HF QRP SDR TRANSCEIVER

Chinese Clone uSDR/uSDX

Manual

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IN THE PUBLIC DOMAIN

Disclaimer:

I'm just a hobbyist. I'm not an engineer, nor am I an expert on the uSDR/uSDX family of projects. I'm not the right guy to make this manual, I am only an operator. Don't follow my advice blindly. Use this information as a starting point, not as a definitive source. I am not responsible for damaged equipment or operators. By retaining this manual, you agree to use it at your own risk.

Purpose

Much of the technical ground relating to clone uSDR/uSDX derived radios is covered, in various locations on the internet. The general use and configuration for individual clone radios is lacking. The goal of this manual is to attempt to cover operational ground that is missed or fragmented.

This is a "makeshift manual" in every way that matters. I have attempted to post only information that I've verified myself, and only information where I have some level of understanding. There may be enormous gaps. But, they won't be as enormous as the void that I found when I started with this radio.

If you have additional information you'd like to add, please send it to the address on my QRZ.com page. If you'd like to be credited, please include that request with the info, and I'll add it to this document.

Clone Style

This manual covers only the specific clone style that I am in possession of, which is pictured below:

This manual was written based on a firmware revision 1.02 device, with the ports as pictured, and the buttons in the horizontal configuration.

Buttons & Encoder

This unit has three buttons, and an encoder with push button, for a total of four buttons. Some units have a secondary red PTT button located on the side. For ease of reference, the buttons are numbered and described herein as:

Button Description	Manual Ref	Operation
MENU	(1)	From VFO = Enter menu mode From Menu = Modify selected menu entry From Modify = Exit to VFO
MODE	(2)	From VFO, Single Press = Cycle between modes From VFO, Double Press = Change Filter BW From VFO, Long Press = Change RIT From Menu = Exit to VFO From Modify = Return to Menu
PTT	(3)	In USB/LSB, used for TX In CW, press and hold to see readout of power out and SWR
(encoder)	(4)	Rotate to adjust VFO frequency, and navigate through menu options From VFO, Single Press = Decrease VFO tune rate From VFO, Long Press = Increase VFO tune rate From VFO, Double Press = Switch to next band From VFO, Press & Hold & Rotate = Adjust volume From Menu = Modify selected menu entry From Modify = Save entry

Menus

Menu options may differ based on the firmware on a particular unit. Some items may be missing on your radio, or additional items may be present. Menu item numbers may differ.

Menu Item	Description
Section 1	*General Settings*
1.1 – Volume	Adjusts the volume
1.2 – Mode	Select the TX mode (USB/LSB/CW; Some units may have AM/FM options)
1.3 – Filter BW	Set the Filter Bandwidth (Full/3000/2400/1800/500/200/100/50)
1.4 – Band	Select the working band
1.5 – Tune Rate	Set the tune rate (1Hz – 10M)
1.6 – VFO Mode	Select VFO A/B
1.7 – RIT	Enable/Disable Receiver Incremental Tuning; Value adjusted by long press (2)

1.8 – AGC	Set Automatic Gain Control (OFF/FAST/SLOW)
1.9 – NR	Noise Reduction (0-8)
1.10 – ATT	Attenuator (Analog, 0db – 73dB in increments)
1.11 – ATT2	Attenuator 2 (Digital in CIC, 0-16 in 6dB increments)
1.12 – S Meter	Select S-Meter display type (OFF, dBm, S number, S bar, or show cw wpm)
1.13 – SWR Meter	Select SWR meter display (OFF, FWD-SWR, FWD-REF, VFWD-VREF); Meter visible when holding (3) in CW mode
Section 2	*CW Settings*
2.1 – CW Decoder	Enable built-in CW decoder (OFF/ON)
2.4 – Semi QSK	Enable QSK operation (OFF/ON)
2.5 – Keyer Speed	CW keyer speed (1-60 Paris wpm)
2.6 – Keyer Mode	Set keyer mode (Iambic-A, Iambic-B, Straight)
2.7 – Keyer Swap	Swap DIH/DAH on keyer input (OFF/ON)
2.8 – Practice	Practice mode disables TX on keyer down (OFF/ON)
Section 3	*Transmit Settings*
3.1 – VOX	Enable voice activated transmit (OFF/ON)
3.2 – Noise Gate	Threshold for VOX and SSB voice transmit (0-255)
3.3 – TX Drive	TX audio gain (0-8 in 6dB increments); 8 = constant amplitude in SSB
Section 4	*Auto CQ in CW Mode*
4.1 – CQ Interval	Idle time between CQ transmissions (0-60 seconds, 0=auto-repeat disabled).
4.2 – CQ Message	Characters (up to 48) to send for CQ; Press (1) to start transmitting. Note that for some firmware versions, the message must start with the letters "CQ" to trigger auto-repeated transmissions (if enabled by setting menu item 4.1 > 0).
Section 8	*RX and TX Fine Tuning*
8.1 – PA Bias Min	Power Amp Bias Minimum, amplitude PWM level (0-255), representing 0% of RF output (set by experimentation, suggest starting at 0-20)
8.2 – PA Bias Max	Power Amp Bias Minimum, amplitude PWM level (0-255), representing 100% of RF output (set by experimentation, suggest starting at 128-180)
8.3 – Ref Freq	Si5351 crystal frequency for calibration
8.4 – IQ Phase	RX I/Q phase offset (0-180 degrees)

SWR Meter

On initial operation, it is not immediately clear how to access the SWR Meter. Values are only displayed in a very specific TX configuration.

To operate the SWR Meter, first make sure it is enabled in the menu (option 1.13). Ensure your Keyer Mode is set to "Straight" and Swap is OFF. Next, set your operating mode to CW, then press and hold PTT (3). The top half of the display should now show your power output and your SWR, as pictured below:

Power Output

These radios are often advertised for either 5W or 10W output. In some cases, you'll see one listing that is advertising both 5W and 10W. Normally, the 10W claim is expressed as only being possible using an external 13.8V power source. The screen captured in the SWR Meter section above was on internal battery power. The same band, battery, and other conditions will yield a value anywhere between 4.6W and 10.15W, on my radio, with some randomness. Your mileage may vary.

To impact your output power, you'll need to experiment with the PA Bias settings (8.1 and 8.2). A source online put it this way: "The amplitude of the composite signal controls the power supply voltage of the PA, thereby controlling the envelope of the SSB signal. The key shaping circuit is controlled by a 32kHz PWM signal, which can control the PA voltage between 0 and 12V in 256 steps, thereby providing a dynamic range of (log2(256) * 6 =) 48dB in the SSB signal."

Elsewhere online, you learn that to maximize your power output, you should increase the PA Bias Max setting in increments of 5, starting at 128, until your output power remains stable even when increasing the PA Bias Max value. That is to say, if you are getting 7W output at a PA Bias Max setting of 195, and it remains at 7W even when you increase that setting to 200 or higher, then dial your PA Bias Max back to a maximum of 195. I have read that the PA Bias Min is not as critical, but I have seen it set anywhere from 10 to 65. I tend to use a value of 20.

Apparently, these value vary, and should be tested on your unit to find the optimal settings. I tend toward running at less than maximum values, since I don't know everything I ought to about the device.

Digital Modes

These radios are programmed with digital frequencies on band switch, ideal for digital operation.

Digital Audio In/Out

ATTENTION: Pinouts may vary between different iterations of the uSDX clones! It is highly recommended that you disassemble your mic and trace your pinout to verify.

I use a standard TRS→TRS audio patch cable between a USB sound card's microphone port and the radio's SPK port, and a custom TRS→TRRS cable to connect the USB sound card's headphone port to the radio's MIC port. My version is wired:
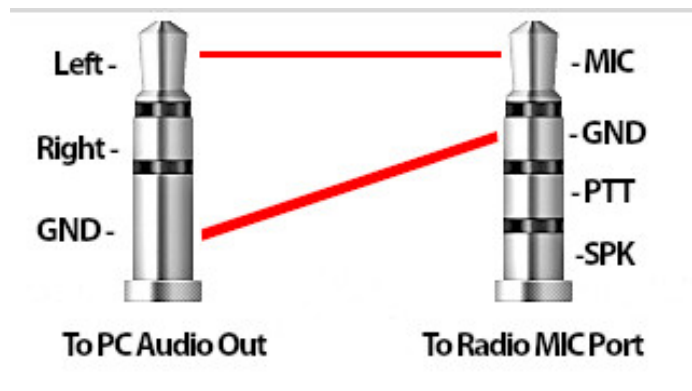
Operator GM4DSO reports a different configuration for his custom TRS→TRRS cable. His version is wired:
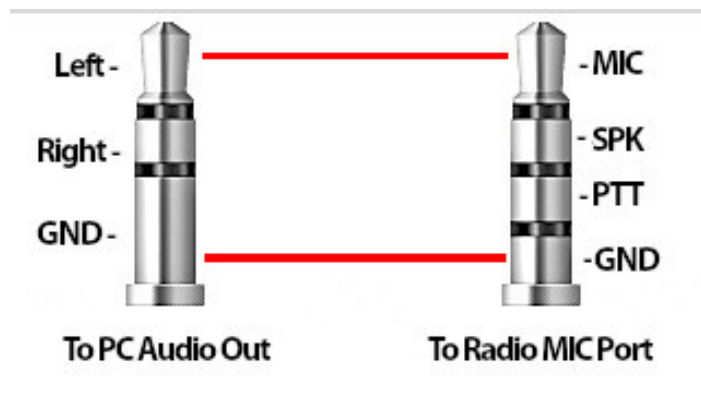

Note that programs like wsjtx and JS8Call will let you select both/left/right channel for output and input.

For the USB sound card, I use the following cheap ones, which can be had on Amazon for about $3/ea when purchased in a three-pack. These have separate input/output jacks:

Watch your audio levels on the radio and the sound card, as you have no galvalnic insulation between the two! If you prefer something safer, I highly recommend the KF5INZ "Easy Digi" card from eBay:
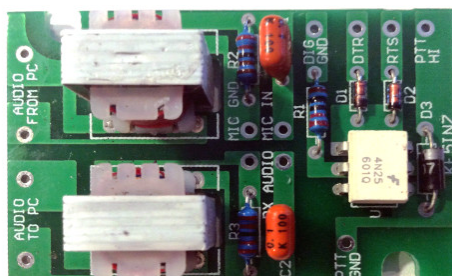
VOX Operation

Menu options 3.1 and 3.2 will enable VOX and set the audio threshold for activating it. I set my Noise Gate to 30, but could possibly get away with a different value. If VOX gets stuck ON, then try a higher number. If your audio source can't activate VOX, adjust your output volume at the source or try a lower number.

Be careful when enabling VOX, especially if you have a hand mic with built-in speaker. Thankfully, the VOX option resets to OFF when you power cycle the radio, so if anything goes wrong, you can turn it off and try again.

The VOX operation on this radio is surprisingly rapid. It works well for digital modes, including modes that require speed, like WinLink/VARA.

CAT Control

So far, I can't get CAT control working. I've tried on Windows and Linux, using different USB/TTL adapters, different RX/TX CTS/RTS pinouts, different baud configurations, and different software (flrig, wstjx, js8call, Omnirig, HRD, etc). No luck anywhere.

One particular error leads me to believe that my firmware isn't up to speed for CAT control. Hamlib reports that the "get_id" command of the TS-480 command set isn't returning a value. It seems to communicate, but doesn't like what it's getting back (or not getting back).

Continuing along that line of thinking, I installed interceptty and watched the serial port traffic. I could see flrig sending the correct TS-480 CAT commands, but the radio was not responding. I could also see some garbage from the i2c, which shares the port.

I'll continue to fiddle with this, and post any useful findings. For now, it's manual tuning and VOX.

Example JS8Call Settings

The following setup procedure works for me using JS8Call. Settings in wsjtx would probably be similar. These settings use VOX and no CAT control.

Connections	Power off your radio, then connect the audio cables to MIC and SPK as described above. Plug your USB sound card into the PC. All connections should be completed.
Power On	Power on only after all cable connections are complete. Select your band. Tune your tuner and check your SWR.
JS8Call Settings	Set rig to None, and PTT to VOX. Select the correct audio devices for input and output, making sure to select the correct channel(s); input left, output both. Ensure that your radio sound card is NOT set as the notification sound card. You should see activity on the waterfall. Set your output slider to -15dB to start. Manually select the correct band.
Radio Menu Options	Set Volume to +9 or +10; adjust as needed to get your JS8Call level around 60dB. Mode should be USB, filter FULL, RIT off, AGC Fast, NR 0, ATT 0dB, ATT2 set between 0-2, VOX on, Noise Gate between 15-30 or as needed, TX drive 5, PA Biases as noted in the Power section above. Make sure your frequency matches the one shown in JS8Call.
PC Audio	Adjust levels as needed.

Port Pinouts

Verified

KEY	TRS = DAH, DIT, GND (DAH/DIT can be reversed in the menu)
MIC	TRRS = MIC, GND, PTT, SPK or alternate TRSS = MIC, SPK, PTT, GND
SPK	TRS = RIGHT, LEFT, GND (mono signal present on both R and L)

Unverified

PA	TRS = PTT, NC, GND
UART	TRRS = RX, TX, NC, GND (NC could possible be an optional RTS. Note, you have to swap these to interact with your serial device, i.e. RX to TX, RTS to CTS, etc.)

Hand Mic Wiring

If your unit came with a hand mic and that mic is working properly with the radio, I recommend opening it up and checking out the wiring, to verify your MIC port pinout. Mine looks like this, with TRRS = MIC, GND, PTT, SPK:

Other users report varying pinouts. The mic is much easier to open than the radio itself, and the pin configuration is often silk screened on the PCB. Use a multi-meter to trace the wires to the TRRS head to determine your pinout.

End Notes

The above information was gleaned from my experience with the radio, people contacting me about this manual, and internet sources. I take no credit, but am happy to give credit to whoever contributes. Special thanks to GM4DSO and WB4JHS for their contributions and testing.

Contact me through QRZ.com with any questions or additional information, and I'll help if I can. It is worth reiterating that the disclaimer at the beginning of this document is there for a reason; I can't guarantee any information herein. It is strictly informational, public domain, and for use at your own risk.

73, Joe KF7MIX