DATALOGGERS

SUCCESSES AND COMMON PROBLEMS

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Qantix Q8

Obsidian

Q330S+

DATALOGGERS AT THE PNSN

Active in Network

- Q330, Q330S+, Q330HR
- TitanSMA
- Centaur6
- Etna2, Obsidian, Obsidian 4x

Testing/Demo

- Q8
- Guralp Minimus Lite(on Loan)

Portable/RDK

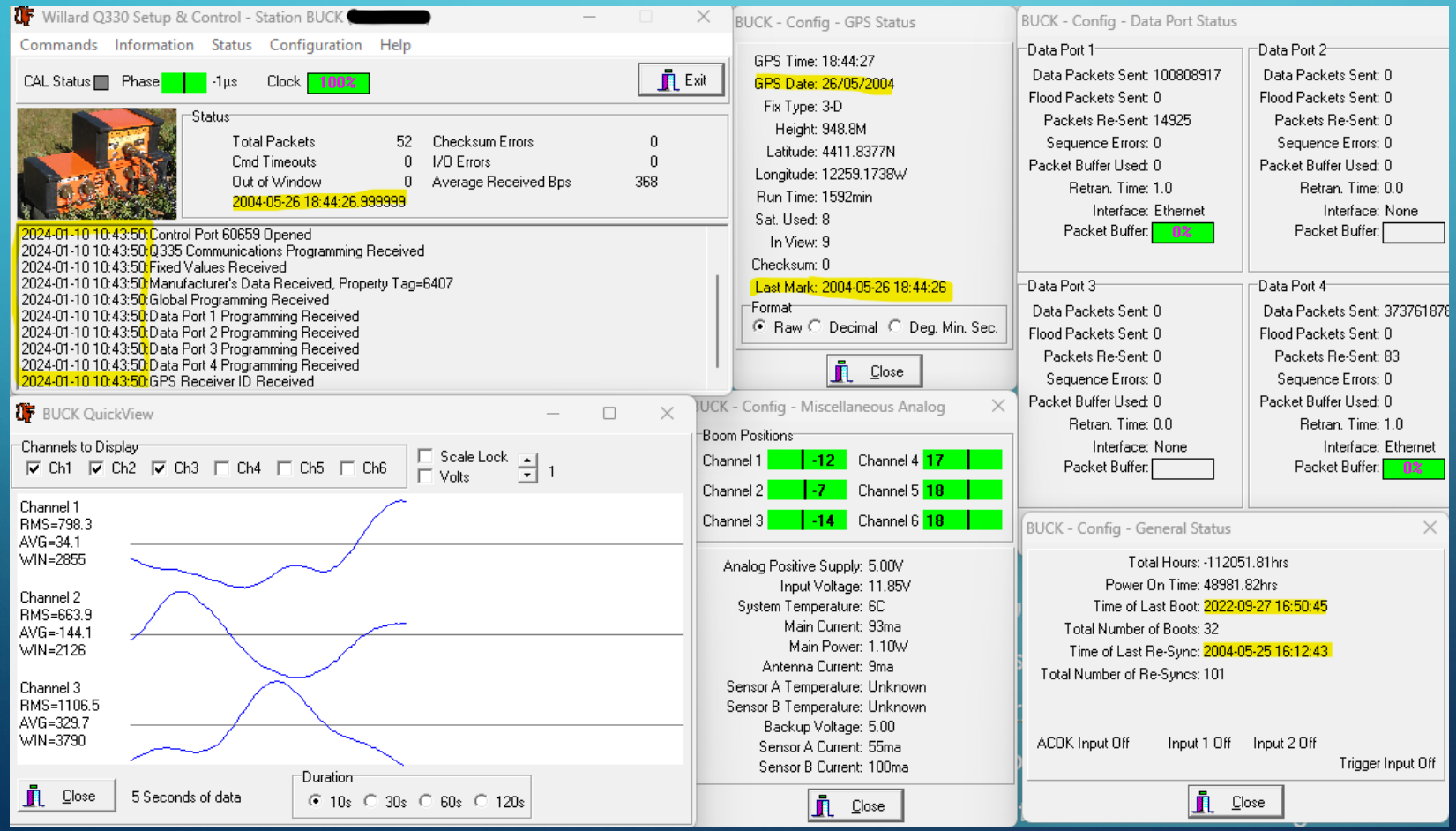
- RT130

Q330 FAMILY

Problems/Issues

- Starting in August 2023 the most common problem we have faced with the S+ is the GPS rollover. Several of our stations started dropping off in BUD monitor and SNW(SeisNetWatch) due to the GPS almanac being cleared. This was caused by a lengthy power failure and/or GPS Cold Start. Initially the cause was not apparent until we looked at the time stamps of the data packets. Within Willard, everything looked normal except in one location, the GPS status. The user messages showed the correct date/time but the GPS status showed Jan 1st 2004. Firmware and documentation available on the q330 website was a bit misleading and vague when it came to the S+, what seemed to be good to update the Baler, did not fix the GPS issue. Kinemetrics support was alerted to the issue and began working on a fix. Early October they had a new Baler update that would indeed fix this issue.

Q330 FAMILY


Willard Q330 Setup & Control - Station BUCK [redacted]
Commands Information Status Configuration Help
CAL Status Phase -1µs Clock 100%
Exit
Status
Total Packets 52
Cmd Timeouts 0
Out of Window 0
2004-05-26 18:44:26.999999
Checksum Errors 0
I/O Errors 0
Average Received Bps 368
2024-01-10 10:43:50:Control Port 60659 Opened
2024-01-10 10:43:50:Q335 Communications Programming Received
2024-01-10 10:43:50:Fixed Values Received
2024-01-10 10:43:50:Manufacturer's Data Received, Property Tag=6407
2024-01-10 10:43:50:Global Programming Received
2024-01-10 10:43:50:Data Port 1 Programming Received
2024-01-10 10:43:50:Data Port 2 Programming Received
2024-01-10 10:43:50:Data Port 3 Programming Received
2024-01-10 10:43:50:Data Port 4 Programming Received
2024-01-10 10:43:50:GPS Receiver ID Received
BUCK - Config - GPS Status
GPS Time: 18:44:27
GPS Date: 26/05/2004
Fix Type: 3-D
Height: 948.8M
Latitude: 4411.8377N
Longitude: 12259.1738W
Run Time: 1592min
Sat. Used: 8
In View: 9
Checksum: 0
Last Mark: 2004-05-26 18:44:26
Format
Raw Decimal Deg. Min. Sec.
Close
BUCK - Config - Data Port Status
Data Port 1
Data Packets Sent: 100808917
Flood Packets Sent: 0
Packets Re-Sent: 14925
Sequence Errors: 0
Packet Buffer Used: 0
Retran. Time: 1.0
Interface: Ethernet
Packet Buffer: 0%
Data Port 2
Data Packets Sent: 0
Flood Packets Sent: 0
Packets Re-Sent: 0
Sequence Errors: 0
Packet Buffer Used: 0
Retran. Time: 0.0
Interface: None
Packet Buffer:
Data Port 3
Data Packets Sent: 0
Flood Packets Sent: 0
Packets Re-Sent: 0
Sequence Errors: 0
Packet Buffer Used: 0
Retran. Time: 0.0
Interface: None
Packet Buffer:
Data Port 4
Data Packets Sent: 373761878
Flood Packets Sent: 0
Packets Re-Sent: 83
Sequence Errors: 0
Packet Buffer Used: 0
Retran. Time: 1.0
Interface: Ethernet
Packet Buffer: 0%
BUCK QuickView
Channels to Display
Ch1 Ch2 Ch3 Ch4 Ch5 Ch6
Scale Lock
Volts
1
Channel 1
RMS=798.3
AVG=34.1
WIN=2855
Channel 2
RMS=663.9
AVG=-144.1
WIN=2126
Channel 3
RMS=1106.5
AVG=329.7
WIN=3790
Close
5 Seconds of data
Duration
10s 30s 60s 120s
BUCK - Config - Miscellaneous Analog
Boom Positions
Channel 1 -12
Channel 2 -7
Channel 3 -14
Channel 4 17
Channel 5 18
Channel 6 18
Analog Positive Supply: 5.00V
Input Voltage: 11.85V
System Temperature: 6C
Main Current: 93ma
Main Power: 1.10W
Antenna Current: 9ma
Sensor A Temperature: Unknown
Sensor B Temperature: Unknown
Backup Voltage: 5.00
Sensor A Current: 55ma
Sensor B Current: 100ma
Close
BUCK - Config - General Status
Total Hours: -112051.81hrs
Power On Time: 48981.82hrs
Time of Last Boot: 2022-09-27 16:50:45
Total Number of Boots: 32
Time of Last Re-Sync: 2004-05-25 16:12:43
Total Number of Re-Syncs: 101
ACOK Input Off
Input 1 Off
Input 2 Off
Trigger Input Off
Close

Q330 FAMILY

- The second part relating to this particular issue is the failure of the USB thumbdrives that came with these loggers. We received SanDisk Cruzer Glide 64GB sticks. They had a manufactured date of 2016 on them. What I started to see as part of the Update upload was that multiple units thumbdrives were inaccessible. In normal operation the data recorded on these would overwrite older data when usage reached 95%. On these older sticks though, they would essentially ignore that limit and fill completely to 100% and then become unmountable and inaccessible. The only real solution is to conduct a site visit and replace them with the new software package present on the new thumbdrive. This has become an inconvenient task as we approached Winter and plenty of our Q330S+ sites can become inaccessible due to weather in higher elevation locations. We currently have 55 Q330S+ sites in network. We are currently replacing all thumbdrives with 2 x 256GB sticks to hopefully stem off any future issues.

Q330 FAMILY

- When multiple Q330S+ sites lose telemetry, once telemetry has been reestablished, we have had a few moments in history of network flooding causing bottlenecking and problems downstream for anything on the same network i.e. RingToCoax(Import server side) -> CoaxToRing(export server side) until it has completed backfilling. We are currently working on setting limits on the Q330S+ itself to mitigate this issue.

Q330 FAMILY

- Is sensitive to power source. We use MPPT 15L and/or Meanwell NPF-60-24 and these S+ really don't like to operate without a 12V Out voltage regulator, the CUI PYB10 DC-DC converter. We do use these regulators to clean up the power for all of our sites.
- Configuration of these data loggers can be daunting in comparison to other data loggers

Q330 FAMILY

Successes

- Overall, a robust logger with very little to worry about once installed and configured
- Ideal for low bandwidth applications using Willard(client side) instead of a web interface hosted on server side
- Many have been operating for years without any significant issues

CENTAUR6 AND TITANSMA

Issues/Problems

- Our biggest issues with these have been the higher bandwidth need. Until a couple years ago when Nanometrics put out a client-side Web Utility that can be hosted on your own machine utilizing ssh to import data, the ability to effectively troubleshoot and maintain these instruments in limited bandwidth or poor telemetry locations was challenging considering most documentation and usage involved utilizing the GUI. There are CLI ways to do certain things, like loading new config, FW, reformatting SD card, general troubleshooting, etc.

CENTAUR6 AND TITANSMA

- We have also had a few units that have had the GPS module fail. However some I was able to fix with GPS updates, others needed to be RMA'd. With newer FW updates, an interesting issue did arise where it would completely delete the baud-rate.conf file from the /var/nanometrics/timing folder which was necessary to issue a reset_trimble_gps_engine command or the upgrade_trimble_smt360.sh command. The file is small, one line stating gpsBaudRate=9600 but it did throw in an unforeseen twist into troubleshooting and fix actions.

CENTAUR6 AND TITANSMA

- Internal CF cards: This issue has mostly reared it's ugly head with TitanSMA's but we have had a few Centaurs also plagued with this issue. Nanometrics had stated in a dialogue with me a few years back about their older units were manufactured with a CF card slot that could become unrecognized by the system or faulty and since then have corrected the issue in production. If the slot was not defective, the CF cards did still begin to fail and would result in the need to disassemble it to get access to the CF card to replace it. It is a somewhat simple/straightforward process however time consuming and a delicate touch is needed as there are fragile buttons and components to be careful with.

CENTAUR6 AND TITANSMA

- With every FW update we have uncovered bugs or unexpected behavior along the way, most recently the 4.8.5 and 4.9.2 update that added OpenVPN and SNMP has had a few hiccups that took some time to see. With the SNMP portion, all appeared fine, but after a varied amount of time anywhere between 30 – 200+ days of uptime SNMP would just stop working altogether with the only fix action being a reboot. As for the OpenVPN, auto deletion of it's config files has occurred however Alexey Chernyshov has been working diligently with Nanometrics engineers to try and get that issue sorted out. Another issue that has long since been resolved from early FW versions is the addition, removal or renaming of modules within the config that would cause a reboot loop if an older config was loaded onto the logger. This caused us to continuously create brand new templates with every update. Most of these issues in this bullet point are present in the TitanSMA

CENTAUR6 AND TITANSMA

- An older bug that is hard/near impossible to replicate and rarely decides to pop up now and then has been one that in a rare set of circumstances and conditions, the Internal Storage would fill up, the External SD card would fill up, and then it would attempt to write to Memory and stop data flow altogether as well as corrupt the FW and/or Config. We did see this on several units and the fix was to do a reformat of the internal, external, reload the FW and config. Despite efforts to attempt to sleuth out this bug with Nanometrics help, we couldn't replicate it in shop and thus have essentially coughed it up to a "Ghost in the Machine" type of anamoly. I believe we have had roughly 3-5 instances of this issue come up over the past 7+ yrs.

CENTAUR6 AND TITANSMA

Successes

- User friendly interface and configuration options
- Easy to install, compact unit
- Reliable instrument
- Customer/Tech support excellent and quick response
- Manufacturer willingness to implement customer feedback and suggestions into future updates
- These are the majority of data loggers the PNSN has deployed. We have a total of 508 Centaurs and TitanSMA's, 402 of them are currently installed out of 803 total active sites.

CENTAUR6 AND TITANSMA

- Useful Nanometrics commands
  - Repairing a SD card

```
appman --wait stop apollo
/usr/bin/nanometrics/media_card_tool repair /dev/mmcblk0
appman start apollo
```

  - Checking and repairing Internal Storage faults

```
/usr/bin/nanometrics/cf_flag status
```

If this command returns an error, then run:

```
/usr/bin/nanometrics/cf_flag reset
init 6
```

```
dmesg | grep ata1
```

This command should return:

```
CFA: Delkin Devices CE08TFPHK-FD000-D, 101130, max PIO6
```

  - Formatting Internal SD Card

```
appman --wait=90 stop all
/etc/init.d/syslog stop
umount /media/internal-physical
/usr/bin/nanometrics/test/format-internal-media.sh
init 6
```

CENTAUR6 AND TITANSMA

- Removing Old Config

```
root@titanSMA-0537:/# appman --wait stop apollo
root@titanSMA-0537:/# rm -rf /etc/nanometrics/config
root@titanSMA-0537:/# appman start apollo
```

- Resetting the GNSS receiver

  NOTE - in the event you see an error message saying GPS Update Needed on the main page run these commands via ssh

  date

  Run this command to test the GNSS receiver:

```
date +'%FT%T' && /usr/bin/nanometrics/test/reset_trimble_gps_engine >/dev/null && sleep 10 && tail -10 /var/log/syslog
```

  If this does not fix the issue, the upgrade command should fix it

```
echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
/usr/bin/nanometrics/upgrade_trimble_smt360.sh --default
Reboot
```

  This also requires that the baud-rate.conf file is present in the /var/nanometrics/timing directory. We have noticed this goes missing through some regular FW updates. This file is one line, gpsBaudRate=9600.

CENTAUR6 AND TITANSMA

- Installing the Firmware via command line

  TitanSMA Command Line Upgrade Instructions

  These instructions use titanSMA and version 4.8.5 as an example.

  1) Use SSH (or a serial port) to log in as root

  2) Remove all previous packages and deploy files

```
rm /var/upgrader/packages/titanSMA/*
rm /var/upgrader/deploy/titanSMA/*
```

  3) Transfer the firmware package (e.g. with Filezilla (port 22) or command-line SSH based utilities like rsync or scp) the following directory location:

```
/var/upgrader/packages/titanSMA/
```

  Rsync is very efficient for copying and syncing large files over poor unstable links, as it uses special algorithm to minimize bandwidth usage by only copying the portions of files that have changed (so called deltas), as well as preserving partially transferred files on destination if it gets disconnected and interrupted. On the flipside, the abundance of options makes it less simple than scp, and you need to be careful with the syntax. Just like scp, it uses SSH protocol to connect, so SSH key can be used in the same way if needed.

  4) Extract package and move to deploy folder (this is a single command line)

```
tar xvzf /var/upgrader/packages/titanSMA/titanSMA-release-4.8.5.tgz
--strip-components=1 -C /var/upgrader/deploy/titanSMA
```

  5) Execute install script

```
cd /var/upgrader/deploy/titanSMA/ && ./titanSMA_install.sh
```

  6) Change directory and run testcode script (this will reboot the unit)

```
cd /var/upgrader/scripts/titanSMA/ && ./testcode.sh
```

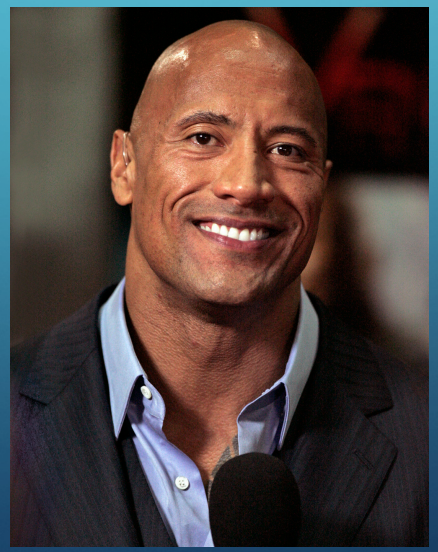
  7) Set default (need to login again as root)

```
cd /var/upgrader/scripts/titanSMA/ && ./setdefault.sh
```

ROCK FAMILY

Issues/Problems

- One of the biggest issues we have with these units is the fact that it puts the Password in plain text into the URL or CLI when you attempt to change the PW for any reason. This is something that is avoided remotely or connected to the internet in any way. The security aspect of this is worrisome.



ROCK FAMILY

- There have been many instances where the internal SD/CF card in these units have failed or have been corrupted and thus replacement of the card is necessary. If prepped ahead of time it is an easy swap, but occasionally this is not feasible. If the card is salvageable you can perform a re-image of the SD/CF card. However this is a much more in depth and lengthy process, but the How-To is included with the KMI Re-image tool.

ROCK FAMILY

- In the past the GUI utilized Java Applets which were deemed a risk by all browsers and has since banned their use. There was a workaround for a short period of time utilizing Mozilla based browsers that were intentionally left out of date, but eventually those too also became unusable and the only way to make changes was to use the CLI to upload new configs or update FW. Eventually KMI did update the FW to remove Java Applets.

ROCK FAMILY

- In comparison to other Manufacturers, FW updates were few and far in between for years. Recently KMI has been pushing updates out more regularly with enhanced features as well as GUI aesthetics and have been more receptive to customer needs with additional features.

ROCK FAMILY

- We have also experienced an issue with losing the ability to communicate. Logging in locally does not always show there is an issue however there is when trying to log in remotely. Typically this is a sign of corrupted FW and the fix action is to re-image the internal card. A rarer instance is that it ends up turning off the eth0 port altogether. We have not determined why this happens but the fix action is the same, eth0 up and re-image.

ROCK FAMILY

- Loading all the ancillary modules is necessary prior to loading in a config. We utilize the ISTI software RockToSlink module and previously RockToEW module. Our config was setup to use one or the other and without those modules installed the instrument would go into a reboot loop if you loaded the config first. You had to serially connect to it and quickly issue a Halt command in order to freeze it and wipe the config to restore function.
- This leads into another point, the additional setup steps for these instruments in comparison to others. Netconfig, Linux FW update, Rockhound update, telnet -> DEFDECK(for internal epi loggers), ISTI software, upload config, fsunlock ->setallpasswds(previous FW versions had to set all 5 manually) -> fslock, rhsave, then you could finally log in to the GUI and begin the site specific changes to the config. A TitanSMA for example is FW update, upload config, change pw in GUI and the 2 CLI passwords, site specific config changes.

ROCK FAMILY

Successes

- One particular instance that we use these over others is with BPA(Bonneville Power Administration) sites. We are on very limited bandwidth at these sites utilizing Serial-Ethernet Digi Terminal Servers with the iMacs system that leaves us with 1990's style of internet around 14.4k-28.8kbps on their fiber backbone. Unfortunately, there is no current plan to upgrade this telemetry system for us. We have attempted to use TitanSMA's at these sites and the latency was a gradual increase over days that within 2-4 weeks the instrument would fall back to ~4+ days behind. Replacing them with Etna2's or Obsidians alleviated this as they do use a lower bandwidth along with the use of 128 byte SLrecord sizes instead of default 512 to send real time data.

ROCK FAMILY

- These units were much more suited for advanced telemetry needs as they do come with OpenVPN and other internal lite firewall options in comparison to others, but Nanometrics has recently put out FW updates that does include OpenVPN and other VPN utilities.

ROCK FAMILY

- With Obsidians(and retired Basalts) the 4th channel is available unlike other SM instruments in our inventory.
- Easier to work on internally if something needs to be replaced or fixed.
- Multiple version of the Obsidian, some with and some without internal SM sensor allowing variety and configurability of the site to place a sensor in a vault rather than a shelter. This is nice to eliminate excess environmental noise created by the shelter structure, especially in windier locations.

GURALP MINIMUS$_2$/LITE

Issues/problems

- Steep learning curve in comparison to other instruments. This can also be a success due to just how much you can configure with this instrument, but starting off it can be daunting and a bit confusing.
- The GPS is a proprietary connector infused with their GPS antenna which does not allow for customized site designs. Although Guralp has mentioned that they may be willing to create an adapter/dongle for this if the need arises.

GURALP MINIMUS$_2$/LITE

- I have noticed a few issues I wasn't particularly thrilled about with configuring these, one being that in order to change the default, you must check mark a box to allow for changes but also need to leave it checked to keep them. Intuitively one would uncheck the box after editing to "Save" their changes but instead this unit just reverts it back to default even after you Submit the changes and it does a reboot to save.

GURALP MINIMUS$_2$/LITE

- Another configuration issue is the inability to use a NULL for location codes. Typically, all of our stations in the PNSN use a naming convention like, STNID.Channel.NET.--. With these units it forces you to use something other than --. Guralp has said that their latest FW allows that, but even after updating to the latest FW I have not found a way to do this or it just doesn't behave as it should.

GURALP MINIMUS$_2$/LITE

- While looking at the Discovery Control Centre one thing I did notice which I found odd was the GPS coords seemed to be a bit off as is apparent in this screenshot. Typically with other instruments there is a little bit of offset due to where our GPS antenna is located and the long cable run down to the basement to our repeaters, but it does at least get the external GPS antenna location. This map shows the red marker(GPS loc) on the East side of Husky Stadium and our location is the green circle which is about .55 miles away.

GURALP MINIMUS$_2$/LITE

- Guralp has moved away from strictly utilizing the SCREAM! Software to communicate with their newest instruments, however it is still present but not necessary. They have moved to their newest type of software named Discovery. Unlike predecessors it is not necessarily required to communicate with the instrument and is more of a Network Monitoring tool in addition to the Minimus's built in web interface. The big however though with this is that it is required for FW updates and push preset configs. So, as always, reliance on proprietary software. I have only utilized the GUI for this device so far.

GURALP MINIMUS$_2$/LITE

Successes

- Unfortunately, the limited usage we have had for this instrument has been strictly in shop so for any field applications we have none, but in shop it has been an interesting and good unit. It's compact form is appealing and once you get familiar with it, it is highly configurable making it a great candidate for Rapid Deployment/Portable use.
- The sheer number of metrics and live feed displays available is excellent almost to a fault due to the number of them. One can easily get lost in what you are looking at until you familiarize yourself with the instrument.

GURALP MINIMUS$_2$/LITE

- Bluetooth connectivity to be able to troubleshoot, make changes, and monitor from your phone or other smart device. Eliminating the needs to break out a laptop and cable is always a boon in the field.

GURALP MINIMUS$_2$/LITE

- Time permitting, quick Demo of the Guralp.


ANY QUESTIONS?