# User Manual of 2<sup>nd</sup> Generation Grid Tie Inverter with Limiter

Grid Tie Inverter With Internal&External Limiter (GTIL)

Why we produced the GTI-L --- It is in response to the overwhelming clamor from our

customers for a product that can control the amount of power that the grid tie inverters

(GTI) can generate so that the amount of excess power produced by the solar panels
are  reduced to insignificant levels, if not eliminated --- because in some countries,

the producer pays for the excess power it gives to the distribution grid. This

is because the electric power meters (the one provided by the electricity provider in the

area) are not aware of the direction of power flow. In other words it only adds even if

power is exported to the grid, thus, the consumers will be charged for power even if it is

given to the grid, and this is the problem


This is the 2$^{nd}$ generation GTIL. The first generation GTIL must be used with an additional limiter module, we also add an switch button to enable the inverter either can work  at limit mode or at normal grid tie mode. With the 2$^{nd}$ generation GTIL, we integrated the limit function inside the GTI-We call this internal limiter. In this way, No additional limiter module is needed, reduced customer's cost, more easier for installation. But in case customer install inverter far away from the main circuit breaker, we also enable the 2$^{nd}$ GTIL work with stand-alone limiter, e call this-external limiter. For sure, the inverter can work under normal Grid tie-no limit mode, just set on the nice LCD and save your setting.

# 1. On-Grid System Using Standard Grid Tie Inverter
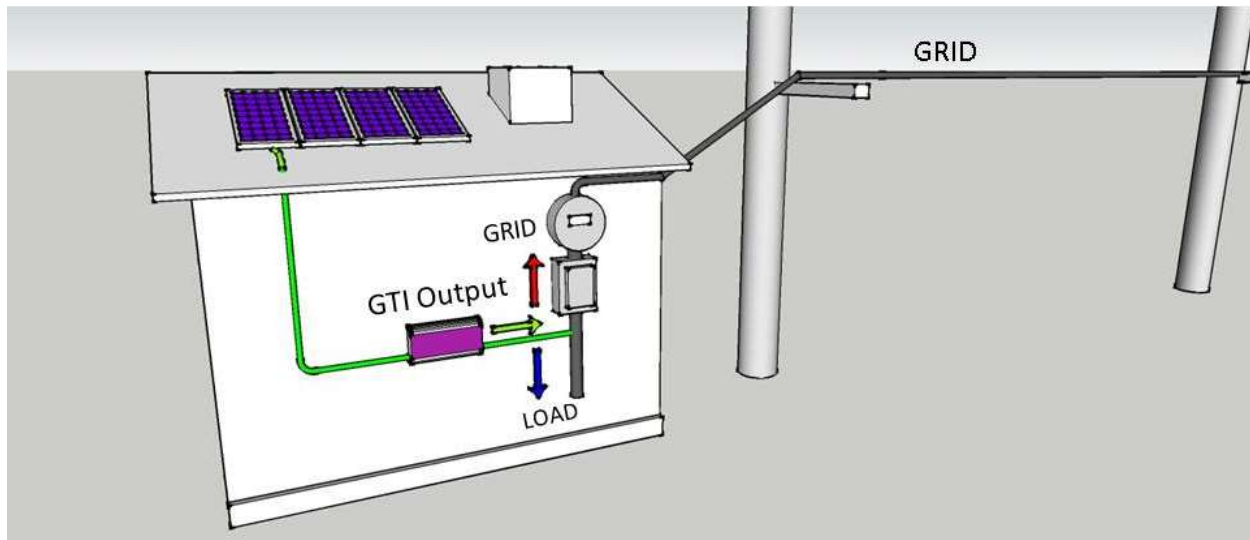


1.1. The Grid Tie inverter converts DC power produced by Solar Panels to AC, connects to the grid and feed all of the power available from the panels to the AC load.

1.2. All excess power that is not needed by the load is then exported to the Grid.

1.3. If the Grid fails, then the Grid Tie Inverter will turn off. When the Grid comes back on line. The Grid Tie Inverter will again supply power to the load and any excess power is exported to the Grid again.

1.4. If the Solar Panel is producing less power and the GTI cannot deliver all the power needed by the load, then power

will be supplemented by the Grid.

1.5. Power Meters (Except smart meter) are not aware of the direction of Power flow. The user then pays for the power exported and delivered by the Grid.
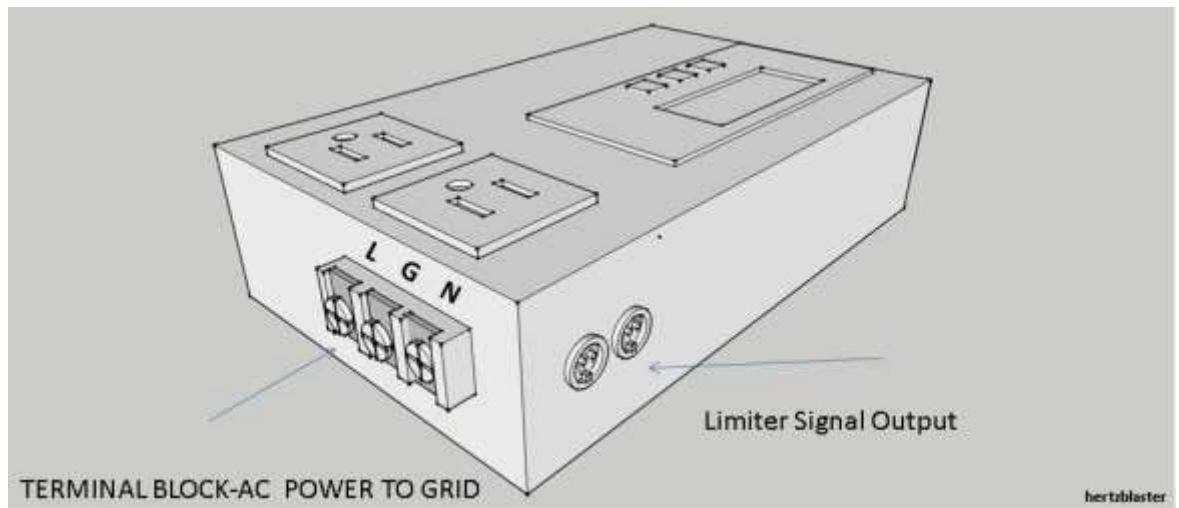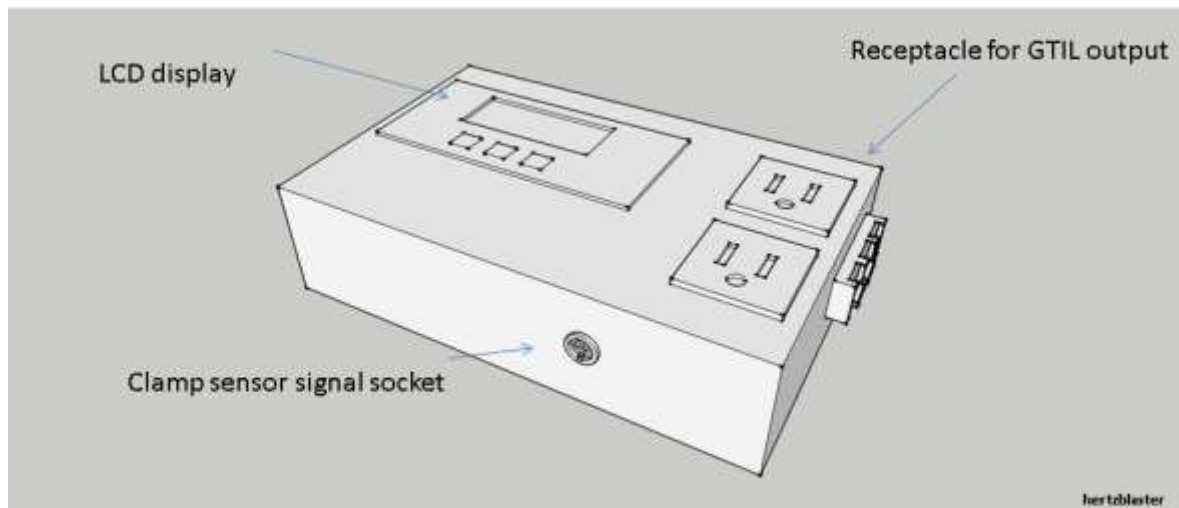
## 2. On-Grid System Using Grid Tie Inverter With Limiter (GTIL)
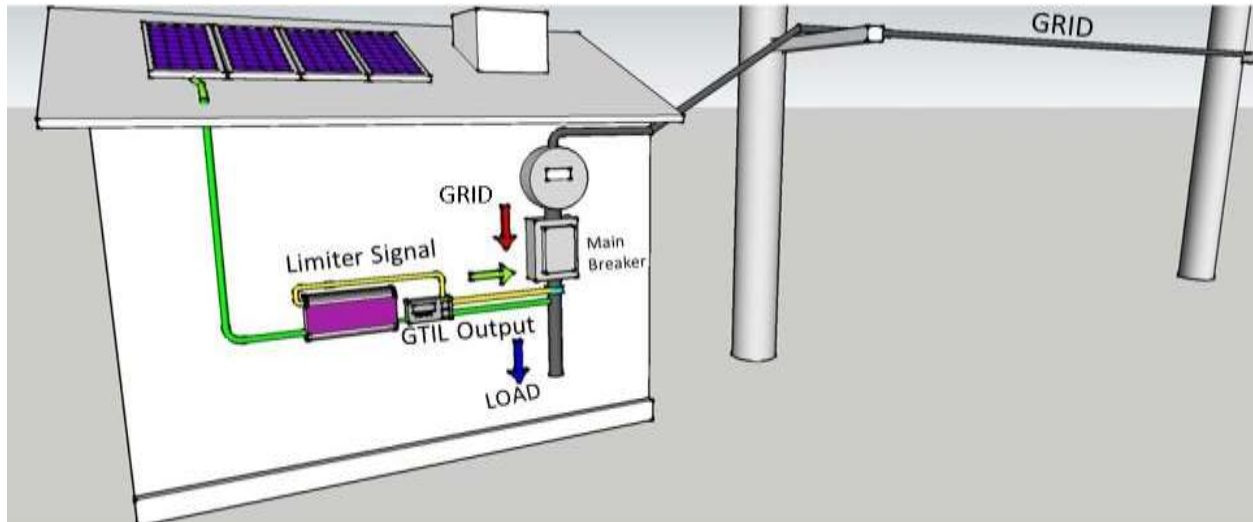


2.1 The Grid Tie Inverter with Limiter delivers only the power needed by the load and prevents delivering excess power hence avoids excess power in going back to the Grid.

2.2 The heart of the Grid Tie Inverter with Limiter is the Limiter Module (LM). The LM continuously sampled the power needed by the load through the current sensor connected after the Main Circuit Breaker. The LM then will process the signal. It then sends signal to Grid Tie Inverter how much power to deliver to the load in real time.

2.3 The user, after installing and connecting the GTIL correctly, need not do anything and the unit will do its work automatically.

## 3. The Limiter Module-Parts Description

# GTIL LIMITER MODULE

LCD display

Receptacle for GTIL output

Clamp sensor signal socket

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L G N

TERMINAL BLOCK-AC POWER TO GRID

Limiter Signal Output

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3.1.   The LCD Display
Displays the Utility Power (grid power), Inverter Power (GTIL power), Utility KWH and Inverter KWH.

3.2.   AC Receptacle For GTIL  AC output
Two (2 pcs) - Connects the AC output of GTIL to LM. Can be plug in either receptacle. Maximum Power per receptacle is 2kw or a total of 4kw GTIL can be plugged in the two receptacles. The output of GTIL can also be directly connected to the grid or through the house convenient outlet. But the LCD will not display the Inverter Power.

3.3.   Clamp Sensor
Connects/clamps to one hot wire after the Main Circuit Breaker. Converts the magnetic field created by the flow of current in the wire into small AC voltage and current which is proportional to the power that passes through the wire.

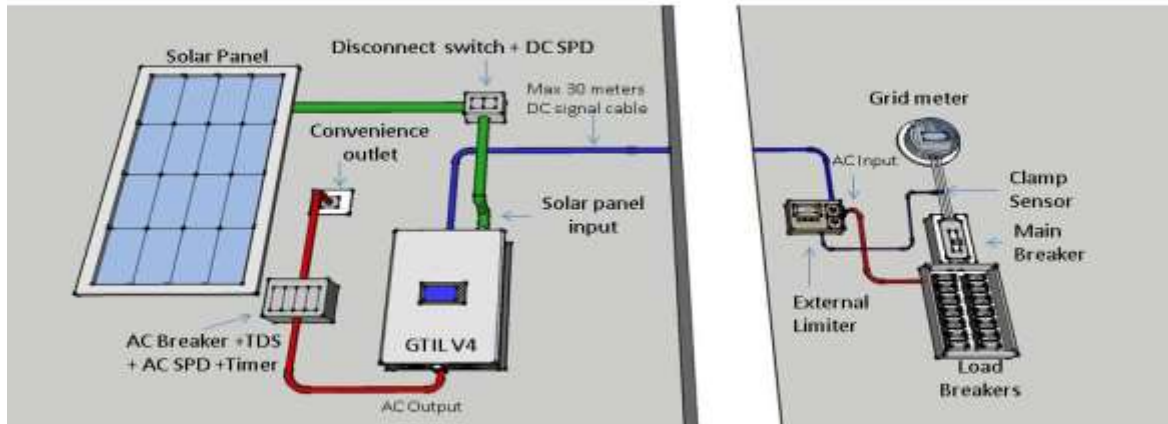3.4.   Clamp sensor AC signal socket– connects the clamp sensor AC signal to the LM module.

3.5.   Terminal Block- AC power to Grid
The AC output of the GTIL is plugged to the LM receptacle in order for the LCD to display the GTIL output in watts and KWH. The GTIL output is connected to the Grid through the Terminal Block. Connecting the terminal block to AC grid also powers the wattmeter and limiter circuit.
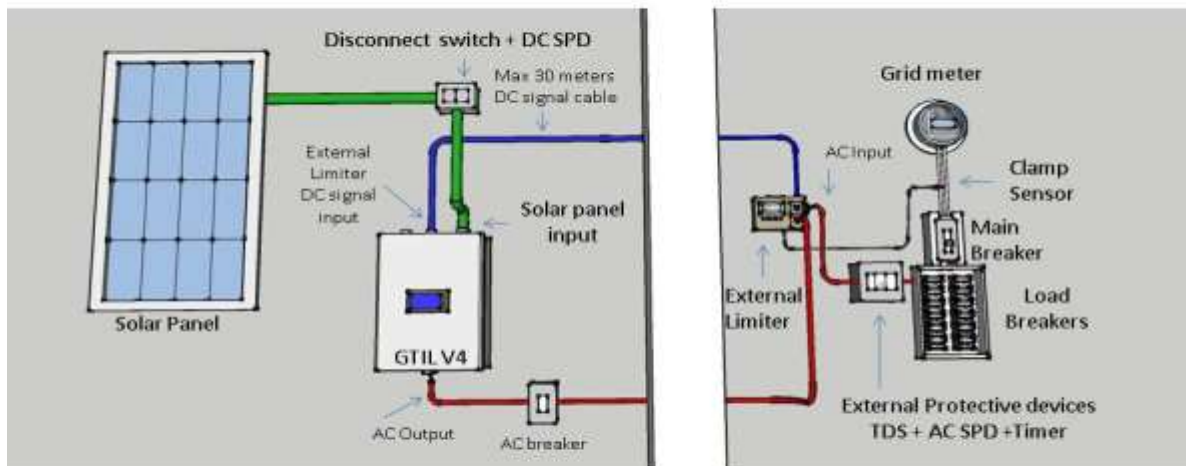
3.6.   Limiter DC Signal Output, 2 pcs– Connects the LM output signal to the GTIL signal input. User can connect  to any of the signal output receptacle.

## 4. WIRING DIAGRAM WITH EXTERNAL LIMITER

**CONNECTION DIAGRAM- GTIL REMOTELY LOCATED**
**( Externanal Limiter Required )**



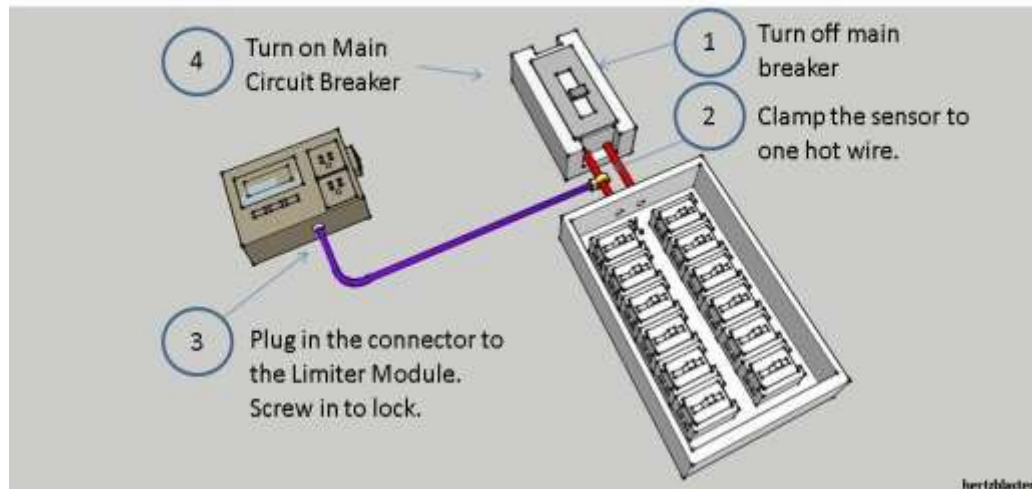**CONNECTION DIAGRAM 2- GTIL REMOTELY LOCATED**
**( External Limiter Required )**

4.1. The installations of the GTIL system are shown above,The ac plug can either connect to the nearby AC socket or plug into the limiter socket,the dc signal cable can reach max 30 meters length so that you can able to install the inverter far away from the limiter module.The ideal installation is that the limiter install near the GTIL. The GTIL unit and the Limiter Module are placed close to each other. The signal wires will be short, as supplied with the unit.

4.2. Use a dedicated 20 A breaker for the GTIL in the Load Circuit breaker panel board

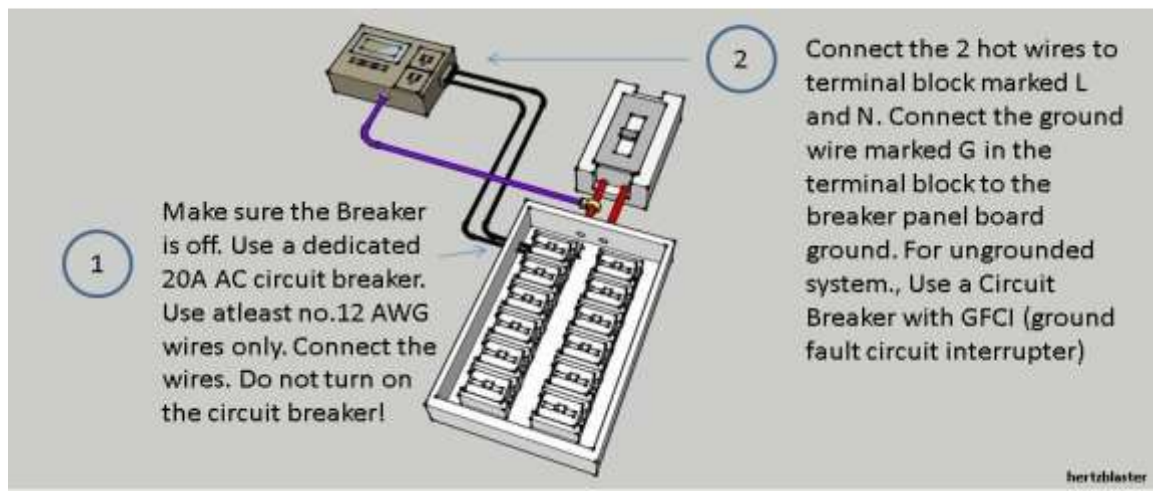### 4.3. **Wiring and Connection Procedure**

4.3.1. After the GTIL and LM are properly installed. Shut off the main circuit breaker. Connect the clamp sensor to one hot wire after the main breaker. Connect the other end of clamp sensor signal cable to the LM. Neatly lay out the signal cable. You can now safely open the Main breaker.



## Step 1 – Connecting the AC clamp sensor

4  Turn on Main Circuit Breaker

1  Turn off main breaker

2  Clamp the sensor to one hot wire.

3  Plug in the connector to the Limiter Module. Screw in to lock.

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4.3.2 Connect the LM module to grid. Using the terminal block, use at least wire no.12 AWG (20A ampacity - wire not included in the package) and connect to 20A circuit breaker dedicated for the GTIL. **<u>Make sure the 20A breaker is off while wiring. Do not turn on the breaker!</u>**

## Step 2-Connecting Limiter Module to Grid



**1** Make sure the Breaker is off. Use a dedicated 20A AC circuit breaker. Use atleast no.12 AWG wires only. Connect the wires. Do not turn on the circuit breaker!

**2** Connect the 2 hot wires to terminal block marked L and N. Connect the ground wire marked G in the terminal block to the breaker panel board ground. For ungrounded system., Use a Circuit Breaker with GFCI (ground fault circuit interrupter)

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4.3.3 Connect the DC signal cable from LM to GTIL input. The connectors have threaded screw to securely fasten the connectors plug at both ends of the cable. Also the connector plugs have dent/slot in the plugs body so it can only be connected in one direction or position.

## Step 3-Connecting Limiter module DC output signal to GTIL

Using the dc signal cable which provided by supplier to connect the external limiter connector of the GTIL to the limiter DC connector.DC output signal socket in the limiter module is marked A and B,you can connect the connector of the cable to either A or B.Plug in and screw in to lock.

## Step4-Connect the solar panel cable to the GTIL DC input

4.3.5. Connect the Solar panel output to the DC power input of GTIL. Make sure the disconnect switch/breaker of solar panel is off.

Before connecting the solar panel cable,make sure that the solar panel disconnect switch or DC breaker is off and observe correct polarity when connecting the cable.Failure to follow will cause serious problem with the unit.Pls read the manual booklet of the GTI included in the package for correct wire and circuit breaker/disconnect switch rating.Do not turn on the DC circuit breaker/disconnect switch.

**4.3.**6. Review all connections and make sure of the tightness of plugs and connections. Re-check DC polarity connections of solar panel.

4.3.7. Turn on the 20A circuit breaker to power the Limiter Module.

4.3.8. In the LM, Press SET button below the LCD for a few seconds. The LCD will light up and initialize.

Welcome to GTIL!!!!

SET △ ▽

GRID TIE POWER LIMITER

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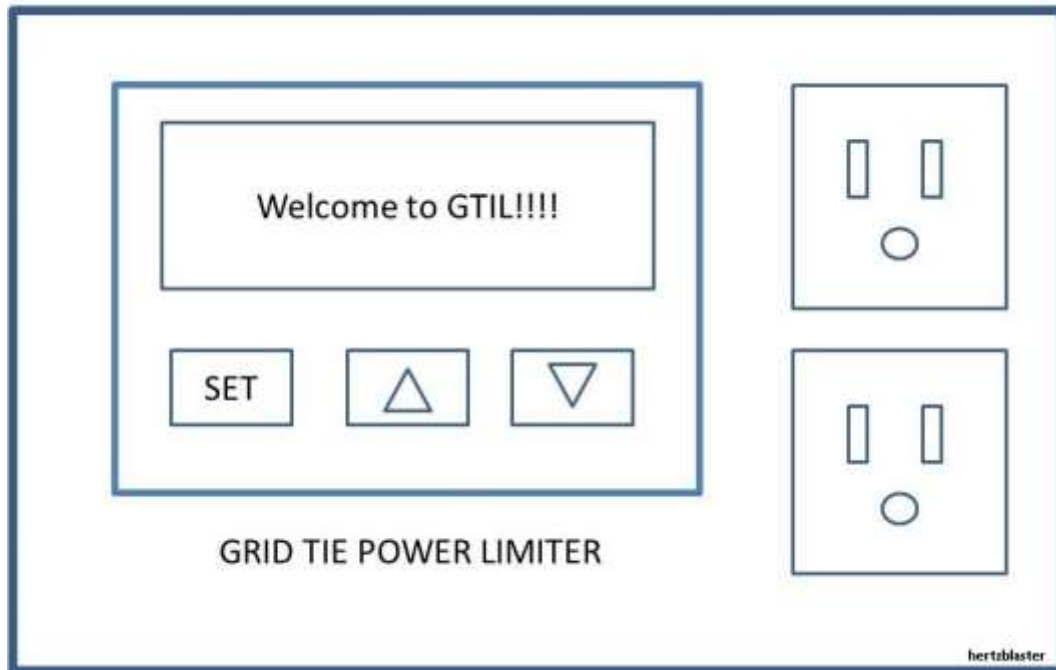
4.3.8. After initialization, LCD will display Utility Power, which is the actual power or total load in real time. Press the up and down buttons to display the Inverter Power, Utility power, Utility Total KWH and Inverter Total KWH. Inverter Power should read zero initially.
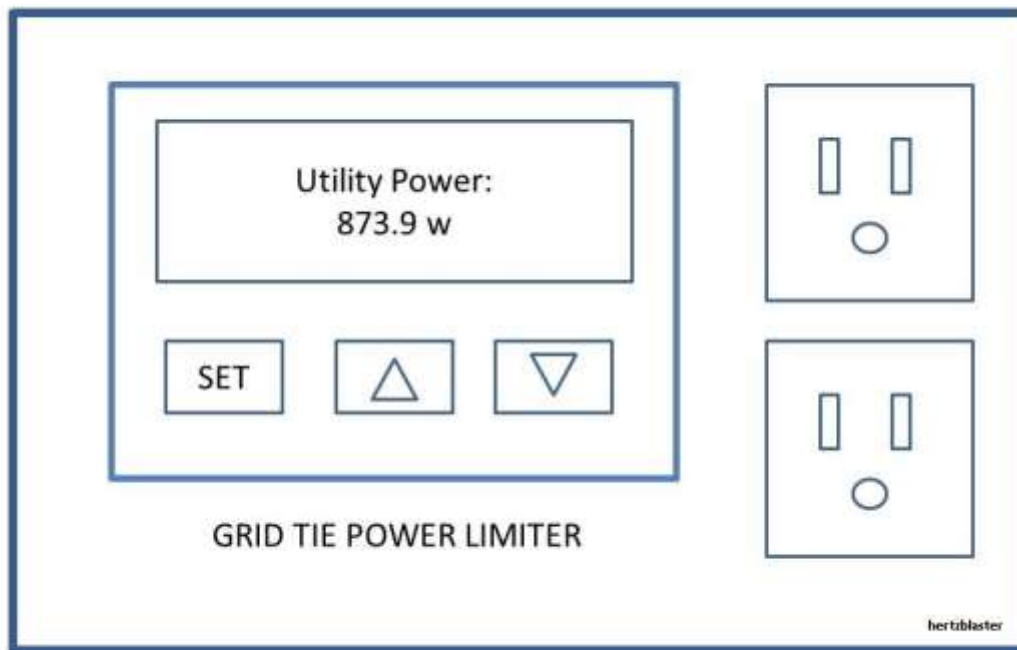
To reset the Utility Total, just press the up button for a few seconds and you will be prompted yes or no to reset. Press up or down button to select either yes or no, and then press SET to reset .

To reset Inverter Total, press the down button continuously and you will prompted  yes or no also to reset. Press up or down to select yes or no and Press SET to reset.
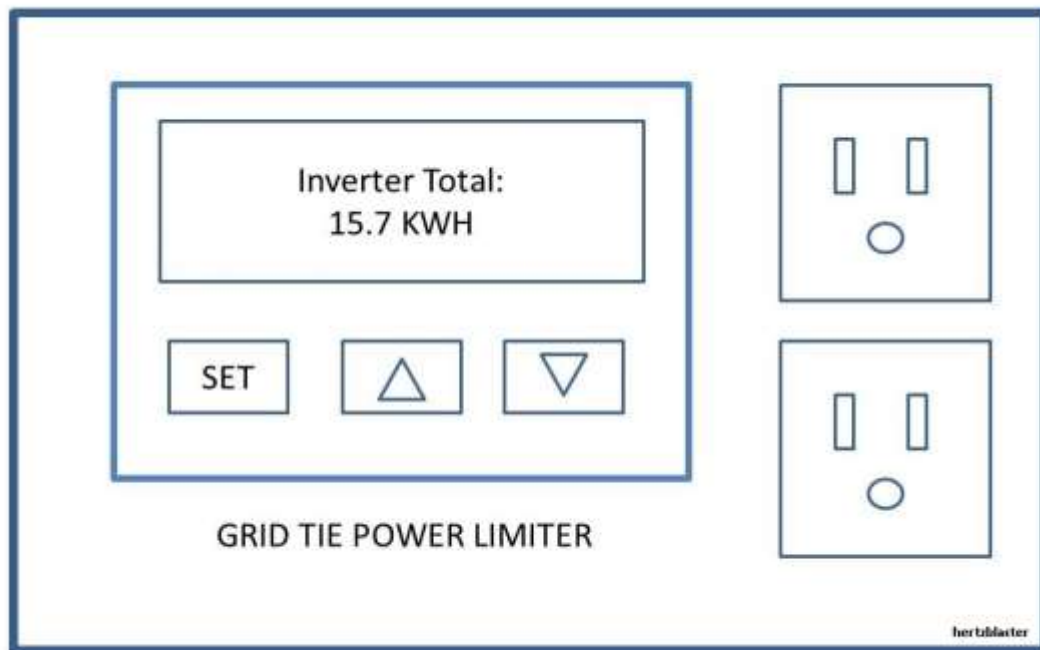
4.3.9. Connect the GTIL power output to the LM AC receptacle using the supplied cable. Turn on the disconnect switch/dc breaker of solar panel.

The wattmeter in the GTIL should power up and start producing power after a minute or two.

4.3.10   Check the LM display. The utility power should display 0-15w indicating the GTIL is already supplying power to the load. Check the inverter power display in the LCD.

4.3.11 To shutdown, turn-off or unplug first the GTIL before disconnecting the power to limiter module. Or shut off  the breaker to LM module to cut power to whole set-up. Do not disconnect Solar panel connection to GTIL while the system is operating.

4.3.12  In normal operation, when the unit is started or the LM breaker is turned on, while all the cables are connected and DC breaker is on,  there will be about 2 minutes and 20seconds time delay before the GTIL unit will run. Always

remember that for LM module to power-up, need to press Set buttons first in the LM module for the system to run.

# 5. Installation of GTIL With Internal Limiter
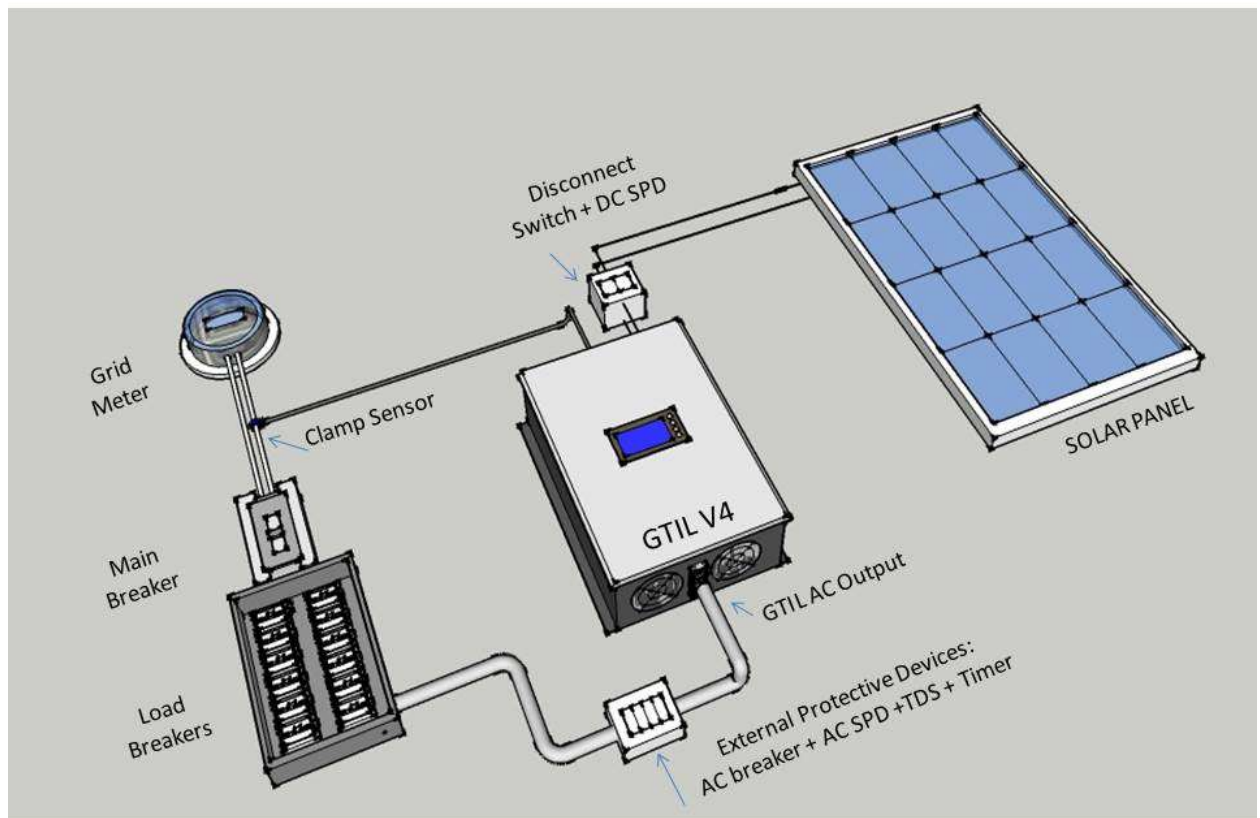


5.1. This installation is not require an additional limiter module,Installation is much easier.Clamp the current sensor cable to one of the hot wire to measure the current,the internal limiter will auto detect the load power and control the inverter output power,excess power will be well controlled.

5.2. External protective device including dc and ac SPD(Surge protection device),dc and ac breaker,etc is recommended to installed in the system.

# 6. Settings Explainations on the LCD of the 2<sup>nd</sup> Generation GTIL:

The GTIL including various functions,all functions should configurate on the LCD setting page.Please see below explainations:
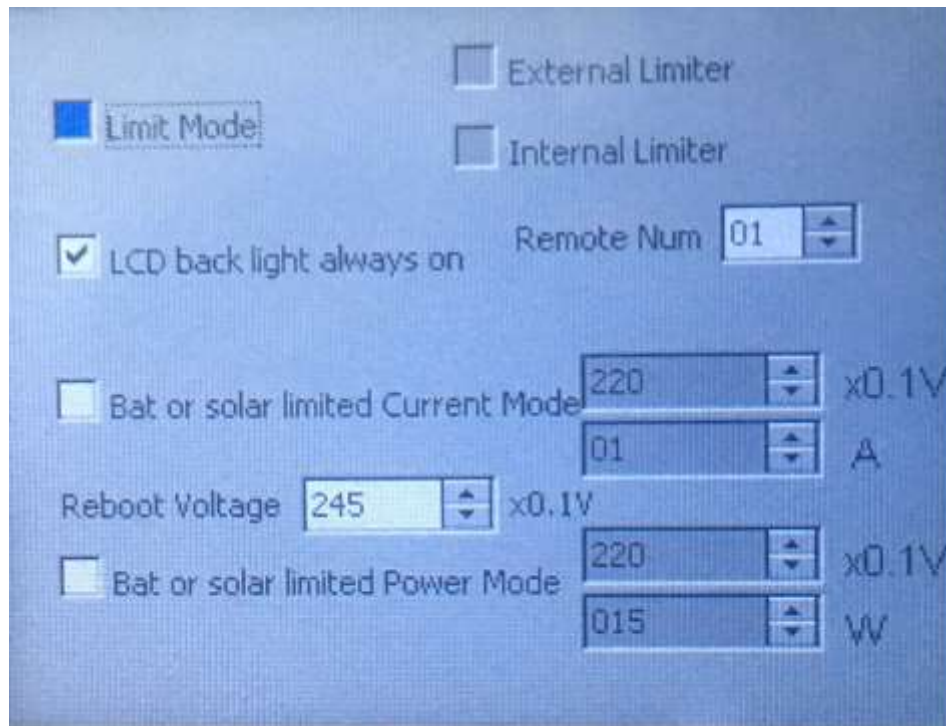


6.1. Limit Mode:External limiter and Internal limiter are settable,

  Limit mode+External limiter both selected means work under external limiter mode.

  Limit mode+Internal limiter both selected means work under external limiter mode.

 6.2.LCD back light:Select it,Lcd will always on.Unselect it,Lcd will auto turn off after about 10s without any action on lcd button.Press any of the button to light lcd again.

6.3.Remote Num:while using with wifi plug for monitoring,set by 1.While using with the WIFI-RTU(one rtu can monitoring multiple inverters),set monitored inverter numbers.

6.4.Bat or solar limited current mode:This function is usable while using with battery.the setted voltage will be the cut off voltage,this means while battery discharged to the setted voltage point or below setted point,inverter will auto disconnect from the battery and stop operating.This can prevent the battery from over discharged.The setted current means inverter will discharge the battery at this current level.Mppt function of the inverter will auto invalid when working under this setting.Set  is 0.1V/step.

**6.5.Reboot voltage:**This setting voltage means while battery charged back,the inverter will auto restart after voltage reached the setting point.It convenient the user and make the function very flexible.Set is 0.1V/Step.

**6.6.Battery and solar limited power mode:**At this working mode,cut off voltage setting is same as 6.4,and the power setting is the maximum output power of the inverter.by this setting,user can limit the output power manually.
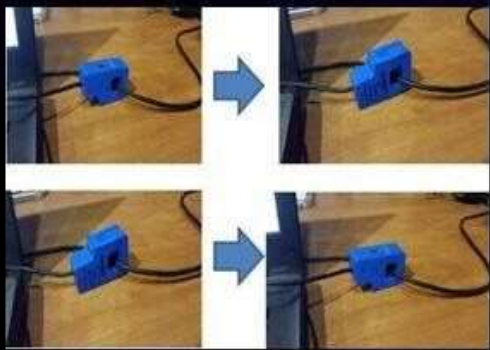
## 7.Important information



1. Start voltage is 49.5v
2. Will deliver Max rated power if above 53v
3. Reduce max output power below 53v
4. Minimal power output below 47v.

Solar panel Voltage

61.9V

0.0w

119.5V
-52.0W

Grid Power

1. Negative display indicates wrong sensor orientation
2. Wrong connection of sensor cable to GTIL input will also indicate negative numbers
3. Normal operation indicates positive numbers at all times under limiter mode.
4. Will not export power under normal operation and correct sensor cable connection.

Changing orientation

**7.1.**The 22-65V type inverter will start up at 25V,and 45-90V type inverter will start up at 49.5V,after start,inverter can still work until 22v or 45v.

**7.2.**Current sensor Orientation:Please check the current flow direction arrow on the sensor before use,make sure the connection is correct.otherwise,inverter will not start up at limit mode.

**7.3.** Negative power under AC voltage means power overflow to the grid.positive means power come from the grid.

## 8.0. Monitoring


Wi-Fi Plug


Wi-Fi RTU

The inverter can be monitored by wifi plug(through DB9 port) or wifi rtu(through RS485 port)One wifi plug can only monitor one inverter,while one wifi rtu can monitor multiple inverters.

## 9.0.Reset  Power curve,Today power and Total Power of Power view page

Disconnect DC and AC,Press the Set and Up button at the same time.then plug the ac,you will see the Final Assembly Code page as show below,select the correct model name and press set button to save setting,then press yes.and reconnect the ac twice.the data will be resetted.

After sales service and technical support- For more information about installation and other concerns, or if you have more questions or clarification about the product, Kindly contact us.

Limiter Module Specification

1. Clamp sensor- Max 100A
2. Wattmeter- Max 9999w
3. Terminal Block-Max 20A
4. Receptacle- max 2000w
5. Clamp sensor signal- 5v AC max mA
6. DC signal Cable- 5v DC, _____ max mA

Available Masspower GTIL Model

1000W –Model  SUN-1000GTIL2-LCD

 22-65VDC/45-90VDC,120VAC/230VAC (AC Voltage Auto sense)

2000W- Model  SUN-2000GTIL2-LCD

45-90VDC/230VAC