

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 such as RMS Express and the software WINMOR 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 w4jle@w4jle.com

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.

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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 PK-232, WL2K is geared to a proprietary modem that removes a kilobuck from your wallet. The PK-232 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 that allows connection to the WL2K system without a hardware modem. 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. RMS Express also can control the SCS modem and most radios via the CAT interface. Future versions will allow PACKET as well. Also included is a TELNET mode that allows connection to the system via an internet connection.

Before we proceed we need to define a few terms:

WINMOR – An ARQ/FEC multispeed digital mode, it allows two stations to connect and pass messages.

WINMOR Software TNC – A stand alone software Modem (TNC) that may be accessed by client software, just as a hardware TNC may be used with various programs.

RMS Express – One of several programs that can interface with the Software TNC, it is written by the authors of the WINMOR Software TNC. This Primer will deal only with RMS Express, I leave it to others to document other client programs.

RMS Station – A Radio Message Server that is connected to the internet and can transfer messages between the WL2K network and a user. It may run Pactor or WINMOR. Packet RMS stations are online but are not yet supported by RMS Express.

CMS – A Central Message Server is the internet half of WL2K and has redundant servers around the world.

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 Full install 1.0.0.0.zip](#) or what ever version is current.

In addition you will need a copy of a third party program, ITSHF, it is available by clicking here <http://www.greg-hand.com/versions/> The versions are listed in date order, get the latest version. It must be downloaded and allowed to install in the default directory C:\itshf\. This enables RMS Express to sort stations in the order of best path for a given time of day. *Do this now so we don't have to worry about it later.*

What Hardware do I need to use it?

First you will need a computer running **Windows Server 2003; Windows Server 2008; Windows Vista; Windows XP or Windows 7**. 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 available at

<http://home.att.net/~n8st/DDI-index.html>

Or a combination interface and external soundcard such as the Signalink from <http://www.tigertronics.com/> . This is by no means a complete list and other combinations that can be successfully used

can be found on the Yahoo WINMOR site and in the RMS Express help file.

I would highly 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! In addition if another Windows application grabs the soundcard you no longer are able to use WINMOR. 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.



3D SOUND

[USB 2.0 Virtual 5.1 Channel 3D Sound Card for PC LAPTOP](#)

Next you will have to have a transceiver that is within frequency specs (More on this in the calibration chapter). Now that you have gathered all the pieces; we will set everything up in the next chapter.

Chapter 2 – Installation

Installing the RMS Express program. - The following is from the Yahoo site, you can check them off as you go:

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 lose 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>

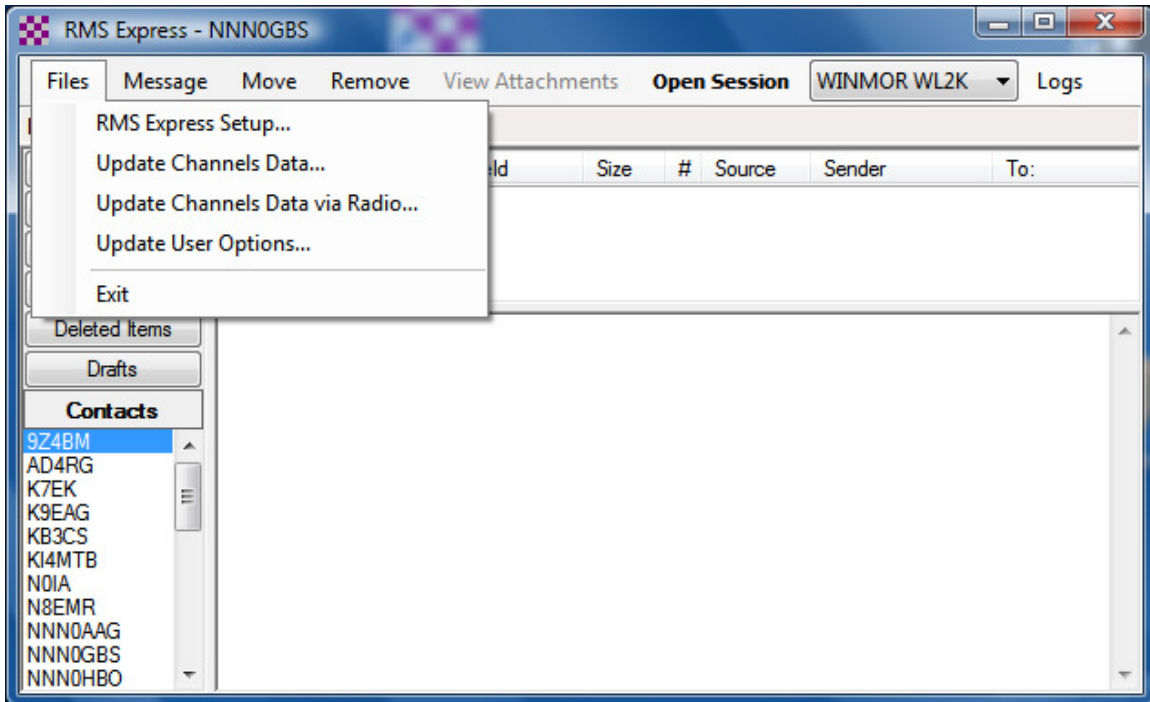
5) *The RMS Express installer will install to any drive or directory but the default is C:\RMS Express. (I recommend you install to C:\MARS RMS this will let you set up a second copy for the amateur side in C:\HAM RMS See Appendix B for the procedure) If you have reinstalled over an older installation (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.*

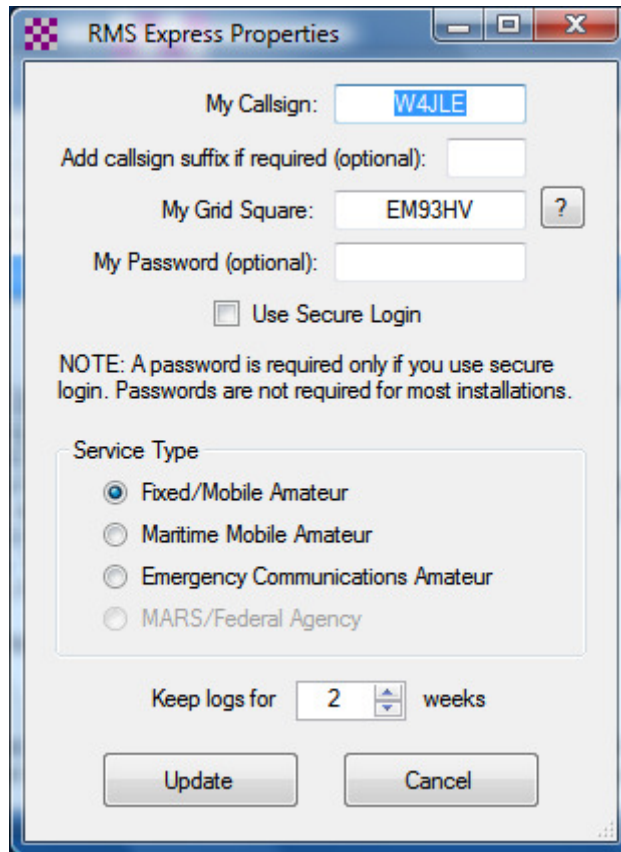
7) *If the program launches OK you should have access to the help file. It is pretty complete try reading it first before asking for help please!*

Chapter 3 – Basic Setup and Overview

Now that we have the program installed, click on the short cut you created and you will see the screen below 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 **RMS Express Setup**. The screen on the next page will appear.



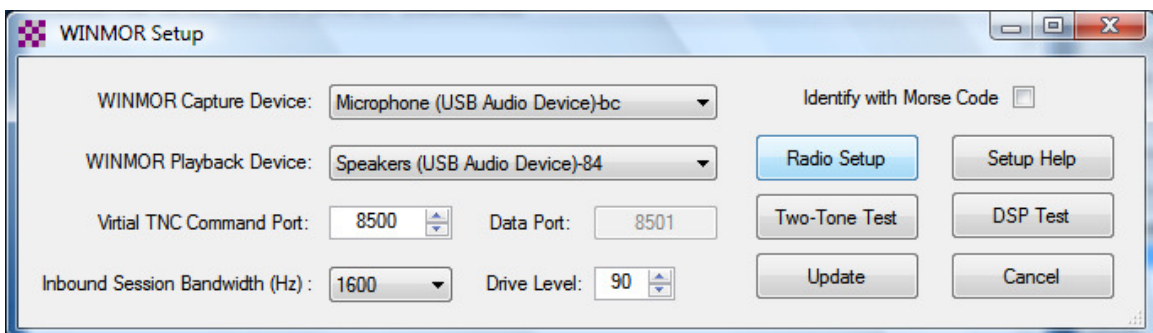
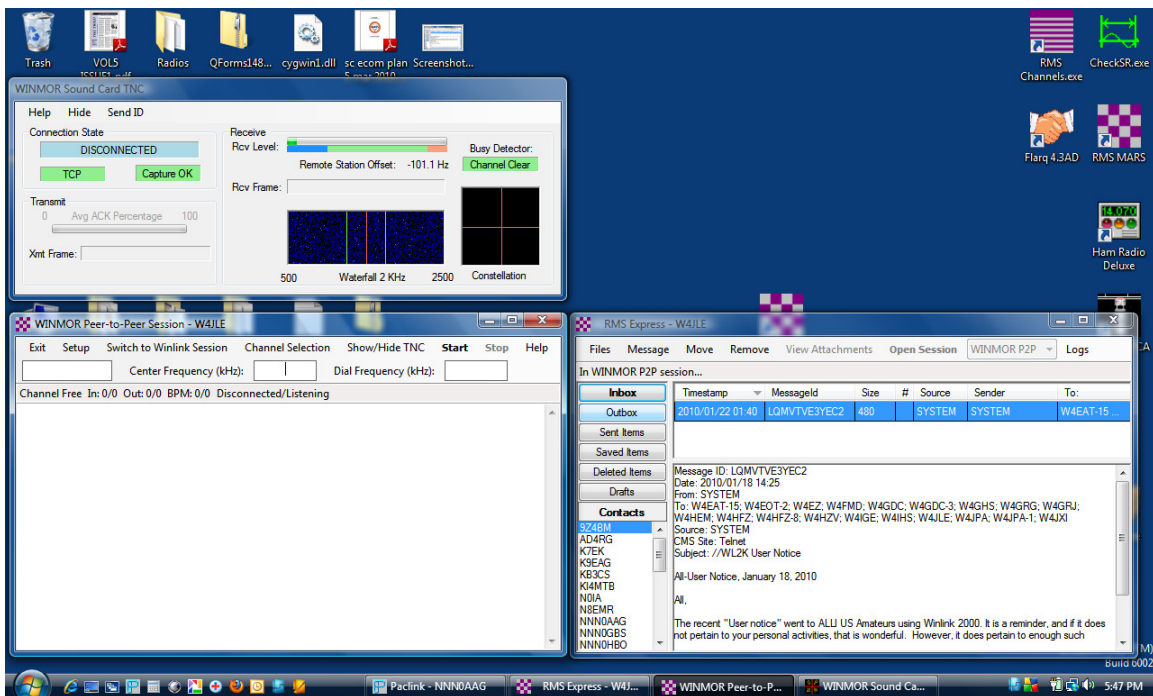
Fill in your callsign and grid square. If you do not know your grid square, go to <http://qrz.com> and enter your callsign, when the first page comes up press more info and it will display your grid square. **The grid square is needed to calculate the best propagation path.** Enter the information in the grid square, select the service type, leave password blank and press update. If you have entered a MARS call, the MARS/Federal Agency will no longer be grayed out and may be selected.

The suffix only affects the CW ID and is not part of the call forwarded to RMS stations. When all the fields are filled in, be sure to press **Update**.

Now return to **FILES** and select **Update Channels Data**, this will download a list of stations available and in conjunction with the **ITSHF** program will allow us to display them in propagation order when we select a WL2K mode. From this point each time the RMS Express program is run it will automatically get the station list and necessary indices for ITSHF. If you are a MARS station, you will be prompted to enter the **Access Key** to obtain the MARS RMS station

list. This key will be obtainable via your chain of command. The station lists may also be downloaded over the radio by picking that choice, however if you are connected to the internet it will not allow that option.

Select the WINMOR WL2K from the dropdown menu and click on **OPEN SESSION**. We should now see two additional windows, the WINMOR session window and the WINMOR TNC window. Additional setup for the session is required, so go to the Session window and select **setup**.



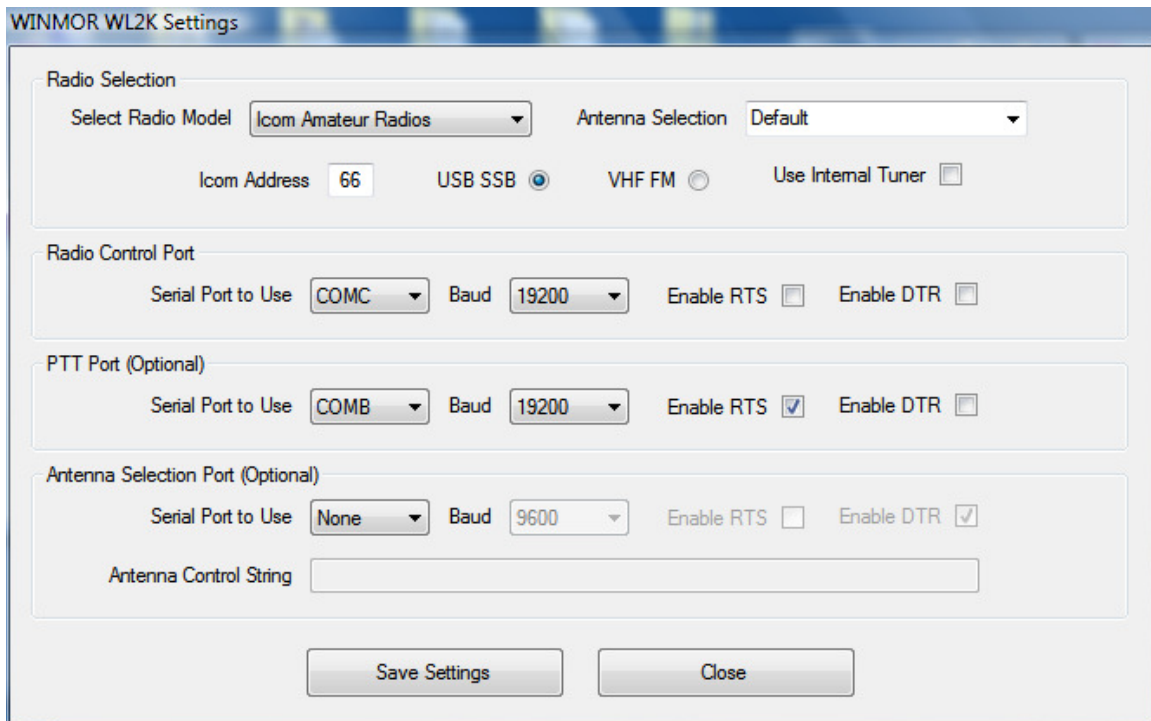
In this example I have already selected my external soundcard using the dropdown for the Capture and playback devices. On the amateur bands check **Identify with Morse code** for MARS uncheck it. Take

the default for **Virtual TNC Command Port** and set the **Inbound Session Bandwidth** to 1600 unless you are planning to operate unattended Peer to Peer on the ham bands. **Drive level** will be covered in the calibrate chapter. For now set it to 90.

Press **update**. 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.

Select **RADIO SETUP**



The screenshot shows the 'WINMOR WL2K Settings' dialog box. It is divided into four main sections:

- Radio Selection:** Includes a 'Select Radio Model' dropdown menu set to 'Icom Amateur Radios', an 'Antenna Selection' dropdown menu set to 'Default', an 'Icom Address' text box containing '66', and radio mode options: 'USB SSB' (selected with a radio button), 'VHF FM' (unselected), and 'Use Internal Tuner' (checkbox, unselected).
- Radio Control Port:** Includes a 'Serial Port to Use' dropdown menu set to 'COMC', a 'Baud' dropdown menu set to '19200', and checkboxes for 'Enable RTS' (unselected) and 'Enable DTR' (unselected).
- PTT Port (Optional):** Includes a 'Serial Port to Use' dropdown menu set to 'COMB', a 'Baud' dropdown menu set to '19200', and checkboxes for 'Enable RTS' (checked) and 'Enable DTR' (unselected).
- Antenna Selection Port (Optional):** Includes a 'Serial Port to Use' dropdown menu set to 'None', a 'Baud' dropdown menu set to '9600', and checkboxes for 'Enable RTS' (unselected) and 'Enable DTR' (checked). Below this is an empty 'Antenna Control String' text box.

At the bottom of the dialog are two buttons: 'Save Settings' and 'Close'.

Radio Selection:

Select the radio manufacturer or model

Select the Icom Address (Icom Radios only. See appendix “A” for a list of Icom addresses)

Select the mode USB SSB or VHF-FM

Select the Antenna selection if supported by your radio

Radio Control Port:

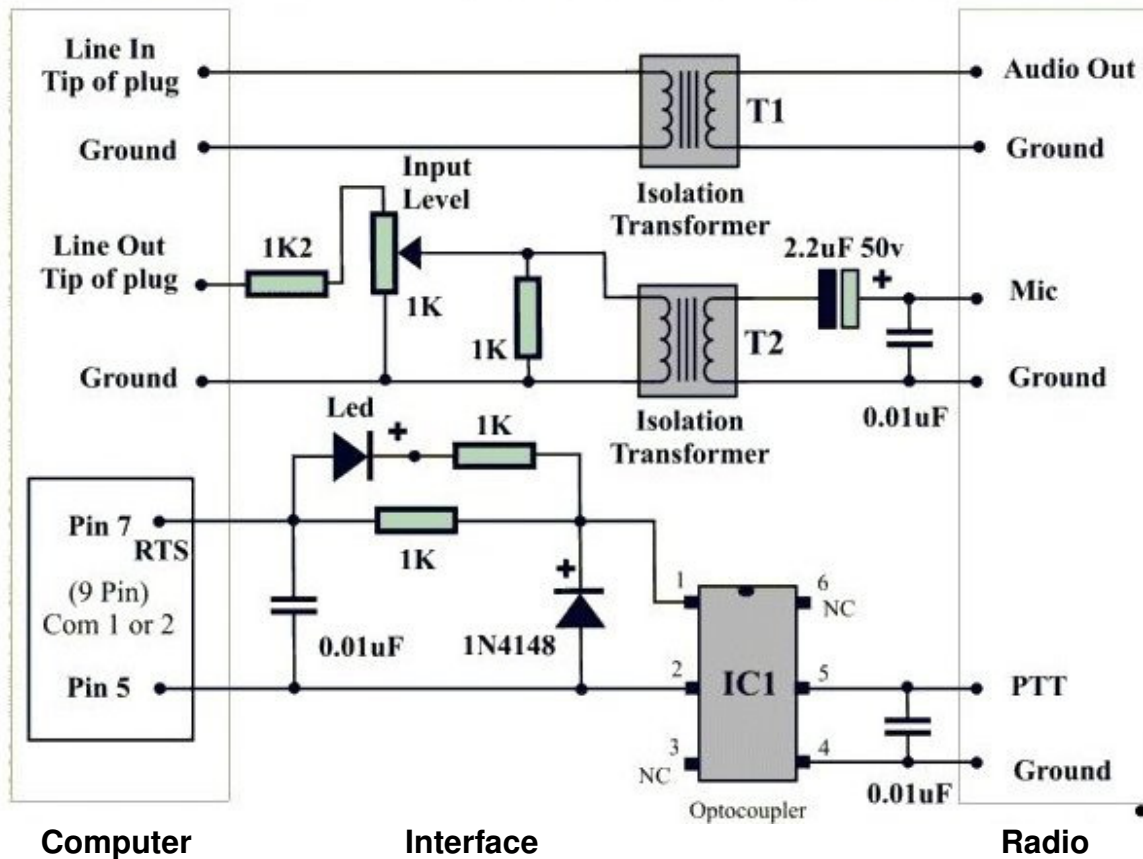
Select the Serial USB port to use for control and the baud rate. Check Enable RTS or CTS if needed. The baud rate should match the setting in the radio.

PTT Port: There are a number of options for PTT Control Depending on your radio and sound card interface one of these may be more convenient.

Antenna Selection Port (optional): Select the serial port, baud rate and control string to be used for antenna control using a remote controlled antenna switch.

Save Settings button: Saves the settings to the RMS Express.ini file

Before we continue with some actual setup examples, 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.

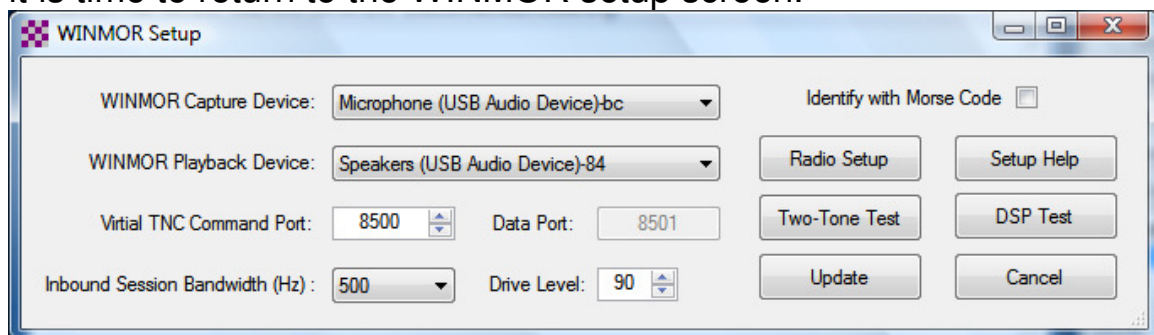


Keying is from the serial port and normally uses the RTS pin of the RS232 port. Many laptops do not have a serial port; fortunately there are interfaces that plug into a USB port to create a serial DB9 to key the radio. I have used various manufactures with no problems. Some users have experienced problems with some brands. If you have a question about a particular brand, I would suggest asking on the reflector what others have experienced. Interfaces such as the Signal Link use a soundcard that is part of the interface and keys the rig with an internal VOX circuit.

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. I being a ~~cheapskate~~ frugal Ham bought a \$2.29 USB CI-V from EBay. If you are using CAT control on an Icom you can eliminate the keying circuit in the interface and key the radio via CAT control. As an aside, even if you're using a SignalLink interface I recommend using CAT keying. The reason is that when NONE (The proper selection for VOX) is selected, RMS Express adds an additional 128 ms delay that lengthens your response to the other station that is not needed. Anytime we can eliminate delays, we increase average throughput.

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 using the \$5.00 USB soundcard and a homebrew interface to an Icom 706 MKIIG. The computer also has an internal sound card we will use for normal windows sounds. I have the USB CI-V converter set up on COM 3 and will use CI-V keying.

The output side of the interface 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. Press **UPDATE**. Next select **Radio Setup**.

WINMOR P2P Settings

Radio Selection

Select Radio Model Antenna Selection

Icom Address USB SSB VHF FM Use Internal Tuner

Radio Control Port

Serial Port to Use Baud Enable RTS Enable DTR

PTT Port (Optional)

Serial Port to Use Baud Enable RTS Enable DTR

Antenna Selection Port (Optional)

Serial Port to Use Baud Enable RTS Enable DTR

Antenna Control String

Save Settings Close

For my setup I select Icom 706 MKIIG under **Radio Model**, As my memory has a habit of deserting me when needed, I refer to **Appendix A** and find I need to enter 58 in the address. Make sure the **USB SSB** is lit. Next I set the **Radio Control Port** to COM 3 and the baud rate to 19.200 which is what I have set in my 706. **Do not use auto in the radio, it can only cause you problems!** I then set the PTT port to CI-V and I am done. **Press Save Settings then Close**. You will be returned to the WINMOR setup screen.

Press the **Two Tone Test** 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 NONE as the keying control we are done. Again I would recommend CAT keying even though it requires a bit more setup.

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 layer:

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.

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.

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"

Frequency Drift: If SSB modulation is used the radio frequency **MUST** have a short term drift of < .5Hz/Second over any 5 second period.

The transceiver MUST have a Receive to transmit switching time of < 100 ms and a Transmit to Receive switching time of < 100 ms

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:

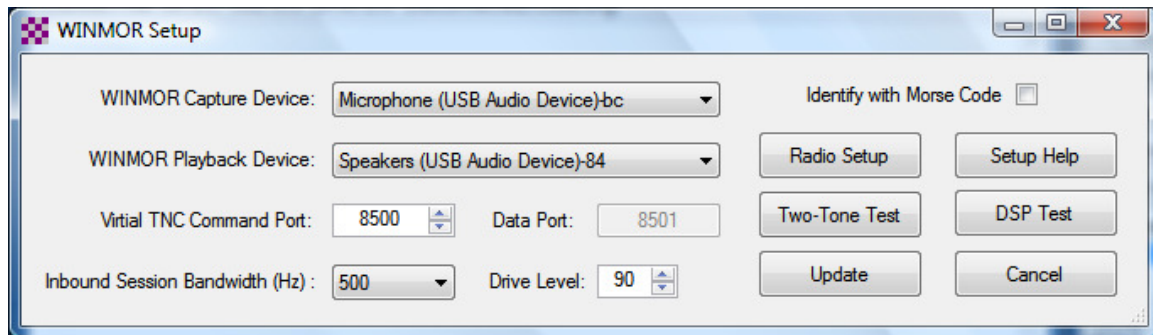
- 2. The sound card capture device (receiving data) MUST be able to support a real or interpolated sampling frequency of 48000Hz +/- .1% (+/-1000 ppm)**
- 3. The sound card playback Device (transmitting data) MUST be able to support a real or interpolated sampling frequency of 12000 Hz +/- .1% (+/- 1000 ppm)**
- 4. 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 within 75ppm.

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 **Two Tone Test** button will allow you to key the transmitter and set the audio level. Use the **Drive Level** to set the power out to no more than 60 percent of normal output 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 percent.

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 level too low, the VOX circuit in the Signalink will not key. Should you have low or no output, check the help file, there is a wealth of information in solving the problem. For example it contains information specific to Flex radios and other tips to getting setup.

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

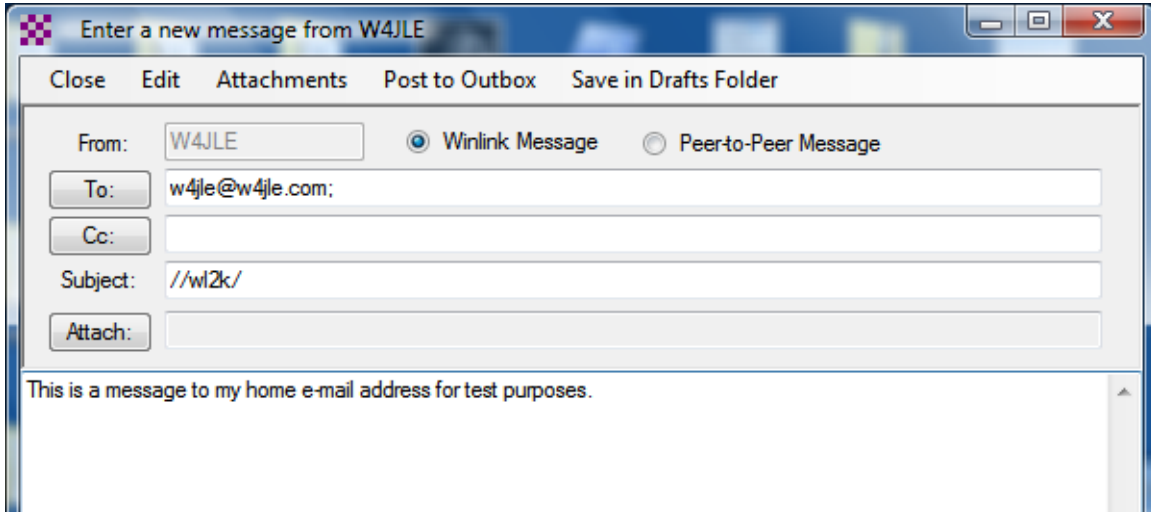
Setting up the receive side is a lot easier as you have the waterfall to help you adjust the volume. Remember to turn off DSP and notch filters etc. The program internal DSP will take care of what is needed.

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 785, in the current version it shows 121. 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. Numbers greater than 50 seem to work OK.

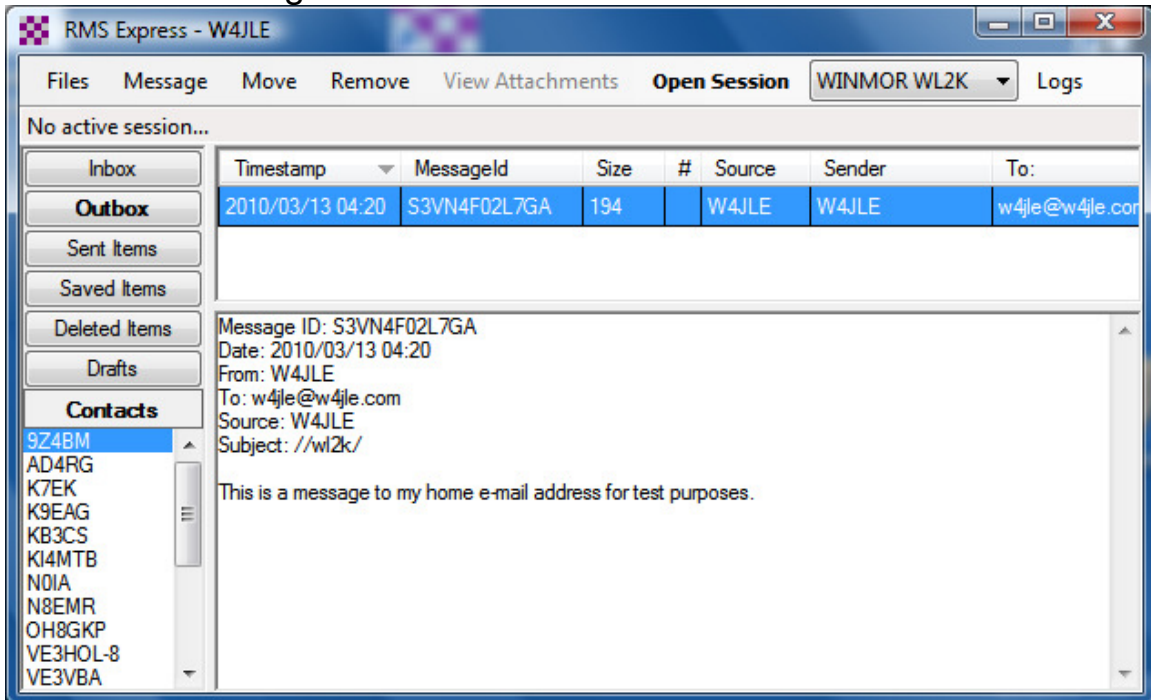
You are now ready to make a connection.

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**

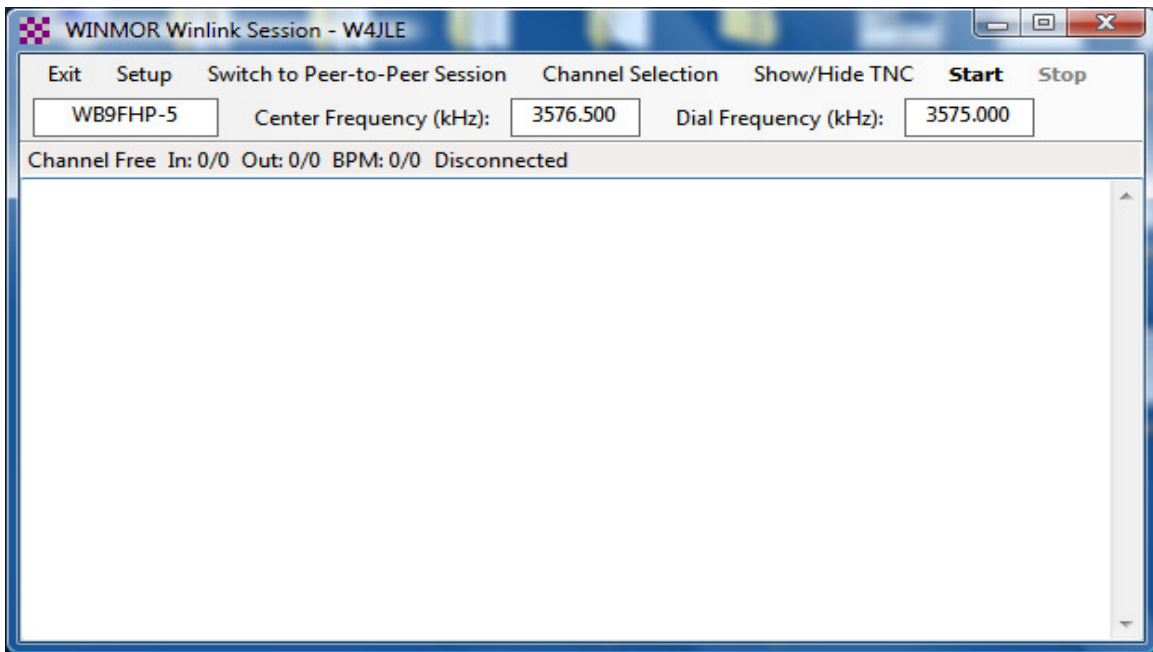


Close the message window and look at the outbox.



You can see your message queued up ready to go. You can select the mode to use in the pull down window to the left of **LOGS**. We will choose **WINMOR WL2K** then press **Open Session**.

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. 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 Station list, when you click on the **Channel Selection** a pop up window will show the stations available for either MARS or Ham stations depending on your callsign. If you have correctly installed ITSHF the list will be in “best chance of propagation” order.

Callsign	Frequency (kHz)	Mode	Grid Square	Distance (Kilometers)	Bearing (Degrees)	Path Quality Estimate
WB9FHP-5	3576.500	500	EM68SM	686	320	70
W1EO-5	7081.900	500	FN42IM	1299	040	68
KB1OOQ-5	3570.700	500	FN42FW	1318	037	68
N0ONL-5	7078.500	500	DN80JP	2063	298	64
KB5OZE-5	3586.500	500	EL49WU	940	244	64
AC5PW-5	3577.500	500	EM31TI	1067	258	62
W5SEG-5	3584.500	500	EL19AN	1637	257	55
K7EK-5	7081.100	1600	CN87TB	3708	306	50
KN6KB-5	7083.000	500	EL98PF	633	174	40
K6IRF-5	3570.000	500	DM14DB	3329	281	37

Click on the first callsign and exit. You will see the windows for frequency and dial frequency in the sessions window contain the correct frequencies. Set your radio to the dial frequency and press **Start** 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 your outbox, you have been successful. If any traffic was at the CMS for your station it will be in your inbox. Note that if you receive an attachment you will have to press the **View Attachment** button to make it visible.

If you are a MARS member and have propagation connect to my station NNA4AG-5, 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 their 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.

<i>500 Hz bandwidth:</i>	
<i>Mode</i>	<i>Words per minute</i>
2 Carrier 4FSK	168
2 Carrier 4PSK	254
2 Carrier 8PSK	548
2 Carrier 16PSK	821
<i>1600 Hz bandwidth:</i>	
2 Carrier 4FSK	168
2 Carrier 4PSK	254
8 Carrier 4FSK	671
8 Carrier 4PSK	1018
8 Carrier 8PSK	2190
8 Carrier 16PSK	3285

The speeds are determined as 5 characters + space /"word" and assume 50% compression. The purpose of the table is to give you a relative idea of speed vs. mode.

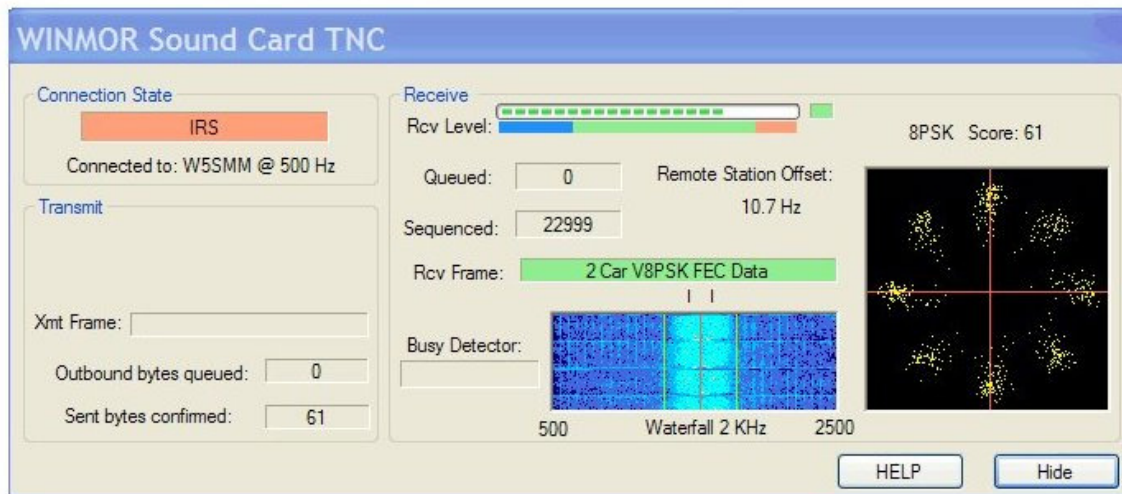
Notice the throughput is not listed in baud rates; the reason is that with the various compression techniques and encoding methods baud rate doesn't lend its self to a reasonable comparison.

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 1/4 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 callsign 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)

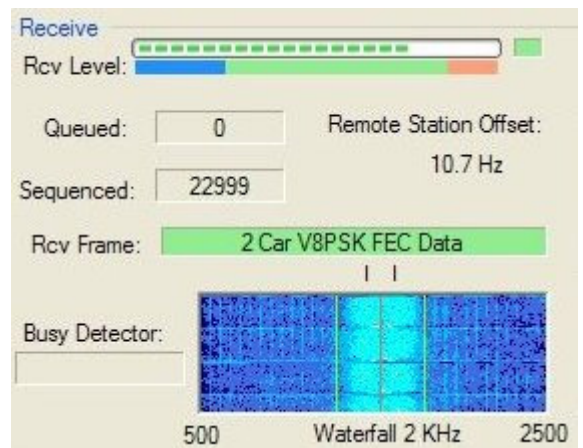
ISS MODE SHIFT Requesting Packets Passed information from the IRS in preparation for a mode shift

SENDID Sends ID Frame and optional CW ID if enabled

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.
- 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, Settings, 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.

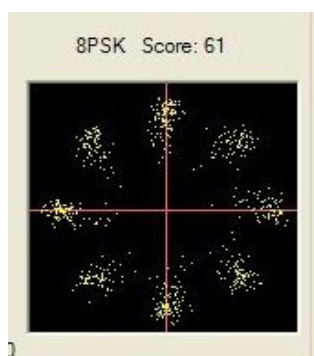
"P" The carrier was decoded correctly using the extended R-S Parity

"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 reassemble 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 you're looking for.

The WINMOR folks have done a great job with the help files, now that you have everything installed take the time to read through them as they always have the latest information.

73

Fred W4JLE/NNN0AAG/NNN0GBS SC

Appendix A

Icom CI-V Default Addresses:

Icom Model	Default Add
703	68
706	48
706 MKII	4E
706 MKIIG	58
707	3E
718	5E
725	30
728	38
729	3A
735	04
736	40
737	3C
746	56
746 PRO	66
751	1C
756	50
756 PRO	5C
756 PROII	64
756 PROIII	6E
761	1E
765	2C
775 DSP	46
781	26
820 H	42
821	4C
910 H	60
7000	70
7200	76
7400	66
7600	7A
7700	74
7800	6A

Appendix B

Multiple RMS Express Instances

RMS Express may be installed and run as multiple instances. This may be desirable for example if the same computer is used as both a normal amateur site and also a MARS site or otherwise must operate under multiple call signs. The following are important and necessary requirements for installing and running multiple RMS Express instances on the same computer.

1) Different Directories for EACH instance.

If more than one instance of RMS Express is used the program *must* be run from different directories and *NOT* share any of the same subdirectories. The RMS Express.ini file (located in the RMS Express) holds the settings for the instance.

2) Creating a multiple instance: (Follow carefully!)

- a) Create a new directory (any desired name) for the new RMS Express instance. It can be on any hard drive:
- b) Copy all the files from your original RMS Express directory (default = C:\RMS Express) to your new RMS Express Instance directory. You do not need to copy the sub directories.
- c) Delete the file "RMS Express.ini" in the new RMS Express instance directory. This will give you a fresh start upon startup of the new instance.
- d) If desired create a shortcut for the new instance by right clicking RMS Express.exe in the NEW instance directory. Select "create shortcut here" upon right click release. Drag the shortcut (DO *NOT* move the actual RMS Express.exe file) from the RMS Express directory to the desired place (e.g. Desktop). Rename the shortcut to an appropriate name for the new instance.
- e) Start the new instance by double clicking on the new instance shortcut or on RMS Express.exe in the new instance directory.
- f) Fill in the site Properties and desired channel menus for the new instance.

3) Instances must have unique site call signs.

The base call sign *MAY* be the same in multiple instances but the site call sign (set up in the properties dialog) **MUST BE UNIQUE** (call sign or -ssid) for each instance.

4) If instances are to be run simultaneously additional limitations apply due to hardware considerations:

- a) Instances **MUST** not share Com ports or sound cards.
- b) Simultaneous operation of multiple instances may add significant CPU overhead.