A Winmor Primer

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Foreword

The purpose of this primer:

I have put this together for both newbie's who are trying to get a handle on Winmor and old fogies such as myself who prefer having a piece of paper next to us while setting up new software. The developers have done a great job of documentation in the help files, and in some cases I have stolen unabashedly from those files. I have attempted to put stolen items in italics. While it is slanted to the MARS member and was used for training in South Carolina, the information is applicable to the amateur operator as well.

I have tried to put together a "how to" that answers the questions I see continually on the reflector. "How do I get a copy of Winmor", the newbie that wants to get running on Winmor first has to realize that Winmor is a mode and requires a client program named RMS Express which includes a virtual TNC.

I hope this primer can take the user from a "curious about this new Winmor thing" to a competent user. It is designed to tell you what time it is, not the history of clocks so in some cases I have not got into specifics and attempt to simplify some of the technical details. If you're really interested in the technical bits, the development team has detailed information available on the Winmor reflector.

Suggestions or corrections to this Primer are greatly appreciated; drop me an email at NNN0AAG@navymars.org

I would like to express my gratitude to the developers Rick Muething KN6KB and Victor Poor W5SMM for their countless hours to provide the amateur and Mars communities with an effective alternative to connect via RF to the Winlink system. Your efforts, as well as those of the other members of the development group, are truly appreciated.

Chapter 1 - Introduction

What is Winmor and why do I care?

Mars members have been using Winlink (WL2K) for traffic that was formerly handled by the MDS mail system. The old MDS used a low cost interface such as a PK232, WL2K is geared to a proprietary modem that removes a kilobuck from your wallet. The PK232 will still connect with an RMS station using Pactor I. On Mars this is not a problem, but on the amateur side many stations will no longer accept Pactor I connections.

Winmor is a soundcard mode of transmission. Much like MT63 or any other digital mode, a program must be wrapped around it to make it useful. In this case the program is called RMS Express. RMS express allows you to communicate between two stations (peer to peer) or to a Winmor RMS station that will allow you to use Winmor in place of the high dollar hardware modem to reach the internet.

Where do I get it?

You will first need a copy of RMS Express. It is available from the Yahoo Winmor group. http://groups.yahoo.com/group/WINMOR/ You will have to join the group to gain access and download the file RMS Express 0.3.11.0 Full Install.zip or what ever version is current.

What do I need to use it?

First you will need a computer running *Windows Server 2003; Windows Server 2008; Windows Vista; Windows 7 or Windows XP*. These are the only operating systems that run .NET 3.5 which is required to use RMS Express. As far as the computer itself, a 500 MHZ or better Pentium is required. Sorry all you folks running Windows 2000 or earlier versions of Windows – they won't work!

Next an appropriate interface, if you're running MT63 or other digital modes you have the necessary interface. If not you will need an interface such as the Donner interface http://home.att.net/~n8st/DDI-index.html

Or a combination interface and external soundcard such as the SignaLink http://www.tigertronics.com/ .

I would recommend an external sound card. That is not to say you can't use the internal sound card in your PC, but many of them have conversion errors that can not be overcome. Besides if you fail to turn off Windows sounds, they can get transmitted! If you have the signal link, you're good to go. I use an external USB sound device I got on EBay for less than $5.00 delivered to my door. I have purchased a number of them and they all have worked correctly right out of the box. The picture and description below will help you locate them on Ebay.

USB 2.0 Virtual 5.1 Channel 3D Sound Card for PC LAPTOP

Next you will have to have a transceiver that is with in frequency specs (More on this in the calibration chapter)

Now that you have gathered all the pieces together, we will set everything up in the next chapter.

Chapter 2 – Installation

Installing the RMS Express program. - The following is from the Yahoo site:

1) Download the full install file RMS Express Setup.zip (the latest version will be posted on the Yahoo WINMOR Ftp site. It is a modest 1.6 Meg download and includes the latest help file.

2) Unzip the file to a temp directory and double click on Setup

3) If you have another version of RMS Express installed you will have to remove that first (Start, Control Panel, Add/Remove software). You won't loose any setup info you had.

4) If you try and install and get a warning that you need .NET 3.5 installed you can download that at the link below. Most newer computers and older ones if you have kept them updated will have .NET 3.5 installed.. Here is the link to Microsoft where you can download the bootstrap loader.
http://www.microsoft.com/downloads/details.aspx?FamilyId=333325FD-AE52-4E35-B531-508D977D32A6&displaylang=en#QuickInfoContainer

5) The RMS Express installer will install to any drive or directory but the default is C:\RMS Express. ***(I recommend you install to C:\MARS RMS this will let you set up a second copy for the amateur side in C:\HAM RMS- More on this later)*** *If you have reinstalled over an older installation (after the removal of the older version) your settings (as contained in the RMS Express.ini file) will not be lost.*

6) You can create a desktop icon easily (there is some bug that won t allow the installer to do this reliably). Use windows explorer or my computer to browse the RMS Express install directory (default C:\RMS Express). Locate the RMS Express.exe file and right click and say create shortcut here . Then right click on the created shortcut and drag to where you want (desktop, folder etc). Just drag the shortcut NOT the RMS Express.exe (the exe MUST be in the same directory as all the other support files you see.) You can launch RMS Express with a double click on the shortcut.

7) If the program launches OK you should have access to the help file. It is pretty complete try reading it first before asking for help please!

The steps are listed here from the Winmor site so you can check them off as you go.

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Chapter 3 – Basic Setup and Overview

Now that we have the program installed, click on the short cut you created and you will first see a notice about expiration of the beta and then the screen below should appear. Resize the box so it fills the bottom right quarter of your screen. When we finish setup you may adjust the boxes to suit yourself, but for now let's all sing out of the same hymnbook during setup.
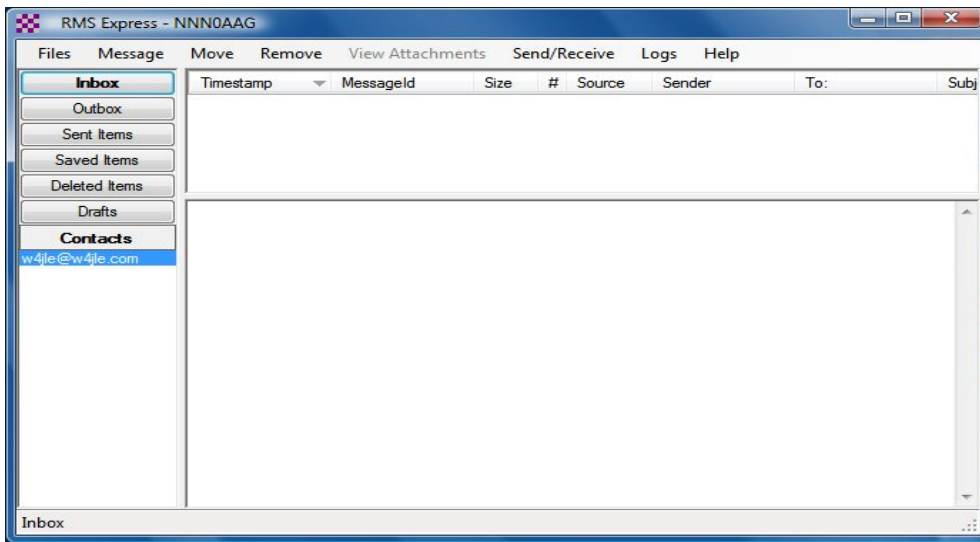

Select files and then properties. The screen below will appear.
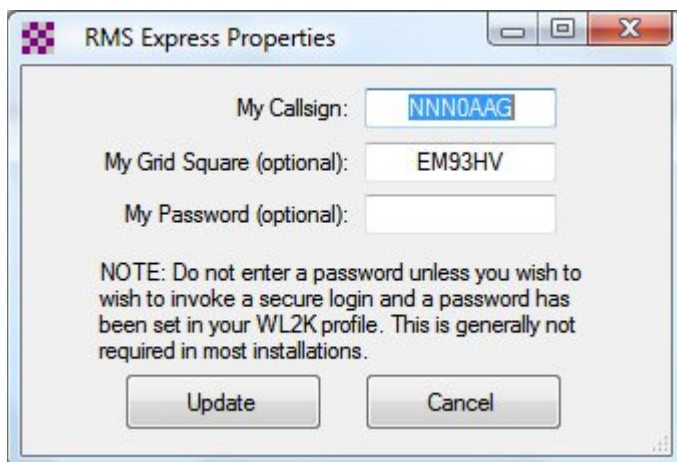
Fill in your call sign and grid square and press update. If you do not know your grid square, go to http://qrz.com and enter your call sign,

when the first page comes up press more info and it will display your grid square. Enter the information in the grid square, leave password blank and press update.

Next go to files and select WINMOR setup. This is the most important screen we will deal with.
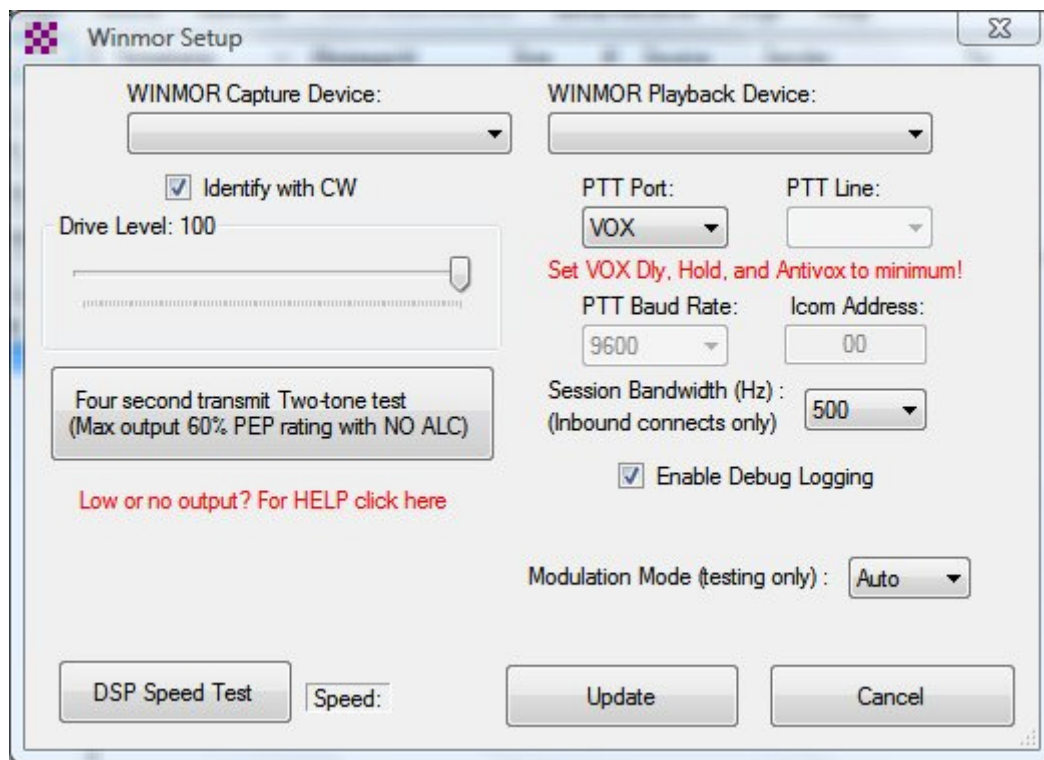
First let's look at the boxes above and talk about what we will do as we get into the setup details. The top two boxes allow us to select the sound card we will be using to send and receive audio to our interface box.

Identify with CW sends a CW ID at the end of a connection. Turn it off (uncheck) for MARS. (Must be on for Amateur frequencies, and no it is not considered MCW in spite of what the ARRL claims)

Drive level will be covered under calibrate. PTT Port, PTT Baud rate and PTT line will be used to set up the keying for your rig.

Icom address is used if you're keying via the CI-V line.

Session bandwidth can be set for 500 or 1600 more on that in the theory chapter. As it only affects stations connecting to YOU, set it at 1600.

The four second two tone test will be used to test, once we set up all the boxes.

DSP speed test will be used when we get to the calibration chapter.

Let's take a minute to talk about interfacing. First we need a connection between the computer and the radio. The circuit below is typical of most interfaces. Note that audio is passed between the radio and the computer, there is no CAT control. The CAT control is handled as a separate issue.
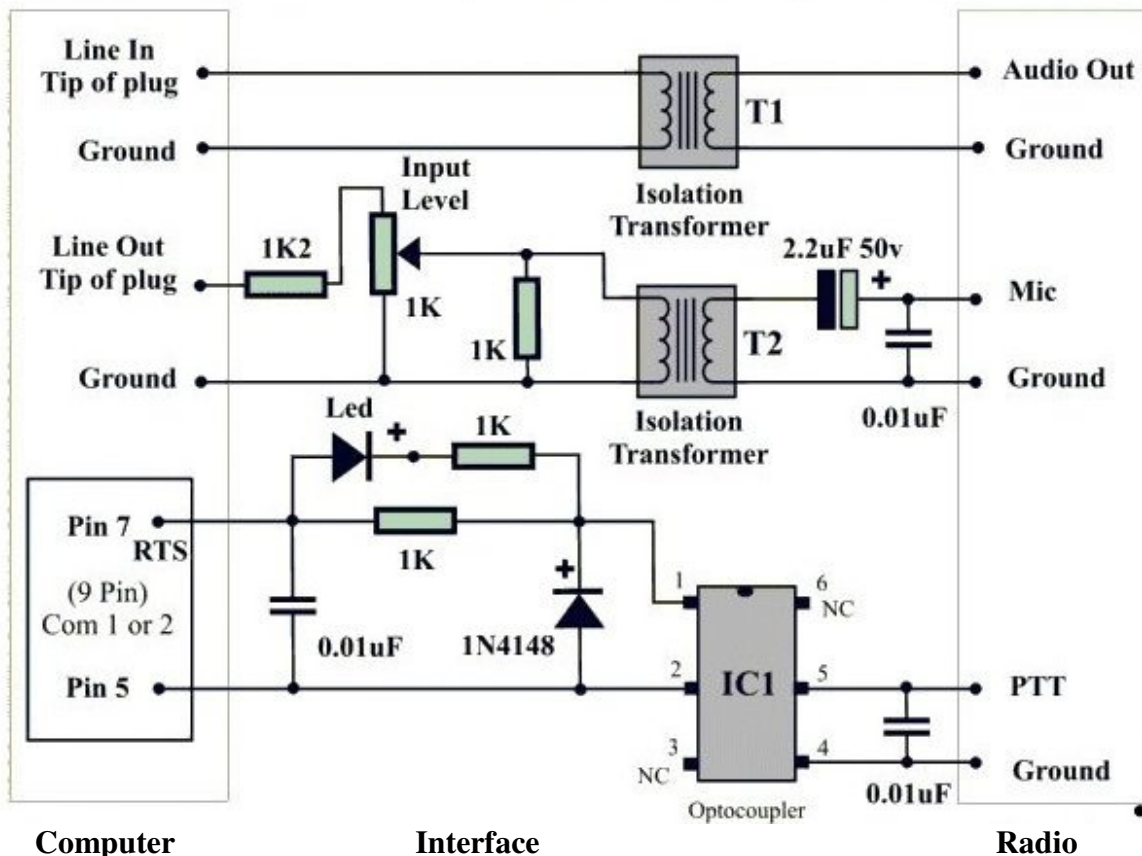

Keying is from the serial port and normally uses the RTS pin of the RS232 port. Many laptops do not have a serial port; fortunately there are interfaces that plug into a USB port to create a serial DB9 to key the radio. Interfaces such as the Signal Link use a soundcard that is part of the interface and keys the rig with an internal VOX circuit. If your

interface requires a serial port and you do not have one, you can find low cost USB to serial adapters on EBay or Tigerdirect.com

Again if you also want to have CAT control of your rig, additional circuits are needed. If you follow the reflectors on the internet, you already know that many are confused by this fact.

OK, now the interface and CAT is out of the way, let's go back and do the setup. I am going to set up my radio to give you an idea what needs to be done. I am using a laptop that has no serial ports. I am using the $5.00 USB soundcard and a Donner interface to an Icom 706 MKIIG. The computer also has an internal sound card we will use for normal windows sounds. I have a USB to 9 pin serial converter that is set up as COM4.

The Donner interface has a 9 PIN DB9 RS232 connector for the keying circuit and 2 plugs that plug into audio in and audio out of the USB soundcard. The output side has a cable that plugs into the accessory socket of the Icom 706. Once all the cables are connected it is time to return to the WINMOR setup screen.
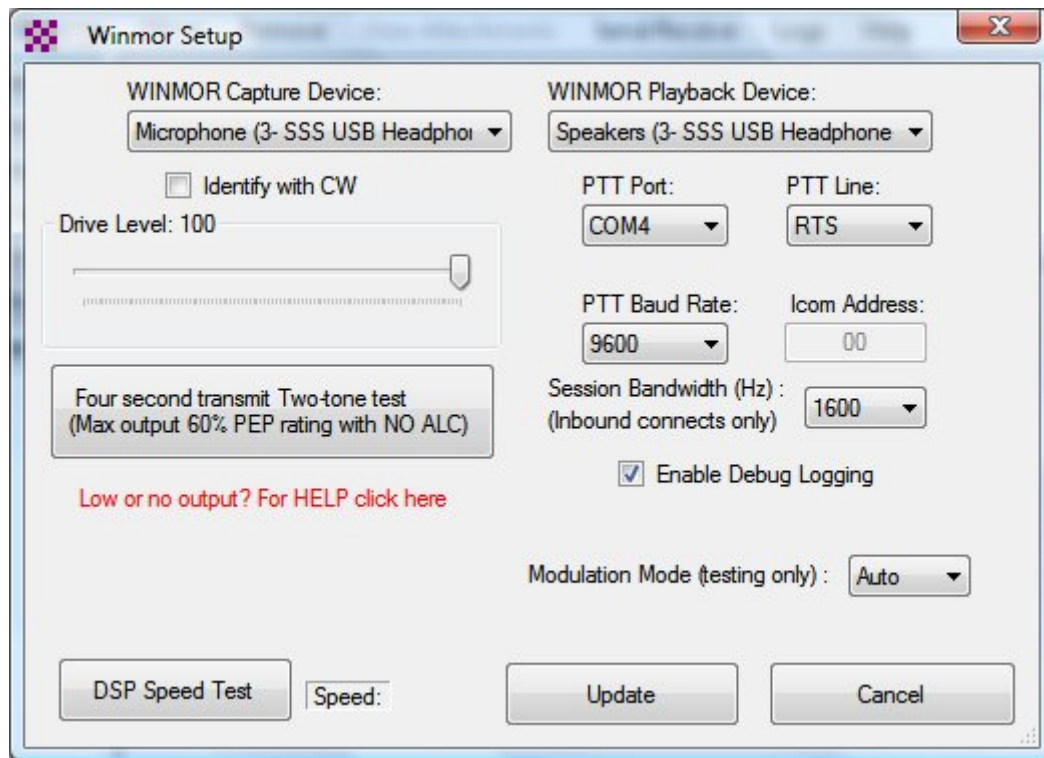
The top two boxes select our USB soundcard from the dropdown menu. Identify with CW is turned off for MARS. For Push to Talk the USB to DB9 on COM4 was selected and RTS for the PTT line. PTT baud rate is not an issue. Bandwidth is set to 1600. Press update.
Press the Four second box and if everything is correct the transmitter should key and the transmitter should show output. If this is the case you're good to go and can proceed to the next chapter for calibration.

A second example consists of a desk top computer, an Icom 746 Pro and a Signal Link interface. The signal link plugs into a USB port and has a built in VOX circuit and volume controls for receive and transmit along with a VOX delay. This is even easier as once we select the Signal Link as the sound device and VOX as the keying control we are done.

Other combinations of equipment may result in different settings, in the event you have questions, post them on the Yahoo reflector. If you still have unanswered questions, feel free to contact the author at
NNN0AAG@NAVYMARS.ORG

Chapter Four – Calibration
Or how to save yourself hours of grief!

To determine the best way to set up your station for WINMOR, one need only look at the specification document. The WINMOR specs state the following about the hardware layer:

The protocol requires the following hardware:
1) *Radio connection. This SHOULD be a single sideband (SSB) transceiver capable of transmitting Upper sideband low distortion audio in the range of 600-2400Hz. When SSB transmission is used it MUST always be done using Upper Sideband (USB). Other modulation schemes (e.g. NBFM) MAY be used in some applications.*
2) *Radio Frequency accuracy: If SSB modulation is used the radio MUST be able to be set to within +/- 100 Hz of a specific (published) frequency.*
3) *UPDATE from Rick:* WINMOR is actually quite tolerant of frequency offset. The DSP code tunes +/- 200 Hz with no degradation….More than 200 Hz off and there is simply no connection ….(falls off the cliff). The actual algorithm could go wider but we wanted to avoid the possibility of capturing an adjacent channel say 400 or 500 Hz away. The performance is the same whether your right on or +/- 200 Hz as long as you IF filters don't cut off anything between the green lines of the waterfall
4) *Frequency Drift: If SSB modulation is used the radio frequency MUST have a short term drift of < .5Hz/Second over any 5 second period.*
5) *The transceiver MUST have a Receive to transmit switching time of < 100 ms and a Transmit to Receive switching time of < 100 ms*
6) *The audio for the protocol MAY be generated using a standard PC sound card and appropriate software. On Radios with built in sound card interfaces (e.g. Icom 7200) it is possible to use the radio's built in sound card to send and receive SSB audio.*

So before we worry about audio settings, we first want to make sure are rigs are on frequency. MARS requirements are that we be within 20 HZ of assigned frequency. Anyone that has watched digital traffic being sent can attest to the fact that many stations are not within limits. While many modes such as MT63 will tolerate a large mistuning with no apparent affect, WINMOR suffers as we get off frequency for reasons we will cover in the Theory Chapter.

So let's see how close we are to being on frequency. I have found the best way is using the FLDIGI program found at http://www.w1hkj.com/Fldigi.html it will also give you all the rest of the common digital modes. It has also served me well in the Frequency Measurement Tests and I am consistently in the <1 Hz error category.

After letting your rig warm up for at least 30 minutes begin.

If you are using a modern rig, all the frequencies are determined by a single oscillator that is divided for all bands. For these rigs such as ICOM 7XX series tune the radio to 9,999.000 MHz on USB. Go to FLDIGI and select the FREQ ANALYSIS mode. The program will lock on to the 10 MHz carrier of WWV and display the frequency on the bottom. We know WWV is on 10 MHz and if we read 10,000,212.9 we know that our radio is off by 212.9 Hz and as we see it is higher than it indicates, we know we have to subtract the 212.9 from our dial reading to be on frequency at 10 MHz or 21.29 Hz per MHz. (divide the error by the frequency in MHz to get the error per MHz) because we are using a single fixed oscillator we can multiply our desired frequency in MHz by 21.29 to get the correction. If I want to be sure I am on dial frequency 3320.5 KHz I can multiply 3.320 * 21.29 =70.6 Hz correction. Or set the dial frequency to 3320.5 – 70.6 = 3320.429 to be on frequency. The correction can be calculated for all the frequencies you use on MARS and you will always be on frequency! I would recommend that you break out the manual and find the oscillator adjustment. Set the rig to receive the highest frequency WWV you can receive, move down 1 KHz in USB and adjust the trimmer until you read dead on using FLDIGI.

If you are using an older rig, it uses mixer oscillators for each band. For the 3 MHz band use CHU Canada to determine your error. Refer to your manual to see what frequencies are covered by each mixer and select a known frequency station in the range controlled by that mixer.

The next item we need to look at is drift; the spec says we have to have no more than .5 Hz over a 5 second period. Again just watch the frequency as it changes at the bottom of the screen in FLDIGI. This will show you how much the frequency is changing over time. It is beyond the scope of this document to correct drift problems.

Next is switching times, it needs to be less than 100 milliseconds. Fortunately this is met by any rig less than 20 years old and a goodly number older than that.

Now if you look at the bandwidth required it becomes apparent that you need to turn off all the noise reduction and filter settings on receive. Just

let the WINMOR program use its internal DSP settings to decode the signal. On Transmit make sure the compression is turned off.

We have taken care of all the things we can do with the hardware layer. All modes of operations will benefit from the above and are a worthwhile endeavor.

Returning to the specifications we find the following information applies to the sound card:

7) **The sound card capture device (receiving data) MUST be able to support a real or interpolated sampling frequency of 48000Hz +/- .1% (+/-1000 ppm)**
8) **The sound card playback Device (transmitting data) MUST be able to support a real or interpolated sampling frequency of 12000 Hz +/-.1% (+/-1000 ppm)**
9) **The processor or PC used to implement the protocol MUST be able to complete the decoding of any frame and respond with the appropriate response in 500 ms or less. (this is currently estimated to equate to a Pentium/Celeron class processor of 500 MHz or above) It may be possible to reduce the PC requirement in the future at the expense of session throughput.**

You can use programs like FLDIGI or CheckSR.exe in Mix W to get a fairly accurate measure of sample rate. However those programs don't really calibrate the sound card for WINMOR and calibration more than +/- 1000 ppm for WINMOR is very CPU intensive (requires remixing for every carrier vs. just one DSP mixing). These programs will let you know if the sound card is in the ballpark. The $5.00 USB soundcards referenced earlier were always with in 75ppm.

With our system calibrated, we are ready to make adjustments to get the most out of our system.

Chapter 5 – Final Adjustments

We can now return to the Winmor setup page and make our final adjustments. The first thing we need to do is setup the sound card in windows.

Right click on the speaker Icon on the bottom right tray and select playback devices and make sure the internal sound card is set as the default. This makes sure all windows sounds are sent to the speaker and never transmitted over the air. Do the same thing for the recording device. As we have already selected our external sound card in Winmor setup, these settings will have no affect on Winmor, and will let all other programs default to the internal sound card.
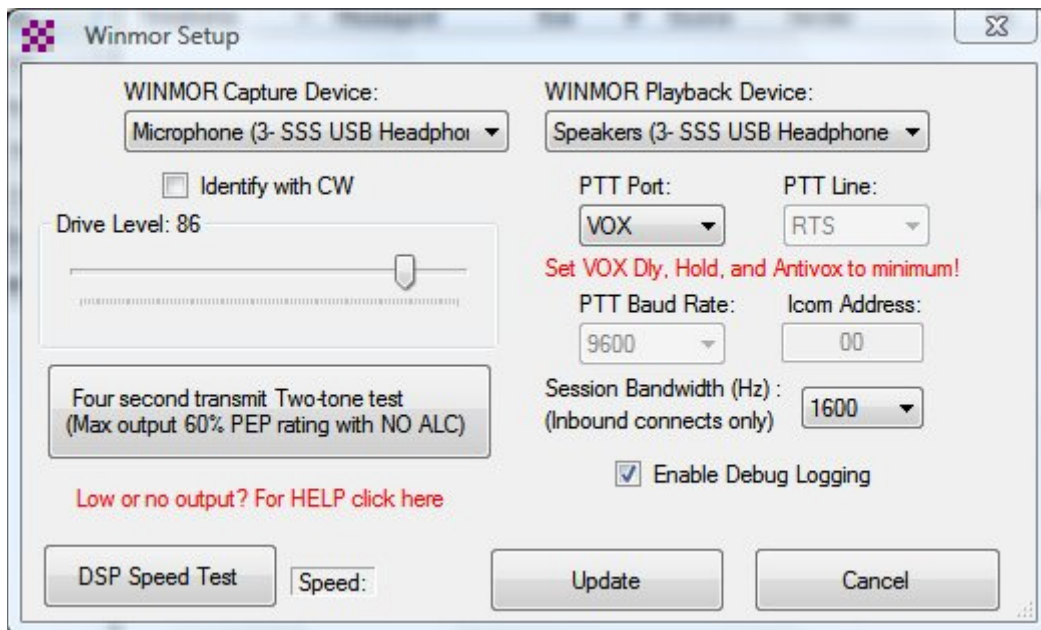
The next step is to set up the transmit audio. The "Four second transmit…" button will allow you to key the transmitter and set the audio level. Use the slider to set the power out to no more than 60 watts with no ALC indication. (Icom rigs will always show some ALC) This is a case where "less is more", what we are after is making sure the radio is as linear as possible. If you overdrive the transmitter the tones will be distorted and connections will be either impossible or extremely difficult. I found my best throughput occurred when I set mine to 50 Watts.

If you are using a Signalink, set the drive level to about 90 and adjust the audio to the transmitter with the Signalink TX volume control. If you set the slider too low, the VOX circuit in the Signalink will not key. Notice the "Low or no output… click here", here is a wealth of information in the help file it accesses. For example it contains information specific to Flex radios and other help in getting setup.

Once you're happy with the setup, *press update* so the program remembers your settings.

Setting up the receive side is a lot easier as you have the waterfall to help you adjust the volume.

One button I have not covered is the DSP speed test. When you press it, it gives you a number that depends on the speed of your processor and what other programs may be running. I have yet to determine what number is good or bad. In early versions my dual core laptop showed 185, in the current version it shows 720. The version that comes with Winmor RMS shows 170 on a dual core 2 MHz desktop. Until someone comes up with a range that is meaningful it is just a curiosity.

One thing remains, and that is to get a current list of MARS Winmor stations. Just download the latest MarsWinmorChannels.XML from the Winlink 2000 website using your mars login, put it in your mars RMS express folder and my station (NNA4AG-5) will appear in the dropdown list along with the other mars RMS stations. My station operates on two different frequencies. TVU and NEC, the frequency shown in the frequency window is appropriate for the time of day you make your connection.
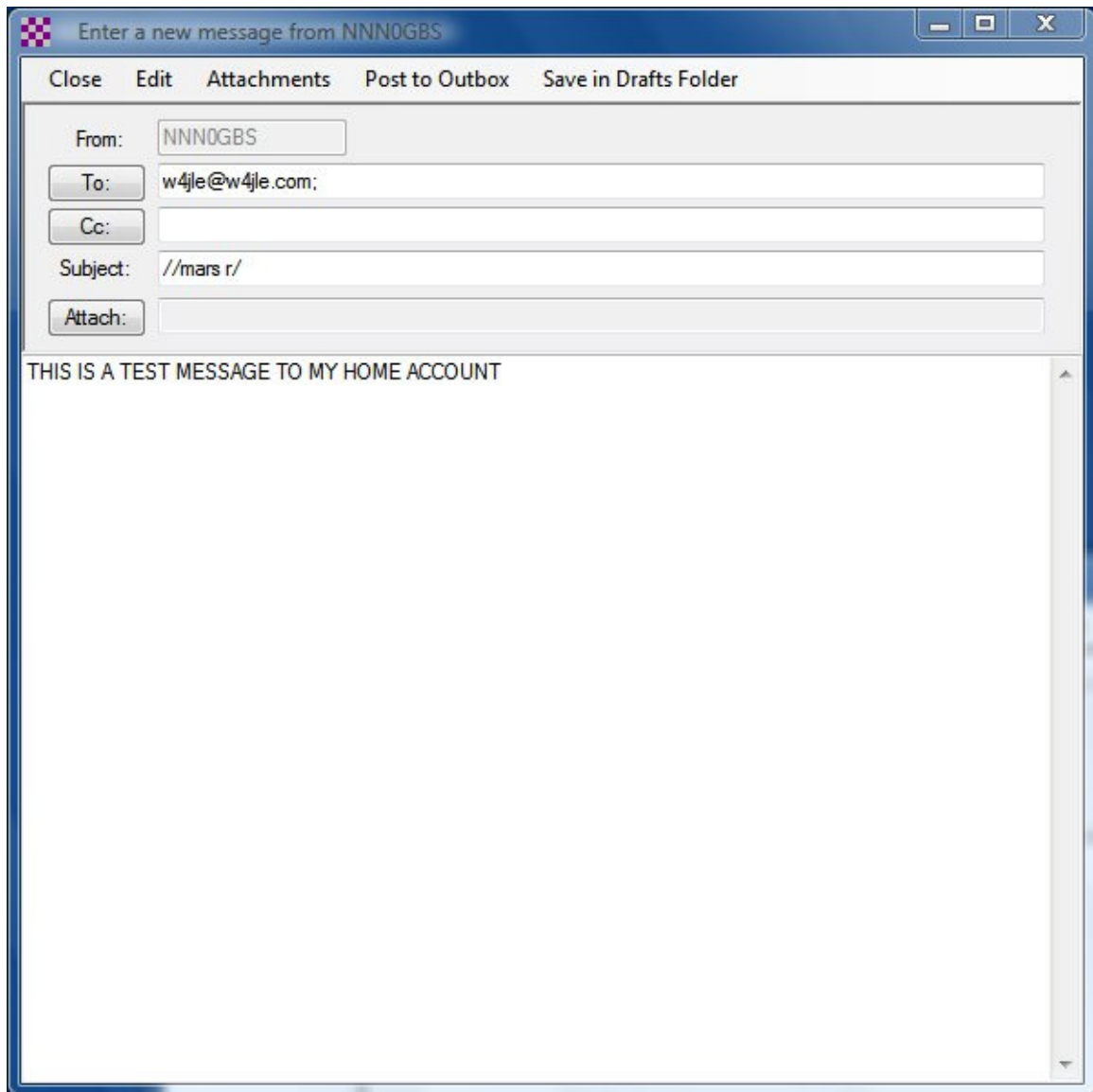
Refer to the Help for downloading (via web, RF or Telnet) the new frequency lists. The help page is (Help, Contents, Index, Frequency Lists). This may be enhanced in the future (allowing MARS download via RF/Telnet) and this section should always be up to date

You are now ready to make a connection.

Chapter 6 – Making a Connection

Now that we have everything calibrated and adjusted it is time to make a connection. We will first prepare a short message to be sent when we connect and be sure everything is working.

Press *message* and then select *new*. Create the message and press *Post to Outbox*

Close the message window and look at the outbox.
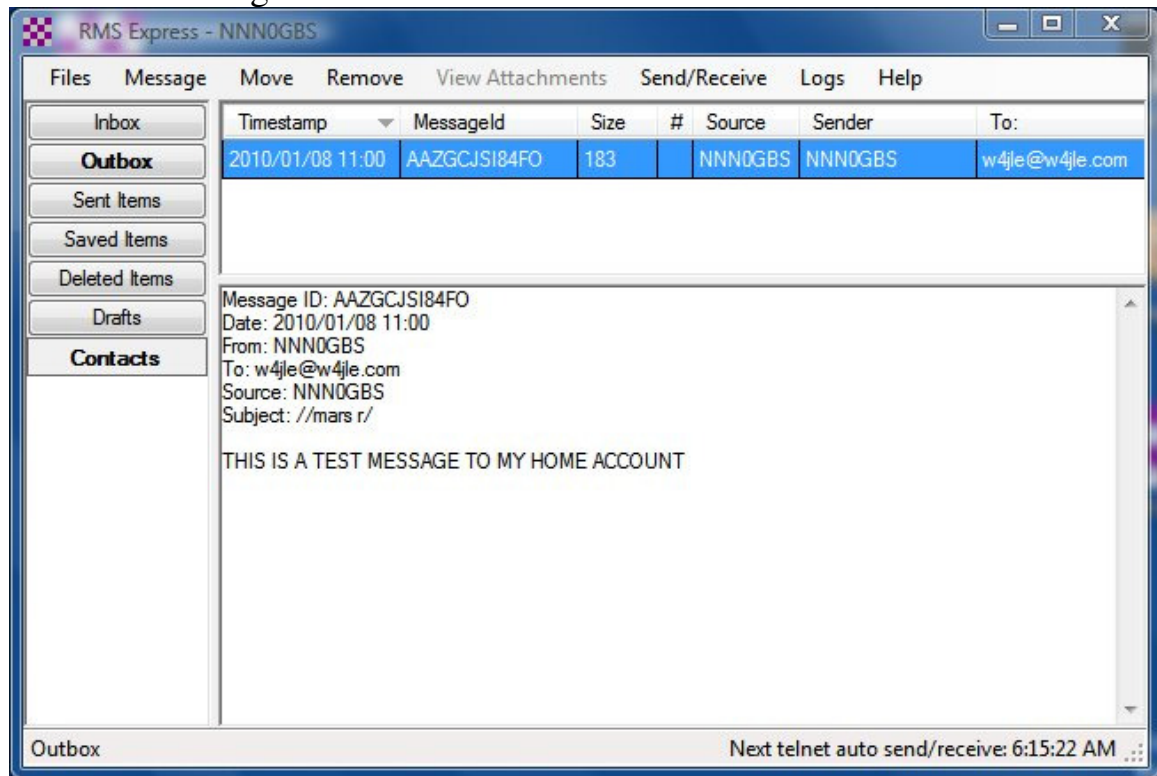
You can see your message queued up ready to go. At this point press
Send/Receive you will then have a choice of sending the message via
Telnet or Winmor.

A short editorial: If we are in an ACTUAL ECOM situation and you have internet
connectivity, send your Winlink traffic via Telnet and leave the RMS stations to
those that need to move traffic from the emergency areas without connectivity.
While this is in conflict with directives to send all traffic via RF one need only
multiply the number of RMS stations times the bandwidth available nation wide
and you will see the total capacity is equal to about three 56K dialup connections.
During drills and for daily traffic we will use RMS stations, but common sense
should prevail during actual emergencies. – Authors opinion

Select Winmor and two additional windows popup on the screen.
On the left you can see the Winmor Session window and on top the
Winmor TNC. If you have downloaded the MarsWinmorChannels.XML,
when you press the pull down arrow beside Callsign you will see all the
MARS Winmor RMS stations. Select NNA4AG-5 and the center
frequency of TVU or NEC will be displayed and to the right the dial
frequency to set your radio to. 0000Z-1359Z it will show TVU 1400Z-
2359Z NEC will be displayed.
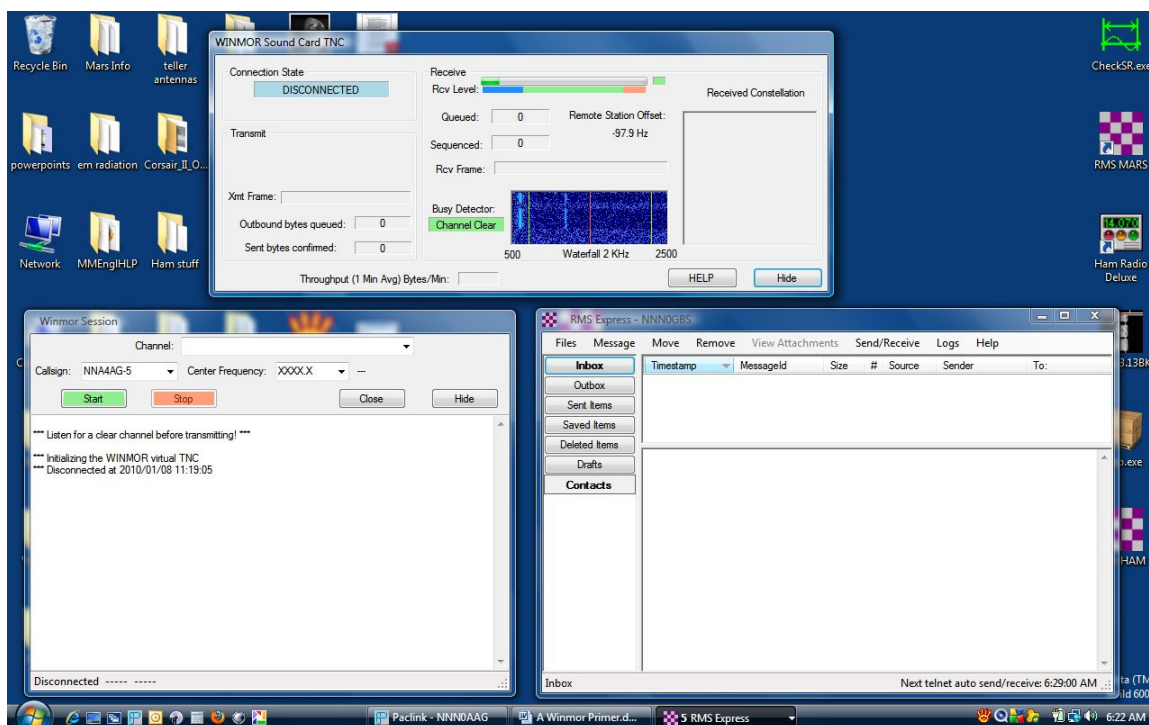
Assuming you have set your radio to the dial frequency, press send and set back and let Winmor do its thing! Until you become familiar with all the various information on the screens (Covered in detail in the theory chapter) when you disconnect look at your outbox. If there are no messages left in the outbox, you have been successful. If any traffic was at the CMS for your station it will be in your inbox.

Feel free to play as much as you like, you can't hurt the RMS and there is no time limit set on my RMS. I am available if you have any questions via e-mail or telephone. (803)657-3602

The next chapter will explain what you are seeing in the various TNC windows. You do not need to know what everything means to use the system, however if you do understand the theory it will aid in fine tuning your system to get the best throughput possible.

If you have a problem making a connection, see the Trouble Shooting chapter.

Chapter 7 – Winmor Simplified Theory

Just as MT63 has several bandwidths such as 500, 1000 or 2000 Winmor has two bandwidths 500 and 1600. One main difference is that in most digital modes the transmitting station sets the speed and the receiving station must set there speed to match. In Winmor it is the receiving station that determines the speed and lets the transmitting station know what speed it is accepting automatically. The speed you set in setup only comes into effect if someone calls your station in peer to peer mode. One of the reasons for this is the RMS stations operating unattended on the amateur side are limited to the 500 bandwidth. In MARS we are not subject to the same rules and all the MARS RMS stations will be accepting 1600.

Within each bandwidth there are a number of different modes that may be operating. These choices are not under the operators control and are determined by the signal strength, propagation conditions, multipathing, noise and interference and the bandwidth set by the receiving station. In other word the program shifts gears to get the best throughput under a set of conditions.

The following table summarizes the speeds available in each mode.

500 Hz bandwidth:

Mode	Words per minute
2 Car 4FSK	168
2 Car 4PSK	254
2 Car 8PSK	548
2 Car 16PSK	821

1600 Hz bandwidth:

Mode	Words per minute
2 Car 4FSK	168
2 Car 4PSK	254
8 Car 4FSK	671
8 Car 4PSK	1018
8 Car 8PSK	2190
8 Car 16PSK	3285

The speeds are determined as 5 characters + space /"word" and assume 50% compression

Notice the throughput is not listed in baud rates; the reason is that with the various compression techniques and encoding methods baud rate doesn't lend its self to a reasonable comparison.

We all know the narrower a signal, the less power that is needed to get information across a circuit. The same thing holds true here. The 500 mode requires only ¼ the power of the 1600 mode or expressing it another way the 1600 mode requires a 6dB better signal. To get an idea how efficient the encoding operates, if we sent the slowest speed (168 WPM) in CW it would occupy 672 Hz bandwidth!

If you're interested in getting into the nuts and bolts, Rick Muething KN6KB has posted a spreadsheet on the Winmor reflector that will give you eighteen parameters for each mode.

My intention was to give you a relative idea of speed vs. the mode you see displayed during a connection.

Now that we know about the modes lets look at the other features on the Winmor virtual TNC.
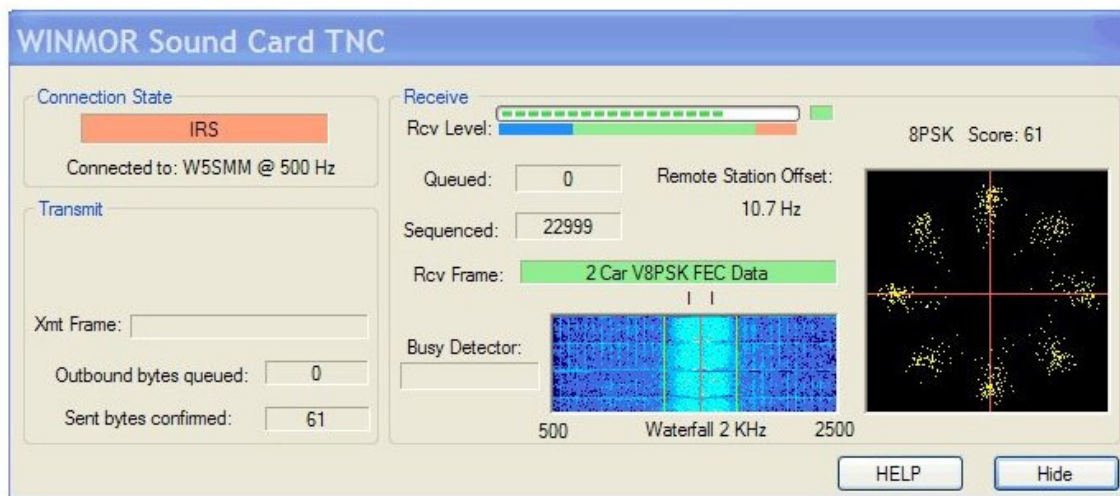
The above is from the help files and was selected to show the various features.

Figure 1

Figure 1 shows the connect box, in this case it shows the connection state as IRS and connection to W5SMM in 500Hz mode.

Connection State: This group shows the WINMOR connection state and when connected the connected call sign and session bandwidth. WINMOR Connection states:

OFFLINE   Sound card disabled and all sound card resources are released

DISCONNECTED The session is disconnected

CONNECTING   The station is sending Connect Requests to a target station.

CONNECT PENDING A connect request frame was sensed and a connection is pending and capture/decoding is in process.

IRStoISS Transition state from IRS to ISS to insure proper link turnover

DISCONNECTING Transition state initiating a disconnect sequence

IRS Information Receiving Station (Receiving data)

IRS MODE SHIFT Supplying Packets Passed information to the ISS for a requested mode shift

ISS Information Sending Station (Sending Data)

ISS MODE SHIFT Requesting Packets Passed information from the IRS in preparation for a mode shift

SENDID Sends ID Frame and optional CW ID if enabled

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Receive Group: Figure 2 The receive group box shows information about data being received by this station. It includes:

Receive Level bar graph: This shows the relative sound card input. While the level is not critical optimal decoding will be obtained with the level in the green area. Level in the Red area may saturate the sound card and in the blue area will reduce the signal dynamic range. The blue-green interface represents 1/16 scale (non linear) so operating the blue area throws away at least 4 bits of the A/D converter's resolution. The small colored rectangle to the right of the Rcv Level display shows sound card activity. Flashing green indicates the sound card is running and accepting input data. If the sound card does not deliver data for a period of 3 seconds it will be logged and a restart of the sound card attempted. There is nothing in the program that sets the sound card level. This is basically set by:

1) The audio level out of the radio Aux or Speaker. Some radios have menus to set the Aux output level.

2) The Input level adjust in the sound card interface.

Figure 2

3) Some sound card interfaces have jumpers that may be used to help adjust the level to the sound card. On the SignaLink USB installing jumper number 2 will increase the level if needed.

4) The windows mixer (if used by the sound card driver). This is accessed by clicking Start, Sett tings, Control Panel, Sound and Audio Devices. Then select the Volume tab, click Advanced. On the Master Volume menu select Options, Properties. On the Properties menu select the appropriate mixer device and adjust volume for Recording. For additional information see Mixer Settings
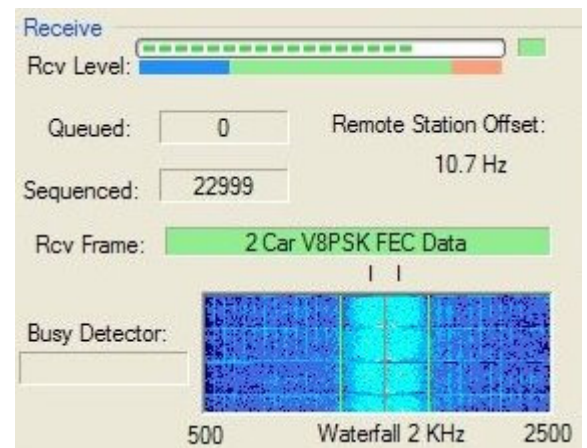
Busy Detector: This indicates the software busy detector's best guess as to what kind of activity there is on the channel. It works on both narrow and wide modes and is meant as an aid to proper listening before

initiating a connection... but always Listen First! The detector is sensitive and if a connect attempt is initiated and it senses channel activity it will warn of a busy channel. The busy detector is still experimental and will likely be modified during beta testing.

The remote station offset indicates a precise measurement of how far the connected station is off this stations frequency. The software will automatically handle up to +/- 200 Hz offset and retunes with EACH received frame. DO NOT try and tune the receiver to bring the offset to 0. It will not improve the decoding and may loose the lock on the connected station.

The Rcv Frame label indicates the type of frame being received. This is fully functional when connected but has limited monitor capability when disconnected. The background color of the Rcv Frame label is coded: Yellow= Frame type detected, acquisition in process. Green=Frame decoded sum check OK. Red=Decode sum check fail.

The Waterfall display shows the audio spectrum from 500 to 2500 Hz. The nominal center is 1500 Hz (the red center line). When listening or connected two green lines show the nominal bandwidth for the connected session (500 or 1600 Hz). The example above is for the 500 Hz mode. There is no manual tuning or click-to-tune capability needed or implemented on the waterfall display. Immediately above the waterfall is a line of characters showing the decoding status of each carrier of the last received data/control frame (2 or 8 carriers depending on the frame received). The above example is for 2 carriers with 2 perfect decodes. The following character codes are used for each carrier:

*"|" The carrier was decoded correctly without any need for summations or extended parity.*

"P" The carrier was decoded correctly using the extended R-S Parity

"M" The carrier was decoded using Memory ARQ (decoding using sums of previous frames)

"+" The carrier was not decoded but added to the Memory ARQ sum.

"-" The carrier was of such poor quality it was not decoded and could not be used for summation.

WINMOR's selective ARQ only repeats those carriers that were not decoded (ACKed). Packet sequencing and accounting queue and re assemble the decoded packets back to the correct sequence order.
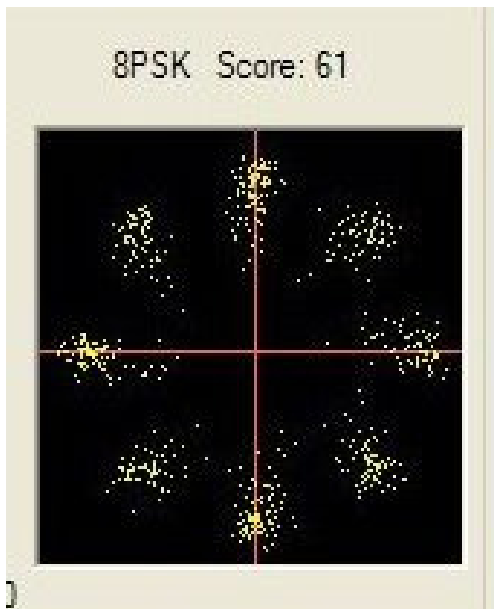
The received constellation is a plot of all the received symbols of a single frame. For best decoding the symbols will be arranged in well grouped "clusters" of 4 (4FSK and 4PSK), 8 (8PSK) and 16 (16PSK) evenly spaced clusters. Yellow pixels are used to plot conventional magnitude and phase (IQ plane) symbols (PSK modes). Blue pixels are used to plot a pseudo constellation derived from the 4 received tone magnitudes (4FSK modes). The layered Viterbi TCM and R-S error correction scheme of WINMOR permits decoding often when the received constellations are badly smeared due to noise and propagation effects. Although it varies with the type of channel propagation a constellation score (0-100) above 30 will usually be at least partially decode able. The constellation above shows a successful decode of a smeared 2 Carrier (500 Hz BW) 8PSK frame with a score of 61. This was done over-the-air with a Signal about one S unit above the noise and with fast fading.

Throughput: The WINMOR virtual TNC continuously monitors throughput (Successful ACK percentage at the ISS) and adjust the modulation mode to try and optimize the throughput for the current propagation and signal strength conditions. At the bottom of the Virtual TNC display is an accurate calculation and display of the most recent 1 minute average of throughput in bytes/minute. The maximum 1 minute average is captured and logged to the session stats at the end of the session.

Chapter 8 – Troubleshooting

If you have read this far and followed all the steps, everything should be working. If you have a problem connecting, the most likely cause is RF getting back in the system. I ran into a particular problem with the Signalink interface. It is extremely susceptible to RF getting into the interface. I finally removed both of the plastic end plates and lined them with copper foil and made all the cutouts with a hobby knife. After reinstalling the ends I cut off the excess foil. This coupled with ferrites on both ends of the USB and interface to rig cable finally cured the bulk of the problems.
The development team has written up a list of suggestions in the help files that cover such things as loop breakers and other helpful suggestions. Because of the many different Radio/interface combinations, no document can cover all possible cases. The Winmor reflector is a great place to get help with your particular combination, You can be sure someone else is running a setup similar to yours and has the answer your looking for.

QRT