

# SP5000 Premium Parallel Installation Guide

## 1. Introduction

This inverter can be used in parallel with maximum 6 units. The supported maximum output power is 60KW/60KVA.

## 2. Parallel cable

You will find the following items in the package:

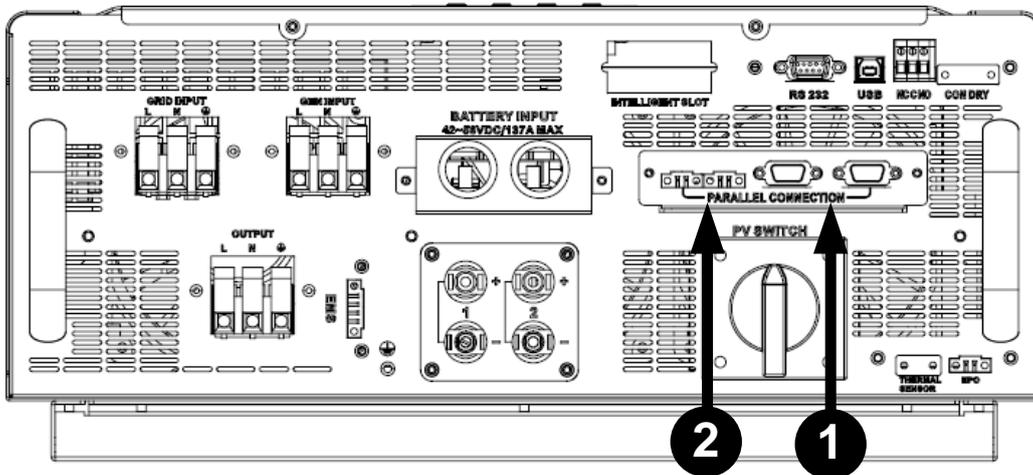


Parallel communication cable



Current sharing cable

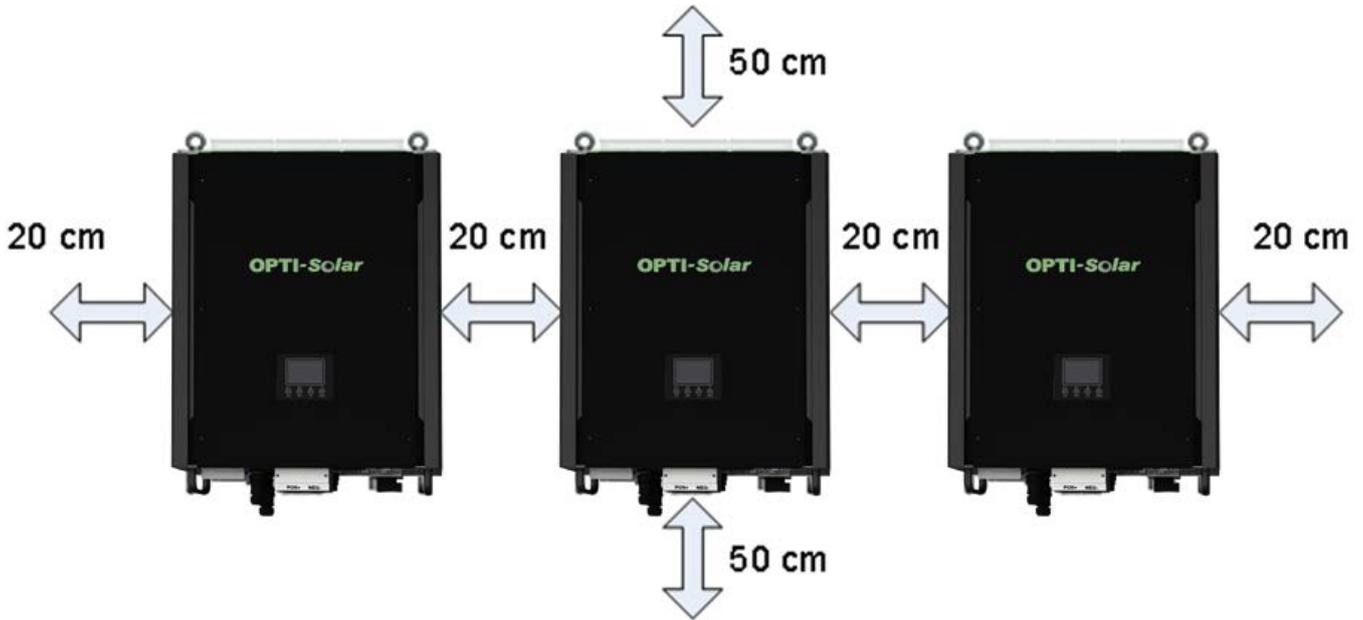
## 3. Overview



1. Parallel communication port
2. Current sharing port

#### 4. Mounting the Unit

When installing multiple units, please follow below chart.



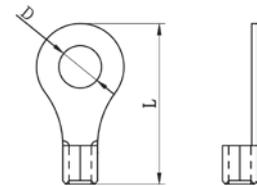
**NOTE:** For proper air circulation to dissipate heat, it's necessary to allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

#### 5. Wiring Connection

The cable size of each inverter is shown as below:

**Recommended battery cable and terminal size for each inverter:**

Ring terminal:



Model	Wire Size	Ring Terminal			Torque value
		Cable mm <sup>2</sup>	Dimensions		
			D (mm)	L (mm)	
5KW	2	38	8.4	54.2	7~12 Nm

**WARNING:** Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

**Recommended AC input and output cable size for each inverter:**

Model	AWG no.	Conductor cross-section	Torque
5KW	10~8 AWG	5.5~10 mm <sup>2</sup>	1.4~1.6Nm

You need to connect the cables of each inverter together. Take the battery cables for example: You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery terminal. The cable size used from joint to battery should be X times cable size in the tables above. "X" indicates the number of inverters connected in parallel. Regarding cable size of AC input and output, please also follow the same principle.

**CAUTION!!** Please install the breaker at the battery side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of battery.

**Recommended breaker specification of battery for each inverter:**

Model	One unit*
5KW	150A/60VDC

\*If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of one unit. "X" indicates the number of inverters connected in parallel.

**Recommended battery capacity**

Inverter parallel numbers	2	3	4	5	6
Battery Capacity	400AH	600AH	800AH	1000AH	1200AH

**CAUTION!** Please follow the battery charging current and voltage from battery spec to choose the suitable battery. The wrong charging parameters will reduce the battery lifecycle sharply.

**Approximate back-up time table**

Load (W)	Backup Time @ 48Vdc 800Ah (min)	Backup Time @ 48Vdc 1200Ah (min)
5,000	240	360
10,000	112	168
15,000	60	90
20,000	40	60
25,000	20	30
30,000	13	20

**PV Connection**

Please refer to user manual of single unit for PV Connection.

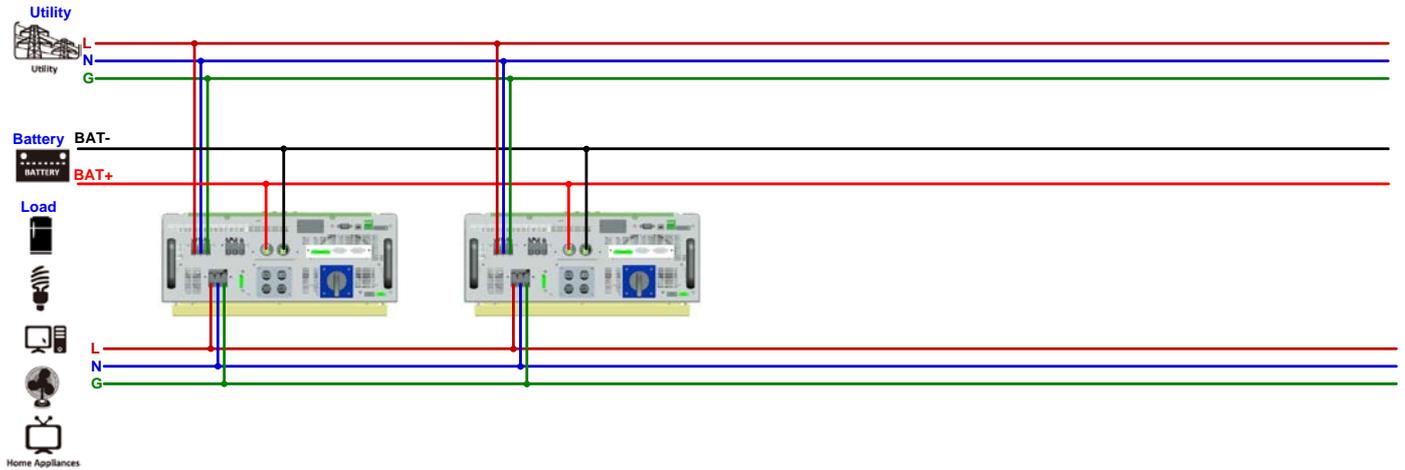
**CAUTION:** Each inverter should connect to PV modules separately.

## 6. Inverters Configuration

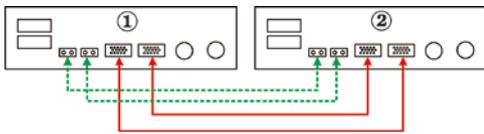
No matter how many pieces of inverters installed in parallel, please connect L, N, G terminals of AC input and AC output from each inverter together separately. Connect all battery terminals of each inverter together. Please refer to the following example of 3 units.

Two inverters in parallel:

### Power Connection

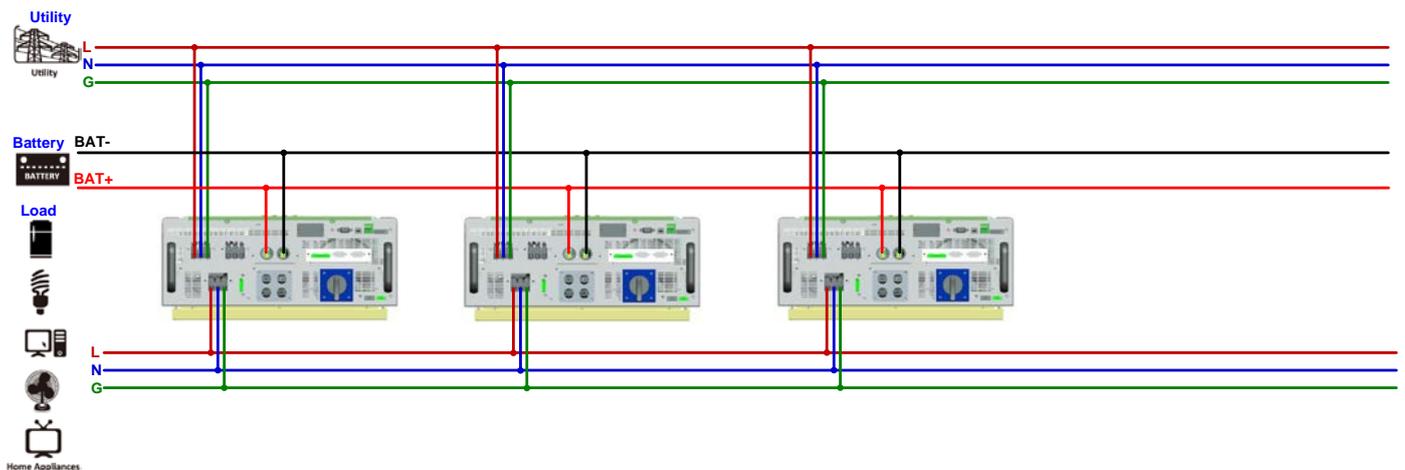


### Communication Connection

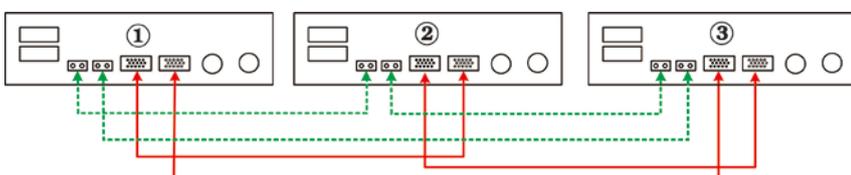


Three inverters in parallel:

### Power Connection

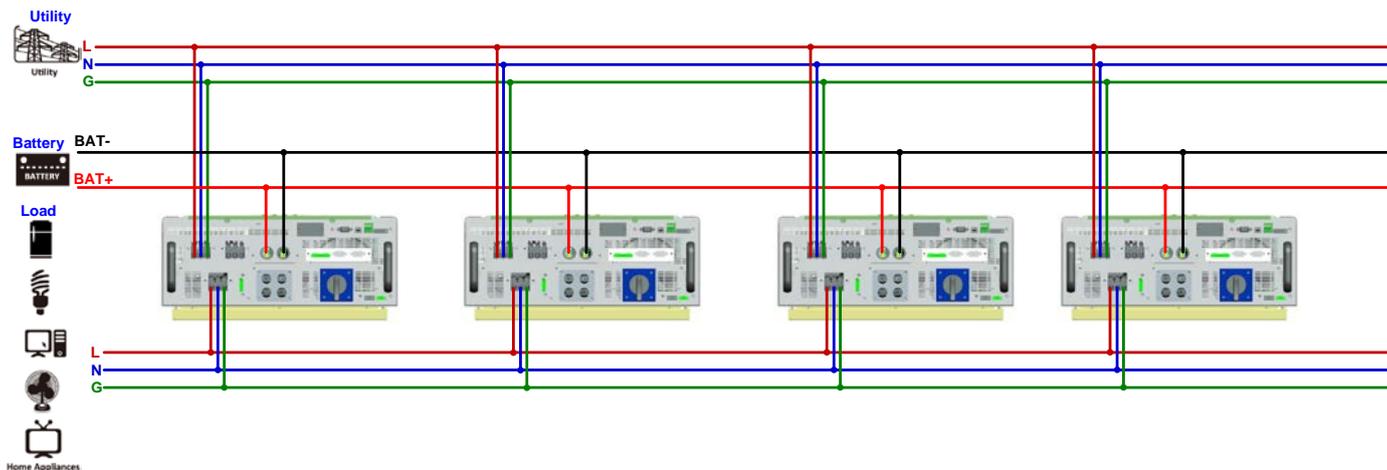


### Communication Connection

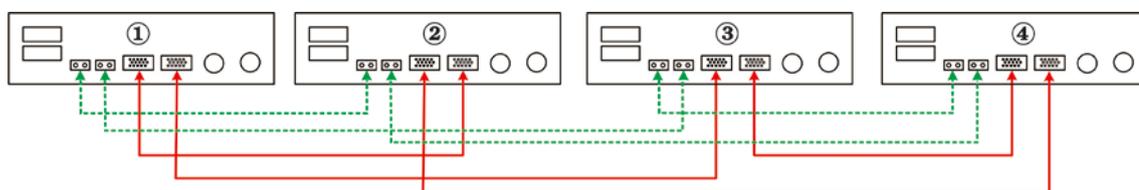


Four inverters in parallel:

### Power Connection

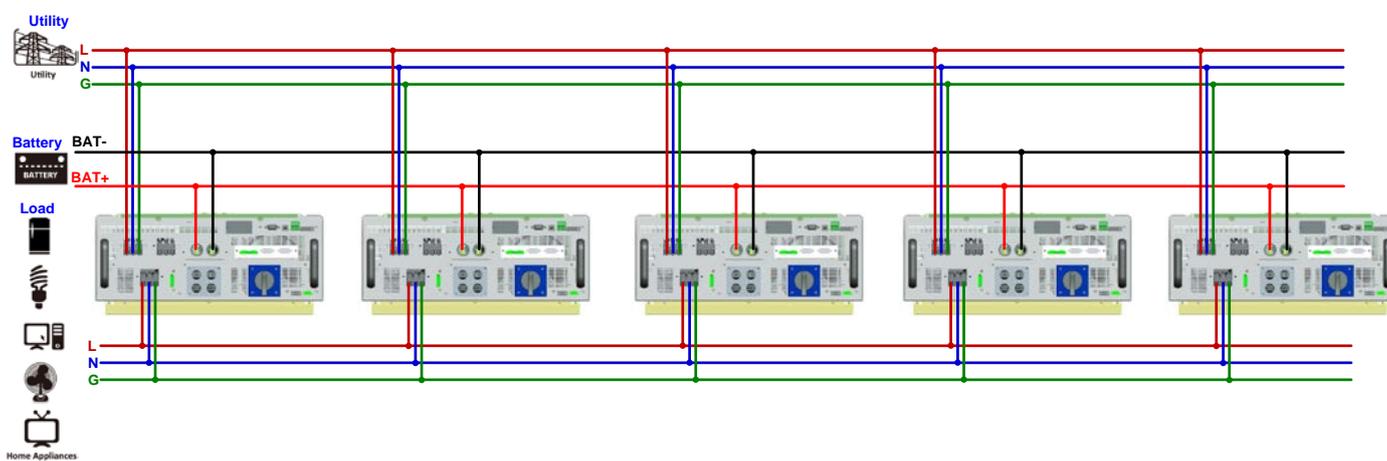


### Communication Connection

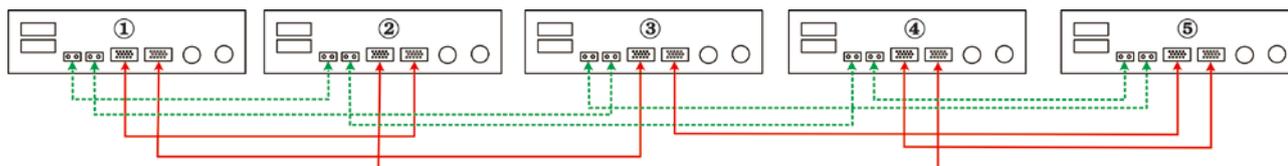


Five inverters in parallel:

### Power Connection

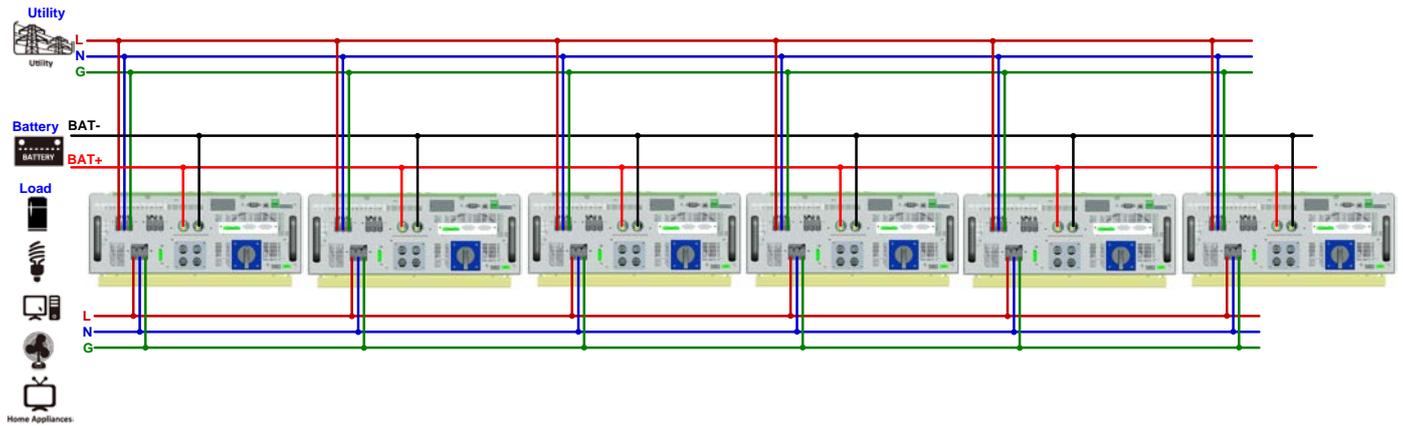


### Communication Connection

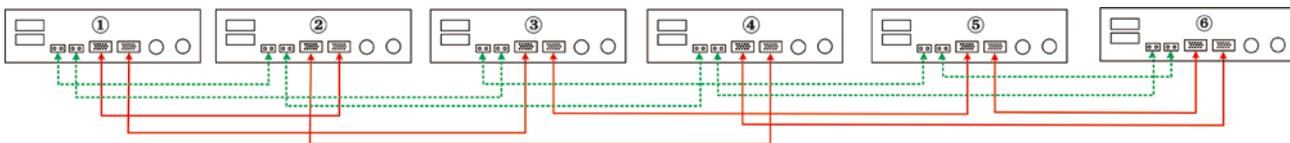


Six inverters in parallel:

### Power Connection



### Communication Connection



## 7. Setting and LCD Display

### Setting Program:

The parallel function setting is only available by Solarpower or Solarpower Pro. Please install the software in your PC first.

For setting, you can set the inverter one by one through RS232 or USB port.

**Note:** When using serial port (USB or RS-232) for communication, you only can monitor the inverter connected with serial port directly. The other inverters will not be listed in Solarpower software. However, some settings can be applied to all with serial port connection. These kinds of settings are listed as below:

Bulk charging voltage(C.V. voltage) 56.1 V  
Floating charging voltage 54.2 V

Battery cut-off discharging voltage when Grid is available 48 V  
Battery re-discharging voltage when Grid is available 54.1 V  
Battery cut-off discharging voltage when Grid is unavailable 42 V  
Battery re-discharging voltage when Grid is unavailable 48 V

Setting

PV energy supply priority setting  
Grid-Tie with Backup (I)  
Priority: 1st: Battery -> 2nd: Load -> 3rd: Grid

Configuration details

Charging source: None  
Not allow to charge battery

Load supply source (PV is available): PV-Grid-Battery  
Priority :1st: PV -> 2nd: Grid -> 3rd: Battery

Load supply source (PV is unavailable): Grid-Battery  
Priority :1st: Grid -> 2nd: Battery

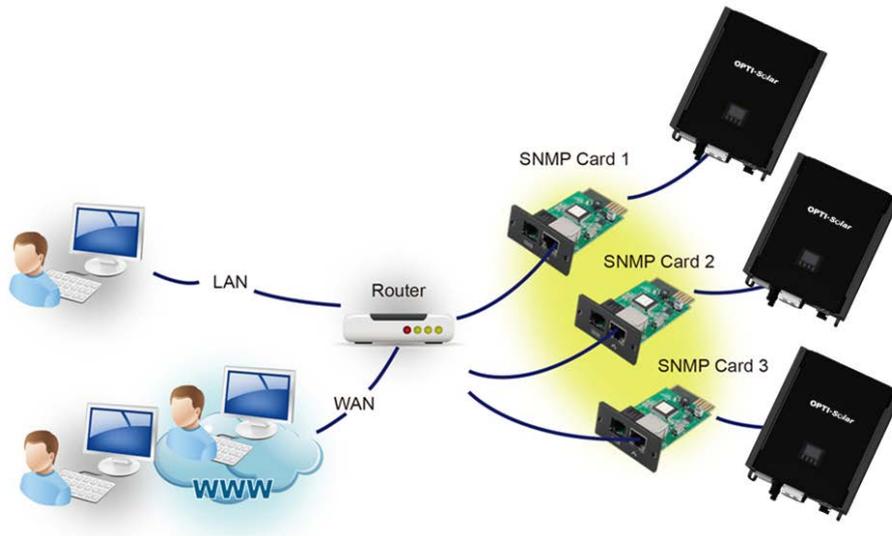
Allow to charge battery  
 Allow AC to charge battery  
 Allow to feed-in to the Grid  
 Allow battery to discharge when PV is available  
 Allow battery to discharge when PV is unavailable  
 Allow battery to feed-in to the Grid when PV is available  
 Allow battery to feed-in to the Grid when PV is unavailable

When battery voltage < 0 V, the AC starts charging

But we suggest you use the SNMP card or Modbus card to combine the system as a centralized monitoring. So you can use “SYNC” option to set all the inverter at the same time.

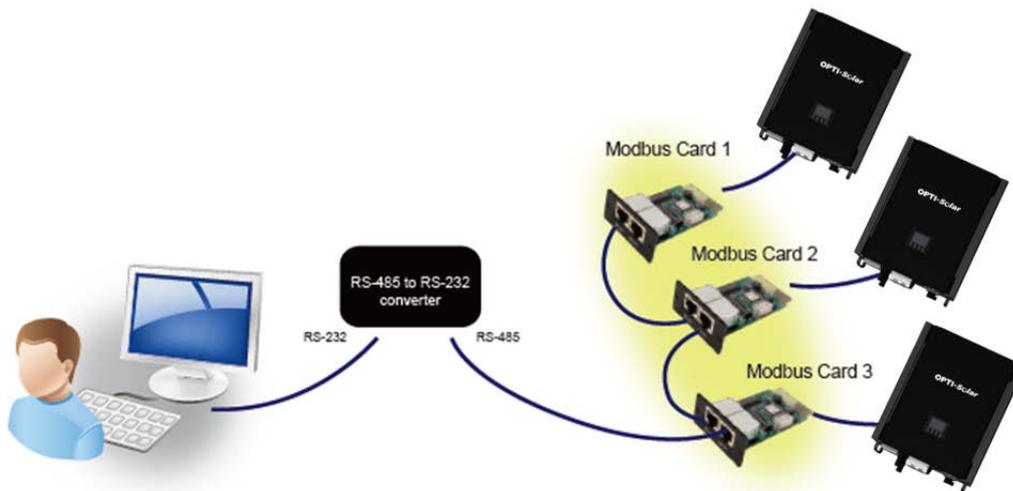
- Use SNMP card to synchronize the parameters:

Each inverter should have one SNMP card. Make sure all of the SNMP cards are connected to the router as a LAN.



- Use Modbus card to synchronize the parameters:

Each inverter should have one Modbus card. Make sure all of the Modbus cards are connected each other and one of the Modbus cards is connected to the computer by RS-485/RS232 converter.



Launch SolarPowerPro in computer and select Device Control >> Parameter Setting >> Parallel output. Two options: Enable or Disable.

If you want to use parallel function, please choose “Enable” and press “” button. Then, “” button will be shown is the screen. Please be sure to click “” button before clicking “” button.

There is a “Sync” button in each parameter setting. When “Sync” is clicked and “Apply” is pressed, this new setting will be applied to all inverters. If not, this setting is only effected in current inverter you choose.

**Note:** Without centralized monitoring system, “Sync” function is not effective. Then, you have to set up the inverter one by one through serial communication port.

## Parallel for output: Enable

The screenshot shows the SolarPower Pro configuration interface. The 'Parallel for output' option is highlighted with a red box and is set to 'Enable'. The interface includes various settings for grid connection, PV input, battery management, and system parameters.

Parameters setting | Restore to the defaults | Output synchronization data | Real-time control

Min. grid-connected voltage: 184 V  Sync   
Max. grid-connected voltage: 264.5 V  Sync   
Min. grid-connected frequency: 47.4 Hz  Sync   
Max. grid-connected frequency: 51.5 Hz  Sync   
The waiting time before grid-connection: 60 Sec.  Sync   
Max. grid-connected average voltage: 253 V  Sync   
Max. feed-in grid power: 10000 W  Sync   
Feed-in power factor: 0.98  Sync   
Min. PV input voltage: 300 V  Sync   
Max. PV input voltage: 900 V  Sync   
Min. MPP voltage: 350 V  Sync   
Max. MPP voltage: 800 V  Sync   
Max. charging current: 60 A  Sync   
Max. AC charging current: 60 A  Sync   
Bulk charging voltage(C.V. voltage): 56.1 V  Sync   
Floating charging voltage: 54.2 V  Sync   
Start LCD screen-saver after: 90 Sec.  Sync   
Battery cut-off discharging voltage when Grid is available: 48 V  Sync   
Battery re-discharging voltage when Grid is available: 54.1 V  Sync   
Battery cut-off discharging voltage when Grid is unavailable: 42 V  Sync   
Battery re-discharging voltage when Grid is unavailable: 48 V  Sync   
Max. battery discharge current in hybrid mode: 300 A  Sync   
Battery temperature compensation: 0 mV  Sync   
Feeding grid power calibration R: 2 W  Sync   
Feeding grid power calibration S: 1 W  Sync   
Feeding grid power calibration T: -1 W  Sync   
Mute Buzzer alarm:  Enable  Disable  Sync   
Mute the buzzer in the Standby mode:  Enable  Disable  Sync   
Mute alarm in battery mode:  Enable  Disable  Sync   
Parallel for output:  Enable  Disable  Sync   
Generator as AC source:  Enable  Disable  Sync   
Activate Li-Fe battery while commissioning:  Enable  Disable  Sync   
Wide AC input range:  Enable  Disable  Sync   
When float charging current is less than X (A) and continued T (Min),then charger off; when battery voltage is less than Y (V),then charger on again.  
X: 0 A T: 60 Min Y: 53 V  Sync   
Any schedule change will affect the power generated and shall be conservatively made.  
System time: 2015-05-14 09:52:39  Sync

## Parallel for output: Disable

The screenshot shows the SolarPower Pro configuration interface. The 'Parallel for output' option is highlighted with a red box and is set to 'Disable'. The interface includes various settings for grid connection, PV input, battery management, and system parameters.

SolarPower Pro configuration | Device control | View | Language | Help

Administrator 192.168.107.233.0000000000000000 2015-05-14 09:54:14 Temperature: 79.0 °C

Parameters setting | Restore to the defaults | Output synchronization data | Real-time control

Min. grid-connected voltage: 184 V   
Max. grid-connected voltage: 264.5 V   
Min. grid-connected frequency: 47.4 Hz   
Max. grid-connected frequency: 51.5 Hz   
The waiting time before grid-connection: 60 Sec.   
Max. grid-connected average voltage: 253 V   
Max. feed-in grid power: 10000 W   
Feed-in power factor: 0.98   
Min. PV input voltage: 300 V   
Max. PV input voltage: 900 V   
Min. MPP voltage: 350 V   
Max. MPP voltage: 800 V   
Max. charging current: 60 A   
Max. AC charging current: 60 A   
Bulk charging voltage(C.V. voltage): 56.1 V   
Floating charging voltage: 54.2 V   
Start LCD screen-saver after: 90 Sec.   
Battery cut-off discharging voltage when Grid is available: 48 V   
Battery re-discharging voltage when Grid is available: 54.1 V   
Battery cut-off discharging voltage when Grid is unavailable: 42 V   
Battery re-discharging voltage when Grid is unavailable: 48 V   
Max. battery discharge current in hybrid mode: 300 A   
Battery temperature compensation: 0 mV   
Feeding grid power calibration R: 0 W   
Feeding grid power calibration S: 0 W   
Feeding grid power calibration T: 0 W   
Mute Buzzer alarm:  Enable  Disable   
Mute the buzzer in the Standby mode:  Enable  Disable   
Mute alarm in battery mode:  Enable  Disable   
Parallel for output:  Enable  Disable   
Generator as AC source:  Enable  Disable   
Activate Li-Fe battery while commissioning:  Enable  Disable   
Wide AC input range:  Enable  Disable   
When float charging current is less than X (A) and continued T (Min),then charger off; when battery voltage is less than Y (V),then charger on again.  
X: 0 A T: 60 Min Y: 53 V   
Any schedule change will affect the power generated and shall be conservatively made.  
System time: 2015-05-14 09:54:14

## Fault code display:

Fault Code	Fault Event	Icon on
60	Power feedback protection	
61	Relay board driver loss	
62	Relay board communication loss	
71	Firmware version inconsistent	
72	Current sharing fault	
80	CAN fault	
81	Host loss	
82	Synchronization loss	

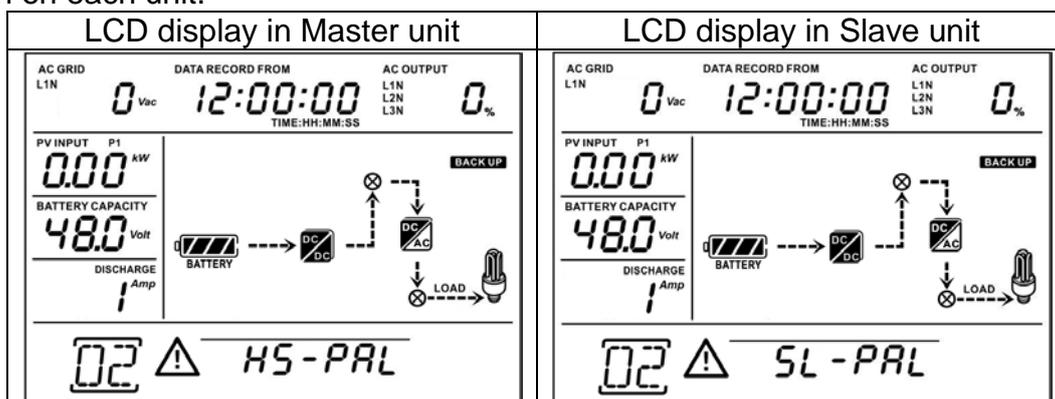
## 8. Commissioning

Step 1: Check the following requirements before commissioning:

- Correct wire connection.
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

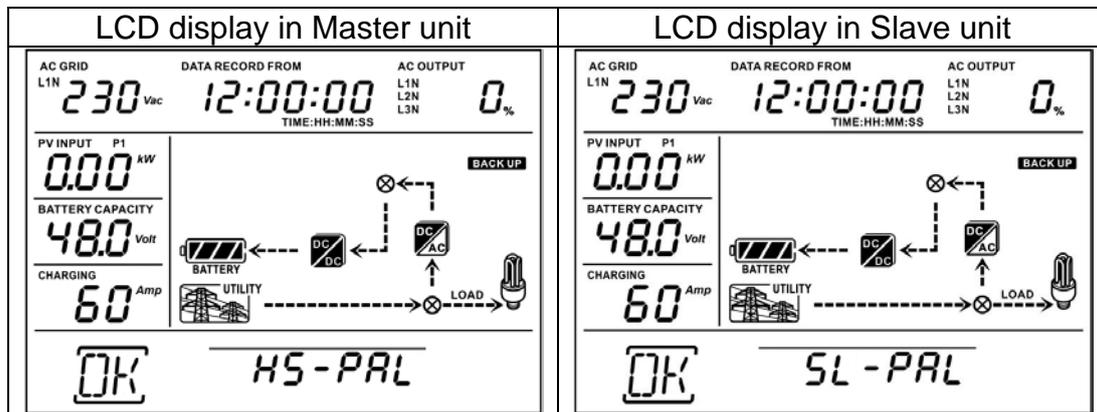
Step 2: Turn on each unit and set “enable parallel for output” on Solarpower or SolarPower Pro. And then shut down all units.

Step 3: Turn on each unit.



**NOTE:** Master and slave units are randomly defined. Warning 02 is AC GRID voltage low.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display fault 82 in following-order inverters. However, these inverters will automatically restart. If detecting AC connection, they will work normally.



Step 5: If there is no more fault alarm, the parallel system is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

## 9. Trouble shooting

Situation		Solution
Fault Code	Fault Event Description	
60	Current feedback into the inverter is detected.	<ol style="list-style-type: none"> <li>1. Restart the inverter.</li> <li>2. Check if L1/L2/L3/N cables are not connected with wrong sequence in all inverters.</li> <li>3. Make sure the sharing cables are connected in all inverters.</li> <li>4. If the problem remains, please contact your installer.</li> </ol>
61	Relay board driver loss	<ol style="list-style-type: none"> <li>1. Disconnect all of power source.</li> <li>2. Only connect AC input, and press Enter key to let it working in bypass mode.</li> <li>3. Check if the problem happens again or not, and feed back the result to your installer.</li> </ol>
62	Relay board communication loss	
71	The firmware version of each inverter is not the same.	<ol style="list-style-type: none"> <li>1. Update all inverter firmware to the same version.</li> <li>2. After updating, if the problem still remains, please contact your installer.</li> </ol>
72	The output current of each inverter is different.	<ol style="list-style-type: none"> <li>1. Check if sharing cables are connected well and restart the inverter.</li> <li>2. If the problem remains, please contact your installer.</li> </ol>
80	CAN data loss	<ol style="list-style-type: none"> <li>1. Check if communication cables are connected well and restart the inverter.</li> <li>2. If the problem remains, please contact your installer.</li> </ol>
81	Host data loss	
82	Synchronization data loss	