Enviritech Heating System Operating Instructions.

A typical Enviritech heating system consists of an Enviritech heat pump that heats underfloor heating on the ground floor of a dwelling, low temperature radiators on the first floor and domestic hot water in the cylinder. The cost of heating of your home is minimised by providing most of the heating requirements at night between 11pm and 8am (winter time), thus using mostly night rate electricity.
There are several critical components, which control the heating system, these are the 3 channel time clock, three way actuated valves, underfloor manifold, actuators for the manifold, master stat and slave stat, wiring centre, circulation pump and submersible well pump. An example layout of the heating system is shown in figure 1.

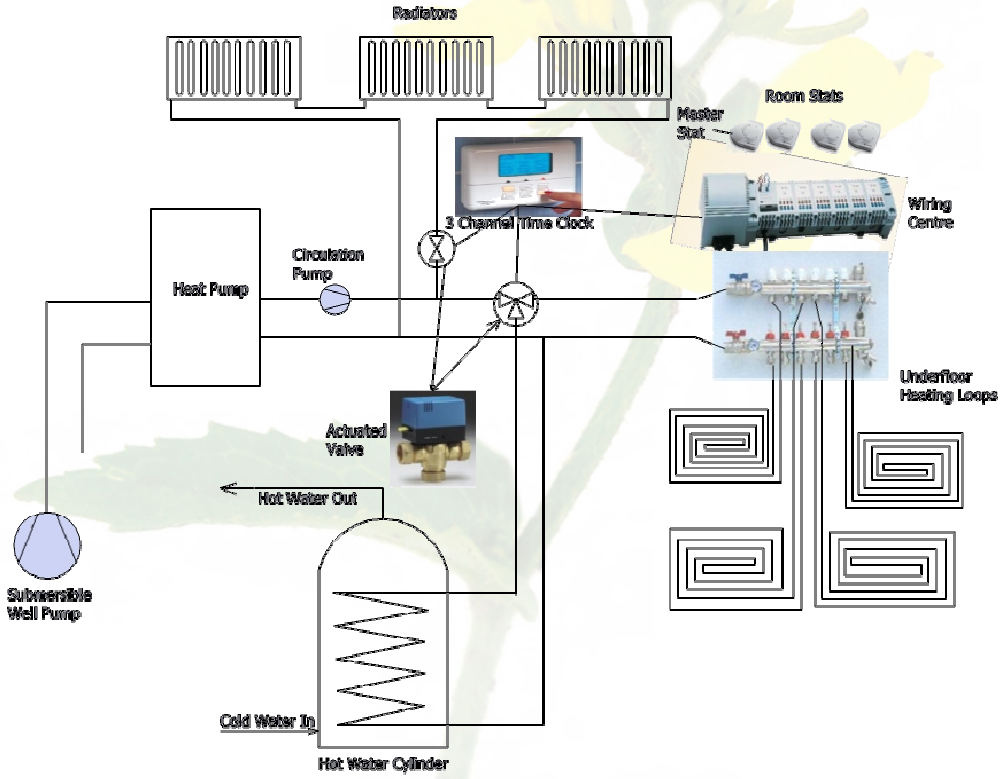

Figure 1: Layout of an Enviritech heating system, which incorporates underfloor heating, radiators and domestic hot water heating.

3 Channel Time Clock
The 3 channel time clock controls the operation of the heat pump. It is generally set to heat the floor loops to 35°C for the most part of the night. The domestic hot water is heated up to 60°C. This takes about an hour and is done at some time in the early morning. The heat pump heats the radiators up to 60°C are also set to turn on for between half an hour and an hour around the time people get up and go to bed. The time clock is programmed so that it suits each house.
There is a manual override for the heating. In figure 2, the buttons from left to right are controls for underfloor heating, radiators and domestic hot water respectively. If any of these are required at any point during the day, pressing the respective boost button once will switch on heating to the area pressed for a

one hour period. Pressing it a second time will switch on the heating for two hours and pressing it a third time will switch it off. Domestic hot water heating and underfloor cannot be switched on at the same time with hot water heating given priority. Radiators can be switched on in conjunction with both domestic hot water or underfloor. They are heated to 60°C if they are switched on at the same time as the hot water however when the radiators are switched on with the underfloor heating they are heated to only 35°C.
The advance button, located just above the boost button will bring the start time for the heating operation forward to the present time. For example if the radiators were set to come on from 9 o'clock to 11 o'clock and the advance button was pressed at 8 o'clock the radiators would then remain on from 8 o'clock to 11 o'clock.
Note: Pressing the on/off switch on the heat pumps key pad overrides the time clock and switches on the heat pump. The heat pump should not be switched on at the keypad as the actuated valves are not controlled and therefore circulation may not be possible. If the heat pump is running and "NET" is not shown on the top right hand corner of the keypads screen then the heat pump is operating in override and requires that the on/off button on the keypad is pressed once.

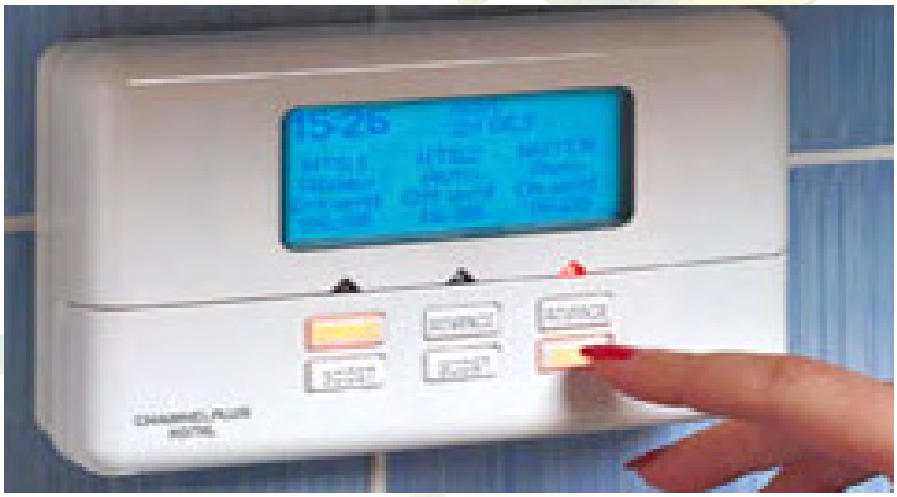

Figure 2: Example of time clock, which controls heating system.

The time clock works by using two & three way motorised valves to direct the flow accordingly. A three way motorised valve is shown in figure 3.

Figure 3: Three way motorised valve used to control the heating circuit.

Heat Pump Control Panel

The heat pump control panel over rides the time clock. Pressing the on/off button while the heat pump is switched off will turn the heat pump on regardless of what the time clock is commanding it to do. The on/off button SHOULD NOT be used to control the heat pump. When the heat pump is being operated under command of the time clock a NET signal is indicated on the top right-hand corner of the display as shown in figure 4. If the heat pump is operating and the NET signal is not present, it is operating in manual mode. The pink on/off button should be pressed once to switch the heat pump off and the heating commands should then be given from the time clock.

There is a timer function on the control panel but this is not used as the heating programme is controlled from the time clock.

The set temperature and the return temperature are displayed on the control panel as indicated in figure 4. The set temperature is set on commissioning and as such there is no need for the user to change it on the control panel. (Its optimum setting is 60°C- (the difference in flow and return temperature when heating hot water only +1°C)). Other parameters can be seen while the heat pump is operating by pressing the set button.

Number of times set button pressed	Parameter displayed
1	Outlet secondary water temperature
2	Ambient air temperature
3	Inlet primary water temperature
4	Outlet primary water temperature

Further instructions on the operation of this control panel are available in the heat pump user manual.

Figure 4: Heat Pumps control panel

Master Stat and Slave Stats

There is a master stat located somewhere in the house, generally the kitchen as shown in figure 5a, and the slave stats are in all the other downstairs rooms except bathrooms as seen in figure 5b. Bathrooms and Halls generally have an open loop circuit.

The stats are controlled off the control unit and regulate the temperature each room will be heated to. Adjusting the stats temperature will see no immediate effect as all the heating takes place during the night so if a room is either too warm or too cold during the day, adjust the stat according to your preference and the difference in temperature will be noticed the next morning.

The master stat has a special function in that it determines if the heat pump needs to be switched on again during the day to boost the heat in the house. This is called the set back temperature. This is generally set to be 3°C lower than the set point on the stat but can be adjusted to anywhere between 2 and 6°C. This is set by removing the dial on the stat and adjusting the dial, which is there. If the room with the master stat drops below the set back temperature, the heat pump switches to the underfloor heating and operates until the room reaches the setback temperature. It does not go any higher than this. The master stat is generally set 1-2 degrees higher than the next highest stat to ensure that all areas are satisfied.

Note: The heat pump is set to operate at night; therefore, it is sleeping during the day. This causes a moon shaped light to switch on during the day and switch off at night. This is perfectly normal and understandably causes some confusion.

Figure 5: (a) Master stat (b) Slave stat

Manifold

The manifold (figure 6) distributes the heated water through the underfloor heating in the house. The actuator (figure 7) controls the flow rate of water to each heating circuit according to the demand of the stats in each room through the wiring centre. If the heat required for all the rooms is met, all the valves will close and the heating will shut off. Bathrooms and Halls are open loop circuits and do not have an actuator.

On the cold return, there are flow meters for each circuit. These show the flow rate in litres per minute through the loop. When all the valves are fully open these flow meters should have, the same flow rate displayed to evenly distribute the heat through the house. If this is not the case, the flow can be adjusted by removing the red cap and turning the flow meter clockwise to reduce it and anti clockwise to increase it. Replace the red cap after the adjustments are made.

The manifolds are also equipped with temperature gauges, which read the flow and return temperature of the floors and air release valves.

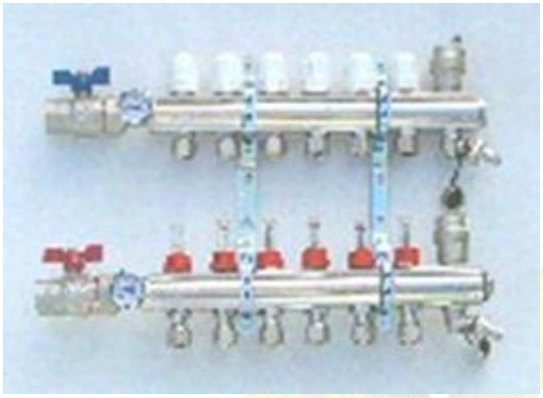

Figure 6: Typical manifold used with Enviritechs underfloor heating systems.

Figure 7: Actuator that is used to control flow rate according to demand from room stat.

Wiring Centre

The wiring centre as shown in figure 8 is where the stats and actuators are powered. This is the heart of the control system, which controls the stats and actuators. There is also an auxiliary volt free contact, which starts up the heat pump.

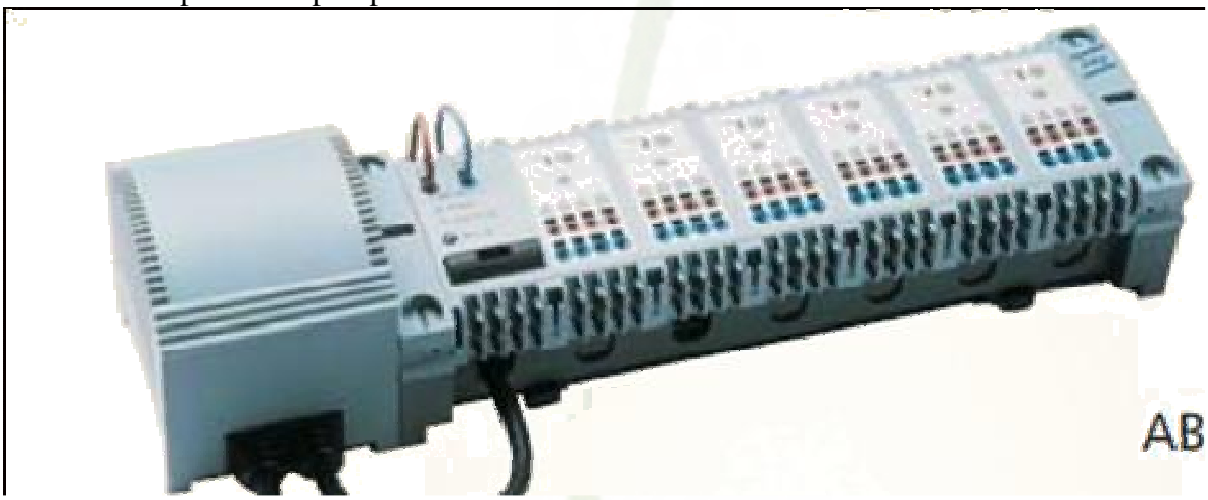

Figure 8: 6 zone wiring centre

Dimming of Lights

During the heat pumps start up cycle, an instantaneous surge occurs when the compressors motor starts. This phenomenon happens with all motors and is due to a high inrush current on starting. This high inrush is experienced for a fraction of a second and does not contribute to a higher consumption of power as it is only for a very short time. This inrush thus causes a lowering of voltage on the house electrics, which in turn may cause lights to dim momentarily. This phenomenon will also be noticeable with other appliances Heat pumps operate best with a minimum number of starts. When commissioned it should be setup so that your heat pump will have as little starts as possible i.e. the heat pump will operate continuously for a period of time to meet your heating requirements. The dimming effect can be more noticeable where a poor power supply is provided.

Optional Extras

i. Soft Start

If the dimming effect is causing problems within the home a soft start can be fitted to the heat pump. This regulates the electricity into the heat pump during start up thus eliminating the dimming.

Note: Soft starts can incur harmonics, which may affect sensitive equipment.

ii. Flow Switch

A flow switch can be incorporated on the primary and secondary water circuits. These units are to protect the equipment from dry running. As the heat pump can detect failure to flow in both the primary and secondary circuits due to temperature comparison these generally are not incorporated. However if for whatever reason the reliability of the flow is questionable we recommend including the relevant flow switch as the flow switch will also offer protection to well pumps, circulation pumps, valves etc as well as added protection to the heat pump.

iii. Heat Recovery

Depending on your heat source, Enviritech can customise a heat recovery system to suit your needs. This maybe incorporated with extract ventilation heat recovery, bulk milk cooler, cold room or other application with waste heat.

Kilnantogue, Rathangan, Co. Kildare
Phone: 045 524831 **Mobile:** 087 2408339 **E-mail:** info@etech.ie
www.etech.ie

Common Errors in Heat Pump Operation

Error	Caused by	Check for	Solution
7	Evaporator pressure too high caused by poor circulation in heating circuit	Circulation Pump Failure Air Lock in Circuit Valves Closed in Heating Circuit Low Water in Heating Circuit Frozen pipes	Call your plumber for assistance Ensure airvalves are clear to allow air to escape Check all valves and open them if closed Check for leaks in circuit and check tank in attic or pressure gauge on auto fill valve. Call your plumber for assistance if no obvious solution found. Wait for pipes to thaw before operating heat pump.
8	Error 7 occurring twice in a one hour period	Heat Pump needs to be reset by power down and power up	There is an issue with your heating circuit. See above for solutions. Power down the heat pump and power it back up to reset this error.
9	Evaporator pressure too low caused by poor circulation from the well. Low refrigerant gas charge in heat pump	Valve closed on well side Submersible pump failure Air lock in circuit Insufficient water supply Freezing of the pipe Low pressure on gauges. If gauges read 0 MPa gas has escaped.	Check all valves on well side and open them if closed Call your plumber for assistance Ensure airvalves are clear to allow air to escape Check for blocks in the pipe. Wait for pipe to thaw before operating the heat pump again Contact Enviritech for assistance.
10	Error 9 occurring twice in a one hour period	Heat Pump needs to be reset by power down and power up	Power down the heat pump and power it back up to reset this error. Ensure that primary water (well) is circulating before allowing the compressor to run.
15	Heat Pump temperature exceeds 60°C	Will automatically reset when temperature drops by 15°C. Temperature set point needs to be lowered so that heat pump resets when temperature drops by 5°C.	Check error 8 above. Set temperature set too high.
19	Primary water flow switch (optional) failure Primary water actuator (optional) failed to open	Check flow switch is operating correctly Check actuator is operating correctly	Press the reset button on the heat pump to reset the error if flow switch is operating correctly Press the reset button on the heat pump to reset the error if the actuator is operating correctly
22 & 23	Primary water too cold or insufficient flow	Check primary water temperature by pressing set button 3 times	Press and hold the set button for 10 seconds. Press the set button until P5 is reached. This temperature can be reduced to as low as 3°C and we recommend that it is set to 4°C

NOTE: Always check well water flow through heat pump. Do not operate heat pump if well water not present as this will void your warranty.

Kilnantogue, Rathangan, Co. Kildare
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