

# 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)*



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

### 1 Warning



Screen Display

**REC ERRORS**  
=====

TIMING MODULE  
FAILURE

### 2 Warning



# 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:

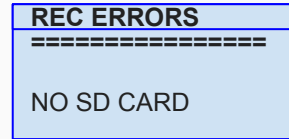
1. Turn off the receiver by pressing the Power button down for a few seconds
  - Eject the SD card
  - Clean the SD card / SD card slot of dust or grit if necessary
  - Check the card capacity (64GB - 256GB)
  - Ensure that the card is formatted as **exFat**
  - Re-insert the card

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

2. Turn on the receiver by pressing the Power button

## Warning

SD 



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

Shutdown      Off



- 2 Press Power button briefly and release

Starting      Acquiring GPS      Ready



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

# SD CARD Wrong Format

## Problem:

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

How to identify a not genuine SD Card

- 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

- 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*

### Delete the SD card MBR, for example:

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

## Warning

SD ■■■■■■■■

<b>REC ERRORS</b>
=====
SD CARD IS DAMAGED CORRUPTED OR THE WRONG FORMAT

# SD Card Read Only

## Problem:

The SD card is set to read only

## Solution:

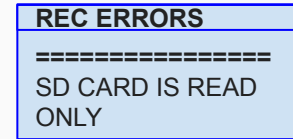
1. Turn off the receiver by pressing the Power button for a few seconds
  - Eject the SD card
  - Move the tab slider up
  - Check that the card is not corrupted by running a Card diagnostic in Windows
  - Re-insert the card



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

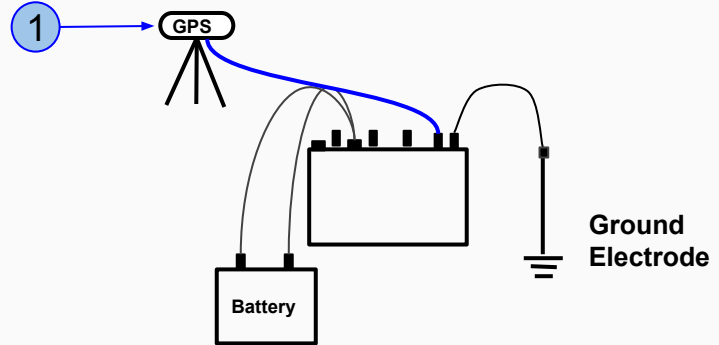


### Instrument Status

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



SD

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

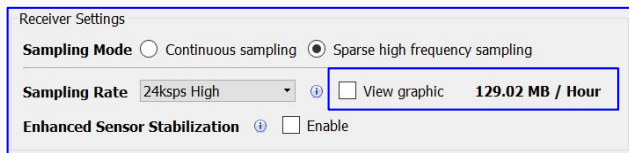
## Problem:

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

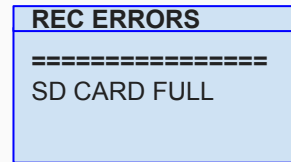
### 2. Turn on the receiver



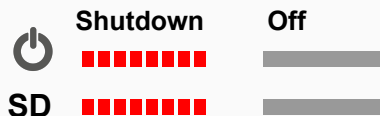
The card will never be filled to the end. There is a protection buffer kept to prevent equipment failure, and its size depends on the decimation scheme. If there is less than 500MB available on the card, free up more space.

## 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 to 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

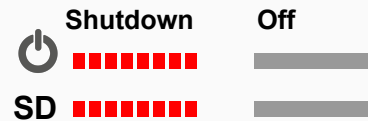
**REC ERRORS**  
=====

INVALID CONFIG
MALFORMED FILE

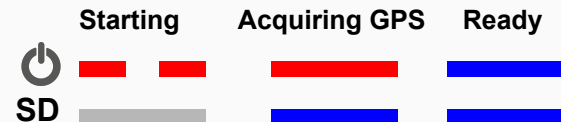
**REC ERRORS**  
=====

NO CONFIG FILE
IN THE SD CARD

1 Press the Power button for >3sec and release



2 Press power button briefly and release



# Invalid Network Configuration

## Problem:

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

## Solution:

### Review the configuration file

1. Open EMpower
2. Prepare module
  - Select the receiver and the Recording
3. Load the Configuration file from the SD Card
  - Review the Networking Settings information

**Warning**

SD ■ ■

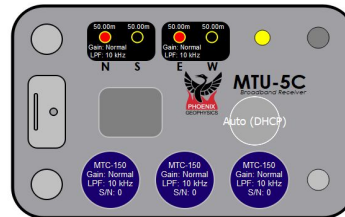
**REC ERRORS**

-----

INVALID CONFIG  
NETWORK  
SETTINGS INVALID

The screenshot shows the EMpower software interface. A red circle with the number '1' points to the 'EMpower Geophysical Software by Phoenix Geophysics' title bar. A red circle with the number '2' points to the 'Prepare' button. A blue dashed box highlights the 'Prepare - EMpower' dialog box, which is open. In this dialog, the 'Receiver Type' is set to 'MTU-5C'. The 'Recording' section has 'MT' selected. The 'Calibration' section has 'Sensor' and 'Receiver' buttons. The 'System Tests' section has 'White Noise', 'Parallel Noise', and 'Self Test' buttons. A 'Close' button is at the bottom right.

The screenshot shows the Configuration Creator - EMpower software interface. A red circle with the number '3' points to the 'File' menu. A blue dashed box highlights the 'Network Settings' dialog box, which is open. The 'Mode' is set to 'Auto (DHCP)'. The 'File Transfer Server' checkbox is checked. The 'Method' is set to 'Rsync'. The 'Server URL', 'User Name', and 'SSH Key' fields are visible. The 'Bandwidth Control' and 'Remote Control Server' checkboxes are unchecked. The 'Server URL', 'User Name', and 'Password' fields are also visible. The 'Configuration layout' section has 'Layout Geometry' set to 'Orthogonal'. The 'Survey Name', 'Site Name', 'Operator(s)', 'Company Name', and 'Configuration Notes' fields are visible.



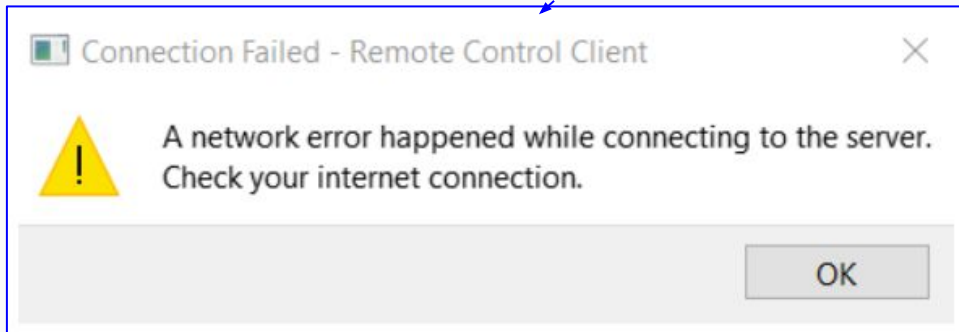
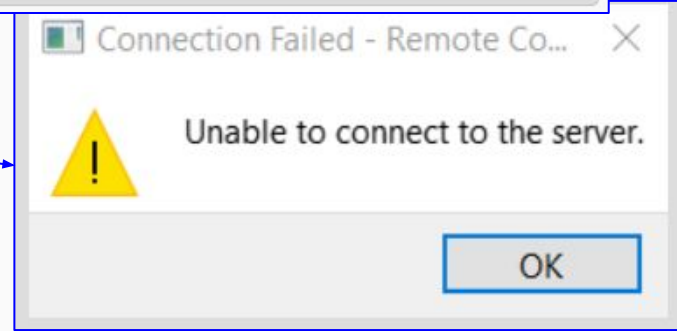
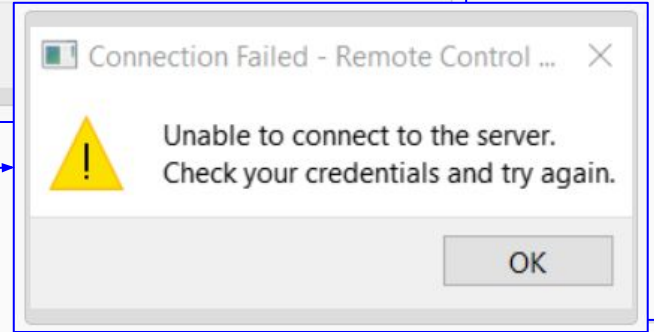
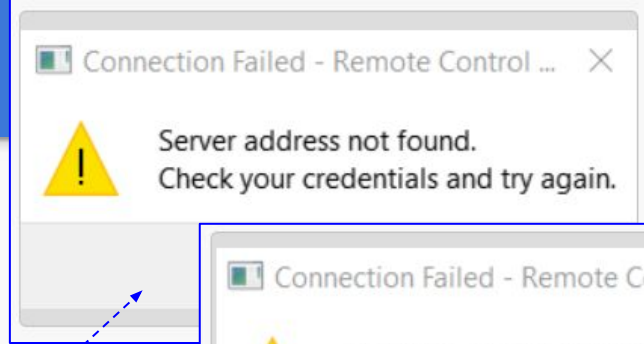
# Remote Control Problems Connection

## 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



# Connection Problems

## Problem:

Receiver can not connect to the server

Ping: **Timeout**

Ping: **DNS Error**

## Solution:

1. Turn off the receiver

2. Eject the SD card

- Review the Networking Settings on the configuration file in EMpower. Review that the server URL works correctly by trying to connect to it using a laptop (see page 12)

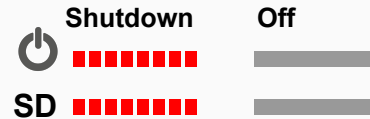


If the receiver is not able to connect to the server, check the connections and protocols of the Network Configuration

NETWORK STATUS
Mode: Rsync
Cable Connected
Address: 193.168.2.172
Gateway: 193.168.1.1
Ping: <b>Timeout</b>

NETWORK STATUS
Mode: Rsync
Cable Connected
Address: 193.168.2.172
Gateway: 193.168.1.1
Ping: <b>DNS Error</b>

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



# Cable Not Detected

## Problem:

The receiver can not detect the cable on the Network port

## Solution:

1. Disconnect the cable
2. Review the cable condition
3. Connect the cable
4. 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 and the screen shows the damaged channel(s) or on boot up.

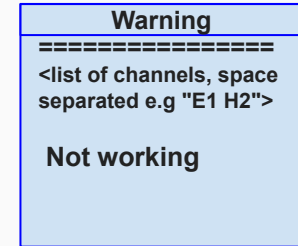
## Solution:

1. Return the receiver to Phoenix to repair the channel(s)
2. Use the working channels to record data
  - Before starting, 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:

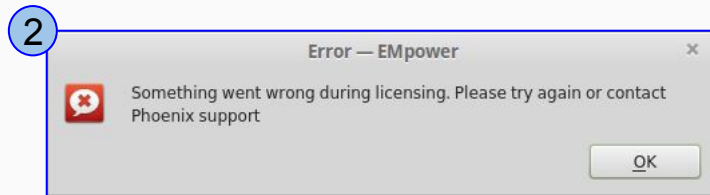
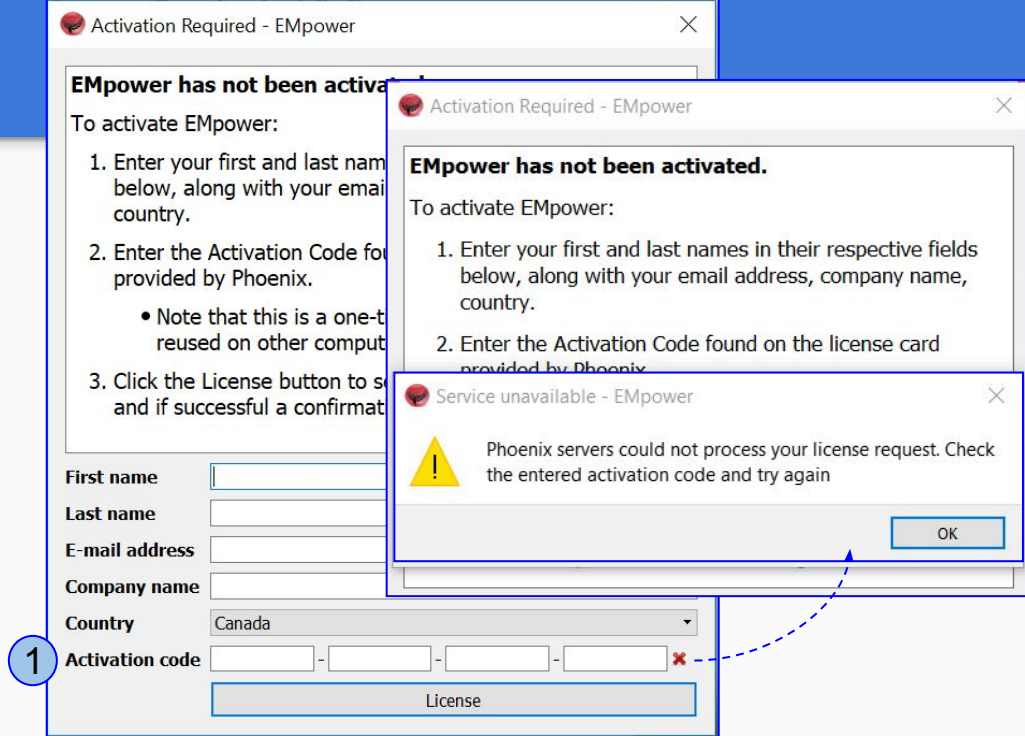
- Check that the activation code entered matches the code on the license card and try again

## 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)



# Unusual Contact Resistance

## Problem:

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

Tools

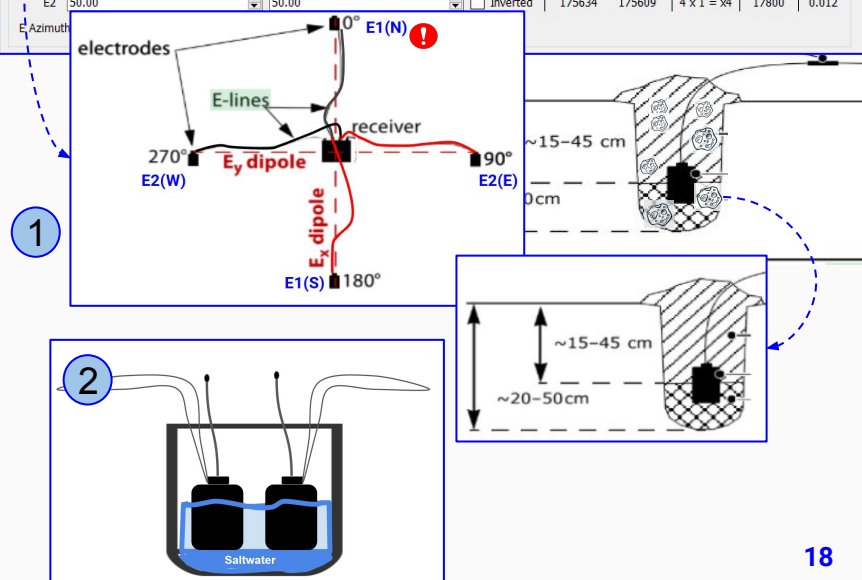
Time Series      Spectra      Process (Orthogonal)

Recording Information

Recording ID: 10039\_2018-02-13-215418  
Start time: Feb 13 2018 16:54:19 (Local) America/Toronto (GMT-05:00)  
Duration: 19 h 49 m 34 s  
Survey name: Bench test PHX  
Station name: PHX  
Operator(s): DF  
Layout Geometry: Orthogonal  
Declination: 0.00°  
Notes: Open inputs 5CH 96k

Electric Channels

Channel	Distance (m) to GND		Polarity	Resistance ( $\Omega$ )		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



# 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. A very small amount of saturation could have been caused by a transient

## Solution:

Check the installation of the electrode in the field (See *Unusual Contact Resistance*).

1. Gain "Normal" is designed to get the optimal point between noise versus input range
2. Change for **High** gain, if the saturation is less than 2% to increase input signal range
  - o In case the saturation is more than 2%, check for noise sources (*cable connections, electrodes, etc.*) and try to eliminate them. If the saturation doesn't change, reduce dipole lengths and set a **Low** channel gain as last resort

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*

Serial Number: 202980    Firmware Version: 0001027X  
Model: BTM01-I    # of Satellites: 7 - 7 satellites ✓    Details

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

1

Channel: E1

Electric channel settings

Enabled

Gain: Normal

Low Pass Filter: 10 kHz

Positive Distance: 50.00 m

Negative Distance: 50.00 m

2

Channel: E1

Electric channel settings

Enabled

Gain: High

Low Pass Filter: 10 kHz

Positive Distance: 50.00 m

Negative Distance: 50.00 m

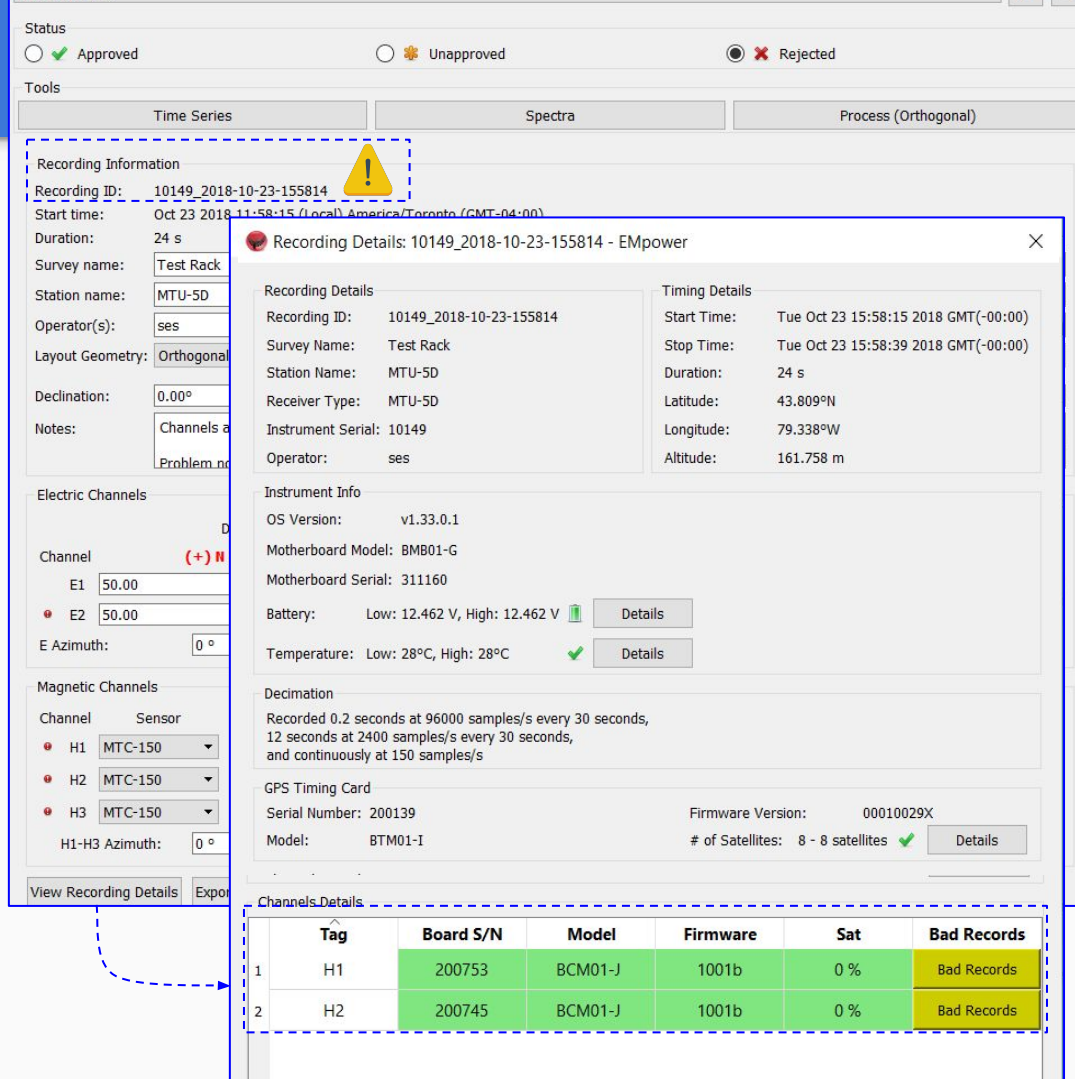
# Bad Records

## 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 transferred 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 no

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

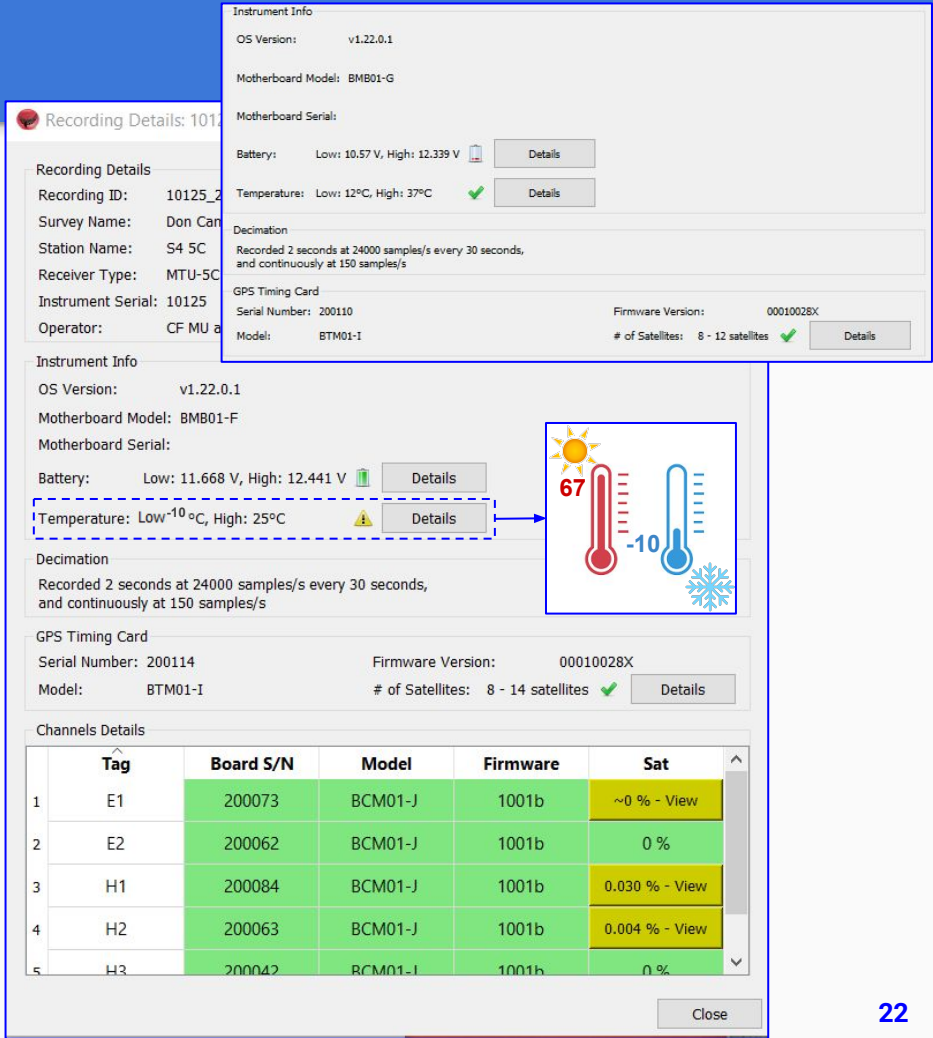
- Measure the battery voltage before connecting it to the receiver, and again when the equipment is turned on (*both measurements should be 12V minimum*)
- Check the battery electrolyte fluid level and add liquid to it if needed

### 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 damage 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 warning icon is present next to the temperature reading.

**Recording Details:**

- Recording ID: 10125\_2
- Survey Name: Don Can
- Station Name: S4 5C
- Receiver Type: MTU-5C
- Instrument Serial: 10125
- Operator: CF MU a

**Instrument Info:**

- 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 (Warning icon)
- Decimation: Recorded 2 seconds at 24000 samples/s every 30 seconds, and continuously at 150 samples/s
- GPS Timing Card: Serial Number: 200114, Firmware Version: 000110028X, # of Satellites: 8 - 14 satellites

**Channels Details Table:**

	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:

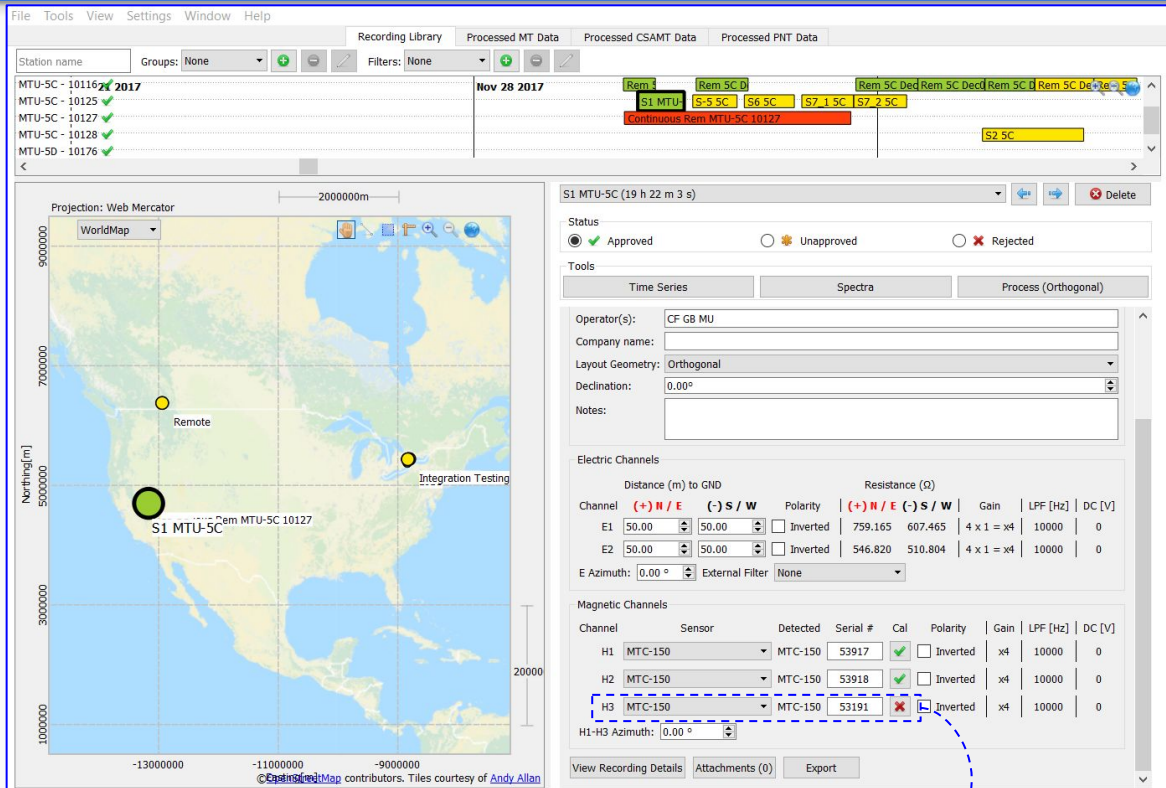
If a red X is displayed in the **Cal** column of a magnetic channel, the calibration file for that sensor serial number has not been found

## 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 use any calibration compensation for processing



Station name	Groups	Filters	Cal
MTU-5C - 101162	None	None	✓
MTU-5C - 10125	None	None	✓
MTU-5C - 10127	None	None	✓
MTU-5C - 10128	None	None	✓
MTU-5D - 10176	None	None	✓
S1 MTU-5C	None	None	✗

Channel	(+) N / E	(-) S / W	Polarity	(+) N / E	(-) S / W	Gain	LPF [Hz]	DC [V]
E1	50.00	50.00	<input type="checkbox"/> Inverted	759.165	607.465	4 x 1 = x4	10000	0
E2	50.00	50.00	<input type="checkbox"/> Inverted	546.820	510.804	4 x 1 = x4	10000	0

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

No matching calibration found

# Bad PNT curve

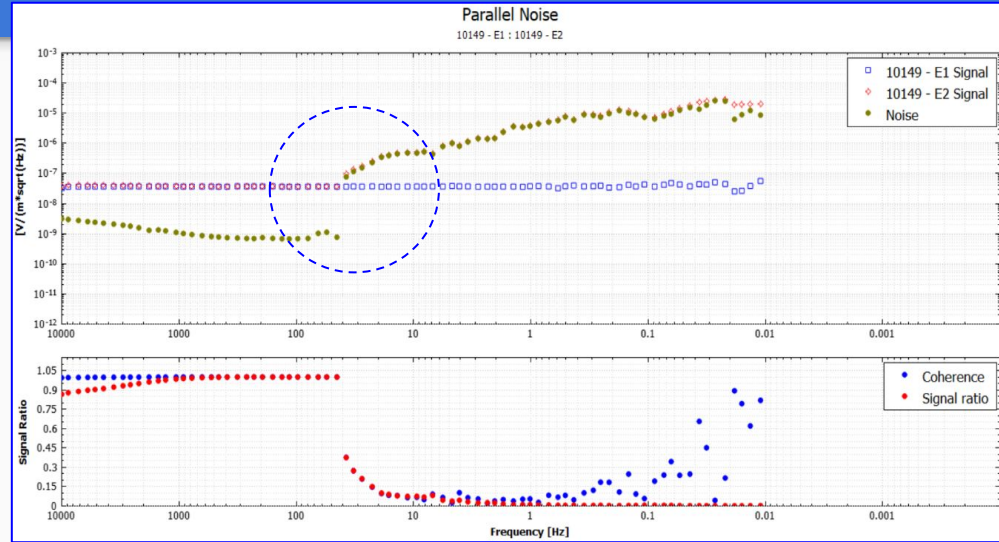
## Problem:

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

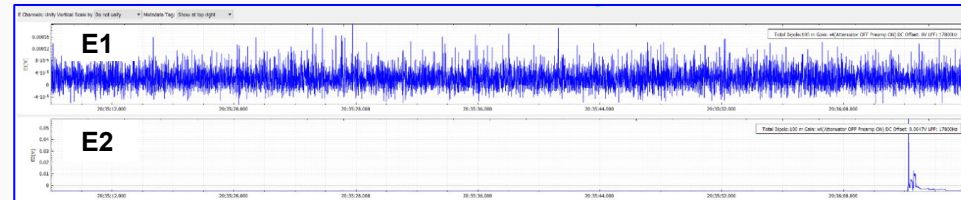
## Solution:

This problem could be caused when something touches the receiver E-line binding post during the recording process.

1. Review the **Time Series** and find the E-line affected.
2. Review the installation and keep cables flat on the ground, not draped over plants or the receiver.



## Time Series







*Please check out the [FAQs](#)*

*<https://phoenixgeophysics.freshdesk.com/>*

*Or email us at: [support@phoenix-geophysics.com](mailto:support@phoenix-geophysics.com)*