



WR-G33DDC Excalibur Pro

Overview

The WinRADiO WR-G33DDC 'EXCALIBUR Pro' is a high-performance, low-cost, direct-sampling, software-defined, shortwave receiver with a frequency range from 9 kHz to 49.995 MHz. It includes a *real-time* 50 MHz-wide spectrum analyzer and 4 MHz-wide instantaneous bandwidth available for recording, demodulation and further digital processing.

The receiver's superior performance results from its innovative, direct-sampling, digital down-conversion architecture along with the use of leading-edge components and design concepts. These all result in a very high IP3, wide dynamic range, high sensitivity, and accurate tuning. These key features create a receiver in a class of its own, with wide application potential, at a very affordable price.

The entire 4 MHz DDC (digitally-down-converted) bandwidth is available for recording and demodulation. Three demodulators allow the simultaneous reception of three signal frequencies within the 4 MHz bandwidth.

Features

- 9 kHz to 49.995 MHz continuous frequency range
- Direct sampling
- Digital down-conversion
- 16-bit 100 MSPS A/D converter
- 50 MHz-wide, real-time spectrum analyzer
- 4 MHz recording and processing bandwidth
- Continuously adjustable filter bandwidth down to 1 Hz
- Three parallel demodulator channels
- Pause function
- Waterfall display functions
- Audio spectrum analyzer
- Audio and IF recording and playback
- Recording with pre-buffering
- EIBI, HFCC and user frequency databases support
- Very high IP3 (+31 dBm)
- Excellent sensitivity (0.20 μ V SSB, 0.10 μ V CW)
- Excellent dynamic range (107 dB)
- Excellent frequency stability (0.5 ppm)
- Selectable medium wave filter
- User-configurable preselector
- Selectable low-noise preamplifier

- Test and measurement functions
- USB 2.0 interface

The receiver's robust front-end is equipped with an ultra-high-linearity amplifier which results in exceptional strong-signal

performance. This already robust front-end is further enhanced with a user-selectable preselector that can operate either in a fully automatic or user-configurable mode. As many as 119 different filter combinations can be constructed by the user (91 bandpass, 14 low-pass and 14 high-pass). The front-end employs 34 subminiature electromechanical relays (rather than often used but distortion-prone semiconductor switches) to ensure high dynamic range.

A user-selectable low-noise preamplifier provides additional sensitivity for the receiver to be able to extract even the weakest signals from noise.

An advanced dithering technique eliminates spurious signals without significantly increasing the receiver's noise floor. The superior 16-bit 100 MSPS analog-to-digital converter provides exceptional performance over an extremely wide range of signals.

Graphical User Interface Software

The WR-G33DDC software provides an elegant and logical user interface. There are several spectrum analyzer configurations including the 50 MHz full span with 1.5 kHz resolution. The fully-zoomable display can be viewed in either the standard or waterfall mode.

The down-converted portion is highlighted and can be selected either via keyboard or by the mouse cursor and then displayed in another window, within which three independent receiver channels can exist. For any channel, the receiver's selectivity, IF shift, passband tuning, notch, and other functions can be adjusted, and the audio spectrum of the demodulated signal can be observed.

In spite of the receiver's ground-breaking architecture, the software still remains simple and intuitive to use, containing all the features generally expected in modern receivers such as noise blanking, memories, scheduler, squelch (level, voice or noise activated), numerous tuning options, and a wide choice of demodulation modes, including user-defined and optional DRM mode.

The digital down-converter provides 24 selectable output bandwidths ranging from 20 kHz to 4 MHz. The receiver's selectivity can be adjusted with 1 Hz resolution. The bandpass audio filter's low and high cut-off frequencies are graphically adjustable, as is the notch filter and noise blanker

The parameters of all three independent channels can be set separately, allowing each to be recorded simultaneously and independently. Recording and playback are also provided at the output of the digital down-converter, where an entire 4 MHz spectrum band can be recorded for later demodulation. Pre-buffering prevents signal loss at the start of a transmission.

A flexible scheduler function allows unattended recording of each channel at specified dates and times, and the built-in support for HFCC, EIBI and user-defined frequency databases ensures effortless storage and maintenance of frequencies.

There is also a unique "pause" function, the world's first for a shortwave receiver, making it possible to pause reception and resume it when convenient. This is very useful in case the receiver is left unattended for a period of time.

A "toolbox" full of various test and measurement tools, such as frequency error, SINAD, THD and modulation meters, logger and scheduler, complement the entire package and make it possible to use this product as a measuring receiver, replacing much more expensive (and often less capable or accurate) conventional test equipment.

The software-defined architecture allows easy software upgrades for demodulation and decoding requirements. Component variations and aging are greatly diminished in a software-defined receiver, assuring long-term premium performance.

Receiver type	Direct-sampling, digitally down-converting software-defined receiver
Frequency range	9 kHz to 49.995 MHz
Tuning resolution	1 Hz
Mode	AM, AMS, LSB, USB, DSB, ISB, CW, FMN, FSK, UDM (user-defined mode) DRM mode optional
Image Rejection	100 dB
IP3	+31 dBm (preamp off) +21 dBm (preamp on)
Attenuator	0 - 21 dB, adjustable in 3 dB steps
SFDR	107 dB min. (preamp off) 103 dB min. (preamp on)
Noise figure	14 dB (preamp off) 10 dB (preamp on)
MDS	-130 dBm @ 10 MHz, 500 Hz BW (preamp off) -134 dBm @ 10 MHz, 500 Hz BW (preamp on)

Phase noise	-145 dBc/Hz @ 10 kHz
RSSI accuracy	2 dB typ.
RSSI sensitivity	-140 dBm
Processing and recording bandwidth (DDC bandwidth)	20 kHz - 4 MHz (selectable in 24 steps)
Demodulation bandwidth (selectivity)	1 Hz - 62.5 kHz (continuously variable in 1 Hz steps)
Spectrum analyzers	Input spectrum/waterfall, 30 or 50 MHz wide, 1.5 kHz resolution bandwidth DDC spectrum/waterfall, max 4 MHz wide, 1 Hz resolution bandwidth Channel spectrum, max 62.5 kHz wide, 1 Hz resolution bandwidth Demodulated audio, 16 kHz wide, 1 Hz resolution bandwidth
ADC	16 bit, 100 MSPS
Sensitivity (@ 10 MHz, with preamplifier)	AM -106 dBm (1.12 μ V) @ 10 dB S+N/N, 30% modulation
	SSB -121 dBm (0.20 μ V) @ 10 dB S+N/N, 2.1 kHz BW
	CW -127 dBm (0.10 μ V) @ 10 dB S+N/N, 500 Hz BW
	FM -117 dBm (0.32 μ V) @ 12 dB SINAD, 3 kHz deviation, 12 kHz BW, audio filter 300-3000 Hz, deemphasis -6dB/oct
Tuning accuracy	0.5 ppm @ 25 °C
Tuning stability	0.5 ppm (0 to 50 °C)
MW filter	Cut-off frequency 1.8 MHz @ -3 dB Attenuation 60 dB min @ 0.5 MHz
Preselection filters	119 filters available in automatic or manual mode (14 high pass, 14 low pass and 91 bandpass) + bypass
Antenna input	50 ohm (SMA connector)
Output	24-bit digitized I&Q signal over USB interface
Interface	USB 2.0 High speed
Power supply	11-13 V DC @ 510 mA typ. (preamp off) 11-13 V DC @ 620 mA typ. (preamp on) 11-13 V DC @ 55 mA typ. (power save)
Operating temperature	0 to 50 °C

Specs subject to change without notice.



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