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Country
Wireless**



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Cross Country Wireless SDR-4+ Interface Specification

version 1.0

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1 Introduction

The Cross Country Wireless SDR-4+ receiver is a HF/VHF SDR receiver covering 850 kHz to 70.5 MHz.

It is a high performance receiver with a typical minimum discernable signal of -135 dBm and an input IP3 figure of +10 dBm.

It is a zero or near zero IF downconverter with built in 48 kHz sampling rate USB audio codec soundcard to provide an I/Q base band output.

The receiver local oscillator uses a Silicon Labs Si570 programmable VCXO controlled via USB from an external program.

The output from the Si570 oscillator is divided by four in a Johnson counter circuit to provide four local oscillator signals at 0, 90, 180 and 270 degree phase shift for the balanced RF switching mixer.

RF bandpass filter switching is automatically controlled with a microcontroller from frequency data supplied to the Si570 oscillator.

When the original SDR-4 receiver was designed in 2011 it was designed as a general purpose amateur bands HF receiver. Most SDR software available for radio amateurs at that time was designed to work with the early SoftRock HF receivers available in kit form. Versions of these receivers used the Si570 oscillator and firmware had been written to control the Si570 with a Atmel microcontroller. Cross Country Wireless licensed the firmware for use in the SDR-4 and SDR-4+ receivers to ensure compatibility with a wide range of existing SDR software.

The continual development of the SDR-4+ has extended the frequency range and RF performance of the receiver so that it now meets the requirements for many professional applications outside the amateur radio enthusiast market.

Cross Country Wireless works with software authors to enable compatibility of the SDR-4+ receiver with their software by offering SDR-4+ receivers at discount rates, technical support and private beta testing of new software on CCW products.

It may be of interest to note that any software written to work with the SDR-4+ will also work with the original SoftRock kit receivers.



2 I/Q audio specification

The Cross Country Wireless SDR-4+ uses a Texas Instruments PCM2906C USB audio codec sound card to act as an analog to digital converter. Earlier models up to serial number 0250 used the Texas Instruments PCM2900B IC.

From the TI data sheet for the PCM2906C:

“The PCM2906C is Texas Instruments' single-chip, USB, stereo audio codec with a USB-compliant full-speed protocol controller and S/PDIF. The USB protocol controller requires no software code. The PCM2906C employs SpAct™ architecture, TI's unique system that recovers the audio clock from USB packet data. On-chip analog PLLs with SpAct enable playback and record with low clock jitter, as well as independent playback and record sampling rates. ”

The PCM2906C (and earlier PCM2900B) use native USB drivers in Windows, Linux and Mac so it does not require any additional software or driver support. The PCM2906C appears as an extra sound card on the PC usually with the name “USB AUDIO CODEC”.

The data sheet on the PCM2906C is available from the TI web site:

<http://www.ti.com/product/pcm2906c>



3 Frequency control specification

The SDR-4+ uses an Atmel microcontroller as a USB port to receive frequency control data from the PC, switch the required RF band pass filter for the frequency of operation and send I²C data to the Si570 programmable VCXO.

The USB port uses a driver based on the open source LibUSB-Win32 software.

For Windows PC an installer program is supplied on a CD disc with the receiver to install the USB driver and driver root certificate.

Linux PCs already have native support for the LibUSB driver.

Most Windows SDR programs use the ExtIO_Si570.dll file included on the CD disc with the receiver. This DLL file was designed to be used to interface with the WinRad SDR program. The WinRad program source code was donated as freeware by the developer when he finished development and it has been used as the basis of several other SDR programs such as HDSDR, WRPlus, Studio1.

More information on the ExtIO_Si570.dll available here:

http://pe0fko.nl/ExtIO_Si570/

The WinRad specification for the external I/O DLL is available from this web page:

http://winrad.org/bin/Winrad_Extio.pdf

Only the SetHWLO command is used to send frequency changes to the SDR-4+.

More information on the firmware used in the Atmel microcontroller (v15.15) is available from this web page:

<http://pe0fko.nl/SR-V9-Si570/>

Linux PCs can use the usbsotrock utility to control the SDR-4+ frequency. More details from their web page:

<https://code.google.com/p/usbsotrock/>