

OutBack FM Series Charge Controller GT Mode

Objective of this application note: explain the role and operation of GT mode, a method of “charge coordination” between an OutBack FLEXmax (FM) series charger controller and an inverter.

Background: One of the advantages of using the FM series charge controller with an Outback inverter is that they have the ability to coordinate when programmed to do so. One method of charge coordination is known as grid-tie mode, or GT mode.

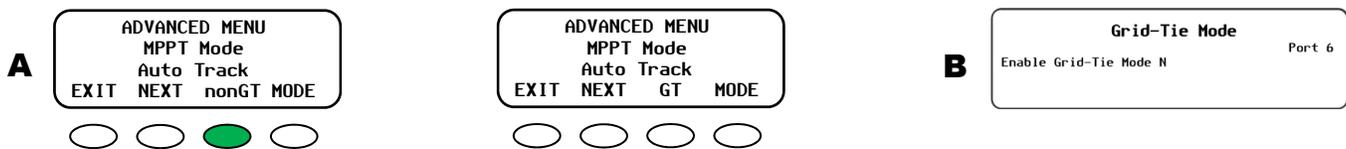
GT Mode explained

A photovoltaic (PV) charge controller has three primary functions.

1. Prevent overcharging the battery bank.
2. Provide an optimum charging algorithm
3. Optimize array output by means of Maximum Power Point Tracking (MPPT).

In a battery-based grid-tie system, there is always a place for the energy to flow, onto the grid itself, as long as the grid is available. A grid-tied inverter’s purpose is to maintain its battery voltage, which is the **Sell** voltage set point. The only thing the charge controller is required to do is to harvest the PV array using MPPT while attempting to reach its own battery voltage setting (**Absorb**). In the past, this required setting the charge controller voltage set points higher than the inverter. Of course, during a power outage, the controller needs to provide the battery-charging algorithm and prevent overcharging.

A system operator can enable GT mode on the controller screen under the **Advanced** menu (**A**) by pushing the soft key below the selection. This toggles the selection from **nonGT** to **GT**.



This mode can also be enabled in the MATE3 system display (**B**). Under the **Settings** menu, the **Charge Controller** screen has a **Grid-Tie Mode** selection. It can be set to **Y** (yes) or **N** (no).

This mode sets the charge controller into continuous Absorb operation. Note that though the charge controller is trying to achieve the **Absorb** target voltage the entire solar day, the inverter is maintaining its **Sell** target voltage by selling the excess energy from the DC bus. This keeps the batteries from reaching the **Absorb** voltage attempted by the charge controller.

When the grid is down during the solar day, the inverter cannot sell energy and the charge controller takes charge of the charging algorithm. The controller reverts to its normal three-stage charging algorithm, tapering the charge down to the **Float** setting when the charge is complete.

Application Note

GT Number

While the primary function of GT mode is to keep the charge controller in Absorb operation, it can also maintain some control of the system to ensure that the system keeps selling. Two conditions that could prevent the inverter/s from selling are

1. Rising inverter temperature due to high ambient temperature
2. Rising AC voltage due to high grid impedance.

The inverter continuously sends a status message to the FM charge controller, represented as a “GT number”. If either of the two conditions above are true, the GT number reads as a recommendation to reduce its output. (This GT number can be read only on the controller itself under the **Misc** menu.)

- When the controller is in GT mode and the inverter is selling, the GT number reads 074. This is a command to the controller to maximize its MPPT energy harvest.
- When the controller is not in GT mode or the inverter is not actively selling, the GT number is 255.

GT	State	PWM%	CHGt
255	00	98.0	0000
EXIT	NEXT		RSTRT

GT X	State	PWM%	CHGt
074	07	94.0	0000
EXIT	NEXT		RSTRT

As the inverter temperature rises, or the AC input voltage rises, or any other reason the inverter deems it necessary, this GT number goes down. As the GT number goes down, the controller reduces its MPPT harvest and lowers its output. Reducing its activity may allow inverter temperature or AC voltage to decrease. This will keep the inverter selling (at reduced levels). If the GT number reaches zero, the charge controller has stopped allowing PV energy to flow to the batteries and the inverter will not sell. This gives the inverter the greatest chance to cool down, or the AC input voltage to return to normal.

Summary

When **GT Mode** is enabled on the FLEXmax series charge controller, it will always use the Absorb voltage set point as its target. This ensures it always attempts to reach a higher voltage than the inverter to use all the PV energy that is available. When **GT Mode** is not enabled, the inverter and charge controller operate effectively independently of each other.

The inverter sends a “GT Number” to the controller in the range of 0 to 074. 0 tells the controller to totally curtail output while 074 tells it to produce as much as possible. This number reads 255 while the inverter is not actively selling energy to the grid or when **GT Mode** is not enabled.

Application Note

About OutBack Power Technologies

OutBack Power Technologies is a leader in advanced energy conversion technology. OutBack products include true sine wave inverter/chargers, maximum power point tracking charge controllers, and system communication components, as well as circuit breakers, batteries, accessories, and assembled systems.

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Other

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