

Operating Mode Implementation according to UL 3141

Application Guide

Solar Energy Business Unit

Fronius USA, LLC

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Gender-specific formulations refer equally to the female and male form.

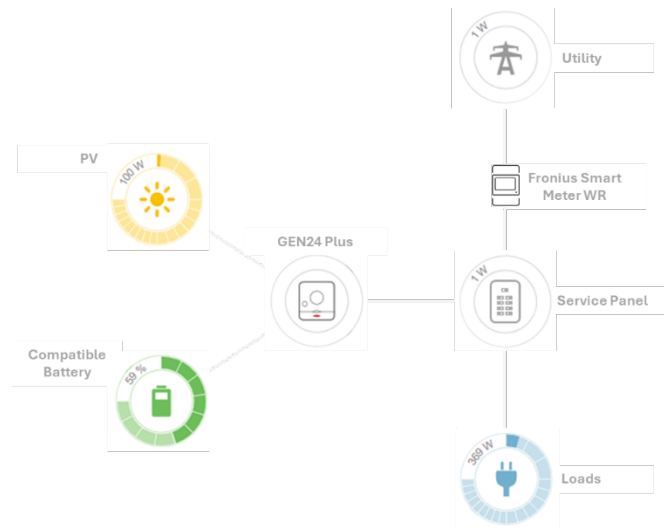
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1 Introduction

There are ways to setup the Energy Storage System (ESS) operating modes, as mandated by UL 3141, which can be implemented through various inverter settings. The four ESS operating modes which can be set are “Unrestricted Mode”, “Import Only Mode”, “Export Only Mode”, and “No Exchange Mode”. Each mode describes the relationship between the ESS and the utility and how energy is exchanged between them.

The Primo GEN24 Plus has a means to set each ESS operating mode as defined by UL 3141.



The above single line diagram shows the components which make up the system which can support the setting of the ESS operating modes. The ESS operating modes are designed to dynamically control the import/ export for charging/ discharging purposes of the battery through the ESS operating mode settings.

A list of components to achieve the ESS operating modes:

- a. Primo GEN24 Plus
- b. Fronius Smart Meter WR including current transformers
- c. Compatible battery

The detailed installation instructions for each product can be found in their respective user manual and shall be installed according to local regulation.

Please select one ESS operating mode from the chapters of this white paper which matches your requirements.

When Time-dependent Battery Controls are used, they may interfere with the intended nature of the ESS operating mode. Please ensure that the charging and discharging power of the Time-dependent battery control are set appropriately to not force the improper mode.

2 Import Only Mode

2.1 Idea

The ESS is configured to only allow import energy from the utility solely for charging purposes, without allowing any export of energy from the battery to the utility for discharging purposes.

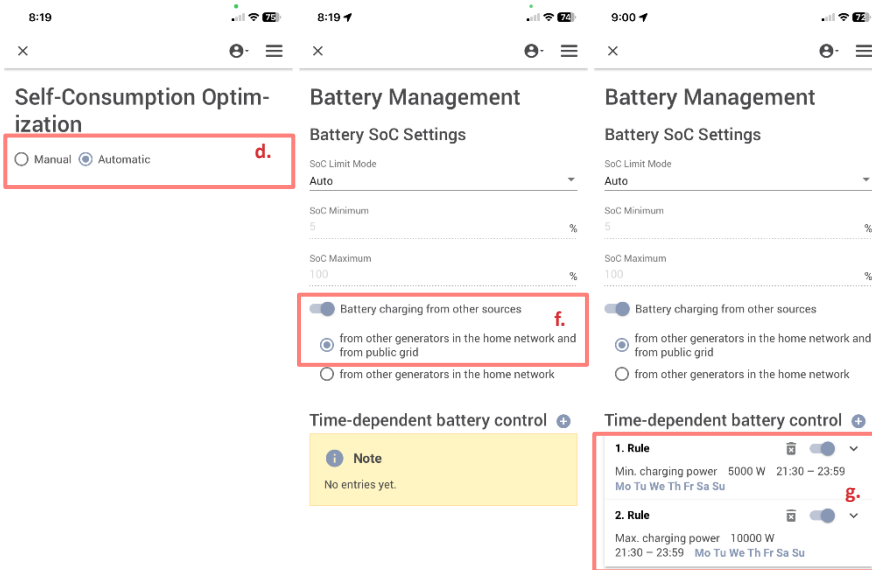
The battery will charge from the utility or the PV array. Any surplus PV power will be exported to the utility or used for local loads.

The battery will charge from the utility based on the minimum state of charge set by the user and Time-dependent battery control.

2.2 Setup

Follow the below steps to activate the Import Only Mode.

- Open and connect to Wi-Fi access point.
- Log in as Technician.
- Navigate to **“Energy Management”** --> **“Self-Consumption Optimization”**.
- Ensure this setting is **“Automatic”**.
- Navigate back to one page and click **“Battery Management”**.
- Ensure that **“Battery charging from other sources”** is activated and **“from other generators in the home network and the public grid”** is selected.
- Ensure that rule(s) for **“Time-dependent battery control”** are added¹. Only use **“Min. charging power”** and/ or **“Max. charging power”**.



¹ Rules 1 and 2 are examples and rule(s) have to be adjusted for customers need.

3 Export Only Mode

3.1 Idea

The ESS is configured to only allow export energy to the utility for discharging purposes, without allowing any import of energy from the utility to the battery for charging purposes.

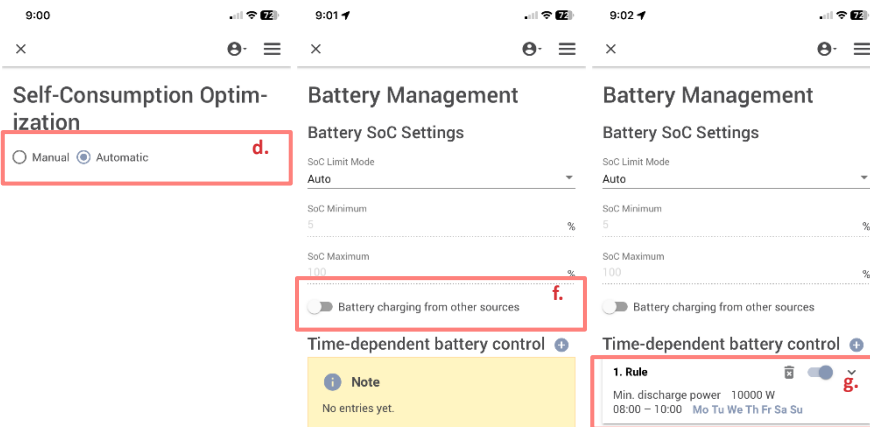
The battery will only charge from the PV array. Any surplus PV power will be exported to the utility or used for local loads.

In this mode, the use of Time-dependent battery control will allow the battery to export energy to the utility.

3.2 Setup

Follow the below steps to activate the Export Only Mode.

- a. Open and connect to Wi-Fi access point.
- b. Log in as Technician.
- c. Navigate to **“Energy Management”** --> **“Self-Consumption Optimization”**.
- d. Ensure this setting is **“Automatic”**.
- e. Navigate back to one page and click **“Battery Management”**.
- f. Ensure that **“Battery charging from other sources”** is deactivated.
- g. Ensure that rule(s) for **“Time-dependent battery control”** are added². Only use **“Min. discharge power”** and/ or **“Max. discharge power”**.



² Rule 1 is an example and rule(s) have to be adjusted for customers need.

4 No Exchange Mode

4.1 Idea

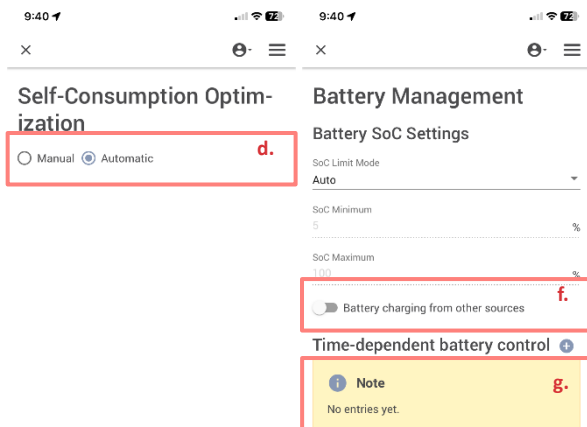
The ESS is configured to not allow exchange energy with the utility for charging or discharging purposes.

The battery will only charge from excess PV power.

4.2 Setup

Follow the below steps to activate the No Exchange mode.

- a. Open and connect to Wi-Fi access point.
- b. Log in as Technician.
- c. Navigate to **“Energy Management”** --> **“Self-Consumption Optimization”**.
- d. Ensure this setting is **“Automatic”**.
- e. Navigate back to one page and click **“Battery Management”**.
- f. Ensure that **“Battery charging from other sources”** is deactivated.
- g. Ensure that no rules for **“Time-dependent battery control”** are added. The power output of the battery is calculated automatically.



5 Unrestricted Mode

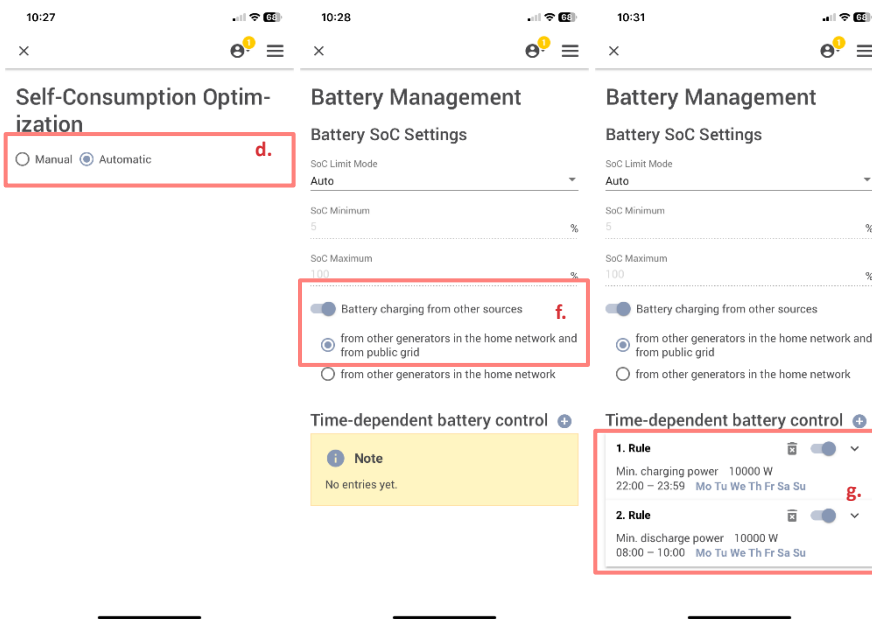
5.1 Idea

There are no restrictions on the ESS for importing/ exporting from/ to the utility for charging discharging purposes of the battery.

5.2 Setup

Follow the below steps to activate the Unrestricted Mode.

- a. Open and connect to Wi-Fi access point.
- b. Log in as Technician.
- c. Navigate to **“Energy Management”** --> **“Self-Consumption Optimization”**.
- d. Ensure this setting is **“Automatic”**.
- e. Navigate back to one page and click **“Battery Management”**.
- f. Ensure that **“Battery charging from other sources”** is activated and **“from other generators in the home network and the public grid”** is selected.
- g. Ensure that rule(s) for **“Time-dependent battery control”** are added³. Either **“Regulation”** (**“Min. charging power”**, **“Max. charging power”**, **“Min. discharge power”**, and/ or **“Max. discharge power”**) can be used, but at least **“Min. charging power”** and **“Min. discharge power”** must be used.



³ Rules 1 and 2 are examples and rule(s) have to be adjusted for customers need. In this example, the battery will be charged from the utility only during low pricing (10:00 PM – 11:59 PM) and discharged to the utility only during peak pricing (8:00 AM – 10:00 AM).

6 Conclusion

Each mode is designed to operate within the parameters of UL 3141. If additional settings are adjusted for the inverter which conflicts with the settings of the ESS operating mode, the ESS mode may not operate as intended. If you require assistance in setting the ESS operating mode or would like additional information, please contact our Fronius Technical Support at (219) 734-5500 or pv-support-usa@fronius.com.