








Communications Hardware Used by UNAVCO in Polar Applications

Article Number: 507 | Rating: Unrated | Last Updated: Sat, Feb 27, 2016 at 1:31 AM

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Data Modems and Antennas

Component	Photo	Manufacturer	Description	Status
Mt. Erebus Serial Radio Repeater		FreeWave and Pacific Wireless TR-900H-120-12	Powered by solar panels and gel cell batteries. Allows data retrieval from remote sites to McMurdo Station and Scott Base. Covers 120 degree swath of Transantarctic Mountains from Cape Roberts to Minna Bluff.	Operational since 2004 at Mt. Erebus Truncated Cones site. Serves GPS stations at Mount Fleming (FLM5) and Cape Roberts (ROB4), and Cape Roberts Tide Gauge. Uses FreeWave serial radio modem and Pacific Wireless horizontally polarized sector antenna.
Serial Radio Modem		FreeWave	900 MHz line-of-sight serial communications, used for links over 100km, suited for sites near research stations (with on-site download computer). Average power draw is ~1.0 Watt.	Operational since 2000. Normally deployed with Yagi antennas. Communications tested successfully in Antarctica with Trimble R7 receiver. Currently deployed at Mount Fleming (FLM5) and Cape Roberts (ROB4) GPS stations, and Cape Roberts Tide Gauge (in conjunction with Land Information New Zealand).
Ethernet Bridge Radio Modem		Intuicom	900 MHz line-of-sight ethernet communications, used for links over 100km, suited for sites near research stations (internet access points). Average power draw is ~1.0 Watt.	Operational since 2004. Normally deployed with Yagi antennas. Communications tested successfully in Antarctica with Trimble NetRS receiver. Currently deployed in EarthScope PBO network, and Antarctic permanent stations CONZ, MACZ, COTE, and WAIS.
Yagi Antenna		Bluewave	900 MHz line-of-sight serial communications, used for links over 100km, suited for sites near research stations. 7-element 10dB model is typical, however antenna selection is site-specific.	Functional point-to-point radio link of 100 miles achieved with similar Yagi antenna (Mt. Fleming to Mt. Erebus repeater).
Iridium Data Modem (remote)		NAL Research A3LA-SA	Iridium allows up to 2400bps, suitable for GPS data downloads. Only communications system with global coverage, suited for the most remote sites where no other communications options are practical. Purchase with audio board disabled. Use SYN-DC-936 DC-DC power converter with serial connection and 20 gauge power wires. Average power draw is ~1.0 Watt when downloading ~1 MB data per day. Iridium modem is sensitive to antenna cable losses; keep overall cable loss between modem and antenna < 3dB.	Operational since 2005 with Trimble NetRS receiver. Currently deployed in 50+ locations in Antarctica and Greenland for POLENET project, UNAVCO/PASSCAL Remote Stations MRI project, and several other PI projects. At present, Iridium/NetRS system must incorporate a timer switch (see below).
Iridium Antenna (remote)		NAL Research SAF5350-A	Quad-helix design. Robust radome and mounting arrangement.	Replacement for SAF5350-C and SAF2040B; stronger design than SAF5350-C and better performance than SAF2040-B. Currently deployed at several test sites, to be installed in Greenland in 2009.
Iridium Data Modem (base)		NAL Research A3LA-MPT	Same as A3LA-SA but with larger case and internal watchdog programming to reboot modem in case of hardware lockup. Purchase	Robust and modular download software allows excellent data retrieval capability. Hub is expandable to download up to 150+

with audio board disabled. Use SAF5350C antenna, MTR2 antenna mount, and HRC-24-7A AC-DC power converter with serial connection.

remote sites.

ANCILLARY EQUIPMENT

Component	Photo	Manufacturer	Part Number	Description	Why?
Timer Switch		ABB	ESDR125A5P ESDR125A1P	Solid state 12VDC timer switch. ON/OFF duty cycle easily varied using onboard dials. 10-1000 minutes for ON cycle. 10-1000 minutes OFF cycle (ESDR125A5P) or 1-100 seconds OFF cycle (ESDR125A1P). Timer switches positive lead. Use Diversitech flag disconnects FD222 and FD212, and piggyback disconnect DS22 to attach wires to timer. Power draw is < 0.1 Watt. Timer introduces < 0.1 Volt drop in power line to Iridium modem. Manufacturer specs [PDF]	Reliable timer is necessary to maintain communications with NetRS/Iridium remote stations, since the modems require periodic power cycling to recover from an internal bug. This timer replaces RS1A44/RS1A42 models that switched the negative lead.
Serial Port Surge Protector		APC	PS9-DTE	Inline surge protector for serial communication lines. Attaches to GPS receiver serial ports, used with Iridium modems and weather station.	Passive component. Mitigates serial comms problems and failures due to static buildup.
RF adapter		Newark	92C7272	SMA plug - TNC jack adapter, Amphenol P/N 242124, for Iridium A3LA-SA modem.	
External Comms Cables		RPC Manufacturing Solutions	Iridium antenna: PPS-RF-001 revC Radio antenna: PPS-RF-002 revC	14 ft. cable assemblies to connect comms antenna to TNC bulkhead connector on wall of enclosure. Connectors are TNC male to TNC male (for Iridium antenna) or TNC male to N male (for Yagi or similar antenna). Iridium modem is sensitive to antenna cable losses; keep overall cable loss between modem and antenna < 3dB.	Low-loss Times Microwave LMR400 cable, tested flexible to -40C.
Internal Comms Cables		RPC Manufacturing Solutions	Iridium modem: PPS-RF-003 revC Radio modem: PPS-RF-004 revD	3 ft. cable assemblies to connect modem to TNC bulkhead connector. Connectors are TNC male to TNC male (Iridium modem) or TNC male to N male (radio modem) crimp-on connectors.	
Comms Bulkhead Connector		Pasternack	PE9154	TNC-TNC thru bulkhead connector is pass-thru for comms antenna cable on enclosure wall.	Has gasket seal.
RF Grounding Plate		UNAVCO	PPS-EN-012 revA	TNC-TNC and N-N bulkhead connectors screw into this plate. Also holds 5/16-18 zinc-plated bolt with locknut to accept ground wire to system common.	This plate electrically connects the Iridium antenna shield and modem body to electrical ground. Intended to improve system grounding and reduce static-induced problems.

Posted by: [Beth Bartel](#) - Tue, Oct 27, 2009 at 6:46 PM. This article has been viewed 5577 times.

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