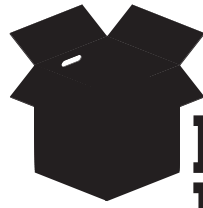
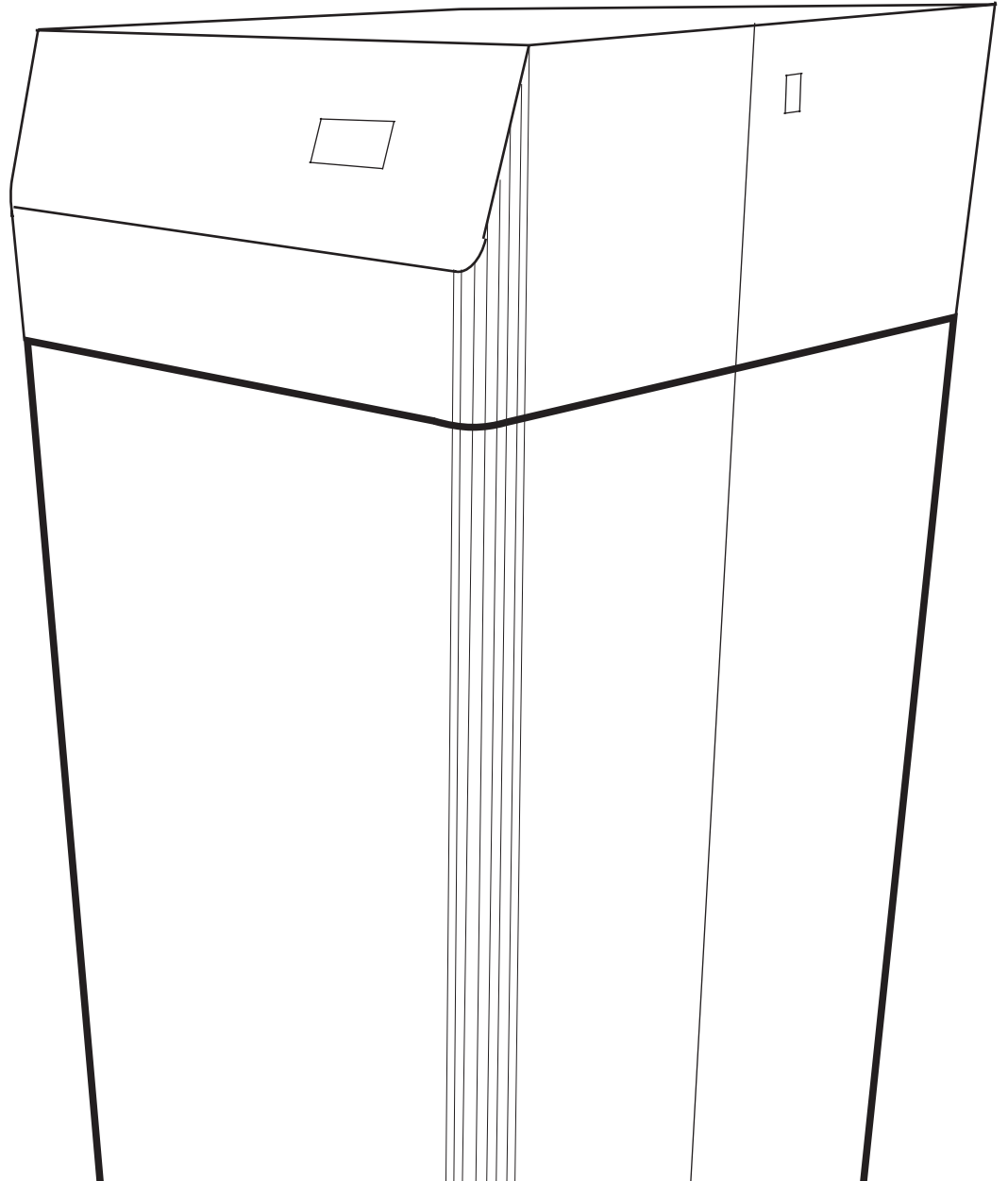


SAHPR



Magic Box International



HEAT PUMP WATER HEATER BMTB 130 / 200 / 300 INSTALLATION AND MAINTENANCE INSTRUCTIONS

CONTENTS

SECTION 1	GENERAL NOTES
SECTION 2	HEALTH AND SAFETY
SECTION 3	DESCRIPTION OF THE SYSTEM
SECTION 4	PLUMBING INSTALLATION OF THE SYSTEM
SECTION 5	REFRIGERATION INSTALLATION OF THE SYSTEM
SECTION 6	ELECTRICAL INSTALLATION OF THE SYSTEM
SECTION 7	TESTING AND COMMISSIONING
SECTION 8	INSPECTION AND MAINTENANCE
SECTION 9	USING THE CONTROLLER
SECTION 10	TROUBLESHOOTING
SECTION 11	REPLACEMENT OF PARTS
SECTION 12	GUARANTEE TERMS AND CONDITIONS
SECTION 13	SERVICE RECORDS
SECTION 14	DISASSEMBLY AND RECYCLING

GENERAL NOTES



- 1.1** The installation of the BMTB 130 / 200 / 300 is the responsibility of the purchaser. Read the information supplied with the equipment carefully before installing and using it. The manufacturer declines any responsibility as regards damages deriving from an incorrect installation, It is the responsibility of the installer to ensure the installation complies with all relevant local and national standards and regulations.
- 1.2** Each component of the BMTB is supplied complete with its own instruction sheet, which must be read in conjunction with this instruction manual, and installed and maintained accordingly.
- 1.3** Copies of this manual and the instructions supplied with each individual component must be handed to the client or user of the system for their future reference and for the purpose of future maintenance.

HEALTH AND SAFETY



Care should be taken when moving the product. Check the weight before any lifting. This is for the safety of the installer and customer. Ensure the product and in particular the box are installed in a safe location and the mounting structure is adequate to withstand the additional loads. Take care when moving equipment to ensure there is no damage to the equipment or existing structure and fittings.

IMPORTANT:

This appliance can be used by children from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children should not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

- 2.1 The BMTB vented / unvented domestic hot water cylinder range has been designed to heat domestic hot water to 130°F in vented or unvented potable water systems.
- 2.2 The BMTB has integral safety devices to protect the product from internal and external faults. An adjustable digital thermostat controls the water temperature.
- 2.3 The BMTB is manufactured in the United Kingdom in an ISO9001: 2000 certified factory and under ISO9001:2008 Quality management system.
- 2.4 Before installing the BMTB System please read this Installation Manual and information individually supplied with any additional equipment carefully and ensure all requirements are met.
- 2.5 The BMTB should be installed and maintained by persons suitably qualified to do so.
- 2.6 All systems upon completion should be subjected to the appropriate local and national water pressure test requirements, or, to not less than 1.5 times its maximum working pressure for one hour. Systems containing plastic pipework should be pressure tested in accordance with the pipe manufacturers instructions. It is also recommended that the existing system be pressure tested for water tightness before commencing work in order to ascertain the condition of the system.

HEALTH AND SAFETY



- 2.7** Magic Box International Cylinders must be stored in the supplied packaging in an upright orientation and should be stored in a dry environment. The equipment should always remain in an upright position during transport and installation. If turned on its side, return the box to the upright position, check the compressor for signs of leakage and leave to rest for 12 hours, before turning the unit on. Magic Box International declines any responsibility as regards damages deriving from incorrect transportation.
- 2.8** If transporting in the horizontal orientation, ensure the unit is laid down on its left hand side, so that the left hand side is facing the ground. Failure to do so may cause permanent damage. Magic Box International declines any responsibility as regards damages deriving from incorrect transportation.
- 2.9** Care should be taken when moving the product. Check the weight before any lifting. This is for the safety of the installer and customer. Ensure the product is installed in a safe location and the mounting structure is adequate to withstand the additional load. Take care when moving the equipment to ensure there is no damage to the equipment or existing structure and fittings.
- 2.10** Safe manual handling and lifting procedures must be used when carrying products.

DESCRIPTION OF THE SYSTEM



- 3.1** The BMTB heat pump water heater (BMTB) consists of a Solar Assisted heat pump, coupled with either a 32, 54 or 79 gallon capacity hot water storage tank. The Solar Assisted Heat Pump is integral to and positioned on top of the unit within the unit casing.
- 3.2** The BMTB is designed to heat the domestic hot water within the tank up to 130°F. The maximum temperature is influenced by the individual installation, pipe lengths and insulation. It uses an exterior aluminium panel (evaporator) to absorb energy from the ambient air. A copper coil (condenser) is wrapped around the external wall of the inner cylinder which heats the water inside the cylinder. The product has a reciprocating compressor for quiet and efficient performance. With these features the BMTB is designed to have a long, trouble free life.
- 3.3** The BMTB has integral safety devices to protect the product from internal and external faults. An adjustable digital thermostat, located at the front of the BMTB controls the water temperature.
- 3.4** The BMTB is designed to store potable water supplied from the public mains with a maximum of 200 p/m.
- 3.5** The BMTB has a built in timer which once a week heats the water in the cylinder above 140°F to provide pasteurisation.
- 3.6** The BMTB is manufactured in the United Kingdom in an ISO9001: 2000 certified factory and tested to EN16147, UL1995, CE, CSA.
- 3.7** SAHP supplies an Installation Kit which contains items that will be needed on the installation of the BMTB's refrigeration circuit.

DESCRIPTION OF THE SYSTEM continued



3.8

Specifications	BMTB 130	BMTB 200	BMTB 300
Maximum cylinder volume (US gal)	34	52	79
Mean thermal capacity (BTU/hr)	2580-6800	2580-6800	2580-6800
power consumption (W)	Typically 600	Typically 600	Typically 600
Operating current (a)	4-5	4-5	4-5
Voltage (v) / frequency (Hz)	220-240, 50/60	220-240, 50/60	220 - 240, 50/60
Operating temperature range (°F)	32-105	32-105	32-105
Refrigerant fluid and charge (lbs)	R134a / 2.64	R134a / 2.64	R134a / 2.64
Max. Hot water temperature (°F)	130	130	130
BMTB weight unfilled/filled (lbs)	183/470	234/675	322/983
Dimensions (height x width x depth("))	50.8 x 21.7 x 21.7	66.1 x 23.6 x 23.6	84.6 x 25.6 x 25.6
Clearances Top/front (")	4/15	4/15	4/15
Max water circuit working pressure (psi)	45	45	45
Cold water input connections (")	3/4	3/4	3/4
Hot water output connections (")	3/4	3/4	3/4
Single panel weight (lbs)	17.64	17.64	17.64
Single panel dimensions (h x w x d ")	66.9 x 31.5 x 1	66.9 x 31.5 x 1	66.9 x 31.5 x 1
Double panel weight (lbs)	33.06	33.06	33.06
Double panel dimensions (h x w x d ")	66.9 x 31.5 x 4	66.9 x 31.5 x 4	66.9 x 31.5 x 4
Thermodynamic panel input / output	3/8 / 3/8	3/8 / 3/8	3/8 / 3/8
Lubricant in the compressor	ESTER / IOSS	ESTER / IOSS	ESTER / IOSS
Sound Power Level	41Db(A)	41Db(A)	41Db(A)
R134a Global Warming potential	(GWP) 1430	(GWP) 1430	(GWP) 1430

PLUMBING INSTALLATION



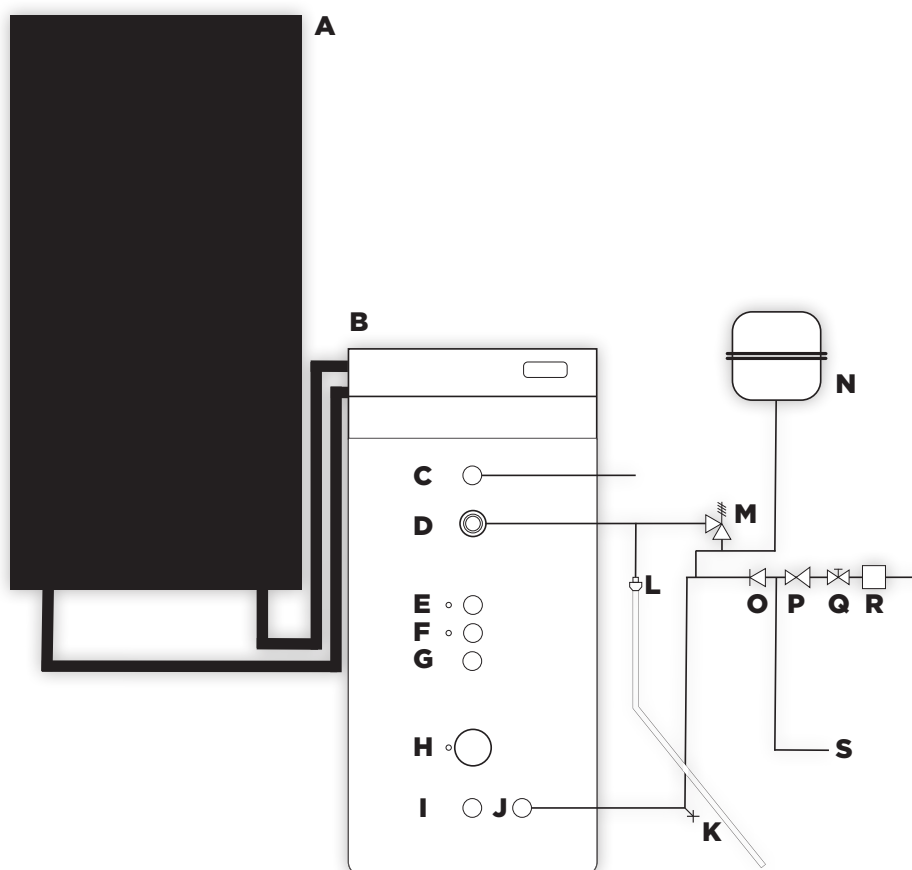
- 4.1** The BMTB must be installed on a stable base which must be capable of supporting the weight when the cylinder is full of water.
- 4.2** Access for maintenance of all equipment should be considered when positioning the vented / unvented cylinder. Care should be taken that the immersion heater can be withdrawn for servicing if required these are 15" long. Relevant local and national standards should always be followed when installing discharge pipe work from the safety valves.
- 4.3** We recommend that the hot and cold water requirements of the property and user are ascertained before the installation of the BMTB either unvented type or vented type.
- 4.4** The minimum incoming cold water mains inlet requirements for the BMTB is 20psi operating pressure and 5 US gal per minute flow rate.
- 4.5** Adjustable pressure reducing valve factory set at 43.5 psi is supplied with the BMTB which must be fitted in the incoming cold water supply to the cylinder. The pressure reducing valve will deliver maximum of 13 US gal per minute.
- 4.6** In hard water areas we recommend that a water treatment unit is fitted to eliminate the formation of limescale in the system.
- 4.7** Do not install the equipment in the following places as they will lead to a malfunction of the equipment: areas with corrosive gases, factories where the electrical voltage experiences wide fluctuations, places with strong electromagnetic waves, places with inflammable materials or gases, other special environments.

PLUMBING INSTALLATION continued



Fig

4.8



- A** Thermodynamic evaporator panel
- B** Big Magic Thermodynamic Box
- C** Hot water outlet
- D** Pressure & temperature relief valve
- E** Dual thermostat
- F** Sensor pocket
- G** Boiler flow
- H** Immersion heater
- I** Boiler return
- J** Cold water in
- K** Drain
- L** Tundish
- M** Pressure relief valve
- N** Expansion tank
- O** One way valve
- P** Pressure reducing valve
- Q** Isolating valve
- R** Cold main
- S** Isolating valve

PLUMBING

INSTALLATION *continued*



- 4.9** A full bore cold water isolating valve must be fitted in the cold water supply to the BMTB. This valve is not supplied with the fitting kit of the unit.
- 4.10** It is good practice to position the mains inlet control manifold at the top of the unvented unit to ensure that the cylinder does not have to be drained down for the purpose of maintenance.
- 4.11** The expansion vessel can be mounted in any Orientation. Access must be available to the top and bottom of the vessel. The vessel should be fixed to a solid wall using the brackets provided. Please remember that the vessel will get much heavier once it is full of water.
- 4.12** For mixer showers and taps a balanced cold feed at the same pressure as the hot feed may be necessary. A 3/4" balanced connection on the inlet manifold is provided for this purpose. Pipe work should initially run in 3/4" then this can be reduced where necessary.
- 4.13** We highly recommend installing a thermostatic mixing valve in system where the set point temperature of either the heat pump or any heat sources connected to the boiler coil are set to 120°F or above.
- 4.14** All exposed pipe work should be insulated and additional considerations should be taken to protect the unit from frost damage. Particular care is needed if the cylinder is to be installed in an exposed location such as an out building or garage.
- 4.15** Before filling and pressuring the cylinder care should be taken to check and tighten all connections including factory fitted connections as they may work loose during transportation and positioning. All of the pipe work connections on the cylinder are either 3/4" compression or 3/4" copper tube should only be used to connect to these connections. Good working practices should be used when preparing pipe work such as using correct pipe cutters and de-burring.
- 4.16** The boiler coil connections supplied are compression connections. The boiler circuit must be positively pumped, gravity circulation will not provide the required heat transfer through the coil.

PLUMBING

INSTALLATION continued



- 4.17** The boiler coil has a maximum working pressure of 50psi. With pressurised boiler circuits an additional expansion vessel needs to be sized to suite the circuit volume and installed along with a safety relief valve and filling loop.
- 4.18** The boiler coil connection must be complete with thermostatic temperature controls. Uncontrollable heat sources such as wood burning store are not suitable. A two port motorised zone valve should be installed into the primary flow before the cylinder.
- 4.19** The discharge pipework of the BMTB unvented unit must be fitted to comply with the latest version of relevant local and national standards.
- 4.20** Before filling please ensure the pressure in the expansion vessel is 43.5psi. This is the same as the setting of the pressure reducing valve. The valve is a Schrader type. If the pressure reducing valve setting is amended, the expansion tank pressure must be amended to match the same settings
- 4.21** Upon completion the whole installation must be thoroughly flushed to remove all installation dirt, fluxes and manufacturing oils before being put into operation. To flush the system first fill the system. Close the cold water supply full bore isolating valve. Completely drain the tank (outlets may need to be opened during this process.) Open the cold water supply full bore isolating valve. Refill the tank with water and repeat.

REFRIGERATION INSTALLATION



Fig 2

5.1 Aluminum Panel (evaporator) Connections

The Thermodynamic aluminum panel evaporator has a 3/8" male flare connection Liquid inlet and 3/8" male flare connection gas outlet that allows connection of the the panel to the BMTB. Connecting 3/8" copper refrigeration pipework must be flared and secured using 3/8" flare nuts. To help eliminate leaks, use refrigeration oil on the thread of the 3/8" flare connections before tightening the flare nut, **no soldering or brazing is permitted**. The heat pump liquid line must be correctly connected to the panel liquid inlet. Incorrect orientation will resort in compressor failure

The Liquid inlet can be identified by the three inflated tubes extending from the connection. Please see figure 2



5.2 Thermodynamic Panel Location

The thermodynamic panel can be located facing any aspect. On either an exterior wall or pitched roof. If the panel is installed on a roof it should be fixed using appropriate solar roof mounting kits in accordance with relevant local and national standards.

5.3 The thermodynamic panel can be installed in a vertical (portrait) position or horizontal (landscape) orientation but there must be a minimum of a 30° tilt. the panel cannot be laid flat, also ensure the gas outlet is always orientated to the lowest point of the as per the figure 3. Incorrect installation will inhibit the free flow of lubricating oil

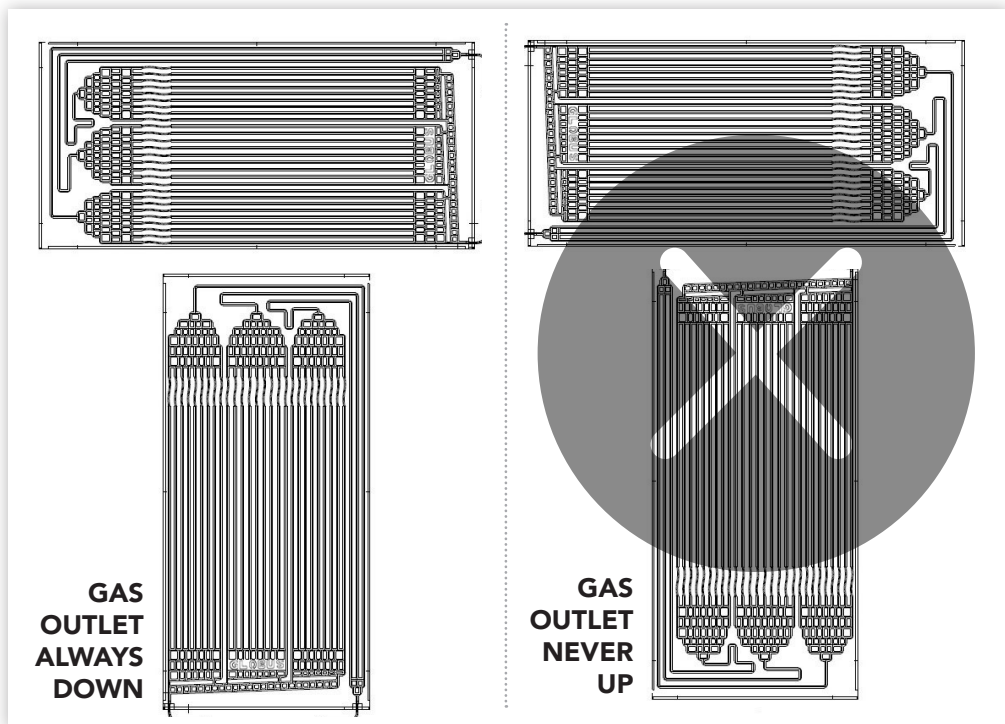
NOTE: Vertical panel orientation offers optimum performance allowing even flow of refrigerant across the panel.

NOTE: For increased performance, install the panel parallel to the prevailing wind allowing the air to pass freely over the surface of the panel.

REFRIGERATION INSTALLATION continued



Fig 3



5.4 Thermodynamic Panel Fixing

To fix the panel to an exterior wall use the supplied L-brackets, nuts, bolts, fixing screws and plugs which are all supplied in the installers pack.

5.5 Fix the L brackets to the thermodynamic panel as shown in Figure 4. Ensure the Bolts are fixed with the bolt head facing out.

5.6 Fix and secure the thermodynamic panel to a wall as show in figure 4. Ensure to fix all 6 Brackets to the panel and exterior wall.

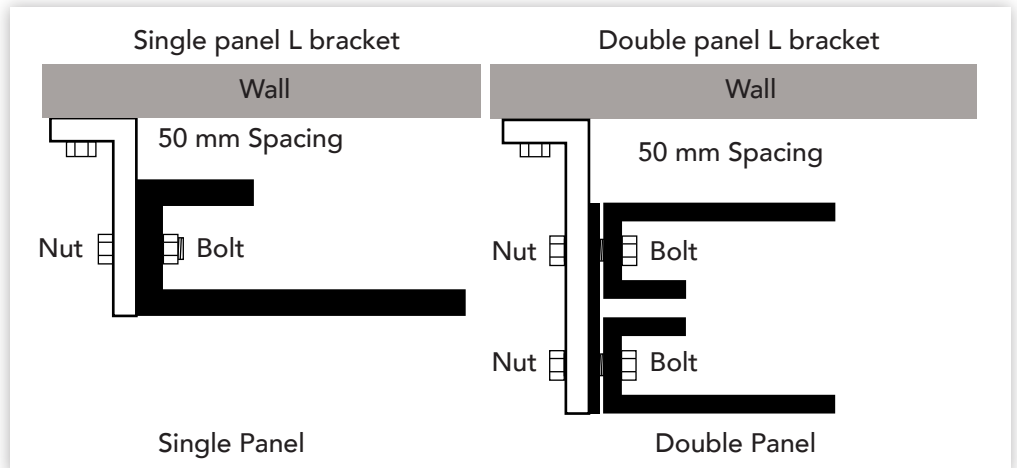
NOTE: Ensure that the BMTB IS connected to the thermodynamic panel correctly as shown in figure 5 failure to do so can result in compressor failure and will invalidate any guarantee.

NOTE: Do not paint over the panel. This will decrease efficiency and potentially cause system failure.

REFRIGERATION INSTALLATION continued



Fig 4

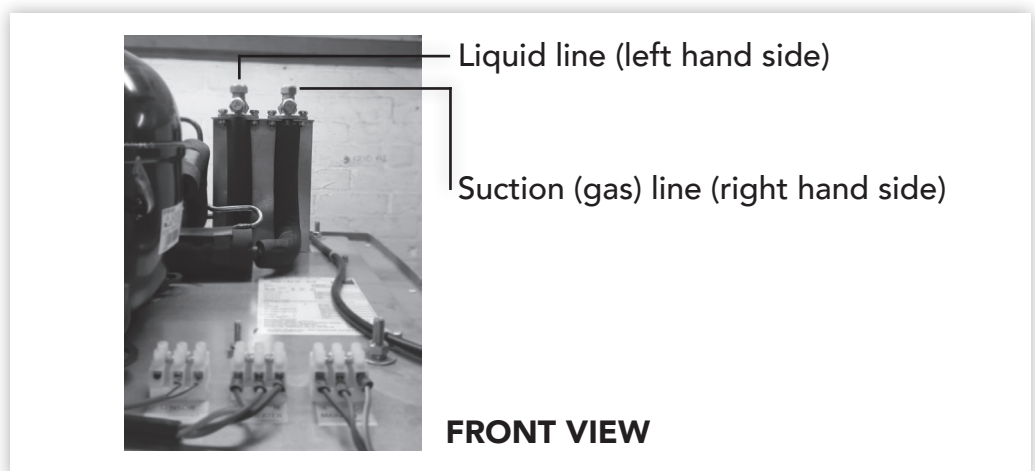


5.7 Refrigeration Connections

The BMTB has a 3/8" male flare connection Liquid outlet and 3/8" male flare connection suction line (as seen in figure 5), that connect the BMTB to the thermodynamic panel.

Connecting 3/8" copper refrigeration pipework must be flared and secured using 3/8" flare nuts. The heat pump liquid must be connected to the corresponding aluminum panel liquid line. Incorrect orientation WILL result in compressor failure. To help eliminate leaks, use refrigeration oil on the thread of the 3/8" flare connections before tightening the flare nut.

Fig 5



5.8 Pipework Installation

All refrigeration pipework should be installed in accordance with ISO 5149.

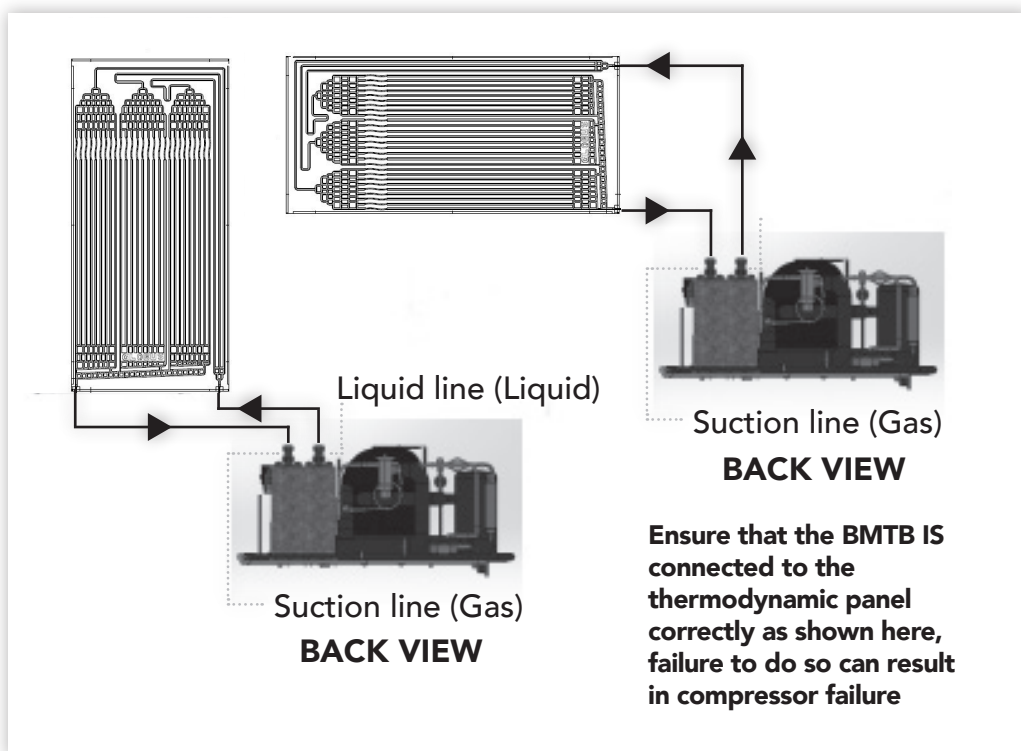
5.9 The BMTB is factory pre-charged with refrigerant R134a with enough refrigerant for up to 26 foot of pipe length each way between the BMTB and the thermodynamic Panel.

REFRIGERATION INSTALLATION *continued*



- 5.10** The pipe length can be extended up to 50 foot each way. However for every extra 3 ft of physical separation between the BMTB and panel 1.6 ozs of refrigerant gas must be added. The minimum pipe length between the thermodynamic panel and the BMTB is 10 ft.
- 5.11** A double panel can be installed instead of a single panel. If a double panel is used an additional 0.22 lbs of refrigerant gas is required, this is in addition to any gas added as per 5.10.
- 5.12** The refrigeration circuit shall be designed with as few bends as possible, with a maximum 90° bend radiance to minimize the load loss and it shall be supported properly with a view not to transmit stresses or vibrations

Fig 5



REFRIGERATION INSTALLATION continued



5.13 Ensure that refrigeration quality copper pipes only are used to connect the Thermodynamic Panel to the BMTB. It must also be ensured all refrigeration pipework is insulated with flexible anti-condensation insulation.

NOTE: Direct contact between the refrigeration outlet and refrigeration inlet line shall be avoided to prevent energy losses in the system.

NOTE: Ensure the BMTB liquid outlet is connected to the Thermodynamic Panel liquid inlet, and the BMTB suction side is connected to the Thermodynamic Panel gas outlet.

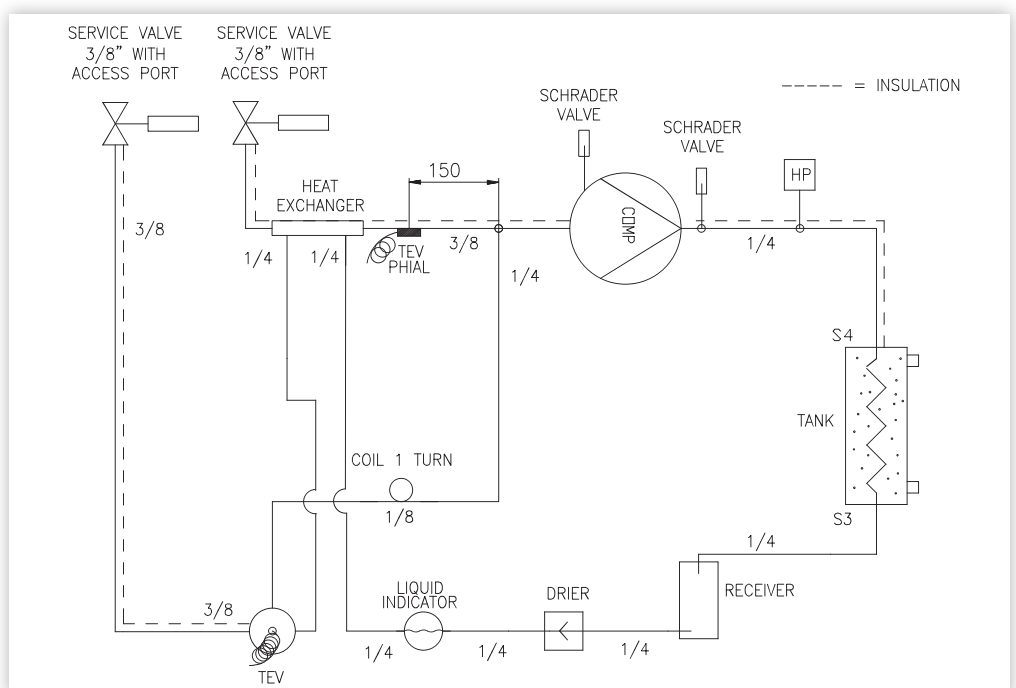
NOTE: Do not loosen or open service ports until all connections are made and the system has been fully leak checked and vacuumed.

NOTE: Do not Cover the brass plate nuts with the anti-vibration insulation as this may create a freeze / thaw action on the brass which may result in the flare nut braking down over time.

5.14 Nitrogen Pressure Test

First pressure test the refrigeration circuit with Oxygen Free Nitrogen. Nitrogen can be introduced using the service port connection as shown in figure 5.

Fig 6
Thermodynamic unit
Refrigeration
circuit



REFRIGERATION INSTALLATION *continued*



- 5.15** Fill the system to 115psi, hold and monitor for 45 minutes. Check all the refrigeration connections with a leak detector. If during the 45 minutes of monitoring the pressure in the system declines, tighten or re-flare the connection and restart the test. Repeat if necessary until pressure is maintained for the 45 minutes.

NOTE: Ensure through the process that the pressure does not exceed 145psi in the Thermodynamic Panel and/or the pipe work

5.16 Vacuum

Once the pressure test has been successfully completed and no leakage of nitrogen has been confirmed, the nitrogen can be vented. The vacuum pump must be connected into the service port to begin vacuuming / evacuating the system. Vacuum the system to 0.5 torr (500 microns) and below for a minimum of 45 minutes.

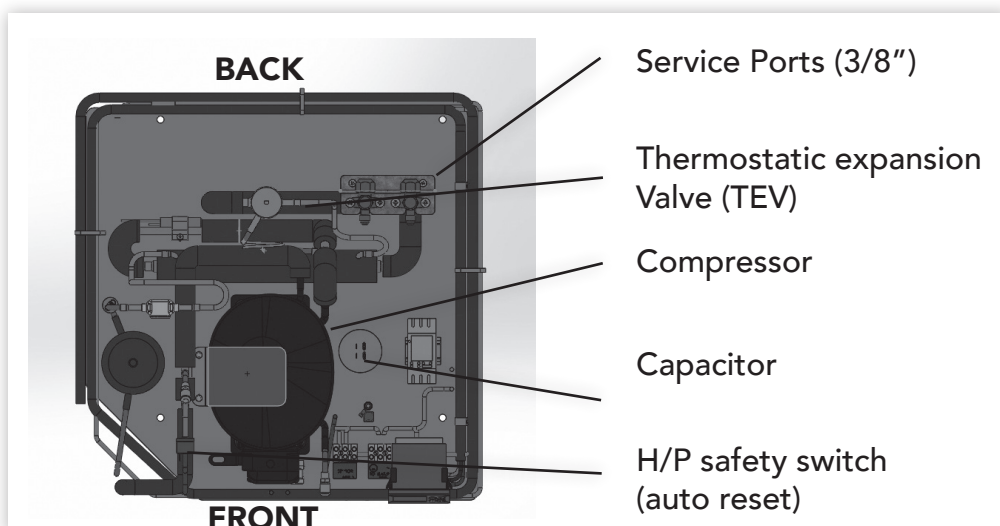
5.17 Releasing Refrigerant

Once the System has been successfully pressure tested and vacuumed, next release the factory pre-charged 2.64 lbs of R134a refrigerant gas.

- 5.18** To do this use a 4mm allen key and rotate both service port valves counter clockwise until fully open.

NOTE: Open the liquid line service port first and then the gas line service port

Fig 7



ELECTRICAL INSTALLATION



Electrical connections

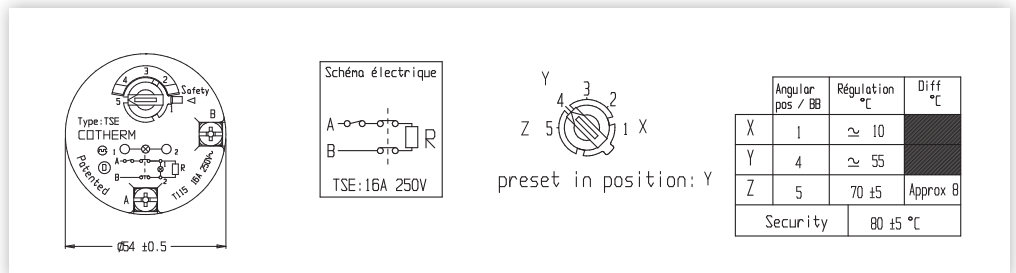
- 6.1** The BMTB shall be electrically connected once all the refrigerant connections and plumbing connections are completed. All electrical work is to be carried out in accordance with the NEC standards, latest issue or local codes of practice as applicable. Ensure to also install the equipment in line with EMC2004/108/EC.
- 6.2** The power supply of the BMTB is single phase: 220V - 240V / 50Hz - 60Hz with ground connection. This supply needs to be separately isolated and protected by an appropriately sized fuse (13Amps)
- 6.3** All electrical work is to be carried out in accordance with the latest issue local codes of practice as applicable. Ensure to also install the equipment in line with relevant local and national standards.

NOTE: In Area's with 110V branch circuits within the home, you will be required to install a dedicated single phase 220 - 240V circuit from the electrical consumer panel to provide 220 - 240V power supply to the BMTB. Be sure to clearly label the wires 220 - 240V on each end for safety.

NOTE: In areas with 4 conductor L1, L2, N and G wiring, connect L1 to L, L2 to N and G to ground.

- 6.4** The power supply of the integral Immersion Heaters is single phase: 220V – 240V / 50Hz – 60Hz with ground connection. Only use the manufacturers supplied immersion heater. Immersion heaters should not have a higher capacity than 5000btu/1.5kW if directly connected to the Heat Pump. If Immersion Heaters with a capacity higher than 1.5kW/5000btu are specified, they must be independently wired to a separate fused switch. Also available are 3kW/10000btu and 6kW/20000btu immersion heaters. contact your distributor.

Fig 8





PV
connectivity

ELECTRICAL INSTALLATION continued

- 6.6** To replace the immersion first disconnect the power supply and drain the tank. disconnect the immersion wiring before unscrewing the immersion heater. Screw in the new immersion heater - reconnect the wiring, refill the tank and reconnect the electrical supply.
- 6.7** Correct wire sizing must be carried out based on the power, wire length and wire enclosures however in most domestic applications 14 gauge wire is suitable. Heat resistance sheathed flex complying to relevant local and national standards should be used.
- 6.8** Do not energize the immersion heater until the cylinder has been flushed and filled with water as this will cause damage to the element.
- 6.9** Do not operate the immersion heater if any cleaning agents are in the cylinder as this will also cause premature failure of the immersion element.
- 6.10** The BMTB Thermodynamic Heat Pump 'Blueberry' controller has the functionality to connect to a Solar PV PV inverter system. If you are not connecting the BMTB to a PV Inverter proceed to section 7.
- 6.11** To connect the BMTB to a PV inverter a 2 conductor wire is required. There is no maximum or minimum distance requirements of this 2 conductor wire. The cable will be carrying a voltage free signal.
- 6.12** Connect the 2 core cable to the unoccupied terminals 5 and 8 as per the wiring diagram, located on the BMTB Blueberry controller sensor terminal located on the top right hand side of the back of the controller. Connect the other end of the two core cable to a N/O relay of the PV inverter.
- 6.13** In cases where a N/O relay is not available within the inverter, the controller can be connected via a 2 conductor voltage free wire to an independent 7 days timer instead which allows the controller to be automatically actuated at a predefined range of hours which can correspond to the assumed maximum PV energy generation.
- 6.14** When the PV inverter generates electricity, the N/O relay will close, which will subsequently signal the Blueberry controller to enter Eco Mode, a programme in which BMTB will automatically raise the set point temperature input of the controller of the water within the connected cylinder to 140°F and re initiate heating again once the water temperature falls below 135°F.

TESTING AND COMMISSIONING



Controller settings

7.1 Convert °C to °F

Press and Hold P - 'C.cl' is displayed

Press \blacklozenge arrow keys until 'r.p' is displayed - Press P

Press \blacklozenge arrow keys until '281' is displayed on the controller - Press P

Press \blacklozenge arrow keys until 'In' is displayed on the controller - Press P

Press \blacklozenge arrow keys until 'I.uP' is displayed on the controller - Press P

Within I.uP:

C0 = °C with 1° res.

F0 = °F with 1° res.

C1 = °C with 0,1° res.

F1 = °F with 0,1° res.

Press \blacklozenge arrow keys until 'F0' is displayed on the controller - Press P

Hold U key for 5 seconds - 'I.uP' is displayed

Press \blacklozenge arrow keys until 'SP' is displayed on the controller - Press P

Press \blacklozenge arrow keys until 'S.HS' is displayed on the controller - Press P

Press \blacklozenge arrow keys until '130' is displayed on the controller - Press P

Hold U key for 5 seconds - 'SP' is displayed - Press P

Press \blacklozenge arrow keys until 'SPE' is displayed on the controller - Press P

Press \blacklozenge arrow keys until '140' is displayed on the controller - Press P

Hold U arrow key for 5 seconds - 'SP' is displayed

Press \blacklozenge arrow keys until 'rE' is displayed - Press P

Press \blacklozenge arrow keys until 'r.d' is displayed - Press P

Press \blacklozenge arrow keys until '10' is displayed - Press P

Hold U arrow key for 5 seconds - 'r.d' is displayed

Press \blacklozenge arrow keys until 'r.Ed' is displayed - Press P

Press \blacklozenge arrow keys until '5' is displayed - Press P

Hold U arrow key for 5 seconds - Repeat until main screen is displayed which will display the current temperature of the water at the plane of the sensor within the BMTB

Single Press P - 'S.P' will flash - the set point temperature will then display

Press \blacklozenge arrow keys until '130' is displayed on the controller - Press P

The display will revert to the 'Main Screen' which will display the current temperature of the water at the plane of the sensor within the BMTB.

NOTE: Through this process we are first altering the units of measurements from °C to °F. We are then altering the maximum set point from 55°C to 130°F. DO NOT increase the set point temperature above 55°C / 130°F. If you do this may invalidate the warranty.



Controller
settings

TESTING AND COMMISSIONING continued

7.2 The Blueberry Controller utilizes a real time clock to actuate the Automacsi Anti-legionella cycle at the appropriate time. To set the real time clock of the controller:

Press and hold 'P' for 5 sec

'c.CL.' is shown

Press 'P' to confirm

**'h. (xx)' is shown, 'h' stands hours (from 1 to 23)
Select the appropriate hour**

Press 'P' to confirm

**'n.(xx)' is shown, 'n' stands for minutes (from 1 to 59)
Select the appropriate minute**

Press 'P'

**d. (xx) is shown, 'd' stands for day of the week. d.(01)
= Monday, d.(02) = Tuesday etc
Select the appropriate day**

Press 'P' to confirm

'c.CL.' is shown

Select 'c.dt' scrolling with the arrow down, 'c.dt' stands for date

Press 'P' to confirm

**'y.(xx)' is shown, 'y' stands for year (from 1 to 99)
Select the appropriate year**

Press 'P' to confirm

**'n.(xx)' is shown, 'n' stands for month (from 1 to 12)
Select the appropriate month**

Press 'P' to confirm

'c.dt' is shown

During the Anti-legionella mode the controller will automatically heat the water within the cylinder to 140°F as an anti-legionella measure. It uses the heat pump not the immersion heater to heat the water to this temperature.

TESTING AND COMMISSIONING continued



Controller settings

- 7.3**
- (a) The Blueberry controller has two different setting programs, Standard and Eco mode generation.
 - (b) Standard Mode: The Blueberry controller will raise the temperature to 130°F (or the programmed temperature) and then switch off. It will automatically start again to raise the water temperature once it falls to 120°F. (or 10°F lower than programmed temperature).
 - (c) To view the set point temperature, press the P button. SP is displayed alternatively with the set temperature. Using the buttons with the arrow pointing upwards / downwards we can increase / reduce the set point temperature. Once set, press the "P" button or leave and the program will revert to displaying the actual water temperature. This is displayed in figures 14 & 15
 - (d) The temperature range is from 50 to 130°F. The unit will raise the temperature to 130°F (or the programmed temperature) and then switch off. It will automatically start to raise the water temperature once it falls to 130°F. (or 10°F lower than programmed temperature).
 - (e) Standard Mode also incorporates an Anti-legionella cycle, this is actuated automatically, once a week (every Monday between 5:00 to 7:00) using the integral real-time clock within the blueberry controller.
 - (f) During the Antilegionella mode the controller will automatically heat water within the cylinder to 140°F as an anti-legionella measure. It uses the heat pump not the immersion heater to heat the water to this temperature.
- 7.4**
- (a) Eco mode is activated when the Blueberry controller receives a signal from the installed 2 conductor wire (refer to section 6) that the connected PV inverter is generating electricity.
 - (b) When Eco mode is active, The Blueberry controller displays the temperature of the water at any time but will intermittently flash 'Eco' across the controller screen.
 - (c) When in Eco mode the Blueberry controller will raise the temperature to 140°F and then switch off. It will automatically start again to raise the water temperature once it falls to 130°F.
 - (d) When the Blueberry controller stops receiving a signal from the installed 2 conductor wire that the connected PV inverter is generating electricity, the Blueberry Controller will exit Eco Mode and enter standard Mode.

TESTING AND COMMISSIONING continued



- 7.5**
- (a) Ensure the BMTB fused switch is off (supplied in the Installers Kit). Connect the BMTB Controller (housed within the cover) to the controller cable junctions, and the earthing point within the lid to the free earth cable. The controller is keyed to ensure correct orientation during connection.
 - (b) Turn the BMTB on at the fused switch. The BMTB digital controller will light up showing the current temperature of the cylinder and the integral pump will begin to run if the cylinder temperature is below 130°F. After a 60 seconds delay the compressor will start to run. This time delay function has been introduced to improve the efficiency of the system and the life of the compressor.
 - (c) Leave the system running for a minimum of 30 minutes and check:
 - (1) **The sight glass to make sure it is clear and dry. A fully functioning correct system should show no bubbles.**
 - (2) **The set temperature is 130°F.**
 - (3) **The unit is increasing the temperature of the water within the cylinder as displayed on the controller.**
 - (4) **Position the casing onto the BMTB and secure in place with the supplied fixing screws.**
 - (5) **Suction pressure is between 25 to 60 psi**



- 7.6**
- (a) The digital thermostat displays the temperature of the water at any time.
 - (b) This thermostat is preset at 130°F.
 - (c) The unit will raise the temperature to 130° (or the programmed temperature) and then switch off. It will automatically start again to raise the water temperature once it falls to 120°F. (or 10°F lower than programmed temperature).

COMMISSIONING CHECK LIST



To be completed by the installer and left with the customer

The BMTB is installed on a level sturdy base

Clearance spaces are retained
in accordance with the installation manual

A dedicated water supply isolation
valve has been installed

The water quality entering the cylinder has
been tested and is less than 200 ppm

The pipework for the hot water supply
has been properly insulated

In areas subject to freezing
protection has been provided

There is no hot water leaking from the
water supply/hot water supply pipes
and temperature and pressure relief valve(s)

Pipework is installed from the temperature
and pressure relief valve and the tundish to
a suitable drain with appropriate protection
to prevent discharged water from scolding people

The expansion vessel has been installed in
accordance with the installation manual and
the pressure charge of the expansion vessel
(accessed & charged via the schrader valve
ontop of the expansion vessel) is checked /
charged to match the pressure setting of the
pressure reducing valve

The pressure reducing valve(s)
have been discharge tested

COMMISSIONING CHECK LIST



To be completed by the installer and left with the customer

The cylinder has been filled, completely drained and refilled to remove manufacturing and installation fluxes and oils

The liquid line of the heat pump is correctly connected to the liquid line of the panel evaporator

The panel evaporator has a minimum 30° pitch (if installed on a vertical wall this yields a 90° pitch inclination)

All refrigeration pipework has been insulated with anti-condensation insulation (excluding brass flare nuts) and no rips, tares or holes are present within the insulation

If a heat source has been connected to the boiler coil, a dual thermostat and motorised isolation valve have been installed and appropriately set up

The hot water and heat pump systems comply with the appropriate regulations

The system has been installed and commissioned in accordance with the manufacturers instructions

The system controls have been demonstrated to and understood by the customer

The manufacturers literature, including this checklist, have been explained to and left with the customer.

Commissioning engineers signature

Customer signature
 (to confirm satisfactory demonstration and receipt of manufactures literature)

INSPECTION AND MAINTENANCE



8.1 Annual Inspection & Maintenance

- (a) The BMTB vented / unvented cylinder requires an annual service to ensure continued safe operation and optimum efficiencies. It is essential that the following tasks are carried out by a service technician on an annual basis.
- (b) Turn the cap of the expansion relief valve on the cold inlet manifold, water should be allowed to flow for at least 5 seconds. Upon release make sure it reseats fully. Carry out the same procedure with the pressure / temperature relief valve. In both cases check that the discharge pipe work (D1 and D2) is carrying the water away adequately. If not check for any potential blockages and clear them where necessary. **WARNING: THE DISCHARGING WATER MAY BE HOT!**
- (c) Check that the factory installed immersion heater is working with an amp meter and the internal thermostat is controlling the water at the required temperature.

8.2 The unit should be cleaned with water only and if necessary non-abrasive detergent.

Note: When cleaning please ensure that the main electrical supply is turned off to the BMTB and don't clean the panel if in direct sunlight.

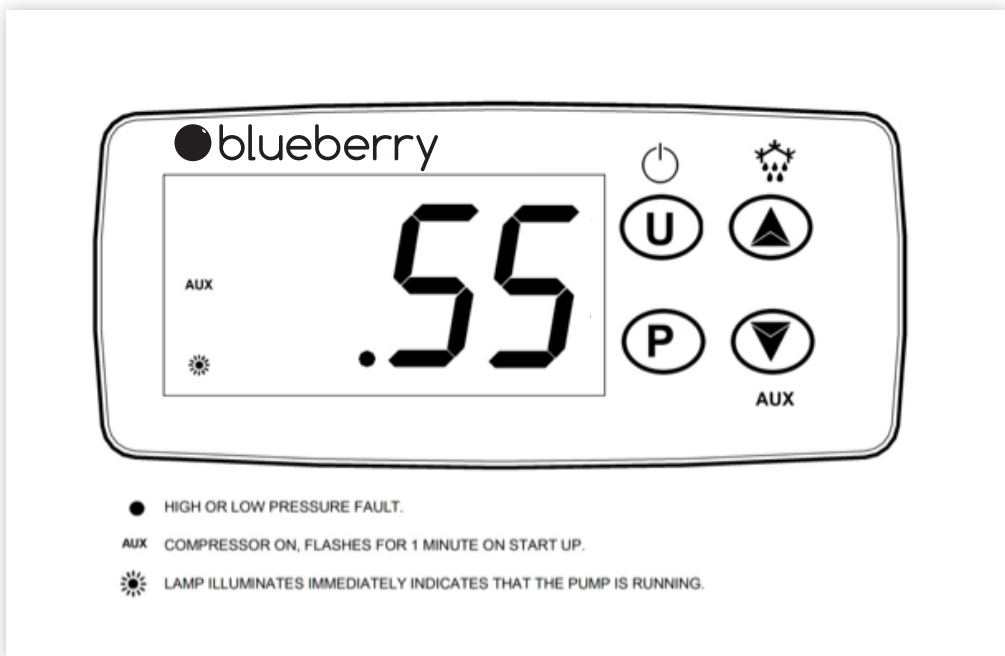
8.3 The system should be drained off if the BMTB is out of use for a prolonged time period and the electrical supply to the unit should be isolated.

USING THE CONTROLLER



Using the BMTB

Fig 10



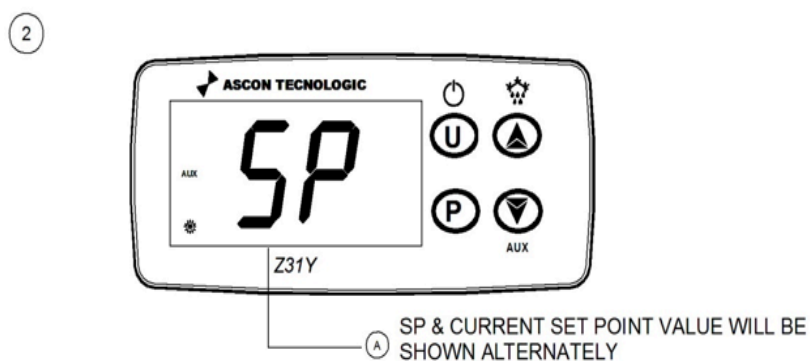
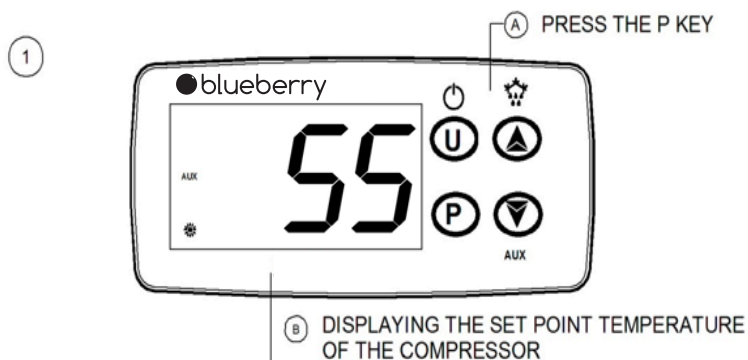
DESCRIPTION	ACTION	COMMENTS
P BUTTON	Press to show SP program mode to change operating temperature of the compressor	The temperature of the compressor is pre-set at 130°F. Never exceed 130°F in Standard mode. Never exceed 140°F in Eco mode.
UP BUTTON	Increases the temperature	
DOWN BUTTON	Decreases the temperature	

USING THE CONTROLLER continued

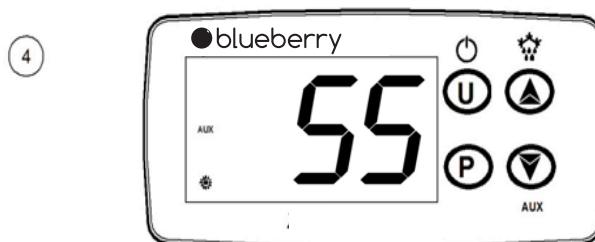
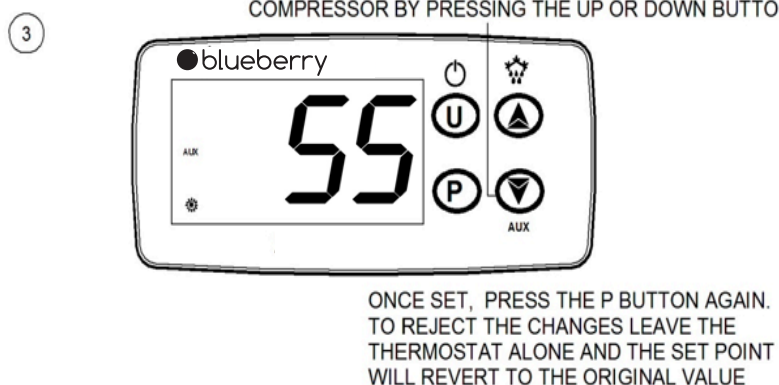


Using the
BMTB

Fig 11



SET THE NEW MAXIMUM TEMPERATURE VALUE FOR THE COMPRESSOR BY PRESSING THE UP OR DOWN BUTTON



TROUBLESHOOTING GUIDE



PROBLEMS	CAUSES	SOLUTION
The screen doesn't show any information.	Lack of power.	<p>Check the power supply.</p> <p>Check that the power switch is on.</p>
The system starts and stops, the screen switches off. A Dot appears on the screen (when off).	<p>Incorrect gas load.</p> <p>Air in the hydraulic circuit.</p> <p>High Pressure switch is on.</p> <p>Non condensable gases in the refrigeration circuit.</p>	<p>Please check the gas through the sight glass.</p> <p>Verify the cleanness of the hydraulic circuit.</p> <p>Check the pressure switches function properly.</p> <p>Lime deposits inside the hydraulic circuit: Clean the filter in the hydraulic circuit and clean the whole system.</p> <p>Check the functioning of the water pump and bleed the pump. Bleed the air through into air vent.</p> <p>Check the R134a load (check the sight glass for the refrigerant)</p> <p>Empty the refrigeration circuit and refill with fresh refrigerant.</p>
E1 error appears on screen.	Temperature probe.	<p>Check the continuity of the probe using a multimeter.</p> <p>Check the temperature probe connection.</p>

TROUBLESHOOTING GUIDE



PROBLEMS	CAUSES	SOLUTION
The water is cold and the compressor is working.	Lower set temperature.	Check the temperature set point on screen.
	The temperature sensor is disconnected to the cylinder.	Check the right placement of the temperature sensor inside the cylinder.
	The pipework between the panel and the magic box is not properly insulated.	Check the proper insulation of the hydraulic circuit and the cylinder.
	Incorrect gas load.	Check the R134a load (check the sight glass for the refrigerant).
The panel is frosting.	Frost could appear during the normal operation and it melts once the LMTB stops.	
The water does not reach temperature.	Incorrect gas load.	Check the R134a load (check the sight glass for the refrigerant).
	Incorrect Installation.	Ensure panel is installed and unit installed correctly.
	Refrigerant Leak or Load.	Check for leaks. If pipe run over 8 metres extra refrigerant must be added (check the sight glass for the refrigerant).

REPLACEMENT OF PARTS



10.1 For quality and consistency of performance it is recommended that only Manufacturers supplied and approved parts be used for initial installation and replacement. No guarantee of performance can be given if non Manufacturer approved parts are used.



REPLACEMENT OF PARTS continued



10.2 Replacement of heat pump

First Contact Magic Box International to determine and confirm with the manufacturer the heat pump is beyond repair. Once this has been confirmed by Magic Box International, complete and return the 'returns under warranty' forms that will be supplied by Magic Box International upon confirmation the heat pump is beyond repair. A replacement Heat Pump will subsequently be couriered to you. The steps to replace the heat pump are outlined below.

10.3 Recover Refrigerant

R134A, as well as other refrigerants, should always be recovered and never be released directly into the environment. You must also use a qualified technician to recover refrigerant gases.

- (a) Collect the refrigerant using a refrigerant recovery unit and recovery bottle. Use R134A refrigerant recovery equipment, refrigerant recovery equipment for other refrigerants may damage the equipment or the unit.
- (b) When carrying out the refrigerant collection on site, unit operation is prohibited, ensure the unit is turned off at the fused switch.
- (c) Connect a recovery machine to the suction line service valve highlighted in figure 7. Ensure to fully open the respective suction line and liquid line service valves to facilitate removal of refrigerant within the evaporator during recovery.
- (d) Actuate recovery equipment to begin recovery of refrigerant gas within the system. Continue to recover refrigerant upto 0 psi. At this point cease operation of the recovery refrigerant, do not create a vacuum within the unit as this may damage the equipment or unit.
- (e) Please note where recovery machines withdraw liquid refrigerant and not vapor , the quantity recovered may not match what the system was charged with.
- (f) Remove recovery equipment and dispose of recovered refrigerant appropriately.

REPLACEMENT OF PARTS continued



10.4 Remove existing heat pump

- (a) Following successful recovery of refrigerant, proceed to remove the heat pump 4x M8 nuts secure the heat pump to the BMTB cylinder top base. Remove these M8 nuts, keep in a safe place to use later on.
- (b) On the front left hand side of the unit, 2x 3/8" pipes protrude from the BMTB cylinder top base. Cut these pipes using appropriate refrigeration pipe cutting equipment. Once completed, ensure to prevent debris from entering the newly exposed pipework.
- (c) Disconnect the suction and liquid line evaporator pipe work from the respective service valves highlighted in figure 7.
- (d) Disconnect the sensor cable and power supply cables to the heat pump, immersion heater and immersion heater rocker switch from the terminal blocks located at the front of the unit. Ensure to appropriately mark these cables for reconnection later on.
- (e) Lift and remove the existing heat pump plate. Ensure to take care when removing the heat pump as this will be required to be couriered back to Magic Box International for investigation for claims under warranty.

10.5 Installing replacement heat pump

- (a) Locate the replacement heat pump onto the 4x M8 bolts protruding from the BMTB cylinder top plate. Secure heat pump in place using 4x M8 nuts removed in section 10.4.
- (b) Align the condenser flow and return 1/4" refrigeration copper pipe to the protruding 3/8" condenser refrigeration copper pipe from the BMTB cylinder top plate. From front, the right hand side copper pipe, connected to the compressor is the condenser flow, the left hand side copper pipe, connected to the receiver is the condenser return.

NOTE: incorrect condenser connect may result to damage to the unit.

- (c) Continue to braze the respective 1/4" and 3/8" refrigeration copper pipes together. Ensure to use Nitrogen when brazing to prevent carbonisation within the pipework during brazing.

REPLACEMENT OF PARTS continued



10.6 Nitrogen pressure test

- (a) Once the replacement heat pump has successfully brazed, proceed to pressure test the refrigeration circuit with oxygen free nitrogen. Ensure the service ports remain open, nitrogen may then be introduced using the service port connection as shown in figure 5.
- (b) Fill the system to 115 psi, hold and monitor for 45 minutes. Check all the newly brazed refrigeration connections with a leak detector. If during the 45 minutes of monitoring the pressure in the system declines, re-braze, tighten or re-flare connections and restart the test. Repeat if necessary until pressure is maintained for the 45 minutes.

NOTE: Ensure through the process that the pressure does not exceed 145 psi in the Thermodynamic Panel and/or the pipe work

10.7 Vacuum

- (a) Once the replacement heat pump has been successfully pressure tested and no leakage of nitrogen has been confirmed, the nitrogen can then be vented.
- (b) The vacuum pump must then be connected into the service port to begin vacuuming the system. Vacuum the system to 0.5 torr (500 microns) and below for a minimum of 45 minutes.

REPLACEMENT OF PARTS continued



10.8 Charge with Refrigerant

- (a) Once the replacement heat pump has been successfully vacuumed, proceed to charge the unit with the appropriate volume of R134A refrigerant.
- (b) To charge the system first ensure to place the R134A refrigerant bottle onto appropriate and accurate weighing scales and zero the scales to allow you to monitor accurately the quantity of refrigerant entering the system. Ensure the refrigeration gauges and connected lines have been purged with R134A before use. Proceed to connect the refrigeration charging line to the suction line service valve.
- (c) A BMTB requires 2.6 lbs of refrigerant to be charged for pipework separation distances up to 26.2' between the heat pump and evaporator. If the pipework separation is greater than 26.2', an additional 1.6 oz per 3 ft of R134A will be required (up to 12.8 oz additionally R134A – 3.4 lbs maximum refrigeration quantity within the system).
- (d) When charging, the differential in pressure between the R134A bottle and BMTB refrigeration circuit will facilitate the passive movement of refrigerant into the BMTB. When passive movement ceases to facilitate the entry of refrigerant, turn the unit on at the fuse spur. The compressor will actuate after 1 minute, and will proceed to draw R134A refrigerant from within the refrigerant bottle. Monitor the weight of refrigerant carefully until the required quantity of refrigerant has been transferred to the BMTB, at which time close all refrigeration isolation valves.
- (e) Proceed to remove any connected refrigeration equipment suitably and follow the commissioning guidelines outlined within section 7 and section 13 of this manual.

GUARANTEE TERMS AND CONDITIONS



The product must be installed and commissioned in line with the manufacturers recommendations as set out in this installation manual. The guarantee must be activated within 30 days of commissioning. Magic Box International will not be able to provide free assistance under these terms if you do not activate your warranty within 30 days of installation. This does not affect your statutory rights.

The guarantee Registration Form should be completed by the installation engineer and returned to the address below or the Registration Form completed on the website:

www.magicboxinternational.com

The installer/sales company should always be the end-users first point of contact, in the event of a breakdown or other malfunction of the product. Only if/when confirmed that there is a fault with the Product and not with the installation design or operation, then contact should be made with Magic Box International. Magic Box International is not responsible for shipping costs associated with warranty returns.

By this guarantee, MAGIC BOX INTERNATIONAL a trading name of SAHP Ltd., registered at 44/54 Orsett Road, Grays, Essex RM17 5ED, Company No. 11807156, guarantees that the solar assisted heat pump has a 2 year compliance guarantee from date of invoice, based on all EU directives in force at time of manufacture; a full 2 year guarantee on a 'return to factory' basis where the unit will be either repaired or replaced.

The BMTB stainless steel cylinder components including controls, valves and electrical parts are guaranteed for 12 months from the date of purchase.

IT SHOULD BE NOTED THAT THE FACTORY FITTED TEMPERATURE AND PRESSURE RELIEF VALVE MUST NOT BE REMOVED OR ALTERED IN ANY WAY OR THE GUARANTEE WILL NOT BE VALID. MBI WILL NOT BE RESPONSIBLE FOR ANY CONSEQUENTIAL LOSS OR DAMAGE HOWEVER IT IS CAUSED.

The guarantee for the stainless steel BMTB vessel itself is guaranteed for 25 years against material defect or manufacturing faults if the original unit is returned to us AND PROVIDED THAT:

GUARANTEE TERMS AND CONDITIONS continued



- It has not been modified
- It has not been subjected to wrong or improper use or left uncared for.
- It has only been used for the storage of potable water supplied from the public mains, max 200mg/litre chloride.
- It has not been subjected to frost damage.
- The benchmark service record is completed after each annual service.
- The unit has been serviced annually.
- Any disinfection has been carried out strictly in accordance with BS6700.

The roll bond evaporator panel is guaranteed for 10 years from the date of purchase.

The guarantee shall only be valid subject to the following conditions: Its installation shall be carried out in accordance with the manufacturer's instructions and in compliance with all the technical and safety standards applicable whether they are European, national or autonomous; it shall also be undertaken by qualified staff.

The present guarantee does not have effect if the general conditions of sale have not been met between the supplier and the domestic end user for the specified equipment, or if the agreed payment terms have not been respected. The end user or customer does not have any right to make any claim for compensation during the time the equipment is damaged or under repair or for damages caused directly or indirect.

**IN ORDER THAT THE GUARANTEE TAKES EFFECT,
IT IS ESSENTIAL THAT THE GUARANTEE COMPLETED ONLINE
WITHIN 30 DAYS OF INSTALLATION AT:
WWW.MAGICBOXINTERNATIONAL.COM**

GUARANTEE TERMS AND CONDITIONS continued



The Guarantee shall be subject to the following conditions:
Its installation shall be carried out in accordance with the manufacturer's instructions and in compliance with all the technical and safety standards applicable whether they are European, national or autonomous; it shall also be undertaken by qualified staff.

The Guarantee shall be null and void if any of the following takes place:

- **Incorrect equipment is used for installation.**
- **The equipment has been installed by staff other than an F Gas qualified engineer.**
- **The equipment has been used for purposes other than those described in the use and deployment standards or in some way other than that recommended in the mentioned standards.**
- **The usage and maintenance instructions have not been complied with.**
- **Water supply for the unit that meets some of the following criteria: Chlorides content > 200mg/L, pH value < 6 (scale Sorensen a 25°C), Sulphate content > 2000mg/L, Chloride and sulphate content > 300mg/L, CaCO₃ content > 300ppm. In general water with values exceeding ceilings set by legislation.**
- **Absence of security group in the inlet system according to the legislation.**
- **System malfunction arising from improper installation of the hydraulic circuit components and/or buffer tank.**
- **Installation of elements outside the specifications of the installation manual.**
- **Damage resulting from improper anchoring equipment.**
- **Unit malfunction due to lack of thermal insulation in the installation**
- **Incorrect placement of thermodynamic solar panel or box**
- **The equipment has received an overload of any nature: electrical, water pressure etc.**
- **Malfunctions brought about by chance or force majeure: atmospheric, geological phenomena etc.**
- **The equipment has not been delivered in its original box.**
- **Damage from atmospheric and external agents: Freezing, dirt, transport, or accidental impacts.**
- **Damages derived from an unusual supply of electricity, water or air (included over pressure and over voltage).**
- **Damage caused by daily wear in metal or plastic.**
- **Breakdowns caused by the replacement of parts or elements not original or authorized in writing by the manufacturer.**
- **Damages caused by the unusual corrosion of the heat exchanger and/or the hydraulic circuit caused from reaction with the circulating fluid.**
- **Damages caused from the installation itself.**
- **Damaged caused by vandalism acts, war, fire, etc.**

SERVICE RECORD



Date of visit _____

Engineer Name _____

Job Role _____

Company Name _____

Telephone Number _____

Comments _____

Signature _____

Date of visit _____

Engineer Name _____

Job Role _____

Company Name _____

Telephone Number _____

Comments _____

Signature _____

Date of visit _____

Engineer Name _____

Job Role _____

Company Name _____

Telephone Number _____

Comments _____

Signature _____

DISASSEMBLY AND RECYCLING



USE TRAINED TECHNICIANS

Only trained technicians can carry out work on equipment containing F gases, including:

- installation
- testing for leaks
- general maintenance
- disposal or decommissioning when you no longer need the BMTB

Check that anyone working on your equipment is qualified.

CHECK FOR LEAKS

Any leaks from the product must be stopped.

Engineers that install, maintain or dispose of equipment share responsibility for trying to stop leaks with the operators of equipment. They must check all equipment for leaks.

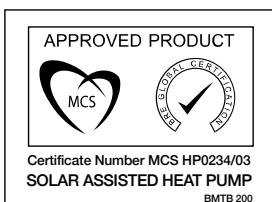
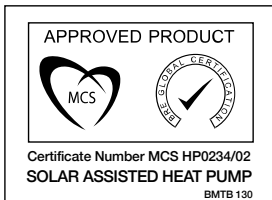
RECOVER F GASES WHEN DISPOSING OF EQUIPMENT

You must use a qualified technician to recover F gas when disposing of equipment.

RECYCLE RECOVERED F GAS

It may be possible to recycle the following gases at your premises when the engineer decommissions the system.

Ask the technician recovering the F gas if it's possible to recycle it. The technician will carry out a basic cleaning process when they recover the gas if it's possible. The gas can then be re-used.



SAHP Magic Box International

**UNIT 2
GALLIFORD ROAD
ESSEX, CM9 4XD
020 3814 1820
INFO@SAHP.INFO**