

USER MANUAL

EDECOA®

HYBRID INVERTER / CHARGER

EM-161A

EM-252A

EM-302A

Version: 2.3

Language: English/Deutsch/Français/Español/Italiano

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ABOUT THIS MANUAL

This manual describes the operation and troubleshooting suggestions for EDECOA Hybrid Inverter EM-161A, EM-252A and EM-302A. Please read this manual carefully before operations.

Keep this manual for future reference.

1.SAFETY INSTRUCTIONS

 **WARNING: This chapter contains important safety and operating instructions. Read and keep this manual for future reference.**

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries, and all appropriate sections of this manual.
2. **CAUTION** To reduce the risk of injury, charge only deep-cycle lead acid-type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. DO NOT disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
4. **NEVER** charge a frozen battery.
5. For optimum operation of this inverter/charge, please follow the required specifications to select the appropriate cable size. It's very important to correctly operate this inverter/ charger.
6. Please strictly follow the installation procedure when you want to disconnect AC or DC terminals. Please refer to the INSTALLATION for details.

2.INTRODUCTION

This is a multi-function inverter/charger, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current, AC/ solar charger priority, and acceptable input voltage based on different applications.

Features

- Pure sine wave inverter
- Configurable input voltage range for home appliances and personal computers via LCD setting
- Configurable battery charging current based on applications via LCD setting
- Configurable AC/Solar Charger priority via LCD setting

- Compatible with mains voltage or generator power
- Auto restart while AC is recovering
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function
- Wi-Fi (Optional)
- Can connect to lithium battery
- Intelligent fan speed adjustment

Basic System Architecture

The following illustration shows the basic application for this inverter/charger. It also includes the following devices to have a complete running system.

- Generator or Utility.
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power all kinds of appliances in the home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioner.

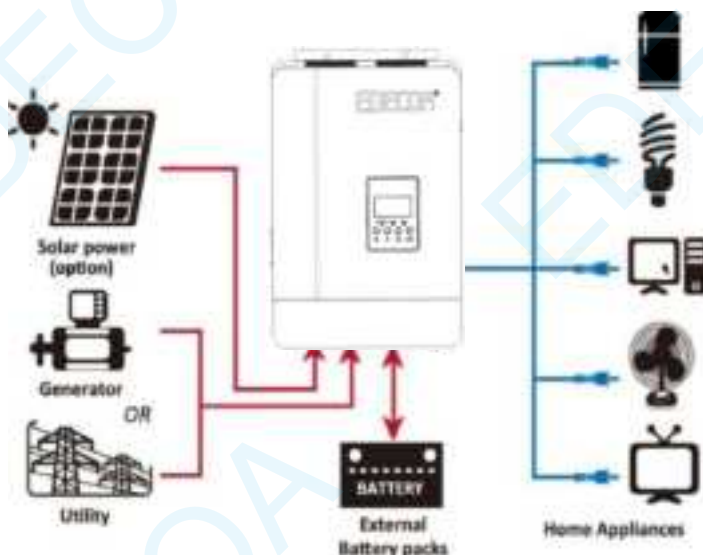
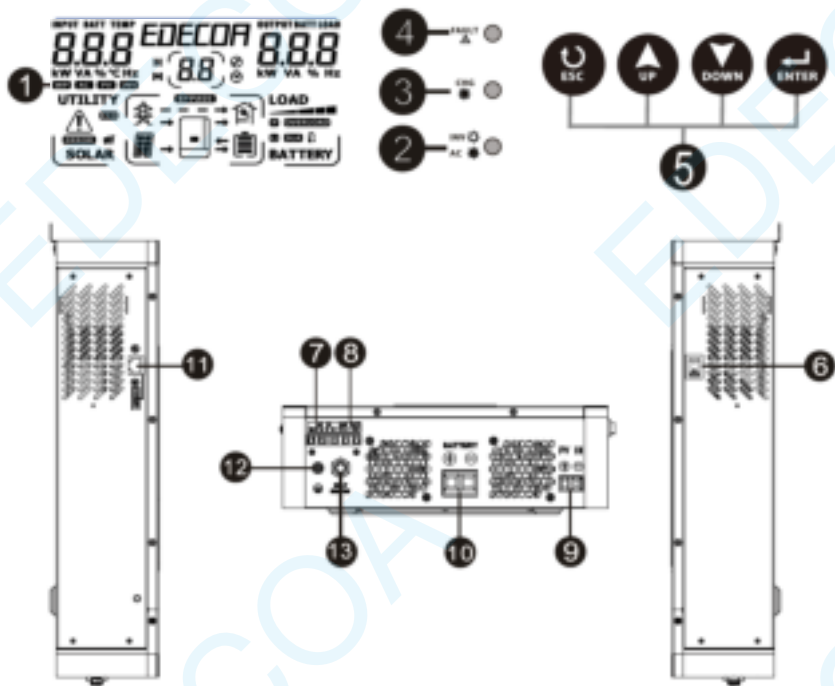


Figure 1 Hybrid Power System

Product Overview



- 1. LCD display
- 2. Status indicator
- 3. Charging indicator
- 4. Fault indicator
- 5. Function buttons
- 6. Power on/off switch
- 7. AC input
- 8. AC output
- 9. PV input
- 10. Battery input
- 11. RS-232 communication port
- 12. Safety (Earth) ground
- 13. Circuit breaker

3.OPERATION

Power ON/OFF

Side view of unit



Once the unit has been properly installed and the batteries are connected

well, simply press the ON/OFF switch (located on the button of the case) to turn on the unit.

Operation and Display Panel

The operation and display panel, shown in the below chart, is on the front panel of the inverter. It includes three indicators, four function keys, and an LCD display, indicating the operating status and input/output power information.



LCD display



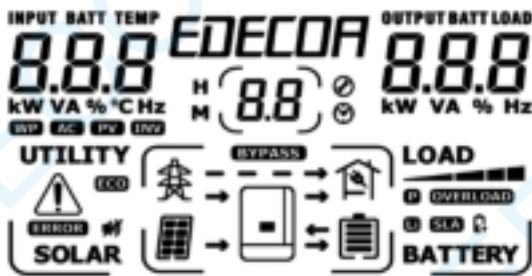
Function keys

LED Indicator			Messages
AC/INV	Green	Solid On	Output is powered by utility in Line mode
		Flashing	Output is powered by battery or PV in battery mode
CHG	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
FAULT	Red	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

Function keys

Function Keys	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

LCD Display Icons



Icon		Function description	
Input Source Information			
		Indicates the AC input.	
		Indicates the PV input	
		Indicate input voltage, input frequency, PV voltage, battery voltage, and charger current.	
Configuration Program and Fault Information			
		Indicates the setting programs.	
		Indicates the warning and fault codes.	
		Warning:  flashing with warning code.	
		Fault:  lighting with fault code	
Output Information			
		Indicate output voltage, output frequency, load percent, load in VA, load in Watt, and discharging current.	
Battery Information			
		Indicates battery level by 0-24%, 25-49%, 50-74%, and 75-100% in battery mode and charging status in line mode.	
In AC mode, it indicates battery charging status.			
Status		Battery voltage	LCD Display
Constant Current mode/ Constant		<2V/cell	4 bars will flash in turns.

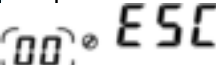
Voltage mode	2 ~ 2.083V/cell	Bottom bar will be ON and the other three bars will flash in turns.
	2.083 ~ 2.167V/cell	Bottom two bars will be ON and the other two bars will flash in turns.
	> 2.167 V/cell	Bottom three bars will be ON, and the top bar will flash.
Floating mode, Batteries are fully charged		4 bars will all be ON.
In battery mode, it indicates battery capacity.		
Load Percentage	Battery Voltage	LCD Display
Load >50%	< 1.717V/cell	
	1.717V/cell ~ 1.8V/cell	
	1.8 ~ 1.883V/cell	
	> 1.883V/cell	
50%>Load>20%	< 1.817V/cell	
	1.817V/cell~1.9V/cell	
	1.9 ~ 1.983V/cell	
	> 1.983V/cell	
Load<20%	<1.867V/cell	
	1.867V/cell~1.95V/cell	
	1.95~2.033V/cell	

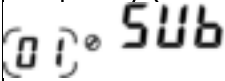
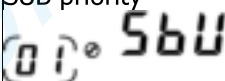
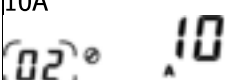
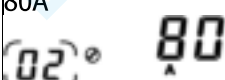
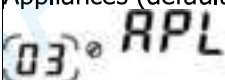
		>2.033V/cell			
Load Information					
OVERLOAD		Indicates overload.			
		Indicates the load level as below.			
		0%~25%	25%~50%	50%~75%	75%~100%
					
Mode Operation Information					
		Unit connected to the utility.			
		Unit connected to the PV panel.			
BYPASS		Load is supplied by utility power.			
		Utility charger circuit is working.			
		DC/AC inverter circuit is working.			
Mute Operation					
		Device muted.			

Program Settings

After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.

Setting Program

Program	Description	Selectable option
00	Exit setting mode	Escape 

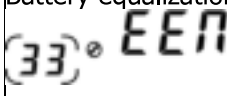
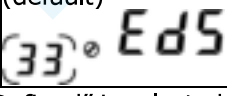
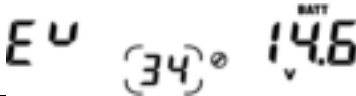
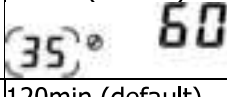
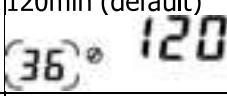
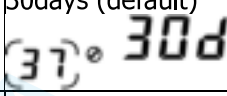
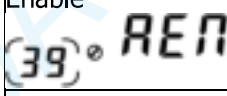
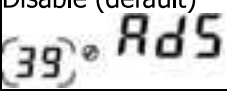
01	Output source priority: To configure load power source priority	SUB priority (default) 	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, utility energy will supply power the loads at the same time. Battery provides power to the loads only when any one condition happens: - Solar energy and utility are not available. - Solar energy is not sufficient and utility is not available.
		SUB priority 	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power the loads at the same time. Utility provides power to the load only when battery voltage drops to either low-level warning voltage or the setting point in program 12.
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	10A 	80A 
03	AC input voltage range	Appliances (default) 	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS	If selected, acceptable AC input voltage range will be within 170-280VAC.

		(03)* UPS	
04	Power saving mode enable/disable	Saving mode disable (default) (04)* SDS	If disabled, no matter connected load is low or high, the on/off status of inverter output will not be affected.
		Saving mode enable (04)* SEN	If enabled, the output of inverter will be off when connected load is pretty low or not detected.
05	Battery type	AGM (default) (05)* AGM	Flooded (05)* FLD
		User-Defined (05)* USE	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
06	Auto restart when overload occurs	Restart disabled (default) (06)* LTD	Restart enabled (06)* LFE
07	Auto restart when over temperature occurs	Restart disabled (default) (07)* LTD	Restart enabled (07)* LFE
08	Output voltage	(08)* 220	(Default) (08)* 230
		(08)* 240	Indicates output voltage
09	Output frequency	50Hz (default) (09)* 50 _{Hz}	60Hz (09)* 60 _{Hz}
10	BMS protocol	(10)* PRC	(10)* PLY
		If you are using Lithium battery from Pace or Pylontech, change program 05 to Lib then you can choose your BMS protocol here. If not, you don't need to change this program.	

11	Maximum utility charging current Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger.	UT1 (10) 2A	UT1 (10) 60A
12	Setting voltage point back to utility source when selecting "SBU priority".	Available options in EM-252A/EM-302A model:	
		(12) 22.0 ^{BATT}	Default (12) 23.0 ^{BATT}
		(12) 25.5 ^{BATT}	
		Available options in EM-161A model:	
		11.0V (12) 11.0 ^{BATT}	11.5V (default) (12) 11.5 ^{BATT}
		12.8V (12) 12.8 ^{BATT}	
13	Setting voltage point back to battery mode when selecting "SBU priority".	Available options in EM-252A/EM-302A model:	
		Battery fully charged (13) FUL ^{BATT}	24V (13) 24.0 ^{BATT}
		27V(default) (13) 27.0 ^{BATT}	29V (13) 29.0 ^{BATT}
		Available options in EM-161A model:	
		Battery fully charged (13) FUL ^{BATT}	12.0V (13) 12.0 ^{BATT}

		14.5V (13)° 14.5 ^{BATT}							
16	Charger source priority: To configure charger source priority	If this inverter/charger is working in Line, Standby or Fault mode, charger source can be programmed as below: <table><tr><td>Solar first (16)° C50</td><td>Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.</td></tr><tr><td>Solar and Utility (default) (16)° 5NU</td><td>Solar energy and utility will charge battery at the same time.</td></tr><tr><td>Only Solar (16)° 050</td><td>Solar energy will be the only charger source no matter utility is available or not.</td></tr></table> If this inverter/charger is working in Battery mode or Power saving mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.	Solar first (16)° C50	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.	Solar and Utility (default) (16)° 5NU	Solar energy and utility will charge battery at the same time.	Only Solar (16)° 050	Solar energy will be the only charger source no matter utility is available or not.	
Solar first (16)° C50	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.								
Solar and Utility (default) (16)° 5NU	Solar energy and utility will charge battery at the same time.								
Only Solar (16)° 050	Solar energy will be the only charger source no matter utility is available or not.								
18	Alarm control	<table><tr><td>Alarm on (default) (18)° 60N</td><td>Alarm off (18)° 60F</td></tr></table>	Alarm on (default) (18)° 60N	Alarm off (18)° 60F					
Alarm on (default) (18)° 60N	Alarm off (18)° 60F								
19	Auto return to default display screen	<table><tr><td>Return to default display screen (default) (19)° E5P</td><td>If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.</td></tr><tr><td>Stay at latest screen (19)° FEP</td><td>If selected, the display screen will stay at latest screen user finally switches.</td></tr></table>	Return to default display screen (default) (19)° E5P	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.	Stay at latest screen (19)° FEP	If selected, the display screen will stay at latest screen user finally switches.			
Return to default display screen (default) (19)° E5P	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.								
Stay at latest screen (19)° FEP	If selected, the display screen will stay at latest screen user finally switches.								
20	Backlight control	<table><tr><td>Backlight on (default) (20)° LON</td><td>Backlight off (20)° LOF</td></tr></table>	Backlight on (default) (20)° LON	Backlight off (20)° LOF					
Backlight on (default) (20)° LON	Backlight off (20)° LOF								
22	Beeps while primary source is	<table><tr><td>Alarm on (default)</td><td>Alarm off</td></tr></table>	Alarm on (default)	Alarm off					
Alarm on (default)	Alarm off								

	interrupted	(22)* R0N	(22)* R0F
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disabled (default) (23)* bYd	Bypass enabled (23)* bYE
25	Record Fault code	Record enabled (25)* FEN	Record disabled (default) (25)* FdS
26	Bulk charging voltage (C.V voltage)	EM-161A default setting: 14.1V (26)* 14.1 ^{BATT}	
		EM-252A/EM-302A default setting: 28.2V (26)* 28.2 ^{BATT}	
		If self-defined is selected in program 5, this program can be set up. Setting range is from 12.0V to 14.6V for EM-161A model, 24.0V to 29.2V for EM-252A/EM-302A model. Increment of each click is 0.1V.	
27	Floating charging voltage	EM-161A default setting: 13.5V (27)* 13.5 ^{BATT}	
		EM-252A/EM-302A default setting: 27.0V (27)* 27.0 ^{BATT}	
		If self-defined is selected in program 5, this program can be set up. Setting range is from 12.0V to 14.6V for EM-161A model, 24.0V to 29.2V for EM-252A/EM-302A model. Increment of each click is 0.1V.	
29	Low DC cut-off voltage	EM-161A default setting: 10.5V (29)* 10.5 ^{BATT}	
		3KVA-24V default setting: 21.0V	

			
		If self-defined is selected in program 5, this program can be set up. Setting range is from 10.0V to 12.0V for EM-161A model, 20.0V to 24.0V for EM-252A/EM-302A model. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.	
33	Battery equalization	Battery equalization 	Battery equalization disable (default) 
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
34	Battery equalization voltage	EM-161A default setting: 14.6V. Setting range is from 12.5V ~ 15V. Increment of each click is 0.1V. 	
		EM-252A/EM-302A default setting: 29.2V. Setting range is from 25V ~ 29.5V. Increment of each click is 0.1V. 	
35	Battery equalized time	60min (default) 	Setting range is from 5min to 900min. Increment of each click is 5min.
36	Battery equalized timeout	120min (default) 	Setting range is from 5min to 900 min. Increment of each click is 5 min.
37	Equalization interval	30days (default) 	Setting range is from 0 to 90 days. Increment of each click is 1 day
39	Equalization activated immediately	Enable 	Disable (default) 
		If equalization function is enabled in program 33, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization	

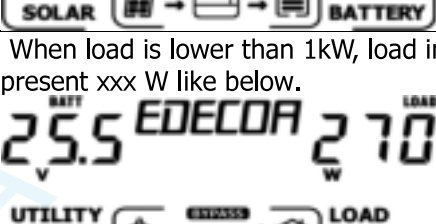
immediately and LCD main page will show “E9”. If “Disable” is selected, it will cancel equalization function until next activated equalization time arrives based on program 37 setting. At this time, “E9” will not be shown in LCD main page.

Display Setting

The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, charging current, PV power, battery voltage, output voltage, output frequency, load percentage, load in Watt, load in VA, DC discharging current, CPU Version.

Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V
Input frequency	Input frequency=50Hz
PV voltage	PV voltage=60V

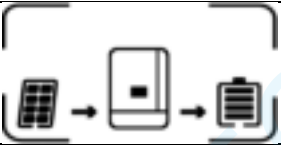
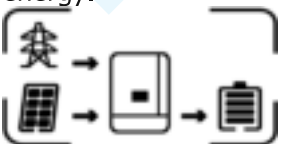
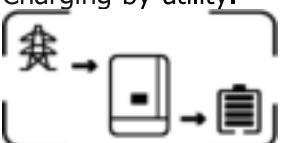
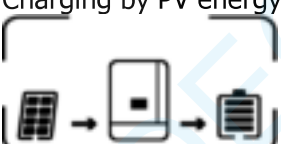
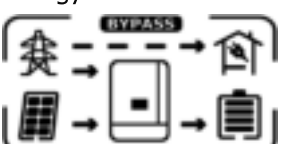
PV power	MPPT charging power = 500W 
Charging current	AC and PV Charging current=50A  Charging current: 25A  AC Charging current=50A 
Battery voltage/ output voltage	Battery voltage=25.5V, Output voltage=230V 

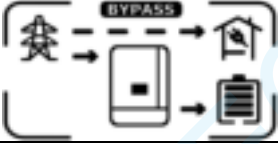
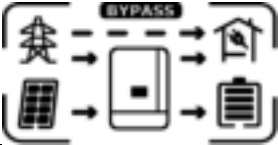
Output frequency	Output frequency=50Hz 
Load percentage	Load percent=70% 
Load in VA	When connected load is lower than 1kVA, load in VA will present xxx VA like below.  When load is larger than 1kVA ($\geq 1\text{kVA}$), load in VA will present x.x kVA like below. 
Load in Watt	When load is lower than 1kW, load in W will present xxx W like below.  When load is larger than 1kW ($\geq 1\text{kW}$), load in W will present x.x kW like below.

Battery voltage/DC discharging current	Battery voltage=25.5V, discharging current=1A
CPU version checking	CPU version 20 11

Operating Mode Description

Operation mode	Description	LCD display
Standby mode / Power saving mode	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy.
Note: *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.		
*Power saving mode: If enabled, the output of inverter		Charging by utility.
		Charging by PV energy.

will be off when connected load is pretty low or not detected.		 No charging. 
Fault mode Note * Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on	PV energy and utility can still charge batteries.	Charging by utility and PV energy.  Charging by utility.  Charging by PV energy.  No charging. 
Operation mode	Description	LCD display
Line Mode	The unit will provide output power from the mains. It will also charge the	Charging by utility and PV energy. 

	battery at line mode.	Charging by utility.  If " SUB priority" is selected as output source priority and solar energy is not sufficient to provide the load, solar energy and the utility will provide the loads and charge the battery at the same time. 
Battery Mode	The unit will provide output power from battery and PV power.	Power from battery and PV energy. 
		PV energy will supply power to the loads and charge battery at the same time. 
		Power from battery only. 

4. Battery Equalization Description

Equalization function is added to charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have but up

on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize the battery periodically.

● **How to Apply Equalization Function**

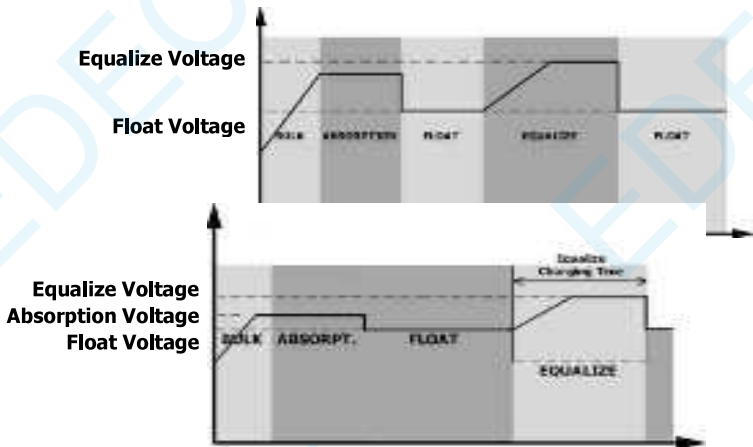
You must enable the battery equalization function in monitoring LCD setting program 33 first. Then, you may apply this function in the device by either one of the following methods:

- 1. Check that program 5 is the user-defined or flooded mode.
- 2. Check program 33 is enabled.
- 3. Setting equalization in program 34 to program 37, that depends on your battery requirements. (detailed information in LCD Setting part).
- 4. Active equalization immediately in program 39.

● **When to Equalize**

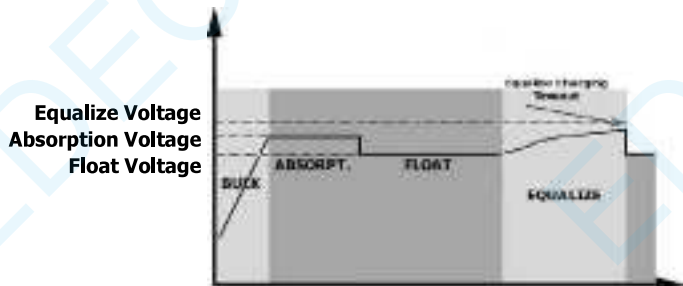
In the float stage, when the setting equalization interval (battery equalization cycle) arrives, or equalization is active immediately, the controller will start to enter Equalize stage.

● **Equalize charging time and timeout**



In Equalize stage, the controller will supply power to charge the battery as much as possible until the battery voltage raises to the battery equalization voltage. Then, constant-voltage regulation is applied to maintain the battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.

However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than



battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.

5.Fault Reference Code

When fault occurs, icon **ERROR** will be on, please check the fault code below when it happens.

Fault Code	Fault Event	Icon
01	Fan is locked when inverter is OFF	01
02	Over temperature	02
03	Battery voltage is too high	03
04	Battery voltage is too low	04
05	Output short circuited or over temperature is detected on internal converter components	05
06	Output voltage is too high	06
07	Overload time out	07
08	Bus voltage is too high	08
09	Bus soft start failed	09
11	Main relay failed	11

13	Solar charger stops due to high PV voltage	(13)
51	Over current/Surge	(51)
52	Bus voltage is too low	(52)
53	Soft start failure	(53)
55	Over DC voltage	(55)
57	Current sensor failure	(57)
58	Output voltage is too low	(58)

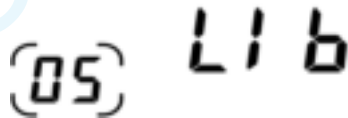
6.Warning Indicator

When warning occurs, icon  will be on, please check the fault code below when it happens.

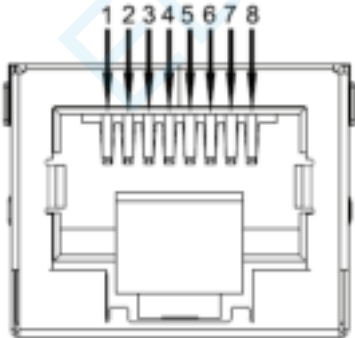
Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	(01)
03	Battery over-charged	Beep once every second	(03)
04	Low battery	Beep once every second	(04)
07	Overload	Beep once every 0.5 second	(07) LOAD 
10	Output power derating	Beep twice every 3 seconds	(10)
12	Solar charger stops due to low battery.		(12)
13	Solar charger stops due to high PV voltage		(13)
14	Solar charger stops due to overload.		(14)

7.Lithium Battery and The Interface

1. Long press ENTER key to enter the setting item and set the 05 item to lithium battery mode Lib (as shown in the figure below)



Pin number	Port definitions
1	TX
2	RX
3	VCC
4	VCC
5	RS485A
6	RS485B
7	GND
8	GND



Communication port pin definition

2. Long press the ESC key to enter the lithium battery display interface (as shown in the picture below)



The initial display interface indicates the total battery voltage and remaining battery capacity

Press the DOWN key to indicate the data as below in turn

LCD data on the left	LCD data on the right
Total battery voltage	Remaining battery capacity
Battery charging current	Battery discharge current
Battery capacity	Battery charge/discharge times
BMS board temperature	MOSFET temperature on BMS board

Maximum voltage of a single battery	Minimum voltage of a single battery
Maximum temperature of a single battery	Minimum temperature of a single battery

3. Detailed description of display interface for lithium battery

Total battery voltage, Battery residual capacity (Initial interface display)	Total battery voltage=50.5V Battery residual capacity=4% 
Battery charging current, Battery discharge current	Battery charging current= 0A Battery discharge current= 21A 
Battery capacity; Battery charger/ discharge Times	Battery capacity= 100Ah Battery charger/discharge Times=4 
BMS board temperature; MOSFET temperature of BMS board	Battery ambient temperature=25.9°C Battery MOS temperature=25.7°C 

Maximum voltage of a single battery, Minimum voltage of a single battery	Maximum voltage of a single battery=3.20V Minimum voltage of a single battery= 3.10V 
Maximum temperature of a single battery, Minimum temperature of a single battery	Maximum temperature of a single battery=25.0°C Minimum temperature of a single battery=24.2°C 

4. Warning Code

Warning Code	Event	Indicator
21	Over-voltage from battery cell	(21)
22	Low-voltage from battery cell	(22)
23	Over-voltage from battery pack	(23)
24	Low-voltage from battery pack	(24)
25	Over current - charging	(25)
26	Over current – discharging	(26)
27	High temp. on charging battery cell	(27)
28	High temp. on discharging battery cell	(28)
29	Low temp. on charging battery cell	(29)

30	Low temp. on discharging battery cell	(30)
31	High temp. environment	(31)
32	Low temp. environment	(32)
33	High temp. on MOSFET	(33)

5. Fault Code

Warning Code	Event	Indicator
21	Over-voltage from battery cell	(21)
22	Low-voltage from battery cell	(22)
23	Over-voltage from battery pack	(23)
24	Low-voltage from battery pack	(24)
25	Over current - charging	(25)
26	Over current – discharging	(26)
27	High temp. on charging battery cell	(27)
28	High temp. on discharging battery cell	(28)
29	Low temp. on charging battery cell	(29)
30	Low temp. on discharging battery cell	(30)
31	High temp. environment	(31)
32	Low temp. environment	(32)
33	High temp. on MOSFET	(33)
35	Short circuit	(35)
36	Over voltage on charger	(36)

8.SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	EM-161A	EM-252A EM-302A
Input Voltage Waveform	Sinusoidal (utility or generator)	
Nominal Input Voltage	230Vac	
Low Loss Voltage	170Vac± 7V (UPS) 90Vac± 7V (Appliances)	
Low Loss Return Voltage	180Vac± 7V (UPS) 100Vac± 7V (Appliances)	
High Loss Voltage	280Vac± 7V	
High Loss Return Voltage	270Vac± 7V	
Max AC Input Voltage	300Vac	
Nominal Input Frequency	50Hz / 60Hz (Auto detection)	
Low Loss Frequency	40±1Hz	
Low Loss Return Frequency	42±1Hz	
High Loss Frequency	65±1Hz	
High Loss Return Frequency	63±1Hz	
Output Short Circuit Protection	Circuit Breaker	
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)	
Transfer Time	10ms typical (UPS); 20ms typical (Appliances)	

Output power derating:

When AC input voltage drops to 170V, the output power will be derated.

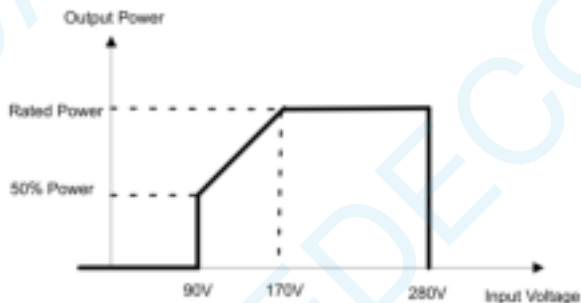


Table 2 Inverter Mode Specifications

INVERTER MODEL	EM-161A	EM-252A/ EM-302A
Rated Output	2200VA/1800W	3200VA/3000W
Output Voltage Waveform	Pure Sine Wave	
Output Voltage Regulation	230Vac $\pm$ 5%	
Output Frequency	50Hz	
Peak Efficiency	94%	
Overload Protection	5s@ $\geq$ 150% load; 10s@ $\geq$ 110% ~ 150% load	
Surge Capacity	2* rated power for 5 seconds	
Nominal DC Input Voltage	12Vdc	24Vdc
Cold Start Voltage	11.5Vdc	23.0Vdc
Low DC Warning Voltage @ load < 50% @ load > 50%	11.0Vdc 10.5Vdc	22.0Vdc 21.0Vdc
Low DC Warning Return Voltage @ load < 50% @ load > 50%	11.5Vdc 11.0Vdc	22.5Vdc 22.0Vdc
Low DC Cut-off Voltage @load < 50% @ load > 50%	10.2Vdc 9.6Vdc	20.5Vdc 20.0Vdc
High DC Recovery Voltage	14.5Vdc	29Vdc
High DC Cut-off Voltage	15.5Vdc	31Vdc
No Load Power Consumption	<25W	<35W

Table 3 Charge Mode Specifications

Utility Charging Mode		
INVERTER MODEL	EM-161A	EM-252A/EM-302A

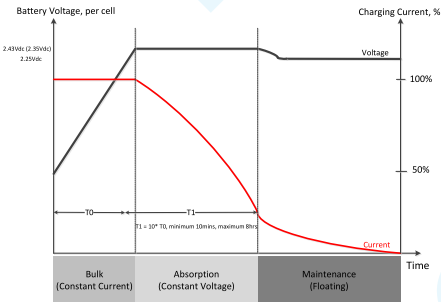
Charging Algorithm		3-Step	
AC Charging Current (Max)		60Amp (@VI/p=230Vac)	60Amp (@VI/p=230V ac)
Bulk Charging Voltage	Flooded Batter	14.6	29.2
	AGM / Gel Battery	14.1	28.2
Floating Charging Voltage		13.5Vdc	27Vdc
Charging Curve			
MPPT Solar Charging Mode			
INVERTER MODEL		EM-161A	EM-252A/EM-302A
Max. PV Array Power		2000W	3000W
Nominal PV Voltage		240Vdc	
PV Array MPPT Voltage Range		55-430Vdc	
Max. PV Array Open Circuit Voltage		450Vdc	
Max Charging Current (Joint Utility and Solar Charging)		80Amp	

Table 4 General Specifications

INVERTER MODEL	EM-161A	EM-252A/EM-302A
Safety Certification	CE/UKCA	
Operating Temperature Range	-10°C to 50°C	
Storage temperature	-15°C~ 60°C	
Humidity	5% to 95% Relative Humidity (Non-condensing)	
Dimension (D*W*H), mm	348 x 282 x 105mm	
Net Weight, kg	5.0	5.5

9.TROUBLE SHOOTING

Problem	LCD/LED/ Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low ($<1.91\text{V/Cell}$)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is fa too low. ($<1.4\text{V/Cell}$) 2. Internal fuse tripped.	1. Contact repair center for replacing the fuse. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped.	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is Flashing.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.

Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
		Temperature of internal converter component is over 120°C.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 02	Internal temperature of inverter component is over 100°C.	
	Fault code 03	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 01	Fan fault	Replace the fan.
	Fault code 06/ 58	Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)	Reduce the connected load. Return to repair center
	Fault code 08/ 09/ 53/ 57	Internal components failed.	Return to repair center.
	Fault code 51	Over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	Fault code 52	Bus voltage is too low.	
	Fault code 55	Output voltage is unbalanced.	

Download and use of PC monitoring software

1. Scan the QR code, find "Power Monitor" and download it.
2. Use the communication cable in the accessories to connect the computer to the hybrid inverter and keep the inverter turned on.
3. Find and open "SolarPowerSystem.exe" in the package file,

You can use a computer to check the working status of the hybrid inverter.

Note: Computers with Win10 systems do not need to install a driver to use them. If you have a Win7 system, you need to install a USB driver file.

