# UZ7HO Soundcard Modem Setup Guide for UIView

**Applicable to Modem version:**

**v045b**

# Contents

## Features:

The UZ7HO's sound card modem currently has the following features:

1. 300, 600, 1200 or 2400 bps AX25 packet operation, configurable by port.
2. Supports internal Soundcards or external USB Soundcards
3. Runs under Windows 98, XP. Vista or Windows 7, without any need for installation.
4. Uses existing preinstalled device driver files for soundcards (except Win98 – as there are no native soundcard drivers included in Win98, you must install the relevant drivers for your soundcard).
5. Emulates SV2AGW packet engine, in TCP mode and can be used as a direct replacement.
6. Dual Channel operation, for unconnected nets.
7. Supports multiple decoder pairs  per channel (explanation later)
8. Supports Com port 1~10 or parallel ports 1~3 for PTT triggering
9. Supports combined or multiple PTT triggering.
10. Supports VOX (in the case of Signalink Modems)
11. Supports Single Channel Output (dual port Tx on Signalink Modems)
12. Supports Correction factors to accurately calibrate the soundcard for HF operation.
13. Menu config for basic settings
14. .ini file for extended options

## About Andrei

The "Soundcard modem" it's attempt to develop AX.25 modem devoid of shortcomings of previous software products. When I started to work in the Packet-Radio I had a choise between hardware and software products. At that time, I have tried lot of software TNCs, but each had its own flaw. I have started with software TNCs under Baycom modem, but almost all of them work under DOS. Now is 21st century, the DOS is obsolete, as the machines where it worked. The Windows give more opportunities, but and limits some operations also. Baycom modems, what works well under DOS is cannot run under Windows. But the sound devices can solve this problem, further, we can make excellent modem on DSP basis.

After deliberation, I have made preliminary action plan and targets. First, the modem should be compatible with the developed software, best way to use TCP/IP technology for it. George Rossopoulos (SV2AGW) has developed a great API interface, what lets to use a modem, even remotely. Next, modem must have an excellent sensitivity, since been developed for HF, specially was written own L2 protocol is compatible with the modern TNCs, that includes many adaptive functions, such as "Collector of the frames" etc. Since the modem is used on HF, I have provided additional filtering transmitting signal and reduce out of band splatters by narrow filter.

Stable core of the program was written in Delphi for about 2 months. Since of May 2010, thanks to Sergei and Yuri UT1HZM RA9SJI, we started the first experiments on HF, it allowed for me to more quickly find faults. It so happened at that time I couldn't to test all by himself, the guys really helped me. Since of spriong of 2011, I began first experiments by himself on the frequency of NET14 group, I periodically ran my APRS digipeater, by reviews of the members NET14 groups, it worked excellent. In fact, the modem develops and until that time...

I very much hope that this product will find its admirers. Now the Packet-Radio is in very poor condition due to the Internet and mobile communications. Perhaps, the new program will add new users, I want to believe it.

See you in the air!

Andrei, UZ7HO

## About the Application:

The software is still in beta and Andrei is churning out versions rapidly as it gets tweaked.
It is has become quite stable in the last few weeks as Andrei has got to the bottom of a few Vista and Win7 bugs.
The application provides dual channel operation and dual waterfalls, so different spot frequencies can be monitored for decoding.

## Installation

The application is provided as a zipped single executable, which when extracted and placed in a folder, can be run. It needs no "installation" and creates the soundmodem.ini file when the application is run for the first time. The soundmodem.ini file stores the operating parameters, to ensure the application restarts "as it was left". Any operational changes to the application are stored to the soundmodem.ini file on the fly.

## Operation

To launch the soundmodem, simply double click the soundmodem.exe application from within the working folder. For ease of use, you may create a Windows shortcut in the normal way and store it on your desktop or start menu.
The application can be configured to run in single or dual channel mode. Either channel or waterfall can be disabled if not required. Disabling unused channels or waterfalls will reduce CPU load.

### Multiple Decoders

By default, each channel isa configured to use  a single decoder, however, the number of decoders can be increased in pairs either side of the "standard" decoder (subject to CPU "horsepower", the more enabled, the more resources used).
This allows parallel decoding of "off frequency" transmissions either side of the centre spot frequency. The default step, at the moment, is 30Hz per decoder pair and it is possible to add up to 16 additional decoders per channel (8 either side of the centre decoder, giving approx ±270Hz decoding bandwidth per channel on Rx (Similar effect to the SCS tracker modems) of strong signals. The decoder pairs are enabled in multiples of 2, i.e. one pair either side of the centre pair.
*Note: Enabling more decoders than the CPU can handle will cause instability, this will exhibit itself as random locks of the s/w, and horizontal bars in the "quiet" areas of the waterfall*.
If parallel decoding is to be used, it is better to increase the number of decoders a step at a time, to ensure reliable operation.
DCD only works on the centre decoder pair..
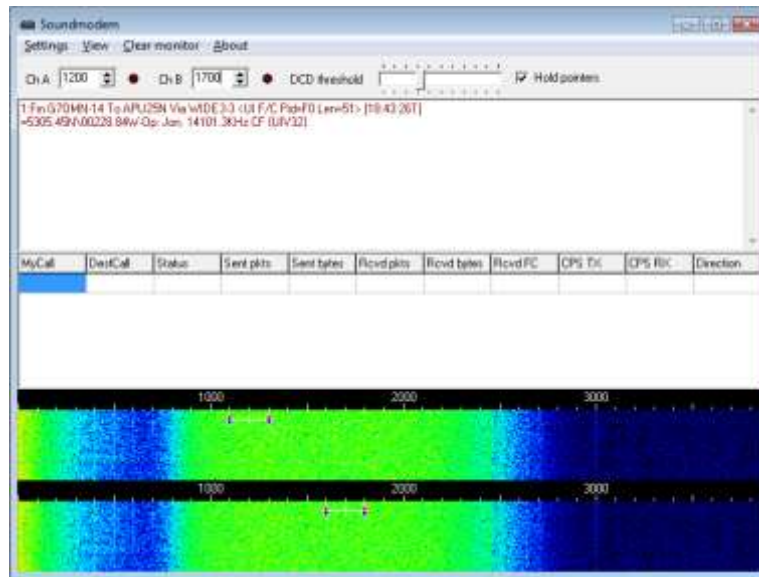
## Main Screen Layout



**Figure 1 The Main Screen**

In Figure 1 above, the window is split into 5 layers:

1. Menu Bar

   Provides access to configuration and settings

2. Decoder Status: Current decoder centre frequencies, DCD indicators, Hold Pointer (Decoder Frequency slider lock) and DCD threshold (It should not be necessary to adjust the DCD threshold).

3. Monitor Window

   Shows Tx packets and Decoded Rx frames. Each displayed frame is prefixed with the applicable port number

4. Status Window

   (This only works on connected nets)

5. Waterfalls

   Channel 1 at the top, Channel 2 below. (The window above shows packets received. The green/yellow area is the spectrum in use (I use a narrow packet filter on my TS2K, so hence the full spectrum is not shown). Data is shown as red.

Once run, the application creates a .ini in the same folder, which allows some tweaking of the settings. However, the basic default settings that are created will serve most people and the settings menu provides access to the general settings to configure the application.

## Configuration

## Menu Bar - Settings:

The Settings Menu provides access to the following:

1. Output volume* sets the Tx output (mic)level . As with any packet mode, adjust for minimum ALC deflection

2. Input Volume* Adjust for moderate density of monochrome waterfall. If using colour waterfalls, you should set for green with some yellow patterning in receive state and red when data is detected.
3. Devices
4. Modems

*These don't do anything if the sound card doesn't support them (as in the case of the Signalink USB, where levels are set by front panel potentiometers)

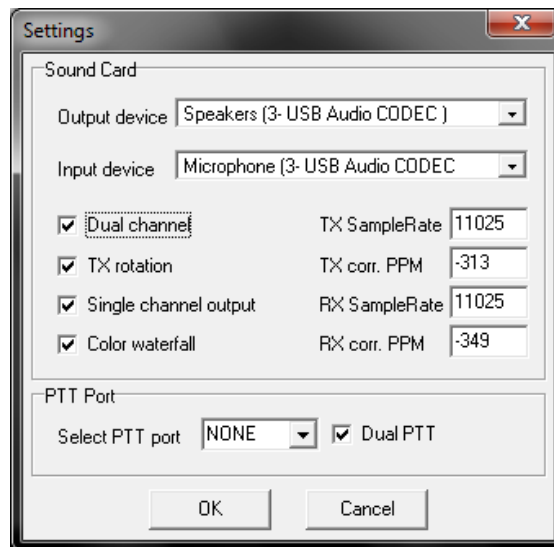## Device Menu

The Devices menu offers the following:

**Input/Output Devices** - Select the appropriate I/O device from the drop down list to use the relevant soundcard as a modem. In Windows Vista/7 these can be separate to the default sound card.

**Dual channel** - Select if two port operation is required.

**Sampling rates-** this sets the sampling rate of signals and these may be left at their defaults for 300, 600, 1200 and 2400 bps operation. If 11025 is not supported try 12000 instead. The sampling rates are limited to a range of 10KHz to 13KHz To ensure correct operation of the SCM. It is possible to amend these values to calibrated values for your soundcard. See _Soundcard Calibration_

**Tx Rotation** – this prohibits the sending of multiple transmissions on the same channel (i.e both ports transmitting together), and forces packets to be sent sequentially. This is mostly for older soundcards or when using Single Channel output. Enable this option when using **Single channel output.**

**Single channel output** – this is used when the souncard in use only supports mono output to the transceiver, it will force the transmitted audio for either port to use the left audio channel. Use this to enable full dual channel Tx with Signalink type modems.

**Color Waterfall** – check this box for a color waterfall display.

**PTT Port** – sets the serial or parallel port to be used for PTT switching.

If using serial ports, RTS is used for Channel 1, DTR is used for Channel 2

If using parallel ports, Pins 2 & 3 are used for Channel 1 and 8 & 9 are used for Channel 2.

If using a modem that supports VOX (e.g. Signalink USB), then this should be set to none to avoid any conflicts.

***Dual PTT*** – this option sets dual channel PTT operation from the COM or LPT port. Each port will operate its "TX pin" independently. This allows a full stereo soundcard to operate two different transceivers independently of each other. If you are using a single transceiver with a single PTT line, you can leave this box unchecked and sending data on either port will cause the transceiver to transmit. (A good example of this is using one HF transceiver to transmit/receive 300bps and 1200bps data within the same pass band)

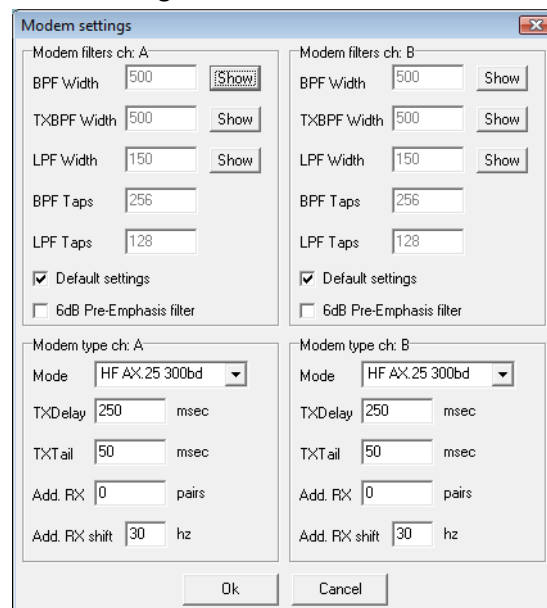## Modems Menu

The Modems Menu offers the following:



Figure 3 Modem Settings

Each modem can be configured individually and quickly from this window.

To change any feature from default, uncheck the box first.

Feature definitions are as follows :

I.   BPF Width*
     This sets the width of the receive Bandpass filter  in Hertz

II.  TXBPF Width*
     This sets the width of the transmit  Bandpass filter  in Hertz

III. LPF Width*
     This sets the post detector bit stream filter, (Always AFSK Baud rate/2).

IV.  BPF Taps
     Band Pass Filter quality – increase/decrease in steps  of 2. Increasing this will increase CPU load but improve Q of filter. If this is reduced, the BPF value should also be reduced.

V.   LPF Taps
     Post detector bit stream filter quality – increase/decrease steps of 2.  Increasing this will increase CPU load but improve Q of filter.

<ol type="I" start="6">
<li><p><em>VI.</em> 6dB Pre-Emphasis filter</p>
<p>This is a receive high pass filter that applies 6dB gain per octave to the high frequncies, to compensate for receivers that do not have a flat passband.</p></li>
<li><p><em>VII.</em> Modem Type</p>
<p>This sets the modem type (300bd, 600bd, 1200bd or 2400bd).</p></li>
<li><p><em>VIII.</em> TXDelay</p>
<p>Sets the length of the lead in tones before the main packet of data is sent, defaults should be ok, but can be fined tuned to allow for radios that have a longer or shorter delay in switching to Tx.</p></li>
<li><p><em>IX.</em> TXTail</p>
<p>Sets the hold time after the packet is sent before the radio switches back to receive. The default value for this should be ok.</p></li>
<li><p><em>X.</em> Add. Rx</p>
<p>Additional decoder pairs that are added either side of the initial decoder. 0 = No additional pairs. 1= 1 additional pair (3 decoders total). A maximum of 8 additional decoder pairs can be added bringing the total to 17 per channel. <strong><em>Use this with caution – as it is very processor intensive.</em></strong></p></li>
<li><p><em>XI.</em> Add. Rx Shift</p>
<p>This sets the shift from the adjacent "inner" decoder pair centre frequency for each additional decoder pair enabled and is configured per channel.</p></li>
<li><p><em>XII.</em> Show Buttons</p>
<p>These give an indication of the current width and Q of the filters. Note that you have to click "OK" to save changes you have made, close and reopen the modem window and then click "Show" before you can see any changes you have made.</p></li>
</ol>

\* These settings are automatically set to their optimal settings for the baud rate if the "defaults" box is checked

## Menu Bar – View:

This allows monitoring windows, status windows, status table and waterfalls to be toggled on or off. By default, all are on.

## Menu Bar – Clear Monitor

This clears the monitor window of received and transmitted data.

## About:

General "About" details – this shows the version number of the s/w



**Figure 4 The About Window**

## The soundmodem.ini file:

This is created when the application is run for the first time.

A sample ini file is below, with explanations in red.

ini file notes:

1   Set from Devices drop down window

2   Set in Modems drop down window

3   These items only appear *if* default boxes are unchecked and changes to the modem configurations have been saved.

4   Enabled or disabled in the View window

5   Amended in the main window

Note that some of the settings apply for "connected" communications, which for APRS (being an unconnected net) do not apply.

***N.B. If you need to amend any settings in the soundmodem.ini file, you must close the soundmodem application before editing the .ini file, as the application reads the file at start up only.***

## Sample .ini file:

| | |
|---|---|
| [Init] | |
| PTT=NONE | Selected PTT port[1] |
| DispMode=1 | Waterfall colour, 0= Mono, 1= Colour[1] |
| StatLog=1 | Enables a log file for connections. n/a for unconnected nets like APRS[1] |
| SndRXDevice=4 | ID of sound card used for Rx[1] |
| SndTXDevice=2 | ID of sound card used for Tx[1] |
| RXSampleRate=11025 | RX sample rate [1] |
| TXSampleRate=11025 | TX sample rate [1] |
| RX_corr_PPM=-349 | RX sample rate correction figure in Parts per Million [1] |
| TX_corr_PPM=-313 | TX sample rate correction figure in Parts per Million [1] |
| DisableUnit=0 | Used debug, disables various modules of the program. Leave @ 0 |
| TXRotate=0 | Prevents tones being Tx'd from both encoders at the same time. Set to 1 to enable serial transmission[1] |
| DualChan=1 | Single channel mode=0, Dual channel mode=1[1] |
| DualPTT=0 | Dual PTT 0=Disabled. 1= Enabled[1] |
| SCO=0 | Single Channel Output. 0=Disabled 1=Enabled[1] |
| TXBufNumber=16 | Buffers allocated to Tx 16~64 |
| RXBufNumber=16 | Buffers allocated to Rx 16~64 |
| UTCTime=0 | When set to 0 the monitor window shows local time, setting to 1 enables the display of UTC time. |
| NRMonitorLines=10 | Sets the number of lines in the receive window buffer, values are 10 to 65535. |
| [AX25_A] | ***(Modem 1, Standard AX25 settings, specific to the windows API – these generally should not need adjustment.)*** |
| Maxframe=3 | Max number of frames transmitted at once |
| Retries=15 | Maximum retries of frame sending |

| | |
|---|---|
| FrackTime=5 | Interval between retries (in seconds) |
| IdleTime=180 | Time (seconds) a link will remain idle before auto disconnect (Connected Net) |
| SlotTime=100 | Milliseconds, reset time for Persist timer. |
| Persist=64 | Tx Probability, A larger number will increase probability, assuming DCD doesn't detect a signal If a signal is present, the Modem waits slottime before restarting the persist timer. Values = 32~255. 64 is a good value for a digi |
| RespTime=2000 | Wait time for an ACK (Connected Net) |
| FrameCollector=2 | Received frames buffer, sets the number of received frames that are buffered to compensate for frames received out of sequence – due to QSB or QRM |
| ExcludeCallsigns= | Provides the option to filter out packets from specific callsigns and prevent them being passed to the host program, separate each callsign with a comma, excluded callsigns are displayed in GREEN in the monitor window.Use this option with caution to prevent upsetting other hams. *See Exclusion Syntax for use examples* |
| ExcludeAPRSFrmType= | Provides the option to filter out packets of specific frame types and prevent them being passed to the host program, enter corresponding ASCII codes separated by commas. Excluded frames are displayed in GREEN in the monitor window. *See APRS Data Type Identifiers Exclusion syntax sections for examples* |
| [AX25_B] | ***(Modem 2, Standard AX25 settings, specific to the windows API – these generally should not need adjustment.)*** |
| Maxframe=3 | Max number of frames transmitted at once |
| Retries=15 | Maximum retries of frame sending |
| FrackTime=5 | Interval between retries (in seconds) |
| IdleTime=180 | Time (seconds) a link will remain idle before auto disconnect (Connected Net) |
| SlotTime=100 | Milliseconds, reset time for Persist timer. |
| Persist=64 | Tx Probability, A larger number will increase probability, assuming DCD doesn't detect a signal If a signal is present, the Modem waits slottime before restarting the persist timer. Values = 32~255. 64 is a good value for a digi |
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ASCII codes separated by commas. Excluded frames are displayed in GREEN in the monitor window. *See APRS Data Type Identifiers Exclusion syntax sections for examples*

[Modem]

| | |
|---|---|
| Default1=0 | Modem 1 running in custom settings[2] |
| Default 2=1 | Modem 2 running in default settings[2] |
| DCDThreshold=32 | This should not need adjustment, (set on Main Screen Slider)[5] |
| HoldPnt=1 | Spot freq sliders, 0 = unlocked, 1= locked, set in main screen check box |
| RXFreq1=1200 | Channel 1 spot frequency (set by slider). Set at 1700 for KAM tones and use published dial frequencies. [5] |
| RXFreq2=1700 | Channel 2 spot frequency (set by slider) [5] |
| AFC=32 | AFC for bit generator – do not adjust |
| TxDelay1=250 | Set Modem 1 transmit lead in time in mS[2] |
| TxDelay2=250 | Set Modem 2 transmit lead in time in mS[2] |
| TxTail1=50 | Set Modem 1 transmit lead out time in mS[2] |
| TxTail2=50 | Set Modem 2 transmit lead out time in mS[2] |
| Diddles=0 | Default is 0. Do not adjust. |
| NRRcvrPairs1=0 | Sets the number of additional decoder s in use in Channel 1. 0=1 central decoder, 1=3 decoders (centre plus one either side of centre), 2 = 5 decoders, 3=7 decoders, 4=9 decoders upto 8=17 decoders. *__Use this setting with caution!__* [2] |
| NRRcvrPairs2=3 | As above, for Channel 2[2] |
| RcvrShift1=30 | Sets the shift from the adjacent "inner" decoder pair centre frequency for each additional decoder pair enabled for channel 1[2] |
| RcvrShift2=30 | Sets the shift from the adjacent "inner" decoder pair centre frequency for each additional decoder pair enabled for channel 2[2] |
| ModemType1=0 | Set Modem 1 Type. 0= 300Bd 1=1200bd[2] |
| ModemType2=0 | Set Modem 1 Type. 0= 300Bd 1=1200bd[2] |
| PreEmphasis1=0 | Modem 1: 0=Pre-emphasis disabled, 1=Pre-emphasis disabled[2] |
| PreEmphasis2=0 | Modem 2: 0=Pre-emphasis disabled, 1=Pre-emphasis disabled[2] |
| BPF1=500 | Modem 1 Rx Band Pass setting in Hz (set in Modems Menu)[2,3] |
| TXBPF1=450 | Modem 1 TX Band Pass Filter [2,3] |
| LPF1=150 | Modem 1 Post detector bit stream filter, AFSK Baud rate/2 [2,3] |
| BPFTap1=256 | Modem 1 Band Pass Filter quality – increase/decrease in steps of 2 [2,3] |
| LPFTap1=128 | Modem 1 Post detector bit stream filter quality – increase/decrease steps of 2. Increasing this will increase CPU load but improve Q of filter. [2,3] |
| BPF2=500 | Modem 2 Rx Band Pass setting in Hz [2,3] |
| TXBPF2=450 | Modem 2 TX Band Pass Filter [2,3] |
| LPF1=150 | Modem 2 Post detector bit stream filter, AFSK Baud rate/2 [2,3] |
| BPFTap2=256 | Modem 2 Band Pass Filter quality – increase/decrease in steps of 2 [2,3] |

| | |
|---|---|
| LPFTap2=128 | Modem 2 Post detector bit stream filter quality – increase/decrease steps of 2. Increasing this will increase CPU load but improve Q of filter. [2,3] |
| [AGWHost] | |
| Server=1 | Enables AGW host mode (0=disabled) |
| Port=8000 | TCP port used for the AGW server. |
| [Window] | |
| Top=404 | Vertical position of the top edge of the window |
| Left=225 | Horizontal position of the left edge of the window |
| Height=543 | Window Height |
| Width=668 | Window Width |
| Waterfall1=1 | Channel 1 waterfall, 1=enable, 0=disable[4] |
| Waterfall2=1 | Channel 2 waterfall, 1=enable, 0=disable[4] |
| StatTable=1 | Show stat table, 1=enable, 0=disable[4] |
| Monitor=1 | Show Monitor Window, 1=enable, 0=disable[4] |

## Interfacing Notes:

The Sound card modem supports Host or Kiss (The AGW API defines this as RAW) TCP connections. In RAW/KISS mode BPQ or UIView are easily supported and will support dual channel operation. Applications that use Host mode to connect to the Soundcard Modem will only be provided with a single channel.

The Soundcard Modem not does support the Direct Data Extension (DDE) mode used by Winpack.

## Using with UI-View.

Configuration is simple. Run the Soundcard modem on a PC connected to the appropriate soundcard and radio and configure the UIView comms set up as below.

### Configuring UIView Comms

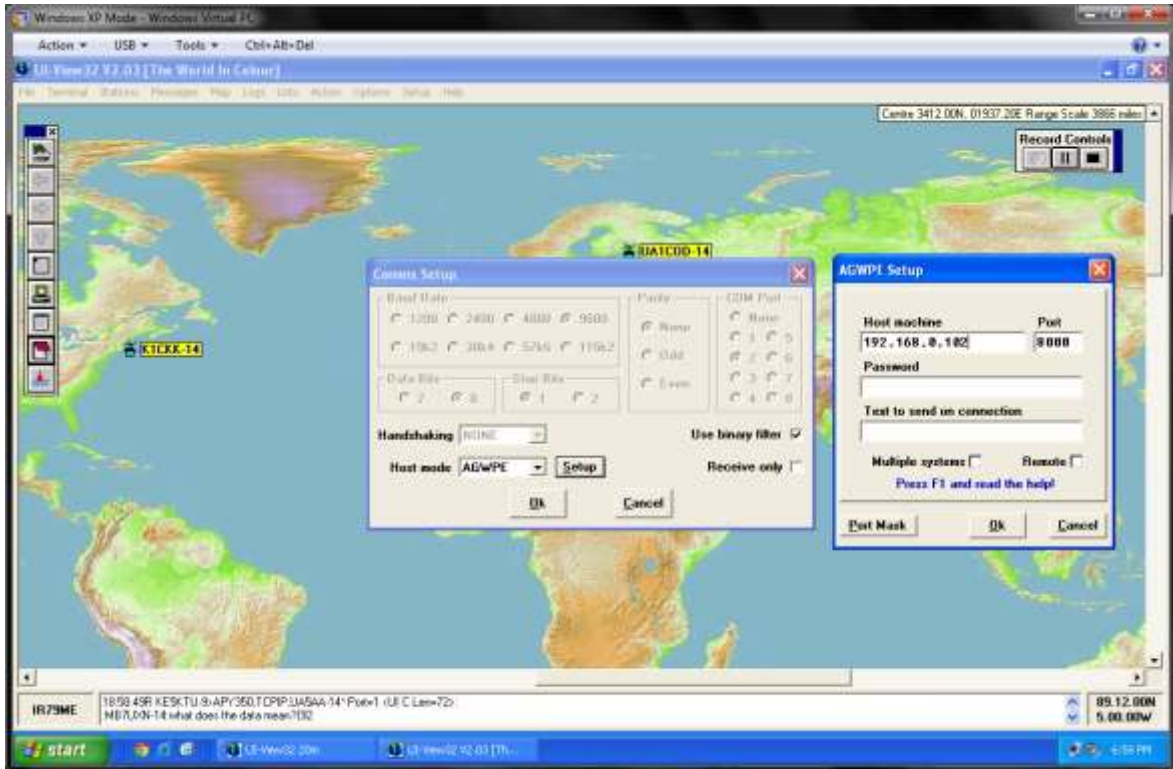Configure UIView Comms set up to use AGW Host mode:

Figure 5 UIView Comms Setup

If you are using the UZ7HO sound card modem in the same PC as you are running UIView, then the host machine should be set to "localhost", as I run UIView in a Virtual Machine on an Windows 7 host, UIView is directed to the IP address of the Host to pick up the SCM TCP traffic. No password is required. Ensure that the Port in UIView also matches the Port= setting in soundmodem.ini file, otherwise no traffic will flow.

## UIView Unproto Port settings
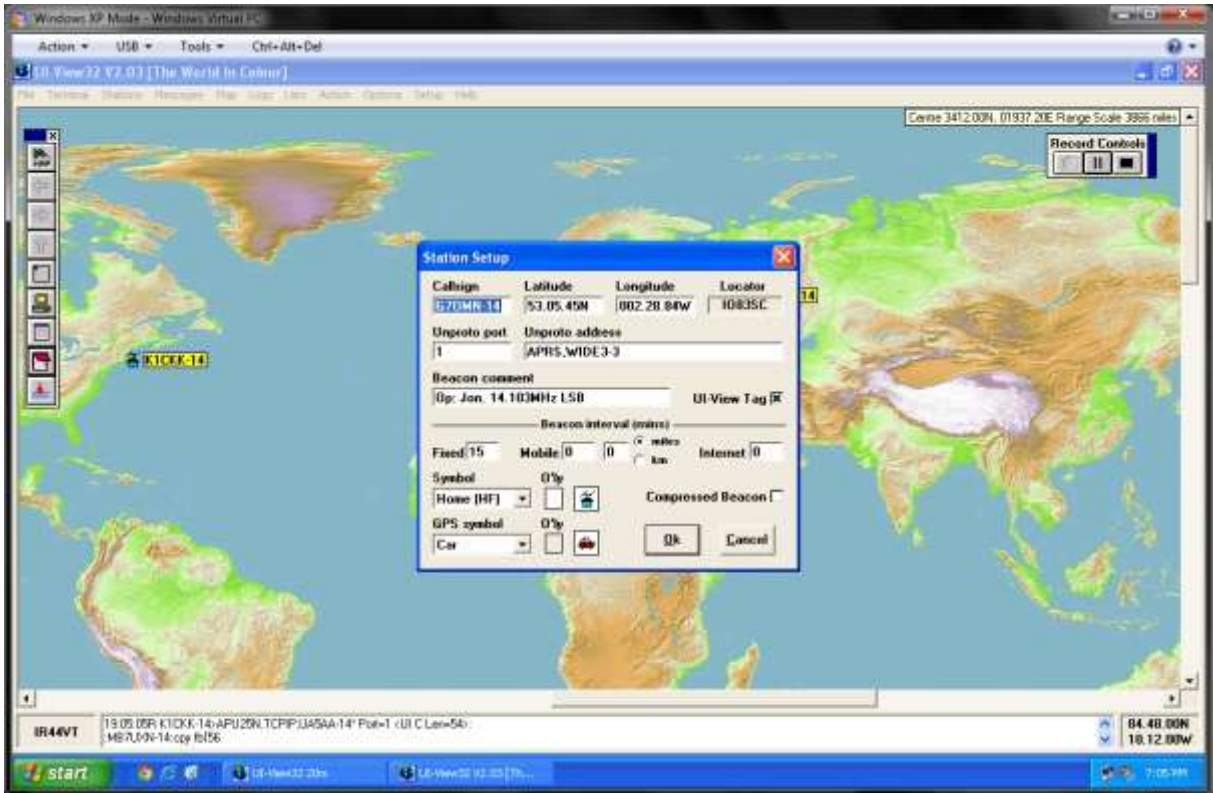Ensure that the correct Unproto port is set in UIView for transmission, Refer to Figure 6 below:

Figure 6 UIView Unproto Port Confiuration

UIView Unproto Port 1 = Channel 1 on the Soundcard Modem, UIView Unproto Port 2 = Channel 2 on the Soundcard Modem.

If you require beacons to go out on both ports, then you would enter 1,2 in the Unproto Port Box. However, if you choose to do this, and you are operating both ports on the same transceiver (and band) then it is advisable to increase the Beacon delay in UIVIew's Miscellaneous settings to avoid your Port 2 beacon packet colliding with a digipeated copy of your Port 1 beacon packet. A sensible recommendation for delay is around 10 seconds. See Figure 7 below.
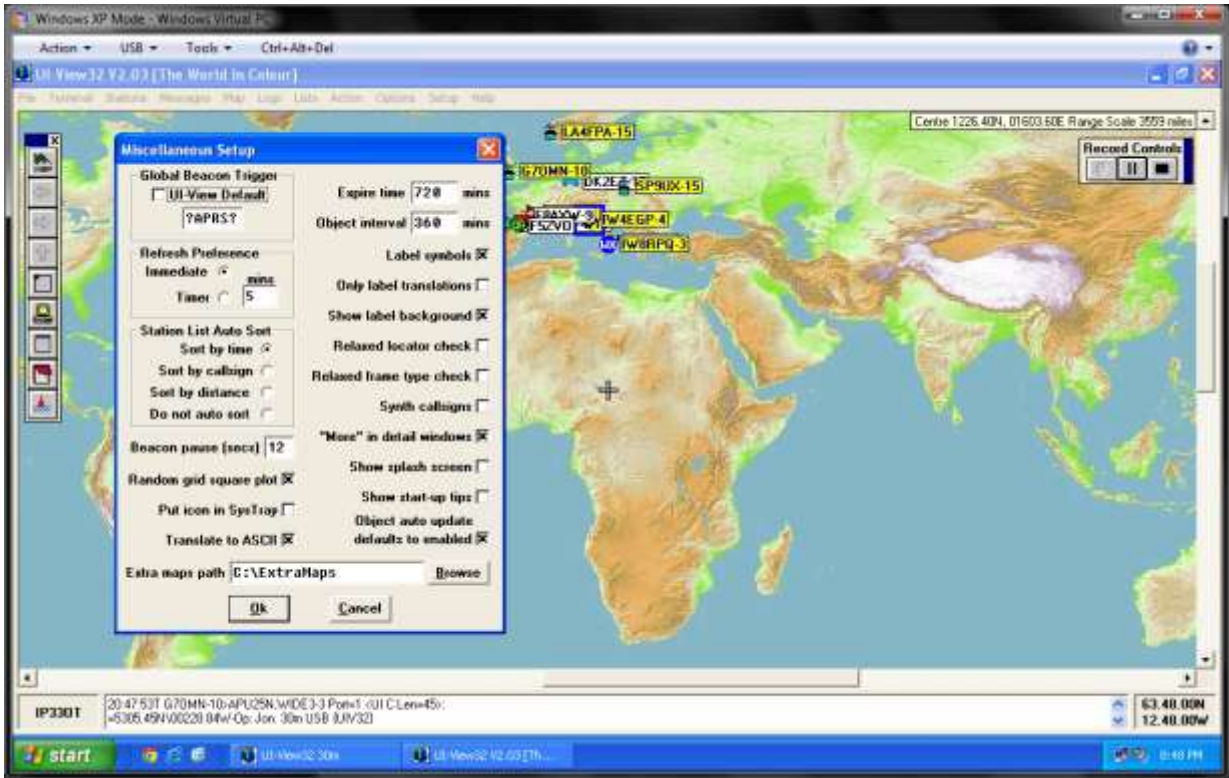
Figure 7 UIView Beacon Delay

*If in doubt, refer to the AGW help files within UIView, as this provides all the necessary set up information.*
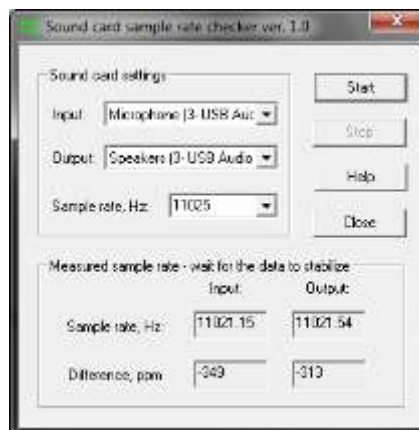
## Soundcard Calibration



Figure 8 CheckSR.exe Application

If you wish to calibrate your sound card, you can use the NBEMS/FLDIGI calibration utility, CheckSR.exe (above) which can be downloaded from:
http://www.pa-sitrep.com/NBEMS/fldigi_calibration.htm
Follow the instructions on the linked page to find the delta values in ppm.

Once the stable values are obtained, enter the "Input" value under the Rx corr. PPM box in the Settings Window, as shown in *Figure 2 The Settings Menu*. The "Output" value should be entered in the Tx corr. PPM box. Remember the "-" if you have a negative value.

## Appendix A - APRS Data Type Identifiers

| Ident | Data Type | Ascii Code | Ident | Data Type | Ascii Code |
|-------|-----------|------------|-------|-----------|------------|
| 0x1c | Current Mic-E Data (rev 0 beta) | n/a | < | Station Capabilities | 60 |
| 0x1d | Old Mic-E Data (rev 0 beta) | n/a | > | Status | 62 |
| ! | Position without timestamp (No APRS messaging), or Ultimeter 200 WX Station. | 33 | = | Position without timestamp (with APRS messaging) **Beacons** | 61 |
| " | [Unused] | 34 | ? | Query | 63 |
| # | Peet Bros U-II Weather Station | 35 | @ | Position with timestamp (with APRS | 64 |
| $ | Raw GPS data or Ultimeter 2000 | 36 | A-S | [Do not use] | 65-83 |
| % | Agrelo DFJn / MicroFinder | 37 | T | Telemetry data | 84 |
| & | [Reserved - Map Feature] | 38 | U-Z | [Do not use] | 85-90 |
| ' | Old Mic-E Data (but Current data for TM-D700) | 39 | [ | Maidenhead grid locator beacon (obsolete) | 91 |
| ( | [Unused] | 40 | \ | [Unused] | 92 |
| ) | Item | 41 | ] | [Unused] | 93 |
| * | Peet Bros U-II Weather Station | 42 | ^ | [Unused] | 94 |
| + | [Reserved - Shelter data with time] | 43 | _ | Weather Report (without position) | 95 |
| , | Invalid data or test dat | 44 | ` | Current Mic-E Data (not used in TM-D700) | 96 |
| - | [Unused] | 45 | a-z | [Do not use] | 97-122 |
| . | [Reserved - Space weather] | 46 | { | User-Defined APRS packet format | 123 |
| / | Position with time stamp (no APRS messaging) | 47 | \| | [Do not use, TNC stream switch character] | 124 |
| 0-9 | [Do not use] | 48-57 | } | Third-party traffic **IGated traffic** | 125 |
| : | Message | 58 | ~ | [Do not use, TNC stream switch character] | 126 |
| ; | Object | 59 | ~ | **Also used for UI-View messages** | 126 |

### Identifier Overview

The APRS Data Type Identifier is the first character in the second line of the transmitted frame. In the example below it is ":" indicating a message. So identify the character in the offending frame and use the table above to ascertain the ASCII code to be inserted in the filter. The green entries are added notes.

07:34:13T MB7UXN-14>APU25N,WIDE2-2 <UI C Len=33>:
:K1CKK-14 :This is a test msg{47

### Exclusion Syntax

**Exclude Callsigns:**
ExcludeCallsigns=TCPIP,IGATE,G9XYZ

**Exclude Frame Types:**

ExcludeAPRSFrmType=59,125

In this example, "Objects" and "I-Gated" traffic would be excluded from being passed to the Host Program

## List of Figures