

Solar Optimizer User Guide

English Engineering Version

Version 1.2

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1. Description

1.1 Introduction

The SC-302M / S installed in a monolithic panels. The monolithic panel information (voltage, current and temperature and other information) through the Zigbee and RS485 signals to the server, to monitor each monolithic panel power generation. When the monolithic panel power generation is insufficient then open the optimization function, enhance the power generation. In order to achieve optimization and monitoring purposes.

1.2 Specification

Input		
Rated Input DC Power	300 W	
Absolute Maximum Input Voltage	12.5-60V	
MPPT Operating Range	15~55 V	
Maximum Input Current	10 A	
Maximum Efficiency	99.5%	
Nighttime Power Consumption	0 W	
Output		
Maximum Output Poewr	300 W	
Maximum Output Current	10A	
Absolute Maximum Output Voltage	60V(PM)	
Operating Output Voltage	0~55 Vdc	
System Voltage	1500V	
Sensor Accuracy		
Input Voltage Accuracy	±2V	
Output Voltage Accuracy	±2V	
Current Accuracy	±0.5A	
Temperature PCB Accuracy	±2℃	
Communication		
RS-485	TIA/EIA RS-485 (Isolation)	
IEEE802.15.4 (SC-302M Only)	Frequency	2.4GHz (2.405~2.475 GHz)
	TX Power	13dBm (PK)
	RX Sensitivity	-100dBm

	Antenna	2dBi
	Distance	100M (Open Space)
Environment		
Operating Temp.	-40°C to 65°C	
Storage Temp.	-40°C to 85°C	
Humidity	0 % to 95% non-condensing	
Weather rating	IP65	

1.3 Label

● SC-302M



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● SC-302S

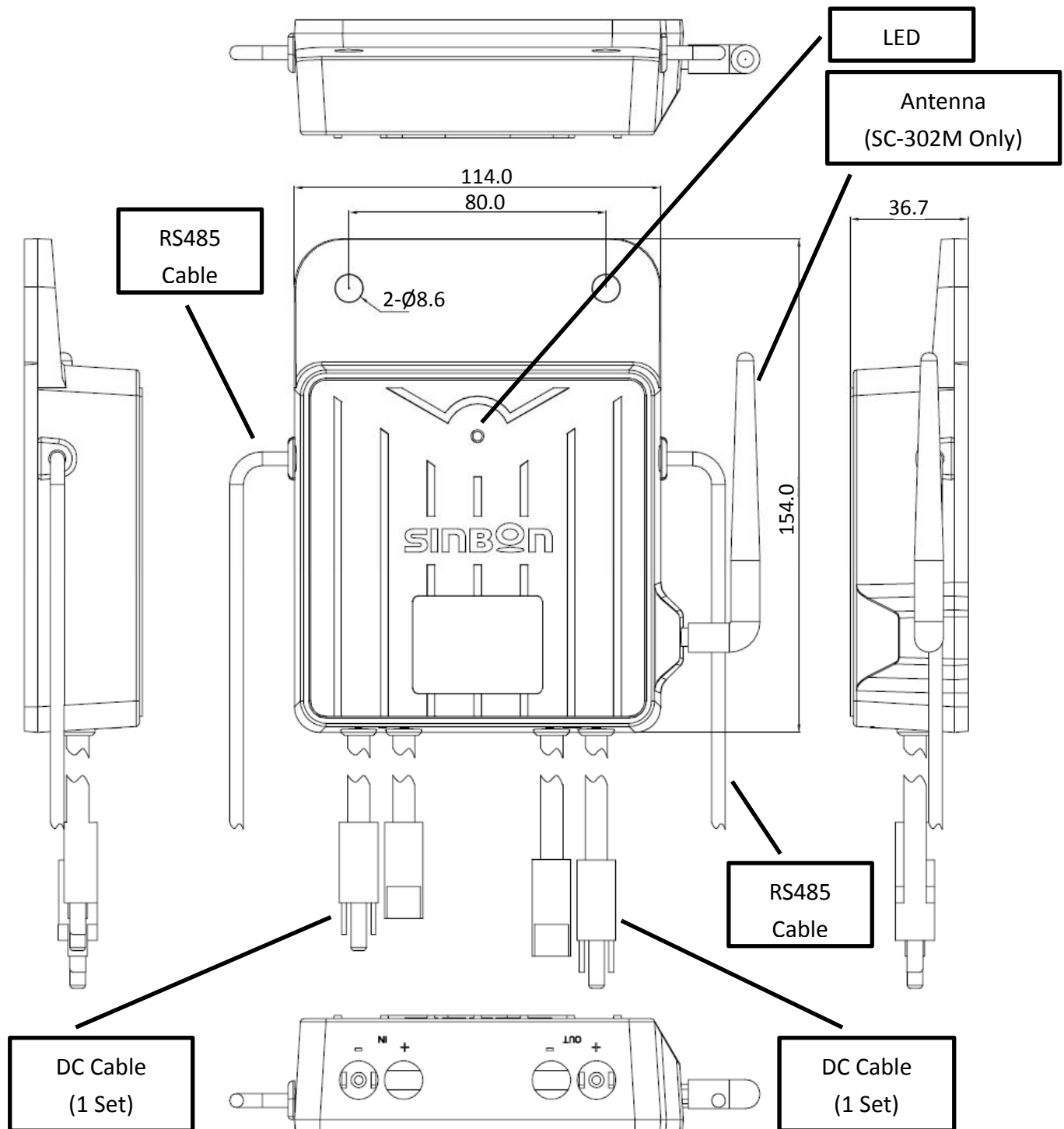


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1.4 Housing/Size



1.5 Lights

- On : The system was initialized successfully.
- Off : No Power.
- Flashing : Communication module and optimization module data transmission.

1.6 Cable

1.6.1 RS485 Cable

Item	Cable SPEC description	Picture	
1	3P F to OPEN L=500MM,RS485 UL2464,26AWG(7/0.16TS)x1P+F+D+AM CONN.F,3P,SOLDER TYPE,WATERPROOF TYPE		
2	3P M to OPEN L=1500MM,RS485 UL2464,26AWG(7/0.16TS)x1P+F+D+AM CONN.M,3P,SOLDER TYPE,WATERPROOF TYPE		
3	RS-485 terminator adaptor , Female EC03681-1023-BF_A _10A 3 PIN Female		
4	RS-485 terminator adaptor , Male CONN.M,3P,SOLDER TYPE,WATERPROOF TYPE, 910015100		

1.6.2 DC Cable

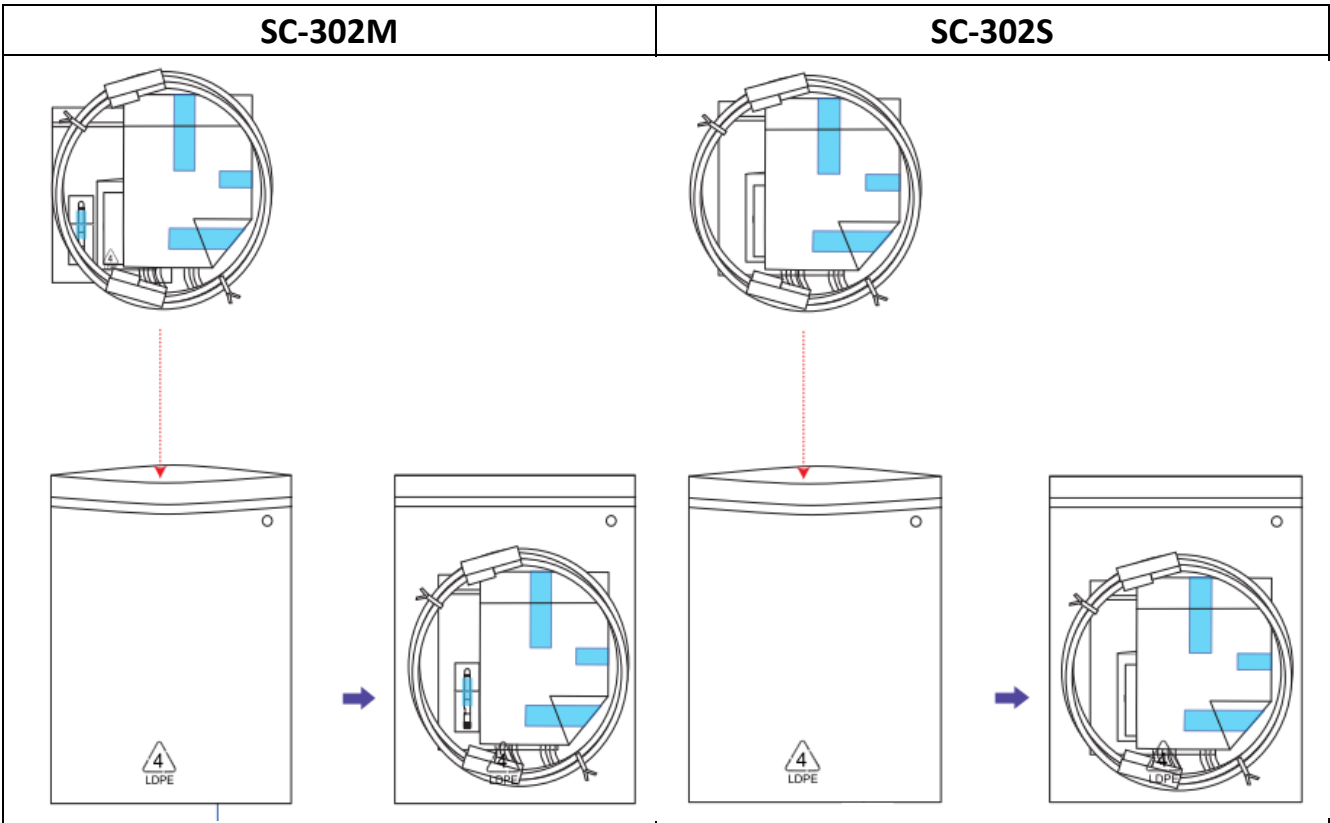
Item	Cable SPEC description	Picture
1	DC Cable , L=500M WIRE, UL4703, 4.0mm2, #12(56/0.30) CONN., M, 1P, P=N/A, BLACK, THERMOPLASTIC	
2	DC Cable , L=500M WIRE, UL4703, 4.0mm2, #12(56/0.30) CONN., F, 1P, P=N/A, BLACK, THERMOPLASTIC	
3	DC Cable , L=100MM WIRE, UL4703, 4.0mm2, #12(56/0.30) CONN., M, 1P, P=N/A, BLACK, THERMOPLASTIC	
4	DC Cable , L=100MM WIRE, UL4703, 4.0mm2, #12(56/0.30) CONN., F, 1P, P=N/A, BLACK, THERMOPLASTIC	

1.7 Accessories (SC-302M only)

1.7.1 Antenna Parts List

Item	SPEC description	Picture
1	2.4G ANTENNA	

1.8 Single package



2. Software user interface

2.1 Master/Slave Setting

- 2.1.1 Connect SBTS-100 and SC-302 : According Power Plant Layout to find the String which want to set, remove the RS485 cable terminal resistance (at head or end).



A-side of the Android Tool RS485 cable connected with panel male or female connectors, and B-side connect with SBTS-100 tablet.

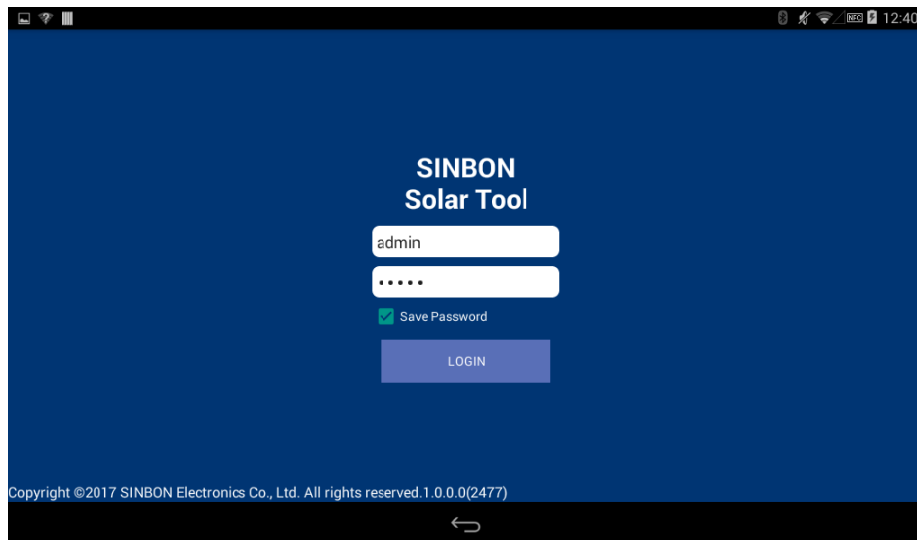


2.1.2 Use the Android Tool to set

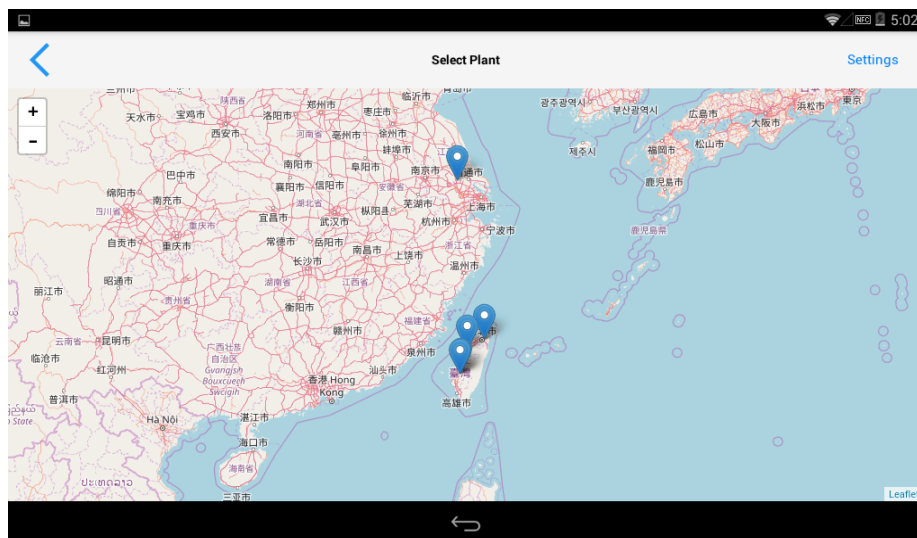


2.1.2.1 Open the application “Solar Tool”

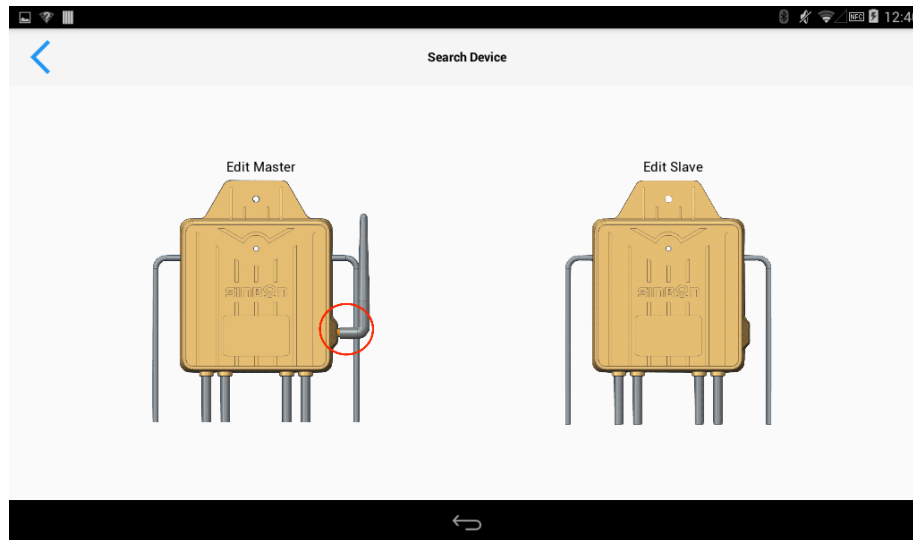
2.1.2.2 Login : The default user and password is admin/admin



2.1.2.3 Select Plant : Choose the power plant which want to set up at world map

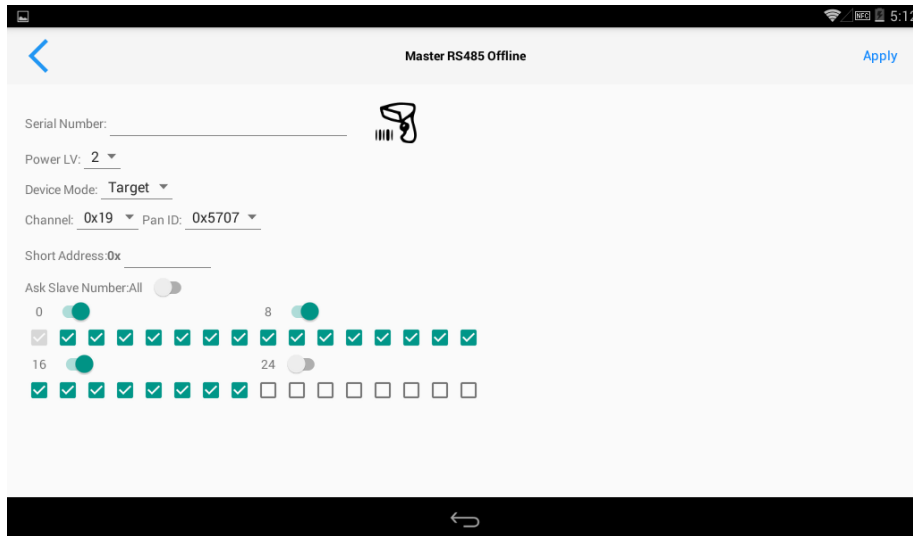


2.1.2.4 Search Device : Choose the device which want to set up

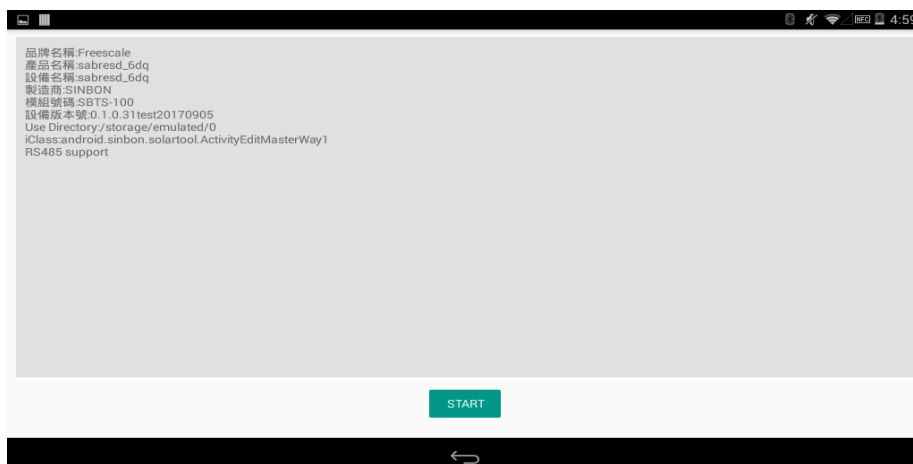


- a. Edit Master : Set up Master, see 2.1.2.5
- b. Edit Slave : Set up Slave, see 2.1.2.6

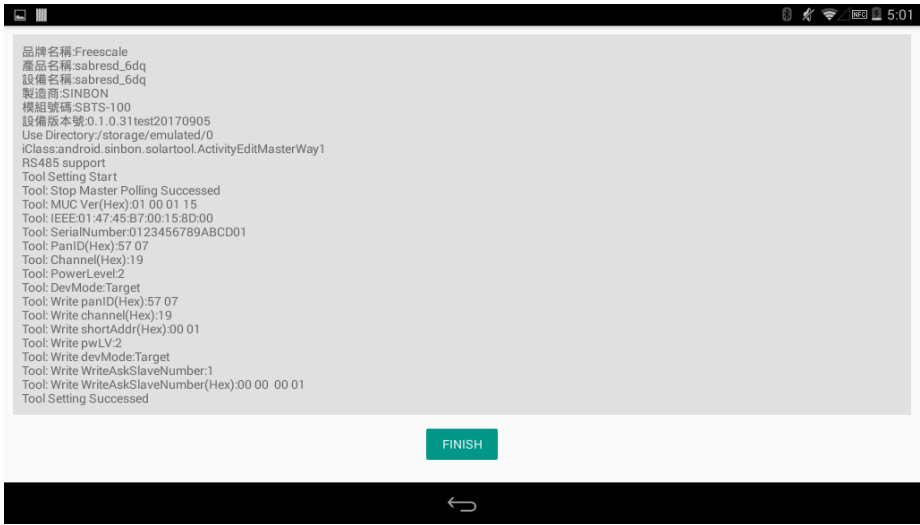
2.1.2.5 Edit Master



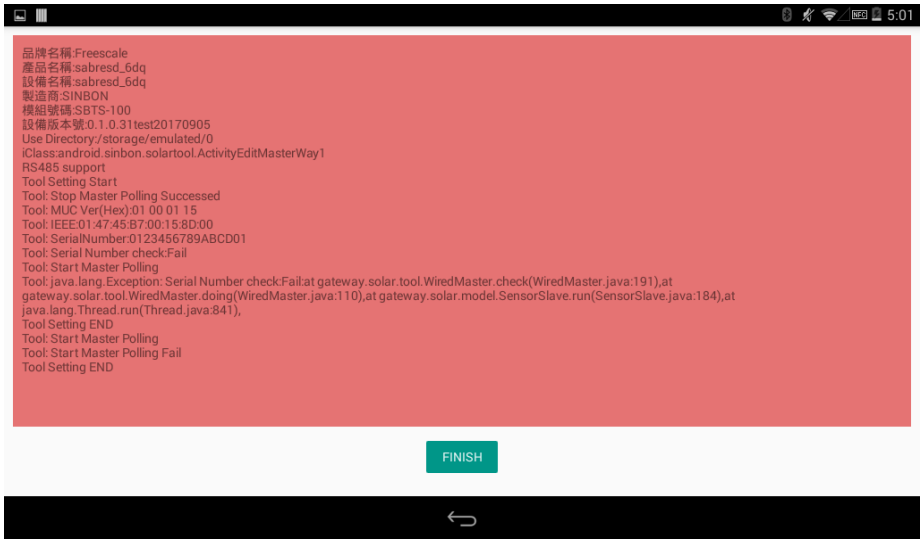
- Serial Number : Enter Serial number manually or scan by Barcode.
- Power LV : Select 0 ~ 3, default value is 2.
The value means the transmit power level of ZigBee, 0 is the minimum and 3 is the maximum.
- Device Mode : Select Target or Router mode , default mode is Target.
- Channel : Select value between 0x0B~0x19. **The value been selected should correspond “ Chan ID ” of the Gateway setting.**
- Pan ID : Select “0x5707” or “0x5342”. **The value been selected should correspond “PAN ID” of the Gateway setting.**
- Short Address : Enter value manually, the value is limited to “0000” ~ “ffff”
Note : The short address of each Master sensors should not be repeated.
- Ask Slave Number : Set number of slave sensors in one string, can switch the button to select all or check the checkbox for multiple choice.
- Press “Apply” button.
- Press “Start” button to start setting.



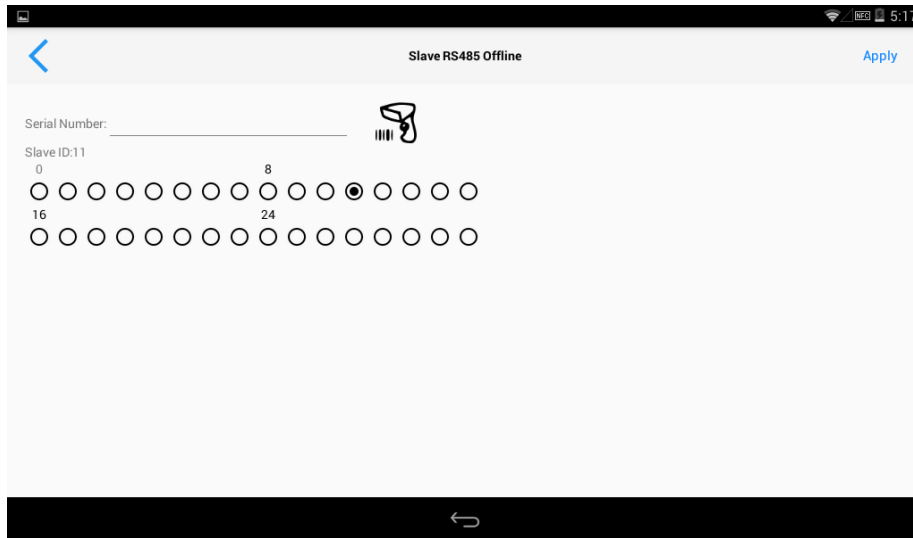
j. Setting success – Press ”Finish” button then back to 2.2.2.4 automatically.



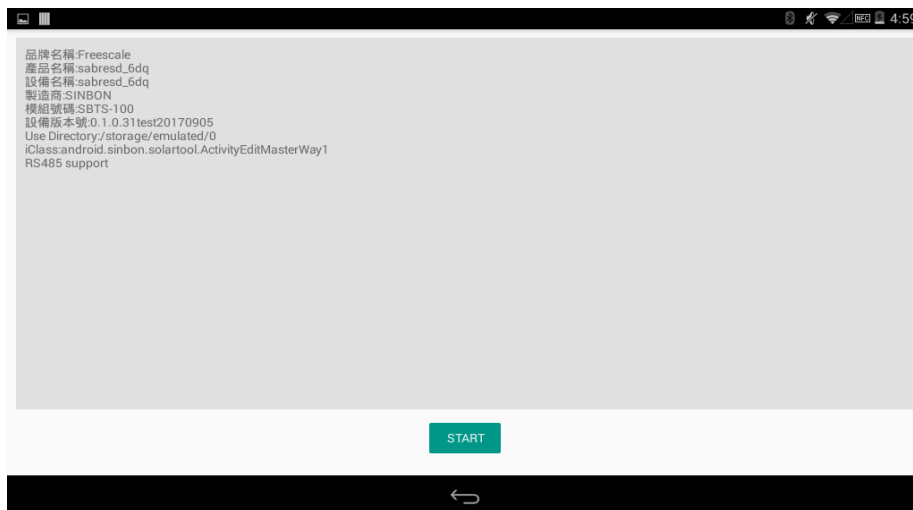
k. Setting fail – Press ”Finish” button the back 2.2.2.5 automatically.



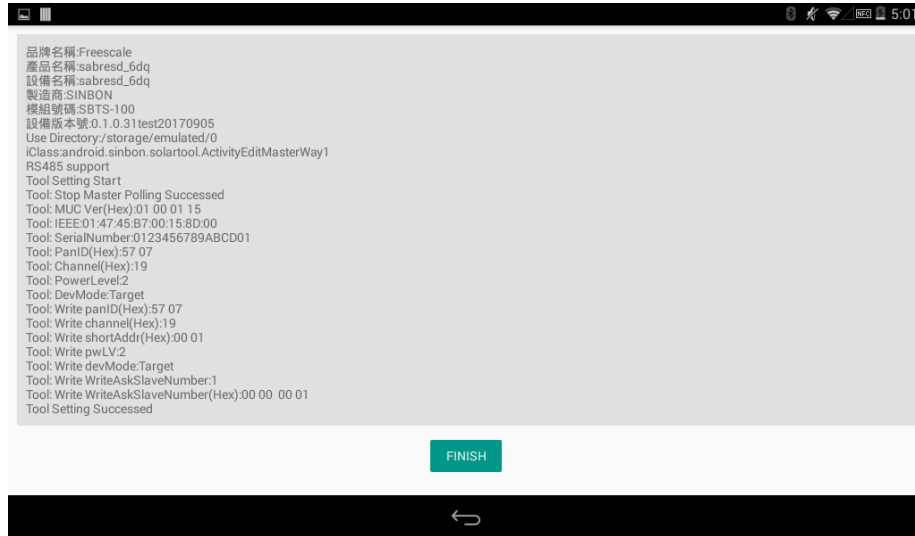
2.1.2.6 Edit Slave



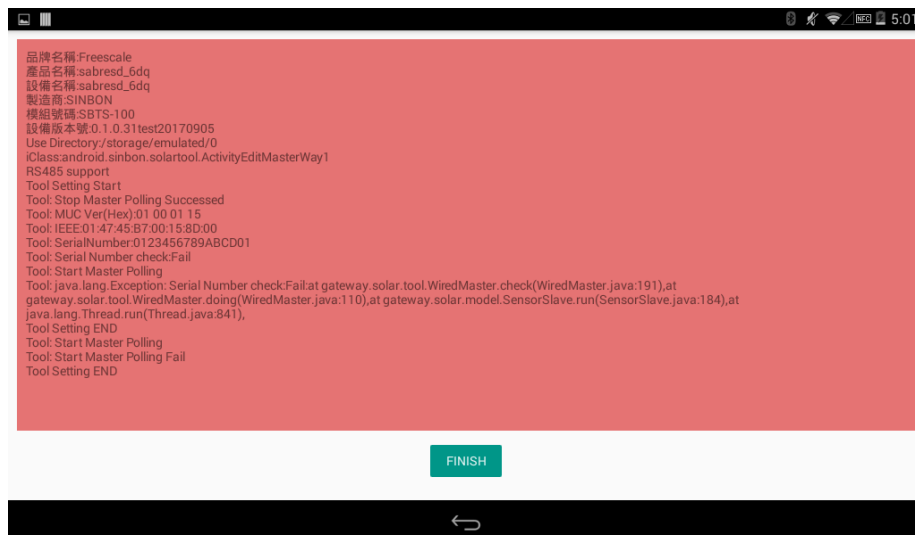
- Serial Number : Enter Serial number manually or scanned by Barcode. 
- Slave ID : Click one of button "1~31" to set the "Slave ID".
- Press "Apply" button.
- Press "Start" button to start setting.



- e. Setting success – Press "Finish" button then back to 2.2.2.4 automatically.



- f. Setting fail – Press "Finish" button the back 2.2.2.6 automatically.

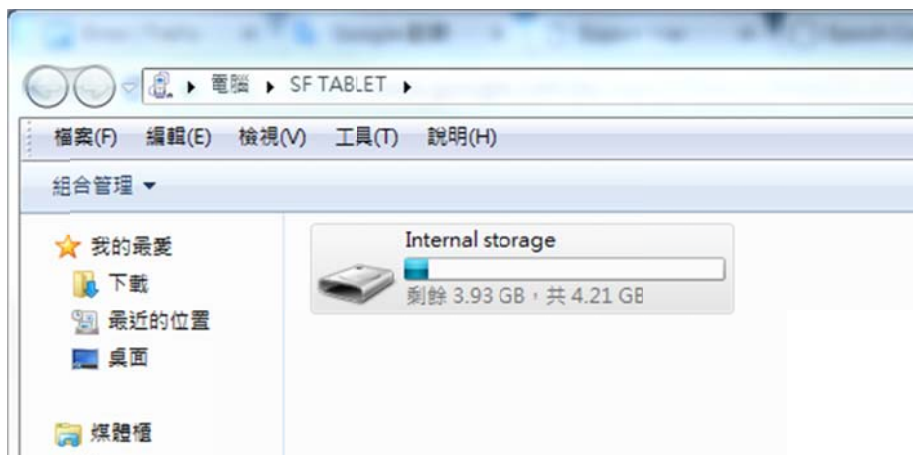


2.2 Export Master / Slave setting profile

- 2.2.1 Use USB cable connect SBTS-100 tablet and computer, then windows will pop-up “AutoPlay” window, select “Open device to view files”.



- 2.2.2 Open “Internal storage”



- 2.2.3 Copy file “wiredMaster.csv” and “wiredSlave.csv” which at root directory to the computer.
- 2.2.4 Send the file “wiredMaster.csv” and “wiredSlave.csv” to the system administrator by e-mail.

3. RS485 Data Format

RS485 use asynchronous transmission that communication by half duplex. 8bit data. 1 stop bit data. No parity. Default baud rate is 115200bps that can't be changed.

1. All data transmission is hex code.
2. All Data format is low byte after high byte. CRC code format is high byte after low byte.
3. It is most need response in 1 second after send command. If response is time out and data will be discarded.
4. Master address of RS485 is 0x0 and 0xFE. Slave address of RS485 is 0x1~0x1F. Radio address of RS485 is 0xFF.
5. The communication using stand Modbus protocol and support single read \ multiple read \ single write \ multiple write.

3.1 Data format definition

Read Register (Function Code 0x03)

3.1.1 Command Format

Format	RS485 Address	Function Code	Start Address	Length	CRC
Byte	1	1	2	2	2
example	0x01	0x03	0x00 0x23	0x00 0x01	0xF2 0xB8

3.1.2 Response Format

Format	RS485 Address	Byte count	Register data	CRC
Byte	1	1	Not sure	2
example	0x01	0x03	0x00 0x01	0xC1 0xF3

3.1.3 Error Code

Format	RS485 Address	Error Code	Exception code	CRC
Byte	1	1	1	2
example	0x01	0x83	0x03	0x91 0x29

3.2 Single Write Register (Function Code 0x06)

3.2.1 Command Format

Format	RS485 Address	Function Code	Start Address	Register data	CRC
Byte	1	1	2	2	2
example	0x01	0x06	0x00 0x23	0x00 0x01	0xA7 0xB8

3.2.2 Response Format

Format	RS485 Address	Function Code	Start Address	Register data	CRC
Byte	1	1	2	2	2
example	0x01	0x06	0x00 0x23	0x00 0x01	0xA7 0xB8

3.2.3 Error Code

Format	RS485 Address	Error Code	Exception code	CRC
Byte	1	1	1	2
example	0x01	0x86	0x03	0x81 0x28

3.3 Register format definition

Start address	Description	Master Authority	Slave Authority	Delay(ms)	Parameter Range
0x0000	Master PanID / Slave RS485Address[2]	Read/Write	Read/Write	200ms	PanID:0x0000~0xFFFF RS485 address:0x01~0x1F
0x000A	Sinbon Version-High byte[2]	Read	Read	--	example:0xA9 0x31
0x000B	Sinbon Version-Low byte[2]	Read	Read	--	example:0x04 0x27 Combine Version: A9310427
0x000C	Device Type[2]	Read	Read	--	0xD2:Master Device 0xD3:Slave Device
0x000D	Firmware Version-High byte[2]	Read	Read	--	example:0x01 0x00
0x000E	Firmware Version-low byte[2]	Read	Read	--	example:0x01 0x02 Combine Version: V1012
0x000F	PCBA Number-1[2]	Read	Read	--	
0x0010	PCBA Number -2[2]	Read	Read	--	
0x0011	PCBA Number -3[2]	Read	Read	--	
0x0012	PCBA Number -4[2]	Read	Read	--	
0x0013	PCBA Number -5[2]	Read	Read	--	
0x0014	PCBA Number -6[2]	Read	Read	--	
0x0015	PCBA Number -7[2]	Read	Read	--	
0x0016	PCBA Number -8[2]	Read	Read	--	
0x001F	Input voltage [2]	Read	Read	--	First byte is Integer. Second byte is number after point. example:0x20 0x40 Decimal:32.64V
0x0020	Output voltage [2]	Read	Read	--	First byte is Integer. Second byte is number after point. example:0x1F 0x10 Decimal:31.16V
0x0021	Current[2]	Read	Read	--	First byte is Integer. Second byte is number after point. example:0x03 0x06 Decimal:3.6A

0x0022	Temperature [2]	Read	Read	--	First byte is Integer. Second byte is number after point. example:0x1A 0x08 Decimal:26.8°C
0x0023	Switch ON /OFF Status[2]	Read/Write	Read/Write	200	0x00: Disconnect 0x01: Connect (default)
0x0024	Optimizer Function Status[2]	Read/Write	Read/Write	200	0x00:Close Optimizer(default) 0x01:Open Optimizer

3.4 Error Code definition

Error Code	Description
0x83	Read register error
0x86	Single write register error
0x90	Multiple write register error
0x97	Multiple read write register error

Exception code	Description
0x01	Function code error
0x02	Start address error
0x03	Quantity or byte count error
0x04	Register no response

4. Set up

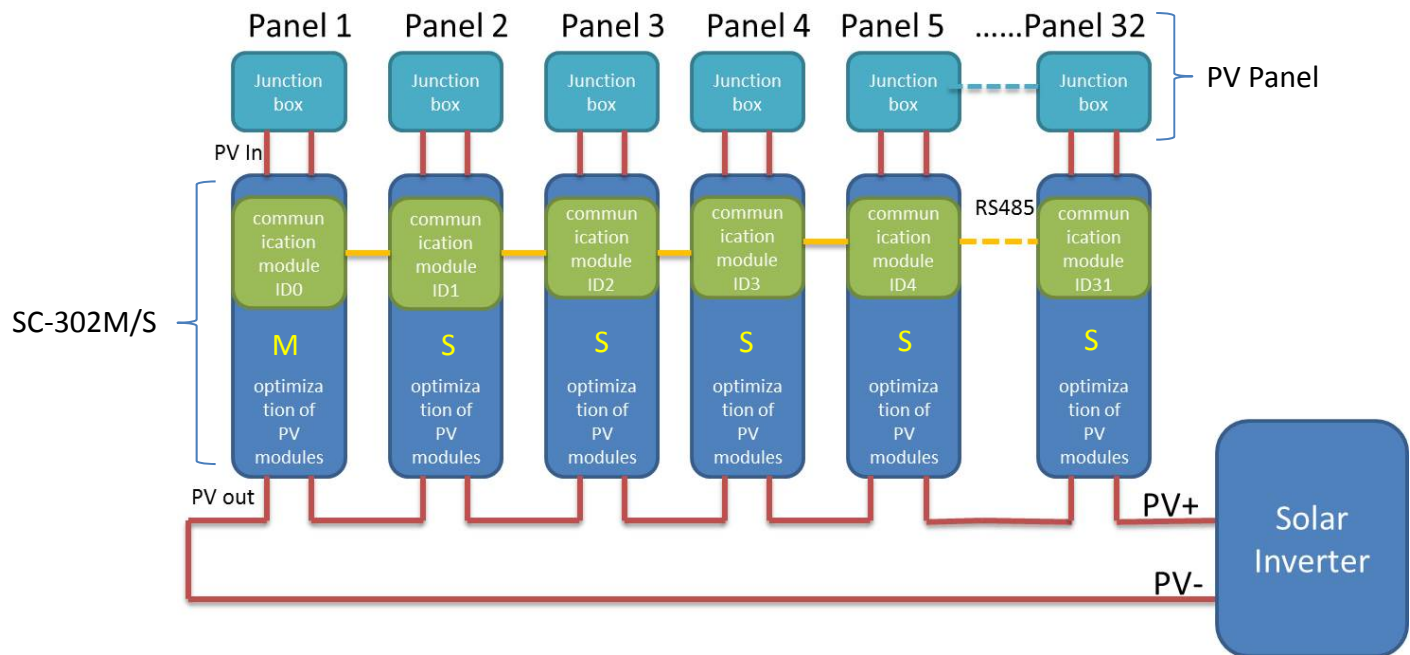
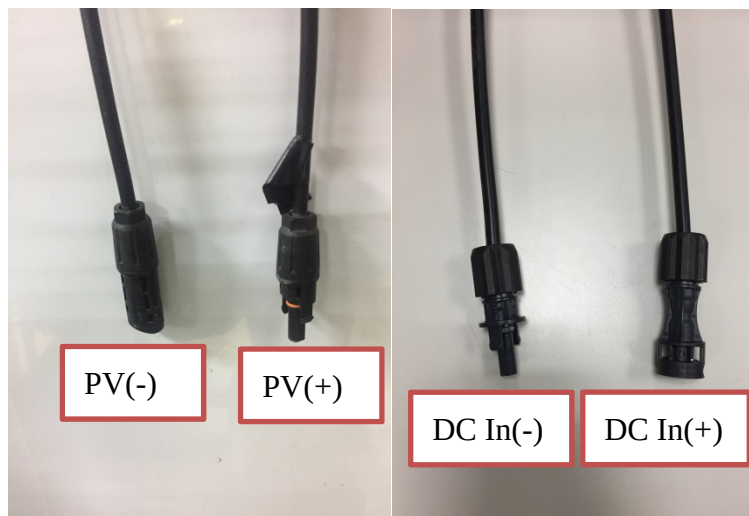


Figure 1. The electrical block diagram of the product

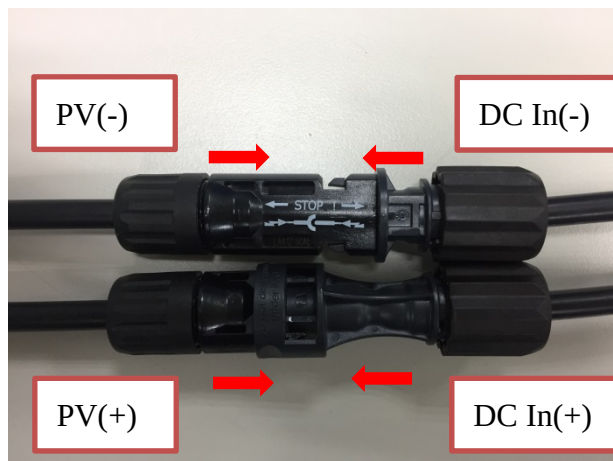
- Step 1 Turn off the inverter power.
- Step 2 The SC-302M / S installed in a monolithic panels.
- Step 3 PV input connected SC-302M/S DC input.
- Step 4 PV output (+) connected previous PV output(-), PV output(-) connected following PV output(+).
- Step 5 The first PV output (+/-) and the last PV output (+/-) connected solar inverter input(+/-).
- Step 6 RS485 cable (male connector) connected previous RS485 cable (female connector), RS485 cable (female connector) connected following RS485 cable (male connector).
- Step 7 The first and the last RS485 Cable (male& female connector) connected RS485 terminator adaptor.

4.1 PV module connection

a. PV to DC Input



b. PV(-) to DC In(-) · PV(+) to DC In(+)



4.2 RS485 Connection

a. RS485 Cable Male and Female connection



b. Connected to the corresponding notch



c. Locked



5. Troubleshooting

If the product has abnormal work, please refer to the following table to deal with the proposed way. If you are not able to resolve a problem please contact us.

Problem	Solution
LED off	● Check PV to DC input connection ● Check the polarity.
Zigbee communication problem (LED abnormal flashing)	● Check PV to DC input connection. ● Check the antenna connection.
RS485 communication problem	● Check PV to DC input connection. ● Check RS485 connection.

6. Warranty and legal

6.1 FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For mobile device (RF out power > 20mW)

1. To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.
2. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter