



**samlex**america®

## APPLICATION NOTE

How to auto start your generator  
with an EVO™ Inverter/Charger

AN#: 012-1024

## How to auto start your generator with an EVO Inverter/Charger

The Status Relay can be used to automatically start your generator when batteries are low. This is ideal when you are off-grid with lots of solar power, generator power, and batteries, and wish to use inverter power as much as possible.

**Applicable to units: EVO-2212, EVO-2224, EVO-3012, EVO-4024**

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### Description

The following setup assumes a solar array and generator combination to support AC loads from the EVO inverter and directly from the generator, while the batteries are under charge using the generator. During a normal daily routine, the solar array charges the batteries, and the batteries are used to power AC loads through the inverter. During this time, the generator is off. If there is not enough solar power to replenish the battery to full, then the batteries will eventually be discharged. This may happen over days, weeks, or months, depending on the size of batteries and solar array. At this point, your generator is used to charge your batteries back to full. Cycling your batteries in this way reduces the life of your battery, but also reduces fuel cost and maintenance of the generator. It is important to discuss this with your battery vendor or installer to get the right type and size of battery for your application.

### Generator ON/OFF Signal Requirement:

Ideally, your generator will have some form of remote input which can connect with the Samlex EVO to turn it on or off. The EVO has the STATUS RELAY, a dry contact relay which can be used for this operation. Check the generator to confirm compatibility with this remote connection. If your generator does not have a remote input, review the GSCM-mini from Atkinson Electronics. Atkinson Electronics has interfaces for various generators which do not come "out of the box" with a remote input.

### Operation:

1. Batteries are charged.
2. Generator is OFF
3. Inverter powers the load
4. While in "inverter mode", eventually the batteries discharge to 11.5VDC (Low Voltage Alarm)
5. After 10 seconds, the generator relay (Status Relay) turns ON which will trigger the generator to start and provide AC power to the EVO.
6. The EVO enters "charging mode", passes power through to the AC equipment and charges the battery. (BULK Charge)
7. The batteries reach the absorption voltage (set to 14.4 VDC).
8. Charging continues for 60 minutes in absorption.
9. The generator relay (Status Relay) turns OFF after 10 seconds and stops the generator.

## EVO Parameter Setup

The following parameters and settings are used to provide the above operation on a lead-acid battery:

EVO™ Parameter	12V	24V	48V	Notes
Charging Profile (CHARGE CURVE)	3	3	3	2 Stage Type 1.Exits the Absorption Stage after Absorption Time. The charge turns OFF after Absorption, there isn't a float stage.
Relay Function (OTHER FUNCTIONS)	2	2	2	Relay ON (gen start) when batteries drop to LOW VOLT ALARM for a period = GS DETECT TIME Relay OFF (gen off) when batteries are charged to the end point of the programmed option under parameter CHARGING PROFILE.
GS Detect Time (CHARGE CURVE)	10 Sec	10 Sec	10 Sec	This delays the generator start by 10 seconds after the DC Voltage reaches the Low Voltage Alarm.
Low Voltage Alarm (CHARGE CURVE)	11.5 V	23 V	46 V	This is the voltage at which the generator will turn on and the inverter will switch to "charging mode". This would be approximately 80% discharge on a lead acid battery, but this should be discussed with your battery vendor to ensure the voltage is correct for the battery installed.
Battery Low Voltage (CHARGE CURVE)	11 V	22 V	44 V	Should the battery reach the "Battery Low Voltage" while in "inverter mode", the EVO will wait 30 seconds, and then turn OFF the inverter. The Batt Low Volts controls the voltage point that the EVO will turn off.
Absorption Voltage (CHARGE CURVE)	14.4 V	28.8 V	56 V	This is the absorption voltage to which the battery should be charged. Charge voltage settings should be obtained and discussed with battery vendor.
Absorption Time (CHARGE CURVE)	60 min	60 min	60 min	Once the absorption voltage is reached, the EVO will stay in Absorption for 15 minutes. When the absorption timer is ended, the unit will end the charge cycle.
Float Voltage (CHARGE CURVE)				Not used in this application. Profile is 2 Stage Charger with an absorption setting.
Mode (CHARGE CURVE)	0	0	0	Make sure that the unit is in Default 0. The unit should not be in Online mode.
Online Option (CHARGE CURVE)	0	0	0	Use Default (0=Option 1)
LV Cut Off Time (CHARGE CURVE)	30 Sec	30 Sec	30 Sec	Should the battery reach the "battery low voltage" while in inverter mode, the EVO will wait 30 seconds, and then turn OFF the inverter. The Cut Off Time controls the time of 30 Seconds.

## Lithium batteries:

If using LiFePO4 with a BMS, then the parameters above can be used with the following changes:

**Low Voltage Alarm:** Set at 12 V / 24 V / 48 V depending on the EVO you have. We recommend checking with your battery vendor on the parameters to confirm the setting is not too low for your application.

**Battery Low Voltage:** Set at 11.5V / 23 V / 46 V

## Battery Charging

The method used to charge the batteries is to use a 2-stage charger, where the generator will charge the battery to the absorption voltage and stay in absorption for 60 minutes, at which point, the charger will turn OFF. This configuration will charge a lead-acid battery to ~80% of its total capacity. Charging the last 20% typically uses a lot of fuel as the generator must remain running at light loads for a long period of time. Not charging the battery will save money on fuel but will degrade your battery faster.

In comparison, this same configuration will charge a lithium battery (LiFePO4) to approximately 95%, and there is little impact to the battery life of a lithium battery.

Have a conversation with your battery vendor or installer, select an appropriate battery, and adjust the absorption time accordingly.

## Customizing Your Setup

The voltage and time parameters are recommendations. Should you wish to set up your system differently, all the voltages and times can be changed using the EVO Remote.

## Testing Your System:

### Setup:

- Complete the setup as described above.
- Batteries charged above 12.5V and the generator OFF.
- Cover or disconnect your solar panels.

**Test:**

1. Turn on appliances or equipment so that the inverter runs off the battery and the batteries drain.
  2. Monitor the drop in voltage of your battery.
  3. When the Low Voltage Alarm sounds, monitor the automatic start of the generator (There will be a 10 second delay after the alarm).
  4. Monitor the charging of the battery to the absorption voltage. 15 minutes after the generator has reached absorption voltage, the generator will shutdown.
  5. If everything runs satisfactorily, uncover or reconnect your solar panels.
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**Technical Support**

Our technical support line is available to answer questions. Should you wish to discuss this set up in relation to your application, or have questions about our product, please do not hesitate to contact us at +1 800-561-5885. We are available from Monday to Friday, 8AM to 4:30PM, Pacific Time.