WiNRADiO G33DDC Excalibur Pro

By Bob Grove, W8JHD

It's hard to believe that a year has gone by since we reviewed WiNRADiO's G31DDC Excalibur shortwave SDR receiver (November 2010). And now the company has recently introduced the next step up, both in performance and cost: the G33DDC Excalibur Pro.

So what are the improvements? As hard as it may be for us thoroughly-satisfied G31DDC owners to believe, there are several. For the most part, they are specification enhancements, not functional additions.

Couldn't these have been simply downloadable upgrades to the G31DDC? No: While software upgrades may address functional aspects of a product, they can't change the hard-wired limits of performance.

A look at the improvements

The new G33DDC doubles the recording and processing bandwidth from 2 to 4 MHz wide. This is the digitally-down-converted chunk of spectrum to which you want to pay particular attention. While the entire tuning range of the receiver is from 9 kHz to 50 MHz – all of which can be displayed in real time on the spectrum screen – signal details are captured only on the smaller span, which can be narrowed down to a crisp 20 kHz if desired.

Reception modes are abundant in the original G31DDC – AM, AMS (AM Synchronous), LSB, USB, CW, FMN (FM narrow), FSK, UDM (User-Defined Mode), and DRM (optional). But, the new model has added DSB (double sideband) and ISB (independent sideband) as well. Seasoned shortwave listeners know the interference-rejecting capability of these modes.

While the early model's sensitivity was excellent (0.35 uV SSB and 0.16 mV CW), it is now 0.20 uV and 0.10 uV for those modes on the new model. This gives an edge to fringe reception assignments.

While we can hardly question the frequency stability of the G31DDC with its 2.5 parts per million spec, now it's a rock-stable 0.5 ppm on the G33DDC.

But doesn't an improvement in sensitivity raise suspicions of vulnerability to strong-signal overload? Suspicions, yes. But WiNRADiO has tackled this handily by providing 119 selectable pass-band filters – 14 high pass, 14 low pass and 91 band pass, plus a bypass selection. These can be chosen manually or programmed automatically. This assures attenuation of possible interference from overly-strong, out-of-band signals.

Phantom image signals, an artifact of receiver design, are even less than on the original model, 100 dB down as compared to the former 90 dB which was excellent.

And for those picky listeners who ask "Why can't they make receivers more selective?" the demodulated signal filter is now continuously adjustable from a wide 62.5 kHz down to 1 Hz – I think that's selective enough!

Built-in test and measurement functions allow the user to assess the performance levels of his receiver at several circuit points.

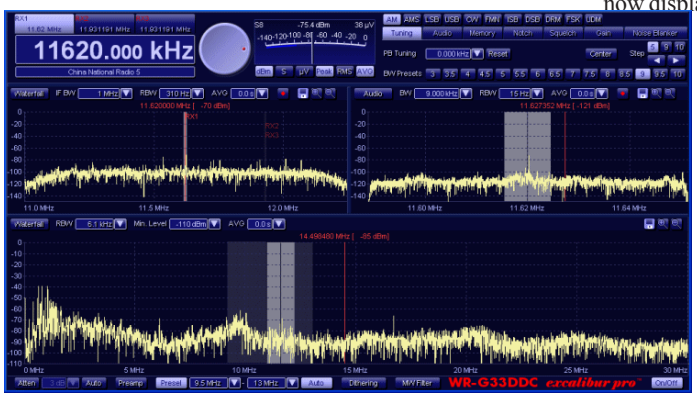
How does this translate into performance?

Not all of us are technically adept enough to nod with understanding at all of these specifications. In a word, the specs cited above are laudable. The flexibility of functions on the G33DDC allow it to suitably detect virtually any signal in its spectrum that is above the natural noise level.

Long-time radio enthusiasts who cut their teeth on radios with knobs are understandably reluctant to switch to a "brick" connected to a computer. It's a whole new experience typing in frequencies and jockeying around a screen with a mouse!

But once we make the transition, the immediate control of the spectrum at your fingertips can be addictive. The visual presentation of a dynamic spectrum with signals popping up and down as spikes on the screen adds a new dimension to radio reception.

Audibly monitoring a communications signal while simultaneously seeing the surrounding signals of the spectrum dancing in color is captivating as well as informative. I find it almost hypnotic!



Let's do some monitoring

Unpacking the G33DDC from its secure shipping box reveals a compact, metal-encased module equipped with a USB connector, an SME antenna connector, and a standard 12 VDC power jack.

On the other end of the enclosure is a pushbutton power switch and an attendant LED indicator. That's it. No knobs.

Included accessories are the USB interconnect cable, linear 120 VAC power supply, software/driver disk, and an SMA/BNC adapter.

The 16-page installation guide is well written, informatively graphic, and easy to follow. It specifies the following minimum computer system requirements: 2 GHz dual-core CPU, 1 GB RAM, an SVGA display, 20 MB of available hard drive space, Windows-supported sound card, USB 2.0 port, and a Windows XP, Vista, or 7 operating system.

While the G33DDC will operate at a slower CPU speed, the ultimate performance will be degraded in terms of selectivity, DDC bandwidth, and response to other programs which may be multi-tasking the computer.

Installation

I inserted the disk into my computer and followed the loading instructions, but after I clicked on "Finish," I received a message telling me that the device driver was not successfully installed. Not to worry. The program icon was now displayed on my desktop, so I clicked it and it loaded perfectly. Go figure.

Fortunately for the easily daunted, the program loads with usable factory presets. As soon as you see the application come up on screen, you can hear and see the activity on the band.

The startup automatically comes up on factory-preset WWV at 10000.000 kHz (frequencies are displayed to 1 Hz). The service for any frequency allocation is shown below the frequency readout, in this case, "Standard time and frequency."

Three spectrum screens are shown in their default settings: the 0-30 MHz full-span spectrum analyzer (extendable to 50 MHz), and two, separate, smaller-span displays for more detailed analysis and recording.

Even better, this spectrum display has a waterfall mode, found only on the more expensive spectrum analyzers. This mode allows a continuously-recording display over time, gradually moving upward on the screen, for as long as 17 minutes, revealing changes in band conditions and on-off signal presence at a glance.

For serious audio applications, there is a fourth spectrum analyzer function, demodulated audio, 16 kHz wide, with 1 Hz resolution bandwidth.

The presentation can be compressed or expanded to suit the requirements of your screen, such as running multiple programs requiring split screen or overlay. Background and character color selections may be applied by choice.

If you really want to be impressed – or impress your friends – click the full-screen icon in the right-hand corner of your screen and let the image take over the whole screen. (I'm impressionable – I grew up during the sci-fi days of the emerging space age!).

❖ Let's try it out

With all three screens programmed to the bandwidth limits of my choice, I let my mouse do a little playing on the screen.

Clicking on the frequency window, I could select which, or all, of the numerals to change to visit other parts of the spectrum. I could also slew up and down the bands with the automatic tuning dial, the increments of which can be custom selected (5 kHz for international broadcasters, 1 kHz for general tuning, etc.).

And for extremely wide excursions of the spectrum, I simply moved my mouse across the slide-rule-dial representation, clicking wherever I wanted to monitor.

Since the spectrum analyzer function is advertised as "real time," I decided to see whether this was really true, or whether there was a substantial sampling time delay as in many similar functions on lesser receivers.

The "echo" between a signal heard on an analog receiver and the audio coming out of the G33DDC was extremely short – barely 1/8 of a second on the widest span. I'd say that's pretty close.

The selectable RF input filters are easily configurable by simply watching the signal spikes and clicking on the start and stop frequencies to see the attenuation bandwidth you need.

Mode selection is a simple key press, and you can drag the cursor of your mouse up a down the spectrum display to select signals to monitor instantly.

The automatic noise limiter is user-adjustable in terms of response level (threshold) and DDC averaging. This allows just the right amount of audio enhancement in any noise-interference issue without seriously debilitating the quality of the sound.

While much of the process is intuitive, read the operational manual that downloaded with the program – software engineers don't always think the way you do!

❖ The menu bar

Quite a number of additional functions are menu-selectable, including saving memory, scheduler, and spectrum display; frequency calibration; task list; recording; selecting optional WiNRADiO plug-ins; and an extensive help list for the various receiver functions.

❖ The bottom line

It's tempting to describe the G33DDC as a G31DDC on steroids. Without question, the original G31DDC still remains, in my judgment, the most remarkable receiver in its price range (currently $899.95 at Grove Enterprises).

But for those stalwart souls who constantly strive for perfection, the upgraded G33DDC does have somewhat better specifications for those more demanding applications. Both models have a very high intermodulation rejection (+31 dBm), but this latest model improves sensitivity.

The G33DDC operates for long periods while staying comfortably cool. It can be sequestered safely out of the way. However, the AC power supply becomes uncomfortably hot. It would be a good idea to place it in an open, well-ventilated spot.

All told, WiNRADiO has added another winner to their growing list of high-performance receivers for serious listeners.

The new WiNRADiO WR-G33DDC is available for $1649.95 from Grove Enterprises.

TABLE OF SPECIFICATIONS, WR-G33DDC

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 μV) @ 10 dB S+N/N, 30% modulation SSB -121 dBm (0.20 μV) @ 10 dB S+N/N, 2.1 kHz BW CW -127 dBm (0.10 μV) @ 10 dB S+N/N, 500 Hz BW FM -117 dBm (0.32 μV) @ 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