Flexradio Flex-3000 Software Defined Radio Installation Guide

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Flexradio Flex-3000 Software Defined Radio

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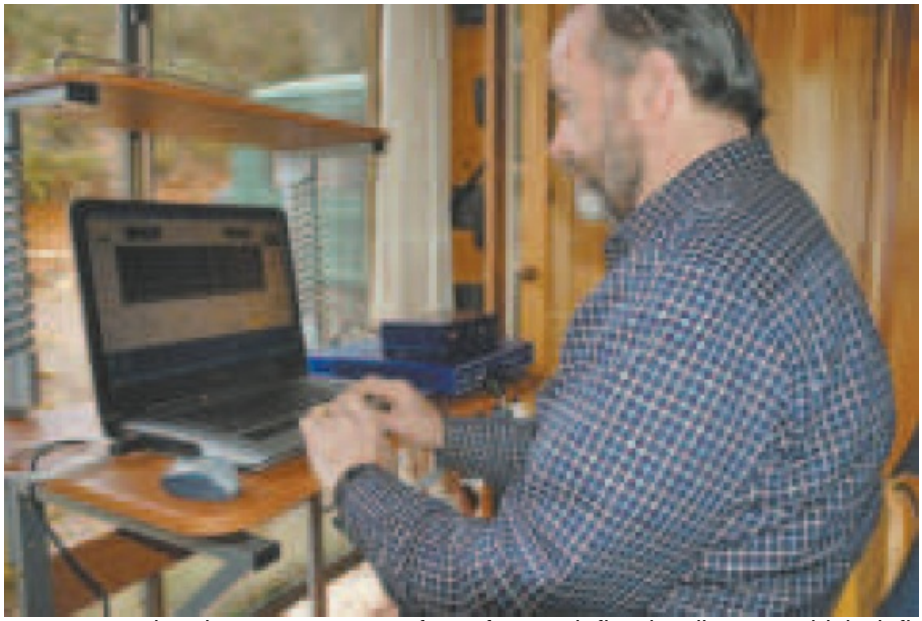
Do you remember your first foray into radio? I certainly remember mine. My boyhood was spent building crystal sets, then graduating to a one valve regenerative receiver, then two valves and then, one day, a two transistor radio built on a Masonite board. I thought all my Christmases had come at once with its performance so much better than the valve radios.

The next fifty plus years have kept me interested in the ever changing challenges of amateur radio. Yes, I have progressed through surplus military receivers, 10 valve home built receivers with the then innovative product detectors which made copying SSB so much easier, to Yaesu, Icom and Kenwood transceivers, all the while being distracted by building or repairing repeaters or some home brew project or another.

Brian VK7RR at his portable operating desk, the laptop in the foreground and the SDR Flex-3000 on the right.



Three years ago I was exposed to the new concept of a software defined radio, one which defied almost all of the then accepted conventions and did not even have a tuning knob. I was intrigued and could not wait to purchase the Flex-5000 radio and then, early in 2009, the Flex-3000.

This is not intended to be a technical article but a practical description of a new concept in transceivers.

My shack still has a Yaesu FT-1000MP Mark 5 sitting on the bench but it no longer even has an antenna attached to it, so taken have I been with the Flex radio.

The 5000 has become my home station and the 3000 is compact enough to be taken portable as you can see.

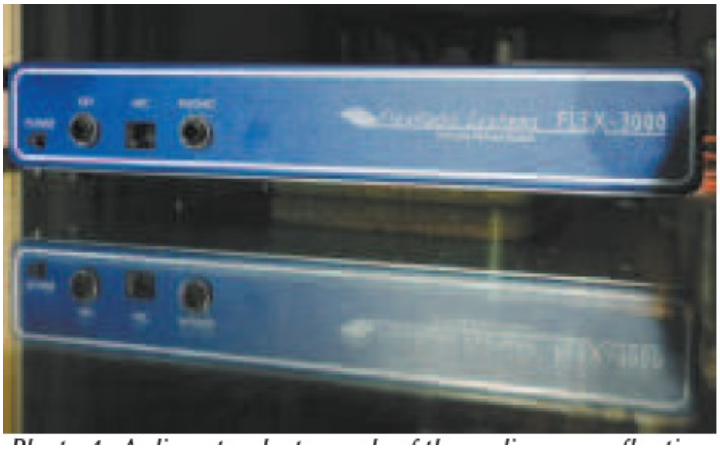
And yes, that is snow outside the window.

The Flex-3000 and my laptop both sit inside a traditional laptop bag. It is slightly bigger and a little heavier than the laptop, weighing in at four kgs.

A photo of the complete station, with the 10 + 10 watt external audio amplifier (referred to in the text) sitting on top of the Flex-3000.

The radio puts out 100 watts on all HF bands and six metres. The power can be varied manually for each band, by a very accurate drive control but can also be adjusted by software, so as to drive linear amplifiers and so on, at different drive levels. It does not have conventional ALC, but then again, if you set it up correctly, it does not need it.

A discrete photograph of the radio on a reflective surface.



A view of one of the hardships the author has to endure when playing amateur radio in the highlands of Tasmania.

The software defined radio, as its name implies, is as much to do with computer operating as it is to do with sitting by a ham rig. It does not require any more knowledge of computers than operating Windows XP.

The basic radio comes with Power SDR, the software which gives you a transceiver like appearance on your computer screen and which provides for all the functions we would expect in a conventional transceiver.

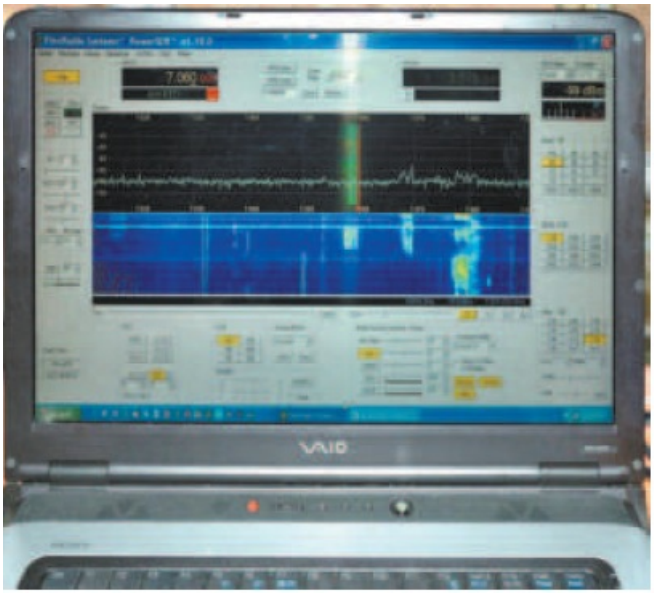
With additional software, some of which is obtainable free of cost and some of which requires a nominal payment, it is a simple matter to set up operating on all digital modes, including, RTTY, Packet, PSK31, SSTV and so on. No external devices, such as a modem, are necessary as all connections are done electronically through the use of this software.

Let me explain what I mean. In a conventional radio, if we want to run in digital mode, we have to run cables from our radio to a decoder/encoder or, these days, to the soundcard of our computer. In the case of my Yaesu, this required about a dozen different cables, some to take audio to and from the radio, one to enable the radio to be tuned via the computer (CAT), one to key the radio for RTTY, another to key it for CW and I have probably forgotten several.

With the Flex, there is one cable, that being a common old garden variety firewire cable. Whilst not as well known as a USB cable, most modern computers have a firewire connection. This permits higher speed data exchange between the computer and the radio than one can achieve with USB2. No other cables are needed. We do not use the sound card in the computer because all processing is done digitally thus limiting the risk of introducing unnecessary distortion. By comparison, most of the processing in my Yaesu station was done in analogue.

The difference is immediately noticeable in weak signal conditions, where you are competing with the noise, so that a Software Defined Radio will decode PSK signals which are below the audible level.

If you have ever used a computer for station operation you will have encountered the problem of trying to have several programs interact from one serial port of the computer. These days we are lucky if our computer has even one serial port, much less more than one and I have had a great deal of trouble using USB to serial adapters.
A screen shot of the Flex-3000 at work, in SSB mode, on 40 metres. The strong signal in the centre was the station to which I was tuned at that time.



A comport (which is the connection to the computer via the serial or USB port) can only talk to one device at a time, so that if you want the computer to control your radio, antenna and perhaps rotator all at once, some other process needs to be used, to avoid a comport conflict where the first program to be engaged hogs the comport and prevents its use for any other process. In the bad old days I would find myself forgetting that I had a program open, then open, say, a logging program and then have the computer disable that program's CAT feature because it was already in use.
Because we are talking about a software defined radio, we can use software to achieve this. First, there is a free program (Ductile), written by Steve Nance K5FR which works hand in hand with another program Com0Com which simulates pairing of comports from real ones to virtual comports.
With these two programs you can load and run a logging program, a digital decoding program and a rig controller all at the same time, and again, without needing any leads. It is all done in software.
Connecting audio between the radio and the digital programs is also done in software using a paid program (NTONYX) which provides a virtual audio connection between them.
In my home station, I was running a 4 element SteppIR until high winds earlier this year re-shaped the driven element. I am still waiting for SteppIR to provide the promised replacements. However, that is another story.
The SteppIR is designed to follow band change commands automatically, and also, within the band, it will adjust the element lengths as you tune up and down the band.
My rotator is an Alphaspid which is also designed to integrate into the CAT commands coming from the computer, so that my logging program will tell it the short or long path bearing of the station I wish to work, and without touching a button, the antenna as if by magic turns in that direction. All of these functions occur without any conflicts, through the use of the software outlined above.
There is of course a cable to the rotator and the SteppIR controller, but we can't have everything!
At my weekender in the central highlands of Tasmania, I have one antenna at present, a full wave loop on 80 metres. The Flex 3000 has a built in ATU which, so far, I have found will present me with a satisfactory match on all HF bands.
I am sitting here writing this article on the computer which is also driving the radio, whilst I listen to a busy Saturday afternoon of activity on 40 metres. Boy the ZL's are strong today.
The one feature which most struck me by the demonstration of the Flex radio was its narrow band performance. It is quite amazing to reduce the receiver pass band on CW to, say, 100 Hz and be able to read the other station without any of the ringing that we have come to expect with narrow crystal filters. With a Flex radio, there are also no more filters to buy; they are all on board, in the form of software.
The other features, which I have now come to treat as a must, are the pan adaptor and the waterfall. These give you a digital picture of the segment of the band that you are tuned to. I have found on a number of occasions that six metre beacons, which are too weak to read, can be seen on the waterfall. Indeed, as the MUF increases, you can sit and watch as these signals climb above the noise floor until ultimately the human ear can start to read them.
You no longer have to sit tuning up and down the bottom part of six. All you need do is cast an occasional look at

the computer screen and this will tell you what the band is doing.
And if you are using digital modes, with the Flex-5000 or 3000, centre the cursor over a station showing on the pan adaptor, click on the right mouse button and then left click and you are tuned to that station.
I have experimented with Mix and TRX-Manager, to name the two that I have most used, as rig control programs, which also allow me to keep a digital log. There are a number of others, including Ham Radio Deluxe. At the end of the day, I think it comes down to personal choice. Each of these programs has certain features that the others don't have. In my case I have cheated a little as I have added several features which allow me to do additional functions in the program of my choice.
Now to the Flex-3000 itself. On the front it has an illuminated, in blue, on/off switch, a 5 mm socket for a CW key, a ubiquitous RJ45 for the mike, and a 5 mm socket for headphones.
On the back are the antenna input BNC connector and controls for external PTT, such as a footswitch, a logic out for switching a linear,
line level out for audio to external amplified speakers and the flex wire cable from the computer. A robust four pin connection for 13.8 volts at 25 amps completes the layout.
The Flex 3000 does not have multiple antenna sockets, whereas the Flex 5000 does. I do not see this as a disadvantage because the radio is intended to be used as a portable rig so that external connections are necessarily kept to a minimum.
In the shack, I found it useful to build a dual channel 10 watt audio amplifier which is in a box painted, as close as I could find, to the distinctive blue of the Flex-3000. I prefer using large speakers in enclosures to powered computer speakers in plastic containers.
The excellent received and transmitted audio from the Flex radios has frequently been commented on by people exposed to them for the first time. On SSB, the audio can be shaped by a graphic equalizer which can adjust transmit and receive audio to your own preference.
And as if that is not enough, because this rig is set up to operate via a computer, if you are connected to the Internet at each end, you are able to operate it remotely. Band change is by the flick of the mouse, tuning is by the scroll wheel, audio gain is again by the flick of the mouse and transmit and receive audio are, in my case, carried via Skype. The two computers are linked by Tight VNC, a very simple program to set up.
With a Flex radio this process is just so simple and would be used between my home and my weekender, if only we had broadband there!
In conclusion, my experience with the big brother, the Flex-5000 left me wanting its younger sibling and mine was in the first batch ordered. I received it about a month ago and have been extremely happy with it to date. I am still in the learning phase, but set up probably had me on the air within an hour of unpacking. And that also required me to make up an adapter for my headset to fit the RJ45.
If you are thinking of changing rigs then these are excellent value for money. Indeed, I would have to say that by comparison with the Big Three, in my humble opinion, the receiver on the Flex-5000 is the best that I have used. It is too early to make any definitive comments on the Flex-3000 but it has some very unusual features, as it started to snow outside whilst my XYL was taking the photos for this article. That is a feature that I have not seen mentioned in the detailed instruction manual!
Photos 1, 2, 3 and 5 by Sue Morgan VK7KSU; Photo 4 by the author.

Documents / Resources

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