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## EC400 SERIES POWER SUPPLY SYSTEM

## EC400 SERIES 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 dealer technical manual available from [www.sargentttd.co.uk](http://www.sargentttd.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:

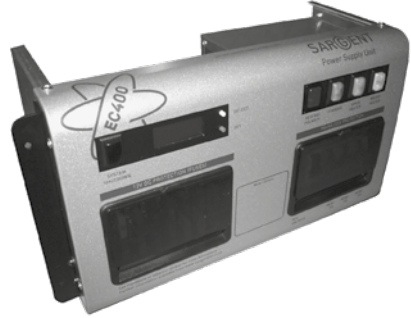
- The EC400 series Power Supply Unit (PSU)** - a combined mains consumer unit and 12V controller located in the front locker or bed box area. The EC400 series of power supply units include horizontal units and vertical units, further details are contained later in this document.
- The EC400 series Control 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 straight forward controls and reliable data communication to the PSU.

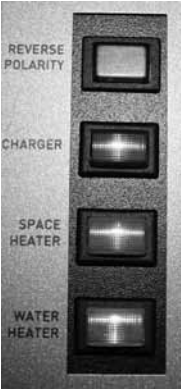
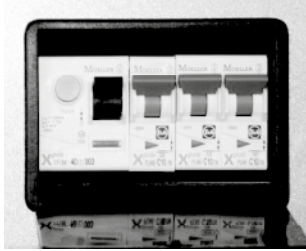

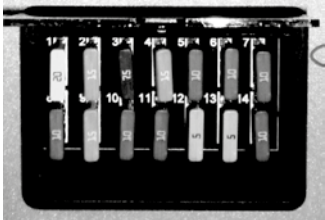
### 2 Using the System

The PSU is located in the front offside locker area or front bed box in motorhomes.

### 2.1 Power Supply Unit - Models

A number of different PSU versions are used within the system. The operation of each model is very similar and is detailed below.



<b>230V Components</b>	
	<p>Red indicator – Reverse polarity indicator, lights up when the 230V supply polarity is reversed.</p>
	<p>Green push switch – Charger switch, this switch turns the 12V battery charger on or off. “In” is on “out” is off.</p>
	<p>Amber push switch – Space heater switch, this switch turns the 230V supply to the space heater / combination heater / central heating system on or off. In is on out is off.</p>
	<p>Clear push switch – Water heater switch, this switch turns the 230V supply to the separate water heater on or off. In is on out is off.</p> <p><b>Note, If the vehicle contains a combined space &amp; Water heater then this button is not used.</b></p>
	<p>Black lever switch, far left – Residual Current protection Device (RCD) and main 230V on / off switch.</p>
	<p>Yellow button, far left – RCD test button.</p>
	<p>Red lever switches, right – 3 x 10A Miniature Circuit Breakers (MCB). Please note that installations with a 3KW Alde heating system will have 2 x 10A and 1x16A MCB's.</p>
<b>12V Components</b>	
	<p>Black push switch, far left – System shutdown switch, this switch turns the power control system on or off. In is on out is off.</p>
	<p>Yellow push button, top right – Select button, this button is used to scroll through the display items on the LCD screen.</p>
	<p>Red push button, bottom right – Set button, this button is used to change the setting of the displayed item on the LCD screen.</p>
	<p>12V DC circuit protection fuses.          Fuse number 1 is top left;          Fuse number 14 is bottom, right.          See section 3.5 for full fuse allocation details.</p>

### 2.3 Activating the System

The EC400 system has a shutdown feature that should be used when the vehicle is in storage or is not being used for long periods of time. 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, most other supplies are turned off.

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

### 2.4 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 internal 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.

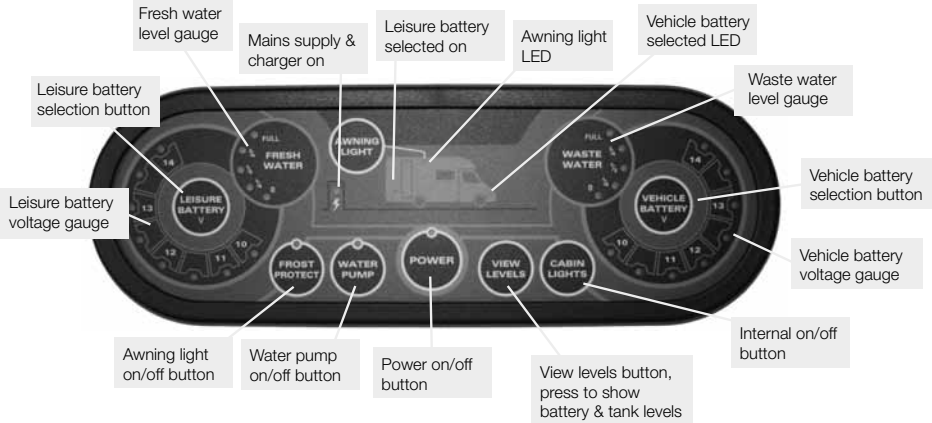
### 2.5 Control Panel - Component Layout

Depending on your type of vehicle (caravan or motorhome) the control panel will vary in specification.

Not all features are present in all vehicles. Please refer to the following diagrams to identify your control panel.

## Motorhome Control Panels

### EC467



### EC462



## 2.6 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. It is possible to lock the display 'on' to allow continuous display. This can be achieved by pressing and holding the view levels button for 2-3 seconds until you hear a beep. To turn this locked feature off, either press and hold the view levels button again for 2-3 seconds or turn the power off and back on.
- 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 vehicle battery select button. The selected battery is indicated by the LED's situated to the front (vehicle) or rear (leisure) of the motorhome logo
- Mains on indication.** When connected to a 230v supply the LED with a "lightning strike" shown will be illuminated.

## EC400 SERIES POWER SUPPLY SYSTEM

- **Charging when the vehicle engine is running.** When the vehicle engine is running both the vehicle battery and the leisure battery LED's will flash in unison to indicate that they are connected together and are being charged by the vehicle.
- **Cabin Lights Button.** For motorhomes, with the power on, press the cabin lights button to turn the main lighting supply on or off.
- **Awning Light Button.** For motorhomes, with the power on, press the awning light button to turn the awning light on or off.
- **Frost Protect Button.** For motorhomes if / when fitted, with the power on, press the frost protect button to turn on the water tank heating system. The adjacent LED will illuminate to show that the tank heating system is on.

### 2.7 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 caravan or motorhome. This is indicated by the two battery LED's flashing together.

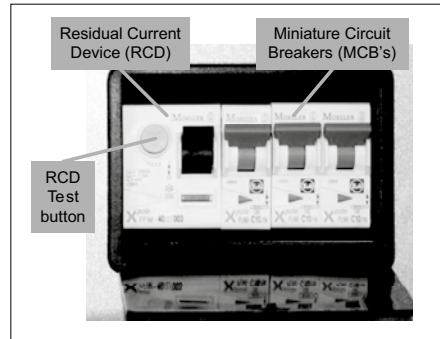
Please ensure the system shutdown switch on the PSU is in the "on" (button in) position before driving (see 2.3). This will ensure the electronic system is active and will therefore be able to control the charging process, supply the refrigerator and monitor other system circuits.

On motorhomes 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 2.4)

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	Rating	Output wire colour	Description
1	10 amps	White	230v Sockets
2	10 amps	White (Yellow for heater)	Extra 230v Sockets / Space Heater
2	16 amps	Yellow	Alde heating (EC470 PSU Only)
3	10 amps	Black (Blue for water heater)	Fridge / Water Heater / 12v Charger (internally connected)

### 3.2 Battery Charger

The EC400 system 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 Charger case may become hot. ALWAYS ensure the ventilation slots have a clear flow of air. Do not place combustible materials against / adjacent to the Charger

### 3.3 Smart Charging

On EC468 and EC469 PSU's, 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.

## EC400 SERIES POWER SUPPLY SYSTEM

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. If a single battery is fitted to a motorhome, this fuse may be increased to 40A, however if two batteries are fitted each battery should be fused at a maximum of 20A.

### 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 EC400-450 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.

## EC400 SERIES POWER SUPPLY SYSTEM

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.

<b>Fuse</b>	<b>Rating</b>	<b>Fuse colour</b>	<b>Description</b>
1	20 Amps	Yellow	* Motorhome Fridge 12V
2	15 Amps	Blue	* Motorhome Towing
3	7.5 Amps	Brown	* Motorhome Marker Lights
4	15 Amps	Blue	* Motorhome Fridge D+
5	10 Amps	Red	Extractor Fans / Heating Systems
6	10 Amps	Red	12V Sockets / TV Amp / ***Radio
7	10 Amps	Red	Front Internal Lights
8	10 Amps	Red	Water Pumps / Toilet
9	15 Amps	Blue	* Electric Step
10	10 Amps	Red	* Motorhome Tank Heaters
11	10 Amps	Red	** Auxiliary Supplies
12	5 Amps	Tan	Electronics / Fridge / Alarm
13	5 Amps	Tan	Oven Ignition / * Water Heater
14	10 Amps	Red	Rear Internal Lights
15	25 Amps	Clear	Charger (fitted internally to PSU)

\* Where Applicable / When Fitted

\*\* Motorhome Awning / Entry lights / Map lights / Enroute Heating / Compressor Fridge / Travel Skts / Bathroom lights

\*\*\* Caravan Radio Supply / Motorhome Bathroom lights

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

<b>Fuse</b>	<b>Rating</b>	<b>Fuse colour</b>	<b>Description</b>
Battery 1	20 Amps	Yellow	Fuse remotely located near battery
Battery 2	20 Amps	Yellow	Fuse remotely located near battery 2 (where fitted)

The following table shows details of the fuse(s) located at the Road Light fuse box (caravans only)

Fuse	Rating	Fuse colour	Description
1	20 Amps	Yellow	Fridge Supply 12V
2	5 Amps	Tan	Left Hand Tail Lights
3	5 Amps	Tan	Right Hand Indicators
4	5 Amps	Tan	Fog Lights
5			Spare location
6	20 Amps	Yellow	Car Battery Supply 12V
7	5 Amps	Tan	Right Hand Tail Lights
8	5 Amps	Tan	Left Hand Indicators
9	7.5 Amps	Brown	Stop Lights
10	5 Amps	Tan	Reverse Lights

### 3.6 Solar Charge Management

EC468 and EC469 PSU's incorporate 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. For this system to operate intelligently, the shutdown button should be left switched on. If the shutdown button is turned off then the solar panel will charge the vehicle battery only.

### 3.7 System Status and Configuration display

On the 468 & 469 PSU, the unit contains an LCD display and two control buttons that allow system information to be viewed or settings changed.

Press the top yellow 'select' button to change the item being viewed. Press the bottom red 'change' button to change the setting. Both buttons work on a continuous loop, so if you want to return to an item or setting keep pressing the button until the required item is reached. The EC468 and EC469 PSU's 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 System Operation

The control panel pump button operates the internal (onboard) water pump. This pump will draw water from the internal (onboard) water tank.

The system also incorporates a separate powered water inlet that can be used with an external filler pump to fill the internal (onboard) water tank.

The water tanks (fresh & waste, where fitted) 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 Frost Protection

On vehicles fitted with water tank frost protection, the control panel frost protect switch can be used to turn the feature on or off.

With protection on, the system monitors the tank water temperature and water level and will control the tank heaters accordingly. If the fresh or waste water levels are less than 25% the appropriate heater will be turned off to prevent overheating or damage to the element.

There are two types of system employed, both working in a very similar way. One system uses heaters with built-in thermostats; the other uses separate temperature probes in the tank. Both types switch on at 4-5°C and off at 8-10°C

### 3.10 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.

### 3.11 Warnings and Alerts

If the vehicle engine is started whilst the motorhome is connected to the 230v supply, a warning beep will be heard. This is to warn you to remove the 230v supply before driving away.

When the vehicle engine is running both the vehicle battery and the leisure battery LED's will flash in unison to indicate that they are connected together and are being charged by the vehicle.

Step operation, if the engine is started with the step in the out position, 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.

Low water level and waste tank, if 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 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.

Low voltage warning and cut off, 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 is selected (being used) and the 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.

### 3.12 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 2.4C
	RCD switched off	Reset RCD as per 2.4D
	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 advice.

## EC400 SERIES POWER SUPPLY SYSTEM

**3.12 Common Fault Table**

Reverse Polarity light is illuminated on PSU	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.
Control Panel Problems	Control Panel has no display	Check batteries and fuses, turn PSU shutdown switch and charger switch on and ensure mains supply is connected. Check control panel connecting lead at PSU and behind Control Panel. Contact your Dealer
	12v Power turns off	Battery protect feature has operated to protect the Vehicle battery and or the Leisure battery. See 3.4C Engine has been started, all equipment has been disconnected to meet EMC requirements. See 2.7
	Control Panel locked / erratic function	Observe control panel handling instructions Control panel software may have crashed. Reboot control panel by turning off the PSU isolate switch. Wait 30 seconds then turn the switch back on.

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	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  Ensure the setting matches your desired requirement.

### 3.13 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)

# EC400 SERIES POWER SUPPLY SYSTEM

## 4 Technical Data & Approvals

### 4.2 Motorhome Equipment - EC460,465,468,469,470 PSU & EC461,462,466,467 Control Panel

Outline Specification		
INPUT 230v	230 Volts / 0 to 16 Amps	+ / - 10%
OUTPUT 230v	RCD protected, 3 x MCB outputs of 10A  Separate switched channels for water heater, space heater and charger  EC470 2 x 10A MCB Outputs & 1 x 16A MCB Output	
INPUT 12v	2 x 20A battery inputs via 2 x 4 way connectors	
SOLAR INPUT	1 x Dedicated solar panel input (20 to 100W panel) via a 2 way connector	
OUTPUT 12v	25A total output via multiple switched channels protected by 14 fused outputs	
CHARGER	Input 220-240 Volts AC +/- 10%, Frequency 50 Hz +/- 6%, Current 3A max.  DC Output 13.6 to 14.4 Volts nominal, Current 25 Amps max (300 Watts).  Overall size (HxWxD) 50 x 250 x 135mm	Fixing centres 128*128mm 1.2kg
Signal INPUT	4 x Fresh water level, 4 x Waste water level, 1 x Engine running, plus multiple vehicle connections	Fresh water negative sensed Waste water negative sensed
Data IN / OUT	CANBUS Data communication and power to Control Panel via 6 way connector	
IP rating	IP31	
Operating temperature	Ambient 0 to 35°C PSU case temperature with full load 65°C Max	Automatic shutdown and restart if overheated / overloaded

<b>Dimensions</b>		
EC468, EC469 PSU	Overall size (HxWxD) 315 x 195 x 150mm  Clearances 75mm above, 50mm left & right	Weight 2.9 Kg
EC462, EC467 Control Panel	Overall size (HxWxD) 87 x 250 x 15mm  Cut-out size (HxW) 70 x 233mm	Fixing centres 130*75mm  Weight 114 g

### 4.3 Approvals

System: BSEN 1648-1, BSEN1648-2  
compliant, BS7671: 2008 compliant

Residual Current Device: RCD 40A 30mA trip  
to BS EN 61008

Miniature Circuit Breakers: MCB's type C  
6000A breaking capacity to BSEN 60898

Electro Magnetic Compatibility (EMC) directive  
2004/108/EC Certificate CE20071224-1

Integrated Charger: BS EN 60335-1/2.29,  
2006/95EC, IEC61000-3.2/3:1995, 1.

Low Voltage Directive: 2006/95EC TUV-  
014900-A1, EN55022, Class B, EN55024/  
Level 2

## MOTORHOME BATTERY

## MOTORHOME BATTERY

**WARNING:** Use precaution when removing or replacing the battery, as batteries contain acid liquids which can cause severe injuries and damage when handled incorrectly. Refer to the cleaning and maintenance section.

Your motorhome has been fitted with one or two leisure batteries depending on size of vehicle and expected electrical loads. The battery is housed in a special compartment designed to hold the battery securely and to contain any electrolyte (acid) spillage. An additional soft tray is used on some vehicles to contain any electrolyte spillage. The compartments are either under the floor or in a side opening Thetford battery box opening to the outside of the vehicle. Under floor compartments are either sealed from the habitation compartment or a breather pipe is fitted to ensure any build up of explosive gases (hydrogen) is vented to the outside. If a breather pipe is fitted it is important to ensure that replacement batteries are also fitted with a breather pipe.

The battery or batteries should only be positioned in the appropriate compartment, which is vented to the outside, and be properly secured before travelling

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.

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. The battery should be kept topped up at all times.

If two leisure batteries are fitted additional care is needed, as one battery deteriorates this can reduce the lifespan of the other.

**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 and 'topping up'.

**WARNING:** Explosive gases may be present at the battery. Take care to prevent flames and sparks in the vicinity.

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.

### Cleaning and maintenance

- Use protective clothing and glasses when handling a leaking battery, and avoid direct contact to the skin, eyes and respiratory organ.
- Should a battery leakage occur, please act according to the instructions supplied by the manufacturer of the battery. Act with caution as caustic substances are present in the battery.
- Always remove the battery and the power cable before carrying out any maintenance of the product.
- Before removing the clamps switch off all appliances.
- Use a soft cloth or sponge and a non-acid/abrasive detergent when cleaning the Battery Box and Soft Tray.
- To check if any acid is present in the Soft Tray, simply press it softly. A strong smell from the Soft Tray may also indicate spilled acid. The battery can be filled again with acid collected from the Soft Tray. Always treat spilled battery acid as hazardous waste. Dispose of spilled battery acid according to the local and national regulations.
- At the beginning of each season or extensive travelling, check the Soft Tray for faults and replace if necessary.
- The cleaning of the Battery Box and Soft Tray should only be done after all power sources have been switched off, in order to prevent a hazardous situations.

### THETFORD BATTERY BOX

The Battery Box has a CE socket for connect to a 230 V power supply and has a maximum load of 16amps.

- The Thetford Battery Box is designed for use with foot mounted batteries. These are recognisable by the rim around the bottom edge of the battery. This rim will locate against the back wall of the Battery Box and the angle metal bracket, which is screwed into place when the battery is fitted. The depth of the battery including rim should be between 173mm and 175mm.
- The maximum battery size that can be fitted is 225mm high (including terminals) x 175mm x 353mm wide. The depth and width dimensions include the rim around the bottom used for securing the battery.

**NOTE:** Batteries that are not foot mounted, ie. without a rim can still be fitted, but check first that they will fit within the battery box and can be secured before purchasing.

Before placing the battery inside the Battery Box, the battery should be placed into the Soft Tray and rested on the ground adjacent to the Battery Box. Carefully connect the electrical wires (the red cable attaches to the + pole and the black cable to the - pole of the battery).

Note! Incorrect connection of the cables will cause a short circuit with potential hazardous consequences.

After mounting the terminals, lift the battery together with the Soft Tray into the middle of the Battery Box compartment. Push the Soft Tray with battery to the back of the Battery Box, into the safeguard bulge.

## SOLAR PANEL CONNECTION

If necessary shift the Soft Tray to the right or left until the battery is in place in the safety area (see photo 1).

The battery is located in the compartment by the manual clamping plate. This has to be screwed to the front of the box.

Please ensure that the Soft Tray is pulled up tightly (to remove creases) before the plate is tightened. The rounded edge of the clamp prevents damage to the Soft Tray. Do not apply extreme force to the screw.

When attaching the 220/230 volts cable on the CE socket, the maximum recommended thickness of the cable is 10 mm. When closing the door, the attached cable is to be fed through the slot at the bottom right of the door.



### SOLAR PANEL CONNECTION POINT

A connection point has been included in the motorhome harness to take a 12v supply from an aftermarket solar panel (or similar device), to the leisure battery.

The solar panel must provide a fused and regulated output in order to connect to this point.

Solar panel installations should be undertaken by trained technicians who are familiar with the systems involved. Particular care should be taken when making connections to solar panels, which can generate high voltages ahead of a regulator when exposed to light.

Depending upon the specification of the motorhome, the connection point will be presented in one of the following formats:

#### **Solar panel connection point with EC400 series control panel and related power supply unit**

In these installations two way connectors will be present close to the leisure battery, and/or at a high level within the furniture (i.e. within a wardrobe, either visible or behind a removable cover).

From these connectors the supply is taken to the power supply unit, and is then directed to the leisure battery and/or vehicle battery. For further details of selecting which battery receives the solar charge, please see the EC400 series instructions.

#### **Solar panel connection point -with EC400 series control panel and related power supply unit, and with roof mounted solar panel connection point**

On some models, in addition to the connections detailed above which take a regulators output to the power supply unit, an additional harness and external connection box has been fitted. The intention of this link harness is to provide an electrical route between the inside of the motorhome body, and a solar panel installation on the roof of the motorhome.

The connection box will be located towards the front of the motorhome roof and within this connection box is a two way weatherproof connector, to which a solar panel or panels can be connected directly.

Within a high level furniture locker, relatively close to the external connection box, two connectors will be found. The first is the other end of the link harness from the roof mounted connection box, this should be connected to the input connections of a solar panel regulator, and the second connector should be connected to the output from the regulator. A Brown and Blue pair of wires will feature in the link from the roof providing the input, with a Red and Black pair of wires taking the regulator output to the power supply unit.

## ACCESSORY HARNESSING

### Alarm Power Supply

A connection exists within the motorhome harness, which can be used as a power supply for an alarm or tracking system. For security reasons, information regarding this is not published; please contact your dealer for further information.

### Satellite Power Supply

Dependant on specification, in many motorhomes a power supply harness is included for use with roof mounted satellite systems. This power supply is terminated in a 4-way connector marked 'SATELLITE', and carries 12v positive, 12v negative, and a signal which can be used to detect when the vehicle engine is running. (The engine run signal is required by some systems to automatically retract satellite dishes.

In addition, on Kon-Tiki and E700 models which have a decoder / receiver position. At this position an additional 230v socket is present for use with a decoder / receiver, and a 12v supply is present (2-way connector, 12v positive and 12v negative), which can be used with an inverter (not supplied) to power a decoder/receiver when a mains supply is not available.

### Tow Bar Connection

The addition of tow bar electrics requires an electronic interface, to prevent problems with road lighting on the base vehicle. At the rear of the motorhome, a power supply is included in the motorhome harness for use with a tow bar interface. Please ask your dealer about the tow bar and tow bar harness kit that is available for use with this connection.

## GENERATOR USAGE

Caution should be used before connecting a generator to your motorhome.

**WARNING:** Never start or stop the generator while electrical loads are connected and switched on. Start the engine, let it stabilise, then connect the electrical load. To stop engine, disconnect the electrical load and let engine stabilise before switching off.

Whilst some generators use inverter technology, others use a more basic principle to generate the 230v supply. Preference should be to choose a generator which produces a consistent sinusoidal wave form with accurate voltage control.

The reverse polarity warning light may illuminate when using a generator. This is a normal side effect when using some types of generator. Instead of connecting the neutral and live conductors 110v above earth. This 110v difference causes the neon polarity indicator to illuminate.

In most cases it is safe to use a generator, but please consult the generator handbook for further information.

## HABITATION RELAY

**HABITATION RELAY**

Habitation relays are fitted to motorhomes by manufacturers to comply with the following legislation:

1. The Road Vehicles (Construction and Use) Regulations 1986 Regulation 60 - Radio interference suppression
2. Council Directive 72/245/EEC of June 20, 1972 amending for the purpose of their adaptation to technical progress, relating to the radio interference (electromagnetic compatibility) of vehicles and Council Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers.

A habitation relay must be fitted by manufacturers, safe guarding the consumer, the purpose of the relay is to disable non-homologated appliances/components whilst the vehicle is in transit.

Unintentional electromagnetic energy can be created by non-homologated devices within the habitation compartment, which could cause a malfunction of the base vehicles electronic systems/components, including safety critical items such as air bags, ABS braking etc.

In your motorhome the habitational relay is within the EC400 / 450 power supply unit.

The Swift Group recommends that electrical fault finding is undertaken by a trained Technician familiar with the systems involved. The basic checks below are therefore limited to items that can be checked without the use of tools etc. If in any doubt please consult a Swift dealer.

<b>Power Supply</b>	
<b>Fault</b>	<b>Remedy</b>
No 230v output from PSU	See Sargent EC400/EC450 information
No 12v output from PSU	See Sargent EC400/EC450 information
Reverse Polarity light illuminated	See Sargent EC400/EC450 information
Control Panel Problems	See Sargent EC400/EC450 information

<b>Appliance Not Operating</b>	
<b>Fault</b>	<b>Remedy</b>
Error code or fault light displayed on appliance (eg fridge LCD display)	Check appliance specific information for next steps
No display at appliance controls	<p>Check power supplies are available (electric hook up, charger operating, battery in good state of charge). Majority of appliances will not be operational when engine is running.</p> <p>Ensure control panel is ON.</p> <p>Check appropriate fusing in Power Supply unit</p>

<b>Internal Lighting</b>	
<b>Fault</b>	<b>Remedy</b>
Lighting not operational	<p>Check power supplies are available</p> <p>Check control panel is ON, and that CABIN LIGHTS button has been pressed</p> <p>Locate furniture mounted switches, where appropriate</p> <p>Check fuses on Power Supply Unit</p> <p>Determine if light is LED or Tungsten / Halogen bulb, or Fluorescent tube – check and replace bulb if appropriate</p>

## ELECTRICS FAULT FINDING

**Road Lighting**

Fault	Remedy
Dashboard warning light illuminated / groups of road lights inoperative	<p>Check all bulbs are located correctly in bulb holders (especially those recently replaced). See bulb replacement information in Service Book</p> <p>If Tow Bar fitted check trailer lighting / disconnect trailer to determine if this is the cause of the fault.</p> <p>Check fuses in Fiat dash for main road lighting (see Fiat handbook for details of which light groups are fused)</p> <p>Check fuse in Power Supply Unit for auxiliary marker lights (Amber side markers, Luton / upper rear markers)</p>

**Electric Step Operation (When fitted)**

Fault	Remedy
Step will not automatically retract with engine start	<p>Check fuses in Power Supply Unit.</p> <p>Check mechanical condition of step – clean / lubricate if appropriate.</p> <p>Check other functions that are linked to the running of the vehicle engine (i.e. fridge 12v operation). If these are also inoperative contact dealer.</p>
Step does not respond to furniture switch	<p>Check fuses in power supply unit</p> <p>Check mechanical condition of step – clean / lubricate if appropriate.</p> <p>It is possible to link the operation of the step to the lock/unlock commands from the central locking keyfob. If this feature is enabled on your motorhome, check if operation of the step via the central locking keyfob is possible. To enable / disable the keyfob feature contact your dealer.</p>

<b>Power Supply</b>	
<b>Fault</b>	<b>Remedy</b>
Fresh water level sensor gives incorrect readings	Use floor hatch within motorhome to access top of water tank, remove sensor (4-screws) and clean probes  If problems persist, dealer assistance required for further fault finding.
Waste water level sensor gives incorrect	If possible, from below motorhome remove level sensor from top of waste tank, and clean probes. Alternatively, clean waste tank internal surfaces by flushing through with water or cleaning agent.  If problems persist, dealer assistance required for further fault finding.

<b>Battery Discharge</b>	
<b>Fault</b>	<b>Remedy</b>
Leisure battery discharging earlier than anticipated	If appropriate to battery, check condition and top-up battery fluid if required  Have condition of leisure battery checked by dealer or tyre/exhaust/battery specialist  If motorhome is not in use, ensure 'SYSTEM SHUTDOWN' button on Power Supply Unit is being used to isolate all circuits  If motorhome is in use, see consumption table in handbook – are several items operating simultaneously / is total load likely to cause discharge.  Check charger is operational when mains hook up is present, and that the charger is allowed sufficient time to replenish battery / batteries.
Vehicle battery discharging earlier than anticipated	If appropriate to battery, check condition and top-up battery fluid if required  Have condition of leisure battery checked by dealer or tyre/exhaust/battery specialist  If motorhome is not in use, see base vehicle handbook section headed 'periods of inactivity'. Consider use of vehicle battery isolator  If motorhome is in use, Power Supply Unit configured to charge / maintain both leisure and vehicle batteries. (Contact dealer for further assistance if unsure)

## ELECTRICS FAULT FINDING

<b>Audiovisual Equipment</b>	
<b>Fault</b>	<b>Remedy</b>
Radio switches off intermittently	Radio will not remain on indefinitely when vehicle ignition is switched off. See base vehicle instructions for further detail.
Rear view camera system inoperative when reversing (if fitted)	Check if camera system can be switched on manually, using power button on rear view mirror Check Reverse Lights are operational on rear of motorhome. (Check base vehicle fuses if reverse lights are inoperative)
Rear view camera system inoperative whether moving forward or reversing (if fitted)	Check fuses in habitation area fusebox (Power Supply Unit)