BASIC SOUND CARD MODE TRAINING GUIDE

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Introduction

The amateur/MARS digital radio station prior to 1980 consisted of a mechanical teletype machine. The teletype machine was connected to the transceiver through an interface know as a terminal unit (TU).   As microprocessor technology appeared in the 70's, TU's evolved, replacing the mechanical teletype machines. When personal computers debuted in the early 80's, they became the perfect companions for the TU's, acting as "dumb" terminals, displaying the received data from the TU and sending data to the TU for transmission. In the late 80's, the TU became much more sophisticated and became the multimode controller we still use today. These controllers like the PK-232, KAM and PTCIIex can run RTTY, packet, PACTOR, AMTOR. Like TU's, the multimode controllers are stand-alone devices that communicate with the personal computer, using it as a "dumb" terminal. In the early 90's sound cards appeared as accessories for personal computers. With the right software, a sound card could take received audio and translate it into digital information. The same sound card could also create various forms of digital audio modulation for transmission.   The hardware multimode controllers are still with us, but they are primarily used for modes like PACTOR and Clover that require more processing muscle than a typical personal computer can provide. All of the other amateur radio digital modes are now handled by the personal computer's sound card. Some examples include, PSK-31, MT-63, Olivia, RTTY, MFSK, CW, G-TOR, THROB, WINMOR and WINDRAM (digital voice).

Required Equipment

The required equipment includes a personal computer with a sound card (internal or external), a Sound Card Interface Unit and a HF transceiver.

Figure 1: Sound Card Interface Options

Figure 1 shows a typical sound card interface options for an amateur radio transceiver. All audio cables are shielded.   Some sound card interfaces have USB rather than RS-232 serial port capability. Some Sound Card Interfaces connect to the microphone input (MIC & PTT) and speaker output, while others connect entirely to an accessory

connector on the back of the radio.   Still other Sound Card Interfaces contain their own external sound card, thus eliminating any internal sound card compatibility issues. All Sound Card Interfaces contains isolation transformers, relays and level converters to provide proper functionality with the modern HF transceiver. Table 1 describes a number of commercially available Sound Card Interface devices.

Table 1: A Collection of Available Sound Card Interface Units

Model	Type	Digital Interface	Power Source	Web Site
RIGBlaster Plus II ($160)	Computer Sound Card	Serial or USB	External	http://www.westmountainradio.com
Rascal II $(69)	Computer Sound Card	USB	USB	http://www.buxcomm.com
MFJ-1275 ($110)	Computer Sound Card	Serial	External	http://www.mfjenterprises.com/
RigExpert Standard ($258)	External Sound Card	USB	USB	http://rigexpert.net
Tigertronics SignaLinkUSB ($99.95)	External Sound Card	USB	USB	http://www.tigertronics.com
RigBlaster Advantage ($200)	External Sound Card	USB	USB	http://www.westmountainradio.com

Each manufacturer can supply custom cables to interface their unit to your specific HF transceiver. The author has specific favorable experience with the RIGBlaster™ Plus, RigExpert Standard and SignaLink™ USB. The new Tigertronics SignaLink™ USB is very easy to install, is inexpensive, and has the advantages of using an external sound card. See Appendix 1 for SignaLink™ USB details. The RigExpert Standard is the most capable of all the sound card devices available at this time.
Connection of each specific unit to your radio and computer is described in the operating manual supplied with each interface unit.   Laptop computers typically have an earphone output rather than a speaker output and a MIC/LINE input. Some newer laptops and desktops have eliminated the serial connector, leaving only the USB digital interface. Examine your target computer before purchasing a Sound Card Interface. The USB controlled devices may require that you install a USB driver. Once again carefully follow the manufacturer's instructions found in your Sound Card Interface Owner's manual.

Software

Army MARS has specified the use of MT-63 and Olivia for digital sound card mode operations. PSK-31 is another sound card mode that is an excellent "Keyboard chat" mode that is widely used on the amateur bands. MT-63 is almost exclusively a MARS mode of operation and is seldom found on the amateur radio bands.
All available software requires the Windows operating system, Windows 98 or newer. Windows XP is highly recommended and most software is Vista and Windows 7 compatible.   Table 2 lists some of the available software.

Table 2: Sound Card Software

Title	Ver.	Modes	Web Site
MixW ($50)	2.20	All	http://www.rigexpert.net/frame/downloads.html
Fldigi	3.21.12	All	http://www.w1hkj.com/
Ham Radio Deluxe	4.0	All	http://www.ham-radio-deluxe.com/

Texas Army MARS recommends MixW and the rest of this manual will provide simplified instructions for setting up MixW V2.20 with both internal and external sound cards.

MixW Software Installation

Once you have your hardware connected, you will next download MixW program, install and set it up for operation as follows:
1. To download MixW go to: http://www.rigexpert.net/frame/downloads.html
2. Click on "*Click here to down load MixW ver. 2.20*"
3. A pop up box will ask you to *Save File*:

.
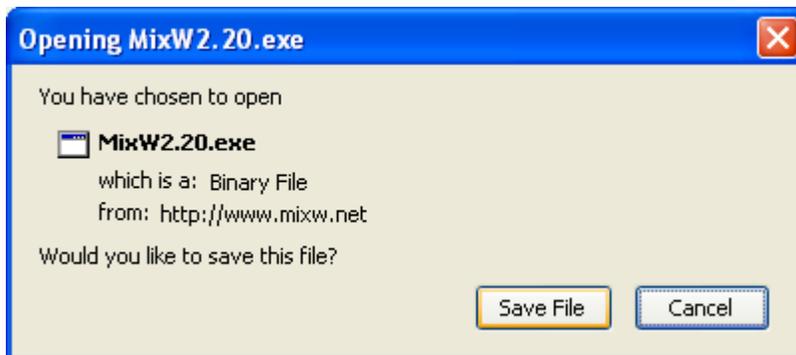
4. Save the file "MixW2.20" to the desktop by clicking " *Save* " as shown below.
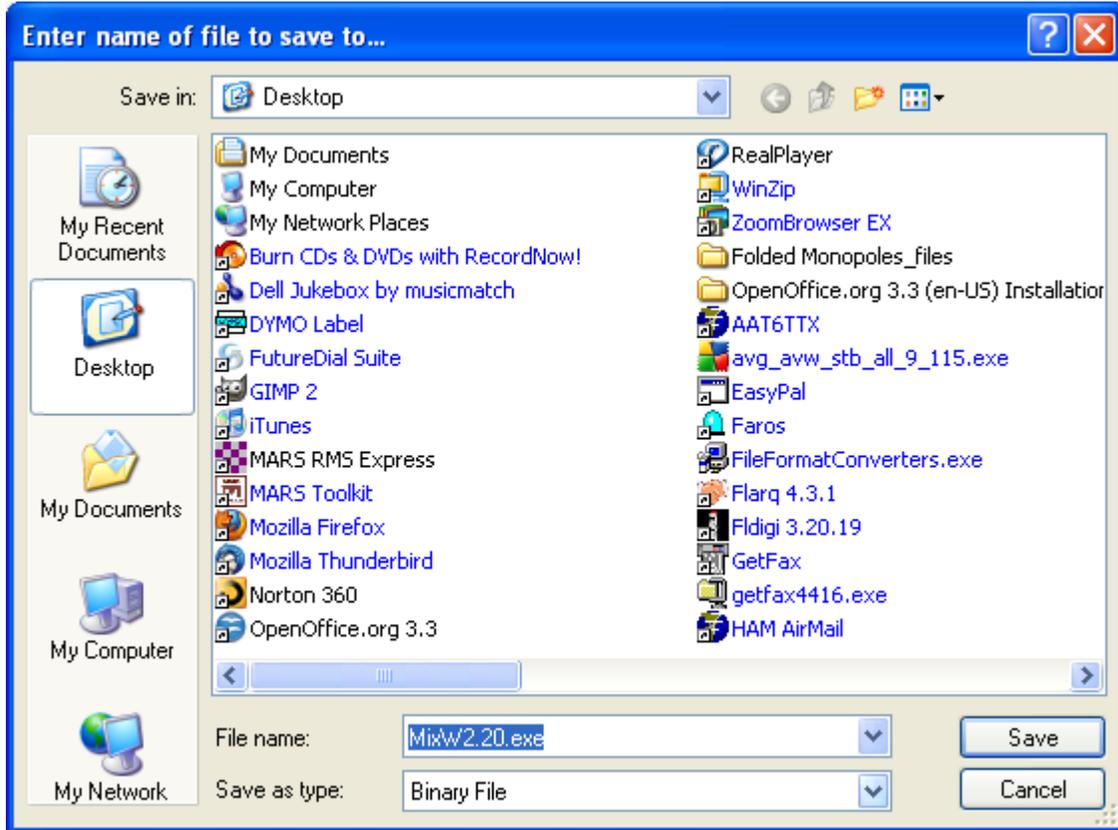
5. Double click on *the MixW2.20 icon on the desktop to install MixW. Click "Next", then "I* Agree", then "*Next*" to install all components. Install the program in the default location C:\Program Files\MixW by clicking "*Install*". Once complete, click "*Finish*".

Initial MixW Setup

The next step is to set-up MixW to operate with a Sound Card Interface and transceiver as follows:
1. Launch MixW by going to Start/All Programs/MixW/MixW2.20.
   Enter personal data including your MARS call then click OK.

2. Expand the MixW display to full screen by clicking on the middle box just to the left of the red X in the upper right hand portion of the MixW screen.
3. Drag and drop the Tuning Indicator, Frequency Control and World to the right of the QSO Log as shown on the next page.

DE AAN6ETX NRnn
R 022330Z OCT 2007
FM SOC/AAN6ETX TX
TO AAA9O DC
INFO AAA6RD TX
     AAA6TX TX
     AAN3HR DC
BT
MARS EXERCISE GARDEN PARTY
SUBJ: SUPPORT REQUEST/TALL WATER/AUSTIN TX
   1. 022315Z OCT 2007
   2. SOC/AAN6ETX/AUSTIN TX
   3. MARS WINLINK AAN6ETX@WINLINK.ORG
   4. AUSTIN OEM REQUESTING BOTTLED WATER AND ICE FOR 25,000 DISPLACED
      RESIDENTS FOR 5 DAYS BEGINNING 3 OCT 2007.
MARS EXERCISE GARDEN PARTY
   BT

NNNN

Receive Buffer

Waterfall display   **MT-63 reception**   **Transmit Buffer**

4. Move the mouse cursor to the waterfall area (dark) then slowly upward until the cursor changes from an arrow to small parallel lines. Left Click and drag the waterfall display down as shown above.
5. Do the same for the next gray line as shown above. The space between the waterfall and the gray line is the Transmit buffer. The large top portion is the receive buffer.
6. Display setting are done under the "View" menu as follows:
   a. Under "*View*" menu select "*Spectrum"* then "*Sound"*.
   b. Under "*View*" menu select "*Spectrum"* then "*Zoom"* and then "*x2"*.
   c. Under "*View"* menu select "*Show Hairlines"*.

Registration

6. MixW without Olivia will run "free" for 15 days. You must register during this time otherwise MixW will stop functioning.   Go to: http://www.mixwusa.com/registration.htm to register and pay. You can register both your amateur radio and MARS call signs for the one fee of $50.
7. Once you are registered, your call sign(s) will be placed in an international registration data file that will be interrogated by your MixW program to complete the registration process. You can check your registration by going to: http://mixw.net/misc/regcust/check.php Enter your call sign in the display to verify your registration as shown on the next page.
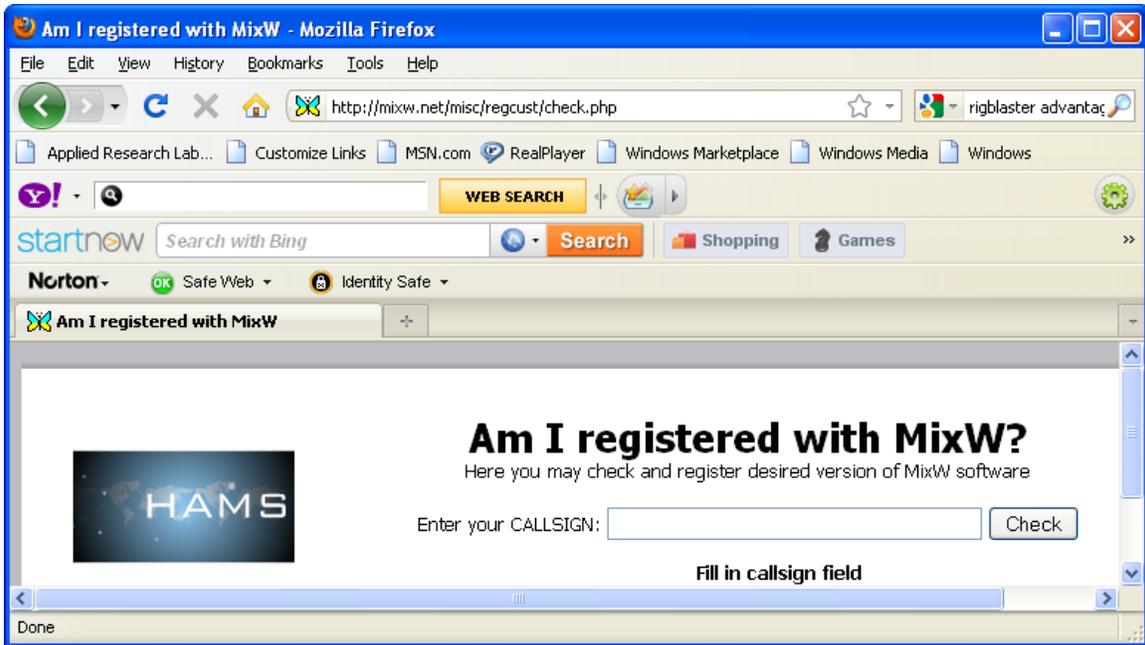
7. To register, make sure that your computer is connected to the Internet, run MixW and then go to Help/Apply Registration.   The "Apply Registration" letters should gray out and you will receive no more "unregistered copy" reminders.   To download Olivia, go to File/Extras/Modes:

Click on "Download" to install Olivia, Contestia, and RttyM as shown below.
Olivia, Contestia, and RttyM should now appear under "Modes".
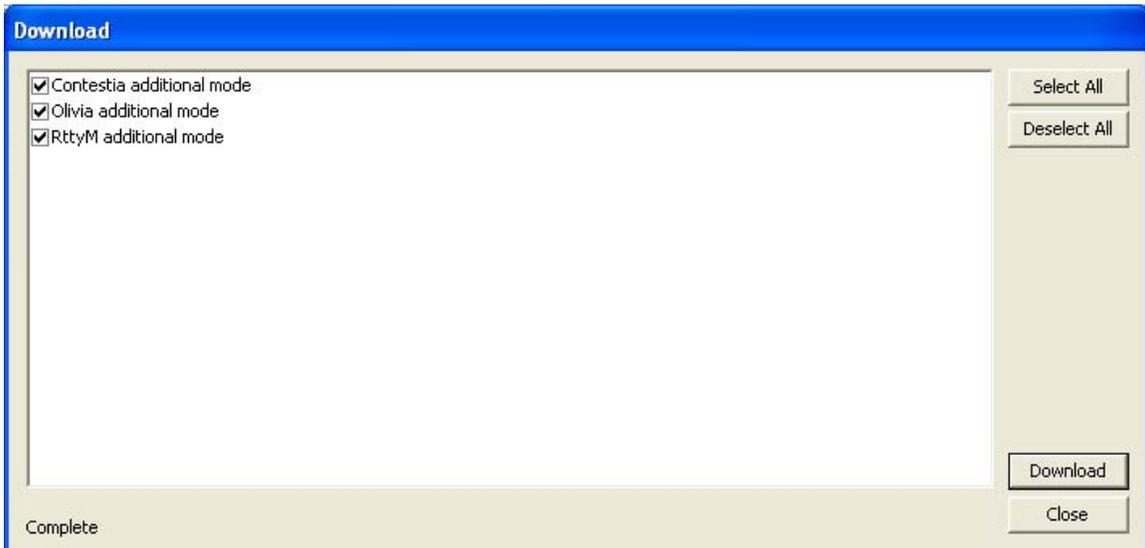
MixW hardware setup for a simple Internal Sound Card Interface (RigBlaster Plus)

Having completed the initial installation of MixW, the next step is to customize the software for the hardware installation. Please refer to your hardware user manual if you are using anything other than a simple serial RigBlaster Plus type interface.

1. **Configuring Transceiver PTT settings:**
Go to Configure/TRCVR CAT/PTT…
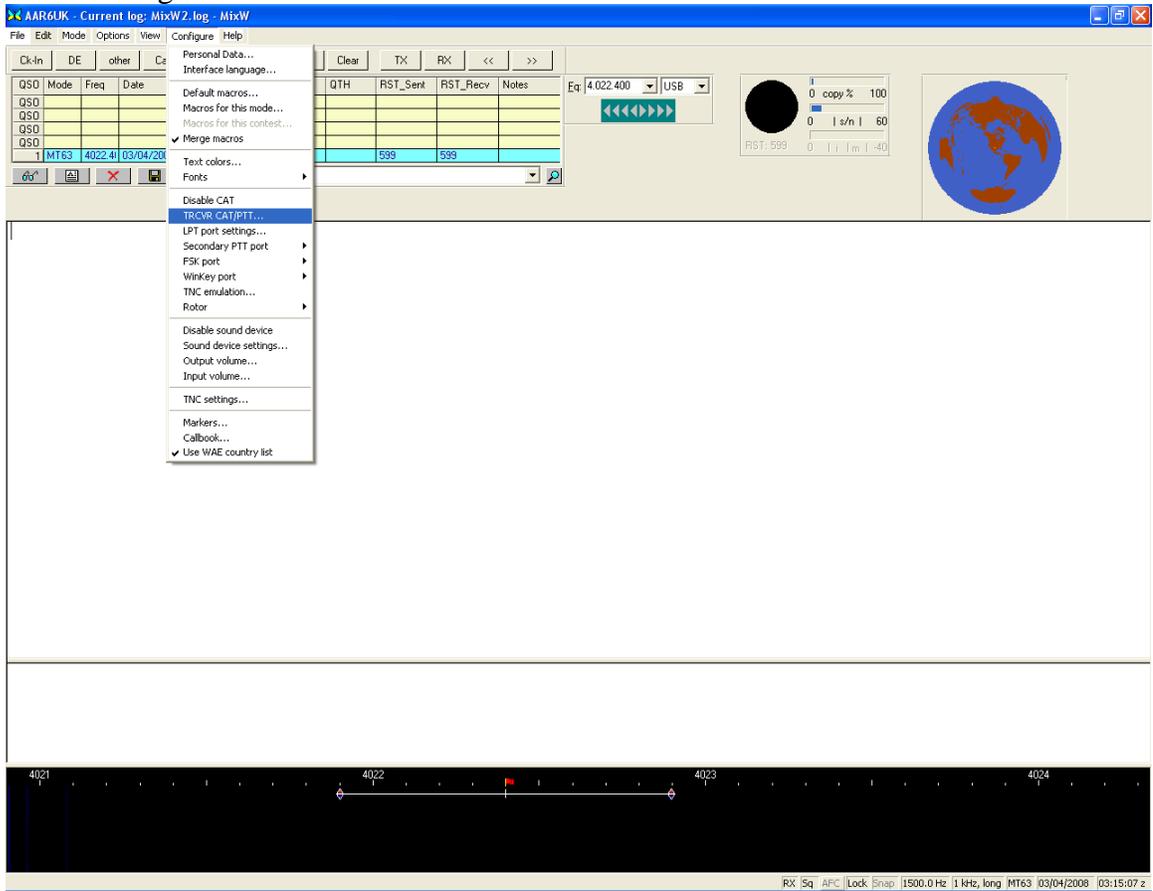
Clicking on TRCVR CAT/PTT… brings up the following screen:
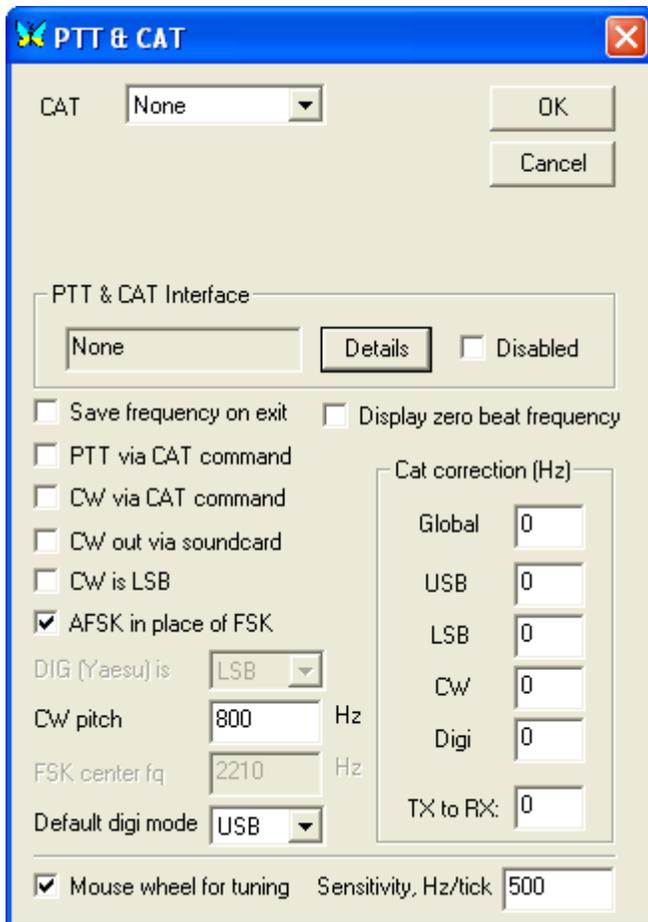
Confirm that all the default setting shown above are in your computer, then click on Details" in the PTT&CAT Interface box. The following screen will appear:
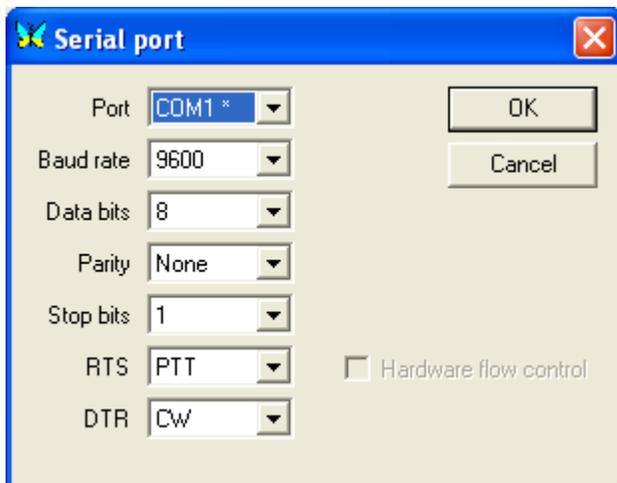
Change "None" to COM1 in the Port box. Confirm that all other settings shown above are in your computer. Then press OK.

Press OK on the PTT&CAT box. PTT should now be configured to operate on the
RTS digital line of COM1.
If your Sound Card Interface has CAT control, see the MixW Operating manual.
The basic instructions for this advanced mode are to configure the CAT control using
the TRCVR CAT/PTT… then use the Secondary PTT port for PTT control.

2. Mode Selection
Under Mode, select MT-63.
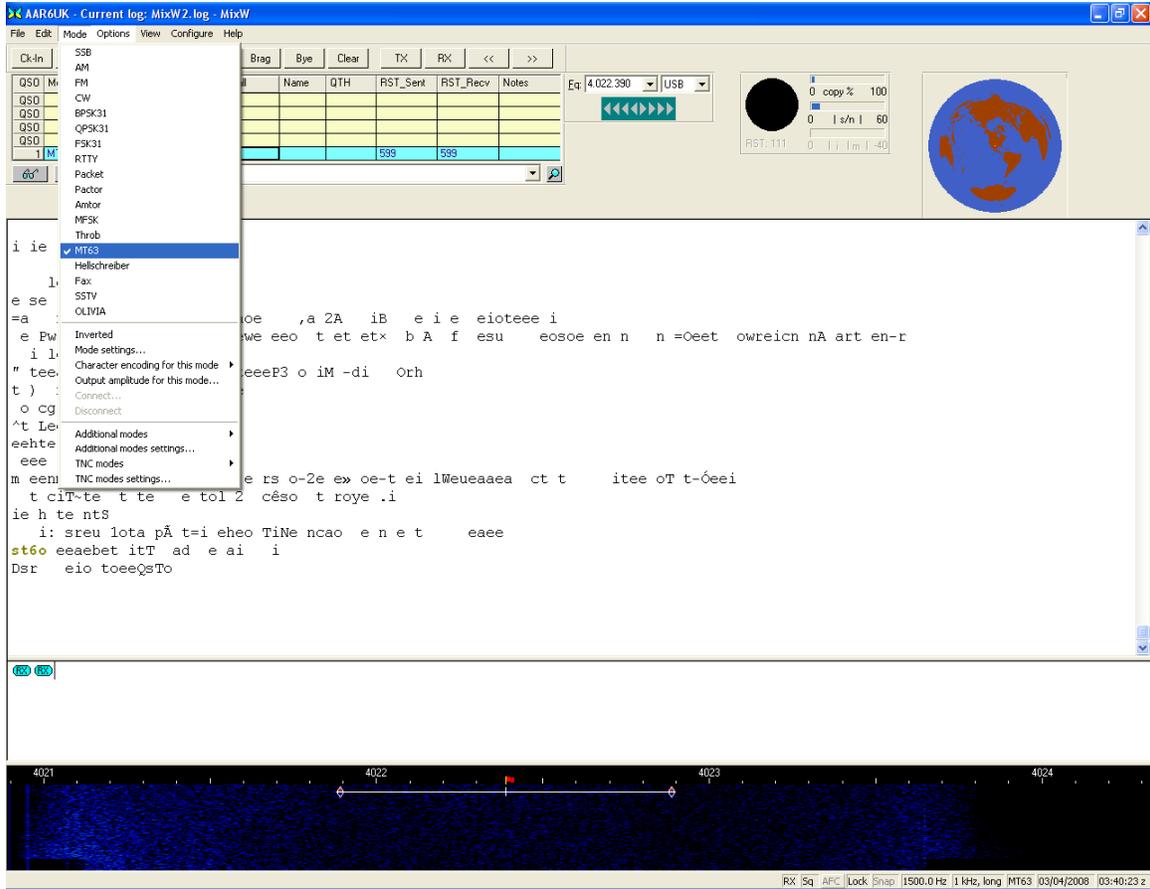
3. Mode settings
After selecting MT-63 mode, go back to Mode and select *"Mode Settings"*. You
should get the following screen:
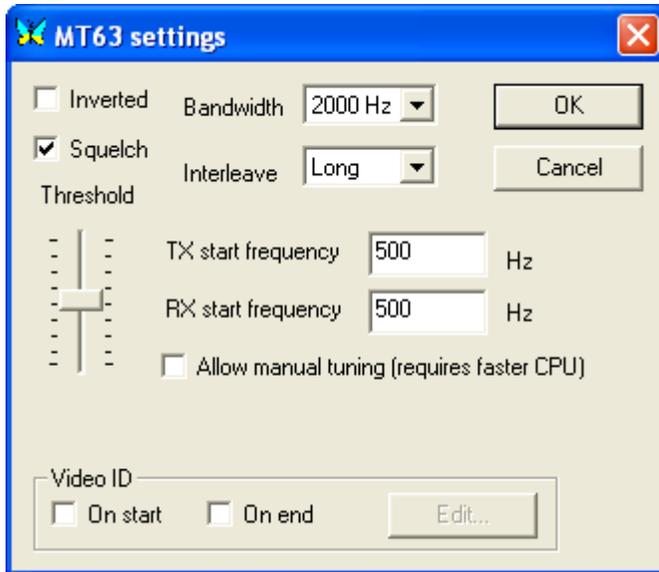
Fill in Bandwidth, Interleave, TX start and RX start frequencies and set the Threshold about 40% to 50%.   Leave the "Allow manual Tuning" box unchecked for now. Click OK when finished.

In a similar fashion, Olivia can be selected. The typical Texas MARS Olivia Settings are shown below.
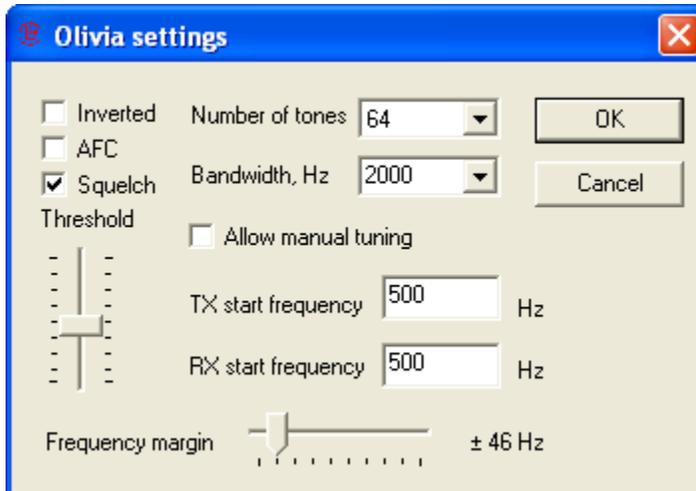
4. Transmit and receive level adjustments
If you have not done so already, connect the computer and transceiver to your Sound Card Interface Unit as described in your owner's manual. Connect the audio output of your transceiver to the Line Input of your computer. If you have only a microphone input, use this instead. New laptops with only one audio input and you may be ask if you wish the input to be mic or line when you plug in the 1/8" jack. If given a choice, select Line Input.

The input and output levels of your sound card are adjusted using the Windows Volume (transmit) and Record (receive) controls. These controls can be launched from within MixW.

a. To adjust the receive level, go to "*Configure/Input Volume*". The display will vary with different sound cards but will be similar to below
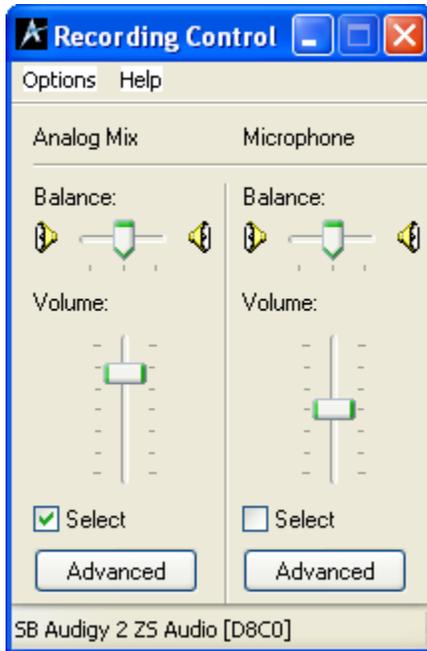
b. Select Analog Mix/Line In or Microphone if no Analog Mix or Line Input is available.
c. With your transceiver receiving noise and its audio output connected to Line-In on your computer, adjust the Line-In volume control until you see light blue-green noise on the waterfall as shown on the next page.
d. When you have finished with this adjustment, close the Recording Control box by clicking on the red X.
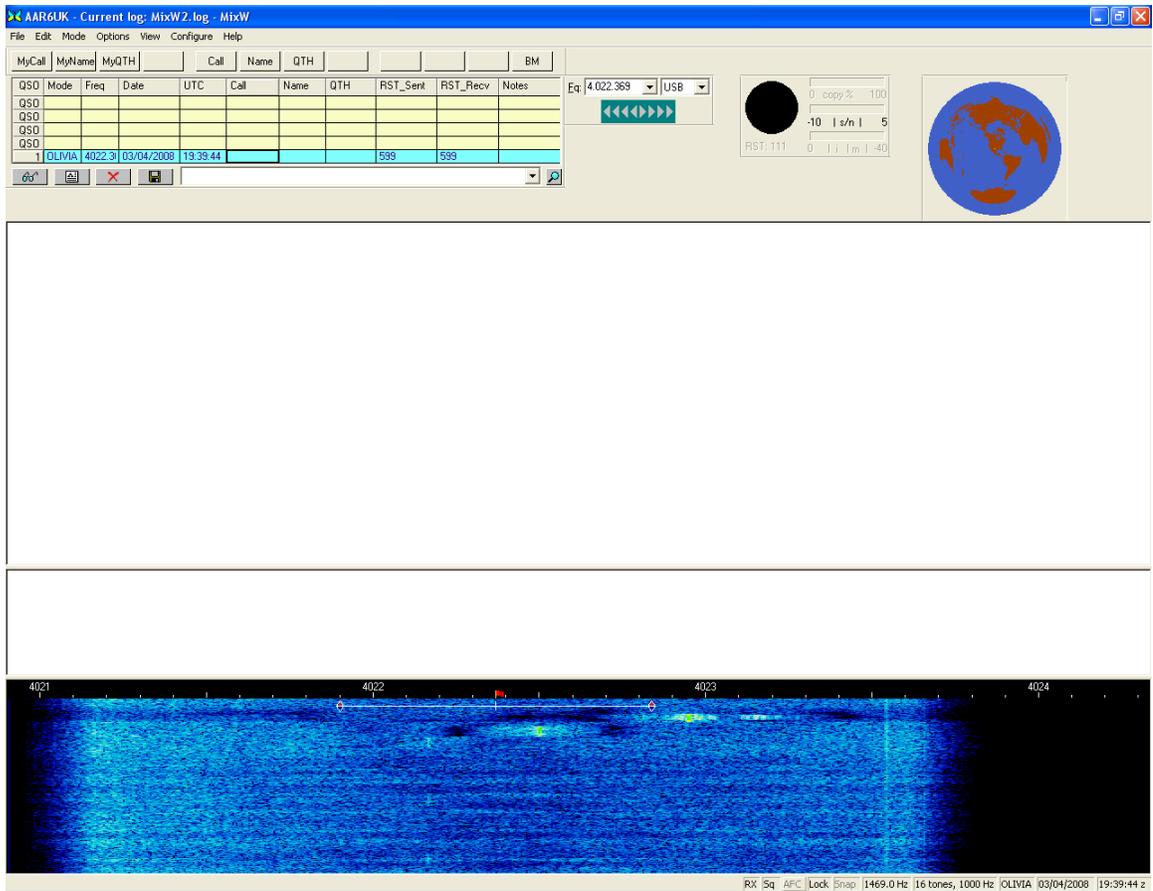
a. To adjust the transmit level go to *"Configure/Output Volume"*. Two controls are used to set the output audio level, The Play Control and Wave/MP3. Again the exact control names will vary with different types of sound cards.

b. Set both controls to about mid-level and then refer to your sound card interface manual.

c. Typically the interal sound card interface unit (RigBlaster Plus) will have a separate volume control either on the front or back of the unit. Set this control at its mid-level position.

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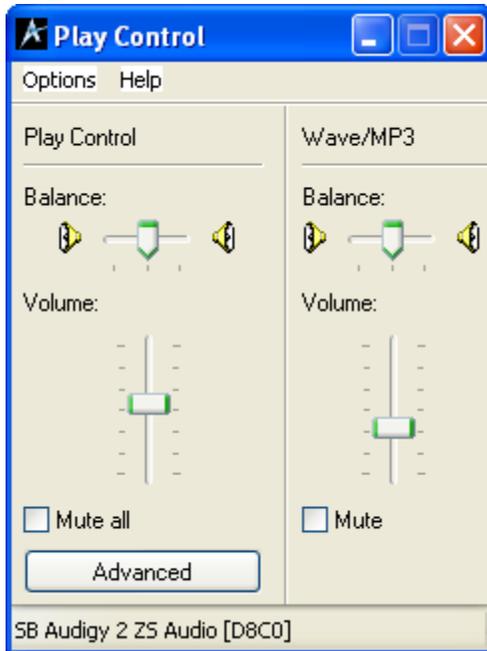
d. Connect your transceiver to a dummy load and select power output on your transceiver's metering and turn off any microphone compression.

e. Click on the TX button at the top of the MixW display to start transmitting. The transceiver should go to transmit mode and display some power output.

f. Adjust the Play controls and Sound Card Interface level until you get about 50% of maximum power (50 watts).

g. Switch over to ALC (Automatic Level Control) metering and adjust the drive again until you get about 50% of maximum ALC. When you have finished with these adjustments, click on the RX button. MT-63 will take about 6 seconds to return to receive mode due to the forward error correction transmission overhead.

h. These same levels will work perfectly for Olivia.

An excellent free-ware program, QUICKMIX, is available to remember and reset these level controls each time you run MixW.

See: http://www.ptpart.co.uk/quickmix/

You can store different setting for MT-63/Olivia and BPSK31. Run this program after you have started MixW to set the internal sound card levels.

Calibration and Trouble Shooting

Trouble Shooting

1. Software – Please read the rest of this manual and your Sound Card Interface Manual. The help files for MixW are quite good also. There is a Windows XP problem that manifests itself as garbled MT-63 transmission but good reception. The other modes like Olivia and BPSK31 transmit and receive perfectly. **The cure is to go to MixW/Configure/Sound device settings/ and change the Samplerate to 12000 from 11025.**

2. Hardware – Most hardware problems are associated with PTT. Carefully review your hardware manual to make sure that you are using RTS and only RTS as your

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PTT command line. For example, RIGBlaster has jumpers to select either or both RTS and DTR for PTT. Remove any jumpers on the DTR line. The DTR jumper caused my system to go to transmit anytime I exited MixW.

Sound Card Mode Operations

Receiving Traffic
<u>**To receive MT-63 traffic, the flashing vertical cursor must be present in the Transmit Buffer. This is most easily accomplished by simply clicking the mouse anywhere in the Waterfall display**</u>.   If the cursor is accidentally left in the Receive Buffer, the traffic will still be successfully received, but will be "hidden" from view until the flashing cursor is moved to the Transmit Buffer.   I know this is not logical…. But this is simply how MixW works!
The received message can be copied and pasted into other documents (AirMail, Notepad, etc.) or even the MixW Transmit Buffer for relay.   Cut & Paste will be discussed in the next section, Computer Skills.
To reduce the amount of "noise" characters, MixW has a character squelch control that can be activated and then its threshold adjusted. Under "*Options"* click on "*Squelch Control"* to activate the squelch. Then go back to "*Squelch Threshold…*" to adjust.

Transmitting Traffic
Traffic to be transmitted can either be typed or pasted into the transmit buffer. The flashing cursor must be in the transmit buffer and at the end of the message you wish to send. MixW can either be in the transmit or receive mode during typing or pasting. MixW will "empty" the transmit buffer and then remain in transmit mode until the RX button is clicked. Type <ENTER> then <ALT-END> or simply <F10> after all text has been entered to force MixW to go to the receive mode when all text has been transmitted.   As text is transmitted, it will be underlined in the transmit buffer and written to the receive buffer as it is transmitted. The delay between underlined text and transmitted text is due to the forward error correction (FEC) technique of MT-63 and Olivia since each has to add additional characters to create the redundant text for FEC.

Forwarding Traffic
Recall that when you are forwarding any 12-line MARS message, the top line is replaced with your call and message number.   All other components of the message, like the Time/Date Group and TO:/FM: remain unchanged. You should also record this message in your Message Log.   For example, if the following message is relayed to me:

```
DE AAR6LN NR 44
R 041430Z Mar 2008
FM AAR6LN TX
TO AAA6RD TX
BT
```

```
SUBJECT: TEST MESSAGE
1. This is a test message for the net as requested.
BT
```

I (AAR6UK) would make the following changes to the message before relaying or delivering the message to AAA6RD.

```
DE AAR6UK NR 135
R 041430Z Mar 2008
FM AAR6LN TX
TO AAA6RD TX
BT
SUBJECT: TEST MESSAGE
1. This is a test message for the net as requested.
BT
```

Necessary Computer Skills

Copy & Paste

To receive, forward and transmit MARS messages, it will be necessary for you to be able to "copy" and "paste" messages to and from Notepad, MixW and Airmail.   The process is exactly the same in all of these documents as well as many other Microsoft Windows applications. The best way to understand this process is to visualize a "scratchpad or clipboard" in the computer that all programs can access. Any of the programs (MixW, Airmail, Notepad, Word, etc.) can write to or read from this scratchpad.   There is only one scratchpad, and only the last thing written to it (copied) will be available to write (paste) to another document.   To "copy" a message to this scratch pad, place the cursor at the top of the text, left-click and hold, while dragging the mouse over the text you wish to copy. This is called "high-lighting" the text. You then release the left-mouse button at the end of the text, and immediate go to *"Edit"*, left-click and scroll down to *"Copy"* and release the button.   You have now placed the high-lighted text into your computer's scratchpad. The high-lighted, copy process is shown below.   You do not even have to keep the MixW program running after the copy process, since the copied text is now located in the computer's central scratchpad memory.
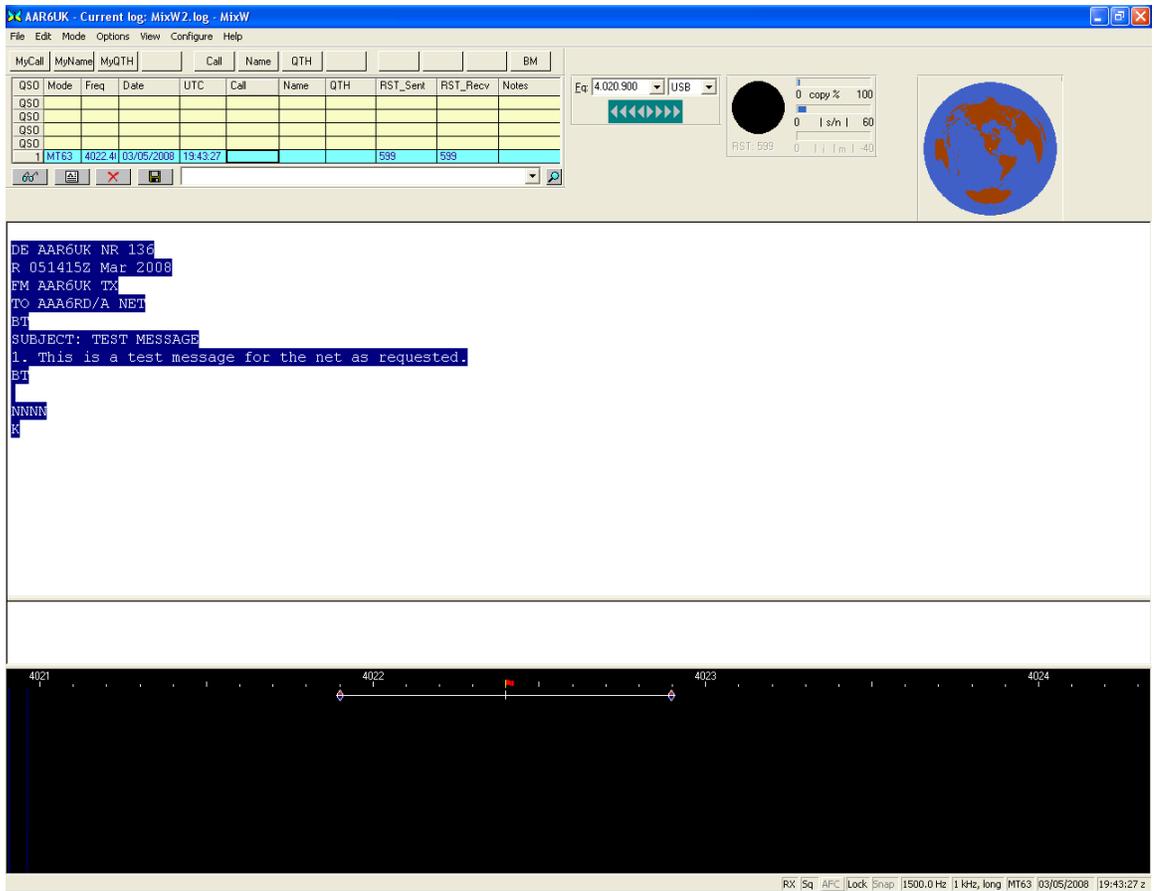
MixW has a convenient feature that brings up an action menu when you release the mouse button after high-lighting. One of these actions items is "copy". Scroll down to "*Copy"* and left-click to save in the scratchpad.

You can now open another application like Airmail and paste the contents of the scratch pad into its message buffer as shown on the next page.
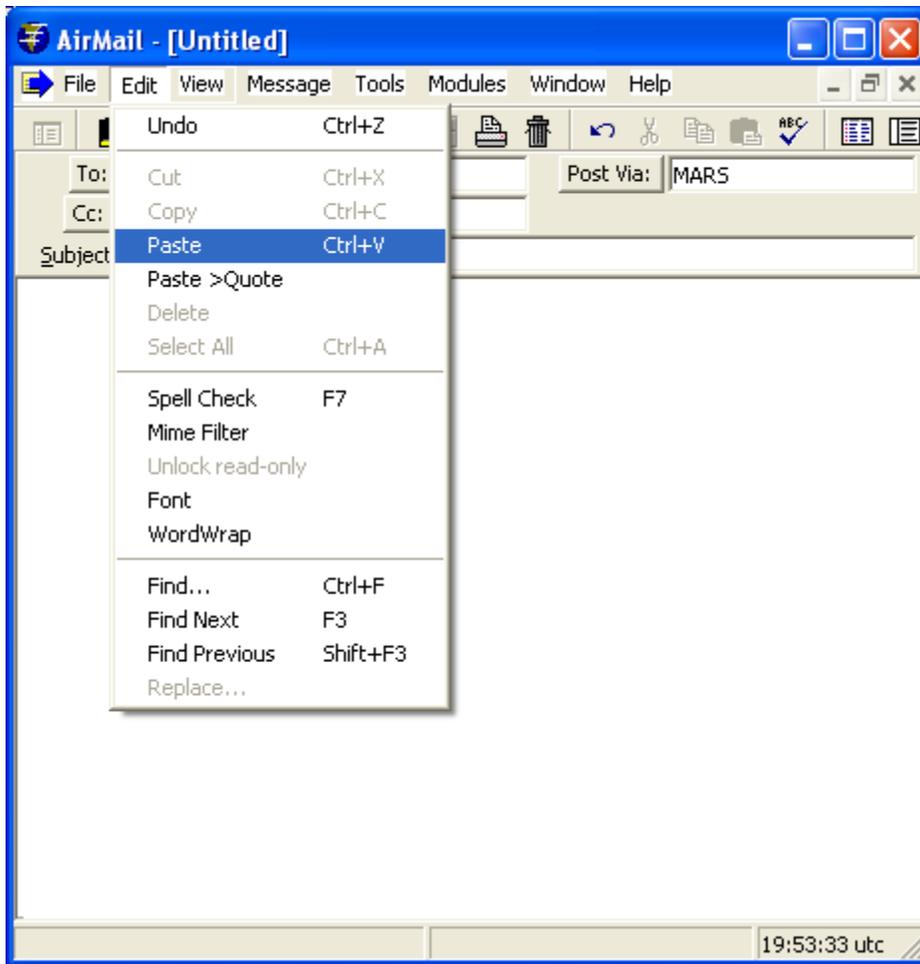
Resulting in the message appearing the AirMail message buffer as shown on the next page.
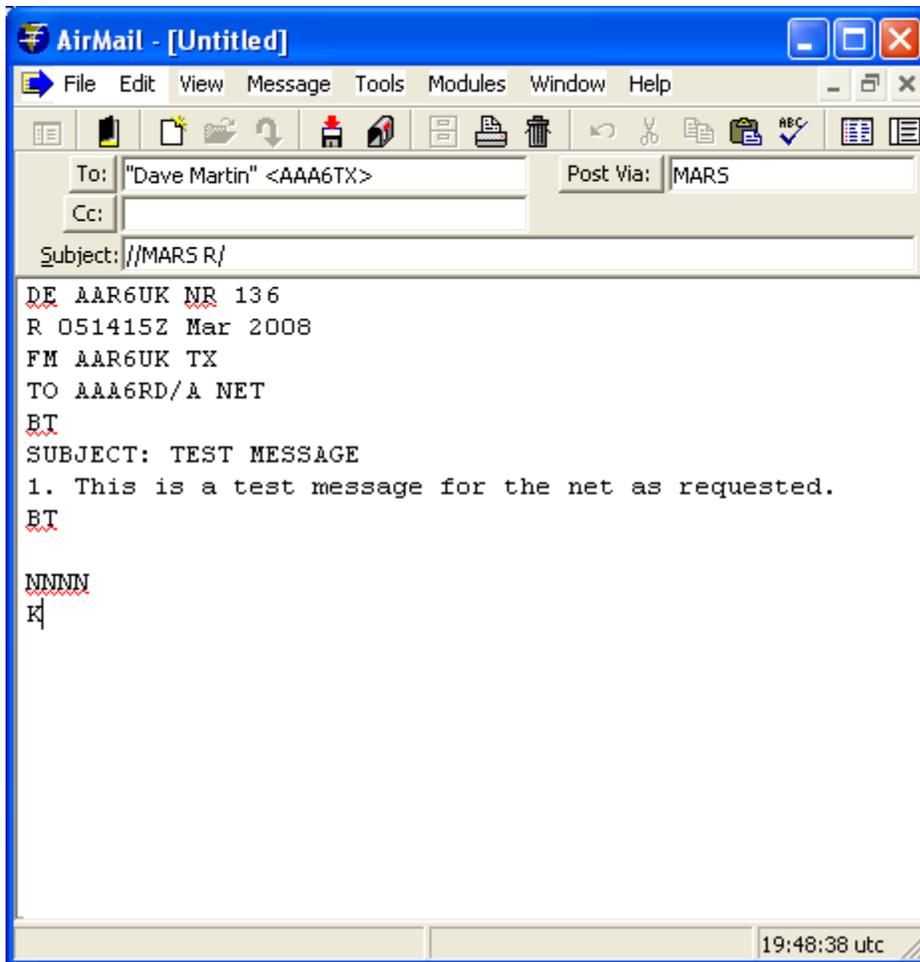
Change the top line, DE AAR6UK NR 136, to your call and your message number, and this message is ready to post (click on the mailbox icon) and transmit either by Winlink TELNET or Pactor.

You can also paste messages into the MixW transmit buffer as discussed below with Notepad.

Notepad

Notepad is small, simple word processor that can be used to generate MARS messages. Its contents can then be pasted into AirMail or MixW for digital transmission. Any messages you wish to save from MixW, can be pasted into Notepad and saved as separate documents.

Notepad is a Windows program found by clicking "*Start"* then "*All Programs"* scrolling to *'Accessories"* then right to the arrow, then down to "*Notepad"*.

Notepad with the test message is shown on the next page.

```
Untitled - Notepad

File  Edit  Format  View  Help

DE AAR6UK NR 137
R 061415Z MAR 2008
FM THOMPSON/AAR6UK TX
TO MANGOLD/AAR6LN TX
BT
SUBJ: TEST MESSAGE
1. THIS IS A TEST MESSAGE FOR THE NET
AS REQUESTED.
BT


NNNN
```
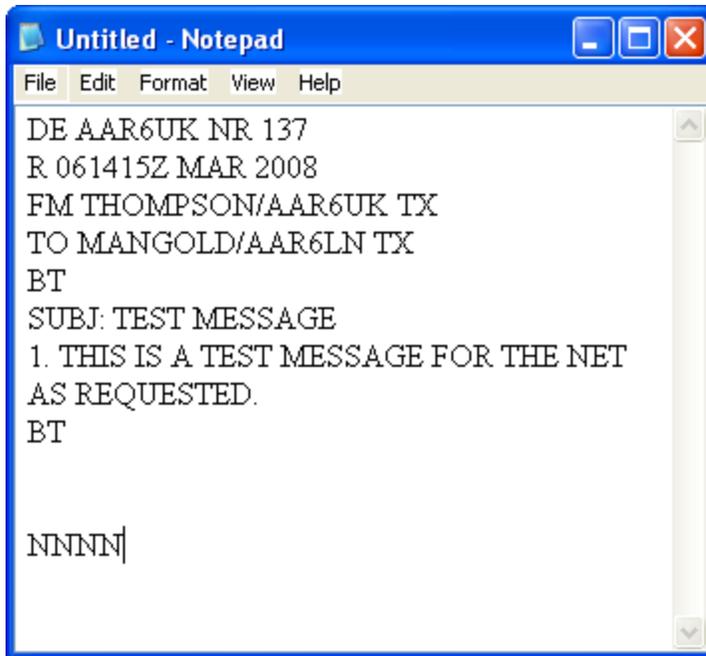
Once you have completed your MARS message, high-light the text, go up to
"*Edit/Copy*". You can then "*Paste*" this document into the transmit buffer of MixW
as shown below.
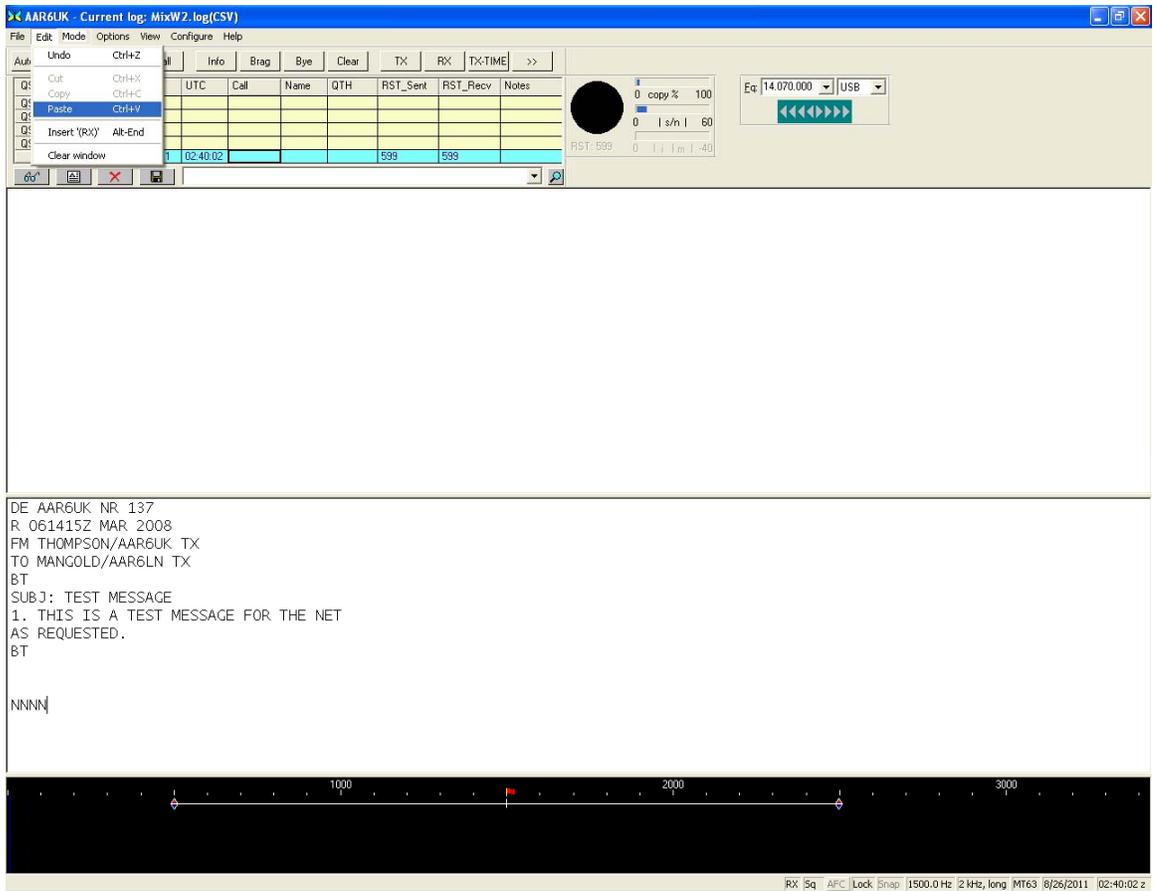
Click the mouse cursor in the transmit buffer, then "*Paste*". Your message will now be transmitted when you click on the TX button. Note that you can use the Transmit Buffer scroll bar to view the complete message. When the end of the message appears in the receive buffer, press the RX button to stop transmission or add <ENTER> <ALT-END> or <F10> to the end of the message to automatically end transmission and return to receive mode.

Simple File Structures
It will be convenient for you to place all your received and transmitted messages in two file folders titled XMIT MSG and RCVR MSG. To generate these new folders in your My Documents File do the following:
　　　　1. Go to "*START*" then "*My Documents*"

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2. Go to "*File/New/Folder",* as shown on the next page, and release the mouse button. Type XMIT MSG and then <RETURN>.   Do steps 1 and 2 above, again, typing in RCVR MSG this time. You have now created two new folders in your Document file.
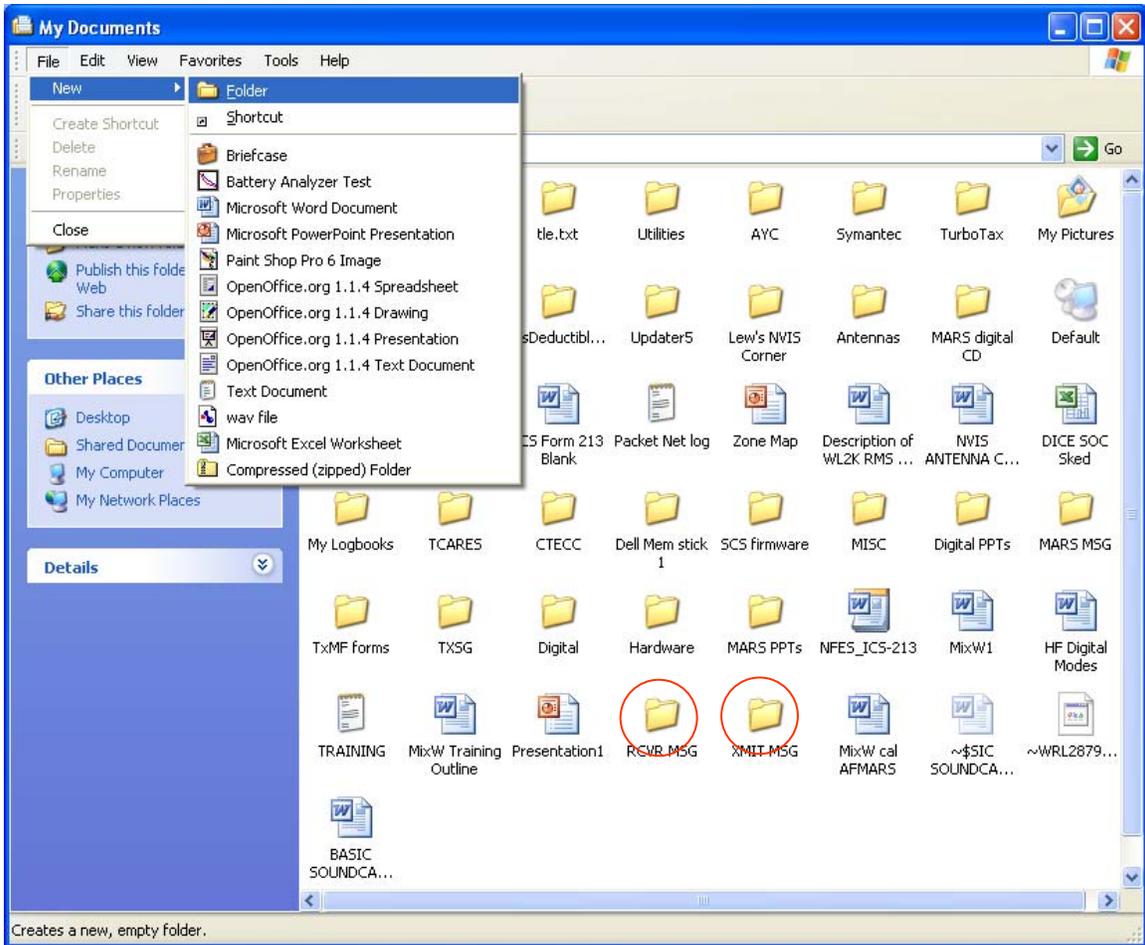
To place a document into one of these new folders, first copy and paste it into Notepad. When finished, click "*File*" then holding mouse button, scroll down to "*Save*" and release the mouse button.

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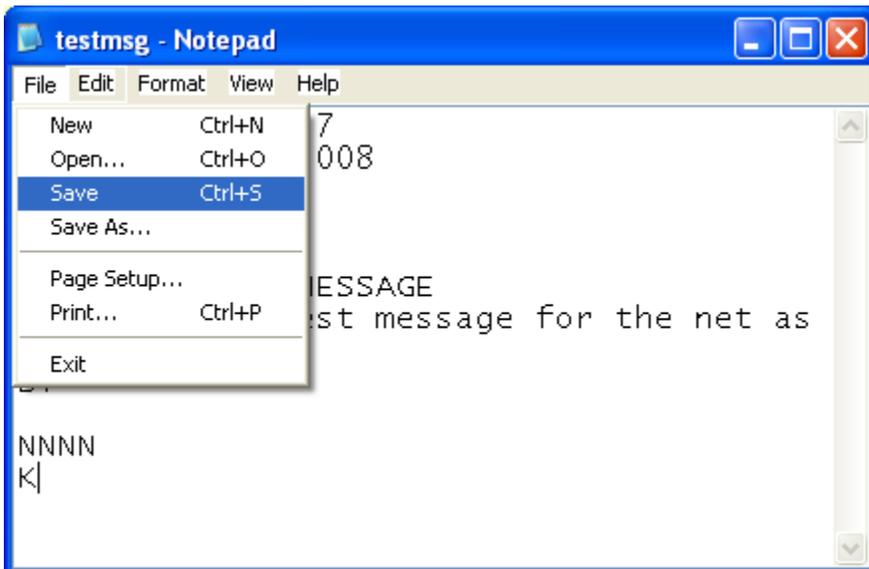
This action will result in the following window appearing:
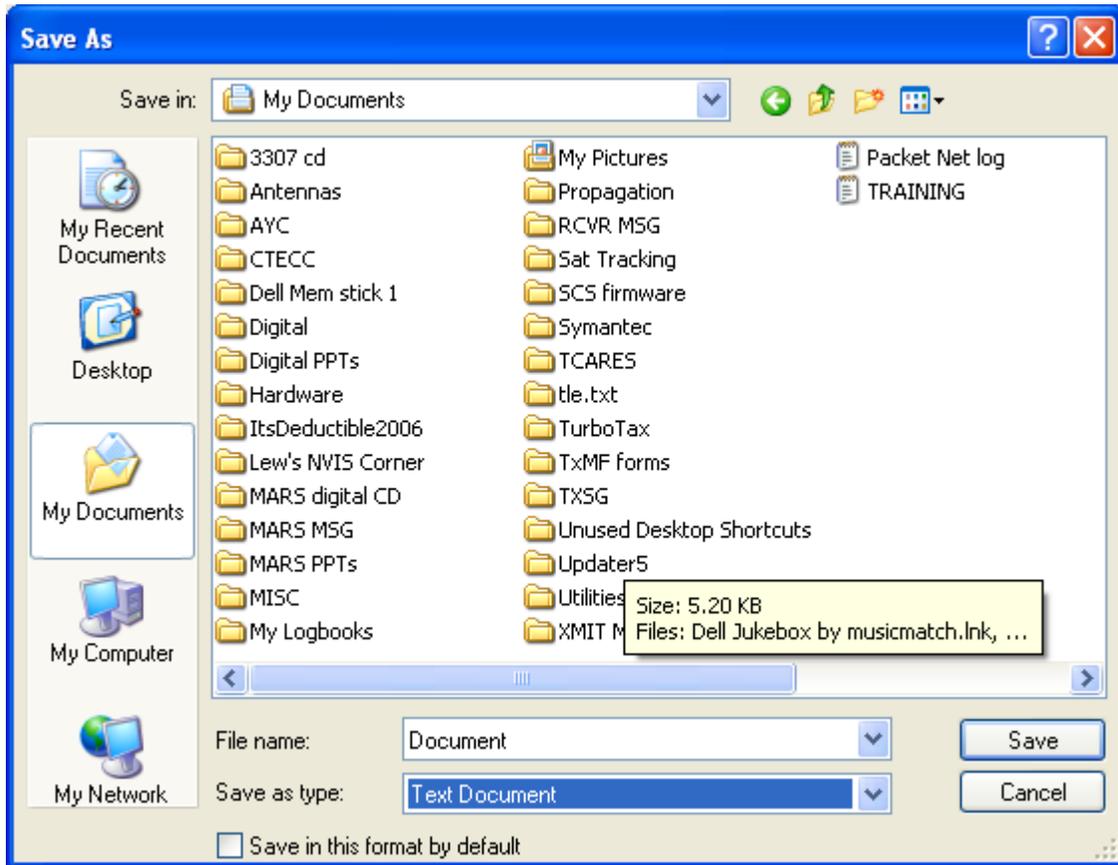
You have to now confirm/make three changes in this screen before clicking "*Save*" so that your document will be placed in the correct file, folder and have the correct name.

1. Double click on one of the two new folders you created, XMIT MSG or RCVR MSG. This will result in opening the folder you created, as shown below.
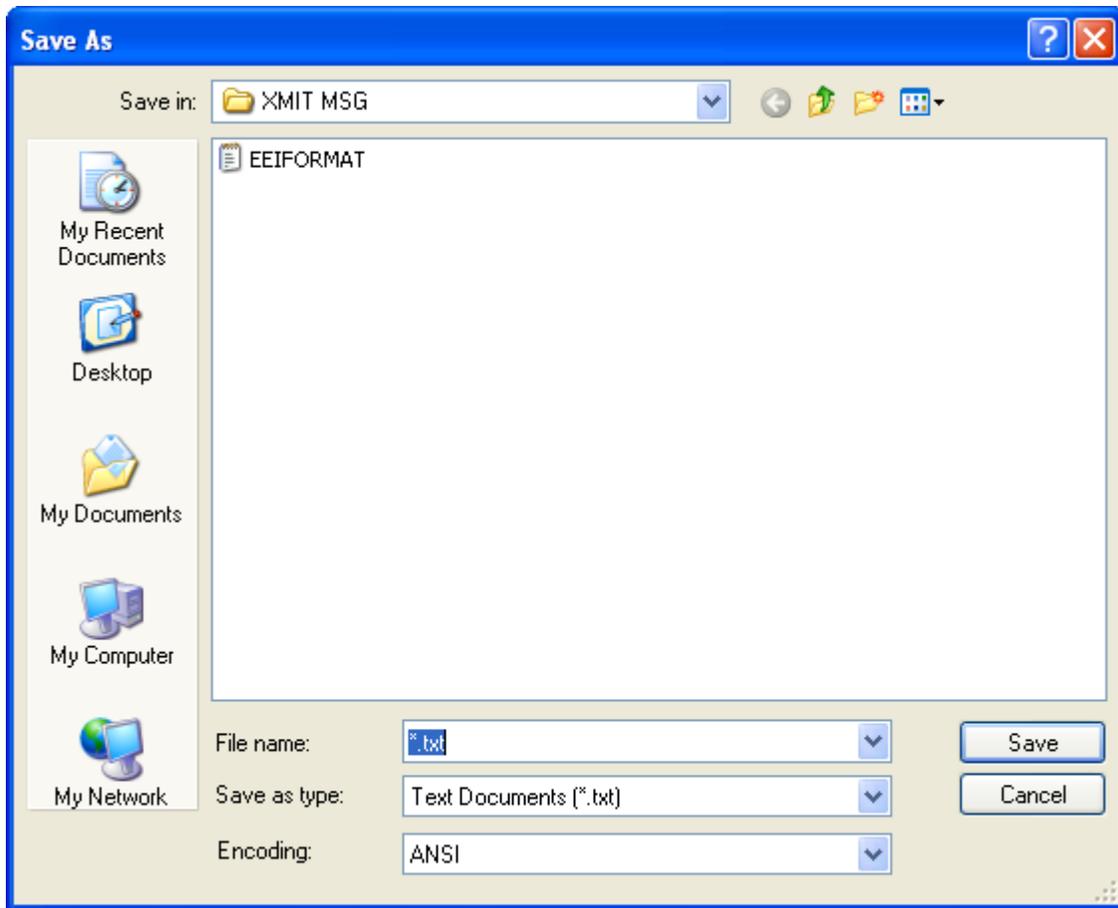
2. Fill in the File name and then click on "*Save*" to store this document in the XMIT MSG folder in My Documents File.

To retrieve this document, go to "*START/My Documents/XMIT MSG*" and then simply double click on the document and Windows will start Notepad and display the message. You can then modify/copy/paste to prepare the document for transmission. The XMIT MSG folder is a good place to build groups of "canned" documents to allow quick generation of MARS messages like EEI, AAR, etc.

APPENDIX 1

Tigertronics *SignaLink*™ USB

Description:
The Tigertronics SignaLink™ USB appears to be both cost effective and a good performing sound card interface. It has the following advantages:

1. External Sound Card
2. USB interface
3. External input and output level adjustments
4. No external power required (powered from USB interface)
5. Large variety of rig interface cables available for both ACC and microphone inputs (plug & play)
6. Simple computer and rig set up
7. Compatible with MixW
8. USB control technique allows Winlink Airmail program to run simultaneously
9. Cost - $99.95 with one interface cable (cheaper than most internal sound card interfaces!)

It has the following limitations when compared with the RigExpert Standard:

1. No rig control (CAT) feature for frequency control (AirMail).
2. No additional COM ports for FSK keying in RTTY mode.
3. Installation manual is confusing.
4. Internal jumpers must be installed to match SignaLink USB to cable and rig.

Set up:
The set up is divided into three steps as follows:

1. Install Internal Jumpers
   a. A CD is provided that contains a large variety of jumper settings. The CD should auto-load and to bring up jumper settings simply click on the installation manual link, then go to "Jumper setting and Radio Wiring Information".
   b. Note that there are two sets of wiring instructions, one for *mic input/speaker output* and the other the *accessories (ACC) port*. I would strongly recommend using the ACC port.   Please see Appendix 2 if you intend to operate both the SignaLink USB and a Pactor TNC

simultaneously as this may affect the cable choice and therefore the jumper settings.

    c. Install the jumpers following the wiring diagram and instructions on page 2 of the printed manual. If you intend to use the SignaLink USB for multiple rigs, purchase (from Tigertronics) 16 pin DIP headers. Different header can be wired for each transceiver interface. In addition, Tigertronics now offers pre-wired, *"plug & play"* jumper modules for many popular radios. See the Tigertronics web site for details.

2. Computer Connection – Carefully follow the instructions on pages 3-5. If your operating system is XP you do not need to install a software driver. Special instructions are available on the CD for Vista. You must install a driver from the CD if you are running Windows 98.   The computer set up is a little confusing in that Tigertronics first has you select your internal sound card for "system" sounds then select the external (USB Audio Codec) for your communications program (MixW) page 4, Transmit Audio Adjustment. If your jumpers are correct, but you cannot get PTT to activate, go back to page 4, Transmit Audio Adjustment, and verify that you have selected the "USB Audio Codec". Note that no COM ports are used in MixW2 so under the options menu in MixW, all com ports are (can be) disabled.

3. Transmit and Receive Level Adjustments – The Windows Playback volume control must be adjusted once as discussed on page 4 and 5. After that all levels are controlled by the external controls on the SignaLink USB box. I found it necessary to set the Wave control as well as the Speaker control to full volume when mixing the outputs of the SignaLink USB and the PTCIIex TNC. I get good performance with about 50% ALC, allowing almost full power operation. Please consult your rig's operating manual about transmit duty cycle capability.

4. From The Tigertronics Engineering Team:
Regarding your question about distortion and microphone "noise" while using the Signalink USB, we have heard of this issue before with a few IC-706 units. The problem is with the radio (not the SignaLink) and is caused by a lack of isolation between the radio's Mic and Accy jacks. Normally the ACCY Port is fully isolated from the mic jack and whatever you attach there will not affect the Mic audio. However, on some 706 radios, they seem to be lacking in isolation, and the ACCY Port loads down the Mic circuitry which results in weak Mic audio until you turn up the Mic gain. You can most likely resolve this issue by adding some isolation inside the SignaLink. This can easily be done by simply replacing the SignaLink's "Mic" jumper wire that you installed in JP1 with a standard 1/4 watt resistor (this will simply plug-in in place of the regular jumper wire). We suggest starting with a 2.7K value and go up from there until you find a value that adds enough isolation to let you keep the Mic gain control set normally (try 2.7K, 4.7K, 10K, 18K, etc. - standard value). Note that you need to use a 1/4 watt size resistor (nothing

larger or you'll damage the JP1 socket). Also, during digital operation you
may need to turn up the SignaLink's TX knob to offset the additional
attenuation from the resistor.

APPENDIX 2

SIMULTANEOUS OPERATION OF SOUND CARD AND TNC HARDWARE

Background
Typical MARS field operation now requires that an operator to be able to receive and transmit both MT-63, a sound card mode, and PACTOR, a TNC (Terminal Node Controller) mode. MT-63 is used for net message broadcasts (Alerts/SITREPS, etc.) while PACTOR is used to send traffic to a MARS Winlink Internet gateway station.

Several methods will be discussed that allow rapid movement between these two modes without having to swap connectors between the sound card interface and TNC. These techniques will be divided into "Multiple Rig Inputs" and "Signal Summing" methods. All examples shown have been tested, but only include three ICOM transceivers. As MARS members apply these techniques, this Appendix will be expanded to include other brands of transceivers.

Multiple Rig Inputs
Modern HF/VHF transceivers include one or more accessory connectors (ACC and Data), a microphone (with PTT) and a speaker output. Combinations of these ports can be used to provide two independent ports for external digital devices. A number of ICOM transceivers include both Accessory and Data ports. While the Data port on the IC-7000 and IC-746Pro were intended for VHF Packet operation, they both have the necessary (input/output/PTT) functions for HF operation also. A SignaLink USB functions exactly the same when plugged into either the ACC or the Data port for these two radios. Wiring details for a SignaLink USB/PTCIIex are shown in Figures 1 and 2. The cable part numbers shown are for Farallon (PTCIIex) and Tigertronics (SignaLink USB). A multiple input arrangement using a RigBlaster Plus and the PTCIIex is shown in Figure 3. Note that this solution uses the microphone and ACC1 inputs and include an ICOM CI-V converter for rig frequency control in Airmail.
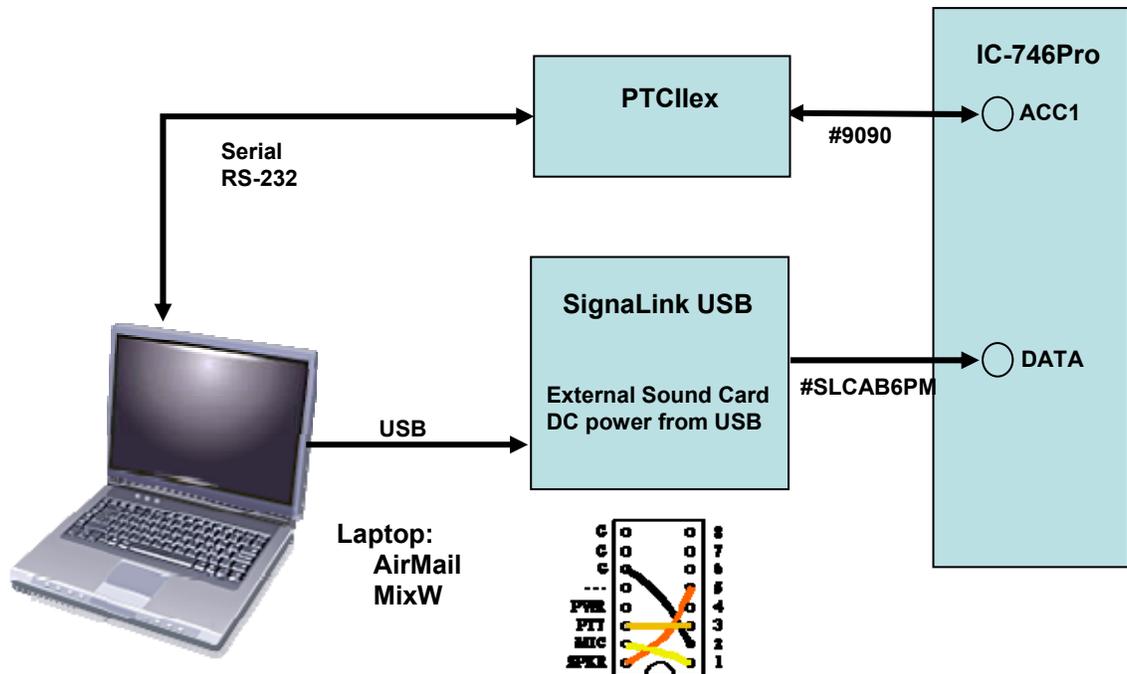
Figure 1: ICOM IC-746Pro Dual Digital Interface
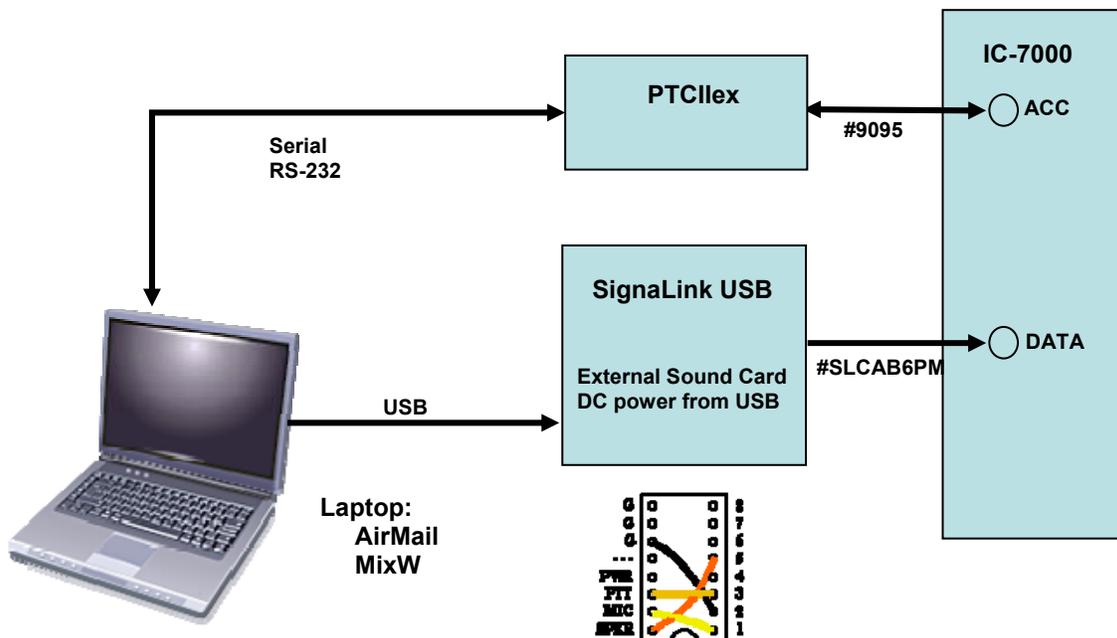
Figure 2: ICOM IC-7000 Dual Digital Interface
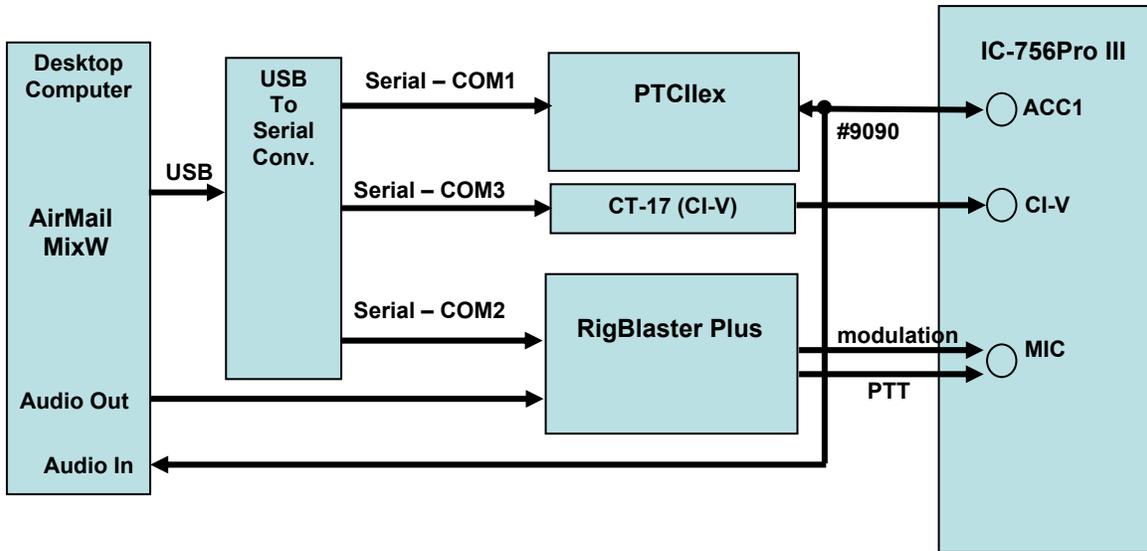
Figure 3: ICOM IC-756Pro III Dual Digital Interface

Signal Summing Technique

Both the sound card (internal or external) and the Pactor TNC all have the same inputs and outputs requirements as follows:

1. Audio input from the receiver
2. Modulation output to the transmitter
3. Push to talk (PTT) control

The audio output from the receiver can be shared between both devices (audio input). The PTT is typically a pull down, i.e., ground to transmit, type function that is effectively a logical "OR". Either device can pull the PTT line down without affecting the other device's PTT circuit. The modulation audio outputs of the two devices can be connected together without damage or malfunction because the two devices have protective resistors in series with their outputs to protect again short circuits. The output protective resistors and the input impedance of the transceiver constitute a resistive summing network as shown in Figure 4. The 200 ohm resistors represent the output impedance of the TNC and Sound Card device. The PTCIIex and PK-232MBX actually have a 200 ohm resistor in series with their outputs. The SignaLink USB has a provision to add such a resistor on the internal jumper socket. The 10 K ohm resistor is the input impedance of the accessory port on most modern HF transceivers. When one of the two input devices is not generating a signal, its output appears to be grounded, this generates a resistive voltage divider that causes an approximate 6 dB voltage drop at the modulation input. This drop in voltage must be made up by increasing the drive level from each device. The amount of current driven back into each device from the other is insufficient to cause electrical damage. This fact was verified with the manufacturers of both the RigExpert Standard and SignaLink USB. Further, no reduction in signal accuracy has been seem with the technique by verifying proper signal function with no increase in harmonics that would be produced by distortion of the modulation signal.
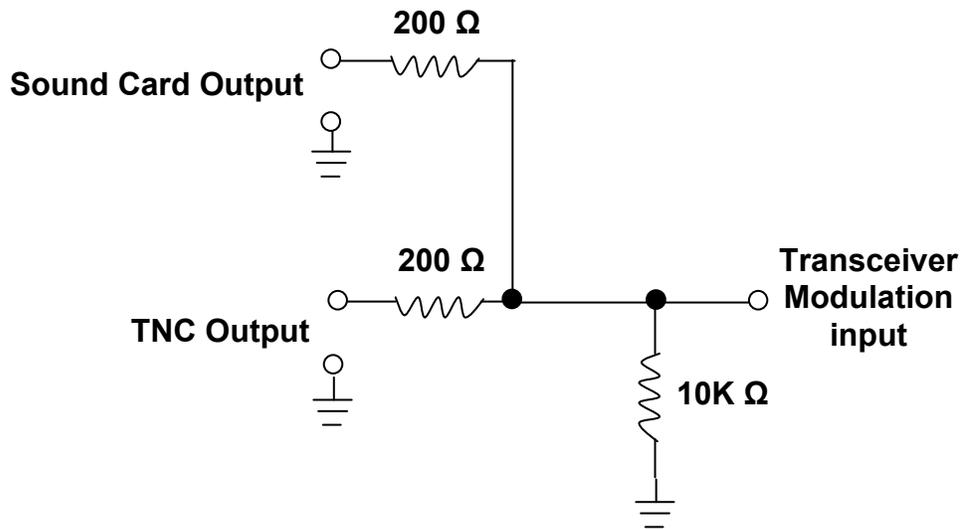
Figure 4: Resistive Summing network

To follow are details on two implementations of this technique: Figures 5 and 6 show the technique for the IC-756Pro series with a SignaLink USB. A 200 ohm resistor should be substituted for the "Mic" jumper wire.
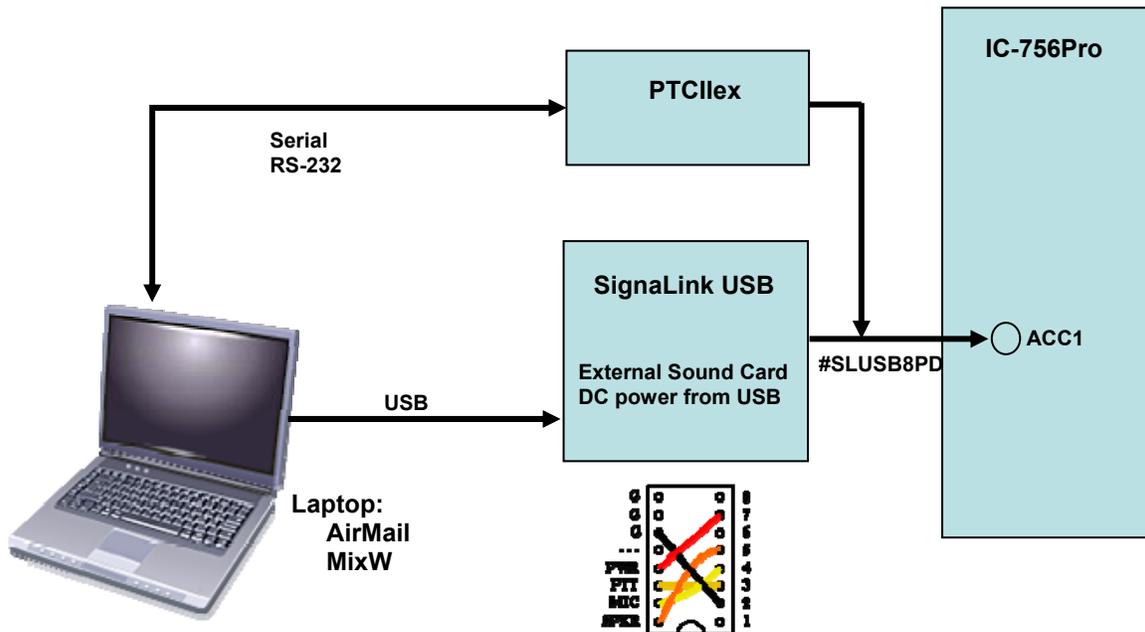
Figure 5: Summing Technique for IC-756Pro with SignaLink USB

Figure 6: Schematic Diagram for the IC-756Pro/SignaLink USB Cable

Figures 7 and 8 show the same summing technique for the very popular ICOM IC-706 series.

Figure 7: Summing Technique for IC-706 Series and SignaLink USB
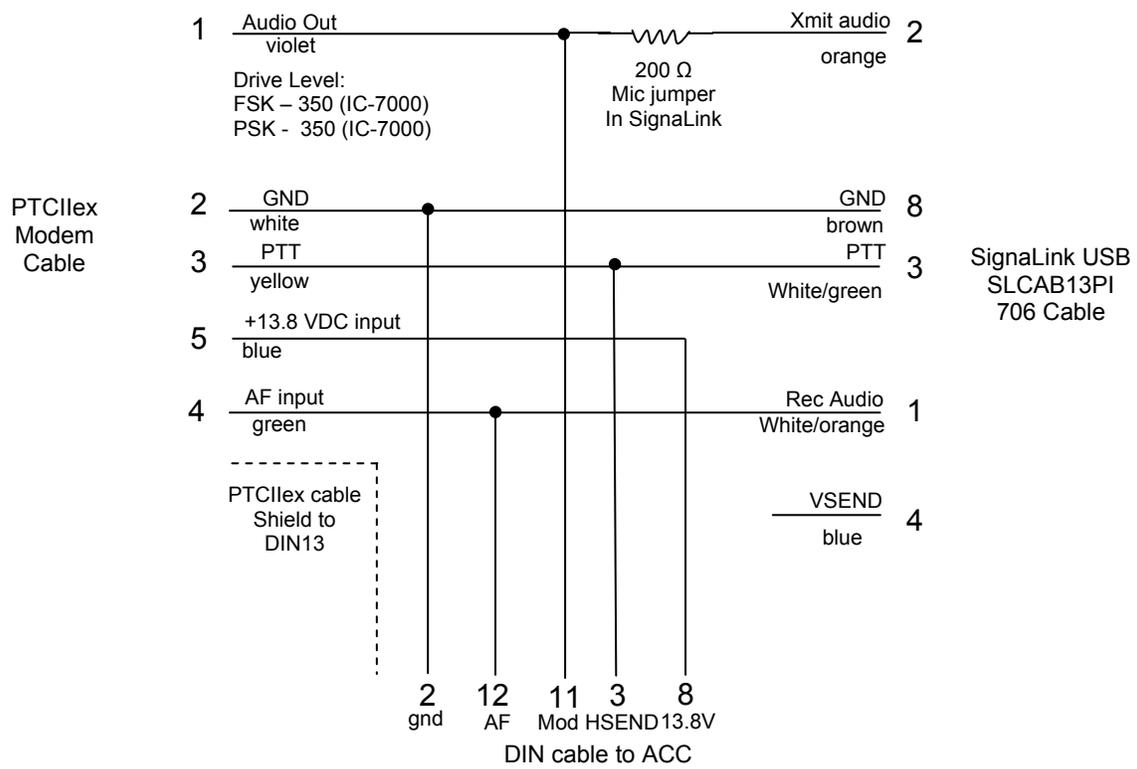
Figure 8: Schematic Diagram and Photo of IC-706/PTCIIex/SignaLink USB Cable

Figures 9 and 10 show the schematic diagrams for the summing cable for the IC-746Pro and IC-706/7000 for the RigExpert Standard.
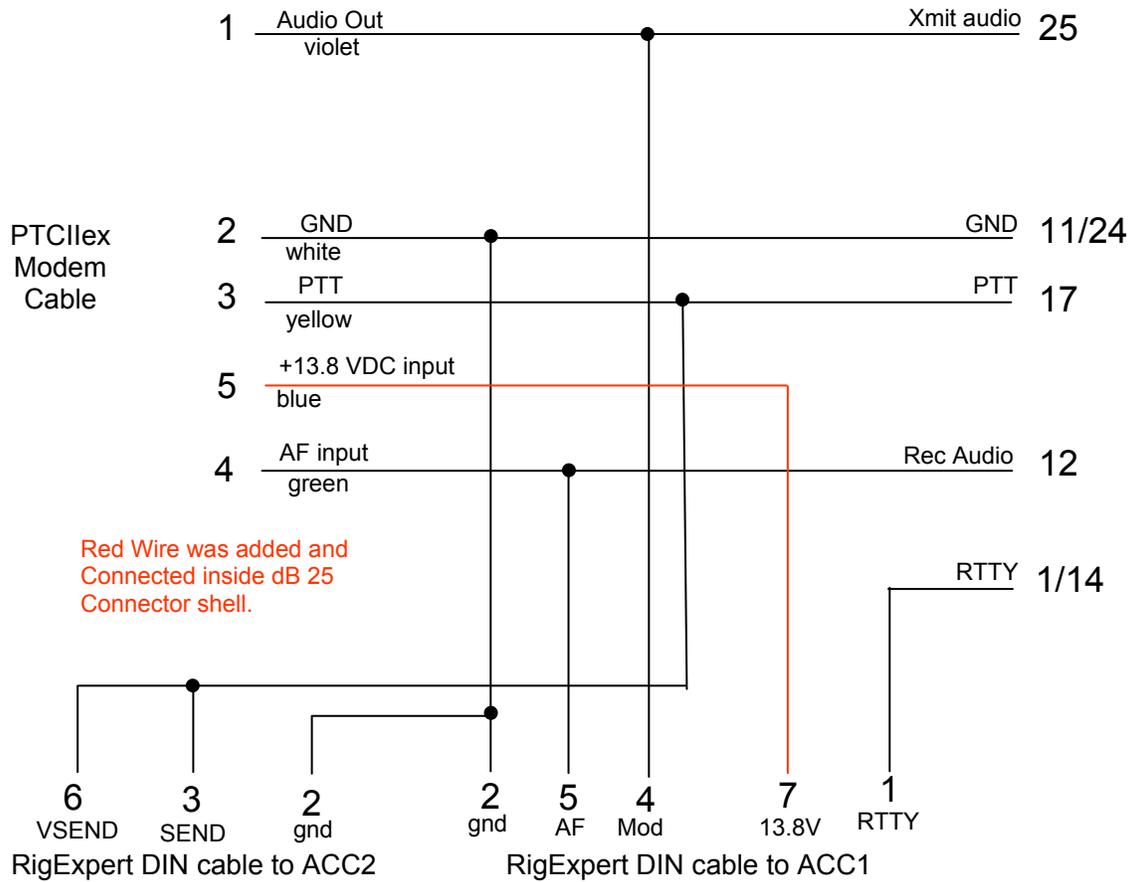
Figure 9: Schematic Diagram for the IC-746Pro/RigExpert Standard Cable

PTCIIex
Modem
Cable

1	Audio Out violet	Xmit audio	25
2	GND white	GND	11/24
3	PTT yellow	PTT	17
5	+13.8 VDC input blue		
4	AF input green	Rec Audio	12
		RTTY	1

RigExpert
Standard
7000 Cable
(DB25)

Red Wire was added and
Connected inside dB 25
Connector shell.

2   12   11   3,7   8   10
gnd   AF   Mod SEND   13.8V   RTTY

RigExpert DIN cable to IC-706 ACC
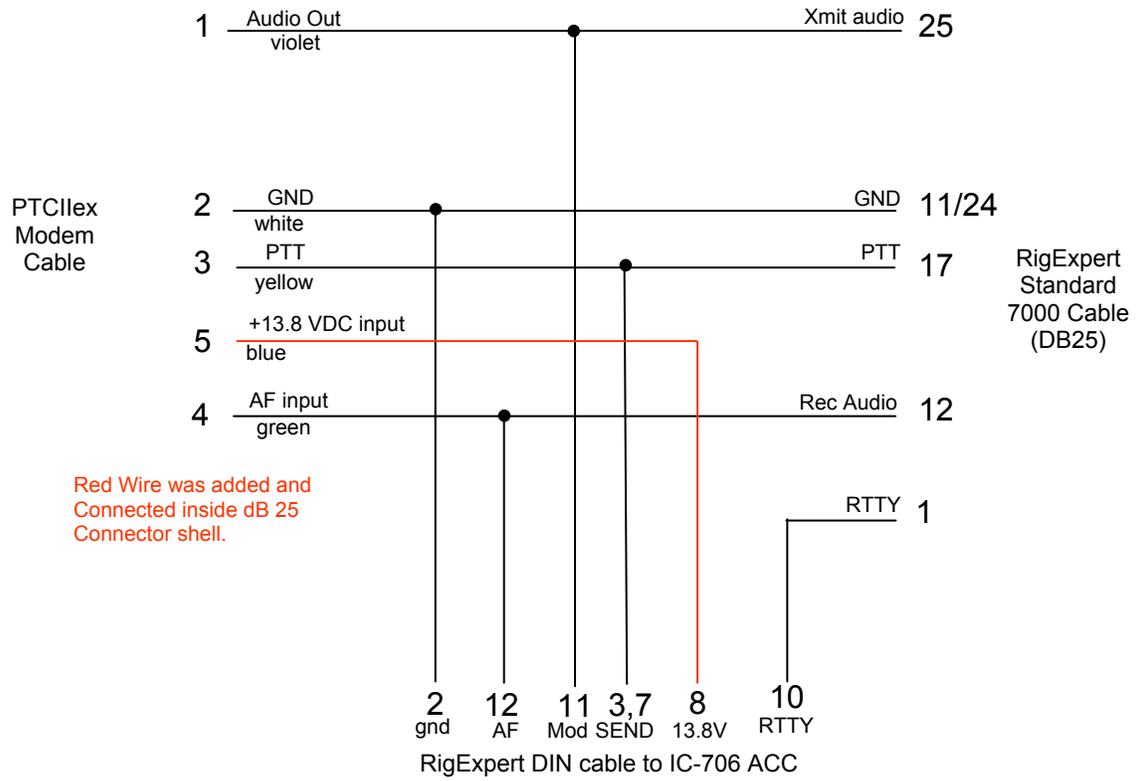
Figure 10: Schematic Diagram and Photo for IC-706/7000 to RigExpert Standard Cable

Software Operation

The multiple inputs and the summing technique allow both MixW and AirMail to be running simultaneously.   In the case of the SignaLink USB, since it used no COM ports, there is never a COM port conflict. In the case of the RigExpert Standard, since it uses two COM ports (PTT and CAT), care must be taken that the COM port for the Pactor TNC does not generate a port conflict.
A very powerful capability of the CAT control on the RigExpert Standard is for rig frequency control in the AirMail program. The CAT serial port number, used in MixW, is placed in the rig control screen of the AirMail Program:
Tools/Options/Connection/Radio Connection.   Check the box "Direct via COM port", put in the "Radio Type", Baud rate, and rig CIV address. If you intend to use the RigExpert Standard CAT port for rig frequency control in AirMail, then you must either disable the CAT port in MixW or not run both programs simultaneously.   I find little use for the CAT port in MixW, so I disable it, so that both programs can be running simultaneously.
The sensitivity of the ACC port on ICOM transceivers causes circuitry noise within the SCS PTCIIex to be transmitted during voice or sound card mode operations. The PTCIIex can be turned off via software control when exiting the AirMail Terminal program (leaving the main AirMail program running). When the AirMail Terminal program is started again, the PTCIIex is booted up. To implement this feature in AirMail, go to *Tools/Options/Connections/Advanced Settings* and Check the box "Power modem off when done".

Cable Construction Hints

The extreme input sensitivity of the accessory ports on some transceivers, can lead to RF pickup causing transceiver oscillation and distortion on the transmitted signal. Care should be taken to assure that all cable shields and connector shells are connected together and grounded to the transceiver and digital devices' chassis. I found several factory cables with the DIN shell not connected to the cable shield.   Correcting this factory error eliminated RF problems in one rig (IC-746Pro).

MixW has a very rich set of special commands, called macros, that can be activated using the functions keys on the MixW control panel. The macro editor for each button is accessed by right clicking on the specific button. You can change both the title of the button and its actions. For example:
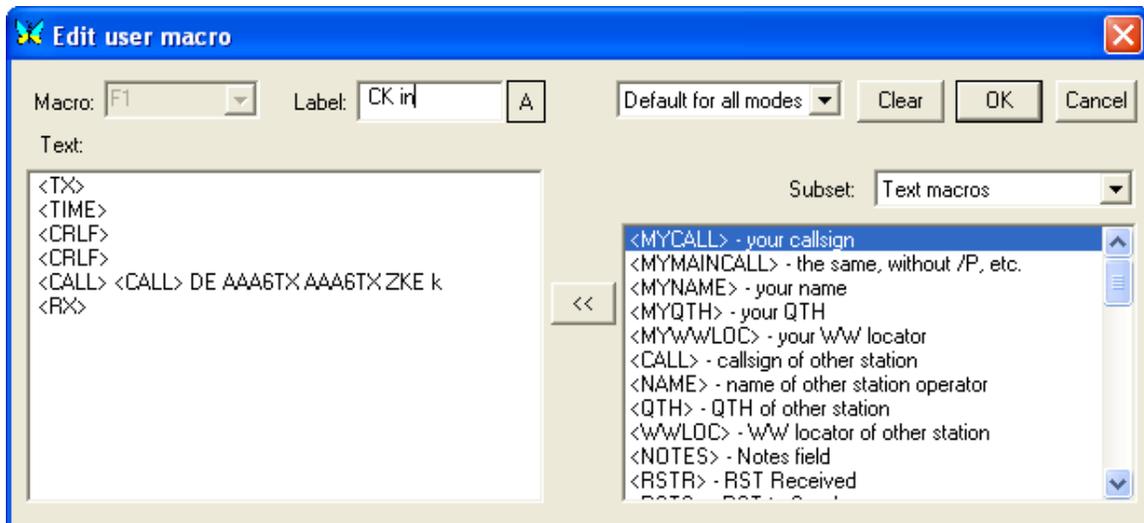
Button *F1*, titled CK in (Check In), does the following:
1. Puts the radio in the transmit mode (<TX>)
2. Sends the UTC time, (<TIME>) Note – now required by Army MARS
3. Sends a couple of carriage return/line feeds, (<CRLF>)
4. Sends the call sign of the station in the station buffer, <CALL>
5. Then transmits "*DE AAA6TX AAA6TX ZKE k*"
6. Finally, places the radio back in the receive mode <RX>
7. Note that <CALL> is either entered manually or by simply double clicking on the call sign in the receive buffer.

A list of the macros I use are shown below. I suggest that each member develop his own set of macros to facilitate digital operations. Note that even radio control commands such as mode and bandwidth changes can be sent as macros.
See: https://www.txarmymars.org/vault/ *Texas Procedures & Resources/TICP MARS Station Setup and Operation/Appendix 2 - Software*
This reference demonstrates how both the IC-7200 transceiver mode and filter bandwidth can be changed when the radio is placed in the sound card transmit mode.

Edit user macro

Macro: F2   Label: DE   [A]   Default for all modes ▼   [Clear] [OK] [Cancel]

Text:
```
<TX>
<TIME>
<CRLF>
<CRLF>
<CALL> DE AAA6TX. <CRLF>
```

[<<]

Subset: Text macros ▼

```
<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received
```

Edit user macro

Macro: F3   Label: CMTS   [A]   Default for all modes ▼   [Clear] [OK] [Cancel]

Text:
```
<TX>
<TIME>
<CRLF>
<CRLF>
<CALL> <CALL> DE AAA6TX INT CMTS, <NAME> k
<RX>
```

[<<]

Subset: Text macros ▼

```
<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received
```

Edit user macro

Macro: F4   Label: NCS1   [A]   Default for all modes ▼   [Clear] [OK] [Cancel]

Text:
```
<TX>
<TIME>
<CRLF>
<CRLF>
A6J, A6J DE AAA6TX AAA6TX
THE QUICK BROWN FOX JUMPED OVER THE LAZY
BROWN DOG'S  BACK.  1234567890
ZRF ZRC1
AR
<RX>
```

[<<]

Subset: Text macros ▼

```
<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received
```

Edit user macro (F5)

Macro: F5   Label: NCS2 [A]   Default for all modes ▼   [Clear] [OK] [Cancel]

Text:
```
<TX>
<TIME>
<CRLF>
<CRLF>
A6J INT ZKE AAA6TX AAA6TX K
<RX>
```

Subset: Text macros ▼

```
<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received
```

[<<]

Edit user macro (F6)

Macro: F6   Label: Not Hrd [A]   Default for all modes ▼   [Clear] [OK] [Cancel]

Text:
```
<TX>
<TIME>
<CRLF>
<CRLF>
DE AAA6TX ZGN AR
<RX>
```

Subset: Text macros ▼

```
<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received
```

[<<]

Edit user macro (F7)

Macro: F7   Label: CLOSE [A]   Default for all modes ▼   [Clear] [OK] [Cancel]

Text:
```
<TX>
<TIME>
<CRLF>
<CRLF>
A6J DE AAA6TX
ZKJ1
ZKJ2
AR
<RX>
```

Subset: Text macros ▼

```
<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received
```

[<<]

Edit user macro

Macro: F8   Label: Clear   [A]   Default for all modes ▾   [Clear] [OK] [Cancel]

Text:

```
<CLEARWINDOW>
```

Subset: Text macros ▾

<<

<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received

Edit user macro

Macro: F9   Label: TX   [A]   Default for all modes ▾   [Clear] [OK] [Cancel]

Text:

```
<TX>
```

Subset: Text macros ▾

<<

<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received

Edit user macro

Macro: F10   Label: RX   [A]   Default for all modes ▾   [Clear] [OK] [Cancel]

Text:

```
<RX>
```

Subset: Text macros ▾

<<

<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received

Edit user macro

Macro: F11   Label: TX-TIME   A   Default for all modes ▼   Clear   OK   Cancel

Text:

```
<TX>
<CRLF>
<CRLF>
<TIME>
<CRLF>
```

Subset: Text macros ▼

<<

```
<MYCALL> - your callsign
<MYMAINCALL> - the same, without /P, etc.
<MYNAME> - your name
<MYQTH> - your QTH
<MYWWLOC> - your WW locator
<CALL> - callsign of other station
<NAME> - name of other station operator
<QTH> - QTH of other station
<WWLOC> - WW locator of other station
<NOTES> - Notes field
<RSTR> - RST Received
```