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## MOTORHOME BATTERY

**Motorhome battery**

Your motorhome has been fitted with a sealed, Absorbed Glass Matt leisure battery which is specially designed for installing on its side

The battery or batteries should only be positioned in the appropriate compartment, and be properly secured before travelling.

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It is recommended that a good quality leisure battery is always connected when the motorhome electrical system is in use.

Leisure batteries are a deep cycling rechargeable heavy duty 12v battery designed to provide power for lights and other electrical appliances. Replacement batteries should be a proprietary brand leisure battery with a minimum 85amp - 110 amp capacity.

**WARNING: When renewing a leisure battery care should be taken ensuring that a fully sealed Absorbed Glass Matt battery, which can be fitted on its side is used. IF UNSURE SEEK ADVICE**

**Other types of leisure batteries contain a liquid and electrolyte which will leak out if laid on its side. CONTACT WITH THE LIQUID ACID CAN CAUSE SEVERE INJURIES AND DAMAGE TO THE VEHICLE.**

Note: Replacement batteries should be checked dimensionally before purchasing, to ensure fitment within the battery compartment, as brands vary in size.

It should be remembered that batteries suitable for the electrical demands of a motorhome differ in design from those for use with a car, and whilst the system may operate with a car battery it is strongly recommended that only a rechargeable leisure type battery, maintained in good condition is used.

**WARNING: When connecting the battery, ensure that the correct polarity is observed (black is negative and red/brown is positive) and that the terminals are securely fastened.**

Under normal circumstances it should not be necessary to remove the battery other than for routine inspection of terminals.

Your motorhome has been fitted with an in-line 20 amp fuse between the battery terminal and the power supply unit. Do not use a higher rated fuse as this may cause damage to your motorhome.

**WARNING: Switch off all appliances and lamps before connecting or disconnecting the battery.**

**Smoking is prohibited around the battery compartment.**

To preserve the life of your leisure battery and charger please observe the following:

- i) Do not leave all 12v lights powered at the same time as this will drain your leisure battery more rapidly.
- ii) If all 12v lights must be powered together, ensure the battery is 'in-circuit' and that the battery charger is turned on.
- iii) For optimum performance use the transformer/charger unit with a leisure battery attached.

Please note the auxiliary battery or batteries supplied with your motorhome may not be fully charged and should be charged for a minimum of 24 hours before use.

Battery performance may be affected by a number of things such as ambient temperature, age, state of charge etc.

## EC400 POWER CONTROL SYSTEM

### 1 Introduction

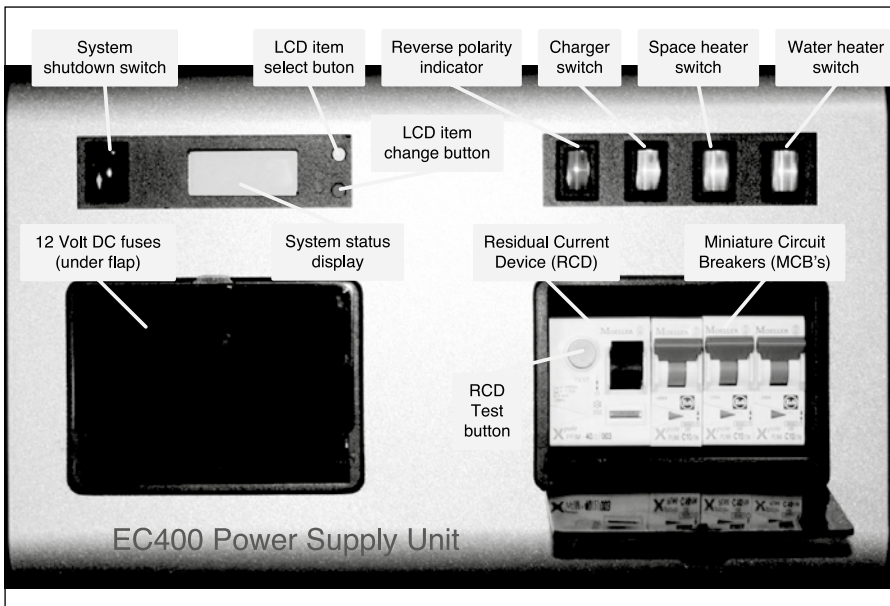
This section of the handbook will guide you through the operation of the electrical system.

Further technical details are contained in section 3 or in the supporting technical manual available from [www.sargentltd.co.uk](http://www.sargentltd.co.uk)

For the safe operation of all electrical equipment within your Leisure Vehicle it is important that you read and fully understand these instructions. If you are unsure of any point please contact your dealer / distributor for advice before use.

The system has a number of key components that you will need to be familiar with before attempting to use the system, these are:

- The Power Supply Unit (PSU) - a combined mains consumer unit and 12V controller located in the bed box.
- The Control Panel (CP) - a remotely located user control panel used to turn circuits on and off and to display battery and water tank information. This panel uses simple straightforward controls and reliable data communication to the PSU.



## EC400 POWER CONTROL SYSTEM

### 2 USING THE SYSTEM

#### 2.1 Power Supply Unit - Component Layout

The PSU is located in the bed box area.

#### 2.2 Activating the System

The EC400 system has a shutdown feature that can be used when the vehicle is in storage. This allows the leisure electronics to be turned off when not required to save battery power. When in the off state the alarm and tracking system supplies are still active, all other supplies are turned off.

Before using the system please ensure the system 'Shutdown switch is in the on position (button in).

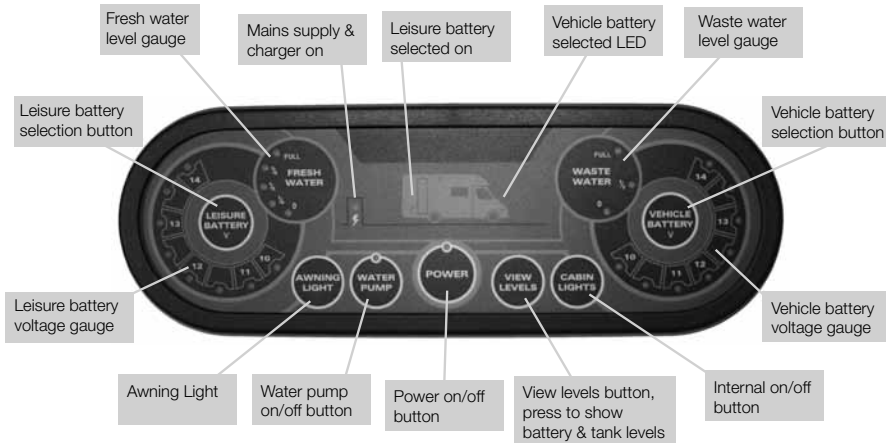
#### 2.3 Connecting to the Mains 230V supply and Safety checks

For your safety it is IMPORTANT that you follow these connections instructions each time your Leisure Vehicle is connected to a mains supply. This section assumes that the system is complete and that a Leisure battery has been installed (see 3.4).

**A)** Ensure suitability of the Mains Supply. Your Leisure Vehicle should only be connected to an approved supply that meets the requirements of BS7671 or relevant harmonised standards. In most cases the site warden will hold information regarding suitability of supply. If using a generator you also need to comply with the requirements / instructions supplied with the generator. Please note that some electronic generators may not be compatible with your leisure system. Further generator operational information is contained elsewhere in this manual.

- B)** Switch the PSU Power Converter OFF. Locate the green 'Charger' power switch on the PSU and ensure the switch is in the off position (button out) before connection to the mains supply.
- C)** Connect the Hook-up Lead. Firstly connect the supplied hook-up lead (orange cable with blue connectors) to the Leisure Vehicle and then connect to the mains supply.
- D)** Check Residual Current Device operation. Locate the RCD within the PSU and ensure the RCD is switched on (lever in up position). Press the 'Test' button and confirm that the RCD turns off (lever in down position). Switch the RCD back to the on position (lever in up position). If the test button failed to operate the RCD see section 3.10.
- E)** Check Miniature Circuit Breakers. Locate the MCB's within the PSU (adjacent to the RCD) and ensure they are all in the on (up) position. If any MCB's fail to 'latch' in the on position see section 3.10.
- F)** Turn the PSU ON. Locate the black 'Shutdown' button and ensure it is in the on position (press button in). Locate the green 'Charger' switch on the PSU and turn to the on position (press button in). The charger switch will illuminate when turned on.
- G)** Check correct Polarity. Locate the 'Reverse polarity' indicator on the PSU and ensure that the indicator is NOT illuminated. If the indicator is illuminated see section 3.10.
- H)** Check operation of equipment. It is now safe to operate the 12v and 230v equipment.

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## 2.4 Control Panel - Component Layout

## 2.5 Control Panel Operation

- **Power Button.** Press the power button to turn the leisure power on. Press the button again to turn the power off. The adjacent LED will illuminate when the power is on, and also the voltage of the selected battery will be displayed on the voltage gauge.
- **Pump Button.** With the power on, press the pump button to turn the water pump on. Press the button again to turn the pump off. The adjacent LED will illuminate when the pump is on, and also the level of the water tank will be displayed on the water gauge.
- **View Levels.** To display the battery voltage levels and the water tank levels on the control panel gauges, press the levels button. The display will remain illuminated for 10 seconds.
- **Battery Select.** By default, the leisure battery is selected as the power source if no mains supply is present, or as the battery to be charged when the mains supply is available. To change the selected battery, press the battery select button. The selected battery is indicated by an LED situated in the centre of the

leisure and vehicle battery gauges.

- **Lights Button.** With the power on, press the lights button to turn the main lighting supply on or off.
- **Awning Light Button.** With the power on, press the awning light button to turn the awning light on or off.

## 2.6 Operation while driving

The EC400 system is designed to shutdown parts of the system while the engine is running. This is to meet Electro Magnetic Compatibility (EMC) regulations and to ensure the safe operation of the motorhome.

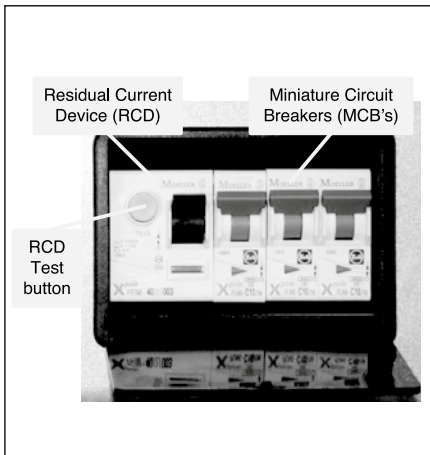
Please ensure the system shutdown switch on the PSU is in the on (button in) position before driving (see 2.2). This will ensure the electronic system is active and will therefore be able to control the charging process, supply the refrigerator and monitor other system circuits.

If / when fitted, designated 12v sockets, en-route reading lights and en-route heating will remain operational while the engine is running.

### 3 SYSTEM TECHNICAL INFORMATION

The following section provides further technical information relating to the electrical system. You can also access the supporting technical manual from [www.sargentltd.co.uk](http://www.sargentltd.co.uk)

#### 3.1 Residual Current Device & Miniature Circuit Breakers



The Residual Current Device (RCD) is basically provided to protect the user from lethal electric shock. The RCD will turn off (trip) if the current flowing in the live conductor does not fully return down the neutral conductor, i.e. some current is passing through a person down to earth or through a faulty appliance.

To ensure the RCD is working correctly, the test button should be operated each time the vehicle is connected to the mains supply (see section 2.3)

The Miniature Circuit Breakers (MCB's) operate in a similar way to traditional fuses and are provided to protect the wiring installation from overload or short circuit. If an overload occurs the MCB will switch off the supply. If this occurs you should investigate the cause of the fault before switching the MCB back on.

The following table shows the rating and circuit allocation for the three MCB's. MCB's fail to 'latch' in the on position see section 3.10.

MCB	Rating	Output Wire Colour	Description
1	10 Amps	White	230v Sockets
2	10 Amps	White (Yellow for heater)	Extra 230v Sockets / Space Heater
3	10 Amps	Black (Blue for water heater)	Fridge / Water Heater / 12v Charger

### 3.2 Battery Charger

The PSU incorporates an intelligent three-stage battery charger / power converter.

During stage 1 the battery voltage is increased gradually while the current is limited to start the charging process and protect the battery. At stage 2 the voltage rises to 14.4V to deliver the bulk charge to the battery. When the battery is charged, the voltage is decreased at stage 3 to 13.6V to deliver a float charge to maintain the battery in the fully charged state. The charger can be left switched on continuously as required.

The battery charger / power converter also provides power to the leisure equipment when the mains supply is connected.

This module supplies DC to the leisure equipment up to a maximum of 25 Amps (300 Watts), therefore the available power is distributed between the leisure load and the battery, with the leisure load taking priority as per the following example:

Leisure load	Available power for battery charging
5A	20A
10A	15A
15A	10A
20A	5A

**WARNING: Under heavy loads the PSU case may become hot. ALWAYS ensure the ventilation slots have a clear flow of air. Do not place combustible materials against / adjacent to the PSU.**

### 3.3 Smart Charging

The system incorporates a smart charge feature, which monitors both leisure and vehicle batteries and automatically adjusts and directs the charger power (and solar power if a solar panel is installed) to maintain the leisure and vehicle batteries at an optimal level.

### 3.4 Leisure Battery

#### A) Type / Selection

For optimum performance and safety it is essential that only a proprietary brand LEISURE battery is used with a typical capacity of 75 to 120 Ah (Ampere / hours). A normal car battery is NOT suitable. This battery should always be connected when the system is in use.

The PSU is configured to work with standard lead acid leisure batteries, and in most cases is also compatible with the latest range of Absorbed Glass Matt (AGM) batteries. Before fitting non-standard batteries please check that the charging profile described in 3.2 is suitable for the type of battery by referring to the battery documentation or battery manufacturer.

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Some vehicle installations can cater for two leisure batteries connected in parallel. In these cases it is recommended that two identical batteries are used.

The battery feed is fitted with an inline fuse between the battery and the electrical harness, and is usually located immediately outside the battery compartment or within 500mm of the battery. The maximum rating of this fuse is 20A per battery.

### B) Installation & Removal

Always disconnect the 230v mains supply and turn the PSU green charger switch to the off position (button out) before removing or installing the battery.

When connecting the battery, ensure that the correct polarity is observed (black is negative [-] and red is positive [+]) and that the terminals are securely fastened. Crocodile clips must not be used.

**WARNING: Explosive gases may be present at the battery. Take care to prevent flames and sparks in the vicinity of the battery and do not smoke.**

### C) Operation / Servicing

Under normal circumstances it should not be necessary to remove the battery other than for routine inspection of the terminals and "topping up" of the battery fluid where applicable. Please see instructions supplied with the battery.

**Note: Do not over discharge the battery. One of the most common causes of battery failure is when the battery is discharged below the recommended level of approximately 10v. Discharging a battery below this figure can cause permanent damage to one or more of the cells within the battery.**

To prevent over discharge, the EC400 system incorporates a battery protect circuit that warns the users and then disconnects the batteries when they fall below set values.

If the power is turned on and the leisure battery level falls below 9V a warning beep will be heard and the leisure battery gauge 10V LED will flash. To cancel the warning, press the levels button.

If the power is turned on and the vehicle battery level falls below 10.9V a warning beep will be heard and the vehicle battery gauge 10V LED will flash. To cancel the warning, press the levels button.

These warnings will not be repeated unless the power switch is turned off and on again. This is to ensure the warning does not become a nuisance.

Battery	Voltage cut off	Action after cut off	Notes
Vehicle	10.9v	Battery selection is changed from Vehicle battery to Leisure battery. If the leisure battery is below 9v then a further warning will occur (see below).	This cut off level is designed to protect the vehicle battery from over discharge. The 10.9v level ensures there is sufficient power in the battery to run the vehicle electronics and start the vehicle. This cut off only applies to power drawn from the battery by the leisure equipment; it will not protect the battery if you leave vehicle circuits switched on, such as the road lights.
Leisure	9v	Power is turned off	This is an emergency cut off level to protect the battery from severe damage. You should not rely on this cut off level during normal operation, but manage your power consumption to a discharge level of 10v.  This cut off only applies to power drawn from the battery by the leisure equipment that is controlled by the control panel power switch; it will not protect the battery from discharge by permanently connected equipment.

### 3.5 12 Volt DC Fuses

**WARNING: When replacing fuses always replace a fuse with the correct value. NEVER replace with a higher value / rating as this could damage the wiring harness. If a replacement fuse 'blows' do not keep replacing the fuse as you could damage the wiring harness. Please investigate the fault and contact your dealer.**

The following table shows the fuse allocation for the 15 fuses fitted to the PSU. Please note that fuses are dependant on PSU versions, so not all fuses may be present.

Fuse	Rating	Fuse Colour	Description
1	20 Amps	Yellow	Motorhome Fridge (where applicable)
2	15 Amps	Blue	Motorhome Towing (where applicable)
3	7.5 Amps	Brown	Motorhome Marker Lights (where applicable)
4	15 Amps	Blue	Motorhome Fridge D+ (where applicable)
5	10 Amps	Red	Fans
6	10 Amps	Red	12V Sockets
7	10 Amps	Red	Front Internal Lights
8	10 Amps	Red	Water Pumps
9	15 Amps	Blue	Electric Step (where applicable)
10	10 Amps	Red	Motorhome Tank Heaters (where applicable)
11	10 Amps	Red	Auxiliary Supplies (where applicable)
12	5 Amps	Tan	Electronics
13	5 Amps	Tan	Ignitions
14	10 Amps	Red	Rear Internal Lights
15	25 Amps	Clear	Charger (fuse fitted internally to PSU)

The following table shows details of the fuse(s) located at the Leisure battery. See also 3.4A

Fuse	Rating	Fuse Colour	Description
Battery 1	20 Amps	Yellow	Fuse remotely located near battery
Battery 2	20 Amps	Yellow	Fuse remotely located near battery 2 (where fitted)

### 3.6 Solar Charge Management

The PSU incorporates a built-in solar charge management feature, which will control the input from a separate solar panel and regulator. Depending on the charge state of the batteries, the solar power will be directed to the required battery, and continuously monitored to ensure optimum operation.

### 3.7 System Status and Configuration display

The PSU also contain a status display unit that can be used to view system information. Press the top yellow 'select' button to change the item being viewed.

### 3.8 Water Pump Operation

The control panel pump button operates the internal water pump drawing water from the onboard tank.

The water tanks (fresh & waste) incorporate a level warning feature to warn the user when the fresh water level drops below 25% or when the waste water level reaches 100%.

If the water pump power is turned on and the fresh water level drops to below 25% a warning beep will be heard and the fresh gauge empty LED will flash. To cancel the warning, press the levels button.

If the water pump power is turned on and the waste water level rises to full (100%) a warning beep will be heard and the waste gauge full LED will flash. To cancel the warning, press the levels button.

These warnings will not be repeated unless the water pump power switch is turned off and on again. This is to ensure the warning does not become a nuisance.

### 3.9 Electric Step Operation

On vehicles fitted with an electric step, this is operated by a button near the entry door. Press and release the button to move the step in or out. One press of the button will move the step out, a further press will move the step in again.

If the engine is started the step will move in automatically, after a short warning buzzer. If this operation fails due to an obstacle a buzzer will sound continuously to warn that the step is still out, and therefore requires your attention.

## 3.10 Common Fault Table

Fault	Possible Cause	Proposed Fix
No 230 volt output from PSU	Connecting lead between the site and Leisure Vehicle not connected	Check and connect lead as per 2.3C
	RCD switched off	Reset RCD as per 2.3D
	RCD not operating correctly	Check supply polarity; if the RCD continues to fail contact your Dealer as there is probably an equipment or wiring fault.
	MCB switched off	Reset MCB by switching OFF (down position) then back ON (up position), if the MCB continues to fail contact your Dealer as there is probably an equipment or wiring fault.
	No or deficient supply from site	Contact site Warden for assistance
	Other fault	Contact your Dealer
Reverse Polarity light is illuminated on PSU	Mains Supply reversed?	The reverse polarity light is designed to illuminate when the Live and Neutral supply has been reversed / crossed over. If the light illuminates there is a problem with the site supply or the cable connecting the supply to your vehicle. The light is designed to work on UK electrical supplies (where the neutral conductor is connected to earth at the sub station). If you are using your vehicle outside the UK this light may illuminate when no fault exists. In these cases consult the site warden for advise.
	Generator being used	'The Reverse Polarity warning light is on when using my Generator'.  This is a normal side effect when using some types of generator. Instead of connecting the neutral conductor to earth, some generators centre tap the earth connection making both neutral and live conductors 110v above earth. This 110v difference causes the neon polarity indicator to illuminate. In most cases it is still safe to use the generator, but please consult the generator handbook for further information.

Fault	Possible Cause	Proposed Fix
Control Panel Problems	Control Panel has no display	<p>Check batteries and fuses, turn PSU isolate switch and charger switch on and ensure mains supply is connected.</p> <p>Check control panel connecting lead at PSU and behind Control Panel</p> <p>Contact your Dealer</p>
	12v Power turns off	<p>Battery protect feature has operated to protect the Vehicle battery and or the Leisure battery. See 3.4C</p> <p>Engine has been started, all equipment has been disconnected to meet EMC requirements. See 2.6</p>
	Control Panel locked / erratic function	<p>Observe control panel handling instructions</p> <p>Control panel software may have crashed. Reboot control panel by turning off the PSU shutdown switch. Wait 30 seconds then turn the switch back on.</p>
No 12 volt output from PSU	No 230v supply	Check all above
	Charger not switched on	Turn charger switch on, switch will illuminate
	Battery not connected and / or charged	Install charged battery as per 3.4
	Power button on control panel not switched to on	Turn power on at control panel
	Battery flat / Battery fuse blown	Recharge battery, check fuses, check charging voltage is present at battery
	Fuse blown	Check all fuses are intact and the correct value fuse is installed as per fuse table
	Equipment switched off / unplugged	Check equipment is switched on and connected to the 12v supply
	PSU overheated / auto shutdown operated	Reduce load on system. Allow PSU to cool down. PSU will automatically restart when cool.
	Other fault	Contact your Dealer
Pump not working	Fuse blown	Replace fuse with correct value as per fuse table.
	Pump turned off	Turn pump on by pressing the pump button at the control panel.
	Setting incorrect	<p>Both the internal and external pump feeds are controlled from the control panel. To alter the setting of the pump switch see section 3.8</p> <p>Ensure the setting matches your desired requirement.</p>

**3.11 Contact details**

Sargent Electrical Services Limited provide a technical help line during office hours. Please contact 01482 678981 if you require technical help. For out of hour support please refer to the tech support section of the Sargent web site [www.sargentltd.co.uk](http://www.sargentltd.co.uk)