Configuring the IC-7100 for Winlink Packet Using the UZ7HO SoundModem

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NOTE: The author accepts no responsibility for equipment misconfiguration or damage caused as a result of using this document. These procedures are not warranted and have not been formally tested.

The Icom IC-7100 transceiver is a very good choice for use with the Winlink Global Radio Email system. It covers all bands from 1.8-450 MHz (except 220 MHz) and its internal soundcard allows the use of most[1] currently-supported software modems without requiring an external audio interface. The IC-7100 only requires one USB cable for both computer control of the transceiver and interface to the internal soundcard.

Reliable packet radio operations using a software modem does require some effort to properly configure the transceiver and set transmit/receive audio levels. Properly done, however, the performance of the DSP-based packet softmodems is significantly better than most hardware Terminal Node Controllers (TNC). Currently-available softmodems for packet radio are mainly freeware, so they are much cheaper as well!

This instruction documents the process for configuring the IC-7100 to use Winlink Express and the UZ7HO SoundModem[2] on a Windows 10 computer for VHF/UHF Winlink packet radio. The Dire Wolf[3] softmodem can also be used for this purpose but I prefer the GUI interface and menu-driven configuration that the UZ7HO SoundModem provides. If you plan to use your IC-7100 for APRS or as a digipeater then Dire Wolf has additional features that make it a good choice.

The configuration process includes:

1. Adjusting IC-7100 menu settings for computer control and audio
2. Installing the IC-7100 USB driver and configure the USB audio device names and levels
3. Installing, configuring, and testing the UZ7HO SoundModem software
4. Installing, configuring, and testing Winlink Express

The procedures below draw on the work of several other experienced amateurs. I've referenced their valuable resources throughout this document.

[1] The IC-7100's internal soundcard is limited to a 2.7 kHz transmit audio bandwidth. As a result, it does not support high-speed modes such as 9600 baud FSK packet or VARA FM WIDE.
[2] The UZ7HO SoundModem software is hosted at http://uz7.ho.ua/packetradio.htm.
[3] Dire Wolf is hosted on GitHub at https://github.com/wb2osz/direwolf.

Adjust IC-7100 Menu Settings

Out of the box the IC-7100 default settings need to be adjusted for proper performance. KV5R (Harold) has already done the hard work of figuring out the best settings for softmodem use of the internal USB audio device. Anyone using the IC-7100 for soundcard modes should review his experiences and insights.[4]

1. Power on the IC-1700.
2. Press the "SET" button on the front panel to access the settings menus.
3. Use the up- and down-arrow buttons touch screen interface to scroll to settings page 3 of 4 (shown by a "3/4" in the upper-right corner of the screen.
4. Press the "Connectors" button on the screen.
5. Scroll to Connectors page 1/4
    a. Press "ACC/USB Output Select" to select **"AF"** if not already selected (press the semicircle arrow key in the lower-right corner to return to the previous screen)
    b. Set "ACC/USB AF Level" to **50%**
6. Scroll to Connectors page 2/4
    a. Set "USB MOD Level" to **20%**
    b. Set "DATA OFF MOD to **"MIC,ACC"**
7. Scroll to Connectors page ¾
    a. Set "DATA MOD" to **"USB"**
    b. Press the "CI-V" button
        i. Set "CI-V Baud Rate" to **"19200"**
        ii. Set "CI-V Transceive" to **"OFF"**

Install USB Driver and Configure Device Audio Levels

The USB driver for the IC-7100 must be installed before the USB cable is connected to your Windows 10 computer. If you have already connected the USB cable, then disconnect it and proceed with the installation.

1. Download the Icom USB driver from https://www.icomjapan.com/support/firmware_driver/2417/. You will need to scroll to the bottom of the page and check "Agree" to make the download link active.
2. Run the installer and accept any agreements, default settings, etc.
3. When prompted, connect the supplied USB cable between the IC-7100 and the computer and wait for the driver to finish installing.
4. When the USB driver completes the install process, open the Windows Device Manager
    a. From the Start... menu, select "Control Panel" then select "Device Manager"
    b. Alternatively, type "device manager" in the Taskbar search box and open the Device Manager application from the search results screen.
5. In the Device Manager window, scroll down to "Ports (COM & LPT)" and click on the caret (">") symbol to the left of the text to expand the contents of the Ports list.
6. You should see two entries labeled "Silicon Labs CP210x USB to UART Bridge (COM#)". Write down the number of the first of the two COM ports. For example, the installer created "COM3" and "COM4" on my computer in that order – COM3 is the one I need to use.

[4] "7100 Computer Interface: setting up USB audio levels on the Icom IC-7100", https://kv5r.com/ham-radio/2018-projects/7100-computer-interface/

7. In the Device Manager window, scroll down to "Sound, video and games controllers" and expand the contents of that list.
    a. Confirm that there is a "USB Audio CODEC" entry in the list.

The proper audio settings will depend to an extent on your computer's hardware configuration, the version of Windows 10 you are running, and whether your computer misidentifies the audio input on the Texas Instruments (TI) chip in the IC-7100 soundcard as a microphone instead of as a "Line In". To diagnose whether your computer has the "TI bug" follow the instructions on KV5R's webpage (see footnote) in the "Set Levels" section. These instructions will assume your computer doesn't have the bug. If it does have the bug, set the audio level in step 3 below according to KV5R's instructions.

1. Open the "Sound" dialog box
    a. Right-click on the sound device icon in the system tray (usually a speaker symbol) and select "Sound" from the pop-up menu.
2. Click on the "Playback" tab in the Sound window.
    a. Right-click on your computer's primary sound device and select "Use as default". This is necessary since windows will make the most recently installed sound device the default for all system and application sounds. This would result in alerts, audio/video soundtracks, etc. being played through the IC-7100 sound card.
    b. Right-click on the device named "Speaker (USB Audio Codec)" - this is the IC-7100 sound device – and select "Properties" from the pop-up menu.
    c. Select the "General" tab in the new window and type **"IC-7100 XMIT"** into the text box at the top of the General tab.
    d. Click on the "Change Icon" button and select the icon that looks like two "phono" plugs. This will help differentiate the IC-7100 sound device from your other sound cards.
    e. Click on the "Levels" tab, then right-click on the text box to the right of the slider bar. Select "db" from the pop-up menu.
    f. Adjust the slider bar so that the text box reads **"-24 dB"** (+/- 1dB).
    g. Select the "Enhancements" tab and check the box next to "Disable all enhancements".
    h. Select the "Advanced" tab and choose **"16-bit, 48000 Hz (DVD Quality)"** in the "Default Format" drop-down list.
    i. Select the "Spatial Sound" tab and choose **"Off"** (you may not have this tab.)
    j. Click "OK" to close the playback device window.
3. Click on the "Recording" tab in the Sound window.
    a. Right-click on your computer's primary sound device and select "Use as default". This is necessary since windows will make the most recently installed sound device the default for all system and application sounds. This would result in your computer trying to use the IC-7100 sound card as your computer microphone.
    b. Right-click on the device named "Microphone (USB Audio Codec)" - this is the IC-7100 sound device – and select "Properties" from the pop-up menu.
    c. Select the "General" tab in the new window and type **"IC-7100 RCVR"** into the text box at the top of the General tab.
    d. Click on the "Change Icon" button and select the icon that looks like two "phono" plugs. This will help differentiate the IC-7100 sound device from your other sound cards.
    e. Click on the "Levels" tab, then right-click on the text box to the right of the slider bar. Select "db" from the pop-up menu.

f. Adjust the slider bar so that the text box reads **"+2 dB"** (+/- 1dB). If the slider is near the center of the slider bar, you have confirmed that you don't have the TI bug.
g. Select the "Advanced" tab and choose **"1 channel, 16-bit, 48000 Hz (DVD Quality)"** in the "Default Format" drop-down list.
h. Click "OK" to close the playback device window.

4. Click "OK" in the Sounds dialog to close the window.

Install and Configure the UZ7HO SoundModem Software

The UZ7HO SoundModem software does not come bundled in an installer. Stephen Smith, WA8LMF, has kindly created an installer to automate the process of creating a folder and copying necessary files, creating Start menu and desktop shortcuts, etc. The installer also contains a copy of the user manual. You will need to download two additional files from UZ7HO's website.

1. Download the SoundModem installer from http://wa8lmf.net/miscinfo/UZ7HO-Soundmodem-Ver-1.05b.exe. Your browser may block the download since it's not signed with a certificate. If this happens use your browser's procedure to manually allow the download.
2. Run the installer. Windows may block it from running since it's not signed – manually allow the installer to run.
    a. When given the opportunity to select the folder for installation, the installer presents a default of "C:\UZ7HOsoundmodem". I usually shorten it to just **"C:\UZ7HO"** for simplicity – either one is fine. Make a note of this path for later use.
3. Download the following files from UZ7HO's website and place them into the folder created in step 2:
    a. http://uz7.ho.ua/modem_beta/ptt-dll.zip (allows SoundModem to control the IC-7100's PTT)
    b. http://uz7.ho.ua/apps/easyterm46.zip (provides a terminal interface to SoundModem)
4. Open the SoundModem application using the desktop shortcut or Start menu entry
5. Open the "Settings" menu and select "Devices"
    a. In the "Output device" drop-down list select **"IC-7100 XMIT (USB Audio CODEC)**"
    b. In the "Input device" drop-down list select **"IC-7100 RECV (USB Audio CODEC)"**
    c. Near the bottom of the Settings dialog in the "Select PTT port" drop-down list select "CAT"
    d. A dialog box will warn you that you need to configure additional settings for CAT control; select the option to open the "Advanced PTT settings".
    e. In the "CAT Settings" dialog box set or change the following values:
        i. Radio: **"IC7100"**
        ii. COM port: select the COM port you identified in step 7 of the "Install USB Driver..." instructions
        iii. Baudrate: **"19200"**
    f. Click "Apply" to close the CAT Settings dialog.
    g. Click "OK" to close the Device Settings dialog.
6. If everything has worked up to this point you should see scrolling white noise in the waterfall at the bottom of the SoundModem window. If the waterfall is black, try closing and restarting SoundMode m.
7. If the waterfall is showing received noise, open the "Settings" menu and select "Modems".
    a. Under "Modem type ch: A" on the lower left of the "Modem settings" dialog change the following settings:

i. Add. RX: **"5"** (adds multiple virtual modems to either side of the default audio frequency to help decode signals that are slightly off-frequency)
ii. Bits Recovery: **"Single"** (applies rudimentary error correction to decode a packet that has a single bit error)

b. Click "OK" to close the Modem settings dialog.

8. Using a separate receiver, set the proper the transmit audio level from the IC-7100 sound card. This is important to prevent clipping of the transmitted audio by the IC-7100 due to over-deviation of the signal, which leads to poor decoding of your signal by other stations.
    a. Select an empty frequency in the 2 meter band – somewhere between 144.900 - 145.100 MHz is likely clear. Set your IC-7100 to that frequency in "FM-D" mode (select FM mode then click on "DATA" in the touchscreen mode setting window.) Set your second receiver to the same frequency in FM mode.
    b. Open the "Sounds" dialog used in the "...Configure Device Audio Levels" step 2e and go to the "Levels" tab containing the slider bar control.
    c. Select the "Calibration" menu in Soundmodem
    d. In the "Calibration" dialog box under "Channel A" (left side) click the "High Tone" button. You should hear a 2200 Hz tone in the 2nd receiver.
    e. Move the slider bar control to the right until the volume of the tone in your second receiver does not get any louder as you move the slider.
    f. Move the slider bar back towards the left until the volume of the tone gets noticeably lower, then move the slider bar left again to reduce the volume noticeably below the level in step e.
    g. Click the "Stop TX" button and close the "Calibration" window by clicking on the "X" in the upper-right corner.

Install and Configure the Winlink Express Software

Follow the instructions on pages 7-13 of the document linked below to configure Winlink Express to use the IC-7100 sound card and SoundModem for Winlink Packet. The instructions are for the Signalink sound card interface but the Winlink Express configuration settings are the same.

https://winlink.org/sites/default/files/RMSE_FORMS/quick_setup_guide_for_packet_winlink_with_signalink_on_windows_v4.1.pdf