UNAVCO Polar Support

Thomas Nylen – PTC 2020
RESOLUTE POLAR

The world’s best geodetic grade receiver specifically designed for polar environments

With built-in micro heaters and Iridium telemetry, the Resolute Polar is designed to withstand the harshest conditions of the polar region. The low power of the Resolute and embedded data handling algorithms ensure the Resolute survives the dark and cold days of the polar winter.

FEATURES
- L1, L2, L5, All constellations
- Less than 1.2 Watts Typical
- Included Iridium RUDICS and SBD
- 1 x 8 GB and 1 x 4 GB microSD Cards
- Ethernet Interface
- Compressed Data Formats
- Small 6” x 6” x 3” Form Factor
- -55°C to +60°C
- Compatible with XeosOnline™ Tunnel

TELEMETRY OPTIONS
- Iridium
- Cellular
- Ethernet

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Matrice 600 Pro

- Direct georeferencing with onboard Septentrio AsteRx-M2 which can utilize any base station that is recording RINEX. GPS is outside of the flight controller and all raw data can be easily post processed.
- Max payload of 5.5 KG
- Capable of carrying RGB cameras as well as smaller multispectral + thermal. Also can handle larger payloads such as lidar and hyperspectral.
- Max flight time 38 minutes (no payload) 18 minutes (full payload)

Matrice 210RTK

- Direct georeferencing, but requires DJI proprietary base station. GPS is built into the flight controller and not user accessible for many post processing tasks.
- Max payload of 1 KG
- Capable of carrying RGB cameras as well as smaller multispectral + thermal.
- Onboard ADS-B allows visual warning on the UAS pilots controller of aircraft in the vicinity as well as advanced warning of aircraft on trajectory to the UAS.
- Max flight time 32 minutes (no payload) 24 minutes (full payload)
UNAVCO Polar Supported Sites

Total Number of Sites = 140

Resolute Polar = 60
   RUDICS = 58
   EB-1 Radio = 2

NetRS/R9 + XI100B RUDICS = 38

NetRS/R9 + 9522B Dial-up = 10

NetR9/PolaRx5 + EB-1 Radio = 16

NetR8/9/PolaRx5 on local networks = 14
Charge Voltages for Deka Gel Cell Batteries

- Deka: charge (maximum)
- Deka: charge (opt.) or float (max.)
- Deka: float (optimal)
- Flexcharge: peak charge, UNAVCO (old)
- Flexcharge: peak charge, UNAVCO (new)
- Flexcharge Standard
KMJP - Battery Banks Capacity [%] and Voltage @ Latitude 84° North

- Capacity % with the # Batteries = 24
- Max Voltage
- Min Voltage
- KMJP Average
- KMJP Max
- KMJP Min

Days Not Powered (Voltage < 11.25) = 0
Min. Capacity = 32%
Load = 5.0W
Min. Air Temp = -25°C
KMJP - Battery Banks Capacity [%] and Voltage @ Latitude 84°North

- Capacity % with the # Batteries = 24
- Max Voltage
- Min Voltage
- KMJP Average
- KMJP Max
- KMJP Min

- Days Not Powered (Voltage < 11.25) = 0
- Min. Capacity = 60%
- Load = 3.0W
- Min. Air Temp = -25°C
HOWE - Battery Banks Capacity [%] and Voltage @ Latitude 87°South

- Days Not Powered (Voltage < 11 or 11.25) = 0
- Min. Capacity = 8%

Load = 5.0W
Min. Air Temp = -40°C

Capacity % with the # Batteries = 22
Max Voltage
Min Voltage
HOWE Average
HOWE Max
HOWE Min
Regressions (p-value: < 2.2e-16)
$d$Volt $\sim$ $d$Capacity%: Multiple $R^2$: 0.84
$d$Volt $\sim$ $d$Temp: Multiple $R^2$: 0.54
$d$Volt $\sim$ $d$Temp + $d$Capacity%: $R^2$: 0.96
HOWE - Battery Banks Capacity [%] and Voltage @ Latitude 87° South

Load = 2.3W
Min. Air Temp = -40°C

- Days Not Powered (Voltage < 11 or 11.25) = 0
- Min. Capacity = 59%
HOWE - Battery Banks Capacity [%] and Voltage @ Latitude 87° South

- Capacity % with the # Batteries = 16
- Max Voltage
- Min Voltage
- HOWE Average
- HOWE Max
- HOWE Min

Days Not Powered (Voltage < 11 or 11.25) = 0
Min. Air Temp = -40°C
Min. Capacity = 43%
Load = 2.3W
**HOWE - Battery Banks Capacity [%] and Voltage @ Latitude 87° South**

- Capacity % with the # Batteries = 14
- Max Voltage
- Min Voltage
- HOWE Average
- HOWE Max
- HOWE Min

- Days Not Powered (Voltage < 11 or 11.25) = 0
- Min. Capacity = 42%

Load = 2.3W
Min. Air Temp = -30°C
HOWE - Battery Banks Capacity [%] and Voltage @ Latitude 87°South

- Days Not Powered (Voltage < 11 or 11.25) = 0
- Min. Capacity = 41%
- Load = 1.5W
- Min. Average Air Temp = -30°C
WLLZ - Battery Banks Capacity [%] and Voltage @ Latitude 78° South

- Capacity % with the # Batteries = 6
- Max Volt
- Min Volt
- WLLZ Average Volt
- WLLZ Max Volt
- WLLZ Min Volt

- Days Not Powered (Voltage < 11 or 11.25) = 0
- Min. Capacity = 19%
- Load = 1.9W
- Min. Average Air Temp = -25°C
GPS-Interferometric Reflectometry (GPS-IR)

A new way to measure snow accumulation using GPS

GPS-IR measures the distance between the antenna phase center and the top of snow/ice surface.

GPS vertical coordinates measure the length of the pole and the motion of the base with respect to the Earth’s center.
FOS1 - Battery Banks Capacity [%] and Voltage @ Latitude 71° South

- Load = 1.4W
- Min. Air Temp = -20°C
- Days Not Powered (Voltage < 11 or 11.25) = 0
- Min. Capacity = 40%
Conclusions for planning and maintaining power systems

• Know the site environment, i.e. temps, snowfall, obstructions etc.
• Know the power requirements of the system
• Adjust the charging system to match the battery specifications
• Install a low voltage disconnect to protect the batteries
• Test the batteries in the field, if possible.