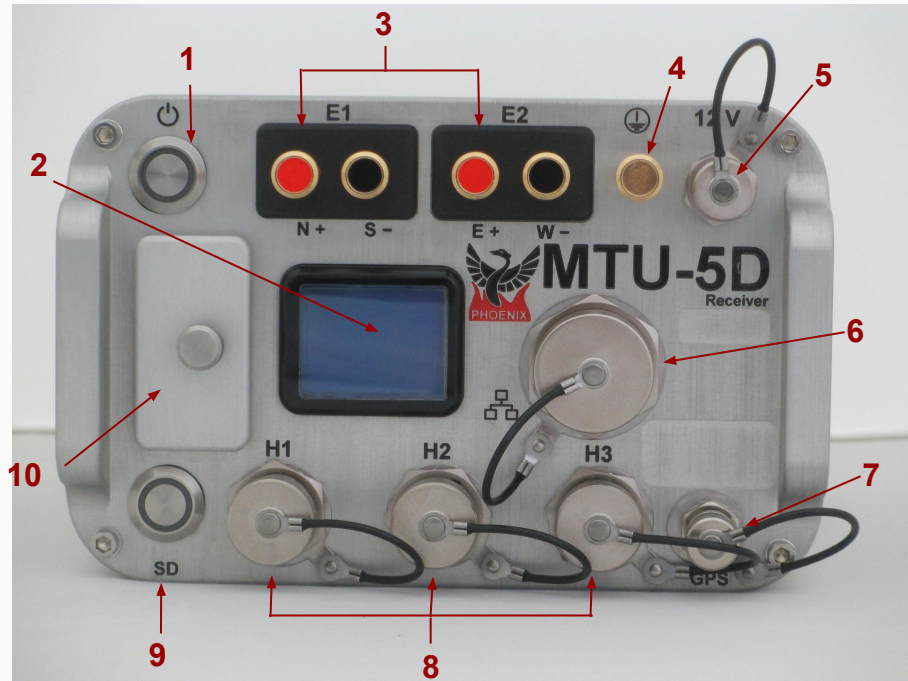


MTU-5D Quick Start User



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

1. Open **EMpower**
2. Click **Prepare** to display the **Configuration Parameters** window
3. Fill in the required information then click **OK**

The screenshot displays the EMpower software interface. The main window is titled "EMpower Geophysical Software by Phoenix Geophysics" and includes a logo for Phoenix Geophysics. A "Prepare" button is highlighted with a red circle and the number 1. A red arrow points from this button to a "Configurator Parameters - EMpower" dialog box, which is also circled with a red circle and the number 2. The dialog box contains the following fields:

- Survey Name:
- Survey Type:
- Receiver Type:
- Timezone:
- Calibration Type:
- Schedule Type:

At the bottom of the dialog box are "OK" and "Cancel" buttons. A red circle with the number 3 is placed over the "OK" button. The background software interface shows various menu options like "Evaluate", "Manage", and "Exit". At the bottom of the main window, it says "Licensed until 2037-12-30".

Configuration Creator

1

2

3

4

Information icon

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

Complete the information:

1. Check that the **Receiver** type is **MTU-5D**
2. Select the **Schedule**
3. **Receiver Settings**
 - Define the **Sampling Mode** and **Rate**
4. **Configuration Layout**

**This information will be displayed on each channel*

0.17 GB / Hour

Orthogonal

Orthogonal

Parallel

White Noise

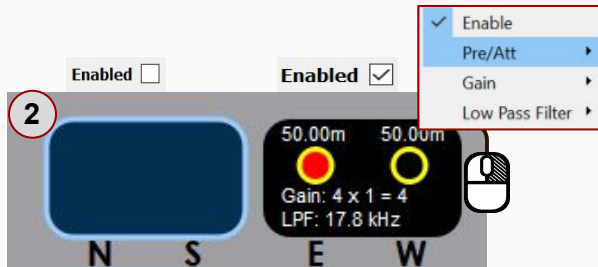
Sensor Calibration

Receiver Calibration

The Notes is useful for documenting any additional information

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 the channel during the recording
3. Fill in the required information on the **Electric channel settings**



Channel settings can be configured using right click or filling out the Electric channel settings section

Channel E1 1

Electric channel settings

2 Enabled

Preamp / Attenuator Preamplifier (x4) 3

Gain x1

Low Pass Filter 17.8 kHz

Positive Electrode Distance 50.00 m

Negative Electrode Distance 50.00 m

Receiver Settings

Sampling Mode Continuous sampling Sparse high frequency sampling

Data Density 24kps Higl

Configuration layout

Layout Geometry Orthogonal

Survey Name NVFeb2018

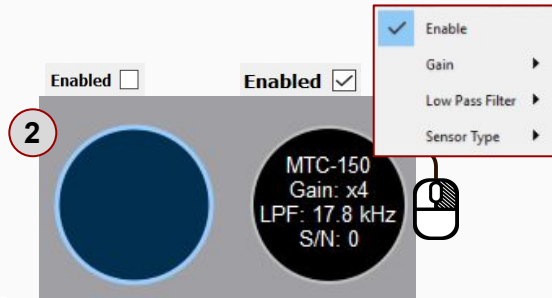
Site Name

Operator(s)

Configuration Notes

Magnetic Channel Settings

1. Select the **Magnetic** channel
2. **Disable** or **Enabled** the channel(s)
 - **Disable** the channel(s) if you do not plan to use during the recording
3. Fill in the required information on the **Magnetic channel settings**



Channel settings can be configured using right click or filling out the Magnetic channel settings section

A screenshot of the Magnetic channel settings configuration panel. The panel is titled 'Magnetic channel settings' and is located under the 'Channel' dropdown menu, which is set to 'H1'. The settings are as follows:

- Enabled**:
- Sensor Type**: MTC-150
- Gain**: x4
- Low Pass Filter**: 17.8 kHz
- Sensor S/N**: 0

Below the Magnetic channel settings is the 'Receiver Settings' section, which includes:

- Sampling Mode**: Continuous sampling Sparse high frequency sampling
- Data Density**: 24kps High

At the bottom is the 'Configuration layout' section, which includes:

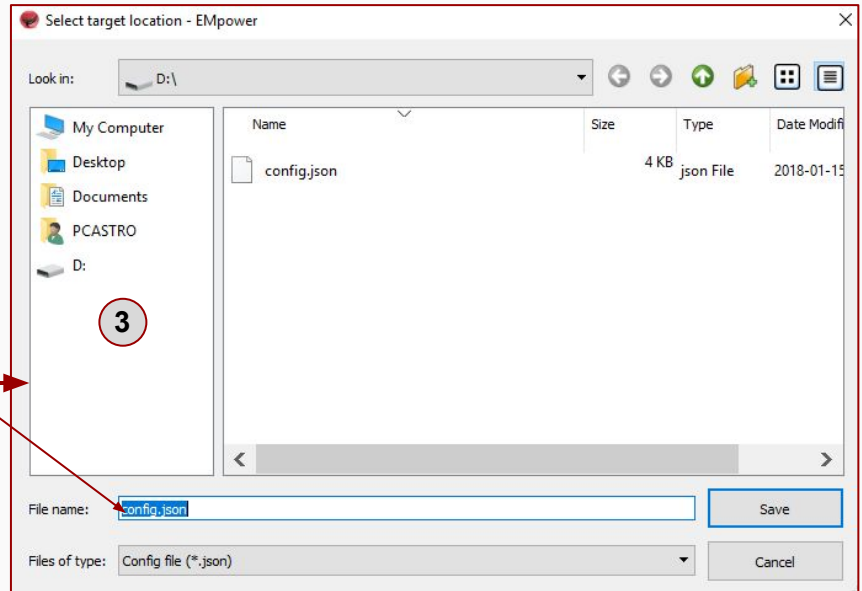
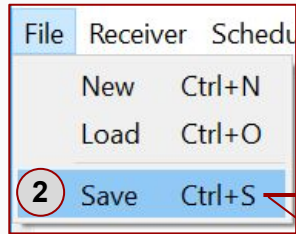
- Layout Geometry**: Orthogonal
- Survey Name**: NVFeb2018
- Site Name**: [Empty field]
- Operator(s)**: [Empty field]
- Configuration Notes**: [Empty text area]

Red circles with numbers 1, 2, and 3 are overlaid on the image to indicate key elements: 1 points to the Channel dropdown, 2 points to the Enabled checkbox, and 3 points to the Gain dropdown.

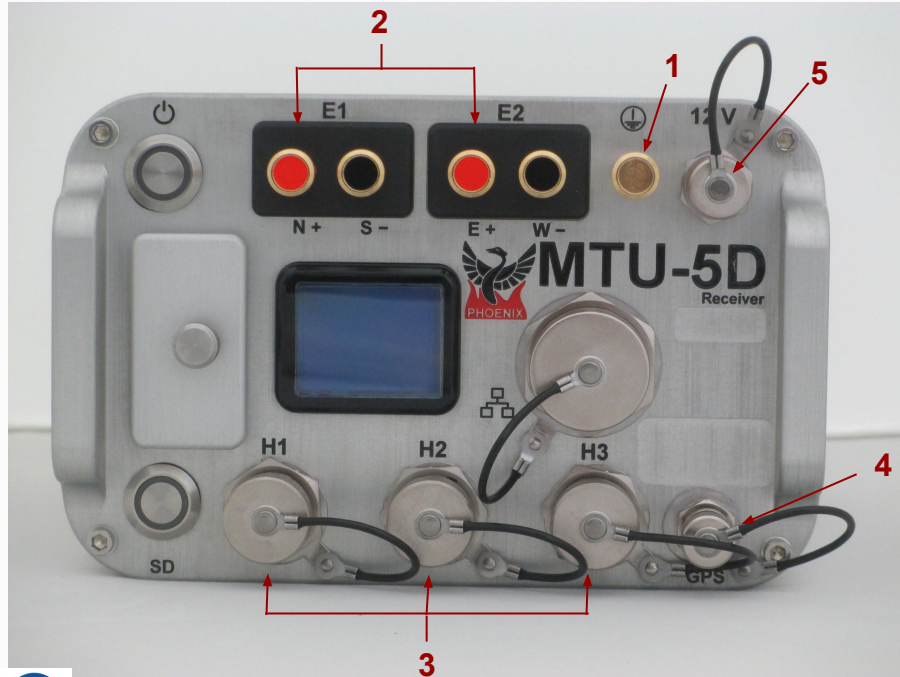
Saving a Configuration File

1. Insert the **SD card** in the computer slot or use a USB memory card reader.
2. Click **File** menu
 - **Save** or **Ctrl+S**
 - **EMpower** will automatically create the file "**config.json**"
3. Save the configuration file in the root folder of the **SD card**.

1



MTU-5D 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





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

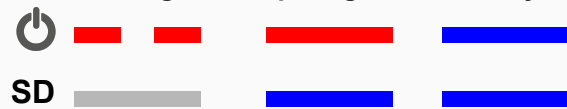
SD Card - Recording Data

Recording



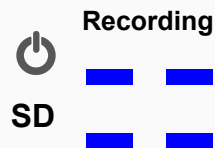
1. Insert the **SD card**
2. To turn on the receiver, press the **Power** button briefly, wait until both **LEDs** are steady blue.
-Automatic Start recording
3. If the schedule type was configured as **Manual**, press the **Power** button to start recording

2   Press button briefly and release



-Automatic Start

The recording starts automatically according to the schedule



3   Press button briefly and release.



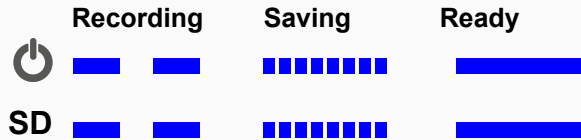
Indicators



  *Slow, equal pulses*

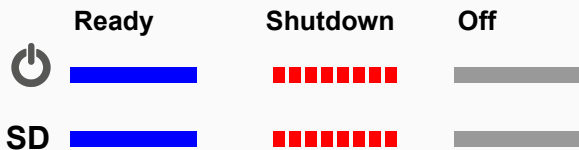
 *Solid color / Off*

SD Card - Stopping Record

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



- 2   Press and hold **Power** button for 3sec




Indicators

 *Rapid, equal pulses*

 *Solid color / Off*

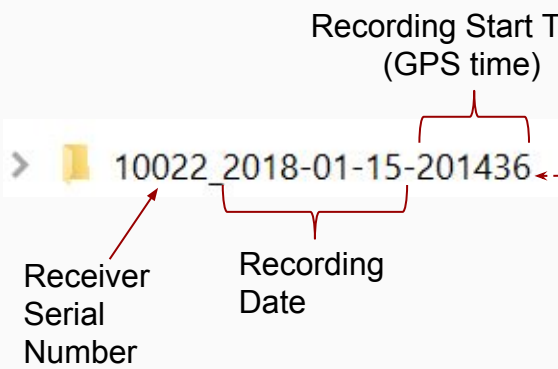
Stopping record

1. Press the **Power** button briefly and release to stop recording
 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**
- 3  Press the **SD card** and release, pull the SD card



Importing and Evaluating Data

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



EMpower

EMpower Geophysical Software by Phoenix Geophysics

v1.26.0 : v1.

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 ma

View time series and spectra

Process data with local or remote referenc

Edit processed data and export for interpr

Manage

Exit

Quit EMpower

Licensed until 2037-12-30

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: [] Choose

Files of type: [] Cancel

Review and Process the recorded information

1. Review the **Electrode** Resistance and make the necessary corrections to the **Electrode** distance with respect to the ground distance
2. Ensure that the magnetic sensor were detected and if necessary, make corrections to the **Magnetic Sensor** types and serial numbers
3. **View Recording Details**, see the next page
4. **Process** the recorded data after review of information, see page 13



This section is also used to input additional field information if desired



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

The screenshot shows the 'Evaluate - EMpower' software interface. The window title is 'Evaluate - EMpower'. The main content area is divided into several sections:

- Status:** Shows 'Approved' (checked), 'Unapproved' (unchecked), and 'Rejected' (unchecked).
- Tools:** Includes 'Time Series', 'Spectra', and 'Process(Orthogonal)' (highlighted with a red circle 4).
- Recording Information:** Displays recording ID (10039_2018-02-23-171514), start time (Feb 23 2018 09:15:14 (Local) America/Los_Angeles (GMT-08:00)), duration (52 m 3 s), survey name (NVFeb2018), station name (NV03), operator(s) (TH+GB+DF), layout geometry (Orthogonal), declination (0.00°), and notes (full rate daytime).
- Electrodes:** A table showing electrode details. A red box highlights the 'Resistance (Ω)' column, with a red circle 1 pointing to it. The table has columns for Channel, Distance (m) to GND, Polarity, Resistance (Ω), Gain, LPF [Hz], and DC [V].
- Magnetic Sensors:** A table showing magnetic sensor details. A red box highlights the 'Detected' column, with a red circle 2 pointing to it. The table has columns for Channel, Sensor, Detected, Serial #, Polarity, Gain, LPF [Hz], and DC [V].
- View Recording Details:** A button at the bottom, highlighted with a red circle 3.

Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF [Hz]	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	50	50	<input type="checkbox"/> Inverted	609.395	512.211	4 x 1 = x4	10000	0
E2	50	50	<input type="checkbox"/> Inverted	946.972	534.614	4 x 1 = x4	10000	0

Channel	Sensor	Detected	Serial #	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-150	MTC-150	53914	<input type="checkbox"/> Inverted	x4	10000	0
H2	MTC-150	Not Present	53886	<input type="checkbox"/> Inverted	x4	10000	0
H3	MTC-150	MTC-150	54100	<input type="checkbox"/> Inverted	x4	10000	0

View Recording Details

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

1. Battery
2. Temperature
3. GPS Timing Card Verify
4. Channels Details

If saturation is not close to 0%, review the channel configuration (see pages 4,5), the gain might be too high and/or there is artificial noise on your site

! Verify that there was not warning display **!**

Recording Details

Recording ID: 10039_2018-02-23-171514
Survey Name: NVFeb2018
Station Name: NV03
Receiver Type: MTU-SD
Instrument Serial: 10039
Operator: TH+GB+DF
Start Time: Fri Feb 23 17:15:14 2018 GMT(-00:00)
Stop Time: Fri Feb 23 18:07:17 2018 GMT(-00:00)
Duration: 52 m 3 s
Latitude: 37.205°N
Longitude: 114.690°W
Altitude: 1054.24 m
OS Version: v1.25.0
Motherboard Model: BMB01-G
Motherboard Serial: [redacted]
Battery: Low: 11.879 V, High: 11.948 V
Temperature: Low: 14°C, High: 24°C

Decimation
Sampled continuously at 96000 samples per second

GPS Timing Card
Serial Number: 200127
Model: BTM01-1
Firmware Version: 00010028X
of Satellites: 10 - 12 satellites

Channels Details

Tag	Board S/M	Model	Firmware	Sat	
1	E1	201271	BCM03-B	10019	0 %
2	E2	201269	BCM03-B	10019	0 %
3	H1	201273	BCM03-B	10019	0 %

1 Battery Voltage - EMpower
Battery Voltage graph showing Voltage (V) vs Time (min). Y-axis ranges from 11.88 to 11.94. X-axis ranges from 0 to 50. The graph shows a fluctuating line representing battery voltage over time.

2 Internal Temperature - EMpower
Internal Temperature graph showing Temperature (°C) vs Time (min). Y-axis ranges from 15 to 24. X-axis ranges from 0 to 50. The graph shows a step-like increasing trend in temperature over time.

3 Number of Satellites - EMpower
Number of Satellites graph showing # of Satellites vs Time (min). Y-axis ranges from 9 to 21. X-axis ranges from 0 to 50. The graph shows a fluctuating line representing the number of satellites over time.

4 Saturated Frames - E2 - EMpower
Saturated Frames - E2 graph showing # of Saturated Frames vs Minutes. Y-axis ranges from 0 to 2. X-axis ranges from 0 to 1016. The graph shows a series of vertical spikes representing saturated frames over time.

Process Data

NV03 Serial 10039 - EMpower

Channels

1

H1	MTC-150
H2	MTC-150
H3	MTC-150

Reference type: Magnetic

Electric Channels

Use the following
Ex = E1
Ey = E2

Select Manually

Processing timeframe

Time zone

UTC Site time zone: America/Los_Angeles (UTC-08:00)

Start: 2018-02-22 15:17:15 End: 2018-02-23 08:26:57

Sunrise: 06:19 Sunset: 17:25
Duration: 17 h 9 m 42 s

2

Electric power grid filter

3

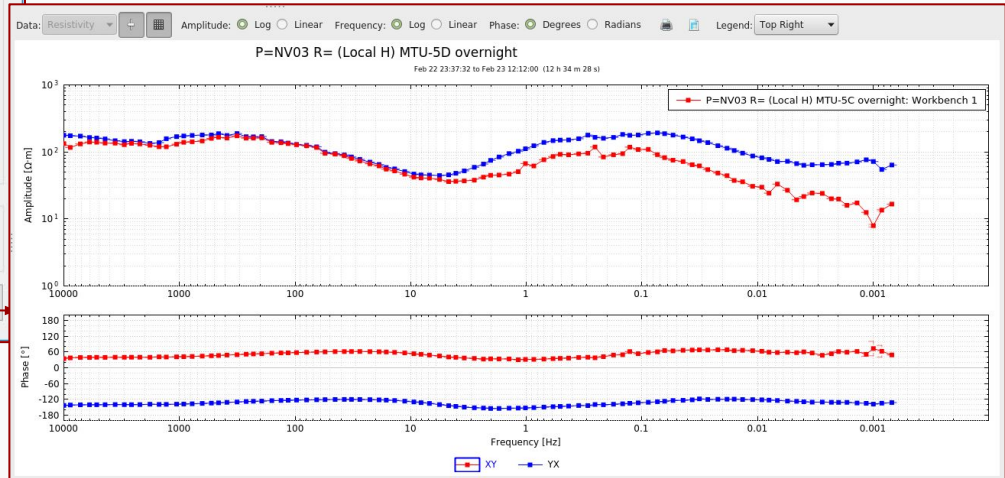
50 Hz 60 Hz None

4

Cancel Process

Setting up the processing parameters:

1. Verify that the channels and references selected are as desired
2. Select the desired length of the recording to be processed by decreasing the time at the beginning and ending of the recording
3. Enable the electric power grid filter that corresponds to the site (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 purpose.