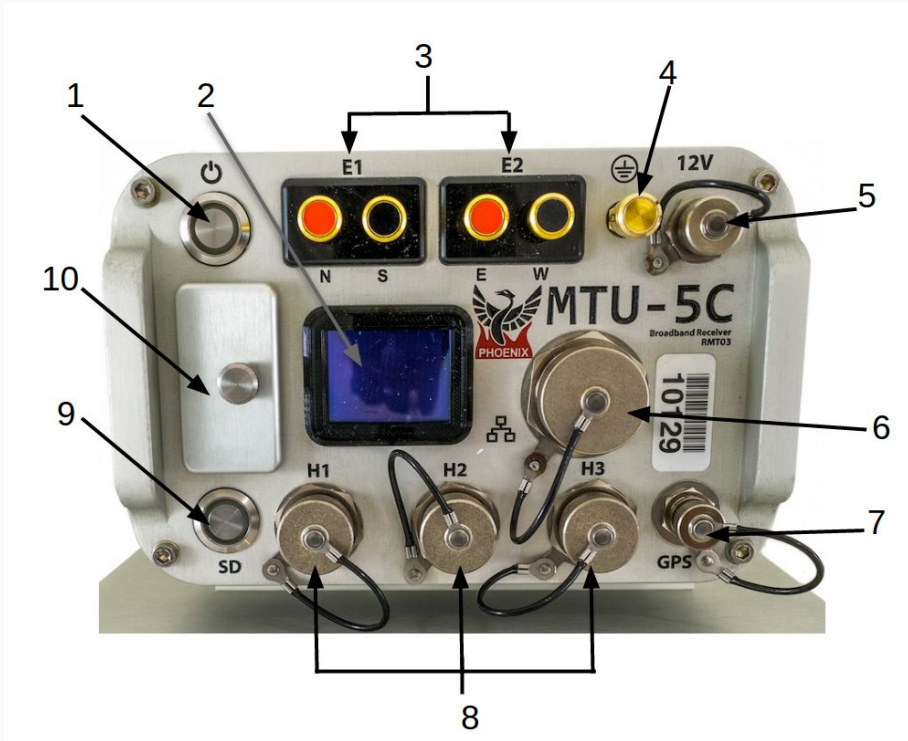


MTU-5C Quick Start Guide



2. MTU-5C (components)
3. Creating a Configuration File
4. Configuration Creator
5. Electric Channel Settings
6. Magnetic Channel Settings
7. Remote Control - Configuration File
8. Using Remote Control Client
9. Saving a Configuration File
10. MTU-5C Connections
11. SD Card - Recording Data
12. Stopping a recording
13. Importing and Evaluating Data
14. Evaluate
15. View Recording Details
16. 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
EMpower Geophysical
by Phoenix Geophysical

Prepare

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

Evaluate

Check data

View time series and spectra

View noise test results

View quick-estimate apparent resistivity

Manage surveys

Manage

Sensor configuration - EMpower

3.1

Receiver Type: MTU-SC

Enabled

Enabled	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

Files of type: Config file (*.json)

Save Cancel

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3

Configuration Creator

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**
5. Define the Receiver Settings **Sampling Mode and/or Sampling Rate**
6. **Configuration Layout**

Configuration Creator - EMPOWER

File Receiver Schedule Tools

- 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
PHOENIX ELECTRONICS
Live Tool

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

Magnetic channel settings

Channel H2

Enabled

Sensor Type MTC-150

Gain Normal

Low Pass Filter 10 kHz

Sensor S/N 0

Receiver Settings

Sampling Mode Continuous sampling Sparse high frequency sampling

Sampling Rate 24000 s/s View graphic 1.38 GB / Hour

Enhanced Sensor Stabilization Enable

Configuration layout

Layout Geometry Orthogonal

Survey Name

Site Name

Operator(s)

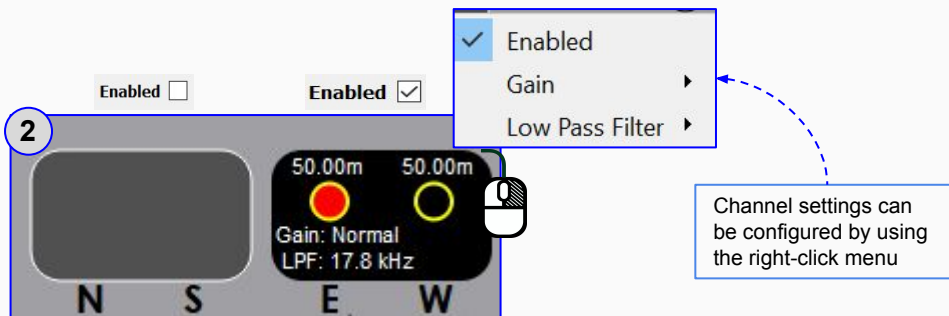
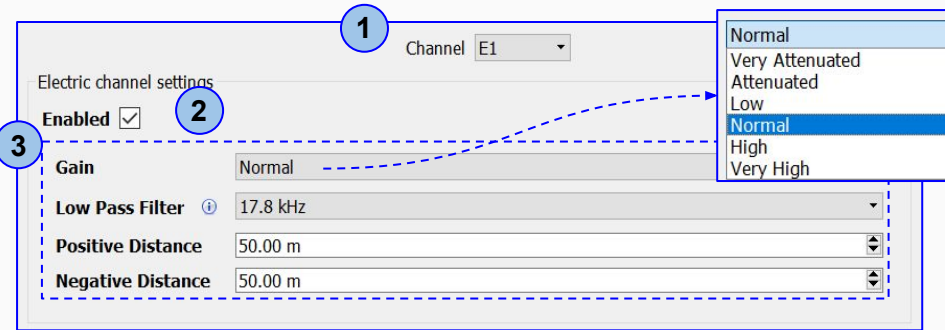
Company Name

Configuration Notes
Additional information

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

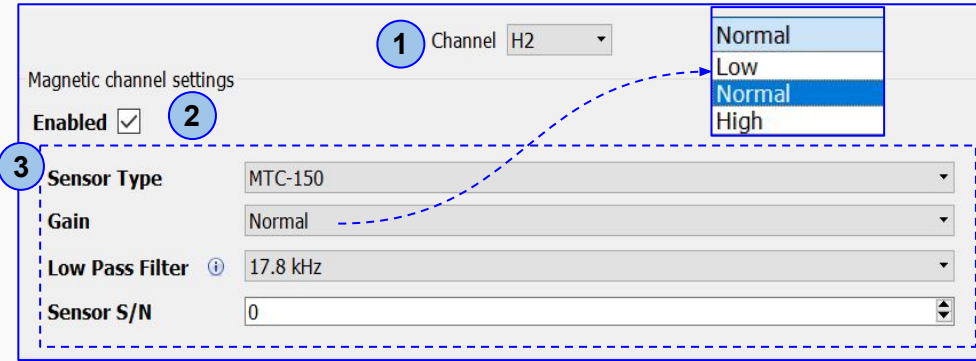
Electric Channel Settings

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**

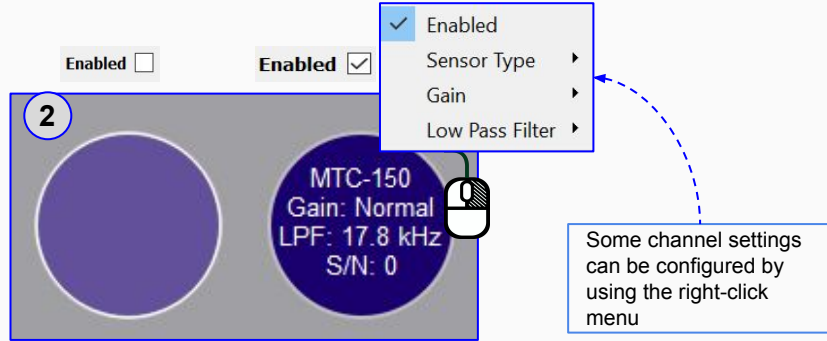


Magnetic Channel Settings

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**



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. Enable **Remote Control Server**
 - Server URL or IP
 - User Name
 - Password

The screenshot displays the 'Configuration Creator - EMpower' software interface. On the left, a photograph of the MTU-5C receiver is shown with a blue circle and the number '1' highlighting the 'Auto (DHCP)' mode selection. On the right, the software's configuration panel is visible. A blue circle with the number '2' points to the 'Channel' dropdown menu, which is set to 'NET'. Another blue circle with the number '3' points to the 'Remote Control Server' checkbox, which is checked. Below this checkbox are input fields for 'Server URL', 'User Name', and 'Password'. The interface also includes sections for 'Network Settings' (Mode: Auto (DHCP), IP Address, Network Mask, Default Gateway), 'Nameservers', and 'Configuration layout' (Layout Geometry: Orthogonal, Survey Name, Site Name, Operator(s), Company Name, Configuration Notes).

Using Remote Control Client

1. Use **Remote Control Client** from Tools menu
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

Note :

Once the receiver has received the new configuration and started the new recording, screen will be inactive for at least 3 minutes.

The screenshot shows the 'Remote Control Client - EMpower' window. The 'Tools' menu is open, highlighting 'Remote Control Client' (1). The 'Connect' button is visible (3). The 'Choose Receiver Type' dropdown is set to 'MTU-5C' (4). The 'Enter Instrument ID' field contains '0' (5). The 'Electric Channels' and 'Magnetic Channels' tables are visible (6). The 'Send Configuration' button is highlighted (7). A warning message is displayed: 'Attenuator turned on for one of electric channels. Receiver firmware v1.54.1 or later is required for attenuator support.' (8). A success dialog box is also shown: 'Success - Remote Control Client. Configuration was successfully transmitted.' (8).

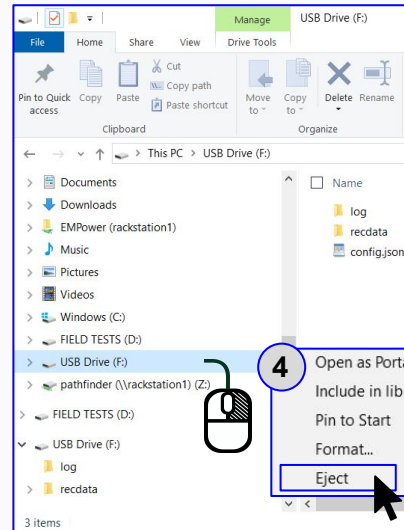
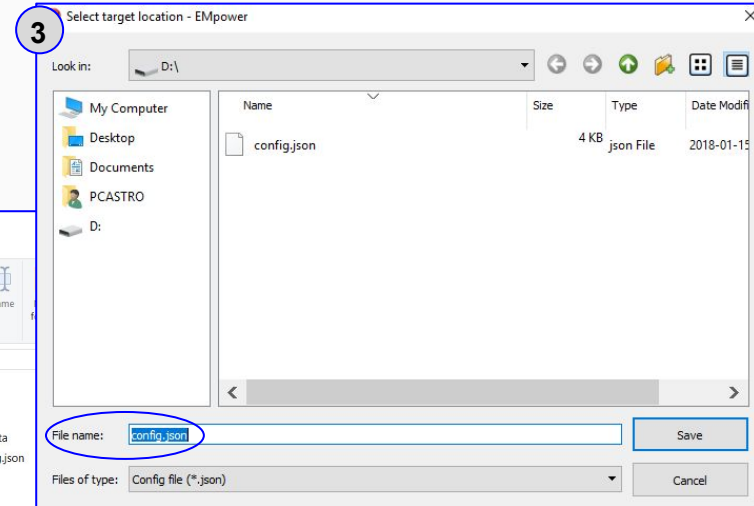
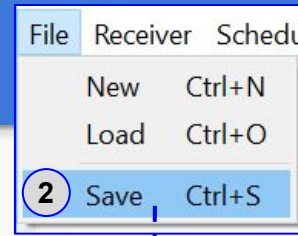
Channel	Enabled	Gain	LPF [Hz]
E1	<input checked="" type="checkbox"/>	Normal	10 kHz
E2	<input checked="" type="checkbox"/>	Normal	10 kHz

Channel	Enabled	Gain	LPF [Hz]
H1	<input checked="" type="checkbox"/>	Normal	10 kHz
H2	<input checked="" type="checkbox"/>	Normal	10 kHz
H3	<input checked="" type="checkbox"/>	Normal	10 kHz

Receiver with firmware newer than v1.54.1 will ignore the configuration about the Attenuator

Saving a Configuration File

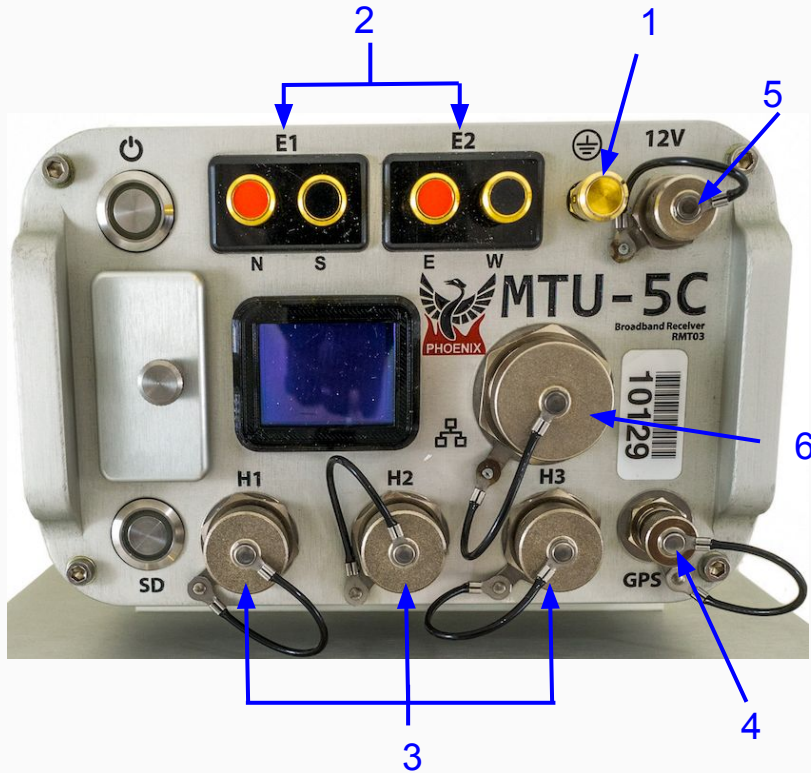
1. Insert the SD Card
 - The computer must be equipped with an SD card slot or use a USB card reader
2. Click the **File** menu
 - **Save or Ctrl+S**
 - **Select the SD card**
 - **EMpower** will automatically create the file "**config.json**"
3. Save the configuration file (**config.json**) in the root 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

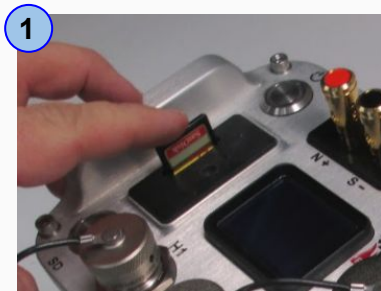


In the field, it is often most efficient to connect the components to the receiver following the order on the right

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
**For any problem with the SD Card, check the Troubleshooting manual*
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

	Recording
Power	
SD	



Indicators

- Rapid, equal pulses*
- Solid color / Off*

- 3 Press the power button briefly and release

	Ready	Channels Detection	Recording
Power			
SD			

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**

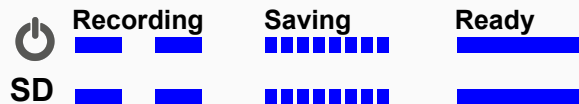


Indicators

■■■■■■■■ Rapid, equal pulses

■■■■■■■■ Solid color / Off

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



- 2 Keep pressing the power button 3 sec and release

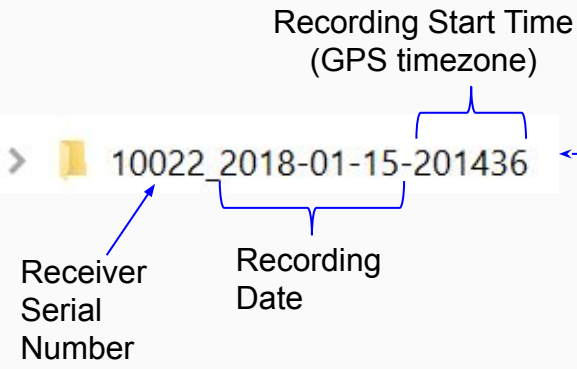


- 3



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:...

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 16*)
- 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*

The image displays the EMpower software interface for processing data. The main window shows the status of the data (Approved) and the processing timeframe (Start: 2019-03-28 15:58:56, End: 2019-03-28 16:04:09). The electric power grid filter is set to 60 Hz. The 'Process' button is highlighted with a blue circle and arrow. The 'Magnetics Selection' dialog box shows a warning that Hx and Hy are mandatory channels. The 'Channel Selection' dialog box shows radio buttons for Ex, Ey, E1, and E2. The 'Resistivity' plot at the bottom shows the amplitude and phase versus frequency for XY and YX channels.

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

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

Saturated Frames - E1 - EMpower

Time Series Level - E1 - EMpower