

EMpower System Troubleshooting Guide



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Equipment Failure to start

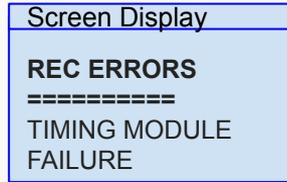
Problem:

1. The **Power** button blinks Red in a fast sequence
(This indicates a severe problem)
2. The **Power** button blinks Red in a slow sequence and never gets out of that state. The display does not light up and the SD button stays off. The receiver stays like this for more than 10 minutes

Solution:

The receiver needs to be repaired. Please contact Phoenix Geophysics technical support, (see last page)

1 Warning



2 Warning



Use the SD button to navigate in the on-screen display

Equipment Unexpected turn off

Problem:

Receiver powers on briefly, and powers off right away, or when returning to the site the equipment is off

Solution:

1. Check that the **Battery** measures 12V with a voltmeter after powering on
 - *Check the recording details of the last recording to see if the battery voltage reached low levels and turned off the receiver*
2. Check if the battery cable is still attached
 - *Animals might have chewed through it or disconnected it*
 - *A damaged cable (internally broken or old) can cause an intermittent power failure during recording*
3. The instrument might have gotten too hot and entered protection mode
 - *Check the recording details of the last recording to see if the temperature reached invalid levels*
4. The instrument might have received a momentary spike of high current through the electric sensor or ground post
 - *Check that the **SD Card** is still healthy, and check the last part of the last recording for saturation*

Warning



No SD Card

Problem:

When the SD card is not detected

Solution:

1. Turn off the receiver by pressing the Power button down for a few seconds
 - Eject the SD card
 - Clean the SD card / SD card slot of dust or grit if necessary
 - Check the card capacity (64GB - 256GB)
 - Ensure that the card is formatted as **exFat**
 - Re-insert the card
2. Turn on the receiver by pressing the Power button

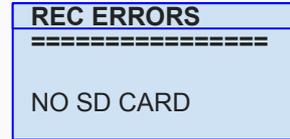
**Use the SD button to navigate the on-screen display*



Only SD cards supplied by Phoenix are supported. Other SD cards that comply with the SDXC standard may work depending on the card rating and environmental conditions

Warning

SD 



- 1 Press the Power button for >3sec and release

Shutdown Off



SD 

- 2 Press Power button briefly and release

Starting Acquiring GPS Ready



SD 

SD CARD Wrong Format

Problem:

Some SD cards have a format that is not according to the SD association standard. To reduce risk of data loss and/or bad performance, use genuine SD cards.

How to identify a not genuine SD Card

- The the tab slider is yellow
- The sticker has a very low graphic quality

Solution:

Format the SD card (*cards must be in **ExFAT format***)

Check the card capacity (*64GB - 256GB*)

1. Download the SD Memory Card Formatter from <https://www.sdcard.org/downloads/formatter/>
2. Format the card using SD Formatter by selecting the below options
 - Format type - FULL(Overwrite)
 - Size Adjustment - ON

Warning

SD ■■■■■■■■

REC ERRORS

SD CARD IS DAMAGED
CORRUPTED OR
THE WRONG FORMAT



SD CARD format is not compatible with the Receiver OS

Problem:

The receiver could not detect the SD card format, sometimes the formatting will be slightly different based upon the tools used

Solution:

1. Windows/ Mac
 - o Use SD Memory Card formatter tool to format the SD card
<https://www.sdcard.org/downloads/formatter/>
2. Linux (*The GUI formatting tools available in Linux might not solve this problem properly. We suggest the console-based procedure below*)

WARNING

Make sure to select the right partition. Use the below commands VERY CAREFULLY, otherwise it could damage the operating system of your computer

- o Delete the SD card **MBR**, for example:
`dd if=/dev/zero of=<sd card block device> bs=512 count=1`
- o Use **fdisk** to create an **MBR** primary partition using the maximum space available
- o Set the partition type to **07**
- o Write changes to the card **MBR**
- o Format the partition using **exFAT** (`mkfs.exfat <sd card partition>`)

Warning

SD ■■■■■■■■

REC ERRORS
=====
SD CARD IS DAMAGED CORRUPTED OR THE WRONG FORMAT

SD Card Read Only

Problem:

The SD card is set to read only

Solution:

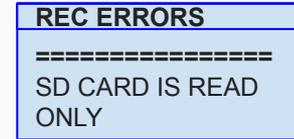
1. Turn off the receiver by pressing the Power button for a few seconds
 - Eject the SD card
 - Move the tab slider up
 - Check that the card is not corrupted by running a Card diagnostic in Windows
 - Re-insert the card



2. Turn on the receiver by pressing the Power button, and review the SD card status on the display

Warning

SD ■■■■■■



Use the SD button to navigate in the on-screen display

- 1 Press the Power button for >3sec and release



- 2 Press the Power button briefly and release



! *If the problem persists, the card might be damaged and might need to be re-formatted as exFat or replaced*

GPS Not Detected

Problem:

In most cases, the Receiver takes only a few minutes to synchronize to the GPS signal. However, under certain conditions, the synchronization could take longer (*see info note below*). Meanwhile the warning **"GPS: 0 [--]"**, appears on the receiver display.

Solution:

1. Reposition the antenna for a clear view of the sky
 - Check the condition of the GPS antenna cable, and replace it if damaged
 - Ensure that there is a clear line-of-sight between the GPS antenna and the sky
 - Test with an antenna and cable from another receiver
2. Wait until the Power button turns blue



This could happen if the receiver has been turned off for several days. In this case, the Receiver needs to re-acquire the satellite almanac. This may take up to 12 minutes.

Warning

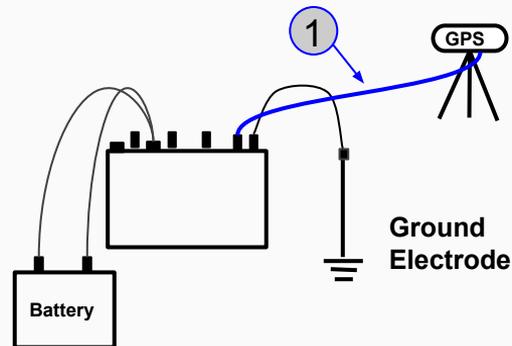


Instrument Status

Mode: Idle
Temp: [C]
GPS: 0 [--]
Batt: [V]: 11.99
SD Use:0.1/64 GB

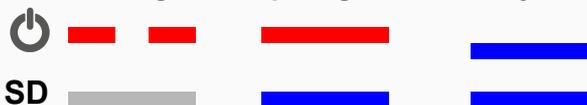


Use the SD button to navigate in the on-screen display



2

Starting Acquiring GPS Ready



Failure to Record

Problem:

When returning to pick up the equipment, the receiver is on, but not recording

Solution:

1. Review the display
 - Make sure that a calibration configuration file was not used by mistake
2. Check to see if the SD card ran out of space
 - Check the LED indicators for this condition (*see the next page*)
3. Check your configuration file and ensure that there were no schedules that could have stopped the recording



SD Card is Full

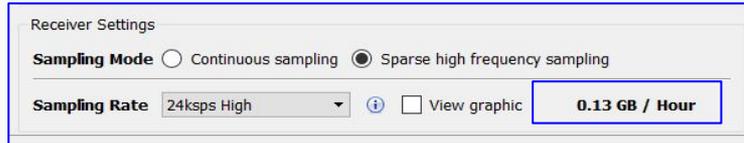
Problem:

When the SD card is full

Solution:

1. Turn off the receiver

- Eject the SD card
- Open the configuration file in the Configuration creator to calculate the space required by the recording program



- Use the file browser to ensure there is enough space available in the SD card
- If necessary, archive old data to a computer or an external device and delete the copy on the card
- Re-insert the SD card

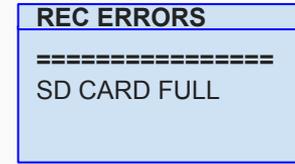
2. Turn on the receiver



The card will never be filled to the end. There is a protection buffer kept to prevent equipment failure, and its size depends on the decimation scheme. If there is less than 500MB available in the card, free up more space.

Warning

SD



- 1 Press the Power button for >3sec and release



- 2 Press the Power button briefly and release



Configuration File Issues

Problem:

A valid configuration file can not be found, or the information is incorrect

Solution:

1. Turn off the receiver
 - Eject the SD card
 - Review the configuration file in EMpower
Ensure that the receiver type matches the receiver where the SD card is being inserted
 - Verify the SD card health by running an SD card diagnostic/repair tool in Windows
 - Re-insert the SD card
2. Turn on the receiver

Warning

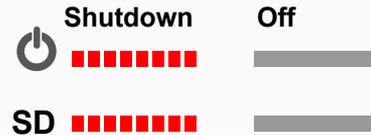


```
REC ERRORS
=====
INVALID CONFIG
RECEIVER TYPE
INCOMPATIBLE
```

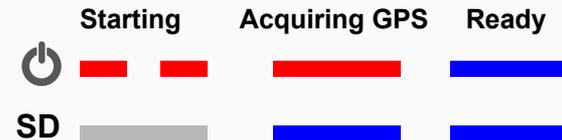
```
REC ERRORS
=====
INVALID CONFIG
MALFORMED FILE
```

```
REC ERRORS
=====
NO CONFIG FILE
IN THE SD CARD
```

- 1 Press the Power button for >3sec and release



- 2 Press power button briefly and release



Invalid Configuration Network

Problem:

When the Network configuration on the configuration file is not proper or corrupted, Receiver will report this warning

Solution:

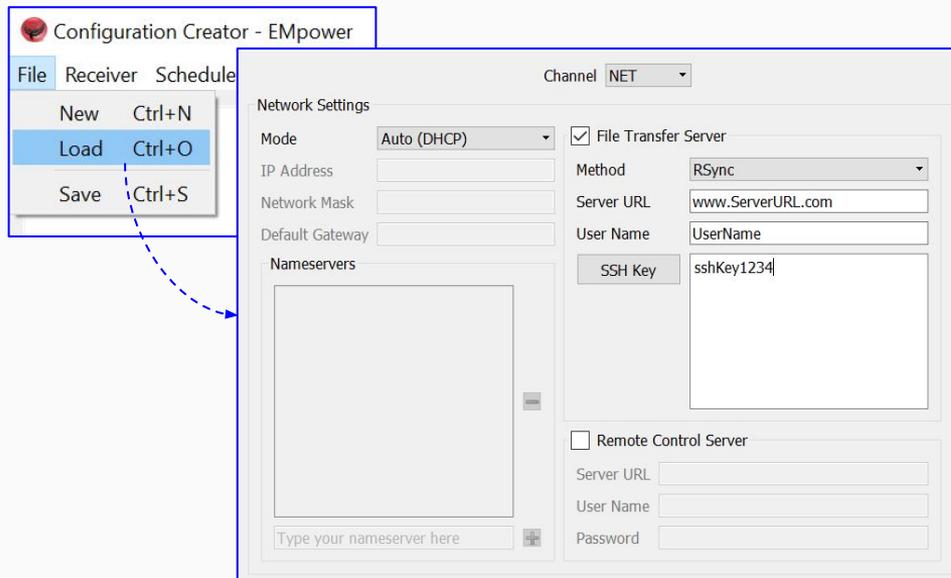
Review the configuration file

- Open EMpower
- **Prepare** module
- Select the receiver, **Load** the Configuration file from the SD Card, and review the Networking Settings information

Warning

SD ■ ■

```
REC ERRORS
-----
INVALID CONFIG
NETWORK
SETTINGS INVALID
```



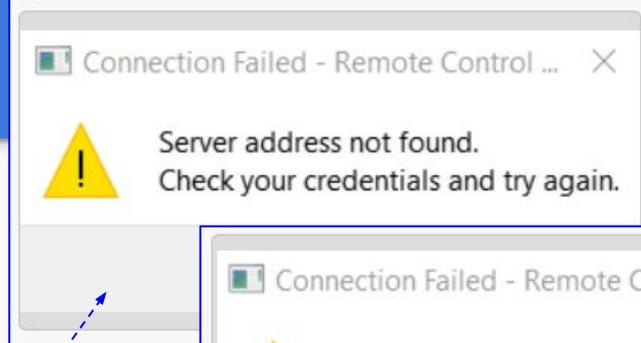
Remote Control Problems Connection

Problem:

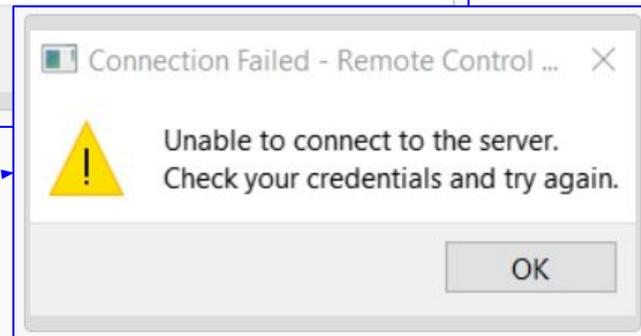
When the connection is not successful these messages may be displayed

Review:

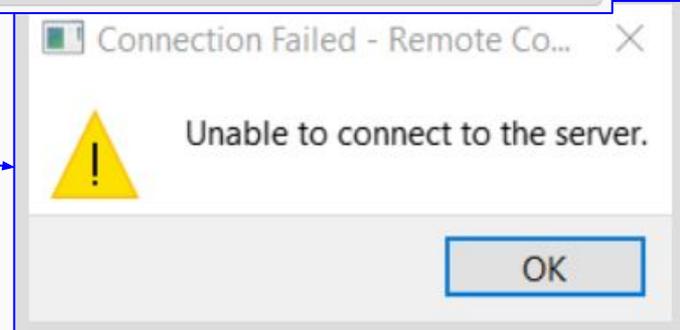
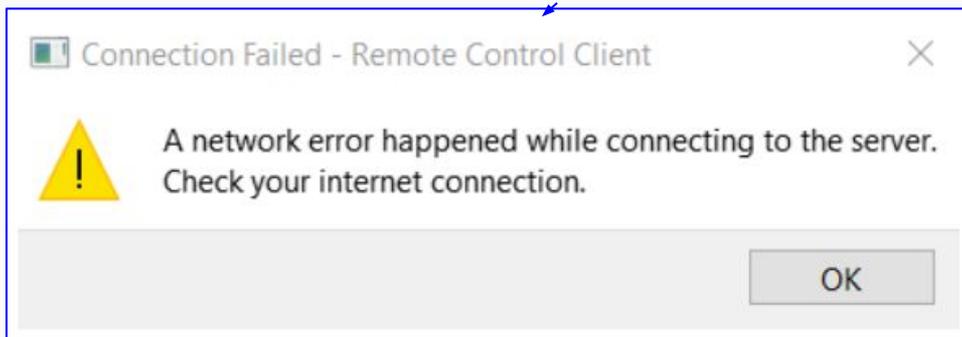
1. Check the credentials provided
2. Make sure that you are connected to internet



1



2



Connection Problems

Problem:

Receiver can not connect to the server

- Ping: **Timeout**
- Ping: **DNS Error**

Solution:

- Turn off the receiver
- Eject the SD card and Review the Networking Settings on the configuration file in EMpower
- Review the server URL works correctly, if EMpower is not enabled to connect to the server, check the connections, and protocols of the Network Configuration

NETWORK STATUS	
Mode: Rsync	Mode: Rsync
Cable Connected	Cable Connected
Address: 193.168.2.172	Address: 193.168.2.172
Gateway: 193.168.1.1	Gateway: 193.168.1.1
Ping: Timeout	Ping: DNS Error

Cable Not Detected

Problem:

The receiver can not detect the cable on the Network port

Solution:

- Disconnect the cable
- Review the cable condition
- Connect the cable
- Ensure there is no loose connection at both ends of the cable

NETWORK STATUS
Mode: Rsync
Cable Not Detected

Channels Damaged / Not Found

Warning:

The SD LED is flashing red, one or more channels have become damaged or are otherwise not found on boot up.

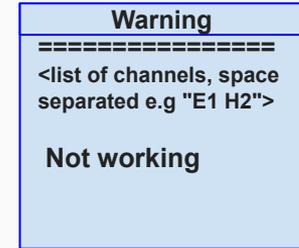
Solution:

1. Return the receiver to Phoenix to repair the channel(s)
2. Use the working channels to record data
 - Before start, disable the damaged channel(s) on the Configuration File
 - Connect the sensors to the working channels
 - Start the recording by pressing the Power button
**The warning state will continue until the recording starts*
 - Once the recording ends, the SD button will start indicating the state by changing to red

The WARNING screen will still be available by pressing the SD button

Warning

SD ■ ■ ■



If all of the channels are not working, this will be deemed to be a critical failure, since the receiver will not be able to take any data in that case.

License Activation

Problem:

1. The **Activation code** field has a red X at the end

Solution 1:

Check that the activation code entered matches the code on the license card and try again

Problem:

2. The computer cannot connect to the server to complete the activation process

Solution 2:

Review the internet connection and try again, if the problem persists contact Phoenix technical support. *(see the last page)*

The screenshot shows the EMpower activation interface with several error messages overlaid. The main window, titled "Activation Required - EMpower", contains the following text:

EMpower has not been activated.

To activate EMpower:

1. Enter your first and last names in their respective fields below, along with your email address, company name, and country.
2. Enter the Activation Code found on the license card provided by Phoenix.

- Note that this activation code cannot be reused on other computers.

3. Click the License button and if successful a confirmation message will be displayed.

Below the instructions are input fields for:

- First name
- Last name
- E-mail address
- Company name
- Country (set to Canada)

Two error messages are overlaid on the form:

- Service unavailable - EMpower**: Phoenix servers could not process your license request. Check the entered activation code and try again. (Indicated by a blue dashed arrow and a circled '1')
- Error — EMpower**: Something went wrong during licensing. Please try again or contact Phoenix support. (Indicated by a circled '2')

Unusual Contact Resistance

Problem:

The Electric channels show a warning icon when the contact Resistance is out of the range

Review:

This might be normal depending on the field conditions. If not, look for broken, frayed or exposed wires or connections, and any evidence of damage in general

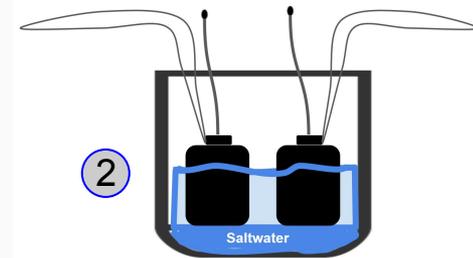
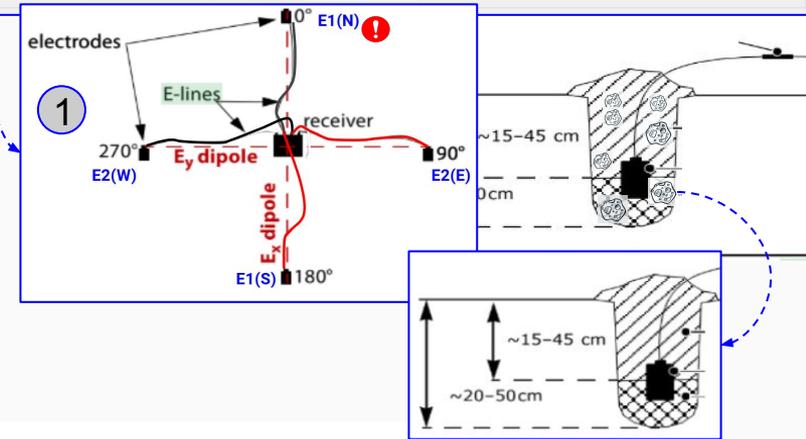
1. Verify the setup
 - Make sure the electrode is sitting on a conductive surface (remove rocks)
2. If the problem persists, set the electrodes upright in a container with a few centimeters of salt water or another ion-rich solution and measure the resistance between any pair of electrodes
 - The resistance should be $<100 \Omega$
 - Measure the DC potential between each electrodes pair
 - The self-potential should be $<10 \text{ mV}$
 - If the last two points are not in this range the electrodes could be damaged or noisy, and need to be replaced

Survey name: Bench test PHX
Station name: PHX
Operator(s): DF
Layout Geometry: Orthogonal
Declination: 0.00°
Notes: Open inputs SCH 96k

Electric Channels

Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF [Hz]	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	50.00	50.00	<input type="checkbox"/> Inverted	175831	175789	4 x 1 = x4	17800	-0.012
E2	50.00	50.00	<input type="checkbox"/> Inverted	175634	175609	4 x 1 = x4	17800	0.012

E Azimuth: 0° External Filter: None



Magnetic Sensor Detection

Warning

1. Sensor Detected Unknown

This recording might still be useful, but there was a source of noise near the sensor while the instrument was trying to detect the signature of the sensor

Solution

- Check the config file. Ensure that the sensor type and serial number are correct
- Move the sensor to a quieter area

Warning

2. Sensor Detected Not Present

This problem could be caused by a bad connection, damaged cable and/or the sensor itself.

Solution

- Connect a sensor that was successfully detected by another instrument to the channel that did not correctly detect the first sensor
- If the fault condition persists in the same receiver channel, please contact our technical support
- If the channel detects the new sensor and the problem follows the coil lead and/or the sensor, replace the coil lead and/or the sensor

1

Magnetic Channels

Channel	Sensor	Detected	Serial #	Polarity
H1	AMTC-30	AMTC-30	2686	<input type="checkbox"/> Inverted
H2	AMTC-30	AMTC-30	2862	<input type="checkbox"/> Inverted
H3	MTC-150	Unknown	2861	<input type="checkbox"/> Inverted

H1-H3 Azimuth: 0.00 °

2

Magnetic Channels

Channel	Sensor	Detected	Serial #
H1	MTC-150	MTC-150	
H2	MTC-150	Not Present	



This recording might not contain valid data

Saturated Frames

Warning:

This critical warning could be caused by a bad connection to the Electrode binding posts of the receiver, high contact resistance of an electrode, noise, or excessive gain

Solution:

1. Check the installation of the electrode in the field (See *Unusual Contact Resistance*)
 - A very small amount of saturations could have been caused by a transient
2. When saturation is caused by constant external noise, reducing dipole length or channel gain might prevent saturation
 - Preference should be given to keeping the preamplifier on and reducing the main channel gain if possible

Recording Details: 10125_2018-10-23-154952 - EMpower

Recording Details		Timing Details	
Recording ID:	10125_2018-10-23-154952	Start Time:	Tue Oct 23 15:49:53 2018 GMT(-00:00)
Survey Name:	Test Rack	Stop Time:	Tue Oct 23 15:49:56 2018 GMT(-00:00)
Station Name:		Duration:	3 s
Receiver Type:	MTU-5C	Latitude:	43.809°N
Instrument Serial:	10125	Longitude:	79.338°W
Operator:	ssorra	Altitude:	166.031 m

Channel: E1

Electric channel settings

Enabled

Gain: Normal

Low Pass Filter: 17.8 kHz

Positive Distance: 50.00 m

Negative Distance: 50.00 m

Recorded 1 second at 24000 samples/s every 60 seconds, and continuously at 150 samples/s

GPS Timing Card

Serial Number: 201988 Firmware Version: 00010029X

Model: BTM01-I # of Satellites: 7 - 7 satellites ✓

Channels Details						
	Tag	Board S/N	Model	Firmware	Sat	Signal Ranges
1	E1	200084	BCM01-J	1001d	50.972 % - View	View Levels
2	E2	200062	BCM01-J	1001d	51.472 % - View	View Levels
3	H1	200042	BCM01-J	1001d	0 %	View Levels
4	H2	200073	BCM01-J	1001d	0 %	View Levels
5	H3	200063	BCM01-J	1001d	0 %	View Levels

Close

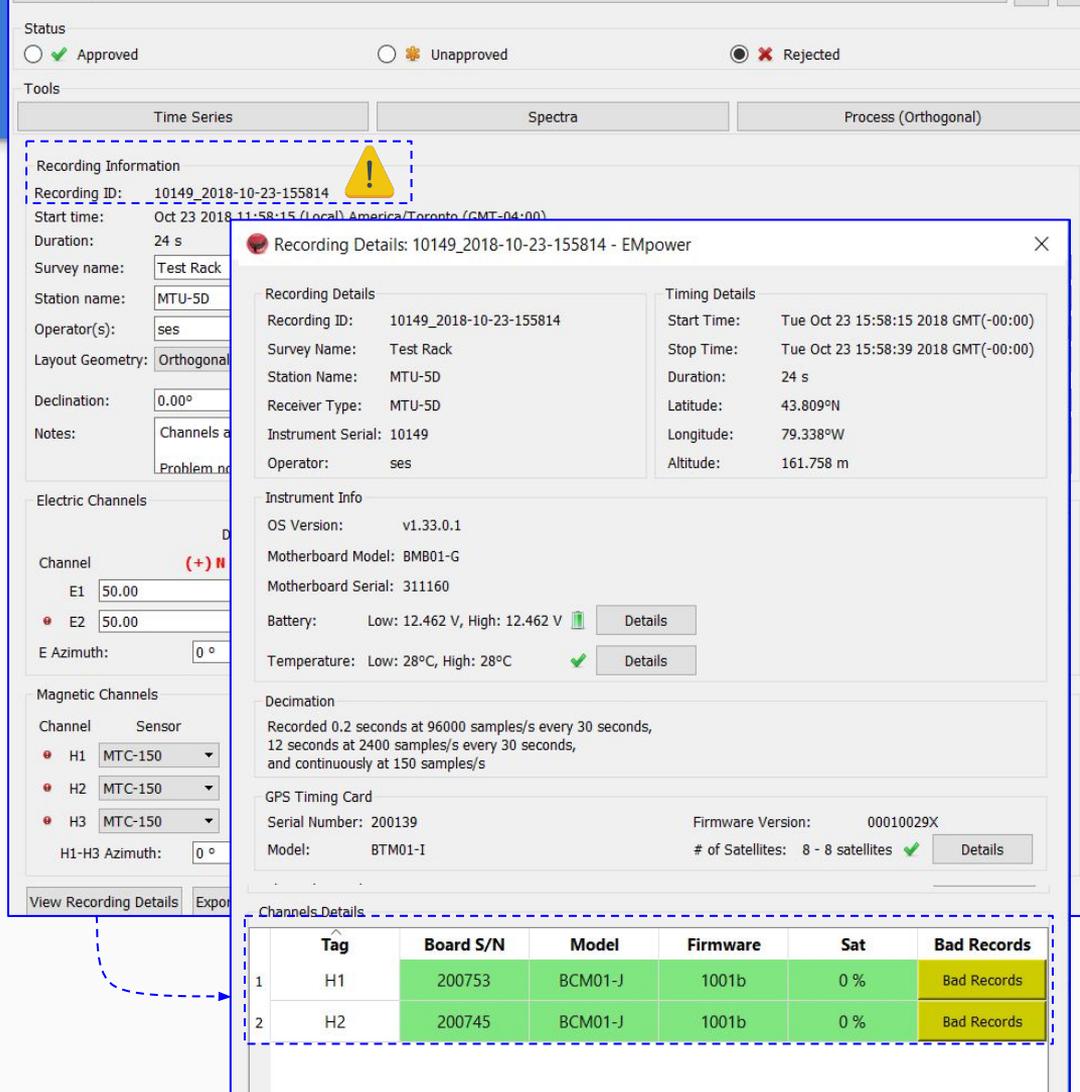
Bad Records

Warning:

The **Recording Information** shows a warning icon by the side of Recording ID (*There is not a solution for this warning*)

Could be caused by:

- Check if the failure occurred while the data was being transferring to the card
- The instrument could have lost data, if the receiver repeats this often, contact Phoenix support (*see the last page*)



Status: Approved Unapproved Rejected

Tools: Time Series Spectra Process (Orthogonal)

Recording Information 

Recording ID: 10149_2018-10-23-155814

Start time: Oct 23 2018 11:58:15 (Local) America/Toronto (GMT-04:00)

Duration: 24 s

Survey name: Test Rack

Station name: MTU-5D

Operator(s): ses

Layout Geometry: Orthogonal

Declination: 0.00°

Notes: Channels a Problem n

Electric Channels

Channel (+) N

E1 50.00

E2 50.00

E Azimuth: 0°

Magnetic Channels

Channel Sensor

H1 MTC-150

H2 MTC-150

H3 MTC-150

H1-H3 Azimuth: 0°

View Recording Details Export

Recording Details: 10149_2018-10-23-155814 - E-Mpower

Recording Details

Recording ID: 10149_2018-10-23-155814

Survey Name: Test Rack

Station Name: MTU-5D

Receiver Type: MTU-5D

Instrument Serial: 10149

Operator: ses

Timing Details

Start Time: Tue Oct 23 15:58:15 2018 GMT(-00:00)

Stop Time: Tue Oct 23 15:58:39 2018 GMT(-00:00)

Duration: 24 s

Latitude: 43.809°N

Longitude: 79.338°W

Altitude: 161.758 m

Instrument Info

OS Version: v1.33.0.1

Motherboard Model: BMB01-G

Motherboard Serial: 311160

Battery: Low: 12.462 V, High: 12.462 V  Details

Temperature: Low: 28°C, High: 28°C  Details

Decimation

Recorded 0.2 seconds at 96000 samples/s every 30 seconds, 12 seconds at 2400 samples/s every 30 seconds, and continuously at 150 samples/s

GPS Timing Card

Serial Number: 200139

Firmware Version: 00010029X

Model: BTM01-I

of Satellites: 8 - 8 satellites  Details

Channels Details

	Tag	Board S/N	Model	Firmware	Sat	Bad Records
1	H1	200753	BCM01-J	1001b	0 %	Bad Records
2	H2	200745	BCM01-J	1001b	0 %	Bad Records

Instrument Health

 **Warning:**

This warning symbol may indicate other problems with the instrument's health

Solution:

1. Battery

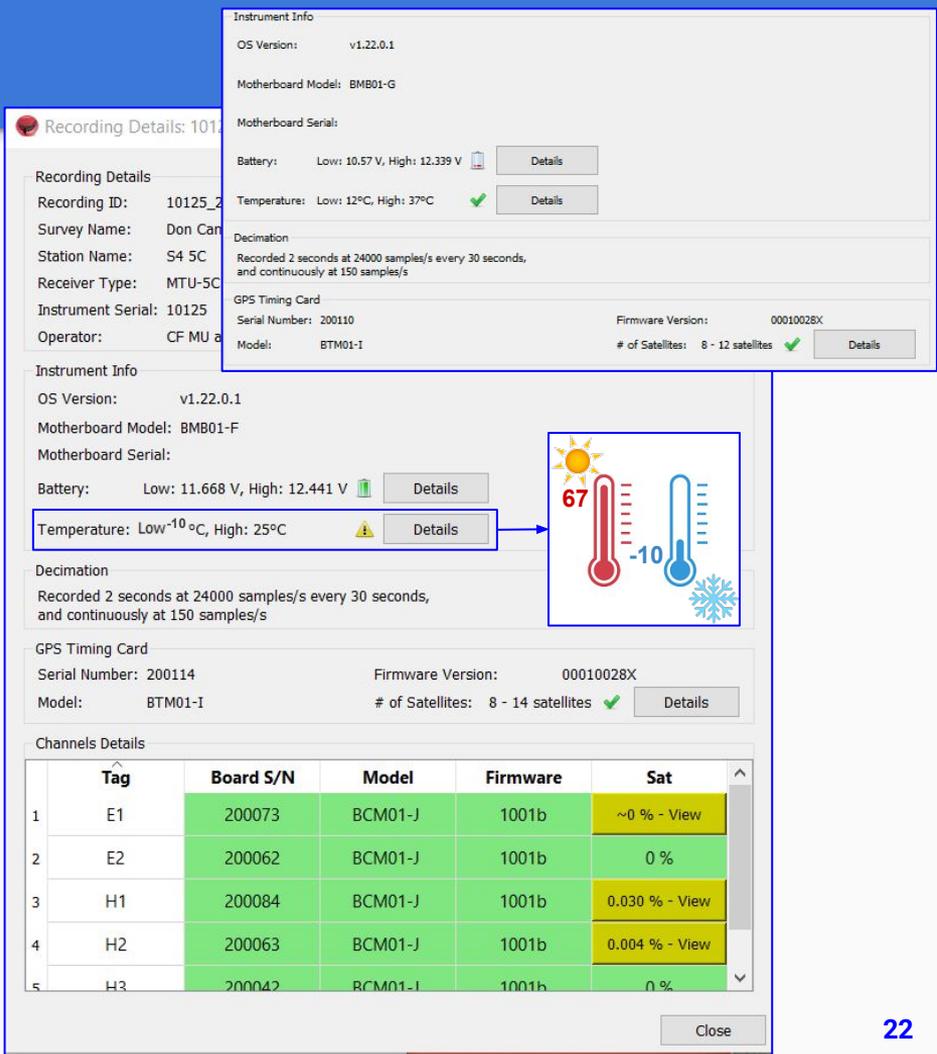
- Measure the battery voltage before connecting it to the receiver, and again when the equipment is turned on (both measurements should be 12V minimum)
- Check the battery electrolyte fluid level and add liquid to it if needed

2. Temperature

- In hot places, protect the receiver with an umbrella and provide good ventilation

3. # of Satellites

- Ensure a clear line-of-sight between the GPS antenna and the sky
- Check for damaged to the GPS cable or antenna
- Test the receiver with a GPS antenna and cable from another receiver (See *GPS Not Detected*)



The screenshot displays the 'Recording Details' and 'Instrument Info' sections of a monitoring application. A blue box highlights a temperature warning: 'Temperature: Low: -10 °C, High: 25°C' with a yellow warning icon. An inset image shows a thermometer with a red liquid level at 67 and a blue liquid level at -10, with a sun icon above and a snowflake below. The 'Recording Details' section includes: Recording ID: 10125_2, Survey Name: Don Can, Station Name: S4 5C, Receiver Type: MTU-5C, Instrument Serial: 10125, Operator: CF MU a. The 'Instrument Info' section includes: OS Version: v1.22.0.1, Motherboard Model: BMB01-F, Motherboard Serial: [redacted], Battery: Low: 11.668 V, High: 12.441 V, Temperature: Low: -10 °C, High: 25°C, Decimation: Recorded 2 seconds at 24000 samples/s every 30 seconds, and continuously at 150 samples/s, GPS Timing Card Serial Number: 200114, Model: BTM01-I, Firmware Version: 00010028X, # of Satellites: 8 - 14 satellites. The 'Channels Details' table is shown below:

	Tag	Board S/N	Model	Firmware	Sat
1	E1	200073	BCM01-J	1001b	~0 % - View
2	E2	200062	BCM01-J	1001b	0 %
3	H1	200084	BCM01-J	1001b	0.030 % - View
4	H2	200063	BCM01-J	1001b	0.004 % - View
5	H3	200042	BCM01-J	1001b	0 %

Missing Sensor Calibration

Warning:

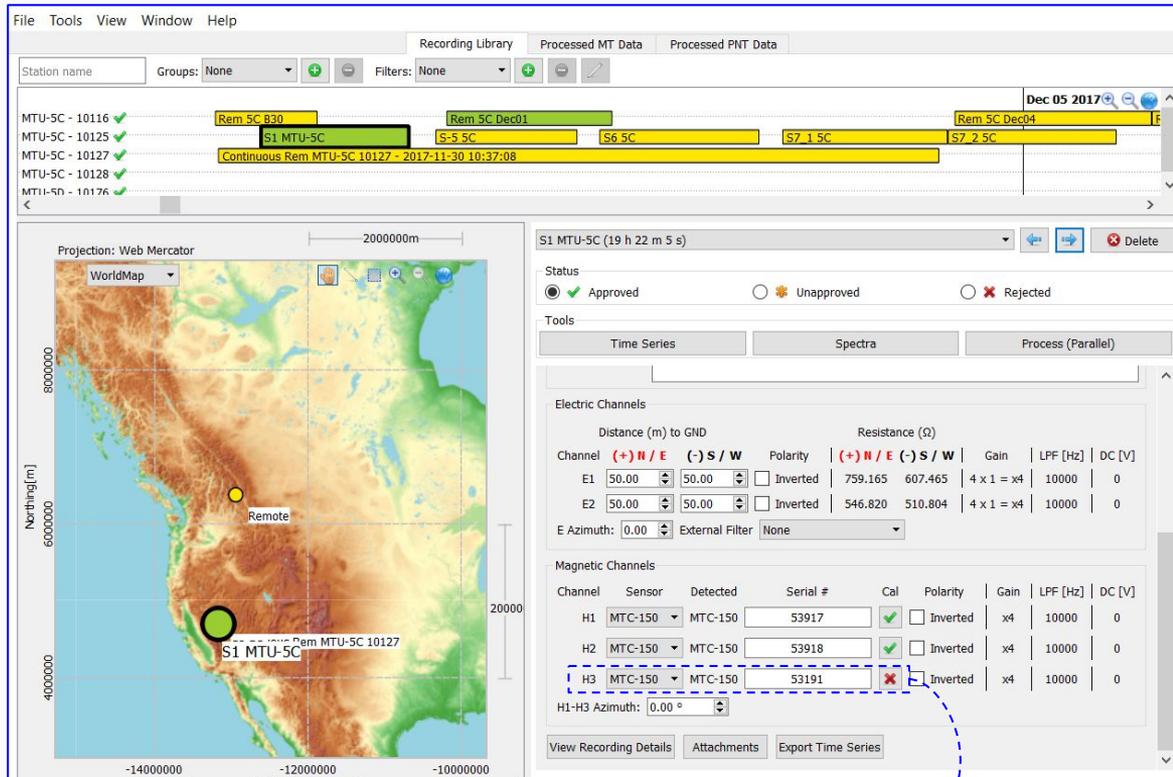
If a red X is displayed in the **Cal** column of a magnetic channel, the calibration file for that sensor serial number has not been found

Solution:

Ensure that the calibration files for the sensors used in the recording have been imported into the project

 Generic calibration of the sensor type selected will be applied in processing when there is no matching calibration found

- White Noise recordings will not process with any calibration



The screenshot shows a software interface with a menu bar (File, Tools, View, Window, Help) and tabs for Recording Library, Processed MT Data, and Processed PNT Data. A table lists recording stations with columns for Station name, Groups, Filters, and various recording parameters. Below the table is a map showing the location of the recording site, 'Remote', with a yellow dot. A green circle on the map highlights the location of 'S1 MTU-5C'. To the right of the map is a detailed view of the 'S1 MTU-5C (19 h 22 m 5 s)' recording. This view includes a 'Status' section with radio buttons for 'Approved', 'Unapproved', and 'Rejected'. Below that are 'Tools' for 'Time Series', 'Spectra', and 'Process (Parallel)'. The 'Electric Channels' section contains a table with columns for Channel, Distance (m) to GND, Resistance (Ω), Polarity, Gain, LPF [Hz], and DC [V]. The 'Magnetic Channels' section contains a table with columns for Channel, Sensor, Detected, Serial #, Cal, Polarity, Gain, LPF [Hz], and DC [V]. In the 'Magnetic Channels' table, channel H3 has a red X in the 'Cal' column, indicating a missing calibration file. A dashed blue box highlights this red X, and a callout box points to it with the text 'No matching calibration found'.

Channel	Sensor	Detected	Serial #	Cal	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-150	MTC-150	53917	✓	<input type="checkbox"/> Inverted	x4	10000	0
H2	MTC-150	MTC-150	53918	✓	<input type="checkbox"/> Inverted	x4	10000	0
H3	MTC-150	MTC-150	53191	✗	<input type="checkbox"/> Inverted	x4	10000	0

No matching calibration found

Bad PNT curve

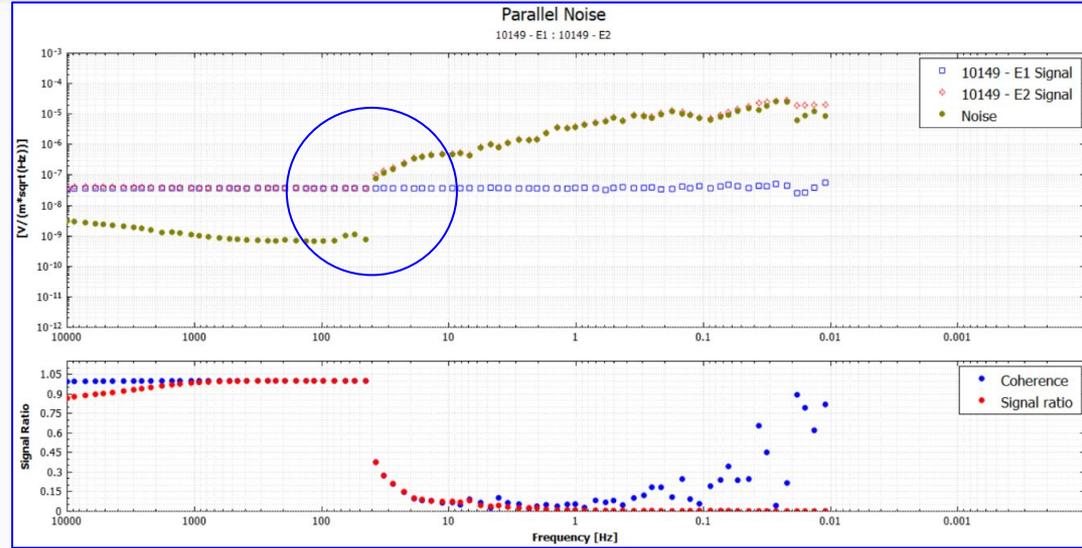
Problem:

Although the high frequency looks correct, the continuous decimation level is affected by the whole time series.

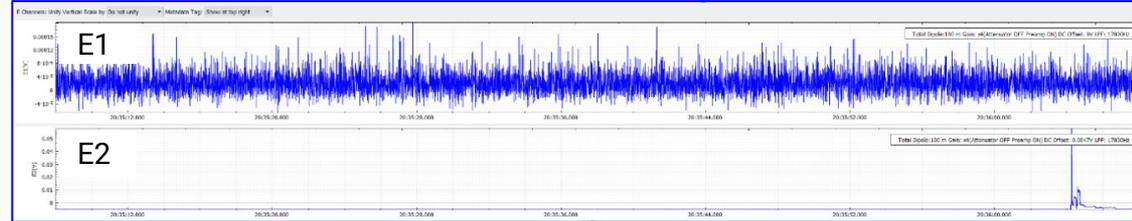
Solution:

This problem could be caused when something touches the receiver E-line binding post during the recording process, review the Time Series and find the E-line affected.

Review the installation and keep cables flat on the ground, not draped over plants or over the receiver.



Time Series





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