MidNite Power Installation Tips
Using Generators with the MN15-12KW-AIO Inverter

The MN15-12KW-AIO inverter can use a generator to recharge batteries in times of low solar input, whether in off-grid or grid backup power situations. But there are some details to know about using generators successfully with this inverter.

Generators must be 120/240 volts split phase output. 120 volt only generators cannot be used.

- The generator output should not have ground fault protection. The neutral and ground of the AC system are typically bonded in the main service panel or meter cabinet (for grid connected systems) and in the inverter or main AC loads panel (for off-grid systems). Connecting the GFI output of a portable generator to an AC system that has a neutral/ground bond will usually trip the GFI on the generator. Either a non-GFI outlet/terminals on the generator must be used, or the generator must be unbonded.
- Generator must be 60Hz (or 50Hz if doing a 50Hz system). Generators that idle down and present less than 56Hz to the inverter can cause serious issues.

The generator is intended to be used with the generator input (SmartLoad 1, the 60A breaker).

1. Program SmartLoad 1 (SmartLoad A) to be a generator input (inverter must be in Standby to change this).
2. Set the max input power from generator (14,400 watts or 60A max). Remember to derate your generator for altitude (typically 3% per 1000 feet elevation), and when used for battery charging service don't use more than 80% of nameplate rating of most generators. If the generator is lugging down and decreasing engine RPM under the battery charging load, it is probably overloaded.
3. Set the max battery charging power from generator (10,000 watts max). The generator will reduce battery charging as needed to keep the total of charging + loads under the max power input of the generator.
4. Set the max run time – maximum time the generator can run at one time. With most air cooled generators it is not recommended to run them more than 4 hours at a time under heavy load.
5. Set the standby time. This is the cooldown time of the generator after it stops charging, before it shuts off, when in Auto mode.
6. Set the generator START and STOP state of charge (if using closed loop lithium batteries) or START and STOP voltage (if using open loop lithium batteries or lead acid batteries).
7. With MidNite Power Powerflo lithium batteries it is not required to bring the batteries to 100% SOC regularly for battery health like lead acid batteries require. However, it is still recommended to charge them to 100% at least once every two weeks for proper calibration of the BMS. Long periods of cycling without getting to 100% can cause inaccurate SOC readings from lithium battery BMS's.

- Dry Force is the AGS output. This is from terminals 1 and 2 of the DRY terminal block. These are made for 16 to 24 gauge signal wire. These terminals are rated for 30 volts and 1 A maximum, if controlling a source that puts voltage through the contacts.
- Set Dry Force to Auto to auto start and stop the generator at the selected SOC or voltage settings.
- Set Dry Force to ON to manually start the generator from the inverter app, **OR** if using a manually started generator that is not under inverter control. The inverter will not connect to the generator input voltage from an externally started generator if the Dry Force is not set to ON.

If the generator is running but the inverter is not charging from it, check:

1. Is the voltage and frequency within spec? Measure line-to-neutral and line-to-line voltage on the input terminal screws of SmartLoad A. Voltage must be between 90 and 145 volts L-N (180 to 280 V L-L). Frequency must be between 56 and 65 Hz. Note that when the generator is charging the

battery, your loads will be receiving the voltage and frequency from the generator. Many loads will not have as wide an acceptable input range as the inverter does.

2. Is the battery SOC below the STOP SOC of the AGS? If the battery is above the STOP SOC of the AGS, it will ignore voltage on the generator input terminals.
3. Is the dry contact set to ON if the generator was manually started without using the inverter app? This needs to be set to ON even the inverter did not start the generator itself.
4. If there is voltage at the AC-in terminals of the inverter and the Dry Force is set to Auto, the inverter will shut off the dry force contacts thus shutting of any generator being controlled by the inverter. The inverter will ignore voltage on the generator input terminals if there is voltage on the AC-in terminals unless the Dry Force is manually set to ON.
5. The inverter must be ON before it can recognize generator input voltage, and may take up to 5 minutes to qualify input voltage before beginning to charge. **The generator cannot be used to dark start a battery that has shut itself off**. **If the battery BMS has turned off, the battery will need to be restarted with another source (PV via the inverter, an AC lithium battery charger, or a generator into the AC-in terminals – see below) before the generator can be used to charge it normally.** It is recommended to set AGS START settings 5% higher than minimum battery SOC to make sure the generator starts before the battery shuts down.

You can also connect a generator to the AC-input terminals of the inverter in an off-grid setup.

- This can be done if you have two different generators you wish to use, or if you are using a large generator and want full 100A feedthrough to the loads from the large generator instead of being limited to 60A max from the generator input terminals. **There are some limitations if using a generator into the AC-in terminals though.**

1. The AC-in terminals are set by default to very tight frequency and voltage parameters required to connect to the grid. Few generators smaller than 100kW can meet this. You may have to adjust the grid voltage and frequency settings to allow for the generator voltage and frequency varying more than the grid typically does.
2. If generator frequency below 56Hz is connected to the AC-in terminals, the inverter may reset to 50Hz standard instead of 60 Hz standard and need to be reprogrammed.
3. The inverter needs to be set to zero export, and zero feed in power to the “grid”, to prevent generator damage.
4. **The AGS function cannot be used to start the a generator connected to the AC-in terminals.** The AGS expects generator voltage to appear on the generator input terminals. If there is voltage on the AC-in terminals, it thinks “grid” has come back, and will turn off the AGS signal.
5. For AGS-like control over a generator connected to the AC-in terminals, SmartLoadC can be used to turn on the coil of a 120 or 240 volt signal relay (not included). A NC output terminal of that relay can go to the two-wire terminals of the generator. The ON/OFF SOC controls of SmartLoadC can control the generator start/stop, but advanced functions like cooldown and max run time will not be present. If using voltage control for this smartload-AGS, there will be no delay and if voltage changes rapidly or the start and stop voltages are too close, the generator may exhibit short cycling.