

Part 4.0

Control Boxes

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Controlled Heatmate (CT-CB) Control Box

4.1

INSTALLATION:

The only control box to be used for the Edwards SV, GXC or LEX systems where they are connected to Heatmate Gas Heaters requiring a water temperature **below 45°C** is the Edwards CT-CB Controlled Heatmate Control Box.

This control box is designed to activate a pump which circulates water through a Heatmate burner. The CT-CB does have an over-temperature function. It is of the utmost importance that the CT-CB is installed correctly and that the operating and over-temperature sensing probes are fully inserted into the provided probe pocket.

CT-CB Specification:

	Min.	Typical	Max.	Units
Ambient Operating Temperature (air)	0	-	60	°C
Humidity at 40°C	-	-	95	%
Mains Supply Voltage	216	230	264	V _{RMS}
Mains Supply Frequency	50	or	60	Hz
NTC Thermister Resistance at 25°C	-	10	-	k _Ω
Pump Relay Output	-	-	10	A

Position of CT-CB:

Important: The CT-CB must **NOT** be mounted in an area where there is likely to be the presence of explosive gases. The CT-CB contains a relay which, by nature, can produce sufficient electrical arcing to ignite an explosive atmosphere.

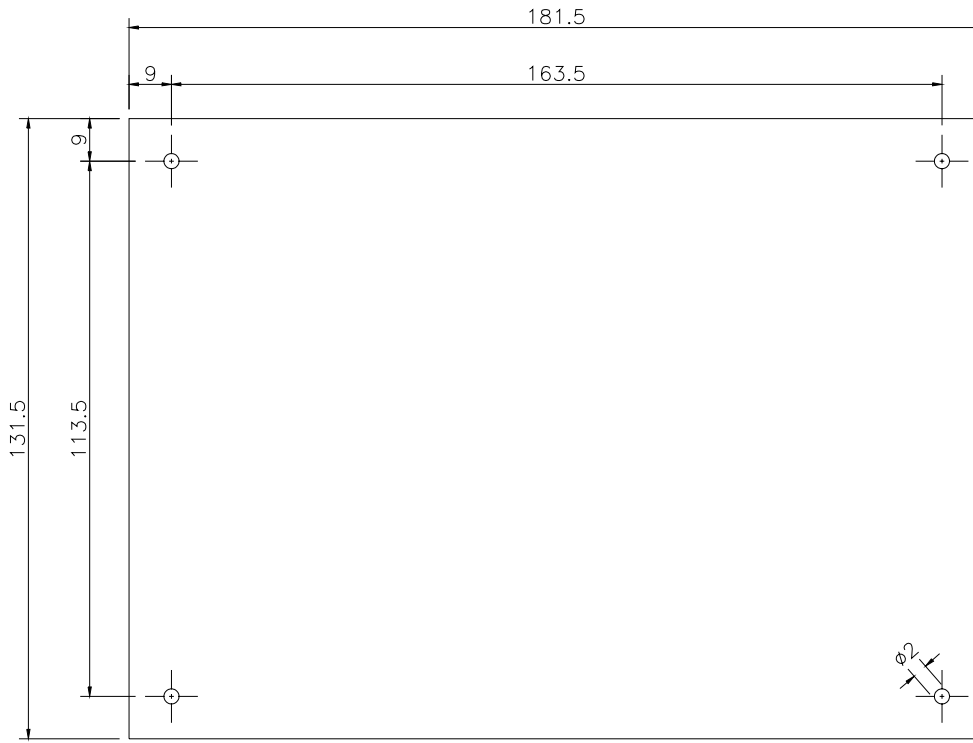
The CT-CB can be either mounted directly to the outer casing of the storage tank or mounted to a wall adjacent to the system, dependant on the installation layout. The CT-CB is intended for fixed installation only and needs to be properly mounted to either the casing or wall.

In manifolded installations where multiple control boxes are present, ensure that the any remote mounted control boxes are clearly marked to identify which unit it is controlling. This will aid trouble-shooting should the need arise.

When selecting a location for the control box, due care must be taken with regards to the location of and the lengths of the various leads on the CT-CB, as well as the position of the Heatmates.

The CT-CB is suitable for installation either indoors or outdoors. As the CT-CB is splash proof only (IP54) it should be installed in a suitably protected area.

For pre-drilling holes in casing/walls, a template may be made to the dimensions on the next page.



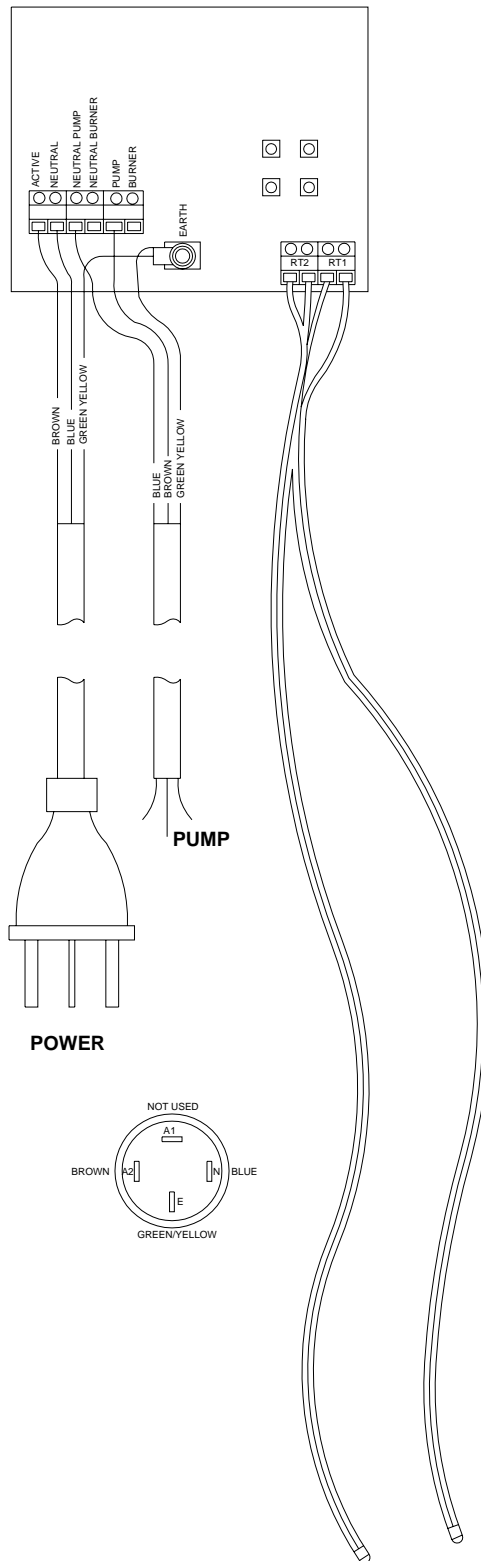
Pre-drilling Template

Electrical Connection:

The CT-CB comes with a standard 3 pin, 240V, 10A plug and lead for connection to a standard GPO.

Wiring Diagram:

CTCB HEATMATE CONTROL BOX



Temperature Probes:

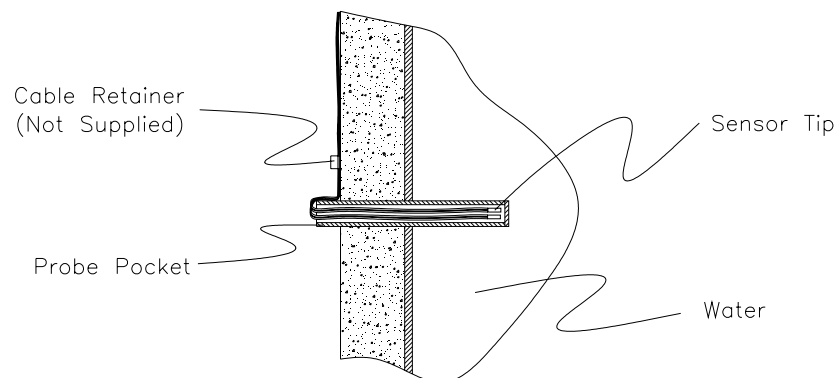
Important: The sensors provided with the CT-CB are designed for indirect contact with the heat source. Under no circumstances are they to be immersed in water or any other liquid or are they to be heated with an open flame. These circumstances will result in permanent damage to the sensor.

The CT-CB comes with two temperature probes. The operating probe is used to sense the temperature of the water in the cylinder and to activate the Heatmate during normal operation and the over-temperature probe senses an abnormally high temperature and shuts down the burner.

The temperature probe pocket is filled with “Thermo paste” to aid heat conduction to the probes.

Insert the temperature probes into the probe pocket of the storage cylinder until it reaches the base of the probe pocket, see below.

Once the temperature probes have been inserted, secure leads from the control box to prevent the probes as shown above from being accidentally removed.



OPERATION:

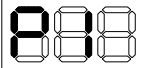
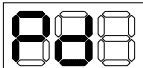

Important: the internals of the CT-CB contain live 240 volt components. These are shielded from accidental contact, which may occur during the adjustment of the control box settings. This shielding is not intended as a full electrical isolation barrier. When performing all other work, other than changing settings, the power to the control box must be turned off. Do not use any pointed metallic object to depress the buttons.

When initially turned on, the CT-CB performs a self check and defaults to “Information Mode”. When in this mode, it displays the tank temperature only and there is no adjustment of any parameters.

The CT-CB is operated via a menu based system that can only be initiated or altered after the removal of the front cover.

Once the cover has been removed, the four push buttons used to change parameters are visible below the digital display. Care must be taken when changing settings as this is performed when the CT-CB is operational.

To initiate changes to the parameters of the control box, press the “Mode” button once. The display will flash between the first available parameter and its setting at 5 second intervals. Any subsequent press of the “Mode” button will cycle the display to the next available parameter. See the following table below for abbreviations.

CTCB Parameters	
	Set Pump-on temperature
	Set Pump-off differential
set upper over temperature 	lockout when T>Burner off threshold + Diff Temp Mn. 2 Dft 10 Max. 10

To adjust a parameter, press the up or down button once per each increment required to change.

Once the desired setting has been achieved, press the “Set” button to store the value.

Note: if using multiple control boxes in a manifolded system, all CT-CB’s need to be adjusted equally.

Pump-on Temperature:

This is the temperature at which the CT-CB will activate the Heatmate and heat the water in the storage cylinder. The setting for this temperature should be 5-7°C below the required hot water operating temperature.

Pump-off Temperature:

The pump-off temperature is the differential setting for the Heatmate to turn off. That is the increase in the temperature that is being sought. This is typically set at 5-7°C.

Operating Temperature:

The Operating temperature is the sum of the “Pump-on” temperature and the “Pump-off” differential. This setting is not directly adjusted.

Over-Temperature:

The over-temperature can be adjusted to a maximum of 10deg.C above the operating temperature setting.

COMMISSIONING:

This page should be photocopied and used as a working sheet.

Commissioning the Edwards warm water system requires the use of a suitably calibrated digital type thermometer.

The following steps are set out to guide the installer through the correct procedure for setting up the system to operate within the temperature range that which has been set out by the client.

Commission the cylinder and heat source in accordance with the sections 3 & 5, respectively in the Edwards Commercial User Guide

Check and secure all leads from control box

Switch on mains power to the control box

Set "Pump On" temperature to to the required outlet temperature as specified by the client minus 5-7°C

Set "Pump Off" differential to 5-7°C

Set the over-temperature to a max. of 10deg.C above the operating temperature set-point

Allow cylinder(s) to heat up to the operating temperature setting ("Pump On" + "Pump Off")

Open the abluion outlet closest to the hot water system and after allowing the temperature to stabilise use a suitably calibrated digital thermometer to check the temperature of the stream of water at the outlet eg handbasin. It is important that the water temperature is measured and not the temperature of any mist or spray.

If required, adjust the "Pump On" temperature on the control box to attain the temperature specified by the client at the abluion outlet.

Check the outlet temperature of the abluion outlet fixture, eg handbasin, furthest away from the hot water heater and ensure that it is within a acceptable operating temperature.

Check the temperature of the abluion water at the respective abluion outlet fixtures when the system is operating at its minimum and maximum flowrate.

If "Pump On" temperature is altered, the commissioning process will need to be repeated.

Check the operation of the over-temperature function... then reset if functioning correctly.

Fill in details on the commissioning log sheet

Hand this Manual and the completed logsheet to client for inclusion in the operating and maintenance manual for the system.

Note: if using a manifolded system with multiple CT-CB, all will need to be adjusted equally at each relevant stage of commissioning. Temperatures are to be checked using a thermometer that is periodically checked against a thermometer which has been recently

checked for accuracy. The designer for the system and the suppliers of plant should be represented at the commissioning stages of the system.

Commissioning Log-sheet

This page should be photocopied prior to filling in. Completed copy to be handed to client for inclusion in Operating and Maintenance Manual for the system.

Date Installed: _____

Model: _____

Heat Source: _____

Serial Number: _____

Location: _____

"Pump On" Set-point: _____

"Pump Off" Set-point: _____

Operating temperature: _____

Temperature at Ablution Outlet 1 (Closest): _____

Temperature at Ablution Outlet 2 (Furthermost): _____

Signed: _____

For and on behalf of: _____

Print Name: _____

Date Commissioned: _____

Copy supplied to client for inclusion in Operating
and Maintenance Manual for the system

PROBLEM SOLVING:

This Section covers problems which may occur in the CT-CB. For problems associated with the water heater and/or heat source, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

No Warm/Hot Water

Possible Cause	Remedy
Thermostat set point has been changed.	Change the set point on the CT-CB as outlined in 'operation' in section 4 of this manual, and re-commission in accordance with section 5 of this manual.
The heat source is not connected or faulty	Check lead is firm. Check the heat source. Repair if faulty.
Power supply is turned off.	Turn on, check settings, re-commission if necessary

Water Is Too Hot

Possible Cause	Remedy
Thermostat tank sensor has come out or is faulty	Check the sensor is inserted into the pocket. Replace if faulty.
Thermostat set point has been changed	Change the set point on the CT-CB as outlined in 'operation' of section 4 of this manual, and re-commission in accordance with section 5 of this manual.

MAINTENANCE:

Maintenance instructions for the heater and heat source can be found in Sections 3 and 5 respectively of the Edwards Hot Water Commercial User Guide.

Controlled Heatmate Control Box (CT-CB):

Owner/client (Yearly):

- Check the physical condition of all leads
- Ensure all leads are firmly in position
- Clean external surface of box with non-corrosive cleaner. Do not hose down.
- Enquire of any complaints from end users, warm water too hot, too cool, etc.

Full Maintenance (Yearly):

The following work can only be performed by a suitably qualified person. It is recommended that the work be performed on a monthly basis or at intervals as required by the particular installation location.

Visual Inspection:

Turn off power and remove front cover of control box and inspect for any signs of water ingress. If there is any sign of water ingress into the box, rectify before proceeding.

Check electrical connections inside control box are tight and free of corrosion. If there are any signs of corrosion, and clean corrosion with a recognised electrical cleaner.

Inspect seal on cover and replace if damaged.

Refit cover on control box.

Performance Check:

The following checks must be performed during periods of little or no usage so that access to ablution outlets serviced by the system can be restricted to those performing these checks. When restricting access to the ablution outlets, follow the appropriate safety guidelines of the client.

Check that the water temperature at the ablution outlets, eg hand basin, is within the ranges set out in the commissioning instructions/log-sheet.

Record details in inspection report and supply to client.

RECOMMENDED SPARE PARTS:

Description	Stockcode
Temperature Sensor	6060146

WARRANTY:

A one year parts, labour, travel and freight warranty applies to the CT-CB. For warranty details on hot water heaters or heat sources, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

For general warranty terms and conditions refer to Section 1.3 of the Edwards Hot Water Commercial User Guide.

Hi-Temperature Heatmate (Hi-CB) Control Box

4.2

INSTALLATION:

The only control box to be used for the Edwards SV, GXC or LEX systems where they are connected to Heatmate Gas Heaters requiring a water temperature **above 45°C** is the Edwards Hi-CB Heatmate Control Box (Hi-CB Heatmate).

This control box is designed to activate a pump which circulates water through a Heatmate burner(s). The Hi-CB Heatmate does not have an over-temperature function as the Heatmate heater itself comes with an integral over-temperature cut-out. The control box is fitted with a Pump Run On Timer. It is of the utmost importance that the Hi-CB Heatmate is installed correctly and that the operating sensing probe is fully inserted into the provided probe pocket.

Usually, one Hi-CB Heatmate is required for each SV, GXC or LEX tank installed.

Hi-CB Heatmate Specification:

	Min.	Typical	Max.	Units
Ambient Operating Temperature (air)	0	-	60	°C
Humidity at 40°C	-	-	95	%
Mains Supply Voltage	216	230	264	V _{RMS}
Mains Supply Frequency	50 or 60			Hz
NTC Thermister Resistance at 25°C	-	10	-	k _Ω
Pump Relay Output	-	-	10	A

Position of HI-CB HEATMATE:

Important: The HI-CB HEATMATE must **NOT** be mounted in an area where there is likely to be the presence of explosive gases. The HI-CB HEATMATE contains a relay which, by nature, can produce sufficient electrical arcing to ignite an explosive atmosphere.

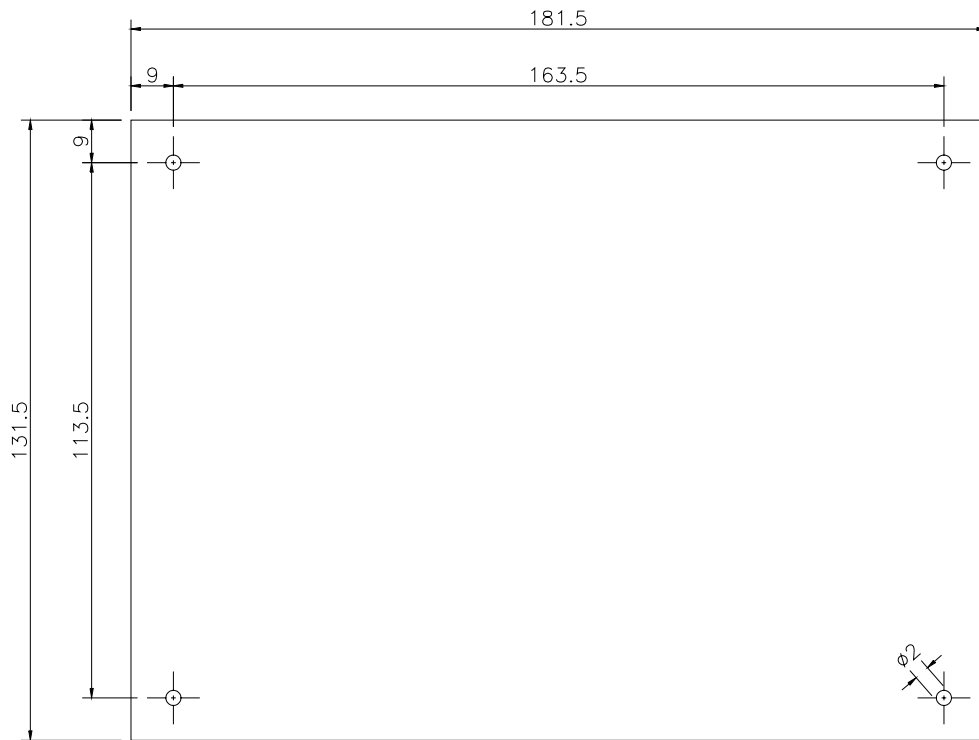
The HI-CB HEATMATE can be either mounted directly to the outer casing of the storage tank or mounted to a wall adjacent to the system, dependant on the installation layout. The HI-CB HEATMATE is intended for fixed installation only and needs to be properly mounted to either the casing or wall.

In manifolded installations where multiple control boxes are present, ensure that the any remote mounted control boxes are clearly marked to identify which unit it is controlling. This will aid trouble-shooting should the need arise.

When selecting a location for the control box, due care must be taken with regards to the location of and the lengths of the various leads on the HI-CB HEATMATE, as well as the position of the pump(s).

The HI-CB HEATMATE is suitable for installation either indoors or outdoors. As the HI-CB HEATMATE is splashproof only (IP54) it should be installed in a suitably protected area.

For pre-drilling holes in casing/walls, a template may be made to the dimensions on the next page.



Pre-drilling Template

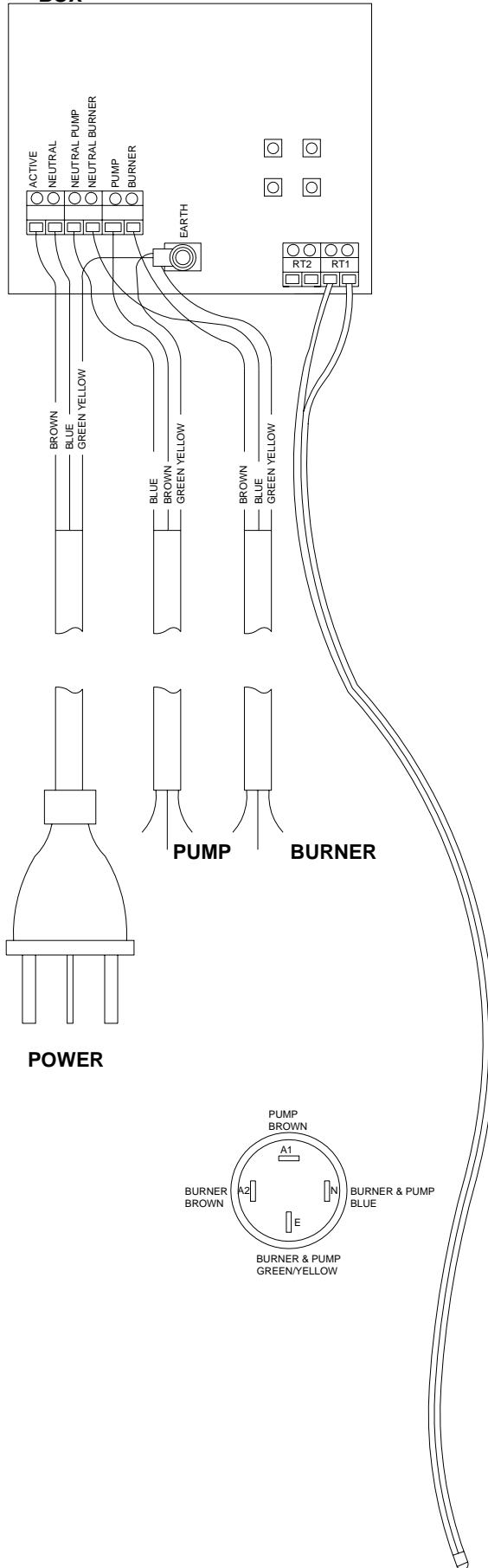
Electrical Connection:

The HI-CB HEATMATE comes with a standard 3 pin, 240V, 10A plug and lead for connection to a standard GPO.

The 3 pin plug must not be made active unless the “flying lead” is either connected to the heat source or has been suitably insulated to protect against accidental electric shock or short circuit.

Wiring Diagram:

HIGH TEMPERATURE HEATMATE HI-CB CONTROL BOX



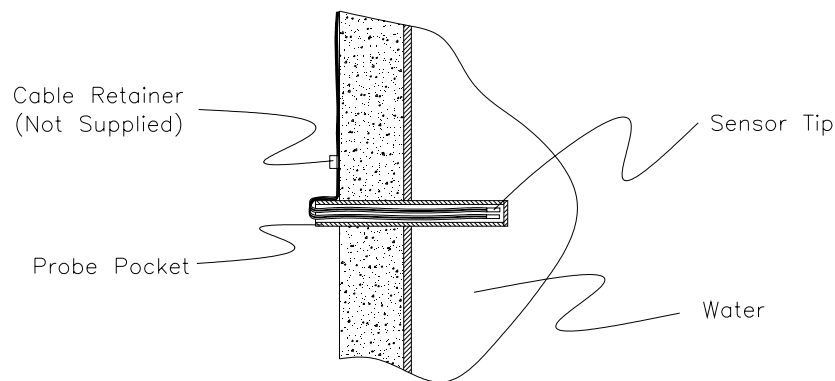
Temperature Probes:

Important: The sensor provided with the HI-CB HEATMATE is designed for indirect contact with the heat source. Under no circumstances is it to be immersed in water or any other liquid or are they to be heated with an open flame. These circumstances will result in permanent damage to the sensor.

The HI-CB HEATMATE comes with one temperature probe. The operating probe is used to sense the temperature of the water in the cylinder and to activate the Heatmate during normal operation.

The operating temperature probe pocket on the LEX & GXC is filled with “Thermopaste” to aid heat conduction to the probe.

Insert the temperature probe into the probe pocket of the storage cylinder until it reaches the base of the probe pocket, see below.



Once the temperature probe has been inserted, secure leads from the control box to prevent the probe as shown above from being accidentally removed.

OPERATION:

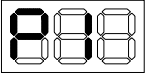
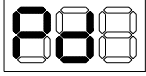
Important: the internals of the HI-CB HEATMATE contain live 240 volt components. These are shielded from accidental contact which may occur during the adjustment of the control box settings. This shielding is not intended as a full electrical isolation barrier. When performing all other work, other than changing settings, the power to the control box must be turned off. Do not use any pointed metallic object to depress the buttons.

When initially turned on, the HI-CB HEATMATE performs a self check and defaults to “Information Mode”. When in this mode, it displays the tank temperature only and there is no adjustment of any parameters.

The HI-CB HEATMATE is operated via a menu based system that can only be initiated or altered after the removal of the front cover.

Once the cover has been removed, the four push buttons used to change parameters are visible below the digital display. Care must be taken when changing settings as this is performed when the HI-CB HEATMATE is operational.

To initiate changes to the parameters of the control box, press the “Mode” button once. The display will flash between the first available parameter and its setting at 5 second intervals. Any subsequent press of the “Mode” button will cycle the display to the next available parameter. See the following table below for abbreviations.

HiCB Parameters	
	Set Pump-on temperature
	Set Pump-off differential

To adjust a parameter, press the up or down button once per each increment required to change.

Once the desired setting has been achieved, press the “Set” button to store the value.

Note: if using multiple control boxes in a manifolded system, all HI-CB HEATMATE’s need to be adjusted equally.

Pump-on Temperature:

This is the temperature at which the HI-CB HEATMATE will activate the Heatmate and heat the water in the storage cylinder. The setting for this temperature should be 5-7°C below the required hot water operating temperature.

Pump-off Temperature:

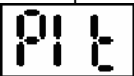
The pump-off temperature is the differential setting for the Heatmate to turn off. That is the increase in the temperature that is being sought. This is typically set at 5-7°C.

Operating Temperature:

The Operating temperature is the sum of the “Pump-on” temperature and the “Pump-off” differential. This setting is not directly adjusted.

Pump Run On Timer:

A ‘pump run on’ timer is fitted. The timer is designed to keep the Heatmate pump running after the burner has shut down in order to keep the water temperature from getting too high. The time is factory set to four minutes. This ‘pump run on’ timer is adjusted via the user interface titled ‘P1t’ between the limits in one minute increments.

	Start timer +pump when burner goes OFF		
	Min	Dflt	Max
	0	4	5

When the 'pump run on' timer is active (ie pump output enabled), the unit shall override the requirement to disable the pump when the thermistor temperature exceeds the pump OFF temperature threshold.

COMMISSIONING:

This page should be photocopied and used as a working sheet.

Commissioning the Edwards warm water system requires the use of a suitably calibrated digital type thermometer.

The following steps are set out to guide the installer through the correct procedure for setting up the system to operate within the temperature range that which has been set out by the client.

- Check and secure all leads from control box
- Switch on mains power to the control box
- Set "Pump On" temperature to the required outlet temperature as specified by the client minus 5-7°C
- Set "Pump Off" differential to 5-7°C. Set pump 'run on' timer for 4 minutes (factory set)
- Allow cylinder(s) to heat up to the operating temperature setting ("Pump On" + "Pump Off"). Ensure pump 'run on' operates for the preset period of time
- Open the ablation outlet closest to the hot water system and after allowing the temperature to stabilise use a suitably calibrated digital thermometer to check the temperature of the stream of water at the outlet eg handbasin. It is important that the water temperature is measured and not the temperature of any mist or spray.
- If required, adjust the "Pump On" temperature on the control box to attain the temperature specified by the client at the ablation outlet.
- Check the outlet temperature of the ablation outlet fixture, eg handbasin, furthest away from the hot water heater and ensure that it is within a acceptable operating temperature.
- Check the temperature of the ablation water at the respective ablation outlet fixtures when the system is operating at its minimum and maximum flowrate.
- If "Pump On" temperature is altered, the commissioning process will need to be repeated.
- Fill in details on the commissioning log sheet
- Hand this Manual and the completed logsheet to client for inclusion in the operating and maintenance manual for the system.

Note: if using a manifolded system with multiple HI-CB HEATMATE's, all HI-CB HEATMATE's will need to be adjusted equally at each relevant stage of commissioning.

Temperatures are to be checked using a thermometer that is periodically checked against a thermometer which has been recently checked for accuracy.

The designer for the system and the suppliers of plant should be represented at the commissioning stages of the system.

Commissioning Log-sheet

This page should be photocopied prior to filling in. Completed copy to be handed to client for inclusion in Operating and Maintenance Manual for the system.

Date Installed: _____

Model: _____

Heat Source: _____

Serial Number: _____

Location: _____

"Pump On" Set-point: _____

"Pump Off" Set-point: _____

Operating temperature: _____

Temperature at Ablution Outlet 1 (Closest): _____

Temperature at Ablution Outlet 2 (Furthermost): _____

Signed: _____

For and on behalf of: _____

Print Name: _____

Date Commissioned: _____

Copy supplied to client for inclusion in Operating and Maintenance Manual for the system _____

PROBLEM SOLVING:

This Section covers problems which may occur in the HI-CB HEATMATE. For problems associated with the water heater and/or heat source, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

No Warm/Hot Water

Possible Cause	Remedy
Thermostat set point has been changed.	Change the set point on the HI-CB HEATMATE as outlined in section 4.1 of this manual, and re-commission in accordance with section 5 of this manual.
The heat source is not connected or faulty	Check lead is firm. Check the heat source. Repair if faulty.
Power supply is turned off.	Turn on, check settings, re-commission if necessary

Water Is Too Hot

Possible Cause	<u>Remedy</u>
Thermostat tank sensor has come out or is faulty	Check the sensor is inserted into the pocket. Replace if faulty.
Thermostat set point has been changed	Change the set point on the HI-CB HEATMATE as outlined in section 4.1 of this manual, and re-commission in accordance with section 5 of this manual.

MAINTENANCE:

Maintenance instructions for the heater and heat source can be found in Sections 3 and 5 respectively of the Edwards Hot Water Commercial User Guide.

High Temperature Control Box (HI-CB HEATMATE):

Owner/client (Yearly):

- Check the physical condition of all leads
- Ensure all leads are firmly in position
- Clean external surface of box with non-corrosive cleaner. Do not hose down.
- Enquire of any complaints from end users, warm water too hot, too cool, etc.

Full Maintenance (Yearly):

The following work can only be performed by a suitably qualified person. It is recommended that the work be performed on a monthly basis or at intervals as required by the particular installation location.

Visual Inspection:

Turn off power to box and remove front cover of control box and inspect for any signs of water ingress. If there is any sign of water ingress into the box, rectify before proceeding.

Check electrical connections inside control box are tight and free of corrosion. If there are any signs of corrosion, and clean corrosion with a recognised electrical cleaner.

Inspect seal on cover and replace if damaged.

Refit cover on control box.

Performance Check:

The following checks must be performed during a period of little or no usage so that access to ablution outlets serviced by the system can be restricted to those performing these checks. When restricting access to the ablution outlets, follow the appropriate safety guidelines of the client.

Check that the water temperature at the ablution outlets, eg hand basin, is within the ranges set out in the commissioning instructions/log-sheet.

Record details in inspection report and supply to client.

RECOMMENDED SPARE PARTS:

Description	Stockcode
Temperature Sensor	6060146

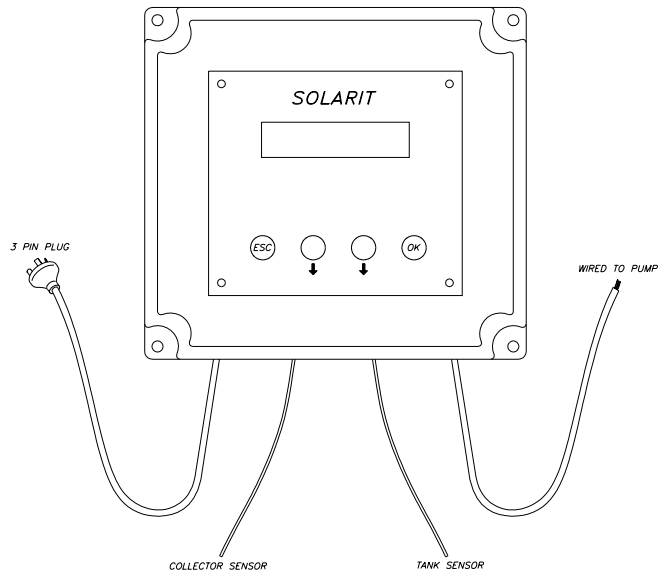
WARRANTY:

A one year parts, labour, travel and freight warranty applies to the HI-CB HEATMATE. For warranty details on hot water heaters or heat sources, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

For general warranty terms and conditions refer to Section 1.3 of the Edwards Hot Water Commercial User Guide.

Installation Details

Layout of Control Box – fig. 1



Description

The Solar Control Box is a model S96 made by Solarit. It controls the solar circulation pump by measuring the temperature difference between the storage tank and the solar panels. It has adjustable temperature settings. When the water in the solar panels is 7°C higher than the tank it turns the pump on until the temperature differential is 2°C and then it turns the pump off. If the collector temperature approaches freezing (3°C) it turns the pump on until the temperature is 7°C. And finally, if the collector water temperature exceeds 86°C it will turn the pump on until it reduces to 84°C.

Positioning the Control Box

Select a position that is easiest for the installation and can be accessed when needed. It can be positioned either directly on the storage tank or on a wall using the 4 mounting holes visible in all four corners when the cover is removed.

Sensor Cable

The sensor cable should be low voltage (less than 20Volt). 4 way security cable or similar is recommended. The cross section of the conductor should be larger than 0.8mm diameter and should not be run close to a mains electricity cable.

Connection To The Storage Tank

The bottom tank sensor needs to be fitted into the pocket provided on the storage tank (refer to fig. 1 of the appropriate storage tank in part 3.0 for its location).

The tank sensor cable is wired into the solar controller (entry from the bottom). The "Tank – Sensor Up" is not used.

Clip the cable as required.

Connection To The Solar Collectors

The solar collector sensor needs to be fitted into the sensor pocket fitting on last collector on the 'hot' side of the bank of panels (see section 5.3 for details).

The collector sensor cable is wired into the solar controller (entry from the bottom).

Clip the cable as required.

Electrical & Pump Connection

Refer to the wiring diagram supplied with box. You do not use the 'Heater Contact In' or 'Heater Contact Out' terminals as Edwards heat sources (boosts) are independently controlled by their own thermostats.

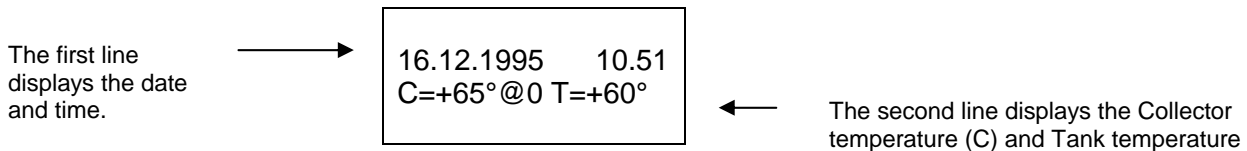
Operation & Commissioning

The controller has 2 display modes;

- Information Mode
- Dialogue Mode

Information Mode

Normally the controller is in information mode and shows a display like the following;



Dialogue Mode

The dialogue mode allows you to change the pre-set operation settings. All modifications of pre-set values are done using the push buttons on the front of the controller:

ESC	Used to abort a function.
OK	Confirms or activates a function.
UP	Selects different options from a menu or adjust a value.
DOWN	Selects different options from a menu or adjust a value.

If you want to change the settings simply press either UP or DOWN and you will have one of the following options;

SET TIME	This function allows you to adjust the time of the real time clock. When 'set time' appears press OK. When 'set minutes' appears, use UP/DOWN to adjust minutes & press OK. Do the same for 'set hours'.
SET DATE	This allows you to change the date. When 'set date' appears press OK. When 'set day' appears, use UP/DOWN to adjust the day & press OK. Do the same for 'set month' & 'set year'.
SET TEMP.	This menu is not to be modified, as it is preset to allow Edwards to use a separately controlled booster (if fitted to the tank).
SET PUMP	This allows you to adjust the temperature settings that operate the circulating pump. When 'Set pump' appears press OK. Then 'set lower appears', use the UP/DOWN keys to adjust – values are in °C. Typical value used is 03. Press OK to enter setting. When 'set upper' appears, use the UP/DOWN keys to adjust to between 06 – 09 and press OK. The next value is the frost threshold. If the area is not prone to frost set it at 0. In all other cases set it at 03.

Finally, the 'over-temperature' value should be entered – typically 86.

Completion Checklist

Adjust the temperatures for the application. See the above instructions.

Check that all leads are connected to the tank & solar.

Maintenance

Owner

- Check all leads are firmly in position.
- Clean the box if dirty – do not hose.

Full Maintenance

This can only be performed by a qualified trades-person.

Visual Inspection

- Inspect the box for any leaks or weeps.
- Check that all connections are tight and not corroded.

Performance Check

- Check that the values are correctly set for the conditions.

Spare Parts

Description	Type / Model	Stock Code
Sensor	Solarit	6060035
Cable	4 way security cable 0.8mm min. diameter	-

Problem Solving

No Solar Contribution on Good Days	
Possible Cause	Remedy
Thermostat set point has been changed.	Change the set point on the digital controller by depressing the SET button and using the ↑↓ keys to adjust. If you have readings of “-20C” then the sensor is interrupted. If you have “99C” appear, it indicates that there is a short circuit in the sensor.
The sensors are not connected or faulty.	Check that sensors are in place correctly. Use a multimeter to measure the resistance between the terminals of the sensor cable in the controller. Resistance values should be; 0°C = 8780 ohm 10°C = 5360 ohm 20°C = 3370 ohm 30°C = 2180 ohm 40°C = 1440 ohm 50°C = 974 ohm 60°C = 672 ohm 70°C = 473 ohm 80°C = 340 ohm 90°C = 247 ohm Replace sensor if faulty.
Power supply is turned off.	Turn on.
Pump is faulty.	Check the pump for operation and replace if necessary.
Air lock in solar circuit.	Ensure that air eliminator valves located at the highest point of the solar panels are not blocked or faulty.

Warranty

Item	Coverage
Components	1 year
Labour, Travel & Freight	1 year

Refer to General Warranty terms & Conditions (Part 1.3) for greater details.

INSTALLATION:

The only control box to be used for the Edwards HEV systems is the Edwards HEV Control Box.

This control box is designed to activate a burner. The HEV also has an over-temperature function which is designed to prevent unsafe conditions from occurring. It is of the utmost importance that the HEV is installed correctly and that both the operating and over-temperature sensing probes are fully inserted into the provided probe pocket.

One HEV Control Box is required for each HEV tank installed.

HEV Control Box Specification:

	Min.	Typical	Max.	Units
Ambient Operating Temperature (air)	0	-	60	°C
Humidity at 40°C	-	-	95	%
Mains Supply Voltage	216	230	264	V _{RMS}
Mains Supply Frequency	50 or 60			Hz
NTC Thermister Resistance at 25°C	-	10	-	kΩ
Burner Relay Output	-	-	10	A

Position of HEV Control Box:

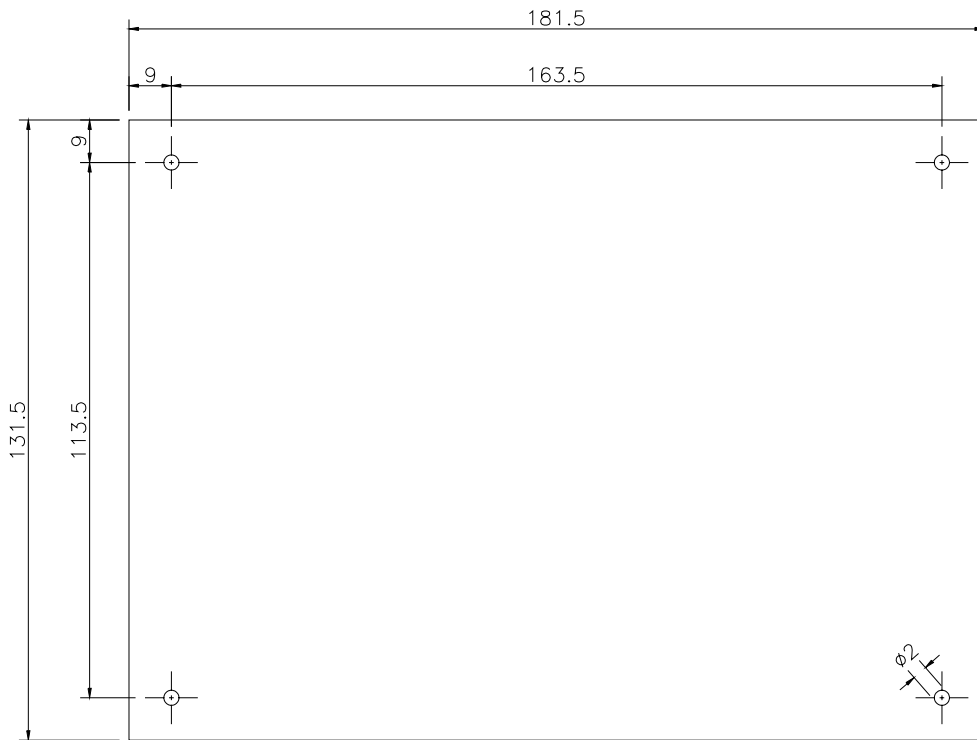
Important: The HEV Control Box must **NOT** be mounted in an area where there is likely to be the presence of explosive gases. The HEV Control Box contains a relay which, by nature, can produce sufficient electrical arcing to ignite an explosive atmosphere.

The HEV Control Box can be either mounted directly to the outer casing of the storage tank or mounted to a wall adjacent to the system, dependant on the installation layout. The HEV Control Box is intended for fixed installation only and needs to be properly mounted to either the casing or wall.

In manifolded installations where multiple control boxes are present, ensure that the any remote mounted control boxes are clearly marked to identify which unit it is controlling. This will aid trouble-shooting should the need arise.

When selecting a location for the control box, due care must be taken with regards to the location of and the lengths of the various leads on the HEV Control Box, as well as the position of the burner(s).

The HEV Control Box is splashproof only (IP54) it should be installed in a suitably protected area. For pre-drilling holes in casing/walls, a template may be made to the dimensions on the next page.

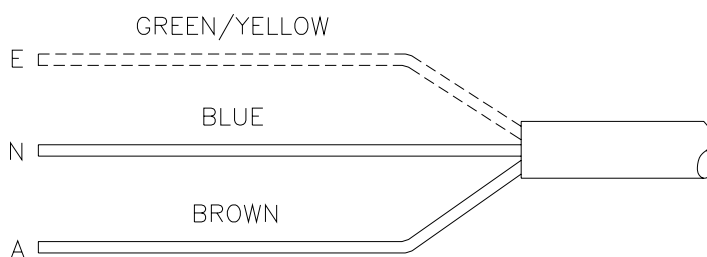


Connection to Burner:

The following work is only to be performed by suitably qualified persons.

The HEV Control Box is supplied with a 1.5m long, 3 core flex cable that shall be hard wired to the burner. The maximum power that can be drawn through the HEV is 240V, 10A at 50Hz.

The “flying lead” shall be connected to the burner as shown below;



Once the lead is hard wired to the burner, it should be secured to prevent accidental damage.

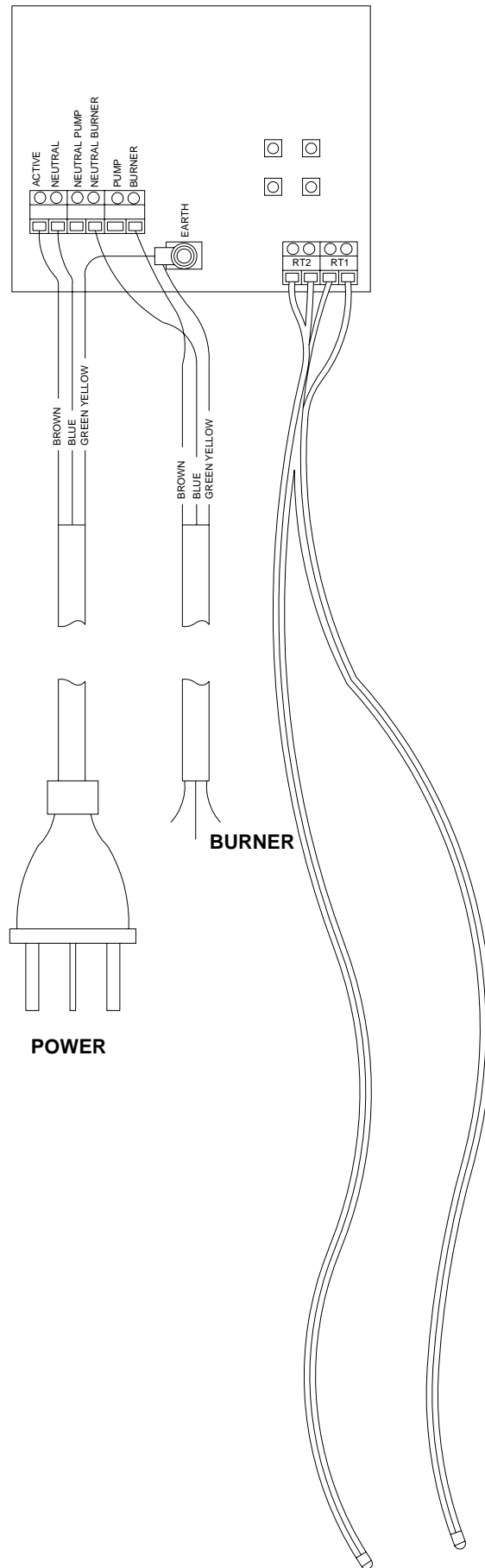
Electrical Connection:

The HEV Control Box comes with a standard 3 pin, 240V, 10A plug and lead for connection to a standard GPO.

The 3 pin plug must not be made active unless the “flying lead” is either connected to the heat source or has been suitably insulated to protect against accidental electric shock or short circuit.

Wiring Diagram:

HEV CONTROL BOX



Temperature Probes:

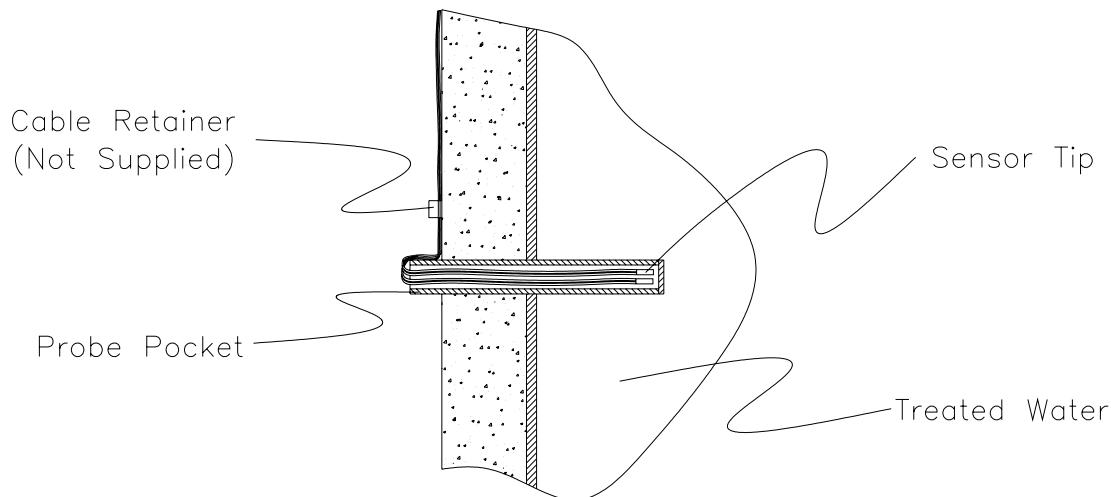
Important: The sensors provided with the HEV Control Box are designed for indirect contact with the heat source. Under no circumstances are they to be immersed in water or any other liquid or are they to be heated with an open flame. These circumstances will result in permanent damage to the sensor.

The HEV Control Box comes with two temperature probes. The operating probe is used to sense the temperature of the treated water in the cylinder and to activate the burner during normal operation.

The over-temperature probe is used as a safety back-up to the operating probe, should an un-safe situation arise. It is imperative that both probes are inserted into the probe pocket on the storage cylinder. These probes are both labelled to aid identification.

The probe pocket is filled with “Thermopaste” to aid heat conduction to the probes.

Insert both temperature probes into the probe pocket of the storage cylinder until they reach the base of the probe pocket, see below.



Once the temperature probes have been inserted, secure leads from the control box to prevent the probes as shown above from being accidentally removed.

OPERATION:



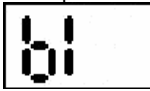





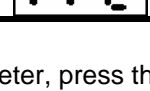
Important: the internals of the HEV Control Box contain live 240 volt components. These are shielded from accidental contact which may occur during the adjustment of the control box settings. This shielding is not intended as a full electrical isolation barrier. When performing all other work, other than changing settings, the power to the control box must be turned off. Do not use any pointed metallic object to depress the buttons.

When initially turned on, the HEV Control Box performs a self check and defaults to “Information Mode”. When in this mode, it displays the tank temperature only and there is no adjustment of any parameters.

The HEV is operated via a menu based system that can only be initiated or altered after the removal of the front cover.

Once the cover has been removed, the four push buttons used to change parameters are visible below the digital display. Care must be taken when changing settings as this is performed when the HEV is operational.

To initiate changes to the parameters of the control box, press the “Mode” button once. The display will flash between the first available parameter and its setting at 5 second intervals. Any subsequent press of the “Mode” button will cycle the display to the next available parameter. See table below for abbreviations.

HEV							
Set Burner ON Temperature 	No requirement						
Set Burner OFF Differential Temperature 	No requirement						
Set Burner ON Temperature 	Burner ON when $T \leq$ threshold <table border="1" data-bbox="705 904 874 963"> <tr> <th>Min</th> <th>Dflt</th> <th>Max</th> </tr> <tr> <td>40</td> <td>60</td> <td>85</td> </tr> </table>	Min	Dflt	Max	40	60	85
Min	Dflt	Max					
40	60	85					
Set Burner OFF Differential Temperature 	Burner OFF when $T \geq$ Burner ON threshold + Diff Temp <table border="1" data-bbox="705 1084 874 1142"> <tr> <th>Min</th> <th>Dflt</th> <th>Max</th> </tr> <tr> <td>1</td> <td>3</td> <td>5</td> </tr> </table>	Min	Dflt	Max	1	3	5
Min	Dflt	Max					
1	3	5					
Set Upper Over Temperature 	Lockout when $T \geq$ Burner OFF threshold + Diff Temp <table border="1" data-bbox="705 1240 874 1299"> <tr> <th>Min</th> <th>Dflt</th> <th>Max</th> </tr> <tr> <td>2</td> <td>10</td> <td>10</td> </tr> </table>	Min	Dflt	Max	2	10	10
Min	Dflt	Max					
2	10	10					
Set Lower Over Temperature 	No requirement						
Set Anti Freeze ON Temperature 	No requirement						
Set Anti Freeze OFF Temperature 	No requirement						
Set Burner ON Time 	No requirement						

To adjust a parameter, press the up or down button once per each increment required to change.

Once the desired setting has been achieved, press the “Set” button to store the value.

Note: if using multiple control boxes in a manifolded system, all HEV’s need to be adjusted equally.

Burner-on Temperature:

This is the temperature at which the HEV will activate the burner and heat the water in the storage cylinder. The setting for this temperature should be 5-7°C below the required hot water operating temperature.

Burner-off Temperature:

The burner-off temperature is the differential setting for the burner to turn off. That is the increase in the temperature that is being sought. This is typically set at 5-7°C.

Operating Temperature:

The Operating temperature is the sum of the “Burner-on” temperature and the “Burner-off” differential. This setting is not directly adjusted.

Over-temperature Lockout:

The over-temperature lockout is the differential between the operating temperature and the emergency cut-out which shuts down the burner and prevents any additional heat from being added to the storage cylinder.

The HEV will go into over-temperature lock-out in the event that either the operating sensor or over-temperature sensor detects a temperature that is equal to or above the Over-temperature Lock-out setting.

Once activated the Over-temperature Lockout will stop all operation of the burner, which in turn stops any further heat from the heat source being added. It also de-activates all thermostatic and menu operations until it has been manually re-set. It will not stop the flow of water through the heat exchanger. The over-temperature lock-out cannot be reset until the temperature in the cylinder has dropped to a safe level.

Manual Reset:

In the event that the HEV goes to Over-temperature Lockout, the HEV will require manual resetting. The display on the HEV will show “Err”.

Before resetting the HEV, the cause of the over-temperature lock-out should be investigated. Refer to the troubleshooting section later in this Manual for possible cause's. If there is no obvious fault, the HEV can be reset and the system further investigated for faults.

Any faults located must be repaired before the system is re-commissioned.

To reset the Over-temperature Lockout, remove the front cover and depress all four control button's (Mode, Up, Down, Set) simultaneously for two seconds. Care must be taken to avoid contact with electrical components which may result in accidental electric shock. Do not use a metallic object to depress any of the buttons.

COMMISSIONING:

This page should be photocopied and used as a working sheet.

Commissioning the Edwards hot water system requires the use of a suitably calibrated digital type thermometer.

- If required, adjust the "Burner On" temperature on the control box to attain the temperature specified by the client at the abluion outlet.
- Check the outlet temperature of the abluion outlet fixture, eg handbasin, furthest away from the hot water heater and ensure that it is operating at its specified setting.
- Check the temperature of the abluion water at the respective abluion outlet fixtures when the system is operating at its minimum and maximum flowrate.
- Check the operation of the over-temperature lockout by removing the operating temperature probe from the probe pocket. Allow the systems to run until it goes into over-temperature lockout. Maintain a watch on the abluion outlet temperature closest to the unit and ensure that it does not exceed over-teperature set point. If the temperature exceeds set point, reduce either the "Burner On" temperature or the "Burner Off" differential.
- If "Burner On" temperature is altered, the commissioning process will need to be repeated.
- Fill in details on the commissioning log sheet
- Hand this Manual and the completed logsheet to client for inclusion in the operating and maintenance manual for the system.

Note: if using a manifolded system with multiple HEV's, all HEV's will need to be adjusted equally at each relevant stage of commissioning.

Temperatures are to be checked using a thermometer that is periodically checked against a thermometer which has been recently checked for accuracy.

The designer for the system and the suppliers of plant should be represented at the commissioning stages of the system.

Commissioning Log-sheet

This page should be photocopied prior to filling in. Completed copy to be handed to client for inclusion in Operating and Maintenance Manual for the system.

Date Installed: _____

Model: _____

Heat Source: _____

Serial Number: _____

Location: _____

"Burner On" Set-point: _____

"burner Off" Set-point: _____

Operating temperature: _____

Temperature at Ablution Outlet 1 (Closest): _____

Temperature at Ablution Outlet 2 (Furthermost): _____

Signed: _____

For and on behalf of: _____

Print Name: _____

Date Commissioned: _____

Copy supplied to client for inclusion in Operating and Maintenance Manual for the system _____

PROBLEM SOLVING:

This Section covers problems which may occur in the HEV. For problems associated with the hot water heater and/or heat source, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

No Hot Water

Possible Cause	Remedy
Manual Reset on over-temperature thermostat has activated.	Reset the HEV as outlined in section 4 of this manual.
Thermostat set point has been changed.	Change the set point on the HEV as outlined in section 4 of this manual, and re-commission in accordance with section 5 of this manual.
The heat source is not connected or faulty	Check lead is firm. Check the heat source. Repair if faulty.
Power supply is turned off.	Turn on, check settings, re-commission if necessary

Water Is Too Hot

Possible Cause	<u>Remedy</u>
Thermostat tank sensor has come out or is faulty	Check the sensor is inserted into the pocket. Replace if faulty.
Thermostat set point has been changed	Change the set point on the HEV as outlined in section 4 of this manual, and re-commission in accordance with section 5 of this manual.

MAINTENANCE:

Maintenance instructions for the heater and heat source can be found in Sections 3 and 5 respectively of the Edwards Hot Water Commercial User Guide.

Control Temperature Control Box (HEV):

Owner/client (Monthly):

Check the physical condition of all leads

Ensure all leads are firmly in position

Clean external surface of box with non-corrosive cleaner. Do not hose down.

Enquire of any complaints from end users, warm water too hot, too cool, etc.

Full Maintenance (Monthly):

The following work can only be performed by a suitably qualified person. It is recommended that the work be performed on a monthly basis or at intervals as required by the particular installation location.

Visual Inspection:

Turn off the power supply and remove front cover of control box and inspect for any signs of water ingress. Rectify any sign of water ingress into the box before proceeding.

Check electrical connections inside control box are tight and free of corrosion. If there are any signs of corrosion, turn off power to box and clean corrosion with a recognised electrical cleaner.

Inspect seal on cover and replace if damaged. Refit cover on control box.

Performance Check:

The following checks must be performed during a period of little or no usage so that access to ablution outlets serviced by the system can be restricted to those performing these checks. When restricting access to the ablution outlets, follow the appropriate safety guidelines of the client.

Check that the water temperature at the ablution outlets, eg handbasin, is within the ranges set out in the commissioning instructions/log-sheet.

Remove the operating sensor from the temperature probe pocket to test for over-temperature lock-out. Temperature at ablution outlet, during lock-out should not exceed the over-temperature temperature setting. In the event that the over-temperature lock-out engages, the HEV will need to be re-commissioned.

After checking for over-temperature lock-out, ensure that the operating temperature sensor is re-fitted to the temperature probe pocket.

Re-check the temperature of the water at an ablution outlet fixture.

Record details in inspection report and supply to client.

3 yearly:

At an interval not exceeding 3 years, in addition to any routine maintenance, both the operating and over-temperature sensors must be replaced.

EMERGENCY DECONTAMINATION:

Should the need arise, the control box can be adjusted to provide hot water for the purpose of Emergency De-contamination.

Important: After Emergency De-contamination the system **must** be re-commissioned. Failure to do so will result in a condition that may lead to the personal injury of the end user. Edwards Hot Water will not take any responsibility should this situation arise.

RECOMMENDED SPARE PARTS:

Description	Stockcode
Temperature Sensor	6060146

WARRANTY:

A one year parts, labour, travel and freight warranty applies to the HEV. For warranty details on warm water heaters or heat sources, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

For general warranty terms and conditions refer to Section 1.3 of the Edwards Hot Water Commercial User Guide.

Pump/Comfort Control Box

4.5

INSTALLATION:

This control box is designed to activate a pump which passes water through a remote heat source. The Pump/Comfort Temp control box does not have an over-temperature function as the Comfort itself comes with an integral over-temperature cut-out. It is of the utmost importance that the control box is installed correctly and that the operating sensing probe is fully inserted into the provided probe pocket.

Usually, one Pump/Comfort is required for each SV, GXC or LEX tank installed.

Pump/Comfort Specification:

	Min.	Typical	Max.	Units
Ambient Operating Temperature (air)	0	-	60	°C
Humidity at 40°C	-	-	95	%
Mains Supply Voltage	216	230	264	V _{RMS}
Mains Supply Frequency	50	or	60	Hz
NTC Thermister Resistance at 25°C	-	10	-	k Ω
Pump Relay Output	-	-	10	A

Position of Control Box:

Important: The control box must **NOT** be mounted in an area where there is likely to be the presence of explosive gases. The Pump/Comfort box contains a relay which, by nature, can produce sufficient electrical arcing to ignite an explosive atmosphere.

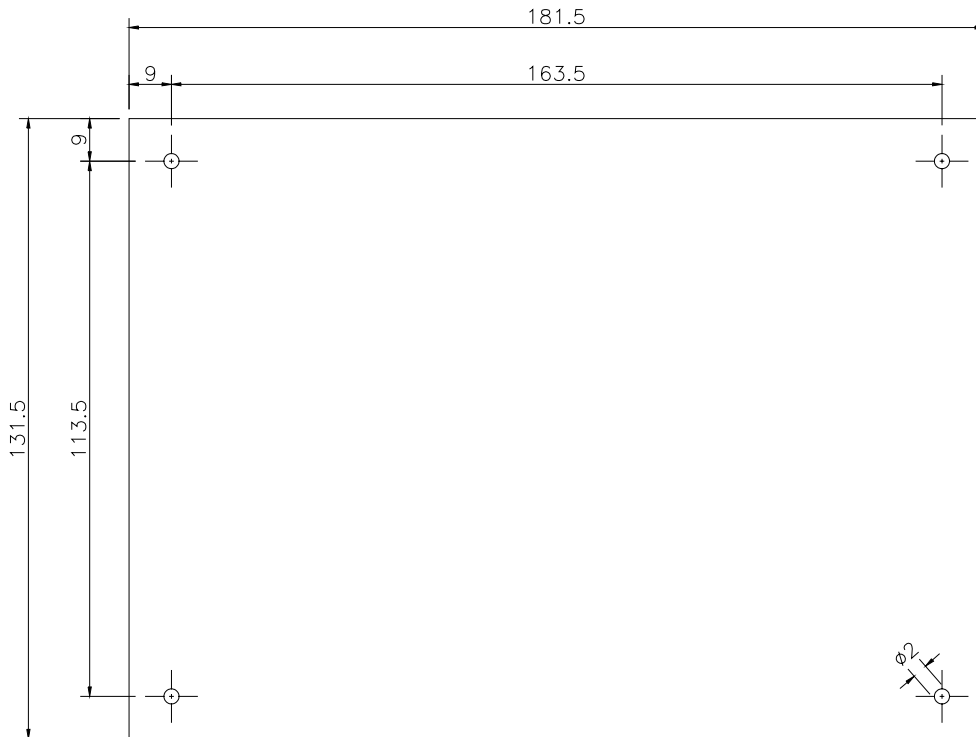
The control box can be either mounted directly to the outer casing of the storage tank or mounted to a wall adjacent to the system, dependant on the installation layout. The Pump/Comfort box is intended for fixed installation only and needs to be properly mounted to either the casing or wall.

In manifolded installations where multiple control boxes are present, ensure that the any remote mounted control boxes are clearly marked to identify which unit it is controlling. This will aid trouble-shooting should the need arise.

When selecting a location for the control box, due care must be taken with regards to the location of and the lengths of the various leads on the Pump/Comfort Control Box, as well as the position of the pump(s).

The control box is suitable for installation either indoors or outdoors. As the Pump/Comfort box is splash-proof only (IP54), it should be installed in a suitably protected area.

For pre-drilling holes in casing/walls, a template may be made to the dimensions on the next page.



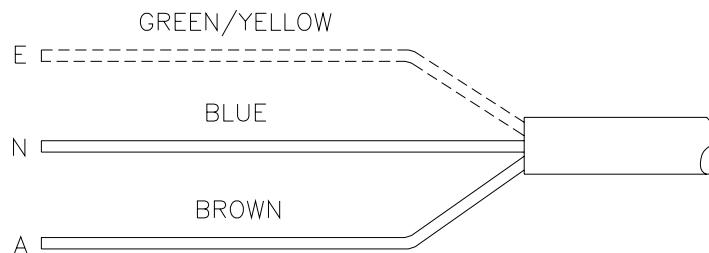
Pre-drilling Template

Connection to Pump:

The following work is only to be performed by suitably qualified persons.

The Pump/Comfort control box is supplied with a 1.5m long, 3 core flex cable that shall be hard wired to the pump. The maximum power that can be drawn through the control box is 240V, 10A at 50Hz.

The “flying lead” shall be connected to the pump as shown below;



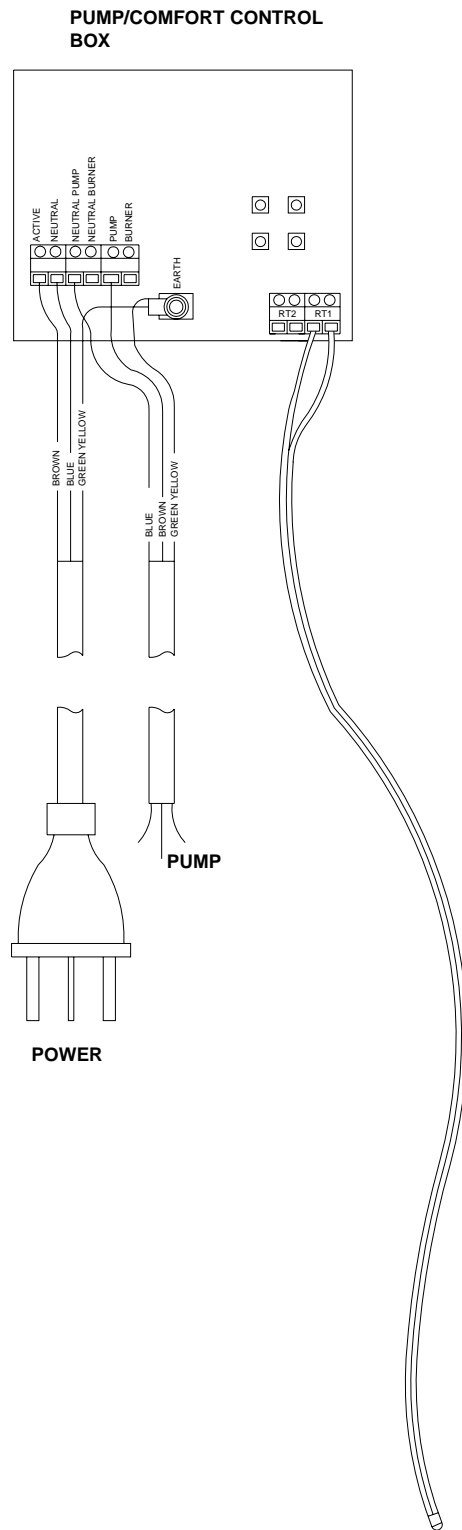
Once the lead is hard wired to the pump, it should be secured to prevent accidental damage.

Electrical Connection:

The control box comes with a standard 3 pin, 240V, 10A plug and lead for connection to a standard GPO.

The 3 pin plug must not be made active unless the “flying lead” is either connected to the heat source or has been suitably insulated to protect against accidental electric shock or short circuit.

Wiring Diagram:



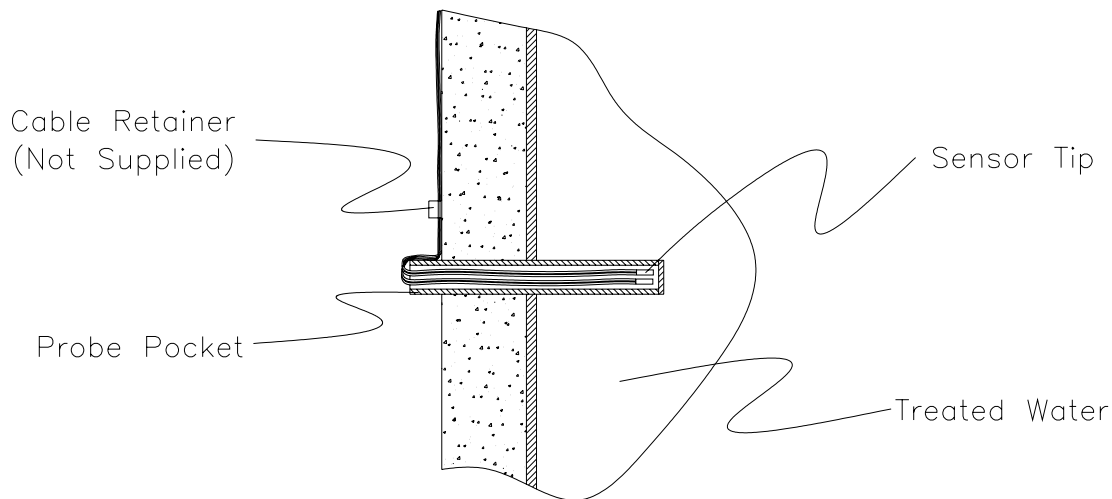
Temperature Probes:

Important: The sensor provided with the Pump/Comfort box is designed for indirect contact with the heat source. Under no circumstances is it to be immersed in water or any other liquid or are they to be heated with an open flame. These circumstances will result in permanent damage to the sensor.

The Pump/Comfort box comes with one temperature probe. The operating probe is used to sense the temperature of the water in the cylinder and to activate the pump during normal operation.

In the GXC and LEX the operating temperature probe pocket is filled with “Thermopaste” to aid heat conduction to the probe.

Insert the temperature probe into the probe pocket of the storage cylinder until it reaches the base of the probe pocket, see below.



Once the temperature probe has been inserted, secure leads from the control box to prevent the probe as shown above from being accidentally removed.

OPERATION:

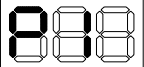
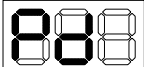
Important: the internals of the control box contain live 240 volt components. These are shielded from accidental contact which may occur during the adjustment of the control box settings. This shielding is not intended as a full electrical isolation barrier. When performing all other work, other than changing settings, the power to the control box must be turned off. Do not use any pointed metallic object to depress the buttons.

When initially turned on, the control box performs a self check and defaults to “Information Mode”. When in this mode, it displays the tank temperature only and there is no adjustment of any parameters.

The control box is operated via a menu based system that can only be initiated or altered after the removal of the front cover.

Once the cover has been removed, the four push buttons used to change parameters are visible below the digital display. Care must be taken when changing settings as this is performed when the control box is operational.

To initiate changes to the parameters of the control box, press the “Mode” button once. The display will flash between the first available parameter and its setting at 5 second intervals. Any subsequent press of the “Mode” button will cycle the display to the next available parameter. See table below for abbreviations.

Pump/Comfort CB Parameters	
	Set Pump-on temperature
	Set Pump-off differential

To adjust a parameter, press the up or down button once per each increment required to change.

Once the desired setting has been achieved, press the “Set” button to store the value.

Note: if using multiple control boxes in a manifolded system, all Pump/Comfort boxes need to be adjusted equally.

Pump-on Temperature:

This is the temperature at which the control box will activate the pump and heat the water in the storage cylinder. The setting for this temperature should be 5-7°C below the required hot water operating temperature.

Pump-off Temperature:

The pump-off temperature is the differential setting for the pump to turn off. That is the increase in the temperature that is being sought. This is typically set at 5-7°C.

Operating Temperature:

The Operating temperature is the sum of the “Pump-on” temperature and the “Pump-off” differential. This setting is not directly adjusted.

COMMISSIONING:

This page should be photocopied and used as a working sheet.

Commissioning the Edwards warm water system requires the use of a suitably calibrated digital type thermometer.

The following steps are set out to guide the installer through the correct procedure for setting up the system to operate within the temperature range that which has been set out by the client.

- Commission the cylinder and heat source in accordance with the sections 3 & 5, respectively in the Edwards Commercial User Guide
- Check and secure all leads from control box
- Switch on mains power to the control box
- Set "Pump On" temperature to to the required outlet temperature as specified by the client minus 5-7°C
- Set "Pump Off" differential to 5-7°C
- Allow cylinder(s) to heat up to the operating temperature setting ("Pump On" + "Pump Off")
- Open the abluion outlet closest to the hot water system and after allowing the temperature to stabilise use a suitably calibrated digital thermometer to check the temperature of the stream of water at the outlet eg handbasin. It is important that the water temperature is measured and not the temperature of any mist or spray.
- If required, adjust the "Pump On" temperature on the control box to attain the temperature specified by the client at the abluion outlet.
- Check the outlet temperature of the abluion outlet fixture, eg handbasin, furthest away from the hot water heater and ensure that it is within a acceptable operating temperature.
- Check the temperature of the abluion water at the respective abluion outlet fixtures when the system is operating at its minimum and maximum flowrate.
- If "Pump On" temperature is altered, the commissioning process will need to be repeated.
- Fill in details on the commissioning log sheet
- Hand this Manual and the completed logsheet to client for inclusion in the operating and maintenance manual for the system.

Note: if using a manifolded system, all Pump/Comfort control boxes will need to be adjusted equally at each relevant stage of commissioning.

Temperatures are to be checked using a thermometer that is periodically checked against a thermometer which has been recently checked for accuracy.

The designer for the system and the suppliers of plant should be represented at the commissioning stages of the system.

Commissioning Log-sheet

This page should be photocopied prior to filling in. Completed copy to be handed to client for inclusion in Operating and Maintenance Manual for the system.

Date Installed: _____
Model: _____
Heat Source: _____
Serial Number: _____

Location: _____

"Pump On" Set-point: _____
"Pump Off" Set-point: _____

Operating temperature: _____

Temperature at Ablution Outlet 1 (Closest): _____

Temperature at Ablution Outlet 2 (Furthermost): _____

Signed: _____

For and on behalf of: _____

Print Name: _____

Date Commissioned: _____

Copy supplied to client for inclusion in Operating and Maintenance Manual for the system _____

PROBLEM SOLVING:

This Section covers problems which may occur in the Pump/Comfort control box. For problems associated with the water heater and/or heat source, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

No Warm/Hot Water

Possible Cause	Remedy
Thermostat set point has been changed.	Change the set point on the Pump/Comfort box as outlined in section 4 of this manual, and re-commission in accordance with section 5 of this manual.
The heat source is not connected or faulty	Check lead is firm. Check the heat source. Repair if faulty.
Power supply is turned off.	Turn on, check settings, re-commission if necessary

Water Is Too Hot

Possible Cause	Remedy
Thermostat tank sensor has come out or is faulty	Check the sensor is inserted into the pocket. Replace if faulty.
Thermostat set point has been changed	Change the set point on the Pump/Comfort Box as outlined in section 4 of this manual, and re-commission in accordance with section 5 of this manual.

MAINTENANCE:

Maintenance instructions for the heater and heat source can be found in Sections 3 and 5 respectively of the Edwards Hot Water Commercial User Guide.

Owner/client (Yearly):

- Check the physical condition of all leads
- Ensure all leads are firmly in position
- Clean external surface of box with non-corrosive cleaner. Do not hose down.
- Enquire of any complaints from end users, warm water too hot, too cool, etc.

Full Maintenance (Yearly):

The following work can only be performed by a suitably qualified person. It is recommended that the work be performed on a monthly basis or at intervals as required by the particular installation location.

Visual Inspection:

Turn off power to box and Remove front cover of control box and inspect for any signs of water ingress. If there is any sign of water ingress into the box, rectify before proceeding.

Check electrical connections inside control box are tight and free of corrosion. If there are any signs of corrosion, and clean corrosion with a recognised electrical cleaner.

Inspect seal on cover and replace if damaged.

Refit cover on control box.

Performance Check:

The following checks must be performed during a period of little or no usage so that access to ablution outlets serviced by the system can be restricted to those performing these checks. When restricting access to the ablution outlets, follow the appropriate safety guidelines of the client.

Check that the water temperature at the ablution outlets, eg handbasin, is within the ranges set out in the commissioning instructions/log-sheet.

Record details in inspection report and supply to client.

RECOMMENDED SPARE PARTS:

Description	Stockcode
Temperature Sensor	6060146

WARRANTY:

A one year parts, labour, travel and freight warranty applies to the Pump/Comfort control box. For warranty details on hot water heaters or heat sources, refer to Sections 3 and 5, respectively, of the Edwards Hot Water Commercial User Guide.

For general warranty terms and conditions refer to Section 1.3 of the Edwards Hot Water Commercial User Guide.