

# APRS THRU ISS



**SYD DEITCH, VE6SYD**

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# APRS

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- The abbreviation APRS stands for Automatic Packet Radio System.
- Both the Local and ISS APRS Digipeaters use AFSK FM at 1200 baud.
- There is a checksum on the packet messages and they may or may require an acknowledgement.
- The fields within the messages of interest sent to the Digipeaters were Position, SMS, and email address.
- The protocol also supports the sending of messages directly to other Amateurs who are currently communicating via APRS as well as WX weather information.

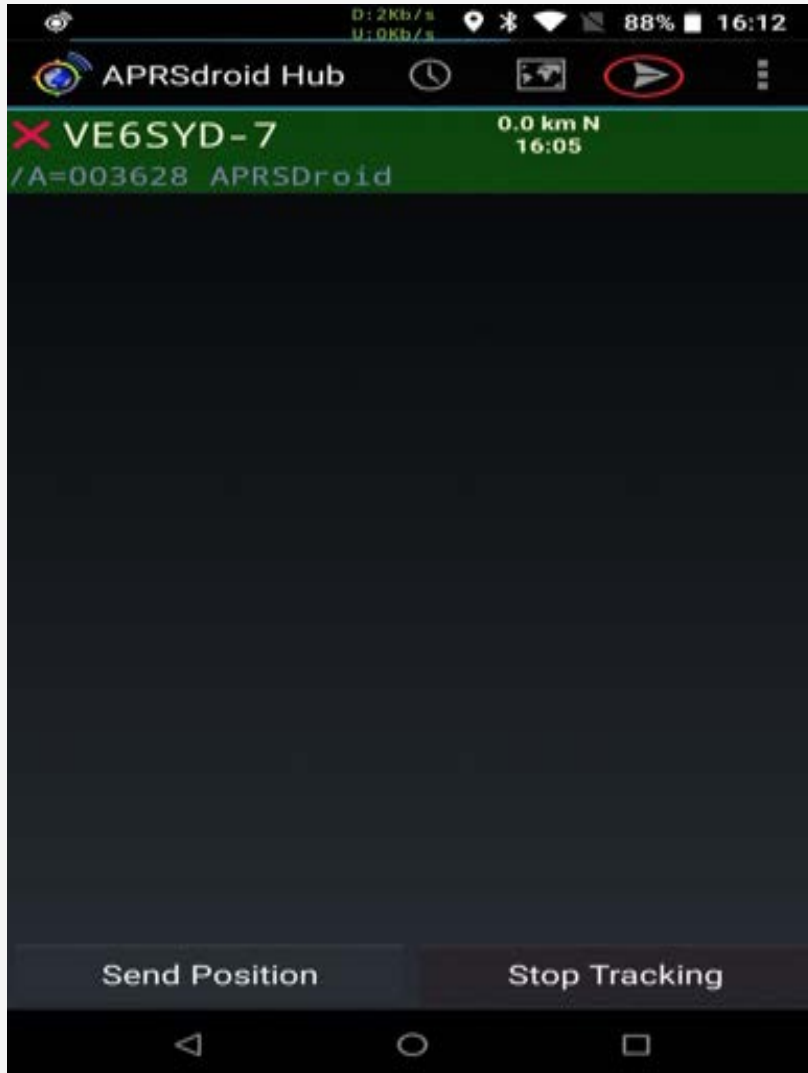
# HARDWARE

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- Baofeng UV5R handheld
  - An older Android Cell Phone,
  - Mag Mount  $\frac{1}{4}$  wave antenna.
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- The cell phone connects to the UV5R via an audio cable used by Baofeng handhelds.
  - The UV5R is setup for VOX 1 (VOX enabled) and Squelch 1 (most sensitive).
  - The UV5R transmits at 5 watts.

# SOFTWARE



- The APRS software used on the Android Cell Phone is called APRSdroid.
- On first use of the app a Passcode is required (need to apply for it thru APRSdroid) to have access to the APRS-IS network.
- As part of the setup for APRSdroid Preferences, you need to enter your Call Sign and a SSID (eqpt. type) and 7 is used for a Handheld.
- Connection Protocol should be set to AFSK and Audio type to Music.
- APRS DigiPath should be set to WIDE1-1,WIDE2-1 for the Calgary Digipeater and ARISS,WIDE2-1 for the ISS Digipeater.
- Media volume in the Cell Phone must be set to the highest level as this is required to key VOX on the UV5R.
- There is an arrow circled in Red on the APRSdroid Hub display to the right which allows you send SMS and emails. To send an SMS message, you send it to MSGTE and the message is @403xxxxxx xxxxxxxx where xxxxxxxx is the phone no. followed by a space and xxxxxxxx is the message. To send an email you send it to EMAIL-2 and the message is the email address, followed by a space, and then the message.

# CALGARY APRS

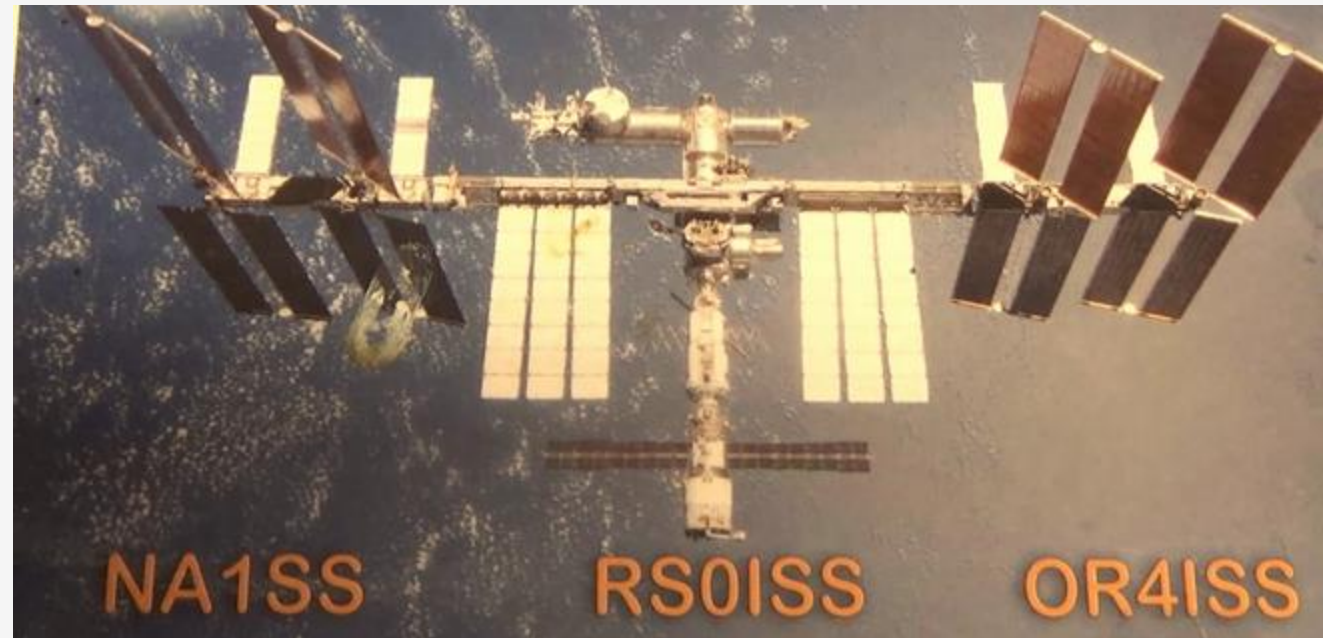
- Before trying the ISS, make sure the system works locally.
- From South Calgary there is no problem communicating with the local CARA Digipeater (VE6RYC) located on Nose Hill via APRS on the frequency 144.390 MHz Simplex.
- I was able to send Position and email messages easily through it to the Internet.
- There was a problem with SMS messages, however. Two years ago, this was not a problem. This capability now appears to be disabled.



Picture courtesy of Google Earth

# THE END

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# ISS APRS LOGISTICS

- It is much different communicating through the ISS Digipeater at a freq. of 145.825 MHz simplex.
- The system was setup in a room on the south side of my house with a south-facing window. This requires a pass with max inclination of 60 to 85 degrees (the higher the better). Greatest COS requires a pass that starts at 270° and ends at 90° degrees with the highest inclination at 90°.
- The AMSAT website <https://www.amsat.org/track/> was used to determine an optimal transit of ISS to try to communicate. Fig 1 circled in Red is a possible candidate, however, the time of this pass is 03:55 Local time. The ISS orbits at an altitude of 400 km and makes a pass around the world every 90 minutes. The pass near Calgary will take from 5 to 11 minutes of which only a few minutes are possible for making contact. There may be up to 4 passes in 24 hours that come near Calgary. Of these there maybe one that satisfies the conditions that are required for communications.

| AMSAT Online Satellite Pass Predictions - ISS    |           |          |             |                   |                |             |           |
|--------------------------------------------------|-----------|----------|-------------|-------------------|----------------|-------------|-----------|
| <a href="#">View the current location of ISS</a> |           |          |             |                   |                |             |           |
| Date (UTC)                                       | AOS (UTC) | Duration | AOS Azimuth | Maximum Elevation | Max El Azimuth | LOS Azimuth | LOS (UTC) |
| 25 Feb 25                                        | 07:47:49  | 00:03:33 | 143         | 1                 | 130            | 104         | 07:51:22  |
| 25 Feb 25                                        | 09:20:09  | 00:09:51 | 207         | 19                | 148            | 77          | 09:30:00  |
| 25 Feb 25                                        | 10:55:59  | 00:10:55 | 246         | 66                | 155            | 76          | 11:06:54  |

Fig. 1

# ISS APRS RESULTS

- On a pass, I successfully sent a position packet thru the ISS Digipeater. I failed on sending an email.
- Fig. 2 shows a map produced by the Web Site <https://aprs.fi> which displays my position.
- A search of my callsign VE6SYD-7 displayed my position on a map and a note that shows the date/time. Feb. 13 8:06 was thru the Calgary Digipeater for testing previously while Feb. 20 6:23 was thru the ISS Digipeater. RS0ISS is confirmation the path was thru the ISS.

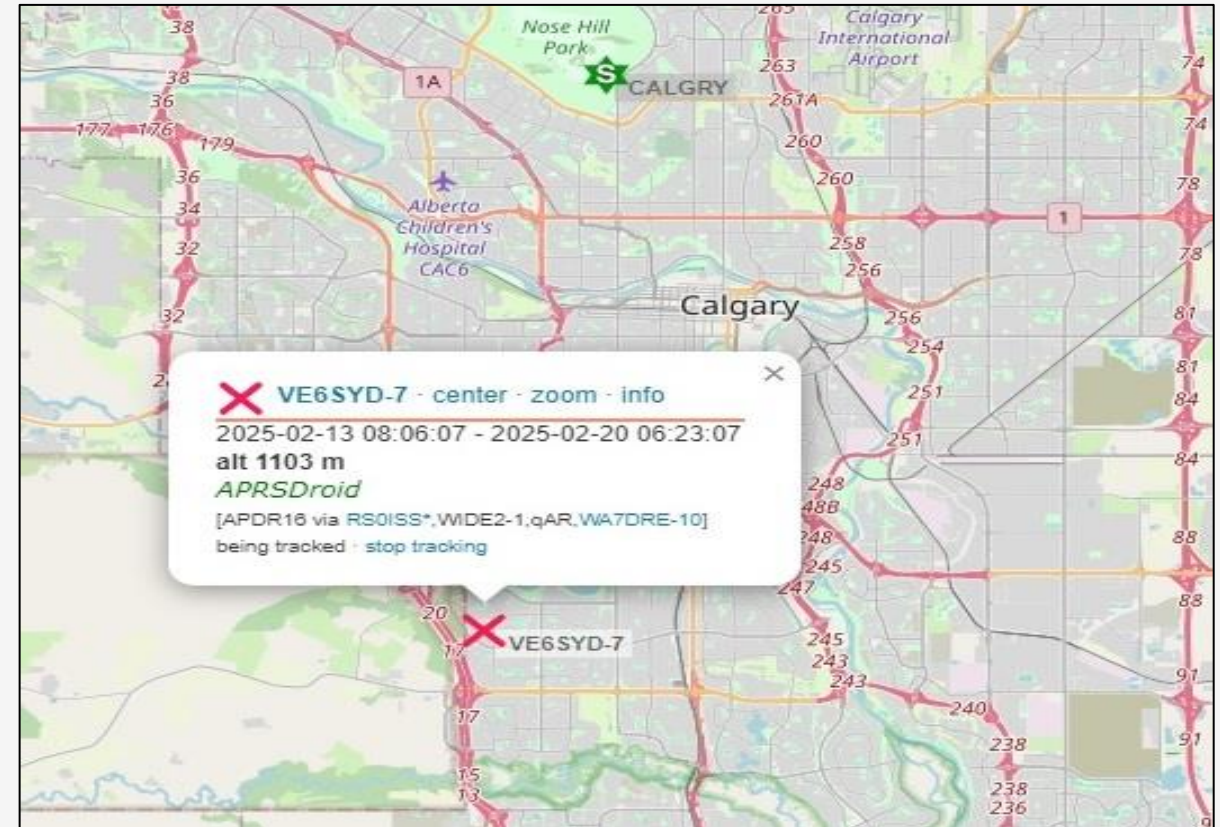


Fig. 2

# ISS APRS RESULTS CONT'D



Fig. 3

- The web site <http://ariss.net> shows a map of call signs that communicated thru the ISS APRS Digipeater.
- On Fig. 3 circled in red, you can make out VE6SYD-7. You can't expand the map view on their Web Site.
- The -7 is from APRSdroid which indicates comm. is via a handheld.

# ISS APRS RESULTS CONT'D

- Fig. 4 shows the call signs that communicated with the ISS Digipeater (mine is circled in black) and the elapsed time since contact.
- Note that 29 minutes before my communication, Australian Amateurs were communicating with ISS.
- Unfortunately, the UV5R is not too sensitive on receive. I do not hear transmissions from the ISS most of the time on a pass. Packets are sent blindly when I estimate the ISS is in range.
- It appears that SMS and email messages require an ACK. Since most of the time the ACK is not received, APRSdroid resends the messages.

Station List [Click here to see times in absolute UTC](#)

| Call        | Messages | lat       | lon        | Age (dd:hh:mm:ss) |
|-------------|----------|-----------|------------|-------------------|
| ✈ KB9VIC-9  | *        | 37.735    | -88.08333  | 00:00:00:06       |
| 🏠 N9WWR     | *        | 42.81733  | -87.817    | 00:00:00:17       |
| 📺 KF0BMD-11 | *        | 39.72     | -104.901   | 00:00:00:49       |
| ✈ RS0ISS    | *        | 0.0000    | 0.0000     | 00:00:01:13       |
| ✈ VE6SYD-7  | *        | 50.96567  | -114.13467 | 00:00:02:19       |
| 🏠 VK2AHB-7  | *        | 33.412    | 149.61282  | 00:00:31:52       |
| ✈ VK3KAW-10 | *        | -36.35933 | 147.12167  | 00:00:32:29       |
| ✈ VK3KAW-4  | *        | -36.35933 | 147.12166  | 00:00:32:44       |
| ✈ VK5ATN-6  | *        | -34.14182 | 138.42198  | 00:00:35:05       |
| 🚚 VK3BYD-15 | *        | -36.38333 | 146.39999  | 00:00:36:52       |
| 🏠 EA2AUK    | *        | 40.32783  | -1.09433   | 00:01:22:37       |
| 🏠 K1WY      | *        | 41.76233  | -72.72567  | 00:01:28:58       |
| 🚚 W2EOB     | *        | 43.275    | -77.7035   | 00:01:30:50       |
| 🏠 KG8CW     | *        | 44.62017  | -85.94167  | 00:01:33:05       |
| 📺 KB9VIC    | *        | 38.74     | -88.08983  | 00:01:36:01       |
| ✈ WA7DRE-10 | *        | 47.68583  | -117.458   | 00:01:41:01       |
| 🚚 SV2CPH    | *        | 40.30267  | 21.79017   | 00:02:49:27       |

Fig. 4

# ISS APRS RESULTS SUBSEQUENT PASS

- On a subsequent pass on another day, I was able to send an email thru ISS. The message was only “email thru ISS”.
- The received email is shown in Fig. 5.



Fig. 5

# ISS APRS RESULTS SUBSEQUENT PASS – CONT'D

- Fig. 6 is a list of Stations that communicated with the ISS on this pass.

Station List [Click here to see times in absolute UTC](#)

| Call                       | Messages | lat      | lon        | Age (dd:hh:mm:ss) |
|----------------------------|----------|----------|------------|-------------------|
| <a href="#">W0VEK-4</a>    | -        | 42.00367 | -91.67267  | 00:00:00:06       |
| <a href="#">KB6LTY-3</a>   | *        | 34.495   | -117.205   | 00:00:00:12       |
| <a href="#">RS0ISS</a>     | *        | 0.00533  | 0.16667    | 00:00:00:44       |
| <a href="#">KB9VIC-9</a>   | *        | 37.735   | -88.08333  | 00:00:00:49       |
| <a href="#">N9WWR</a>      | *        | 42.81733 | -87.817    | 00:00:01:04       |
| <a href="#">VE5VK-9</a>    | *        | 52.1705  | -106.61217 | 00:00:01:07       |
| <a href="#">K5DNA</a>      | *        | 35.11667 | -92.43667  | 00:00:01:23       |
| <a href="#">K7MT-6</a>     | *        | 46.64083 | -111.955   | 00:00:01:30       |
| <a href="#">W0JW-6</a>     | *        | 41.21056 | -93.83722  | 00:00:02:55       |
| <a href="#">KM6LYW</a>     | *        | 38.90883 | 120.93233  | 00:00:02:57       |
| <a href="#">W1VE6SYD-7</a> | *        | 50.96567 | -114.13467 | 00:00:03:02       |
| <a href="#">N1NCB-1</a>    | *        | 45.91683 | -69.90567  | 00:01:28:30       |
| WY4D                       | *        | -        | -          | 00:01:29:49       |
| <a href="#">K8YES-6</a>    | *        | 40.36683 | -80.53867  | 00:01:30:00       |
| <a href="#">KB1DGY</a>     | *        | 41.90067 | -72.1225   | 00:01:30:20       |
| <a href="#">W2EOB</a>      | *        | 43.275   | -77.7035   | 00:01:31:03       |
| <a href="#">KD1LV-7</a>    | *        | 42.39867 | -71.10883  | 00:01:31:54       |
| <a href="#">K1WY</a>       | *        | 41.76233 | -72.72567  | 00:01:32:09       |
| <a href="#">KG8CW</a>      | *        | 44.62017 | -85.94167  | 00:01:32:13       |
| <a href="#">W9QQ</a>       | *        | 34.136   | -83.75867  | 00:01:33:12       |
| KC4JGT                     | *        | -        | -          | 00:01:33:16       |
| <a href="#">AE0CJ-1</a>    | *        | 38.703   | -90.61667  | 00:01:35:23       |
| <a href="#">WA7DRE-10</a>  | *        | 47.68583 | -117.458   | 00:01:42:13       |

Fig. 6

# ISS APRS RESULTS SUBSEQUENT PASS – CONT'D

- Fig. 7 shows more information of the stations making contact and the message type. My contact with the ISS is circled and you can see to whom the email was sent to and its contents.

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00:00:01:07 : VE5VK-9]URQPRS,RS0ISS*,WIDE2-1,qAR,KC0000-6:~r@el N-/~"9m}146.640MHz Saskatoon DO62qe_4
00:00:01:14 : KB6LTY-3]CQ,RS0ISS*,qAO,N6BA-10:=3429.70N/11712.30W-@ KB DE CHRISTY DM14j1
00:00:01:21 : VE5VK-9]APY500,RS0ISS*,WIDE2-1,qAR,KO6KL-10::CQ :from Saskatoon thru the ISS {42
00:00:01:23 : K5DNA]APK003,RS0ISS*,qAR,KO6KL-10::K7MT-6 :QSL Bill fm EM35{32
00:00:01:30 : K7MT-6]APRS,RS0ISS*,DP0SNX,qAR,W0JW-6:=4638.45N/11157.30W`SGATE HELENA MT DN46 DR735 10W M2 EB {UISS54}
00:00:01:58 : KB9VIC-9]DH4TLZ,RS0ISS*,WIDE2-1,qAR,WA7DRE-10:~t]@1 @S\`KB9VIC EM58 OLNEY IL HOME OF WHITE SQUIRRELS_%
00:00:02:55 : W0JW-6]CQ,RS0ISS*,qAR,WA7DRE-10:=/9]=Y6gd`` B SATGATE EN31 73
00:00:02:57 : KM6LYW]AP7100,RS0ISS*,qAR,WA7DRE-10:=/9]=Y6gd`` B SATGATE EN31 73
00:00:03:02 : VE6SYD-7]APDR16,RS0ISS*,WIDE2-1,qAR,WA7DRE-10::EMAIL-2 :ve6syd@sjdeitch.com email thru iss {2
00:00:03:45 : RS0ISS]0P0PS2,APRSAT,qAR,WA7DRE-10:~v&@1 @SI]ARISS-International Space Station=
00:01:27:51 : RS0ISS]0P0PS2,APRSAT,qAR,VE2GQF-2:'v&@1 @SI]ARISS-International Space Station=
00:01:28:30 : N1NCB-1]APOT21,RS0ISS*,WIDE2-1,qAR,VE2GQF-2:/133618h4355.01N/06954.34W_328/000!W!/A=00007313.0V 63F
00:01:29:49 : WY4D]CQ,RS0ISS*,qAR,VE2GQF-2:CQ CQ CQ ( Live)
00:01:30:00 : KA8YES-6]CQ,RS0ISS*,qAR,KB3AWQ-10:=4022.01N/08032.32W-SatGate EN90ri emt31@emtchunks.net Hello Via ISS
00:01:30:20 : KB1DGY]APRS,RS0ISS*,qAR,KB3AWQ-10:=4154.04N/07207.35W-Hi from CT FN31wv
00:01:30:32 : N1NCB-1]APOT21,RS0ISS*,WIDE2-1,qAR,VE2GQF-2:/133416h4355.01N/06954.34W_313/000!W!/A=00007112.9V 63F
00:01:30:34 : WY4D]CQ,RS0ISS*,qAR,VE2GQF-2:CQ CQ CQ ( Live)
00:01:30:51 : RS0ISS]0P0PS2,APRSAT,qAO,KR4MTN-15:'v&@1 @SI]ARISS-International Space Station=
00:01:31:03 : W2EOB]TSQV5P,RS0ISS*,WIDE2-1,qAR,KB3AWQ-10:'iF11 @j/]"4g}w2eob@yahoo.com New York &
00:01:31:03 : W2EOB]TSQV5P,RS0ISS*,WIDE2-1,qAR,W0JW-6:'iF11 j/]"4g}w2eob@yahoo.com New York &
00:01:31:19 : WY4D]CQ,RS0ISS*,qAR,KB3AWQ-10:CQ CQ CQ ( Live)
00:01:31:23 : KB9VIC-9]APY400,RS0ISS*,WIDE2-1,qAR,VE2GQF-2::K8BCW :QSL MSG RCVD _EM58 OLNEY IL 73 NAME HR VIC {32
```

Fig. 7