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User Report: The Expert Electronics MB1 SDR HF/VHF Transceiver

Do you remember the excitement when you turned on your first HF radio? For me it was 28 years ago with my second-hand Yaesu FT-101ZD, which I used to listen to DX late at night. What a thrill! It didn't take long for me to upgrade to a brand-new rig and relive that feeling, and it's been like that ever since. I'm always looking for that first sparkling moment when you turn on a new radio. Because of this I can't imagine myself working DX with only a computer; it just doesn't feel right. At the same time, I'm an early adopter, and I know that software defined radio (SDR) technology is the way to go. Stand-alone SDR transceivers are now available that don't force us to give up our precious knobs and buttons.

The first time I learned of the Expert Electronics MB1 (also marketed as the SunSDR MB1) was in 2013, when I first watched Expert Electronics Senior Hardware Developer Vasily Vasilyev, RN6LHF, in a YouTube video of the prototype. The MB1 was only released for international sales in 2016, and the first time I saw one was at the 2016 Dayton Hamvention®. At Hamvention 2017, I recognized Vasily at the Expert Electronics booth and congratulated him on the very nice-looking radio. He explained the technology behind it to me. I was impressed by the large high-resolution external display that boasted a huge S-meter.

After Hamvention, I contacted Expert Electronics to find out more, and they suggested that I start by taking a look at their ColibriNANO, a relatively inexpensive and small SDR on a USB stick, designed primarily for HF with an included TCXO. I didn't expect too much, but it really exceeded my expectations. I was also impressed by the hardware and software integration. What I liked the most about this SDR was its remote capabilities and, especially, the web client (Raspberry Pi 3 with an HTML 5 webserver). It even works with my iPhone browser. I also appreciated the software interface and the overall performance. Now that I had the confidence, it was time to move on to the MB1. I got mine about 1 year ago.

Overview

The MB1 is an all mode HF/VHF transceiver covering from 160 to 2 meters and containing its own integrated *Windows* 10 PC. It combines a classic design with advanced digital up-conversion (DUC) and direct digital conversion (DDC) design. It offers a main receiver and a sub-receiver, each with its own VFO. You can activate a second receive frequency on the sub-receiver VFO, but only on the same band as the main receiver VFO — good for split operation or to monitor a second frequency on the same band.

Two versions of the MB1 are available. Both have the same radio hardware, but the integrated PC differs. My "original" MB1 has an i5-6400T processor and a 128-GB solid-state drive (SSD). The other version, the MB1 Prime, comes with an upgraded i7-6700T processor and a 512-GB SSD.

I don't use the MB1 as my shack computer; it's dedicated to the radio application, except for call sign lookup on QRZ.com and other browsing on the external monitor, which is very handy. In this situation the i5 version is more than enough.

A power button switches the radio on or off, so you don't have to worry about shutting down *Windows*. There's no need for a 13.8-V external power supply either, since this unit has an integrated PSU and plugs into an ac outlet.

The mic can connect to the PC mic input on the rear panel, the **MIC1** front-panel connector (1/4-inch stereo) or the **MIC2** modular (RJ-45) front-panel) connector that's compatible with any recent Yaesu microphone.

The radio offers four HF/6 meter SO-239 antenna connectors and two type N connectors for VHF. You also have four PTT outputs that you can program for each band independently. This is terrific if you use multiple amplifiers. The **RX IN** and **RX OUT** ports are useful for connecting separate receive antennas.

Figure 1b — The radio's rear panel.

Figure 1 — The MB1 front panel.

First Impressions

My initial impression when I first tried this radio was *Wow and Wow!* My friend Robin, VA2NRJ, and I share the same point of view regarding HF radios. He's a computer specialist, but still he prefers radios with knobs and buttons. See our reactions (**https://youtu.be/PWh3kaXnwJk**) when unboxing the radio and turning it on for the first time. It didn't take long for Robin to order his MB1.

Performance

I have owned and operated high-end HF radios in the past, and the MB1 compares nicely with any flagship radio on the market. When I switch between my other high-end radio, the performance is similar, but the MB1, as an SDR, has a faster spectrum scope and it's easier to operate because I can use a mouse. When I'm using my other radio, I'm looking for the mouse all the time.

The auto notch is very effective and, combined with the filters, it's possible to reject close-by signals very efficiently. The noise blanker could be improved; I found **NB2** to be most effective. The noise reduction utility is similar to what's in my other rig.

When I transmit with the original hand mic, the signal is very clean, and, with a two-tone signal, it's within specs. If I use my Heil PR-20 studio mic and crank the gain up too far, it does splatter, so you have to be careful. The MB1 has an integrated transmit equalizer, so adjusting the mic gain in both locations can adds up. A "predistortion" feature planned for this summer should prevent this. A new ALC implementation also is planned for this spring. Since I've had the unit, several updates have been made. The ability to add (or modify) features through software upgrades is one of the strengths of SDR technology. Expert Electronics says that software upgrades will always be free.

For contesters and DXers who also like to ragchew, you can set different audio profiles for easy recall. For those who like to play with expanded SSB (eSSB) audio, this rig is for you. It even has an integrated noise gate. Actually, this radio can transmit up to 10,000 Hz bandwidth — but we can't recommend doing that.

When it comes to features, the MB1 is far more advanced than anything I've used before. For example, you can set the radio to display DX spots directly on the spectrum scope. Click with the mouse on the dot over the call sign, the radio QSYs, and you're ready to call.

ExpertSDR2 Software

ExpertSDR2 is the SDR software used in every Expert Electronics SDR transceiver and receiver, from the ColibriNANO to the MB1. The version differs for each

		I5-6400T	I7-6700T
Computer	CPU	I5-6400T	I7-6700T
	Motherboard	GIGABYTE MDH11KI on Intel® H110 Express Chipset	
	RAM	8 GB SoDDR4 - UMAX DDR4 2400 1024 x 8	
	Hard drive	120 GB M.2. SSD	525 GB M.2. SSD
	Intergrated Display	IPS 7" touchscreen 1280 x 800	
	USB 3.0 port	4 on the rear panel	
	USB 2.0 port	2 on the front panel	
	Video output	HDMI and DPORT for external monitor, support 4K	
	Ethernet LAN	1 Gbps RJ-45	
	COM port	1 x DB9	
Transceiver	Signal generation	Digital Up Conversion	
	RF DAC clock frequency	640 MHz	
	RF DAC resolution	14 bits	
	TX modes	AM, SAM, DSB, LSB, USB, CW, NFM, DIGL, DIGU	
	TX bands	160, 80, 40, 30, 20, 17, 15, 12, 10, 6, 2	
	Maximum RF output for HF	100	
	Maximum RF output for 6 M	50	
	Maximum RF output for 2 M	50	
Receiver	Design concept	Direct Digital Conversion	
	RF ADC clock frequency	160 MHz	
	RF ADC resolution	16 bits	
	RX frequency range, MHz	0.09 to 65 MHz and 95 to 148 MHz	
	RX modes	AM, SAM, DSB, LSB, USB, CW, NFM, WFM, SPEC, DIGL, DIGU, DRM	
	Maximum spectrum display width	80 MHz	
	Independant receivers	2	
	Blocking Dynamic Range (BDR)	129 dB	
	Dynamic Range over IMD3	>100 dB	
	Reciprocal Mixing Dynamic Range (2 kHz)	>110 dB	
	MDS level	-124 dBm	
	Image channel rejection	> 110 dB	
	Local oscillator stability	+/- 0.5 ppm	
	Built-in preamplifier	-20, -10, 0, +10 dB	
	Additional VHF preamplifier	22 dB	
Other	Power voltage range	100 to 240 V ac, 50 to 60 Hz	
	Maximum consumption power	320 W	
	Operating temperature	0 to +50 °C (32 to 122 °F)	
	Dimensions L x W x H	285 x 325 x 150 mm (11,2 x 12,8 x 5,9 inches)	
	Weight	9.3 kg (20.5 lbs)	

Figure 2 — The MB1 specifications.

Figure 3 — MB1 TX EQ settings.

radio, though, and you have to download the specific version for your device so that it matches the hardware. For the MB1 it also has a custom interface to perfectly fit the integrated display. You still can switch to the full *ExpertSDR2* software format, but I found it difficult to read on the small display. It's perfect for an external monitor, however. It's not possible, though, to display the interface on both the integrated display and an external display at the same time, except when you activate the RX2. You can use an external monitor in 4K resolution, and when you check the 4K option in the menu, fonts will be resized automatically to fit your screen.

The RX2 feature does slow down the spectrum a little with the basic MB1 model (i5 CPU with 8 GB). This may be an incentive to upgrade to the Prime version.

It's also possible to install the remote server software in the MB1, and you can use it remotely with any *Windows* PC by installing the remote client. They also have a client for *macOS* and *Linux* users. Some third-party software and plugins are available.

Even though the MB1 is a fully stand-alone SDR transceiver, a minimum of computer know-how will be helpful, mainly for software upgrades.

Upgrading the MB1 PC Hardware

You can upgrade the MB1 just as you would any conventional PC, but you will need advanced computer skills. My friend Robin, VA2NRJ, already upgraded the PC hardware himself — the memory from 8 GB to 16 GB of RAM, the hard drive from 128 GB to a 512 GB, and the CPU to an i7-7700T. The motherboard firmware needed to be upgraded, and the hardest part was
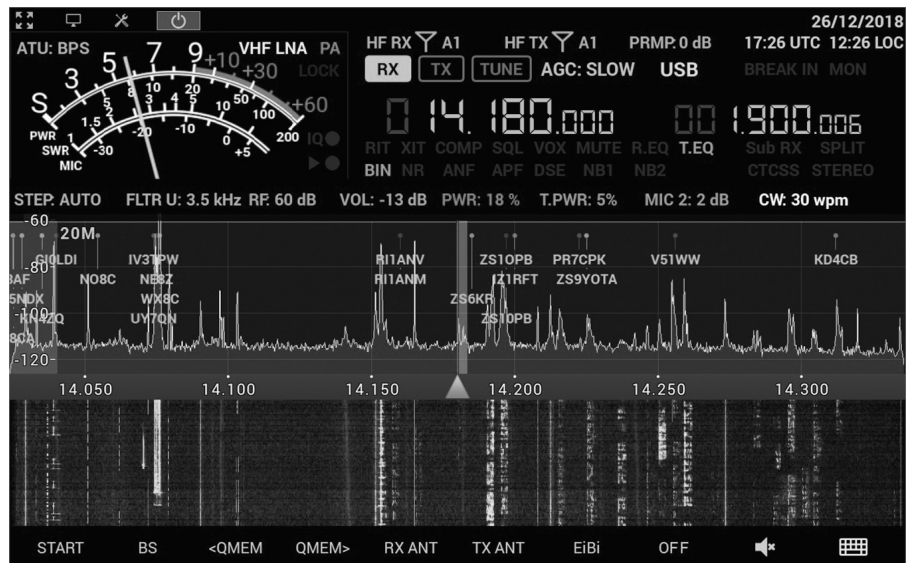

Figure 4 — The MB1 display of DX spots.

finding the correct version supporting the i7-7700T.

I find that my basic MB1 (i5 CPU with 8 GB of RAM) has performed very well, and if you're only using it as a radio, the performance is more than enough, in my view. If you want to run a 4K external monitor, activate RX2 all the time, install third-party software, or use the MB1 as a shack PC, you should get the Prime version.

Conclusion

The Expert Electronics MB1 is jam packed with cool and helpful features. It looks good and performs well. I like the well-thought-out details, such as the DX spot display in the spectrum scope, illuminated buttons, the fast VFO, the beautiful IPS color display, and the audio flexibility. I also appreciated that this radio is made by hams for hams, and every time I contacted the manufacturer or the North American distributor, I received a fast response and great support.

This radio is fun to operate and play with, but because of the high-tech complexity, my only advice for potential buyers is that it does require some computer skills even to operate. It's also possible to buy 12-month premium technical support from the distributor, which includes remote access to the MB1, if needed. If you are looking for something new that is a mix of both worlds, SDR within a traditional-looking radio, the MB1 is probably your best option.