

SDR-TRX-Readme

February 15, 2024

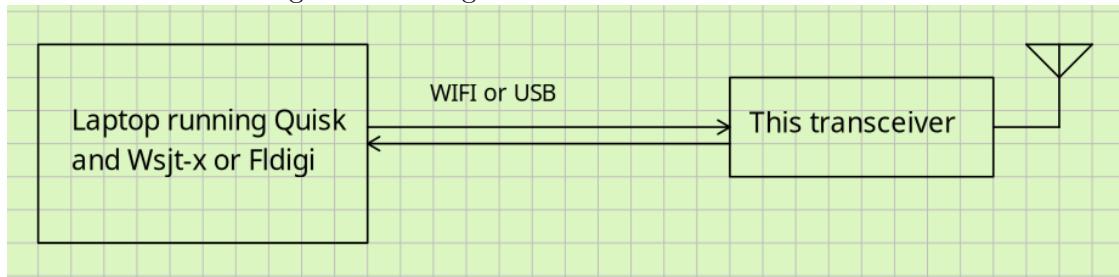
1 SDR-TRX Digital Modes Transceiver, 2024

1.1 Philosophy and Design Goals

This SDR is a prototype hardware platform to assist in developing a transceiver for digital modes (FT8, JSTcall, WSPR, CW, etc) that do not require linear amplification like SSB. This is designed for amateur radio enthusiasts who view their hobby as an avenue for experimenting, who like building things, have an interest in HF radio propagation. The idea is to use a laptop and mainstream (actively maintained) existing software as the display and for the DSP needed. The hardware described here will fill out the rest of the transceiver. The assumption is that most hams will have a PC of some kind already, and this is an easy and cheap way to get on the air using the digital modes and their PC. I am also using this as a platform to demonstrate to my students how to do an electronic design project. It is hoped a transceiver based on this prototype platform will be inexpensive enough that third-world hams or those with few funds to spend on their hobby would find attractive. This project is built using designs previously published and would not be possible without them. The next section is meant to be a short review of some of the projects I found especially useful. ### Previous Work ##### Especially Relevant Work * [WSJT-Transceiver](#) * [Quisk SDR Software](#) * [WSJT-X Low S/N Digital Mode Decoding Software](#) * [Fldigi](#) * [DL2MAN Sandwich](#) * [PE1NNZ uSDX](#) * [A Comparison of Affordable Self-Assembled SDR Receivers](#) * [QRP Labs QDX Transceiver](#) (This transceiver is quite similar.) ##### More General but Useful Work * [Easy-Transceiver](#) * [Etherkit JTEncode](#)

1.1.1

The basic block diagram showing how this SDR interfaces with a PC is shown below.



A clone of the Silicon Labs, Si5351a, the MS5351M is used as the local oscillator for the QSD down converter. The resultant audio frequency data is sent to the PC where Quisk demodulates it and sends it on to WSJT-X or Fldigi for decoding. The MS5351M's third oscillator is used to generate the digital signals on transmit. These signals are amplified by a class E circuit for the 20-meter band. Throughout the unit, there are features that provide stepping stones toward the final goal.

For example, an output is provided to allow the sound data to be sent to the PC where a sound card on the PC converts the sound signal to digital samples. A Raspberry Pi Pico or Pico W is used on the SDR to control the MS5351M local oscillator and exciter, sample the receiver audio data using a PCM1808 ADC, and send the sampled data to the PC for processing. It also receives transmit data from the PC to allow transmission of the digital signals desired.

The Kicad project SDR-TRX contains the hardware documentation, including the schematic diagram and the printed circuit board. The software is still in development.