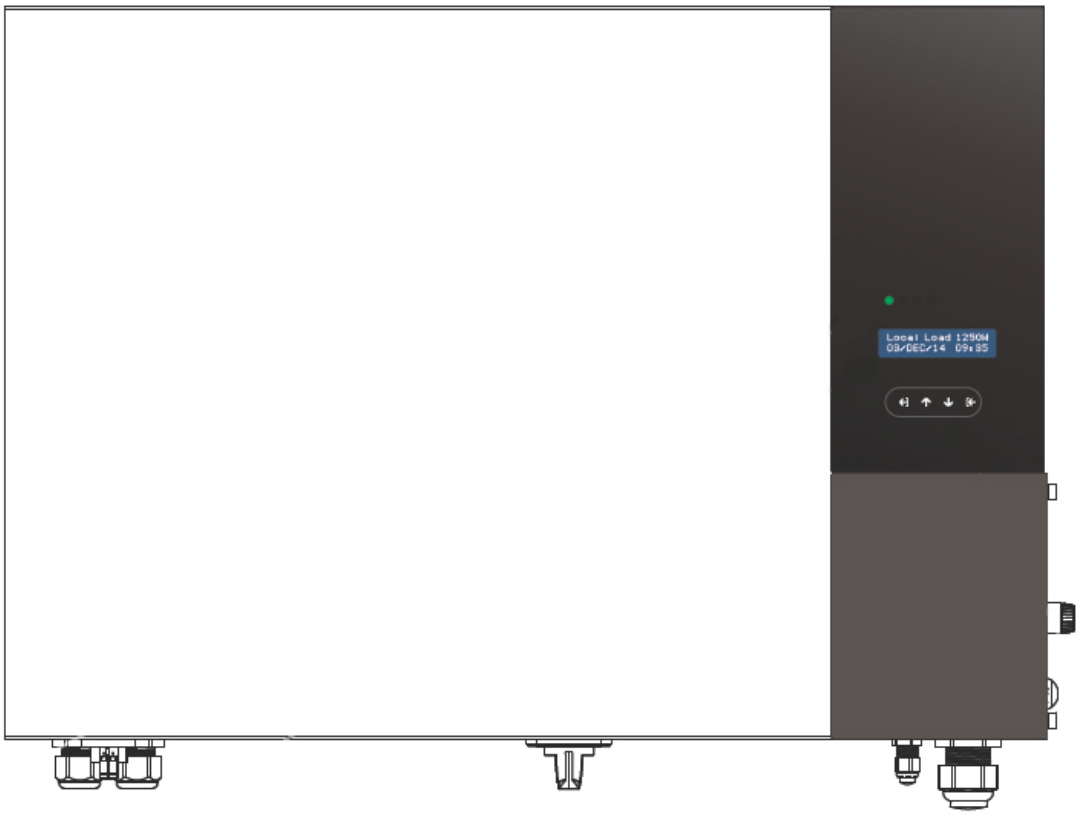
Off Grid Solar Inverter



LVS – 50M

User Manual

LONGTIME
Power Solution Provider

Save This Manual

Please read this manual carefully prior to installation, wiring, operation and maintenance of the LVS-M Series.

This manual contains important instructions and warnings that you should follow during the installation, wiring, operation and maintenance of the LVS-M Series. Failure to follow these instructions and warnings will void the warranty.

Please note that only qualified and trained technician can do installation, wiring, operation and maintenance of the LVS-M Series.

Contents

Section 1: Safety Precautions


AC and DC sources are connected to this device. To prevent risk of electric shock during maintenance or installation, please ensure that all AC and DC connections are disconnected.


High voltage inside device can cause electric shock, even when converter is not operating. Wait for 10 minutes before opening it.


Danger voltage exists on all conductive wires and terminals of battery circuit. Please protect and prevent touching of them.


Solar input is designed for solar power conversion only, do not use it for other DC sources and purpose.


If the product is used in a manner that is not covered by the scope of warranty, the protection provided by the product may be impaired.


Must be installed by a competent person.


Do not stay permanently at a distance of less than 30cm to this converter. Device generates electromagnetic radiation could be harmful in such a close range.


Some metallic parts of enclosure may be hot during operation.

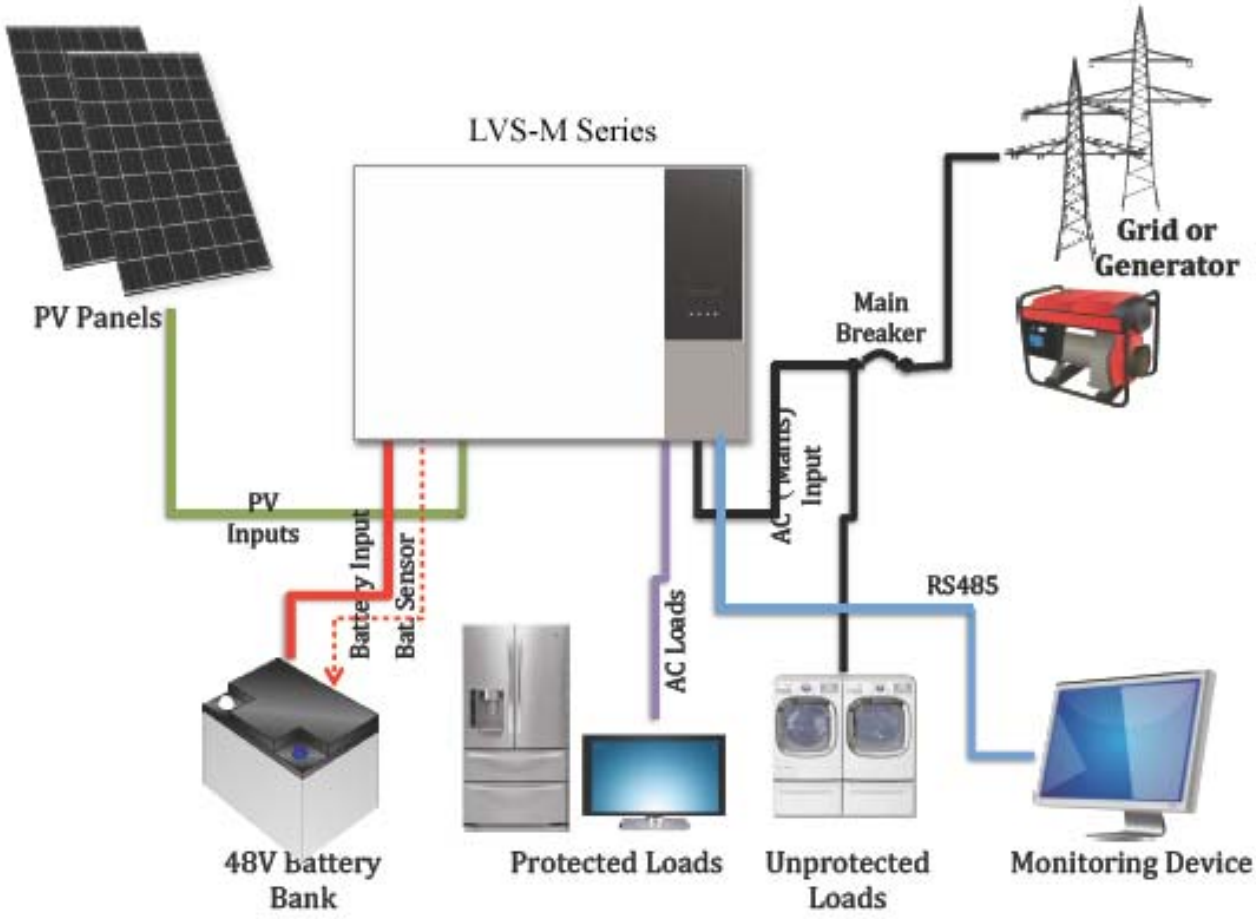

Do not throw this electronic device into the trash when discarding. To minimize pollution to environment, please handle according to local regulation.

Section 2: Warranty Information

Warranty will be void if damage caused by any, but not limited to the followings:

- Unauthorized opening of the unit.
- Installation faults such as improper environment, wiring and application.
- Working conditions beyond the unit specifications.
- Improper operation of the unit.
- Violation of safety instructions inside this manual.
- Damage during transportation.
- Any internal modification.
- Replacing or installation of unauthorized software.
- Unforeseen calamity or force majeure.

Section 3: Demonstration



- LVS-M Series: manage PV input, charging, discharging and load supplying functions.
- PV panels: receive sunlight and convert it into electricity.
- Battery bank: stores energy from mains and PV input.
- Protected loads: Appliances and devices need AC power from LVS-M Series.
- Unprotected loads: loads supplied by grid or generator directly. In case no AC from grid or generator, unprotected loads are not powered any more. Usually loads larger than LVS-M Series rating power should be connected here.
- Grid: Public AC Utility.
- Generator: supplies AC power by diesel engine or other means.
- Monitoring device: a device to monitor system performance by using RS485.

Section 4: Operation Principles

The LVS-M Series is an intelligent and automatic power manager. Its major principles are:

4-1 On Grid Power Manager

In places with the Utility, the LVS-M Series can manage the power from PV, grid and battery. For protected loads connected to the LVS-M Series, during blackout, the LVS-M Series can supply power to loads from PV and/or battery.

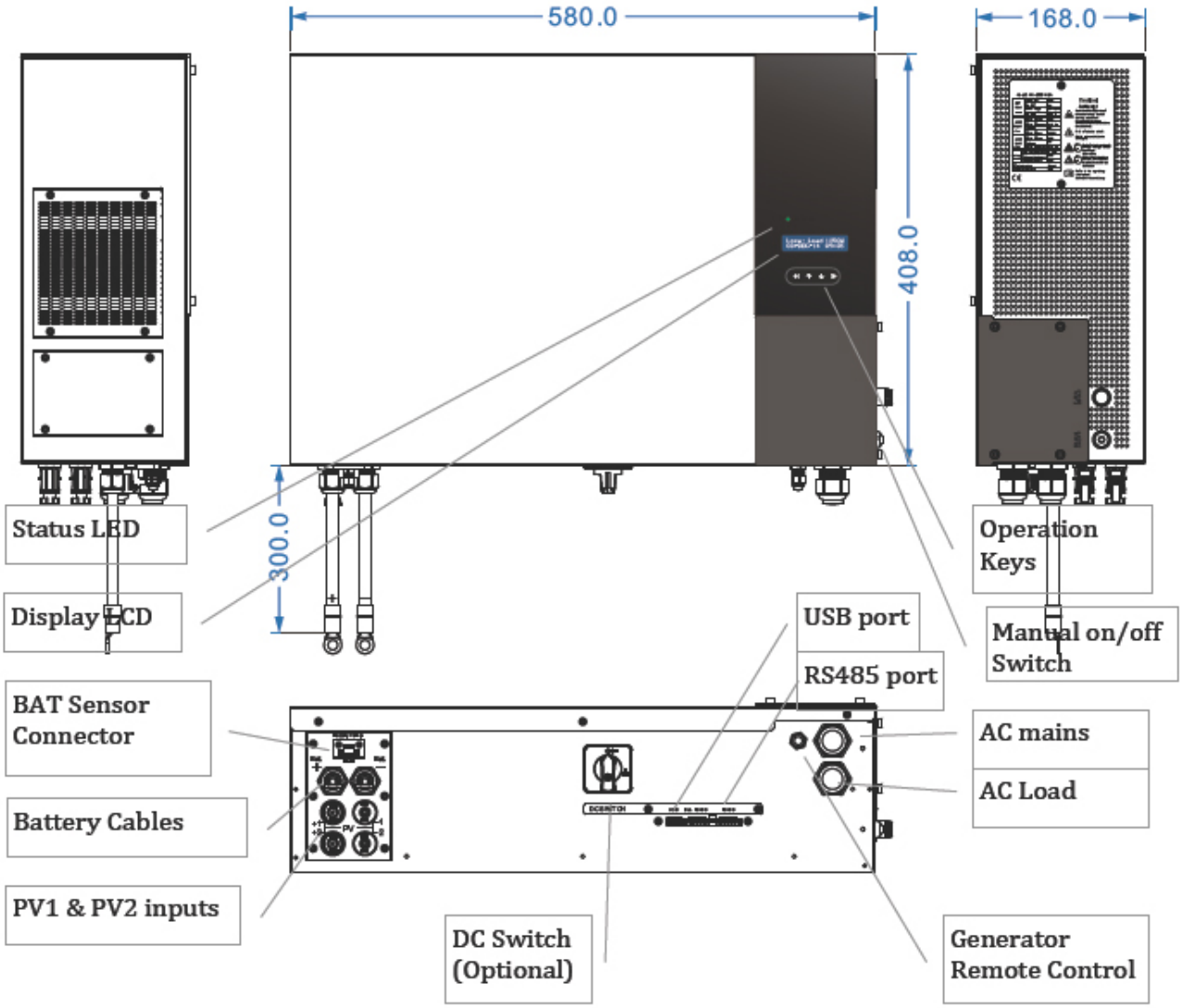
4-2 Off Grid Power Supply

In places without the Utility, protected loads will be powered by the LVS-M Series. The power may come from PV panels and/or battery. In case a generator is connected, whenever power from PV and battery are not enough, the LVS-M Series switches loads to generator directly.

4-3 Charge / Discharge Controller

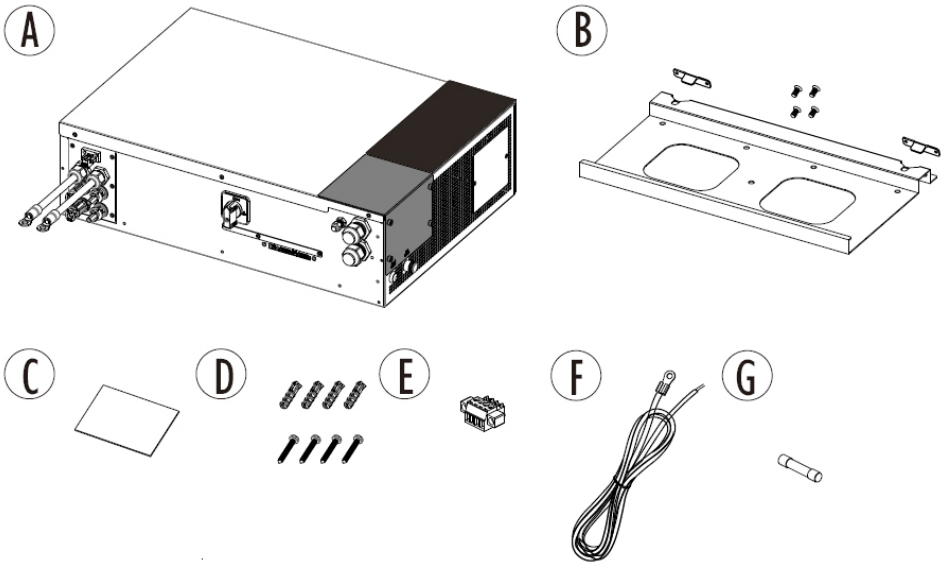
While there is excess power from PV, the LVS-M Series will direct it to battery. While PV power is not enough, the LVS-M Series will supply loads from battery. In case you have set charging battery from the Utility, the LVS-M Series will charge battery from the Utility after battery is fully discharged.

Section 5: Product Overview



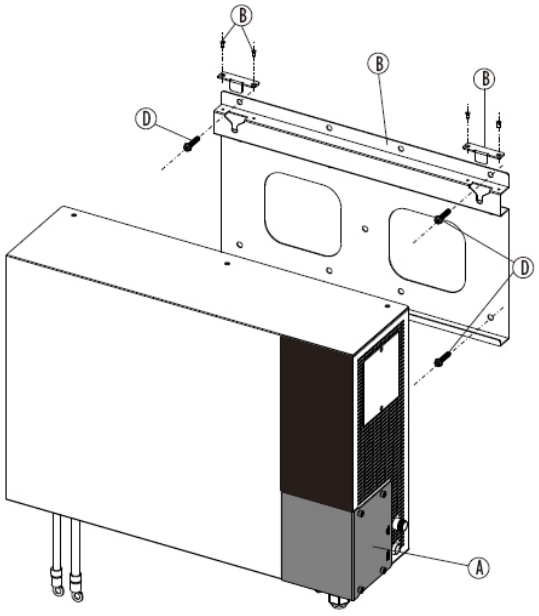
Section 6: Installation

6-1 Inside the Package



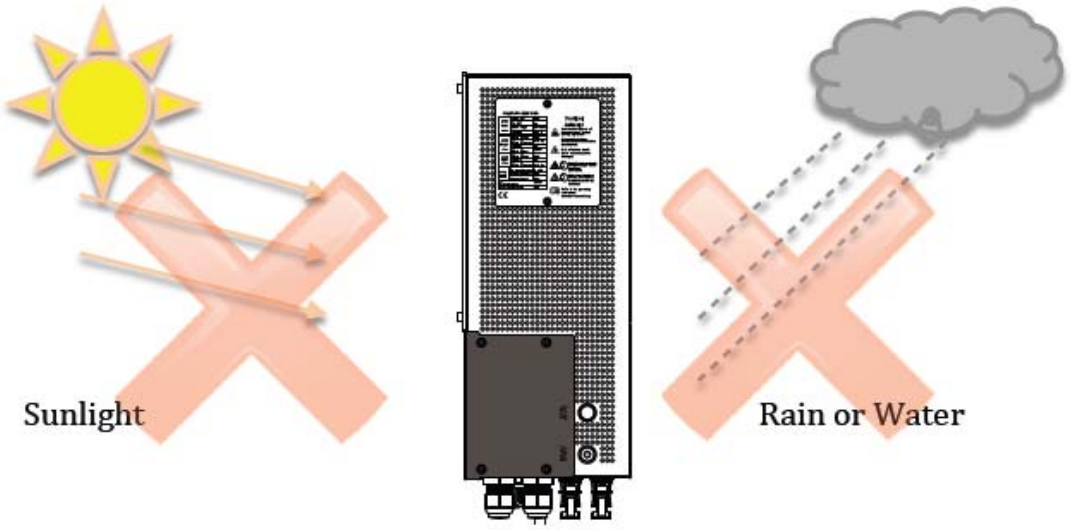
Item	Description
A.	LVS-M Series
B.	Mounting bracket
C.	User manual
D.	Plastic anchor & screws * 4, used to fix bracket on wall
E.	RS485 connector / plug
F.	Battery sensor
G.	Spared AC fuse * 1 (30A/250V)

6-2 Assembly Chart

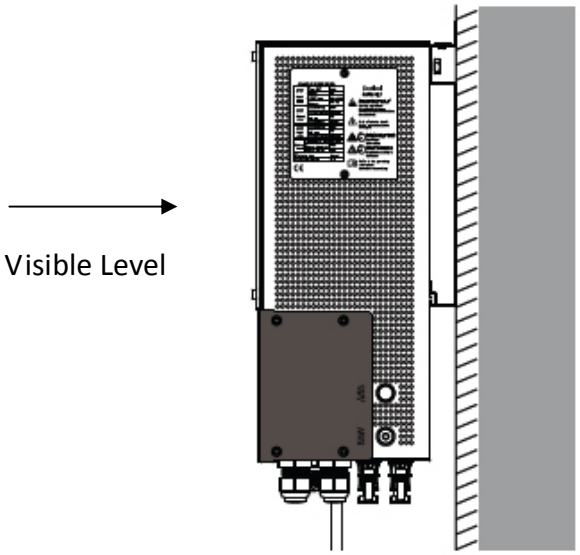


6-3 Choosing Proper Location

- Do not expose the LVS-M Series to sunlight, rain or water.



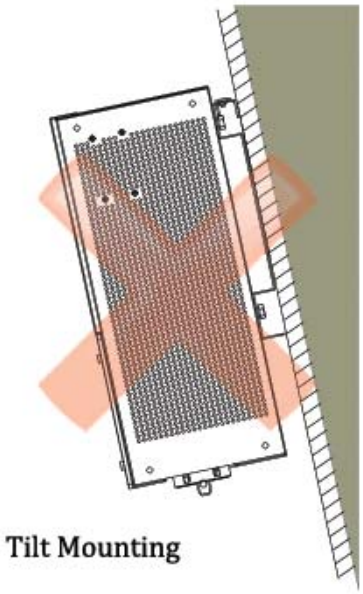
- Install the LVS-M Series at visible level so you can see its status and fix it on a solid surface.



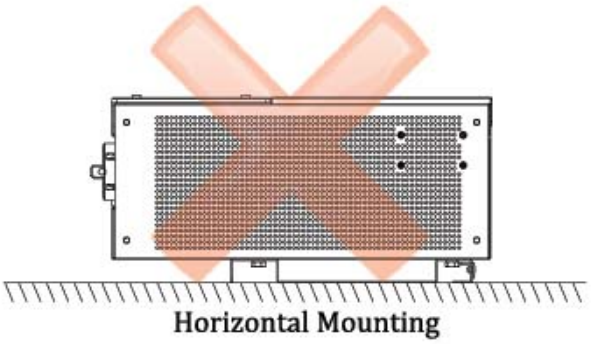
Mounting Surface	
Concrete	Ok
Metal	Ok
Stone	Ok
Wood	Not recommended

6-4 Mounting Properly

- Direction: mount the LVS-M Series in vertical direction; tilt or horizontal mounting should be avoided.

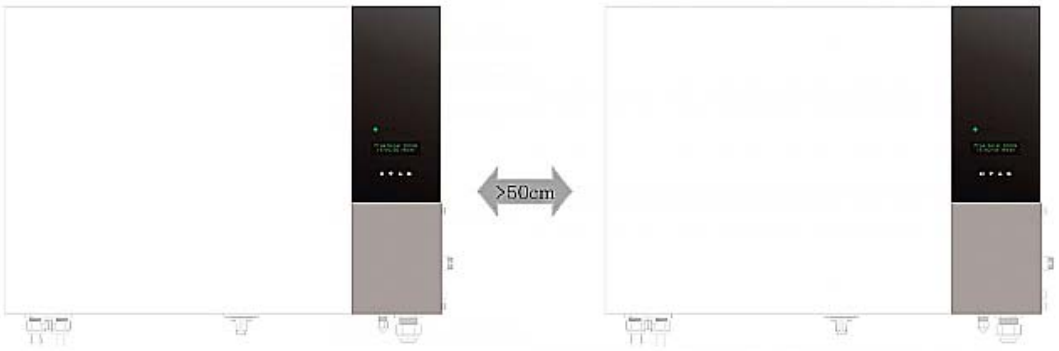


Tilt Mounting



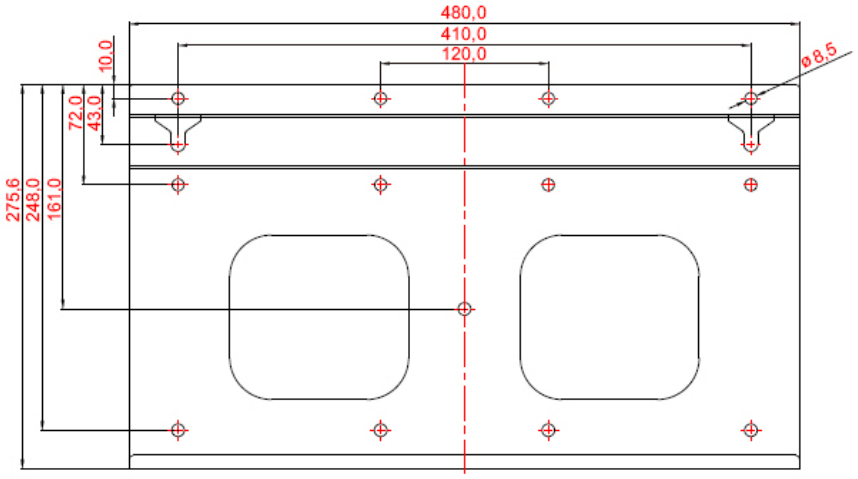
Horizontal Mounting

- Keeping clearance: reserve at least 50cm distance between the LVS-M Series.

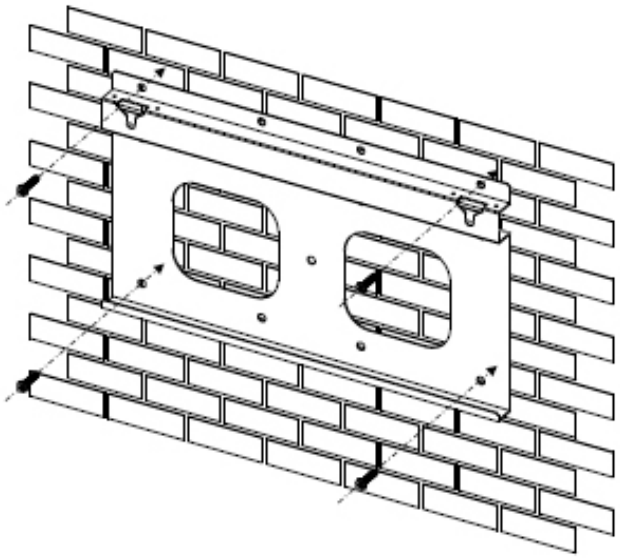


6-5 Mounting Procedure

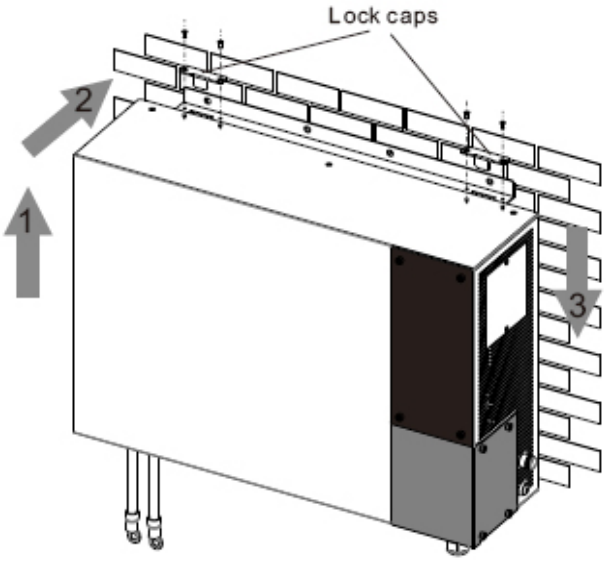
- Dimension of Bracket: the bracket is used to support the LVS-M Series on the wall. Before fixing it, refer to drilling locations and dimension below.



- Mounting Bracket: place the bracket in place you choose. Drill at the correct positions and fix bracket with the screws in the accessories.

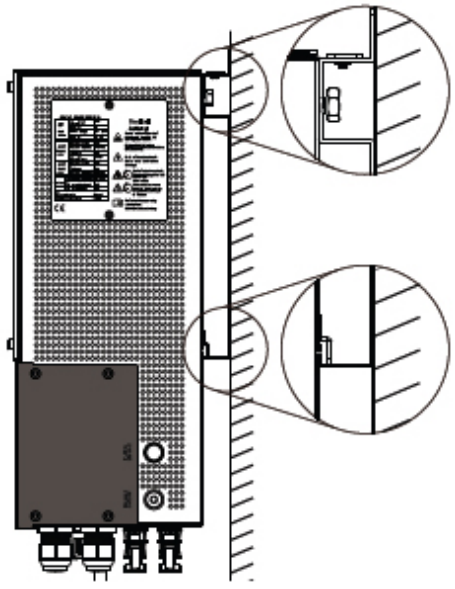


- Attaching the LVS-M Series:



1. Lift the LVS-M Series slightly higher then bracket. Make sure all fixing points on back are at right positions.
2. Attach the LVS-M Series close to bracket.
3. Hang the LVS-M Series on bracket slowly.
4. Fix lock caps with screws in accessories.

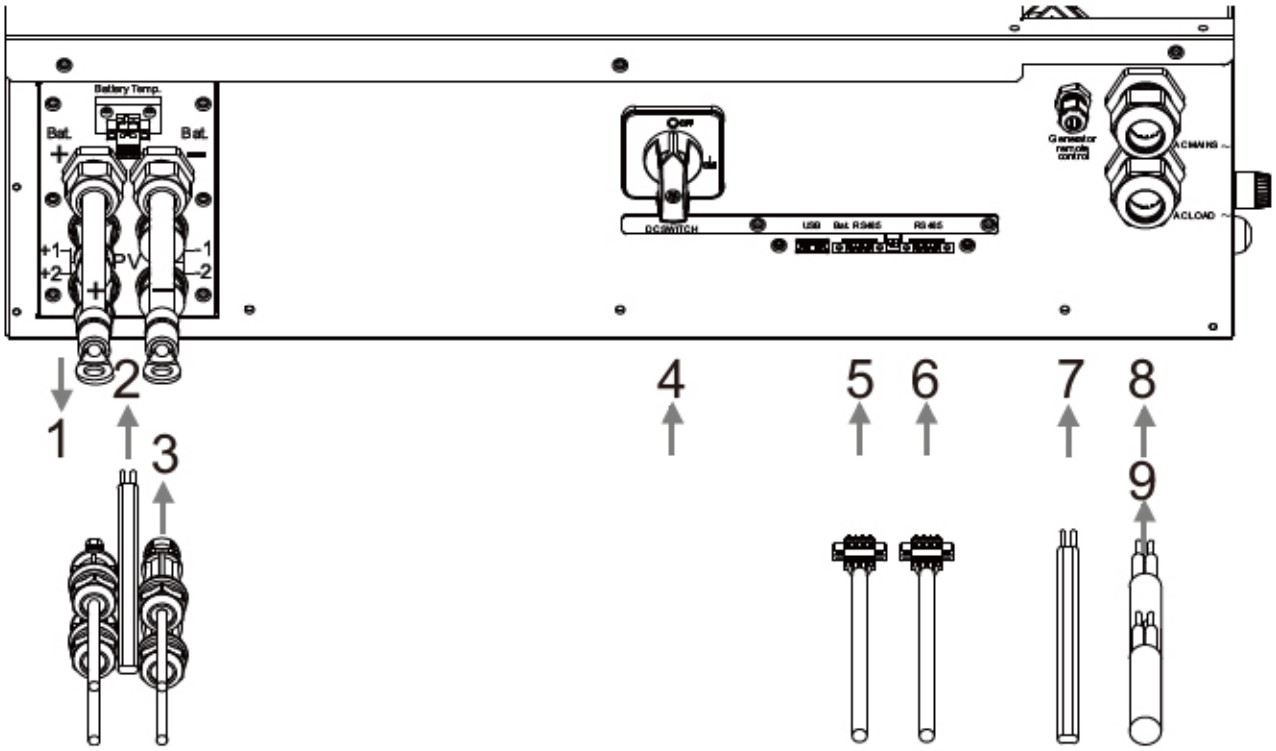
- Checking:



1. Check all supporting points and make sure they are in the right positions.
2. Lock caps are fixed with screws.
3. Make sure the LVS-M Series is well installed and fixed on the wall.

Section 7: Wire Connections

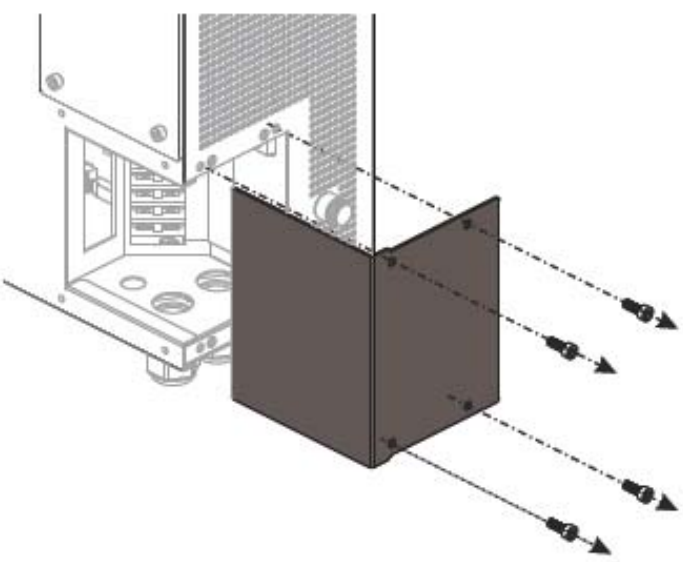
7-1 Bottom View

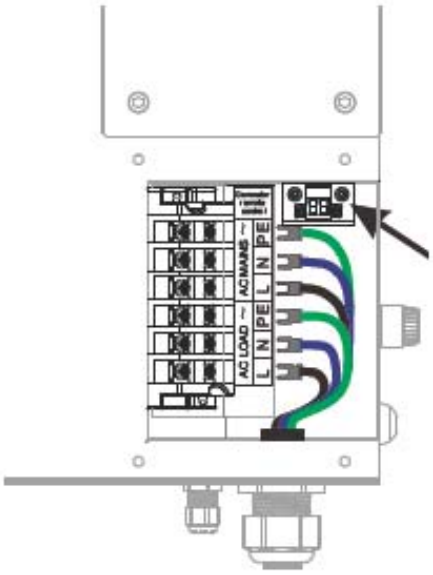


1.	Battery socket (Negative & Positive)
2.	Battery temperature sensor socket
3.	PV1 & PV2 input
4.	DC switch (optional)
5.	Battery RS485, for Lithium battery pack with battery management system
6.	RS485 connector, for monitoring and communication
7.	Cable gland for generator remote control
8.	AC input
9.	AC output

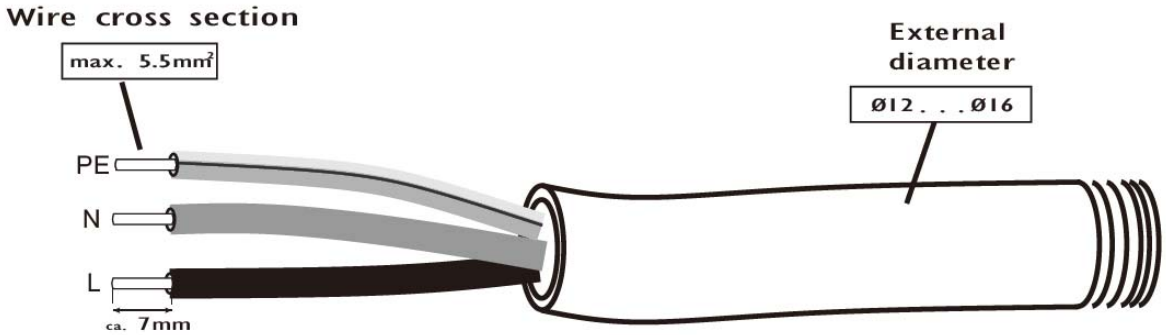
7-2 Connecting AC Mains

1. Open side cover for wiring.





2. Select wires as below figure.

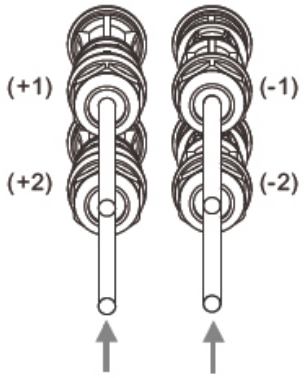


3. Insert wires through the cable gland.
4. Crimp the wire with Y-terminal.
5. Insert wires with terminals, fix them according to polarity and torque on terminals as figure.
6. Tighten the cable gland.

7-3 Connecting Loads

1. Prepare similar wire as AC mains.
2. Repeat steps as AC mains connection.
3. Fix them on AC Loads terminals.

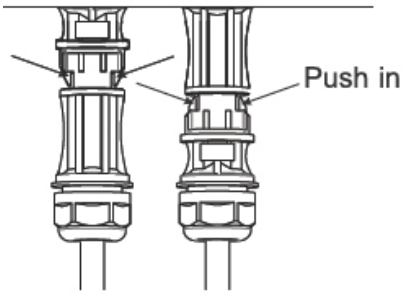
7-4 Connecting PV



1. If there is DC switch on the LVS-M Series, **SWITCH OFF** it in advance.
2. Using following connectors for PV DC cables:
   - Wieland PST40i1 (preferred).
   - Multi-contact MC4.
3. Plug connectors to the LVS-M Series.

7-5 Disconnect PV

To disconnect PV cables, please:



1. Turn off DC switch if available in advance.
2. Push in the inter-locker on PV connectors.
3. Pull of the connectors & cables.

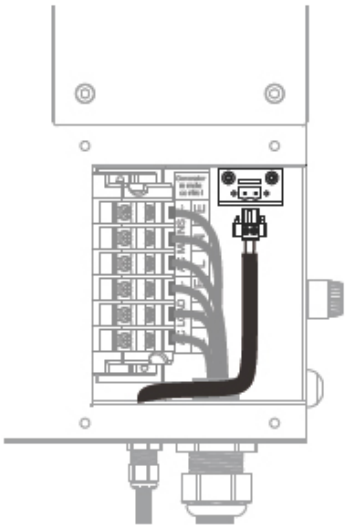
7-6 Connecting Generator

To connect a generator, please use the AC MAINS terminals as described in ”7-2 Connecting AC Mains”.

You can either connect grid or generator only. These 2 sources can not be connected to the LVS-M Series in the same time.

- Control your generator: if your generator is equipped with remote start/control function, you can connect a wire to “Generator Remote Control” to control it. It is a normally open dry contact inside the terminal. Before end of discharging, those 2 terminals will be short; this can

be used to enable a generator. Once this contact is active, it will remain short until AC mains come back.



To connect this control, please:

1. Prepare a wire-cable.
2. Unplug the socket on “Remote Generator Control”.
3. Connect and secure cable terminals on this plug.
4. Insert this plug back.

To turn on/off your generator, your generator also needs to have remote on/off connectors (terminal). Please refer to the specifications and manual of the generator.

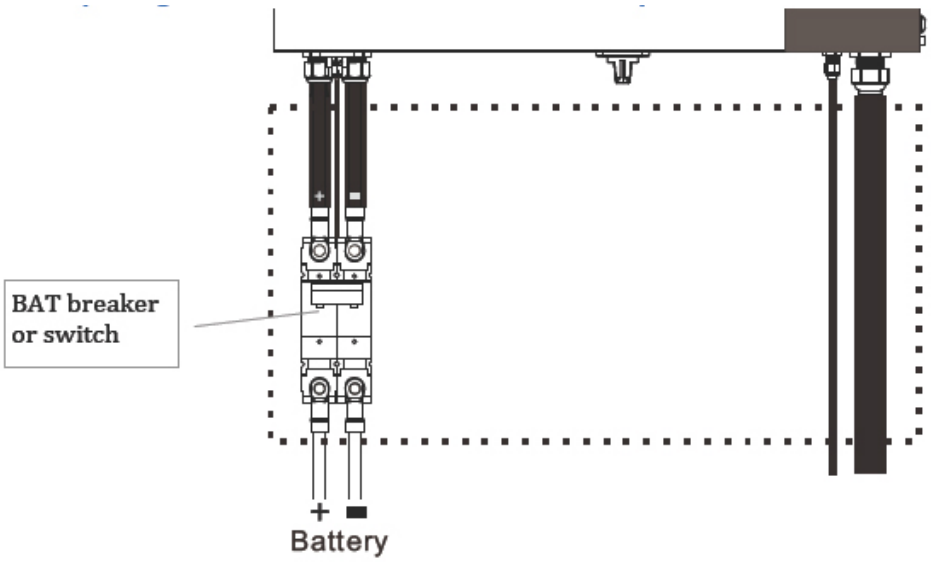
7-7 Connecting Battery Bank

The voltage of battery bank is 48VDC. The recommended numbers of battery packs are 1~5. Please refer to specification for recommended battery type. There will be some other batteries can be used, please contact your local dealer and service for latest information.

Official batteries are designed for the LVS-M Series considering safety, life and performance. Using other batteries may cause danger and /or poor performance.

Before connecting battery wires, please switch off DC voltage from batteries and all AC in advance.

- Preparing wires and connectors for battery:



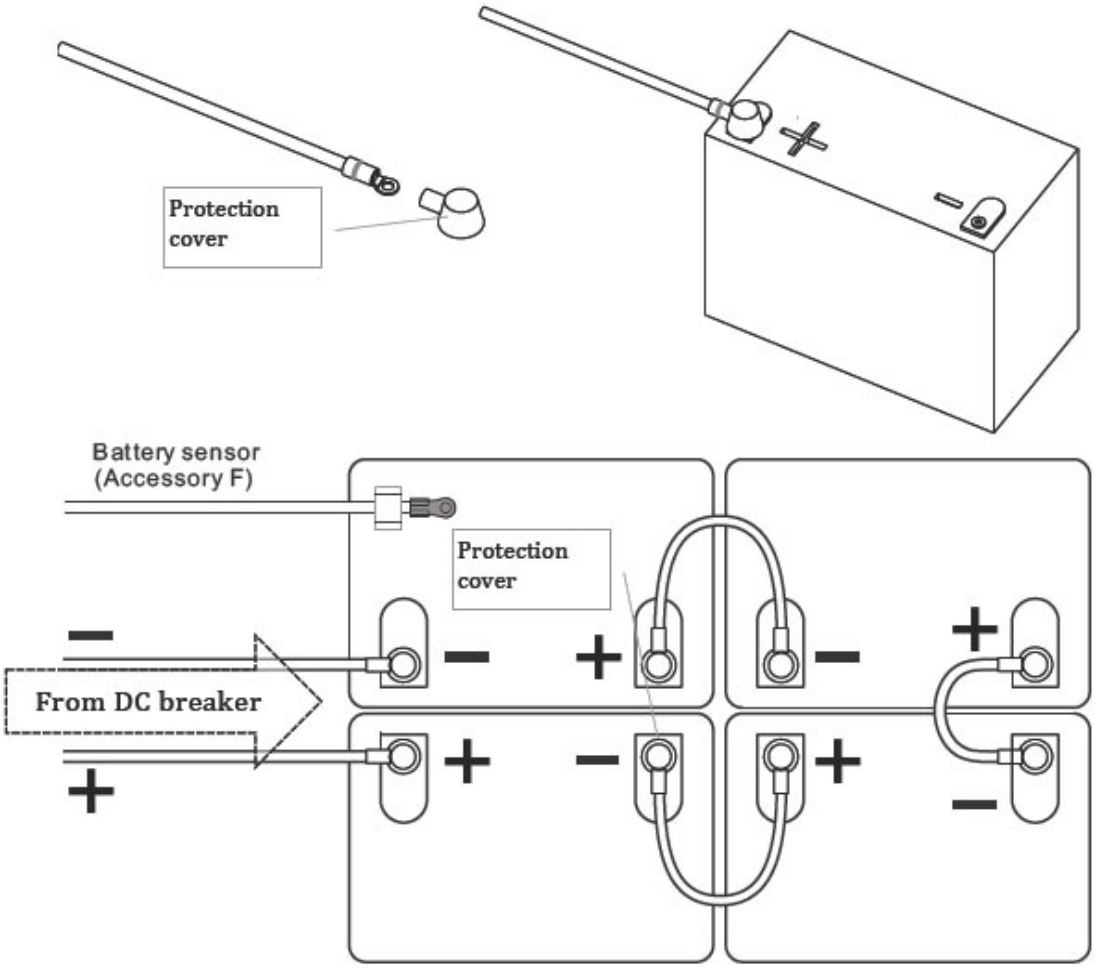
1. Select wires of cross-section >50mm. Red color is for positive (+) wire and black for negative (-).
2. Prepare a breaker/switch of 150A/125VDC
3. Prepare conduit for those wires.
4. Prepare cover or sleeve for battery terminals (refer to figures in “Connecting”).

- Connecting batteries:

1. Pay attention and follow the instruction of warning label on the unit.
2. Crimp (+) and (-) wires with ring terminals.
3. Watch out the polarities.
4. Fix wires on both sides of DC breaker/switch.
5. Protect and hide all the cables in conduits.
6. Use battery terminal covers on all battery wires.
7. Fix the wires on battery terminals as figures below.
8. Make sure all terminals are protected.

Reverse connections of positive (+) and negative (-) will damage the LVS-M Series. Incorrect wiring is not covered by warranty.

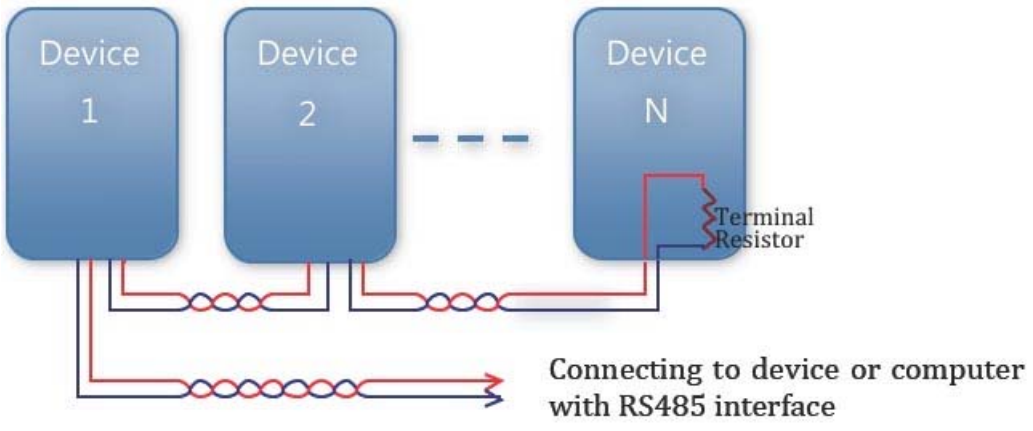
Make sure all the connections are well contacted. Any loosen may cause fire and damage



- Connecting battery sensor: accessory F is the battery temperature sensor. It is used to measure battery temperature for optimized charging. Please connect and fix this sensor as figure in previous section.

7-8 Connecting RS485

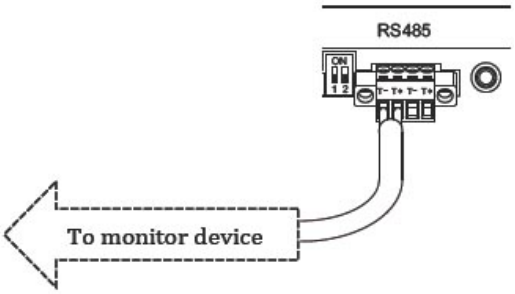
To monitor and control the LVS-M Series by external devices such as computer, you need to connect them by RS485. A typical RS485 connection diagram is shown below:



- All wires between devices and computer shall be twisted.
- Maximum allowable wire length is 1000 meters.
- The terminal-end device may need a terminal resistor.
- Due to multiple connections, each individual device should be assigned as address as to recognize by computer or device.

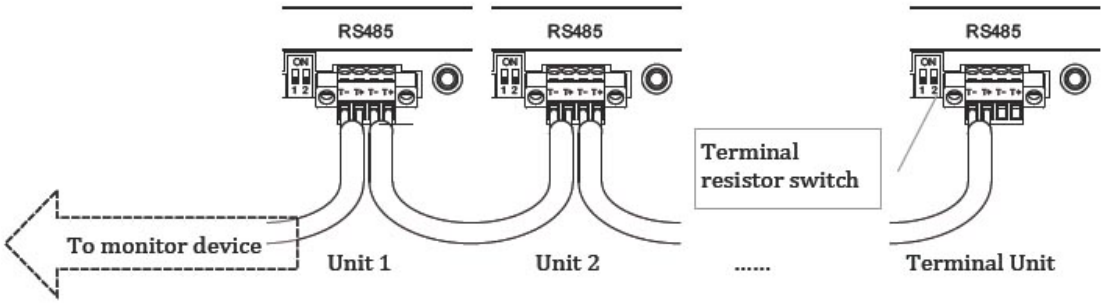
1. Connection:

For single unit, please connect as figure below:



- Prepare a 2-wire cable.
- Take off the plug on RS485 connector.
- Fix cable on this plug. Take care of the polarity.
- Push back the plug.

For multiple connections, please connect as figure below:



The No.2 DIP switch is the terminal resistor switch of the RS485. The default position of this switch is “off”. However, if the communication does not work well, please try to switch it to “on” to improve.

2. Setting Address:

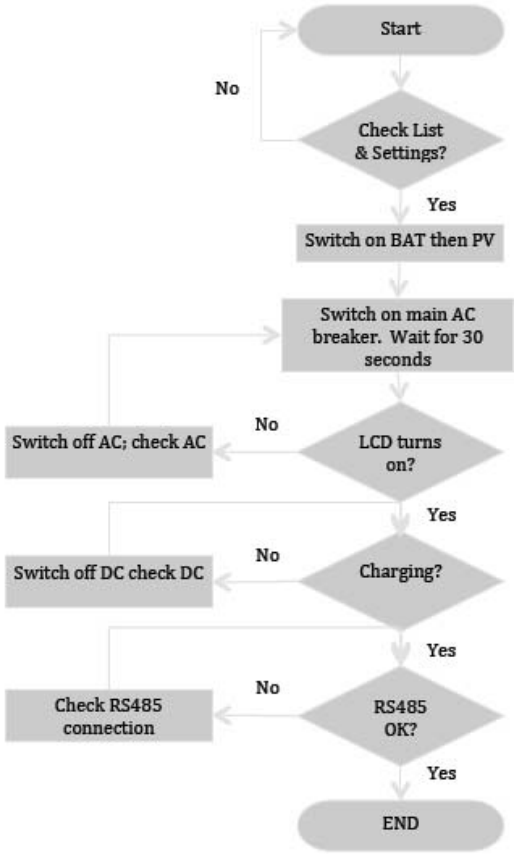
For multiple connections, you need to assign each unit with different address. To set the address, please refer to section of “Set RS485 Address”.

7-9 Ready to Start

Before starting the system, check below items:

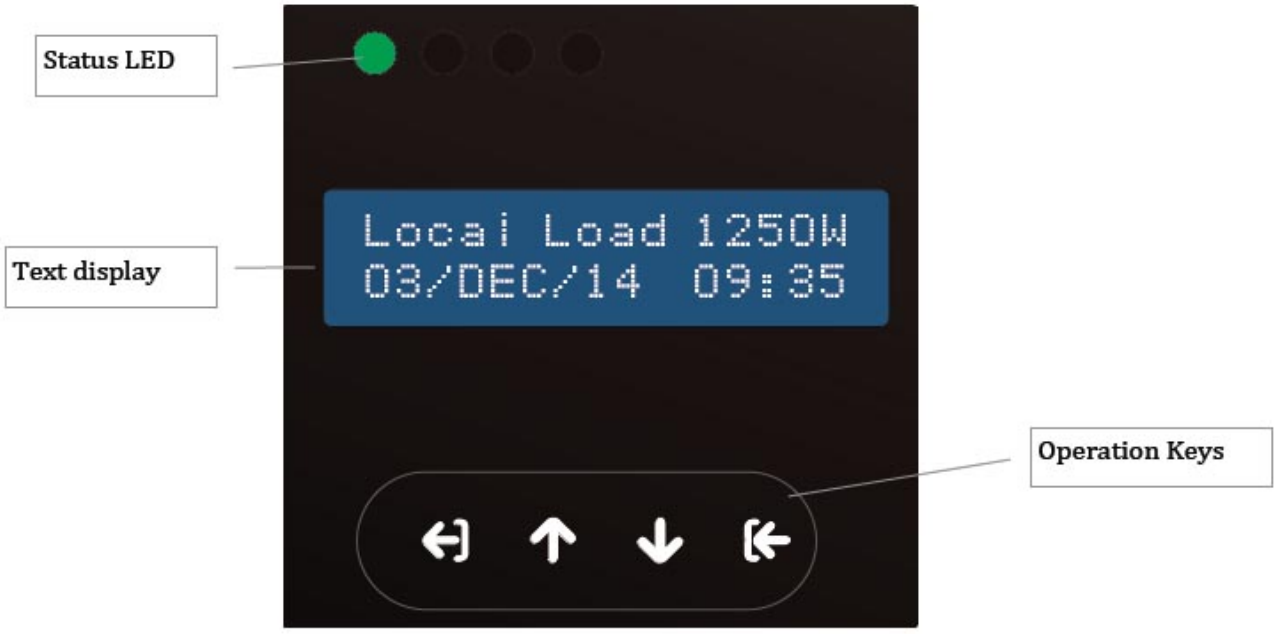
Item	Point of Check	Checked?
Mounting	● The LVS-M Series is firmly mounted on the bracket ● 2 lock caps are secured	
AC	● All wires are firmly fixed on terminals ● All polarities are correct ● Protective ground is available and connected	
PV	● All wires are firmly fixed on connectors ● Polarities are correct ● PV open voltage is less than maximum voltage of PV input ● Internal and /or external DC switch is on before operation	
RS485	● Wires and cables are locked and fixed ● Polarities are correct ● For multiple units, be sure to set their RS485 in different address	
DC (Battery)	● All cables are firmly secured ● Polarity is correct ● Breaker/switch is on ● Battery sensor is installed and connected	

7-10 Start-up Procedure



Section 8: Operation

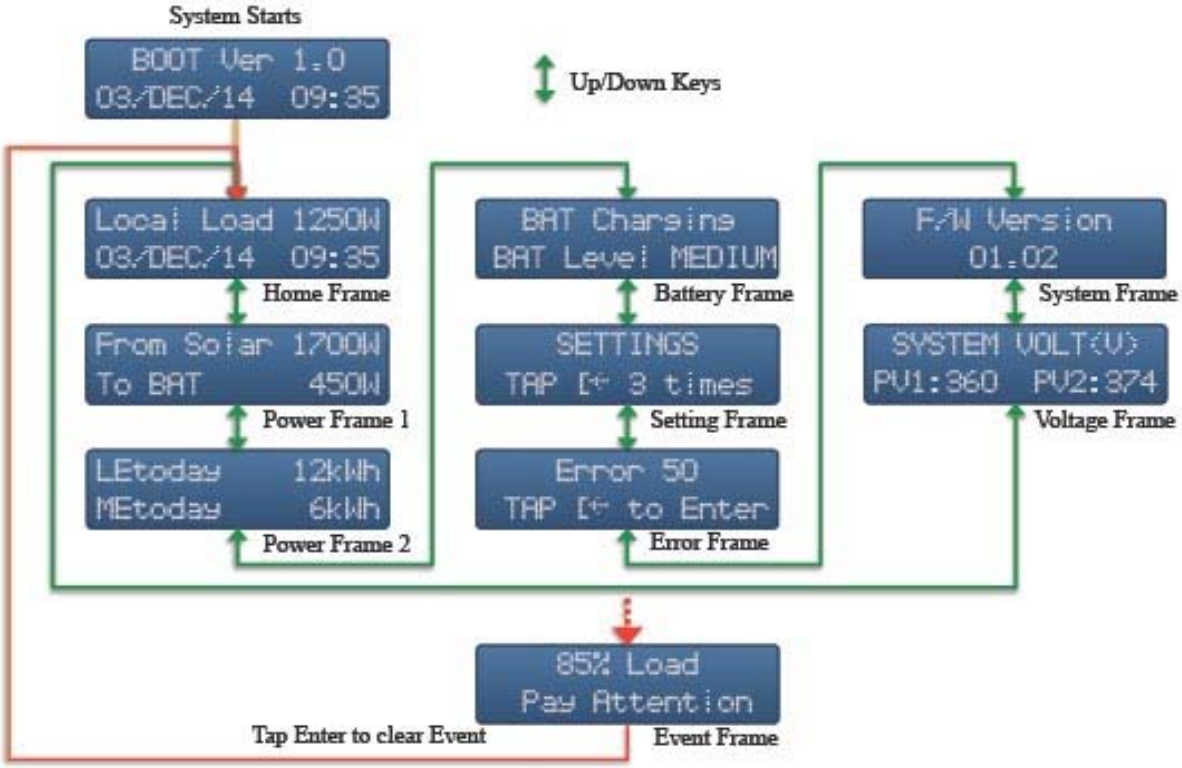
8-1 Display and Buttons



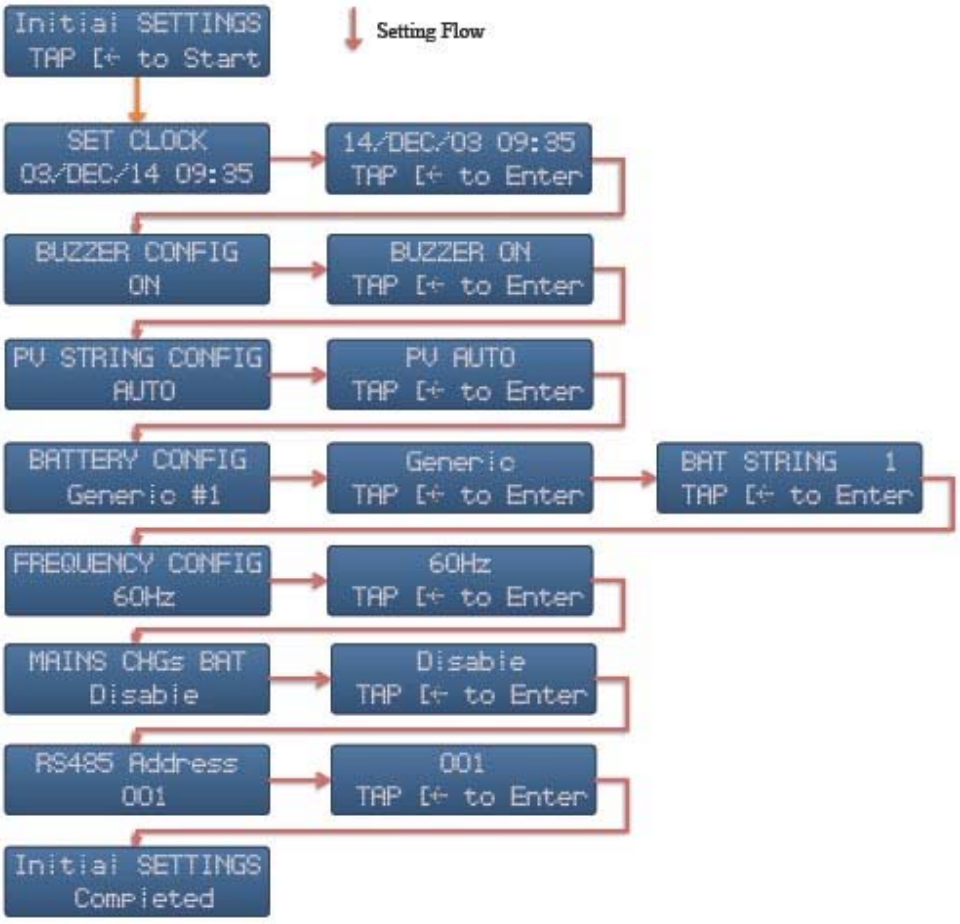
Status LED	There are 2 LED's to indicate the LVS-M Series status. In normal condition, green one turns on; in abnormal or warning conditions, red one turns on. In case green LED is flashing, there is internal comm. error, please call your local service.	
Text display	2 lines, showing status, data and instructions.	
Operation keys		Exit to previous display
		Menu up
		Menu down
		Enter or confirm a setting or selection

8-2 Operation Chart

By pressing operation keys, different displays will follow the chart as below:


System Starts
BOOT Ver 1.0
03/DEC/14 09:35
Up/Down Keys
Local Load 1250W
03/DEC/14 09:35
Home Frame
From Solar 1700W
To BAT 450W
Power Frame 1
LEtoday 12kWh
MEtoday 6kWh
Power Frame 2
BAT Charging
BAT Level MEDIUM
Battery Frame
SETTINGS
TAP [↵ 3 times
Setting Frame
Error 50
TAP [↵ to Enter
Error Frame
F/W Version
01.02
System Frame
SYSTEM VOLT(V)
PV1:360 PV2:374
Voltage Frame
85% Load
Pay Attention
Tap Enter to clear Event
Event Frame

8-3 Settings


Initial SETTINGS
TAP [↵ to Start
Setting Flow
SET CLOCK
03/DEC/14 09:35
14/DEC/03 09:35
TAP [↵ to Enter
BUZZER CONFIG
ON
BUZZER ON
TAP [↵ to Enter
PV STRING CONFIG
AUTO
PV AUTO
TAP [↵ to Enter
BATTERY CONFIG
Generic #1
Generic
TAP [↵ to Enter
BAT STRING 1
TAP [↵ to Enter
FREQUENCY CONFIG
60Hz
60Hz
TAP [↵ to Enter
MAINS CHGs BAT
Disable
Disable
TAP [↵ to Enter
RS485 Address
001
001
TAP [↵ to Enter
Initial SETTINGS
Completed

You need to set the LVS-M Series after first installation so as to have proper operation in the future. After switching on the LVS-M Series of the first installation, the initial setting frame comes out automatically. The chart is indicated.

Initial setting is a “one-way” flow. You can not come back to previous setting even you set wrong. In case incorrect operation during setting, please set it again later on.

8-3-1 Set Clock

To set clock, press up and down buttons to increase or decrease on blinking characters. Press Enter to change among day, month, year, hour and minute; press Enter to confirm settings.

Incorrect clock causes improper operations. Make sure the LVS-M Series clock is correct all the time.

In case switching off the LVS-M Series for more than 5 days, the internal clock setting will lose and change back to the default setting.

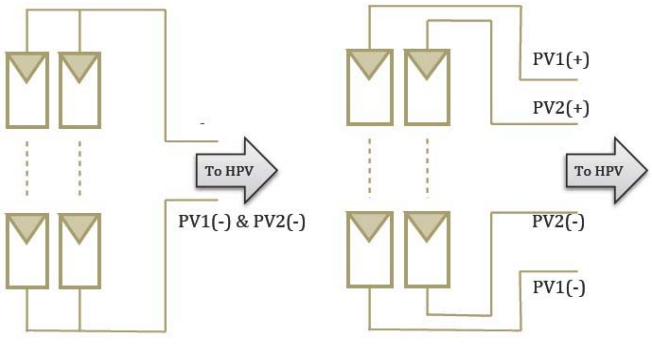
8-3-2 Buzzer Configuration

Press Enter button to start setting buzzer on/off. Press Up and Down to change setting. Press Enter again to confirm your selection.

8-3-3 PV String Configuration

This function is to set the string configuration of PV panels for multiple MPPT model. There are 3 options: INDEPENDENT, PARALLEL and AUTO.

- Independent: 2 input strings are connected to different MPPT of the LVS-M Series individually.
- Parallel: 2 strings are wired together before connecting to the LVS-M Series.
- Auto: If you do not know exactly the configuration, select this. The LVS-M Series will judge automatically. This is the default setting.



Parallel configuration *Independent configuration*

8-3-4 Battery Configuration

This text shows the battery type and its string number. The available selections are:

- Generic: it is for general type of lead-acid battery. If you are using types other than official ones, please select this type.
- YUASA NPA100-12I.
- CHLORIDE12CDC100.
- PANASONIC LC-T12105X.
- 3K EBB100.

After setting the type, you have to set string number, the numbers of battery bank in parallel, as well. The possible selections are 1~4 and >=5.

Except Generic, all the other batteries are official ones. Each configuration has its own parameters. Please refer to Battery Charging/Discharging Parameter in Appendix for detail information.

If you know parameters of non-official; battery, please choose similar battery type of the list to have best performance.

8-3-5 Frequency Configuration

The setting is to set the AC output frequency to 50Hz or 60Hz.

You can set frequency once only in initial setting. Please select proper one for your applications.

In case AC mains are connected during setting, the LVS-M Series will follow AC mains' frequency. In this case, frequency configuration frame will not appear during initial setting.

8-3-6 Mains Charging Battery

This setting is to set whether the LVS-M Series will use AC mains to charge battery or not. In some applications, you may need AC mains (Grid or Generator) to charge the battery bank when PV power is not enough and battery capacity is low. Select "Enable" so as to charge battery in this case; select "Disable" to skip this.

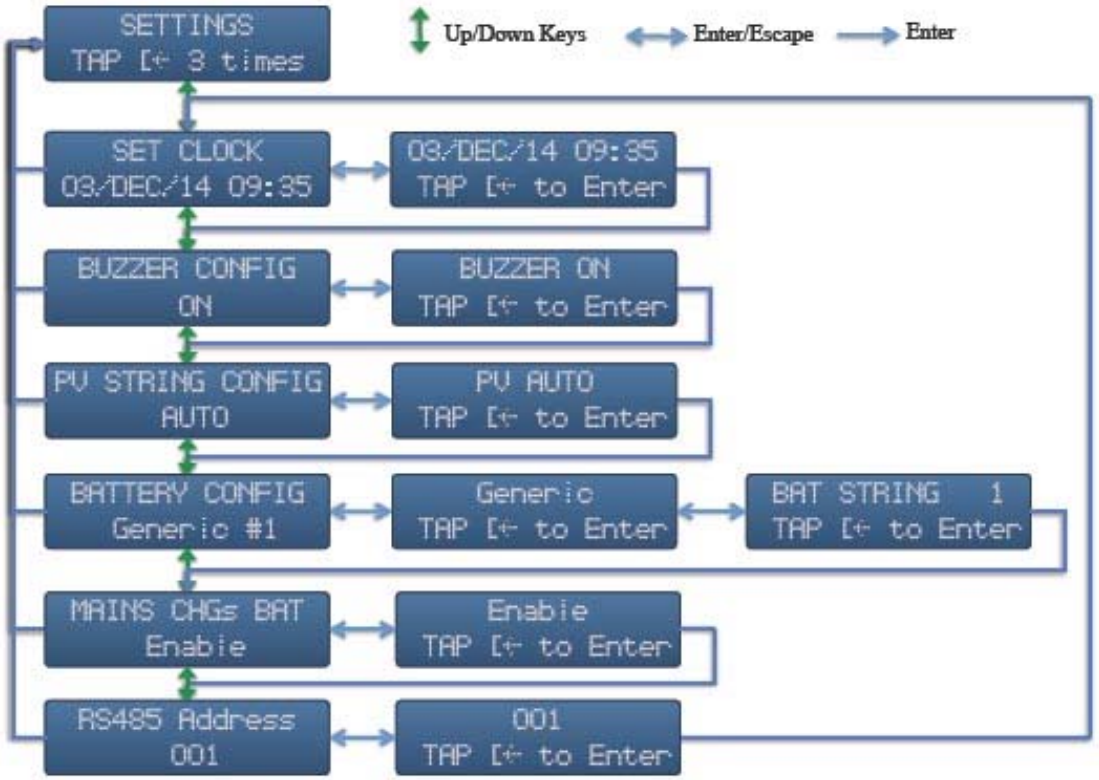
Mains maximum current limits the charging current. Charging power equals mains power minus load power.

8-3-7 Set RS485 Address

This is to set RS485 address. The selectable address is from 1 ~ 200. Default address is 1. To know the detail of addressing of RS485, please refer to section of " Connecting RS485".

8-4 Normal Settings

Normal setting is used to set the unit whenever you would like to. Its process is similar to initial setting except operation flow as below:



In case you would like to set the LVS-M Series, just use "Menu Up" and "Menu Down" buttons to Setting Frame and press "Confirm" button 3 times in 2 seconds to start.

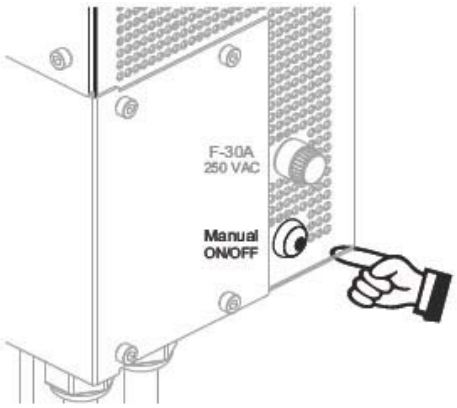
8-5 Factory Setting

The LVS-M Series can be restored to factory setting. If you like to do this, please ask for your local service.

8-6 Manual ON/OFF

The manual ON/OFF switch is beneath the LVS-M Series as figure shown below:

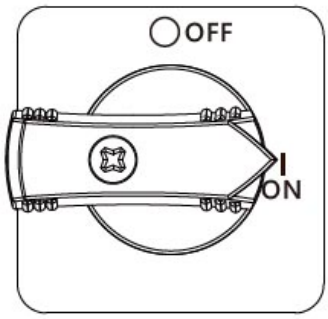
This switch is used to turn ON/OFF the LVS-M Series manually. In case battery capacity is enough, push the button to start the LVS-M Series. The LVS-M Series will supply power from battery bank to your loads.

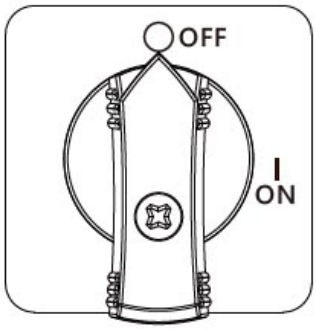


To turn off the LVS-M Series, push the switch again, all the AC output will be off and the LVS-M Series will shutdown itself.

8-7 DC Switch of PV (optional)

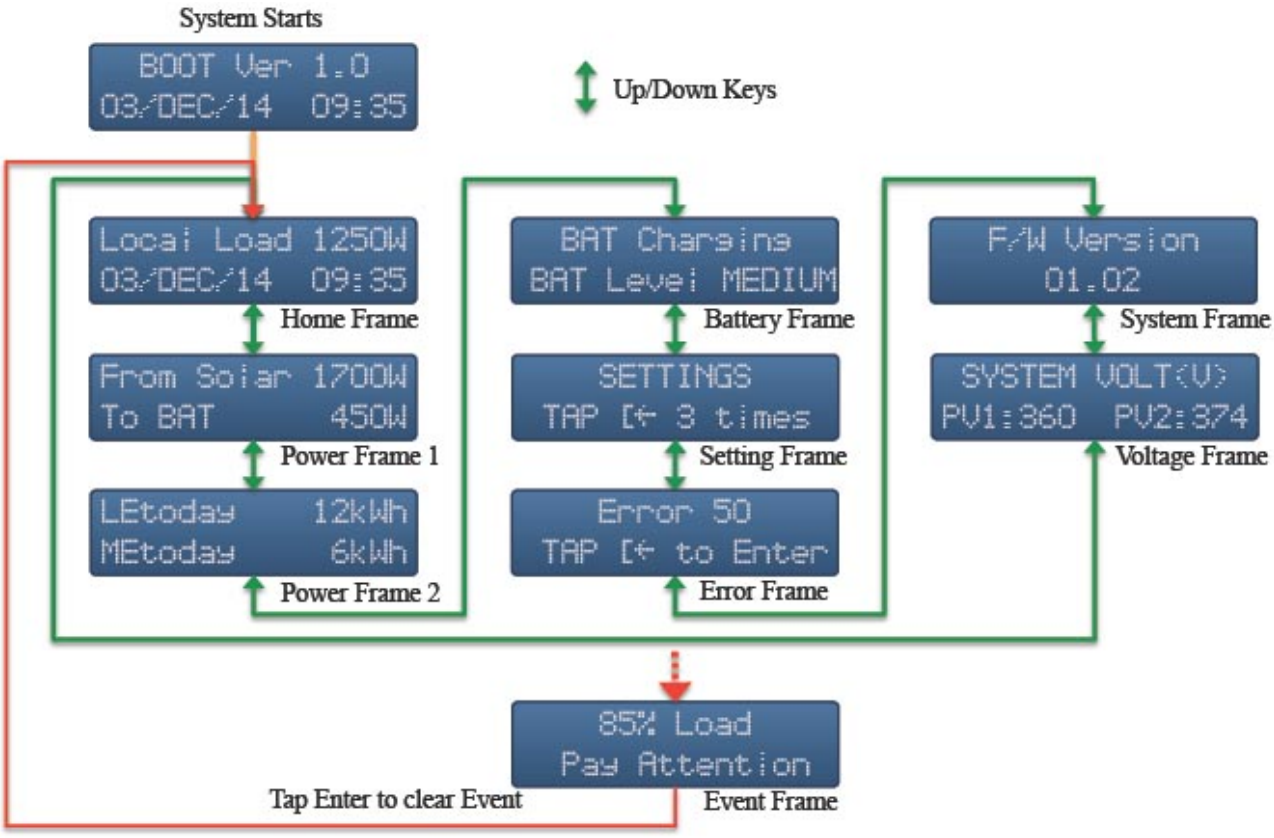
This switch is used to turn on or off the PV inputs. The positions are shown as below figures.





Section 9: LCD Display

9-1 LCD Display Chart



**** Note:***

- ***In case no operation for 1 minute, LCD will go back to home frame automatically.***
- ***Event frame will not appear in case there is no error/event.***
- ***To enter setting frame, you have to press "Enter" button three times in 2 seconds.***

9-2 Home Frame

Home frame shows the operation status and related data at first text line. It shows date and time at second line.

Mode	Display in First Line	Description
Normal	Local Load XXXXW	The LVS-M Series supplies power of XXXXW from PV and/or battery to load. Display on Power frame 1 will show “From Solar XXXXW” and “From BAT XXXXW”.
Bypass	From Mains XXXXW	Load power is from AC mains. Display on Power frame 1 will show “From Mains XXXXW”.
Warning	Refer to warning message	On warning or error happening, the LVS-M Series shows the warning messages.
Error	Refer to error message	On error happening, the LVS-M Series shows the error messages.
Manual OFF	Manual off, push ON/OFF to turn on	Manual off. Load will continuously be supplied by Grid.

9-3 Power Frame 1

Showing the instant power from different sources:

Display in First Line	Description
From Solar XXXXW	The power coming from PV under normal mode.
From Grid XXXXW	The power coming from Grid (Mains) under bypass mode.

Display in Second Line	Description
To BAT XXXXW	The power charged to battery.
From BAT XXXXW	The power comes from battery.

9-4 Power Frame 2

Showing the accumulated energy of local consumption and grid:

Display	Description
LEtoday XXXKWh	Local energy consumption of the day.
GEtoday XXXKWh	Grid energy supplied of the day.

9-5 Battery Frame

Showing battery status:

Display	Description
BAT Charging	Battery status. “Charging”, “Discharging”, “Standby” or “Disconnected”.
BAT Level Medium	Battery capacity level. “Full”, “High”, “Medium”, and “Low”.

Battery efficiency varies from many factors and is difficult to calculate. The power reading on the LVS-M Series display is a calculation for indication of system operation.

9-6 Setting Frame

Press “Enter” button 3 times in 2 seconds on setting frame, the setting procedure starts. Refer to setting in previous section for detail information.

9-7 Error Frame

Display in First Line	Description
Error 0	Error number is zero.
Error XX	Total error accounts.

Display in Second Line	Description
No Error	No error recorded.
Tap “Enter” button	Press “Enter” button to see error detail.

Total errors can be recorded are 50. For error large than 50, latest one will replace earliest one.

If you like to see the error types, please tap “Enter” button and using “UP” and “Down” buttons to see the detail. The format will be:

Line 1	Line 2	Description
Error XX	Error Message	Line 1 shows the error number, line 2 tells you the error message. The messages are listed in tables of error and warning in section Event Frame.

9-8 System Frame

The F/W version of the LVS-M Series appears in this frame. In case service is required, please tell this information to your service agent.

9-9 Voltage Frame

This frame display major system voltage of PV1, PV2, Mains, Battery, alternatively.

9-10 Event Frame

In the cases there are events such as errors, warnings and reminding, event frame will appear automatically. The prompt information is listed in error and warning tables below.

Error Message

Line 1	Line 2	Buzzer	Description
AC VOLT HIGH	Vac XXX V	Silent	ACV is higher than upper limit
AC VOLT LOW	Vac XXX V	Silent	ACV is less than lower limit
AC FREQ HIGH	Fac XX.X Hz	Silent	AC frequency is more than upper limit
AC FREQ LOW	Fac XX.X Hz	Silent	AC frequency is less than lower limit
PV VOLT HIGH	Vpv XXX V	Continue	PV is higher than upper limit
BAT VOLT HIGH	Vbat XX.X V	Continue	Battery voltage is higher than upper limit
OVERLOAD	Output is off	Continue	Output is overload more than defined time, output is cutoff
O/P SHORT CKT	REMOVE CKT.	Continue	Output is short
NO BATTERY	Check BAT Conn.	Continue	Battery is not connected
CX	No Display		C1 ~ C7 error, reserved for internal diagnose

Warning Message

Line 1	Line 2	Buzzer	Description
XX% Load	Pay Attention	Every 0.5 sec	The load is between 85% and 100%
1XX% Load	Pls. Reduce Load	Every 0.5 sec	The load is between 101% and 110%
Low Bat. Cap.	Will Shutdown	Every 0.5 sec	Battery low and will shutdown
Fan Fails	Check or Replace	Every 0.5 sec	External fan does not work properly

Section 10: Interface

10-1 RS485

RS485 interface aims to monitor the LVS-M Series. You need to have RS485 connection and related software. Please refer to “Connecting RS485” for proper connection and setting. Please refer to software manual for installation and application.

10-2 USB

10-2-1 Download Data to USB Stick

You can plug in a pre-formatted USB stick into USB port to download the operation data. The stick must be FAT or FAT32 formatted.

To do this, plug in USB stick, LCD will show “Download Data Processing”. After plugging in the USB, all data inside the LVS-M Series will be downloaded to the stick automatically. LCD will show corresponding status.

After downloading, while LCD shows “Download Data Finished”, you can then pull off USB stick.

Data download in USB disk are in a file of CSV format.

If your USB disk contains firmware for an update, the LVS-M Series not download data to USB stick.

10-2-2 Firmware Upgrade

You can upgrade the LVS-M Series by USB disk with official firmware. To do this, you need to have firmware in USB stick. To update by USB, please get the latest firmware, save it into a blank USB disk, plug USB disk to the LVS-M Series, it will start the upgrade automatically. For detail information, please also consult your local service.

To prevent unexpected stop, before starting upgrade, make sure PC or Mains are available.

The internal memory can store up to 1 month length of data. Data older than this period will be replaced by latest data automatically.

Once data in the logger has been deleted, it cannot be recovered. Therefore it is recommended to backup data periodically if you wish to retain this information.

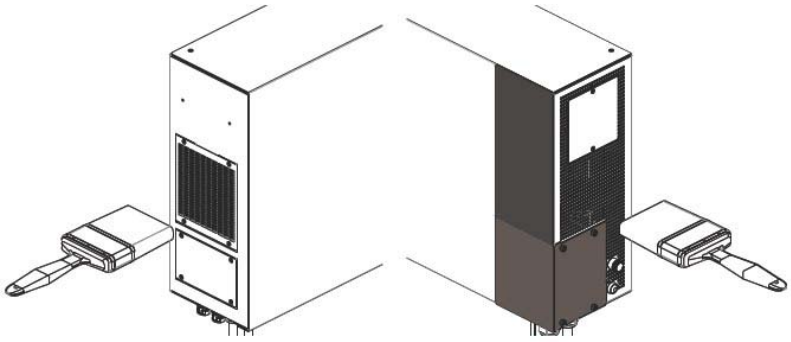
Section 11: Trouble Shooting

Trouble	Solution
No display or incorrect display	1. Make sure all PV and battery is properly connected. 2. Check battery fuse and switch (breaker) is on. 3. Check AC (Mains). If no AC, try to push “Manual On/Off “ button. 4. If above actions are useless, please DO NOT push manual on/off any more, call your service immediately.
Error on display	1. C# Error: switch off all AC and DC then switch on the DC and then the AC again. 2. If above error continues, please contact with local service.
C4 appears	C4 means internal over temperature. Please: 1. Review installation location, cooler ambient is preferred. 2. Clean up dust on fans and ventilation holes. 3. If C4 continues, please contact with local service.
Unable to charge batteries	1. Improper battery type. Please use official batteries. 2. The life cycle of battery ends. Please replace batteries. 3. Improper battery connection. Please check the wirings between the LVS-M Series and battery bank.
RS485 does not work	1. Check all wiring, connection and polarity. 2. Try to switch “On” or “Off” terminal DIP switch
Internal Comm. error	1. Green status LED is flashing 2. Please contact with local service.

Section 12: Maintenance

12-1 Regular Maintenance

- Keep proper distance from other obstacles. Make sure air-flow and heat dissipation path is cleared.
- Clean up any dust on this unit, especially on the ventilation holes.
- Check operation and status if possible.
- Check all wiring and cables.



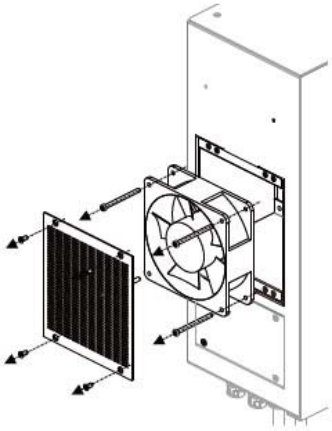
12-2 Replacing Fans

For years of operation, the fans of the LVS-M series may be worn out. When the fans are very noisy or stopped, please replace fans. Please follow below steps:

To replace the fan, it is required to have qualified and authorized technician.

Before replacing fan, please turn both AC and DC off.

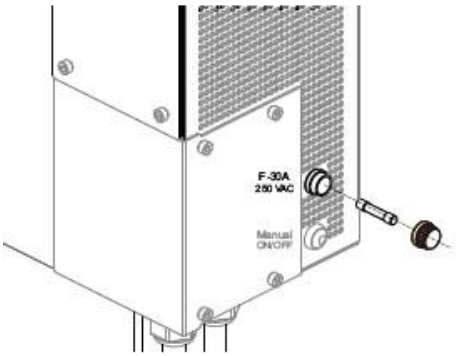
1. Switch PV, DC and AC off.
2. Remove screws, open fan cover.
3. Remove screws of fan.
4. Take fan out.
5. Unplug fan connector.
6. Replace new fan supplied by authorized dealer.
7. Close and fix this cover again with screws.



12-3 Replacing Fuse

For some abnormal situations such as overload on AC out, the AC fuse may be broken. If this happens, you need to replace the fuse (35A/250VAC, fast-acting).

There is a spare fuse in accessory. Take that fuse and follow below figure and replace it.



Appendix: Battery Charging/Discharging Parameter

Type	No.	Charging Current	Charging Voltage	Cutoff Voltage
Generic	1	20	13.7	10.8
	2	40	13.7	10.8
	3	60	13.7	10.8
	4	80	13.7	10.8
	>=5	100	13.7	10.8
Yuasa NPA100-12I	1	25	14.5	9.9
	2	50	14.5	9.9
	3	75	14.5	10.2
	4	100	14.5	10.2
	>=5	100	14.5	10.2
Chloride 12CDC100	1	20	14.7	9.9
	2	40	14.7	9.9
	3	60	14.7	10.5
	4	80	14.7	10.5
	>=5	100	14.7	10.5
3K EBB 100	1	20	14.4	9.9
	2	40	14.4	9.9
	3	60	14.4	10.5
	4	80	14.4	10.5
	>=5	100	14.4	10.5
PANASONIC LC-T12015	1	30	14.5	9.9
	2	60	14.5	9.9
	3	90	14.5	10.2
	4	100	14.5	10.2
	>=5	100	14.5	10.2

**** Note:***

- ***The voltage indicated is for single 12V battery.***
- ***Cutoff voltage is the voltage of rated power. E.G.: for one string, it is the voltage of 150A discharging.***