



# Low temperature circulator LTC2

*Operating Manual*

**Grant Instruments**, based near Cambridge, England is a world leader in the manufacture and design of equipment for sample preparation, scientific analysis, data acquisition and data analysis providing solutions to the global scientific and industrial markets.

### **Standards Compliance and Quality**

Grants' brand and reputation are based around quality, reliability and accuracy. We ensure our products stringently meet all necessary international safety standards. We pay particular attention to the safety testing of products and remain at the forefront of the product safety standard for laboratory equipment IEC 61010-1. The company is committed to operating its safety test laboratory in accordance with the requirements of ISO 17025.

Grant operates a Quality Management System that complies with the requirements of BS EN ISO 9001:2008.

Beyond compliance to the standard, Grant is committed to continually improving in everything we do; with particular emphasis on understanding what matters to our customers and suppliers, and designing our systems and work to meet their needs.

If you have any feedback on Grant's products or services we would like to hear from you. Please send all feedback to:

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## 1.0 Use of products

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The following products are covered by this operating manual:

- LTC2 & LTC2L

The products listed above are low temperature circulators designed for indoor laboratory use by a professional user.

The LTC2 consists of a TC120 immersion thermostat combined with an R2 refrigeration unit, with insulated hoses and clips to allow circulation of temperature control fluids to external equipment.

## 2.0 How to use this operating manual

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This operating manual will allow you to unpack, set-up and operate this low temperature bath/circulator correctly and safely. Important safety information, symbols and warnings are listed below and should be read carefully. Section 4 gives information about how to unpack and install the product correctly. Section 5 gives operating information for the LTC2. Product technical specifications and tips are provided in sections 6 and 7. The warranty for this product is for FOUR YEARS and is detailed in section 8 and should be registered by completing the on-line registration form at [www.grantinstruments.com](http://www.grantinstruments.com).

If there is a technical matter that this operating manual does not address, or any other question concerning this product, please contact Grant Instruments or your local distributor, who will be able to provide any additional information.

## 3.0 Safety information

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### 3.1 Safety compliance

The LTC2 meets the requirements of international safety standard IEC 61010: Safety requirements for electrical equipment for measurement, control, and laboratory use.

### 3.2 Safety symbols

The symbols below are marked on the equipment and throughout this manual to indicate:



Caution: Surfaces and heat transfer liquid can be hot during and after use.



Read this manual before using the bath.



Important safety warning.

### 3.3 Safety warnings



Read the whole of these instructions. Safety may be impaired if they are not followed.



For the LTC2, only use liquids specified in these operating instructions, within the specified temperature range. If the alarm lamp is illuminated the liquid temperature may be above its recommended maximum. Do not inhale the vapours given off as they may be toxic. Liquids should be safely discarded and replaced.



Do not use the LTC2 with flammable heat transfer liquids.



Do not use the LTC2 to heat any sample material that could cause a fire or any other kind of hazard.



Do not use the equipment in an area where there are aggressive or explosive chemical mixtures.



If a potentially hazardous liquid is spilt onto or inside the equipment, disconnect it from the power supply and have it checked by a competent person.



Before moving, disconnect from the mains power supply



It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilt on the equipment.



If the alarm lamp is illuminated do not touch the liquid or the heater, they may be very hot. Refill carefully, a hot heater can cause a spattering of very hot water droplets and scalding steam.



Do not touch surfaces which become hot during high temperature operation.

## 4.0 Operating instructions

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### 4.1 Unpacking instructions

Standard equipment includes:

- LTC2 low temperature circulator
- Pump connector kit
- 4 x Jubilee clips
- 6m of insulated hose
- Mains cord



The LTC2 weighs 25kg. Take necessary precautions when lifting.

Remove packing materials carefully and retain them for future shipment or storage of the equipment.

### 4.2 Recommended liquids

The following table lists the recommended liquids for different temperature ranges. Always ensure the liquid used is safe and suitable for your working temperature. If using non-recommended heat transfer liquids, it is the responsibility of the user to conduct an assessment to ensure the intended fluid is compatible with the LTC2. If in doubt please contact the Grant technical support team.



To ensure protection the overtemperature cut-out must be set appropriately for the heat transfer liquid selected (see table below).



If using non-recommended heat transfer liquids it is important to set the over-temperature cut-out to a value no higher than 25°C below the fire point of the liquid.



Use fume extraction when using silicone fluids at elevated temperatures

Temp range	Recommended liquid	Comments
-30°C to 30°C	50% water, 50% antifreeze (inhibited ethylene glycol)	WARNING: Ethylene glycol is toxic – follow the manufacturer's instructions. For safe disposal consult the local regulations.
0°C to 30°C	80% water, 20% antifreeze (inhibited ethylene glycol)	Use a lid to reduce the dilution of the mixture caused by condensing water vapour from the air, and to maintain the cool down rate.
5°C to 99.9°C	Water*	Water can be used but care should be taken above 60°C as hot vapour can be dangerous. Use a lid or polypropylene spheres above 60°C to ensure good performance & reduce evaporation. At temperatures approaching 99°C the temperature performance will be affected due to localised boiling. The units should not be used to boil water.
70°C to 120°C	Silicone fluid Viscosity ~20cs Flash point ≥230°C Fire Point ≥280°C	Dow Corning DC200/20 silicone fluid is a suitable liquid – follow the manufacturer's instructions. For safe disposal consult the local regulations.

\* See section 7.1 for further details

### 4.3 Installation

After transportation, let the unit stand in its intended working position for six hours. This is to allow the oil to drain to the bottom of the compressor. This is normal procedure for refrigeration compressors. Allow at least 100mm clearance from obstructions on all sides so that there is free air flow through the unit, from the front to the back (this also has the advantage that air is not blowing directly out of the sides onto instruments next to the LTC2).



Place the LTC2 on a level, non-combustible surface. Ensure that the mains plug and the switch at the rear of the unit are easily accessible.



If the equipment has been transported or stored in cold or humid conditions, condensation may form inside it. If that could have happened, allow time (at least 2 hours at room temperature) for the condensation to evaporate before using the equipment.



Do not block or restrict ventilation slots.



Do not connect to a power supply or switch on before filling the tank.



Drain before moving the bath. Before draining allow the liquid to cool below 50°C.



Do not touch the condenser fins, they are sharp and may cause injury.

### 4.4 Electrical supply



Connect the LTC2 to a grounded (earthed) electrical power supply with voltage and frequency within the range specified on the serial number plate.



The LTC2 must only be connected to the mains using the mains cord supplied or one with an identical rating (see section 9.4)



Ensure the mains switch and isolating device (power supply connector) are easily accessible during use.



## 5.0 Operating procedures

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### 5.1 Operation

#### 5.1.1 Liquid level

Fill the tank to an appropriate level with a liquid suitable for your working temperature; see section 4.2 for liquid options. Allow for thermal expansion and contraction of the liquid during operation and for any liquid in external circulation paths. If using liquids that can evaporate then periodic checking and refilling should be completed. The low level float switch will alarm if the liquid level drops below the minimum required level and the unit will switch off the heater and stop temperature control.

#### 5.1.2 Operation above 60°C

A lid or polypropylene spheres must be used above 60°C to maintain temperature control and to ensure that the bath fluid temperature reaches the set point. They will save energy by preventing excessive evaporation and reduce the frequency that the bath needs to be refilled.

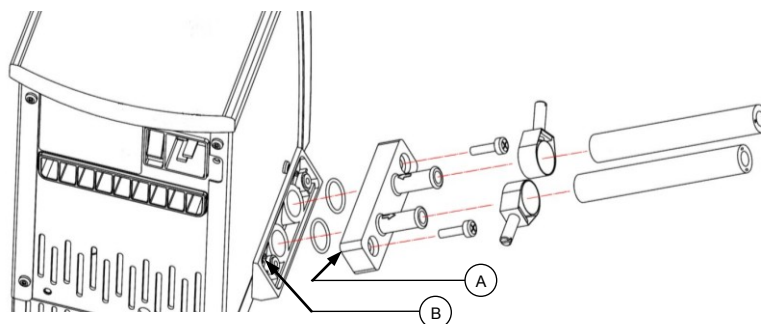


Take care when lifting and removing the lid as it may be hot. Steam and hot vapours can cause scalding.

#### 5.1.3 Using the pump

The LTC2 allows liquid to be pumped around a closed external system (not open to the atmosphere). It cannot be used for circulation through an external open tank. The pump is fitted with a blanking plate as standard. Fit a pump connector plate as shown below. Ensure o-rings are located in the grooves, use silicone grease to hold the o-rings in place. Note: the blanking/connector plates have a locating hole (see A below) to assist correct alignment onto the pump moulding. It is important to verify the hole is aligned with the corresponding locating pin (see B below) on the pump moulding. Failure to do so will result in a leaking connection. Retain the blanking plate for refitting when the pump is no longer required.

The LTC2 is supplied with insulated hose which is designed to operate at temperatures between -40°C to 80°C. We recommend that suitable high temperature hose is used for temperatures above 80°C.



Always use pump connectors and hoses that are suitable for the operating temperature and liquid used. Check the pipe connections are secure.



Never disconnect any pipes or hoses while they contain very hot or very cold liquids or while the LTC2 is pumping.



Never use silicone oil with silicone tubing.

Pumping heat transfer liquid around an external system can lead to hazards that are outside the control of Grant Instruments. It is essential that the user conducts a risk assessment of the entire equipment installation to ensure that correctly rated materials have been used throughout and that the system can be used safely.

#### **5.1.4 Emptying the LTC2**

The LTC2 tanks should be emptied to a safe level prior to moving. A drain tap is included to allow convenient emptying. See section 5.2.3 for full details.



Allow the liquid temperature to fall below 50°C before emptying.

#### **5.1.5 Setting up and switching on**

Follow instructions in section 5.1.3 to attach the pump connector plate and insulated hose. Before filling and switching on, attach the open end of the hose to the application, taking care to note the inlet and outlet.



Ensure all hoses are connected securely. Liquid will begin pumping immediately once the LTC2 is switched on.

Add the appropriate working liquid to the bath to at least the minimum recommended fill level such that the float level switch is fully raised.

The control unit can be powered either from the mains supply directly or via the cooler unit (230V units only). An interconnect cable can be used to supply power from the mains socket outlet on the rear of the cooler unit to the control unit (see Section 5.2.4). Plug the mains cable into the fused power inlet socket on the rear of the refrigeration unit.

Switch on the LTC2 control unit using the power switch on the rear. The motor will start immediately and the buzzer will sound while the unit starts up. Switch on the refrigeration unit using the power switch on the front of the unit. The LTC2 will start to control at the set temperature.

## 5.2 Using the LTC2

### 5.2.1 Product description, control unit



### 5.2.2 Control unit product indicators

There are two indicator lights on the control unit:

- Heater on light (orange) marked  $\text{SSS}$
- Alarm light (red) marked  $!$

The alarm lamp will light to indicate the following faults:

- Float switch has operated due to low liquid level
- Over temperature cut out has operated
- Temperature probe fault

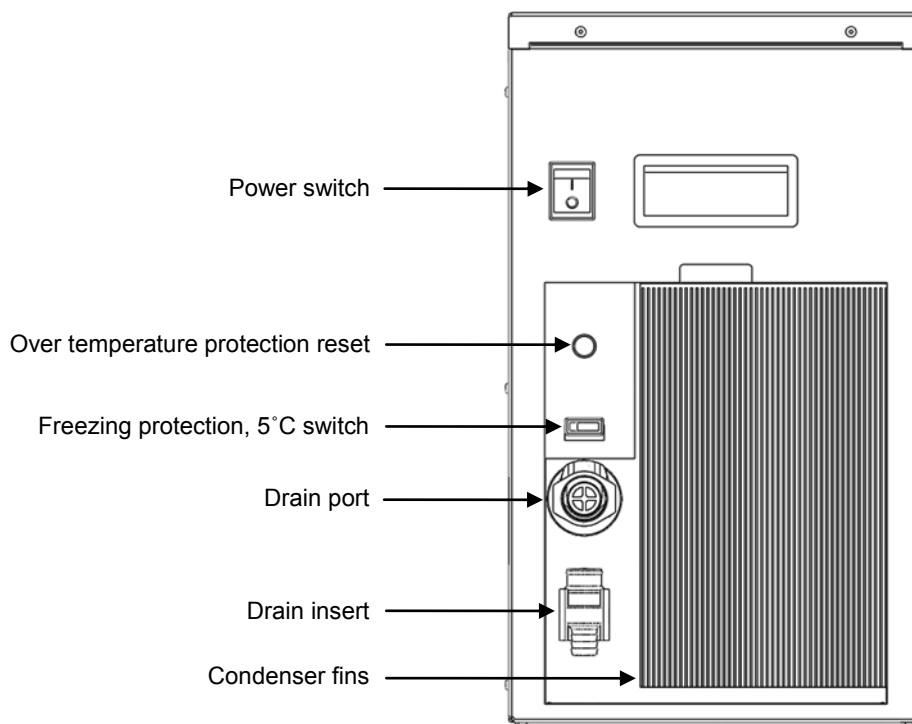
The cause of the alarm will also be shown on the display.

The display normally shows temperature in °C of the liquid being controlled.

The **S**(et) button is used to select and store values whilst the **F**(unction) button is used to access menu options and cancel functions.

The main dial is used to change temperature values and other settable parameters.

### 5.2.3 Product description, refrigeration unit front panel (grille removed)

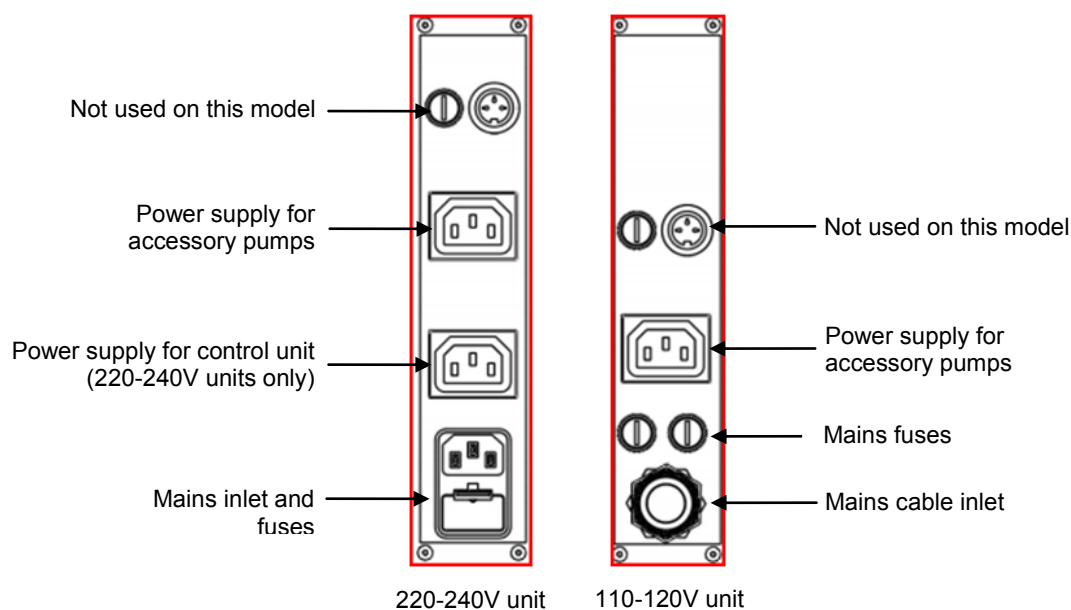


The refrigeration unit has a resettable over temperature protection which protects the unit from overheating. This will be actuated when the working fluid temperature is between 110°C and 120°C. The unit can be reset by waiting for the liquid to cool below 100°C, then unscrewing the black cap and pushing in the revealed button. Note, this protection is in addition and separate from the over temperature protection on the control unit.

The freezing protection switch uses a low temperature thermostat to ensure the working fluid never drops below 5°C. With the switch in the depressed/in position the cooling will be switched off by a low temperature protecting thermostat. If water is used in the bath this will prevent it from freezing. In the out/off position the thermostat is bypassed allowing the unit to run at temperatures below 5°C.

The drain port and insert allow convenient emptying of the refrigeration bath. To drain the unit first remove the drain insert from the holder and connect a suitable length of hosing with a bore of 12.7mm (½") to the drain insert. Have the non connected end of tubing in a receptacle, suitable for the liquid to be drained. Push the drain insert into the drain port and let the liquid drain. To release the drain insert push down the grey button on the drain body and extract the drain insert. Liquid to be drained should not be below 10°C or above 50°C.

## 5.2.4 Product description, refrigeration unit rear panel



## 5.2.5 Setting the control temperature

The temperature of the circulation liquid can be set using the **S** button.

1. Whilst the display is showing the bath temperature, press the **S** button. This will cause the display to flash indicating that it can be set.
2. Use the main dial to set the desired temperature.  
*If no key is pressed for 10 seconds then the display will revert back to showing the bath temperature and the set temperature will remain at its original value.*
3. Press the **S** button to store the requested value and the display will revert to showing the bath temperature.  
*If the temperature selected is higher than the current liquid temperature, the heater light will come on.*

## 5.2.6 Selecting liquid type

The liquid type determines the limits of the set temperature range.

1. Press the **F** button four times – the display will show the current liquid type.
2. Use the main dial to select the required liquid.
3. Press the **S** button to set the liquid type and return to normal temperature display.

Selection of the liquid types below changes the settable range as follows:

Liquid	Set temperature range
H2O	0°C to 100°C
Oil	0°C to 120°C
LTL*	-20° to 50°C

\* LTL = low temperature liquid, for example 50% water/50% glycol

### 5.2.7 Setting the over-temperature thermostat

An over-temperature cut-out dial with a temperature scale is located at the top right of the unit. The over-temperature probe independently monitors the bath temperature and switches the heater off if it goes above the cut-out threshold. For the LTC2, the temperature cut-out threshold can be adjusted for convenience.

#### Coarse setting of the over-temperature thermostat

Rotate the temperature cut-out dial in line with the marked scale to the desired setting. This should be higher than the set temperature to avoid operating the cut-out before the set temperature has been reached.

If the alarm is triggered, it can be cancelled by pressing either the **F** or **S** button once. The unit must then be switched off to clear the cut-out alarm. To continue to use the LTC2, let the bath liquid cool by at least 5°C either naturally or by replacing the liquid switch the unit off, wait 10 seconds and switch it on again to clear the alarm. To avoid nuisance tripping the trip point needs to be set at least 5°C above the desired control temperature.

#### Alternative setting of the over-temperature thermostat

Rotate the temperature cut-out dial to maximum (or at least a value above the level required) and configure the set temperature to the cut-out level required. Leave the bath to reach the set temperature and stabilise for at least 5 minutes. Turn the cut-out dial slowly anticlockwise until the alarm lamp comes on and the alarm sounds intermittently. The display will alternate between showing "Cut" and the liquid temperature. This gives an over-temperature trip point at the set temperature. The audible alarm can be cancelled by pressing either the **F** or **S** button once.

To continue to use the LTC2, let the liquid cool by at least 5°C, either naturally or by replacing the liquid, switch the control unit off, wait 10 seconds or switch it on again to clear the alarm. To avoid nuisance tripping the trip point needs to be set at least 5°C above the desired control temperature.

### 5.2.8 Configuring a preset

The LTC2 can be configured with three temperature presets to allow the circulator to be conveniently run at frequently used temperatures. Use the method below to configure preset 1; other presets can be set in a similar manner.

Be aware that once a preset has been saved using the steps below, it will automatically start once all the steps have been completed.

1. Press the **F** button and rotate the dial until the display shows "t-1".  
*The display will alternate between the preset number and its temperature.*
2. Press the **S** button to select the preset.
3. Use the dial to set the desired preset temperature.  
*If no key is pressed for 10 seconds then the display will revert back to showing the bath temperature and the preset temperature will remain at its original value.*
4. Press the **S** button to save the preset temperature.  
*The preset will automatically start as soon as the value is saved.*

Preset temperatures and set temperatures are limited to between -20°C and 120°C. The factory preset settings are shown in the following table.

Preset	Set temperature range
t-1	37°C
t-2	56°C
t-3	72°C

### 5.2.9 Running a bath preset

1. Press the **F** button and rotate the dial until the display shows the correct preset.
2. Press the **S** button to select the preset.
3. Press the **S** button to set the bath to the preset temperature.

### 5.2.10 Completing a calibration

The LTC2 allows a two point calibration to be completed. The calibration menu can be accessed by simultaneously pressing the **F** and **S** buttons for about 5 seconds.

The calibration temperatures are constrained by the temperature limits of the liquid type setting. Calibration should be carried out using a traceable reference thermometer with an accuracy of at least 0.1°C. This thermometer should be held securely in the centre of the bath or vessel.

The calibration of the LTC2 is in two parts, a low temperature offset and a high temperature offset. The high temperature calibration point must be at least 40°C higher than the low temperature point.

Calibration points should be chosen to be at critical experimental temperatures where accuracy is important or at the extremes of the working range of used temperatures.

If only the low temperature calibration point is set then the calibration will be performed between this point and 100°C with the offset decreasingly linearly. If only the high temperature calibration point is set then the calibration will be performed between 0°C and this point with the offset decreasingly linearly.

If the thermometer value is entered before the unit is completely stable then the calibration could be poor and liquid temperature readings will be incorrect. If the LTC2 is not in accordance with the thermometer following calibration then it may not have been successful and the unit should be reset.

#### Setting the low temperature offset

1. Adjust the set temperature to the required low temperature calibration point.
2. Allow the unit to stabilise for at least 5 minutes after a stable temperature condition has been achieved.
3. Measure the liquid temperature by placing a reference thermometer into the centre of the bath.
4. Press the **F** and **S** buttons simultaneously for approximately 5 seconds until "LCAL" is shown.
5. Press the **S** button to select.
6. Use the main dial to update the display to show the temperature on the reference thermometer.
7. Press the **S** button to store the temperature.  
*Press the F button to cancel the calibration.*
8. Press the **F** button to return to the liquid temperature display.

### Setting the high temperature offset

1. Adjust the set temperature to the required high temperature calibration point.
2. Allow the unit to stabilise for at least 5 minutes after a stable temperature condition has been achieved.
3. Measure the liquid temperature by placing a reference thermometer into the centre of the bath.
4. Press the **F** and **S** buttons simultaneously for approximately 5 seconds until "LCAL" is shown.
5. Rotate the dial until the display shows "HCAL" and press the **S** button to select.
6. Use the main dial to update the display to show the temperature on the reference thermometer.
7. Press the **S** button to store the temperature.  
*Press the F button to cancel the calibration.*

### 5.2.11 Restoring factory calibration settings

The restore factory calibration allows the unit settings to be reset if there is a problem during calibration or you wish to cancel any of the calibration settings.

1. Press the **F** and **S** buttons simultaneously for approximately 5 seconds until "LCAL" is shown.
2. Rotate the dial until the display shows "rST" and press the **S** button to select.
3. Press the **S** button four times (the display will show "Con.3", "Con.2", "Con.1" and sound the buzzer to confirm the factory reset has been completed).

### 5.2.12 Adjusting display brightness

The brightness of the display can be adjusted over a limited range (20% to 100%) if required.

1. Press **F** and **S** buttons simultaneously for approximately 5 seconds until the display shows "LCAL".
2. Rotate the dial until the display shows "disP" and press the **S** button to select.
3. Rotate the dial between the settings and select required brightness  
*The displayed values show the display brightness*
4. Press **S** button to save the value.
5. Press **F** button to return to the normal temperature display.

### 5.2.13 Setting a countdown timer

The LTC2 includes a countdown timer in minutes which triggers an audible alarm on completion. The timer can be set between 1 minute and 6000 minutes (100 hours).

1. Press the **F** button twice – the display will show "Cloc".
2. Press the **S** button to select.
3. Use the main dial to select "On" and press the **S** button to select. The display flashes with time (in minutes) indicated. Rotate navigator control to set time required.
4. Press the **S** button to save and return to liquid temperature display with timer countdown started.

When the countdown clock is set the display alternates between bath temperature and time remaining in minutes.

When the countdown timer reaches zero the audible alarm will sound and the display will alternate between the water temperature and "End". The alarm can be accepted by pressing the either the **F** or **S** buttons.



**Note: the LTC2 will continue to control at the set temperature after the timer reaches zero – the heater will not switch off.**

#### **5.2.14 Cancelling the timer**

The countdown timer can be easily cancelled.

1. Press the **F** button twice – the display will show “Cloc”.
2. Press the **S** button to select.
3. Use the main dial to select “Off” and press the **S** button to select. The display will revert to the bath temperature and the timer will be cancelled.

#### **5.2.15 Setting a high temperature warning alarm**

The high temperature alarm sets a warning buzzer to sound if the bath temperature exceeds a defined level.

1. Press the **F** button three times – the display will show “Alar”.
2. Press the **S** button to select.
3. Use the main dial to select “On” and press the **S** button to select. The display flashes the high temperature alarm value. Rotate the dial to set the high temperature alarm required.
4. Press the **S** button to save and return to liquid temperature.

If the high temperature alarm value is exceeded then LTC2 will sound the buzzer intermittently and show “-Al-” on the display. The alarm can be acknowledged by pressing either the **F** or **S** buttons. However, the alarm is persistent and will trigger again if the temperature still exceeds the high temperature value. The alarm can be cancelled by following the steps above but using the dial to select “Off” in step 3 and pressing the **S** button to confirm.

**Note: the high temperature alarm will not switch off the heater.**

## 6.0 Technical specifications

### 6.1 Operating conditions

Ambient temperature range	5 to 40°C
Altitude above sea level	Up to 2,000m (6,500ft)
Operating environment	Indoor use only
Maximum relative humidity	80% RH up to 31°C decreasing to 50% RH at 40°C

### 6.2 Electrical details

Mains supply: 220-240V @ 50Hz or 110-120V @ 60Hz  
 Pollution degree: 2  
 Installation category: II

Mains supply voltage fluctuations are not to exceed  $\pm 10\%$  of the nominal supply voltage.

### 6.3 Performance

Specification		LTC2	LTC2L
Typical cooling power at an ambient of 20°C	@ 20°C	250W	
	@ 0°C	140W	
	@ -10°C	100W	
	@ -20°C	35W	
Stability (DIN 12876)		$\pm 0.1^\circ\text{C} \dagger$	
Uniformity (DIN 12876)		$\pm 0.1^\circ\text{C}$	
Settable temperature range		-20°C to 120°C	
Working temperature range		-20°C to 100°C	
Refrigerant R134a		140gm	
Tank capacity		5L	
Top opening		110/145mm	
Max pump head pressure		210mBar	
Max pump flow rate		16L/min	
Safety 100°C limit		Cut-out	
Safety H <sub>2</sub> O freezing protection		5°C thermostat & switch	
Max current consumption (both units)		8.0A	15.5A*
Heater power		1.3kW	1.4kW

\*Requires two separate mains cords

† Temperature stability may be affected ( $\pm 0.3\text{C}$ ) in the presence of strong RF fields (10V/m) at 380-400MHz. This level of interference is very unlikely and is only likely to be encountered in electrically noisy industrial locations as defined in EN61326)

## 7.0 Technical Tips

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### 7.1 Which water should you use in your bath?

For the long-term reliability of water baths it is important to use oxygenated water that is free from ions and minerals that can cause corrosion of stainless steel. We recommend the use of distilled water and de-ionised water from modern ion exchange systems that do not use salt back flushing to regenerate the ion-exchange cartridges.

Stainless steel is protected from corrosion by a layer of chromium oxide. If the layer is damaged, oxygen present in water can reform the oxide layer. If the water is still or de-oxygenated, and the oxide layer is damaged, ions can corrode the stainless steel tank. If a water bath has been unused for some time, or water boiled, we recommend changing to fresh distilled water or correct de-ionised water.

Water normally contains calcium or magnesium ions. De-ionised water has most ions removed as indicated by its conductivity level; the purer the water the lower the conductivity. It is important to use only de-ionised water from an ion exchange system with replaceable cartridges. Do not use de-ionised water generated from an ion-exchange system that incorporates a salt back-flush system to regenerate the ion-exchange resin as this can leave sodium ions that are very corrosive to stainless steel.

### 7.2 How to prevent rust in water baths

Most Grant tanks, as well as immersed parts, are made from type 304 stainless steel, an extremely versatile general purpose grade of stainless steel. It is the excellent forming characteristic that has made this grade dominant in the manufacture of laboratory and industrial water baths, as well as domestic sinks and saucepans. Type 304 stainless steel is highly suitable for applications where hygiene is important; it exhibits good heat resistance and excellent resistance to corrosion.

However, despite resistance to general surface corrosion, stainless steel is susceptible to specific types of corrosion, in particular pitting (small pin hole style corrosion) and stress corrosion cracking. It can also undergo general corrosion in specific environments, such as one containing hydrochloric or sulphuric acids.

Stainless steel is protected by its high content of alloying elements, primarily chromium and nickel. Chromium is the most important with respect to corrosion resistance, although the nickel assists in allowing the chromium to do its job. The chromium forms an oxide layer on the surface of the steel, which inhibits further oxidation. This layer adheres extremely well to the metal substrate, but it is essential that it remains intact, and must be protected from various forms of damage.

If the surface chromium oxide layer becomes damaged, oxygen present in water can partially reform the oxide layer, so it is advisable to ensure that water is always fresh and well oxygenated. Baths that will be out of use for an extended period should be emptied, and all moisture should be wiped from the bottom of the tank.

In some cases a brown layer may appear on the surface of a stainless steel tank. In most of these cases this is not rust, but it may be a surface deposit of minerals from the local water supply, or ferrous particles or salts that have fallen into the tank. These surface deposits can usually be removed by using a household cleaner such as Duraglit or Silvo metal polish.

### **7.3 How to prevent algae and bacteria?**

Water baths provide the ideal environment for the growth of micro-organisms. If left uncontrolled the growth of these organisms can result in a range of serious problems and health risks from pathogenic bacteria.

The growth of algae on the surface of parts will cause biofouling which can reduce performance.

Micro-organisms that produce acidic metabolic by-products can cause bio-corrosion by depolarisation of metal surfaces.

There are a number of biocides available on the market.

## **8.0 Warranty information**

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When used in laboratory conditions according to this manual, this product is guaranteed for FOUR YEARS against faulty materials or workmanship.

Extended warranty for years four and five can be purchased by contacting our sales department at [labsales@grantinstruments.com](mailto:labsales@grantinstruments.com).

## **9.0 Maintenance and service**

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### **9.1 Routine maintenance**

The over-temperature cut-out on the control unit should be checked periodically by turning the over-temperature dial with a screwdriver anticlockwise until the alarm lamp comes on. The control unit will also sound a buzzer and “Cut” will be shown on the display. The over-temperature dial should then be turned to the maximum setting without the alarm cancelling. The control unit should be powered off and back on to confirm that the cut-out can be reset correctly. If the alarm lamp fails to light when the value indicated on the over-temperature dial is more than 10°C below the current temperature as indicated by the main display, then the unit should be checked by a competent person.

The float liquid level protection should also be checked periodically by lowering the level of liquid in the bath and noting that the unit cuts out with the top turn of the heater still immersed in the liquid.

When hoses are fitted to the pump they should be inspected periodically and replaced as necessary to avoid hose failure.

No other routine maintenance is required.

### **9.2 Cleaning**

Regular maintenance of the LTC2 is important to allow the unit to perform to its specification and is required for warranty validity.

The removable grille enables easy access to the condenser for cleaning. Cooling power will be reduced if the fins become clogged with dust. The condenser fins (see section 5.2.3) should be examined monthly and, if necessary, use a vacuum cleaner nozzle and soft brush to remove the dust.

Clean the outside of the equipment with a damp cloth, using water only. Do not use chemical cleaning agents. Before using any other cleaning or decontamination method, check with Grant Instruments or your local representative to make sure that the proposed method will not damage the equipment. Scale on immersed parts can be removed using chemical de-scaling products designed for use on equipment that has metal parts.



De-scaling products may be toxic and manufacturer's instructions should always be followed

### 9.3 Fuses

The control unit fuses are internal and should not need to be replaced. Please contact the Grant Instruments service department if the unit has a fuse fault.

The refrigeration unit has externally accessible fuses that can be changed by a qualified technician. Disconnect the unit from the power supply socket. For the 220-240V unit only, remove the IEC power plug from the rear of the unit. Press down the fuse drawer catch and pull out. Check fuses and if necessary replace. Push the fuse drawer back in until fully engaged and replace the IEC plug.

For the 110-120V unit, twist the fuse holder cap anticlockwise to release the fuse. Check fuse and if necessary replace. Refit the fuse in the unit and twist clockwise to secure. Repeat for the second fuse.

Replacement fuses must be 1.25" x 0.25" anti surge ceramic type with the rating defined in the following table:

R unit	Fuse rating
R2	15AT
R2L	5AT

### 9.4 Replacing the mains cord

Any replacement mains cords used for the control unit or refrigeration unit must meet the same specification as the one originally supplied to maintain the safety of the unit.

All mains cables (including the interconnect mains cable) must have the following markings; <HAR>, HO5VV-F 3Gx1mm<sup>2</sup> 90°C and be rated to carry 10A. The mains plug and IEC connector must carry approvals from a European certification body (e.g. BSI, VDE or equivalent).

The LTC2L (110-120V) control unit and refrigeration unit both have fixed mains cords which should not be replaced.

### 9.5 Routine safety tests

If routine tests are to be made, we recommend a test of the integrity of the protective earth conductor and an insulation test at 500V DC. Routine flash tests are not recommended for any electrical equipment, because repeated high voltage tests degrade insulation materials.

## 9.6 Service

If service is required, switch off the unit and contact Grant Instruments or your local representative for repairs.

Please note, all returned units must be accompanied by a Return Materials Authorisation (RMA) number, obtainable by contacting the Grant service department (details below).

Service Department  
Grant Instruments (Cambridge) Ltd  
Shepreth  
Cambridgeshire  
SG8 6GB  
UK

Tel: +44 (0) 1763 260 811  
Fax: +44 (0) 1763 262 410  
E-mail: [labservice@grantinstruments.com](mailto:labservice@grantinstruments.com)

## 10.0 Optional accessories

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### 10.1 Alternative pump

A pump comes as standard on the LTC2. If greater head (pressure) is required you can choose from two accessory pumps and the appropriate pump lid. Add L to pump part numbers for 120V (60Hz) versions. See the Grant website at [www.grantinstruments.com](http://www.grantinstruments.com) for full technical specifications.

Pump Product	Description
VTP1	Max head pressure: 1000mBar Max flow rate: 9 L/min
VTP2	Max head pressure: 1700mBar Max flow rate 12 L/min
17927	Pump lid for LTC2

A full listing of product accessories and options is available in the Grant Scientific Reference Catalogue (a copy of which is available upon request) and on the Grant website at [www.grantinstruments.com](http://www.grantinstruments.com).

## 11.0 Troubleshooting

Symptom	Possible cause	Action required
Display shows "Cut"	Over-temperature cut-out has operated	Check the set temperature is correct and that the over-temperature cut-out temperature is set at least 5°C above the set temperature. Refer to section 5.2.7 for setting instructions.  If the over-temperature cut-out temperature is correctly set but the unit still shows a "Cut" alarm then the unit has an internal fault and must be repaired before it is used again.
Temperature does not rise when expected	Set temp is lower than liquid temp  Set temperature is too close to ambient	Check that the bath set temperature is correct (see section 5.2.5).  Increase the set temperature (see section 5.2.5)
Temp continues to rise when not expected	Set temp is higher than liquid temp	Check that the bath set temperature is correct (see section 5.2.5).
Unit fails to cool	Compressor overheated causing internal over-temperature thermostat to operate	Wait for compressor to cool, when thermostat will reset and compressor will switch on again.
Alarm light on	Over-temperature cut-out has operated  Low liquid level float switch has operated	Check the over-temperature cut-out is set appropriately (see section 5.2.7).  Check that the liquid level in the bath is adequate.
Set temperature too restricted	Liquid type set does not allow required set point	Change to different liquid type (see section 5.3.5).
Display shows "Flot"	Liquid level has dropped below minimum level	Check that the liquid level in the bath is adequate.
Display shows "-Al-"	High temperature warning alarm has tripped	Check that the bath set temperature is correct (see section 5.2.3).  Check that high temperature alarm is correct (section 5.3.4).  Check that the liquid level in the bath is adequate (see section 6.3 for minimum fill levels).
Display shows "Er H"	Incorrect calibration value	The high temperature calibration point is less than 40°C above the low calibration point – choose a higher temperature (see section 5.2.10).

Display shows "Er L"	Incorrect calibration value	The low temperature calibration point is less than 40°C below the high calibration point – choose a lower temperature (see section 5.2.10).
Display shows "Er d"	Incorrect calibration value	The calibration value is greater than 10°C from the set point – check thermometer reading and set point (see section 5.2.10).
Display shows "Open"	Faulty temperature probe	Have a competent person check the probe for an open circuit fault or contact Grant.
Display shows "Shrt"	Faulty temperature probe	Have a competent person check the probe for a short circuit fault or contact Grant.
Unit showing erratic temperatures	Calibration values not set correctly	Restore the factory calibration settings (see section 5.2.11) then re-calibrate if required (see section 5.2.10).
Display shows "Hot"	Heating water at or near to boiling without lid  Heating very large volumes of liquid with large thermal losses	Add a lid to reduce thermal losses and leave unit running with the "Hot" warning present. If the alarm has not cleared within 1 hour contact Grant.  Add measures to reduce thermal losses and leave unit running with the "Hot" warning present. If the alarm has not cleared within 1 hour contact Grant.
Display shows "Fuse"	Faulty fuse(s)	Have a competent person check the internal fuses or contact Grant.
Display shows "Crct"	PCB fault	Have a competent person check the product or contact Grant.
Display shows "Self"	Safety relay fault	Have a competent person check the product or contact Grant.
Stirrer motor not rotating	Stirring propeller or pump impeller is obstructed  Faulty motor	Clear obstruction.  Have a competent person check the motor or contact Grant.
Display shows "Cold"	Accidentally entered manufacturer reset mode	Warning can be cleared by pressing <b>S</b> button, but note that all settings (including any factory calibration) will be reset to the default values. Contact Grant Instruments service department for assistance if required.

For any other errors or service requests, please contact Grant Instruments service department.



## 12.0 Contact Grant Instruments

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At Grant we are continuously trying to improve the performance we offer our customers. If you have any feedback on Grant's products or services we would like to hear from you. Please send all feedback to:

Quality Manager  
Grant Instruments (Cambridge) Ltd  
Shepreth  
Cambridgeshire  
SG8 6GB  
UK

Tel: +44 (0) 1763 260 811  
Fax: +44 (0) 1763 262 410  
E-mail: [feedback@grantinstruments.com](mailto:feedback@grantinstruments.com)

## 13.0 Compliance

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### WEEE directive

Grant Instruments complies fully with the Waste Electrical & Electronic Equipment (WEEE) regulations 2006. We are a member of the B2B compliance scheme (Scheme Approval Number WEE/MP3338PT/SCH), which handle our WEEE obligations on our behalf. Grant Instruments have been issued with a unique registration number by the Environmental Agency, this reference number is WEE/GA0048TZ.

For information regarding WEEE collections in the UK please contact our B2B Compliance Scheme directly on 01691 676 124.  
For other countries please contact your equipment supplier.

For General WEEE information please visit: [www.b2bcompliance.org.uk](http://www.b2bcompliance.org.uk)

### RoHS directive

All the products covered by this manual comply with the requirements of the RoHS Directive (Directive 2002/95/EC).

### Electrical safety and electromagnetic compatibility

All the products covered by this manual comply with the requirements of the Low Voltage Directive (2006/95/EC) for electrical safety and the EMC directive (2004/108/EC) for electromagnetic compatibility. See the Declaration of Conformity on the inside back page.

## Notes

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# Grant

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