



Embedded Computing, Timing and Telemetry Products

WR-G31DDC Excalibur

The WiNRADiO WR-G31DDC 'EXCALIBUR' is a high-performance, low-cost, direct-sampling, software-defined, shortwave receiver with a frequency range from 9 kHz to 50 MHz. It includes a *real-time* 50 MHz-wide spectrum analyzer and 2 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-converter 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 tuning accuracy. These key features create a receiver in a class of its own, with wide application potential, at a very affordable price.

Features

- 9 kHz to 49.995 MHz continuous frequency range
- Direct sampling
- Digital down-conversion
- 16-bit 100 MSPS A/D conversion
- 50 MHz-wide, real-time spectrum analyzer
- 2 MHz recording and processing bandwidth
- Three parallel demodulator channels
- 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 (0.35 μ V SSB, 0.16 μ V CW)
- Excellent dynamic range (107 dB)
- Selectable medium-wave filter
- 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. 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.

The entire 2 MHz DDC (digitally-down-converted) bandwidth is available for recording and demodulation. Three

demodulators allow the simultaneous reception of three signal frequencies within the 2 MHz bandwidth



Graphical User Interface Software

The WR-G31DDC 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.

The digital down-converter provides 21 selectable output bandwidths ranging from 20 kHz to 2 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 2 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.

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.

The standard WR-G31DDC package includes:

- WR-G31DDC receiver
- Application software
- Comprehensive user's manual
- Low-noise linear power supply
- USB cable
- BNC-to-SMA adapter

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, CW, FMN, FSK, UDM (user-defined mode) DRM mode optional
Image rejection	90 dB typ.
IP3	+31 dBm min.
Attenuator	0 - 21 dB, adjustable in 3 dB steps
SFDR	107 dB min.
Noise figure	14 dB
MDS	-130 dBm @ 10 MHz, 500 Hz BW
Phase noise	-145 dBc/Hz @ 10 kHz
RSSI accuracy	2 dB typ.
RSSI sensitivity	-140 dBm
Processing and recording bandwidth (DDC bandwidth)	20 kHz - 2 MHz (selectable in 21 steps)

Demodulation bandwidth (selectivity)	10 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 2 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 (typ. @ 10 MHz)	AM	-101 dBm (2.00 μ V) @ 10 dB S+N/N, 30% modulation
	SSB	-116 dBm (0.35 μ V) @ 10 dB S+N/N, 2.1 kHz BW
	CW	-123 dBm (0.16 μ V) @ 10 dB S+N/N, 500 Hz BW
	FM	-112 dBm (0.56 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	2.5 ppm (0 to 50 °C)	
MW filter	Cut-off frequency 1.8 MHz @ -3 dB Attenuation 60 dB min @ 0.5 MHz	
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 @ 500 mA typ. 11-13 V DC @ 45 mA typ. (power save)	
Operating temperature	0 to 50 °C	

Specifications are subject to change without notice due to continuous product development and improvement.

