



Power Recovery User Guide

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Requirements

Hardware	Suggestions	Software
Computer	• OS 64 bits • Windows, Linux, or Mac	• EMpower v2.48.0.3* or above
Receiver	• Supported receivers: ○ <i>MTU-5C</i> ○ <i>MTU-8A</i> ○ <i>RXU-8A</i>	• Firmware v2.48.0.2* or above • Only units shipped after June 2021 work with this feature • Some units shipped in 2025 work with the battery-based auto power ON and temperature-based auto power ON
Field Installation	• An intermittent power supply that recharges a battery bank, preferably installed at least 100m away from any sensor (electrode or magnetic) of the measurement site to avoid noise • Large bank of lead acid batteries • Constant DC power line from battery bank to receiver	

Advantages

The Automatic Power Recovery feature is designed for semi-permanent installations with an intermittent power source (*for example, solar panels*), which is used to constantly recharge a large array of 12V lead-acid batteries.

If the main power source fails and stops recharging the batteries, this will lead to the eventual depletion of the batteries. At this point, the receiver will safely power ON when the batteries have been recharged to an acceptable level. In this type of installation, if the Power Recovery feature has been enabled in the recording configuration, the receiver will Power ON automatically and can start recording again.

- If internet access is available at the deployment site, the receiver can be controlled from a remote location by using two additional EMpower tools:
 - **Remote Control** to send new configuration settings ([DAA10 - Receiver Remote Control System Configuration manual](#))
 - **Network Upload** to send the recording data files to a server ([DAA17 - Remote Data Upload System Guide manual](#))

How it works

The **Power Recovery** feature will only activate and power up a receiver automatically after a specific sequence of events:

- Receiver configured with Power Recovery enabled
- Shut down of the receiver due to low battery voltage
- Power restored to 12.3V

If these conditions are not met in this order, the receiver will not Power ON automatically.

For example, this feature will not cause the receiver to Power ON after the power cable is disconnected and reconnected to the receiver, since this does not match the pattern of an unattended discharge from the battery bank connected to the receiver.

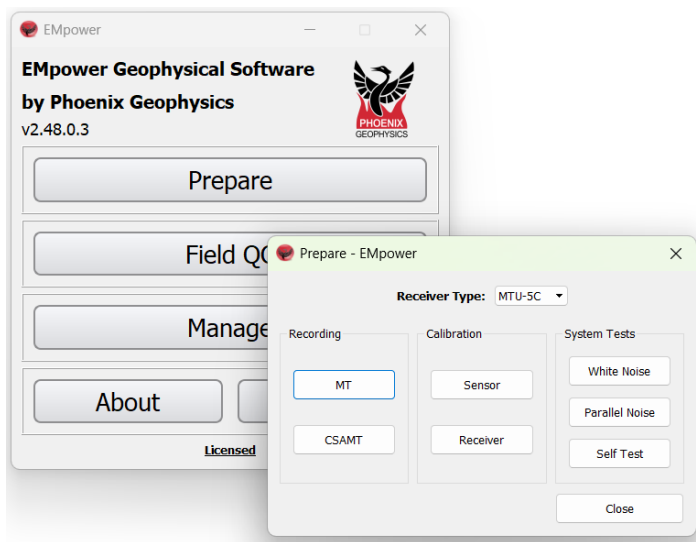
To help understand the scenarios in which the feature works, we will describe the following steps of the sequence in more detail:

1. Using Power Recovery
2. Power OFF conditions
3. Automatic Power ON

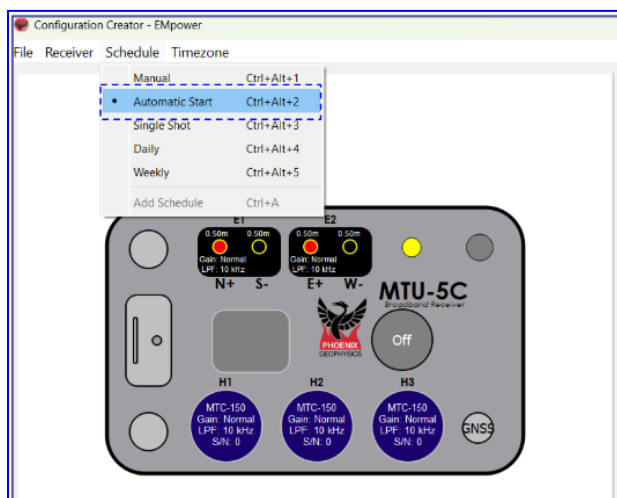
Using Power Recovery

Activate the Power Recovery feature in the config file by following these steps:

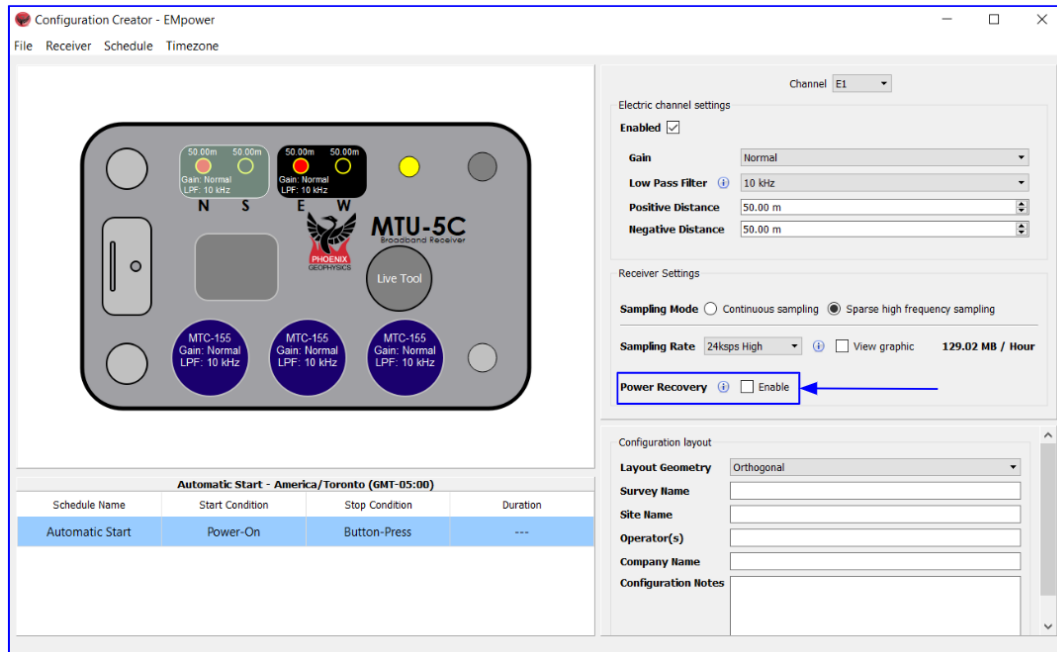
1. Open the Prepare section in EMpower, select the desired receiver type, and create a configuration file (*for more information, consult the [quick start manuals](#)*)



2. Use **Automatic Start** schedule, which will make the receiver start as soon as it powers ON and the clock is synchronized to the GPS constellations



3. Define the Channels Settings, Sampling Settings, and Layout Information
4. Enable the Power Recovery by selecting the *Power Recovery* checkbox



Once the receiver Powers ON using this configuration file from the SD card, it saves a flag in its internal memory indicating that it should automatically attempt to power ON again if power is lost, provided that the proper Power OFF sequence has occurred.

Note that this Power Recovery flag will remain stored in the receiver memory until the receiver boots up with a new configuration file that does not have Power Recovery enabled.

Power OFF condition

The Power Recovery feature activates when the receiver detects a gradual voltage drop. If the battery voltage falls to 10.7 V or below, the receiver performs a soft Power OFF within about one minute to safely stop and save the ongoing recording.

In case an abrupt power failure occurs, the receiver cannot complete a proper shutdown or execute the soft power OFF sequence, as it requires sufficient time to stop recordings, close files, and safely terminate system operations. This may result in data loss or file corruption.

In both of these scenarios, the receiver will enable the automatic Power ON feature requested via the Power Recovery function.

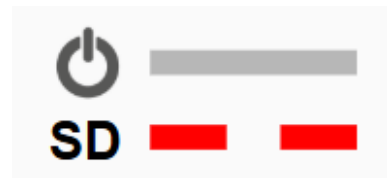
Note that if the receiver is powered OFF manually or via any special command other than the soft power started from a low battery state, the automatic Power ON of the Power Recovery feature will not be enabled. This means that even if the configuration file requests Power Recovery, if the receiver is powered OFF by the user by pressing the power button, the receiver will not attempt to Power ON automatically, since this does not match the pattern of events of power loss in an unattended installation.

Automatic Power ON

In this final step, the receiver will attempt to power ON once the proper voltage is restored. A 5-minute delay is required to prevent potential damage to the equipment if a defective or overused battery is being used, as such batteries may cause the voltage to drop back to 12 V when there is no load. The Power Recovery feature protects the receiver from rapidly turning ON and OFF when a faulty battery is connected to the receiver.

Power Recovery sequence from the OFF state:

1. When the receiver has a minimal voltage ($>11.6\text{V}$), the receiver will continuously monitor the battery voltage to see if it meets the thresholds for automatically powering ON. The SD LED will slowly blink red.

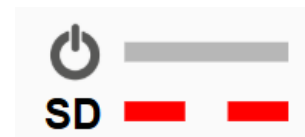
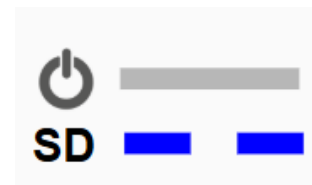


- If at this point the voltage drops below 11.3V, the SD LED will turn OFF again.



2. When the battery voltage rises above 12.3V, a 5-minute countdown timer starts prior to Power ON.

- During the countdown, the SD LED will slowly blink blue, indicating that the receiver will Power ON soon.
- If the voltage drops below 12.3V, the countdown is reset and the receiver returns to step 1.



3. If after 5 minutes, the battery voltage remains above 12.3 V, the receiver will Power ON and start the recording as per the schedule originally defined in the config file.



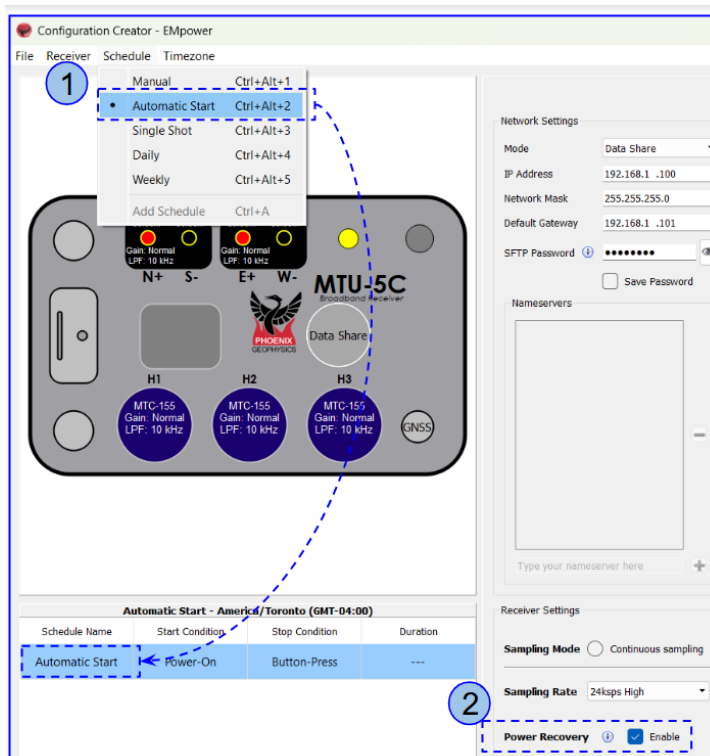
Extended Power Recovery functionality

The Power Recovery thermal feature in **MTU-5C (RMT08-A model)** receivers enables reliable operation in semi-permanent installations subject to power fluctuations. The latest update introduces enhanced temperature management, allowing the receiver to safely power OFF at high temperatures and automatically Power ON once it has cooled down to safe operating levels.

Requirements

Hardware	Suggestions	Software
Computer	- OS 64 bits - Windows, Linux, or Mac	EMpower 2.48.0.3* or above
Receiver	- Supported for MTU-5C (RMT08-A) - Minim motherboard BMB02-A bootloader version: 0x00001	Firmware v2.48.0.2* or above

1. Select **Automatic Start** Schedule
2. Enable the **Power Recovery** (see [Using a config file with Power Recovery enabled](#))



Power Recovery and Thermal sequence from the OFF state:

1. When the receiver has a minimum voltage (>11.6V), it monitors the battery voltage to determine whether the conditions for automatic Power ON are met. During this time, the SD LED will slowly blink red. This indication continues if the internal temperature remains above 62 °C



- If at this point the voltage drops below 11.3V, the SD LED will turn OFF again.

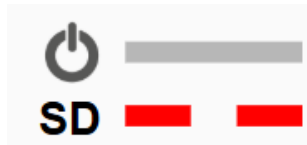


2. If the battery voltage rises above 12.3V and the internal temperature is at or below 62 °C, a 5-minute countdown will start.

- During the countdown, the SD LED will slowly blink blue, indicating that the receiver will Power ON soon.



- If the voltage drops below 12V during the countdown, the countdown is reset and the receiver returns to step 1.



3. If, after 5 minutes, the battery voltage is above 12V and the internal temperature is at or below 62 °C, the receiver will Power ON.



Notes

- *As mentioned earlier, the power recovery feature is designed to work in installations where an intermittent power source is used to constantly recharge a large array of 12V lead acid batteries. The feature is not designed or tested to work in any other type of setup.*
- *To obtain quality data in an installation with intermittent power sources, the power source must not generate noise in the band of measurement. Solar panel controllers and other switched power elements are known to introduce noise to nearby MT sensors. Therefore, it is recommended to install any noisy power elements far from the measurement site, sending only DC power over a long cable.*
- *The accuracy of the voltage measurement is roughly $\pm 1\%$ ($\sim 125\text{mV}$), so the user can expect to see some variation in the thresholds, as stated above.*
- *If the user presses the power button at any time during this waiting period, the receiver will immediately try to Power ON, ignoring any countdown timers or battery voltage.*
- *If the user modifies the configuration file to disable Power Recovery, and the feature was previously enabled due to a low-battery condition, this state remains stored in flash memory. As a result, the next time adequate power is supplied to the receiver, it will automatically power ON even if the current configuration file has Power Recovery disabled.*



Please check out the [FAQs](https://phoenixgeophysics.freshdesk.com/) <https://phoenixgeophysics.freshdesk.com/>
Or email us at: support@phoenix-geophysics.com