

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.

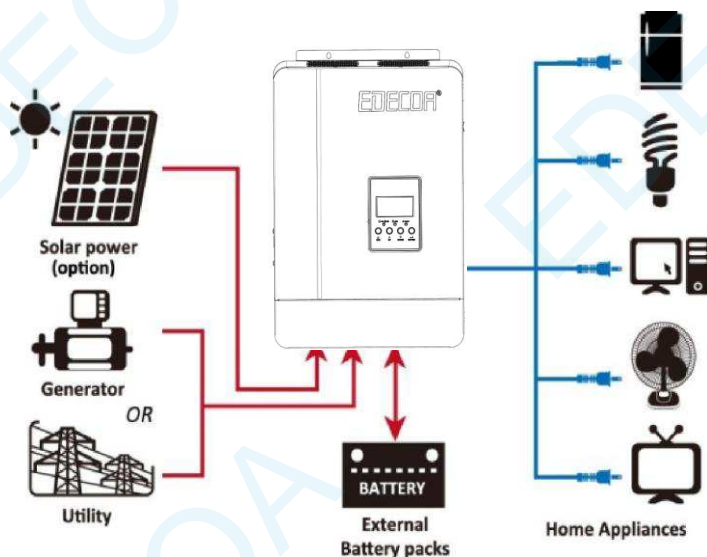
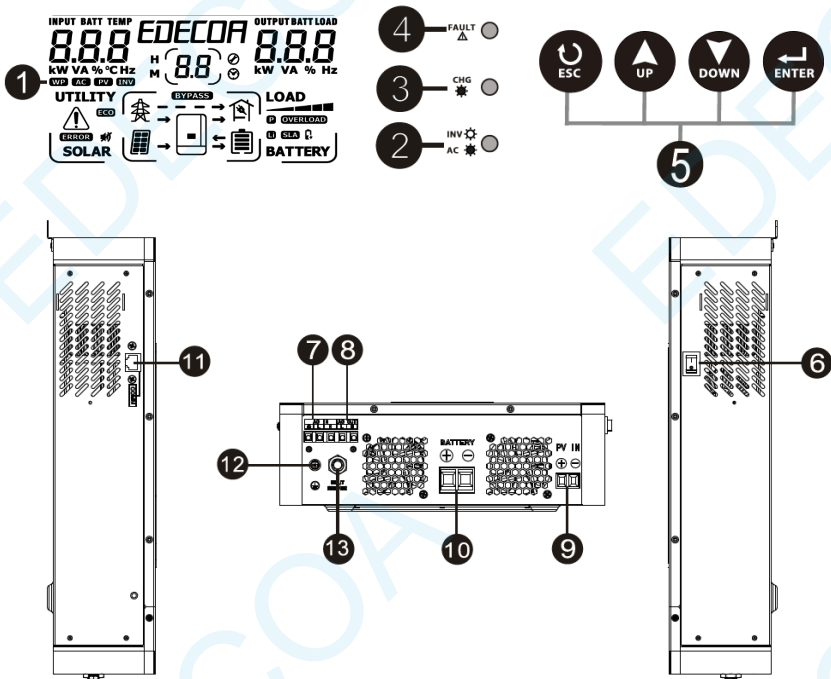


Figure 1 Hybrid Power System

Product Overview

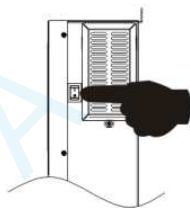


- 1. LCD display
- 2. Status indicator
- 3. Charging indicator
- 4. Fault indicator
- 5. Function buttons
- 6. Power on/off switch
- 7. AC input
- 8. AC output
- 9. PV input
- 10. Battery input
- 11. RS-232 communication port
- 12. Safety (Earth) ground
- 13. Circuit breaker

3. OPERATION

Power ON/OFF

Side view of unit

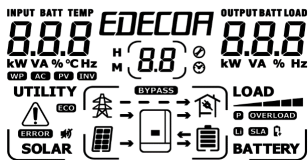


Once the unit has been properly installed and the batteries are connected

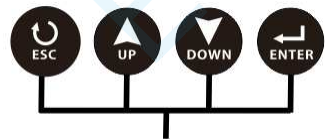
well, simply press the ON/OFF switch (located on the button of the case) to turn on the unit.

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



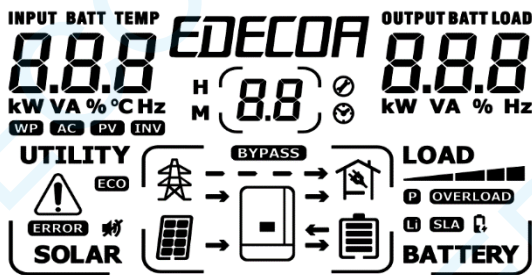
Function keys



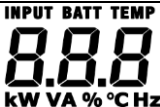




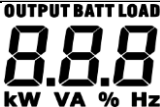

| LED Indicator | | | Messages |
|---------------|-------|----------|--|
| AC / INV | Green | Solid On | Output is powered by utility in Line mode |
| | | Flashing | Output is powered by battery or PV in battery mode |
| CHG | Green | Solid On | Battery is fully charged. |
| | | Flashing | Battery is 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.

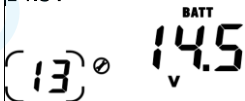
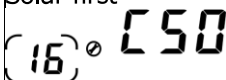
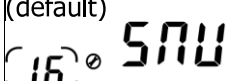

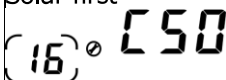
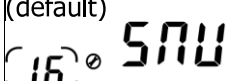

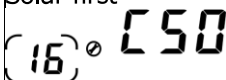
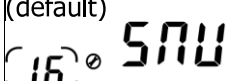

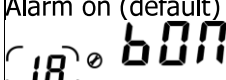
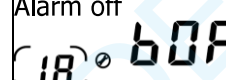
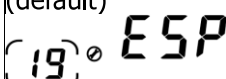
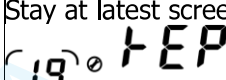
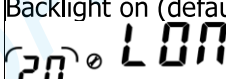
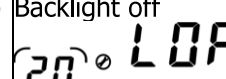
Setting Program

| Program | Description | Selectable option |
|---------|-------------------|---|
| 00 | Exit setting mode | Escape  ESC |

| | | | |
|----|---|--------------------------------------|--|
| 01 | Output source priority: To configure load power source priority | SUB priority (default) (01) 0 SUB | 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 (01) 0 SUBU | 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 (02) 0 10 | 80A (02) 0 80 |
| 03 | AC input voltage range | Appliances (default) (03) 0 RPL | 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. |





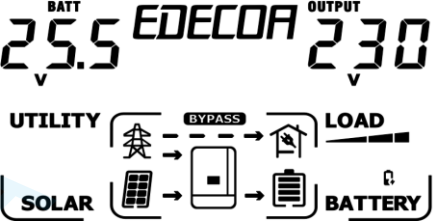
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| | | (03)° UPS | |
| 04 | Power saving mode enable/disable | Saving mode disable (default) (04)° SDS | If disabled, no matter connected load is low or high, the on/off status of inverter output will not be affected. |
| | | Saving mode enable (04)° 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)° LTE |
| 07 | Auto restart when over temperature occurs | Restart disabled (default) (07)° LTD | Restart enabled (07)° LTE |
| 08 | Output voltage | (08)° 220 _v | (Default) (08)° 230 _v |
| | | (08)° 240 _v | 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. | |


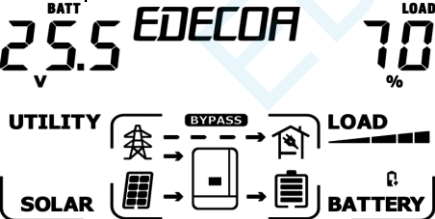

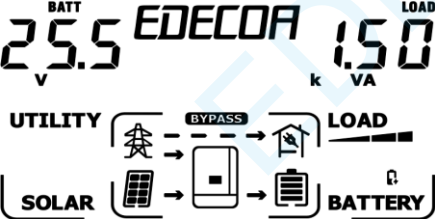
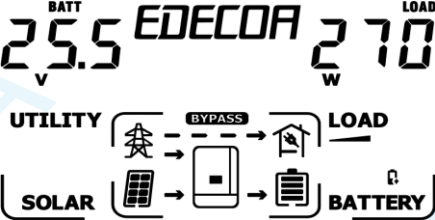
| | | | |
|----|---|---|--|
| 11 | Maximum utility charging current Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger. | UT1 (1)° 2A | UT1 (1)° 60A |
| 12 | Setting voltage point back to utility source when selecting "SBU priority". | Available options in EM-252A/EM-302A model: | |
| | | (12)° ^{BATT} 22.0 v | Default (12)° ^{BATT} 23.0 v |
| | | (12)° ^{BATT} 25.5 v | |
| | | Available options in EM-161A model: | |
| | | 11.0V (12)° ^{BATT} 1.10 v | 11.5V (default) (12)° ^{BATT} 1.15 v |
| 13 | Setting voltage point back to battery mode when selecting "SBU priority". | 12.8V (12)° ^{BATT} 12.8 v | |
| | | Available options in EM-252A/EM-302A model: | |
| | | Battery fully charged (13)° ^{BATT} FUL v | 24V (13)° ^{BATT} 24.0 v |
| | | 27V(default) (13)° ^{BATT} 27.0 v | 29V (13)° ^{BATT} 29.0 v |
| | | Available options in EM-161A model: | |
| | | Battery fully charged (13)° ^{BATT} FUL v | 12.0V (13)° ^{BATT} 12.0 v |

| | | | | | | | | | |
|--|--|---|---|--|--|--|--|---|---|
| | | 14.5V  | | | | | | | |
| 16 | Charger source priority: To configure charger source priority | <p>If this inverter/charger is working in Line, Standby or Fault mode, charger source can be programmed as below:</p> <table> <tr> <td> Solar first  </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)  </td> <td> Solar energy and utility will charge battery at the same time. </td> </tr> <tr> <td> Only Solar  </td> <td> Solar energy will be the only charger source no matter utility is available or not. </td> </tr> </table> <p>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.</p> | | Solar first  | Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available. | Solar and Utility (default)  | Solar energy and utility will charge battery at the same time. | Only Solar  | Solar energy will be the only charger source no matter utility is available or not. |
| Solar first  | Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available. | | | | | | | | |
| Solar and Utility (default)  | Solar energy and utility will charge battery at the same time. | | | | | | | | |
| Only Solar  | Solar energy will be the only charger source no matter utility is available or not. | | | | | | | | |
| 18 | Alarm control | Alarm on (default)  | Alarm off  | | | | | | |
| 19 | Auto return to default display screen | Return to default display screen (default)  | 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  | If selected, the display screen will stay at latest screen user finally switches. | | | | | | |
| 20 | Backlight control | Backlight on (default)  | Backlight off  | | | | | | |
| 22 | Beeps while primary source is | Alarm on (default) | Alarm off | | | | | | |

| | | | |
|----|---|--|---|
| | interrupted | (22)° ROn | (22)° ROF |
| 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 CU (26)° 14.1 ^{BATT} _v | |
| | | EM-252A/EM-302A default setting: 28.2V CU (26)° 28.2 ^{BATT} _v | |
| | | 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 FLU (27)° 13.5 ^{BATT} _v | |
| | | EM-252A/EM-302A default setting: 27.0V FLU (27)° 27.0 ^{BATT} _v | |
| | | 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 COU (29)° 10.5 ^{BATT} _v | |
| | | 3KVA-24V default setting: 21.0V | |

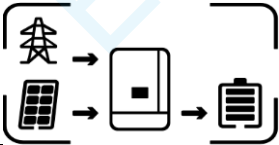
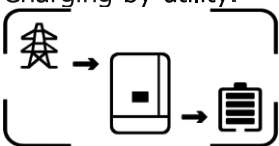
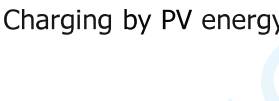
| | | | |
|----|------------------------------------|--|---|
| | | <div> <div>10.0V</div> <div>(29)°</div> <div>BATT 21.0V</div> </div> <p>If self-defined is selected in program 5, this program can be set up. Setting range is from 10.0V to 12.0V for EM-161A model, 20.0V to 24.0V for EM-252A/EM-302A model. 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.</p> | |
| 33 | Battery equalization | <div>Battery equalization</div> <div>(33)°</div> <div>EE7</div> | <div>Battery equalization disable (default)</div> <div>(33)°</div> <div>Ed5</div> <p>If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.</p> |
| 34 | Battery equalization voltage | <div>EM-161A default setting: 14.6V. Setting range is from 12.5V ~ 15V. Increment of each click is 0.1V.</div> <div> <div>EV</div> <div>(34)°</div> <div>BATT 14.6V</div> </div> <div>EM-252A/EM-302A default setting: 29.2V. Setting range is from 25V ~ 29.5V. Increment of each click is 0.1V.</div> <div> <div>EV</div> <div>(34)°</div> <div>BATT 29.2V</div> </div> | |
| 35 | Battery equalized time | <div>60min (default)</div> <div>(35)°</div> <div>60</div> | <div>Setting range is from 5min to 900min. Increment of each click is 5min.</div> |
| 36 | Battery equalized timeout | <div>120min (default)</div> <div>(36)°</div> <div>120</div> | <div>Setting range is from 5min to 900 min. Increment of each click is 5 min.</div> |
| 37 | Equalization interval | <div>30days (default)</div> <div>(37)°</div> <div>30d</div> | <div>Setting range is from 0 to 90 days. Increment of each click is 1 day</div> |
| 39 | Equalization activated immediately | <div>Enable</div> <div>(39)°</div> <div>AEN</div> | <div>Disable (default)</div> <div>(39)°</div> <div>Ad5</div> <p>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</p> |

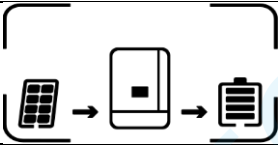

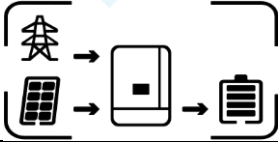
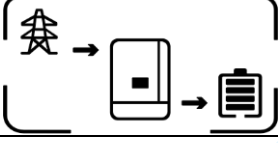
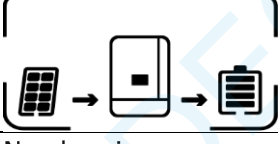

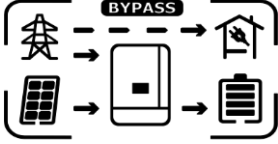
| | |
|--|--|
| <p>PV power</p> | <p>MPPT charging power = 500W</p>  |
| <p>Charging current</p> | <p>AC and PV Charging current=50A</p>  <p>Charging current: 25A</p>  <p>AC Charging current=50A</p>  |
| <p>Battery voltage/ output voltage</p> | <p>Battery voltage=25.5V, Output voltage=230V</p>  |

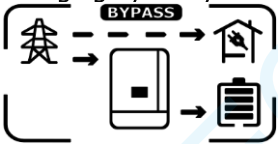
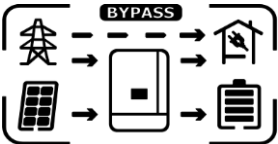
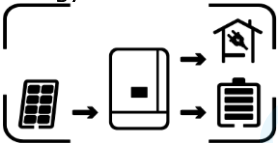

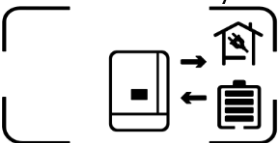
| | |
|------------------|--|
| Output frequency | <p>Output frequency=50Hz</p>  |
| Load percentage | <p>Load percent=70%</p>  |
| Load in VA | <p>When connected load is lower than 1kVA, load in VA will present xxx VA like below.</p>  <p>When load is larger than 1kVA ($\geq 1\text{kVA}$), load in VA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

| | |
|--|--|
| | |
| Battery voltage/DC discharging current | <p>Battery voltage=25.5V, discharging current=1A</p> |
| CPU version checking | <p>CPU version 20 11</p> |

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.  |

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

| | | |
|--------------|---|---|
| | battery at line mode. | <p>Charging by utility.</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>  |
| Battery Mode | The unit will provide output power from battery and PV power. | <p>Power from battery and PV energy.</p>  |
| | | <p>PV energy will supply power to the loads and charge battery at the same time.</p>  |
| | | <p>Power from battery only.</p>  |

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

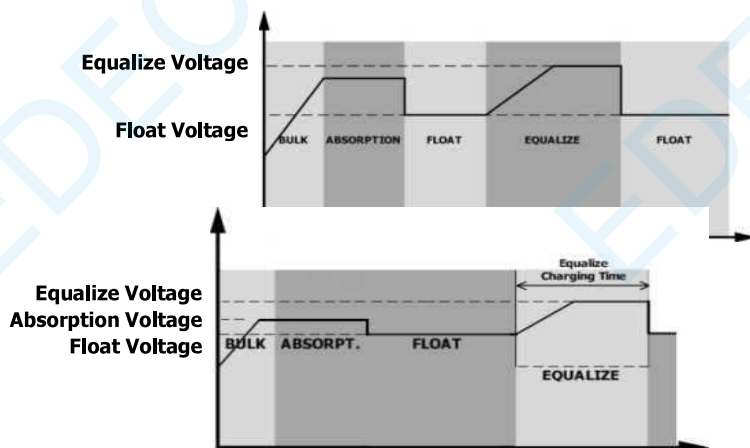
You must enable the battery equalization function in monitoring LCD setting program 33 first. Then, you may apply this function in the device by either one of the following methods:

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

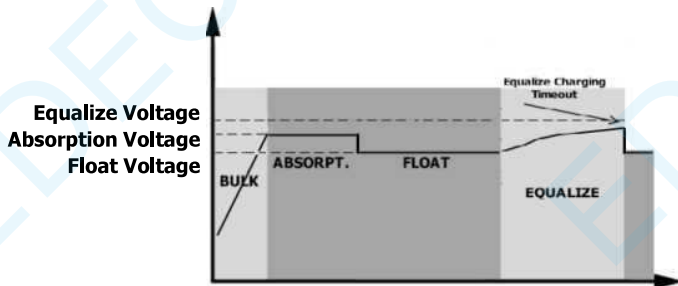
In the float stage, when the setting equalization interval (battery equalization cycle) arrives, or equalization is active immediately, the controller will start to enter Equalize stage.

● 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) |

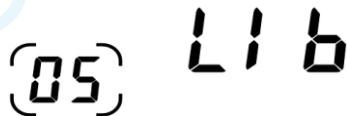
6.Warning Indicator

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

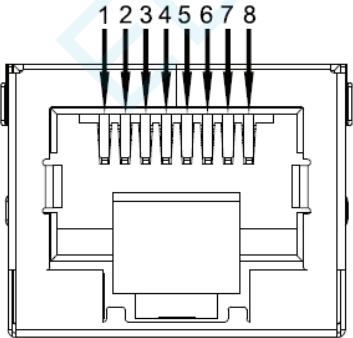
| Warning Code | Warning Event | Audible Alarm | Icon flashing |
|--------------|--|-------------------------------|---|
| 01 | Fan is locked when inverter is on. | Beep three times every second | (01) |
| 03 | Battery over-charged | Beep once every second | (03) |
| 04 | Low battery | Beep once every 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)




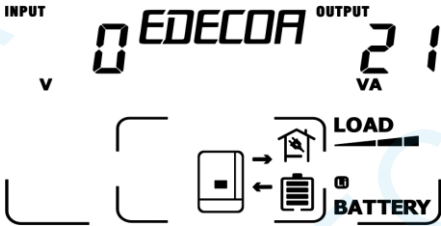
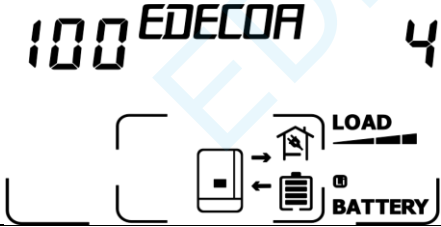
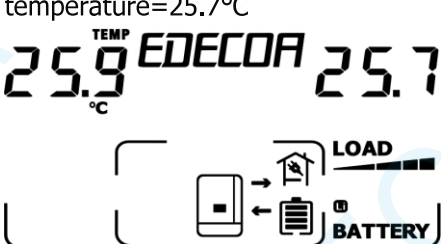
The initial display interface indicates the total battery voltage and remaining battery capacity

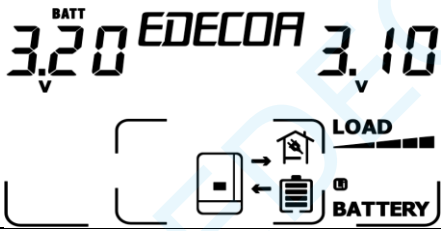
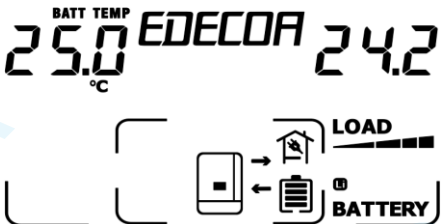
Press the DOWN key to indicate the data as below in turn

| 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

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

| | |
|--|--|
| Maximum voltage of a single battery, Minimum voltage of a single battery | <p>Maximum voltage of a single battery=3.20V Minimum voltage of a single battery= 3.10V</p>  |
| Maximum temperature of a single battery, Minimum temperature of a single battery | <p>Maximum temperature of a single battery=25.0°C Minimum temperature of a single battery=24.2°C</p>  |

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.

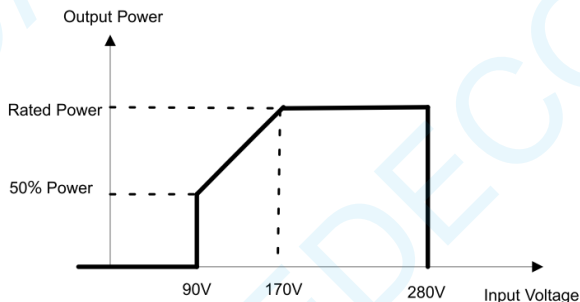


Table 2 Inverter Mode Specifications

| 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 |

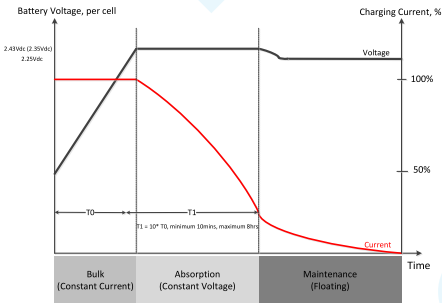
| Charging Algorithm | | 3-Step | |
|---|-------------------|---|---------------------------|
| AC Charging Current (Max) | | 60Amp (@VI/p=230Vac) | 60Amp (@VI/p=230V ac) |
| Bulk Charging Voltage | Flooded Batter | 14.6 | 29.2 |
| | AGM / Gel Battery | 14.1 | 28.2 |
| Floating Charging Voltage | | 13.5Vdc | 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.

