Workshop
Iridium and other comms systems

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Questions

- **How can I get wireless comms at South Pole with 7 km range?**
- **How do I get Long Range WiFi?**

- **This solution may need frequency clearance from the spectrum manager**
  - **High power IEEE 802.11 WLAN**

    http://www.l-com.com/productfamily.aspx?id=6053
  - **Freewave Transceivers**
  - **WiMAX, WipLL**

- **Where can I get a low power computer (SBC)?**

- **This may depend on your definition of “low power”.**
  Technologics TS-7260
  http://www.embeddedarm.com/products/board-detail.php?product=TS-7260

- **Where can I get a Cold Weather Router?**
- **Technologics TS-7260 with Ethernet board**
- **Moxa**
  AWK-3121 or AWK-4121

- **How do I maximize traffic with 1 Access Point?**
- **Reliable inverse multiplexer for UAV ops?**
- **ARGOS Checksum?**

Iridium

- **How do I get started with Iridium?**
- **How do I link a Campbell Datalogger to Iridium?**

- **See later discussions**

- **Where can I find an Iridium Handbook?**
- **The basics start here**

- **Can I determine my location with Iridium?**

- **Yes.**

8.1 –MSGEO - Request Geolocation

Exec Command: -MSGEO

Query the geolocation grid code received from the network in the last Access Decision Notification message. The response is of the form:

-MSGEO: <x>,<y>,<z>,<time_stamp>

<x>, <y>, <z> is a geolocation grid code from an earth centered Cartesian coordinate system, using dimensions, x, y, and z, to specify location. The coordinate system is aligned such that the z-axis is aligned with the north and south poles, leaving the x-axis and y-axis to lie in the plane containing the equator. The axes are aligned such that at 0 degrees latitude and 0 degrees longitude, both y and z are zero and x is positive (x = +6376, representing the nominal earth radius in kilometres). Each dimension of the geolocation grid code is displayed in decimal form using units of kilometres. Each dimension of the geolocation grid code has a minimum value of –6376, a maximum value of +6376, and a resolution of 4.

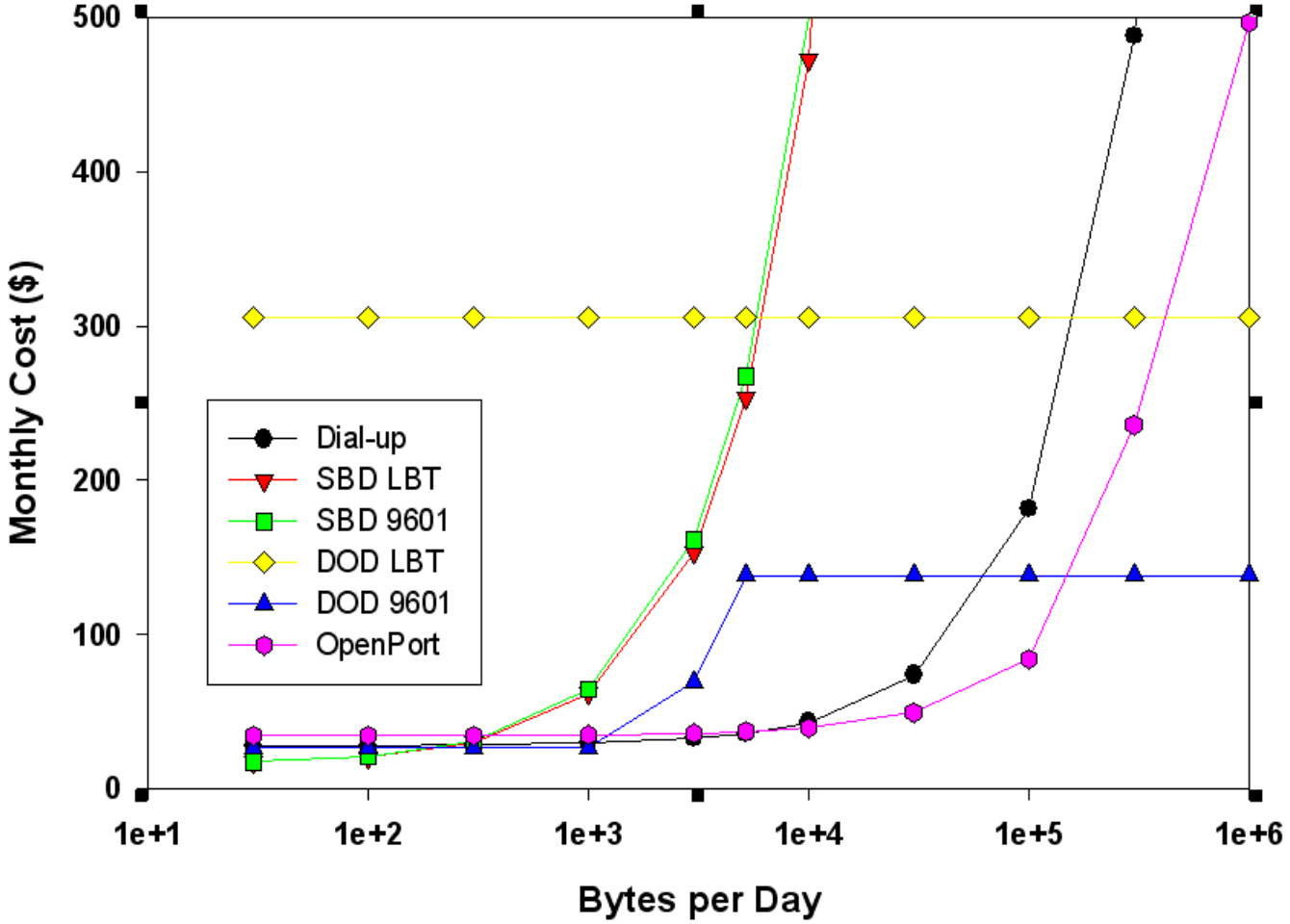
<time_stamp> is assigned by the ISU when the geolocation grid code received from the network is stored to ISU internal memory. Current Iridium system time, which is a running count of 90 millisecond intervals, is used for the time stamp. Time stamp is a 32-bit integer displayed in hexadecimal form.

- **Should I use SBD or Dialup?**

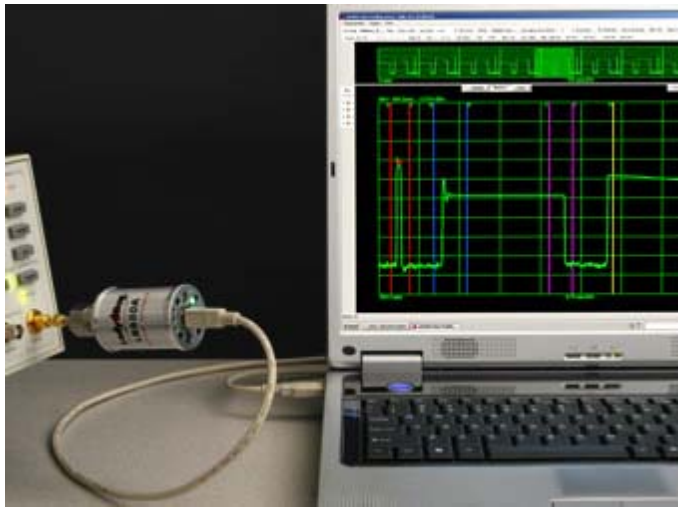
- **This depends on a number of factors:**
  - **Volume of data**
  - **Size of individual data records**
  - **Presence of computing power at Iridium location**
  - **Qualification for DOD SIM**
- **SBD for records < 340 or 1960 Bytes**
  - **Commercial SIM limited to 2 KB/day to equal DOD cost**
- **Dialup for > 1 kByte record size**

Iridium Service Cost Comparison

- **Assumes one report per day**

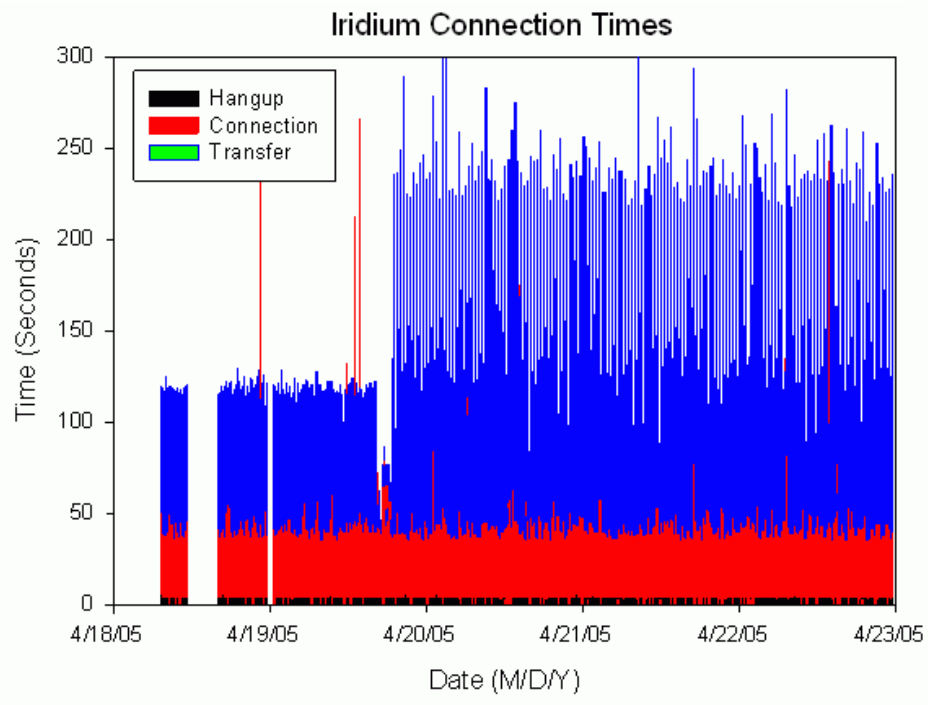


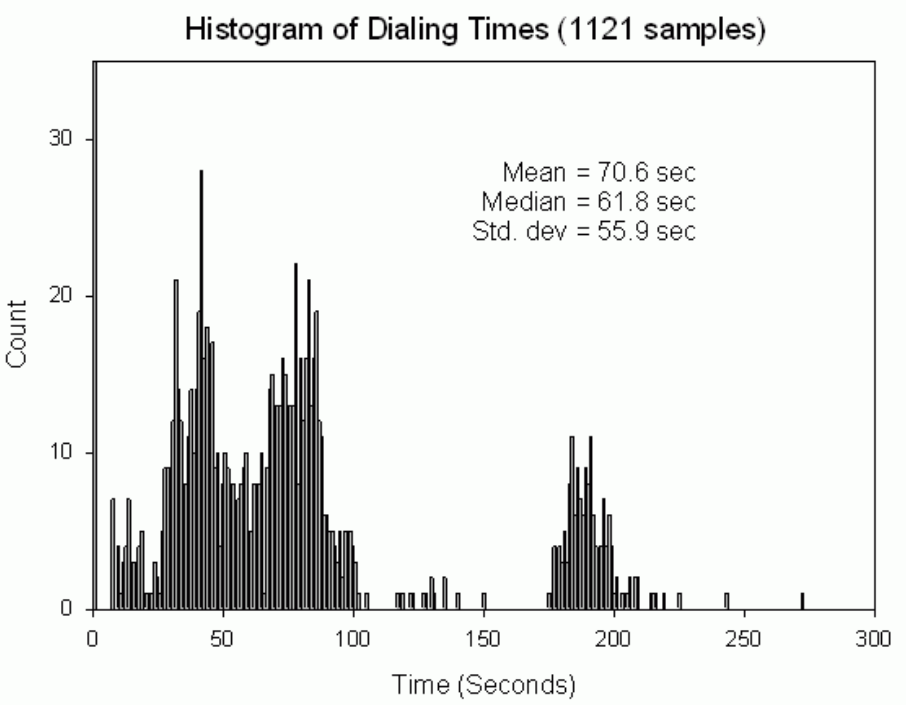
- **What's a cheap way to check an Iridium modem?**
- **An RF Diode Detector (properly impedance matched)**
- **A USB Power Detector**



- **A USB Spectrum Analyzer**

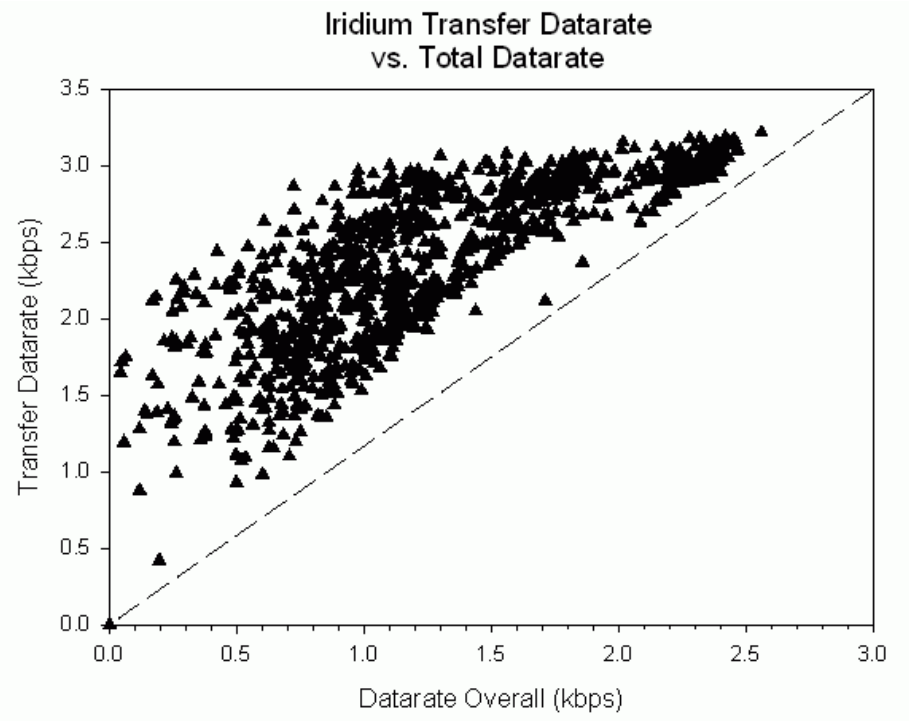
- **Can I minimize or control the latency of short data bursts on Dialup?**

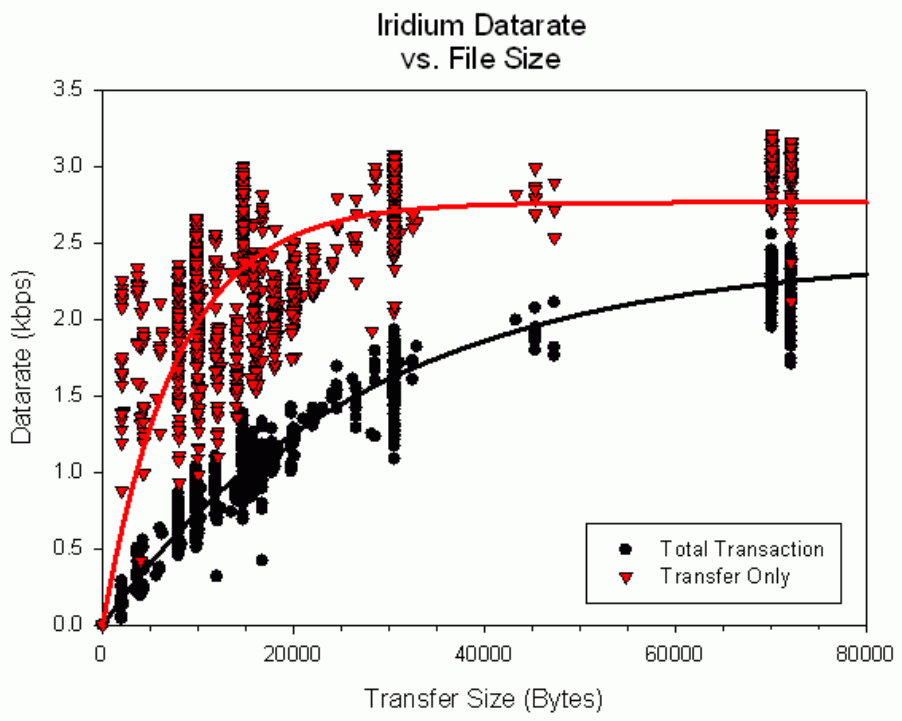




Iridium Comm. Parameters (Cont'd)

- **Dial-up connection time significantly impacts datarate**
- **"Flattening" at about 35 KB**

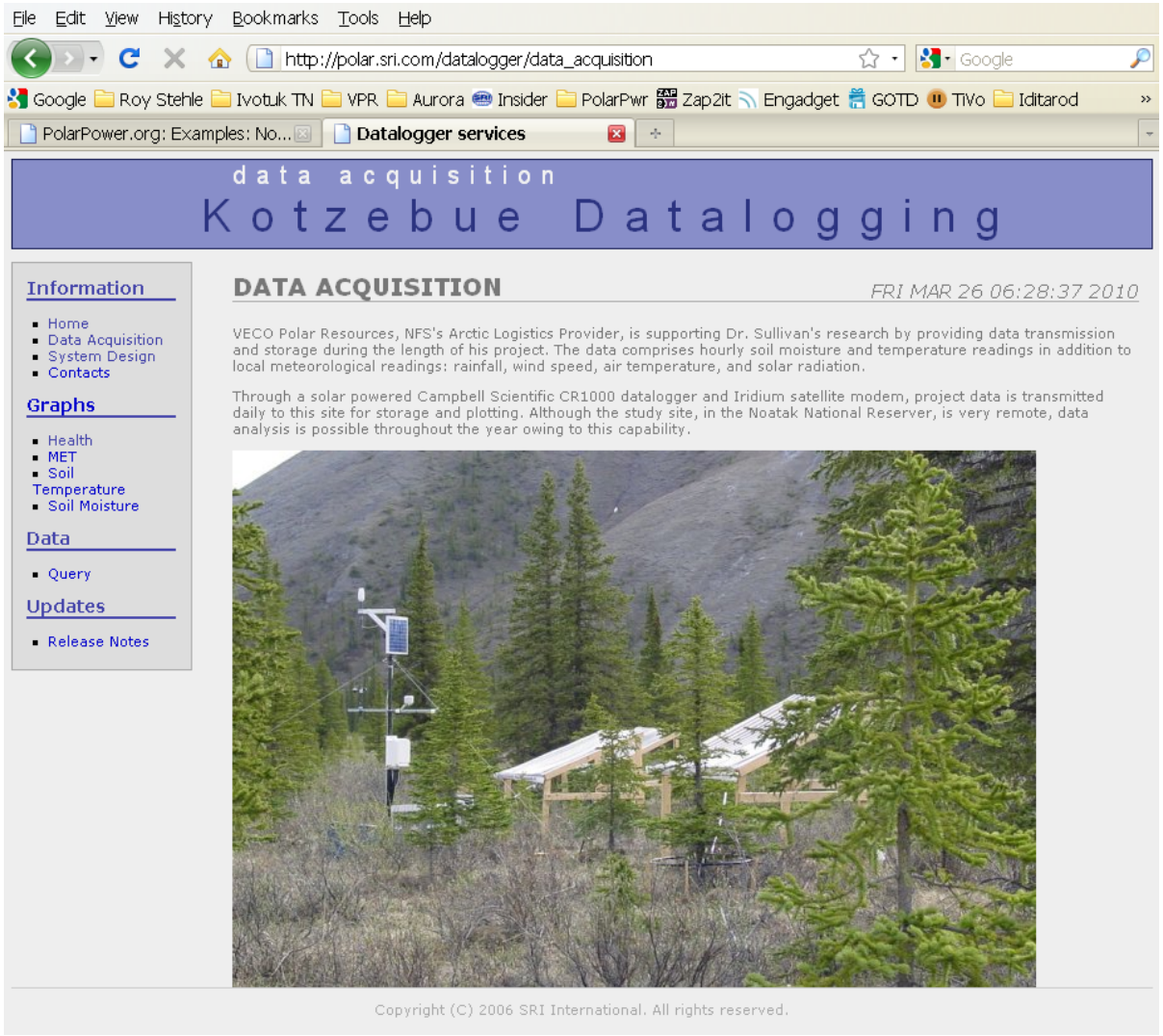




- **How do I increase bandwidth above 2400 bps?**

- **Bonded modems, which isn't cheap.**
- **OpenPort, which isn't cheap ($5K)**

Paddy Sullivan's Datalogger System



FAQS

Learning From Experience

Iridium – Dial-Up

Everyone Does Dial-Up – Remote Usage Reminder

- Disable "PIN" and "Call Forwarding" For Modem Use
- Power Cycle Modems Once / Week Or Sooner (Cures Many Evils)
- ALWAYS Dial-out Occasionally (Loss of Registration Issue Example)
- Use More Than One Communications Mode – Devices Can Be Concurrently Provisioned For: Dial-up, SBD, RUDICS, SMS, Etc.
- DoD SIMs and Commercial SIMs Do Not Talk To Each Other !!!
- Remember the Iridium Dial Plan – There Are Different Access Codes For NADP, 800#'S, Intl, Etc. (Iridium Is Country Code "8") 008-816-763-12345
- Be able To Reconfigure Remote Systems On-The-Fly (Epoch Change Example)
- Have Intelligent "Phone-Home" Algorithm – No Blind Dialing

Operational Suggestions

- 1) Upgrade to latest firmware
- 2) Up the voltage to 4.8 VDC
- 3) Grounding - ref wind generated static
- 4) Power supply grounding - insure common reference
- 5) Beware of power supplies with insufficient current - will run modem enough to respond to AT commands but not run the RF board satisfactorily
- 6) Use two stop bits

Operational Suggestions

- 7) Consider a non-hockey-puck style antenna
- 8) Use multi-channel technology if possible (router or Linux SBC which manages ML-PPP link consisting of several modems)
- 9) Eliminate ground station Iridium modem by using a government phone line of commercial SIM cards (beware of cost with commercial SIMs)
- 10) Insure Iridium to computer baud rate is identical at both sides - not supposed to make a difference but it does in some applications
- 11) Use Data-After-Voice (DAV) [AT+WDAV=1] for Iridium modem to Iridium modem comms (must always be set in the initialization string in both modems - modems will not save WDAV setting to memory)

Understand the Interface

- **Pin 1 is a sensitive toggle to power on/off for A3LA-X. It will only turn off power on earlier A3LA models.**
- **Understand that Power Ground may be isolated from Signal Ground**

PIN #	SIGNAL	DESCRIPTION	INTERFACE
1	EXT_ON_OFF	Power on/off control input	DC Power
2	+12VDC	Output Voltage to Power the DPL Handset	DC Power
3	EXT_GND	External GND input	DC Power
4	EXT_B+	External 4.0VDC – 32.0VDC input	DC Power
5	SPKR_AUD	Speaker audio output	Analog Audio
6	DA_TX	PCM digital audio output	Digital Audio
7	RI	RS232 Ring Indicate	RS232 Data
8	RTS	RS232 Request To Send	RS232 Data
9	S_TX	RS232 Transmit Data	RS232 Data
10	DCD	RS232 Data Carrier Detect	RS232 Data
11	DA_FS	PCM digital audio frame sync output	Digital Audio
12	DA_CLK	PCM digital 2.048MHz audio clock output	Digital Audio
13	S_RX	RS232 Receive Data	RS232 Data
14	SIGNAL GND	Signal ground, 0V signal reference and return	GND
15	MIC_AUD	Microphone audio input	Analog Audio
16	EXT_B+	External 4.0VDC – 32.0VDC input	DC Power
17	EXT_GND	External GND input	DC Power
18	DPL_TX	Digital Peripheral Link (DPL) data output	DPL UART
19	DTR	RS232 Data Terminal Ready	RS232 Data
20	DPL_RX	Digital Peripheral Link (DPL) data input	DPL UART
21	DSR	RS232 Data Set Ready	RS232 Data
22	CTS	RS232 Clear To Send	RS232 Data
23	SIGNAL GND	Signal ground, 0V signal reference and return	GND
24	DA_RX	PCM digital audio input	Digital Audio
25	SIGNAL GND	Signal ground, 0V signal reference and return	GND

Table 1. Pin assignment for the multi-interface connector.

Operational Suggestions

- **AT+CBST=71,0,1 Modem selection necessary for RUDICS**
- **LBT always Auto-bauds independent of interface setting**
- **DOD SIMs required paired Modems for commercial users (i.e., without .MIL domain connection)**
- **Always send the Initialization string(s) at each power-up or connection. This allows modem substitution without worrying about stored profiles.**
- **Use grounded antennas to reduce noise and damage from static buildup.**
- **NAL's MPT option can be more problematic than beneficial. It restricts baud rate to 19.2 kbps; imperfect logic corrupts data.**

Operational Suggestions

- **Large quiescent power dissipation is in DC-DC converter, which needs to supply large current surges on short notice.**

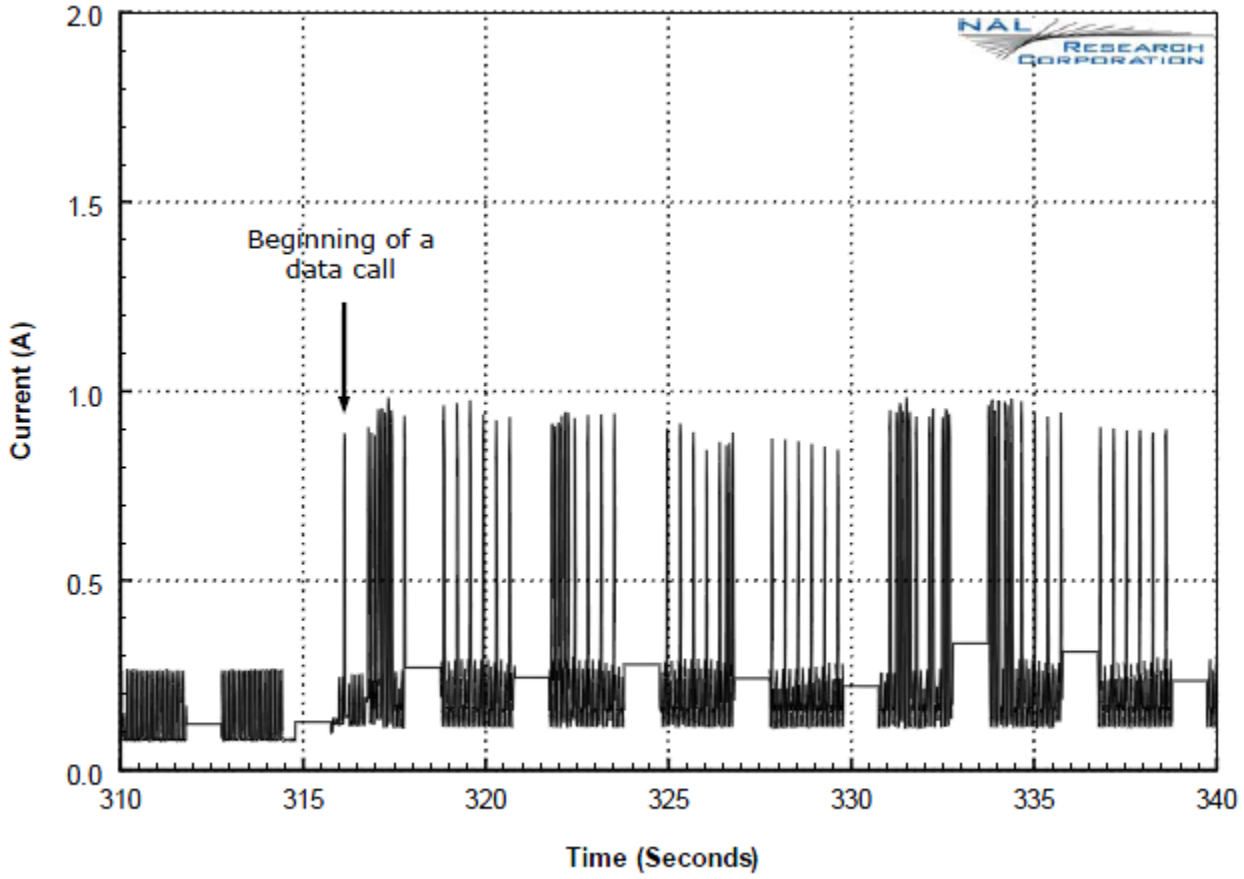


Figure 19. Average current drawn by model A3LA-D during dial-up connection at 9.0VDC input.

Operational Suggestions

- **Provide the best sky visibility to achieve reliable connectivity. Keep cable losses to a minimum.**
- **Each “Signal Bar” equals ~4 dB. (AT+CSQ)**
- **SBD transfers over 350 Bytes (9601) or 1980 Bytes (9522) add considerable message handling complexity.**