

Genetry Solar

Satisfaction Guaranteed
....or your power bill back!



6KW and 12KW Split Phase LF Pure Sine Wave Power Inverters

with battery charge, automatic transfer switch,
generator start, WiFi connectivity and updates,
split and 3-phase capable

*A product of Genetry Solar
www.genetrysolar.com
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Designed in the United States of America. Assembled by hand in the United States with global materials.

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Warnings and Safety Notices

Any electrical system can pose considerable danger. Due to the necessary power levels, off-grid systems can be very dangerous if improperly installed or maintained. The installer and system owner must be aware of all associated potential dangers and risks.

- Never touch any electrical terminals while the system is in operation. Use electrical safety principles at all times while near devices or products with electrical potential, even if these devices are in the “off” state.
- Never disassemble the Genetry Solar inverter. Lethal electrical potentials can be present inside.
- The Genetry Solar Inverter must be properly set up for the desired installation. Improper setup can cause premature inverter failure, fire, property damage, or other forms of danger and loss.
 - Battery charge **MUST** be properly set up by a qualified installer or electrician.
 - Lead acid batteries generate hydrogen gas while charging. This is highly explosive, and must be properly vented for safety.
 - Lithium-based batteries have very specific charging settings. The Genetry Solar Inverter **must** be properly configured for the batteries it is connected to. Lithium batteries must be used in conjunction with a properly rated BMS (battery management system) for safety.
- The Genetry Solar Inverter must be installed in a suitable location, protected from dirt, debris, metal fragments, liquids, or any other such substances.
- Properly rated battery cables must be used. Inadequately sized cables can easily start a fire. **Do not under any circumstances use automotive jumper cables to power this inverter.**
- All power connections to this inverter must be fused with properly rated fuses or breakers.
 - Battery connections must be fused
 - AC input must be fused
 - AC output must be fused



Quick Feature List

- Designed in the U.S.A., assembled by hand in the U.S.A. by Genetry Solar with materials sourced both locally and globally
 - unlike almost every other LF inverter on the market today, these are **not** rebranded Chinese inverters. Their design is fully and completely an in-house design by Genetry Solar.
 - Modular design designed with field-serviceability in mind
- Pure Sine wave output, **not** a modified sine or square wave inverter
- Low Frequency Universal Transformer
 - High surge current capability (NOT a “high frequency inverter”)
 - Full Rated Power 24/7/365 guaranteed at ambient temperatures < 100°F
 - Possible to reconfigure the system design nominal voltage in the field if necessary
 - i.e. if you bought a 24v inverter, it is possible to rewire it to 48v without needing to purchase a different inverter. Cooling fans may need replaced, but they're a lot cheaper than buying an entire separate inverter.
 - Toroidal transformer design with the following benefits:
 - significantly lower no-load wattage compared to “E-core” transformers
 - notably reduced shipping weight
 - The Genetry Solar 12kw inverter is the **only** 12kw LF inverter (that we know of!) which can ship via regular parcel. It does *not* have to ship by freight!
 - smaller size
- Split-Phase 240V/120vAC or single-phase 120vAC output (*6kw only*; the 12kw is 240v only)
 - For EU single-phase 220v, simply adjust the inverter’s output voltage setting, and ignore the “Neutral” AC output terminal. L1-L2 → 220/240vAC single phase output.
- 50/60Hz output frequency, adjustable from 40-70Hz in ~0.25Hz steps if necessary
- Fully customizable Power Save feature
 - Adjustable “search”, “off”, and “min load” thresholds
 - Automatic “power save enable” from adjustable battery voltage threshold (*CUSTOMER FEATURE REQUEST*)
 - Works in normal system mode, as well as any “master” mode
 - Detects loads on either L1-N and L2-N circuits for split-phase operation (unlike most Chinese LF inverters, which can only detect loads on L1-N)
- Supports Battery Charge, UPS/ATS, and Generator Start

- Dual-relay Generator Start feature, allowing CPU-controlled start/stop of almost any signal-controllable electric-start generator on the market
- User can “gate” any of 32 internal signals to either of the “Gen Start” relays, allowing for unique extensibility (*firmware v1.2r6+*)
- All voltage setpoints are user-configurable. Make the inverter yours, specifically set for your system setup and needs.
 - Fully customizable undervoltage and overvoltage alarm and shutdown settings
 - Configurable battery “bulk” and “float” charge voltages
 - Adjustable battery charge current
 - Adjustable “low voltage” battery charge trigger voltage (starts generator if configured)
- Supports grid-tie inverter (“GTM” - Grid Tie Master) mode
 - Automatic linear frequency shift to throttle down / shut off GTIs
 - Automatic battery charge with excess GTI power
 - applies voltage and current limit rules by throttling the GTI via frequency shift
- Automatic sync to input AC wave, voltage & frequency
 - provides 100% seamless transfers from battery → AC Input
 - note that return from AC Input → battery will have a brief glitch due to backfeed protection functionality
 - “Split” phase possible, sync 180° degrees. (480vAC is possible with this.)
 - 3-phase 240v possible with 3 Genetry Solar Inverters (Master, 120° Sync, and 240° Sync)
- WiFi connectivity for remote monitoring and control
 - supports AP mode (Access Point), allowing you to connect your phone directly to the inverter, no WiFi network required
 - supports STA mode (Station), for normal WiFi network connection
 - MQTT communication for cloud access/world-wide monitoring or control of the inverter
 - Local HTTP server with mDNS if you don’t want to have your inverter connected to the cloud
 - Read status from the inverter, as well as control it via commands
 - Screen mirroring function allows you to access every function of the WiFi board from an Internet-connected device supporting mDNS and HTML5
 - Firmware updates to allow improvements, feature requests, and bugfixes
 - can update via Internet connection
 - also supports “firmware upload” from smartphone/laptop, no Internet connection needed

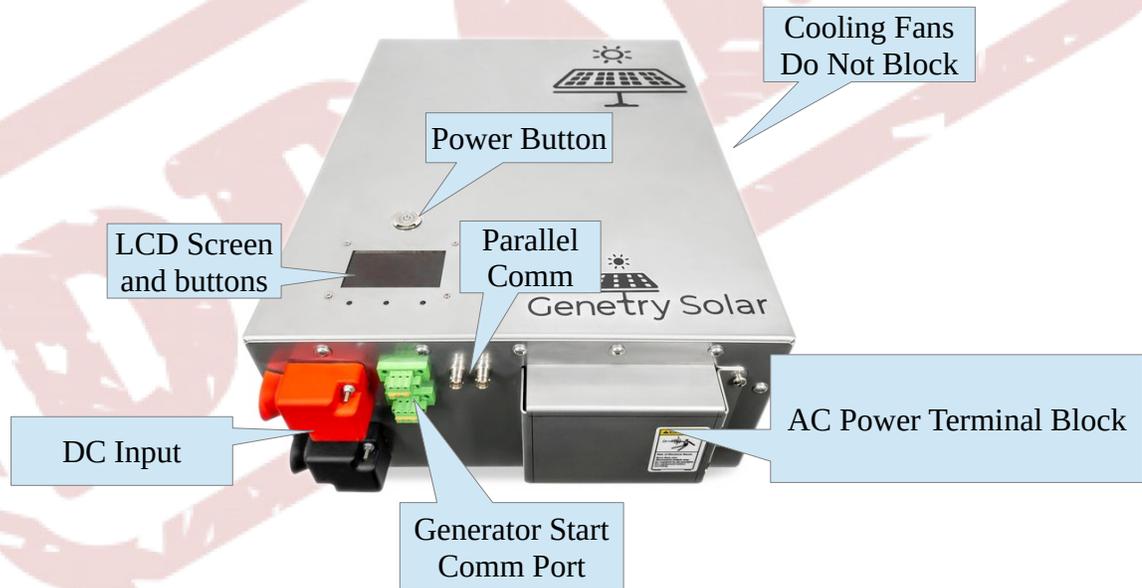
(firmware v1.2r0+)

- handy for inverters deployed in remote locations where no Internet is available. Just download the update file provided by Genetry Solar to your smartphone/laptop, and head out to the inverter. Connect the smartphone/laptop to the inverter, and upload the update directly to the inverter.
 - Need a specific feature? Contact Genetry Solar. It may be possible to implement via firmware update.
- Electrically isolated physical serial port for hardwired access
 - can choose between RS-232 / RS-485 / CANbus when ordering the inverter
 - supports MODBUS protocol, but other standards can be added if necessary
- 3.5” LCD providing a “window” into the inverter’s operation, full control and status
 - No more wondering “what’s really going on inside that big expensive box?”
 - LCD “flip” setting so inverter can be installed upside-down if desired
 - Onboard 9-channel oscilloscope for monitoring and diagnostics
- Up to 9 points of temperature monitoring, with multi-zone cooling for best efficiency
 - “Fan test” at power on
 - Fans come to a complete stop when not needed
 - Full PWM control of cooling fan speed, directly controlled by internal temperatures
- Supports automatic shutdown if fault condition detected
 - Configurable automatic restart for battery voltage, temperature and overload errors
 - *For functional safety errors, automatic restart is not possible*
- Covered with a 2-year limited warranty from Genetry Solar

The Inverter At A Glance

What you have purchased is one of the most feature-rich and customizable inverters on the market today, offering features and capabilities found nowhere else. We've all found ourselves at one time or another staring at a product, "It would be perfect if only it could do [...]" The Genetry Solar Inverter is fully customizable for your system setup needs.

All settings, system configuration and other features are accessed from the LCD screen. Some status and controls can be accessed via either local server or cloud server.



Power Switch

- Press this button to turn the inverter on. Press it again to turn the inverter off.
- RGB LED indicates inverter status
 - Green LED: Inverter Mode
 - Blue LED: AC Input / Charge
 - Red LED: Error
 - Flashing Yellow LED: Alarm
- For the geeks: the power button is a latching on/off switch directly controlling the Genetry Solar Control Board's power supply (shorting a ~6v signal to battery negative): it is not a momentary "CPU button."

NOTE: The Rev. C control board has the design ability to override the power button and remain on if needed. However, it cannot turn itself on.

LCD Screen

- Allows viewing of all system info
- Allows changing of all system settings

AC Power Terminal Block

These terminals allow connecting the inverter to loads to be powered, as well as AC input sources (if desired).

WARNING: The AC Input and AC Output terminals are not fused. External fusing is required for safe operation.

Depending on the inverter configuration as ordered, the output of the inverters can be either 240v split-phase, or it can be 120v single-phase (full wattage at single-phase output).

240v Split-Phase Setup

This setup is most common, and allows for the choice of either 120v or 240v AC input (please specify the desired AC input voltage at purchase time). Output is 120 + 120 split-phase power.



Output L1

Output Neutral

Output L2

Input L1 / L

Input L2 / N

NOTE: For 220v single-phase operation, ignore the “Output Neutral” terminal. “Output L1” = L, and “Output L2” = N.

120v Single Phase Setup

If higher amperage 120v output is required, a single-phase 120v inverter configuration can be requested at purchase time. This changes the internal wiring of both the transformer and the terminal blocks, but provides twice the amperage of a 240v setup.

NOTE: Only available on the 6kw inverter! The internal AC parts in the 12kw are not rated for 100A continuous current.



Output L

Output Neutral

Output L (redundant)

Input L

Input N

NOTE 2: In single-phase configuration, the AC Input can **only** accept 120v AC. It **cannot** accept 240v AC (the inverter will provide an AC Input alarm). This is because the transformer secondaries are paralleled together for full-load 120v operation.

Ground Bonding

In order to comply with NEC rules, it is important that the end user is aware of how the inverter's internal AC power path affects ground-neutral bonding requirements.

The only internal electrical connection to the chassis is a 10nF high voltage decoupling capacitor between the AC Output Neutral and the chassis (to float the chassis in the middle of the AC potential for U.L. regulations.) This can easily be overdriven by grounding the chassis to a different potential if needed in order to meet electrical codes.

NOTE: AC voltage can be dangerous! Please consult a licensed electrician for any modifications to an existing power distribution system!

DC Input

Genetry Solar recommends ALWAYS using a properly-rated and properly-connected DC breaker between the battery and the inverter. It may seem an added cost, but in the event something goes wrong, being able to easily shut the power off is critical.

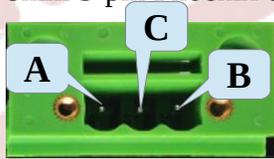
The Genetry Solar inverter has been designed with a “universal” design, where (most) of the same parts can be used regardless of the input battery voltage, or desired AC output voltage. However, this means that there is a possibility that the system battery voltage specification may not be known. If this is the case, Genetry Solar suggests connecting 12vDC to the battery terminals, and powering the inverter on. If the voltage is out of range, the inverter will error and refuse to start. (If the voltage is in the system spec range, it may power on, depending on the system mode and setup.) After the inverter is powered up, the current system configuration can be read from the first line on the STAT page.

Generator Start Connector

Generator Start on the Genetry Solar inverters has 2 separately controllable relays (maximum 5 amps) that can be used to start or stop almost any electrically-controllable generator on the market.

The relays are electrically isolated from all other power potentials present on the Genetry Solar inverter. Note that the 2 independently controllable relays share a common terminal.

Generator Start connector is a 5.08mm 3-pin Phoenix connector.



C = Common.

A = switch channel A.

B = switch channel B.

[For more details on the Generator Start settings and behavior, see the Settings.](#)

Local Network Functions

Not everyone wants to have their inverter talking to a remote “cloud” server that they are not in control of, i.e. “What if the cloud goes down?”

Or maybe like some RV owners, you want to be able to access status and inverter controls from a direct wireless connection to your inverter *without* a WiFi hotspot or router involved? Genetry Solar inverters have you covered! Genetry Solar inverters come with an internal webserver, which serves a simple yet elegant webpage directly from the inverter—with absolutely no connection to the Internet required.

NOTE: *Genetry Solar local server HTML files/pages make liberal use of HTML 5, CSS, Javascript and other present-day web design methods; older Internet-connected devices may not support some functionality.*

There are two main WiFi connection methods available on the GS inverter:

- Connection to a standard WiFi network (“Station” mode)
- Inverter generates it's own WiFi network (“Access Point” mode)

You can access the Genetry Solar inverter’s local webserver from either option (or even from both, if you so choose).

To access the Genetry Solar local webserver, follow the following steps:

1. Connect/make sure the inverter is connected to an existing WiFi network. (This network does *not* have to have Internet connectivity on it.)
2. Navigate to the WiFi page on the inverter’s LCD. Choose one of the following methods for access:
 - For connecting via mDNS, you will need the inverter's current mDNS path
 - The mDNS path can be found on the WiFi page of the inverter’s LCD:



MD: Genetry- [blurred]

The default path is “Genetry-#####” (where the “#” are hexadecimal numbers unique to the inverter).

NOTE: *This path can be customized from the local server.*

- → The full web path will be “http://[the above path].lan” (without the quotation marks).

NOTE: *Some web browsers may prefer the “.local” suffix over “.lan” And some networks/browsers simply may not support mDNS altogether.*

- For connecting via IP address, you will need the inverter’s current and corresponding IP address.
 - If you are using the Genetry Solar inverter’s AP WiFi network (Access Point),

you will need the AP: IP address.

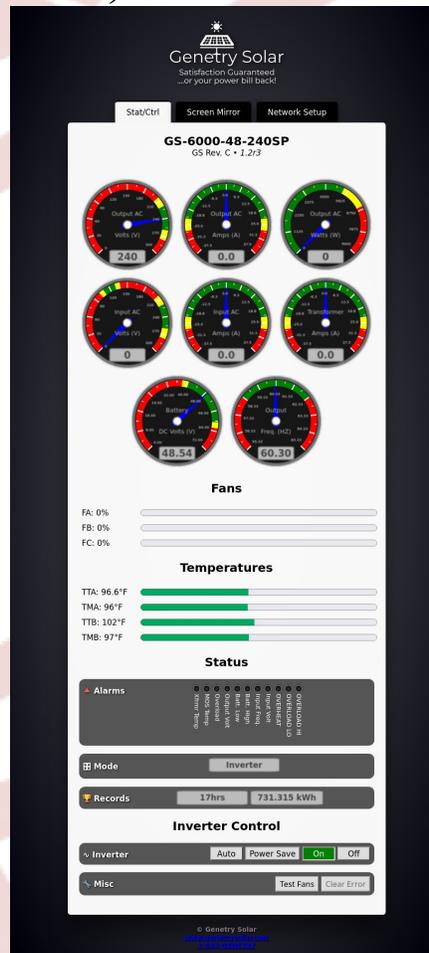
NOTE: This should be 50.50.50.50 if the AP is currently active.

- If the Genetry Solar inverter is connected to an existing WiFi network, you will need the STA: IP address. (This is set/determined by the WiFi router.)

NOTE: If the inverter is connected to a router, the “STA” IP address is not “fixed”, and may change upon router or inverter restart!

```
STA: 192.168.10.115
AP: 50.50.50.50
```

- Example for the STA: IP above: “http://192.168.10.115/” (without quotes)
3. Connect your Internet-capable device (smartphone, tablet, PC, etc.) to the same network the Genetry Solar inverter is connected to. (This is important: you will not be able to access the Genetry Solar inverter’s local webserver from a *different* WiFi network or from the Internet.)
 4. Using your Internet-capable device, navigate a web browser to the Internet path determined from step #2. The web browser should load something similar to the following (*firmware 1.2r0+*):



- You can directly poll the inverter for current status information by reading a dynamically-generated JSON file at: “[local server path]/stats.json”. (The default HTML page simply reads and parses this file.)
- Commands can be POSTED via HTML to “[local server path]/cmd”. (If the `SRUR` permissions are set to `R/W`, it will process the command and return an HTTP 200.) Currently accepted commands are as follows (**NOTE: Case sensitive!**):
 - `PWRoff` → set inverter to Power Off mode
 - `PWRon` → set inverter to Power On mode
 - `PWRsav` → set inverter to Power Save mode
 - `PWRsw` → set inverter to Auto Power Save mode
 - `RESETerr` → clear an error and restart the inverter
 - `FanTest` → briefly spin the fans up to full speed
 - `CHGon` → Start Charge
 - `CHGoff` → Stop Charge
 - `CHGflt` → Use “Float” voltage for charge
 - `CHGblk` → Use “Bulk” voltage for charge
 - `GENon` → Run Generator Start sequence
 - `GENoff` → Run Generator Stop sequence
 - `ATSinv` → Switch ATS to DC Input (*manual override*)
 - `ATSac` → Switch ATS to AC Input (*manual override*)
 - `ATSauto` → Release ATS manual override

NOTE: If the `SRUR` permissions are set to `RO` (Read Only), clicking the buttons will return an HTTP error code. As there is no protection on this setting from the screen mirroring function, you can lock yourself out of the inverter via the screen mirroring...requiring going to the actual inverter to press the actual buttons to re-enable `R/W` permissions on the `SRUR`!

- You can directly read the screen pixels from the inverter at “[local server path]/screen.bin”. It is a uncompressed 128x64 pixel bitmap; refer to the source code of the local server webpage for display functionality.
- Like other Genetry HTML functions, you can right-click the page, view the source code, and integrate it into a dashboard or other existing setup you may have.

Inverter Features / Modes

This section covers some of the more complex inverter features in detail. Most smaller settings and features are covered in [the LCD section](#).

Power Save Mode

You may be thinking, “What is Power Save mode anyway? How does it ‘save power’?” The concept is fairly simple, but there are several things to keep in mind before deciding whether to use it or not.

At no load, the inverter will consume some power. This is known as the “no-load power”, where the inverter is basically “idling.” Transformer magnetics, internal power supplies and processors all contribute to this power draw. As such, the only way to “save some power” is to temporarily shut off as many things as possible.

By and far the biggest idle power consumer is the main power transformer. This is where “power save” comes in as a function. If the inverter does not detect a big enough “load” on the output of the inverter ([this minimum load amount is configurable in the settings!](#)), it can be configured to automatically “turn off the engine” (so to speak), thus significantly reducing the power usage of the inverter.

However, it is not possible to detect a load on the inverter without applying power to “check for a load.” Therefore, after a user-adjustable delay, the inverter will automatically “restart the engine” for a few seconds (again, user-adjustable), and check to see if there is a big enough load on the output. If there is, the inverter remains on (to power the load). If the detected load is *not* large enough, the inverter will automatically “turn off the engine”, restarting the cycle.

While this may be a relatively clever function, there is a caveat that should be kept in mind: It is increasingly common for modern appliances to have MCUs or CPUs (“computers”) in them. The problem is when the inverter “shuts off the engine” to save power, these “computers” also lose power, and forget what they were doing. When the inverter “checks for load” by re-applying power after the “off” power save cycle, the “computer” basically starts over from the beginning, having completely forgotten what it was doing.

Unfortunately this means that most modern appliances (refrigerators, dishwashers, etc.) will not properly function if connected to an inverter configured for Power Save Mode. (Conversely, older refrigerators and freezers utilizing a bimetallic thermostat will work perfectly.) If this is the case, Genetry Solar recommends disabling Power Save functionality by setting the Inverter Mode to On ([this setting is found in the Configuration menu](#)).

Genetry Solar inverters have an Auto Power Save feature (a customer feature request!) This allows the inverter to automatically enter Power Save if the battery voltage drops below a user-specified threshold, and revert back to “always on” if the battery voltage exceeds said threshold. For fully off-grid users, this can automate a seemingly minor part of the system, in addition to serving as a very easy way to determine if the batteries have reached full charge (i.e. if no load is on the inverter, and it is not in power save mode, it can safely be concluded that the batteries are full.)

Automatic Transfer Switch (ATS) and Uninterruptible Power Supply (UPS)

While an “ideal” off-grid system would have the inverter as the sole source of AC power, sometimes there just isn’t enough power available in the batteries to sustain the necessary loads. In order to keep your house running smoothly, you may need an external AC input source. This can come from a generator, or sometimes even the regular AC power grid.

Genetry Solar inverters support AC Input. [There are multiple settings controlling this functionality](#), with 2 basic control modes:

- ATS (Automatic Transfer Switch) runs on DC priority: it is controlled by battery voltage threshold setpoints
- UPS (Uninterruptible Power Supply) runs on AC priority: the battery bank is used only if the AC input power is unavailable or unusable.

Battery Charge

The Genetry Solar inverter supports two potential sources for battery charge:

- AC Input (Generator / Grid / etc)
 - **NOTE:** *the input power source must be able to handle the COMPLETE output load on the inverter (i.e. pass-through), PLUS the charge amperage. Not to mention that in order to actually charge the batteries, the “load” must be completely offset by the AC input source. Power cannot simultaneously flow in both directions any more than you can successfully walk forwards and backwards at the same time.*
 - **NOTE for “legacy” GS inverters:** *If the inverter is configured for 120vAC input, the charge wiring amperage limit remains the same as 240vAC input. This results in the maximum safe input wattage being ½ that of 240vAC input.*
 - *“In-house” GS 6kw inverters utilize 8AWG wire on the AC lines, and can safely handle full 50A amperage of 6kw @ 120vAC.*
- Grid-Tie Inverter(s) connected to the AC Output of the Genetry Solar inverter
 - Battery charge here works by backfeeding power through the inverter. Charge voltage / current regulation is controlled by a positive frequency shift throttle (if supported). See [Grid Tie Master Mode](#) for more details.

Both charge sources are controlled by [the same charge settings](#), though they are completely separate methods.

Generator Start

Generator Start functionality is available on all system modes, though not all system modes may support the necessary triggers for automatic start/stop. All Genetry Solar inverters have a 2-

channel generator start control built in, allowing several different modes to support different electric generator start methods. (Most LF inverters with generator start functionality only have a single-channel (“dry contact”) output, often providing NC and NO outputs. Genetry Solar inverters have 2 independently controllable outputs, allowing potential automation of any generator with an electric start system.)

The settings controlling Generator Start can be found in the [AC Input / Transfer settings page](#).

Grid-Tie Master

Grid-Tie Master Mode is a function available only in “Master” modes (including Normal). It allows the connection of a grid-tie inverter (or grid-tie system) to the output of a Genetry Solar inverter. This can serve several purposes, including load reduction and even battery charge.

NOTE: *It may be possible to wire an existing grid-tie solar setup to a Genetry Solar inverter with a battery bank as an emergency off-grid power system. Please note that the output of a Genetry Solar inverter must never under any circumstances be wired to a mains panel connected to the power grid.*

If the grid-tie inverter’s power output is greater than the loads on the system, the Genetry Solar inverter will either backfeed the excess power back into the batteries (observing the battery charge enable, current limit and voltage setpoints) *and/or* it will start to throttle down the grid-tie inverter(s) with a linear frequency shift. (If the batteries are full, there is no place to put the excess energy, meaning that the grid-tie inverter[s] must be shut down to stop the power flow.)

Regulation is controlled via frequency shift from the root output frequency. All grid-tie inverters must shut down (per government regulation!) if the frequency exceeds a particular setpoint. *Some* grid-tie inverters (especially newer ones) support linear throttling, allowing the Genetry Solar inverter to gently regulate their output level as needed.

- Connect 240v grid-tie inverters across the Output L1 and Output L2 lines.
- 120v grid-tie inverters can be connected across either
 - Output L1 and Output N lines
 - *OR* Output L2 and Output N lines

PLEASE NOTE: *This frequency shift will affect the output frequency of the inverter up to +2.5Hz. You may notice certain appliances and/or clocks running faster. The Genetry Solar inverter does NOT have any functional ability to try to “normalize” an offset over a 24-hour period for AC clock/timer accuracy.*

Hardware Limitations

Oh no, not *limitations*, please??!

Well, there ARE some hardware limitations that must be kept in mind when designing a system around a particular product.

GS6 in 120v: 50A

GS6 in 240v: 25A

GS12 in 240v: 50A

(GS12 is not offered in 120v, as the cables/connectors/sensors cannot handle the amperage)

At 220v, 50A is 11,000W. However, at the design spec 240v, 50A is 12,000W.

Amperage is what generates heat, and thus the inverter's limitations are far more of "amperage" limitations than wattage limitations. (The inverter is rated in watts only because this is a much easier metric for determining total power capability.)

The MOSFETs in the 12kw inverter are governed to a maximum peak current of 1,100A. This directly limits the peak surge output that the inverter can supply.

- $24v * 1,100A = 26,400W$
- $36v * 1,100A = 39,600W$
- $48v * 1,100A = 52,800W$
- $60v * 1,100A = 66,000W$

The MOSFETs in the 6kw inverter are governed to a maximum peak current of 600A. This directly limits the peak surge output that the inverter can supply.

- $12v * 600A = 7,200W$ (Sag in the battery cables will further reduce this)
- $24v * 600A = 14,400W$
- $36v * 600A = 21,600W$
- $48v * 600A = 28,800W$

The LCD Screen

Ever been perplexed by how little information can be obtained from the vast majority of LF (low-frequency) inverter designs on the market? Ever wonder just how much information is actually available inside that big box?

A lot, it turns out.

The Genetry Solar inverter is equipped with a simple 3.5” graphics LCD panel, and it is almost akin to looking at the night sky through a telescope. You can monitor almost every aspect of the inverter, and geek out on technical data—even if you have to do a lot of “panning and tilting” to access all of it ☺. Did we mention you can change dozens of settings, making the inverter an integrated part of your whole system?

Theory of Operation

Navigating the LCD screen is accomplished via three buttons below the LCD. It is very simplistic, but also highly functional.

The three buttons are as follows (left to right):

- Up SEL: Move selection up ADJUST: increase selected setting
- Enter Toggle between “select” and “adjust” modes **or** “click” buttons
- Down SEL: Move selection down ADJUST: decrease selected setting

“Select” mode is identified by highlighted text on the selected item.

“Adjust” mode is identified by flashing text on the selected item. Toggling between these modes is generally accomplished by pressing “Enter.” (Menu items *without* an adjustable setting will “click” by pressing “Enter.”)

NOTE: Inverters prior to the “in-house full design” will default to the “Up – Down – Enter” button sequence.

There are several special functions necessary for navigating around the menus. At power-up, the menu bar will be selected; you can use Up and Down to switch between screens. (Note that the menu bar scrolls side-to-side as you navigate.) It will look something like this:



Pressing “Enter” will enter “screen” mode on the chosen screen (in this case, “WiFi”). This enables you to select any settings or options on that particular menu. Notice that in “screen” mode, all the rest of the menu options disappear:



You will notice the first option/setting/button on the screen will also be highlighted. In this

state, Up/Down will allow you to navigate through the available options/settings/buttons in the menu. Meanwhile, Enter will toggle “modify” state (in the event of an option/setting), or “click” a button.

To return to the menu bar, ensure that you are not in “modify” mode, and then simply press or hold “Up” until the selection reaches the menu bar. The menu bar will switch back to the first picture, indicating that Up/Down now switches between screens as before.

“LCD Sleep”

If no buttons have been pressed within the LCD timeout (which is configurable from the **Cf** screen), the LCD backlight will dim to save a little power. Pressing any of the three buttons will exit LCD sleep mode.

NOTE: *Pressing a button to wake the LCD will briefly bypass the normal function of the button. You do not have to worry about inadvertently changing something in this case.*

Power Up

When powering on the inverter you will be greeted with the Genetry Solar splash screen. (Press any button to exit it.) During this time, all of the cooling fans in the inverter should spin up to full speed as a power on test to ensure they are working.

NOTE: *If one or more of the fans fail to spin up, please contact Genetry Solar for assistance. Non-working fans can potentially lead to inverter overheat, shutdown, or damage.*

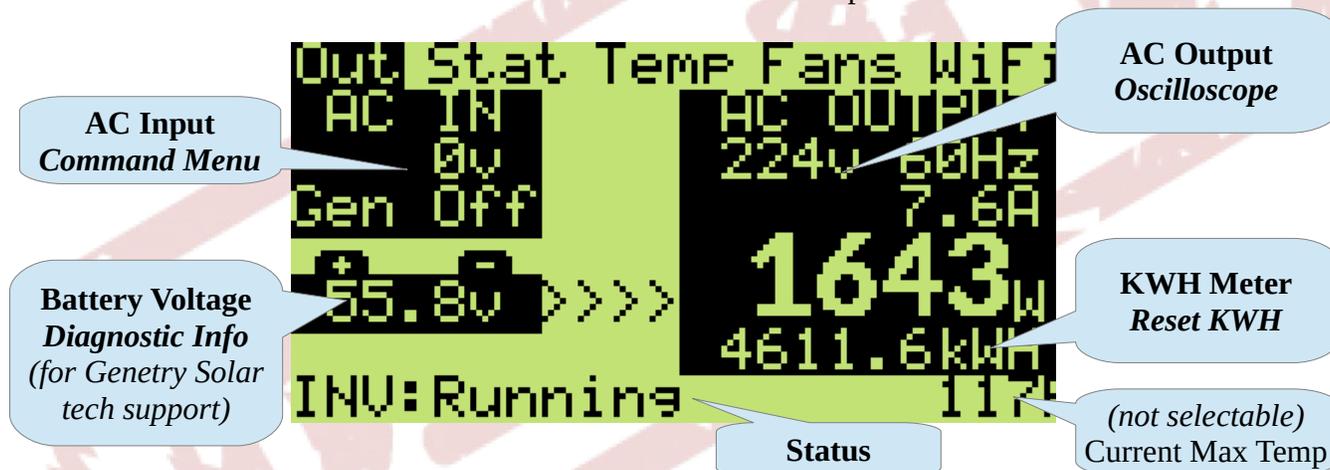
After the splash screen the LCD will default to the **Out** screen.

(Please note that what you see on your LCD may vary depending on your inverter’s specifications and configuration, as well as the inverter’s firmware version.)

Out. Page

The OUT page shows as many of the system power stats as possible.

Most of the data here is self-explanatory, though note that there are several “hidden” functions on this page that provide even more data/info into the inverter’s status. Pressing “Enter” (to select this page) will highlight several menu items in turn, each of which provides further functionality. Note below that the italicized items are “hidden” functionalities which provide further information.



AC Input / Command Menu: Displays the current measured AC input voltage. If selected (press Enter to select the page, and it will automatically select the first item), this changes to Command. Press Enter to access the [“Command” menu](#)

AC Output / Oscilloscope: Displays current output voltage; if selected, it changes to Scope. Press Enter to access [the on-board multichannel oscilloscope](#), providing realtime view of actual waveforms and diagnostic stats:

KWH Meter / Reset KWH: Displays total accumulated power drawn from the inverter’s output. If highlighted, it changes to Reset; press Enter to reset the accumulator.
NOTE: In the event that you only want to count power generated from battery, you can select this accumulator between “all power” and “inverter power” from the CFG page.

Battery Voltage / Diagnostic Info: Display current DC input battery voltage. If highlighted, it switches to Diass; press Enter to access [the Diagnostic Info page](#).

Status: The lowest line on the LCD screen reports the current inverter functional status. (Note that the RGB Power Switch LED will also indicate a color/blink code based on this status.) Possible statuses are as follows:

(no CPU connection)	Internal CPU cable disconnected or other technical problem
PWR: Initializing	Inverter power-on startup function
PWR: Turning Off...	Inverter is running “power down” tasks
OFF: System Off	System Mode set to Off / Power Mode set to Off
OFF: ColdOff	“ColdOff” threshold has been reached

AC: Pass-Thru	Power Pass-Through. Output powered by AC Input
AC: Bulk Charge	Battery Charge in Constant Current mode
AC: Float Charge	Battery Charge in Constant Voltage mode
AC: Standby Mode	No viable AC Input detected (<i>AC-Only System Mode</i>)

Some status functions are accessible from several modes, and the “function code” may vary from any of the following options (based on the System Mode): INV, GTM, MAS, MAS-Split, MAS-Trip1.

INV: Running	Normal Inverter operation
INV: InSync	Inverter is in-sync with an AC input signal
INV: Load Run	Power Save Mode, load wattage threshold exceeded
INV: Check (x)	Power Save Mode, checking for load
INV: Off Timer (x)	Power Save Mode, in off-timer
GTM: Throttle -15%	AC Frequency Shift (up to +2Hz) for grid-tie pull-back throttle
INV: Throttle 30%	AC Frequency Shift (up to -2Hz), Droop for Parallel throttle

Alarm and errors are necessary for any inverter, alerting the user if a monitored item has gone out of the allowable specification and/or is surpassing safety thresholds, requiring the system to shut down to protect itself. Note that alarms (ALM) will alternate with the system status while the inverter continues to run; errors (ERR) will shut the system down.

NOTE: An active alarm will also cause the LCD backlight to “pulse” if the LCD backlight timeout has expired. This may be handy for hearing-impaired users.

ALM: Transfrmr Temp	Transformer temperature is nearing shutdown threshold
ERR: Transfrmr Temp	Transformer temperature exceeded shutdown threshold. Check load level and ventilation.
ALM: MOSFET Temp	MOSFET temperature is nearing shutdown threshold
ERR: MOSFET Temp	Transformer temperature exceeded shutdown threshold. Check load level and ventilation.
ALM: DC Over Volt	DC input voltage is over OVP alarm setting
ERR: DC Over Volt	DC input voltage exceeded OVP shutdown setting
ALM: Battery Low	DC input voltage is below UVP alarm setting
ERR: Battery Low	DC input voltage fell below UVP shutdown setting
ALM: AC Output Volt	AC Output voltage regulation problems
ERR: Output Low	Inverter was unable to regulate the output voltage
ERR: Output Over U	Inverter was unable to regulate the output voltage

ERR: Overloaded	Output overload threshold has been exceeded
ALM: Overload	Output load is above the inverter's maximum load
ERR: Bad CPU comm.	CPU lost communication with the LCD board
ERR: No Slave Signal	Master Mode: no feedback detected
ERR: Bad Slave Sync	Master Mode: improperly-phased feedback detected
ERR: Charge Res Fault!	Battery charge current can't be regulated
ERR: Drive Volt Low!	FET Drive Voltage out of range; damaged LF Driver/FETs?
ERR: AC Out Shorted	AC Output was measured <30vAC for one half cycle
ERR: AC Backfeed!	AC was detected on Output when starting Inverter mode
ERR: FET Amp Limit!	Internal MOSFET current limit exceeded maximum threshold
ERR: Volt Relay Fail!	Internal auto-switch voltage relay is not responding
ERR: DC Overvoltage!	DC Input voltage exceeded maximum threshold of ~75v
ERR: Xformer Polarity!	Transformer polarity is reversed (internal)
ERR: Xformer Voltage!	Maximum positive throttle reached, but no detected AC Output
ERR: GTM Regulate Fail!	Maximum negative throttle reached, and reverse AC power flow still detected (i.e. grid-tie inverter did not shut down).
ERR: No Sys Confis!	(should not see this error; it will pull up Inverter Setup page)
ERR: Bad Sys Confis!	Invalid system configuration detected
ALM: INVERTER HOT!	A non-specified thermistor is nearing the configured maximum temperature.
ERR: OVERHEAT!	A non-specified thermistor exceeded the configured maximum temperature.
ALM: NEAR MAX LOAD!	Output AC load has exceeded 102% of max load
ALM: OUT OVERLOADED!	Output AC load has exceeded 108% of max load
ERR: OVERLOADED	Output AC load has exceeded 115% of max load
ERR: CPU BOOTLOADER	If a firmware update failed to be applied, the CPU may be unable to start. Retry the update.
ERR: ??undefined??	You are in trouble ☹. (Contact Genetry Solar for assistance.)

Command Menu

Sometimes despite the best automation abilities and functionality, you want to manually tell your inverter to do something. Genetry Solar inverters have you covered!

From the “Command” menu, you can select an available command from the list to (temporarily) override the inverter’s automatic choices. Note that none of these “Commands” will be persistent across inverter restarts (unlike settings in the “CFG” page).



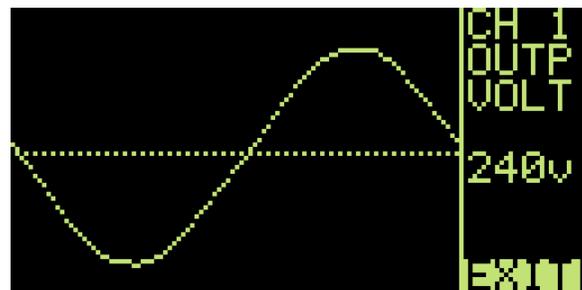
NOTE: Not all Commands will be visible depending on the inverter’s setup and current usage. For example, the “GEN” commands will not be visible if the Generator Start functionality is disabled.

These buttons have the exact same functionality as the ones provided on the Genetry Solar local webserver, as well as the Genetry Solar website remote server.

Oscilloscope Screen

Wait, an *oscilloscope* on the Genetry Solar inverters? You bet!

With the processor monitoring multiple items at multiple points per AC wave, it’s extremely easy to expose that information in an oscilloscope manner. What you see on the ‘scope screen is raw data: it has not been “prettified” or otherwise tricked-out to look “better than reality.”



There are two kinds of oscilloscope channels in the Genetry Solar inverters:

- “Scope” channels display values read during a single AC wave. They are always “current” to the actual measured values at the immediate moment.
- “Historical” channels display a single point for each single AC wave.
 - “Historical” channels also will STOP updating if the inverter errors out—making it very easy to see a “historical” perspective of what may have caused the error. (Note that a vertical bar will indicate the exact AC cycle that the error condition was triggered.)

NOTE: If you are trying to collect information for Genetry Solar regarding errors, it can be extremely valuable to photograph the “Historical” channels **before** resetting the inverter.

Available ‘scope channels for firmware v1.2r5 are:

1. OUTP VOLT scope: AC Output Voltage (seen above)

- | | |
|--------------|--|
| 2. INPT VOLT | scope: AC Input Voltage |
| 3. XFMR AMPS | scope: Transformer Current (= AC Out Amps – AC In Amps) |
| 4. OUTP AMPS | scope: AC Output Current |
| 5. INPT AMPS | scope: AC Input Current |
| 6. BTRY AMPS | scope: DC Battery Current (<i>only usable on full-GS inverters with internal current sense. All inverters without internal DC busbars will show a maxed-out range</i>) |
| 7. dAMP | historical: (Debug) Transformer Current |
| 8. dVLT | historical: (Debug) Output AC Voltage |
| 9. SYNC | historical: AC Input-Output Sync |
| 10. BATV | historical: DC Battery Voltage |
-

Diagnostic Info

The Diagnostic Info page is intended for providing diagnostic information to Genetry Solar technical support. (Most items seen here are not scaled in any particular way.)

Note that one of the first items Genetry Solar technical support will ask for is the inverter firmware version. It is here on the lines “LCD Version” and “CPU Version” which should always match. If they do not, a persistent inverter alarm will go off (*firmware v1.2r0+*).

How many other commercially-available inverters have you seen with a diagnostic screen like this? (None that we know of! Some only provide you with the “luxury” of seeing internal temperature!)

```

Diagnostic Info
LCD Version: 1.2r5
CPU Version: 1.2r5

Sys Mode: 1 0
Error Code: 0
Setup:00000000
Alrm:0000000000000000
fSys:0000000010000000
fInv:0000000000000000
fCha:00000000111001111

Xfmr Amps: 11
Batt. V/A:2175 10147
AC Out V/A:1485 - 2
AC In V/A: 735 - 20

Debug: 0 0

I/OFreq:33388 667
Throttle: 95.44%
Xfmr In: 32.390vAC
* Ratio: 7.35

```

Stat Page

The Stat page pulls a large number of “quick” statistics together in one place to make it easy to determine the inverter’s health statistics at a glance. Note that this is a scrolling page; not all lines shown below will be visible on the LCD at one time.

Many of the statistics can also be manually reset (if RESET pops out on a line while you are scrolling, press “Enter” to reset it.)

All “Session Statistics” (items below the Hourmeter) are cleared to zero if the inverter is power cycled (power switch or otherwise).

```
Int Stat Temp Fans WiFi
G5- 6K/48-240SPL
Rev.: C
Void: ---
Hours: 39, 0m, 2d, 13h

Ontime: 25d, 2:43:56
Uptime: 81%
Pwr: Inv(100%) AC(0%)

Batt. V: 52.1 → 56.8
Max Watts: 8682W
Pk Surge: 0W
Xfmr Eff.: 91%

BtyAmpPk: 4092
BtyA_Cnt: 0
Errors: 0
Alarms: 0
ATS Cnt: 0

MQTT Msgs: 17738
WiFi RSSI: -81db
CPU QOS: 100%

(DBG)Stack Avail.
5412 1108 548 15112
```

- Inverter setup configuration
- Control Board Revision
- Warranty Status
- Hourmeter (*cannot be reset*)
- Session “Powered On” duration
- Inverter “Active” session percentage
- Session Power Source percentages
- Session battery voltage range
- Session peak registered load
- Single-cycle maximum registered current
- Calculated transformer efficiency
(*NOTE: This is an estimate at best!*)
- DEBUG: Current Sense Peak
- DEBUG: Current Sense Trigger Count
- Session Error count
- Session Alarm count
- DEBUG: Session ATS transition count
- Session MQTT Message Count (*NOTE 1*)
- Current WiFi RSSI in DB
- Internal communication quality
- (*debug information*)

NOTE 1: MQTT Message count includes requests for status updates. This number will constantly increment if you are on the Genetry Solar remote server inverter status page.

The top line indicates the inverter setup specifications. Due to the “universal system design”, this can be the easiest way to determine system setup. The breakdown is as follows:

- GS Genetry Solar
- 6k 6KW continuous output rating
- 48 Nominal Battery Voltage (in this example, 48v)
- 240SPL Output and Input voltage specifications
 - 240 Output total voltage
 - SP Split Phase (if applicable)
 - L / B L = 120v charge, B = 240v charge, blank = no charge
 - *NOTE: Only applicable to units with a Rev A.1 or Rev. B control board! All Rev. C GS inverter support auto-switching AC input*

The VOID line will indicate if the software warranty has been voided. Certain settings are locked to the software warranty, as changing them could potentially damage the inverter. If the software warranty is voided, it will indicate as such here.

REV indicates the control board’s revision. This can be important for determining what features or capabilities are present in the inverter’s hardware.

TEMP Page

The **TEMP** page allows you to see all of the available temperature sensors on the system, as well as assign them to control any or all of the three fan channels (next screen).

NOTE: If there are more than 6 temperature sensors on the system, this screen will need to be scrolled to view the remaining temperature sensors.

NOTE 2: There is a chance the settings on this page will have to be put behind a “warranty gate” due to issues with these settings easily being able to make the inverter overheat.

The screenshot shows the following data:

Channel ID	User Character	Current Measured Temperature	Measured Highest Temperature	Fan Channel Assignments
Now				Max Fan-HBC
T2		100.8F	(118.1)	XXX
T4		101.3F	(113.8)	XXX
TT		109.6F	(129.5)	XXX
MM		96.8F	(107.3)	XXX
A		87.9F	(94.8)	XXX

If a thermistor is disconnected, it will read “-----”. When the **TEMP** screen is refreshed, disconnected thermistors will disappear, and the list may be reordered.

NOTE: Due to the large amount of EMI (electromagnetic interference) inside the inverter chassis under high loads, you may occasionally see a non-connected thermistor appear in the list with an extremely low temperature reading. This is normal, and can safely be ignored.

Channel ID: Available temperature channel ID’s are as follows:

- 1,2,3,4,5,6 Thermistor channels found on the LCD board
- T Transformer Temperature Sensor (control board)
- M MOSFET Temperature Sensor (control board)
- A Inverter internal ambient sensor (**CANNOT control fans**)

NOTE: The Ambient (A) temperature sensor cannot be assigned to any fan channels. It is also only present on inverters with a Rev. A.1 or Rev. B control board.

User Character: Allows you to “tag” thermistor channels so you know what they are measuring (i.e. “T” for transformer thermistors, “M” for MOSFET thermistors, etc.) Range: 0 - Z.

Current Temperature: Currently measured temperature on this channel.

Highest Temperature: Highlight and “click” these to reset them.

Fan Channel Assignments: An ✕ indicates that this thermistor is assigned to the corresponding fan channel (A, B, or C).

Fan channels are controlled by the thermistor assigned to it with the highest temperature. The default configuration assigns all thermistors to all fan channels, so all fans will be controlled by whichever thermistor measures the highest temperature in the inverter.

Fan channel assignments allow for customized cooling functionality. For example, if the cooling fan near the MOSFET board (for inverters with one MOSFET board) is plugged into channel A, you can assign all of the thermistors mounted to the MOSFET board heatsinks to fan channel A, and that fan will only run as fast as necessary to keep the MOSFETs cool. Meanwhile, other thermistors can control, say, fan channel B to keep the transformer cool. Or any mix of the two—say, assigning the MOSFET temperature sensor closest to the transformer to *both* fan channels A and B.

If a fan channel does not have any valid assigned thermistors, it will run at 100% as a safety. (Even if a fan channel has thermistors assigned to it, if these thermistors are not connected, the fan channel will still run at 100%.)

Fans Page

The Fans page allows you to monitor, configure, and test the three fan control channels internal to the inverter (A, B, and C). This is a scrolling screen; not all lines shown below will be visible on the screen at one time.

NOTE: Most smaller Genetry Solar inverters only have 2 cooling fans, and as a result, one of the 3 channels will not do anything. This is by design, and is not a problem with the unit.

The screenshot shows a terminal-style display with the following text:

```
Stat Temp Fans WiFi C
A AAAA BBBB CCCC
TH Chan: M M M
Throttle: 0% 0% 0%
Min Tmp: 110F 110F 110F
Max Tmp: 145F 145F 145F
Shutdwn: 180F 180F 180F
ColdOff: --- --- ---
Off Spd: 0% 0% 0%
ProCool: 0% 0% 0%
Min PWM: 10% 10% 10%
PWM Freq: 20K 20K 20K
```

Callouts point to the following sections:

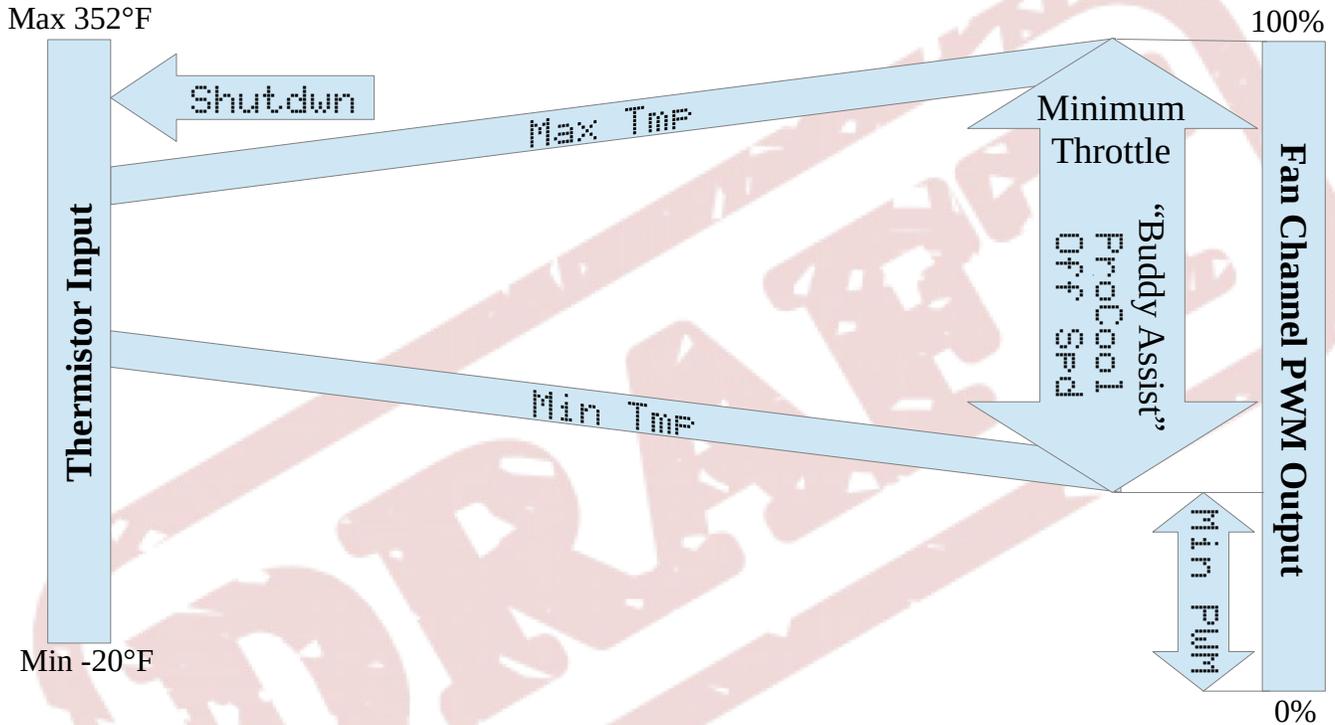
- Status and controls for fan channel A (points to the first column of data)
- Status and controls for fan channel C (points to the third column of data)
- Status and controls for fan channel B (points to the second column of data)

TH Chan The ID of the thermistor channel currently controlling this fan channel.

NOTE: If there is no valid thermistor channel assigned to this fan channel, the fan channel will run at 100% throttle as a failsafe.

Throttle	The current PWM output for this channel (0-100%). NOTE: When these are highlighted, they will switch to “TEST.” If you “select” one, you can temporarily specify an absolute fan throttle output from 0-100% in 10% increments. This is very handy to test fans for proper operation, as well as for calibrating fan setpoints.
Min Tmp	Specifies the temperature at which this fan channel will start to throttle up. Must be below Max Tmp.
Max Tmp	Specifies the full-throttle temperature for this fan channel. Must be above Min Tmp and below Shutdown temperature settings.
Shutdown	The shutdown temperature for this channel, maximum of 181°F. Must be above Max Tmp. NOTE: If a thermistor channel has no fan channel assignments, it will use the <u>lowest</u> shutdown temperature from the three fan channels. NOTE 2: If the inverter is software-unlocked, the maximum temperature here is 200°F.
ColdOff	Automatically turns the inverter off if any temp sensors assigned to this fan channel fall below the specified threshold temperature. Usually intended for wintertime applications. <i>(Feature request by AquaticsLive!)</i>
Off Spd	Sets the minimum fan speed, if the cooling fans need to run all the time. Default: 0% (fans completely stopped if not needed)
ProCool	Proactive Cooling: Specifies the minimum fan speed at inverter full load (100%). For example, with an 6KW inverter, and ProCool setting of 70%, the fan channel minimum throttle at a 6,000W load will be 70%. (This determines the <i>minimum</i> fan speed based on load, regardless of temperature.)
Min PWM	Sets the “1% throttle” output PWM value. Some fans will not operate with a very narrow PWM output, and this allows calibration so the fans start immediately when needed.
PWM Freq	The PWM output frequency for this channel, range: 20Hz to 30,000Hz (30K). If you are using a PWM fan, check the datasheet for the recommended PWM frequency. NOTE: Genetry Solar inverters use PWM fans, and the default setting here is 20KHz. WARNING: 2-wire 48v cooling fans MAY burn out with high PWM frequencies. Genetry Solar recommends frequencies under 1KHz (1000Hz) unless dedicated 4-wire PWM fans are being used. Genetry Solar is not liable for damages resulting from fans being used outside of manufacturer specifications. NOTE: The newer Genetry WiFi boards do <u>not</u> support 2-wire fans.

A block diagram of the various fan control settings is as follows:



If a thermistor assigned to a fan channel exceeds 100% of the specified Max Tmp, the system will start to throttle up the other fan channels as well (“Buddy Assist”) to attempt to cool the inverter down. The other fan channels will reach 100% throttle when the hot thermistor reaches approximately 120% of the specified Max Tmp. The purpose of this is to get as much airflow as possible through the inverter to try to avoid an overheat shutdown.

WiFi Page

The WiFi page allows you to view the current WiFi and communication status, as well as access the WiFi settings offered by the inverter.

The Genetry Solar inverter can both connect to a WiFi network (“STA” mode), as well as also generate its own WiFi network (“AP” mode). Note that AP mode can come in handy for use with a cheap Android tablet to create a “remote” screen without any wiring.

An “AP” network has an 8-character password unique to each inverter. This password can be found from the “Configure Network” page (select the line displaying the current network, press “Enter”) if the inverter is in “AP” or “A+S” WiFi modes. (In “STA” or “Off”, the generated AP will not have a password—but it also is only active when the “Configure Network” page is open.)

```
Stat Temp Fans WiFi Cf
WiFi: STA+S: Connected
MQTT: R/W → Connected
SRUR: R/W → Active
Update: (up to date)
Update Branch: Rev.

linksys
Diagnostic QR Code...
ID: GS [redacted]
MD: Genetry- [redacted]
STA: 192.168.10.115
AP: 50.50.50.50

Restart WiFi Board
Erase WiFi Configs
```

Current WiFi network
Select this line to
access Config page

WiFi signal
strength indicator

WiFi board's unique
ID number

WiFi

Allows control of the WiFi. There are 4 possible settings here:

- Off → WiFi disabled / powered off
- STA → WiFi in “Station” mode → connects to an existing WiFi network
- AP → WiFi in “Access Point” mode → the inverter generates a WiFi network
- A+S → WiFi in dual-network mode: connects to an existing WiFi network *and* also generates a completely separate WiFi network

NOTE: Configuration of the WiFi network settings is done from the WiFi configuration webpage (see below).

Possible status messages are as follows:

-----	WiFi disabled
WiFi Idle	WiFi switching modes
SSID Gone	WiFi network specified in the config could not be found
Connected	Successfully connected to configured WiFi network
WiFi Fail	Couldn't connect to the configured WiFi network
WiFi Lost	Lost connection to the configured WiFi network
Disconnect	WiFi is disconnected

MQTT

Mosquitto client control. The Mosquitto client enables remote access to data and inverter controls by use of a remote Internet cloud server. This makes it possible to access and/or control your inverter from pretty much anywhere in the world.

NOTE: Firmware updates are communicated to the inverter via the MQTT protocol; if MQTT is disabled and/or the inverter is not pointed to the default Genetry Solar remote server (wifi.genetrysolar.com), it will not be able to receive firmware updates.

Settings are:

- RO (read-only), where the inverter cannot be remotely controlled
- R/W (read/write), enabling remote control of the inverter
- Off disables the MQTT client entirely

Possible status messages are as follows:

-----	MQTT client disabled (by above)
Timeout	Could not connect to the MQTT server within the timeout
Conn. Lost	Lost connection to the MQTT server
Conn. Fail	Unable to connect to the MQTT server. Bad path?
Connecting	Attempting connection to MQTT server
Connected	(Normal operation)
Deny Ver.	MQTT server rejected the used MQTT protocol version
Bad ID	MQTT server rejected the specified Client ID.
Unavailabl	MQTT server unavailable at this time
Login Fail	MQTT server rejected the login credentials
Conn. Deny	MQTT server rejected the connection attempt

SRVR

Local Network Server, for directly accessing the inverter without the use of a cloud MQTT server or any Internet access for that matter. This allows interfacing to DIY projects with WiFi connectivity, such as Arduino, Raspberry PI, etc.

NOTE: Like with MQTT, you can set the SRVR to RO (read-only) or R/W (read/write)

permissions depending on what security level you need.

Possible status messages are as follows:

```
----- Server disabled
Active   Server is ready for connections
Code xx  Error encountered in server setup
```

See [Local Server Features](#) for more details.

Update Software Update Status. If Genetry Solar has released a new firmware version, you will be notified here (requires WiFi connection to Internet, and MQTT enabled to default wifi.genetrysolar.com server).

NOTE: *Your inverter cannot be updated remotely, as an update requires that the inverter be restarted.*

When an update has been verified, you will see something like this:

```
Get v 1.3r22
```

This indicates the major version, the minor version, and the revision number. Select this item and “click” it to enter the firmware update utility.

NOTE: *You will see a screen warning you that the inverter must be shut down to update. Due to hardware limitations, there is no way around this requirement.*

NOTE 2: *If you are using the local server screen mirror function, it will immediately freeze if you “accept” the warning screen. The screen mirror will resume operation as soon as the inverter finishes installing the update and restarts. If the update fails, the screen mirror will not restart. (This is because the update function halts all other functions for increased stability.)*

BUG REPORTING: If you encounter problems with your inverter that you believe are a result of a firmware bug, please contact Genetry Solar with a detailed description of the problem, as well as the steps needed to reproduce it (if possible).

NOTE: Genetry Solar may not be able to fix the bug if it cannot be readily reproduced.

Update Branch This allows you to determine what kind of updates you would like to be notified about. The options are as follows:

Major	Major version number change (v1.x, 2.x, 3.x, etc.) Generally indicates major feature additions/changes
Minor	Minor version number change (vx.1, x.2, x.3, etc.) Most often indicates stable versions with bug fixes
Rev.	Revision number change (vx.x r0, x.x r1, x.x r2, etc.) New feature additions will first appear here, though potentially with minor bugs.

Tech Tech Support channel. **Only use this if directly instructed to do so by Genetry Solar. Unspecified updates on this channel MAY render your inverter unusable.**

Configure WiFi “Clicking” this will cause the inverter to generate a WiFi network (currently “Genetry_#####” where the “#”s comprise a hexadecimal value). Connect to this with an Internet-connected device with web browser capability (smartphone, laptop, PC, Mac, etc.) in order to access these settings.

NOTE: You can scan the QR code on the LCD with a smartphone to automatically connect to the inverter's hotspot WiFi network. Alternatively, you can manually connect to it from your device's WiFi settings.

Upon connecting to the inverter's WiFi hotspot, a “network login” or similar message should pop up on the connected device. (If this does not happen, try opening a web browser, and inputting “50.50.50.50” (without the quotes) into the browser's address bar.

When you get the inverter's WiFi configuration page loaded in your web browser, the inverter will scan for available WiFi networks, and give you a list. **NOTE:** WiFi repeaters will appear as separate entries. Simply pick the one with the best signal strength.

After clicking/tapping on the desired WiFi network on the inverter's configuration page in your web browser, enter in the password (if necessary), and click “Connect.” The inverter will attempt to connect to the network; if successful, it will save the credentials internally. (These will be used whenever the inverter tries to connect to WiFi.)

You can also configure the MQTT server path from this config page, if you would like your inverter to connect to a different MQTT server.

NOTE: Changing the MQTT path from the default “wifi.genetrysolar.com” will prevent your inverter from receiving update notifications. Genetry Solar does not provide technical support for this feature.

CANCELING AN IN-PROGRESS FIRMWARE UPDATE: The inverter allows canceling an update in the download process. To cancel an update that is in the “Downloading” phase, press Up & Down to cancel; you may have to attempt several times.

Diagnostic QR Code If you “click” this menu item, the inverter will generate a QR code that you can provide to Genetry Solar for diagnostic assistance (if necessary). Data provided is comprised of system status and/or records, but no user-identifiable information.

ID: This is your inverter's ID number. “Clicking” this will generate a QR code which can be scanned via the Genetry Solar cloud server to assign your inverter to your Genetry Solar inverter account.

CAUTION: Do not share your inverter's ID number with anyone other than

Genetry Solar Tech Support. While the risk is very remote, if your inverter is *not* registered to your account on the Genetry Solar MQTT server, someone else could potentially register it to their account and remotely access it. Worse, this would also prevent you from registering it to your own account.

MD: Reports the inverter's current mDNS address. The mDNS path can be changed (if desired) from the inverter's local server.

STA: If the inverter is connected to an existing WiFi network, this will indicate the inverter's given WiFi IP address

AP: Indicates the inverter's WiFi Access Point IP address. (Generally should be 50.50.50.50 when the AP is active.)

Restart WiFi Board Allows restarting the WiFi board without interrupting the inverter's power controls. (Use this if WiFi is not connecting.)

Erase WiFi Confies Use this function to clear/reset all WiFi configuration settings

CFG Page

Tired of inverters that just have a power switch and a knob or two as the extent of what you can customize? Welcome to the Configuration page of the Genetry Solar inverter.

There are so many settings that they are broken up by category. “Click” a category to enter the subscreen with the settings. (Exit the subscreen by going back “Up” off the top of the subscreen.)

NOTE: If the LCD board cannot communicate with CPU, the CFG page will default to the Appearance subscreen.

```
Stat Temp Fans WiFi Cfg
Appearance.....
System.....
Battery/Charge.....
AC Output/Inverter..
AC Input/Transfer...
```

Appearance

Provides settings pertinent to the LCD and inverter appearance.

```
Cfg
Backlight: 7→ 1min→0
Contrast: 0
UpsideDwn: No

Watts Radix: W
Batt. Radix: U
Temp. Radix: F

'OUT' KWH Display: All
Power LED: Normal
Sleepwalk: No
BtnConfig: U/E/D
```

Backlight	<p>Holds 3 settings for the backlight.</p> <p>1st: 1-7 sets the “active” LCD backlight brilliance</p> <p>2nd: Sets the no-activity timeout after which the LCD backlight will dim</p> <p>3rd: 0-6 sets the “dimmed” LCD backlight brilliance</p>
Contrast	Use this to adjust the LCD contrast (if necessary)
UpsideDwn	<p>If enabled, this will flip the graphics on the LCD 180 degrees, and also flip the button functions. (This allows the LCD to be easily readable regardless of whether the inverter is mounted right side up or upside down. Please note that there are no “sideways mount” rotation options.)</p>
Watts Radix	<p>For OUT screen, selects whether the big numbers display Watts or Load Percent (the latter is based on the inverter's rated maximum load).</p> <p>NOTE: If set to “Watts”, Amps will be displayed on the OUT screen. Also note on split-phase inverters that “Amps” will read ½ the expected value for 120v loads, as it measures 240v amperage.</p> <p>NOTE 2: In firmware v1.2r1 and before, this was “Show Load Percent”</p>
Batt. Radix	<p>For OUT screen, selects between “Volts” and “Percent” for the battery readout. (CUSTOMER FEATURE REQUEST!)</p> <p>NOTE: “Percent” is calculated from the UVP Alarm and OVP Alarm setpoints, where “0%” = UVP Alarm, and “100%” = OVP Alarm. This “Percent” is by no means intended to be an SOC meter!</p>
Temp. Radix	Selects between Fahrenheit and Celsius radices for all temperatures
'OUT' KWH Display	<p>Selects whether the resettable KWH meter on the OUT screen displays total output KWH, or just “inverter” KWH (i.e. not counting pass-thru)</p> <p>(Firmware v1.2r0+)</p>
Power LED	<p>Allows disabling the RGB LED on the Power button</p> <p>(CUSTOMER FEATURE REQUEST!)</p>
Sleepwalk	<p>Function to automatically cycle through the LCD menus if the backlight timeout has expired.</p> <p>NOTE: If the backlight timer is disabled, this function will not activate.</p>
BtnConfis	<p>Allow configuration of the physical button sequence. “In-house” GS inverters default to U/E/D, while “legacy” inverters use U/D/E</p> <p>(Firmware 1.2r2+)</p>

System

Provides access to System-level settings. This is a scrolling page, and not all of the pictured lines will be visible at one time.

NOTE: If the inverter is unlocked (warranty voided by user), the “Unlock Configuration” line will not be present.

```
Cfg
Mode: Normal
Overheat Restart: No
Overload Restart: No
OVP/UVP Restart: No
Min Delay (sec): 240

Buzzer Volume: 7

Calibrate Readings...
System Setup...
Unlock Configuration..
```

Mode

This setting determines the entire inverter’s behavior, and as such should be only set after careful assessment of the desired behavior. Read [“System Modes”](#) for more details on the available options here.

NOTE: This setting does not take affect until you press “Enter” after choosing an option. It is not “live” like all other settings on the inverter.

- Normal: Default mode, most commonly used
- Inverter Only: Prevents switching to AC Mains mode.
NOTE: Will still synchronize to an input AC signal!
- AC Input Mode: Disables inverter mode, runs AC Mains whenever possible (incl. battery charge)
- Off: All power output is disabled
- MASTER: Requires AC input signal, or will shut off with an error.
NOTE: All Master modes will not synchronize to an AC input signal.
- MASTER-Split Fz: Requires an AC input signal 180° out of phase with the inverter’s output signal, or it will shut off with an error. Intended for use with SLAVE-Split mode

- MASTER-3 Phase: Requires AC input signal either 120° or 240° out of phase with the inverter’s output signal, or it will shut off with an error. For use with SLAVE-3Phase modes
- SLAVE-Parallel: Special mode to backfeed power out of the inverter’s AC INPUT terminal block, with a frequency-shift controlled throttle.
- SLAVE-Split Phs: Provides an output 180° out of phase with the inverter’s input signal, useful for split-sync setups. If no AC input signal present, the inverter goes into standby mode
- SLAVE-3Phase #2 / #3: Provides an output either 120° or 240° (respectively) out of phase with the inverter’s input signal, used for 3-phase system setups. As with Split Phs, the inverter will enter standby mode if there is no valid AC input signal

Overheat Restart	Enables automatic inverter restart after an overheat shutdown
Overload Restart	Enables automatic inverter restart after an overload shutdown
OVP/UVP Restart	Enables automatic inverter restart after a battery voltage range shutdown
Restart Timeout	Specifies the “settling” duration following an inverter shutdown, before any of the Restart rules can be checked. If the fault condition is still present after this duration expires, the delay will be restarted. <i>NOTE: If auto-restart is desired, it must be configured <u>before</u> a system shutdown, or the inverter will not auto-restart.</i>
Buzzer Volume	Set the volume of the internal beeper in the inverter (range: 0-7). <i>NOTE: Inverter will beep every time this value is adjusted!</i>
Calibrate Readings	Enters a subscreen for adjusting the calibration of the inverter’s various sensors.
System Setup	(WARRANTY GATE) Enters a subscreen which allows reconfiguration of the inverter’s fundamental setup. <u>AT YOUR OWN RISK!</u> This function is normally only needed if changing the inverter's transformer primary setup for a different voltage
Unlock Configuration	Enter a subscreen which allows you to unlock your inverter (and by doing so, voiding the warranty). <u>For advanced users only.</u> If the inverter is unlocked, settings can be changed that can potentially cause inverter failure. <u>At your own risk.</u> <i>NOTE: The sequence is purposely somewhat difficult to complete. You may have to try several times before succeeding!</i>

Battery/Charge

This menu contains the battery voltage thresholds and battery charge settings.

Genetry Solar recommends setting the battery OVP (overvoltage protection) and UVP (undervoltage protection) after determining the desired operating range of your batteries. (Setting OVP is particularly important if the inverter is configured to charge the batteries.) Simply configuring these settings to the maximum limits will basically disable several highly valuable protection functions.

```

Cfa
Nominal: 48.0v
OVP: E(62.8v) A(60.4v)
UVP: E(38.0v) A(40.5v)
Charge Mode: Manual
Charge Trig: 48.0v
Charge Amps: 25%
Bulk Volts: 57.9v
Float Volts: 56.9v
Absorb Tmr: 225min
Tmr Task: Float

```

Nominal

Critically important setting that should not be changed casually. The inverter calculates all battery voltage setpoints as an offset from this number. As such, changing this number will change ALL other battery voltage setpoints, including triggers, thresholds and charge setpoints. (This does make it very easy to maintain your battery voltage offsets if the inverter is reconfigured for a different system voltage.)

The purpose for this setting is that some setpoints are calculated as a “positive offset from Nominal”, and other as “Negative offset from Nominal.” For example, UVP Error cannot be set higher than Nominal, and OVP Error cannot be set less than Nominal.

Adjusting Nominal to a value close to the “middle point” of the system voltage range (if necessary) allows all functions to be usable.

OVP E(XX.X)

Overvoltage Protection Error (shutdown) threshold. If battery voltage exceeds this setting, the inverter will shut down with ERR:DC Volt High

Calculated as “points above Nominal”. Adjusting this setting will also adjust the [OVP] A number.

[OVP] A(XX.X)

Overvoltage Protection Alarm threshold. If battery voltage exceeds this setting, the inverter will alarm with ALM:DC Over Volt.

	Calculated as “points below OVP E”
UVP E(xx.x)	Undervoltage Protection Error (shutdown) threshold. If battery voltage goes below this setting, the inverter will shut down with ERR:DC Volt Low
	Calculated as “points below Nominal” <u>Adjusting this setting will also adjust the [UVP] A number.</u>
[UVP] A(xx.x)	Undervoltage Protection Alarm threshold. If battery voltage exceeds this setting, the inverter will alarm with ALM:Battery Low.
	Calculated as “points above UVP E”
Charge Mode	Set between Manual and Auto. <ul style="list-style-type: none"> • Manual: Only starts charge if manually requested (i.e. via Command menu, local server, or remote server) • Auto: <ul style="list-style-type: none"> ◦ If ATS Mode is set to UPS(AC) mode, the inverter will automatically start FLOAT charge mode when AC input is present. ◦ If ATS Mode is set to ATS(DC), the inverter will start BULK charge mode if the Charge Tris threshold is triggered.
Charge Tris	Specifies a battery voltage threshold below which battery charge will automatically be started (if Charge Mode = Auto and ATS Mode is set to ATS(DC)) (Calculated as points <u>above</u> Nominal.) <i>NOTE: This setting is very similar to the <u>ATS/GEN On</u> setting on the <u>AC Input screen</u>, causing the inverter to switch to AC Input (if available) if the battery voltage falls below the configured threshold. If this threshold is triggered, it will auto start battery charge.</i>
Charge Amps	Set to a value between 0-100% to control charge current. <i>NOTE: Battery charge current is based on the AC input maximum amperage, not the battery side current. Battery charge current will be determined by the input AC power, the inverter transformer's configured ratio as well as the inverter's charge efficiency</i>
Bulk Volts	Sets the voltage setpoint for switching from CC (constant current) battery charge mode to CV (constant voltage) Float charge stage. (Points <u>above</u> Nominal)
Float Volts	Sets the voltage setpoint for the CV (constant voltage) battery charging stage. (Points <u>above</u> Nominal)
Absorb Tmr	Specifies the length of an “absorption” cycle, i.e. how long to hold the battery voltage at the “Bulk” setpoint before running the specified task. Configurable in 15-minute intervals

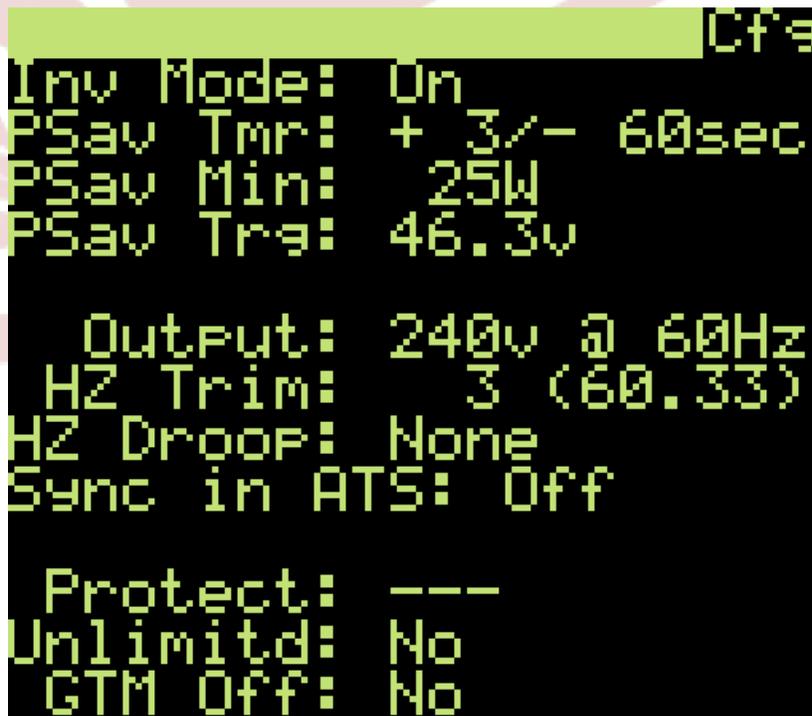
Tmr Task

(From Absorb Tmr): The task to run when the Absorb Tmr expires. Options are:

- ----- → No operation, continue with the Bulk setpoint
- Float → Switch to the Float voltage setpoint
- End Chg → Stop battery charge
- Inverter → Switch to Inverter mode (if ATS enabled)
- Gen Off → Run the configured Generator Stop sequence

AC Output / Inverter:

Here you can find control settings for the Inverter function, as well as several general Output control settings. Note that there are 4 fully adjustable settings for Power Save, making it easy to customize to your needs. ([Read more about Power Save here.](#))

A screenshot of a terminal window showing inverter settings. The title bar is green and contains the text 'Cf9'. The background is black with green text. The settings listed are: Inv Mode: On; PSav Tmr: + 3/- 60sec; PSav Min: 25W; PSav Trg: 46.3v; Output: 240v @ 60Hz; HZ Trim: 3 (60.33); HZ Droop: None; Sync in ATS: Off; Protect: ---; Unlimitd: No; GTM Off: No.

```
Cf9
Inv Mode: On
PSav Tmr: + 3/- 60sec
PSav Min: 25W
PSav Trg: 46.3v

Output: 240v @ 60Hz
HZ Trim: 3 (60.33)
HZ Droop: None
Sync in ATS: Off

Protect: ---
Unlimitd: No
GTM Off: No
```

Inv Mode

Control the “inverter mode.” (Note that this is separate from the “system mode” [on the System page.](#)) The following options are available:

- Auto: “Automatic Power Save” switches between Pwr Sav and On based on the battery voltage’s relation to the PSav Trg setpoint
- PWRsave: Specifies “power save” mode, controlled by the PSav Tmr and PSav Min settings

	<ul style="list-style-type: none"> • On: Inverter output always on (errors / alarms notwithstanding) • Off: Inverter output always off. (This option is of value for external system automation.)
PSav Tmr	Configures the Power Save “load check” (+ number, 1-9 seconds) and “off timer” (- number, range 15-225 seconds @ 15 second intervals). (See the “Power Save” section for more details.)
PSav Trg	Sets the “Auto Power Save” battery voltage threshold (if Inv Mode is set to Auto, otherwise this setting is ignored) <ul style="list-style-type: none"> • If battery voltage is LESS than this threshold → Power Save On • If battery voltage is MORE than this threshold → Power Save Off
Output	Adjusts the desired output voltage and output frequency (50/60Hz). <i>NOTE: Adjusting the frequency here will reset the HZ Trim setting</i>
HZ Trim	Allows trimming the “center” AC output frequency in roughly 0.25Hz steps if needed. The number in parentheses is the mathematical estimated output frequency; the actual output may be slightly different due to manufacturing tolerances. <i>NOTE: The output frequency can automatically adjust up to +/- 2Hz if the GTM or HZ Droop settings are enabled.</i>
HZ Droop	Function to automatically reduce (“droop”) the AC output frequency based on the desired percentage of load ratio to system maximum rating. This function is only intended for use with Parallel mode, where it serves as the “throttle” for the “slave” inverters...though there may be other possible uses.
Sync In ATS	Allows disabling of AC input-output frequency and phase sync when AC input is connected, but not used. This can be used if flickering is noticed with sensitive lighting connected to the inverter (as a result of the sync function). When AC input is requested via ATS, the inverter will quickly sync before initiating a seamless switchover. <i>(Firmware 1.2r2+, but likely will be eventually deprecated in favor of a smoother sync method.)</i>
Protect	<i>(Placeholder, no function here.)</i>
Unlimitd	<i>(WARRANTY GATE.)</i> Disables inverter overload protection. <u>For use at your own risk only!</u>
GTM Off	Allows for disabling the GTM (Grid-Tie Master) mode, if needed. You can read more about Grid-Tie Master mode in the Features section. <i>NOTE: If this is set to Yes, the automatic frequency shift and inverter shutdown protection are both disabled. As it is not possible to disable the battery charge resulting from reversed AC power flow through the inverter, this may result in overcharge/damage to the batteries connected to the Genetry Solar inverter if a grid-tie inverter is connected to the output of the Genetry Solar inverter.</i>

AC Input / Transfer

This menu contains settings for the AC input functionality of the inverter.

```
Transfer: DC (ATS)
ATS/GEN On : 48.0v
ATS/GEN Off: 62.8v
Input Volt: Auto
120v MaxAmp: 2.5A
240v MaxAmp: 2.5A

GEN Type: Disabled
GEN Pulse: 1 sec
```

Transfer

Sets the automatic transfer switch mode between the following options:

- DC (ATS): Inverter auto switches between Inverter mode and AC Mains mode based on the configured battery voltage threshold setpoints. Battery charge trigger is controlled by the `Bty Tris` setting in the [Battery / Charge](#) screen.
- AC (UPS): Inverter runs in AC Mains mode unless the AC input power is out of spec (voltage / frequency). Also automatically starts battery Float charge.

ATS/GEN On

Configures the battery threshold trigger below which ATS will run the Generator Start sequence (if enabled), and switch to AC Mains (when present)

ATS/GEN Off

Sets the battery threshold trigger above which ATS will automatically run the Generator Stop sequence (if enabled), and switch back to Inverter mode (from battery)

Input Volt

Selects the allowable AC input voltage (requires Rev. C control board for auto-switching!) You can select between 120v, 240v and Auto (= auto-switching between 120v and 240v modes depending on the AC input voltage presented to the inverter)

120v MaxAmp

Specifies the maximum allowable AC Input current from a 120v source

240v MaxAmp

Specifies the maximum allowable AC Input current from a 240v source. Note that if charge is active, the inverter will automatically throttle charge amperage all the way down to zero (if necessary) to keep the input amperage below these setpoints. (Applies to 120v MaxAmp as well.)

GEN Type

The Genetry Solar inverter has a 2-channel generator start output, and as

such can support several different kinds of electric-start generators. The following generator start sequence patterns are supported:

- **Disabled:** Generator Start functionality is disabled
- **Run:** “A” contact closed for “on”, open for “off”. (“B” unused)
- **I_g->Strt:** Regular “ignition” key: closes “A”, then closes “B” for a specified duration. Opens “A” to shut generator off
- **(On)(Of):** “Pushbutton” control: inverter closes “A” for the specified duration to start, and closes “B” for the same duration to stop

GEN Pulse

Specifies the “pulse” duration for I_g->Strt and (On)(Of) generator start modes (range: 1-15 seconds)

Specifications

Specification	Genetry Solar 6K LF	Genetry Solar 12K LF
Continuous Output Power	6,000W @ < 100°F ambient	12,000W @ < 100°F ambient
Surge Output Power (1 second)	~18,000W (uncharacterized)	~36,000W (uncharacterized)
Maximum AC Output Ratings	240v @ 25A (Split-Phase) 120v @ 50A (Single Phase)	240v @ 50A (Split-Phase) (single phase not supported)
AC Input / Output Frequency	50Hz / 60Hz custom 40-70Hz	
Maximum AC Input Power	Split-Phase: 240v @ 25A 120v @ 25A Single Phase: 120v @ 50A	Split-Phase: 240v @ 50A 120v @ 50A Single Phase: (not supported)
Transfer Efficiency	99%	
Battery Charge Efficiency from AC	~75% (most Chinese LF inverters are ~60%)	
Maximum Charge Current	(auto temperature limited) 12v: approx 300A 24v: approx 185A 36v: approx 125A 48v: approx 93A	(auto temperature limited) 24v: approx 375A 36v: approx 250A 48v: approx 185A 60v: approx 150A
	NOTE: REQUIRES ALL-GS DESIGN FOR THE ABOVE! Prior 6k inverters run ~60% efficiency and cannot reach or safely sustain these charge currents.	
Battery Input Voltage	12v → range 10-16v 24v → range 20-32v 36v → range 30-48v 48v → range 40-64v	12v → range 10-16v 24v → range 20-32v 36v → range 30-48v 48v → range 40-64v
Power Usage: No Load <ul style="list-style-type: none"> • 240v @ 60Hz output • no cooling fans running • WiFi on, LCD backlight full • rated battery voltage 	Approx. 24W. 12v: ~2A 24v: ~1A 36v: ~0.67A 48v: ~0.5A	Approx. 48W. 24v: ~2A 36v: ~1.3A 48v: ~1A 60v: ~0.8A
Power Usage: Power Save Mode <ul style="list-style-type: none"> • no output • no cooling fans running • WiFi on, LCD backlight full • rated battery voltage 	12v → 210mA 24v → 110mA 36v → 85mA 48v → 72mA	

Power Usage: Off • Power Button Off NOTE: Most of this is the cooling fans, which are shut off via PWM.	12v → 80mA 24v → 50mA 36v → 47mA 48v → 45mA	
Undervoltage Alarm / Shutdown	12v → adjustable 10-12v 24v → adjustable 20-24v 36v → adjustable 30-36v 48v → adjustable 40-48v	
Overvoltage Alarm / Shutdown	12v → adjustable 12-16v 24v → adjustable 24-32v 36v → adjustable 36-48v 48v → adjustable 48-64v	
Chassis Dimensions (without terminals)	11.5" (W) 16.75" (D) 7.5" (H)	15.25" (W) 19.75" (D) 8.1" (H)
Battery Terminals	M8 Stud + Nut	M10 Bolt
Inverter Weight	Approx. 52lbs	Approx. 111lbs
LCD Screen	128×64 monochrome LCD with white LED backlight	
WiFi Connectivity	802.11b/g/n 2.4GHz MQTT (Mosquitto) client Local HTTP server	
Generator Start Relays	LF Control Rev. A.1 Maximum switching current 0.5A Maximum switched power 10W LF Control Rev. B Maximum switching current 5.0A LF Control Rev. C Maximum switching current 5.0A	

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LIABILITY WAIVER, & TERMS OF USE**
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You must read the present Safety Legal Disclaimer, Warranty, Liability Waiver & Terms of Use in full before installing and using/operating your Genetry Solar product. Failure to comply with all of the provisions of this Safety Legal Disclaimer, Warranty, Liability Waiver & Terms of Use could result in property damage, serious bodily injury or even death.

GENETRY SOLAR offers its products to you conditioned upon your acceptance without modification of the terms, conditions, and notices contained herein. Use of **GENETRY SOLAR** products constitutes your acceptance without modification of the terms, conditions, and notices contained herein.

TWO YEAR LIMITED WARRANTY

GENETRY SOLAR warrants that for a period of **TWO YEARS** from the date of shipment (the Warranty Period), such products will conform to the product specifications provided, and shall be free from significant defects in material and workmanship.

Proof of Purchase required from **GENETRYSOLAR.COM** or an authorized retailer for warranty service or replacement.

This section contains Customer's exclusive remedy for products that do not conform to the **TWO YEAR LIMITED WARRANTY** provided by **GENETRY SOLAR**.

During the Warranty Period:

1. Customer shall notify **GENETRY SOLAR** of any claim or defect asserted under the **TWO YEAR LIMITED WARRANTY** within the Warranty Period.
2. Customer shall ship, at Customer's expense, the defective product to **GENETRY SOLAR's** facility for inspection and testing.
3. If **GENETRY SOLAR's** inspection and testing reveal, to **GENETRY SOLAR's** reasonable satisfaction, that the product is defective, and such defect has not been caused or contributed to by any factors described under **LIMITATIONS ON WARRANTY**, below, **GENETRY SOLAR** in its sole discretion shall repair or replace the defective product, or

credit or refund the price of the defective product less any applicable discounts, rebates, or credits.

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- Where the Warranty Seal has been broken, or the product has been repaired or altered by anyone other than **GENETRY SOLAR** or its authorized representatives.

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