BITX40v3: An Affordable & Fun "Kit" Transceiver

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In days gone by, kits came from companies like Heathkit and electronic parts were as far as your nearest Radio Shack store. But back in those days, the Canadian Amateur Radio exam was a lot more difficult and you had to know Morse code also.

Things have changed, the new Canadian Amateur Radio operators on the bands today are not required to have extensive electronics knowledge or CW to obtain their Amateur ticket. Many of these new Basic and Basic with Honours Qualified Amateurs are not very familiar with electronic circuits and most have never used a soldering iron or a voltmeter.

There is a real need to gently introduce this new type of Amateur to the fun of building something so he can feel good about his accomplishment and hopefully want to learn more.

One excellent answer to this need that recently appeared on the market is the BITX40v3 40m SSB transceiver from Ashhar Farhan, VU2ESE, of HF Signals in India (http://www.hfsigs.com/). Farhan was inducted into the QRP Hall of Fame at the 2017 "Four Days in May" at the Dayton Hamvention for his "outstanding contributions to the QRP community".

The BITX40v3 is a 5+ watt semi-kit transceiver covering the entire 40 metre Amateur band and consisting of two main parts: a transceiver RF circuit board and a digital display/frequency control unit dubbed the "Raduino" – both units are shipped to you assembled and tested. Total cost delivered to your door is $59 US or about $80 or so Canadian (payment is in US dollars with PayPal). To purchase one, first click on the "Buy" link at the top of the HF Signals webpage and then click the "Do you live outside India?" link.

So what do you get for your money? Well almost everything you need to make this into a working SSB transceiver. Check the shipping list on the HF Signals webpage. What you don't get is a case to put it in or a speaker as these items would be too expensive to mail.

The two circuit boards and various components are shipped in the plastic box shown in Figure 1.

Anyone holding a minimum of Basic Qualification with HF Privileges can assemble and use this transceiver, and part of the fun is the varied knowledge experienced in the process. The Raduino performs the functions of a digital variable-frequency oscillator (VFO), controller and LCD display. It uses an
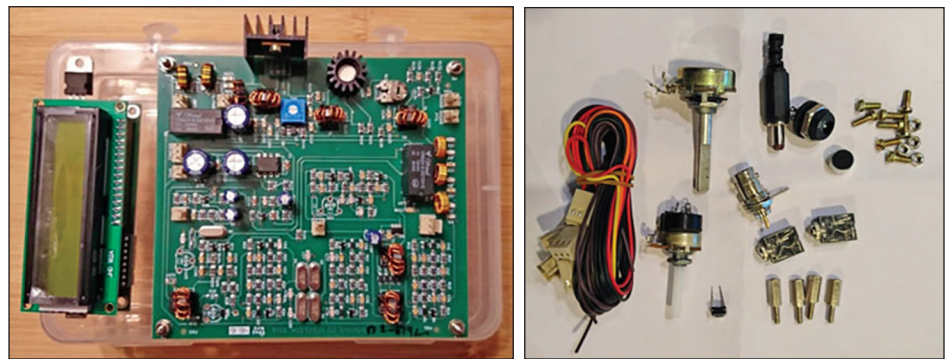

Figure 1: The two circuit boards and various components included in the kit.

Arduino Nano clone so there is an opportunity to learn some Arduino programming. There are Raduino sketches created by others such as Allard, PE1NWL, which add new features to the BITX40 – just load them into the Arduino Nano on the Raduino board.

The BITX40 comes with very basic firmware loaded into the Raduino board so it is ready to use as soon as you get it assembled. You will probably want to upgrade to the latest firmware to take advantage of new features.

Instructions on how to install the required Arduino IDE software onto a computer and how to upload the latest version of the Raduino software or sketch to your BITX40v3 can be found at: https://www.dropbox.com/s/s327me4umdckcpc/Raduino_SW_install.pdf?dl=0

The BITX40 circuit boards use installed connectors for all wiring, but there is soldering required on the other end of the wires for the volume control, ON/OFF switch, DC power jack, tuning control, microphone jack, speaker, antenna connector, headphone jack and menu/function button. So a chance to learn or practice basic soldering skills is offered. For those who have never used a soldering iron before, take a look at "Soldering is Easy – Here's How to do it" at: http://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf. This teaches the basics of soldering in a comic book format.

Putting this transceiver into an enclosure is where people really get creative. Some even utilize a case from other electronic equipment such as an old AM radio, defunct satellite TV receiver or scrapped QRP Amateur transceiver or you can just make one out of plastic or aluminum. This is an opportunity for an Amateur to have fun using tools to cut, drill, glue, screw or bolt together his radio case and to create something unique.

The kit only includes an electret microphone element and a small button switch for a Push-to-Talk (PTT) so even a

SIDEBAR

A Canadian Amateur Radio operator must hold a minimum of a Basic with Morse code or a Basic with Honours Certificate of Proficiency in order to operate on frequencies below 30 MHz (the HF bands).

As stated in government document "RIC-3 – Information on the Amateur Radio Service, Issue 4", he is permitted to "build and operate all station equipment except for 'home-made' transmitters". "Build" in the context of the Basic Certificate is limited to the assembly of commercially available transmitter kits of professional design. No physical modifications to the circuitry of the radio are permitted.

Since the BITX40v3 circuit boards are pre-assembled at the factory, the Amateur is only required to mount and interconnect these circuit boards in a suitable enclosure. Thus anyone holding either a Basic with HF privileges or an Advanced Qualification can get in on the fun of building and operating the BITX40v3 SSB transceiver.

Note that some of the modifications now appearing for the BITX40v3, which add additional features such as CW and RIT, do require physical modification to the circuitry and thus would need to be performed by an Amateur holding an Advanced Certificate.

Updating the firmware in the Arduino on the Raduino board is not modifying the radio circuitry, and therefore can be performed by any Amateur holding Basic with HF privileges.

functional microphone has to be manufactured. Some Amateurs are using a piece of plastic pipe with end-cap, or a miniature plastic box, or a 3D printed microphone enclosure. It's up to you.
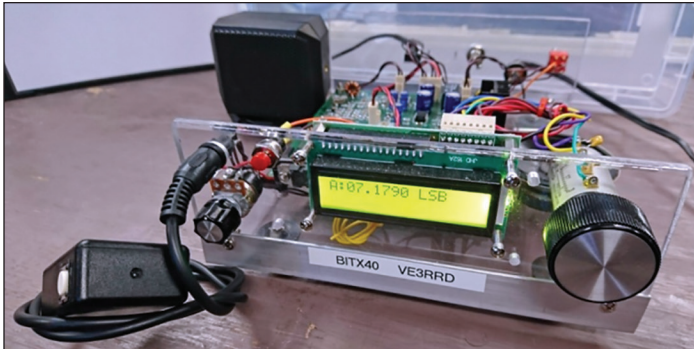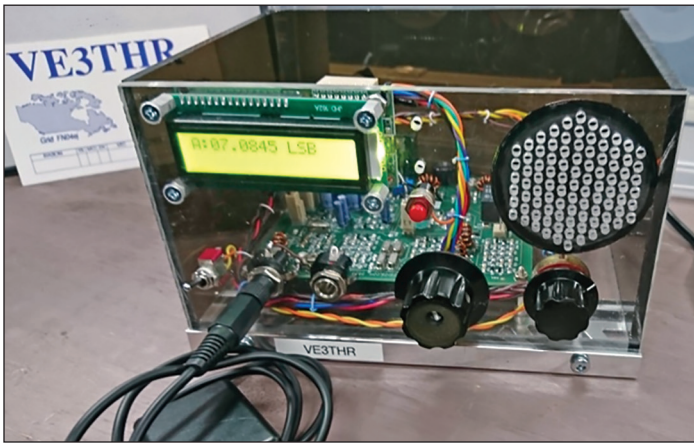
Figure 2: BITX40 transceivers built by three members of the Barrie Wireless Amateur Experimenter Group (WAX Group): Tom, VE3THR, Jack, VE3RDQ and Al, VE3RRD.

For those wanting to go further, there are a number of "mods" that can be done such as upgrading the frequency tuning control or adding an audio automatic gain control (AGC) circuit board to the receiver volume control. Improved Raduino software is available which adds USB (the stock BITX40v3 is LSB only) so that it can be used for many different digital modes.

Free computer software, such as Fldigi and WSJT-X, make getting on the air with different digital modes a lot easier. The Fldigi software can be downloaded from https://sourceforge.net/projects/fldigi/files/fldigi/. The Fldigi user manual can be found at http://www.w1hkj.com/FldigiHelp/index.html.

Fldigi supports too many digital modes to list, but includes such popular ones as PSK-31, RTTY, MT63, Olivia and Hellschreiber. WSJT-X – which supports JT-65, JT-9, FT8, WSPR and a few other weak signal modes – can be downloaded from https://physics.princeton.edu/pulsar/k1jt/wsjtx.html.

The latest version of Raduino software also adds dual VFOs, RIT and split capability and the author has promised even more feature support in future versions.

This transceiver requires 12 to 13.8 VDC with the output power about 5W at 12V and about 7W at 13.8V. Since the BITX uses a separate power connector for the final amplifier (an IRF510 transistor), a higher voltage of up to 25V can be applied to the PA to obtain 20W or more output although a much bigger heat sink is required. Those who hold an Advanced Qualifications certificate can modify their BITX to operate on other bands such as 80m and 20m if desired. There is even a hardware mod to add CW capability which is already supported in the latest Raduino software.

And how about building your own 40m antenna to use with your BITX40? A 40m dipole is easy to make and is a very efficient antenna. You just need to get it up in the air high enough. Many plans can be found on the Internet.

The BITX transceiver is "open source" and exists in various versions available from others (many are sold on eBay), but the preassembled BITX40v3 using SMD parts on a printed circuit board designed by Ashhar, VU2ESE, is only available from HF Signals and is only sold through their website.

This is a great kit for both old and new Amateurs – giving a lot of fun and learning experience for your dollar. It could also make a good Amateur club project for its members.

BITX QSO nights are currently held every Sunday evening. Visit https://groups.io/g/BITX20 for frequency and times. As I write this it occurs between 7 and 9 pm (your local time) around 7178 and 7277 kHz, but time and frequencies may change. BITX40 spots are sometimes listed on https://www.qrpspots.com/ and http://www.dxsummit.fi/#/ so checking them may tell you where all the BITX40 users are.

Get in on the fun, build a BITX40v3 and join the growing numbers of Amateurs worldwide who already have. I hope to have a BITX to BITX QSO on 40m with you soon.

Support for the BITX40v3 can be found at the following sites:

- http://miscdotgeek.com/unofficial-bitx40-faq/ – answers many basic questions about the BITX40

- http://www.hfsigs.com/bitx40v3_wireup.html – instructions on wiring up the BITX40

- https://groups.io/g/BITX20 – this group supports all versions of the BITX

- http://bitxhacks.blogspot.ca/ – information on many mods and improvements

- https://www.facebook.com/groups/1850616678547526/ – QRP Bitx40v3 40m radio Facebook group

- https://github.com/amunters/bitx40 – the latest improved Raduino software from PE1NWL

- http://barrie-wax-group.blogspot.ca/ – Barrie Amateur club builders' group blog

Al Duncan was first licensed in 1983 as VO1RD then was VE4AOA from 1985 to 1988 and VE3RRD from 1988 to the present. Retired from 20 years in the military in 1989 where he was in the communications and electronics trades. Next he worked as a Bell Mobility RF field maintenance technician from 1989 until retirement in 2008. He has served on the Barrie Amateur Radio Club executive for 9 years, teaches the Basic Amateur Radio Qualification course for the club, and is an Industry Canada Accredited Examiner. He has also created a special interest group in the Barrie club called the Wireless Amateur Experimenter Group (WAX Group) to foster learning how to build things for the hobby rather than just buying "ready-made".

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