

MT REVIEW

FLEX-3000™ SDR Transceiver Review, Part 2 The future of radio in your shack today

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In the May issue of *Monitoring Times* I presented part one of my review of the FLEX-3000™ SDR by FlexRadio Systems™ in Austin, Texas. In part two of our *MT* review, I will discuss the set-up and operational aspects of the FLEX-3000 transceiver.

❖ What's in the Box?

The following items are included with each FLEX-3000 unit that ships from FlexSystems: FLEX-3000 transceiver; 6-pin to 6-pin FireWire® cable (6 feet); unterminated 12 AWG power cable (4 feet); PL259/BNC adapter; Quick Start Guide; and a CD ROM with the owner's manual, quick start guide, PowerSDR™ 1.18 or later, FlexRadio FireWire Driver.

When you order your FLEX-3000, if you plan on using it with a laptop, you will probably want to have FlexSystems ship a 6-pin to 4-pin FireWire cable instead of the normal 6-pin to 6-pin.

The FLEX-3000 power cable is unterminated at one end so that you can adapt it to various DC power connectors, such as Anderson Power Poles, banana plugs, screw terminals or spade lugs. You will be connecting the two red wires to the positive terminal and the two black wires to the negative terminal of your power supply.

❖ Setting Up the FLEX-3000

After you unpack the materials from the shipping carton, you should first determine where in the shack you are going to set up the FLEX-3000. Some basic considerations here include: place it near the computer you will use, avoid placing it in direct sunlight; avoid blocking cooling vents for good air flow and temperature control; easy access to the back panel of the 3000, and other considerations such as antenna connections, power supply location and operating needs.

You will need the following to get your FLEX-3000 on the air:

- The two cables and CD-ROM that came with your FLEX-3000.
- An HF-Antenna or dummy load.
- A good RF ground.
- A stabilized 13.8V DC power supply, capable of 25A continuous duty.
- A Windows® PC, with an IEEE 1394 (Firewire) connection.
- A microphone/PTT and/or CW paddles/keystroke/straight key.

Prior to powering up any radio, I prefer to connect all my peripherals first to reduce the chance of a static discharge that can take out some valuable electronics. So things like grounding wires, microphone, key, speaker/headphone, antennas, power cables to the power supply, and the FireWire cable are all connected

prior to turning on the power supply and the transceiver.

Also prior to powering up the transceiver, you will be installing your FireWire device driver. After that installation you will be restarting the computer and turning on your 3000 transceiver.

After you have successfully installed your device driver, you are then ready to install the PowerSDR software. Follow the directions carefully, but before you get started, you need to ensure that the current version of Microsoft .NET Framework 1.1 and .NET 1.1 Service Pack 1 is installed on your computer.

You can get more information on this at the following knowledge base links on the FlexSystems website: <http://kc.flex-radio.com/KnowledgebaseArticle50072.aspx> and <http://kc.flex-radio.com/KnowledgebaseArticle50073.aspx> This is an important step as you won't be able to run the PowerSDR software unless you have the right .NET Framework software package installed.

In the final steps, you will be configuring your device driver (previously loaded), setting up audio parameters, and configuring your Windows audio mixer panel. There are detailed instructions on all of this in Chapter 2 of the FLEX-3000 owners manual.

If you have successfully accomplished all of this, you will be ready to hit the Start button on your PowerSDR software and commence operations.



❖ Powering up the FLEX-3000

If you have powered up the radio and software, at this point your eyes will probably be as wide open as mine were. Look at figure one and you will see why. For some, all the bells and whistles you see on the PowerSDR front console may be a bit overwhelming.

The front console (see Figure 1) controls the basic functions of the radio: frequency, mode, filters, and display. To help you get use to the controls and their functions I recommend that you hover your mouse over any control, and it will present a tool tip that will show a brief description of that control's function.

I know it will be tempting to load up and key up without further instruction or guidance, but I highly recommend you don't. There is a lot of capability on your computer screen in front of you right now, and if you really want to take advantage of that I recommend that you point your browser to this link (www.flex-radio.com/Products.aspx?topic=powersdr1x_testdrive) on the company website.



Final Rating: 4-3/4 out of 5

I won't go into detail on the operation of the FLEX-3000 using the PowerSDR software, since that would be outside the scope of this review. The Adobe PDF owner's manual is extremely well written and illustrated, and has detailed explanations of all the controls and menus that are available on the PowerSDR front console. No matter what level of technical expertise you have, the owner's manual can provide you with simplified or detailed information on the operations and controls of this transceiver.

As I have mentioned previously, this is a highly capable transceiver. As an operator you have nearly complete control over every aspect of transmit and receive operations with this unit. To truly appreciate this fact, browse through the various tabs and menus in the setup and operating forms within the PowerSDR software package. You really need to become familiar with these menu options prior to transmitting with the FLEX-3000.

For instance, some of the options you can control using the software operating forms include: memory channels, recording and playback of post-processed audio, a three and ten-band equalizer, Transverter setup form, CW memory and keyboard control, an audio mixer control, and voltage/temperature information. I repeat: You have a lot of capability with this radio/software control package.

❖ On Air Operations with the FLEX-3000

Once you have configured the set-up and operations forms, you are ready to put the FLEX-

TABLE 1: FLEX-3000 MANUFACTURER SPECIFICATIONS

Receiver Frequency Range:	10 kHz – 60 MHz (operating – requires external, customer provided filters below 1.8 MHz to eliminate images); 160m – 6m (specified amateur bands only)
Transmitter Frequency Range:	160m – 6m (specified amateur bands only) and MARS/CAP capable
Emission Modes:	A1A (CW), A3E (AM), J3E (LSB, USB), F3E (FM), F1B (RTTY), F1D (PACKET), F2D (PACKET)
Frequency Steps:	1 Hz minimum
Antenna Impedance:	50 Ohms, unbalanced; 17 - 150 Ohms, unbalanced (with tuner on); and Max SWR 3.0:1 (with tuner on).
Audio In/Out:	10dBV nominal (consumer level), input impedance: 5k Ohms/Output impedance 600 Ohms.
Recommended Headphones:	40mW, 16 Ohms, (higher impedance headphones will also work)
Power Consumption:	1.5A receive (typical) and 25A (transmit maximum @ 100 watts)
Supply Voltage:	13.8 VDC ± 10%
Dimensions: (WxHxD):	12.3" x 1.8" x 12.3" (31.1cm x 4.4cm x 31.1cm)
Receiver Circuit Type:	Direct conversion, low IF
Intermediate Frequency:	Software selectable from DC to 20 kHz
MDS:	14 MHz Receive gain – 1.3/0.3 μV; MDS: -123 dBm/-133 dBm in 500 Hz bandwidth
Selectivity (-6/-60 dB):	CW: 500 Hz -6/-60 dB: 5.00/6.40
	SSB: 2.4 kHz -6/-60 dB: 2.39/2.54
	AM: 6.6 kHz -6/-60 dB: 6.60/6.74
Image Rejection:	70 dB or better (160 - 6m amateur bands)
Transmitter	
Power Output:	1-100 watts PEP CW and SSB (25 watts AM carrier)
Emission Modes:	A1A (CWU, CWL), J3E (USB, LSB), A3E (AM), F3E (FM), DIGITAL
Harmonic Radiation:	Better than -55 dB (160 - 10m amateur bands) Better than -65 dB (6m amateur band)
SSB Carrier Suppression:	At least 55 dB below peak output
Undesired Sideband Suppression:	At least 55 dB below peak output
Audio Response (SSB):	Flat Response 10 Hz to 20 kHz, 3-band or 10-band software EQ
3rd Order IMD:	Better than 33 dB below PEP @14.2 MHz 100 watts PEP
Microphone Impedance:	600 Ohms (200 to 10 kOhms)

3000 on the air for operation. You will find a basic set-up of the controls for various transmit/receive modes in Chapter Six of the operations manual.

The computer aided tuning (CAT) control

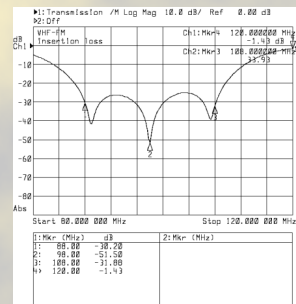
commands of PowerSDR are based on those of the Kenwood TS2000 and have been expanded to cover PowerSDR's many unique features. Additionally, PowerSDR can provide a virtual COM port connection to third party software

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using a virtual serial port (VSP) driver software package. There are two programs available, depending on your computer platform.

vCOM is a virtual communications port that only works on the Windows XP platform and it is a 32-bit application. A better software choice (and it is free) is K5FR's VSPmanager. This null-modem emulator (VSPmanager) is a 64 and 32-bit signed kernel-mode virtual serial port driver for all Windows packages. You can create an unlimited number of virtual COM port pairs and use any pair to connect one COM port-based application to another. This program, and instructions for installation and use, are available for downloading at http://k5fr.com/ddutil/wiki/index.php?title=VSP_Manager.

The FLEX-3000 is an excellent unit for digital mode operations, but using a sound card and operating using a FlexRadio Radio SDR is a little different from using a traditional analog transceiver. The radio software directly interacts with the sound card based digital mode program, so the primary concern is how do you get the audio from PowerSDR to the digital mode program that is running on the same computer.

Even though there are a couple of ways to accomplish this, the method that FlexRadio recommends is the one that I used. It involves the purchase and download of a third-party software package – the Virtual Audio Cable or VAC.

VAC creates a point-to-point conduit or audio bridge where audio signals that enter into one end of the “cable” come out the other end. Each end of the “cable” looks like a sound card device in Windows. So, to transfer audio signals from PowerSDR to a digital mode sound card program, we defined two (2) VAC “cables,” one for the received audio and one for the transmitted audio. Therefore, all you need to operate digital mode with PowerSDR and any of FlexRadio Systems software defined radios is to obtain a legal copy of VAC.

VAC is a third-party application and is not provided by FlexRadio Systems as a standard component of a software defined radio. This software package must be purchased directly from NTONYX by the user. You can find out more about VAC and how to purchase it from their web site at <http://software.muzychenko.net/eng/vac.html>.

The bottom line is that each third party digital/logging/contest program has its own method of CAT control and selecting the COM port and sound card. You will need to dig in the books for your software and the PowerSDR to put everything in order and operate digital modes with your FLEX-3000. FlexRadio tech support can provide some basic support in this regard, but they can't provide guidance on every software package out there. Patience and a good understanding of your software package will usually get the job done and get you on the air digitally.

You can get detailed information on digital operations with the FLEX-3000 on the FlexRadio Systems website in the Knowledge Center at <http://kc.flex-radio.com/KnowledgebaseCategory58.aspx>.

❖ How did it perform?

The review unit arrived just in time to put it on the air for the ARRL International SSB contest. Even though the FLEX-3000 has a 100 watt continuous duty transmitter, I especially enjoy operating the 3000 as a 5 watts QRP entrant in the contest and I knew that this would be a good test for the FLEX-3000. If it performed well during this busy ham band weekend at the low end of the sunspot cycle, then it would be a welcome addition to any shack under a wide variety of conditions.

In sum, with one exception, I was very impressed with the FLEX-3000 under contest conditions. The ability to implement a wide variety of filter combinations proved invaluable in picking out weaker stations with smaller pileups that allowed me to work them using my 5-watt power requirement. The other plus was the ability to customize my transmit audio to cut through the pileups and get my QRP signal heard.

The final result was 170 stations worked and 108 foreign multipliers counted on 15, 20, 40 and 80 meters. During the pre-contest period, I used my time to experiment with a wide variety of transmit audio combinations with various DXCC stations. Audio and signal reports were excellent in every case and most stations were quite surprised I was running QRP.

The only downside I found with the FLEX-3000 was with the automatic tuner unit (ATU). Quite frankly, it performed erratically all weekend long when coupled with my wire antenna farm. I was consistently getting high SWR readings and messages requiring me to bypass the tuner and use my manual Armstrong MFJ tuner.

Once I realized that there was an issue with the ATU and I switched over to my MFJ antenna tuner, my contest station count rose accordingly.

I am not the only person to note this ATU problem. It has been mentioned by many on the FlexRadio newsgroup. According to company officials they have just finished a complete re-write of the ATU software. It is currently in beta test and will be included in their v2.0 software release that should be available by the time you read this. According to one company source early testing indicates the problem has been solved and the ATU operations are now “amazing.”

Bottom line, this is a great radio in receive/transmit capability for the money. FlexRadio Systems is a solid/dependable company and has one of the best tech support teams I have seen in a long time. Dudley Hurry, who heads their tech support, is extremely knowledgeable individual and was a pleasure to work with.

The FlexRadio Systems FLEX-3000 transceiver sells for a MSRP of \$1699.00 and is available online at the company website www.flex-radio.com.

So, if you like operating on the cutting edge of technology, the FLEX-3000 transceiver is an affordable solution that will let you experience the excitement of six meters and HF radio like no other radio in its price class.

All About Antennas continued from page 17

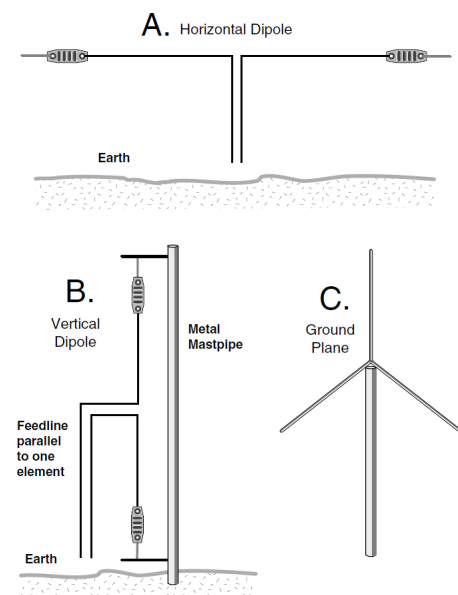
Just because it's a transmatch doesn't mean it's a good transmatch. Flimsy construction and small-gauge wire may mean additional losses, especially at higher power levels. High-power transmatches are invariably more efficient than the low-power variety.

Efficiency

Efficiency is a commonly misunderstood concept in antenna system design; it is simply the percentage of transmitter-generated signal which is radiated by the antenna, or received signal voltage which is delivered to the receiver. If there were no resistive or insulation losses, any antenna and feed line would be 100% efficient whether or not they are properly matched.

Balanced or Unbalanced?

Most elevated, horizontal antennas are fed at or near the center; they are said to be balanced, both from a standpoint of symmetry as well as reference to ground.



Most vertical antennas are unbalanced, often making use of radial systems as an artificial ground reference. There is nothing inherently superior about one over the other; it is merely a question of whether they are best fed by twin lead (balanced) or coax (unbalanced). Balun (balanced-to-unbalanced) transformers, which we will discuss later, as well as transmatches can be used to match balanced to unbalanced circuit elements, and to match impedances.

What is the penalty for misbalancing the feed point? It may cause some RF current to flow on the surface of the feed line, or some stray radiation from the feed point, producing some distortion in the pattern's symmetry, affecting gain somewhat.

Next Month

The last part of this series. Choosing an antenna to match the task. How about accessories? Final take-home points.

