

# INSTALLATION MANUAL

## H5000 HYBRID INVERTER

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## 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

	<b>WARNING.</b> 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.
	<b>CAUTION.</b> This indicates important information where failure to comply may result in safety hazards or cause damage to this product.
	<b>CAUTION.</b> This indicates the risk of a hot surface. The surface may reach a temperature high enough to cause serious burn injuries.

### General Precautions

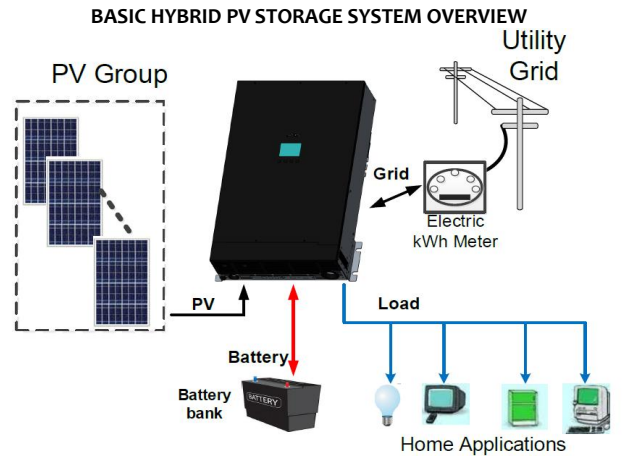
-  **CAUTION.** Before installing and using this inverter, read all instructions and cautionary markings on the inverter and all appropriate sections of this guide.
-  **CAUTION.** Normally grounded conductors may be ungrounded and energized when a ground fault is indicated.
-  **CAUTION.** This inverter 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.** 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

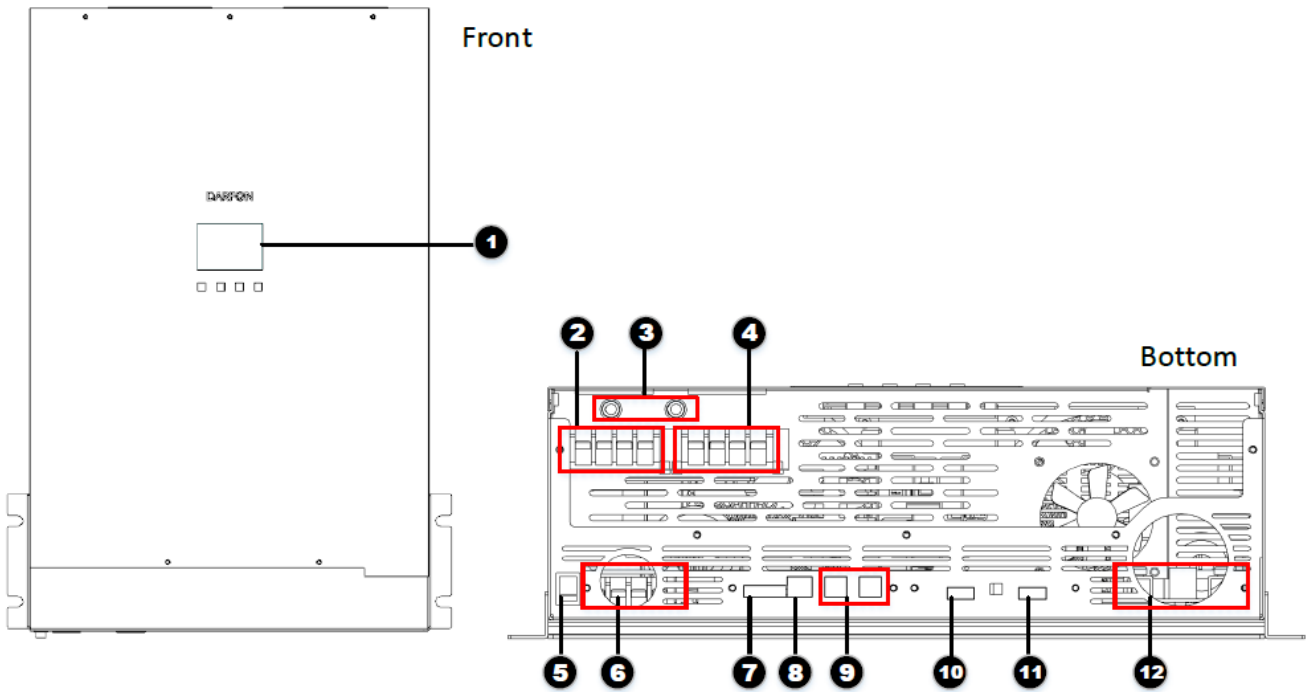
The H5000 hybrid inverter provides power to the essential load by utilizing power from PV panels, the utility and batteries. When the PV panels (two string input) generates enough power, the inverter supports the essential load, feeds back to the grid and charges the batteries, all at the same time. When the energy generated by the PV panels is not sufficient to support the essential load, the inverter takes power from the utility.

To accommodate various power situations, the H5000 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.

**Note: 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



- 1 Display Panel
- 2 AC Grid Connectors
- 3 Breaker for Grid Power
- 4 Output Load Connectors
- 5 On/Off switch
- 6 PV Connectors
- 7 AUX 12V/Dry Connectors
- 8 External Display Connectors
- 9 Multi-inverter Communication Port
- 10 RS485\_MS Communication Port
- 11 RS485\_SL Communication Port
- 12 Battery Connectors

## MOUNTING THE INVERTER


### Preparation

Before installation, inspect the unit make sure nothing inside the package is damaged. You should have received the following items in the package: H5000 hybrid inverter and Installation Manual.

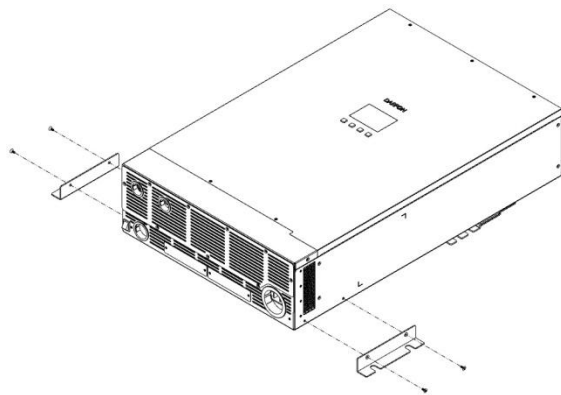
The following considerations must be taken into account before selecting where to install.

- 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.

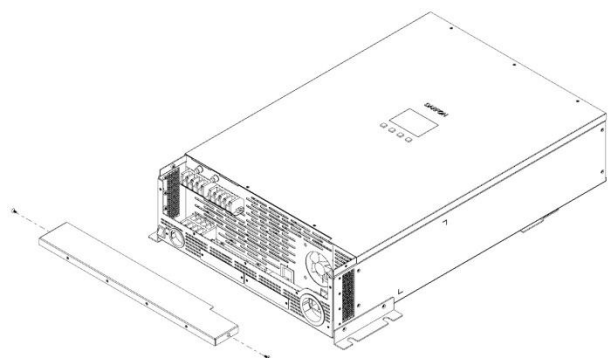
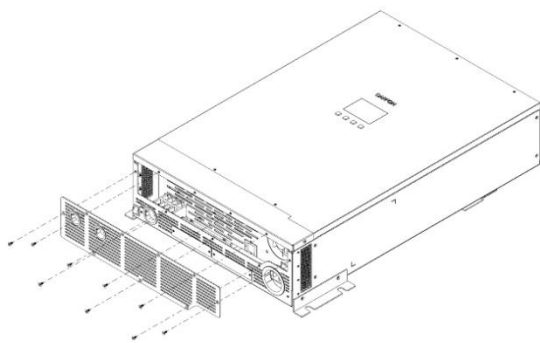
### Installing the Inverter onto the Wall

 **CAUTION.** This inverter is heavy (71lb). Be carefully while lifting and mounting the unit.

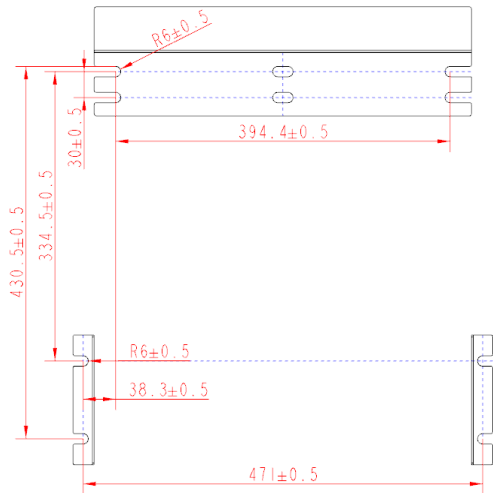
**Step 1. Install the bracket onto the each side of inverter and secure it with two screws on each side.**



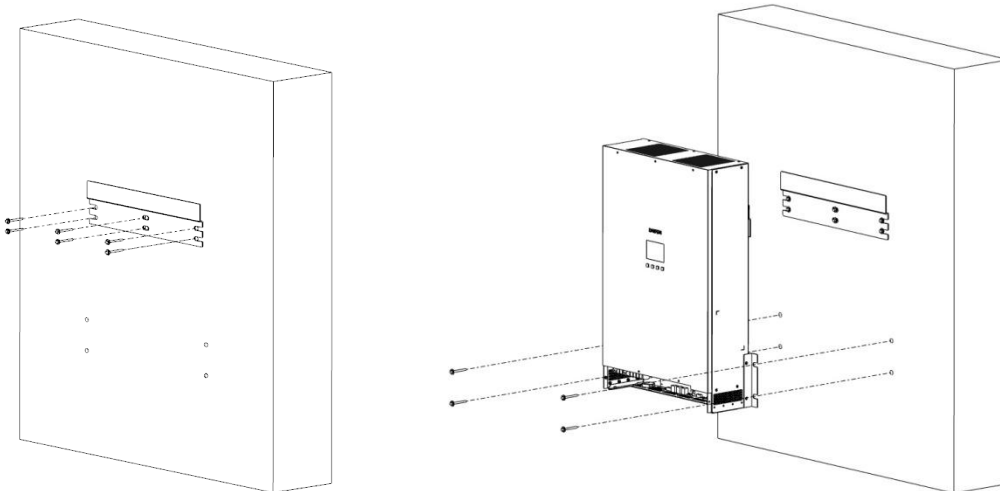
**Step 2. Remove the eleven screws on the bottom of the inverter and pull the bottom cover off.**



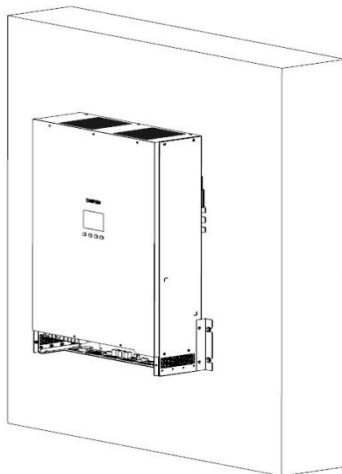
**Step 3. Using the mounting bracket as a template and install anchors as needed.**



**Step 4. Install the mounting bracket onto the wall.**



**Step 5. Hang the unit onto the mounting bracket and secure it with two screws on each side.**

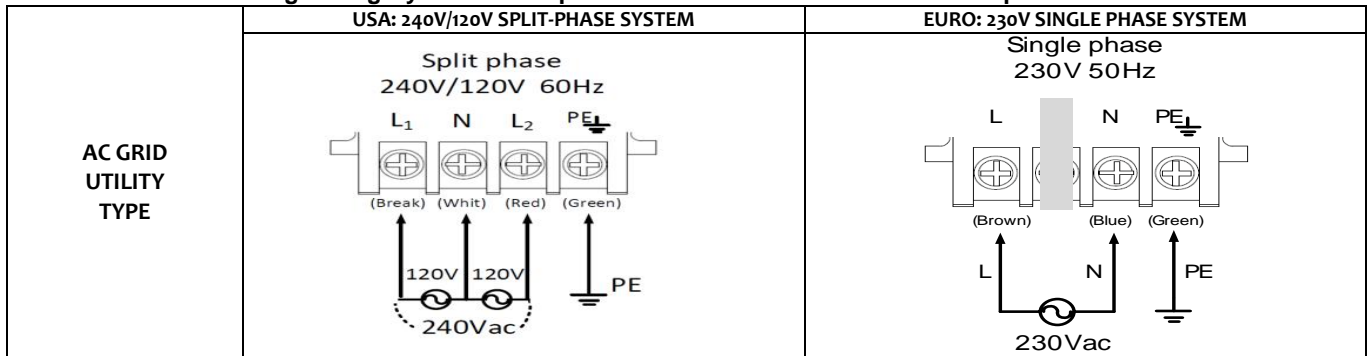


# GRID (UTILITY) CONNECTION

## Preparation

Before connecting to the utility, please install a separate AC circuit breaker between inverter and AC Grid utility. This will ensure the inverter can be securely disconnected during maintenance and is fully protected from over current of AC input.

- Notes:** 1. The separate circuit breaker is necessary for safety. Use a 240VAC/40A circuit breaker.  
 2. The overvoltage category of the AC input is III. It should be connected to the power distribution.



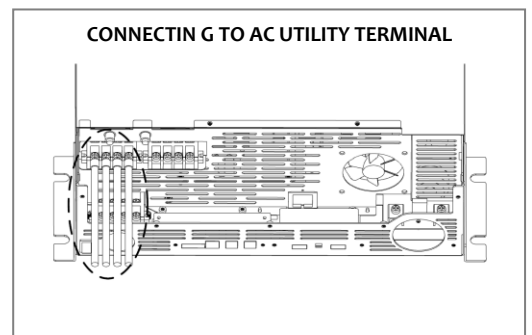
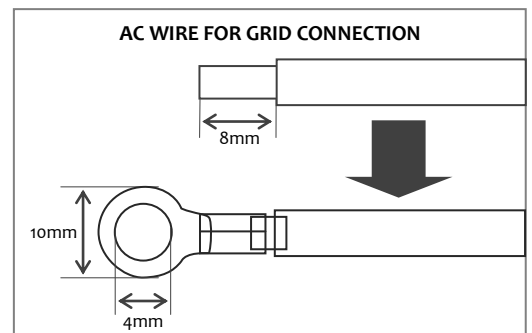
GRID CONNECTION WIRING REQUIREMENTS	GRID RATED POWER	NOMINAL VOLTAGE	WIRE SIZE	TORQUE
	5KW	230/240 VAC	8 AWG	0.82 Nm

**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. Turn off the circuit breaker.
- Step 3. For each AC wire, strip 8mm of isolation and then insert the conductor into the ring lug.
- Step 4. Connect the AC wires to the inverter according to the labels indicated on the terminal block and your grid utility type. Be sure to connect PE protective conductor (Ground) first.



# BATTERY CONNECTION

## Preparation

Before connecting the batteries, install a separate DC circuit breaker between the inverter and the batteries.

- 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 Ferrite Phosphate batteries, consult with the battery manufacturer installer for the details. What type of details does the installer need?
  3. Use a 60VDC/160A circuit breaker.

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)

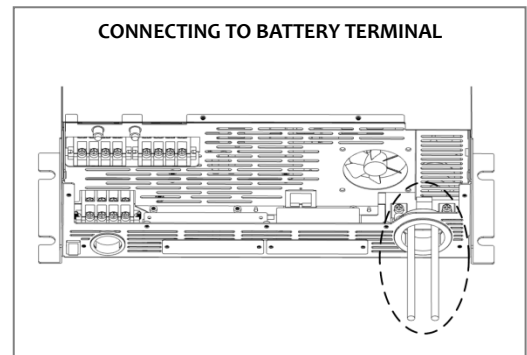
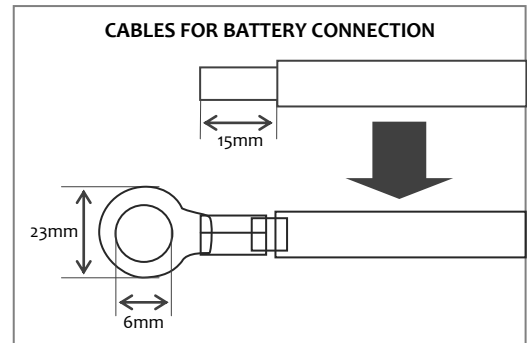
**WARNING.** To reduce the risk of injury, use the recommended cable size above. It is very important for system safety and efficient operation to use the appropriate cable for battery connection.

## Connecting the Batteries

Please follow below steps to implement battery connection:

- Step 1. Make sure the nominal voltage for the batteries is 48VDC.**
- Step 2. Strip 15mm of insulation from the battery cables, and then insert the conductors into cable ring terminals.**
- Step 3. Connect the external battery cable ring terminal to the battery terminal. Following battery polarity guide printed near the battery terminal.**

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



**WARNING.** Shock Hazard. Installation must be performed with care due to high battery voltage in series.

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

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

**CAUTION.** Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) is connected to positive (+) and negative (-) is connected to negative (-).

## PV MODULE (DC) CONNECTION

### Preparation

Before connecting to the PV strings, install a separate DC circuit breaker between the inverter and each PV string. This system can connect to two strings of PV modules with MPPT control.

Configure each PV input as recommended in the table below.  $V_{mp}$  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  $V_{mp}$ .

TERMINAL MARK	PV INPUT POWER	TYPICAL AMPERAGE	CABLE SIZE	TORQUE	BEST $V_{MP}$	$V_{MP}$ 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

- Notes:** 1. Use 600VDC/20A circuit breakers.  
 2. The overvoltage category of the PV input is II.

**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.

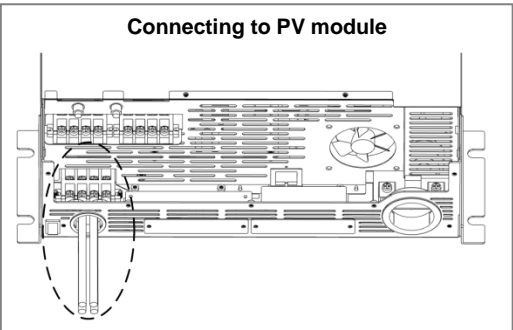
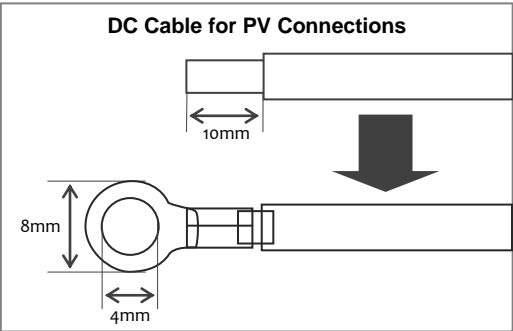
**CAUTION.** To reduce the risk of damage due to surge, Darfon recommends surge protection between the modules and the inverter.

**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.
- Step 2.** Turn off the circuit breaker.
- Step 3.** Strip 10mm of insulation from the PV cables and insert the conductors into the cable ring terminals. PV1+, PV1-, PV2+ and PV2-
- Step 4.** Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.

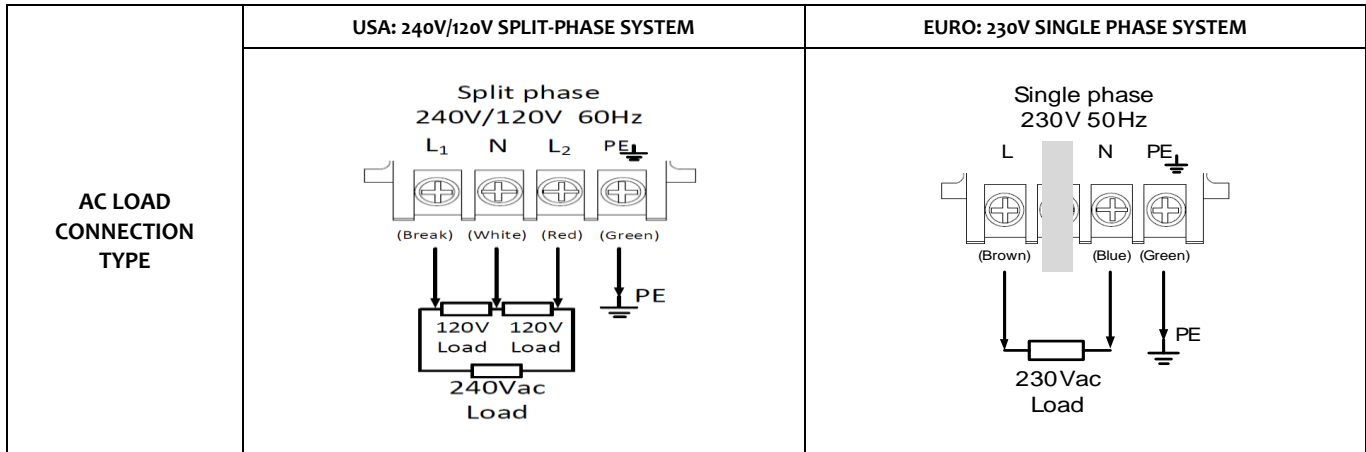


**WARNING.** Never touch terminals of the inverter directly. It will cause lethal electric shock.

## LOAD (AC OUTPUT) CONNECTION

### Preparation

To prevent further supply to the load via the inverter during any mode of operation, an additional disconnection device should be placed on in the building wiring installation.



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

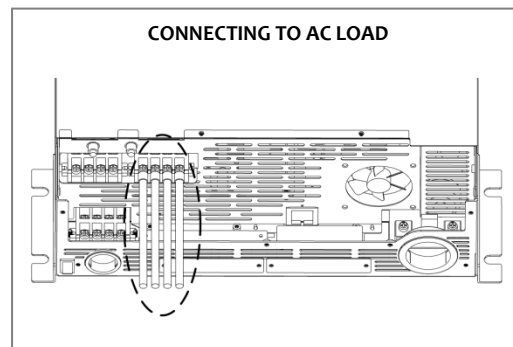
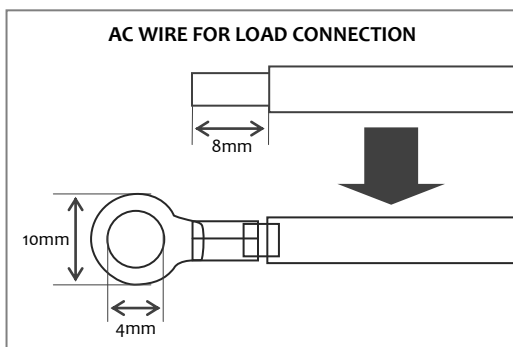
**WARNING.** To reduce the risk of injury, use the recommended cable size above. It is very important for system safety and efficient operation to use the appropriate cable for AC connection.

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

### Connecting to the Load

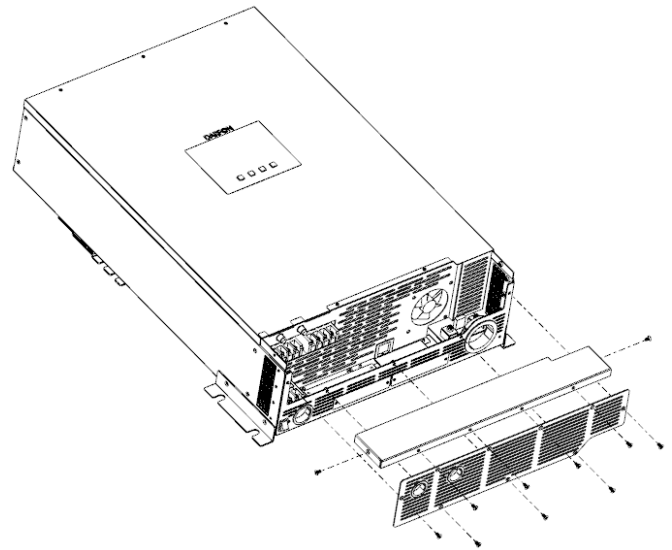
**Step 1.** Use four wires AC Cables. Remove each isolation sleeve 8 mm and insert conductor into cable ring terminal.

**Step 2.** Make sure your AC load type which corresponding to Grid utility type, and then connect four wires cable (or three wires cable) according to polarities indicated on terminal block. Be sure to connect PE protective conductor (  $\text{PE} \equiv$  ) first. Refer to Fig. 12.



## FINAL INSTALLATION STEPS

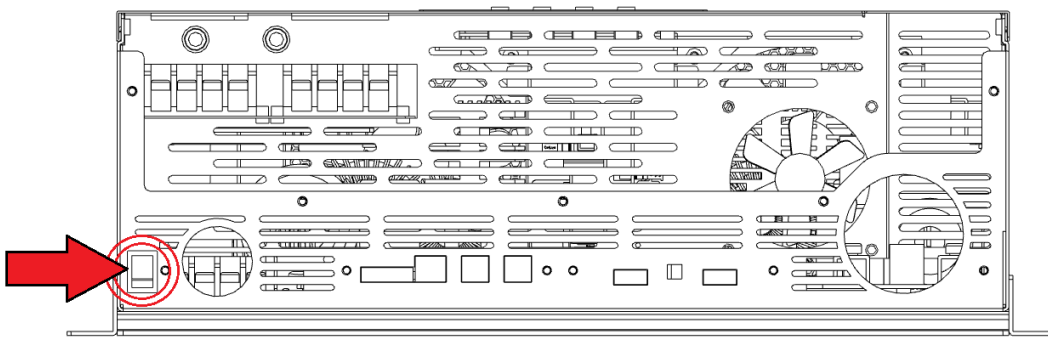
The wiring for all the connections should be done at this point. Place the bottom cover back on the inverter and secure it with the eleven screws.



## TURNING THE SYSTEM ON

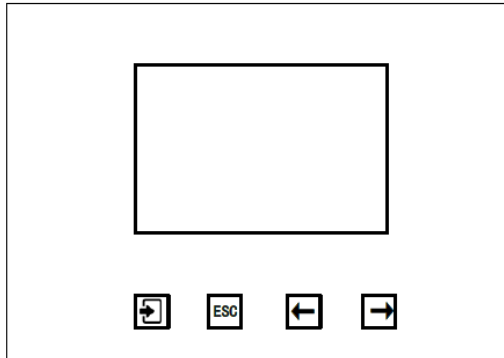
**Step 1.** Turn the on/off switch, located on the bottom of the case, to the on position. This will put the inverter into standby power.

- If the inverter only has battery input, no PV and Grid, then continue to Step 2.
- If the inverter has PV, Grid or multi input, then the system will automatically start.



**Step 2.** To start the inverter, hold down the Enter key,  located on the display panel, for about 3 seconds until two beeps are heard. This system should now be on.

## OPERATION AND DISPLAY PANEL

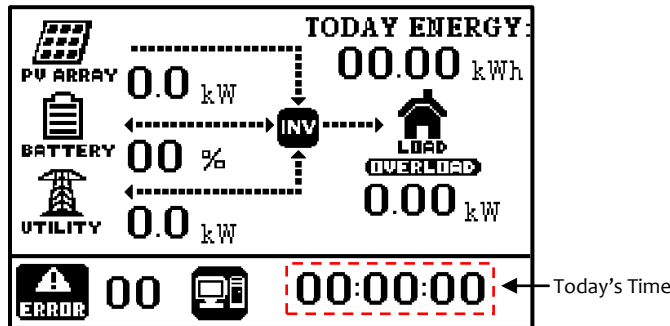


ICON	FUNCTION	DESCRIPTION
	Enter	Confirm the selection in setting mode or enter setting mode.
ESC	Exit	Exits setting mode.
	Left	Go to previous page, move or decreasing all Number.
	Right	Go to next page; move; to increase all Number.

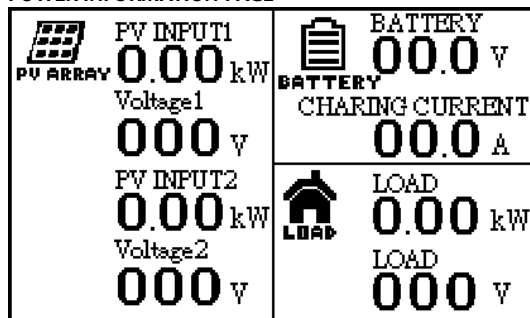
### LCD Display Icons and Pages Introduction

The display panel includes two part, four function keys and a LCD display. The LCD display will show three different pages which include “Power flows”, “Power information” and “System setting”.

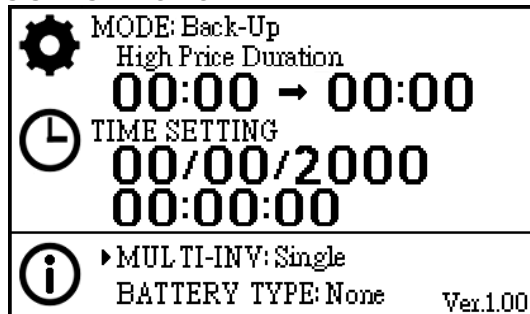
#### POWER FLOWS PAGE



#### POWER INFORMATION PAGE




#### SYSTEM SETTING PAGE




ICON	DESCRIPTION
	Represents the PV Array
	Represents the Battery Pack
	Represents the Utility
	Represents the Load
	Represents the Hybrid Inverter
	Indicates the Connection to a PC
	Indicates the Error and error codes
	Indicates an overload has occurred
	Represents the System Mode Setting
	Represents the System Time Setting
	Represents the System Information

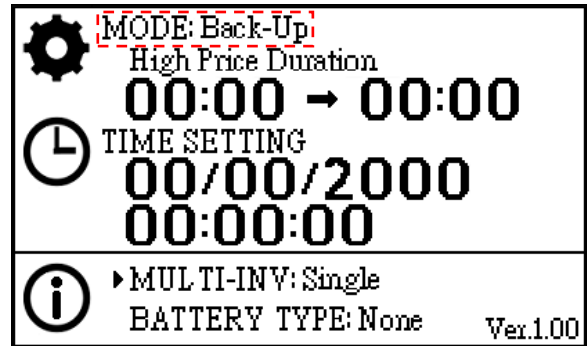
### System Settings


The System settings are divided into two parts, “System Mode Setting” and “System Time Setting.” To get to the System Setting Page, switch pages using the ← or → keys. Click  to enter the System Setting Page. To exit the System Setting Page, click **ESC**.

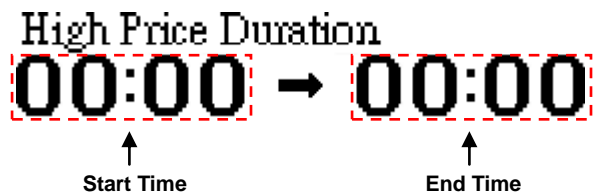
#### A. System Mode Setting

Once you are in the System Setting Page, make sure “System Mode Setting” is selected and press  to get into the edit mode. You can select the mode by using the ← or → keys. Modes of operation (See page 17 for mode definitions):

- a) Back-up
- b) Residential
- c) Back-up w/o Feed-in
- d) Residential w/o Feed-in
- e) TOU
- f) TOU w/Batt. Feed-in






When either “Time of Use” or “Time of Use with Battery Feed-in” modes are selected, you will be prompted to enter the start and end times for “High Price Duration” in 24-hour notation. Use the  key to toggle between the time fields and the ← or → keys to select the values.

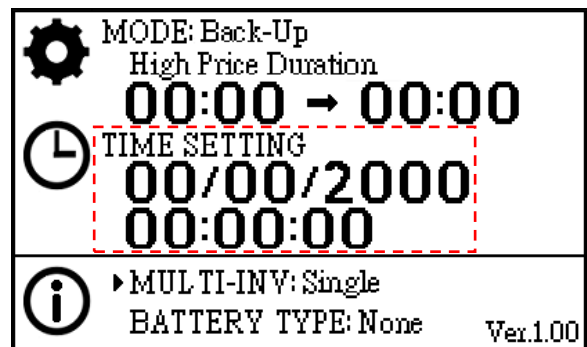


Once the value for the last time field is set, press the  key. You will then be prompted to enter the password. Go see password section on page 14 for details.

#### B. System Time Setting

Once you are in the System Setting Page, press → to select “System Time Setting”, and then press  to get into the edit mode. 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 14 for details.



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

**C. Passwords**

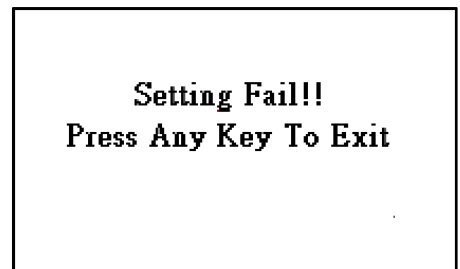
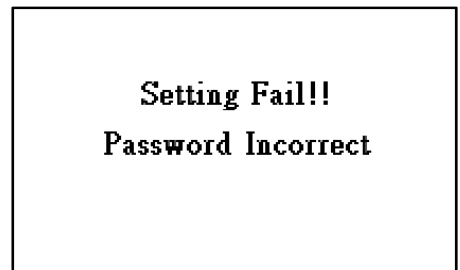
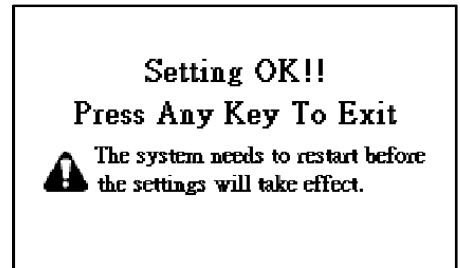
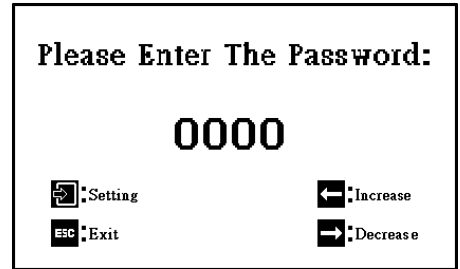
Any changes made to the system settings (mode or time) will prompt you to enter the four-digit user password. The first digit will flash. Use the ← or → keys to change the number, and then ↵ to select the number. Repeat the process for the remaining three digits. The default user password is 9999. After entering the password, wait for a few seconds for the confirmation message.

To modify the settings for “MULTI-INV” and “BATTERY TYPE” at the bottom of System Setting Page, you will need the factory password. Please contact your Darfon representative.

If the password was entered correctly, the display will show a “Setting OK!!” message. The system will now need to be manually restarted with the on/off switch on the bottom of the inverter

If the password was not correct, the display will show a “Setting Fail!! Password Incorrect” message. Please confirm you have the correct password and try changing the settings again.

If the password was correct, but the display still shows a “Setting Fail!!” message, you will need you will need exit the screen and go to the Power Flows page to check for the error code. Look up the error code in the “Warning and Fault Definition” section of this manual and follow the instructions for the solution. Once completed and the error code is cleared try changing the settings again.




### 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	An 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	
17	PV input voltage exceeds the upper threshold	No-action	1. Check if the open circuit voltage of PV modules is higher than 500VDC. 2. If PV open circuit voltage is less than 500VDC and the error message remains, please contact your installer.
18	Auxiliary power* failed  *Auxiliary power means switch power supply.		1. Turn off the system. 2. Then, restart the system. 3. If the error message still remains, please contact your installer.
19	PV insulation resistance is too low	No-action	1. Check if the impedance between positive and negative poles to the ground is greater than 1MΩ. 2. If the impedance is lower than 1MΩ, please contact your installer.
20	Charging voltage is too high	No-action	1. Check if the connection between battery and inverter is well. 2. Make sure battery condition is ok. 3. Then, restart the inverter. 4. If error message remains, please contact your installer.
21	Fan fault	No-action	1. Please check if fans are running ok. 2. If fans are running ok, please shut down inverter first and then, restart it. 3. If fans are stop running 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	<ol style="list-style-type: none"> <li>1. The output power is higher than 5500W.</li> <li>2. 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.</li> <li>3. If the output power is higher than 7500W, the system will shut down after 1 second but not restart.</li> </ol>
23	PV Input Overpower	No-action	<ol style="list-style-type: none"> <li>1. Shut down the system completely.</li> <li>2. Restart the system to see if it's OK.</li> <li>3. If error message still remains, please contact your installer.</li> </ol>

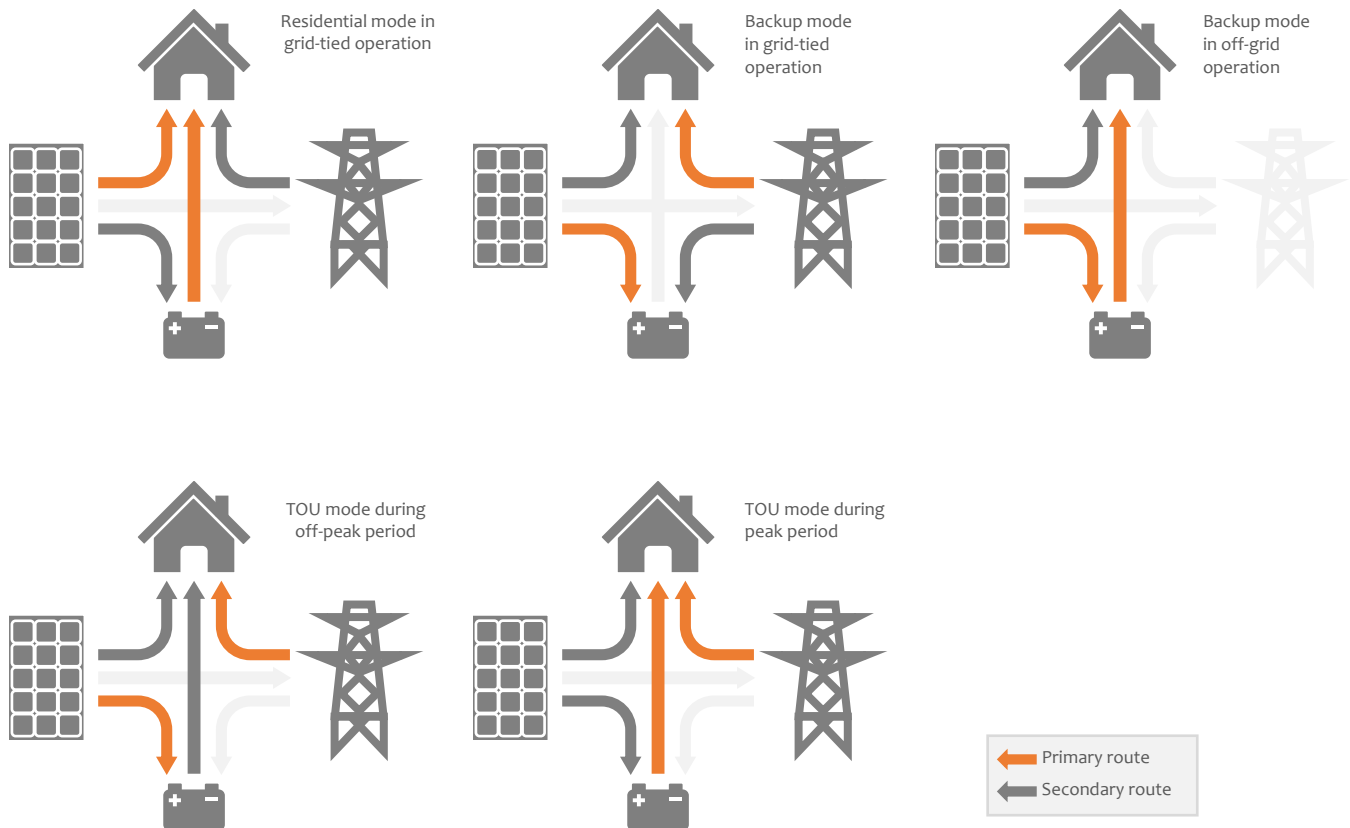
On the Power Flows Page, the  icon will flash when there is a warning. Listed below are the warning codes and their solutions.

CODE	WARNING	SOLUTION
51	Data saving fault.	<ol style="list-style-type: none"> <li>1. Shut down the system completely.</li> <li>2. Restart the system to see if it's ok. If error message still remains, please contact your installer.</li> </ol>
52	Input PV is found lost.	
53	PV input voltage reads low.	<ol style="list-style-type: none"> <li>1. Check if the open circuit voltage of PV modules is higher than 500VDC.</li> <li>2. If PV open circuit voltage is less than 500VDC and the error message remains, please contact your installer.</li> </ol>
54	Power island	<ol style="list-style-type: none"> <li>1. Shut down the system completely.</li> <li>2. Restart the system to see if it's ok. If error message still remains, please contact your installer.</li> </ol>
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.	<ol style="list-style-type: none"> <li>1. The battery voltage is less than 42V.</li> <li>2. Wait PV or Grid to charge up the battery.</li> </ol>
62	Low battery	<ol style="list-style-type: none"> <li>1. Battery capacity is &lt; 30% or battery voltage is &lt; 45.6V.</li> <li>2. Wait for PV or Grid to charge the battery.</li> </ol>
63	Battery is disconnected.	<ol style="list-style-type: none"> <li>1. Shut down the system completely.</li> <li>2. Check if the battery is connected firmly.</li> <li>3. Restart the system to see if it's ok. If error message still remains, please contact your installer.</li> </ol>
64	Inverter output OCP	<ol style="list-style-type: none"> <li>1. Shut down the system completely.</li> <li>2. Restart the system to see if it's ok. If error message still remains, please contact your installer.</li> </ol> Alarm Buzzer: ON – 1sec, OFF – 1sec
65	RS485 communication fault	<ol style="list-style-type: none"> <li>1. Shut down the system completely.</li> <li>2. Restart the system to see if it's ok. If error message still remains, please contact your installer.</li> </ol>
66	Output de-rating	<ol style="list-style-type: none"> <li>1. When system temperature is too high, the output power is de-rating.</li> <li>2. Lower the load or lower the environmental temperature.</li> </ol>

## 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.

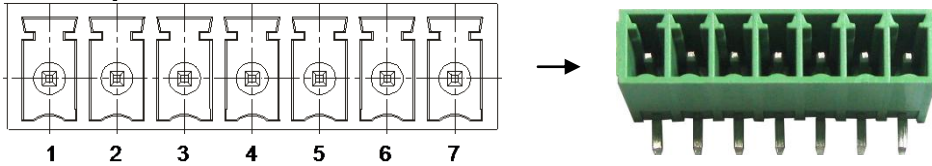
PRESET MODES	PRIORITY LEVEL FOR PV SUPPLY TO			PRIORITY LEVEL FOR CRITICAL LOAD FROM			CHARGE SOURCE		FEED-IN TO THE GRID		DOD OF BATTERY	
	Load	Batt.	Grid	PV	Grid	Batt.	PV	Grid	PV	Batt. (No PV)	On-Grid	Off-Grid
1. Back-up (default)	2	1	3	1	2	3	Yes	Yes	Yes	No	40%	0%
2. Residential	1	2	3	1	3	2	Yes	No	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	Low electricity cost	2	1	3	1	2	Yes	Yes	Yes	No	40%	0%
	High electricity cost	1	2	3	1	3	Yes	No	Yes	No	40%	0%
6. TOU w/Batt. Feed-in	Low electricity cost	2	1	3	1	2	Yes	Yes	Yes	Yes	40%	0%
	High electricity cost	1	3	2	1	3	Yes	No	Yes	Yes	40%	0%



## AUX. CONTROL PORT

On the bottom panel, there are 7 pin for Aux. control port have defined as 1) dry contact, 2) 12VDC source and 3) input voltage level sensor. It could be used to remote control for external generator.

### Electric parameter



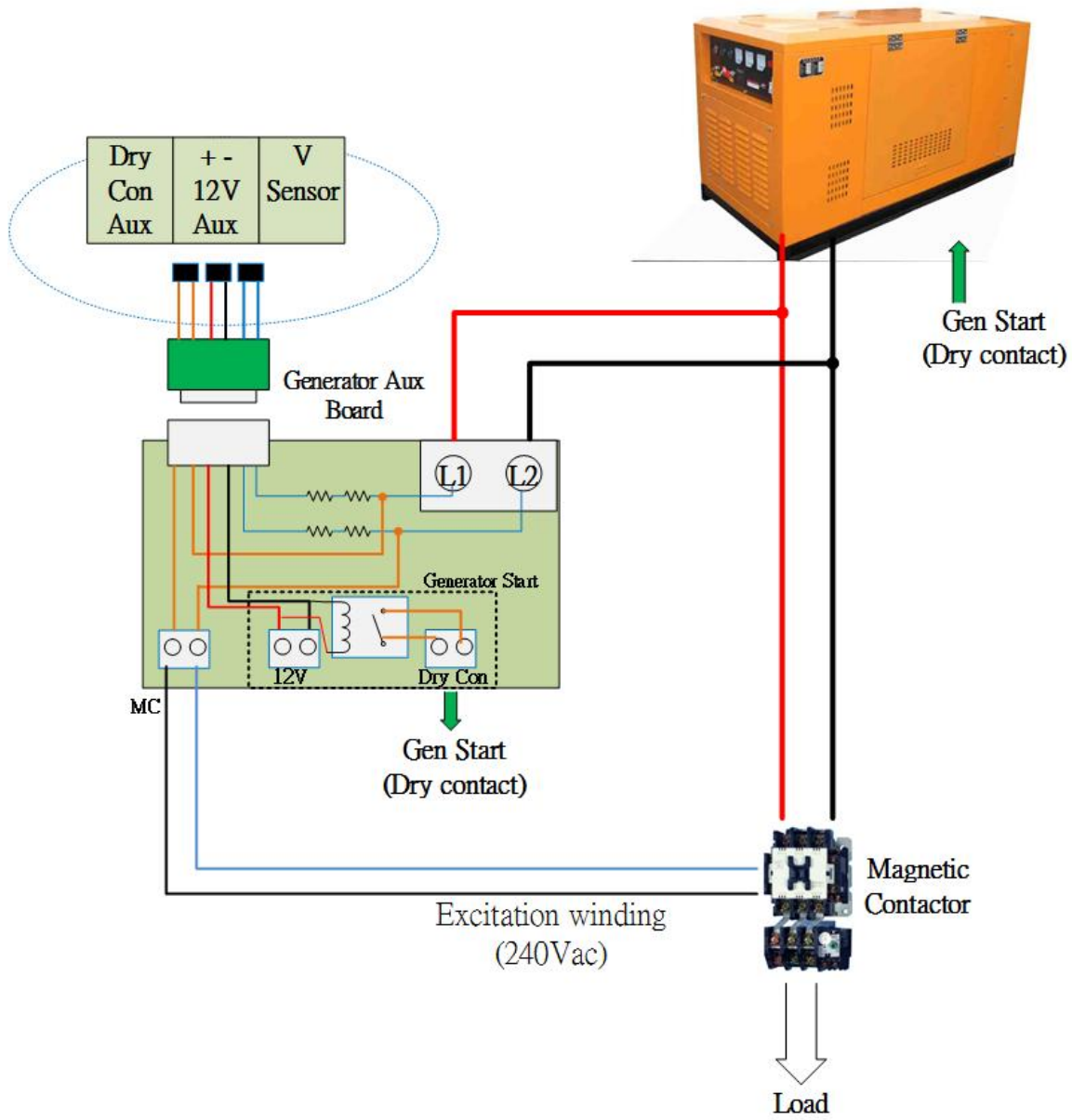
PIN #	SYMBOL	DESCRIPTION	REMARK
1	V- sensor	Input Voltage Level Sensor	By using high resistance resistor for generator voltage sensor. Recommend series resistance is 5MΩ. @240Vac
2	V+ sensor		
3	+12V	12 VDC source	Max. rating current: 250mA
4	Ground		
5	N/A	N/A	N/A
6	Normal Open	Dry contact	Normal : Open Action : Close
7	Common		

### Function Description

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

### Generator Application Schematic

Generator recommended circuit wiring

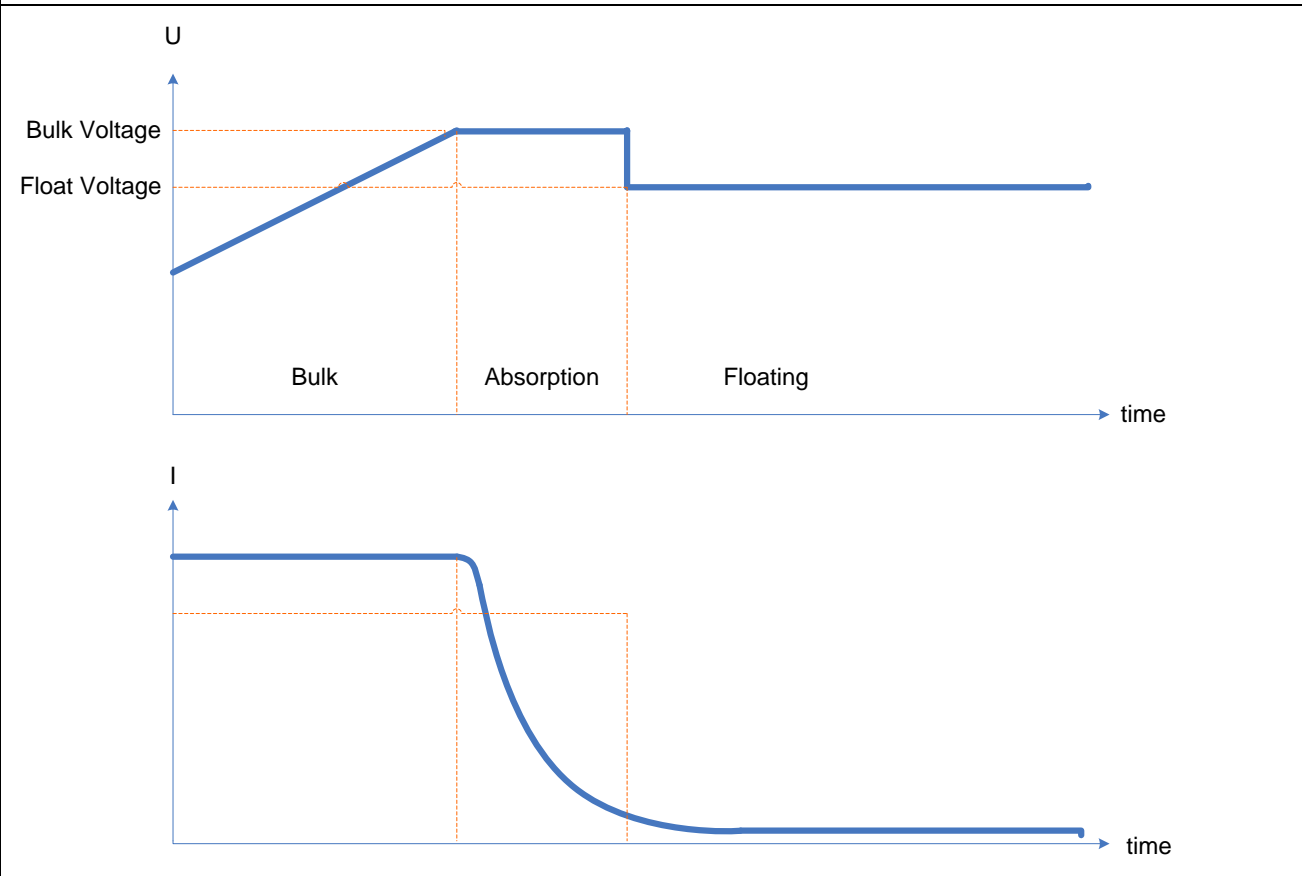


## BATTERY CHARGING REQUIREMENTS

The default charging parameters are shown below. Use this as a reference to make sure the battery selected is compatible with H5000 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 contact your Darfon representative.

Charging Voltage	Default Value
Max. Charging Current	60A
Floating Charging Voltage	54.0 Vdc
Max. Absorption Charging Voltage	56.0 Vdc
Battery Overcharge Protection	58.0 Vdc

Charging process based on default setting.  
 3 stages:  
 First - max. charging voltage increases to 56V;  
 Second- charging voltage will maintain at 56V until charging current is down to 5 Amp;  
 Third- go to floating charging at 54V.



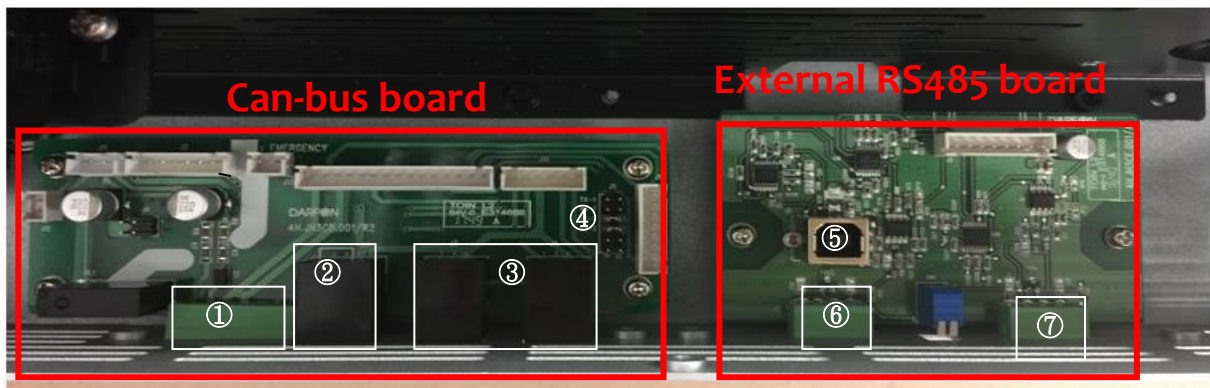
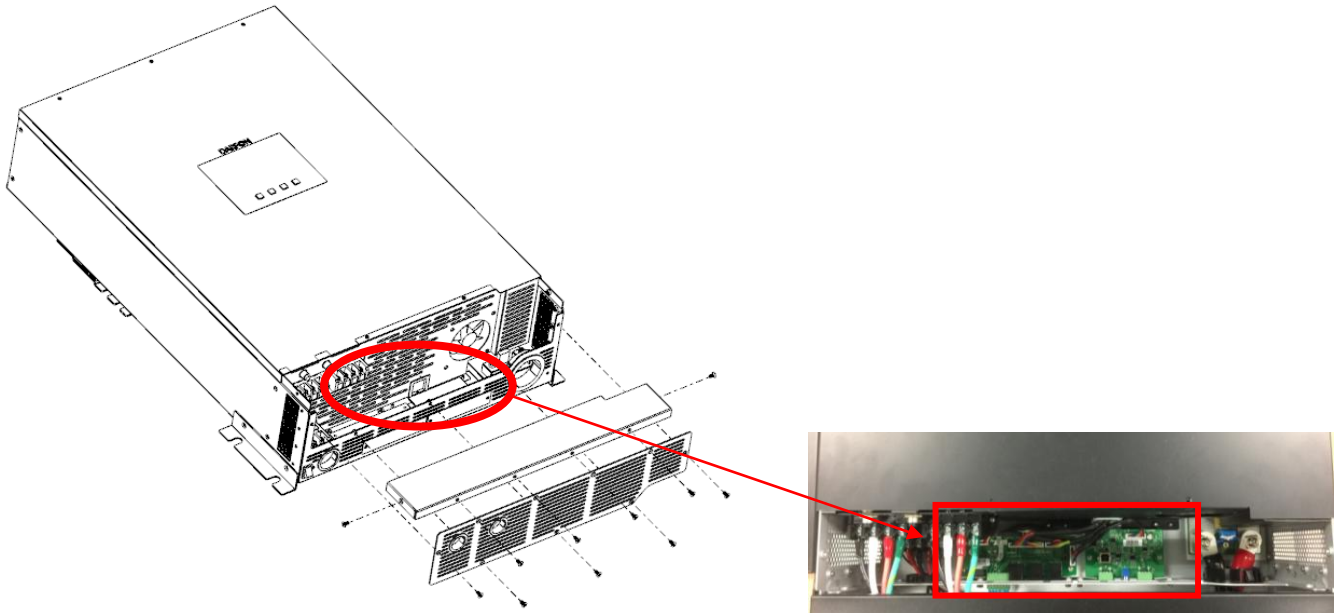
## HARDWARE CONNECTION:

### Connecting to the hardware

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

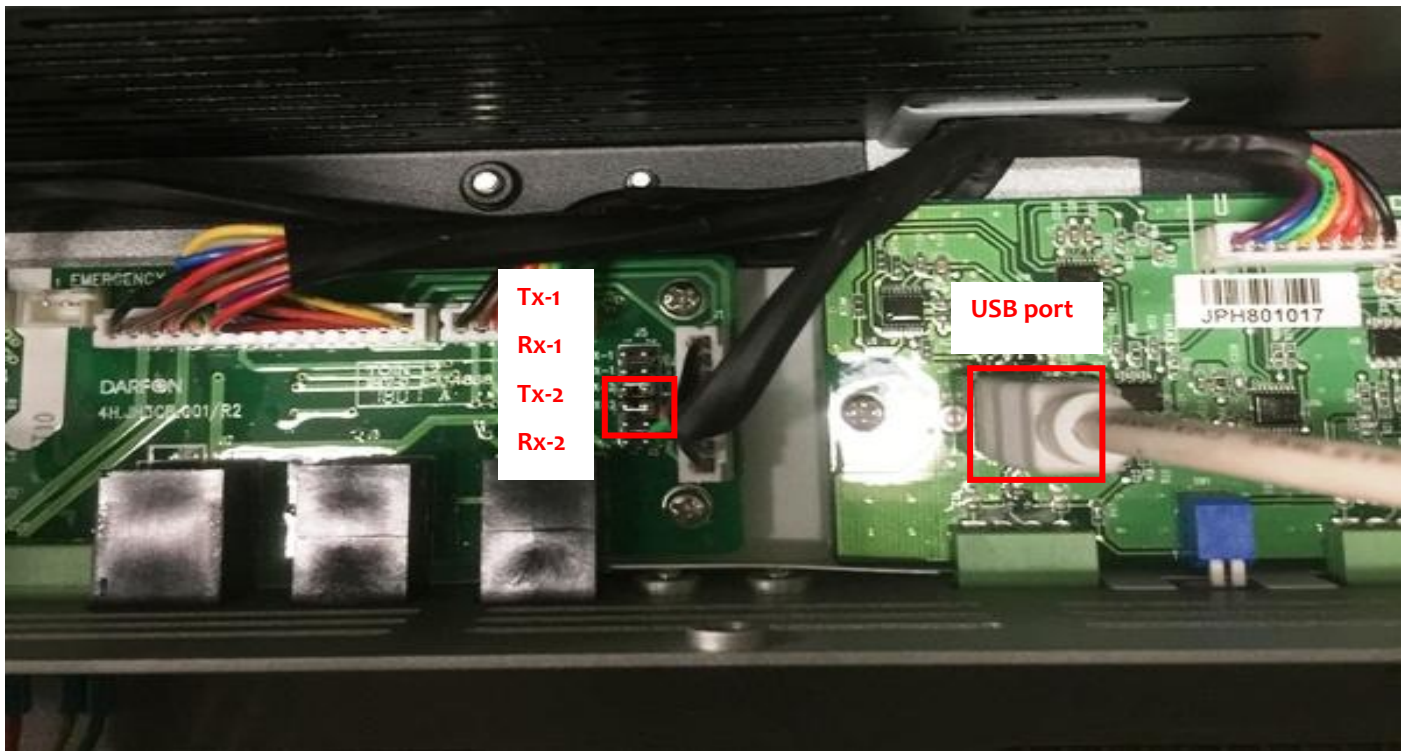
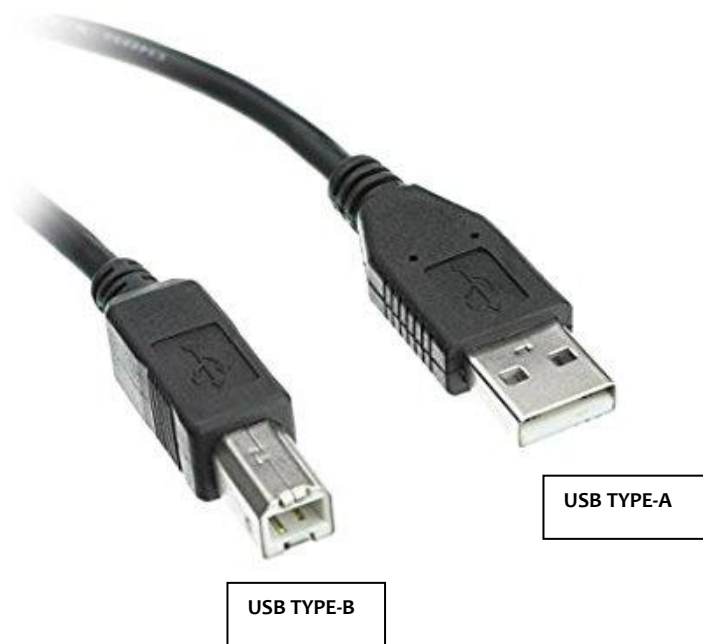
There are two PCB boards,

1. Left side: Can-bus 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
1.	AUX. PORT FOR GENERATION FUNCTION
2.	EXTERNAL DISPLAY PORT
3.	PARALLELED CAN-BUS PORT
4.	BOOT-LOAD AND COMMUNICATION JUMPER.
5.	USB PORT
6.	RS-485 SLAVE
7.	RS-485 MASTER

**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 H5000 hybrid inverter need to connect the power, either choices PV, Battery or Grid.**

Then use the application software setting your parameters.

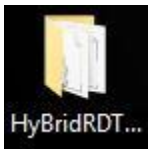
## USE APPLICATION SOFTWARE MODIFIES PARAMETERS:

### Preparation

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

### Connecting to the application software and modifies parameters

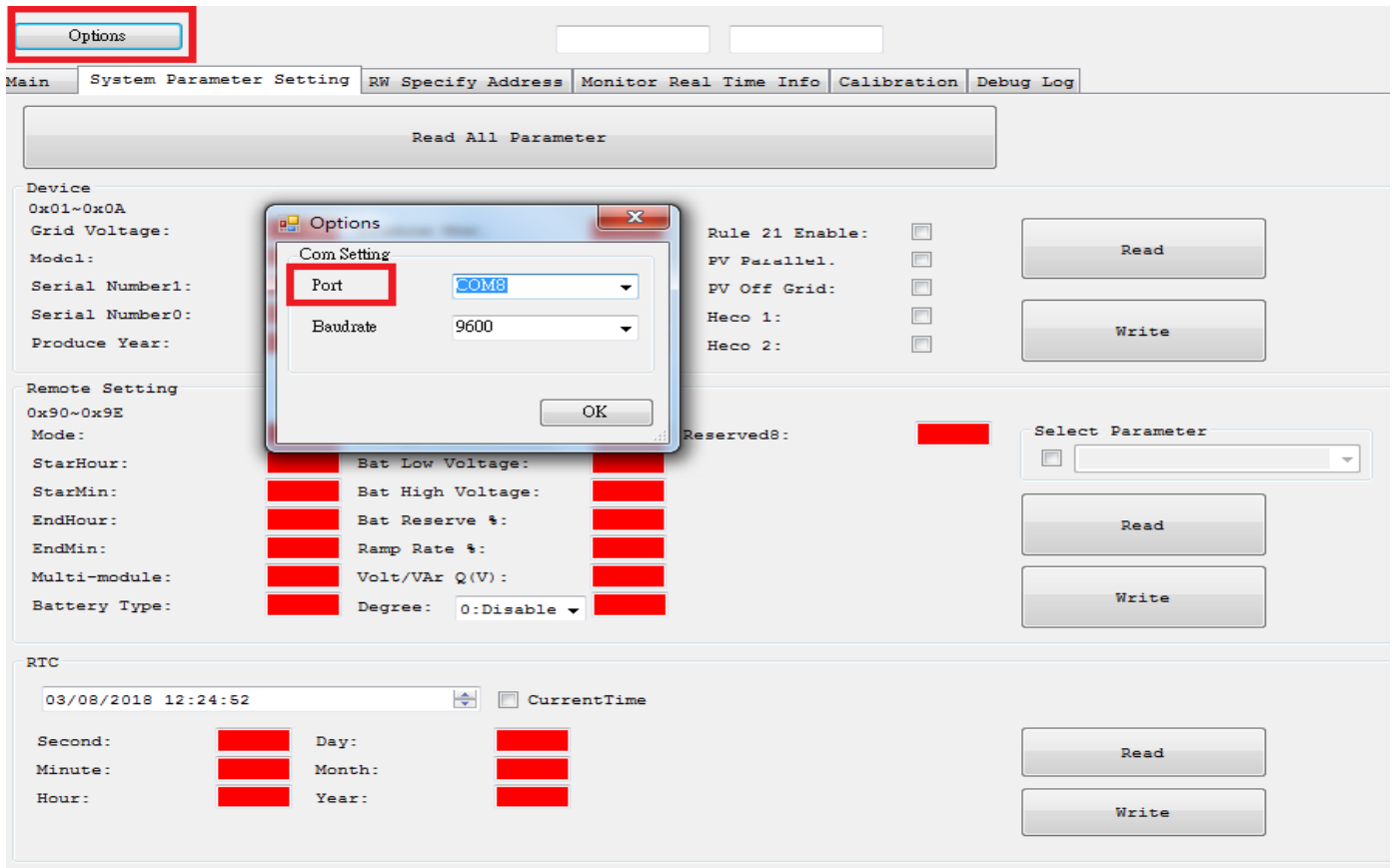
#### Step1: Click “HyBridTool” folder



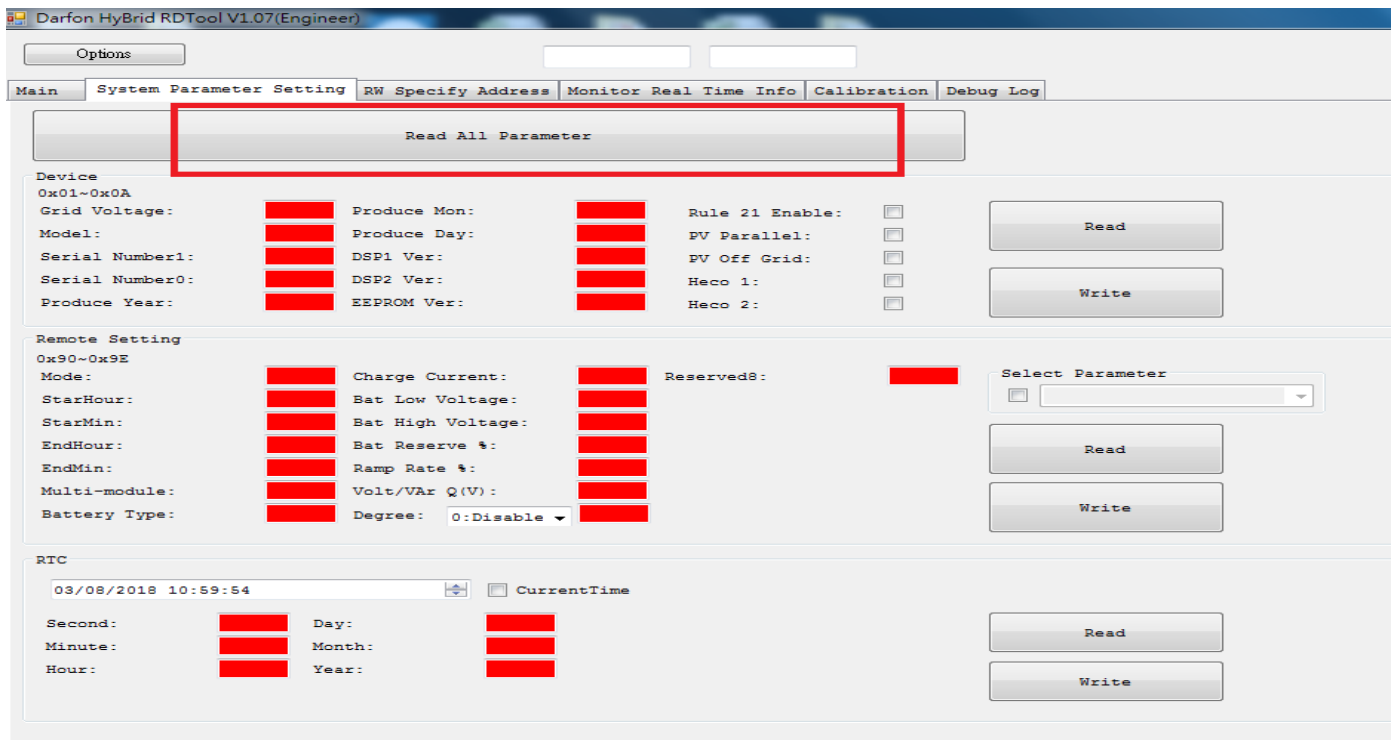
#### Step2: Click “HyBridRDTool”

名稱	修改日期	類型	大小
en-US	2018/1/26 上午 1...	檔案資料夾	
History	2018/1/26 上午 1...	檔案資料夾	
zh-TW	2018/1/26 上午 1...	檔案資料夾	
CaliDefault	2017/10/17 下午 ...	文字文件	1 KB
DebugLog	2018/3/8 上午 11...	文字文件	1 KB
HyBridRDTool	2017/12/29 下午 ...	應用程式	482 KB
HyBridRDTool.pdb	2017/12/29 下午 ...	PDB 檔案	382 KB
HyBridRDTool.vshost	2017/11/20 下午 ...	應用程式	23 KB
HyBridRDTool.vshost.exe.manifest	2017/3/19 上午 0...	MANIFEST 檔案	1 KB
ModbusDefinition	2015/6/18 下午 0...	文字文件	2 KB
Parameter	2015/7/16 下午 0...	文字文件	1 KB
Setting	2018/3/8 上午 11...	組態設定	1 KB

**Step3: Click “Option”, and select port**



**Step4: Click “Read All Parameter”**





**Parameters setting tables:**

■ **Device:**

GRID VOLTAGE	0:240V 1:230V 2:220V 3:208V 4: FULL RANGE	AC L1 TO L2 VOLTAGE
MODEL	SYSTEM	ERS/PV INVERTER
S/N-1	SYSTEM	S/N CODE HIGH SIDE
S/N-0	SYSTEM	S/N CODE LOW SIDE
YEARS	SYSTEM	PRODUCT
MONTH	SYSTEM	PRODUCT
DATE	SYSTEM	PRODUCT
INVERTER VERSION	SYSTEM	INVERTER VERSION
DD VERSION	SYSTEM	DD VERSION
EEPROM VERSION	SYSTEM	EERPOM VERSION
RULE 21 ENABLE	0:DISABLE 1:ENABLE	
PV PARALLEL	0:DISABLE 1:ENABLE	


**Remote setting:**

<b>MODE</b>	<b>0: BACK UP</b> <b>1: RESIDENTIAL</b> <b>2: BACK UP WITHOUT FEED IN</b> <b>3: RESIDENTIAL WITHOUT FEED IN</b> <b>4: TOU WITHOUT BATTERY FEED IN</b> <b>5: TOU WITH BATTERY FEED IN</b>	<b>OPERATING MODE</b>
<b>STARHOUR</b>	<b>0~23</b>	<b>HIGH PRICE PERIOD START HOUR</b>
<b>STARMIN</b>	<b>0~59</b>	<b>HIGH PRICE PERIOD START MINUTE</b>
<b>ENDHOUR</b>	<b>0~23</b>	<b>HIGH PRICE PERIOD END HOUR</b>
<b>ENDMIN</b>	<b>0~59</b>	<b>HIGH PRICE PERIOD END MINUTE</b>
<b>MULTI-MODULE SETTING</b>	<b>0: SINGLE</b> <b>1: PARALLEL</b> <b>2: THREE PHASE</b>	<b>MALFUNCTION!</b>
<b>BATTERY TYPE</b>	<b>0: NO SETTING</b> <b>1: LEAD-ACID</b> <b>2: GLODEN CROWN</b> <b>3: DARFON GROWATT</b>	
<b>BATTERY CURRENT</b>	<b>10A ~ 60A</b>	<b>MAX BATTERY CHARGING CURRENT</b>
<b>BATTERY SHUTDOWN VOLTAGE</b>	<b>44.0V ~ 48.0V</b>	<b>BATTERY CUT OFF VOLTAGE</b>
<b>BATTERY FLOATING VOLTAGE</b>	<b>54.0V ~ 58.0V</b>	<b>BATTERY FLOATING CHARGING VOLTAGE</b>
<b>BATTERY RESERVE PERCENT</b>	<b>10% ~ 60%</b>	<b>BATTERY RESERVE QUANTITY IF GRID CONNECTED</b>
<b>RAMP_RATE_PERCENTAGE</b>	<b>0~50%</b>	<b>0: DISABLE, 1~50%</b>
<b>VOLT/VAR Q(V)</b>	<b>0~3</b>	
<b>DEGREE LEAD/LAG</b>	<b>ABB</b>	<b>A 0: DISABLE, 1: LEAD, 2: LAG,</b> <b>BB: 2 DIGIT VALUE</b>

## MAINTENANCE & CLEANING


Perform 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.

### Battery Maintenance

- Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
- When replacing batteries, replace with the same type and number of batteries or battery packs.
- The following precautions should be observed when working on batteries:
  - a) Remove watches, rings, or other metal objects.
  - b) Use tools with insulated handles.
  - c) Wear rubber gloves and boots.
  - d) Do not lay tools or metal parts on top of batteries.
  - e) Disconnect charging source prior to connecting or disconnecting battery terminals.
  - f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

 **CAUTION.** A battery can present a risk of electrical shock and high short-circuit current.

 **CAUTION.** Do not dispose of batteries in a fire. The batteries may explode.

 **CAUTION.** Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

## SPECIFICATIONS

<b>SOLAR DC INPUT</b>	
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)
<b>AC OUTPUT TO LOAD</b>	
Output Power (Continuous) @ 25°C	5000W
Output Power (Continuous) @ 40°C	4500W
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%
<b>AC INPUT FROM GRID (GRID SUPPORT)</b>	
AC Input Voltage Limits (Bypass)	L-L: 180 to 280V (240 V nominal)
Automatic Transfer Relay Rating / Typical Transfer Time	33A / 20ms
AC Input Frequency Range (Bypass)	55 to 65 Hz
<b>AC OUTPUT TO GRID</b>	
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
<b>EFFICIENCY</b>	
Peak PV to Grid	96%
CEC weighted PV to Grid	95.5%
<b>DC BATTERY CHARGER</b>	
Maximum Charge Current	60A
Output Voltage Range	42 - 60V (48V Nominal)
Power Factor Corrected Charging	>98%
Compatible Battery Types	AGM (default), Gel, Li-ion, custom
Battery Bank Range	200 - 600Ah (Suggested)
<b>GENERAL SPECIFICATIONS</b>	
Product weight	35.0 kg (71.2lb)
Product dimensions (H x W x D)	69 x 44.5 x 15cm (27.2 x 17.5 x 5.9in)
IP degree of protection	NEMA Type 1 Indoor
Temperature	Operating: 0 to 55°C (power derated above 40°C ) Storage: -25 to 70°C
Compliances	UL1741SA, FCC Class B, IEEE 1547
<b>FEATURES</b>	
System monitoring and network communications	Available
Intelligent features	Six operation modes for Grid sell, peak load shave, PV energy generated and prioritized consumption of PV, Grid or battery
Auxiliary port	0 to 12 V, maximum 250 mA DC output, selectable triggers

### GRID SUPPORT PARAMERTERS

Model(s)	H5000	
Certificate #	UL1741SA	
<b>Manufacturer Stated Tolerance</b>		
	Value	unit
Voltage	2%	%
Current	5%	%
Frequency	2%	%
Time	0.1 sec	Sec

#### INVERTER (INPUT) SIDE VOLTAGE

VALUE	RATING	UNITS	DESCRIPTION
V <sub>input max rating</sub>	500	Volts	Max input voltage
V <sub>operating RANGE</sub>	250~430	Volts	Maximum power point track range
I <sub>DC rating</sub>	13A/13A	Amps	DC input current rating for each string

#### INVERTER AC (OUTPUT) SIDE

VALUE	RATING	UNITS	DESCRIPTION
V <sub>AC-NOMINAL(Phase-neutral)</sub>	120	Volts	Nominal Voltage Phase-neutral (if neutral available)
V <sub>AC-NOMINAL(Phase-phase)</sub>	240	Volts	Nominal Voltage Phase-phase
P <sub>OUT</sub>	5	KW	Active Power Output
I <sub>NOMINAL-OUTPUT</sub>	21	Amps	Nominal current per phase
I <sub>MAXIMUM-OUTPUT (at Vlow)</sub>	24	Amps	Maximum output current at lowest operating voltage

VOLTAGE RIDE-THROUGH		Trip time	DESCRIPTION
OV	t <sub>TRIP (V&gt;120%)</sub>	0.166 sec	Trip time when the voltage is above 288Vac
@ I <sub>RMS,max</sub>	t <sub>TRIP (110%&lt;V&lt;120%)</sub>	13 sec	Trip time when the voltage range is between 264Vac and 288Vac
Normal	I <sub>RMS@ (V=90%~109%)</sub>	-	No applicable when the voltage range is between 211.2Vac and 264Vac
UV	t <sub>TRIP (70%&lt;V&lt;88%)</sub>	21 sec	Trip time when the voltage range is between 168Vac and 211.2Vac
@ I <sub>RMS,max</sub>	t <sub>TRIP (50%&lt;V&lt;70%)</sub>	11 sec	Trip time when the voltage range is between 120Vac and 168Vac
	t <sub>TRIP (V&lt;50%)</sub>	1.5 sec	Trip time when the voltage is below 120Vac

FREQUENCY RIDE-THROUGH		Trip time	DESCRIPTION
OF	$t_{TRIP} (F > 62 \text{ Hz})$	0.166 sec	Trip time when the frequency is above 62Hz
@ I <sub>RMS,max</sub>	$t_{TRIP} (60.5 \text{ Hz} < F < 62 \text{ Hz})$	300sec	Trip time when the frequency range is between 60.5Hz and 62Hz
Normal	$I_{RMS}@ (V=58.5\text{Hz} \sim 60.5\text{Hz})$	-	No applicable when the frequency range is between 58.5Hz and 60.5Hz
UF	$t_{TRIP} (57 \text{ Hz} < F < 58.5 \text{ Hz})$	300 sec	Trip time when the frequency range is between 57Hz and 58Hz
@ I <sub>RMS,max</sub>	$t_{TRIP} (F < 57 \text{ Hz})$	0.166 sec	Trip time when the frequency is below 57Hz

POWER FACTOR	Minimum Inductive PF <sub>min,ind</sub>	Minimum Capacitive PF <sub>min,cap</sub>	Power Factor Settling Time	DESCRIPTION
5kW	70%	70%	3 sec	Capacitive (Var injection) power factor to Reactive (Var absorption) power factor range. CA Rule 21 Default PF = 1.0 and off

Volt-VAr Q(V)			
VALUE	RATING	UNITS	DESCRIPTION
S <sub>rated</sub>	5K	VA	Apparent Power Rating (VA)
P <sub>rated</sub>	3.5K	W	Output Power Rating (W)
V <sub>nom</sub>	240	V	Nominal AC EPS voltage (V)
[V <sub>min</sub> , V <sub>max</sub> ]	211~264	V	AC EPS voltage range with function enabled (V)
VAr %	5	%	Reactive Power Accuracy
VAr/s	500	VAr/sec	Maximum Ramp Rate
Q <sub>max,over cap</sub>	3.57	VAr	Maximum Rated Reactive Power Absorption (Inductive, Underexcited)
Q <sub>max,under ind</sub>	3.57	VAr	Maximum Rated Reactive Power Absorption (Inductive, Underexcited)
K VAR <sub>max</sub>	148	VAr/V	Maximum Slope
[Deadband <sub>min</sub> , Deadband <sub>max</sub> ]	235~245	V	Deadband Range (V)

POWER RAMP RATE	RR <sub>norm_up_min</sub>	RR <sub>norm_up_max</sub>	Accuracy	DESCRIPTION
Normal Op RAMP <sub>RATE</sub>	1% (%I <sub>rated</sub> /sec)	50% (%I <sub>rated</sub> /sec)	3%	Percentage of nominal generated power per second "Ramp Rate"
Soft Start RAMP <sub>RATE</sub>	1% (%I <sub>rated</sub> /sec)	50% (%I <sub>rated</sub> /sec)	3%	Percentage of nominal generated power per second "Ramp Rate"

## 5-YEAR LIMITED WARRANTY

Darfon Electronics Corp. and Darfon America Corp. (“Darfon”) H5000 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.

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

Darfon Technical Support

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