Quick Guide to ARISS and PCSAT-1 Digipeating

For the time being most of the two-way Amateur Radio activity with the International Space Station (ARISS) is 1200 baud AFSK packet on 145.825 MHz (uplink and downlink). Packet operation via ARISS and PCSAT-1 is similar in most aspects with the differences noted below.

Setting up the packet station hardware

This basic guide will only cover getting a basic packet station using an external hardware terminal node controller operational on ARISS packet. There are several soundcard TNCs also available if you do not own the hardware but for the time being are beyond the scope of this quick guide.

Follow the directions for connecting your TNC to the PC and to the radio. The remainder of this quick guide will summarize the TNC commands for packet communication with the spacecraft.

Overview of Operating Packet via ARISS or PCSAT

Much of terrestrial packet operation consists of you requesting a

CONNECTION to another station. Packet communication via ARISS and PCSAT almost exclusively relies up 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. 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 ARISS 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 CONVERS command as outlined here:

1. Set UNPROTO CQ VIA ARISS.

2. Enter CONVERS mode from the cmd: prompt on your TNC screen.

3. Enter a short message such as *Greetings from JoAnne via the space station* and hit <enter>.

4. You should see your TNC key your rig and send the message.

5. While you are in CONVERS mode all input from your keyboard is piped to the TNC and radio. If you try to enter any additional TNC commands it will think it is another short message and transmit it over the air. Simply exit CONVERS mode at the end of a pass using Control-C (usually).

6. After receiving the Control-C your TNC will once again be ready to accept any commands and show the cmd: prompt.

Quick Overview of Your Packet Station

You will likely be able to get on ARISS and PCSAT-1 packet using the gear you already have in your station. A full OSCAR-class horizon-to-horizon computer controlled tracking system is not necessary. Your basic station will consist of:

1. Desktop or laptop computer.
2. 1200 Baud Packet TNC (dig it out of the closet from when you last used it in the 1990's)
3. 2 Meter rig on 145.825 MHz. 5 to 50 watts seems to be what most hams are using.
4. Many have success with their 2 meter vertical on the roof or tower - no tracking necessary. A few use a very small 2 meter beam (3 to 5 elements) on a fixed elevation of 15-30 degrees on a small rotor.
5. You have to know when the spacecraft is within range. If you already own a tracking program it will work fine - just add ISS and PCSAT-1 (NO-44) to the objects you are tracking.
6. http://www.heavens-above.com is a web page showing location of the ISS. It also will tell you where the other amateur satellites are if you follow the links.
7. http://www.amsat.org/amsat-new/tools/ will give you web based tracking information.

Summary of the TNC commands

The actual syntax to enter the commands into your TNC 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.

On The Air Examples

You can monitor the latest real-time ARISS packet activity on this web page: http://www.ariss.net/

You can monitor the latest real-time PCSAT-1 packet activity on this web page: http://www.findu.com/cgi-bin/pcsat.cgi

There are a couple of nice features on these web pages. They provide a real-time "heard" list of everyone who has had their UI packets digipeated by the spacecraft. There is 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.

APRS format location information? No! You do not need to run APRS 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.

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 this:

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

Disecting the above message string:

- `=4211.29N/08827.08W` is simply the = character plus my QTH info from Google Earth

- `-` 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.

So give ARISS and PCSAT packet digipeater operations a try! Don't worry if it takes a couple of passes to get the hang of things ... we all went through that. With a little practice and a good pass you will enjoy the thrill of seeing your callsign repeated from space.

Questions? Comments? Feel free to e-mail me at: k9jkm@comcast.net