

Add ISS Packet Operation to Your Satellite Activity

(Use Equipment Already in Your Shack ... or Acquire it for Cheap)

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Abstract: This article is aimed toward introducing new Amateur Radio Satellite operators to ARISS packet operations using radio equipment that they may already own. This is intended to be a guide to repurposing their terrestrial equipment for a start on space activities using the strong and predictable downlink of the ISS.

Meeting STEM Goals Gets Amateur Radio Aboard the ISS

The Amateur Radio station aboard the International Space Station is known as the ARISS program – the Amateur Radio on the International Space Station. Many astronauts and cosmonauts have amateur radio licenses. Amateurs from the ISS partner countries, in the USA, Russia, Japan, Europe and Canada, have set up the ARISS program to foster amateur radio communications between the astronauts and cosmonauts who reside on the station and stations on the ground.

ARISS was the first amateur radio projects to gain access to the International Space Station as it helps NASA fulfill Science, Technology, Engineering, and Math (STEM) goals for education. ARISS is an international educational outreach program partnering the participating space agencies, NASA, Russian Space Agency, ESA, CNES, JAXA, and CSA, with the AMSAT, ARRL, and IARU organizations from participating countries.

ARISS offers an opportunity for students to experience the excitement of Amateur

Radio by talking directly with crewmembers on-board the International Space Station. Teachers, parents and communities see, first hand, how Amateur Radio and crew members on ISS can energize youngsters' interest in science, technology, and learning.

In the current launch environment Amateur Radio in space enthusiasts have discovered that has become nearly impossible to gain a free (or, even low-cost) launch opportunity simply so that a bunch of hams can talk with each other. We generally have to be ready to explain our added value to a launch to even get the ear of the people in charge. The ARISS amateur radio gear on the ISS provides added value in its STEM educational mission. The beneficial side effect for Amateur Radio operators is that the ARISS station remains available for general amateur radio usage when it is not engaged in educational contacts. Since the signal from the ISS is generally very strong this is where you can take advantage of trying your hand on the “easiest of the Easy Sats.”

Easiest of the “Easy Sats”

Where to Listen

Knowing where to listen and where to transmit are important first steps to getting started. The table below shows the most common ARISS Amateur Radio frequencies. There are a few additional “special modes” such as a 1269.500 MHz FM uplink that are rarely, if ever utilized. School contacts use the 145.800 MHz downlink with unpublished uplink frequencies used at the school site. The most commonly used ISS Amateur Radio frequencies are summarized in the table below.

Many hams spend a lot of time listening for ISS crew activity on the strong 145.800 MHz downlink. They often express disappointment that no FM voice activity had been heard for weeks. Crew activity depends a lot on their time available plus personal interest in making random contacts. Some prior crews made voice contacts frequently while use of the ARISS amateur radio gear is limited to school contacts for other crews.

Most Commonly Used ISS Amateur Radio Frequencies	
Mode V APRS (Worldwide APRS Digipeater)	
Uplink	145.8250 MHz FM 1200 BPS
Downlink	145.8250 MHz FM 1200 BPS
Mode U APRS (Worldwide APRS Digipeater)	
Uplink	437.5500 MHz FM 1200 BPS
Downlink	437.5500 MHz FM 1200 BPS
Mode V/V Crew Contact (Regions 2 & 3)	
Uplink	144.4900 MHz FM
Downlink	145.8000 MHz FM
Mode V/V Crew Contact (Region 1)	
Uplink	145.2000 MHz FM
Downlink	145.8000 MHz FM
Mode U/V (B) FM Voice Repeater (Worldwide)	
Uplink	437.8000 MHz FM
Downlink	145.8000 MHz FM
Mode V SSTV Imaging	
Downlink	145.8000 MHz FM

Packet is Where Its At (most often it seems)

Packet activity from the ISS is often noted on the **145.825 MHz** downlink. The uplink is on the same **145.825 MHz** frequency. Since the crew rarely engages in keyboard

contacts, most of the packet activity you are hearing is originated from earth stations using the ARISS digipeater. Lacking packet gear you will only hear the brzzzz-brap

sound of the 1200 baud audio frequency shift keyed (AFSK) signal.

You will need to know when the ISS is within range of your station. Refer to the appendix **Know When to Listen – Tracking Resources**.

Getting on the air with the ARISS packet digipeater can likely be accomplished with amateur radio gear you already own. No special amateur radio equipment beyond what is used for terrestrial contacts is needed to begin taking your first steps

toward Amateur Radio in space. This means if you do not own certain items they can likely be acquired inexpensively. Think of ARISS packet radio as regular ham radio (including packet) aimed skyward.

The good news is once you have equipped your station for ARISS packet and learned the ropes for ARISS operation your station will be ready for those rare voice contacts with the ISS crew. You will just need to switch the packet gear for a microphone and start calling.

Get Your Station Going on 145.825 MHz Packet

When packet radio was popular on VHF/UHF many years ago you may have acquired your Terminal Node Controller (TNC) which you interfaced to your FM radio. There were many packet bulletin board systems and personal packet mailboxes that were accessible via your TNC. That activity has diminished over time, having been replaced by the internet. You may have a TNC sitting on the shelf collecting dust. This same “old” hardware, capable of operating 1200 baud AX.25 AFSK modulation is still useful for packet radio operation via the ISS. There were many models of the AX.25 TNC including:

- MFJ-1270C TNC-2 Packet Controller
- Kantronics KPC-3 TNC

If you don't a TNC that you used in the “old days”, these can often be purchased rather inexpensively at a hamfest. When you see a

good deal, grab it if you prefer the hardware approach to packet operation.

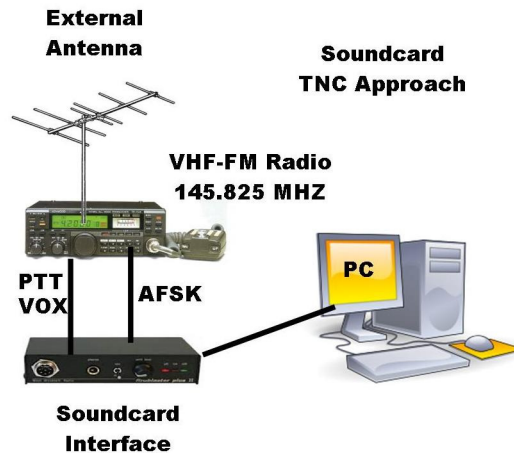
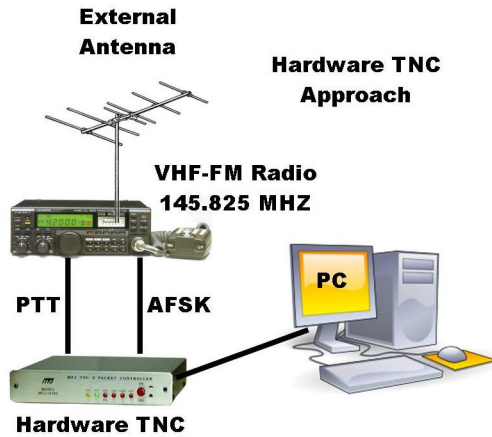
In the years since the peak of the hardware TNC based activity software for sending and receiving the AFSK packet signal has been created for the sound card in your personal computer. Your computer will perform the functions previously provided by a TNC hardware box.

In addition to the soundcard software you will need to install a soundcard interface between your radio and your computer to adapt the signal levels to be compatible with the digital signal processing done by the soundcard. You have a few options to this approach also.

- Build a soundcard interface from plans found on the internet.

- Rigblaster by West Mountain Radio \$100-\$300
(www.westmountainradio.com)
- Donner Digital Interfaces \$40-\$100
(www.donnerstore.org)

Whether you choose the hardware TNC or the software/soundcard TNC approach depends on what gear you have on-hand.



Overview of the Hardware TNC Approach

A hardware TNC requires a cable between it and your personal computer's RS-232 port. Many of the TNCs are sold with a cable that performs this function. Others come with a wiring diagram showing you which pins you need to connect. Additionally a cable is required between the TNC and your radio. If you previously had your TNC interfaced to your radio for terrestrial packet operation the connections remain the same for ISS packet operation. The personal computer needs to run a terminal emulator program so you can control the TNC, initiate messages, display received messages.

Overview of the Soundcard TNC Approach

The connection between your PC, the soundcard, and the soundcard interface consists of three separate connections in reality.

- You need to route the soundcard's LINE OUT connection to the interface. This will go to your TRANSMIT audio connection on the radio.
- You need to route the audio output from your receiver to the interface's received audio to the LINE IN connection on your soundcard.
- The serial port is used for push-to-talk rig control. Some stations have had success with using the VOX on the radio to key the rig during transmit. This is dependent on the type of radio you own (if this is available). Setting the sound drive levels may require careful adjustment so the radio reliably switches to transmit.

External Antenna is Recommended

The downlink signal from the ISS is very strong but you will not have much luck

trying to get your packets through the digipeater with an indoor antenna or with the flexible antenna on your HT. The good news is that your external antenna does not require full OSCAR-class tracking and control. Many enjoy success with a VHF vertical

antenna on the roof of the house. A small beam need not be complex. A 3-element VHF beam at a fixed elevation of 15-20 degrees on a small TV rotor is all that is necessary.

Overview of Operating Through ISS Using the TNC

Much of terrestrial packet operation consists of you requesting a CONNECTION to another station. Packet communication via ISS almost exclusively relies on using **CONNECTIONLESS** operation. The AX.25 protocol defines these types of packets as **UI packets**. An UI packet is pretty much transmitted out there for anyone and everyone to receive and copy. When stations transmit UI packets the AX.25 protocol will not be waiting for all of the handshake messages to complete – this very much simplifies the message exchanges. There are a few parameters in the TNC that make UI operation an easy mode to operate.

Every AX.25 packet that you transmit consists of two main parts: The Packet Header & Message Text. The Header contains your callsign which you set with the MYCALL command. Other packet stations will "know" it is a UI packet - a packet for everyone - based upon what you set in the UNPROTO command.

The most basic, barebones UNPROTO needed for ISS packet is simply set **UNPROTO CQ VIA ARISS**. You can add additional routing later as you become more familiar with packet operations. This

is all you need for your packet to get into space and be digipeated back to earth.

Assuming I have my UNPROTO defined as above, now all I need to do to transmit an UI packet from my station is to enter a short text message via the keyboard and terminal program on the PC. This requires the use of the TNC's **CONVERS** command as outlined here:

- Set UNPROTO CQ VIA ARISS.
- Enter CONVERS mode from the cmd: prompt on your TNC screen.
- Enter a short message such as *Greetings from JoAnne via the space station* and hit <enter>.
- You should see your TNC key your rig and send the message.

While you are in CONVERS mode all input from your keyboard is transmitted every time you hit the <enter> key. To exit the CONVERS mode at the end of a pass use Control-C (usually) to get back to the TNC **cmd:** prompt.

When the TNC-2 hardware is in a connection with a specific station node or in the CONVERSE mode it generally does not dis-

play all packets. Refer to the TNC command summary table for details, but setting MONITOR ON, MALL ON, MCON ON will

allow you to see all of what is going on the channel. Refer to the TNC-2 command table for details.

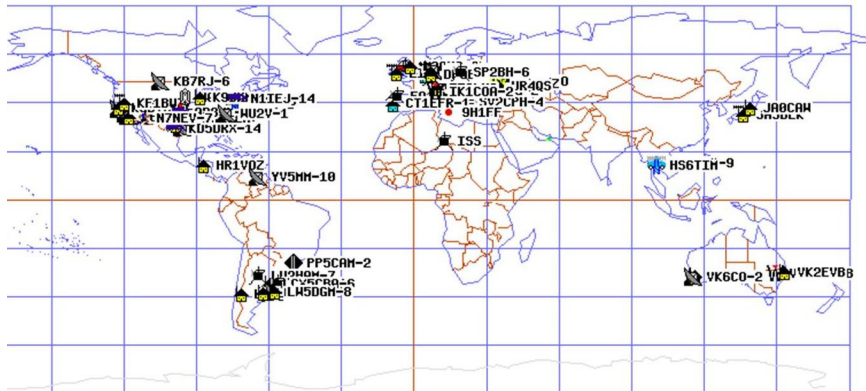
On The Air Example Using the TNC

The latest real-time ARISS packet activity is usually displayed on this web page:
<http://www.ariss.net/>

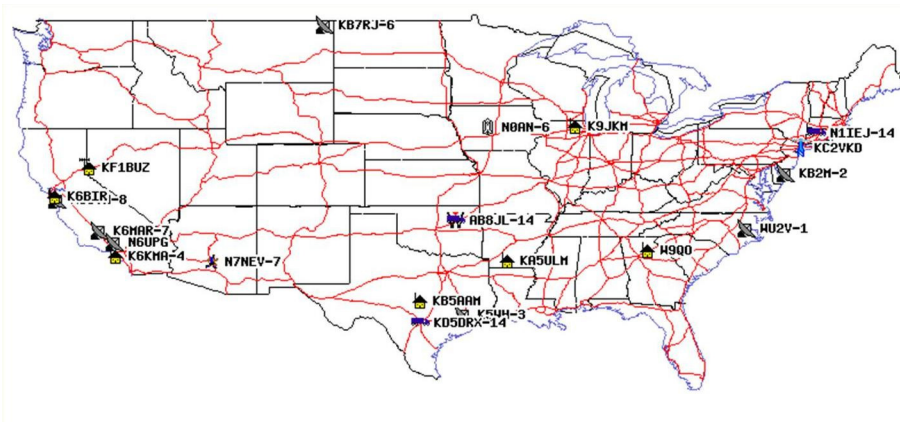
You will find a couple of nice features on this web page. You will see a real-time "heard" list of everyone who has had their

UI packets digipeated by the spacecraft. There is also a map display that will show the QTH of stations who provide APRS formatted location information. At the bottom of the pages you can view the entire packet of the most recent traffic from the spacecraft.

World Map Showing Stations Heard via ariss.net



USA Map Showing Stations Heard via ariss.net



APRS format location information?

No! You do not need to run any extra APRS software to be displayed on the map. You can generate the APRS format directly at your keyboard if you wish to show up on the map. If you wish to simply send text messages to be digipeated via the spacecraft you simply type your message without the location data. While your QTH isn't showing on the map your packets will in fact still be digipeated – and, that you will see on your screen.

Where do you find your APRS location information? This is just your GPS location. If you do not have access to a GPS box simply find your QTH on Google Earth (in the View -> Grid menu).

So if I would like to display K9JKM on the map and send a message to my fellow space-packeteers I should send a text string using the UNPROTO and CONVERS steps previously outlined, and make my message look like the example below:

=4211.29N/08827.08W-Hi from JoAnne near Chicago in EN52 <enter>

The parts of the message string can be explained as:

- **=4211.29N/08827.08W** is simply the = character plus my QTH info from Google Earth
- The – is the 'dash' or hyphen. It tells the map to display me as the little house with antenna icon. The ARISS packet page above has a link where you can find other icons for you on the map
- **Hi from JoAnne near Chicago in EN52 <enter>** can be any message text you wish. You will likely have better luck getting through and being digipeated if you transmit short messages.
- If I see someone on the downlink who I would like to have a keyboard QSO with all I would need to do simply enter the message from the keyboard without any APRS-formatted location: *Hi Bob, good to see you this pass* will just send Bob (and everyone reading the packet mail) your message.

The <http://www.ariss.net/> web page also shows a packet log of stations that have successfully digipeated. I highlighted one of my digipeats in the example below. I was digipeated by the RS0ISS-4* callsign (this is the callsign of the ARISS packet alias). The asterisk shows the last station to digipeat my packet. N6VUD-2 is running a SATGATE to transfer the packets to the internet and on to the web page.

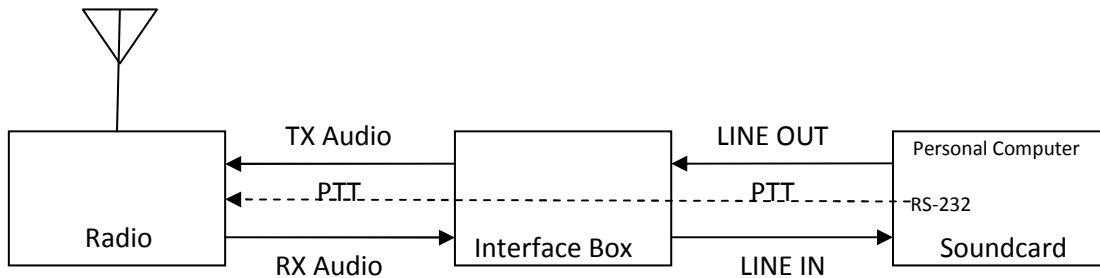
```
00:00:01:25 : K6KMA-4]APRS,RS0ISS-4*,qAr,GWS-2:=3349.51N/11806.91W-
00:00:01:35 : VA7VW-6]WA6YET,RS0ISS-4*,qAR,N6VUD-2:Hello from Ron in Vernon BC DO00ig
00:00:01:40 : K9JKM]CQ,RS0ISS-4*,qAR,N6VUD-2:=4211.29N/08827.08W-Greetings
00:00:01:45 : KD5DRX-14]TU4RUY,RS0ISS-4*,qAR,N6VUD-2:`1D2 {u/]"4;}Quinnesecc Mi
00:00:01:45 : KB7RJ-9]TX5YXP,RS0ISS-4*,SGATE,WIDE2-2,qAR,N6VUD-2:`p]M1!}k/]";m}146.520MHz QTH
Plentywood in NE MT=
00:00:01:51 : K6BIR]APU25N,RS0ISS-4*,qAR,N6VUD-2:=3739.56N/12206.43W- {UIV32N}
00:00:02:15 : VA7VW-6]K6KMA-4,RS0ISS-4*,qAR,K6SJC:Hello from Ron in Vernon BC DO00ig
```

Summary of the Hardware TNC-2 commands

The actual syntax to enter the commands into your TNC (from the **cmd:** prompt) will likely vary according to the manufacturer. The following list of parameters seems to be common to most TNC-2 controllers used for 1200 baud packet.

Summary of the TNC commands		
TNC Parameter	Value	Description or Action
MYCALL	Your Callsign	Default is NOCALL, but you want others to know you are there.
DAYTIME	YYMMDDHHMM	Used if you want to timestamp the packets you are receiving.
MONITOR	ON	Displays all packets on the frequency
MALL	ON	Displays all packets on the frequency (connected or unconnected)
MCOM	ON	Displays the AX.25 protocol with the message
MCON	ON	Allow you to see all packets even when in CONVERS mode
MSTAMP	ON	Monitored packets are timestamped
MRPT	ON	Displays the entire digipeat path for the packets.
CONSTAMP	ON	Connect and disconnect status messages are timestamped
HEADERLN	ON	Header information is displayed on separate line from message text
PASSALL	ON	TNC will accept and display packets that have errors (noise)
PASSALL	OFF	TNC will only accept and display packets that have complete CRC.
CONVERS	<enter>	Mode to type packet message from keyboard directly to the TNC
MHEARD	<enter>	Displays your TNC's "heard" list (updated only when PASSALL OFF)
UNPROTO	CQ VIA ARISS	Most basic string for ARISS to copy, route, and digipeat your packet
UNPROTO	CQ VIA W3ADO-1	Basic string for PCSAT-1 for DAYTIME ONLY operation.

Overview of Operating the ISS Digipeater Using Your Computer's Soundcard and Software



Overview Soundcard and Radio Connection

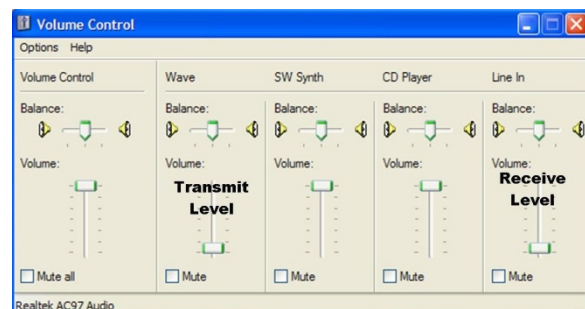
Operating packet without the traditional standalone TNC requires a combination of software and hardware connection.

- Software will generate and decode the AX.25 packet signal using the digital signal processing capabilities of the soundcard in your computer.
- A soundcard interface box is needed to set the proper sound levels between the computer and the radio.
- Push-to-talk (PTT) rig control is often generated by the software by setting selected pin(s) of the RS-232 serial interface. Some radios such as a Yaesu FT-857D will reliably switch between TX and RX function if the VOX levels are set in the radio's operating menus.
- If you already have interfaced your radio to the soundcard for other amateur radio applications such as RTTY, PSK31, JT65, SSTV you are already set for AX.25 ARISS packet operation with the ISS – all you need is to download, install, and configure some free software.

Since the connections between your radio and the soundcard interface of your choosing are specific to your situation we will defer discussion of this because you need to consult your radio operator's manual and the instruction book of the soundcard interface. Careful research before buying an interface box will reveal that many of the leading brands will also sell you an interface cable kit specific to your radio.

Setting Your Soundcard Levels

As mentioned, if you are already using your soundcard for other amateur radio applications such as PSK31, etc. usually the same settings can be used for packet. If needed use the "Wave" slider control to set the transmit level; use the "Line In" slide control to set the receive level.



Install the Software You Need

The software you need for ARISS packet operation is available for free download.

The items you will need include:

- **AGWPE** - Written by George Rossopoulos, SV2AGW, and is an acronym for "SV2AGW's Packet Engine". It was originally created as a TNC management utility and has many super features of value to TNC users, plus it has the ability to encode and decode packet tones using your computer's sound card. Download from:
<http://www.sv2agw.com/ham/agwpe.htm>
- **UISS** – Written by Guy Roels, ON6MU designed for UI packet communication (unproto) packet with ISS. This will be your user interface for packet communications with the ISS. This software is free for amateur and non-commercial use. A PRO version is available and donations are welcome. Download from:
<http://users.belgacom.net/hamradio/uiss.htm>

Installation and user guides for the software packages are included on their websites.

Here are a few links to websites that will

give you the information needed to get on the air quickly:

- The “golden” reference for sound-card packet configuration and operation is the “Sound Card Packet” site by Ralph Milnes, NM5RM:
<http://www.soundcardpacket.org/>
- Additional help for installing AGWPE is written up in a word document, “An Easy Set Up For Soundcard Packet” by Karl Berger, W4KRL. These are basic instructions for getting started but you will not need the WinPack steps outlined. (We’re using UISS instead.)
<http://www.w4ovh.net/SoundcardPacketSetup.doc>
- Mineo Wakita, JE9PEL has published several on-line references for the installation and use of UISS:
<http://www.ne.jp/asahi/hamradio/je9pel/ui32uiss.htm>
UISS setting up APRS satellite:
<http://www.ne.jp/asahi/hamradio/je9pel/uissagwp.htm>
- The UISS site has a reference page:
<http://users.belgacom.net/hamradio/uisslinks.htm>

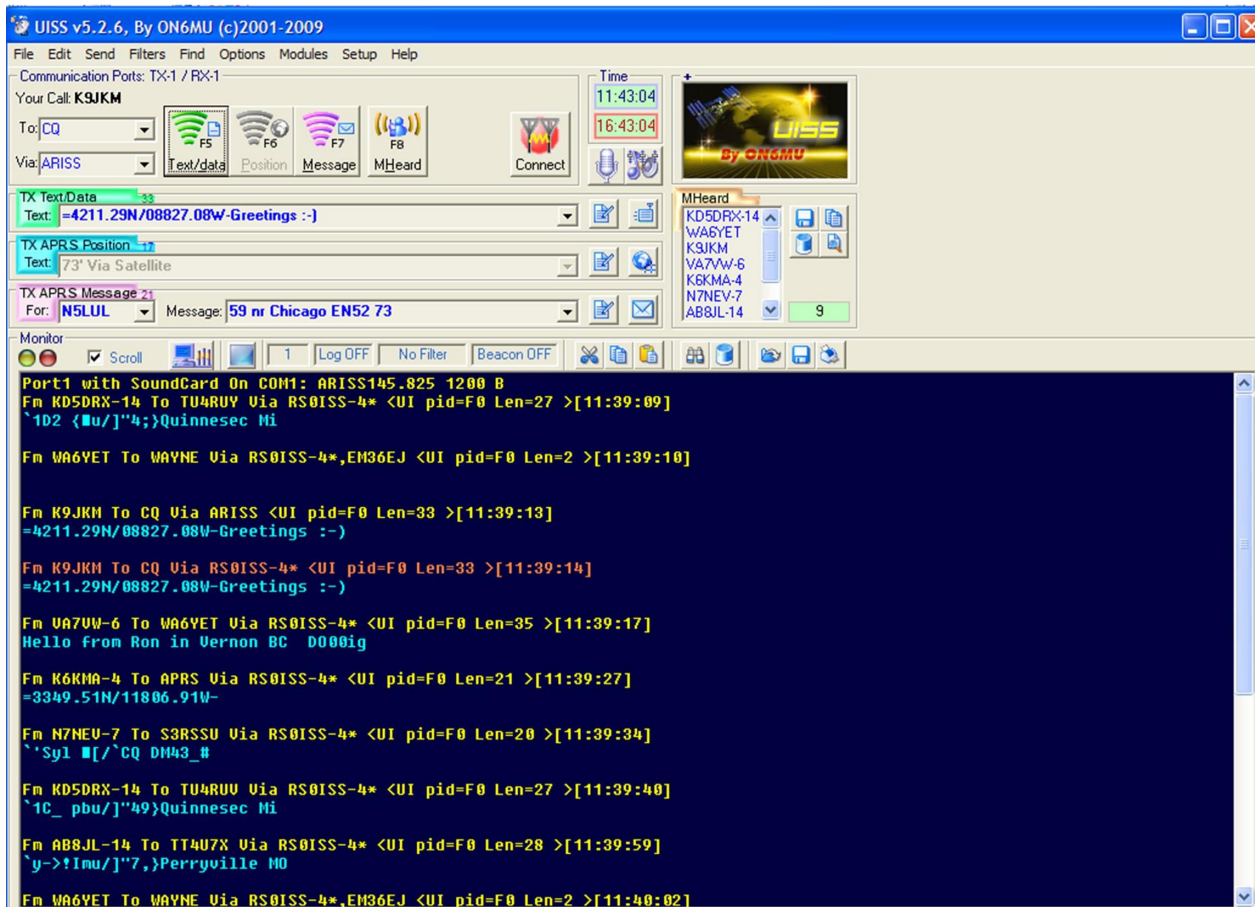
Example Operating Session With the Soundcard

All of the necessary parts are installed ... and the ISS is approaching. Here is an example of an operating session to further acquaint you with this mode of operating.

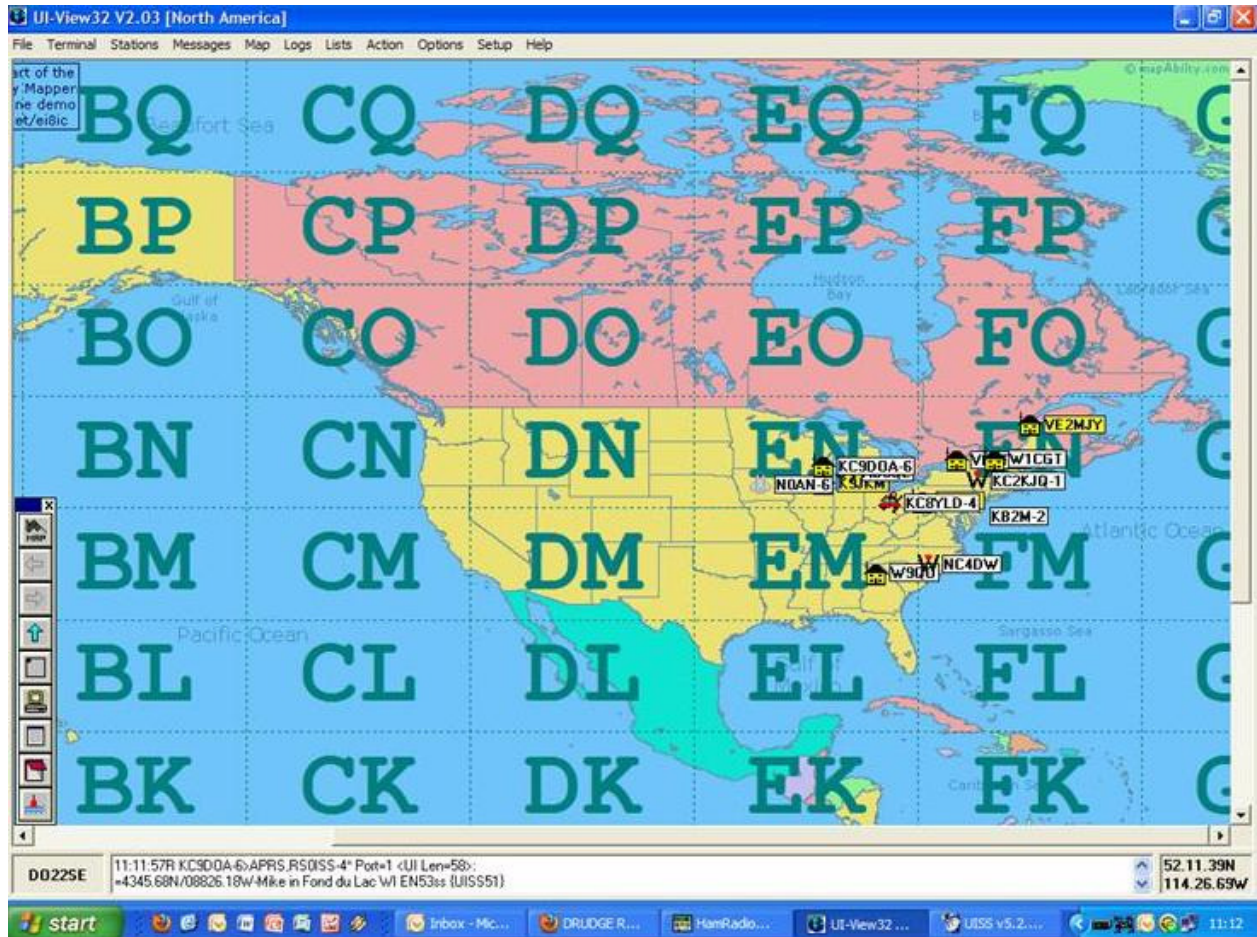
- 1) **Always start AGWPE first.** Click on the AGWPE icon on your desktop and you will see the following splash screen telling you things are running. The splash screen will go away in about 10 seconds. You will also see the AGWPE Packet Engine startup “bubble” appear in the toolbar. You can “X” (to exit) the bubble but AGWPE will continue to run as shown by its icon in the toolbar. You can left or right click on the icon to get to AGWPE configuration settings if you ever need them.



- 2) **Start UISS.** Click on the UISS icon on your desktop and the program will open to the operator screen.
 - a. Your **UNPROTO** string **CQ VIA ARISS** is set by using the pulldown menus in the **To** and **Via** windows in the top/left of the screen.
 - b. The APRS-formatted location information which was also used in the hardware TNC configuration is entered in the **TX Text/Data** window.
 - c. The **MHEARD** command used with the hardware TNC to show who is on the frequency has its equivalent display shown in the MHEARD list on the right side of the screen.
 - d. To transmit my packet configured for digipeating via ARISS **=4211.29N/08827.08W-** just click on the Text/Data button in the top row.
 - e. UISS will show all of the packets being received when the ISS is within range. Your packet will be highlighted when you (and everyone else in range) receives the digipeated packet.



3. Optionally you can display the stations you receive on an APRS-format map. In the example here **UI-View** shows the stations received that were transmitting their location data during a pass of the ISS over the eastern half of North America.
 - a. Start AGWPE first, then start UI-View



In summary the previously mentioned screen at <http://www.ariss.net> will also update in the same manner whether the packet came from a hardware or software TNC.

A Note About a Packet “Hard-Connect” to RS0ISS-11 BBS

In a word ... please don't! The ISS PBBS with the ID RS0ISS-11 operates in the same manner as a terrestrial Packet BBS operates. A “hard-connection” (C RS0ISS-11) establishes a full AX.25 connection which brings the entire messaging handshaking protocol into operation. The handshake messages will faithfully repeat, and repeat, and repeat per protocol until they are properly acknowledged. The usual case is that there are many stations sending packets to the ISS resulting in data collisions when RS0ISS-11 is expecting its handshake. Everyone tuned into the pass will see the endlessly repeating AX.25 handshake bytes until the sequence times out. You may have been out of range for several minutes already but the ISS is still listening for you.

Appendix: Know When to Listen – Tracking Resources

If you have experimented with Amateur Radio satellites you may already own a tracking program which will let you see when the ISS is within range of your shack. If you are new to this phase of the hobby

this section will point you toward several on-line resources that you can use right away without additional special preparation.

Tracking Resources on the Web

This section is geared toward helping the beginning operator track the ISS. You will find several resources on the web to help you track the ISS without needing to install dedicated tracking software. These tracking pages are considered to be “close enough”

in the case of calculating when the ISS is within range of your station. This is because the downlink signal from the ISS is so strong and the 145.825 MHz downlink frequency does not require tracking the Doppler shift for you to be able to make successful contacts.

- The **AMSAT Tools** web page: <http://www.amsat.org/amsat-new/tools/>
 - You can select the ISS by using the pull-down menu:

AMSAT
Satellite Tracking for ISS

850 Sligo Ave., Suite 600
Silver Spring, MD 20910
1-888-322-6728

Launch Pad Navigator Sat Status Keps Passes News Store Members Contact Us Return

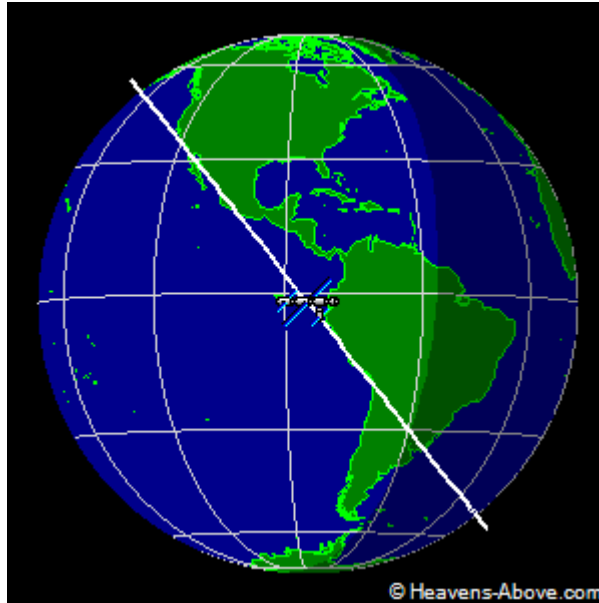
Current Position of ISS
Tue, 11 Sep 2012 17:13:44 GMT (12:13:44 local time)
Current Location: 8.5E 30S

Select a Different Satellite: ISS

Note: Position is approximate and depends on your computer's performance.

For the best in full featured tracking software visit [The AMSAT Store](#)

- The **Heavens Above** web page: <http://www.heavens-above.com> will allow you see the current position of the ISS and many other satellites:



- The **N2YO** page: <http://www.n2yo.com/> is an excellent tracking resource featuring a real-time map that updates in your browser window:

REAL TIME SATELLITE TRACKING

[Whats up in your sky right now NEW](#)

Find a satellite...

[N2YO.com on Facebook](#) [Advanced](#)

MOST TRACKED	JUST LAUNCHED	POPULAR CATEGORIES	UP IN YOUR SKY	OTHER SATELLITE FEATURES
ISS (ZARYA)	BEIDOU M6	GEOSTATIONARY BRIGHTEST	GPS	ALL CATEGORIES SEARCH DATABASE
DIRECTV 1R	BEIDOU M5	WEATHER NOAA	IRIDIUM	BROWSE SATS ALERTING TOOLS
GOES 15	METOP-B	IRIDIUM GLOBALSTAR	GLOBALSTAR	STORM TRACKING FAQ
GOES 12	AEROCUBE 4	MILITARY AMATEUR RADIO	SIRIUSXM	SEND FEEDBACK PREFERENCES
MOLNIYA 1-36	AEROCUBE 4.5B	TV SATELLITES GPS OPERATIONAL	WHAT'S UP?	SATELLITE LINKS SUPPORT N2YO.COM
TOP 50 »	LATEST 50 »			

ISS (ZARYA)

LOCAL TIME: 10:00:31
 UTC: 15:00:31
 LATITUDE: 50.39
 LONGITUDE: -115.99
 ALTITUDE [km]: 410.52
 ALTITUDE [mi]: 255.09
 SPEED [km/s]: 7.37
 SPEED [mi/s]: 4.58
 AZIMUTH: 303 NW
 ELEVATION: -0.6
 RA: 1h 33m 41s
 DEC: 23° 14' 36"

The satellite is in day light

PERIOD: 93m
 5 DAY PREDICTIONS »

[Make A Donation](#)

RECOMMENDED RESOURCES

[Satellite TV](#)
[IP2Location IP Geolocation](#)
[Find your Magnetic Declination](#)
[Check Google Page Ranking](#)
[Last Minute Stuff](#)

YOUR CURRENT LOCATION

Your IP address: 67.184.171.11
 Latitude: 42.16808°
 Longitude: -88.42814°
 Magnetic decl.: 3° 0' W

Is this incorrect?
[Set your custom location](#)

Map Satellite

Retrieving data... Draw orbits Draw footprint Keep selection centered

- The **ISS Fan Club** web page: <http://www.issfanclub.com/> includes a tracking widget showing the current location of the ISS. It also includes the latest known status of the downlink frequencies as reported by amateur radio stations worldwide:

The screenshot shows the ISS Fan Club website. At the top, there's a navigation bar with links for Frequencies, QSL, IAA, NA1SS DXCC, and About this site. Below that, a search bar and a menu with options like APRS Tracking, Ham Radio Contacts, Images from Space, Forum, Polls, and Guestbook. The main content area is divided into several sections:

- ISS Position:** A map showing the ISS's current location over the Atlantic Ocean, with a Google logo and a 'Your location: US' indicator.
- User login:** A form with fields for Username and Password, and a CAPTCHA section.
- News Article:** A photo of three men holding a sign that says 'The Best regards to ISS FAN Club'. The text below the photo reads: 'Joe Acaba (NA1SS) - Marcelino Canino Canino Middle School, Dorado, Puerto Rico on 12 September 2012 at 1728 UTC'. The article describes how Joe Acaba spoke to students via telebridge station K6DUE in Maryland.
- Voice and Packet Radio sections:** These sections provide real-time status for various radio stations, including 'Last ACTIVE' time, 'Downlink' frequency, and 'Uplink' frequency.

Tracking programs

As discussed, the web tracking screens will get you started and will be quite adequate in many instances for casual operating.

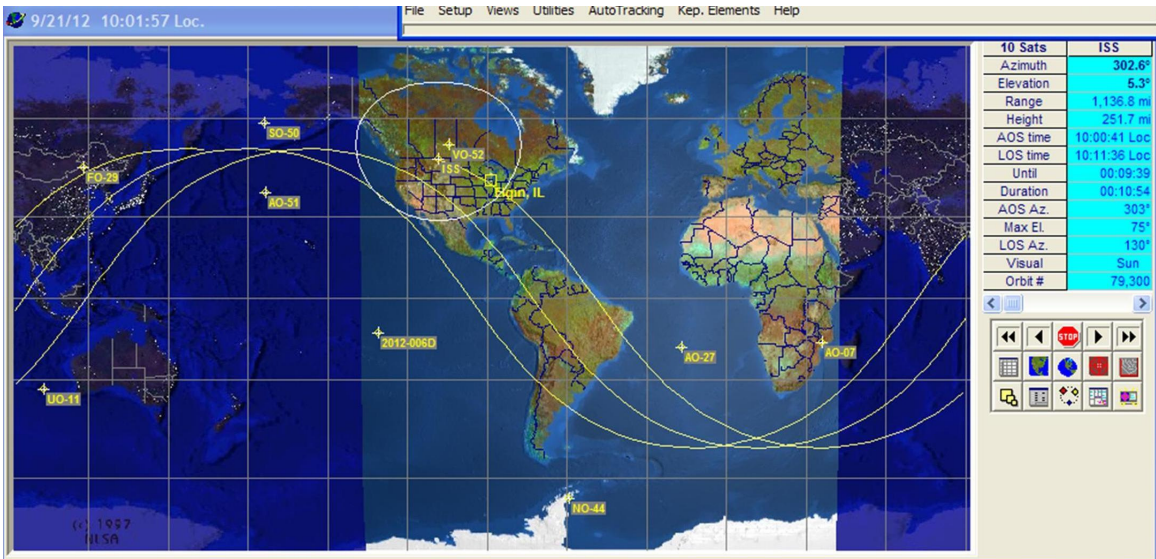
Installing a tracking program on your computer is the next step. I am mentioning this as your second option due to the learning curve with all of their features adding another level of complexity. But, once learned, your own tracking program on your computer in the shack will give you the best level of prediction with display features tweaked for your personal preferences. You will also have the capa-

bility to track and display the position of multiple spacecraft. Tracking software will enable many interesting features:

- Real-time position display on a map
- Real-time position data including azimuth and elevation to point your antenna
- Predict future passes
- Advanced features include:
 - Rotor control to automatically aim your antennas
 - Rig control to track the Doppler shift.

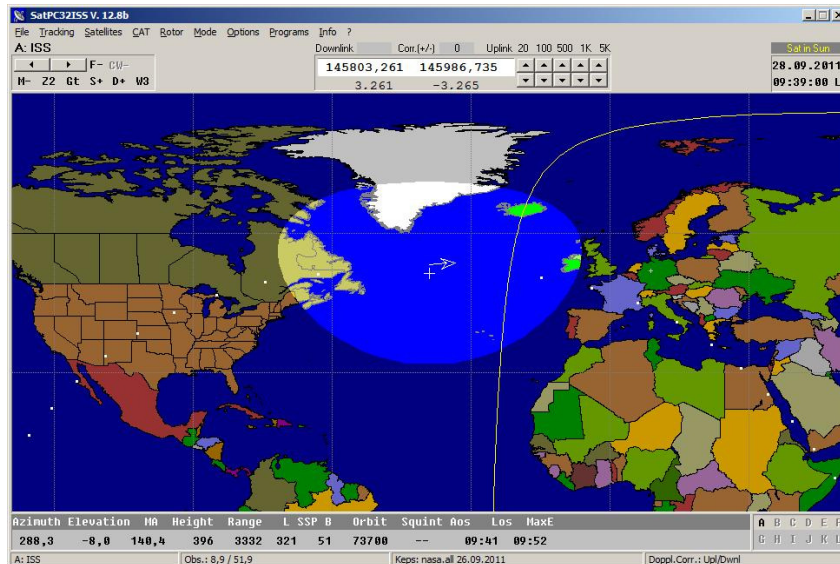
Examples of three popular tracking programs for your PC are included on the following pages.

Nova by Northern Lights Software Association
<http://www.nlsa.com/>



SatPC32

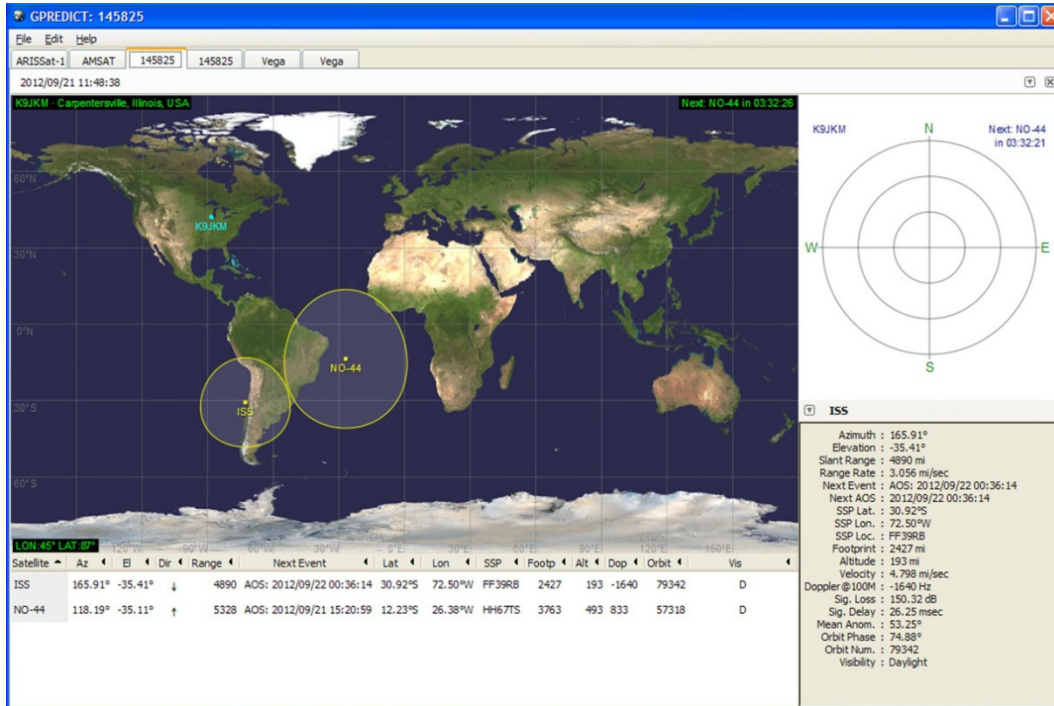
- This program is written by Erich Eichmann, DK1TB. He has donated all the proceeds from the software to AMSAT. You download the software and receive assistance from his website: <http://www.dk1tb.de/indexeng.htm>
- You can try the program in a demonstration mode to try it out for free. You can purchase this software from the AMSAT store on-line: http://store.amsat.org/catalog/product_info.php?cPath=2&products_id=50
- After purchasing the software, Martha will send you a license key to use to unlock all the features of the software.



GPredict

<http://gpredict.oz9aec.net/>

Gpredict is a real-time satellite tracking and orbit prediction application. It can track an unlimited number of satellites and display their position and other data in lists, tables, maps, and polar plots (radar view). Gpredict can also predict the time of future passes for a satellite, and provide you with detailed information about each pass. Gpredict is free software licensed under the GNU General Public License.



Sidebar: Swapping the UZ7HO Soundmodem packet program in place of AGWPE

Many operators note that often a strong sounding downlink is heard from the ISS but the AGWPE and UISS combination of software will not decode and display the packet message. This is because the checksum was not correct. Losing only a bit or two of the digital packet due to noise or fading will result in that packet's checksum not being correct. AGWPE only passes the received packets that have a correct checksum. When using a hardware TNC with the PASSALL command enabled you can see all packets, including the incomplete packets, or with reception errors. Often the packets with errors contain enough useful data for a human to still understand them. However, in the software TNC emulation this command is not available.

I have read of other operator's experiences having better error condition response using the UZ7HO Soundmodem software in place of the AGWPE packet engine. Conveniently the UZ7HO Soundmodem software, an AX.25 packet TNC for your computer's soundcard, can be used in place of the AGWPE software mentioned in this article. Either program will work but the setup in UISS differs for the UZ7HO software.

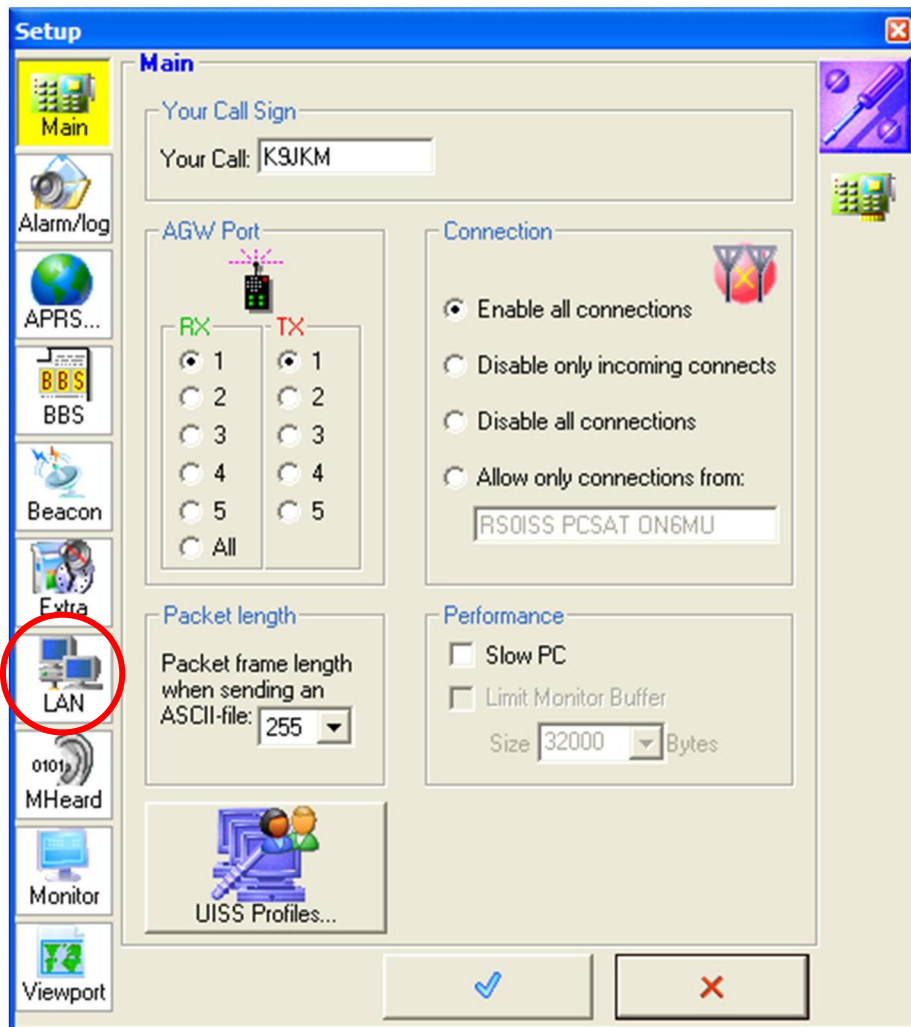
To get started using this optional approach get the UZ7HO Soundmodem from <http://uz7ho.org.ua/packetradio.htm>. Download and unzip these files:

sm2ch45.zip	19-Oct-12 03:23	425.69K
user_guide_v045b_EN.pdf	17-Apr-13 02:23	1003.34K

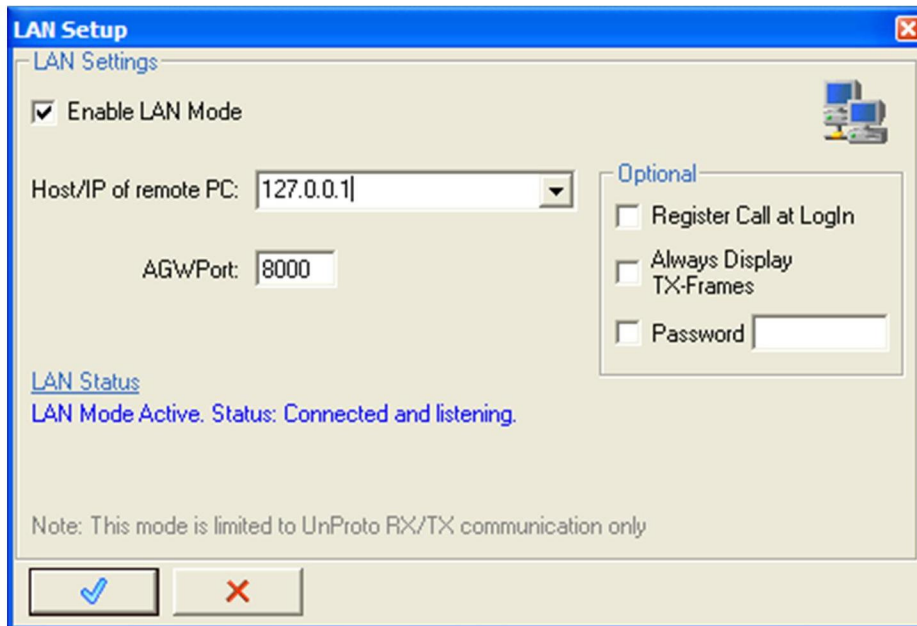
The setup guide and user guide are easy to follow. I tuned my receiver to the 144.390 MHz APRS frequency. I immediately saw the APRS messages. Good! The setup is receiving. I tuned back to 145.825 MHZ ARISS packet frequency to wait for the next ISS pass over my station.

The UISS program will require settings to be changed to operate with UZ7HO Soundmodem:

1. In UISS top menu select Setup -> UISS -> LAN and you will see this screen:

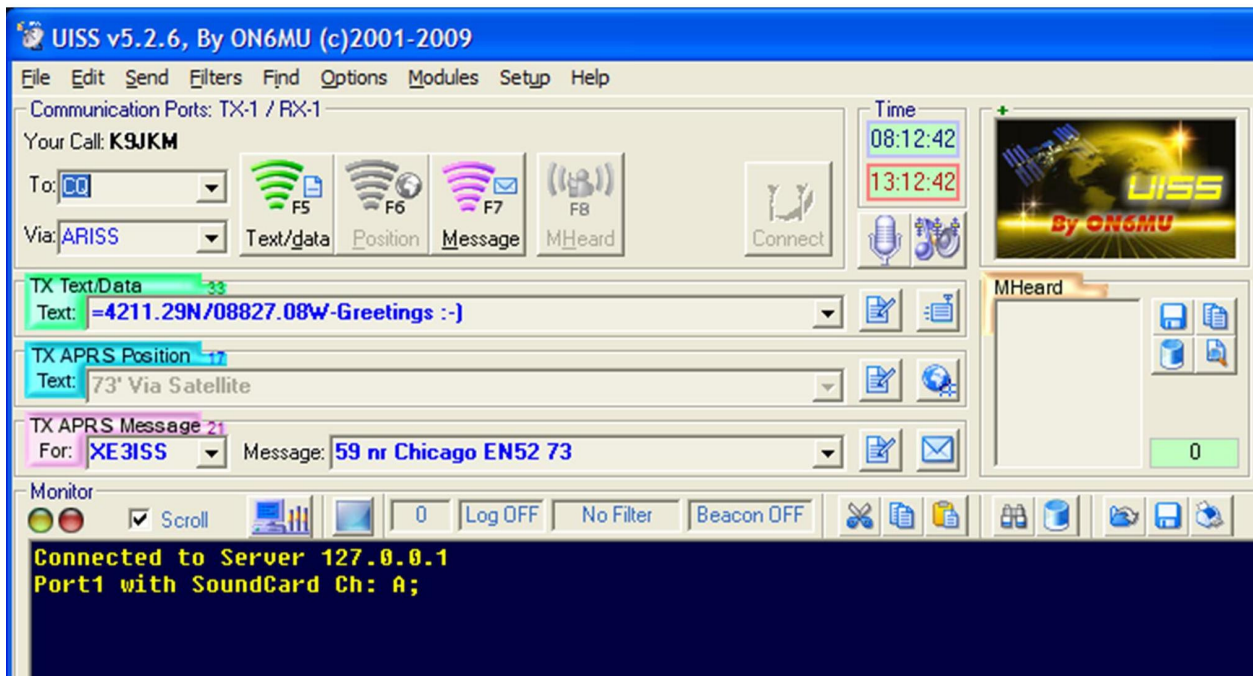


2. In LAN setup click on 'Enable LAN Mode' Host 127.0.0.1 Port 8000



3. UISS may ask you to restart, go ahead and restart UISS. To return back to operation with the AGWPE software unclick the 'Enable LAN Mode' option and restart UISS.

For normal operation start the UZ7HO Soundmodem first. Then start UISS. When both programs are running UISS will show it has connected with the Soundmodem:



Your setup is now ready for the next ISS pass! To send your APRS position report click on the UISS Text/Data button. You can enter custom messages for quick packet contacts with other stations into the TX APRS Message box and then click on the Message button.