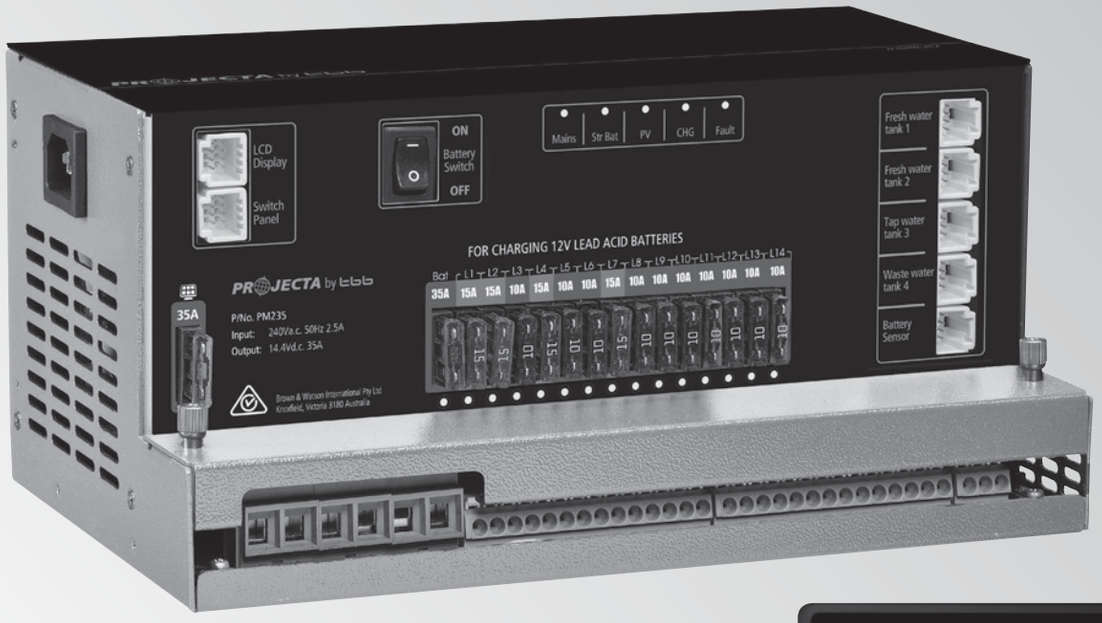
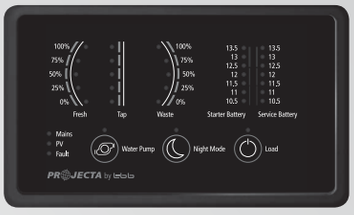
PROJECTA

INTELLI-RV

12V POWER MANAGEMENT SYSTEM





P/No. PM200

IMPORTANT SAFETY INFORMATION

Please read this manual thoroughly before use and store in a safe place for future reference.

WARNINGS

- Explosive gases. Prevent flames and sparks. Provide adequate ventilation during charging
- Before charging, read the instructions
- For indoor use. Do not expose to rain
- For charging lead acid batteries ONLY (of the size & voltage specified in the specifications table)
- Always charge the battery on the correct voltage setting. Never set the charger to a higher voltage than the battery
- Disconnect the 240V mains supply before making or breaking the connections to the battery
- The battery charger must be plugged into an earthed socket outlet
- Connection to supply mains is to be in accordance with National wiring rules
- Do not attempt to charge non-rechargeable batteries
- Never charge a frozen battery
- If the AC cord is damaged, do not attempt to use. It must be replaced or repaired by a qualified person
- Corrosive substances may escape from the battery during charging and damage delicate surfaces. Store and charge in a suitable area
- Ensure all vehicle accessories including lights, heaters, appliances etc. are turned off prior to charging
- This charger is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning the use of the appliance by a person responsible for their safety
- Young children should be supervised to ensure that they do not play with the appliance

CONTENTS

1. System Introduction – PM200

PM200 is designed for use in caravans or motor homes. The unit has integrated functions such as: battery charger, distribution blocks, PWM solar charger controller, charging relay, battery low voltage protector, water pump controller, water tank indicator and LED Display.

The PM200 is designed for an easy installation and a user-friendly interface.

SYSTEM COMPONENTS:

1. PM235 Master power unit
2. PMSWLED LED Display
3. PMWS200 or PMWS400 Water tank sensor (Not supplied)
4. Cables (Refer to Chapter 4.1 for the cable list)

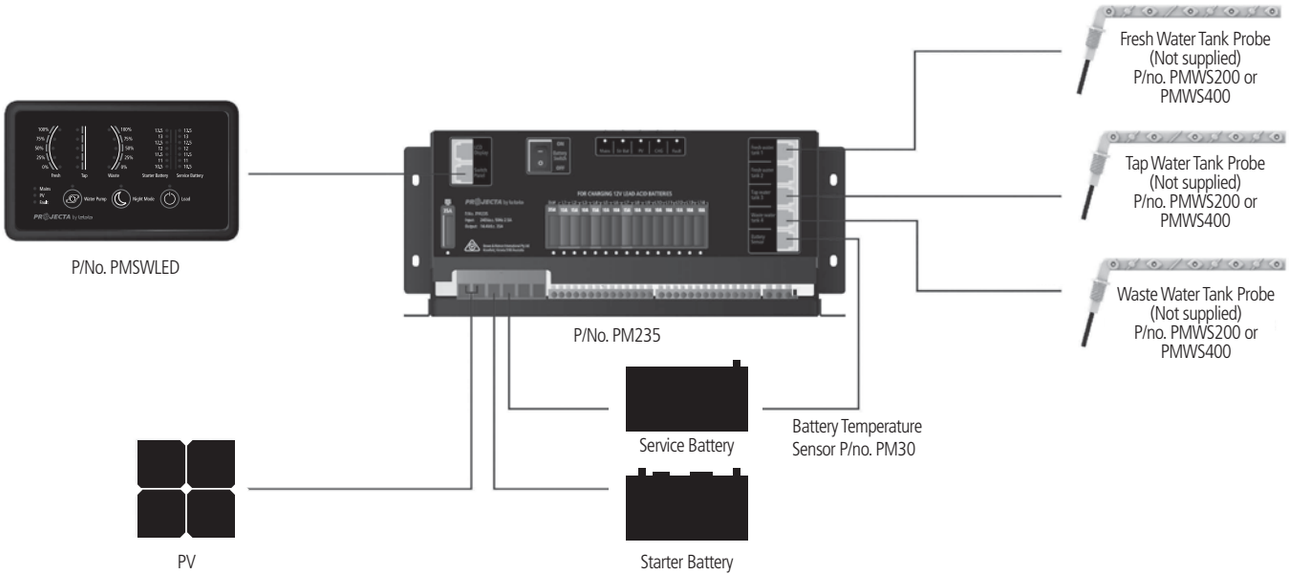


Figure 1 System Components for PM200

1.1 Features

- Smart battery charger 12V 35A (20A for charging current)
  - Multi stage adaptive charging algorithm
  - Active Power Factor Correction (PFC) charging
  - Temperature compensation charging
  - Voltage compensation charging
- Float charge for starter battery
- Solar charge controller (PWM), 30A
- 14 built-in outputs
  - 14 built in fused outputs
- Charging from Alternator at 12V 60A - 60A continuously, 100A 30mins
- Battery Low Voltage Protection
- Built-in battery switch to isolate the battery when in storage
- Support external remote battery switch
- Built-in shunt for precise battery measurement
- 1 water pump control with up to 3 connections for water sensors
- Thermal controlled fan
- Spring terminal & screw terminal
- T-bus compatible

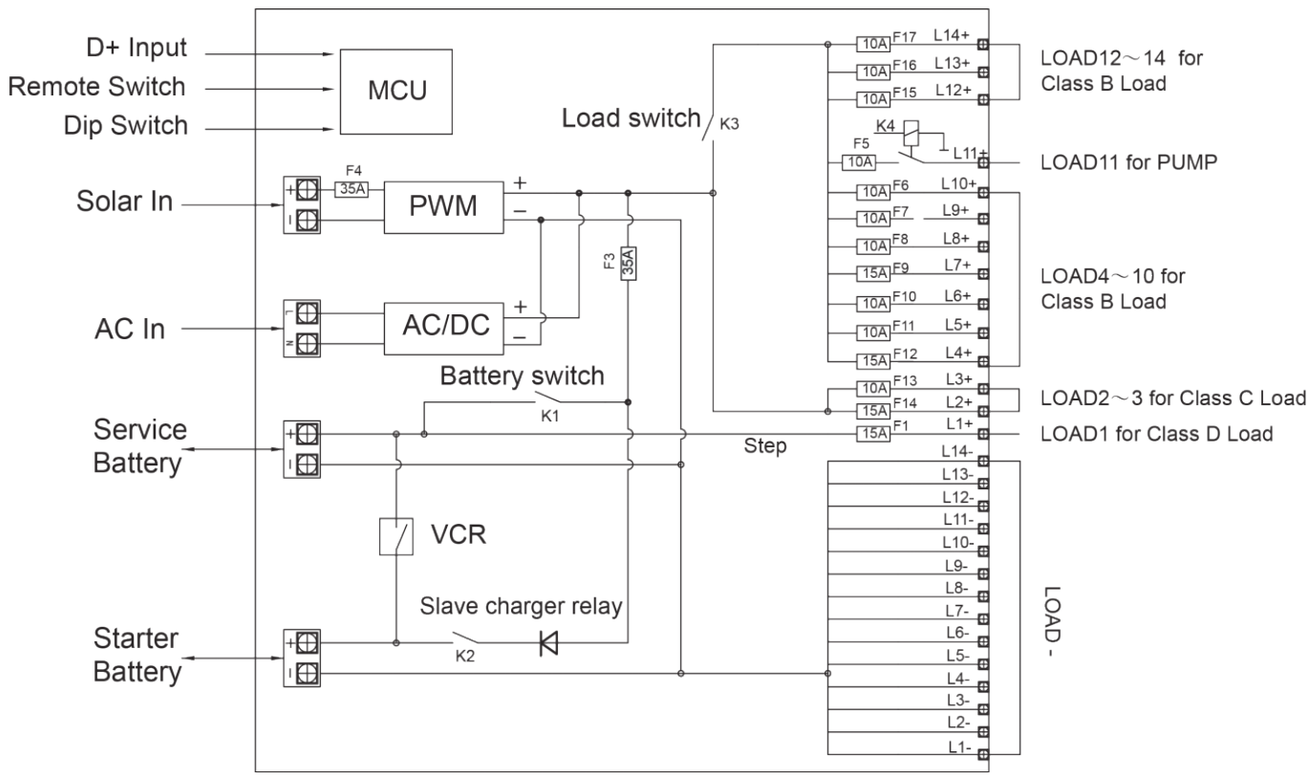


Figure 2 System Schematic

1.2 L.E.D Display

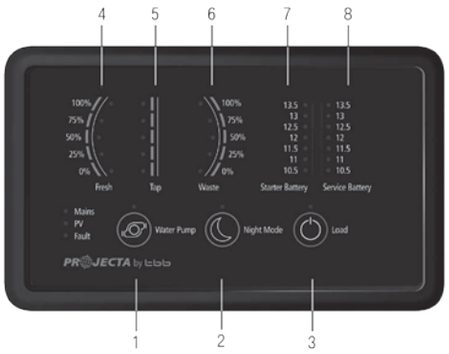


Figure 3 PMSWLED switch panel

Table 1 Front panel of PMSWLED

Nº	LABEL	TYPE	DESCRIPTION
1	Water pump	DC load control	Load control, on/off control
2	Night mode	Scene mode	Refer to 2.10
3	Load	DC load control	Load control, on/off control. Refer to 2.7
4	Fresh water tank	Sensor	Detect the level of fresh water tank
5	Tap water tank	Sensor	Detect the level of tap water tank
6	Waste water tank	Sensor	Detect the level of waste water tank
7	Starter battery	Voltage	Detect the voltage of starter battery
8	Service battery	Voltage	Detect the voltage of service battery

Table 2 LED indication of PM260

Nº	LABEL	COLOUR	STATUS	DESCRIPTION
1	Main	Green	ON	Battery charged or power supply mode
			Flash	Battery charging under grid electricity
			OFF	NO AC input
2	PV	Green	Solid	Battery charged
			Flash	Battery charging under solar energy
			OFF	NO solar input / AC charging / Aux charging
3	Fault	Red	ON	Short circuit
			1 flash	Service battery voltage low
			2 flash	Service battery voltage high
			3 flash	Over temp (heat sink)
			4 flash	Bulk charge timeout
			5 flash	VCR anomaly
			6 flash	Over temp (environment)

1.3 Water Tank Probe

For PM200, max three probes can be controlled in the system.

NOTE: Always check the probe required for the water tank before purchase. If the probe included does not fit the water tank, please contact the seller.

There are 2 probe styles:

PMWS200:

- Side installation
- Suitable for water tank
- Depth >200mm

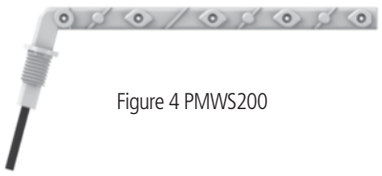


Figure 4 PMWS200

PMWS400:

- Side installation
- Suitable for water tank
- Depth 300-400mm

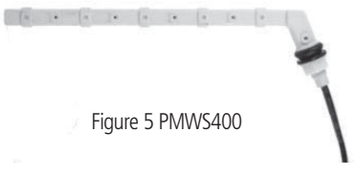


Figure 5 PMWS400

2. KEY FEATURES AND FUNCTIONS

2.1 Multiple Inputs

PM200 master power unit may have many sources at one time. These sources include the AC mains, solar panel and starter battery (Auxiliary). Only one of them will be dominated to provide power at one time, even if all are available, priorities are listed to the right.

Table 3 Source priority

AC MAINS	**X**	**X**	
SOLAR	**X**		**X**
AUXILIARY		**X**	**X**
DOMINATING SOURCE	AC MAINS	AC MAINS	AUX

2.2 Battery Charger Of Stationery/Service Battery

The charger automatically starts when the appropriate qualified power is connected, either from grid, generator or solar.

With multiple charging stages (soft start-bulk absorption float-recycle), PM200 is designed to fully charge battery quickly. To guarantee the optimal charging for batteries of different states, the PM200 features Microprocessor-controlled charging algorithm. The Float and Recycle charging programs guarantees that the battery condition does not change despite being connected for a longer period.

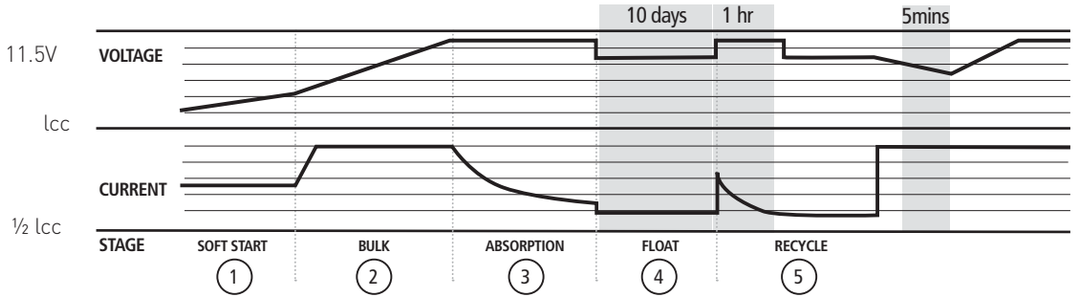


Figure 6
Charging Algorithm

Icc is the rated current.

1. **SOFT START**
   Increases battery life by gently starting to charge the battery 5% of bulk
2. **BULK**
   Reduces charging time by delivering maximum charge to set voltage life by gently starting to charge the battery 25% of bulk
3. **ABSORPTION**
   Ensures a full charge to the battery without overcharging
4. **FLOAT**
   Float charge maintains the battery at 100% charge
5. **RECYCLE**

Battery temperature compensation charging

The BTS PM30 (Battery Temperature Sensor) supplied with PM200, measures the temperature of the battery and automatically adjusts, in real time, to charge the battery properly at compensation rate of – 4mv±10%/°C/cell. In case BTS is not present, the PM200 will use 25°C as default.

Voltage compensation charging

With a voltage sensor PM30 the PM200 can, if required, automatically adjust its output to compensate the voltage drop caused by a cable. This assures the right voltage is being delivered for optimal charging.

Adjustable charging capacity

Users can adjust the charging current by specifying the battery capacity. The charging current is set at threshold rate of 10% the of the battery capacity (I = 0.1C) by default.

Lithium battery charging

The PM200 can be configured to charge Lithium battery. With the Lithium battery, the max charging current will automatically be set at 30% of battery capacity (Imax=0.3C).

2.3 Vehicle Battery Charger

Along with a powerful charger for service battery, PM200 offers a float charge of up to 3A to keep the starter battery charged, whether connected to the AC main or PV. When starter battery is less than 12.4V, the PM200 starts charging after 30 minutes delay and stops charging when voltage reaches 12.8V.

2.4 Power Supply Mode

If no battery is attached to PM200 unit, it will work as a power supply automatically with a 12.8VDC output.

2.5 PWM Solar charger controller

PM200 has a built-in PWM charger for the service battery.

- Max input voltage 25VDC
- Max charging current 20A
- Max supply current 30A

2.6 Voltage Charging Relay (VCR or commonly known as a VSR)

PM200 master power unit has a built-in voltage charging relay (VCR), which offers a convenient source to charge the service battery by alternator whilst engine is running. When the starter battery reaches 13.4VDC with threshold time delay, the VCR will charge the service battery from the alternator. VCR will continue the charging until the starter battery voltage drops under 12.8VDC.

NOTE: The PM200 when charging from the starter battery does not provide the 5 stage charge. It simply takes whatever power and charging is available from the vehicle alternator.

2.7 Categorised Outputs

The 14 outputs are categorised into groups and controls as per below:

Table 4 Categorised outputs definition

CATEGORY	QTY	DESCRIPTION	POSSIBLE LOAD SUITABLE
Class A1	1	Relay controlled output with fuse, protected by main master switch relay	Water pump
Class B	10	Fused outputs, protected by master switch relay	Ventilation fan etc
Class C	2	Live load	Fridge, security alarm etc.
Class D	1	Permanent on load	Auto step

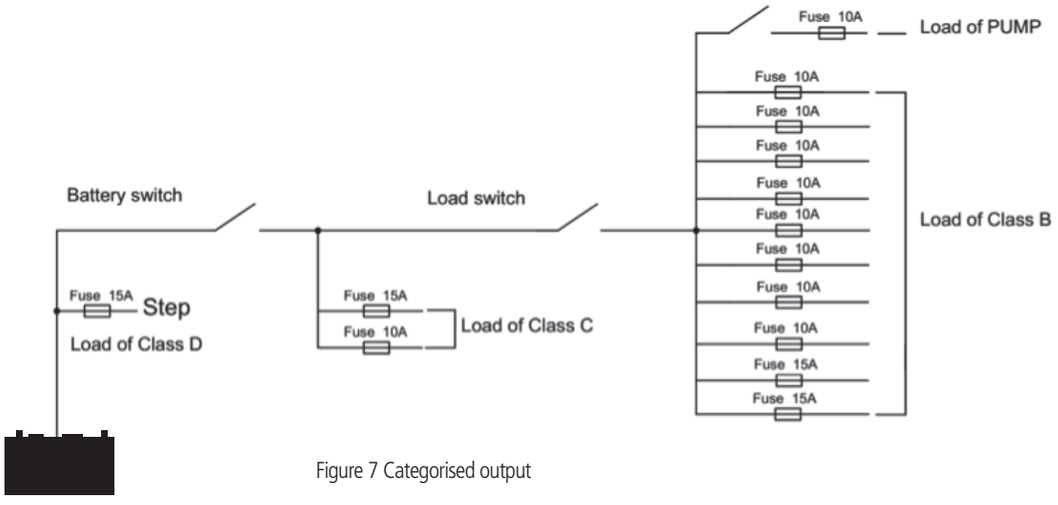


Figure 7 Categorised output

2.8 Battery Low Voltage Protection (BLVP or commonly know as an LVD)

PM200 master power unit has a built-in low voltage protection relay. It will disconnect the load once the battery voltage drops below the threshold voltage. The default setting is 10.5VDC.

2.9 Manual Battery Switch

The PM200 unit offers a convenient way to switch off the output of the service battery on-board. It protects the service battery from being drained by electronics on board, completely isolating the battery. PM200 unit also supports a remote manual battery switch. Before using the remote switch, ensure the 'switch selector' is set to 'Remote'. The switch is only effective when the system has no other energy resource for the load except the battery.

2.10 Silent Mode

In Silent Mode, the backlight of the Led Display and the fan will be turned off or decreased in speed.

3. STRUCTURE AND INSTALLATION

3.1 PM200 Master Power Unit

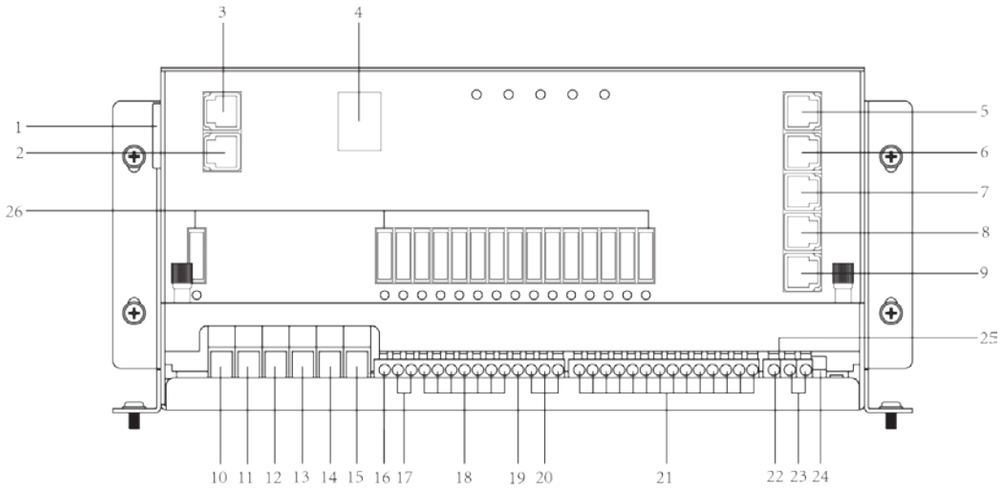


Figure 8 Front panel of PM235

Table 5 Connection of PM235

Nº	LABEL	DEFINITION	DESCRIPTION
1	AC Mains	AC input port	
2	Switch panel	Comm port	Connect to switch panel
3	LCD Display	Comm port	Connect to monitor (Monitor is not available in PM200)
4	Battery switch	Service battery switch	Manual battery switch
5	Fresh water tank 1		Connect to fresh water tank 1
6	Fresh water tank 2		Fresh water tank 2 is not available in PM200
7	Tap water tank		Connect to tap water tank
8	Waste water tank		Connect to waste water tank
9	Battery sensor	For temp compensation	Connect to service battery+
10	PV+	Solar input	Connect to PV+
11	PV-	Solar input	Connect to PV-
12	Starter Bat+	Starter battery+	Connect to starter battery+
13	Service Bat+	Service battery+	Connect to service battery+
14	Starter Bat-	Starter battery-	Connect to starter battery-
15	Service Bat-	Service battery-	Connect to service battery-
16	L1+	Step	Connect to load of class D
17	L2+ ~ L3+		Connect to load of class C
18	L4+ ~ L10+		Connect to load of class B
19	L11+	Water pump	Connect to Water pump+
20	L12+ ~ L14+		Connect to load of class B
21	L1- ~ L14-		Connect to DC load -
22	D+ Point	D+ input	Connect to D+
23	Remote Switch	Terminal block	Connect to remote switch
24	Select Switch	Dip switch	Select local switch or remote switch (Note: open the upper cover board to operate)
25	Setting	Dip switch	Set the battery type and capacity (Note: open the upper cover board to operate)
26	Fuse		Fuses and fuse failure indication

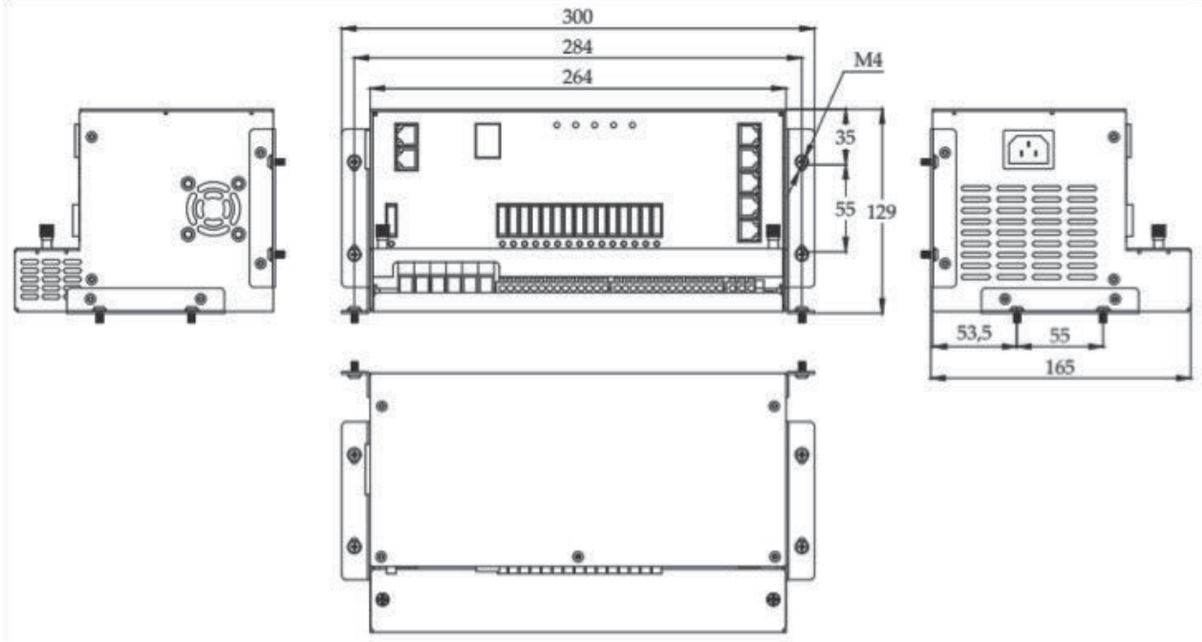
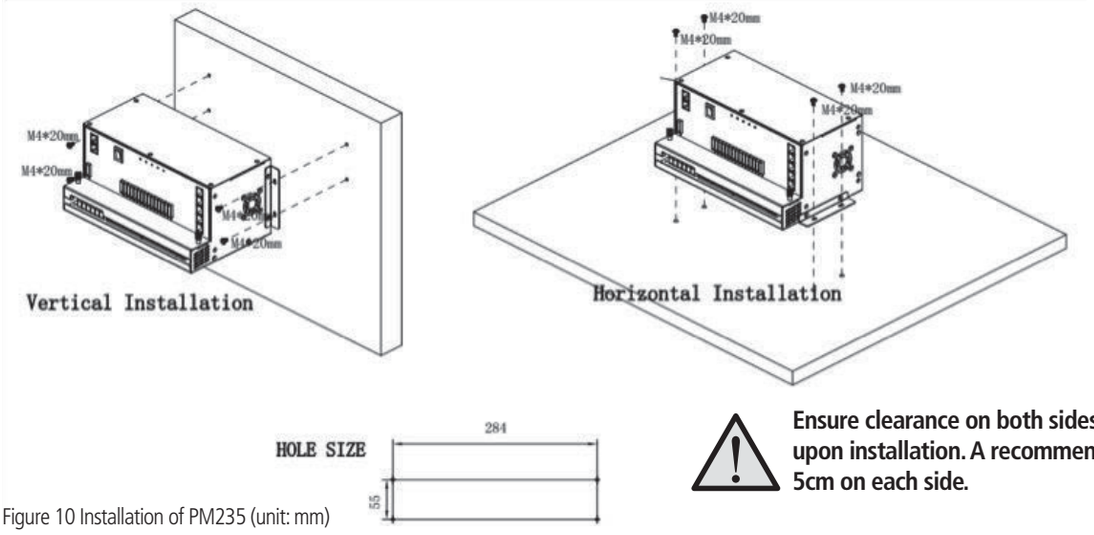


Figure 9 Dimension of PM235 (unit: mm)

Installation:

PM235 can be installed on a horizontal surface or vertically on a wall. Please see following instructions:



Ensure clearance on both sides of PM235 unit upon installation. A recommended clearance of 5cm on each side.

Figure 10 Installation of PM235 (unit: mm)

3.2 L.E.D Display

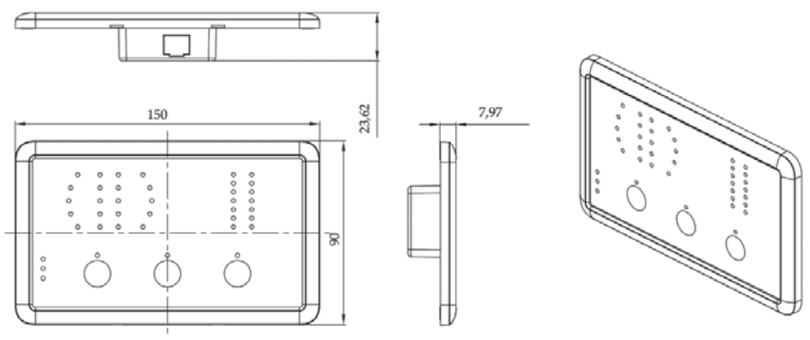


Figure 11 Dimension of PMSWLED (Unit: mm)

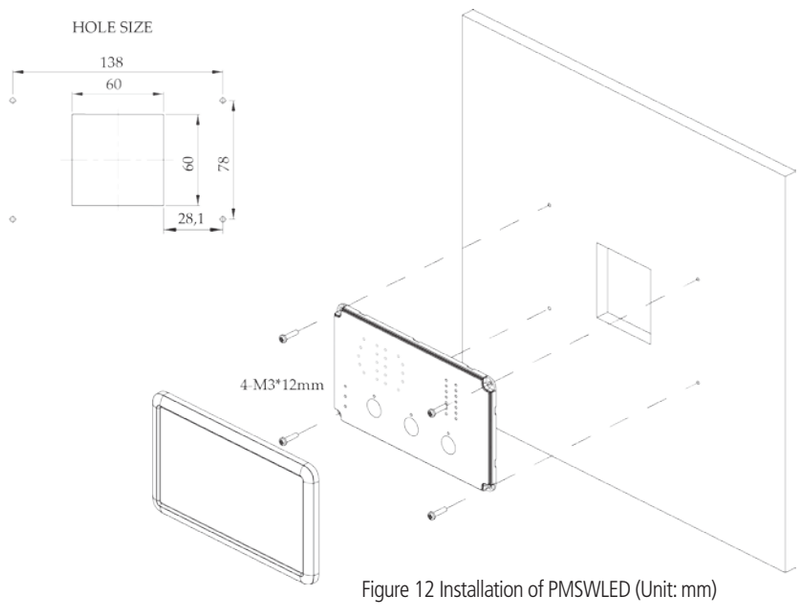


Figure 12 Installation of PMSWLED (Unit: mm)

3.3 Water Tank Probe

3.3.1 PMWS400 Water Tank Probe

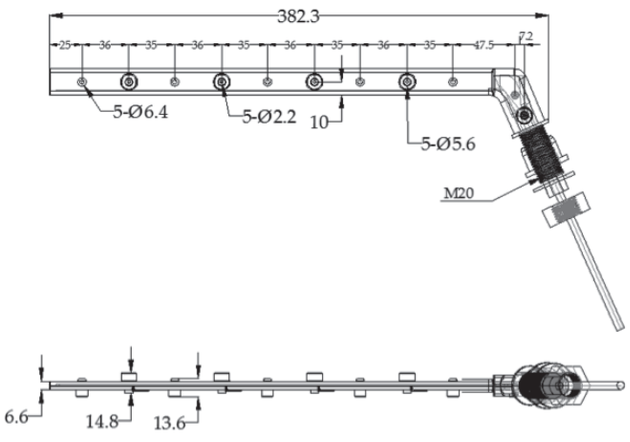


Figure 13 Dimension of PMWS400 (Unit: mm)

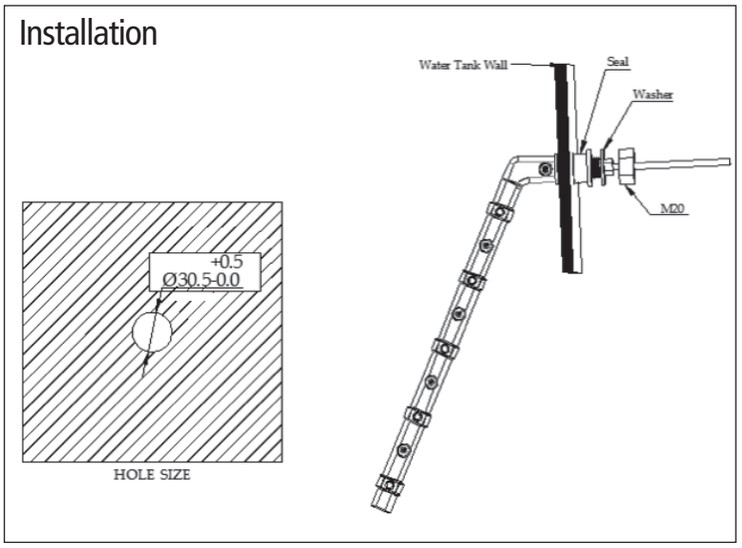


Figure 14 Installation of PMWS400

3.3.2 PMWS200 Water Tank Probe

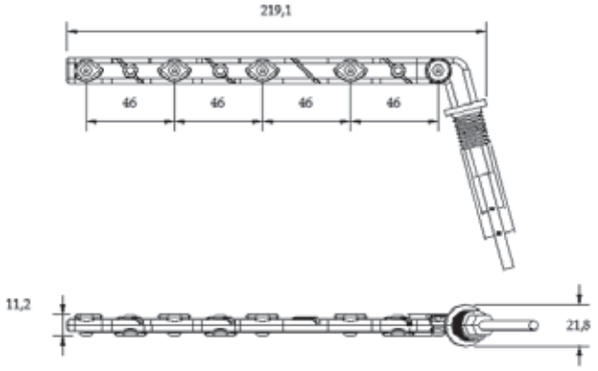


Figure 15 Dimension of PMWS200 (Unit: mm)

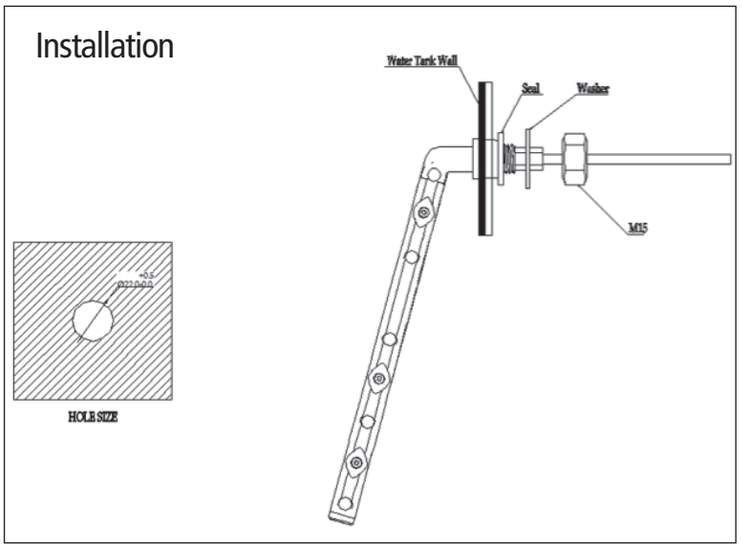


Figure 16 Installation of PMWS200

4. WIRING

4.1 Material

CODE	NAME	MODEL/LENGTH	QTY	P/NO. ON DRAWING
1	Caravan Master Power	PM235	1	1
2	Membrane Switch Panel	PMSWLED	1	3
3	Fresh water tank level sensor	Not included and to be ordered separately	0	4
4	Tap water tank level sensor		0	6
5	Waste water tank level sensor		0	7
6	PV		0	9

CODE	NAME	MODEL/LENGTH	QTY	P/NO. ON DRAWING
7	Switch panel line	5m	1	PMSWLEDC
8	Battery sensor line	3m	1	PMBS
9	Water tank probe line	4m	0	PMWS200 / PMWS400
10	Water tank probe line	4m	0	
11	Water tank probe line	4m	0	
12	Power Cable	1.5m	1	PMAC

Table 6 Components list of PM200

4.2 System Schematic

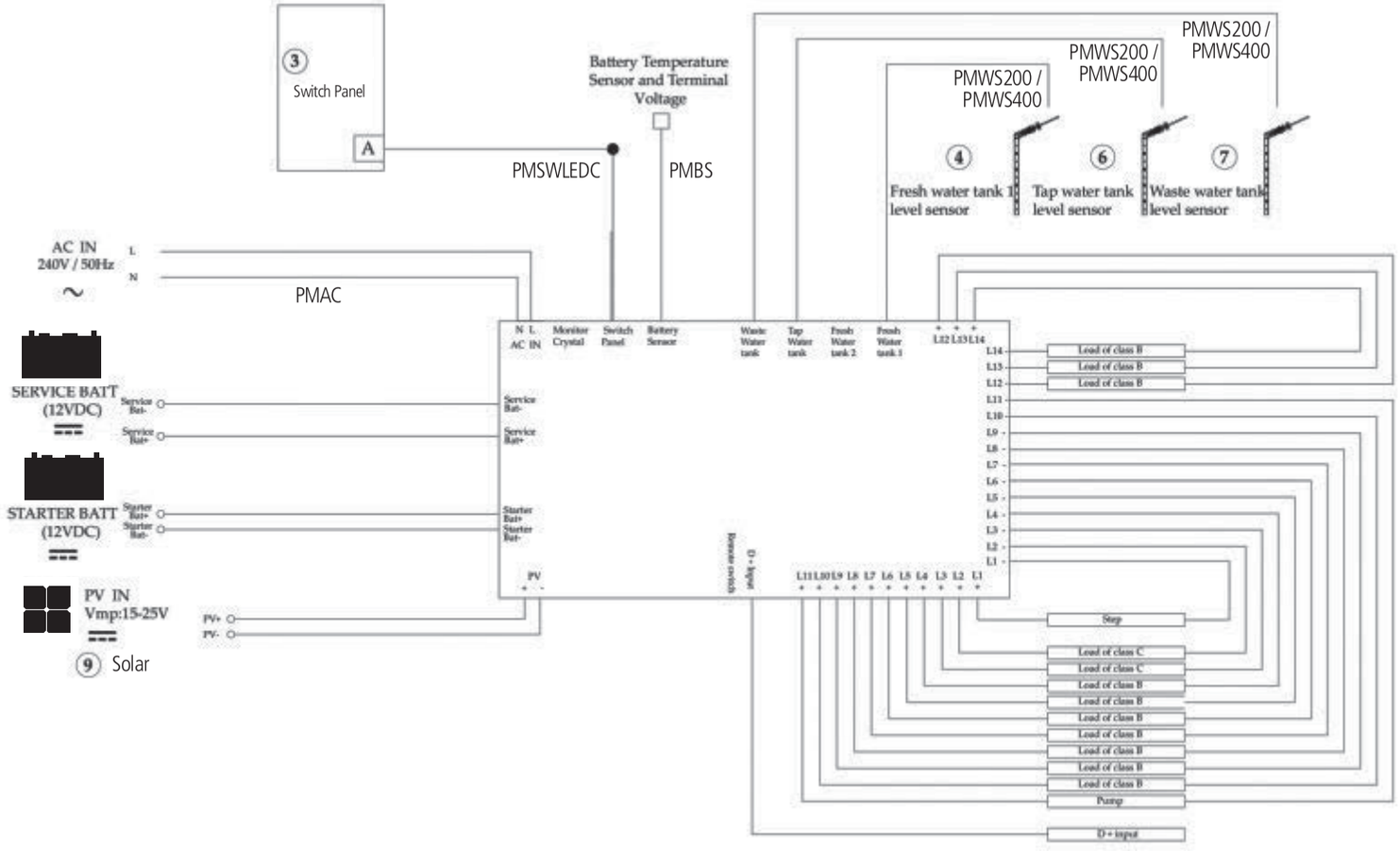


Figure 17 System Diagram

4.3 Preparation

PM200 system is designed with a concept of 'Plug and Play' in mind. To complete the easy installation, a screw driver and DC cables are required. Follow Table 7 recommendation for minimum wiring.

CURRENT	MINIMUM CABLE SIZE
0–5A	1.0mm^2 or 18 AWG
5–10A	2.0mm^2 or 14 AWG
10–15A	3.0mm^2 or 13 AWG
15–20A	4.0mm^2 or 11 AWG
20–25A	5.0mm^2 or 10 AWG
25–30A	6.0mm^2 or 9 AWG

Table 7 Minimum cable size

When running cables, if they pass through panels or wall, ensure the cables are protected from damage by sharp edges. In such cases, it is recommended to use cable glands.

4.4 Connection

PM200 unit is designed with a spring and screw terminal. Please refer to following illustration at right.
Each type of terminal is designed to fit a different range of cables.

TYPE	TERMINAL MODEL NUMBER	SUITABLE CABLE GAUGE
Type 1	ERTB10-10.16	0.5mm^2 – 10mm^2
Type 2	wago804-114	0.25mm^2 – 2.5mm^2

Table 8 Recommended terminal and cable gauge

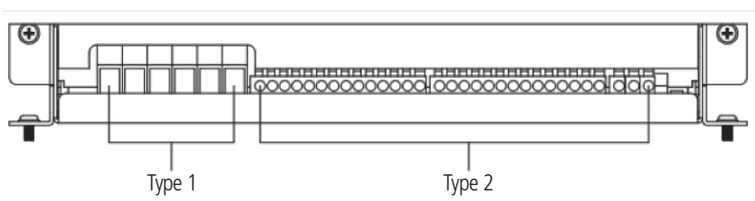


Figure 18 PM235 Terminal

TYPE 1

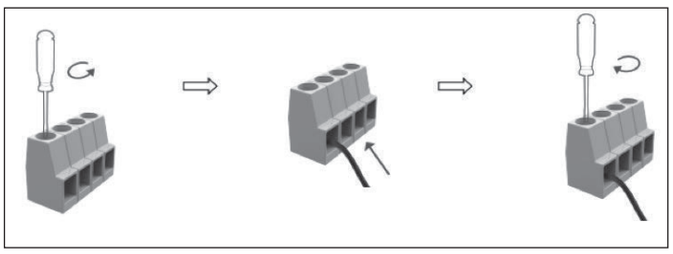


Figure 19 Connection of Terminal Type 1

TYPE 2

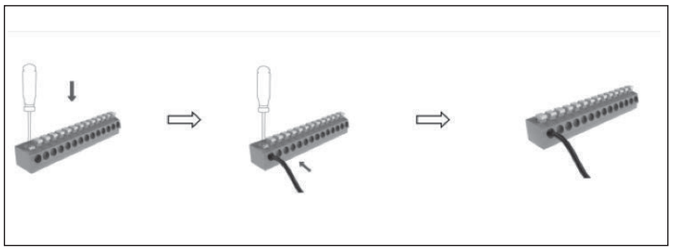


Figure 20 Connection of Terminal Type 2

5. DISPLAY

5.1 PM235 Master Power Unit

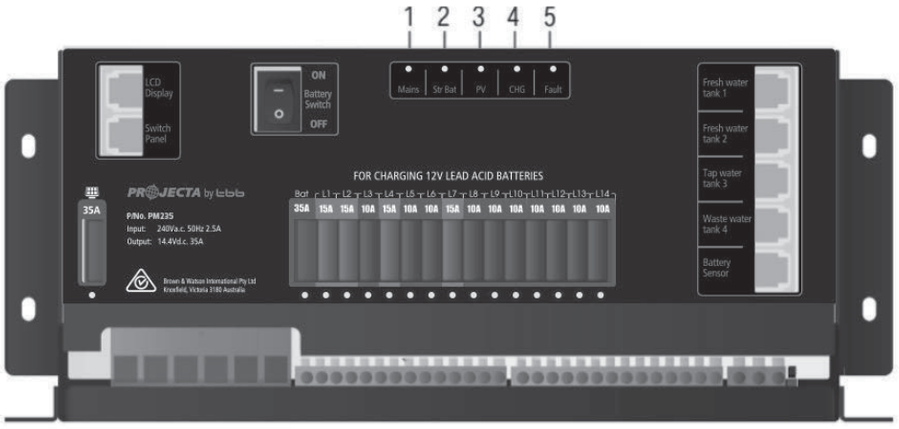


Figure 21 An overview of PM235

No.	LED	COLOUR	STATUS	DESCRIPTION
1	Mains	GREEN	ON	AC input OK
			OFF	AC disconnected
			Quick flashing (flash twice every second)	AC input abnormal
2	Str Bat	GREEN	ON	Str Bat charging the battery
			Slow flashing (flash once every second)	The input of the Aux is normal but it is charged by the AC
			Quick flashing (flash twice every second)	Str Bat input error
			OFF	Str Bat disconnected
3	PV	GREEN	ON	PV charging the battery
			Slow flashing (flash once every second)	The input voltage of the PV is normal but it is charged by the AC or Starter battery
			Quick flashing (flash twice every second)	PV input error
			OFF	PV disconnected
4	CHG	GREEN	ON	Battery charged
			Flashing (flash once every second)	Battery charging
			Slow flashing (1 second on 2 seconds off)	Battery discharge
			OFF	Battery disconnect
5	FAULT	RED	ON	Short circuit
			1 flash	Service battery voltage low
			2 flash	Service battery voltage high
			3 flash	Over temp (heat sink)
			4 flash	Bulk charge timeout
			5 flash	VCR anomaly
			6 flash	Over temp (Ambient)

Table 9 LED indicator description of PM235

5.2 L.E.D Display

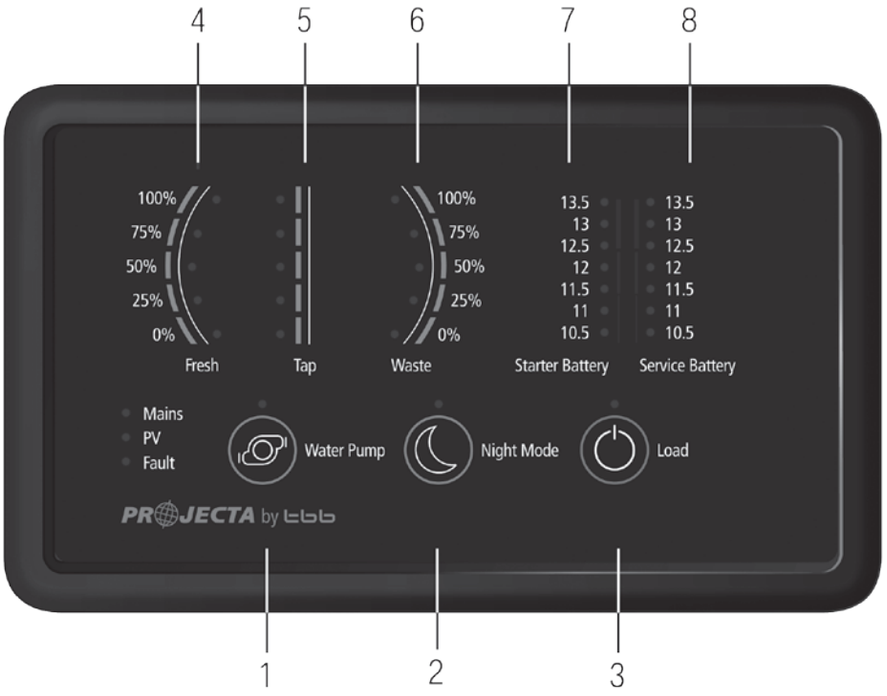


Figure 22 An overview of PMSWLED

Table 10 Front panel of PMSWLED

Nº	LABEL	TYPE	DESCRIPTION
1	Water pump	DC load control	Load control, on/off control
2	Night mode	Scene mode	Refer to 2.10
3	Load	DC load control	Load control, on/off control. Refer to 2.7
4	Fresh water tank	Sensor	Detect the level of fresh water tank
5	Tap water tank	Sensor	Detect the level of tap water tank
6	Waste water tank	Sensor	Detect the level of waste water tank
7	Starter battery	Voltage	Detect the voltage of starter battery
8	Service battery	Voltage	Detect the voltage of service battery

Table 11 LED indication description of PMSWLED

Nº	LABEL	COLOUR	STATUS	DESCRIPTION
1	Mains	Green	ON	Battery charged or power supply mode
			Flash	Battery charging under grid electricity
			OFF	NO AC input
2	PV	Green	Solid	Battery charged
			Flash	Battery charging under solar energy
			OFF	NO solar input / AC charging / Str Bat Charging
3	Fault	Red	ON	Short circuit
			1 flash	Service battery voltage low
			2 flash	Service battery voltage high
			3 flash	Over temp (heat sink)
			4 flash	Bulk charge timeout
			5 flash	VCR anomaly
			6 flash	Over temp (environment)

6. OPERATION

6.1 Configuration on PM200

You could configure the battery type and capacity through PM235 master power unit.

6.1.1 Battery Capacity and Battery Type

There is a dip switch for you to set battery capacity and battery type.

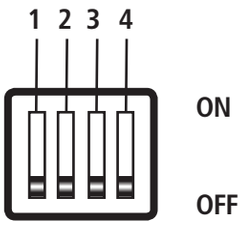


Figure 23 Dip Switch of PM200

Dip switch definitions:

DIP SWITCH	1	2	3	4
	Battery Capacity		Battery Type	

Table 12 Dip Switch definition

Configure the max charging current of PM235:

DS1	DS2	BATTERY CAPACITY	CHARGING CURRENT OF PM235
ON	ON	50Ah	5A
ON	OFF	100Ah	10A
OFF	ON	150Ah	15A
OFF	OFF	200Ah	20A

Table 13 Battery Capacity setting by dip switch

When choosing max charging current, please take into consideration the consumption of the DC load connected with the system.

Configure the battery type connected:

DS3	DS4	BATTERY TYPE	ABSORPTION	FLOAT
OFF	OFF	AGM	14.4V	13.5V
OFF	ON	GEL	14.1V	13.5V
ON	OFF	$LiFePO_4$	14.4V	13.5V
ON	ON	WET	14.7V	13.7V

Table 14 Battery Type setting by dip switch

Factory default setting:

DIP SWITCH	1	2	3	4
STATUS	OFF	OFF	OFF	OFF

Table 15 Factory default setting

6.1.2 Select Battery Switch Local/Remote

This function offers a possibility for user to use a remote battery switch to power on/off the service battery output

Figure 24 Local/Remote Select Switch

DIP SWITCH	DESCRIPTION
Local	The switch on PM235 unit works
Remote	The remote switch works and local one is disabled

Table 16 Local/Remote Setting

6.2 Daily maintenance

- Confirm the Battery Switch is switching on when you want to charge the battery with the AC grid.
- Check the nominal battery voltage is 12Vdc.
- Ensure the space (10cm each side) beside the PM235 unit for the good ventilation.

It is recommended to switch off the local Battery Switch on main panel of PM200 master power unit or remote switch to cut off the consumption of the service battery.

7. TROUBLE SHOOTING

7.1 L.E.D Display on PM235 Unit

No.	LED	COLOUR	STATUS	DESCRIPTION
1	Mains	GREEN	Quick flashing (flash twice every second)	AC input abnormal
2	Str Bat	GREEN	Quick flashing (flash twice every second)	The Starter Battery is 2~13.4V or >16.0V, while AC power is connected.
3	PV	GREEN	Quick flashing (flash twice every second)	Solar input voltage error – Solar input >25Vdc
4	Fuse L.E.D	Red	OFF	Fuse blown, need to check load and replace fuse
5	FAULT	RED	ON	Short circuit
			1 flash	Service battery voltage low
			2 flash	Service battery voltage height
			3 flash	Over temp (heat sink)
			4 flash	Bulk charge timeout
			5 flash	VCR anomaly
			6 flash	Over temp (environment)

Table 17 Error LED indicator of PM235

8. SPECIFICATION

MODEL		PM235
ELECTRICAL SPECIFICATIONS		
Grid	Nominal input voltage (V)	240±10%VAC 50/60Hz
	Power factor	0.95
	Input current at full load	2.5A
Battery	Starter Battery	12VDC
	Starter battery voltage range	12.8-16VDC
	Service battery	12VDC
	Service battery voltage range	10.5-16VDC
PV	Charger type	PWM
	Open circuit voltage	25VDC
	Max supply current	30A
	Max charging current	20A
Charging Relay	Relay specification	12VDC 60A continuous, peak current 100A, 30mins
	Connect voltage	13.4V
	Connect delay time	10sec
	Disconnect voltage	12.8V
	Disconnect delay time	60sec
	High voltage limit	16.0VDC
Charger Mode	Charge Algorithms	5 Stage
	Battery type	AGM/GEL/ $LiFePO_4$/WET
	Start voltage	2V
	Bulk current	20A (Max)
	Absorption voltage	(14.4/14.1 /14.4/14.7) ±0.15VDC
	Float voltage	(13.5/13.5 /13.5/13.7) ±0.13VDC
Power Supply Mode	Nominal output voltage	12.8±0.2 VDC
	Rated output current	35A (Continuous)
Efficiency		88%
Working temperature		-40°C~+65°C (50°C: full load; 60°C: 20A; 65°C: shutdown the output)

MODEL		PM235	
OTHERS			
Battery Disconnect (LVD)	Disconnect voltage	AGM/GEL/WET	10.5VDC (default)
		$LiFePO_4$	11.2 VDC (Default)
	Delay off time	60 sec	
	Reconnect voltage	AGM/GEL/WET	11.5VDC (default)
		$LiFePO_4$	12.2 VDC (Default)
Current draw on battery	240VAC is off, no vehicle charging	405mA	
	LVD battery <10.5 current draw on battery	110mA	
	LVD battery <10 current draw on battery	0mA	
Fused outputs	Numbers	14	
	Rated current	15A x 4: 10A x 10	
Protection	Short circuit on output	Fuse blown	
	Reverse polarity	Diode reverse isolation	
	Overload protection	Derate the output until overload is removed	
	Battery charger over temperature	Shut down PM235	
	Ambient over temperature	Alarm	
	Battery over voltage limits	Battery charger disconnect, loads disconnect	
PHYSICAL SPECIFICATIONS			
Dimensions (L*W*H)	264 × 164 × 128mm		
Weight	3kgs		
Enclosure	Steel case		
Battery Connector	M4 Screw (16mm^2)		
Load Connector	Wago804-114 (2.5mm^2)		
Cooling	Forced cooling		
Protection category	IP20		
Approvals			
Electrical	AS/NZS 60335-2-29		
EMC	CISPR14		

Table 18 Specification of PM235

WARRANTY STATEMENT

Applicable only to product sold in Australia

Brown & Watson International Pty Ltd of 1500 Ferntree Gully Road, Knoxfield, Vic.,telephone (03) 9730 6000, fax (03) 9730 6050, warrants that all products described in its current catalogue (save and except for all bulbs and lenses whether made of glass or some other substance) will under normal use and service be free of failures in material and workmanship for a period of one (1) year (unless this period has been extended as indicated elsewhere) from the date of the original purchase by the consumer as marked on the invoice. This warranty does not cover ordinary wear and tear, abuse, alteration of products or damage caused by the consumer.

To make a warranty claim the consumer must deliver the product at their cost to the original place of purchase or to any other place which may be nominated by either BWI or the retailer from where the product was bought in order that a warranty assessment may be performed. The consumer must also deliver the original invoice evidencing the date and place of purchase together with an explanation in writing as to the nature of the claim.

In the event that the claim is determined to be for a minor failure of the product then BWI reserves the right to repair or replace it at its discretion. In the event that a major failure isdetermined the consumer will be entitled to a replacement or a refund as well as compensation for any other reasonably foreseeable loss or damage. This warranty is in addition to any other rights or remedies that the consumer may have under State or Federal legislation.

IMPORTANT NOTE

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

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