

# EMpower System Troubleshooting Guide



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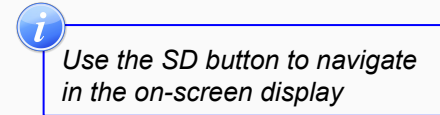
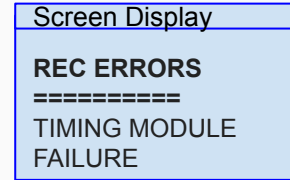
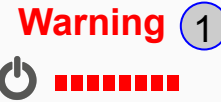
# Equipment Failure to start

## 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)



# 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:

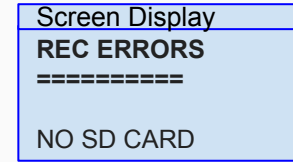
1. Turn off the receiver by pressing the Power button down for a few seconds
  - Eject the SD card
  - Clean the SD card / SD card slot of dust or grit if necessary
  - Check the card capacity (64GB - 256GB)
  - Ensure that the card is formatted as **exFat**
  - Re-insert the card

*\*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



SD

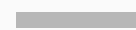


- 2 Press Power button briefly and release

Starting      Acquiring GPS      Ready



SD



# 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
  - o Eject the SD card
  - o Move the tab slider up
  - o Check that the card is not corrupted by running a Card diagnostic in Windows
  - o 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 ■■■■■■

Screen Display

REC ERRORS

=====

SD READ ONLY



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



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

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

	Shutdown	Off
Power	■■■■■■	————
SD	■■■■■■	————

- 2 Press the Power button briefly and release

	Starting	Acquiring GPS	Ready
Power	■ ■	■■■■	■■■■
SD	————	■■■■	■■■■

# 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 **"No satellites found/waiting for the signal"**, 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

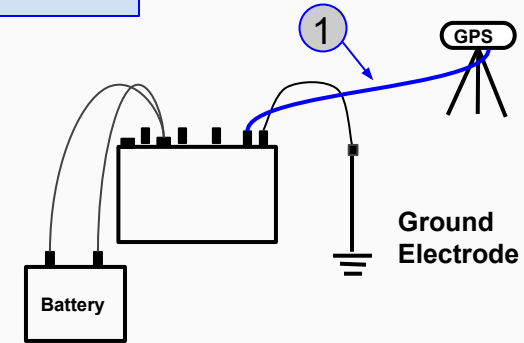


Screen Display

GPS: N [--] - no satellites found / waiting for signal



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



2



SD

Starting



Acquiring GPS



Ready



# Equipment 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 programed



- 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

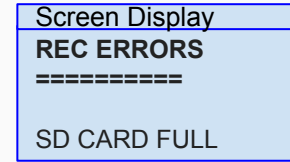
2. Turn on the receiver



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

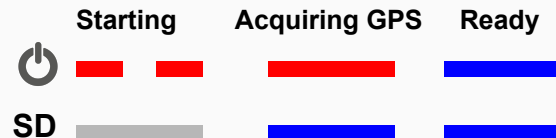


Screen Display	Screen Display	Screen Display
<b>REC ERRORS</b> =====	<b>REC ERRORS</b> =====	<b>REC ERRORS</b> =====
RECEIVER TYPE IN CONFIG FILE IS INCOMPATIBLE	CONFIG FILE IS CORRUPTED	NO CONFIG FILE IN THE SD CARD

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



- 2 Press power button briefly and release



# License Activation

## Problem:

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:

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 displays the EMpower activation interface. At the top, a title bar reads "Activation Required - EMpower". The main content area is titled "EMpower has not been activated." and provides instructions: "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 is a one-time code and cannot be reused on other devices. 3. Click the License button and if successful a confirmation message will be displayed." Below the instructions is a registration form with fields for "First name", "Last name", "E-mail address", "Company name", and "Country" (set to "Canada"). A blue dashed arrow points from the "E-mail address" field to a yellow warning icon in a dialog box titled "Service unavailable - EMpower". The dialog box contains the message: "Phoenix servers could not process your license request. Please check the entered activation code and try again." A blue circle with the number "1" is next to the dialog box. At the bottom, another dialog box titled "Error - EMpower" is shown, with the message: "Something went wrong during licensing. Please try again or contact Phoenix support." A blue circle with the number "2" is next to this dialog box. The "OK" button is visible in the bottom dialog box.

# 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

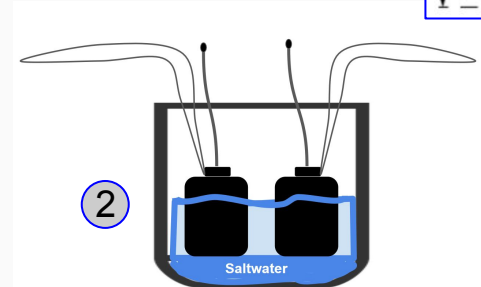
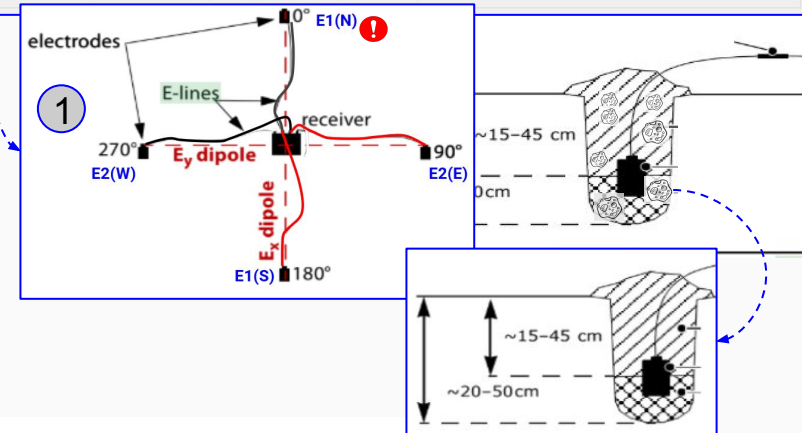
1. Verify the setup
  - Make sure the electrode is sitting on a conductive surface (remove rocks)
2. If the problem persists, set the electrodes upright in a container with a few centimeters of salt water or another ion-rich solution and measure the resistance between any pair of electrodes
  - The resistance 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 ( $\Omega$ )		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

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 correctly, and the problem follows the coil lead and/or the sensor, replace the coil lead and/or the sensor

Status:  Approved  Unapproved  Rejected

Tools: Time Series Spectra Process (Ortho)

Recording Information

Recording ID: 10125\_2018-02-23-191543  
Start time: Feb 23 2018 11:15:43 (Local) America/Los\_Angeles (GMT-08:00)  
Duration: 58 m 27 s  
Survey name: NVFeb2018  
Station name: NV03  
Operator(s): TH+GB+DF  
Layout Geometry: Orthogonal  
Declination: 0.00°  
Notes: full-rate daytime "AMT"

Electric Channels

Channel	Distance (m) to GND	(-) S / W	Polarity	(+) N / E	(-) S / W	Gain
E1	50.00	50.00	<input type="checkbox"/> Inverted	442.951	979.298	4 x 1 = x4
E2	50.00	50.00	<input type="checkbox"/> Inverted	899.293	634.689	4 x 1 = x4

E Azimuth: 0°

Magnetic Channels

Channel	Sensor	Detected	Serial #	Polarity	Gain	LPF [Hz]
H1	AMTC-30	AMTC-30	2686	<input type="checkbox"/> Inverted	x4	10000
H2	AMTC-30	AMTC-30	2862	<input type="checkbox"/> Inverted	x4	10000
H3	MTC-150	Unknown	2861	<input type="checkbox"/> Inverted	x4	10000

H1-H3 Azimuth: 0° External Filter: None

View Recording Details Export Time Series

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 channel gain or preamplification may prevent saturation
  - Preference should be given to keeping the preamplifier on and reducing the main channel gain if possible

The screenshot shows the 'Recording Details' window for recording ID 10125\_2018-10-23-154952. It is divided into several sections: Recording Details, Timing Details, Instrument Info, Decimation, GPS Timing Card, and Channels Details.

**Recording Details:**  
Recording ID: 10125\_2018-10-23-154952  
Survey Name: Test Rack  
Station Name:  
Receiver Type: MTU-5C  
Instrument Serial: 10125  
Operator: ssorra

**Timing Details:**  
Start Time: Tue Oct 23 15:49:53 2018 GMT(-00:00)  
Stop Time: Tue Oct 23 15:49:56 2018 GMT(-00:00)  
Duration: 3 s  
Latitude: 43.809°N  
Longitude: 79.338°W  
Altitude: 166.031 m

**Instrument Info:**  
OS Version: v1.33.  
Motherboard Model: BMB01  
Motherboard Serial: 03  
Battery: Low: 12.344  
Temperature: Low: 32°C

**Decimation:**  
Recorded 1 second at 24000 and continuously at 150 samples

**GPS Timing Card:**  
Serial Number: 201988  
Model: BTM01-I

**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

The 'Electric channel settings' for channel E1 are highlighted with a blue dashed box and a circled '2'. The settings are: Enabled (checked), Preamp / Attenuator (Preamplifier), Gain (x1), Low Pass Filter (10 kHz), Positive Distance (50.00 m), and Negative Distance (50.00 m).

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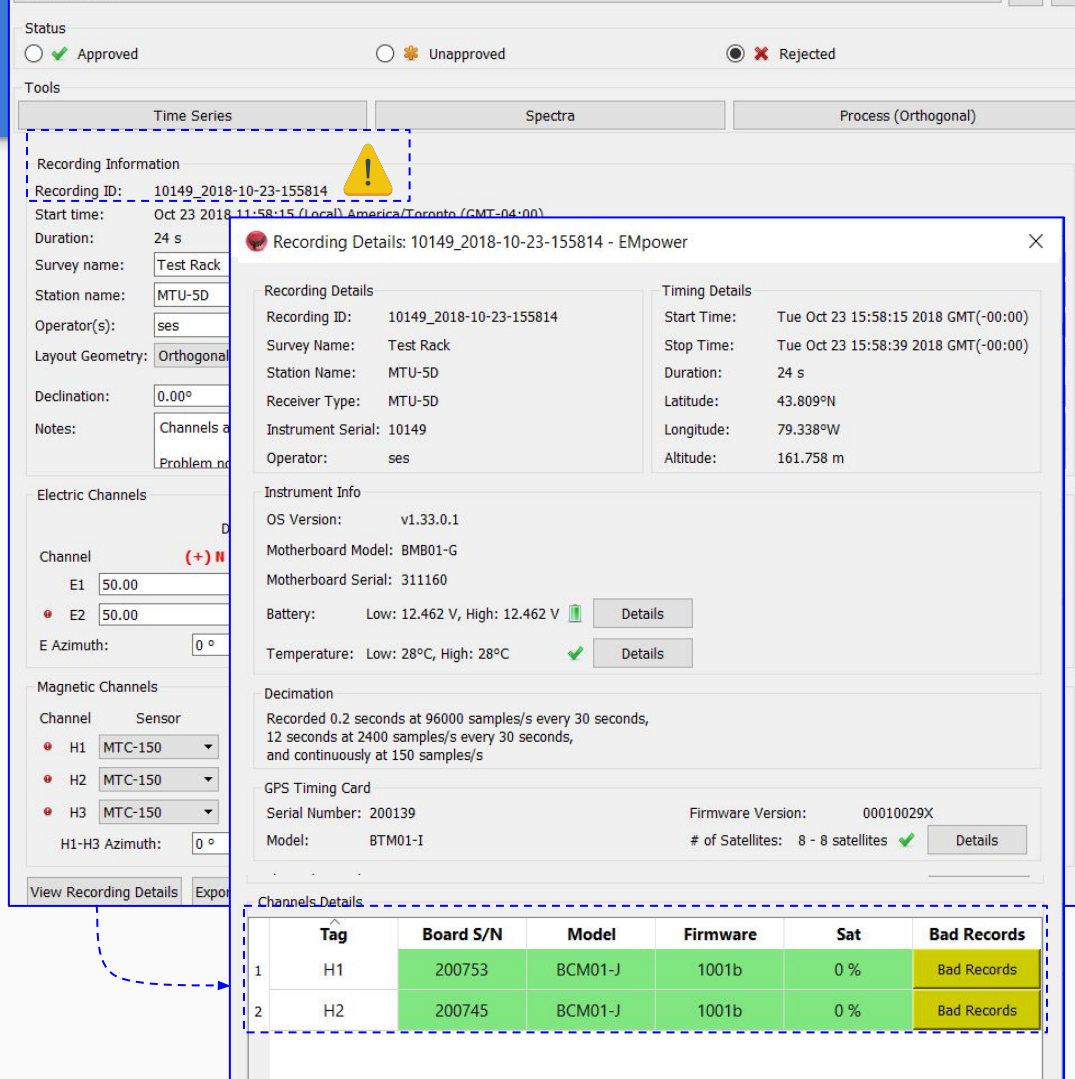
# Bad Records

## **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*)



The screenshot displays a software interface for recording management. At the top, there is a status bar with three options: 'Approved' (selected), 'Unapproved', and 'Rejected'. Below this is a 'Tools' section with tabs for 'Time Series', 'Spectra', and 'Process (Orthogonal)'. The main area shows 'Recording Information' for a specific recording ID, which includes fields for Start time, Duration, Survey name, Station name, Operator, Layout Geometry, Declination, and Notes. A yellow warning icon is present next to the Recording ID. A 'Recording Details' dialog box is open, providing further information about the recording, including Timing Details (Start Time, Stop Time, Duration, Latitude, Longitude, Altitude), Instrument Info (OS Version, Motherboard Model, Motherboard Serial, Battery, Temperature), and Decimation settings. At the bottom, a 'Channels Details' table is shown, listing channels H1 and H2 with their respective Board S/N, Model, Firmware, Sat status, and a 'Bad Records' column.

	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

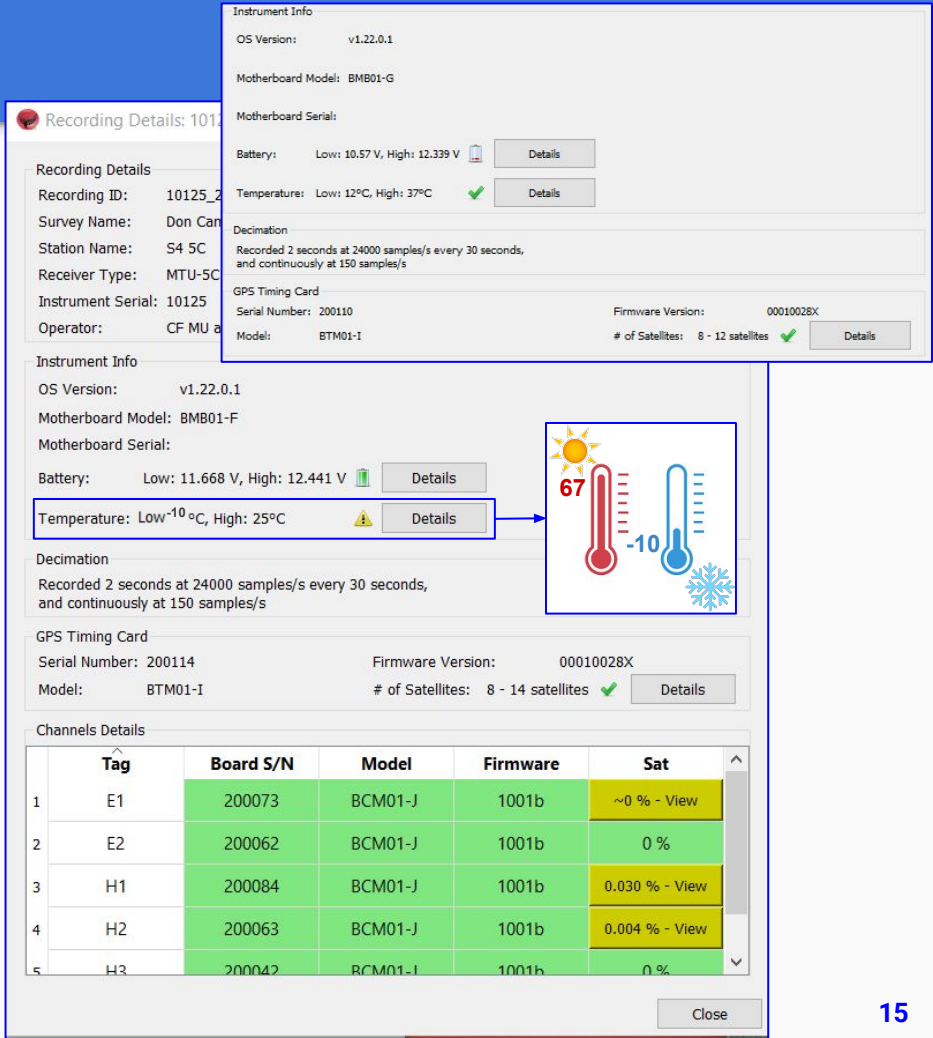
- Measure the battery voltage before connecting it to the receiver, and again when the equipment is turned on (both measurements should be 12V minimum)
- Check the battery electrolyte fluid level and add liquid to it if needed

### 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 instrument health monitoring interface. It is divided into several sections:

- Recording Details:** Shows recording ID 10125\_2, Survey Name Don Can, Station Name S4 5C, Receiver Type MTU-5C, Instrument Serial 10125, and Operator CF MU a.
- Instrument Info:** Shows OS Version v1.22.0.1, Motherboard Model BMB01-F, Motherboard Serial, Battery (Low: 11.668 V, High: 12.441 V), and Temperature (Low: -10 °C, High: 25 °C) with a warning icon. A callout box highlights the temperature section, showing a thermometer with 67 and -10, and a sun/snowflake icon.
- 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.
- Channels Details:** A table listing channels with columns for Tag, Board S/N, Model, Firmware, and Sat.

	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 the EMpower software interface. At the top, there's a menu bar (File, Window, Help) and a toolbar. Below that, a 'Recording Library' pane shows a list of recordings for 'Nov 29 2017'. The main area is a map showing a location near Hawthorne, Nevada, with a red 'X' marker and a green circle. To the right, there are two panels: 'S1 MTU-5C (19 h 22 m 5 s)' and 'Magnetic Channels'. The 'Magnetic Channels' panel contains a table with columns for Channel, Sensor, Detected, Serial #, Cal, Polarity, Gain, LPF [Hz], and DC [V].

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

This is a close-up of the 'Magnetic Channels' table from the screenshot above. A dashed blue box highlights the row for channel H3, where the 'Cal' column contains a red 'X' instead of a checkmark. A blue dashed arrow points from this 'X' to a grey callout box at the bottom right that says 'No matching calibration found'.

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





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