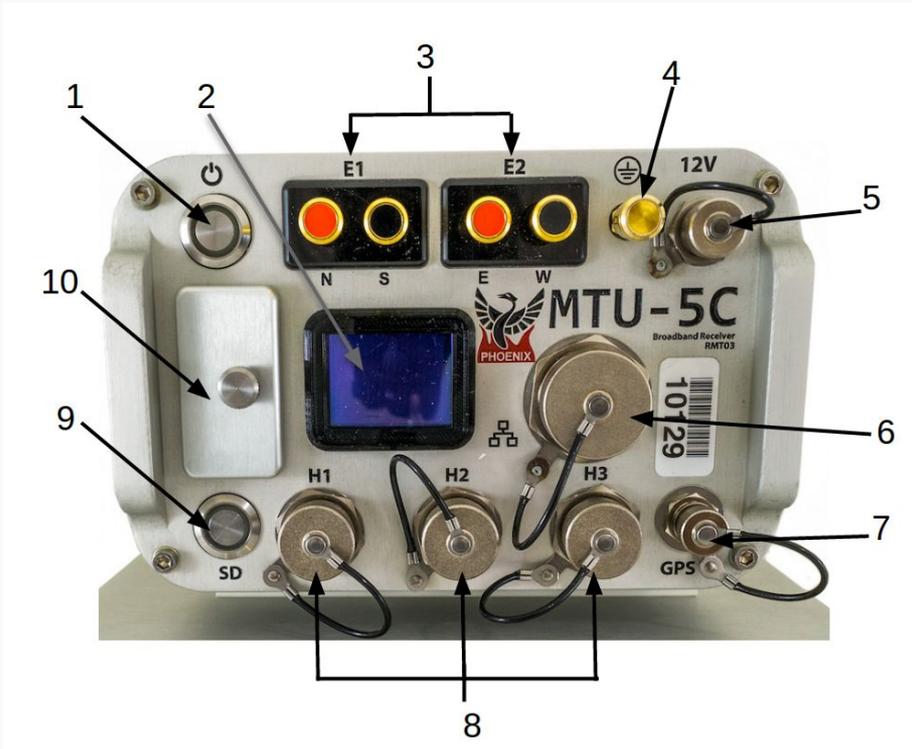


# MTU-5C Quick Start Guide



- MTU-5C (components)
- Creating a Configuration File
  - Configuration Creator
  - Electric Channel Settings
  - Magnetic Channel Settings
  - Remote Control
    - Using Remote Control Client
    - Remote Control - Troubleshooting
- Saving a Configuration File
- MTU-5C Connections
- SD Card - Recording Data
  - Stopping a recording
  - Importing and Evaluating Data
- Evaluate
  - View Recording Details
- Process Data



## Components

1	Power/Record button and indicator
2	Display
3	E1 (Ex) electrode connectors E2 (Ey) electrode connectors
4	Ground electrode connector
5	12VDC power input
6	LAN connector
7	GPS antenna connector
8	H1 (Hx) magnetic sensor connector H2 (Hy) magnetic sensor connector H3 (Hz) magnetic sensor connector
9	SD card button and indicator
10	SD card slot and cover

# Creating a Configuration File

Open **EMpower** and click the **Prepare** button

Complete the required information

## 1. Select the **Receiver Type**

## 2. **Recording**

### 2.1. **MT - Configuration Creator**

## 3. **Calibration**

### 3.1. **Sensor Calibration**

### 3.2. **Receiver Calibration**

- No additional configuration needed

## 4. **System tests**

### 4.1. **White Noise**

### 4.2. **Parallel Noise - Configuration Creator**

### 4.3. **Self Test**

- No additional configuration needed

**EMpower**

**Prepare - EMpower**

**EMpower Geophysical by Phoenix Geophysical**

1 Receiver Type: MTU-SC

2 Recording

3 Calibration

4 System Tests

2.1 MT

3.1 Sensor

3.2 Receiver

4.1 White Noise

4.2 Parallel Noise

4.3 Self Test

Prepare

Evaluate

Manage

Check data

View time series and spectra

View noise test results

View quick-estimate apparent resistivity

Manage surveys

**Sensor configuration - EMpower**

3.1 Receiver Type: MTU-SC

3.1 Sensor Type

Serial number

Enabled

Channel	Sensor Type	Serial number
<input checked="" type="checkbox"/> H1	MTC-150	0
<input checked="" type="checkbox"/> H2	MTC-150	0
<input checked="" type="checkbox"/> H3	MTC-150	0

All enabled magnetic channels require a unique, non-zero serial number.

Load Save Close

**Prepare - EMpower**

4.1 Receiver Type: MTU-SC

Select your white noise source

Broadband WN3 - High WN3 - Low

Return

**Select target location**

Look in: C:\

Name	Size	Type	Date Modified
config.json	3 KB	js...le	15/07/2019 9:24

3.2 / 4.3

File name: config.json Save

Files of type: Config file (\*.json) Cancel

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# Configuration Creator - Proposal

1. Check that the **Receiver type is MTU-5C**
2. Select the **Schedule**
  - 2.1. **Manual or Automatic Start**
  - 2.2. Or for a specific schedule use, **Single Shot, Daily or Weekly** and click **Add Schedule** to define the time and date
3. **Live tool** (see the [Networking Settings manual](#))
4. **Channels Settings** (see pages 6-7)
5. Define the **Sampling Mode and/or Sampling Rate**
6. **Configuration Layout**

Configuration Creator - EMpower

File Receiver Schedule Timezone

- Manual Ctrl+Alt+1
- Automatic Start Ctrl+Alt+2
- Single Shot Ctrl+Alt+3
- Daily Ctrl+Alt+4
- Weekly Ctrl+Alt+5
- Add Schedule Ctrl+A

MTU-5C Broadband Receiver

Phoenix Geophysics

Live Tool

MTC-150 Gain: x4 LPF: 10 kHz S/N: 0

MTC-150 Gain: x4 LPF: 10 kHz S/N: 0

MTC-150 Gain: x4 LPF: 10 kHz S/N: 0

Channel E1

Electric channel settings

Enabled

Preamp / Attenuator Preamplifier

Gain x1

Low Pass Filter 10 kHz

Positive Distance 50.00 m

Negative Distance 50.00 m

Receiver Settings

Sampling Mode  Continuous sampling  Sparse high frequency sampling

Sampling Rate 24kps High  View graphic 0.13 GB / Hour

Configuration layout

Layout Geometry Parallel

Survey Name Orthogonal

Parallel

Site Name

Operator(s)

Company Name

Configuration Notes

Additional information

*i* This section is used for inputting the parameters and instrument details that will be used for the recording

# Electric Channel Settings

1. Select the **Electric** channel
2. **Enable** or **Disable** the channel(s)
  - Disable the channel(s) if you do not plan to use them during the recording (*This will save space on the SD card*)
3. Complete the information in the **Electric channel settings**

Channel: E1 (1)

Electric channel settings

Enabled  (2)

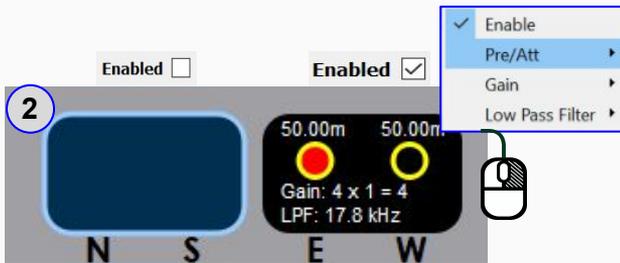
Preamp / Attenuator: Preamplifier (3)

Gain: x1

Low Pass Filter: 10 kHz

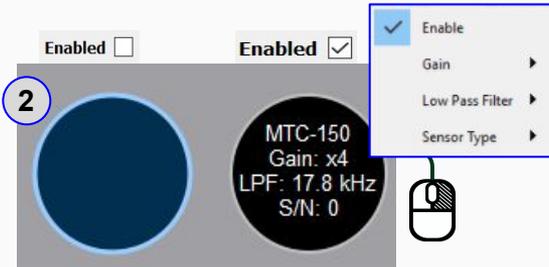
Positive Distance: 50.00 m

Negative Distance: 50.00 m

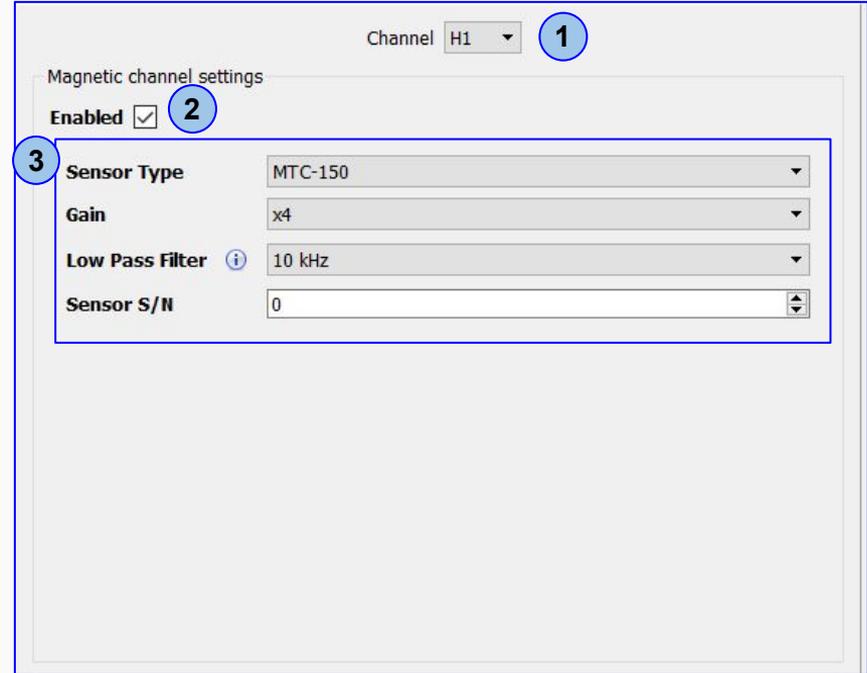


# Magnetic Channel Settings

1. Select the **Magnetic** channel
2. **Enable** or **Disable** the channel(s)
  - Disable the channel(s) if you do not plan to use them during the recording (*This will save space on the SD card*)
3. Fill in the required information on the **Magnetic channel settings**



Some channel settings can be configured by using the right-click menu



Channel settings can be configured by using the right-click menu or by using the Magnetic channel settings section

# Remote Control

1. Select **Channel NET** or click the **Live Tool** channel
2. Define the **Mode**
  - Auto (DHCP)
  - Static
3. Remote Control Server, enable
  - Server URL or IP
  - User Name
  - Password



Use "Receiver Remote Control System Configuration" manual → [link](#)

The screenshot displays the 'Configuration Creator - EMpower' software interface. The window title is 'Configuration Creator - EMpower' and the menu bar includes 'File', 'Receiver', 'Schedule', and 'Timezone'. The interface is divided into several sections:

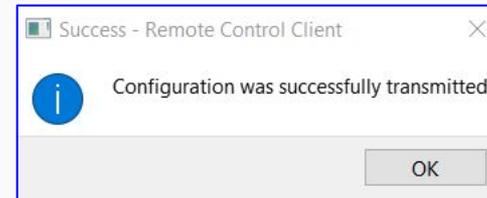
- Channel:** A dropdown menu is set to 'NET', indicated by a circled '1'.
- Network Settings:** A section containing fields for Mode (set to 'Auto (DHCP)'), IP Address, Network Mask, and Default Gateway. It also includes options for File Transfer Server, Method (set to 'RSync'), Server URL, User Name, and an SSH Key field. A circled '2' is placed over this section.
- Nameservers:** A section with a text input field and a '+' button. A circled '3' is placed over the 'Remote Control Server' checkbox and its associated fields (Server URL, User Name, Password).
- Receiver Settings:** A section with 'Sampling Mode' (radio buttons for 'Continuous sampling' and 'Sparse high frequency sampling', with the latter selected) and 'Sampling Rate' (set to '24kps High').
- Configuration layout:** A section with 'Layout Geometry' (set to 'Orthogonal'), 'Survey Name' (set to 'Phoenix'), 'Site Name', 'Operator(s)', 'Company Name' (set to 'Phoenix-Geophysics'), and 'Configuration Notes'.

In the center of the interface is a photograph of the MTU-5C Broadband Receiver. The receiver has four channels labeled N, S, E, and W. Each channel has a '50.00m' display and a 'Gain: Preamp x 1 10 kHz' label. The receiver also features three 'MTC-150' modules, each with 'Gain: x4', 'LPF: 10 kHz', and 'S/N: 0' labels. A circled '1' is placed over the 'Auto (DHCP)' label on the receiver.

# Using Remote Control Client

1. Run the Remote Control Client application
2. Provide a valid **hostname**, **username** and **password**
3. Then click on **Connect** button to establish a connection
4. **Choose Receiver Type**
5. **Enter the instrument ID**
6. Configure **Electric and Magnetic channels** as needed
7. Click on the **Send Configuration** button
  - To check the configuration on the receiver screen wait for at least **three minutes**

The screenshot shows the 'Remote Control Client' application window. It features a 'Connect' button (3) and a 'Disconnect' button. Below these are input fields for 'Host name', 'Username', and 'Password' (2), and a 'Choose Receiver Type' dropdown menu (4) set to 'MTU-5C'. An 'Enter Instrument ID' field (5) is also present. The main area contains two tables for channel configuration: 'Electric Channels' and 'Magnetic Channels'. Each table has columns for 'Channel', 'Enabled', 'Gain', and 'LPF [Hz]'. The 'Enabled' column contains checkboxes, and the 'LPF [Hz]' column contains dropdown menus. A callout box (6) with an information icon explains: 'Enabled flag toggles the channel acquisition mode (on when enabled and off otherwise)'. At the bottom right, there is a 'Send Configuration' button (7) and a 'Close' button.

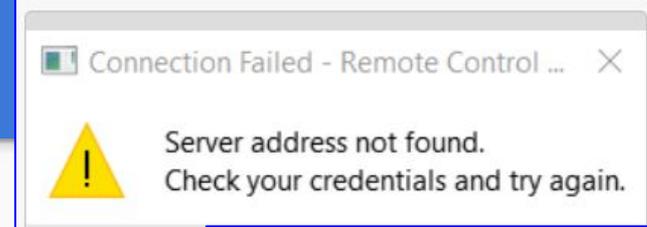


# Remote Control Client application - Troubleshooting

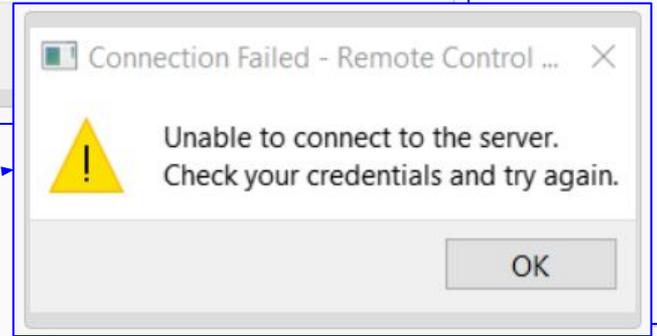
When the connection is not successful these messages may be displayed

## Solutions

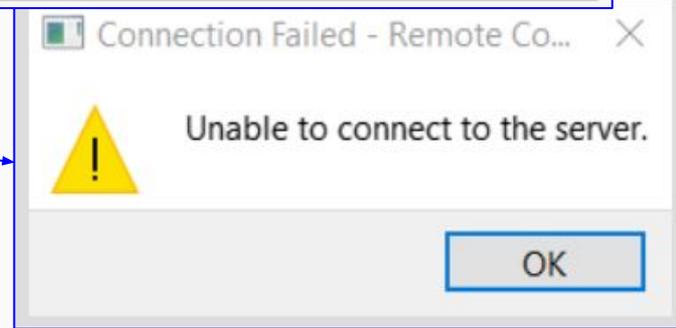
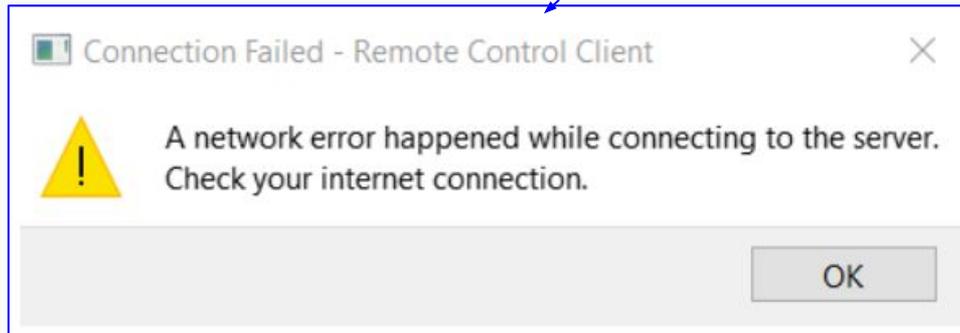
1. Check the credentials provided
2. Make sure that you are connected to the internet



1

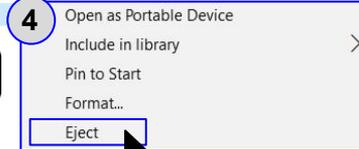
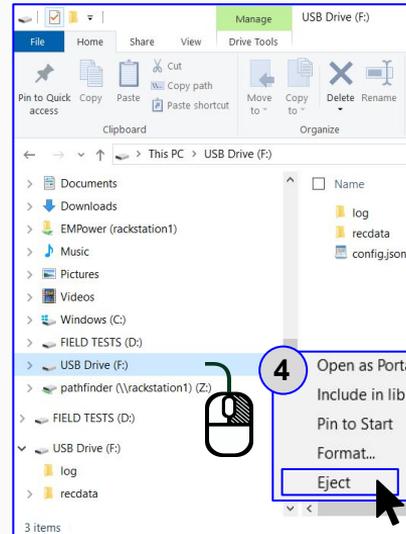
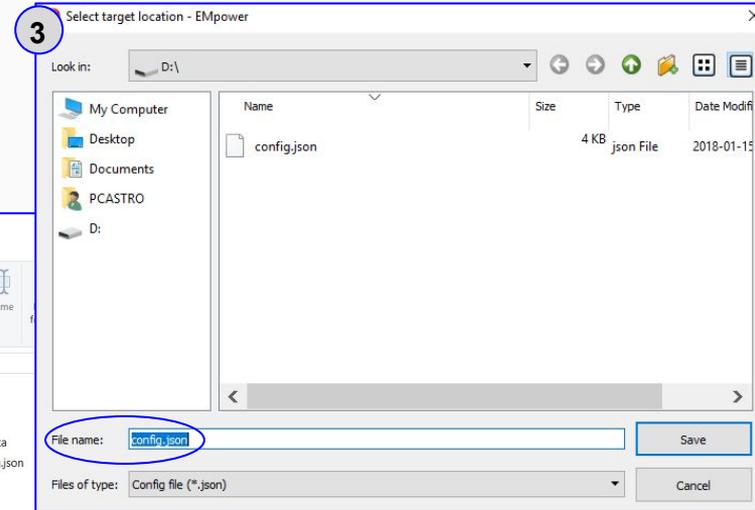
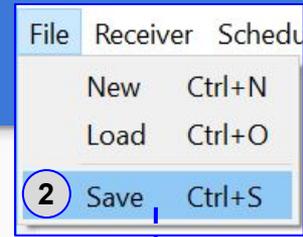


2



# Saving a Configuration File

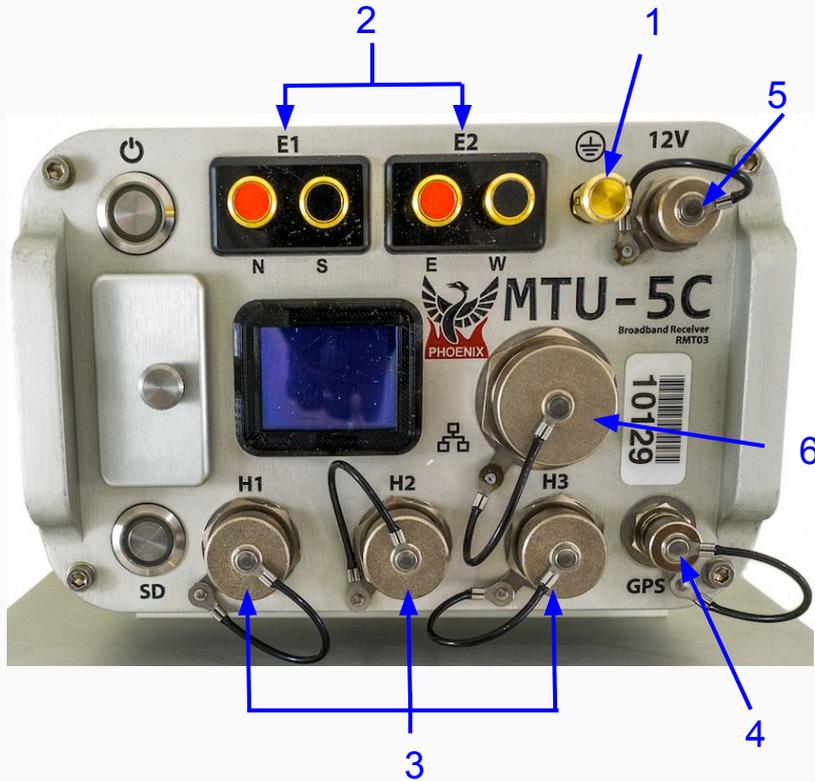
1. Insert the SD Card
  - The computer must be equipped with an SD card slot or use a USB card reader
2. Click the **File** menu
  - **Save or Ctrl+S**
  - **Select the SD card**
  - **EMpower** will automatically create the file "**config.json**"
3. Save the configuration file (**config.json**) in the root folder of the **SD card**
4. Open the file explorer
  - Right click **SD card** drive
  - **Select Eject option**
  - **Pull out the SD Card**



# MTU-5C Connections

Start by connecting:

1. Ground electrode
2. Electrodes to channel E1(Ex) (N+, S-) and channel E2(Ey) (E+, W-)
3. Magnetic sensors to channels H1(Hx), H2(Hy) and H3(Hz)
4. GPS antenna
5. 12V DC Power Source
6. Network connector



 In the field, it is often most efficient to connect the components to the receiver following the order on the right

# SD Card - Recording Data

## Recording

1. Insert the **SD card**
2. To turn on the receiver, press the **Power** button briefly
  - 2.1. Wait until both **LEDs** are solid blue
  - 2.2. **Automatic Start** recording
3. If the schedule type was configured as **Manual**, press the **Power** button to start recording



- 2 Press the power button briefly and release

	Starting	Acquiring GPS	Ready
Power			
SD			

- 2.1 **Automatic Start**  
*The recording starts automatically according to the schedule*

2.2		<b>Recording</b>
	<b>SD</b>	

- 3 Press the power button briefly and release

	Ready	Channels Detection	Recording
Power			
SD			



### Indicators

- Rapid, equal pulses
- Solid color / Off

# Stopping a recording

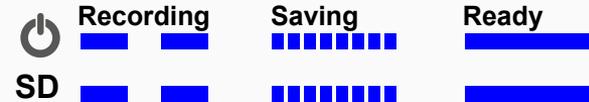
1. Press the **Power** button briefly and release to stop recording
  - Wait until both LEDs are steady blue
2. Turn off the receiver, pressing the **Power** button for a few seconds the **LEDs** will flash red
  - Wait until both **LEDs** turn off
3. Eject the **SD card**
  - Press the **SD card** and release, pull the **SD card**



## Indicators

- Rapid, equal pulses
- Solid color / Off

- 1 Press the **Power** button briefly and release



- 2 Keep pressing the power button 3 sec and release

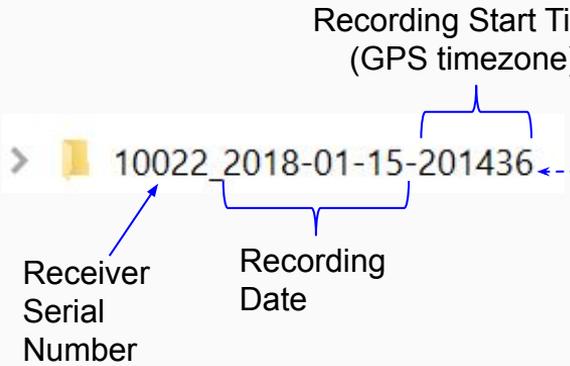


- 3



# Importing and Evaluating Data

1. Click the **Evaluate** button
2. Select **View data**
3. Select the **SD card**
  - The recording creates two folders, log and recdata
4. Open the **recdata** folder and select the recording file and click **Choose**



EMpower

### EMpower Geophysical Software by Phoenix Geophysics

Prepare

**1** Evaluate

**2** View data

Check quality of acquired data

View calibration

Monitor receiver

View self-test results

Manage surveys

Import data and prepare for

View recording sites on a map

View time series and spectra

Process data with local or remote reference

Edit processed data and export for interpretation

Quit EMpower

Manage

Exit

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Evaluate - Selection — EMpower

Recording Folder - EMpower

Look in: E:\

Name	Size	Type	Date Modified
config.json	3 KB	json File	2018-04-10 3:58
log		File...lder	2018-04-11 2:55
recdata		File...lder	2018-04-11 5:05

Recording Folder - EMpower

Look in: E:\recdata

Name	Size	Type	Date Modified
10022_20...5-201436		File...lder	2018-01-15 7:...

Directory: [ ]

Files of type: [ ]

Choose

Cancel

## Review and Process the recorded information

- Review the Electrode **Resistance** values and make the necessary corrections
  - Electrode **Distance (m) to GND**
  - E-Azimuth**
  - External Filter**
- Ensure that the magnetic sensors were detected and make the necessary corrections
  - Serial #**
  - Polarity**
  - H1-H-3 Azimuth**
- View Recording Details** (see page 14)
- Process** the recorded data after the reviewed the information (see next page)

Channel	Sensor	Detected
H1	MTC-50H	Not Present



The warning icon indicates that something might be wrong with the recording, review the recording information and make necessary changes

Evaluate - EMpower

MB 8 (12 m 23 s)

Status  
 Approved  Unapproved  Rejected

Tools  
 Time Series Spectra Process (Orthogonal)

Recording Information

Recording ID: 10125\_2019-01-30-182945  
 Start time: Jan 30 2019 13:29:46 (Local) America/Toronto (GMT-05:00)  
 Duration: 12 m 23 s

Survey name:   
 Station name: MB 8  
 Operator(s): WH+SC+MU  
 Company name:   
 Layout Geometry: Orthogonal  
 Declination: 0.00°  
 Notes: High contact resistance  
 +40 azimuth  
 +15 declination

Electric Channels

Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF [Hz]	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	32.80	30.80	<input type="checkbox"/> Inverted	2639.58	3565.26	4 x 1 = x4	10000	0.0082
E2	29.00	26.00	<input type="checkbox"/> Inverted	2651.17	3302.63	4 x 1 = x4	10000	-0.0063

E Azimuth: 0° External Filter: None

Magnetic Channels

Channel	Sensor	Detected	Serial #	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-150	MTC-150	53874	<input type="checkbox"/> Inverted	x4	10000	0.031
H2	MTC-150	MTC-150	53909	<input type="checkbox"/> Inverted	x4	10000	-0.0099
H3				<input type="checkbox"/> Inverted	N/A	N/A	N/A

H1-H3 Azimuth: 0°

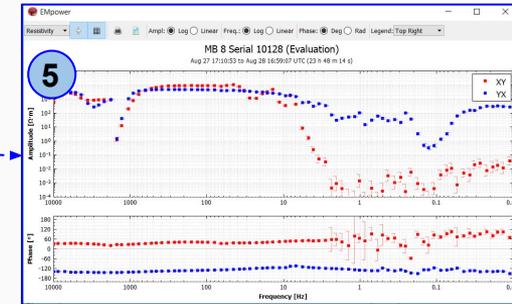
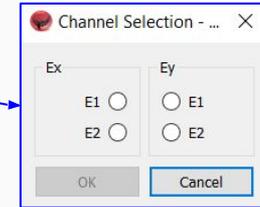
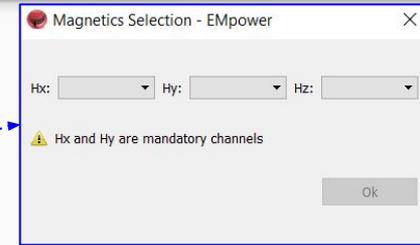
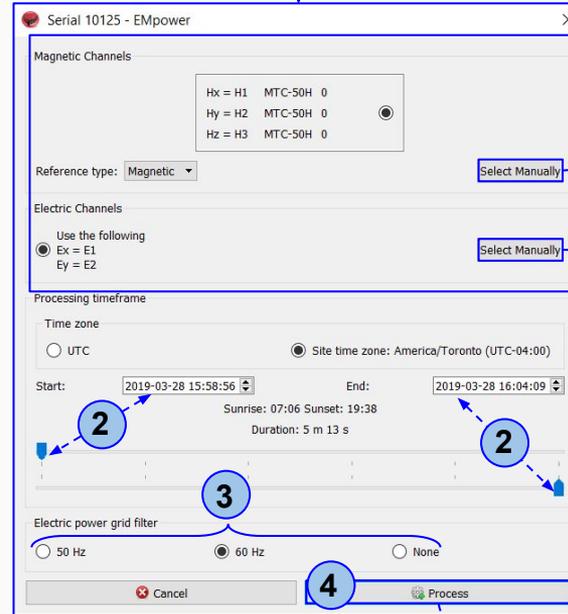
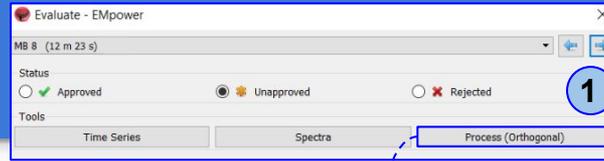
View Recording Details

This section can also be used to input additional field information if desired

# Process Data

1. Click the **Process** button
  - Verify that the channels and references selected are the desired ones
2. Define the time period by entering a start and end date/time
3. **Enable the electric power grid filter** that corresponds to the frequency carried by the power lines in the survey region (*50Hz, 60Hz or None*)
4. Click the **Process** button
5. A live display of the resistivity curve will appear after a few seconds

*\*This resistivity curve is not saved. It is purely for QC purposes*



# View Recording Details

Review that the following levels are within valid limits for quality control:

1. Battery Voltage
2. Internal Temperature
3. Number of Satellites
4. Saturated Frames
5. Time Series Level

- If saturation is not close to ~0%, review the channel configuration (see pages 4 - 6), the channel gain might be too high and/or there is artificial noise on your site

**Recording Details: 10205\_2018-10-04-193809 - EMpower**

<b>Recording Details</b>		<b>Timing Details</b>	
Recording ID:	10205_2018-10-04-193809	Start Time:	Thu Oct 4 19:38:10 2018
Survey Name:	WA	Stop Time:	Sun Oct 7 23:52:14 2018
Station Name:	Remote	Duration:	76 h 14 m 4 s
Company Name:		Latitude:	46.1459°N
Receiver Type:	MTU-SC	Longitude:	122.783°W
Instrument Serial:	10205	Altitude:	1136.11 m
Operator:	EF&YA		

**Instrument Info**

OS Version: v1.27.1

Motherboard Model: BMB01-G

Motherboard Serial: 031987

Battery: Low: 12.192 V, High: 12.88 V ■ Details

Temperature: Low: 17°C, High: 21°C ✓ Details

**Decimation**

Recorded 2 seconds at 24000 samples/s every 30 seconds, and continuously at 150 samples/s

**GPS Timing Card**

Serial Number: 201288      Firmware Version: 00010029X

Model: BTM01-1      # of Satellites: 6 - 15 satellites ✓ Details

Tag	Board S/N	Model	Firmware	Sat	Signal Ranges
1	201070	BCM01-I	1001c	~0% - View	View Levels
2	201074	BCM01-I	1001c	0.001% - View	View Levels
3				0%	View Levels
4				0%	View Levels

**1 Battery Voltage**

**2 Internal Temperature**

**4 Saturated Frames - E1**

**3 Number of Satellites**

**5 Time Series Level - E1**