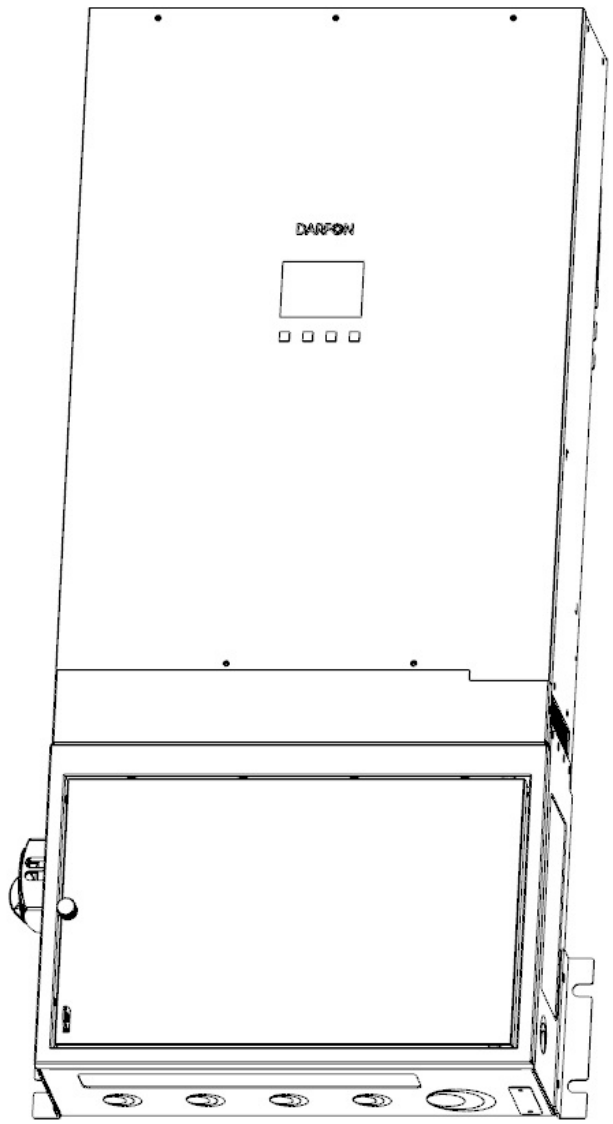
DARFON



INSTALLATION MANUAL

H5001 HYBRID INVERTER

TABLE OF CONTENTS

IMPORTANT SAFETY WARNINGS

PLEASE READ ALL INSTRUCTIONS AND CAUTIONARY MARKINGS ON THE UNIT AND THIS MANUAL BEFORE USING THE INVERTER. AND, STORE THIS USER MANUAL WHERE IT CAN BE ACCESSED EASILY.

This manual is for qualified personnel. The tasks described in this manual may be performed by qualified personnel only.

Safety Symbols

	**WARNING.** This indicates the risk of electric shock. The presence of high voltage levels may constitute a risk of injury or death to users and/or installers.
	**CAUTION.** This indicates important information where failure to comply may result in safety hazards or cause damage to this product.
	**CAUTION.** This indicates the risk of a hot surface. The surface may reach a temperature high enough to cause serious burn injuries.

General Precautions


CAUTION. Before installing and using this inverter, read all instructions and cautionary markings on the inverter and all appropriate sections of this guide. Installing this inverter by licensed electricians only.


CAUTION. Normally grounded conductors may be ungrounded and energized when a ground fault is indicated.


CAUTION. This inverter is heavy. It should be lifted by at least two persons for the safety.


WARNING. Authorized service personnel should reduce the risk of electrical shock by disconnecting AC, DC and battery power from the inverter before attempting any maintenance or cleaning or working on any circuits connected to the inverter. Turning off controls will not reduce this risk. Internal capacitors can remain charged for 5 minutes after disconnecting all sources of power.


WARNING. Do not disassemble this inverter yourself. It contains no user-serviceable parts. Attempt to service this inverter yourself may cause a risk of electrical shock or fire and will void the warranty from the manufacturer.


WARNING. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that the wire is not undersized. Do not operate the Inverter with damaged or substandard wiring.


CAUTION. Under high temperature environment, the cover of this inverter could be hot enough to cause skin burns if accidentally touched. Ensure that this inverter is away from normal traffic areas.


WARNING. To avoid a risk of the inverter damage, make sure that the working areas no metal particle and keep clean around the working areas.


WARNING. Use only recommended accessories from installer. Otherwise, not-qualified tools may cause a risk of fire, electric shock, or injury to persons.


CAUTION. To reduce risk of fire hazard, do not cover or obstruct the cooling fan.

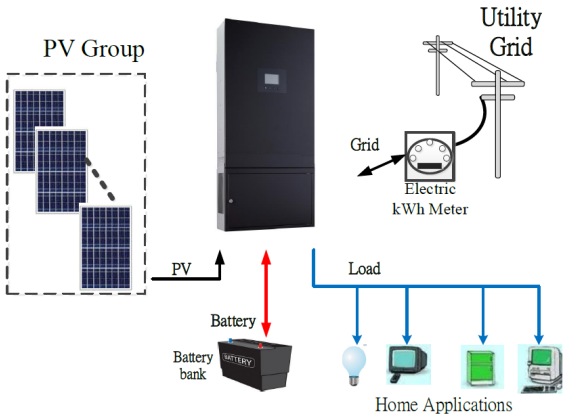

CAUTION. Do not operate the Inverter if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the Inverter is damaged, call for an RMA (Return Material Authorization).


CAUTION. This inverter is not allowed to operate in parallel. Do not parallel connect more than one unit in AC output connector. Otherwise, it will damage this inverter.

INTRODUCTION

The H5001 hybrid inverter provides power to the essential load by utilizing power from PV panels, the utility and batteries. When the PV panels (two string input) generates enough power, the inverter supports the essential load, feeds back to the grid and charges the batteries, all at the same time. When the energy generated by the PV panels is not sufficient to support the essential load, the inverter takes power from the utility.

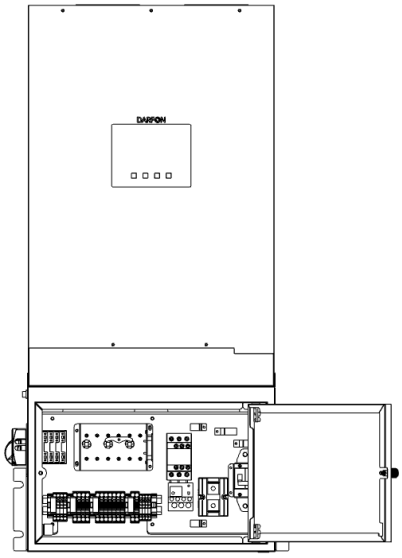
BASIC HYBRID PV STORAGE SYSTEM OVERVIEW

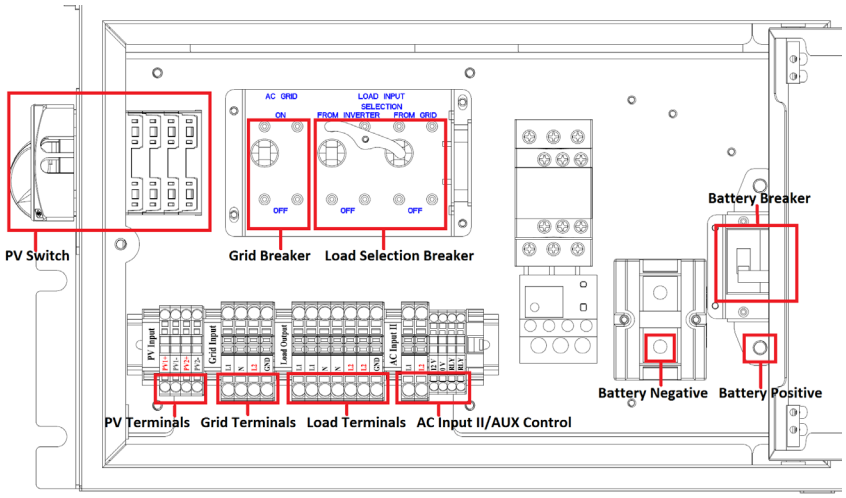


To accommodate various power situations, the H5001 is designed to handle continuous power from PV panels, batteries and the utility. When the MPP input voltage from the PV panels is within the acceptable range, between 250 and 430VDC, the inverter is able to feed the grid and charge the batteries. This inverter is only compatible with single crystalline and polycrystalline PV panels, and any other type of PV panels cannot be used.

Notes: When PV input voltage is lower than 250V, the power of the inverter will de-rate. This hybrid inverter has two PV input.

Product Overview





Distribution Box

A wiring subpanel is pre-assembled at the factory. It consists of breakers, disconnects and batteries paralleled circuits.

MOUNTING THE INVERTER

Before installation, make sure nothing inside the package is damaged. You should have received the following items in the package: H5001 hybrid inverter, backplate, brackets, screws and this installation manual.

The following considerations must be taken into account before selecting where to install.

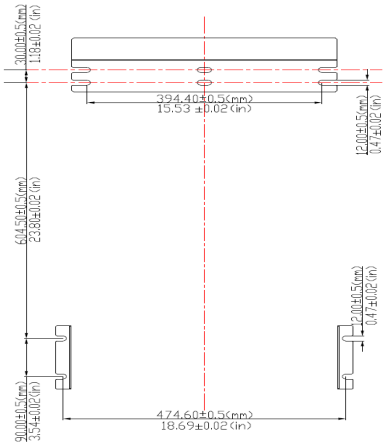
- The unit cannot be mounted on flammable construction materials.
- The unit must be mounted to a solid surface.
- The unit should be installed at eye level in order to easily read the LCD display at any time.
- Allow 20cm (8in) of clearance to the sides and 50cm (20in) to the top and bottom of the unit for proper air circulation to dissipate heat.
- The ambient temperature must be between 0 and 50°C and relative humidity must be between 5 and 85% to ensure optimal operation. Do not operate where the temperature and humidity are beyond the specified limits.
- The unit has a Pollution Degree rating of PD2. The unit must be mounted in a protected area that is dry, free of excessive dust and has adequate air flow.
- The unit was designed with an IP20 protection rating and is for indoor applications only.

⚠ **CAUTION.** This inverter is heavy (87lb/40kg). Be carefully while lifting and mounting the unit. Installation should be handled by two people. Do not hang or place additional weight onto the inverter.

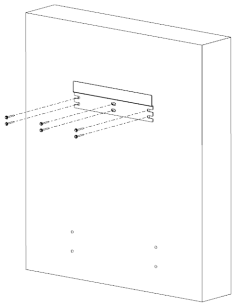
Installing the Inverter onto the Wall

Step 1. Use the backplate as a template, and install anchors as needed.

Note: If installing onto drywall, Unistrut needs to be mounted and secured to two studs in the wall. The backplate and inverter's brackets are secured to the Unistrut using Unistrut lugs.

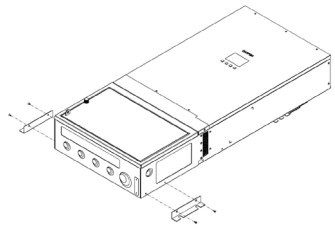


Step 2. Mount the backplate onto the wall.

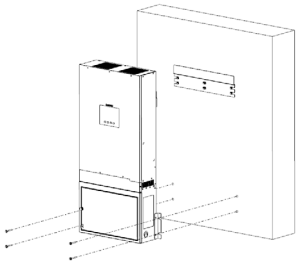


Note: Use at least two screws, one on the left the other on the right.

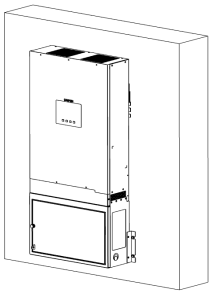
Step 3. Install the brackets onto each side of the inverter.



Step 4. Hang the inverter onto the backplate.



Step 5. Secure the brackets on inverters to the wall.



Note: Use at least two screws, one on each side of the inverter.

PV MODULE (DC) CONNECTION

There is a DC (PV) circuit breaker in the distribution box. This system can connect to two strings of PV modules with MPPT control. Configure each PV input as recommended in the table below. Vmp is a PV panel's max power point voltage. The PV charging efficiency is maximized when the PV system's voltage is close to Best Vmp.

TERMINAL MARK	PV INPUT POWER	TYPICAL AMPERAGE	CABLE SIZE	TORQUE	BEST VMP	VMP RANGE
PV input 1	3.25kW	13A	12 AWG	1.4 - 1.6 Nm	360V	250V - 430V
PV input 2	3.25kW	13A	12 AWG	1.4 - 1.6 Nm	360V	250V - 430V

WARNING. Because this inverter is non-isolated, only two types of PV modules are acceptable: single crystalline and poly crystalline with only Class A-rated. To avoid any malfunction, do not connect any PV modules with possibility of leakage current to the inverter. For example, non-grounded PV modules will cause leakage current to the inverter.

CAUTION. To reduce the risk of damage due to surge, Darfon recommends surge protection between the modules and the inverter.

CAUTION. To reduce the risk of injury, use the proper cable size for PV module connection.

CAUTION. Exceeding the maximum input voltage can destroy the unit. Check the PV string voltage before wiring the connection.

Connecting the PV Arrays

Step 1. For each PV input string, make sure the input voltage is between 250VDC and 430VDC, and the maximum current is 13A.

Note: The inverter can still be installed if you are only using one PV input string.

Step 2. Make sure the circuit breaker is off.

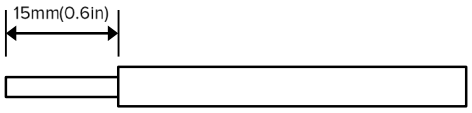
Step 3. Strip 15mm(0.6in) of insulation from each PV cable (PV1+, PV1-, PV2+ and PV2-).

Step 4. Insert the PV cables into the PV quick connect terminals. Make sure the polarity for each connection is correct; positive to positive and negative to negative.

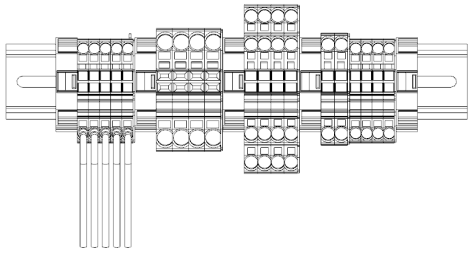
WARNING. Never touch the terminals of the inverter directly. It will cause lethal electric shock.

WARNING. The final connection for DC strings should be done at the array not at the inverter.

DC CABLE FOR PV CONNECTIONS

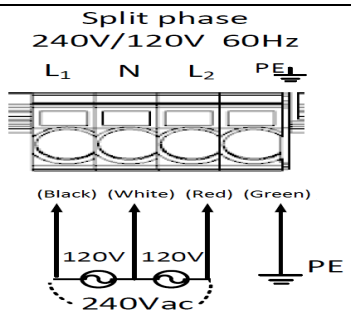
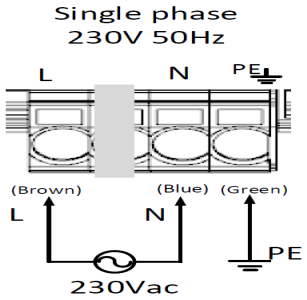


CONNECTING TO PV MODULE



GRID (UTILITY) CONNECTION

There is an AC (Grid) circuit breaker in the distribution box. This will ensure the inverter can be safely disconnected during maintenance and is fully protected from overcurrent of AC input.

	USA: 240V/120V SPLIT-PHASE SYSTEM	EURO: 230V SINGLE PHASE SYSTEM
AC GRID UTILITY TYPE		

GRID CONNECTION WIRING REQUIREMENTS	GRID RATED POWER	NOMINAL VOLTAGE	WIRE SIZE	TORQUE
	5KW	230/240 VAC	8 AWG	0.82 Nm

WARNING. To reduce the risk of injury, use the recommended wire size above. It is very important for system safety and efficient operation to use the appropriate wire for grid (utility) connection.

WARNING. To prevent the risk of electric shock, make sure the ground wire is properly earthed before operating this unit whether the grid is connected or not.

Connecting to the Grid/Utility

Step 1. Check the grid voltage and frequency with an AC voltmeter. It should be within the operation AC voltage range of the product's specifications.

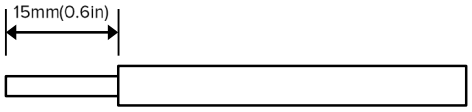
Step 2. Make sure the circuit breaker is off.

Step 3. For each AC wire, strip 15mm(0.6in) of isolation.

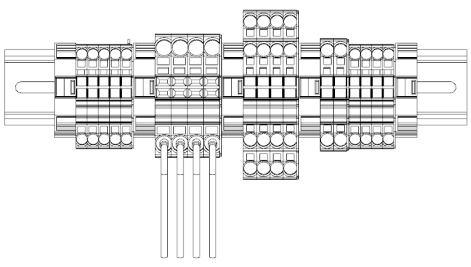
Step 4. Connect the AC wires to the inverter according to the labels indicated on the terminal block or your grid utility type.

Note: The PE protective conductor (Ground) should be the first to be connected.

AC WIRE FOR GRID CONNECTION



CONNECTIN G TO AC UTILITY TERMINAL



BATTERY CONNECTION AND CHARGING REQUIREMENTS

There is a DC (Battery) circuit breaker in the distribution box. Before connecting the batteries, please have the battery specifications on hand.

Notes: 1. For lead acid batteries, Flooded, Gel or AGM can be used. Please check maximum charging voltage and current when first using this inverter.

2. If using Lithium batteries, consult with the battery manufacturer for details.

BATTERY POWER	TYPICAL AMPERAGE	BATTERY CAPACITY	CABLE LENGTH	CABLE SIZE	TORQUE VALUE
5KW	104A	200 to 600AH	< 3m (one-way)	2 AWG	2 to 3Nm (18 to 26 in-lb)

WARNING. To reduce the risk of injury, use the recommended cable size above. It is very important for system safety and efficient operation to use the appropriate cable for battery connection.

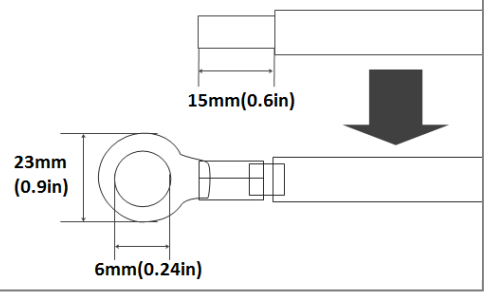
Connecting the Batteries

Step 1. Make sure the circuit breaker is off.

Step 2. Make sure the nominal voltage for the batteries is 48VDC.

WARNING. Shock Hazard. Installation must be performed with care due to high battery current.

CABLES FOR BATTERY CONNECTION

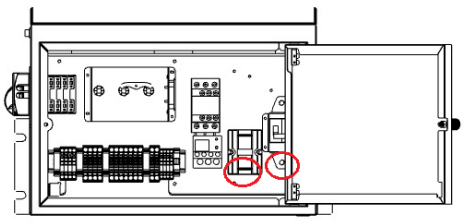


Step 3. Strip 15mm(0.6in) of insulation from each battery cable and insert it into a ring lug.

Step 4. Connect the battery ring lugs to the battery terminals. Make sure the polarity for each connection is correct; positive to positive and negative to negative.

RED cable to the positive terminal (+);
BLACK cable to the negative terminal (-).

CONNECTING TO BATTERY TERMINAL



CAUTION. Before making the final DC connection or closing DC breaker, make sure the connections have the correct polarity.

CAUTION. Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.

CAUTION. Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.

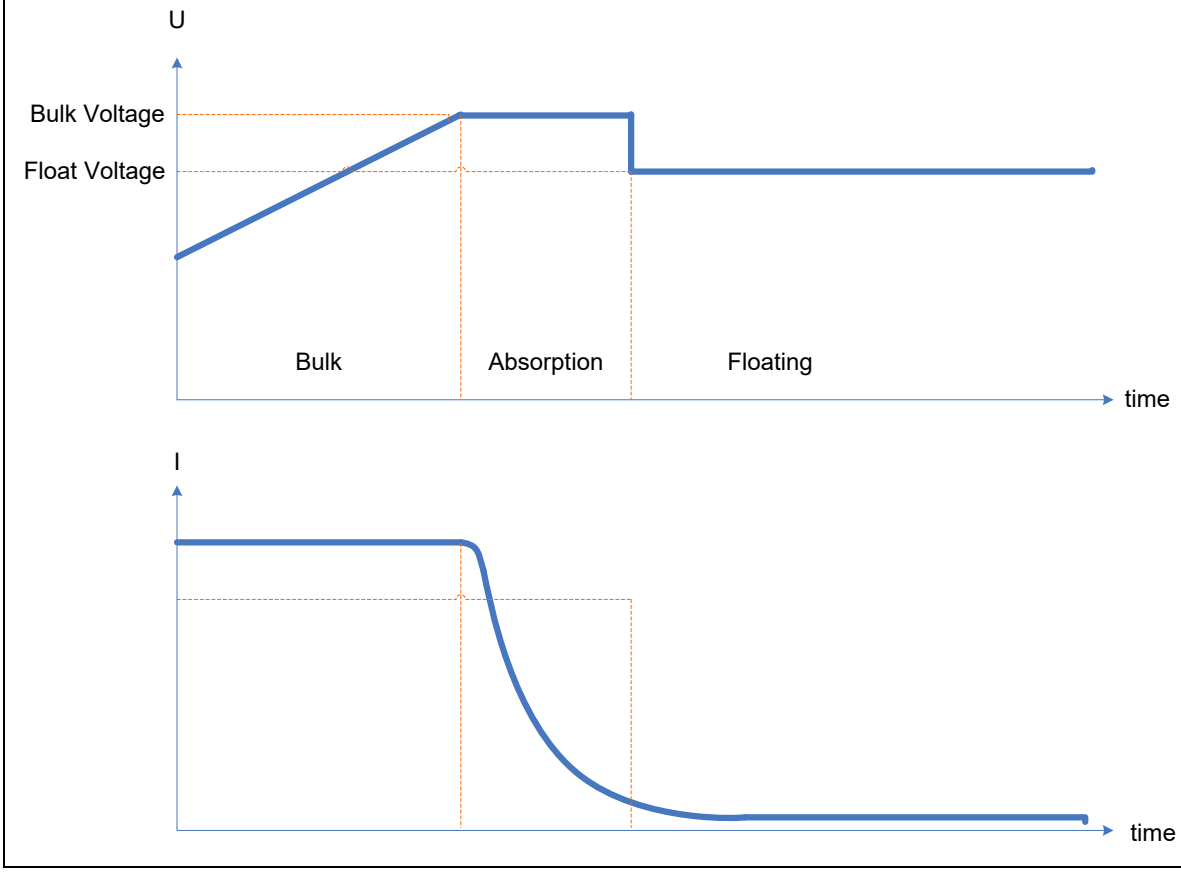
Step 5. Update AP registers as needed. Please refer to the remote setting (Page 28).

Battery Charging Requirements

The default charging parameters are shown below. Use this as a reference to make sure the battery selected is compatible with H5001 inverter. It is recommended that you use a deep cycle battery when the mode of operation is not set as one of the two back-up modes. If you want to change battery charging parameters, please refer to the remote setting on page 25.

1. Lead-Acid Battery Charging Characteristics(include non-conmunication batteries)

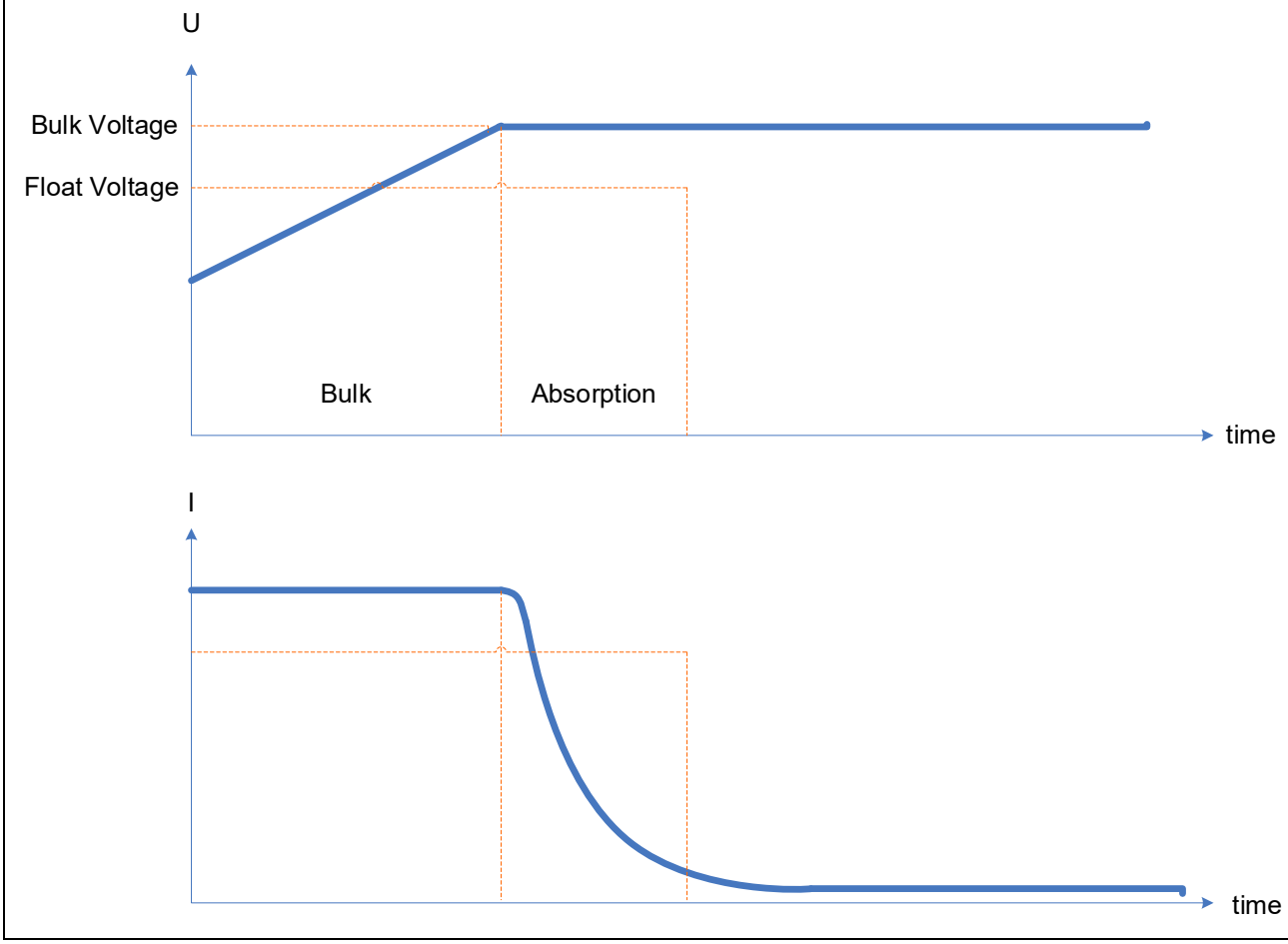
Charging Parameter	Default Value
Max. Charging Current	60A
Floating Charging Voltage	54Vdc
Absorption Charging Voltage	56Vdc
Charging process based on default setting. The three stages: First - charging voltage increases to 56V. Second- charging voltage will maintain at 56V until charging current is down to 2 Amp. Third- go to floating charging at 54V.	



2. Lithium Battery Charging Characteristics

Charging Parameter	Default Value
Max. Charging Current	60A
Golden Crown Battery Charging Voltage	56Vdc
Darfon Battery Charging Voltage	57.4Vdc
Panasonic Battery Charging Voltage	52Vdc

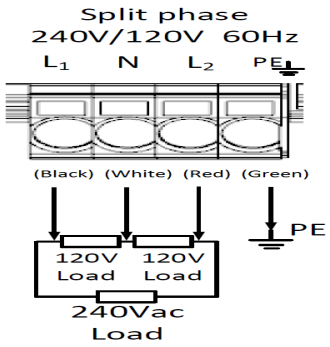
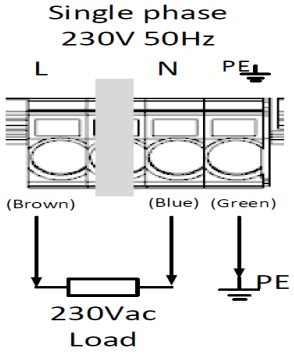
Charging process based on default setting.
The three stages:
First - charging voltage increases to Charging voltage.
Second- charging voltage will maintain until battery SOC is 99%.
Third- stop charging after 1 hour.



LOAD (AC OUTPUT) CONNECTION

There are two AC circuit breakers inside the distribution box for the load connection; one for the load and the other for grid bypass. These two breakers are interlocked (to ensure only one breaker will be active at a given time).

Note: If the inverter needs to be repaired, please turn on the AC breaker (from Grid), the Grid can continue to supply the load when the inverter has been taken off.

	USA: 240V/120V SPLIT-PHASE SYSTEM	EURO: 230V SINGLE PHASE SYSTEM
AC LOAD CONNECTION TYPE		

AC OUTPUT MAX POWER	NOMINAL VOLTAGE	WIRE SIZE	TORQUE
5KW	230/240 VAC	8 AWG	0.82 Nm

WARNING. To reduce the risk of injury, use the recommended cable size above. It is very important for system safety and efficient operation to use the appropriate cable for AC connection.

Connecting to the Load

Step 1. Make sure the circuit breaker is off.

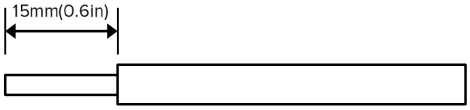
Step 2. For each AC wire, strip 15mm(0.6in) of isolation.

Step 3. Connect the wires according to the labels indicated on the terminal block or your grid utility type.

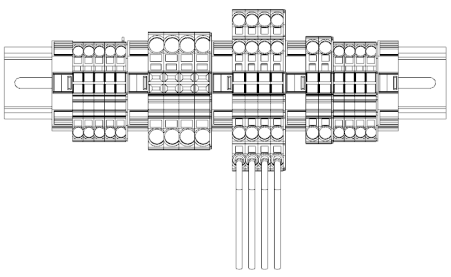
Step 4. Be sure to connect PE protective conductor first.

CAUTION. Make sure the AC Load and AC Grid are properly connected. Misconnecting them will damage to this product.

AC WIRE FOR LOAD CONNECTION



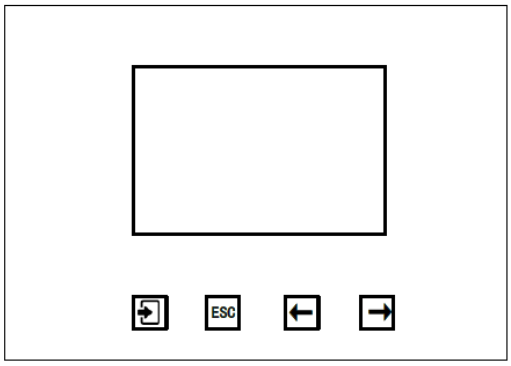
CONNECTING TO AC LOAD



OPERATION AND DISPLAY PANEL

Display Panel Overview

The display panel consists of four function keys and an LCD screen. The display panel will be used to manage and monitor the system.



ICON	FUNCTION	DESCRIPTION
	Enter	Confirm the selection in setting mode or enter setting mode.
ESC	Exit	Exits setting mode.
←	Left	Go to previous page, move or decreasing all Number.
→	Right	Go to next page; move; to increase all Number.

Starting the System

Step 1. Make sure all the connections have been completed and properly installed.

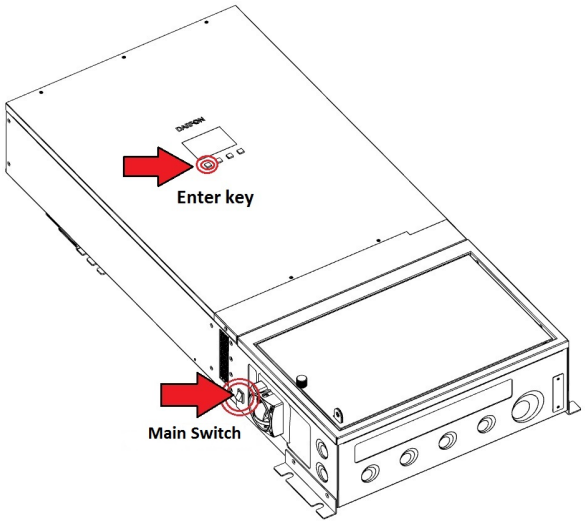
Step 2. Turn/set the PV Switch, Grid Breaker and Battery Breaker to the on position.

Step 3. Turn on the Main Switch (located on the left side of the inverter).

Step 4. If the inverter has multiple sources of power or just a PV or grid connection, the inverter will start automatically. If the battery is the only power source, then press the enter key for 3 seconds until two beeps are heard to start the inverter.

Step 5. Check AC output voltage: L-L 240Vac / L-N 120Vac. /L-N 230Vac

Step 6. Turn on Load Breaker in the distribution box.



Stopping the System

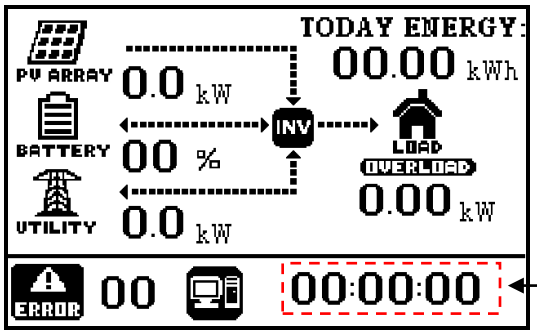
Step 1. Turn off the Main Switch (Located on the left side of the inverter).

Step 2. Turn off all power switch and breakers.

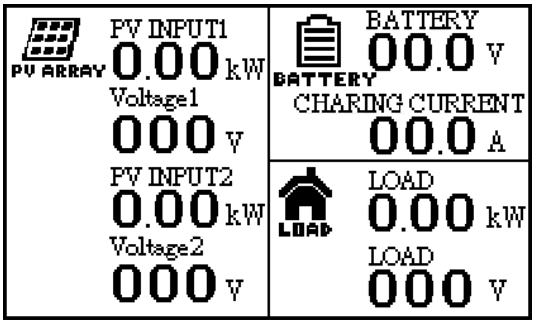
LCD Screen – Icons and Pages

The LCD screen will display three different pages: “Power Flows”, “Power Information” and “System Settings”. Use the ← or → keys to toggle between the various pages. The screen will default to the “Power Flows” page.

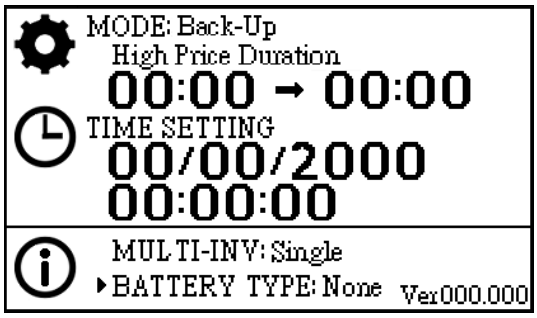
POWER FLOWS PAGE



POWER INFORMATION PAGE



SYSTEM SETTINGS PAGE



ICON	DESCRIPTION
PV ARRAY	Represents the PV Array
BATTERY	Represents the Battery Pack
UTILITY	Represents the Utility
LOAD	Represents the Load
INV	Represents the Hybrid Inverter
	Indicates the Connection to a PC
ERROR 00	Indicates the Error and error codes
OVERLOAD	Indicates an overload has occurred
	Represents the System Mode Setting
	Represents the System Time Setting
	Represents the System Information

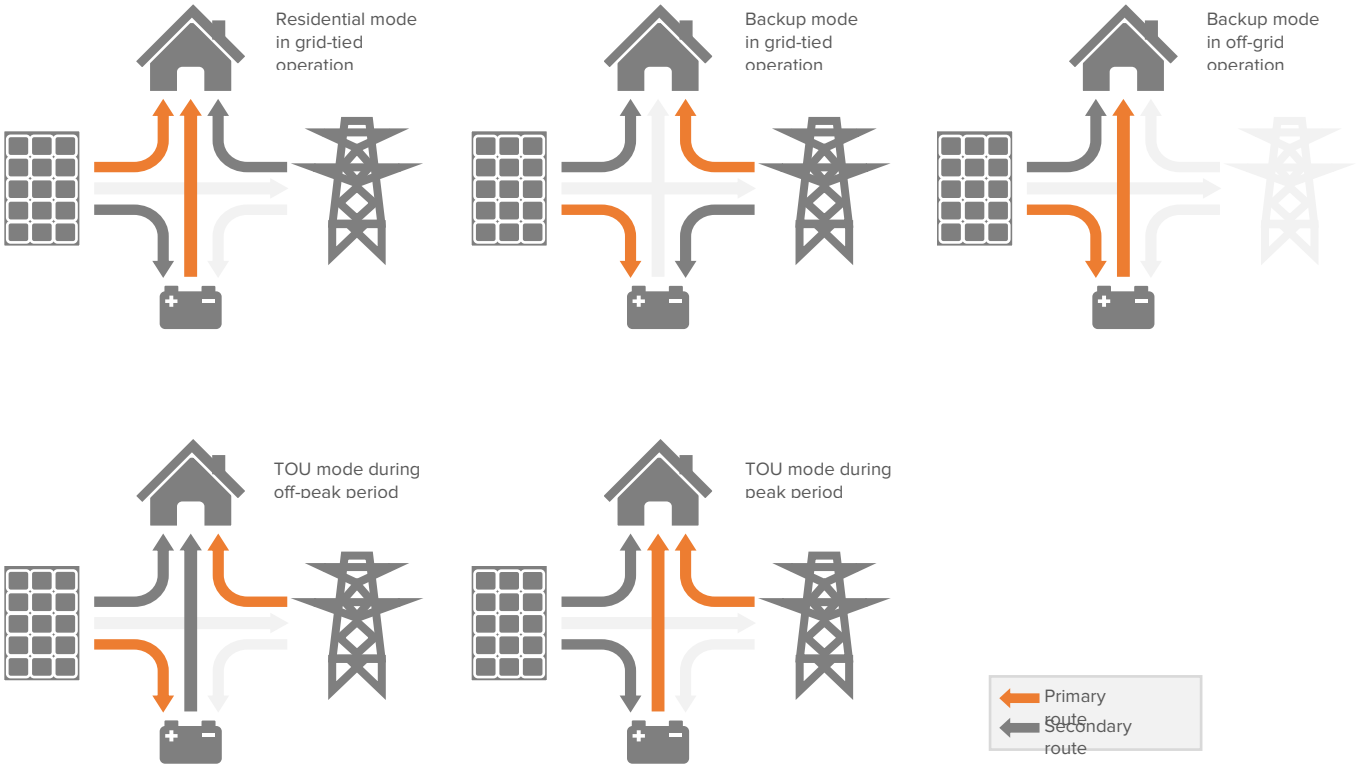
Mode Rule Definition

This hybrid inverter has six modes of operation for backup, residential and time of use. Each mode assumes a set of conditions and prioritizes the consumption of PV, Grid or batteries accordingly to optimize energy flow.

PRESET MODES		DESCRIPTION
1. Back-up (default)		Keep the battery full and discharge the battery only if power outage happens.
2. Residential		Reduce power consumption from the Grid. Use the power from PV and battery first.
3. Back-up w/o Feed-in		Operate as Back-up mode but will not feed-in power back to the Grid.
4. Residential w/o Feed-in		Operate as Residential mode but will not feed-in power back to the Grid.
5. TOU w/o Batt. Feed-in	Low electricity cost	Operate as Back-up mode.
	High electricity cost	Operate as Residential mode.
6. TOU w/ Batt. Feed-in	Low electricity cost	Operate as Back-up mode.
	High electricity cost	*1Operate as Residential mode and will feed-in constant power back to the Grid.

Note: *1 The default feed-in power is 3000W.

PRESET MODES		PV USE PRIORITY			LOAD PRIORITY			CHARGE FROM		FEED GRID FROM		BATTERY DOD	
		Load	Batt.	Grid	PV	Grid	Batt.	PV	Grid	PV	Batt. (No PV)	On-Grid	Off-Grid
1. Back-up (default)		2	1	3	1	2	3	Yes	Yes	Yes	No	40%	0%
2. Residential		1	2	3	1	3	2	Yes	No	Yes	No	40%	0%
3. Back-up w/o Feed-in		2	1	X	1	2	3	Yes	Yes	No	No	40%	0%
4. Residential w/o Feed-in		1	2	X	1	3	2	Yes	No	No	No	40%	0%
5. TOU w/o Batt. Feed-in	Low electricity cost	2	1	3	1	2	3	Yes	Yes	Yes	No	40%	0%
	High electricity cost	1	2	3	1	3	2	Yes	No	Yes	No	40%	0%
6. TOU w/ Batt. Feed-in	Low electricity cost	2	1	3	1	2	3	Yes	Yes	Yes	Yes	40%	0%
	High electricity cost	1	3	2	1	3	2	Yes	No	Yes	Yes	40%	0%

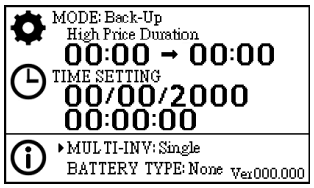


System Settings

In the display panel, use ← or → keys to get to the System Setting Page. System settings are divided into two parts, "Mode" and "Time Setting." Click ↵ to enter the System Setting Page and click **ESC** to exit.

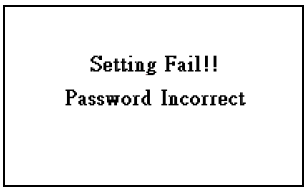
A. Selecting/Changing Modes

Step 1. In the System Setting Page, press ↵ twice to enter the page to select Mode.

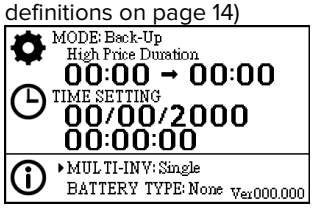


Step 2. Enter the password 9999. Use the ← or → keys to change the number, and then ↵ to set it.

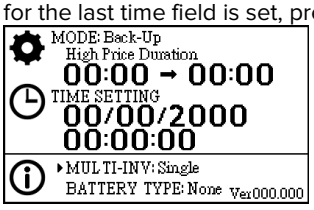
If you get an incorrect password message, please confirm you have the correct password and try again.

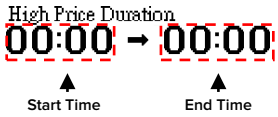


Step 3. Use the ← or → keys to toggle between modes and ↵ to select it. (See mode definitions on page 14)

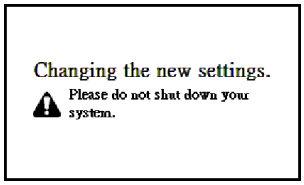


Step 4. For modes "Time of Use" or "Time of Use with Battery Feed-in", enter the start/end times for "High Price Duration" in 24-hour notation. Use the ← or → keys to change the number, and then ↵ to set it. Once the value for the last time field is set, press the ↵ key.

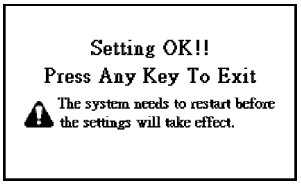




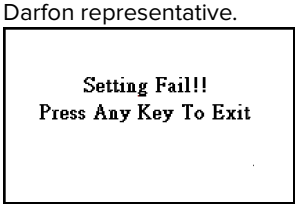
Step 5. Settings are being updated. Please wait for next massage.



Step 6. Press any key and manually restart with the main switch located on the leftside of the inverter.

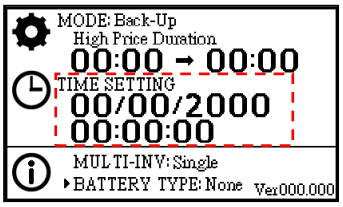


If you get a setting fail message, press any key. Please re-turn on the main switch and re-setting the mode again. If still get a setting fail message, please contact your Darfon representative.



B. Setting System Time

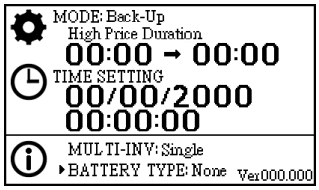
In the System Setting Page, press → to select "Time Setting", and then press ⏎.
The date format is DD/MM/YYYY, and the time format is hh:mm:ss.
Use the ⏎ key to toggle between the date fields and the ← or → keys to select the values. Once the value for the last date field is set, press the ⏎ key. You will then be prompted to enter the password. Go see password section on page 15 for details.



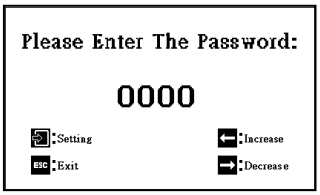
YEAR RANGE	MONTH RANGE	DAY RANGE	HOUR RANGE	MINUTE RANGE	SECOND RANGE
2010 to 2100	1 to 12	1 to 31	0 to 23	0 to 59	0 to 59

C. Setting Battery Type.

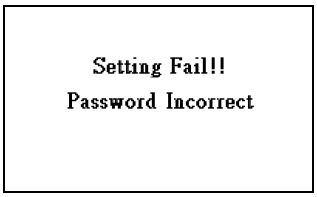
Step 1. In the System Setting Page, press ⏎ to enter the page and select ⓘ to select Battery Type.



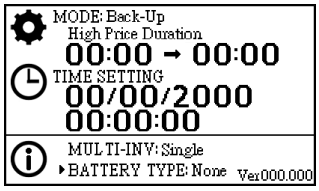
Step 2. Enter the password 1111. Use the ← or → keys to change the number, and then ⏎ to set it.



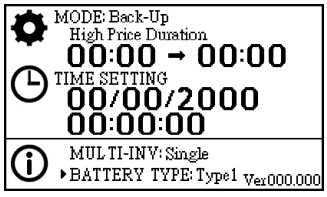
If you get an incorrect password message, please confirm you have the correct password and try again.



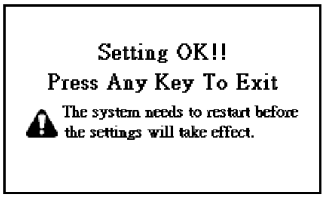
Step 3. Use the ← or → keys to select Battery Type and ⏎ to select it.



Step 4. Use the ← or → keys to toggle between battery types and press ⏎ to select it. (See Battery Type definitions on page 25)



Press any key and manually restart with the main switch located on the leftside of the inverter.



Warning and Fault Definition

On the Power Flows Page, the ERROR icon will flash when an error has occurred. Listed below are the error codes and their solutions.

CODE	FAULT EVENT	ALARM	SOLUTION
01	DC bus voltage exceeds the upper threshold	Non-action	1. Shut down the system completely. 2. Restart the system to see if it's ok. 3. If error message still remains, please contact your installer.
02	Arc occurs on PV	Non-action	
03	DC bus voltage falls below the lower threshold	No-action	
04	A relay fault event is detected	No-action	
05	Battery discharging current exceeds the upper threshold	ON – 1sec OFF – 1sec	
07	Battery charging current exceeds the upper threshold	ON – 1sec OFF – 1sec	
08	Short circuit on PV1 input	No-action	
09	Short circuit on PV2 input	No-action	
10	Short circuit on inverter output	Always ON	
11	Leakage current CT fault	No-action	
12	DC/DC OP Current Sensor fault	No-action	
13	Inverter OP Current Sensor fault	No-action	
14	PV OP Current Sensor fault	No-action	
15	EEProm read failure	No-action	
16	Over temperature fault	ON – 1sec OFF – 1sec	4. The internal temperature is higher than specified temperature. 5. Leave system to be cooled to room temperature. 6. If the error message still remains, please contact your installer.
17	PV input voltage exceeds the upper threshold	No-action	7. Check if the open circuit voltage of PV modules is higher than 500VDC. 8. If PV open circuit voltage is less than 500VDC and the error message remains, pelase contact your installer.
18	Auxiliary power* failed *Auxiliary power means switch power supply.		9. Turn off the system. 10. Then, restart the system. 11. If the error message still remains, please contact your installer.
19	PV insulation resistance is too low	No-action	12. Check if the impedance between positive and negative poles to the ground is greater than 1MΩ. 13. If the impedance is lower than 1MΩ, please contact your installer.
20	Charging voltage is too high	No-action	14. Check if the connection between battery and inverter is well. 15. Make sure battery condition is ok. 16. Then, restart the inverter. 17. If error message remains, please contact your installer.
21	Fan fault	No-action	18. Please check if fans are runing ok. 19. If fans are runing ok, please shut down inverter first and then, restart it. 20. If fans are stop runing or error message remains after restart the inverter, please contact your installer.

On the Power Flows Page, the OVERLOAD icon will flash when an overload has occurred.

CODE	FAULT EVENT	ALARM	SOLUTION
22	Overload	ON – 0.25sec OFF – 0.75sec	21. The output power is higher than 5500W. 22. If the output power is between 5500W and 7500W, the system will shut down after 40 seconds and restart. If the system shut down 3 times it will not restart again. 23. If the output power is higher than 7500W, the system will shut down after 1 second but not restart.
23	PV Input Overpower	No-action	24. Shut downthe system completely. 25. Restart the system to see if it's OK. 26. If error message still remains, please contact your installer.

On the Power Flows Page, the ⚠ icon will flash when there is a warning. Listed below are the warning codes and their solutions.

CODE	WARNING	SOLUTION
51	Data saving fault.	27. Shut down the system completely. 28. Restart the system to see if it's ok. If error message still remains, please contact your installer.
52	Input PV is found lost.	
53	PV input voltage reads low.	29. Check if the open circuit voltage of PV modules is higher than 500VDC. 30. If PV open circuit voltage is less than 500VDC and the error message remains, pelase contact your installer.
54	Power island	31. Shut down the system completely. 32. Restart the system to see if it's ok. If error message still remains, please contact your installer.
55	Grid is disconnected.	
56	Power grid voltage exceeds the upper threshold	
57	Power grid frequency falls below the lower threshold	
58	Power grid frequency exceeds the upper threshold	
59	Power grid frequency falls below the lower threshold	
60	DC injection fault	
61	Battery voltage is too low.	33. The battery voltage is less than 42V. 34. Wait PV or Grid to charge up the battery.
62	Low battery	35. Battery capacity is < 30% or battery voltage is < 45.6V. 36. Wait for PV or Grid to charge the battery.
63	Battery is disconnected.	37. Shut down the system completely. 38. Check if the battery is connected firmly. 39. Restart the system to see if it's ok. If error message still remains, please contact your installer.
64	Inverter output OCP	40. Shut down the system completely. 41. Restart the system to see if it's ok. If error message still remains, please contact your installer. Alarm Buzzer: ON – 1sec, OFF – 1sec
65	RS485 communication fault	42. Shut down the system completely. 43. Restart the system to see if it's ok. If error message still remains, please contact your installer.
66	Output de-rating	44. When system temperature is too high, the output power is de-rating. 45. Lower the load or lower the environmental temperature.

GENERATOR [OPTIONAL]

The inverter can only work with “split-phase” generators that delivers clean 120/240Vac at 60Hz. Single-phase and three-phase generators are not compatible with this inverter.

Note: Generators installed in a building should not have a bond between the neutral and ground connections. Installations in North America are expected to bond the neutral and ground at the main electrical panel.

Generator Sizing

- Available generator power may be limited by ratings for circuit breakers and/or generator connectors. The maximum allowed AC circuit breaker size is 40A.
- The generator should be sized to provide enough power and current for all loads. The minimum recommended generator wattage is 6.25kW becuase many generators may not be able to maintain AC voltage or frequency for long periods of time if they are loaded more than 80% of rated capacity.

Automatic Start Generator

The inverter can provide a start signal to control an automatic start generator. The generator must be an electric-start model with two-wire start capability. For other start-up methods, additional equipment may be required.

The 12V and Relay AUX terminals are used to start an automatic generator.

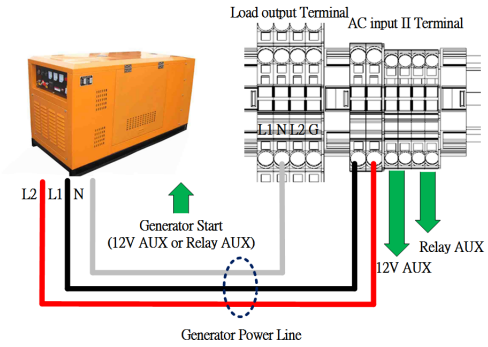
- The 12V AUX terminals are a switched 12Vdc power supply and can supply up to 0.25A.
- The Relay AUX terminals are “dry” contacts with no voltage and can conduct up to 7A and up to 250Vac.

Function Signal Description

UNIT	CONDITION		12VDC SOURCE	DRY CONTACT
Power Off	Unit is off and no output is powered.		0 Vdc	Open
Power On	Grid Available	Battery voltage < Battery cut-off discharge voltage	0 Vdc	Open
		Battery voltage > Battery re-discharging voltage	0 Vdc	Open
	Grid Unavailable	Battery voltage < Battery cut-off discharge voltage	12Vdc	Close
		Battery voltage > Battery re-discharging voltage	0Vdc	Open

Generator Application Schematic

On AC input II Terminal, there are 6 pin for control Generator. Control port have defined as 1) Generator Power Line, 2) dry contact and 3) 12VDC source and. It could be used to remote control for external generator.



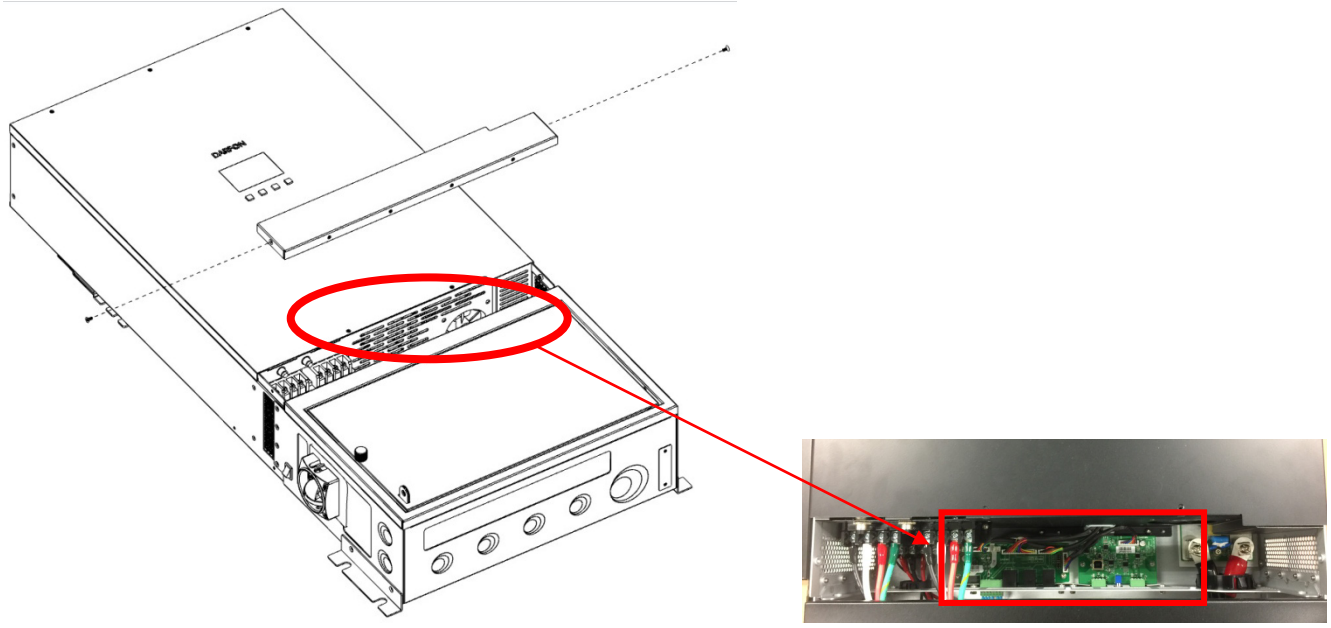
CONFIGURING THE HARDWARE

Connecting to the hardware

Step1: Remove the eleven screws on the bottom sides of the inverter.

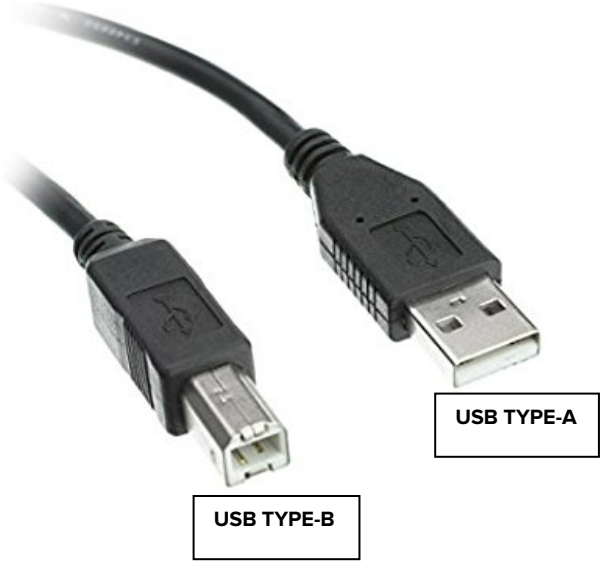
There are two PCB boards,

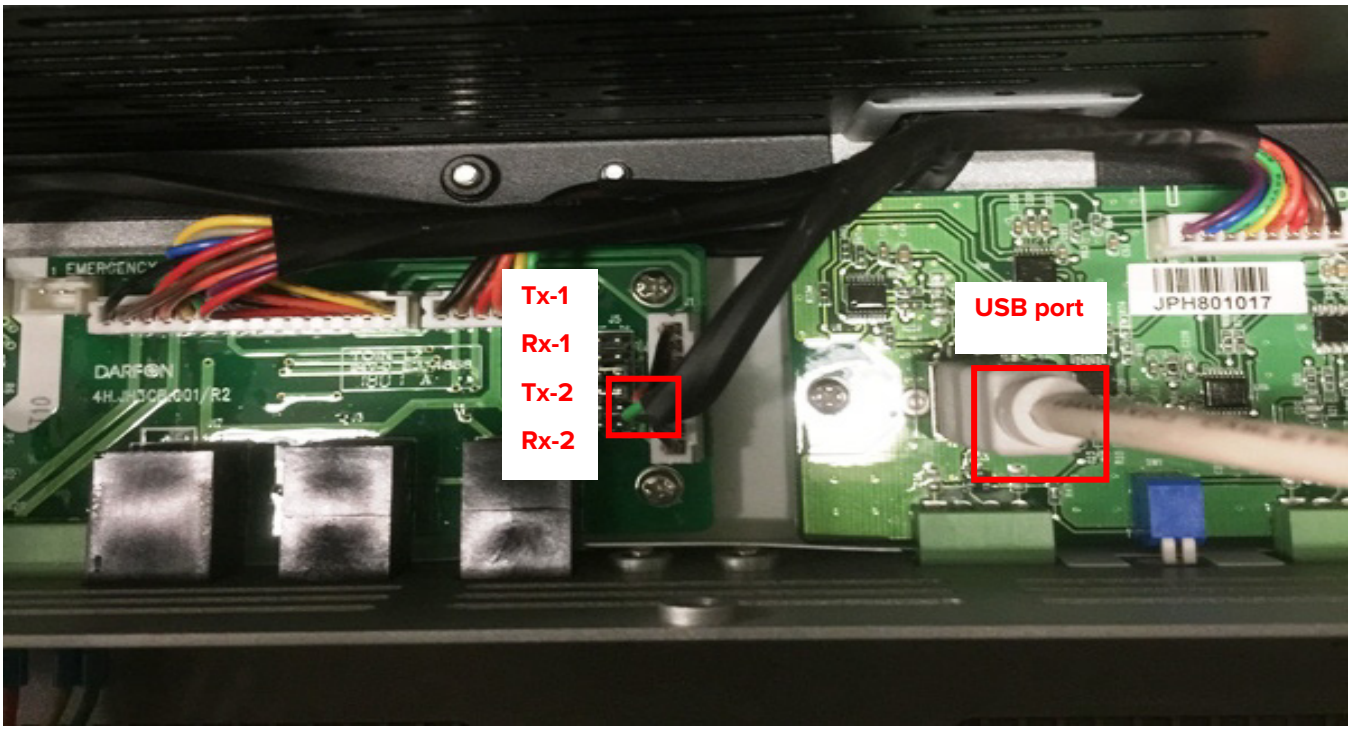
1. Left side: Communication board is used for parallel and display communication.
2. Right side: External RS485 board is used for master RS485 (communicated with battery) and slave RS485 (communicated with application software & data-logger).



	FUNCTION DESCRIPTION	REMARKS
1.	AUX. PORT	FOR GENERATION FUNCTION
2.	EXTERNAL DISPLAY PORT	FOR H100/H200 CABINET USE
3.	PARALLELED COMMUNICATION PORT	FOR H5001 PARALLELED FUNCTION
4.	BOOT-LOAD AND COMMUNICATION JUMPER.	
5.	USB PORT	
6.	RS-485 SLAVE	FOR DATA LOGGER USE/REMOTE CONTROL USE
7.	RS-485 MASTER	FOR BMS USE

Step 2: Please use the USB wires (Type-A <->Type-B) and plug in the USB Type-B connector to the USB port, another side (Type A) connecting to the computer.





Step 3: Please make sure the jumper pins on Tx-2 and Rx-2.

Step 4: The H5001 hybrid inverter need to connect the power, either choices PV, Battery or Grid.

Then use the application software setting your parameters.

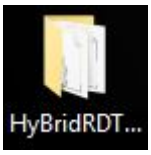
USE APPLICATION SOFTWARE MODIFIES PARAMETERS

Preparation

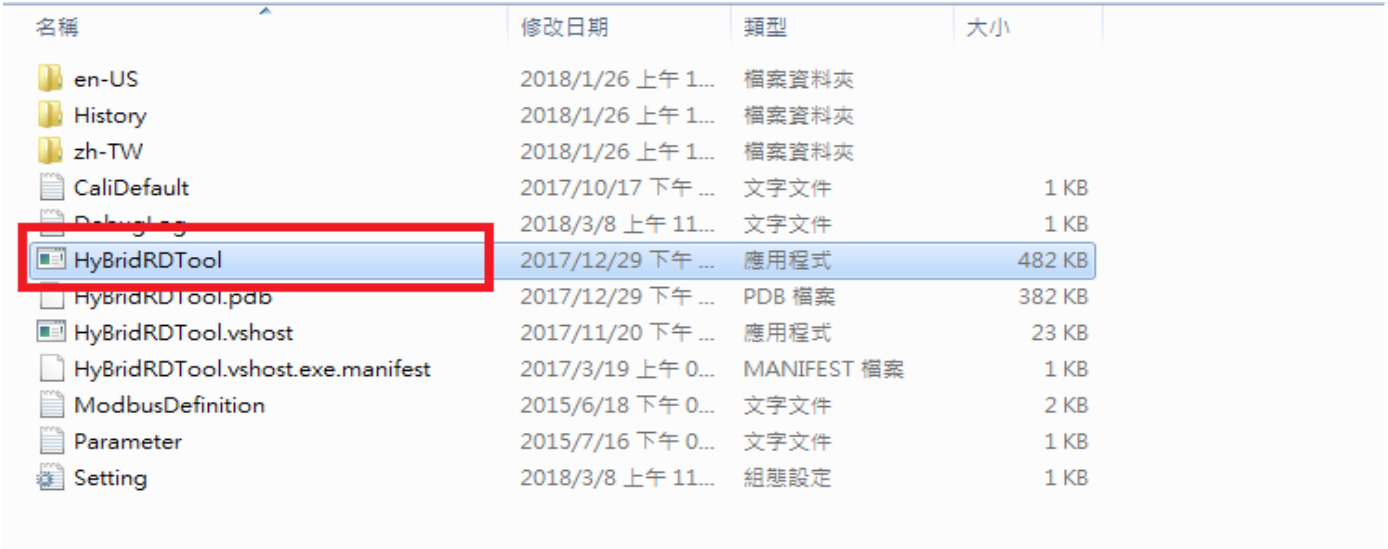
Download the H5000 application software from Darfonsolar website: http://www.darfonsolar.com/downloads/

Connecting to the application software and modifies parameters

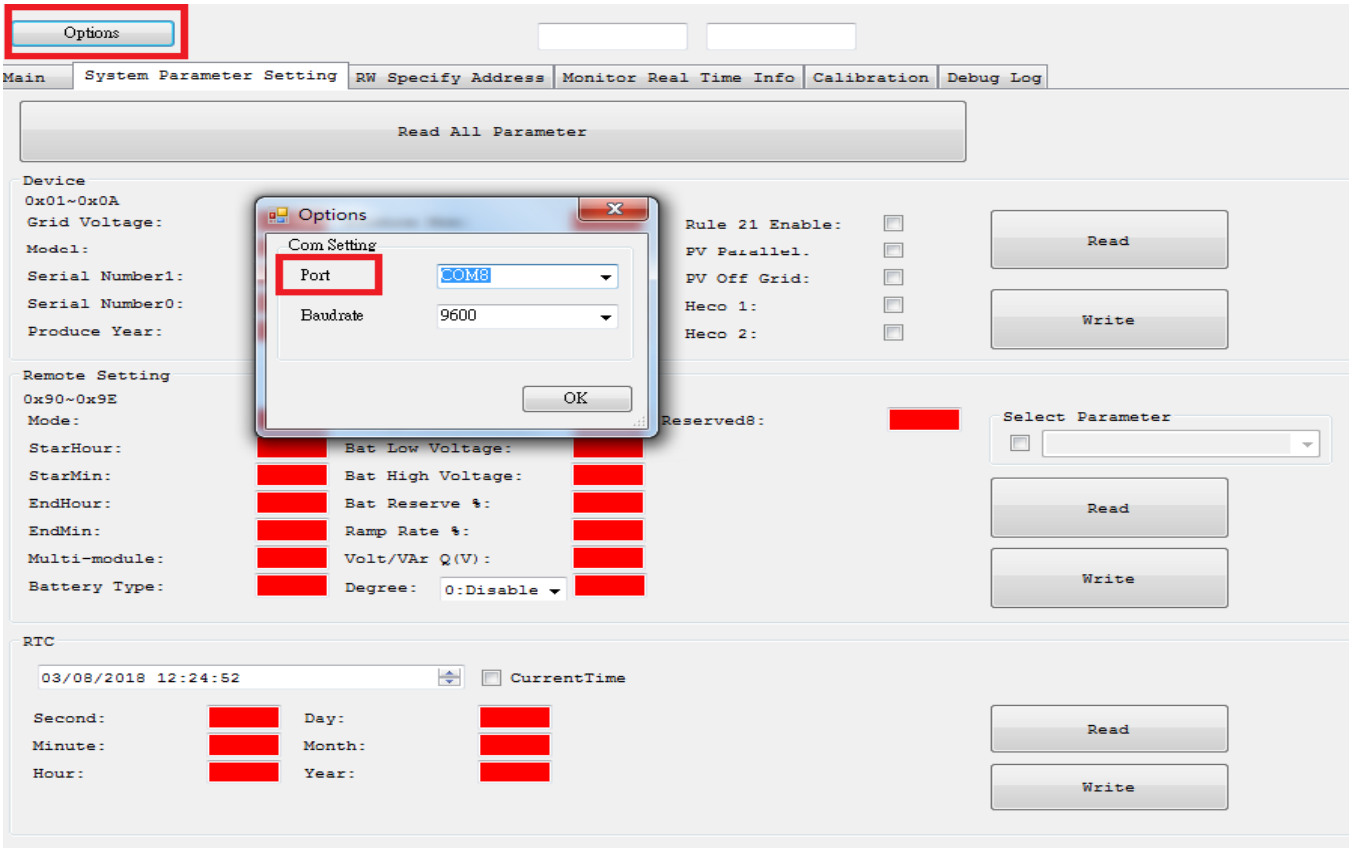
Step1: Click "HyBridTool" folder



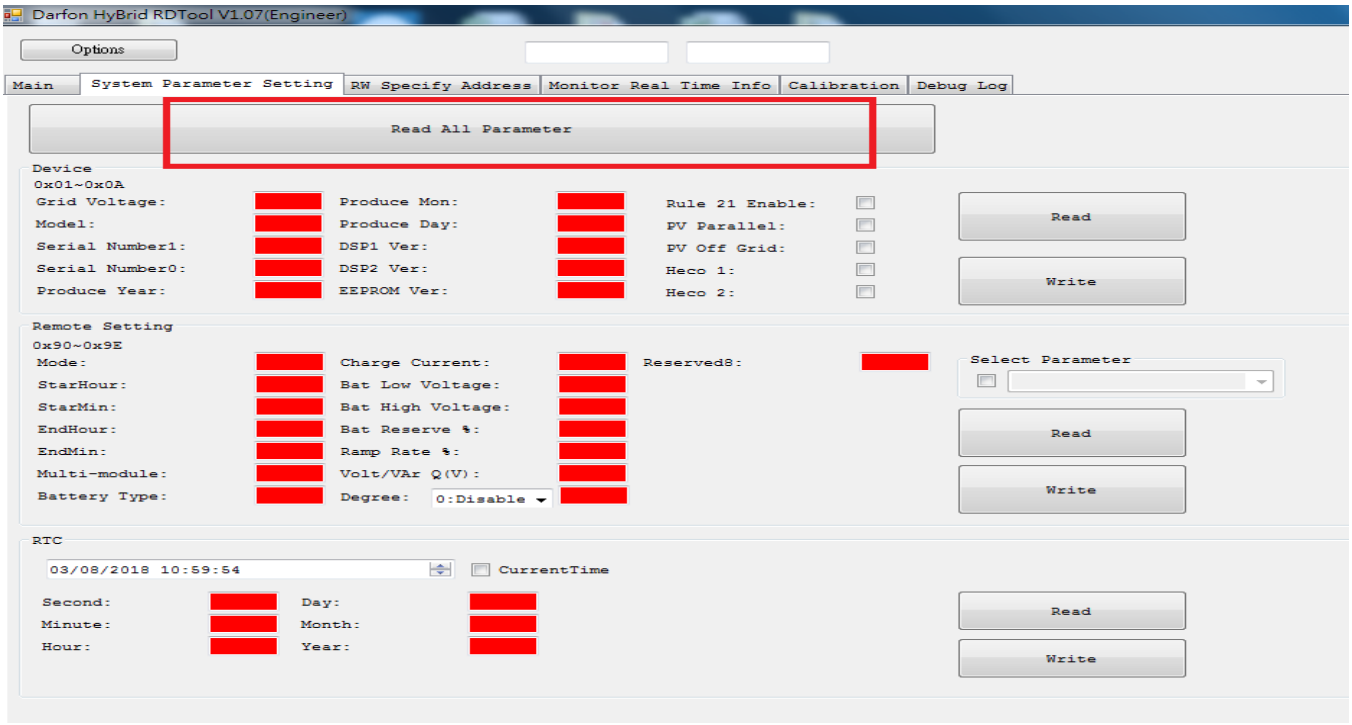
Step2: Click "HyBridRDTool"



Step3: Click "Option", and select port

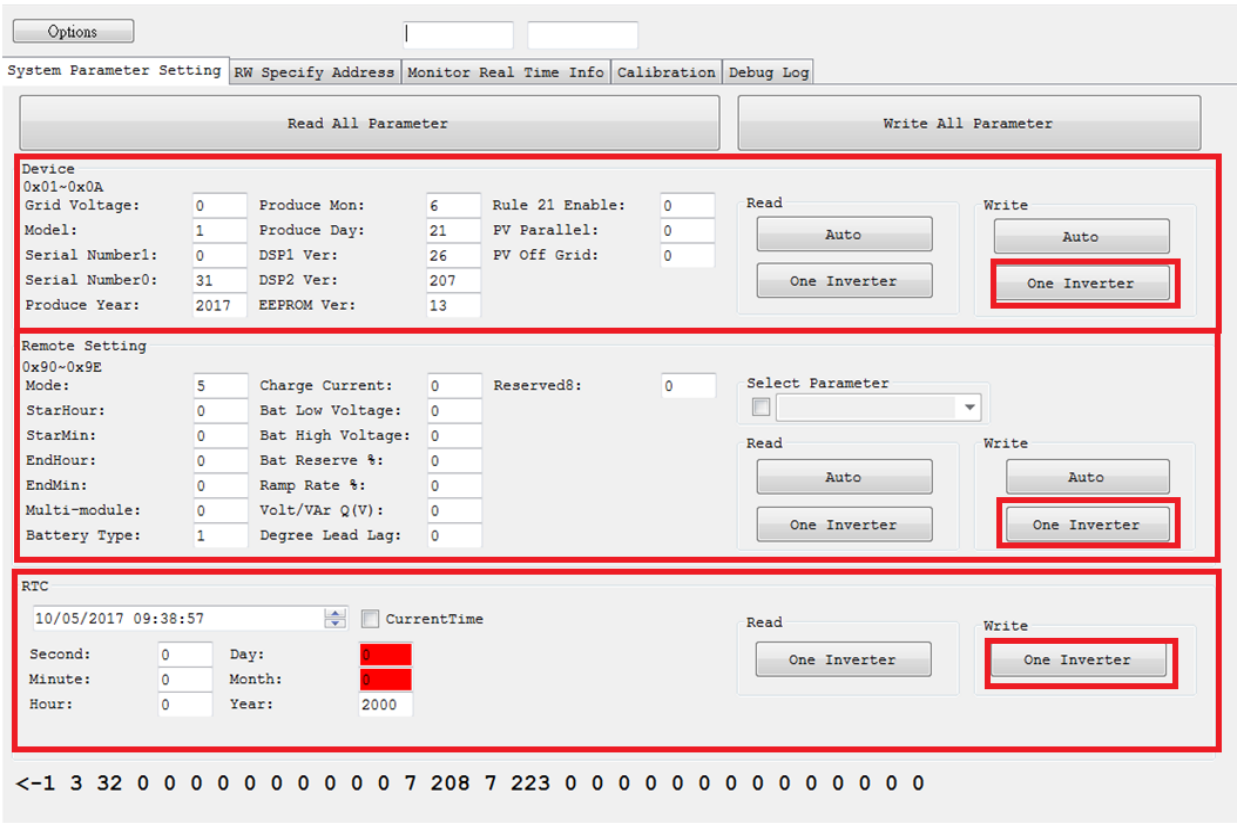


Step4: Click "Read All Parameter"

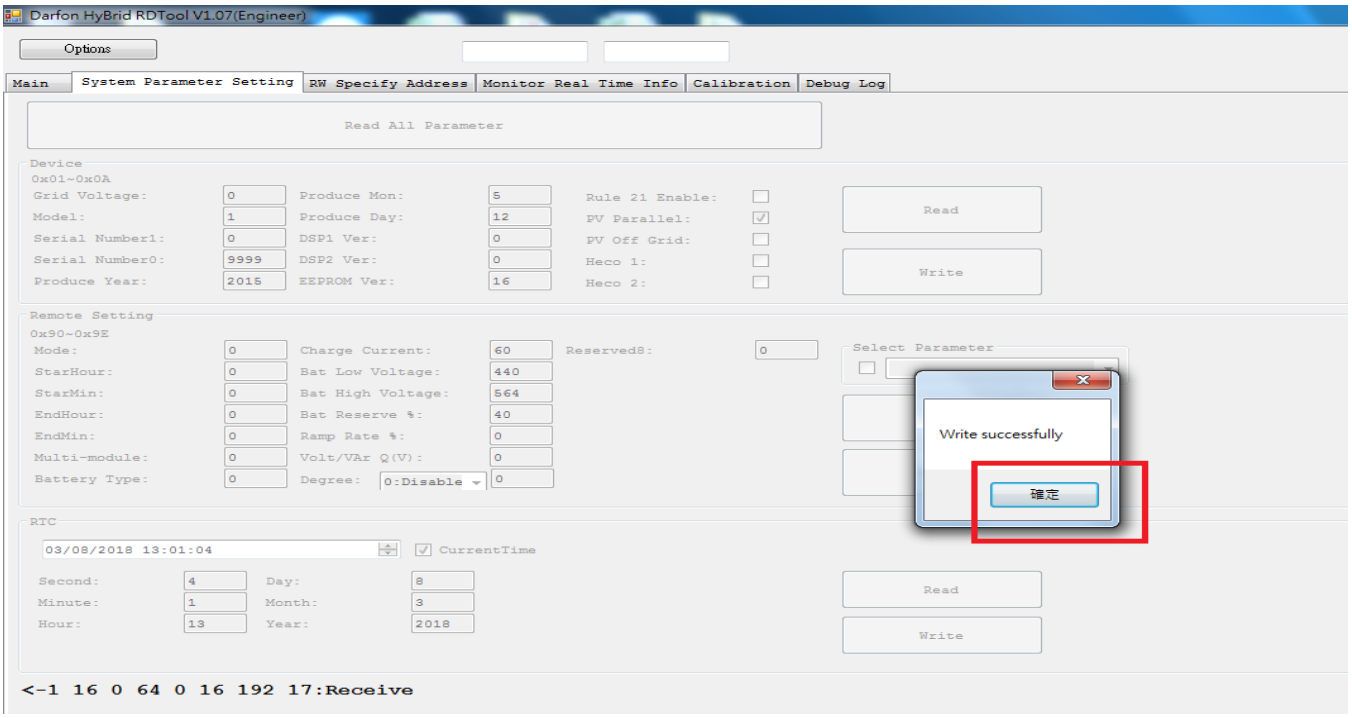


Step5: Modifies parameters.

Step6: Click “one Inverter”, every group has its write one inverter button.



Step7: Click “確定”, it means ok if “Write successfully”



Step8: Click “Read All Parameter” and please make sure the parameters are modified correctly.

Parameters setting tables

Device Settings

PARAMETER	VALUE	DESCRIPTION
GRID VOLTAGE	0:240V 1:230V 2:220V 3:208V 4: FULL RANGE	AC L1 to L2 VOLTAGE
MODEL	SYSTEM	ERS/PV INVERTER
SERIAL NUMBER1	SYSTEM	S/N CODE HIGHT SIDE
SERIAL NUMBER0	SYSTEM	S/N CODE LOW SIDE
PRODUCE YEARS	SYSTEM	PRODUCT
PRODUCE MON	SYSTEM	PRODUCT
PRODUCE DAY	SYSTEM	PRODUCT
DSP1 VER	SYSTEM	INVERTER VERSION
DSP2 VER	SYSTEM	DD VERSION
EEPROM VER	SYSTEM	EERPOM VERSION
RULE21 ENABLE	0:DISABLE 1:ENABLE	
PV PARALLEL	0:DISABLE 1:ENABLE	
PV OFF GRID	0:DISABLE 1:ENABLE	

Remote Settings

PARAMETER	VALUE	DESCRIPTION
MODE	0: BACK UP 1: RESIDENTIAL 2: BACK UP WITHOUT FEED IN 3: RESIDENTIAL WITHOUT FEED IN 4: TOU WITHOUT BATTERY FEED IN 5: TOU WITH BATTERY FEED IN	OPERATING MODE
STARHOUR	0~23	HIGH PRICE PERIOD START HOUR
STARMIN	0~59	HIGH PRICE PERIOD START MINUTE
ENDHOUR	0~23	HIGH PRICE PERIOD END HOUR
ENDMIN	0~59	HIGH PRICE PERIOD END MINUTE
MULTI-MODULE	0: SINGLE 1: PARALLEL 2: THREE PHASE	MALFUNCTION!
BATTERY TYPE	0: DEFAULT 1: LEAD-ACID 2: GOLDEN CROWN 3: DARFON 4: PANASONIC	
CHARGE CURRENT	10A ~ 60A	MAX BATTERY CHARGING CURRENT
BAT LOW VOLTAGE	44.0V ~ 48.0V	BATTERY CUT OFF VOLTAGE
BAT HIGH VOLTAGE	54.0V ~ 58.0V	BATTERY FLOATING CHARGING CURRENT
BAT RESERVE %	10% ~ 60%	BATTERY RESERVE QUANTITY IF GRID CONNECTED
RAMP RATE %	0~50%	0: DISABLE, 1~50%
VOLT/VAR Q(V)	0~3	
DEGREE LEAD/LAG	ABB	A 0: DISABLE, 1: LEAD, 2: LAG, BB: 2 DIGIT VALUE

MAINTENANCE & CLEANING

Preform the following maintenance annually or more often if the site requires it to ensure proper operation.

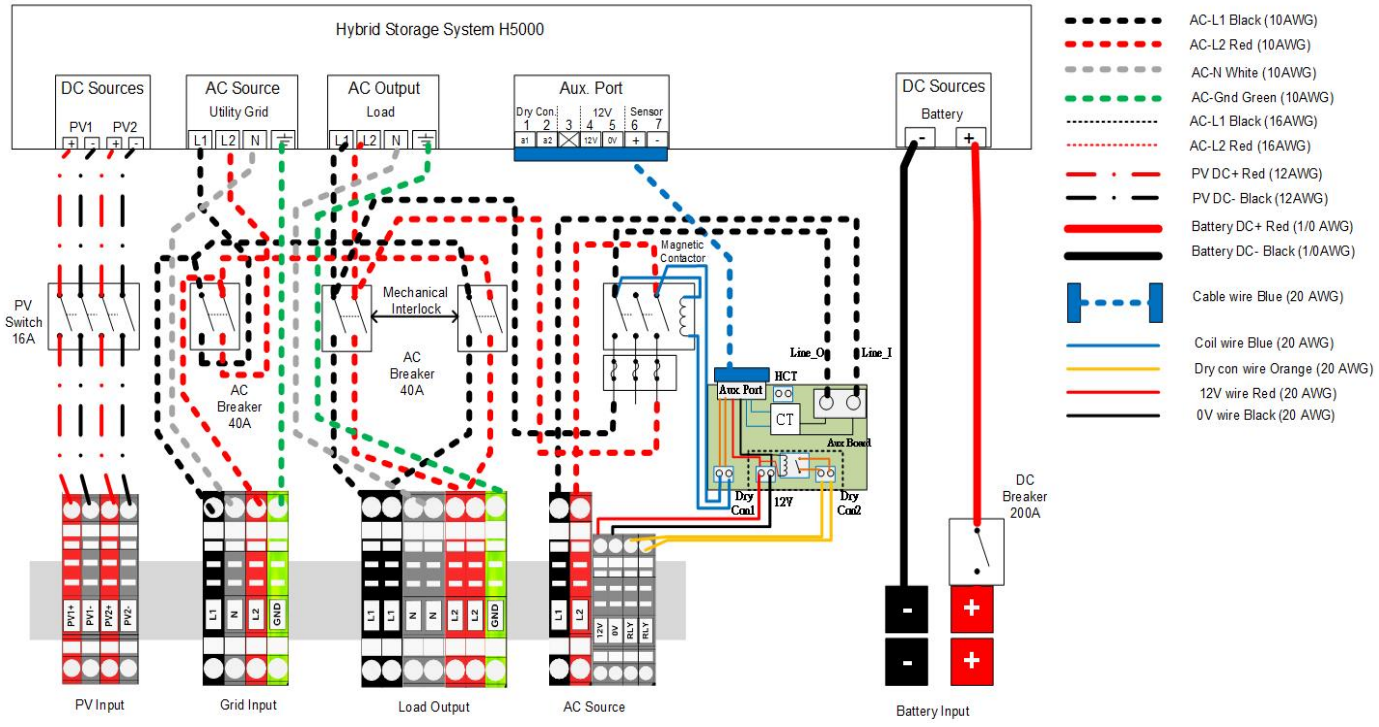
- Clean this inverter, during the cool time of the day, whenever it is visibly dirty.
- Before cleaning this inverter, make sure to turn off all the breakers (AC, battery and PV).
- Ensure all connectors of this inverter are clean.
- Periodically inspect the system to make sure that all wires and supports are securely fastened in place.

CAUTION. There are no user-replaceable parts inside the inverter. Do not attempt to service the unit yourself.

Wiring Diagram

The following diagram shows how the distribution box is electrically connected to the hybrid inverter. When replacing breakers or wires on the distribution box the following rules must be observed: (1) All AC breakers must be sized for 40A or less, and (2) All wiring must be sized for 40A or more.

NOTES: The H5001 has L1 and L2 connections for two AC input sources, although it can only accept one source at a time. The H5001 has separate neutral connections for grid input, generator input and output. These are electrically common. The distribution box is both an input conduit box and an AC load center. The distribution box also contains maintenance transfer switches(load selection breaker). Maintenance transfer switching assemblies allows for the inverter to be taken offline if necessary without shutting the entire system down. These assemblies include an interlock mechanism that isolates the AC Lines from each other.



SPECIFICATIONS

SOLAR DC INPUT	
Maximum Power	6500W
Operation / MPPT Voltage Range	120 to 500VDC / 250 to 430VDC
Minimum Start Voltage	150VDC
Maximum Input Current	13A / 13A (two string input)
AC OUTPUT TO LOAD	
Output Power (Continuous) @ 25°C	5000W
Overload 40/5/1sec @ 25°C	5500/6500/7500W
Rated Output Current	21 A (@120V and 240 V)
Output Frequency (Selectable)	50/60Hz
Output Voltage	L-N: 120V ± 3%; L-L: 240V ± 3%
Total harmonic distortion (THD) at rated power	< 5%
Power Factor	>99%
AC INPUT FROM GRID (GRID SUPPORT)	
AC Input Voltage Limits (Bypass)	L-L: 180 to 280V (240 V nominal)
Automatic Transfer Relay Rating / Typical Transfer Time	48A / 20ms
AC Input Frequency Range (Bypass)	55 to 65 Hz
AC OUTPUT TO GRID	
Grid Sell Current Range (Depending On Operation Mode)	0 to 24A (@240V)
Grid Sell Voltage Range	L-L: 211 to 264V ± 3.0V
Grid Sell Frequency Range	59.4 to 60.4Hz ± 0.05Hz
EFFICIENCY	
Peak PV to Grid	96%
CEC weighted PV to Grid	95.5%
DC BATTERY CHARGER	
Maximum Charge Current	60A
Output Voltage Range	44 to 60V (48V Nominal)
Compatible Battery Types	AGM (default), Gel, Li-ion, LiFePO4,custom
Battery Bank Range	200 - 600Ah (Suggested)
GENERAL SPECIFICATIONS	
Product weight	39.4 kg (86.8lb)
Product dimensions (H x W x D)	990x 448 x 150mm (39 x 17.6 x 5.9in)
IP degree of protection	NEMA Type 1 Indoor/IP20
Temperature	Operating: 0 to 55°C (power derated above 40°C) Storage: -25 to 70°C(-13 to 158°F)
Compliances	UL1741SA, CSA CS22.2, IEEE 1547, FCC Class B, HECO

GRID SUPPORT PARAMERTERS (UL1741SA)

Manufacturer Stated Tolerances

VOLTAGE	CURRENT	FREQUENCY	TIME
2%	5%	2%	0.1 sec

Solar DC Input

PARAMETER	RATING	DESCRIPTION
$V_{DC,op}$	120-500V	Max input voltage
$V_{DC,mppt}$	250-430V	Maximum power point track range
$V_{DC,start}$	150V	Min start voltage
$I_{DC,max}$	13A/13A	DC input current rating for each string

Inverter AC Output

PARAMETER	RATING	DESCRIPTION
$V_{nom,L-N}$	120V	Nominal Voltage L-N (if neutral available)
$V_{nom,L-L}$	240V	Nominal Voltage L-L
P_{nom}	5KW	Active Power Output
$I_{AC,nom}$	21A	Nominal current per phase
$I_{AC,max}$	24A	Max current at lowest operating voltage

Voltage Ride-Through

VOLTAGE ZONE	ZONE LIMITS	TRIP TIME	DESCRIPTION
HV2	V ≥ 120%	0.166 sec	Trip time when the voltage is above 288Vac
HV1	110% < V < 120%	13 sec	Trip time when the voltage range is between 264Vac and 288Vac
Nominal	88% ≤ V ≤ 110%	-	No applicable when the voltage range is between 211.2Vac and 264Vac
LV1	70% ≤ V < 88%	21 sec	Trip time when the voltage range is between 168Vac and 211.2Vac
LV2	50% ≤ V < 70%	11 sec	Trip time when the voltage range is between 120Vac and 168Vac
LV3	V < 50%	1.5 sec	Trip time when the voltage is below 120Vac

Frequency Ride-Through

FREQUENCY ZONE	ZONE LIMITS (HZ)	TRIP TIME	DESCRIPTION
HF2	F ≥ 62	0.166 sec	Trip time when the frequency is above 62Hz
HF1	60.5 < F < 62	300 sec	Trip time when the frequency range is between 60.5Hz and 62Hz
Nominal	58.5 ≤ F ≤ 60.5	-	Not applicable when the frequency range is between 58.5Hz and 60.5Hz
LF1	57 ≤ F < 58.5	300 sec	Trip time when the frequency range is between 57Hz and 58Hz
LF2	F < 57	0.166 sec	Trip time when the frequency is below 57Hz

Power Factor

POWER	MIN INDUCTIVE, $PF_{MIN,IND}$	MIN CAPACITIVE $PF_{MIN,CAP}$	SETTLING TIME	DESCRIPTION
5kW	70%	70%	3 sec	Capacitive (Var production) and Inductive] (Var absorption) minimum power factor. Default PF = 1.0

Volt-VAr Q(V)

PARAMETER	RATING	DESCRIPTION
S_{rated}	5KVA	Apparent Power Rating (VA)
P_{rated}	3.5KW	Output Power Rating (W)
V_{nom}	240V	Nominal AC EPS voltage (V)
V_{min} - V_{max}	211 - 264V	AC EPS voltage range with function enabled (V)
$VA_{percent}$	5%	Reactive Power Accuracy
VA_{ramp}	500 VA/sec	Maximum ramp rate
$Q_{over-cap,max}$	3.57 VA	Maximum Rated Reactive Power Production (Capacitive, Overexcited)
$Q_{under-ind,max}$	3.57 VA	Maximum Rated Reactive Power Absorption (Inductive, Underexcited)
$VA_{slope,max}$	148 VA/V	Maximum slope of power over voltage

D_{min} - D_{max}	235 - 245V	Deadband range (V)

Power Ramp Rate

	$RR_{NORM\_UP\_MIN}$	**$RR_{NORM\_UP\_MAX}$**	**ACCURACY**	**DESCRIPTION**
Normal Operating	1% (I_{rate}/sec)	50% (I_{rate}/sec)	3%	Percentage of nominal generated power per second
Soft Start	1% (I_{rate}/sec)	50% (I_{rate}/sec)	3%	Percentage of nominal generated power per second for the first time start up.

5-YEAR LIMITED WARRANTY

Darfon Electronics Corp. and Darfon America Corp. (“Darfon”) H5001 Hybrid Inverter (“Product”) limited warranty covers defects in workmanship and materials for Product that (i) is in compliance with the installation instructions supplied with it; (ii) has been used and operated for its intended purpose in compliance with the Product’s manual supplied with the originally shipped system; and (iii) has not been moved from the originally-installed end user location (“Limited Warranty”). This Limited Warranty is only valid for new Product(s) purchased. This Limited Warranty is for a period five (5) years from the date of original purchase of the Product at point of sale to the originally-installed end-user location (“Warranty Period”). During this Warranty Period, the Limited Warranty is transferable to a subsequent owner of the Product as long as the Product remains installed at the originally-installed end user location.

To be eligible for this limited warranty, the purchaser must ensure the completion and submission of the warranty registration form within thirty (30) calendar days of installation. The information provided will only be used by Darfon for support and warranty purposes.

Subject to Darfon’s inspection of the Product and finding that the defect is covered by the Limited Warranty, Darfon at its sole discretion will repair or replace the defective Product with the same or a comparable model free of charge. In repairing or replacing the defective Product, Darfon will use new and/or reconditioned parts. The repair or replacement of the Product or the supply of additional products does not constitute the beginning of a new warranty period, nor shall the original term of this limited warranty be extended. Any replaced products shall become the sole property of Darfon. This Limited Warranty covers the repair or replacement of the defective Product only, but does not cover costs related to the troubleshooting, uninstalling, or reinstalling the repaired/replaced Product. Under this Limited Warranty, Darfon will cover the cost of shipping the repaired/replaced Product from Darfon’s location, to a location proposed by the installer and agreed by Darfon, via non-expedited freight carrier selected by Darfon; however, it does not cover damages caused during the shipment of the Product and any such damage is the responsibility of the freight carrier.

This Limited Warranty does not cover damage or malfunctions due to: (1) improper installation or operation, including usage under conditions for which the Product was not designed, usage under unsuitable environmental conditions, or usage not in accordance with its installation manual or applicable laws/regulations; (2) installations, reinstallations, repairs and/or alterations performed by persons not authorized by Darfon; (3) power surges, connection to incorrect voltage, or combination with incompatible components or accessories; (4) misuse, abuse, negligence, fire, natural disasters, force majeure or other unforeseeable circumstances outside the range of influence of Darfon and/or (5) normal wear and tear.

Furthermore, this Limited Warranty does not cover Product that: (1) has its label/serial number removed or altered; (2) has been installed on movable device or marine environment; (3) has direct contact with corrosive agents, including but not limited to salt water, acid rain and biological infestations; and/or (4) has been uninstalled from the originally-installed end user location and reinstalled elsewhere.

In the event the warranty service is required, the end user will need to contact the original installer for support. The installer will need to comply with Darfon’s Return Merchandise Authorization policy and procedure on behalf of the end user. If the original installer cannot be contacted, the end user will need to contact Darfon for a referral to a local authorized installer. This Limited Warranty will be void if the Product is uninstalled and returned by an unauthorized installer.

THIS LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY DARFON AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON INFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION. IN NO EVENT WILL DARFON BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

To the extent any implied warranties are required under applicable law to apply to this Limited Warranty, such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some states and provinces do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply to the extent of any applicable law. This Limited Warranty gives the customer specific legal rights, and the customer may have other rights that may vary from state to state.

Online Warranty Registration: http://www.darfonsolar.com/warrantyregistration.php

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