Join" group callsign by adding ii here



Say for example, you are part of the Georgia ARES group and you want to send others in the group a message, You would send:

- `KN4CRD: @ARESGA QSL?`

This group callsign will behave similarly to `@ALLCALL`. Everybody who has added the `@ARESGA` group to their station configuration will have the message printed on the screen. If instead, you transmit:

- `KN4CRD: @ARESGA SNR?`

Then, all group member stations who have AUTO enabled would respond with a signal report, similar to if you queried each group station individually.

There are a number of built-in group callsigns that can be transmitted just as efficiently as standard callsigns. All custom groups will require an extra frame during transmission:

Continental DX Groups		**ITU Regions**	
@DX/NA	@DX/AF	@REGION/1	@REGION/2

@DX/SA	@DX/OC	@REGION/3	
@DX/EU	@DX/AN	**Generic Groups**	
@DX/AS		@GROUP/0	@GROUP/1
Operator Groups		@GROUP/2	@GROUP/3
@COMMAND	@CONTROL	@GROUP/4	@GROUP/5
@NTS	@NET	@GROUP/6	@GROUP/7
Special Groups		@GROUP/8	@GROUP/9
@JS8NET	@APRSIS	@RAGCHEW	@JS8
@EMCOMM	@ARES	@MARS	@AMRRON
@RACES	@RAYNET	@RADAR	@CQ
@HB	@QSO	@QSOPARTY	@CONTEST
@FIELDDAY	@SOTA	@IOTA	@POTA
@QRP	@QRO		

6.13.3.3 @JS8NET and @APRSIS

Available are two "special" groups for spotting. When spotting stations receive messages to these @JS8NET and @APRSIS groups, the stations post the messages to the JS8NET spotting server for processing. This allows for specialized functionality to be built to handle these messages. These groups are non-standard, so you cannot add them to your groups list for standard group processing. However, you can send messages to these groups directly, by yping it into your TX message box, save it to your saved messages, etc.

The @APRSIS group is an **experimental** feature allowing APRS messages to be spotted to the APRS-IS gateway. Two message commands are available, GRID for spotting your callsign at a specific location and CMD for sending a raw APRS packet.

For example, any station receiving this message:

- `KN4CRD: @APRSIS GRID FN04TV53`

Will submit that spot to JS8NET and spot my callsign at that location to the APRS network. You would then be able to query that spot in an APRS client, like https://aprs.fi.

To send a raw fram, like a direct APRS message to SMSGTE, you would send:

- `KN4CRD: @APRSIS CMD :SMSGTE :@5551212 TEST`

Everything after the CMD frame JS8Call forwards as an APRS packet.

6.13.4 Directed Commands

There are special directed messages that you can send to stations for automatic reply, if they have AUTO enabled. Directed commands consist in the form of:

- [CALLSIGN][COMMAND]

6.13.4.1 Questioning a Station

- `SNR?`—What is my SNR?

`SNR`—Send signal report.

- `GRID?`—What is your grid locator?

  `GRID`—Send a long-form grid locator, to be spotted on a map via PSKReporter & JS8NET

- `INFO?`—What is your station information?

  `INFO`—Send station information.

- `STATUS?`—What is your station status message?

- `HEARING?`—What stations are you HEARING?

6.13.4.2 Messaging a Station

- `>[MESSAGE]`—Please relay this message to its destination.
  - When received in its entirety, the destination station will send an ACK reply to the message.
  - Optionally, this message can be relayed to its final destination through multiple relay stations by prefixing additional callsigns to the message:
    - `KN4CRD>HELLO!`

      Will send the message to KN4CRD
    - `KN4CRD>DR4CNK>HELLO!`

      Will send the message to DR4CNK through KN4CRD
    - `KN4CRD>DR4CNK>J0Y>HELLO!`

      Will send the message to J0Y through DR4CNK through KN4CRD
  - Stations will respond to a subset of commands issued through forwarded messages:

    SNR, INFO, GRID, MSG, MSG TO:, etc.

    …and will reply using the relay-path provided.

- `MSG [MESSAGE]`—Please store and display this message in your inbox.

  Access your inbox-messages by right-clicking on the callsign and selecting `View Message Inbox`…

- `MSG TO:[CALLSIGN] [MESSAGE]`—Please store this message at your station for later retrieval by [CALLSIGN].

  Stores a message in persistent storage on disk to be retrieved later using the `QUERY MSGS` command.

  [CALLSIGN] is the first word after the : and is the final recipient of the message.

- `QUERY CALL [CALLSIGN]?`—Can you communicate directly with CALLSIGN?

  If a station can hear the callsign, it will return `YES` and then an `ACK` to that callsign with an SNR report.

- `QUERY MSG [ID]`—Please deliver the complete message identified by ID.

- `QUERY MSGS`—Please deliver any messages you have stored for me.

  Each response will contain the ID of the oldest message yet to be delivered.

  To retrieve the message text, issue a `QUERY MSG` command with the ID.

- `AGN?`—Have the station automatically retransmit their last message.

There are also a number of *short messages* that can be included in a directed message frame, which would be transmitted in one cycle with standard non-compound, non-group callsigns:

- `QSL?`—Did you receive my last transmission?
- `QSL`—I received your last transmission
- `YES`—I confirm your last inquiry
- `NO`—I negative confirm your last inquiry
- `HW CPY?`—How do you copy?
- `RR`—Roger. Received. I copy.
- `FB`—Fine Business
- `TU`—Thank You
- `73`—I send my Best Regards
- SK—End of Contact
- `DIT DIT`—End of Contact / Two Bits

6.14 Messaging Examples

If we wanted to ask DR4CNK what their station information was, we would send:

- `DR4CNK INFO?`

  Who would automatically respond with a directed message back to us:

  `DR4CNK: KN4CRD INFO 50W VERT IN THE SOUTH OF FRANCE`

  Assuming AUTO reply enabled.

If we wanted to transmit a “relay” message to OH8STN through DR4CNK, we could use the relay command and send:

- `DR4CNK>OH8STN>HELLO JULIAN!`

  During relay at each hop, JS8Call appends the originating sender’s callsign to the message.

  The command above would be received by OH8STN, they would send an ACK back, then retransmit the message, like so:

  - KN4 station sends:

    `KN4CRD: DR4CNK>OH8STN>HELLO JULIAN!`

  - DR4 station relays:

    `DR4CNK: OH8STN>HELLO JULIAN! DE KN4CRD`

You can also mix and match standard and free text messages, but most of the time you won't need to.

6.15 Standard Operating Procedure

During preparation of this document, KJ5MTI monitored the 40 & 20 m bands. While attempting to catch a CQ that produced a "telephone" symbol, he had several opportunities to respond to CQs and to initiate CQs of his own. In answering one CQ, the remote station requested "AGN" and so he sent his transmission again; Once again, they replied "DID NOT COPY". Finally, he looked at the speed. They were using "`fast`" mode. So he switched to `fast` mode and replied. That fixed the speed problem, but then he couldn't entice the other station to send him an SNR report.

As a result of his JS8Call operations, KJ5MTI developed a rule by which he won't count any exchanges as QSOs unless he and the other station exchange, at the minimum, signal reports. No signal report, no QSL confirmation of contact.

Operating experience of KJ5MTI led him to conclude that many operators don't know how to properly utilize JS8Call. This isn't surprising based on our investigation of this excellent application. There is also a cultural tendency from the past of ham radio operators not reading the instructions before indulging in the excitement of exploration and discovery—nothing inherently wrong with that attitude, though it can lead to extended exercises in frustration and, perhaps, dampening of one's enthusiastic ardor.

KJ5MTI notes that: Many people start out in "`fast`" mode. Some people even start in "`slow`" mode. My strategy, whether right or wrong, is to start in "`normal`" mode and only switch to a different speed when:

(1) Operators establish contact,

(2) Conditions support the switch.

(3) Operators coordinate the switch.

6.16 Messaging Tactics

QTH of KJ5MTI and W5AWS are separated by 11 miles (17.7 km) as the crow flies. Our objective was direct radio communication across town without using permanent infrastructure, using QRP HF transceivers and, in the case of W5AWS, low efficiency antenna configurations. W5AWS has had QRP CW QSOs with KI5EGH at about the same distance in the opposite direction on 40 m using a mag-loop antenna, but was never heard by KJ5MTI.

After various trials and errors, we gravitated toward JS8Call for its weak-signal data payload capabilities. Further, we realized that we could communicate inside a skip-zone by bouncing messages off outlying stations that could hear and reach us both.

6.16.1 Storage and Retrieval

Directed messaging allows three commands to be used for message storage and retrieval at intermediate stations:

- `MSG TO:[CALLSIGN] [MESSAGE]`

Store this MESSAGE at an intermediate station for CALLSIGN.

- `QUERY MSGS`

  Query the destination for messages stored for your station callsign.

- `QUERY MSG [ID]`

  Query for a specific message stored for your station callsign.

We achieved our first successful QSO using the store and retrieval capability of JS8Call through a station who could communicate with us both.

Asynchronous communication is very convenient because it is difficult getting operators in-place at the same time. Also, it solves the problem of QSB and poor band conditions, enabling us to reach through brief windows in atmospheric conditions to store and retrieve messages.

6.16.1.1 Storing a Message

First discover those stations who can communicate with the recipient of your message. For me to discover who can communicate directly with KJ5MTI, I would send this message by right-clicking on @ALLCALL and selecting:

- @ALLCALL QUERY CALL [CALLSIGN]?

  Please acknowledge that you can communicate with [CALLSIGN], replacing [CALLSIGN[with KJ5MTI to send this command:

  `@ALLCALL QUERY CALL KJ5MTI?`

  Response to this command might be something like this:

  `[CALLSIGN]: W5AWS YES -13 (35M)`

  …which means that [CALLSIGN] can hear KJ5MTI at an SNR of -13 dB at a distance of 35 miles. JS8Call calculates that distance from the Maidenhead grid locators reported by each station.

At this point, we have established that there is a clear path of communication between W5AWS and KJ5MTI via [CALLSIGN]. Next, store a message on [CALLSIGN] for later retrieval by KJ5MTI.

- CALLSIGN MSG TO: KJ5MTI [MESSAGE]

  There must be a space after the colon and before the recipient's callsign. It won't work if you don't insert a space.

  CALLSIGN responds with an ACK, though it might get lost in transit due to fluctuations in the atmosphere.

6.16.1.2 Retrieving a Message

Since we might not know which station is holding messages for us, the best thing to do is to inquire with this command:

- `@ALLCALL QUERY MSGS`

  Which will produce a reply like this:

  [CALLSIGN]: W5AWS YES MSG ID 222

Next, retrieve the message.

- `[CALLSIGN] QUERY MSG 222`

  Which will return the message similar to this:

  W5AWS MSG [MESSAGE] FROM KJ5MTI

  JS8Call will then place the message in your inbox. Finally, aksnowledge receipt of the message; JS8Call will prompt you to do this with a pre-populated message.

- [CALLSIGN] ACK

6.16.2 Relaying Messages

Ability of JS8Call to relay messages is very much in the tradition of the Amateur Radio Relay League, increasing the reach of weaker stations by relaying messages through more powerful stations by simply concatenating callsigns with a Greater-Than-sign >, thus:

- `DR4CNK>OH8STN>HELLO JULIAN!`

6.16.3 Beware Mode Speed

Though KJ5MTI had it set, he did not know the that enabling “multi” would *decode* all speeds at once, which is good to know.

KJ5MTI participated in Winter Field Day 2026 and noticed some stations were using “fast” or “turbo” modes. Even though they could be decoded, operators couldn’t reply unless they selected the correct speed—KJ5MTI wasn’t sure all participating in WFD understood that.

W5AWS didn’t know whether this is true, yet assumed that when one selects a station to reply, the system automatically matches the transmission speed of the reply to the speed of the original message. W5AWS couldn’t imagine it not working like that as having to manually match the speeds is far too much work and cognitive load.

KJ5MTI experienced a couple instances that lead him to believe that a manual intervention is necessary, but didn’t have any concrete proof. His first experience was during a JS8Call exchange with another gentleman who requested they try switching to a faster mode, which they did, but KJ5MTI had to manually select the mode from the drop-down menu. The other instance was when KJ5MTI was participating in WFD and tried to reply to a CQ and didn’t get any response; this was a radio club in Florida. So KJ5MTI looked at the signal in the waterfall, noticing it was wider than normal he switched to “fast” mode and tried contacting them again and got a response.

These two instances lead KJ5MTI to believe that one’s speed has to be manually selected to match that of the remote station.

To verify this belief, KJ5MTI uploaded the JS8Call source-code to ChatGPT. According to ChatGPT, JS8Call does decode the faster speeds, but it doesn’t automatically change your reply speed to match. KJ5MTI cautions that ChatGPT *can* make mistakes, but in this instance its conclusion does match his experience.

KJ5MTI discovered that in both the “band activity” and “call activity” panes you can choose to display a “mode speed” column. Access these settings under the `View` menu item, also by right-clicking on the pane header.

6.17 AUTO–Automatic Replies

With AUTO enabled, the software will automatically respond to directed queries, like `SNR?`, `INFO?`, and `GRID?`. With AUTO turned off, JS8Call will buffer responses to directed queries in the send-message text-box until you are ready to send the replies manually.

If you would like to participate in AUTO, but would not like to be responsible for message relays, you can disable relays with AUTO enabled in the settings.

6.18 LOG—Station Log

There is a log-item in the main menu of the application. You can also press F5 to start a log entry. The software will do its best effort to pre-populate log fields. However, you'll likely have to fill out some missing information manually since the QSO is free-text and not automated.

The application stores the log in `JS8Call.log` and `JS8Call.adif` in the log directory, which you can find by clicking `File -> Open log directory` in the main menu.

Currently, the logging function in JS8Call will log each contact, according to the ADIF specification, as MFSK mode and JS8 submode. There is also an option in the Logging settings to log the mode as DATA instead of MFSK & JS8.

Once logged, the selected directed callsign is automatically deselected by default, however this option can be overridden in the configuration.

In the log directory, there is a file called ALL.TXT that records every decoded message along with a time-date stamp, which is the same for WSJT-X. KJ5MTI found this useful when he received QSO rejections on QRZ.com from a station he contacted, but was not in their logbook. One can go to this file and search on their callsign and verify in most cases that a QSO occurred and, at the minimum, exchanged signal reports.

With the help of ChatGPT, KJ5MTI verified `ALL.TXT` is a “raw”, append-only file of everything JS8Call decodes and is used for debugging, post-analysis and auditing of what is actually heard versus what was filtered by the UI. KJ5MTI also noticed it can get quite large and this is probably why JS8Call and WSJT-X provide an option to `Erase ALL.TXT` in the Log drop-down menu.

Note: Remember to periodically erase the log file `ALL.TXT`.

6.19 SPOT—Callsign Spotting

With SPOT enabled, JS8Call will report callsigns you hear, or your callsign if heard by other stations, to PSKReporter under the JS8Call mode.

JS8Call will also spot GRID commands with 6 or more characters. Make sure to set your grid locator to 6-12 characters for the most accurate spot. You can drill down

with this map to your location if you're unsure of your rid: http://k7fry.com/grid/. If you have a lat/lon, you can also use the lonlat2maiden script here:

- http://www.jidanni.org/geo/maidenhead/

6.20 HB—Heartbeat Transmission

There is an automated heartbeat mechanism that transmits on an interval. You can turn on the HB button by selecting "Enable Heartbeat Networking" from the mode menu. An HB button will then appear on the bottom left. This automated transmission will transmit your grid to the heartbeat network, directed to the @HB group callsign.

- `KN4CRD: @HB HEARTBEAT EM73 ♢`

This interval at which the heartbeat transmits can be changed from the control menu or by right-clicking the HB button. JS8Call transmits heartbeats on a random unused frequency offset between 500Hz-1000Hz to help prevent QRM. There is an option in the settings to allow hear-beating anywhere—which is especially useful on lower bands like 160m and 630m.

When you have AUTO replies enabled, and you enable `Send Heartbeat Acknowledgments`, your station will send an ACK reply to signal to the other operator that you can hear them. These are essentially *lightweight heartbeats* from your station and will reset your heartbeat timer.

The intent of heartbeat is not to report on propagation. Instead, it is to help populate your call activity, the heard list on the right, so you know who's likely to be reachable to make contact. You can't work them if you can't "hear" them or if they cannot hear you.

Keep in mind, though, that HBs are not designed to start conversations. When you turn HB on, you are "joining" the heartbeat network. This network allows for planning of relays and sending messages to be stored at those receiving stations. Think of HBs and ACKs as a way to plot network topology, and relays (>) as a way to send through that network messages to be read later, sort of like an SMS text message.

While heartbeating, if a station has a message to deliver to another station it hears heartbeating, it will announce that in a HEARTBEAT SNR, thus:

- `KN4CRD: KM4ACK HEARTBEAT SNR -12 MSG 32 ♢`

You can then retreive that message using the "QUERY MSG" directed command:

- `KM4ACK: KN4CRD QUERY MSG 32`

While in QSO, when receiving a transmission that is displayed in your incoming messages window, the HB timer will be reset to prevent your station from interfering with your QSO.

Also, keep in mind that unattended transmissions may be against the rules of your jurisdiction. To be most safe, heartbeat should only be automatically sent while you are at the control point of your station. There is an idle timer that you can configure in the settings that will disable your heartbeat once you leave your station idle, as in no mouse or keyboard movement.

NOTE: HBs are intentionally restricted to slow, normal and fast speeds for bandwidth efficiency and enhanced compatibility in the HB network.

6.21 CQ—Calling CQ

The default way to call CQ is with the `CQ CQ CQ` message. This is configured by default. What's notable, though, is that you can configure this message in the settings. These are the messages supported that JS8Call will send in one frame transmission:

CQ CQ CQ	CQ CQ	CQ	CQ CONTEST
CQ FIELD	CQ FD	CQ QRP	CQ DX

When using one of these message formats, you can also include your four-digit grid, and it will be encoded in one transmission cycle:

CQ CQ CQ EM73	CQ CQ BB88	CQ CC77	CQ CONTEST FN04
CQ FIELD AB01	CQ FD CN01	CQ QRP JO42	CQ DX GC28

You can start your CQ message with one of these formats; it will be sent directed, meaning your callsign will automatically be included. You can also add to the messages without issue:

CQ QRP 500MW CQ?

If you deviate from these formats, you will not be sending a directed message, your grid will not be included, and you must include your callsign in your message.

You can also send CQs on an interval by right-clicking the CQ button and selecting a repeat interval. This will cause your station to repeat your CQ transmission until you receive a reply message.

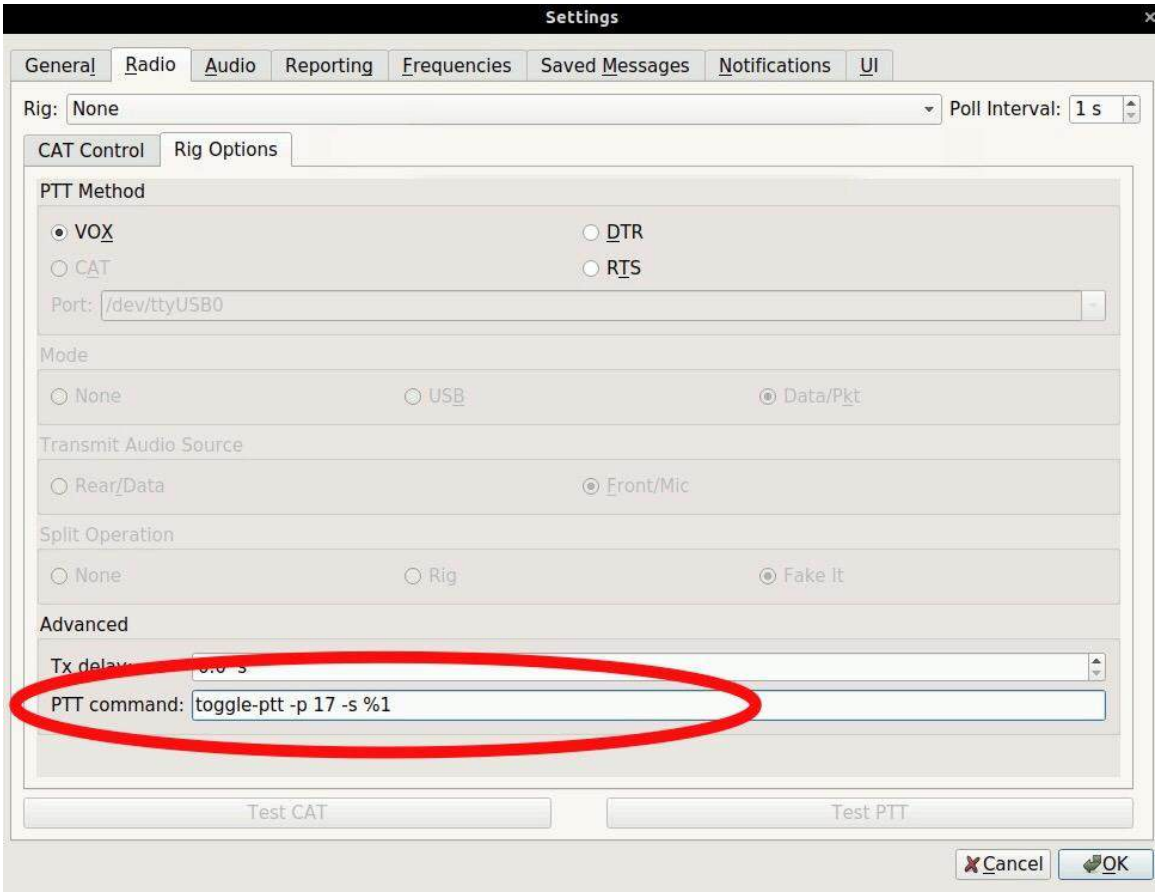
6.22 REPLY—Replying to a CQ

The default way to reply to a CQ is with `HW CPY?`. This allows the caller to choose whom to connect with and send a signal report. You can customize this message with a reply, but keep in mind that most stations will be replying with something that can be sent in one 15-second transmission. Here's an example exchange:

- `→KN4CRD: CQ QRP EM73 ♢`
- `←DR4CNK: KN4CRD HW CPY? ♢`
- `→KN4CRD: DR4CNK SNR -12 TU 4 CALL QSL? ♢`
- ←DR4CNK:-KN4CRD RR -22 FB INTO GO28 GUD QRP DX! ♢

6.23 PTT—Advanced Control Option

There is an advanced feature for rig control called PTT Command. This allows JS8Call to execute an external script for controlling PTT of a transceiver.



What this PTT command does is allow you to execute any command line script to toggle your Rig PTT line.

In the above example, the `toggle-ptt` script will be called with the `-p 17` and `-s` parameters on transmit. The `%1` in the above command will be replaced with `"on"` or `"off"` depending on the state of the PTT. If you do not add a `%1` in your command, `"on"` and `"off"` will be appended to the end of the command for invocation.

6.23.1 Example

- If you define your PTT command as:

  `/usr/bin/ptt %1`

- When JS8Call starts transmitting, it will execute:

  `/usr/bin/ptt "on"`

- When JS8Call has finished transmitting, it will execute:

  `/usr/bin/ptt "off"`

This is particularly helpful for Raspberry Pi / DRAWS when you use the GPIO ports to control your rig PTT. Here is an example script:

```
#!/bin/bash

STATE=$1
PIN=12
if [  $# -le 0 ]; then
    echo -e "\nUsage:\n$0 state \n"
    exit 1
```

```
fi

if [ "$STATE" = "on" ]; then
    echo "toggling gpio $PIN on";
    gpio write $PIN 1
else
    echo "toggling gpio $PIN off";
    gpio write $PIN 0
fi
```

6.24 Frequencies

Most operators using the application can be found ±4-8kHz from the standard FT8 frequencies. It is essential to avoid the main FT8 frequencies, as that will cause confusion among WSJT-X operators. Here are some suggested frequencies to use:

- 160m: 1.842 MHz // 2kHz above FT8
- 80m: 3.578 MHz // 5kHz above FT8
- 40m: 7.078 MHz // 4kHz above FT8
- 30m: 10.130 MHz // 6kHz below FT8
- 20m: 14.078 MHz // 4kHz above FT8
- 17m: 18.104 MHz // 4kHz above FT8
- 15m: 21.078 MHz // 4kHz above FT8
- 12m: 24.922 MHz // 9kHz above FT8
- 10m: 28.078 MHz // 4kHz above FT8
- 6m: 50.318 MHz // 5kHz above FT8
- 2m: 144.178 MHz // 4kHz above FT8

You might notice a few of these being close to the JT9 frequencies. Don't grab your pitchforks, JS8Call blocks out transmitting within the lower 500Hz of the pass-band. This leaves enough room for 25 simultaneous JT9 signals.

You might also notice that there are a few bands missing from this list. JS8Call does not make a recommendation for calling frequencies on 2200 m, 630 m, 60 m, or higher than 2 m, as many of these bands are special cases and have unique rules in many jurisdictions. It is up to the operator to coordinate and determine the best frequency and operating pattern on these bands.

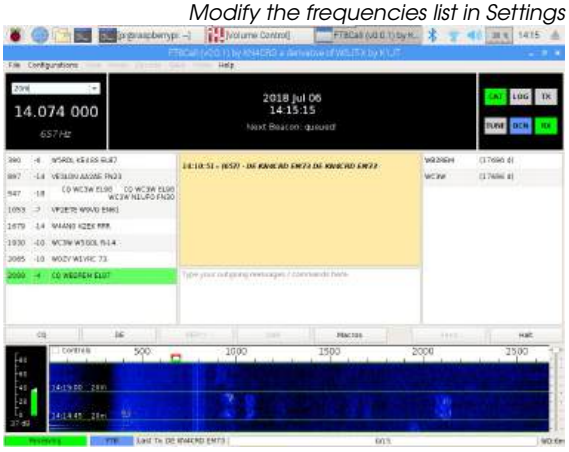
But also, please keep in mind these are only *suggested* frequencies. We all have VFOs, so please use them. Just remember to be good operators and prevent from interfering with other signals on our shared bands.

You CAN type in any frequency. JS8Call will not limit which frequencies you can manually transmit on.

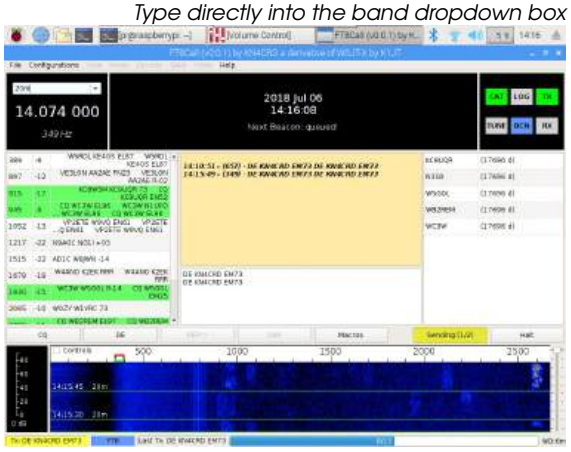
You can use the https://js8call.groups.io/g/main mailing list to schedule on other frequencies with test operators.

If you want to transmit on a non-standard frequency, recommended, you can either modify the frequencies list in the settings, or you can type directly into the band dropdown box in the top left of the screen.

Modify the frequencies list in Settings



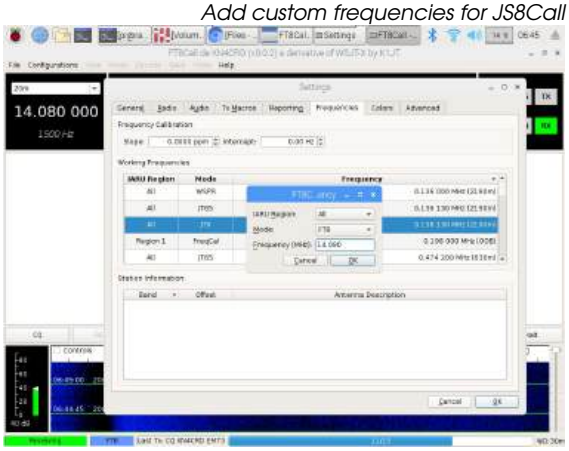
Type directly into the band dropdown box



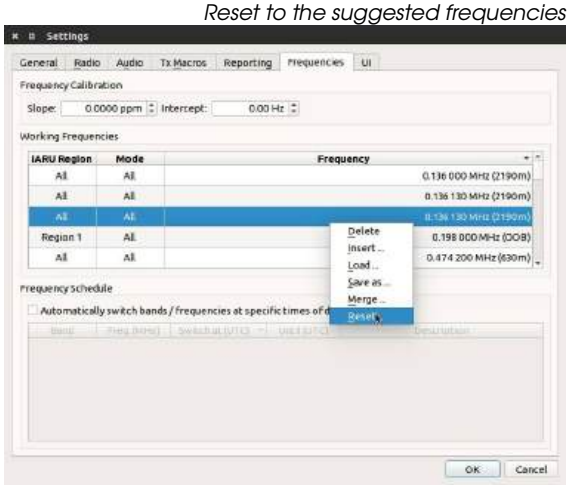
If you would like to add custom frequencies for JS8Call, you can do so in the settings.

If you'd like to reset to the suggested frequencies, right-click the frequencies box and click Reset.

Add custom frequencies for JS8Call



Reset to the suggested frequencies



6.25 Saved Messages (Macros)

There are a few quick saved-message buttons for transmitting common messages. You can edit these in the settings window. Just be mindful that long messages will take a while to send.

Saved messages have macro-like functionality. These are the macro variables, words that are surrounded by <> characters, that can be used in saved messages which will be replaced when sending the message. These macros also apply to configured messages like `CQ`, `Reply`, `INFO`, etc.

<MYCALL>	My Callsign
<MYGRID4>	My 4 digit grid locator
<MYGRID12>	My extended grid locator up to 12 digits
<MYINFO>	My Station Information Message
<MYCQ>	My CQ Message
<MYHB>	My HB Message
<MYREPLY>	My Reply Message

<MYSTATUS>	My Station Status Message
<MYVERSION>	My JS8Call Version
<MYIDLE>	My Station Idle Time (no keyboard/mouse movement)
<CALL>	Selected Callsign
<SNR>	The SNR for the Selected Callsign
<TDELTA>	The time delta for the Selected Callsign

6.26 Tips & Tricks

(1) Be a good citizen—if you see a CQ you should try answering it before calling CQ yourself.

(2) If you hear no CQs, call CQ!

(3) An example QSO:

- →KN4CRD: CQCQCQ EM73 ♢
- ←DR4CNK: KN4CRD SNR +01 GOOD SIGNAL ♢
- →KN4CRD: DR4CNK SNR -12 TU 4 CALL RIG IS KX2 5W DIPOLE ♢
- ←DR4CNK: KN4CRD RR -22 FB KX3 100W VERT ♢
- →KN4CRD: DR4CNK RR FB REALLY ENJOYING THE CHAT MODE WITH LONG MESSAGES. BUT HEY LET'S TRY A RELAY ♢
- … (and on, and on, if you want)
- →KN4CRD: DR4CNK 73 ♢
- →KN4CRD: @ALLCALL QRZ? ♢

(4) You do not need to include your callsign when initiating your directed replies. They will be prefixed to your message automatically when you have a callsign selected in your heard list.

(5) You do not have to reply on the same frequency offset as the caller. But, if you're calling another station off their frequency, you need to include their callsign at the beginning of the the message so it is directed to them and will show up in their yellow directed activity window.

(6) Directed messages pack as much data as standard FT8 frames. The following examples are all one transmit cycle long:

- KN4CRD/P: CQCQCQ EM73 (1 transmit frame)
- VE3/KN4CRD: CQ QRP EM73 (1 transmit frame)
- KN4CRD: @ALLCALL? (1 transmit frame)
- DR4CNK: KN4CRD SNR +15 (1 transmit frame)
- DR4CNK: KN4CRD AGN? (1 transmit frame)

(7) For replying to a station's CQ, double-click their call in the call activity window, then either choose a directed command or type a message to them:

- DR4CNK: KN4CRD HW CPY?
- DR4CNK: KN4CRD SNR +12
- DR4CNK: KN4CRD YES
- DR4CNK: KN4CRD NO
- DR4CNK: KN4CRD RR
- DR4CNK: KN4CRD 73
- DR4CNK: KN4CRD HELLO MY FRIEND GREAT TO HEAR YOU!

(8) You can send free-text at any time. That's what JS8Call was inspired by:

- HI JIM TU 4 CALL UR -12 INTO ATLANTA BTU DE KN4CRD (4 transmit frames)

(9) It might be helpful to learn some of the morse code prosigns and abbreviations: https://en.wikipedia.org/wiki/Prosigns_for_Morse_code. Some examples:

- K —over
- BTU —back to you
- FB —fine business
- HW? —how do you copy?

(10) Generally, you can just type words and sentences and let JS8Call compress it efficiently.

- Now, there *is* a word suggestion feature that marks up your transmission text while you are typing your message, like a spell-check. It will mark words that do not appear in the code dictionary, often weird abbreviations), because counterintuitively, using a lot of abbreviations will often result in LESS efficient transmission.
  - For example
    - Say we transmit "`CONGRATULATIONS AND WELL WISHES FRIEND`". This compresses to 67 bits, for 20 words per minute and 1.76 bits per character, 34 characters, in one transmit cycle.
    - But, let's say you want to be clever and use some weird abbreviations to help it transmit faster... "`CNGRATS ES WL WISHS FRND`" has 10 fewer characters. but compresses to 122 bits, for 10 words per minute and 5.08 bits per character. That's almost twice the bits, and clearly IS twice the number of transmit cycles.

(11) JS8Call imposes minimal restrictions on you, the operator. It is up to you and you alone to abide by or break the rules of your license and jurisdiction.

6.27 Frequently Asked Questions

(1) What is considered a JS8 contact?

- An amateur radio contact is a two-way exchange of information between two stations.

- However, a contact is really what you make of it. It could be minimal information, it could be a 60-minute ragchew. If the contact is for an award or contest, then there are rules for what determines a valid contact.
- Your callsign, a signal report, your name, your location, your rig details, what the weather is like, etc, are all good things to communicate.
- Keep in mind that the free-text nature of JS8 is what makes it valuable. You can exchange *any* information in your contact. If all you're exchanging is your grid and signal report, then FT8 is probably a better option for you.

(2) What are the random three or six characters at the end of relay and ACKed message commands?

- These are a checksum for the message added to ensure all of the message frames were delivered correctly before retransmitting or alerting. If received in its entirety by the receiving station, these checksums will not be displayed to the recipient.

(3) All printable uppercase ASCII characters can be used. Do some take more time to send than others?

- Yes. The characters that are sent in the messages are variably encoded, ranging from 3 to 19 bits in length based on their probability of being used in a sentence. The most common characters take the least amount of space, allowing us to send more than 13 characters per transmission cycle on average.
- For excample: Space and E are only 2.5 bits in length. You could send about 22 (!!) of them in a single transmission. Whereas a character like { is more like 14 bits in length, you could only send 4 of those. In reality, though, how frequently do you use that character?
- Here are some examples of phrases that could be sent in one 15 second transmit cycle:
  - `EEEEEEEEEEEEEEEEEEEEE` (22 characters)
  - `I HAVE EATEN A SHOE` (20 words per minute)
  - `WHICH WAY TO OHIO` (16 words per minute)
  - `NEVER HAVE I EVER` (16 words per minute)
  - `TU UR 599 4A GA` (20 words per minute)

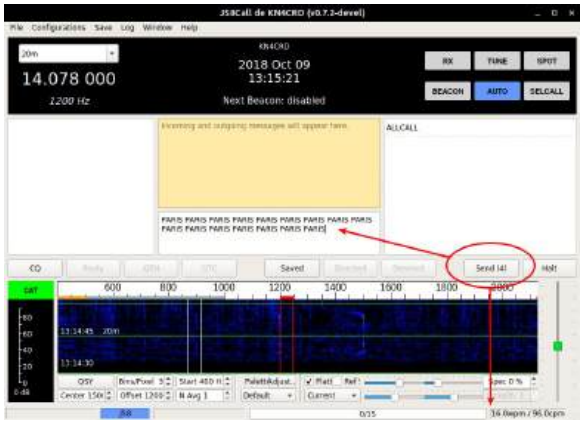
(4) How fast does JS8Call transmit?

- JS8Call normal mode uses the same 15-second transmission cycle as FT8. What is different is that due to the variable encoding of the characters, JS8Call can transmit up to 22 characters per transmission frame. For average sentences, JS8Call can pack words very tightly, at around 15 WPM.
  - For example:

- "WE HOLD THESE TRUTHS TO BE SELF-EVIDENT THAT ALL MEN ARE CREATED EQUAL THAT THEY ARE ENDOWED BY THEIR CREATOR WITH CERTAIN UNALIENABLE RIGHTS THAT AMONG THESE ARE LIFE LIBERTY AND THE PURSUIT OF HAPPINESS"
  - This phrase is 35 words. It would take 10 transmission cycles to send—2 minutes, 30 seconds. That is about 14 WPM.
- "A SUCCESSFUL MAN IS ONE WHO CAN LAY A FIRM FOUNDATION WITH THE BRICKS OTHERS HAVE THROWN AT HIM"
  - This phrase is 19 words. It would take five transmission cycles to send—1 minute 15 seconds. That is just over 15 WPM.
- "THIS IS A TEST OF JS8"
  - This phrase is six words and takes one transmission cycle to send—15 seconds. That is 24 WPM

- Morse code has a neat way of calculating WPM, timing how long it takes to transmit the word PARIS. In JS8Call, PARIS is encoded into 17 bits, 3.4 bits/character. Each transmission cycle can pack up to 69 character bits. That equates to about 16 WPM.

  The app shows this in the status bar.



(5) Isn't 10-20 WPM too slow to have a conversation?

- If propagation is good enough for a faster mode, you should be using it instead! However, with poor conditions like we experience at solar minimum, JS8Call might just be the best balance.
- It may seem really slow, and it is, relatively speaking. However, FT8 modulation is able to theoretically decode down to -24dB below the 2500 Hz noise floor. Not many modes can say this, especially those which transmit at faster speeds. What does this mean? JS8Call may work when other modes cannot.
- We believe that communicating slowly is better than not communicating at all.
  - This is especially true of Morse code. It is far better to send Morse slowly and clearly and be copied the first or second time rather than having to repeat numerous times.

(6) What is the JS8Call Relay Challenge?

- This is a friendly competition to maximize the number of continents one can pass a message back and forth to using the relay command.
- We'll be giving away an award (and prize) to the first team of operators to successfully relay a message from one continent across three other con-

tinents (NA, SA, EU, AF, AS, OC, AN) and relay an ACK back to the original station using JS8Call. All you need to do is submit your logs from each station and optionally photographic or video documentation of your effort.

- For example, this is what the outgoing and incoming messages could be:
  - `KN4CRD>LB9YH>VK1MIC QSL?`
  - `VK1MIC>LB9YH>KN4CRD QSL`

(7) Does Heartbeat (HB) mode violate FCC 97.221 Automatically Controlled Digital Station rules in the United States?

- For operators in the United States, here's a reference to the rules:

  http://www.arrl.org/part-97-text

- With this, keep in mind:
  - The control operator is responsible for the station operation. The software makes a best effort to require a human to be present during operation: HB off by default, a watchdog timer feature built-in, etc. It is up to the operator to make sure they are in compliance with the rules of their jurisdiction.
  - Responses to directed queries by non-automatic stations fall under §97.221.C.1 exemption.
- Standard recommended practice for operators is to turn off HB repetition when not at the station control point; but, they should feel comfortable leaving AUTO on while they are away since their station would only be responding to queries initiated by a non-automatic station.

(8) Do message relays (>) violate FCC 97.113.d rules in the United States?

- For operators in the United States, here's a reference to the rules:

  http://www.arrl.org/part-97-text

- Some background:
  - Repeater stations (definition 40) are stations which re-transmit radio signals simultaneously on a different frequency.
  - Message forwarding systems (definition 32) are explicitly allowed in FCC 97.219.
- JS8 message relays do not automatically retransmit radio signals on the same or a different frequency. Doing so would make the function a repeater. Instead, the JS8Call software cooperates in a message forwarding system, creating a new message to be forwarded via new radio signals. These new signals include the original message, a checksum of the message, and the relay path back to the originating station.

(9) Why isn't my station responding to `@ALLCALL`?

- Previous versions of JS8Call (FT8Call) had a directed message of `@ALLCALL?`, that had stations return `SNR` reports automatically. This has

been replaced, starting in version 0.7 of JS8Call, with HB and ACKs. Stations will no longer respond to the `@ALLCALL?` Query.

- You can produce a similar query by issuing the command:

  `@ALLCALL QUERY CALL [callsign]?`

  …. Please acknowledge that you can communicate with [CALLSIGN].

(10) Why isn't my station acknowledging (ACK) other heartbeats (HB)?

- You have to turn on HB Acknowledgments and have AUTO enabled to ACK other stations. This means, the order of operations are:
  - Turn on AUTO
  - Right click HB, select "`Send Heartbeat Acknowledgments`"
  - Your station will now ACK other heartbeats, assuming you don't have anything selected.

(11) Can I run multiple copies of JS8Call side-by-side?

- Yes! There is a `-r/--rig-name` flag you can pass on the command line to give each instance a unique name. This creates a separate directory for your configuration and log files, so you can run multiple rigs at the same time.
  - You can do this by running JS8Call from the command line with this parameter, like:

    `js8call --rig-name FT817`

  - Or, if you are on Windows, create a shortcut for each unique name/config:
    - Create a shortcut to JS8Call on your desktop.
    - Right click and select properties.
    - Under the "`General`" tab edit the name of the shortcut with a unique name, like "`JS8Call FT817`".
    - Under the "Shortcut" tab add this to the target line.

      Leave a space after .exe then `--rig-name=FT817`

      Replace `FT817` with anything that uniquely identifies your rig

      Something like:

      `C:\Program Files (x86)\js8call\bin\js8call.exe --rig-name=FT817`

(12) Can I use group callsigns to run a net?

- Yes! You would do so by announcing which group callsign your net will be using. If you do not want to use a custom group, `@NET` is sufficient.
- All stations who will participate in the net will need to add the group callsign to their station configuration.

- To facilitate fast check-ins, you can issue an SNR? command to the group and log the replying stations as checked-in.

(13) What does the decoder sensitivity actually do?

- Great question. Decoder sensitivity setting determines how much time will be spent on decoding during a decoding cycle. Each sensitivity level changes the behavior of the decoder somewhat:
  - (1x) One Decode Pass — The decoder will do one pass using belief propagation and try to decode any signals it detects.
  - (2x) Two Decode Passes — The decoder will subtract any signals that were decoded in the first pass and try again.
  - (3x) Three Decode Passes — The decoder will perform three subtraction passes using belief propagation with ordered statistics
  - (4x) Four Decode Passes — The decoder will perform four subtraction passes using belief propagation with ordered statistics.
- NOTE: You may have to run with a lower sensitivity if you have a low power machine or if your CPU cannot keep up with the decoder.
- NOTE: Higher sensitivity levels that use ordered statistics have a higher chance of producing a "false decode" — noise that matches the sync pattern and passes the checksum process. This trade-off is intentional. If you would like to avoid false decodes, you can decrease your sensitivity to 1x or 2x.

6.28 Troubleshooting

If you are having trouble, head over to the troubleshooting chatroom for help:

- https://groups.io/g/js8call

6.29 Common Problems & Solutions

6.29.1 JS8Call will not run on my system

Make sure you are running a supported operating system, that you have disabled any programs that may be using your audio device, or preventing JS8Call from using the audio device… like an aggressive antivirus. If you're running Windows, and have a Windows Defender running, you'll need to either whitelist JS8Call or turn off the defender.

6.29.2 I see signals on the waterfall, but I cannot decode them

Make sure the signals you are seeing are actually JS8Call signals and not FT8 signals, they are incompatible, by ensuring you're on one of the JS8Call frequencies. Make sure you are in Upper Sideband (USB) mode. Make sure you have synchronized your clock to within 2 seconds of UTC. Make sure you're not runnin WSJT-X at the same time.

6.29.3 I do not see any signals on the waterfall

Check your incoming audio from your rig. Make sure you have JS8Call audio configured correctly. That means allowing JS8Call to access the "*microphone*" in the system privacy settings and making sure the levels are set correctly.

Check to make sure you are on one of the JS8Call frequencies. Keep in mind that JS8Call is still in development and has more than an order of magnitude fewer operators on the air. There may actually be nobody on within your reception range. Check PSKReporter to see if there are others on the band. If you still cannot see any signals, either:

(1) You have an RX problem with your station

(2) None of the operators are operating on the band you are on

(3) Or propagation isn't being friendly to you

NOTE: Keep in mind that JS8Call isn't magic... we're still at the mercy of the ionosphere.

6.29.4 My rig won't transmit

- Check your outgoing audio to your rig.
- Make sure you have JS8Call audio configured correctly.
- Unplug the rig from the computer and hook up the computer output to a set of headphones or speakers. Try to transmit, maybe with the TUNE button in the app. Can you hear the tones? If not, then you have an audio problem, if so then you have a transceiver problem.
- Make sure your PTT is configured correctly for your rig or use VOX. You can test this in the settings. The PTT button will turn green if it can key your transmitter. If you have audio into the rig, but still have no RF out, make sure you have your rig configured correctly by checking your digital gain / tx gain / mic levels. After that, make sure your rig works... switch over to FM or CW and send a carrier to make sure the rig can actually transmit at all.

7 Glossary

AF.....Africa
AGC.....Automatic Gain Control
ACK.....Acknowledge
ADIF.....Amateur Data Interchange Format
ALC.....Automatic Level Control
AMMRON.....American Redoubt Radio Operators Network
https://en.wikipedia.org/wiki/American_Redoubt
AN.....Antarctica
API.....Application Programming Interface
APRS.....Automatic Packet Reporting System
APRSIS.....APRS Internet Service
ARES.....Amateur Radio Emergency Service
ARRL.....Amateur Radio Relay League.
AS.....Asia

ASCII.....American Standard Code for Information Interchange
CAT.....Computer Aided Transceiver
CMD.....Command
CPU.....Central Processing Unit
dB.....Decibels
EMCOMM.....Emergency Communications
EU.....Europe
GNU.....Gnu is Not Unix
GPS.....Global Positioning System
HF.....High Frequency radio spectrum: 3 to 30 MHz.
IOTA.....Islands On The Air: https://www.iota-world.org/
LSB.....Lower SideBand
MARS.....Military Auxiliary Radio System: https://en.wikipedia.org/wiki/Military_Auxiliary_Radio_System
MFSK.....Multiple Frequency-Shift Keying
NA.....North America
OC.....Oceana
PC.....Personal Computer
PDF.....Portable Document Format
POTA.....Parks On The Air: https://parksontheair.com/index.html
PSK.....Phase Shift Keying
PTT.....Push-To-Transmit (Talk)
QMX.....**Q**RP Labs **M**ultimode **X**cvr
QRO.....Telegrapher's Q-Code directing increase in power. Also, any power setting above QRP.
QRP.....Q-Code—Lower Your Power; or low-power radio communications.
QSB.....Your signal is fading or, equivalently, I am experiencing fading.
QSL.....Telegrapher's Q-Code: I received your last transmission
QSO.....Communication with another operator
QSY.....Change Frequency to (followed by frequency number)
QTH.....Telegrapher's Q-Code shorthand for station geographic location.
RACES.....Radio Amateur Civil Emergency Service: https://en.wikipedia.org/wiki/Radio_Amateur_Civil_Emergency_Service
RADAR.....Rapid Deployment Amateur Radio: https://groups.io/g/RaDAR
RAYNET.....Radio Amateurs Emergency Network: https://en.wikipedia.org/wiki/Radio_Amateurs_Emergency_Network
RF.....Radio Frequency
RFI.....Radio Frequency Interference
RTTY.....Radio Teletype
SA.....South American
SMS.....Short Message Service: A standard protocol used for sending text messages, typically up to 160 characters, between mobile phones and other devices.
SMSGTE.....SMS Gateway To Email: Name of the service that acts as a gateway, letting amateur-radio operators exchange SMS texts and APRS or e-mail messages. In practice, SMSGTE receives an APRS packet, forwards it as an SMS to a cellular phone, and can also take an incoming SMS and deliver it to the APRS network.
SNR.....Signal-to-Noise Ratio in dB.

SOTA.....Summits On The Air: http://www.sota.org.uk/
SSB.....Single SideBand
UI.....User Interface
URL.....Universal Resource Locator
USB.....Upper SideBand
USB.....Universal Serial Bus
UTC.....Coordinated Universal Time: https://en.wikipedia.org/wiki/Coordinated_Universal_Time In 1967 the CCIR adopted the names Coordinated Universal Time and Temps Universel Coordonné for the English and French names with the acronym UTC to be used in both languages. The name "Coordinated Universal Time (UTC)" was approved by a resolution of IAU Commissions 4 and 31 at the 13th General Assembly in 1967 (Trans. IAU, 1968).
VFO.....Variable Frequency Oscillator
W.....Power rating in Watts
WFD.....Winter Field Day
wpm.....Words Per Minute
WPM.....Words Per Minute
WWV.....Shortwave time signal: https://en.wikipedia.org/wiki/WWV_(radio_station)

8 Revision History

Release: Edit and reformat the official documentation for easy reading and comprehension, remove dead links, consolidate data from external references where appropriate, and incorporate lessons learned during field operations.

8.1 Revision-1

i. Added a revision history.

ii. Added paragraph 2 Document Applicability.

iii. Added details about sound notifications to paragraphs *6.1.1.3 Audio Tab* and *6.1.1.7 Notifications Tab*.

iv. Added paragraph 6.16.3 Beware Mode Speed.

v. Clarified paragraph 6.10.1 Indicators description related to the appearance of the telephone icon.

vi. Added speculative interpretation to paragraph 6.13.1 Standard Messages.

vii. Added explanation of the ALL-TXT log file to paragraph 6.18 LOG—Station Log, and recommendation to periodically erase the file contents.

8.2 Revision-2

i. Added the following data to the document properties Description-tab: Title, Subject, Keywords, and Comments.

ii. Changed the page-header text to a Title-field that pulls the document title from the document properties.

iii. Inserted above the Table of Contents a cross-reference active-link to the latest revision heading text.

iv. Paragraphs 6.1.1.3 & 6.1.1.7 : Explicitly referenced the related figure to which user settings will differ.

v. Paragraph 6.10.1 : Reworded the telephone-icon description for clarity.

vi. Paragraph 6.16.3 : Corrected a typo and clarified use of ChatGPT.

vii. Paragraph 6.18 : Removed superfluous verbiage.

8.3 Revision-3

i. Added paragraph 6.15 Standard Operating Procedure.