

APRS-PSK63

For Improved Performance and Noise Immunity on HF Radio

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Abstract

APRS (Automatic Packet/Positioning Reporting System) developed by Bob Bruninga, WB4APR, has become extremely popular worldwide. Over the years there has been tremendous growth in VHF digipeating, the APRS Internet Network, and recently UHF 9600 bps experimental nodes are making a comeback. HF APRS hasn't changed much since the 90's with Bell 102 tones still in use. At last, a simple way was found to link WinAPRS with a resurrected PSK31 TCP/IP Server upgraded for double speed. APRS-PSK63 (including QPSK63) is now possible with WinAPRS, as well as UIVIEW. Readers of this article will be able to setup their own APRS-PSK63 HF nodes. On-the-air trials have been very promising with improved performance and noise immunity!

Introduction

We authors both belong to the HFPack HF Portable Group founded by Bonnie Crystal, KQ6XA in 2000. This group is dedicated to enthusiasts everywhere who enjoy HF Backpack Mobile, and portable operations in the field. Being HFPackers who also loved operating with digital modes, it didn't take long for us to inquire about using APRS when hiking up trails with antennas on our backpacks. Yes.. We enjoyed using VHF for tracking and short text messaging, but there are locations up in the hills that are difficult for digipeater access. In order to keep in touch, we often like to alert other HFPackers of our locations, and status before calling CQ HFPack (our group's motto). HF APRS seemed like the natural progression so we examined our options. Old Tic's were rescued from holding up book shelves in our shacks, TNC-1's with bell 102 modem headers were dusted off, and an old KAM plus was brought back from the dead with a hard reset. Firing up these relics from the past was a revelation! The big thought that crossed our minds, in addition to wondering how we were going to lug all of these extra boxes around, was how would they perform with our HF radios? Would the same noise bursts that plagued HF packet years ago still haunt us today?

Retries of Death

Testing began in earnest on both 20 meters and 40 meters at various times of the day and evening. Bill, K6ACJ was using WinAPRS 2.75 at the time, while I was using APRS for DOS version 8.69 . Since we are now entering the low point of the sunspot cycle , band conditions were becoming quite poor . Increasing thunderstorm activity during the spring also made a bad situation worse. Data hits were quite common, and our POSITS often never made it across without errors. Bill, K6ACJ thought he would get improved results with SV2AGW's AGWPE Software Packet Engine. I was skeptical , and sure enough the bell 102 , 300 baud packets still left much to be desired in the presence of noise. No amount of DSP tricks , passband tuning , narrow filtering, or changing to superior sound cards made any difference. The results from our HF packet experiments were quite dismal despite considerable effort . Connected HF packet often suffered from Retries of Death , so in a way it was no surprise that even unconnected protocol would be difficult under noisy band conditions. There had to be something better out there, and the answer was PSK. We both abandoned HF Packet, and I (WB6MLC) decided to inquire if APRS was ever successfully operated on HF with PSK tones.

The Resurrection

I spent hours searching the Net for information, and finally discovered articles on APRS-PSK31 by the late Roger Barker. G4IDE. Roger had indeed described and wrote a PSK31 TCP/IP server that could link to UIVIEW, his APRS software contribution. He conducted experiments in 2001 with a couple of others on 80M and 10M with good results. The APRS-PSK31 paper trail stopped after 2002, and no more information could be found. His "experimental PSK Server software" was also not available for download at TAPR, or on his UIVIEW web sites. I learned that Roger, G4IDE had passed away on Sept. '04, and now there would be no more new info available. Browsing around the TAPR web site, I literally stumbled across Evhen Tupis' (W2EV) Propnet Group, and discovered that they were using PSK31Srv vers. 1.08 for atmospheric probing. This was the software that Bill, K6ACJ and I needed to get APRS on PSK once again, so I quickly downloaded it to the APRPack web site. I was happy to resurrect PSK31Srv since the Propnet Group was planning to replace it with their own PropnetPSK . After setting up UIVIEW , I was ready to begin APRS-PSK31 on-the-air trials with the small group of APRPackers (HFpack + APRS).

Extensive testing with UIVIEW on 20M and 40M and PSK31Srv revealed what was expected of PSK31 as a low bandwidth mode with higher noise immunity. Although it was indeed an improvement over 300 baud bell 102 packet, the POSIT exchanges were too slow , and often data hits still occurred before the data stream was completely received. APRPackers complained that even short text messages seemed to take forever! Another solution was necessary or this was not going to work.

PSK63 for High Performance

The PSK31 engine in PSK31Srv.exe was discovered to be based on Moe Wheatley's (AE4JY) PSKCOREDLL project. The PSKCORE.DLL allows many PSK31 programs to be upgraded , so it was just a matter of replacing the older DLL Roger , G4IDE had used in his PSK server software. In mid-2003, AE4JY had added a double speed mode to allow PSK63 and QPSK63 . Skip Teller, KH6TY had released QuikPSK in Nov. 2003 featuring PSK63CORE.DLL , which was perfect!

I proceeded to upgrade PSK31Srv to become PSK63Srv, and fired it up with UIVIEW32. The results were very impressive with 100wpm speed to improve both the turnaround and the responsiveness of the newly hatched APRS-PSK63 mode. POSIT exchanges on the air was very quick, and Short Text Messaging was snappy. When contacts were made during noisy band conditions, the double speed PSK63 and QPSK63 with FEC made HF operation very enjoyable. Bell 102 packet would have collapsed if used under the same conditions noted during these on-the-air trials. In fact, Bill K6ACJ and I did compare the two modes, and PSK63 always came out the winner.

Skip Teller, KH6TY, the author of the acclaimed Digipan, reported that PSK63 has improved polar path performance over PSK31. In his FAQ, he stated that twice the power would give equivalent PSK31 performance at only double the bandwidth.

Patrick Lindecker, F6CTE, who created MultiPSK 3.91, wrote that PSK63 has a S/N ratio of -7DB, while QPSK63 with convoluted encoding should do even better.

Bill, K6ACJ, Leigh, WA5ZNU, Howard, W6IDS, and I made various contacts with APRS-PSK63, and then switched to the new digital mode, OLIVIA. OLIVIA can copy -12DB down into the noise, and we noticed that both PSK63 and QPSK63 compared very favorably. Everything seemed to be progressing nicely, but then another problem arose. PSK63Srv obviously worked well with UIVIEW, and Roger, G4IDE himself said his software should work with other programs that can do a TCP/IP connection. Since Roger is now a Silent Key, there will be no more upgrades despite minor add-ons written by the supporters of UIVIEW. Bob Bruninga, WB4APR told me that he was much too busy with his satellite projects at the Naval Academy to retool APRS for DOS with a TCP/IP stack. Is this the end of the line?

WinAPRS the Missing Link

Bill, K6ACJ and others in our group had already spent considerable time mastering WinAPRS, and enjoy the high definition TIGER maps which allow zooming down to the nearest fire hydrant. When I attended the Dayton Hamvention 2005, I was fortunate enough to meet the Sproul Brothers, who displayed the latest version of WinAPRS on a large LCD monitor. I discussed our work-in-progress with APRS-PSK63, and was greeted with a positive response. Mark Sproul, KB2ICI, said he was thinking of trying PSK. Since I was a newbie to WinAPRS, I had a chance to hear about how WinAPRS can continue to improve and grow from the creators themselves. Upon my return I was determined to figure out how to get our PSK63Srv to be fully compatible with WinAPRS.

Bill, K6ACJ studied the problem, and came up with a simple solution which involves re-editing a .prt file in the ports folder in WinAPRS. PSK63Srv appears to UIVIEW as an internet server by linking to it on Localhost:3131. When this is done, everything that goes out is translated into PSK63 tones, and vice versa. What Bill, K6ACJ had done was to create a new port list that includes Localhost:3131 as an entry. When this is made active, WinAPRS can link up with PSK63Srv. All beaconing, messaging, and other features are now made available on HF.

We exchanged POSITS, sent messages, and exercised the Query mode for hours when conditions were reasonable on 40 Meters at 7.087mhz. Both UIVIEW and WinAPRS had no trouble talking to each other. We had good results after tweaking the retry count to 2 for messaging. The turnaround time was very snappy at 100 wpm speed. No FRACK problems were encountered too.

Although the Message center does send and receive ACKs, we found that on HF it is not necessary

to have each and every ACK successfully received by both sides. Unconnected Short Messaging with WinAPRS on HF works very well. Yes... during very bad conditions even PSK63 and QPSK63 can cause WinAPRS to retry if there are data hits. After receiving two ACKs, no more is necessary to confirm receipt of a message. Overall, the performance was very promising.

APRS-PSK63 in the Field

Now that the APRPack Group had successfully tested APRS-PSK63 with both WinAPRS and UIVIEW, it was time to take everything to the field. Our original goal was to keep in contact with base stations at home, or with other HFPackers also operating portable. The software works just like any other digital mode software, so standard PSK31 hardware interfaces will work just fine. Rig level adjustments are also the same as before, so there is no new learning curve. The advantages of running APRS-PSK63 are many. A single Laptop, the compact interface box, and the radio is all that is needed. Our thoughts of dragging TNC boxes around can now be forgotten.

Recently for Field Day 2005, I wanted to demonstrate how using APRS-PSK63 can work from a remote location where digipeaters are difficult to access on VHF. Using a Yaesu FT-857D, a Panasonic Toughbook notebook, and a 80M W3FF Buddipole mounted only 11ft off the ground, I was able to exchange POSITs with Bill, K6ACJ hundreds of miles away in Huntington Beach, CA. Running only 30watts from the Eastern Sierras where I was surrounded by trees, NVIS propagation worked very well.. ARES and RACES members who would need to track resources in the field can quickly setup an NVIS APRS-PSK63 station in hilly areas, or inside deep canyons where VHF signals do not penetrate well. Fig. 1 and Fig. 2 show my portable setup, and the Buddipole that was used. Fig. 3 shows a screen capture of WinAPRS and PSK63Srv.



Fig.

1 FT-857D and Panasonic Toughbook, with FT-817 as a backup rig



Fig.2 The W3FF 80M Commercial Buddipole was only 11ft. off the ground for NVIS propagation.

Setting up your own

The PSK Server software necessary for setting up a barebones APRS-PSK63 station can be downloaded from the APRpack Yahoo Group's file section at

<http://groups.yahoo.com/group/aprpack/?yguid=86469733>

The following is a list of what is needed to get started:

PSK31Srv.zip

PSK63CORE..zip

PSK63Srv.txt (complete instructions on how convert PSK31Srv to PSK63Srv)

Aprsnet.PRT for WinAPRS linking (to be placed in the ports folder)

Approved membership in the moderated APRPack Group is necessary to download the above, so PSK31Srv might still be found at W2EV's Propnet Site for a limited time.

<http://www.rochesterny.org/beaconet/propnet/propnetDownloads/PSK31Srv.zip>

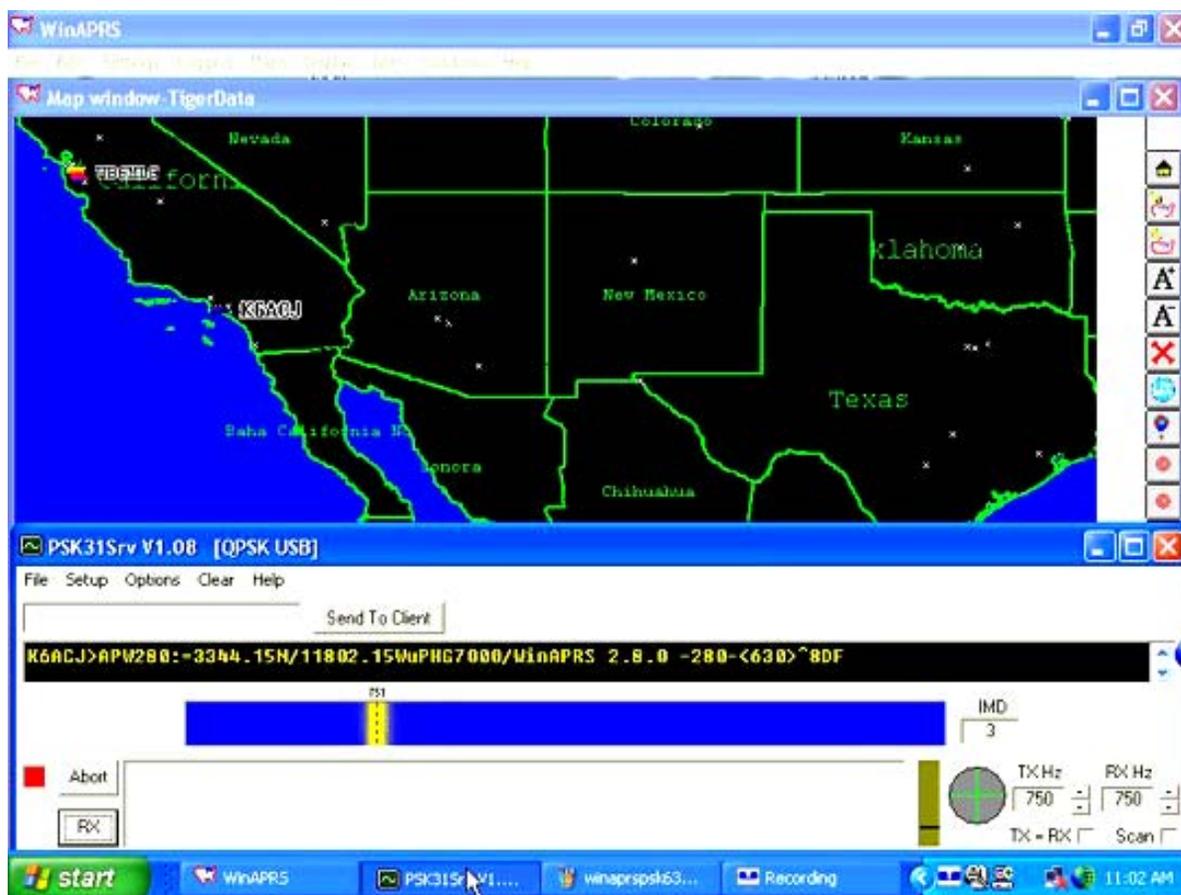


Fig. 3 WinAPRS linked to PSK63Srv while transmitting a beacon.

A second source for the PSK63CORE.DLL is Skip Teller's (KH6TY) QuikPSK site at <http://www.qsl.net/kh6ty/psk63/>.

At the end of this paper in our Addendum section condensed versions of the APRS-PSK63 Help files from the APRPack Group will be listed for your convenience. Screen shots of menu setups have also been included.. The help files that come bundled with PSK31Srv are actually extremely helpful. Of course if there are still questions, members of the APRPack Group are always happy to help newbies get on the air with few problems . The setup initially looks complicated , but once up and running APRS-PSK63 is very easy to maintain and use in the field. It works with most Sound cards available, and older laptop systems running Windows98 . Unfortunately there is no Macintosh version of PSK63Srv.

Are there any problems or bugs in PSK63Srv? APRPack members did notice a startup tuning bug that seems to go away after 5-10minutes. The Waterfall Frequency readout may wander or drift several Hz, and will settle down within 2-3hz of the offset frequency. On some systems , this problem may never occur, so it depends on the sound card. Since the program is running at double speed, the offset should be set at **750hz for both TX and RX**. This will result in our desired 1500hz offset!

Operational Protocol

When first bringing a new APRS-PSK63 station to life, there are some protocols that are helpful if followed. First, be sure to turn off, or deactivate the sound in WinAPRS and in UIVIEW. Many of us now use laptops with no serial ports, so digital mode VOX must be used to key one's rig. APRS software does a pretty good job of announcing new stations heard, or sounding position alarms. This simple step also can improve the performance of older systems. APRPack group users reported freezes and unexplained crashes in their computers when POSITS were being received. It turned out that the Voice Annunciations can severely tax the system resources of many computers. Besides, one does not wish to have Mail Announcements going out over the air.

What about Text Messaging? With PSK63, can you be as verbose as you want? Bill, K6ACJ had put together a very informative FAQ on HF Short Text Messaging with WinAPRS. Unlike VHF, the HF environment is quite different, so one must pay attention to the number of characters in their text. Bob Bruninga, WB4APR stated that APRS was never meant for intense Keyboard to Keyboard conversations, so his advice should be followed in both WinAPRS and UIVIEW's Message centers. One feature in APRS-PSK63 that many will love is the ability to use PSK63Srv directly for short keyboard chats when conditions are too noisy for text messaging. Its simple interface works well if you need to transmit vital data such as new frequencies, or schedules in QPSK63. QPSK63 includes its own FEC (forward error correction), so it is quite robust!

What about roundtable sessions on the air? Roger, G4IDE stated that roundtables are successful if the group picks the weakest station as the hub station. This means that all stations should send short text to this same station in the TO field in their message center. The net effect is that everyone should be able to see what is being sent to the hub station, who will be sending out ACKS to each of the senders.

We at the APRPack Group also noticed that it is best for the first station on the scene with their APRS Beacons to become the Leader. As in Digipan, all others who join the roundtable should click on the waterfall trace of the leader so all will be on the same frequency. We found out that certain soundcards do have frequency offset errors, and not everyone will end up where they think they should be. PSK63Srv does not have the AFC or calibration controls found in other PSKCOREDLL programs, but you do have the equivalent of a "NET" button. If you check TX=RX (which normally should be off as the default) during the roundtable or group session, you now can lock onto the Leader.

Frequencies

The APRPack Group is a spin-off of the main HFPack HF Portable Group, so we got permission from our fearless leader, Bonnie Crystal (KQ6XA) to use the shared HFPack Data Frequencies found at www.HFPack.com. These frequencies are far away from regular PSK31 activity, so there is no fear of causing interference. We APRPackers normally can be found beaconing at the following : 7065 MHz USB, or 7087 MHz as the alternate, and 10.145.5 MHz USB depending on conditions.

The Future

APRS-PSK63 has a lot of potential for anyone who needs to use portable HF Radio for tracking emergency resources, position reporting, or Short Text Messaging in the field. Once configured the software is easy to use for emergency training, or just for plain fun. The APRPack members thought it would be entertaining to exchange POSITS as a valid contact with others on HF. APRS-PSK63 Sprints could be held with the intent of filling the map with as many POSIT symbols as possible.

Currently, no APRS-PSK63 HF gateways, or IGATES exist. Bob Bruninga, WB4APR had concerns about PSK63 tuning as an issue., and thought some kind of automatic AFC should be developed. We APRPack members have used this mode for months, and came to the conclusion that tuning is not really that big of a problem. The TUNE protocol he suggested for HF Packet years ago can be applied to APRS-PSK63. Once a beacon is heard and the POSIT is printed, a Query command can be issued to get the other station to retransmit. If the second transmission is successfully received, Then you are properly tuned in. This technique has been used successfully by Bill, K6ACJ and myself for hours. Our stations always responded each time to the Query, and Short Text Messages were exchanged periodically with no retries. What about possible errors in the POSIT data received? One built-in feature of PSK63Srv is the availability of CRC checking and validation. When this is activated, it helps to prevent the printing of garbage POSITS on our screens. Bill, K6ACJ and I feel that APRS-PSK63 is robust enough to use for IGATE experimentation.

What improvements can be made? If we had a wish list, we would like to see a Universal Server software that can attach multiple modes to WinAPRS. PSK63Srv will never be upgraded unless the source code were found, and all the new features of the latest PSKCORE.DLL are activated and recompiled. Roger, G4IDE stated that PSK31Srv can be freely distributed in the public domain. It would be ideal if his software could be archived at TAPR, which would allow many more APRS-PSK63 stations to quickly go on the air. PSK63 activity also would get a big boost. If we can recompile a new, improved version that goes way beyond version 1.08, great progress can be made for the future.

Conclusion

HF APRS had not undergone much change with Bell 102 packet still being used on 10.150 MHz HF Gateways and IGATES. After resurrecting PSK31Srv server software (which was written back in 2001), upgrading it with PSK63CORE.DLL, and linking it to WinAPRS, APRS-PSK63 was created for improved performance and noise immunity on HF Radio. HF APRS fans and experimenters should give it a try, and see for themselves what a difference this new mode can make.

Addendum

The following are help files originally posted on the APRPack Yahoo Group web site.

Fig.4 shows a typical screen shot of UIVIEW with PSK63Srv. Fig. 5 shows the UIVIEW server setup. For WinAPRS fans, Fig.6 shows an edited Aprsnet.prt file that is placed in your ports folder. Fig.7 shows the resulting ports list with LocalHost:3131 made active for linking PSK63Srv to WinAPRS.

Getting Started with APRS-PSK-63

The APRPack Group has been actively shaking down a new (resurrected) data mode called APRS-PSK31, which we recently upgraded to APRS-PSK63 with double the speed.

It will allow APRPack members to do APRS tracking on HF radio with real PSK63 tones instead of 300 baud Packet.

This mode was first announced by G4IDE(SK) way back in 2000, and was held in limbo. I decided to resurrect it, and adopt it for the APRPack group. What can you do when HF portable, mobile, or pedestrian mobile? It is possible to send and receive Posits (location symbols+ call signs) which pop up on a map like GPS waypoints, send short text messages (HFNow style scheds, greetings) to unattended HFpack stations, or direct PSK63 Chat if conditions are poor. It is the perfect data mode for those who already love APRS, or who are just getting started.

The mode still has a couple of kinks to work out, so newbies can help us shake it down by getting on the air. Presently it works well with UI-VIEW16 and UI-VIEW32, but a way has also been found to link it with WinAPRS, another very popular APRS program written by the Sproul Brothers in the USA. We use standard HFpack data frequencies of 7065 USB, 14.109.5 USB, and 10.145.5 USB depending on the time of day. For the complete HFpack Frequency list of APRPack frequencies, go to WWW.HFpack.com.

So the new motto is... "Don't just listen...Beacon CQ APRPack!"

What do you need to get started? In the APRPack files section you must download the following:

UIVIEW16 for UIVIEW fans
PSK31SRV.zip
PSK63CORE.zip
PSK63Srv.txt (step by step psk63 conversion help)
Checklist for UIVIEW etc

And for WinAPRS fans:

aprsnet.prt for WinAPRS linking (WinAPRS 2.7.7 is recommended)
PSK31SRV.zip
PSK63CORE.zip for PSK63 conversion
PSK63Srv.txt (step by step instructions for psk63 conversion)

APRS-PSK63-Quickstart Hints for WinAPRS (read this for the latest info)

“Short Text Messaging on the HF Bands with WinAPRS 2.8” PDF file (READ this multiple times!)

Barebones Setup Hints

Next, for UIVIEW users, go to APRPack Links section, click on the Software folder, and download the USA relief map. Drag the map and its INF file to your maps folder in UIVIEW. You can use the simple tactical USA map that comes standard in UI-VIEW16 or this really big one for extra fun. UI-VIEW32 has no stock USA tactical map, so you can copy the USA and its matching Setup INF file from UIVIEW16 to its maps folder. UI-VIEW32 is supported by UnderTow Software for more detailed maps that can also zoom down to street level. More info on how to purchase this software can be found at the main UIVIEW web site.

If you already have WinAPRS, or want to try it, go to **www.winaprs.com** to download the latest application, map info, and help files for setup. WinAPRS uses its own TIGER map system that can zoom down to street level. WinAPRS comes with a sample USA map to get you started. Other user supplied maps are available on the net if you do a Google search for them .

IMHO, APRS-PSK63 has good Text Messaging integration with UI-VIEW32, but more on-the-air testing with WinAPRS will obviously help to inspire new improvements from its authors. For excellent WinAPRS messaging help on HF Radio, see the "Short Text Messaging on the HF Bands with WinAPRS 2.8" PDF file for detailed instructions.

The above files and programs in the APRPack Files Section will allow one to setup a barebones APRS-PSK63 station. It can be used with your existing PSK31, or digital radio interface.

If you do not have an interface, check out The HamStop on the web.

You may have noticed that there are also two different PSKCORE.DLL files for download depending on the speed of your system. When we started doing only PSK31, a more updated and faster core was needed. With the adoption of PSKCORE63, you no longer need to worry about which PSKCORE to use. Ignore the original PSKCORE comments in the Check List ,and just stick with the default, older PSKCORE.dll that comes with PSKSRV31. It will be instantly replaced when you convert to PSK63. We will keep the PSKCORE.dll files available for future reference only. Again.. what does PSKCORE.DLL do? It is the engine that drives the original PSK31SRV server software, generates the tones, and manages reception of PSK data .

So, the recent development that CHANGED everything for us was the addition of PSK63CORE.DLL, which will convert the PSK31SRV software into PSK63SRV for PSK63.

This newer flavor of PSK can run at 100 WPM. It is quite fast, and ended up becoming the default for all of our operations. Ok. lets move on to the next step!

Install and convert the PSK31 Server Software for PSK63

After unzipping and installing PSK31Srv on your computer, the main application will be found in the PSK31SRV folder nestled inside the Peak Systems Folder . It is here you will find the original PSK31CORE.DLL engine that needs to be replaced for PSK63 conversion. The following instructions copied from the file, “**PSK63SRV.txt**” will tell you exactly how to do this.

PSK63Srv Conversion

All of the info in this file has been updated to allow easy conversion of your PSK31SRV folder into a PSK63SRV folder inside the Peak Systems Folder (in programs).

To make a long story short, follow the step by step instructions below:

1. Create a new folder inside the Peak Systems folder in Programs. Name it PSK63SRV.
2. Copy EVERYTHING in the PSK31SRV folder, and paste or drag them to the newly created PSK63SRV folder.
3. Download the PSK63CORE.ZIP file from the APRPACK files section to your desktop. It is a PSKCORE.dll ver. 1.15 file customized for psk63 when unzipped.
4. Open your PSK63SRV folder and highlight the PSK31Srv.exe icon, make an shortcut, and then drag it to your desktop, or task bar etc. Rename this shortcut to PSK63Srv.
5. Now while the PSK63SRV folder is still opened, rename the old PSKCORE.dll to PSKCORE.old to save it.
6. Drag or copy the PSKCORE.dll version 1.15 (you had just unzipped) to the PSK63SRV folder.
7. Close everything up , and click on the new Shortcut for PSK64Srv.
8. The familiar PSK31Srv.exe window should pop up, but it will CW ID at a very fast rate. The pitch will also be extremely high due to the 1500hz defaults left over from PSK31SRV settings. Change the TX Hz to 750, RX Hz to 750, and make sure TX=RX and Scan buttons are unchecked. Scan can be used to hunt for stations, but we found that it is best to leave it deactivated.
9. If your Waterfall frequency is way off, realign it by doing a brief test transmission (click TX button) and clicking on your own waterfall trace until the frequency reads 750, or within 2-3 Hz. (You might have to repeat this calibration a couple of times before the software stabilizes . It tends to settle down within 5 to10 minutes., and will stay locked on frequency)

Click the RX button , and now you are done. As long as these defaults are in place, a new INI file will be automatically rewritten to save the changes. The Waterfall drifting is a minor bug we hope to fix someday after recompiling a new version of PSK63Srv.

10. BPSK with both CRC Checking and Validation is APRPack's default startup mode. Go to the setup menu to confirm this.
11. QPSK USB with CRC checked is still the favored Direct Chatting mode with PSK63Srv when conditions are really bad.
12. PSK63Srv doubles everything , so this is why the offset of 750hz was chosen to get us back to 1500 Hz. Using 1000hz puts out a 2000hz signal that can cause severe clipping in Yaesu TX pass

bands. ICOM narrow filters and pass band tuning tend to favor signals higher in frequency for optimum performance. The default offset should always be 1500 Hz.

13. PSK63Srv conversion also affects the FRACK time if you are using UIVIEW. It should be set to 20 for the best results. WinAPRS users do not need to worry about this parameter on HF Radio.
14. To prevent freezes in PSK63Srv when UIVIEW starts up, or when a POSIT pops up on the screen, you must disable Sound in the Options menu in UIVIEW16 or 32. Some slower laptops and desktops might not have enough CPU horsepower to crunch PSK31 at double speed AND voice announce the POSITS all at the same time. The symptom involves buttons that lockup, or the Waterfall and tuning scope are frozen. WinAPRS users should also disable sound at startup. Other applications such as Yahoo Instant Messenger, and Internet Browsers running in the background might cause pauses in the outgoing PSK63 data stream in slower systems.

A sample screen shot of PSK63Srv setup can be seen in Fig. 8. and Fig. 9.

Ok.. if the above was followed correctly, you are now ready to configure your favorite APRS software.

WinAPRS Setup Hints

The Sproul Brothers did a terrific job in providing us with WinAPRS , a full featured APRS Program that can use TIGER maps for great detail when zooming down to street level.

In the APRPack Files section, the “**aprsnet.prt**” file is copied and dragged to the “**Ports**” folder

In your WinAPRS folder. You will be asked by Windows if you wish to replace an existing file with the same name, so click YES.! This new port list file will allow PSK63Srv to mimic an internet server when the port named LOCALHOST:3131 is made active. The following is the setup sequence APRPack members had recommended to others in our group:

- 1) Start WinAPRS
- 2) Select the enclosed USA map, and zoom down to the desired location and level.
- 3) Resize and reposition the Window such that it occupies the upper 1/3-1/2 of your screen. Why? This will allow you to easily view the active PSK63Srv window when it is in focus for PSK chat, and for observing the Water fall display and Tuning scope. I like to be able to see both programs at the same time for ease of APRS communications on HF.
- 4) Click on **Station** in the main setup menu, and enter in your coordinates, POSIT symbol, PHG information, and other location info (state, county, city) Since this is HF Radio, I would leave this info blank to reduce the overhead. It is best to keep transmissions as short as possible to reduce the chance of a data hit.
- 5) Enter your Call last and hit Return. Why? This sequence worked every time for the APRPackers.
- 6) Next, click on **Ports** in the main menu. Click on **LOCALHOST:3131** to highlight it. Clicking the Open button will then activate it .
- 7) Close the **Ports** Window
- 8) In a moment you should see your Beacon POSIT data streaming on the Monitor Window below the map, and your POSIT should appear on the screen. If PSK63Srv were active at this time, your Rig would be transmitting a beacon on the air.
- 9) Activate PSK63Srv, check the setup window to insure everything is correct, and calibrate the Waterfall Frequency display as described in **PSK63Srv.txt**. You might have to resize the

PSK63Srv window such that it fits directly below WinAPRS. A sample screen shot is included so you can see how everything should look (Fig. 3).

- 10) If everything works, you should be able to send beacons and receive PSK63 data both to and from your HF rig via the digital interface. If for some reason PSK63Srv does not respond, just reopen the **Ports** list window again and redo the **LocalHost:3131** port activation procedure.
- 11) Read the “Short Text Messaging on the HF Bands with WinAPRS 2.8” file at the end of this Addendum for fine tuning hints for your **WinAPRS APRS-PSK63** barebones system

UIVIEW Setup Hints

Included in the APRPack Files section is UIVIEW 16 for creating a barebones APRS-PSK63 system. It does not have the full featured Mail Center found in UIVIEW32, which is what I would recommend. With UIVIEW32, you have full control on message retry count, which should be set to 2. Otherwise, after registration via the UIVIEW website, UIVIEW16 is almost identical. If you do not register, the program will never save your settings.

If you are already APRS experienced, then the rest of UIVIEW setup is easy. If not, read the the APRPack Check list, or ask a question. The UIVIEW help files do stand alone as an excellent "How to" resource for getting APRS-PSK63 newbies up to speed. The help files will tell you everything you need to know. Below are some hints to get you started:

- 1) The **Setup Station menu** is very straight forward with most of the defaults still in use. For APRS-PSK63 operation, **Fixed** and **Mobile** beacon times should be set to Zero. The **Internet** beacon time can be set to a value of 30. Open the **Message Center** and click on the **Options menu** . Now set **FRACK to 20**, and a **Message Retry count to 2**.
- 2) In the **Aprs server list** selected from the **Setup menu**, you enter **LOCALHOST:3131** , and the box is checked.. Use the **INSERT** key on your keyboard to input it on UIVIEW32 .
- 3) UIVIEW is then linked to PSK63Srv by clicking “**Login to Aprs Server**” in the **Action Menu**.
- 4) Be sure to deactivate **sound** in the **Options** menu.
- 5) I recommend that newbies play first with UIVIEW16, since it doesn't need to be registered before you can use it. It also comes with a USA Tactical map that you can load immediately for testing. Once one feels comfortable with UI-VIEW16, the more fully featured UI-VIEW32 can be downloaded from the web.
- 6) The UIVIEW active window should also be repositioned and resized to occupy the upper 1/3 to
- 7) 1/2 of your monitor screen. When properly done, PSK63Srv can fit directly below it with all features completely available when in focus. You want to be able to easily see the Waterfall Display, and the Tuning Scope when operating.

So again what main frequencies are we using?

14.109.5 MHz daytime

10.145.5 MHz daytime NVIS, and early evenings

7.065.00 MHz late evenings for Zombie APRS-PSK63 (midnight and beyond)

7.087 MHz is our alternate frequency if we are clobbered by Winlink Bots!

What sideband should one use?

I would use USB! Someday we may migrate to 10.150mhz LSB if IGATES are converted to PSK63.

How many are on the air?

So far there are several of us, and the list keeps growing! APRS-PSK63 beacons can be heard most evenings around 8:00pm on 7.065mhz USB. using BPSK if conditions are good. CRC checking and Validation is active as our default configuration to prevent garbage POSITS from printing on the maps.

Will a better FAQ be Posted ?

Yes.. we are working on it daily! :-)

Operational Protocol for tracking , short messages, and direct chatting will all be described and updated in the files section. The Check list for UIVIEW currently listed will get one on the air, and tracking. Although the checklist starts off by mentioning PSK31, all future work will be done only with PSK63. A separate FAQ more specific for WinAPRS will continue to be updated .

UIVIEW 16 users should upgrade to, and register UIVIEW32 at a later date, Go to .. <http://www.ui-view.org/> for downloading and email registration (you will need your call specific registration and validation numbers before you can start UI-VIEW32 for the first time). Practice with UIVIEW16 while waiting for the numbers to arrive via e-mail. There is no registration fee for UI-VIEW. Follow the instructions on www.winaprs.com for the \$50.00 registration of WinAPRS. If you don't register, WinAPRS will not save any settings!

If you have any questions, ask the APRPack group.

Don't worry about all of the above information, and setup steps. It's really not that bad or complicated, and WE will walk you through it. Yahoo APRPack Group Chat sessions can be scheduled if necessary for the APRS newbies.

We hope to see many newcomers showing up for our APRS-PSK63 sessions , which will be announced in the APRPack group.

On Sept 24, 2005 members of the APRPack Group are presenting this paper on APRS-PSK63 at the ARRL Digital Conference in Santa Ana, CA. We sincerely hope this will help initiate linking our new mode to the APRS Internet Network.

Ken WB6MLC

"Don't just listen...beacon CQ APRPack!"

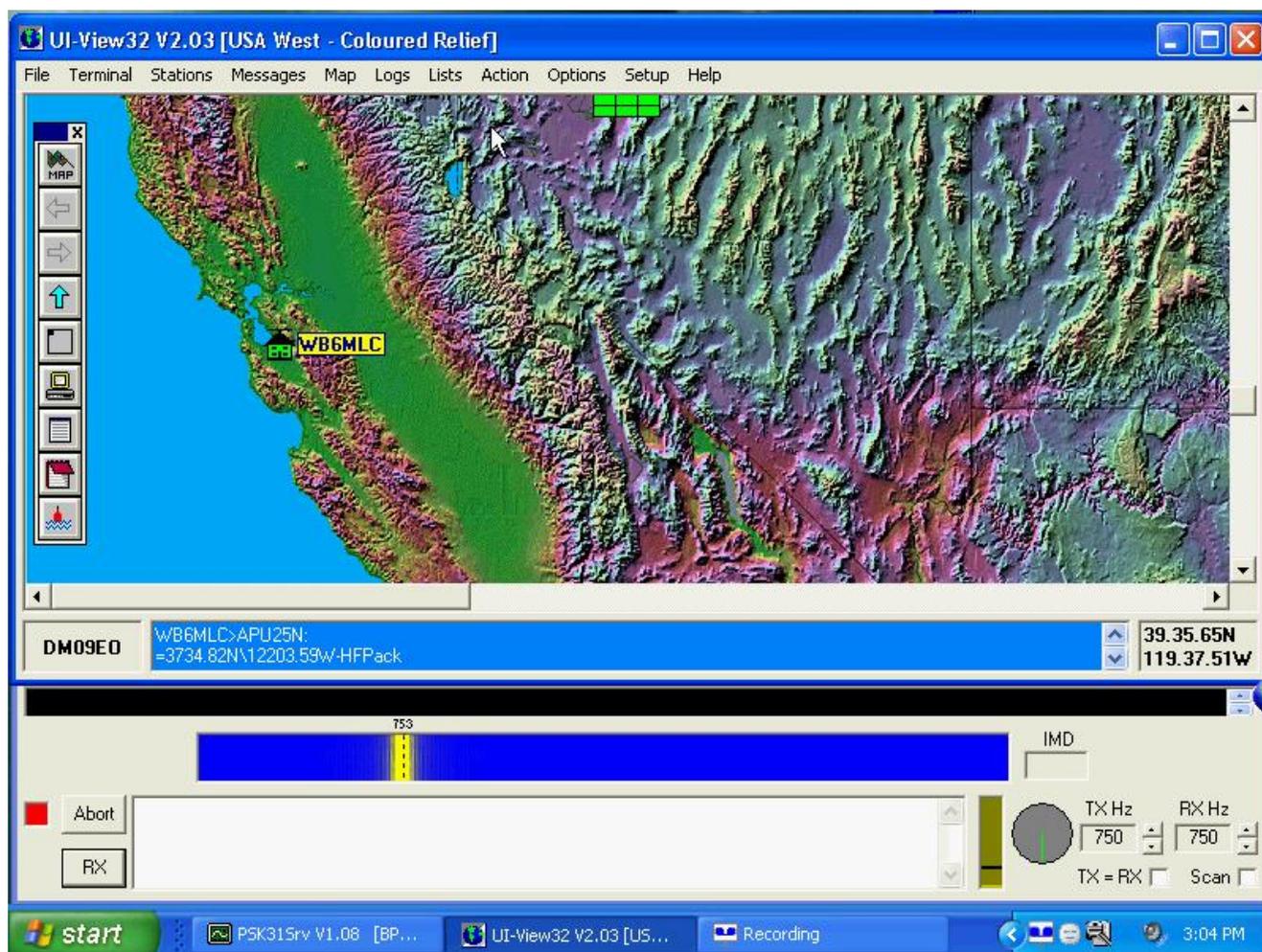


Fig. 4 UIVIEW 32 with PSK63Srv transmitting a beacon.

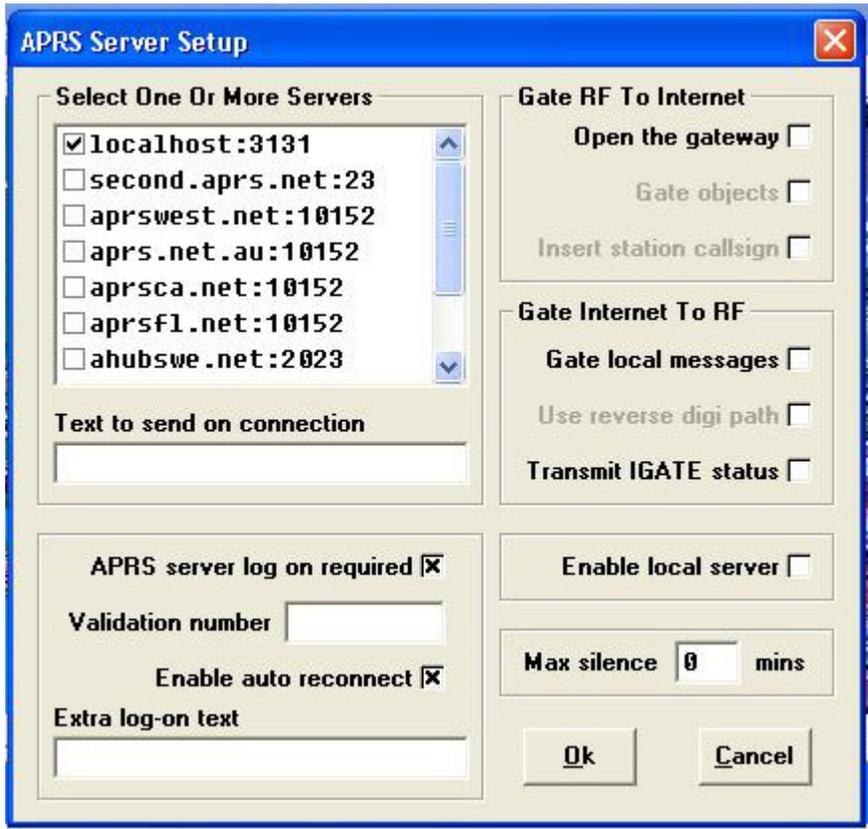


Fig.5 UIVIEW Server Setup to allow linking to PSK63Srv

```

aprsNet - WordPad
File Edit View Insert Format Help
// Created by WinAPRS on 5/26/2005
NAME LOCALHOST:3131
TYPE TCP
PARSER APRS
HOST LOCALHOST:3131
PATH
BAND TCP

```

Fig.6 Aprsnet.prt is edited to include LOCALHOST:3131 to allow WinAPRS linking

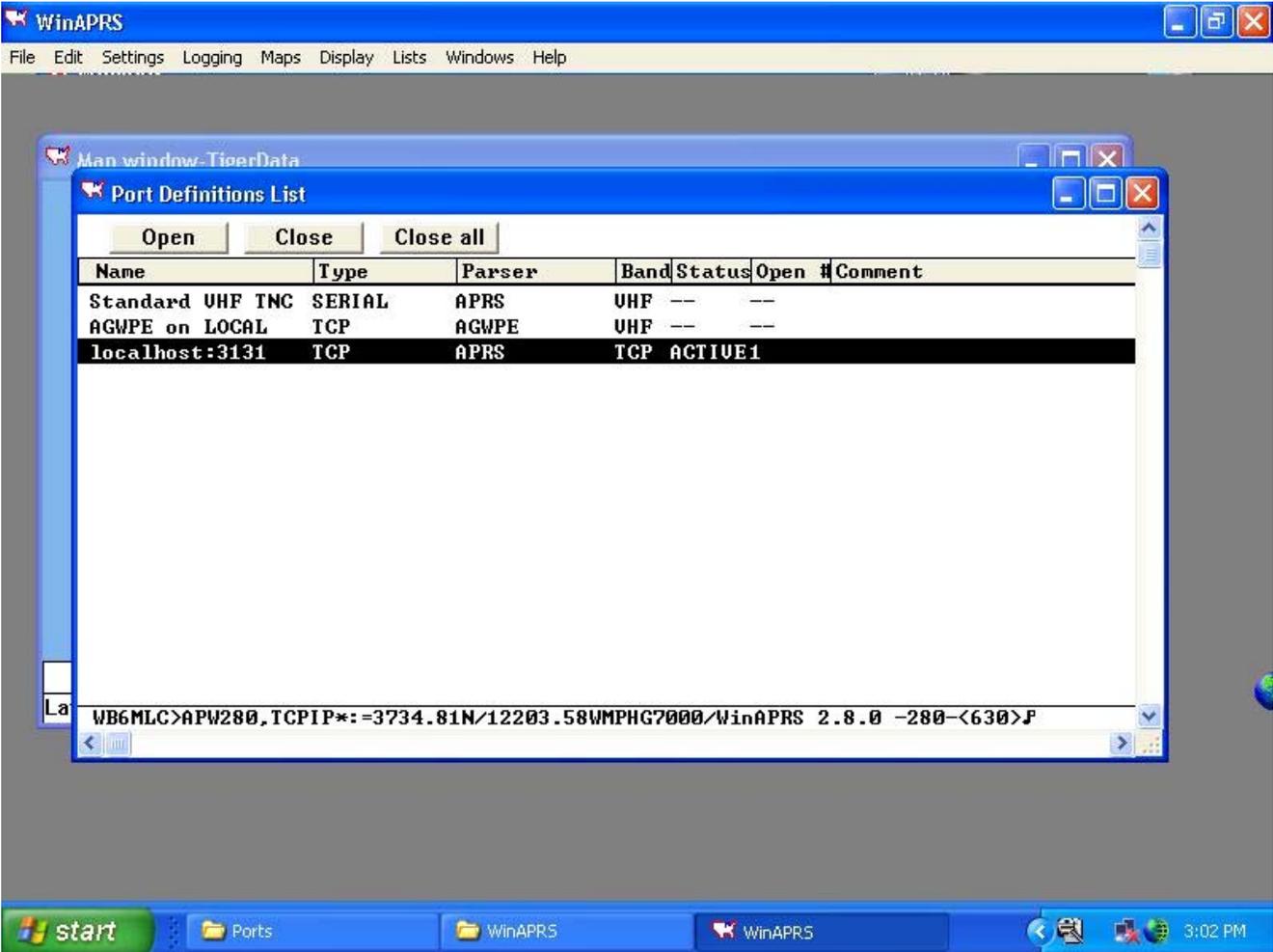


Fig.7 Activation of LOCALHOST:3131 in the Ports List completes the linkup with PSK63SRV

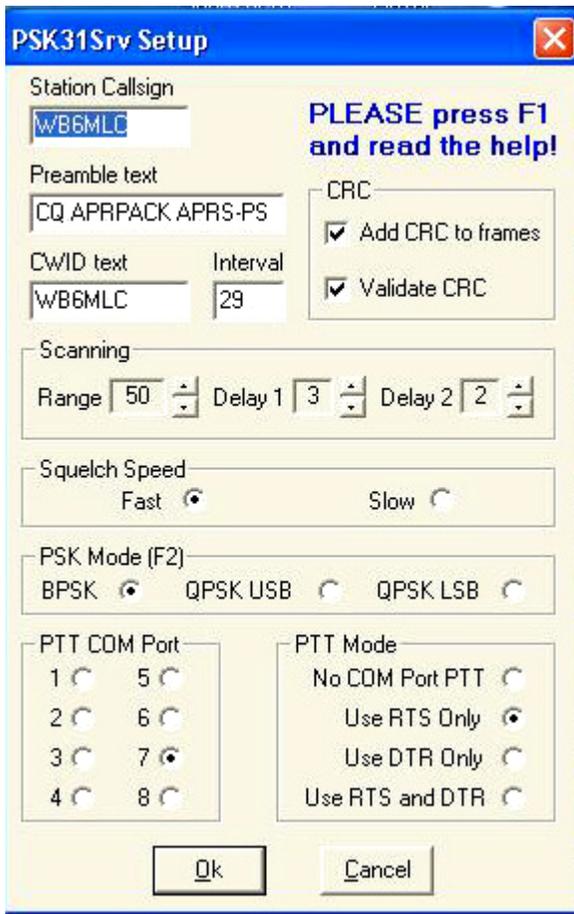


Fig. 8 PSK63Srv setup screen . The Preamble text helps to sync the data stream, and should be kept short. For example, “APRS-PSK63” is adequate.

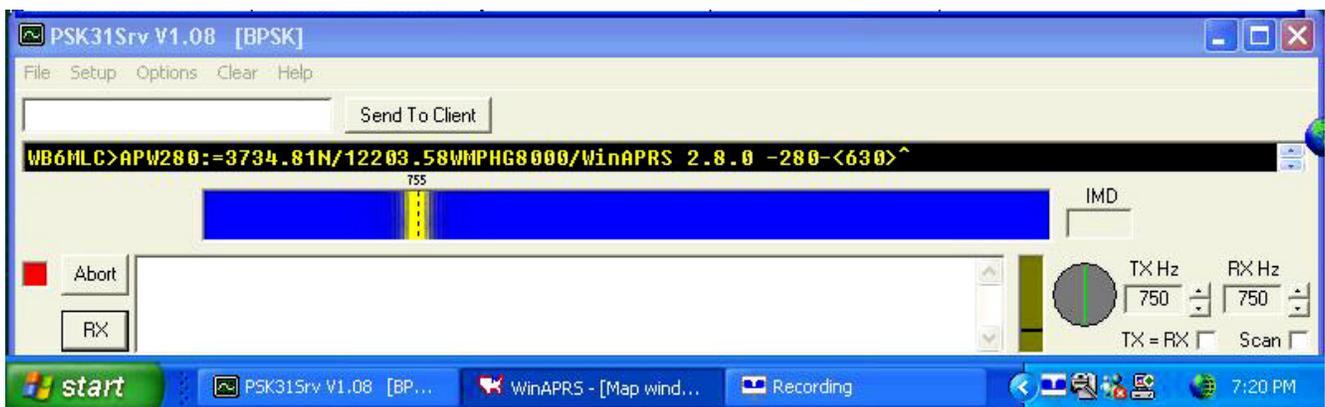


Fig. 9 Here is a separate screen shot showing PSK63Srv transmitting. Notice that TX=RX and Scan are left unchecked. TX Hz and RX Hz are also set to 750 Hz for the default setup. The black monitor window is for received text, and below the Waterfall is the transmitted text .

Short Text Messaging on the HF Bands with WinAPRS 2.8

Bill Prats K6ACJ

HFPack / APRPack Yahoo Groups

This document is designed for the *first time user* of WinAPRS text messaging with APRS-PSK63. Messaging with WinAPRS might seem like a daunting task but with this guide and some experience, you'll find the system very useful. WinAPRS might be considered 'Industrial Strength' as it gives the user full control over all aspects of messaging. Message statuses and keyboard shortcuts are described in detail to help manipulate the system especially under weak signal HF conditions when human intervention is necessary. This information is backwards compatible to WinAPRS 2.7.5.

Message Basics

WinAPRS text messaging works very well on strong signal FM VHF or SSB but our paper is focused on HF APRS operating USB from low power rigs like the FT817 or FT857s in back packs, on picnic tables and mobile, all less than ideal conditions. When conditions are not ideal to send or receive clean digital data streams, the message buffer gets stuck waiting for an ACK from a previous message. By knowing the basics, the message status can be manipulated to keep the data flowing.

Note: A 'stuck' or 'blocked' message does not prevent the *POSIT* information from transmitting per the setting in the *Settings, Position Report Rate*.

From:	To	Num	Pkt	Ack	Date/Time	Message
K6RUM	K6ACJ-10000	2			10/08 14:26	GA
K6ACJ-10K6RUM	000	2	A		10/08 14:28	Howdy, I received a GA from you
K6RUM	K6ACJ-10001	1			10/08 14:32	The name is Leon
K6ACJ-10K6RUM		1	-		10/08 14:32	AA:At Lunch, leave a message.
K6ACJ-10K6RUM	001	1	A		10/08 14:34	Hello Leon, I'm just now gettir
K6ACJ-10K6RUM	002	2	A		10/08 14:34	answer msg
K6RUM	K6ACJ-10002	1			10/08 14:35	We are /n at rest in Sunny Hill
K6RUM	K6ACJ-10003	2			10/08 14:38	Inx fer coming back to me 73 cu
K6ACJ-10K6RUM	003	5	Q		10/08 15:14	Tell me your equipment setup, l
K6ACJ-10WB6MLC-7004		5	Q		10/08 17:36	Hello Ken, do you copy ... K6f
K6ACJ-10WB6MLC	005	2	A		10/08 18:36	Hello Ken, copy my mssg ?? Bil
K6ACJ-10WB6MLC	006	5	A		10/08 21:36	Can you copy Ken ?? 0431 utc t
KB6CUR	K6ACJ-10D	1			10/08 22:13	Hello ?
K6ACJ-10KC5CR	007	1	Q		10/08 22:22	Hello, name is Bill, qth at hor

HF Text Messaging in the List, Message-List Window

Terminology and Status Detail

- Acknowledgment is a status word to indicate the other station received a good message.

- POSIT is your GPS position. *Settings, Station, Latitude and Longitude*
- QUEUE is a LIST of Messages or items. Like a line at a ticket window.
- Status flags indicate the message state and control if and when the message will be transmitted.
 - A or Ack = Acknowledgement from the other station that the last message transmitted was clearly received and ACKnowledged. The QUEUE pointer advances to the next message to send.
 - Q = ready to send
 - QB = Queued message is Blocked waiting for an ACK to a previous message
 - Black Message = Auto Answer response in this example
 - Red Message = A successful message to you. 'R'eply to send back.
 - Green Message = A 'sent' message was successfully received and ACKed at the receiving station
 - Blue Message = A 'sent' message waiting for an ACK.

Messages are typed into a software buffer and sent out in a time ordered sequence controlled by status flags. The send order is First in First out or FIFO. WinAPRS at the receiving station must respond to each message with an ACK that is received and processed at the sending station for each and every message sent. The ACK must be processed at the sending station before the next message in order is QUEUED for sending. Radio messages can be corrupted by QRN or QRM so there is a retry counter for each message, *PKT column*. Its default max is 5. What this means is that each message will be sent up to 5 times OR less when an ACK is received and processed.

Refer to the *NUM column*; each message is given a message number. The ACK corresponds to the message number transmitted. After the correct processing of the received ACK, the next message is QUEUED to go. The current message status changes to an 'A' and the message turns from Blue (Queued) to Green (Aked).

Each screen in WinAPRS has its own set of unique keyboard shortcuts. Message window shortcuts are listed below.

Receiving a Message

Messages can be directed to your station and received at any time. WinAPRS 2.7.7 will annunciate messages with "you have mail" through the PC loud speakers. Go to *Lists, Message List* to see your messages or all messages.

Sending a Message

There are two ways to create and send a message:

1. If the station ICON is displayed on the screen map, click on the station ICON then click on the mail envelope in the station window. Fill in the information and send. Pull down LIST and Message List to follow the response or to send responses.
2. The LIST pull down contains two items for messaging:
 - a. New Message
 - b. Message List

List, New Message brings up a blank message screen to create a new message dialog. Enter the target station and your message. Leave the path at its default for now.

List, Message List is used to respond to continue a dialog of ongoing messages in RESPONSE to a received message. Click ALL. Note the complete status display.

Cautions and Operating Notes for HF Operators

- Prevent transmitting overload: Set the *message retry* to 2 in the Settings, TNC pull down menu
- Keep messages short for best performance, less than *40 characters* are recommended. This is a *short text message* mode.
- Exchanging messages and ACKs during poor HF band propagation might hang messages in the blocked status. Manually control the status of the current message to set the next message to send. Use the *Backspace key* to remove the **B** block status on messages held pending an ACK on the previous message. The next **B** (blocked) message will now send. The message changes from Blue to Green

Text Message Status

- Refer to TERMINOLOGY in the first chapter

Text Message Window Screen Commands

- *Backspace Key* = Used to remove the **B** block status for the message and sends it. Message changes from Blue to Green. If used to DELETE a message that has sent but not ACKed, the color changes to Lavender.
- *D* = *Designed to Delete* Received messages.
- *N* = Send this message again
- *R* = *Respond* to a highlighted message. The station call and path auto fill in.
- *S* = *Send* a new message. You fill in the target address, text and path (default is normal)
- *X* = Clears the send counter so the message will send again
- '=' *Equal Key* sets the message status to Ack to stop transmission for this message.

END PAGE

Biography



K6ACJ Biography

Inspired by farm living and nearby war birds flying overhead, I began experimenting with electronics and became licensed as KN6ACJ in 1957. Ham Radio was my internet. My ham radio background helped me qualify for a long career in digital electronics and large computer systems with NCR Corporation then into various management and executive positions.

While setting the foundations for adult life, spare time was rare but in 1974 I managed to home brew a S-100 8080 microcomputer. After creating a CP/M compatible BIOS, I began programming ham programs; my favorite was a CW send and receive program with automatic speed control and

PLL sound interface; a secret weapon on the HF CW bands.

Current affiliations include membership in Huntington Beach RACES, The American Red Cross and membership in Yahoo Groups for HFPACK, APRPACK and others.

With a full time career in the past, considerable time has gone into discovering various digital modes to broadcast GPS position and to prevent keyboard withdrawal symptoms while on the road by using APRS text messaging on VHF and HF. I've inspired fellow HFPackers to try HF digital modes and to experiment to improve the state of the art for HF Text Messaging and Position Reporting.



WB6MLC Biography

I was first licensed in 1963. Over the years I have enjoyed operating with HF digital modes, working Oscar Satellites, HF mobileering, and most recently APRS with HF Pack Pedestrian Mobile. Instead of being tied to my shack, I now appreciate hiking up trails with backpack mounted antennas and HF Radios.

Current affiliations are with the HF Pack/APR Pack HF Portable Groups. I am also a Practicing Dentist in Fremont, CA.

Release Form

Bill Prats, K6ACJ and Ken Chong, WB6MLC both authorize the ARRL and TAPR to publish our paper in the Sept 24th 2005 Digital Conference Compendium .