

USER MANUAL

EDECOA[®]

HYBRID INVERTER / CHARGER

MODEL:

EM-201L

EM-322L

VERSION:2.3

Language: English/Deutsch/Français/Español/Italian

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ABOUT THIS MANUAL

This manual describes the assembly, installation, operation and troubleshooting of this unit, it also provides safety and installation guidelines as well as information on tools and wiring. Please read this manual carefully before installations and operations. Keep this manual for future reference.

SAFETY INSTRUCTIONS



WARNING: This chapter contains important safety and operation 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 avoid danger, charge only deep-cycle lead acid-type rechargeable batteries. Charging other types of batteries may cause 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 electric shock or fire. If you need to use other types of batteries, you can contact the after-sales service for guidance.
4. You must disconnect all wirings before attempting any maintenance or cleaning to reduce the risk of electric shock.
5. **CAUTION** - Only qualified personnel can install this device with battery.
6. **NEVER** charge a frozen battery.
7. For optimum operation of this inverter/charge, please follow the required specs to select the appropriate cable size. It's very important to correctly operate this inverter/ charger.
8. Be cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts which could cause an explosion.
9. Please strictly follow the installation procedure when you want to disconnect AC or DC terminals. Please refer to the INSTALLATION section of this manual for the details.

10. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
11. **NEVER** cause AC output or DC input short-circuited. Do NOT connect to utility when DC input short circuits.
12. **Warning!!** Only qualified service persons are allowed to service this device. If errors still occur after following the troubleshooting table, please send this inverter/charger back to the local dealer or service center for maintenance.

INTRODUCTION

This is a multi-function inverter/charger, combining functions of inverter, solar charger and battery charger to provide uninterruptible power support. LCD display offers user-configurable and easy-accessible button operation.

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 to mains voltage or generator power
- Auto restart while AC recovery
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function

Basic System Architecture

The following illustration shows the basic application for this inverter/charger. It also includes the following devices to have a functional 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 at home or in an office environment, including motor-type appliances such as fan, refrigerator and air conditioner.

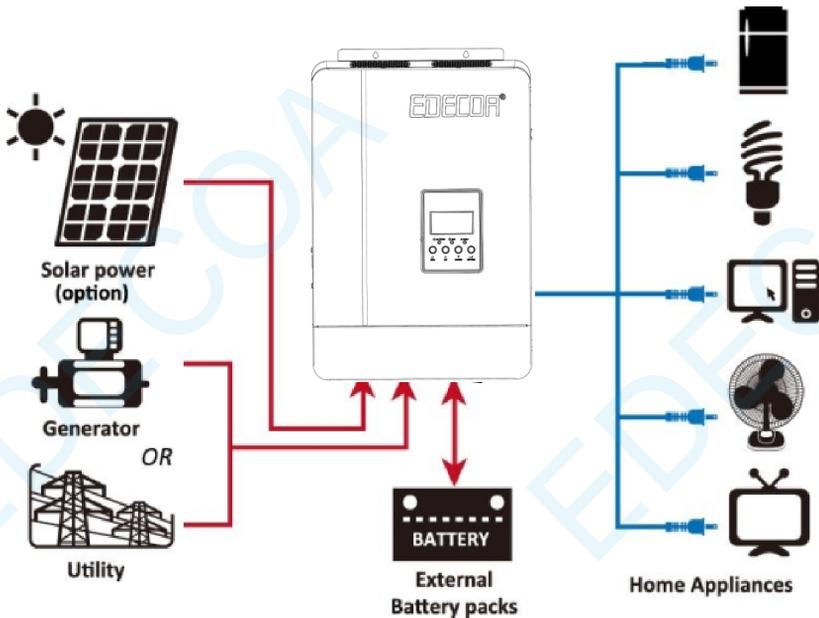
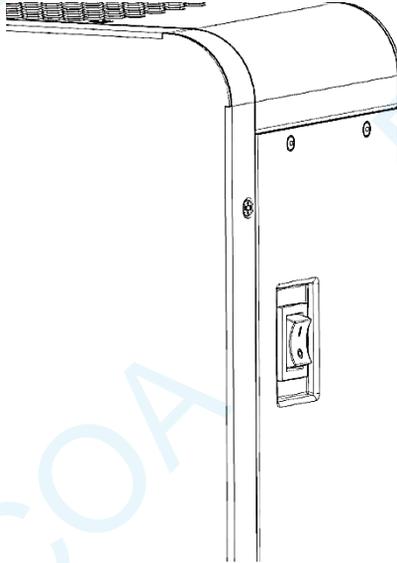


Figure 1 Hybrid Power System

OPERATION

Power ON/OFF

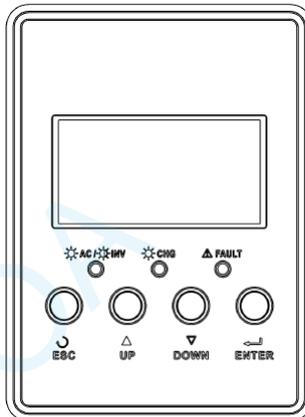
Once the unit has been properly installed and the batteries are connected



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

Operation and Display Panel

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



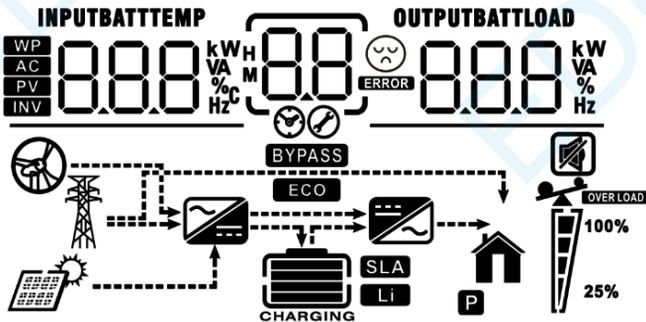
LED Indicator

LED Indicator		Messages	
	Green	ON	Output is powered by utility in Line mode.
		Flashing	Output is powered by battery or PV in battery mode.
	Green	ON	Battery is fully charged.
		Flashing	Battery is charging.
	Red	ON	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

Function keys

Function Key	Description
ESC	Exit setting mode
UP	Go to previous selection
DOWN	Go to next selection
ENTER	Confirm the selection in setting mode or enter setting mode

LCD Display Icons



Icon	Function description
Input Source Information	
	Indicates the AC input.

	<p>Indicates the PV input</p>
	<p>Indicate input voltage, input frequency, PV voltage, battery voltage, and charger current.</p>
<p>Configuration Program and Fault Information</p>	
	<p>Indicates the setting programs.</p>
	<p>Indicates the warning and fault codes.</p> <p>Warning: </p> <p>Fault: ERROR</p>
<p>Output Information</p>	
	<p>Indicate output voltage, output frequency, load percent, load in VA, load in Watt, and discharging current.</p>
<p>Battery Information</p>	
	
<p>Load Information</p>	
	<p>Indicates overload.</p>
<p>Mode Operation Information</p>	
	<p>Unit connected to the utility.</p>
	<p>Unit connected to the PV panel.</p>
	<p>Load is supplied by utility power.</p>
	<p>Utility charger circuit is working.</p>

	DC/AC inverter circuit is working.
Mute Operation	
	Unit alarm is disabled.

LCD Setting

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

Setting Programs:

Program	Description	Available option(s)	
	Exit setting mode	00H	Default
		00E	When selected, restore all programs to default.
	Output source priority: To configure load power source priority	(Default) U5b	Utility provides power to the loads as the first priority. Solar and battery will provide power when utility is not available.
		5U6	Solar energy provides power to the loads as priority. If solar energy is not sufficient to power all connected loads; utility energy will be supplement. Battery provides power to the loads only under either following conditions: - Solar energy and utility are both not available. - Solar energy is not sufficient and utility is not available.

		56U	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.
		ntS	When solar power is available, priority sequence is Solar → battery → utility. When solar power is not available, priority sequence is utility → battery, while battery is the backup power source.
	<p>Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)</p>	<p>10A</p> <p>10_A</p>	<p>80A (Default)</p> <p>80_A</p>
		<p>140A (Maximum)</p> <p>140_A</p>	
	AC input voltage range	<p>Appliances (default)</p> <p>APL</p>	AC input voltage range becomes within 90-280VAC.
		<p>UPS</p> <p>UPS</p>	AC input voltage range becomes within 170-280VAC.

	Battery type	AGM (default) AGM	Flooded FLD
		User-Defined USE	If "User-Defined" is selected, battery charging voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
	Auto restart when overload occurs	Restart disabled (default) LTD	Restart enabled LTE
	Auto restart when over temperature occurs	Restart disabled (default) ETD	Restart enabled ETE
	Output frequency	50Hz (default) 50 Hz	60Hz 60 Hz
	Output voltage	220V 220 v	230V(default) 230 v
		240V 240 v	
	Maximum utility charging current	2A (Minimum) 2 A	40A (Default) 40 A
		80A (Maximum) 80 A	
	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01.	Available options for EM-201L: default setting is 11.5V, range from 10.5V to 13.1V.	
		Default 11.5 v	
		Available options for EM-322L: default is 23.0V, range from 21.0V to 26.2V.	

		Default 230^v	
	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01	Available options for EM-201L: default setting is 13.5V, range from 12.0V to 14.6V. Default 13.5V 13.5^v	
		Available options for EM-322A: default setting is 27.0V, range from 24.0V to 27.0V. Default 27.0V 270^v	
		10A 10^A	20A (Default) 20^A
		120A 120^A	
	Charger source priority	If this inverter/charger is working in Line, Standby or Fault mode, charger source can be programmed as below:	
		Solar and Utility (Default) 50U	Solar energy and utility will charge battery at the same time
		Solar first 050	Solar energy will charge battery as priority. Utility will charge battery only when solar energy is not available.
		Only Solar 0050	Solar energy will be the only supplying source of energy disregard utility is available or not.
		If this inverter/charger is in Battery mode or Power saving mode, only solar energy is available for battery charging. Solar energy will charge battery if it's available and sufficient.	

	Alarm control	Alarm on (default) 60n	Alarm OFF 60F
	Automatically return to default display screen	Return to default display screen (default) ESP	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) in 1 minute after no button is pressed.
		Stay at previous screen FEP	If selected, the display screen will stay at previous screen user finally switches.
	Backlight control	Backlight on (default) L0n	Backlight OFF L0F
	Beeps while primary source is interrupted	Alarm ON (default) A0n	Alarm OFF A0F
	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disabled (default) byd	Bypass enabled byE
	Record Fault code	Record enabled (default) FEn	Record disabled FdS
	Bulk charging voltage (C.V voltage)	Default setting of EM-201L: 14.1V 14.1 ^v	
		Default setting of EM-322L: 28.2V 28.2 ^v	

		Only when self-defined is selected in Program 5 will this program become available. Setting range is from 24.0V to 29.2V for EG-422B, 48.0V to 58.4V for EG-624B. Increment of each click is 0.1V.	
	Floating charging voltage	Default setting of EM-201L: 13.5V 13.5 ^v	
		Default setting of EM-322L: 27V 27.0 ^v	
		Only when self-defined is selected in program 5, this program can be set up. Setting range is from 24.0V to 29.2V for EG-422B, 48.0V to 58.4V for EG-624B. Increment of each click is 0.1V.	
	Low DC cut-off voltage	Default setting of EM-201L: 10.0V 10.0 ^v	
		Default setting of EM-322L: 20.0V 20.0 ^v	
	Battery equalization	EEN	Ed5
		Only when "Flooded" or "User-Defined" is selected in program 05 will this program become available.	
	Battery equalization voltage	Default setting of EM-201L: 14.6V 14.6 ^v	Setting range for EM-201L is from 12.0V to 15.0V. Increment of each click is 0.1V
		Default setting of EM-322L: 29.2V 29.2 ^v	Setting range for EM-322L is from 24.0V to 30.0V. Increment of each click is 0.1V
	Battery equalization time	60min (default) 60	Setting range is from 5min to 900min. Increment of each click is 5min.

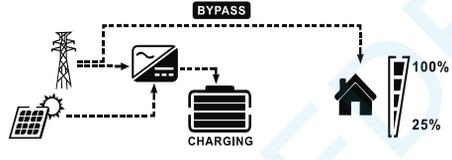
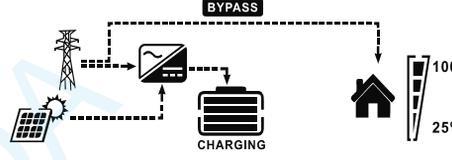
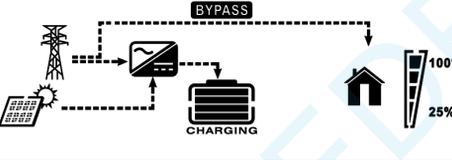
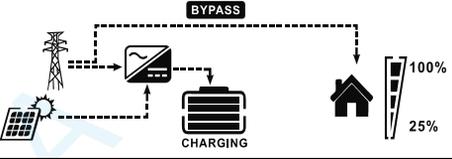
	Battery equalization timeout	120min (default) 120	Setting range is from 5min to 900min. Increment of each click is 5 min.
	Equalization interval	30days (default) 30	Setting range is from 0 to 90 days. Increment of each click is 1 day.
	Activate equalization immediately	Enable AEN	Disable (default) AD5
<p>Only when equalization function is enabled in program 30 will this program be available. 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 35 setting. At this time, "E9" will not be shown in LCD main page.</p>			
	LED pattern lights	LED lights ON (default) LON	LED lights OFF LOF
	Time setting - Year	The value here ranges from 00 – 99, indicates the last 2 digits of the year.	
	Time setting - Month	The value here ranges from 01 – 12	
	Time setting - Day	The value here ranges from 01 – 31	
	Time setting - Hour	The value here ranges from 00 – 59	
	Time setting - Minute	The value here ranges from 00 – 59	

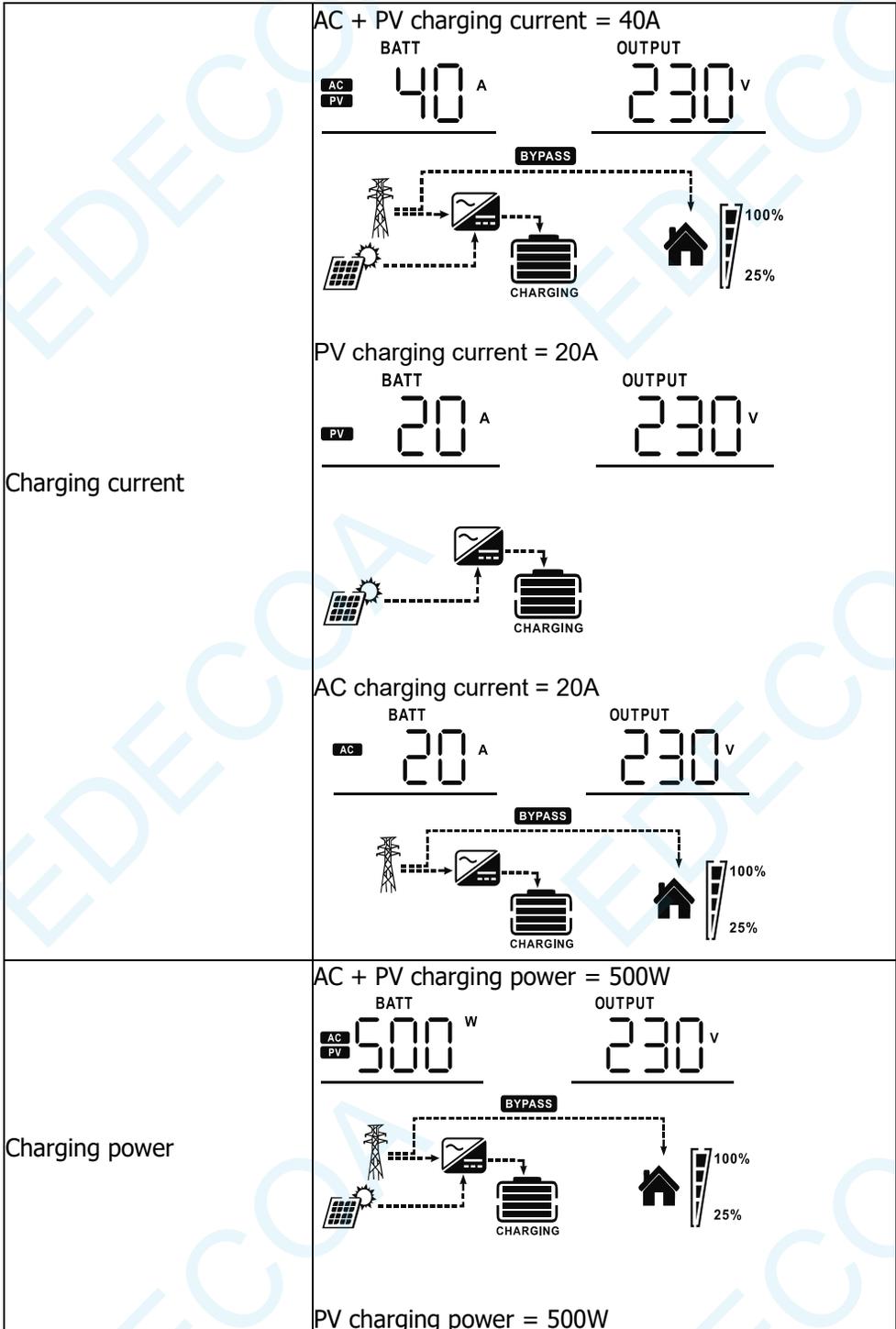
	Clear Energy	Disabled (Default) 	Enabled
	AC charging start time - Hour	You can set up the time of starting AC charging here, for example 20:50 – 20 in program 87 and 50 in program 88.	
	AC charging start time - Minute		
	AC charging end time - Hour	You can set up the time of ending AC charging here, for example 07:50 – 07 in program 89 and 50 in program 90	
	AC charging end time - Minute		

Display Setting

The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The information display 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.

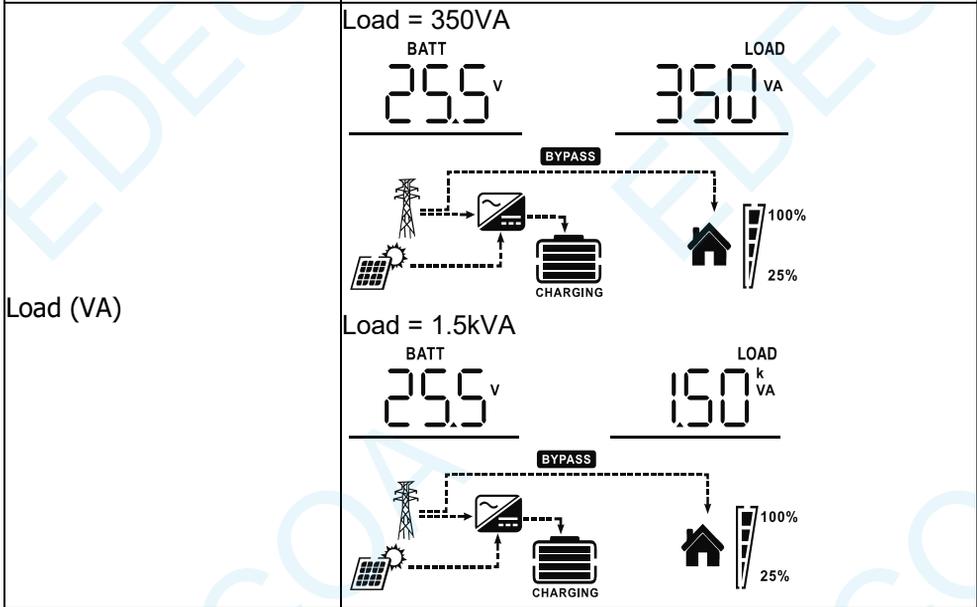
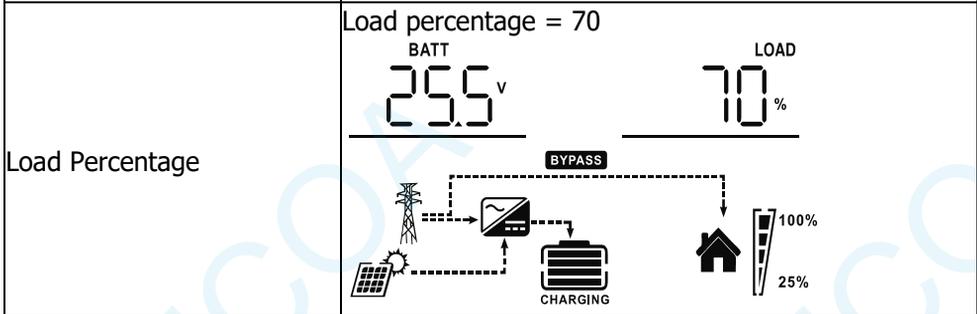
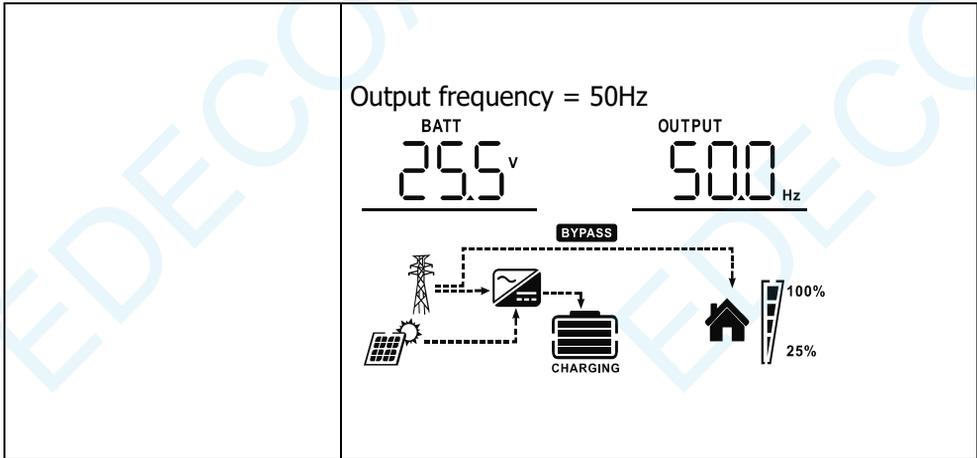
Information display	LCD display
Input voltage/Output voltage (Default Display Screen)	<p>Input Voltage=230V, output voltage=230V</p> <p>The LCD display shows 'INPUT 230v' and 'OUTPUT 230v'. Below the display is a schematic diagram showing a power source (solar panel and grid) connected to a device. A dashed line labeled 'BYPASS' goes from the device to a house icon. A battery icon labeled 'CHARGING' is also shown. A vertical bar on the right indicates battery levels at 100% and 25%.</p>

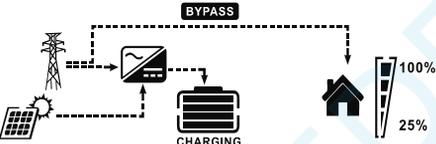
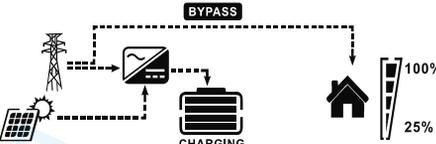
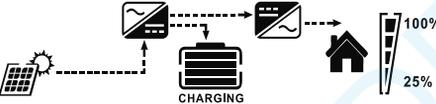
<p>Input frequency</p>	<p>Input frequency=50Hz</p> <p>INPUT AC 500 Hz</p> <p>OUTPUT 230 V</p> 
<p>PV voltage</p>	<p>PV voltage=100V</p> <p>INPUT PV 100 V</p> <p>OUTPUT 230 V</p> 
<p>PV current</p>	<p>PV current = 2.5A</p> <p>INPUT PV 2.5 A</p> <p>OUTPUT 230 V</p> 
<p>PV power</p>	<p>PV power = 500W</p> <p>INPUT PV 500 W</p> <p>OUTPUT 230 V</p> 



Charging current

Charging power

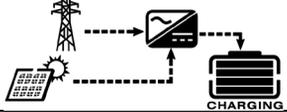
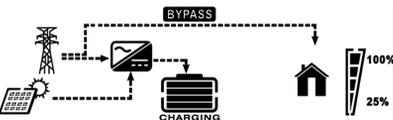


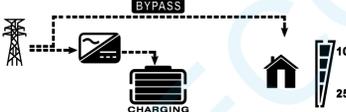
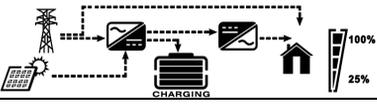
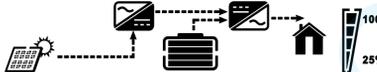
<p>Load (Watt)</p>	<p>Load = 270W</p> <p>BATT 25.5^v LOAD 270^W</p>  <p>CHARGING</p> <p>Load = 1.2kW</p> <p>BATT 25.5^v LOAD 1.20^{kW}</p>  <p>CHARGING</p>	
<p>Battery voltage/DC discharging current</p>	<p>Battery voltage = 25.5V, discharging current = 1A</p> <p>BATT 25.5^v BATT 1^A</p>  <p>CHARGING</p>	
<p>PV energy generated today</p>	<p>Standby</p>	<p>159^{kWh} DAY</p> 
	<p>Charging</p>	<p>159^{kWh} DAY</p>  <p>CHARGING</p>
<p>PV energy generated this month</p>	<p>Standby</p>	<p>159^{kWh} MONTH</p> 

	Charging	
Total PV energy generated	Standby	
	Charging	
Date	24 12 26	
Time	13 38 29	
Main CPU version checking	Version No.10.01	

Operating Mode Description

Operation mode	Description	LCD display
Standby mode / Power saving mode Note: *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery	No output but inverter still can charge batteries.	Charging by utility and PV energy.
		Charging by utility.

<p>without AC output. *Power saving mode: If enabled, the output of inverter will be off when connected load is too low or not detected.</p>		 <p>Charging by PV energy.</p>  <p>Not charging.</p> 
<p>Fault mode Note: * Fault mode: Errors are caused by internal circuit error or external reasons such as high temperature, short-circuited load and so on.</p>	<p>PV energy and utility can charge batteries.</p>	<p>Charging by utility and PV energy.</p>  <p>Charging by utility.</p>  <p>Charging by PV energy.</p>  <p>Not charging.</p> 
<p>Line Mode</p>	<p>Inverter will provide output from utility. Battery will also be charged.</p>	<p>Charging by utility and PV energy.</p> 

	<p>Inverter will provide output power from utility. Battery will also be charged.</p>	<p>Charging by utility.</p> 
<p>Battery Mode</p>	<p>Inverter will provide output power from battery and PV power.</p>	<p>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.</p>  <p>Power from battery and PV energy.</p> 

Battery Equalization Description

Equalization function 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. This condition – sulfation - will reduce the overall capacity of the battery. Therefore, it's recommended to equalize the battery periodically. Equalization also helps to remove sulfate crystals that might have but up on the plates.

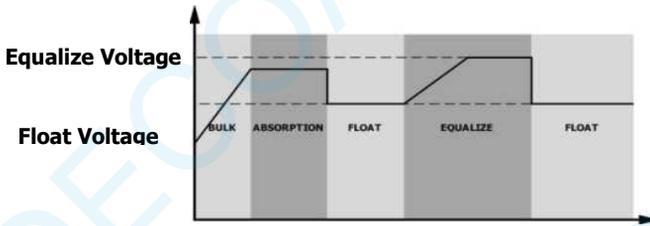
● How to Apply Equalization Function

Enable the battery equalization function in monitoring LCD setting program 33 first. Then apply this function in the device by either one of the following methods:

1. Setting equalization interval in program 34.
2. Active equalization immediately in program 39.

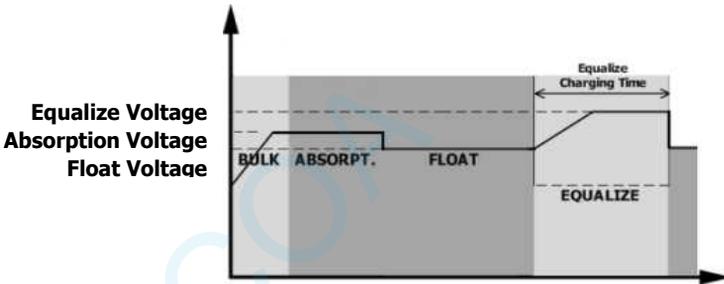
● When to Equalize

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.

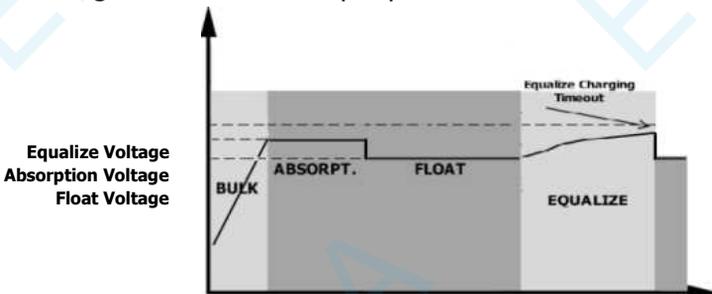


● **Equalize charging time and time-out**

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.



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	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
05	Output short circuited or over temperature is detected on internal converter components	
06	Output voltage is too high	
07	Overload time out	
08	Bus voltage is too high	
09	Bus soft start failed	
51	Over current/Surge	
52	Bus voltage is too low	
53	Soft start failure	
55	Over DC voltage	
57	Current sensor failure	
58	Output voltage is too low	
59	PV voltage exceeds limit.	

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	
03	Battery over-charged	Beep once every second	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	
10	Output power derating	Beep twice every 3 seconds	
12	Solar charger stops due to low battery.		
13	Solar charger stops due to high PV voltage		
14	Solar charger stops due to overload.		

SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	EM-201L	EM-322L
Input Voltage Waveform	Sinusoidal (utility or generator)	
Nominal Input Voltage	230 VAC±5%	
Low Loss Voltage	170 VAC± 10 V (UPS) 90 VAC± 7 V (Appliances)	
Low Loss Return Voltage	180 VAC± 10 V (UPS)	

	100 VAC± 10 V (Appliances)
High Loss Voltage	280 VAC± 7 V
High Loss Return Voltage	270 VAC± 7 V
Max AC Input Voltage	300 VAC
Nominal Input Frequency	50 Hz / 60 Hz (Auto detection)
Cut-off Low Frequency	40±1 Hz
Recovery (Low) Frequency	42±1 Hz
Cut-off High Frequency	65±1 Hz
Recovery (High) Frequency	63±1 Hz
Output Short Circuit Protection	Circuit Breaker
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)
Transfer Time	10ms
<p>Output power derating: When AC input voltage drops to 170V, the output power will be derated.</p>	

Table 2 Inverter Mode Specifications

INVERTER MODEL	EM-201L	EM-322L
Rated Output	2.0 kVA/2.0 kW	3.2 kVA/3.2 kW
Output Voltage Waveform	Pure Sine Wave	
Output Voltage Regulation	230 VAC±5%	
Output Frequency	50Hz	
Peak Efficiency	92%	
Overload Protection	3s@≥150% load; 5s@≥ 110% ~ 150% load	

Surge Capacity	2 * rated power for 1 second	
Nominal DC Input Voltage	12.0 VDC	24 VDC
Cold Start Voltage	11.5 VDC	23.0 VDC
Low DC Warning Voltage		
@ load < 50%	11.25 VDC	22.5 VDC
@ load ≥ 50%	11.0 VDC	22.0 VDC
Low DC Warning Recover Voltage		
@ load < 50%	11.75 VDC	23.5 VDC
@ load ≥ 50%	11.5 VDC	23.0 VDC
Low DC Cut-off Voltage		
@load < 20%	10.75 VDC	21.5 VDC
@ load ≥50%	10.5 VDC	21.0 VDC
High DC Recovery Voltage	15.5 VDC	31 VDC
High DC Cut-off Voltage	16.0 VDC	32 VDC
No-Load Power Consumption	<38 W	<38 W

Table 3 Charge Mode Specifications

Utility Charging Mode			
INVERTER MODEL		EM-201L	EM-322L
Charging Algorithm		3-Step	
Charging Current (UPS) @ Nominal input voltage		80A @ $V_{I/P} = 230Vac$	
Bulk Charging Voltage (V)	Flooded Battery	14.6 VDC	29.2 VDC
	AGM / Gel Battery	14.1 VDC	28.2 VDC

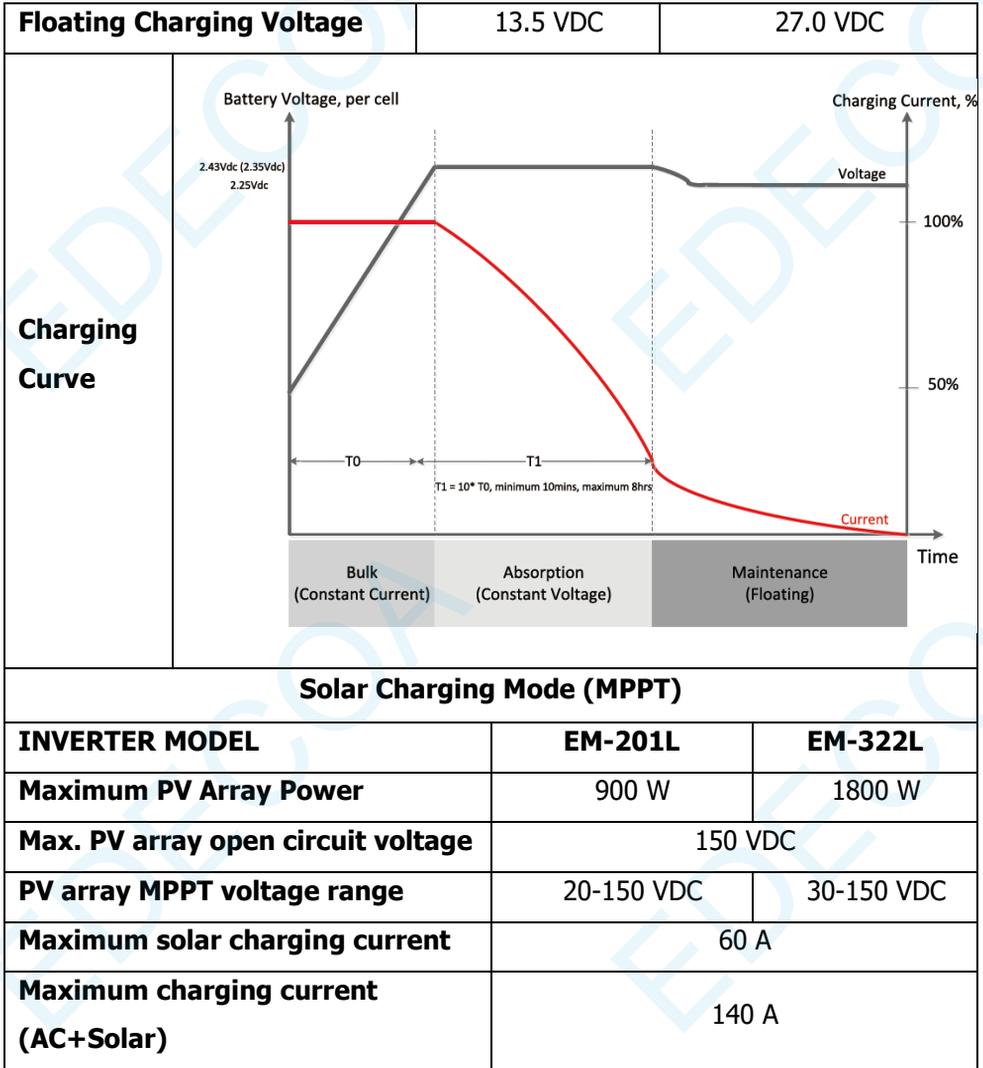


Table 4 Charge Mode Specifications

Model	EM-201L	EM-322L
Safety Certification	CE	
Operating temperature range	-10~55°C	
Storage temperature	-15~60°C	
Dimension(D*W*H) (mm)	415 * 290 * 111	
Net weight (kg)	7.2	7.3

TROUBLE SHOOTING

Problem	LCD/LED/ Buzzer	Explanation /Possible cause	What to do
Shuts down automatically during startup process.	LCD/LEDs and buzzer activated for 3 seconds and then complete off.	The battery voltage is too low (<1.91V/Cell)	<ol style="list-style-type: none"> 1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	<ol style="list-style-type: none"> 1. The battery voltage is far too low (<1.4V/Cell) 2. Battery polarity is connected reversed. 	<ol style="list-style-type: none"> 1. Check if batteries and the wiring are connected firmly. 2. Replacing the fuse. 3. Re-charge battery. 4. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED flash.	Input protector is tripped.	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED flashes.	Insufficient quality of AC power. (Shore or Generator)	<ol style="list-style-type: none"> 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)
	Green LED flashes.	"Solar First" is selected	Change output source priority to utility.
When the unit is turned on, internal relay keeps ON and OFF repeatedly.	LCD display and LEDs flash.	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.

	Output short circuited.	Check if wiring is connected well and remove abnormal load.
Fault code 05	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 service 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)	1.Reduce the connected load. 2.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 and if happens again, return to repair center.
Fault code 52	Bus voltage too low	
Fault code 55	Output voltage imbalance	
Fault code 56	Battery connection issue or fuse burnt	Check battery connection.