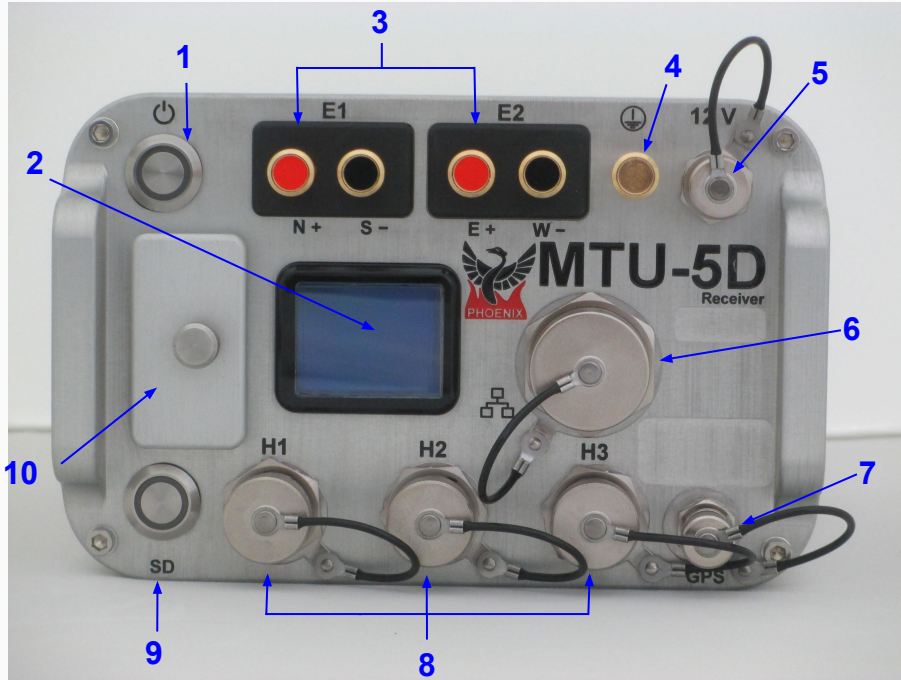


MTU-5D Quick Start Guide



2. MTU-5D (components)
3. Creating a Configuration File
4. Configuration Creator
5. Electric Channel Settings
6. Magnetic Channel Settings
7. Saving a Configuration File
8. MTU-5D Connections
9. SD Card - Recording Data
10. Stopping a recording
11. Importing and Evaluating Data
12. Evaluate
13. Process Data
14. View Recording Details



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

Recording

Calibration

System Tests

White Noise

Parallel Noise

Self Test

Close

Evaluate

Check data

View time series and spectra

View noise test results

View quick-estimate apparent resistivity

Manage surveys

Manage

Prepare - EMpower

Receiver Type: MTU-5D

Select your white noise source

Broadband

WN3 - High

WN3 - Low

Return

Sensor configuration - EMpower

Receiver Type: MTU-5D

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

Select target location

Look in: C:\

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

config.json

Save

Files of type: Config file (*.json)

Cancel

Licensed until 2020

Configuration Creator

1. Check that the **Receiver type** is **MTU-5D**
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. **Channels Settings**
4. Define the Receiver Settings **Sampling Mode** and/or **Sampling Rate**
5. **Configuration Layout**

Configuration Creator - EMpower

File Receiver Schedule Time

1

2

2.1

2.2

3

4

5

MTU-5D
Professional Receiver

Electric channel settings

Channel E1

Enabled

Gain Normal

Low Pass Filter 17.8 kHz

Positive Distance 50.00 m

Negative Distance 50.00 m

Receiver Settings

Sampling Mode Continuous sampling Sparse high frequency sampling

Sampling Rate 96000 s/s View graphic 5.53 GB / Hour

Enhanced Sensor Stabilization Enable

Configuration layout

Layout Geometry Orthogonal

Survey Name

Site Name

Operator(s)

Company Name

Configuration Notes

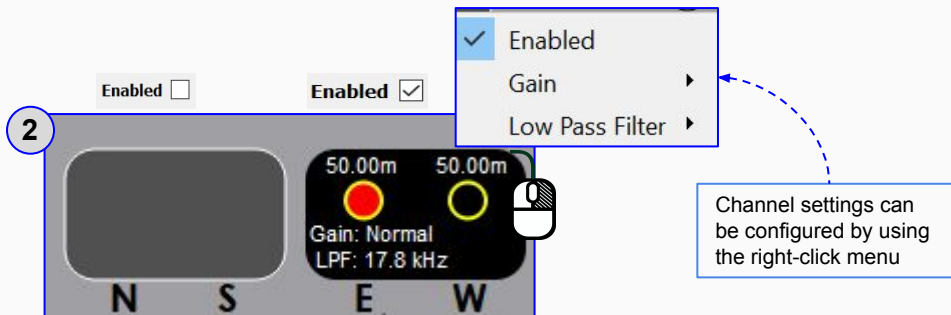
Additional information

i

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

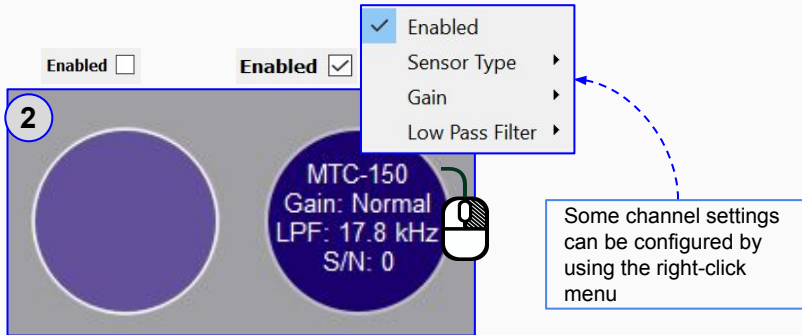
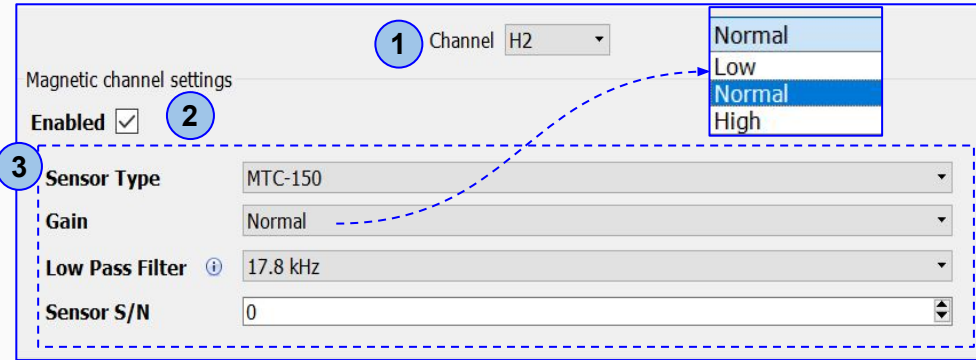
Electric Channel Settings

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**

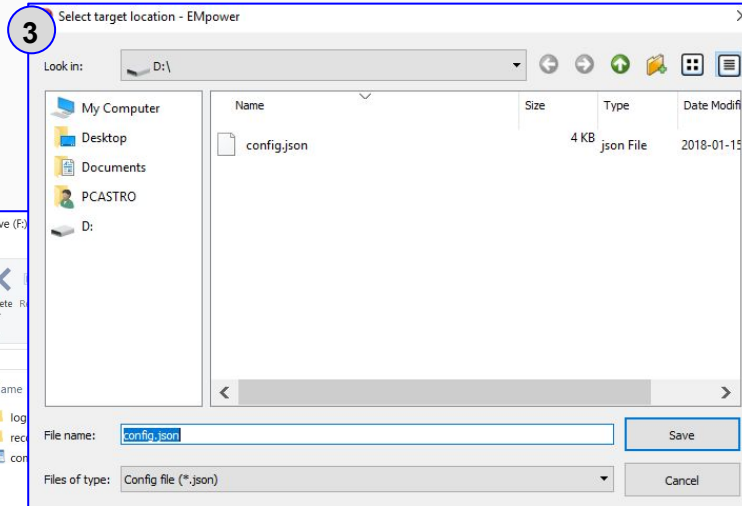
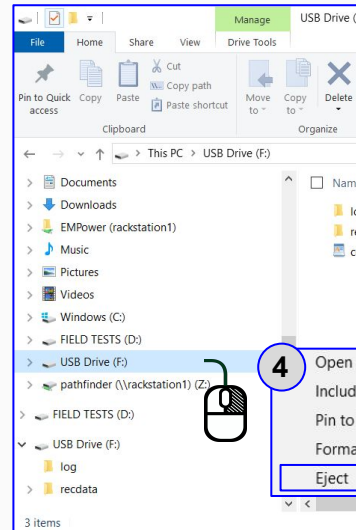
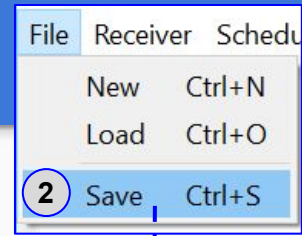


Channel settings can be configured by using the right-click menu or by using the Magnetic channel settings section

Saving a Configuration File

1. 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**

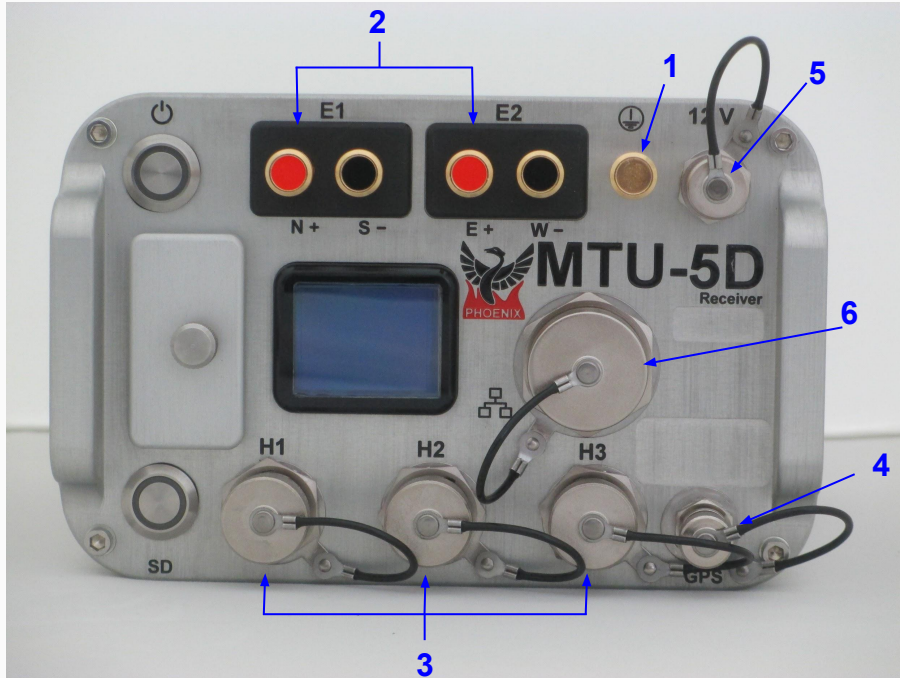
 Only SD cards supplied by Phoenix are supported. Other SD cards that comply with the SDXC standard may work depending on the card rating and environmental conditions



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
6. Network connector

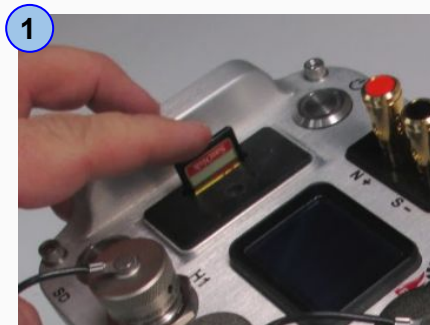


In the field, it is often most efficient to connect the components to the receiver following the order on the right




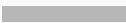



SD Card - Recording Data

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	 

- 3 Press the power button briefly and release

	Ready	Channels Detection	Recording
Power		 	 
SD			 



Indicators

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

Stopping a recording

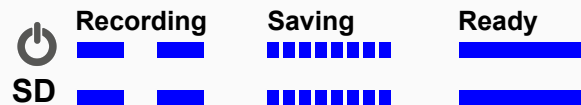
1. Press the **Power** button briefly and release to stop recording
 - Wait until both LEDs are steady blue
2. Turn off the receiver, pressing the **Power** button for a few seconds the **LEDs** will flash red
 - Wait until both **LEDs** turn off
3. Eject the **SD card**
 - Press the **SD card** and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

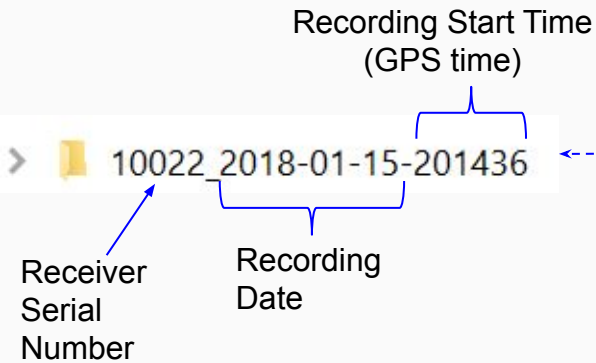


- 3



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 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 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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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 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

The screenshot shows the 'Evaluate - EMpower' software interface. At the top, the status is 'Approved'. The 'Recording Information' section includes fields for Recording ID, Start time, Duration, Survey name, Station name, Operator(s), Company name, Layout Geometry, Declination, and Notes. A blue circle with the number '4' and an arrow points to the 'Notes' field, which contains the text: 'High contact resistance +40 azimuth +15 declination'. A blue circle with an 'i' icon is also present next to the 'Notes' field, with a callout box stating: 'This section can also be used to input additional field information if desired'.

The 'Electric Channels' section is highlighted with a blue circle and the number '1'. It contains a table with columns for Channel, Distance (m) to GND, Resistance (Ω), Polarity, Gain, LPF [Hz], and DC [V].

Channel	(+) N / E	(-) S / W	Polarity	(+) N / E	(-) S / W	Gain	LPF [Hz]	DC [V]
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

Below the table, 'E Azimuth' is set to 0° and 'External Filter' is set to None.

The 'Magnetic Channels' section is highlighted with a blue circle and the number '2'. It contains a table with columns for Channel, Sensor, Detected, Serial #, Polarity, Gain, LPF [Hz], and DC [V].

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

Below the table, 'H1-H3 Azimuth' is set to 0°.

A blue circle with the number '3' is located near the 'View Recording Details' button.

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, titled "Evaluate - EMpower", shows the status of the data (MB 1) and the "Process (Orthogonal)" button. A secondary window, "Serial 10125 - EMpower", shows the configuration for the magnetic channels (Hx, Hy, Hz), reference type (Magnetic), electric channels (Ex, Ey), processing timeframe (Start: 2019-03-28 15:58:56, End: 2019-03-28 16:04:09), and electric power grid filter (60 Hz). A "Magnetics Selection" dialog box shows that Hx and Hy are mandatory channels. A "Channel Selection" dialog box shows the selection of Ex and Ey channels. The final window displays a resistivity curve plot for "MB 8 Serial 10128 (Evaluation)" with Amplitude [mV] vs Frequency [Hz] and Phase [°] vs Frequency [Hz].

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

- 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

5. Time Series Level

Recording Details: 10155_2019-04-24-085903 - EMpower

Recording Details		Timing Details	
Recording ID:	10155_2019-04-24-085903	Start Time:	Wed Apr 24 12:46:40
Survey Name:	10155 MT	Stop Time:	Thu Apr 25 00:00:00
Station Name:		Duration:	22 h 58 m 50 s
Company Name:		Latitude:	37.679°N
Receiver Type:	MTU-5D	Longitude:	123.792°E
Instrument Serial:	10155	Altitude:	1119.23 m
Operator:			

Instrument Info

OS Version: v1.27.1

Motherboard Model: BMB01-G

Motherboard Serial: 03100B

Battery: Low: 12.44 V, High: 12.869 V Details

Temperature: Low: 20°C, High: 38°C Details

Decimation

Recorded 0.1 seconds at 96000 samples/s every 60 seconds, 1 second at 24000 samples/s every 60 seconds, and continuously at 150 samples/s

GPS Timing Card

Serial Number: 200188 Firmware Version: 00010029X

Model: BTM01-I # of Satellites: 7 - 12 satellites Details

Tag	Board S/N	Model	Firmware	Sat	Signal Ranges	
1	E1	201462	BCM03-B	1001a	0%	<input type="button" value="View Levels"/>
2	E2	201427	BCM03-B	1001a	~0% - View	<input type="button" value="View Levels"/>
3	E2	201464	BCM03-B	1001a	0%	<input type="button" value="View Levels"/>
4	E2	201427	BCM03-B	1001a	0%	<input type="button" value="View Levels"/>

1 Battery Voltage - EMpower

2 Internal Temperature - EMpower

3 Number of Satellites - EMpower

4 Saturated Frames - E2

5 Time Series Level - E1