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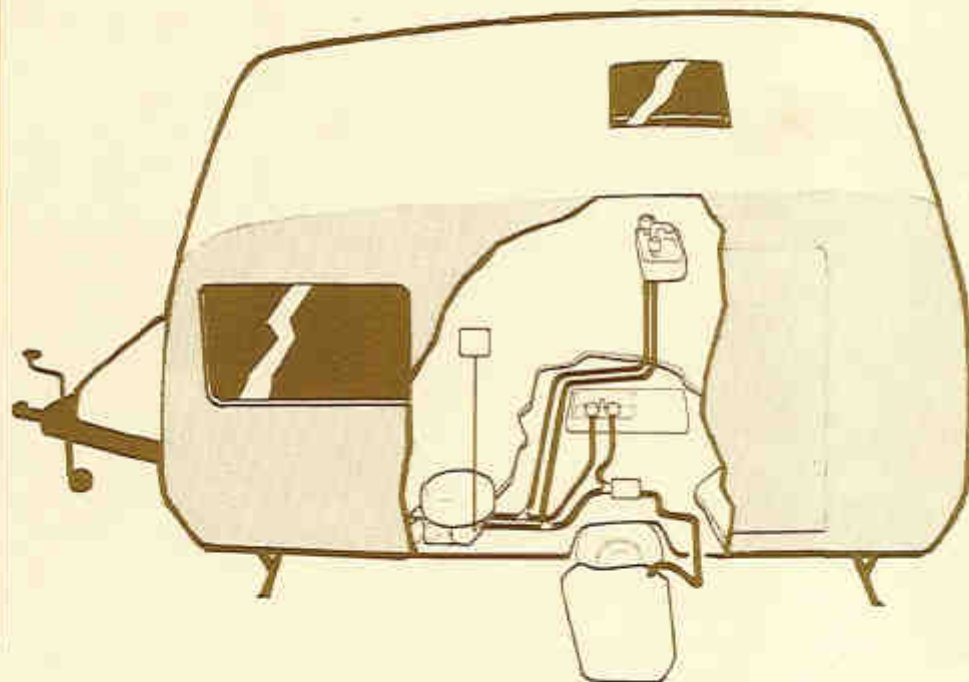
**Water Heating**

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# CASCADE

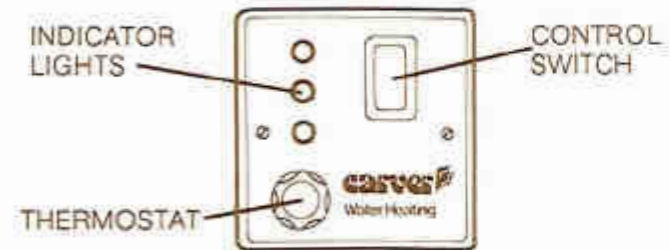
**Gas Water Heater**



**OWNER'S HANDBOOK  
INCLUDING  
OPERATING INSTRUCTIONS**

# OPERATING INSTRUCTIONS

The Cascade Water Heater is simply and conveniently operated by this remote controller;



**BEFORE SWITCHING ON** make sure that water flows from the hot taps. This indicates that the water heater is full. Check that the gas and electrical supplies have been connected and turned on.

1. **SWITCH WATER HEATER ON** at the controller, Green and Yellow indicator lights will come on.
2. **SET THERMOSTAT** to mid scale on the controller and adjust it later to suit your water temperature preference after initial use.
3. **THE GREEN AND YELLOW LIGHTS** on together indicate that the water temperature is lower than selected, and that the burner is on.
4. **THE GREEN LIGHT ONLY** indicates that the selected water temperature has been reached and that the burner is shut down. During this mode the heater is using very little power (0.1 amps) and as there isn't a pilot flame, gas is not being consumed.
5. **THE RED LIGHT** indicates a fault condition. If it occurs refer to the fault tracing charts in this handbook.
6. **FROST PRECAUTIONS AND DRAINING.** The heater itself is frost damage resistant, but if it is required to drain the heater down it is provided with a drain cock which can be opened by screwing anti-clockwise. Open taps in sink during draining for entry of air.

REFER TO WATER SYSTEM FAULT TRACING CHART IF DIFFICULTY IS EXPERIENCED.

**WARNING.** Water heaters (as with other gas appliances) should be switched off and gas cylinder valve(s) turned off whilst caravan is in motion.

The Cascade is a storage water heater consisting of an insulated 9 litre (2 gallon) water tank supported on a floor mounting plate along with the gas burner, heat exchanger and control gear assembly. The complete unit is mounted through a hole in the caravan floor with only the floor plate and hot water tank inside the caravan and the gas burner assembly below the floor.

This arrangement has the advantage of using the minimum of interior space whilst preventing condensation and flue gases from entering the living space.

Control and operation of the heater is simply and conveniently done by switching on a wall mounted electronic control unit that can be placed in any desired position within 3M (9' 9") of the heater, this distance being determined by the length of cable connecting it to the heater.

Once connected to the caravan supplies of gas, water and electricity, and switched on, hot water is ready to use within a short space of time, heated to the temperature selected on the adjustable thermostat which is also incorporated in the control unit. The heater functions in a similar manner to a domestic hot water system in that water is heated in a tank and then displaced by cold water entering the bottom of the tank.

With the Cascade, when connected to a cold water supply from the caravan pump, the tank will fill until the level of water reaches the top of the vertical standpipe positioned inside the tank.

This pipe finishes short of the top of the tank allowing an aircap to remain in the tank. This aircap allows for the small expansion of water which takes place during heating.

When water reaches the top of the standpipe it will then weir over the end of the pipe, through the outlet connector, and flow out of the hot taps. Once water is flowing from the taps the tank has been filled and therefore the heater can be switched on.

When the control unit is switched on, the green indicator light shows that the heater has an electrical power supply.

The main function of the control unit is to maintain the water at the temperature selected. A temperature sensing probe is positioned inside the tank and will continuously scan the temperature in the tank. If the temperature is at or above the required setting the logic in the control circuit will hold the heater in a standby condition and the green light will remain on only.

If the temperature is below the required setting the logic will cause the gas solenoid valve and the electronic igniter to operate and turn the yellow and green indicator lights on.

Assuming there are adequate supplies of gas and electrical power to the heater the burner will light. The flame is then detected by a sensing electrode positioned over the burner which then transmits this information back to the control unit logic which in turn will shut the igniter down and leave the gas valve open on reduced voltage once the flame has established.

Heat will then be transferred by the heat exchanger, which is positioned above the burner, to the water inside the tank.

The heat exchanger is a sealed unit that automatically absorbs heat at its finned end and transmits it to the plain immersed end. The burner will remain alight until the temperature selected is reached where upon the logic will allow the solenoid gas valve to close.

This control system is supported by back-up safety controls which will operate if there has been a failure in the installation such as faulty plumbing causing loss of water, or faulty gas or electrical supplies. When such faults occur they will cause the control unit to display the red 'fail' light, and shut the system down.

The logic causes the 'fail' light to show because the temperature sensing probe is telling the logic to light the burner which it cannot do because all the requirements for a flame are not being met.

The fail light might be seen when operating the heater for the first time when connected to a new installation or having replaced the gas bottle. The ignition cycle will be attempted but if air rather than gas is reaching the burner, ignition will not take place. If after ten seconds gas has not purged through to the burner, the logic will shut the valve and igniter down to a fail safe condition. This condition will remain until the control unit is switched off, left for ten seconds and then switched on again. The heater will then go through another ignition cycle.

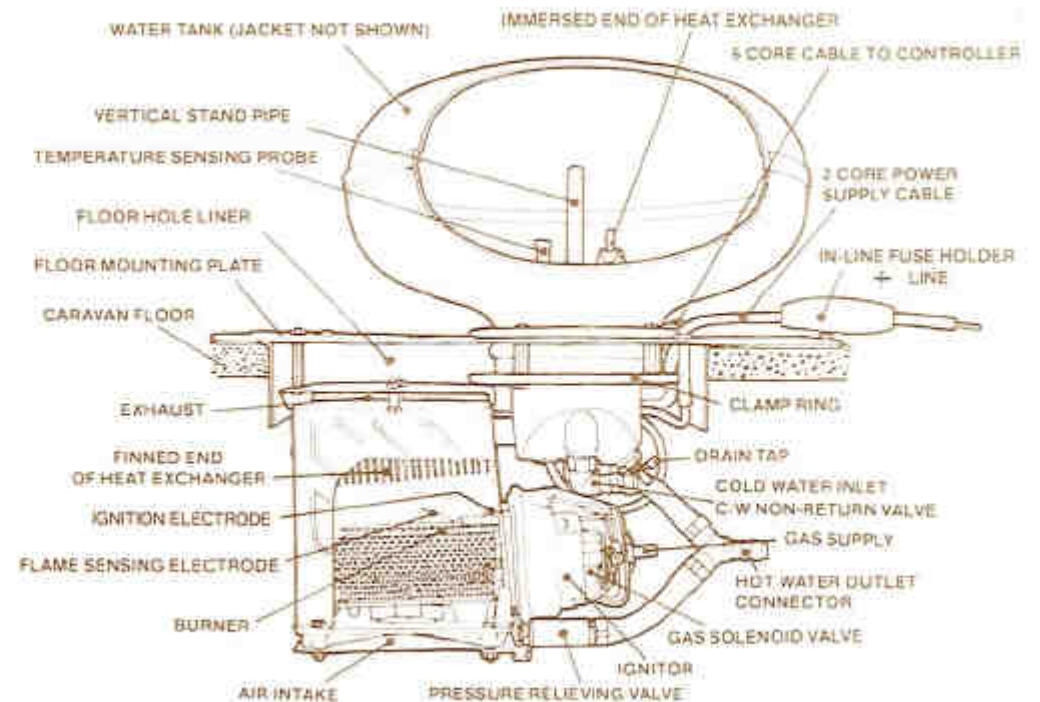
Once ignition has taken place the heater is prevented from being damaged through overheating caused for example by being switched on without being filled with water, by a thermal switch which is mounted on the heat exchanger.

If this operates it will shut the gas valve down causing the logic to attempt an ignition cycle which will not take place because the valve is closed. The fail light will then come on.

A failure of the thermostat is also guarded against by the inclusion of a thermal fuse in the temperature sensing probe. This prevents the water from boiling by shutting the gas valve down before the temperature inside the tank becomes excessive.

Further protection against being overpressurised, by a failed thermostat or runaway water pump that is capable of generating high pressure into the caravan water system, is provided by a pressure relieving valve that is fitted in the hot water outlet.

#### SIDE SECTION VIEW OF HEATER INDICATING PARTS



## WATER SUPPLY NOTES

The Cascade Water Heater is suitable for installation into any existing caravan water system, whether manually or electrically pumped, with only the following precautions:-

1. It must not be directly connected to a mains water supply
2. It must have a pumped cold water input pressure not exceeding 20 p.s.i. (1.4 bar). A pressure of approximately 10 p.s.i. (0.7 bar) is recommended. If you are in doubt as to the maximum pressure capability of your present pump, check with its' manufacturer.
3. If the pump is manually switched and is capable of delivering more than 20 p.s.i. output pressure, an automatic pressure limiting switch should be incorporated into the pressurised cold water part of the system.

Failure to observe these precautions will cause premature operation of the heater's pressure relief valve and prevent use of the entire water system.

## ELECTRICAL SUPPLY NOTES

The Cascade Water Heater is designed to operate with an electrical supply of between 11.0 and 15 volts D.C.

The ideal operating voltage of at least 12 v.d.c. should be found in a caravan wiring circuit operating from a car-type battery in a well charged condition.

Assuming that the battery is in good condition, the usual situation which prevents a full 12 volts reaching the water heater is excessively long runs of light gauge wire giving a large voltage drop when passing current. This can occur particularly when taking power to the caravan through an extension lead from the tow-car.

To check for this condition compare the voltage at the supply battery terminal with the voltage at the water heater power connection when other electrical appliances in the caravan (particularly the water pump) are switched on. A drop of less than 1.0 volt between the two checking points should be found if the wiring is of adequate gauge.

A further cause of low voltage supply may be a faulty connection due to lost mechanical contact or corrosion. This fault may be accompanied by a heating of the connection when passing a heavy current. **ENSURE THAT ALL ELECTRICAL CONNECTIONS ARE WELL MADE AND INSULATED TO AVOID A FIRE RISK.**

**Battery chargers** do not always produce a perfect direct current, the output may be a rippling voltage which will permanently damage the heater's electronic components. **NEVER use a battery charger as the sole power supply to the Cascade.**

**Do not use** a separate battery and bulb for checking the continuity of wiring within the heater as this may overload certain components. Use a commercial multimeter for checking both continuity and voltage. Do not attempt any electrical rectification work on the heater other than that covered in the fault rectification guide.

In case of difficulty contact your Authorised Dealer.

## GAS SUPPLY NOTES

L.P.G. is short for Liquefied Petroleum Gas, the two gases in common use being Butane and Propane. Calor, Shell and Camping Gaz are proprietary names and can apply to either gas or a mixture of both.

In all cases the bottle contents are in liquid form under pressure from the gas above it, and the pressure is only dependant on the type of L.P.G. and its temperature.

When gas is supplied the pressure in the bottle is slightly reduced and liquid "boils" off to restore the balance. This action cools the liquid and the bottle, and condensation or even frost may sometimes be observed on the outside of the bottle. The bottle when in use is always cooler than the surrounding air so allow plenty of circulation in cool weather and do not cover the bottle with a "cozy" if in difficulties bring the bottle into a warm room but never put it in front of a fire.

### Butane

Butane is supplied in the U.K. in Green, Blue or Aluminium bottles. These have a male left hand threaded connection except for Camping Gaz which has a special female right hand thread and the Calor aluminium and 32 lb bottles which have a special clip-on connection. Most continental bottles have a male left hand thread similar to, but not identical with U.K. butane.

Butane ceases to gas off effectively at about 0°C (32°F) and as drawing off the gas cools the contents it is unsuitable for caravan use in temperatures under 2°C (35°F).

### Propane

Propane is supplied in Red, or partly red bottles which have a female left hand threaded connector. This same connection is used in Scandinavian countries, but in Germany or Austria propane is supplied in bottles with a male connector.

Propane continues to gas off down to -42°C (-42°F) and is therefore suitable for all winter caravanning.

### The regulator

The regulator is a governing device which reduces the internal bottle pressure to one that will suit the equipment in the van. This pressure is usually expressed in millibars (mbar). The usual pressures in U.K. are 28 mbar for butane and 37 mbar for propane. These are the pressures that will support columns of water 280mm (11") and 370mm (14") high. Equipment designed to burn butane at 28 mbar will work equally well on propane at 37 mbar.

**DRAINING HEATER**  
Turn the drain tap anti-clockwise a maximum of 6 turns. If heater is airlocked remove hot water outlet pipe from the 'Y' connector.

### Warning

Some industrial L.P.G. appliances operate at high pressure and require a "high pressure" regulator. This often has an adjusting handle on it. Under NO circumstances should such a regulator be used on caravan applications.

## WATER SYSTEM FAULT TRACING

Fault	Cause	Cure
Water not flowing from any tap when operated, but pump runs	Freshwater tank empty	Check
	Pump wired in reverse	Check wiring; refer to pump manufacturers instructions
	Pump not primed	Refer to pump manufacturers' instructions
	Pipe inlet or outlet pipe disconnected	Check connections
	Pump pipes restricted by kinking	Check pipe runs
	Blockage in pump inlet or outlet pipe	Check, starting inside freshwater tank
Pump does not run	Blocked in-line filter or pump filter	Dismantle and clean
	Pump or tap incorrectly wired	Refer to pump/tap manufacturer's instructions
	Pump fuse blown	Check wiring connection and then replace with fuse of correct rating
	Battery disconnected	Check connections
	Pump seized or overheated	Refer to pump manufacturers' servicing instructions
	If a pressure pump is being used, pressure sensing switch may have failed	Refer to pump manufacturers' servicing instructions
Water flows from cold tap but not from hot	If a switched tap is being used, the switch may have failed	Refer to tap manufacturers' servicing instructions
	Feed pipe to water heater incorrectly connected to the heater outlet	Refer to installation instructions
	Blockage in hot pipe line	Disconnect pipes and inspect
	Heater inlet or outlet pipes kinked preventing flow	Check and re-route if necessary. Ensure that hose is 'Carver' recommended type
Water flows from hot tap but not from cold	Hot tap not connected	Refer to installation instructions
	Hot tap failed or blocked	Disconnect and inspect
	Cold water pipe kinked preventing flow	Check and re-route if necessary
Reduced flow from both hot and cold taps	Blockage in cold pipe line	Disconnect pipes after 1st 'Y' connector and check up to tap
	Cold tap not connected	Refer to installation instructions
	Cold tap failed or blocked	Disconnect and inspect
	Battery condition low causing pump to run slowly	Check battery state of charge refer to electrical supply note
Reduced flow from either taps	If new taps have been fitted they may be restricting flow	Disconnect and check that they have at least 1/4" (6.3mm) bore
	Pump needs servicing	Refer to pump servicing instructions
	Partially blocked pump filter or in-line filter, if fitted	Dismantle and clean if necessary
	Pump outlet pipe kinked restricting flow	Check and re-route if necessary
	Water leak	Check all water connections
	'Y' connector(s) fitted incorrectly	Refer to installation instructions
Warm water flows out of cold tap	Pipe kinking restricting flow	Check and re-route if necessary
	Bore size difference in taps	Use taps of equal bore size
	Hot water back feeding into cold line; usually if mixer tap or single outlet hot and cold taps being used	Fit non return valve in cold supply near tap
Water heater pressure relief valve venting water	Pressurised water system; pump switching pressure too high	Refer to water supply note
	Switched tap water system; pump flow rate is greater than tap flow rate capacity	
Water heater difficult to drain	Drain tap partially blocked	Attempt to clear blockage with wire or turn on pump to blow blockage out. If neither method works unscrew drain tap
	Hot taps not open preventing air entering hot system to let water out	Open taps
	Loops hanging in pipe runs	Refer to installation instructions

## HEATER FAULT TRACING

Primary Symptom	Secondary Symptom	Cause	Cure
When switching on from cold, no indicator lights come on	Heater does not operate	Reversed power supply	Check connection from heater to caravan wiring. Heater brown wire is positive
		Power supply not reaching heater	Check wiring from heater connections back to power supply
		Connection at controller incorrectly made or become dislodged	Refer to installation instructions and check
		Fuse not connected or blown	Check for wiring fault. Replace with 1 amp fuse
When switching on green and yellow indicator lights come on then go out after 10 seconds leaving red indicator light on only	When listening to the heater operate during this sequence, a click should be heard followed by continuous ticking for 10 seconds	No gas supply	Check bottle
		Air in gas supply pipe	Purge pipe by switching off; wait ten seconds; switch on again. Repeat if necessary
		Incorrect gas pressure	Refer to gas supply note
		Air intake or flue obstructed	Check underfloor parts of heater
		Water coming from pressure relief valve	Pump pressure too high. Refer to water supply note
		No click heard but continuous ticking for 10 seconds	Low voltage. Refer to electrical supply note
A click heard but no continuous ticking	Dislodged connector on controller	Thermal cut-off blown	Remove controller fascia. Make sure that connector is pushed fully home. It will not be possible to relight heater. Seek service attention
		Low voltage	Refer to electrical supply note
Red indicator light on within a short time of switching on, after successful ignition	No water coming from hot tap. Heater switched on without tank being filled	Dislodged connector on controller	Remove controller fascia. Make sure that connector is pushed fully home
		Heat exchanger over-temperature switch operated	Allow the heater to cool down then fill tank and switch on
Red indicator light on after about 20 mins to 30 mins	Water temperature normal	Floor hole liner incorrectly fitted; dropped out of floor hole; blocking flue	Check installation. Refer to installation instructions.
Red indicator light on when electric pump operates	Pump running slowly fluorescent lights flickering	Low voltage	Refer to electrical supply notes
Red indicator light on during extreme wind conditions		Air intake obstructed	Check underneath caravan; ensure free air access to heater
Red indicator light on after about 45 mins to 1 hour of being switched on	Water seems hotter than usual. Pressure relief valve may be operating	Temperature control faulty	Do not continue to use heater; seek service attention
Red and green or red and yellow indicator lights on	Controller buzzing. Heater not operating	Battery charger only being used. Control unit failure	Refer to electrical supply notes. Seek service attention
Green indicator light on only	Heater cold and will not operate	Temperature control faulty	Seek service attention
Yellow indicator light on only whether controller is switched on or off	Heater not operating	Connector incorrectly positioned or reversed on controller	Refer to installation instructions
Continuous clicking from heater when switched on	Heater not igniting	Low voltage	Refer to electrical supply note
All three indicator lights showing together when switched on	Heater not operating	Battery charger only being used	Refer to electrical supply note

## SERVICING OF CARVER CARAVAN APPLIANCES

IF DIFFICULTY IS EXPERIENCED IN OBTAINING QUALIFIED SERVICE FOR YOUR CARVER APPLIANCE, CONTACT THE SALES DEPARTMENT AT THE ADDRESS ON THE BACK OF THIS HANDBOOK REQUESTING A LIST OF APPROVED DEALERS

For spares and repair

Contact

Arc Systems

[www.arcsystems.biz](http://www.arcsystems.biz)

0115 9213175

### GUARANTEE

PROVIDED THAT THIS HEATER HAS BEEN INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTIONS PROVIDED, IT IS GUARANTEED FOR 12 MONTHS FROM THE DATE OF PURCHASE BY THE FIRST USER AGAINST FAULTY WORKMANSHIP OR MATERIALS.

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Water Heating