Getting Started with 30m APRS

by Sholto Fisher
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Anyone who knows me knows my favorite digital mode is Packet Radio (AX.25). Although the mode and protocol were defined many years ago it is still one of the most flexible and exciting modes to play with especially if you are also interested in computers and networking.

AX.25 (Amateur X.25) has both connected and unconnected modes of operation (similar to TCP/UDP for those of you who grew up with the Internet).

As AX.25 is a layered networking protocol it is possible to leverage it with many "higher level" applications. Examples of these (in the connected mode) would be Packet Radio BBS's, Nodes, Winlink e-mail servers (RMS), DX Clusters, telnet type chat, etc.

One of the main applications for the unconnected mode of operation is APRS. APRS (Automatic Packet Reporting System) is defined in Wikipedia as "real time tactical digital communications of information of immediate value in the local area" which is a little unfortunate as it implies APRS has only a local scope and used for disseminating quickly changing information e.g. vehicle tracking.

There is no argument that most APRS is to be found on VHF but there is nothing inherent in the protocol to limit it to small geographic areas or vehicle tracking!

30m HF APRS

When propagation is down on higher bands this Winter why not give 30m HF APRS a shot?

Winter months are often the best for the 30m band as noise is greatly reduced and the band is open much longer than 20m. During the daylight hours you'll have coverage out to a few hundred miles and on a good evening you can span continents and oceans.

What Can I Do With HF APRS?

You can see from the map that one of the obvious uses of APRS is to inform others of your presence. Stations will come and go on the map as the band changes. This is useful in itself as it gives you a feel for live propagation conditions.

Most HF stations will be at fixed geographic locations but there are also mobile and maritime mobile stations active.

Many of the fixed stations act as an "i-gate" or Internet gateway. Basically any decoded packets will be "gated" to the Internet and made available on websites such as http://aprs.fi. This is a good way to check if your signal is getting out. When you become more experienced you may want to operate your own I-gate and allow others to be "heard" on the Internet.

Most APRS software also has provisions for messaging which is very similar to SMS type communications. This is a great way to introduce yourself or keep up with old friends.

You will notice from the map that the ISS (International Space Station) is shown and has a roughly circular range "footprint" associated with it. This was not a direct transmission from the ISS in case you were wondering. It is a transmission of an APRS "object" by one of the other HF stations which is overlaid on the map.   APRS objects can be anything and represent one of the most interesting ideas in APRS. Besides the

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ISS track and footprint I have seen weather events and live earthquake data represented as objects. The possibilities are many and most client software is capable of displaying them.

What Do I Need?

General 30m APRS transmissions are 300 baud FSK with tones emitted at 10.1492 and 10.1494 Mhz. This is 200Hz shift HF Packet Radio and can be decoded by a number of devices & software programs.

Another way of visualizing this would be a dial frequency of 10.1478 Mhz USB with your Mark/Space audio tones on 1400 & 1600Hz.

Traditionally a TNC (hardware modem) would be used but for much better results two software programs which utilize a computer sound card have established themselves at the forefront of Packet Radio decoding:
Dire Wolf -
https://github.com/wb2osz/direwolf

The Dire Wolf modem was specially designed for APRS (both HF and VHF variants) and is extremely sensitive and capable of limited error recovery. It is available for Windows, Linux and Mac OS-X operating systems. It is even compilable on inexpensive "Single Board Computers" such as the Raspberry Pi.

UZ7HO Soundmodem -
http://uz7.ho.ua/packetradio.htm

Soundmodem is a Windows only application and like Dire Wolf extremely sensitive and has error correction facilities. For Windows users this is probably the most user friendly of the programs and has a nice easy to understand GUI with a "waterfall".

Both of these programs plus a sound card interface provide the lower layer of AX.25. For APRS you'll also need some client software.

One of the oldest and the former champion of APRS clients was UI-View32 available from http://www.ui-view.net/.

It is still a very comprehensive client but now showing its age so you might want to read WA8LMF's notes for updating some critical areas of the software at http://wa8lmf.net/aprs/UIview_Notes.htm

A more modern Windows APRS client is AGWTracker http://www.sv2agw.com/ham/agwtracker.htm Designed to be used with the AGW PE sound card software it is fully compatible with both Dire Wolf and Soundmodem.

For Linux and Mac OS-X there is Xastir http://xastir.org/index.php/Main_Page. Again a very capable client and more than adequate for our purposes.

All client software will need some degree of configuration. Typically this involves letting the program know you will be using an "AGW" port for communication, entering your call sign, choosing your icon (e.g. HF "house" or "i-gate"), setting a text beacon and repetition rate and defining your geographical coordinates.

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As with other forms of digital amateur radio it is often better to observe for while before jumping in with transmissions. WA8LMF again has some interesting notes regarding 30m APRS here
http://wa8lmf.net/aprs/HF_APRS_Notes.htm

I hope this article inspires you to give 30m APRS a shot. The usefulness of any Packet Radio network is directly proportional to the number of stations who participate.

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Upcoming Events

HAMFESTS

January	February	March	Hamvention
1/7/17 **WARAC Midwinter Swapfest** Waukesha, WI	**2/10-12/17** **Orlando Hamcation** Orlando, FL	**3/4/17** **Charlotte Hamfest** Concord, NC	**NEW LOCATION!** **Greene County Fair & Exposition Center**
1/22/17 **WCRA Midwinter Hamfest** St. Charles, IL		**3/11/17** **Mike & Key Hamfest** Pullyup, WA	**May 19-21** Xenia, OH
1/28/17 **Winterfest** Collinsville, IL			

RIGblaster Advantage Linux Drivers

by Sholto Fisher
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West Mountain Radio drivers have been included in the Linux kernel since version 3.8.4. Most recent distributions should have no problem automatically recognizing West Mountain Radio devices.

(The following notes are for Ubuntu but may also apply to derived distributions).

You can find the serial port by opening a terminal and typing:

```
ls -l /dev/ttyUSB*
```

This should return a display similar to the one below:

```
crw-rw---- 1 root dialout 188, 0 Sep 30 13:49 /dev/ttyUSB0
```

If the group "dialout" is not listed in the output you will need to add your user name to that group. This is the most common reason why rig control or ptt won't function!

Use the following command:
```
sudo usermod -a -G dialout <user name>
```

where <user name> is your linux user name... and then log off and log back on for the changes to take effect.

If you have more than one USB serial device on your system you can use the following command to determine which ttyUSB device number is assigned to the RIGblaster:

```
ls -l /dev/serial/by-id | grep 'RIGblaster'
```

This will return a display similar to:

```
lrwxrwxrwx 1 root root 13 Oct  7 05:42
```

```
usb-Silicon_Labs_West_Mountain_Radio_RIGblaster_Advantage_d5b25d6b-if00-
port0 -> ../../ttyUSB0
```

To show the RIGblaster Advantage sound card playback device type the following:

```
aplay -l
```

Which should return a display similar to the following:

```
**** List of PLAYBACK Hardware Devices ****

card 0: Intel [HDA Intel], device 0: AD1882 Analog [AD1882 Analog]

    Subdevices: 1/1

    Subdevice #0: subdevice #0

card 0: Intel [HDA Intel], device 2: AD1882 Alt Analog [AD1882 Alt Analog]

    Subdevices: 1/1

    Subdevice #0: subdevice #0

card 1: Audio [RIGblaster Advantage Audio], device 0: USB Audio [USB Audio]
```

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```
    Subdevices: 1/1

    Subdevice #0: subdevice #0
```

To show the RIGblaster Advantage sound card recording device use this:

```
arecord -l
```

Which should return a display similar to the following:

```
**** List of CAPTURE Hardware Devices ****

card 0: Intel [HDA Intel], device 0: AD1882 Analog [AD1882 Analog]

    Subdevices: 1/1

    Subdevice #0: subdevice #0

card 0: Intel [HDA Intel], device 2: AD1882 Alt Analog [AD1882 Alt Analog]

    Subdevices: 1/1

    Subdevice #0: subdevice #0

card 1: Audio [RIGblaster Advantage Audio], device 0: USB Audio [USB Audio]
```

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The West Mountain Radio Diagnostic Software is a very useful tool for use with your RIGblaster. The main screen provides a simple listing of serial and audio devices on your Windows computer but in addition to this a "Port Splitter" is provided which extends the functionality of the RIGblaster Advantage.

What do we use serial com ports for in Ham Radio?

Many of our ham radio programs require a serial connection to the radio for the purposes of rig control aka CAT or Icom CI-V. The serial connection in this case is a bidirectional data stream to and from the radio's CPU. It allows programs such as Ham Radio Deluxe to determine which frequency the radio is tuned to and to permit changes to the operating modes of the radio. All logging software relies on rig control to function.

This data stream uses the TxD (transmit data) / RxD (receive data) lines of the serial port. It does not matter if we are talking about a real serial port (such as found on older PC's) or a serial port implemented over USB (as in the case of the RIGblaster Advantage & Plug & Play) it is all the same from the point of view of the ham radio software.

In addition to the TxD/RxD lines the RIGblasters use some serial control registers for special functions. These are RTS (ready to send) and DTR (data terminal ready). RTS activates the PTT (push to talk function) and DTR is often for keying the CW or FSK jack. These are simply single bits which get toggled on or off.

For example setting RTS would cause the RIGblaster to put the radio into transmit.

Toggling, or a more accurately bit-banging DTR at a symbol rate of 1.5 stop bit, 45.45 baud, 5 bit Baudot would produce an FSK RTTY output on the CW/FSK jack. Bit-banging DTR in time with Morse code timings would make the RIGblaster transmit CW.

In theory, as long as the radio does not require hardware flow-control of its TxD/RxD data it should be perfectly possible from a programming point of view to utilize rig control and manipulate RTS/DTR in anyway required so that here is no interaction. That is theory. Practice is another thing altogether.

Why do I need the com port splitter?

One of the limitations in Windows is that a serial com port can be opened once only. This is actually a good idea as it prevents multiple programs from trying to talk to the serial port at the same time which would most likely result in chaos but this means running your favorite digital mode software with your favorite logging program may not be a simple proposition.

It also does not take into account that some radios do in fact require hardware flow-control. For example most modern Kenwood radios with a 9 pin RS-232C rig control jack require the CTS (clear to send) and RTS (ready to send) control registers so even a top class programmer could not get around the fact that RTS is required for rig control and also used by the RIGblaster for the transmit function.

Now there are often work-arounds in ham radio and you may be lucky depending on the equipment you use. For instance, if you

own one of the Kenwood radios mentioned above (or in fact any radio with an RS-232C rig control jack) you do not have to have rig control run through the RIGblaster Advantage. You could use a separate connection directly from the computer to the radio using a "USB to RS-232C adapter". These adapters provide their own com port so it is relatively easy to configure your logging software (e.g. HRD) to use this port for rig control and then configure your digital mode software (e.g. DM-780) to use the RIGblaster's com port for the PTT function.

But what if you have to run rig control through the Advantage? Icom radios and some Yaesu (e.g. FT-817) use a TTL serial connection so a "USB to RS-232C adapter" is not going to do it and anyway, that is why you bought a RIGblaster!

You might also be using our "Kenwood serial cable" (#58119-1432) which does connect from the Advantage to a Kenwood radio. This cable is modified so that RTS/CTS are tied together (and not passed through to the RIGblaster). It tricks the Kenwood into thinking flow-control is active.

In cases like these the West Mountain Radio "Com Port Splitter" can be invaluable. Simply, it remaps the original RIGblaster com port functions onto two or three virtual ports.
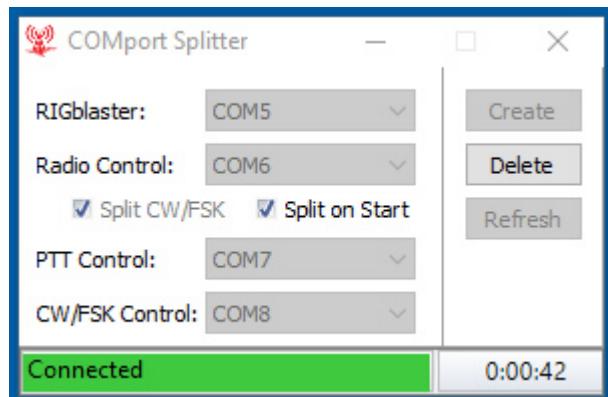
In the image shown, the original RIGblaster com port was COM5. The port split function has been used to map radio control (i.e. TxD/RxD) onto COM6, PTT control (RTS) onto COM7 and CW/FSK control (DTR) onto COM8.

The "Split on Start" checkbox tells the program that you wish to recreate the port split each time you boot Windows.

The "Split CW/FSK" checkbox controls whether you want to combine PTT and CW/FSK onto the same virtual port or not. Some software requires RTS and DTR on the same port for proper operation e.g. MMTTY running standalone using the ExtFSK library for FSK.

For Ham Radio Deluxe you will need to create three virtual ports as DM-780 does not work correctly in "serial port CW" or FSK RTTY modes if it has to share a com port for PTT. If you don't care about RTTY FSK or "serial port CW" then you could get by without splitting the port into three.

Deciding on what is best for your situation will require you to understand your needs and what your software and equipment expects. Sometimes it's not an easy choice and there may be more than one way of doing it but if you get stuck you can always contact West Mountain Radio Support for help!

73 and best wishes for the holiday season!