

1. Introduction

Thank you for purchasing Modbus Duo Box. This manual contains instructions and warnings that should be followed during the installation, operating and storage of the box. Please keep this manual for further reference.

Applicable models:

- Hybrid inverter 3kw, 4kw, 5kw
- 3-phase hybrid inverter 10kw

Before installation, please make sure this Modbus Duo Box is compatible to your existing inverter.

This external box can provide communication slot for the inverter without intelligent slot. It provides communication between inverter and lithium battery.

Here are the detailed functions:

- Via the communication between the inverter and lithium battery, it's able to re-configure the charging voltage, charging current, battery discharge cut-off voltage and max. discharge current based on the lithium battery parameters.
- Have unit start or stop charging depending on the status of lithium battery.

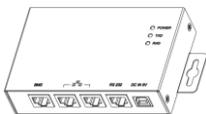
Special Precautions

- If this modbus duo box must be stored prior to installation; storage must be in a dry place
- The admissible storage temperature range is from -10°C to +70°C.

2. Unpacking and Overview

2-1. Package Contents

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:



Modbus Duo Box



RJ45 cable (black)

*For BMS function



RJ45 to RS232 cable

*To connect inverter and box



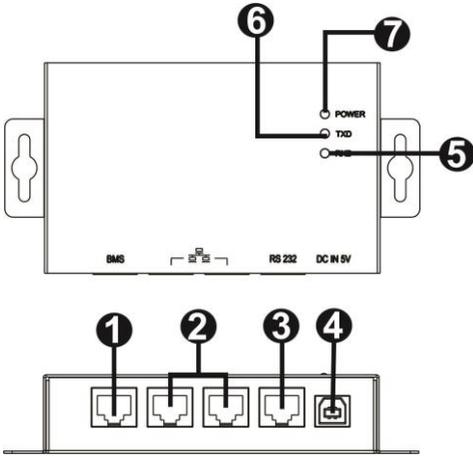
Manual



USB cable

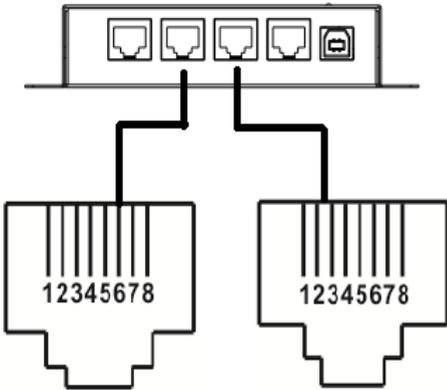
Note: This supplied RJ45 cable is custom-made.

2-2. Product Overview



- ❶ BMS port (Refer to section 3 for the details).
- ❷ Meter port (Refer to section 4 for the details).
- ❸ RS-232 port
- ❹ 5V DC input
- ❺ RS232 RXD LED
- ❻ RS232 TXD LED
- ❼ Power indicator

3. Interface Configuration



- RS485-Meter Pin Configuration

Pin	Function
4	RS-485 - B
5	RS-485 - A
8	GND

- RS232 Pin Configuration:

Pin	Function
1	Txd
2	Rxd
8	GND

- USB spec

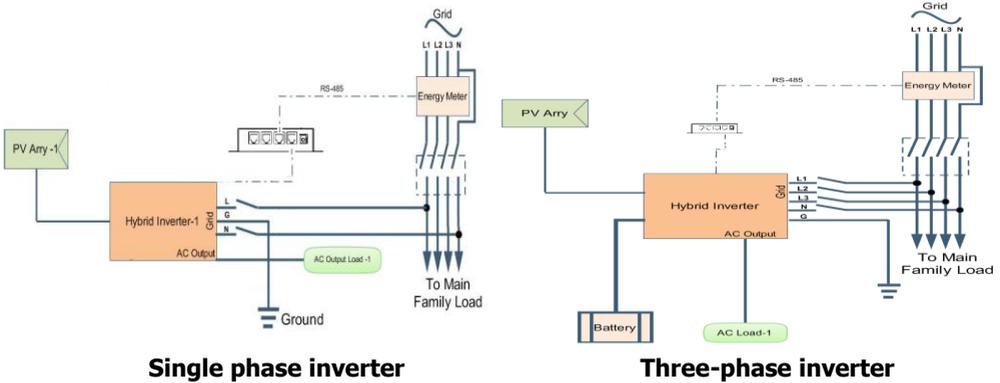
Voltage	5V DC
Current	500 mA

USB port is used as input power source, not for communication purpose.

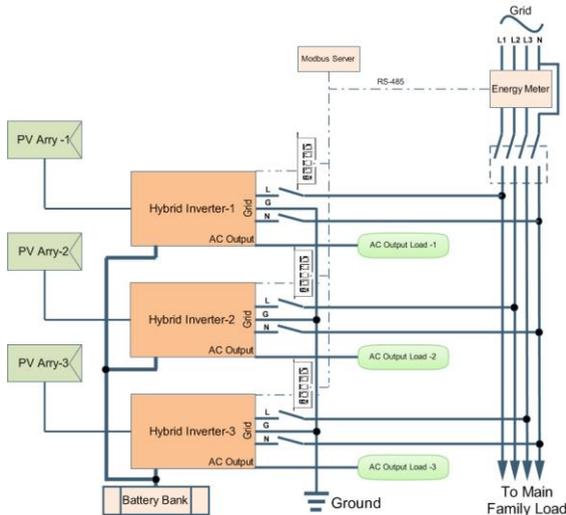
4. BMS Configuration & Connection

4-1. Application Diagram

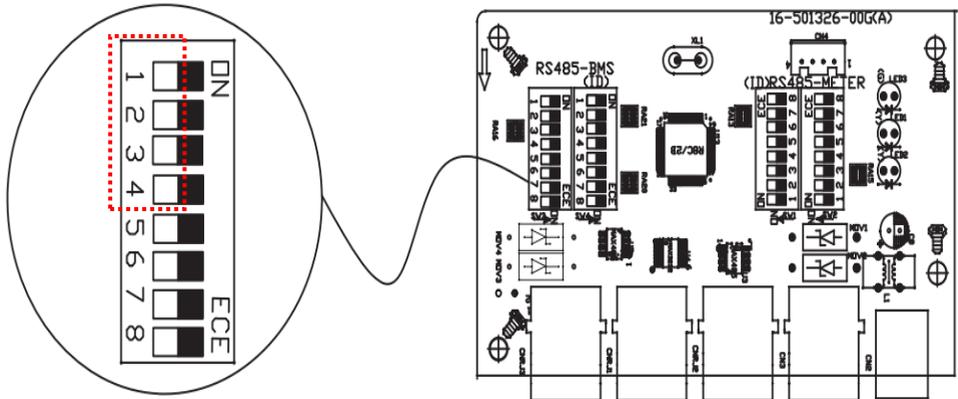
- 1) For single inverter application: Equipped with Modbus Duo Box, hybrid inverter is connected to energy meter with RS485-meter communication port. It's to arrange self-consumption via Modbus Duo Box to control power generation and battery charging of the inverter.



- 2) For three-inverter application: Equipped with Modbus Duo Box, three hybrid inverters are connected to energy meter with RS485-meter communication port. As a control center, Modbus server will control power generation and battery charging of three inverters via Modbus Duo Box for successful self-consumption.



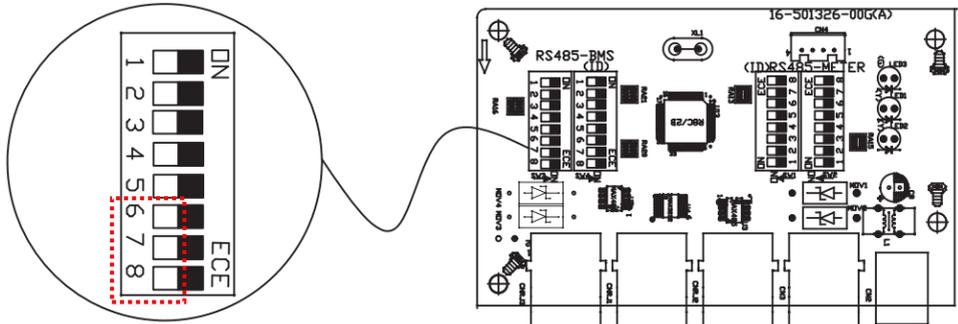
4-2. Communication Format Configuration



Function	Bit Setting		Meaning
Baud rate	# 2	# 1	
	OFF	OFF	2400bps
	OFF	ON	4800bps
	ON	OFF	9600bps*(Default)
Parity check	ON	ON	19200bps
	# 4	# 3	
	OFF	OFF	Even parity
	ON	OFF	Odd parity
	OFF	ON	No parity check 1 stop bit (Default)
	ON	ON	No parity check 2 stop bits

***It's request to use 9600bps baud rate and no parity check1 stop bit if using BMS port. The bit setting should be # 1 as OFF, # 2 as ON, # 3 as ON and # 4 as OFF.**

4-3. Resistance Configuration

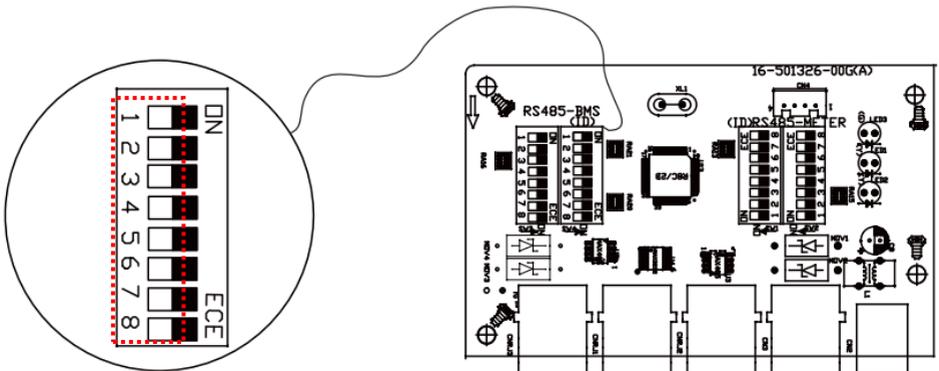


There are three bits (#6, #7 and #8) to configure the BMS resistance. From top to bottom, it's 1 to 8 as shown left. When the switch is pushed left, the bit is set to "OFF". Otherwise, the bit is set as "ON".

Function	Bit #	Setting	Meaning
Push up resistance	# 6	ON	Enable (Default)
		OFF	Disable
Push down resistance	# 7	ON	Enable (Default)
		OFF	Disable
Terminate resistance	# 8	ON	Enable (Default)
		OFF	Disable

4-4. SW4 Reset

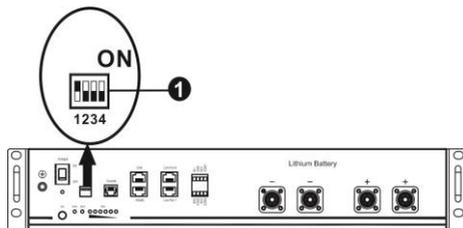
All of dip switches in SW4 should be switched to "OFF" or "ON" status.



Bit #	Setting	Meaning
# 1	ON	Enable (Default)
# 2	OFF	Disable(Default)
# 3	OFF	Disable(Default)
# 4	OFF	Disable(Default)
# 5	OFF	Disable(Default)
# 6	OFF	Disable(Default)
# 7	OFF	Disable(Default)
# 8	OFF	Disable(Default)

4-5. Lithium Battery Communication Configuration

1. ADD Switch: There are 4 ADD switches on lithium battery to define different baud rate and battery group address. If switch position is turned to bottom for "OFF" position, it means "0". If switch position is turned to upper for "ON" position, it means "1".



- Dip 1 is "ON" to represent the baud rate 9600.
- Dip 2, 3 and 4 are to set up battery group address.

Dip switch 2, 3 and 4 on master battery (first battery) are to set up or change the group address.

NOTE: "1" is upper position and "0" is bottom position.

Dip 1	Dip 2	Dip 3	Dip 4	Group address
1: RS485 baud rate=9600	0	0	0	Single group only. It's necessary to set up master battery with this setting and slave batteries are unrestricted.
Restart to take effect	1	0	0	Two-group condition. It's necessary to set up master battery on the first group with this setting and slave batteries are unrestricted.
	0	1	0	Two-group condition. It's necessary to set up master battery on the second group with this setting and slave batteries are unrestricted.

NOTE: The maximum groups of lithium battery is 2 and for maximum number for each group, please check with battery manufacturer.

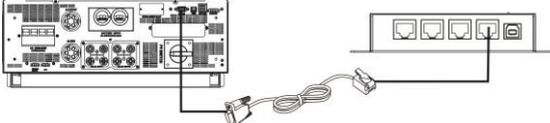
4-6. Active Function

This function is to activate lithium battery automatically while commissioning. After battery wiring and commissioning is successfully, if battery is not detected and active function is enabled in bundled software, the inverter will automatically activate battery if the inverter is powered on.

4-7. Connection and Operation

After configuration, please connect this box to inverter and Lithium battery by following below steps.

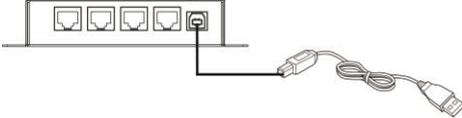
(1) Use supplied RJ45(gray) cable to connect Modbus duo box and the inverter.



(2) Use supplied RJ45(black) cable to connect Modbus Duo Box and Lithium battery.



(3) Use supplied USB cable to connect Modbus Duo Box and DC input (5VDC) source.



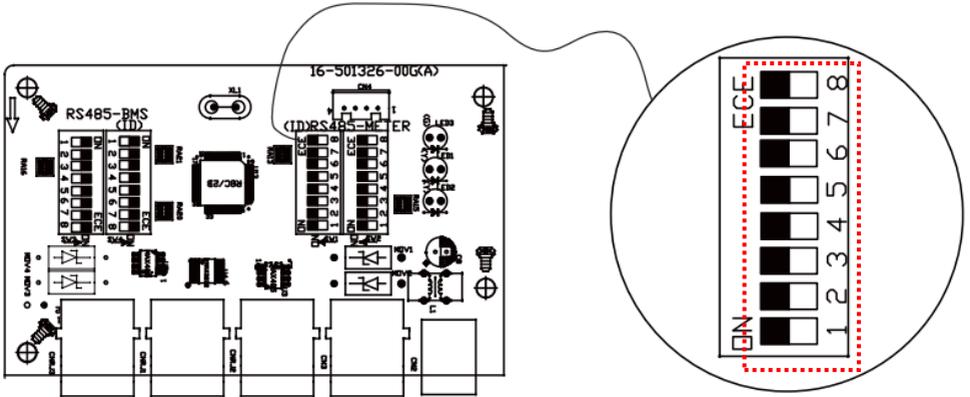
(4) Switch on Lithium battery.

(5) Turn on the inverter.

After all wires are connected well and the communication between the inverter and battery is successful, it will show "LI -bat" flashing on the LCD screen.

5. Meter Port Configuration

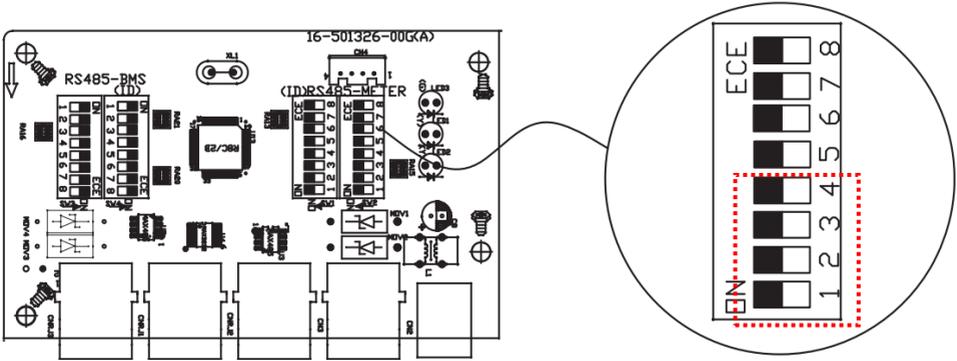
5.1 Machine ID Configuration



There are eight bits to present ID of each box. Use SW1 to set machine ID. From top to bottom, it's 8 to 1. As shown, when the switch is pushed left as "ON" position, the value of this bit is set to "one". Otherwise, the value of the bit is set as zero when the switch is pushed to right as "OFF" position. The ID of modbus duo box is set to 0x01 as chart. Please check appendix for detailed ID no. and SW1 setting.

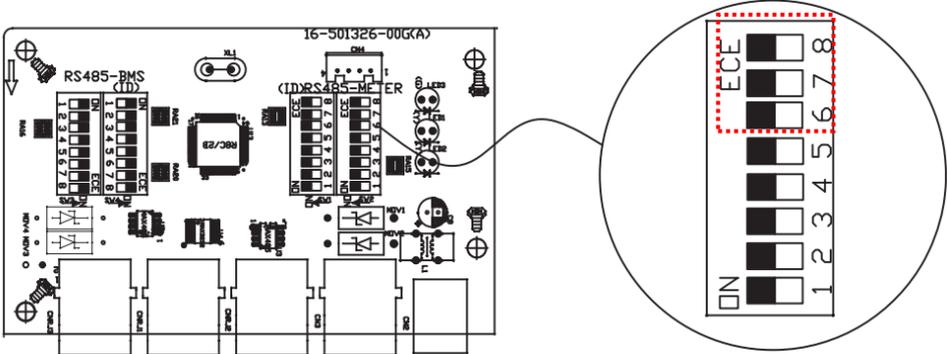
Bit #	Setting	Meaning
# 1	ON	Enable (Default)
# 2	OFF	Disable(Default)
# 3	OFF	Disable(Default)
# 4	OFF	Disable(Default)
# 5	OFF	Disable(Default)
# 6	OFF	Disable(Default)
# 7	OFF	Disable(Default)
# 8	OFF	Disable(Default)

5.2 Communication Format Configuration



Function	Bit Setting		Meaning
Working mode	# 2	# 1	
	OFF	OFF	Working in server mode
	ON	ON	Working in single mode (Reset total feed-in power to zero)
	ON	OFF	Working in single mode (Reset feed-in power to zero in each phase. Only apply for 3-phase inverter)
Parity check	# 4	# 3	
	OFF	OFF	Even parity
	ON	OFF	Odd parity
	OFF	ON	No parity check 1 stop bits (Default)
	ON	ON	No parity check 2 stop bits

5.3 Resistance Configuration



Function	Bit #	Setting	Meaning
Push up resistance	# 6	ON	Enable (Default)
		OFF	Disable
Push down resistance	# 7	ON	Enable (Default)
		OFF	Disable
Terminate resistance	# 8	ON	Enable (Default)
		OFF	Disable

5.4. Single Inverter Connection

5.4.1. Configuration

CAUTION: Before wiring connection, make sure that configurations of modbus duo box and energy meter are the same.

1) Energy meter configuration

Setting parameters:

Name	modbus ID	bate rate(bps)	parity check	stop bit
Energy meter	001	19200	NONE	1

A. Enter set-up mode before setting up all parameters.

To enter set-up mode, press  button for 3 seconds until password screen appears.



Setting menu is password-protected. It's requested to enter correct password (default '1000') before proceeding. If an incorrect password is entered, the screen will display "Err".



B. Set up modbus ID (modbus address) as 001.

1	<p>The LCD screen displays 'SET' on the top line, 'Addr' on the second line, and '001' on the third line.</p>	<p>From main menu, press M or P to jump to modbus address (Addr). Press E to enter Modbus ID setting submenu.</p>
2	<p>The LCD screen displays 'SET' on the top line, 'Addr' on the second line, and '001' on the third line.</p>	<p>Press M or P to enter ID numbers. The range is from 000 to 247.</p>

C. Set up baud rate as 19.2K Hz

1	<p>The LCD screen displays 'SET' on the top line, 'BAUD' on the second line, and '9.6 k' on the third line.</p>	<p>From main menu, press M or P to jump to Baud Rate submenu. Press E to enter Baud Rate submenu.</p>
2	<p>The LCD screen displays 'SET' on the top line, 'BAUD' on the second line, and '9.6 k' on the third line. The '9.6' is circled in red.</p>	<p>The current setting will flash.</p>
3	<p>The LCD screen displays 'SET' on the top line, 'BAUD' on the second line, and '38.4 k' on the third line.</p>	<p>Press M or P to view all options in order. There are four options available to choose: 2.4k, 4.8k, 9.6k, 19.2k and 38.4k.</p>

4		<p>When 19.2k is displayed, press  to confirm setting. Then, press  to return to main menu.</p>
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D. Set up parity as NONE

1		<p>From the main menu, press  or  to jump to Parity (PAR1) submenu. Press  to enter Parity submenu.</p>
2		<p>The current setting will flash. Press  or  to view all options in order. There are three options available to choose: EVEN, ODD and NONE.</p>
3		<p>When NONE is displayed, press  to confirm setting. Then, press  to return to main menu.</p>

E. Set up stop bit as 1

1		<p>From the main menu, press  or  to jump to STOP (StoP) submenu. Press  to enter Stop submenu.</p>
2		<p>The current setting will flash. Press  or  to view all options in order. There are two options available to choose: 1 or 2.</p>

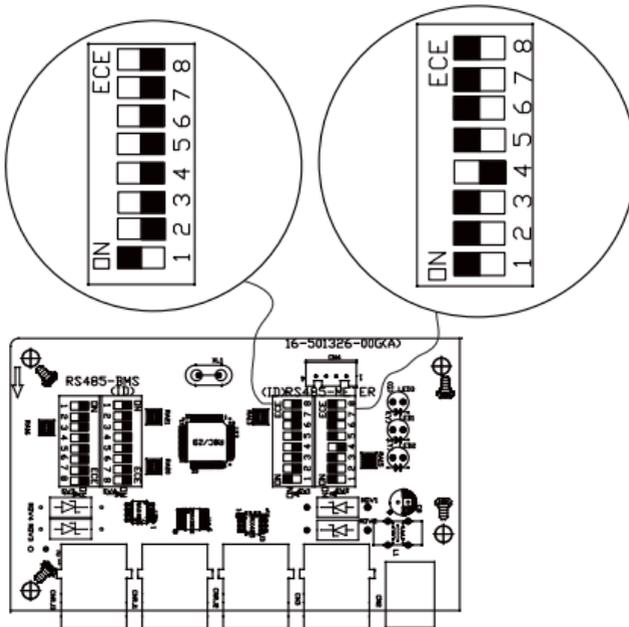
3		<p>When 1 is displayed, press to confirm setting. Then, press to return to main menu.</p>
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2) Modbus Duo Box configuration

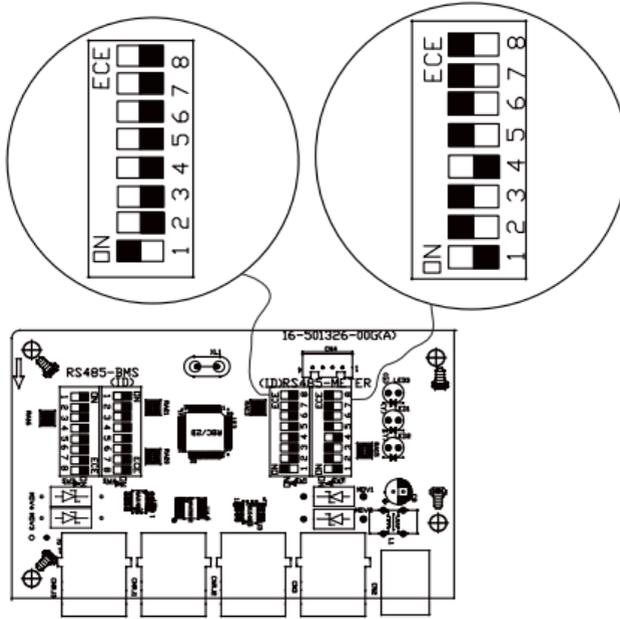
Setting parameters:

Name	modbus ID	bate rate(bps)	parity check	stop bit
Modbus duo box	001	19200	NONE	1
	Set up modbus duo box working in single mode. (Refer to section 5.2.)			

- ① Reset total feed-in power to zero



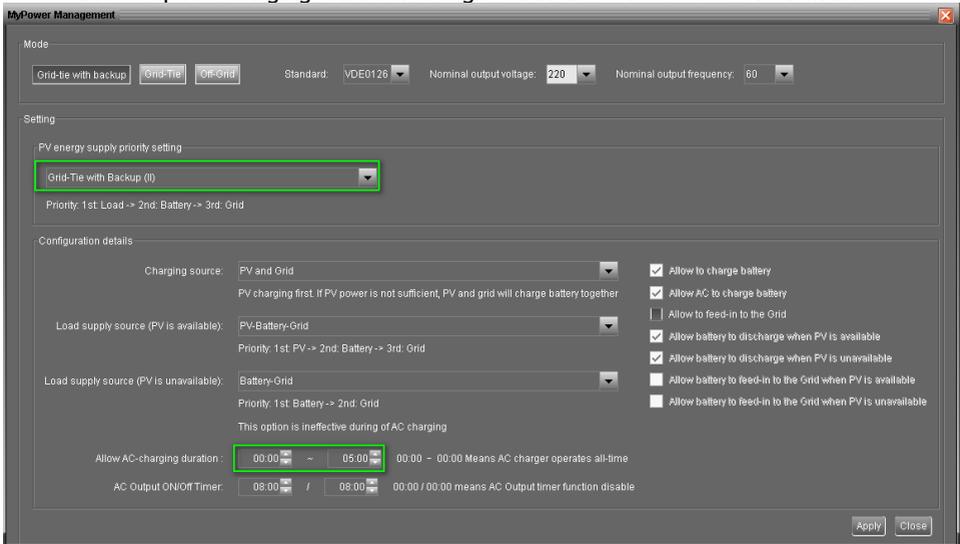
- ② Reset feed-in power to zero in each phase. (Only apply for 3-phase inverter)



3) Software configuration

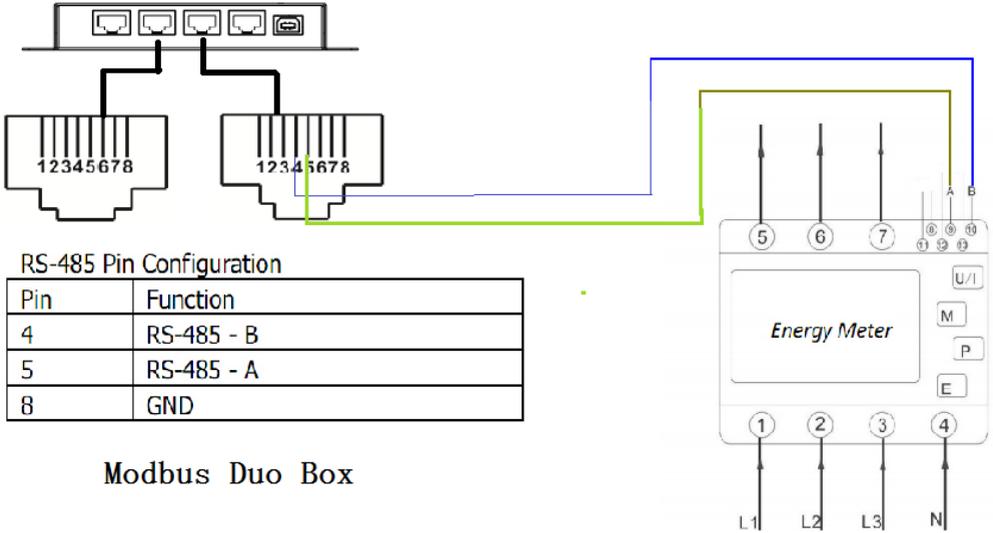
Setting parameters:

- A. PV energy supply priority setting: Grid-Tie with backup (II)
- B. Set up AC-charging duration at night such as "00:00-05:00" as default.



5.4.2. Wiring Connection

Please follow below chart for wiring connection between Modbus Duo Box and energy meter:



RS-485 Pin Configuration

Pin	Function
4	RS-485 - B
5	RS-485 - A
8	GND

Modbus Duo Box

Single inverter connection

5.6 Three-inverter Connection

5.6.1. Configuration

CAUTION: Make sure that all modbus addresses are different in the modbus network and modbus duo box are working in server mode.

1) Energy meter configuration (Refer to section 5.4.1 for the details)

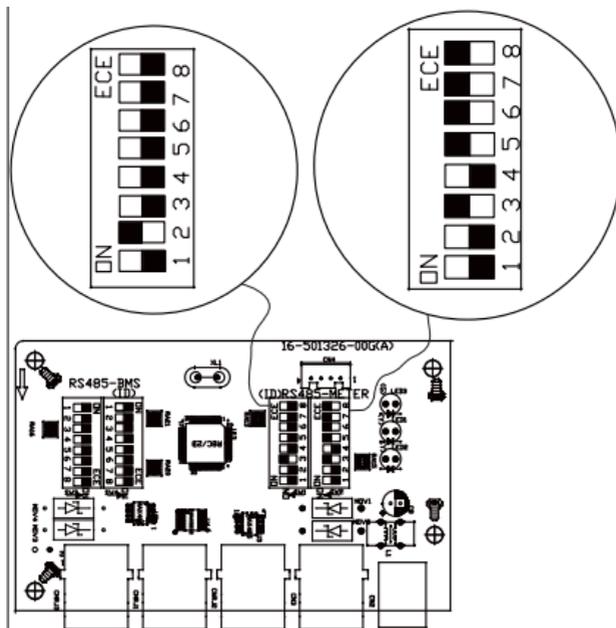
Setting parameters:

Name	modbus ID	bate rate(bps)	parity check	stop bit
Energy meter	001	19200	NONE	1

2) Modbus Duo Box configuration

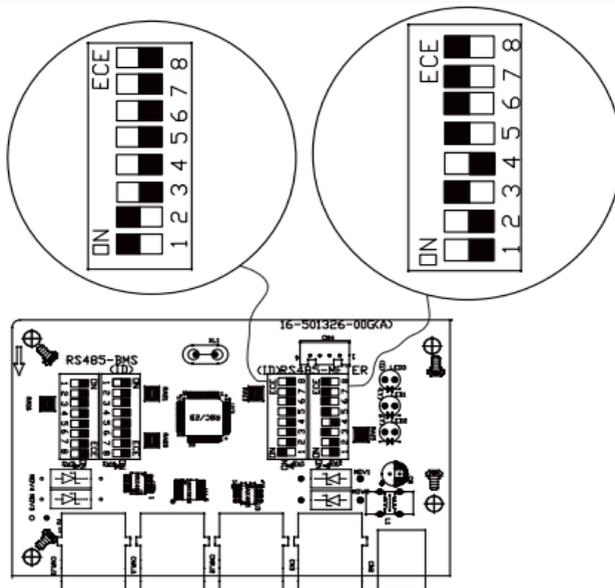
Setting parameters for Modbus Duo Box No. 1:

Name	modbus ID	bate rate(bps)	parity check	stop bit
Modbus Duo Box No. 1	002	19200	NONE	1
Setting modbus duo box in server mode. (Refer to section 5.2)				



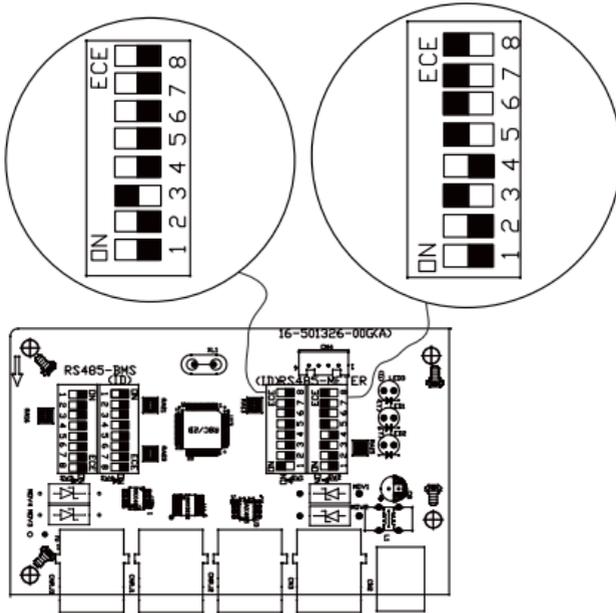
Setting parameters for Modbus Duo Box No. 2:

Name	modbus ID	bate rate(bps)	parity check	stop bit
Modbus Duo Box No. 2	003	19200	NONE	1
	Setting modbus duo box in server mode. (Refer to section 5.2)			



Setting parameters for Modbus Duo Box No. 3:

Name	modbus ID	bate rate(bps)	parity check	stop bit
Modbus Duo Box No. 3	004	19200	NONE	1
Setting modbus duo box in server mode. (Refer to section 5.2)				

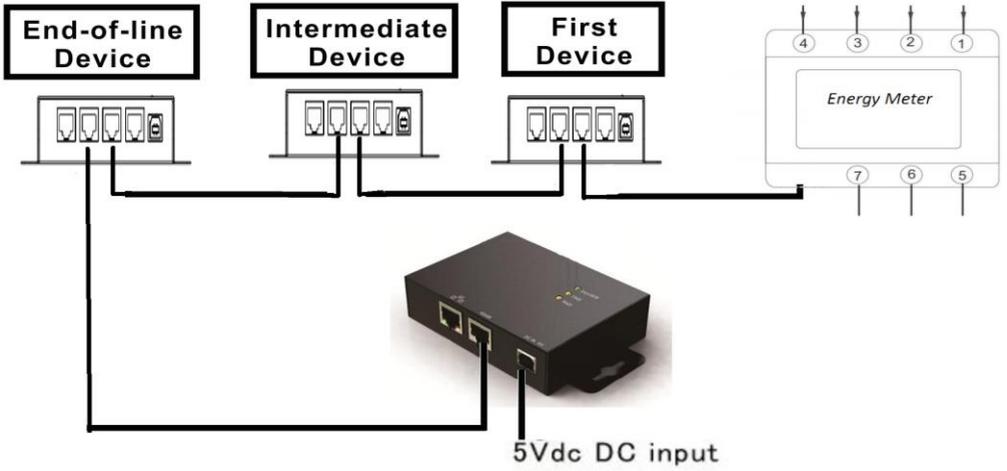


3) Inverter configuration (Refer to section 5.4.1 inverter configuration for the details)

Set hybrid inverter parameter:

- A. PV energy supply priority setting: Grid-Tie with backup (II)
- B. Set up AC-charging duration at night such as "00:00-05:00" as default.

5.6.2. Wiring Connection (Check section 5.4.2 for first modbus wiring to energy meter)



Three-inverter connection with modbus server

APPENDIX: Machine ID Configuration Table (SW1) √=ON x=OFF

SW1 ID	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
1	√	x	x	x	x	x	x	x
2	x	√	x	x	x	x	x	x
3	√	√	x	x	x	x	x	x
4	x	x	√	x	x	x	x	x
5	√	x	√	x	x	x	x	x
6	x	√	√	x	x	x	x	x
7	√	√	√	x	x	x	x	x
8	x	x	x	√	x	x	x	x
9	√	x	x	√	x	x	x	x
10	x	√	x	√	x	x	x	x
11	√	√	x	√	x	x	x	x
12	x	x	√	√	x	x	x	x
13	√	x	√	√	x	x	x	x
14	x	√	√	√	x	x	x	x
15	√	√	√	√	x	x	x	x
16	x	x	x	x	√	x	x	x
17	√	x	x	x	√	x	x	x
18	x	√	x	x	√	x	x	x
19	√	√	x	x	√	x	x	x
20	x	x	√	x	√	x	x	x
21	√	x	√	x	√	x	x	x
22	x	√	√	x	√	x	x	x
23	√	√	√	x	√	x	x	x
24	x	x	x	√	√	x	x	x
25	√	x	x	√	√	x	x	x
26	x	√	x	√	√	x	x	x
27	√	√	x	√	√	x	x	x
28	x	x	√	√	√	x	x	x
29	√	x	√	√	√	x	x	x
30	x	√	√	√	√	x	x	x
31	√	√	√	√	√	x	x	x
32	x	x	x	x	x	√	x	x
33	√	x	x	x	x	√	x	x
34	x	√	x	x	x	√	x	x
35	√	√	x	x	x	√	x	x
36	x	x	√	x	x	√	x	x
37	√	x	√	x	x	√	x	x
38	x	√	√	x	x	√	x	x

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39	√	√	√	x	x	√	x	x
40	x	x	x	√	x	√	x	x
41	√	x	x	√	x	√	x	x
42	x	√	x	√	x	√	x	x
43	√	√	x	√	x	√	x	x
44	x	x	√	√	x	√	x	x
45	√	x	√	√	x	√	x	x
46	x	√	√	√	x	√	x	x
47	√	√	√	√	x	√	x	x
48	x	x	x	x	√	√	x	x
49	√	x	x	x	√	√	x	x
50	x	√	x	x	√	√	x	x
51	√	√	x	x	√	√	x	x
52	x	x	√	x	√	√	x	x
53	√	x	√	x	√	√	x	x
54	x	√	√	x	√	√	x	x
55	√	√	√	x	√	√	x	x
56	x	x	x	√	√	√	x	x
57	√	x	x	√	√	√	x	x
58	x	√	x	√	√	√	x	x
59	√	√	x	√	√	√	x	x
60	x	x	√	√	√	√	x	x
61	√	x	√	√	√	√	x	x
62	x	√	√	√	√	√	x	x
63	√	√	√	√	√	√	x	x
64	x	x	x	x	x	x	√	x
65	√	x	x	x	x	x	√	x
66	x	√	x	x	x	x	√	x
67	√	√	x	x	x	x	√	x
68	x	x	√	x	x	x	√	x
69	√	x	√	x	x	x	√	x
70	x	√	√	x	x	x	√	x
71	√	√	√	x	x	x	√	x
72	x	x	x	√	x	x	√	x
73	√	x	x	√	x	x	√	x
74	x	√	x	√	x	x	√	x
75	√	√	x	√	x	x	√	x
76	x	x	√	√	x	x	√	x
77	√	x	√	√	x	x	√	x
78	x	√	√	√	x	x	√	x
79	√	√	√	√	x	x	√	x

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80	x	x	x	x	√	x	√	x
81	√	x	x	x	√	x	√	x
82	x	√	x	x	√	x	√	x
83	√	√	x	x	√	x	√	x
84	x	x	√	x	√	x	√	x
85	√	x	√	x	√	x	√	x
86	x	√	√	x	√	x	√	x
87	√	√	√	x	√	x	√	x
88	x	x	x	√	√	x	√	x
89	√	x	x	√	√	x	√	x
90	x	√	x	√	√	x	√	x
91	√	√	x	√	√	x	√	x
92	x	x	√	√	√	x	√	x
93	√	x	√	√	√	x	√	x
94	x	√	√	√	√	x	√	x
95	√	√	√	√	√	x	√	x
96	x	x	x	x	x	√	√	x
97	√	x	x	x	x	√	√	x
98	x	√	x	x	x	√	√	x
99	√	√	x	x	x	√	√	x
100	x	x	√	x	x	√	√	x
101	√	x	√	x	x	√	√	x
102	x	√	√	x	x	√	√	x
103	√	√	√	x	x	√	√	x
104	x	x	x	√	x	√	√	x
105	√	x	x	√	x	√	√	x
106	x	√	x	√	x	√	√	x
107	√	√	x	√	x	√	√	x
108	x	x	√	√	x	√	√	x
109	√	x	√	√	x	√	√	x
110	x	√	√	√	x	√	√	x
111	√	√	√	√	x	√	√	x
112	x	x	x	x	√	√	√	x
113	√	x	x	x	√	√	√	x
114	x	√	x	x	√	√	√	x
115	√	√	x	x	√	√	√	x
116	x	x	√	x	√	√	√	x
117	√	x	√	x	√	√	√	x
118	x	√	√	x	√	√	√	x
119	√	√	√	x	√	√	√	x
120	x	x	x	√	√	√	√	x

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121	√	x	x	√	√	√	√	x
122	x	√	x	√	√	√	√	x
123	√	√	x	√	√	√	√	x
124	x	x	√	√	√	√	√	x
125	√	x	√	√	√	√	√	x
126	x	√	√	√	√	√	√	x
127	√	√	√	√	√	√	√	x
128	x	x	x	x	x	x	x	√
129	√	x	x	x	x	x	x	√
130	x	√	x	x	x	x	x	√
131	√	√	x	x	x	x	x	√
132	x	x	√	x	x	x	x	√
133	√	x	√	x	x	x	x	√
134	x	√	√	x	x	x	x	√
135	√	√	√	x	x	x	x	√
136	x	x	x	√	x	x	x	√
137	√	x	x	√	x	x	x	√
138	x	√	x	√	x	x	x	√
139	√	√	x	√	x	x	x	√
140	x	x	√	√	x	x	x	√
141	√	x	√	√	x	x	x	√
142	x	√	√	√	x	x	x	√
143	√	√	√	√	x	x	x	√
144	x	x	x	x	√	x	x	√
145	√	x	x	x	√	x	x	√
146	x	√	x	x	√	x	x	√
147	√	√	x	x	√	x	x	√
148	x	x	√	x	√	x	x	√
149	√	x	√	x	√	x	x	√
150	x	√	√	x	√	x	x	√
151	√	√	√	x	√	x	x	√
152	x	x	x	√	√	x	x	√
153	√	x	x	√	√	x	x	√
154	x	√	x	√	√	x	x	√
155	√	√	x	√	√	x	x	√
156	x	x	√	√	√	x	x	√
157	√	x	√	√	√	x	x	√
158	x	√	√	√	√	x	x	√
159	√	√	√	√	√	x	x	√
160	x	x	x	x	x	√	x	√
161	√	x	x	x	x	√	x	√

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162	x	√	x	x	x	√	x	√
163	√	√	x	x	x	√	x	√
164	x	x	√	x	x	√	x	√
165	√	x	√	x	x	√	x	√
166	x	√	√	x	x	√	x	√
167	√	√	√	x	x	√	x	√
168	x	x	x	√	x	√	x	√
169	√	x	x	√	x	√	x	√
170	x	√	x	√	x	√	x	√
171	√	√	x	√	x	√	x	√
172	x	x	√	√	x	√	x	√
173	√	x	√	√	x	√	x	√
174	x	√	√	√	x	√	x	√
175	√	√	√	√	x	√	x	√
176	x	x	x	x	√	√	x	√
177	√	x	x	x	√	√	x	√
178	x	√	x	x	√	√	x	√
179	√	√	x	x	√	√	x	√
180	x	x	√	x	√	√	x	√
181	√	x	√	x	√	√	x	√
182	x	√	√	x	√	√	x	√
183	√	√	√	x	√	√	x	√
184	x	x	x	√	√	√	x	√
185	√	x	x	√	√	√	x	√
186	x	√	x	√	√	√	x	√
187	√	√	x	√	√	√	x	√
188	x	x	√	√	√	√	x	√
189	√	x	√	√	√	√	x	√
190	x	√	√	√	√	√	x	√
191	√	√	√	√	√	√	x	√
192	x	x	x	x	x	x	√	√
193	√	x	x	x	x	x	√	√
194	x	√	x	x	x	x	√	√
195	√	√	x	x	x	x	√	√
196	x	x	√	x	x	x	√	√
197	√	x	√	x	x	x	√	√
198	x	√	√	x	x	x	√	√
199	√	√	√	x	x	x	√	√
200	x	x	x	√	x	x	√	√
201	√	x	x	√	x	x	√	√
202	x	√	x	√	x	x	√	√

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203	√	√	x	√	x	x	√	√
204	x	x	√	√	x	x	√	√
205	√	x	√	√	x	x	√	√
206	x	√	√	√	x	x	√	√
207	√	√	√	√	x	x	√	√
208	x	x	x	x	√	x	√	√
209	√	x	x	x	√	x	√	√
210	x	√	x	x	√	x	√	√
211	√	√	x	x	√	x	√	√
212	x	x	√	x	√	x	√	√
213	√	x	√	x	√	x	√	√
214	x	√	√	x	√	x	√	√
215	√	√	√	x	√	x	√	√
216	x	x	x	√	√	x	√	√
217	√	x	x	√	√	x	√	√
218	x	√	x	√	√	x	√	√
219	√	√	x	√	√	x	√	√
220	x	x	√	√	√	x	√	√
221	√	x	√	√	√	x	√	√
222	x	√	√	√	√	x	√	√
223	√	√	√	√	√	x	√	√
224	x	x	x	x	x	√	√	√
225	√	x	x	x	x	√	√	√
226	x	√	x	x	x	√	√	√
227	√	√	x	x	x	√	√	√
228	x	x	√	x	x	√	√	√
229	√	x	√	x	x	√	√	√
230	x	√	√	x	x	√	√	√
231	√	√	√	x	x	√	√	√
232	x	x	x	√	x	√	√	√
233	√	x	x	√	x	√	√	√
234	x	√	x	√	x	√	√	√
235	√	√	x	√	x	√	√	√
236	x	x	√	√	x	√	√	√
237	√	x	√	√	x	√	√	√
238	x	√	√	√	x	√	√	√
239	√	√	√	√	x	√	√	√
240	x	x	x	x	√	√	√	√
241	√	x	x	x	√	√	√	√
242	x	√	x	x	√	√	√	√
243	√	√	x	x	√	√	√	√

244	x	x	√	x	√	√	√	√
245	√	x	√	x	√	√	√	√
246	x	√	√	x	√	√	√	√
247	√	√	√	x	√	√	√	√