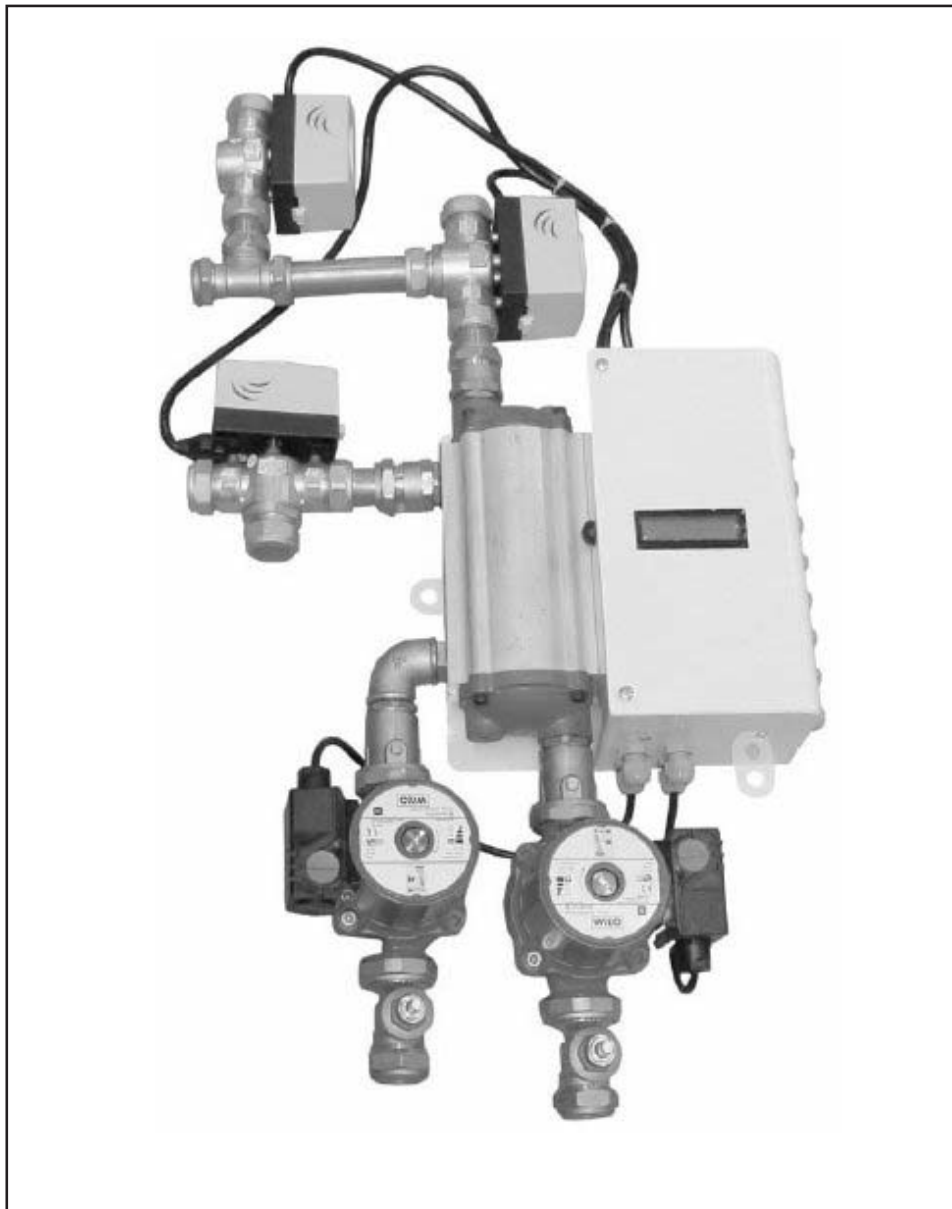


ECO-CONNECT PLUMBING SYSTEM



INSTALLATION MANUAL

PLEASE READ THESE INSTRUCTIONS BEFORE INSTALLING AND USING THIS SYSTEM

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As responsible manufacturers we take care to make sure that our products are designed and constructed to meet the required safety standards when properly installed and used.

IMPORTANT NOTICE: PLEASE READ THE ACCOMPANYING WARRANTY

Any alteration that is not approved by AGA could invalidate the approval of the appliance, operation of the warranty and could affect your statutory rights.

This system **MUST** be installed by a competent person, conversant with domestic plumbing, heating systems and electrical requirements. As the project will be in conjunction with a heating appliance, the installer should be registered with GasSafe, OFTEC or HETAS, as appropriate and follow the guidance of the Benchmark Scheme Code of Practice. Trade training is offered by AGA.

REMEMBER: When replacing a part on this appliance, use only spare parts that you can be assured conform to the safety and performance specification that we require. Do not use reconditioned or copy parts that have not been clearly authorised by AGA.

INTRODUCTION

The Eco-Connect panel is a plumbing and wiring device to allow an intelligent link up between a solid fuel appliance on an open vented plumbing system, and an automatic appliance such as an oil, gas or pellet boiler on a closed system.

The solid fuel appliance could be a stove or wood-burning cooker.

Priority is automatically given to taking energy from the renewable source.

At the centre of the plumbing, is a shell and tube heat exchanger which allows heat transfer to take place from the open vented to the sealed system. There are three pre-wired and plumbed motorised valves and two pumps, which are powered on or off, to collect the heat from the required source of heat and distribute it to the desired zones (Fig. 1).

OPERATION

Valve 1 - Part of the open vented circuit. It directs the heat from the solid fuel appliance, to either the gravity flow through the cylinder if flow temperature is below 65°C (Fig. 2) or towards the heat exchanger under pumped circulation (Figs. 3 and 4), when above 65°C.

Valve 2 - Part of the sealed circuit. This valve collects the output from either the heat exchanger, boiler, or a mix of both. Where there is no demand for heating, but the solid-fuel appliance is above 65°C. From port 'A' and the heat exchanger (Fig. 3),

or

if there are demands for heating or hot water, solely from the automatic boiler (when solid-fuel appliance is below 65°C) using port 'B' (Fig. 5)

or

in a mid position, mixed mode (when solid-fuel appliance is between 65 - 71°C) using both ports 'A' and 'B' (Fig. 6)

or

solely from the solid-fuel appliance, when it is above 71°C (Fig. 7), or the 'Eco' function is selected.

Valve 3 - Controls the pumped output to the domestic hot water cylinder.

Pump 1 - Circulates the water from the solid fuel appliance.

Pump 2 - Extracts the heat from the heat exchanger into the sealed system.

Both the pumps operate in parallel, pushing water through the vented and sealed paths of the heat exchanger.

At the heart of Eco-Connect, is a micro processor controlled wiring centre with an LCD display to provide feedback to the customer. The wiring centre takes inputs from programmers and thermostats, for up to four heating zones and one domestic hot water zone and provides signals to the external motorised valves controlling the flow to these heating zones. The wiring centre also provides "voltage-free" contacts T32, T33, giving a switch loop to command the automatic boiler to fire as required.

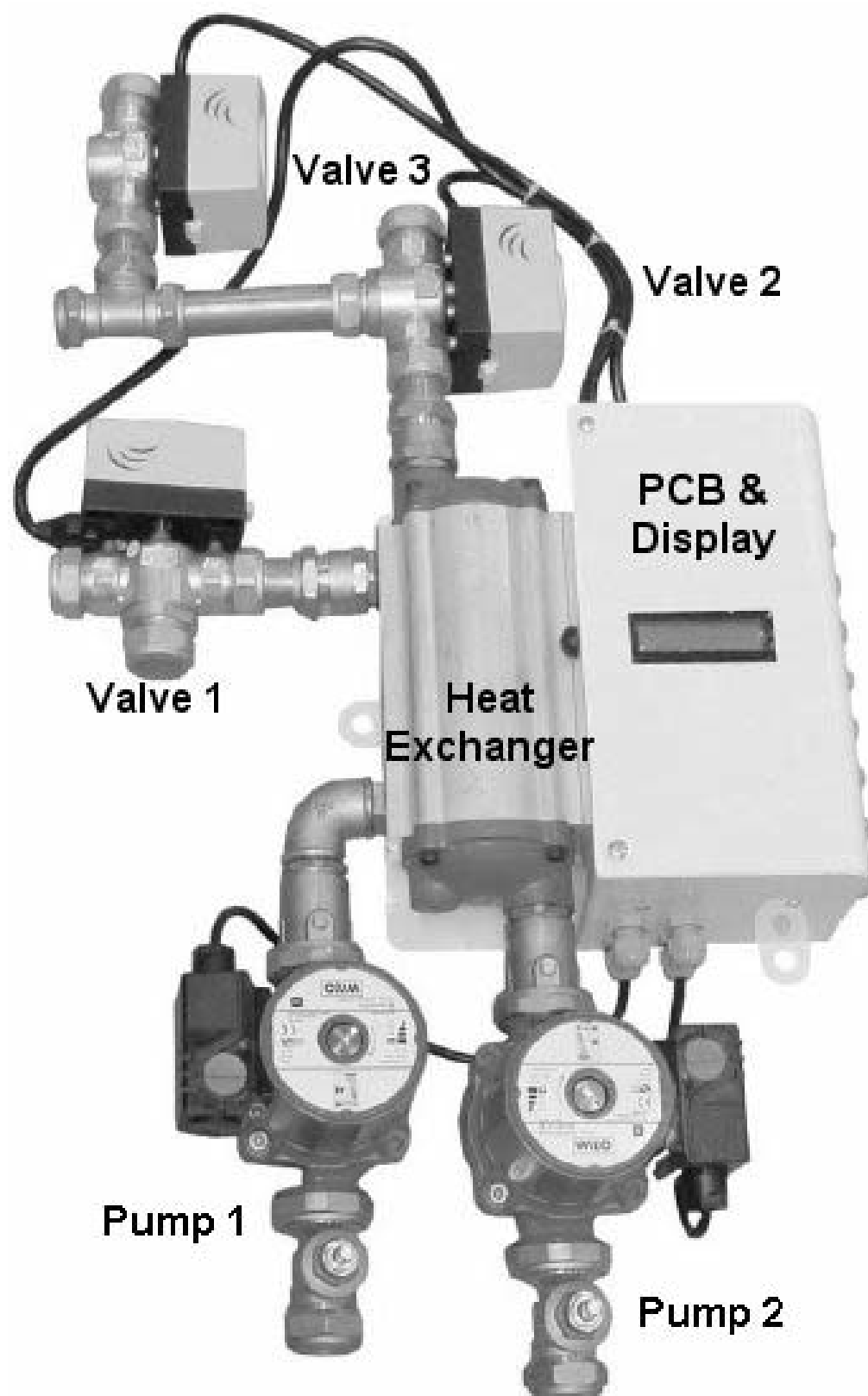


Fig. 1

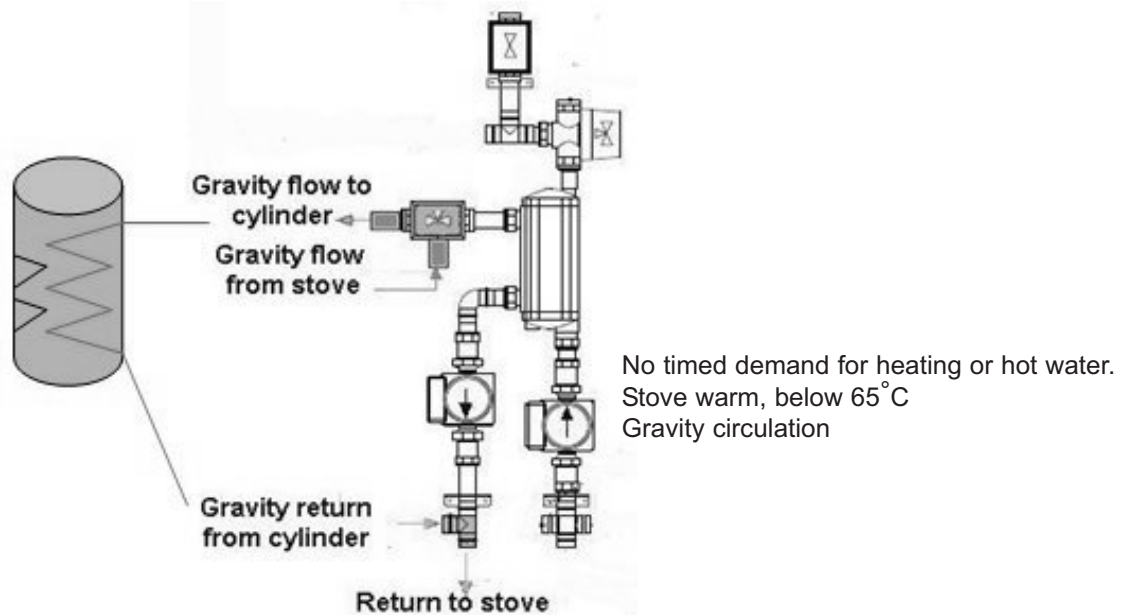


Fig. 2

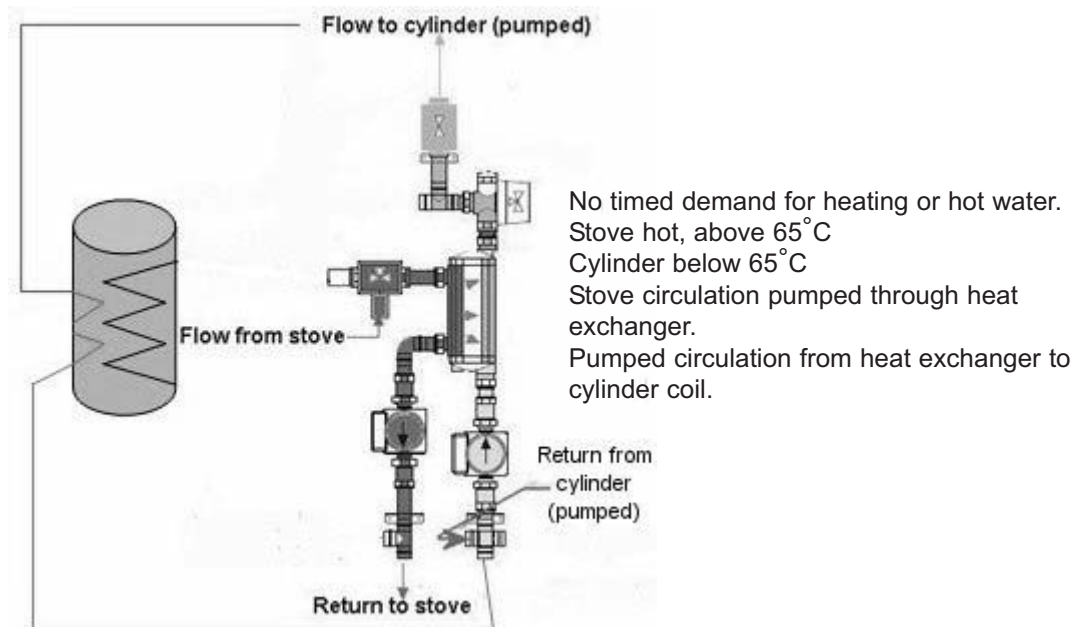


Fig. 3

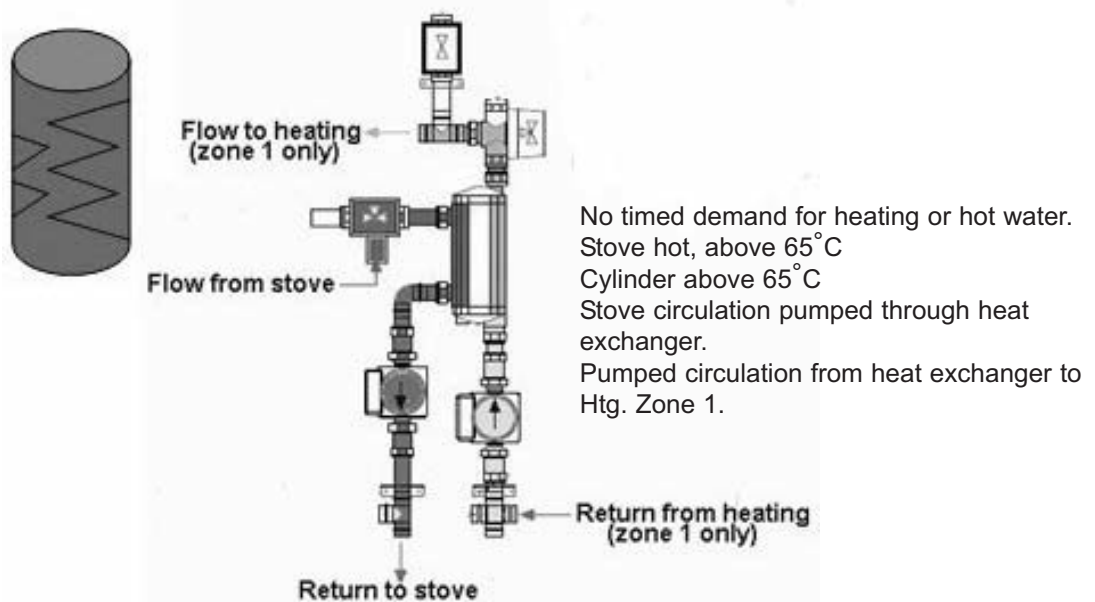


Fig. 4

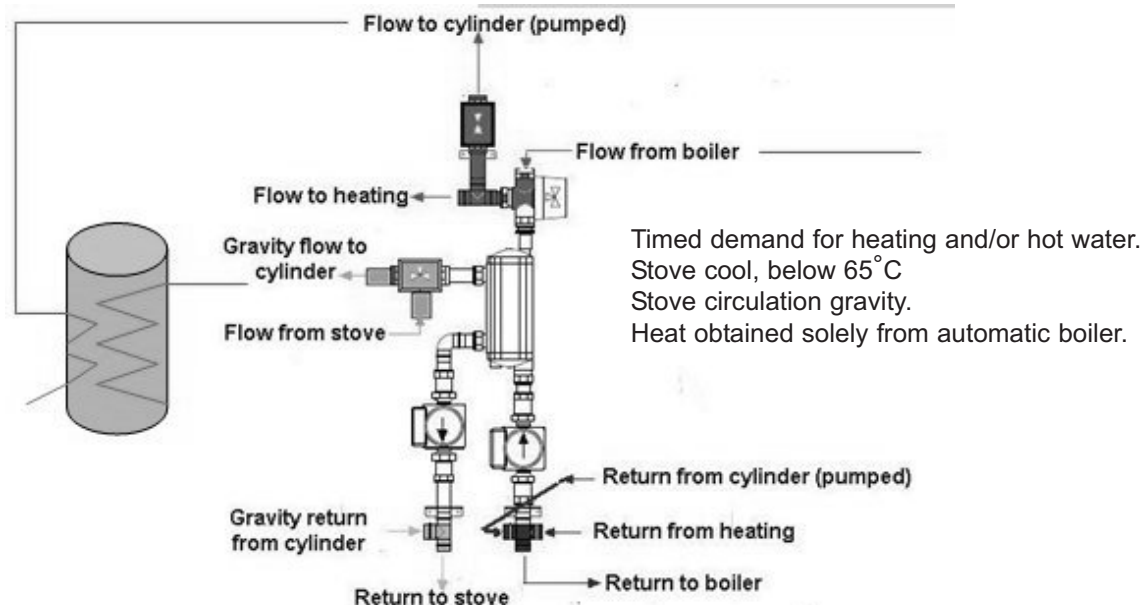


Fig. 5

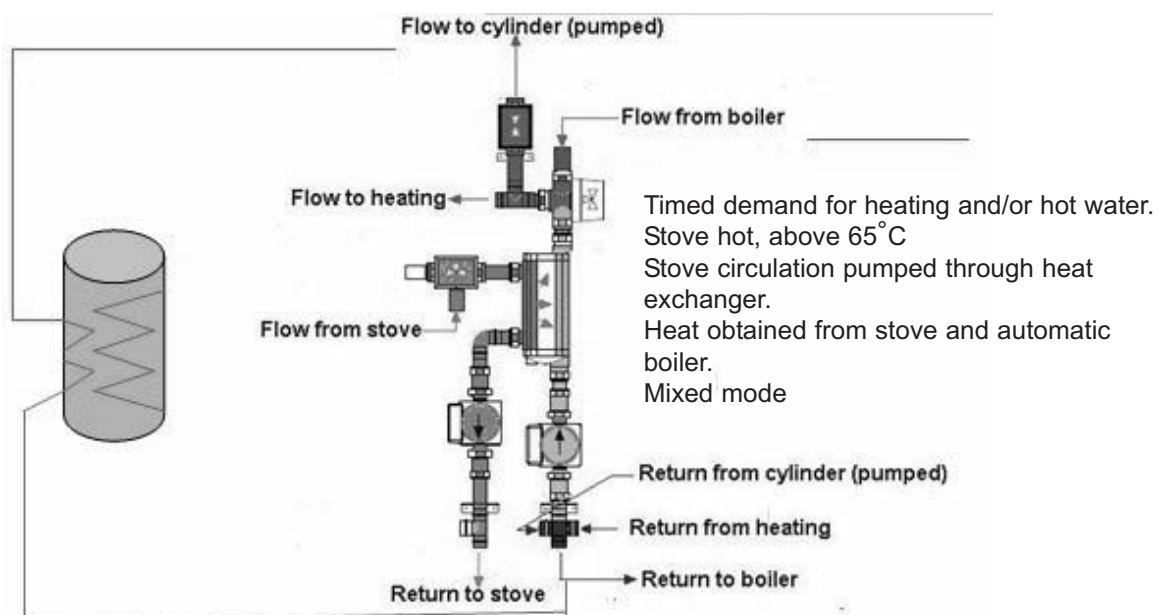


Fig. 6

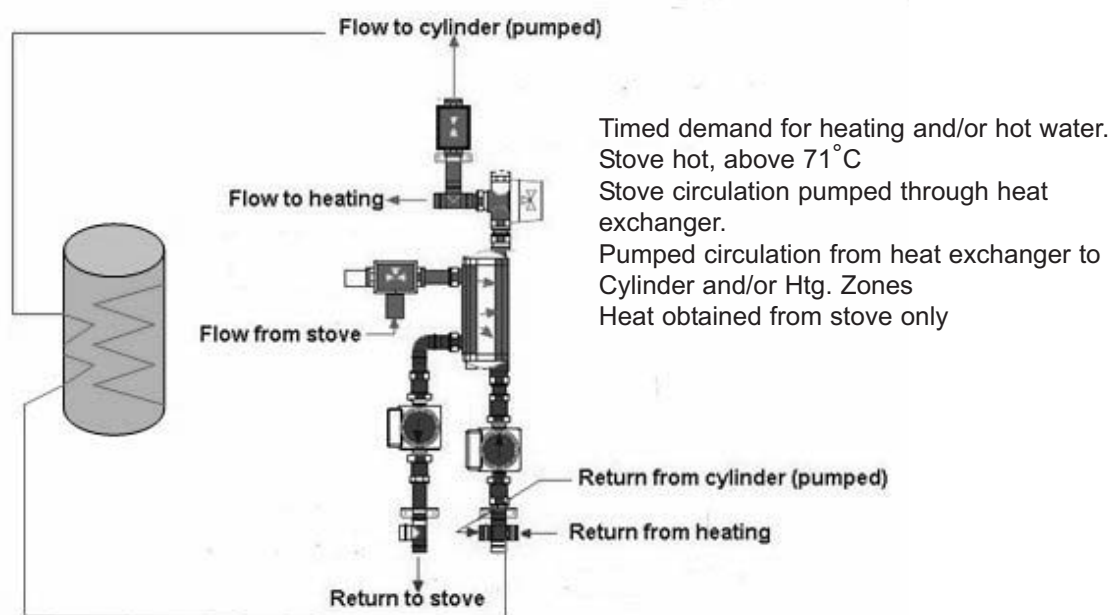


Fig. 7

ECO-CONNECT SPECIFICATION

Weight - 18.5 kg

Maximum temperature rating - 100°C

Maximum operating pressure (sealed system) - 2 bar

Maximum head (open vented system) - 30m

Pipework connections - 28mm copper

Electrical supply - 230V AC 50 Hz. Isolator to be fused at 3 amp. I.P Rating - IP20.

This product carries a 3 year parts warranty, providing it has been correctly installed and commissioned.

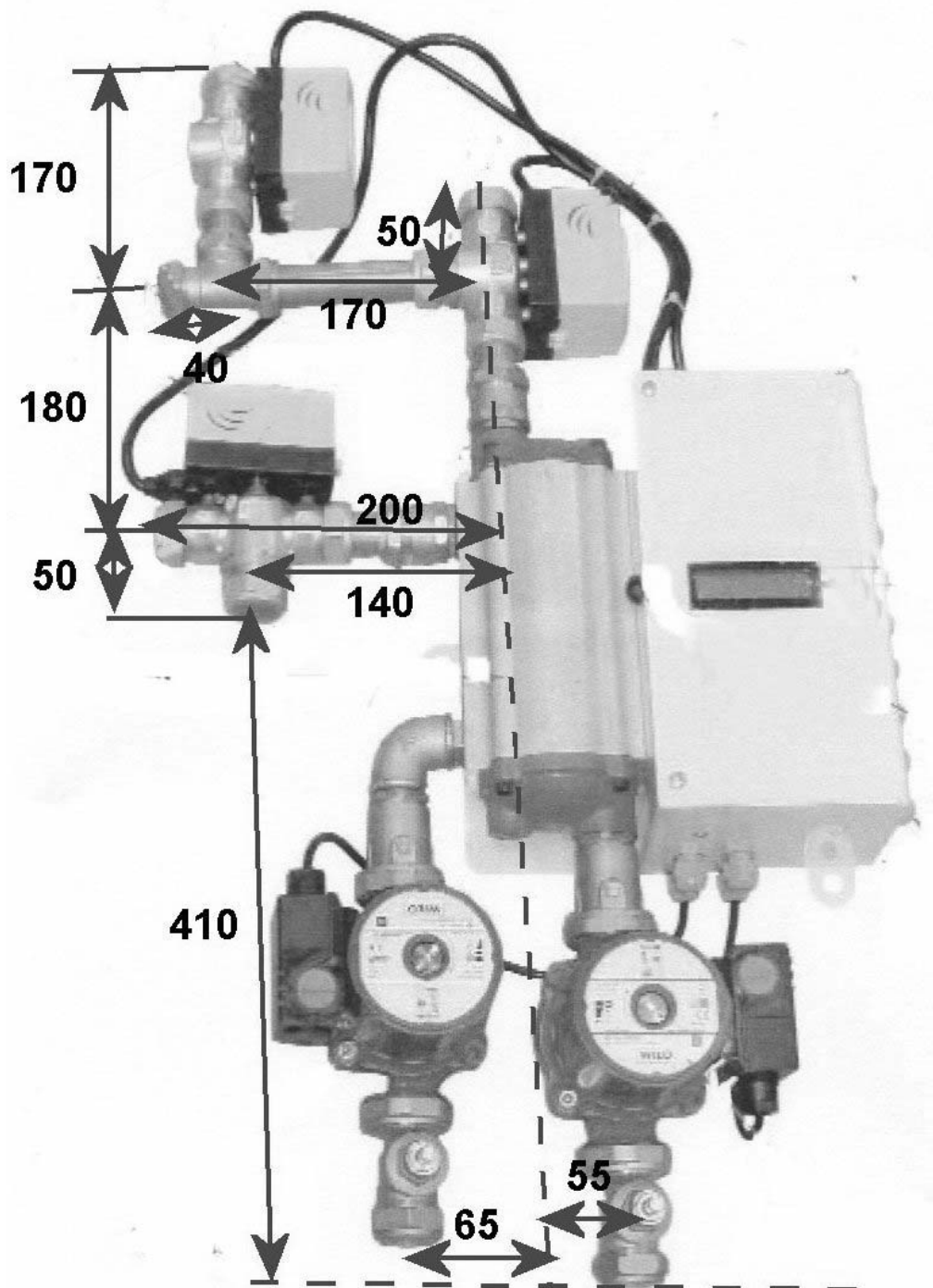


Fig. 8 - Dimensions

SYSTEM REQUIREMENTS

Solid Fuel Appliance

This can be a stove/roomheater approved to EN13240, with a maximum boiler output of 12kW burning either wood or mineral fuel. It must incorporate a water-sensing thermostat and be installed in accordance with the manufacturer's instructions.

Alternatively a woodburning cooker may be used, approved to EN12815, installed in accordance with the manufacturer's instructions.

Automatic Boiler

Typically this would be a regular oil or gas-fired boiler, but could be a central-heating cooker where the boiler output is fully controllable, e.g. models with twin burners. Certain wood pellet boilers could be used where these are fully automatic. Appliances must be CE approved.

Combination boilers are not suitable.

Such appliances should be simple on/off products, requiring a single 'on' mains voltage command signal, without sophisticated integral energy management controls. If in doubt, refer to AGA Trade Technical Help-line or boiler manufacturer.

There is no limit on the automatic boiler output, but it should be matched to meet the demands of the combined heat and hot water demands. We recommend that the thermostat be set to approximately 80°C.

It must be an appliance designed to work on a fully pumped system only. Therefore a circulating pump (not supplied with Eco-connect package), will need to be fitted to either the boiler flow or return pipe. Where pump overrun facilities are required by the manufacturer, the circulation pump must continue to be controlled from the boiler. In this case, a suitable pump by-pass pipe between the boiler flow and return must be provided, fitted with an automatic pressure valve.

The mains electrical supply to the boiler must be fed from the same isolator as Eco-Connect.

The appliance manufacturers installation instructions must be adhered to.

Hot Water Storage Cylinder

The cylinder must be of the open vented type, sealed or unvented types are not suitable for use with Eco-Connect. It must be able to accept an input by gravity circulation from the solid fuel appliance.

The cylinder must have manufacturers applied insulation.

A thermostatic blending valve should be fitted on the draw-off supply to the taps.

Two basic types of cylinder can be considered suitable. Multi-coil indirect or Thermal store.

Storage capacity will depend on a number of factors, such as size of household, number of bathrooms and the number of energy sources. Typically 200 litres could be considered as the minimum, but should be increased if say, Solar thermal panels are also to be incorporated. Refer to equipment manufacturers instructions.

Feed and Expansion Tank (Solid Fuel Appliances)

As with any solid fuel appliance installation, the F and E tank may have to cope with a 'boiling over' or 'Pitching' situation, particularly in the event of a power-cut, when temperatures of 100°C could be experienced.

Consequently it must have a minimum capacity of 200 litres, be heat-resistant (>110°C), adequately supported and incorporating a copper float and overflow pipework.

The solid-fuel appliance must have its own F and E tank, cold-feed and open vent pipe with no intervening valves.

Plumbing - General

New and existing plumbing systems must be fully flushed out and refilled with an appropriate corrosion inhibitor. Inhibitor levels should be checked at 5 year intervals.

Excessive amount of PTFE thread tape should not be used, and care taken not to allow strands to enter the Eco-Connect pipework.

Where possible pipework should be insulated to conserve energy, particularly in the vicinity of Eco-Connect.

System Design

(See Figs. 9 and 10) These show typical system layouts, although for clarity certain components are omitted, such as drain valves, hot water feed-tank etc.

In all cases the pipework between the Stove, Eco-Connect and the cylinder must be laid out so as to permit gravity circulation for slumbering conditions. A minimum vertical rise of at least 1 metre between the stove and Eco-Connect should achieve this. All pipe connections on Eco-Connect are 28mm.

Up to four heating zones can be controlled.

Zone 1 is also automatically used as the heat dump in the event of the solid fuel appliance overheating. An underfloor heating circuit is ideal for zone 1, or if radiators are used, they should be able to handle 50% of the solid fuel appliance output. Only lockshield valves should be fitted in this circuit.

Direct cold water injection is not acceptable as a safety measure.

Fig. 9 shows a Multicoil indirect cylinder, with a woodburning stove linked to an automatic oil-fired central heating cooker, optionally also served by Solar thermal collectors.

The stove is vented with its own F and E tank and the cooker/boiler is on a sealed system

'A' is the optional coil from the solar collectors on a sealed circuit with its own pump sensors and control station.

'B' Is the gravity coil from the stove under slumbering conditions.

'C' Is the pumped coil served by the stove (through the heat exchanger) and/or automatic boiler.

'D' Is the thermistor T3. It is operational when pumped circulation is taking place, but with no DHW and limits the cylinder temperature to a maximum of 65°C. It should be located approximately one-third of the way down and ideally fitted in a pocket or snugly under the insulation.

'E' Is the regular cylinder thermostat (not supplied with Eco-Connect). It should be located immediately above the pumped coil.

'F' Are the optional sensors for the solar input

'H' Is the automatic boiler system pump (not supplied with Eco-Connect).

Fig. 10 shows a typical Thermal store cylinder using heat from a wood burning cooker, and an automatic oil or gas fired boiler with Solar input.

'A' Is the optional coil from the solar collector on a sealed circuit with its own pump sensors and control station.

'B' Is the pumped coil served by the stove (through the heat exchanger) and/or automatic boiler.

'C' Gravity connections, using the main body of water in the cylinder to absorb heat under slumbering conditions.

'D' Is the thermistor T3. It is operational when pumped circulation is taking place, but with no DHW demand and limits the cylinder temperature to a maximum of 65°C. It should be located approximately two-thirds of the way down and fitted in snugly under the insulation in contact with the wall and the cylinder.

'E' Is the regular cylinder thermostat (not supplied with Eco-Connect) It should be situated above the pumped coil, approximately one-third down.

'F' Are the optional sensors for the solar input.

'G' Is a typical external heat-exchanger associated with thermal store cylinders to generate hot water at mains pressure.

'H' Is the automatic boiler system pump (not supplied with Eco-Connect).

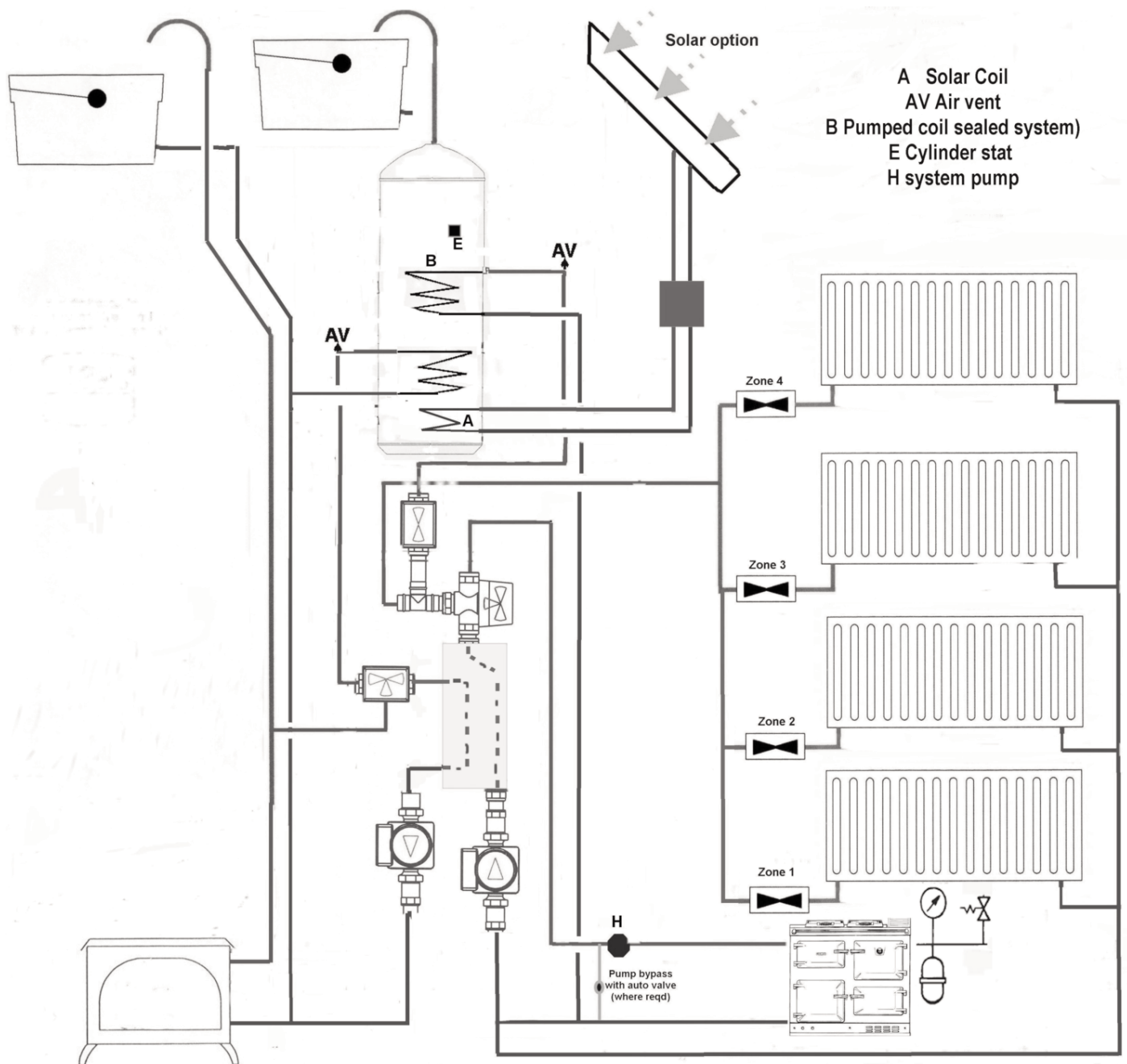


Fig 9

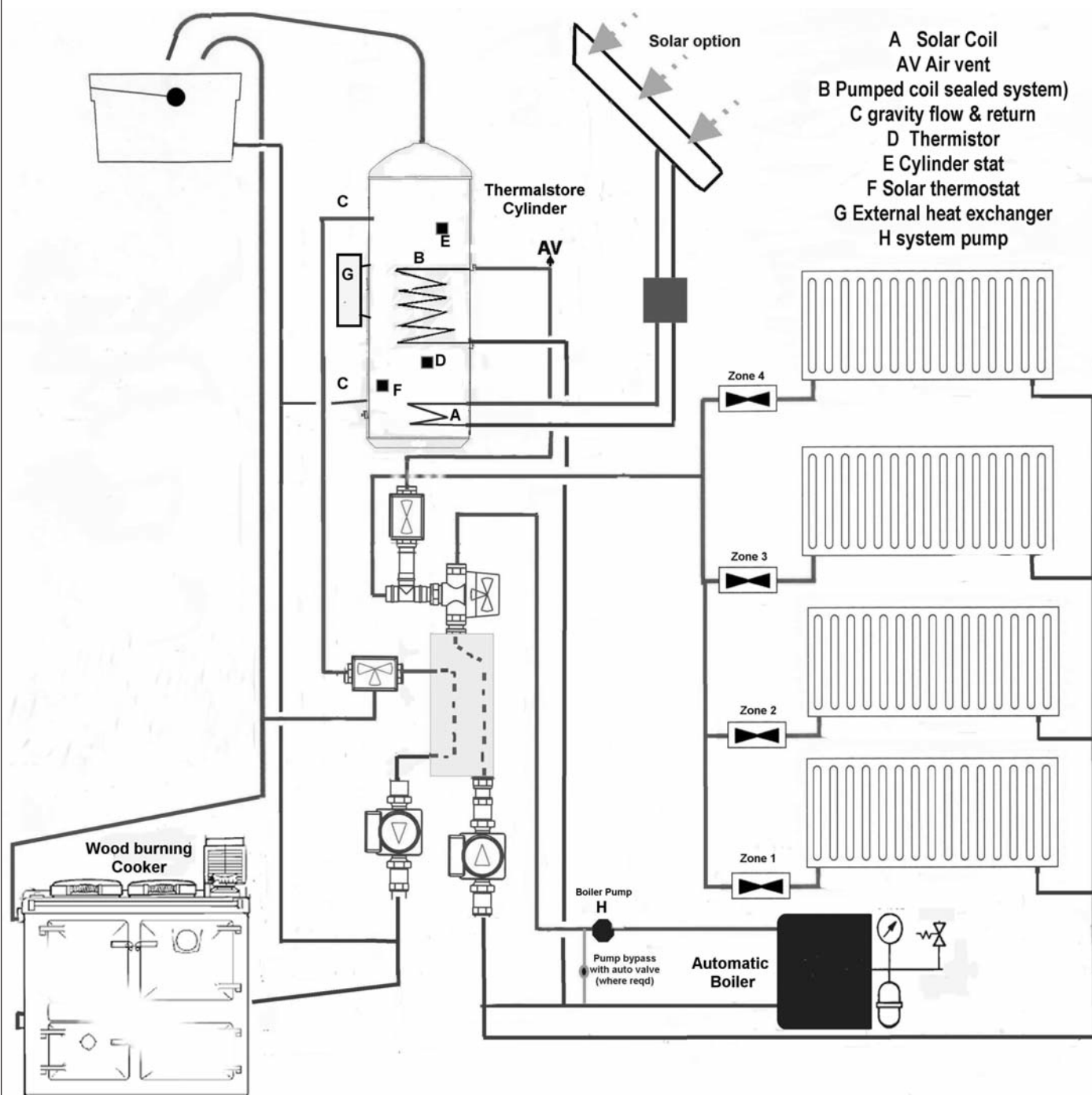


Fig 10

Electrical Supply

See Figs. 11 and 12.

Wiring external to Eco-Connect must be installed by a competent person in accordance with current National Wiring Regulations and any local regulations.

The appliance is supplied for 230V 50Hz and is fitted with an internal fuse rated at 3 amp.

A pre-wired mains inlet cable is provided for connection into an adjacent fused double pole switch having contact separation of at least 3mm. This should be fused at 3 amp.

We would recommend that the supply be protected by a 30mA Residual Current Circuit Breaker (RCCB).

As the switching of the automatic boiler is achieved internally through Eco-Connect, it is essential that the mains electrical feeds to the boiler, any ancillary controls and equipment and Eco-Connect must be taken from the same isolator to avoid the danger of electrical shock.

An additional isolator will normally be required adjacent to the automatic boiler.

External Controls (See Fig. 11)

Heating - Separate time and temperature controls with appropriate motorised valves should be provided for each heating zone, wired back to the Eco-Connect Panel.

Hot Water - Time control should be provided and a cylinder thermostat will be required, typically set to 65°C for a normal cylinder or 80°C for a thermal store. (This is in addition to the cylinder temperature thermistor supplied with Eco-Connect).

No DHW motorised valve is required as this is already fitted on the Eco-Connect Panel.

The 'demand to fire' to the automatic boiler is provided "voltage free" contacts T31, T32 on Eco-Connect. Eco-Connect therefore provides "Boiler Interlock".

If the automatic boiler requires pump overrun facilities, the system pump should be wired directly to the boiler.

Fig. 11 shows the schematic arrangements. Fig. 12 shows typical external electrical connections

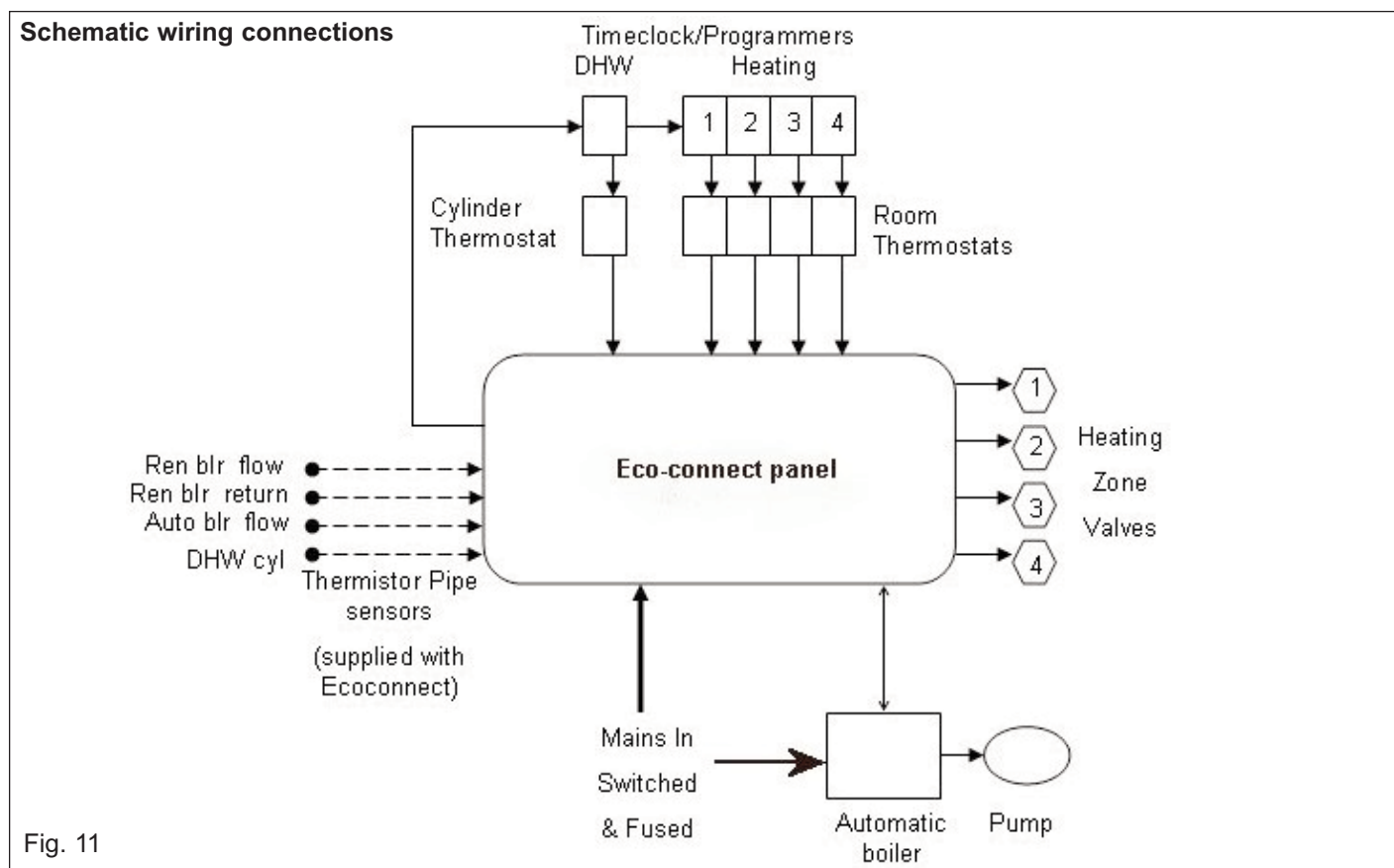


Fig. 11

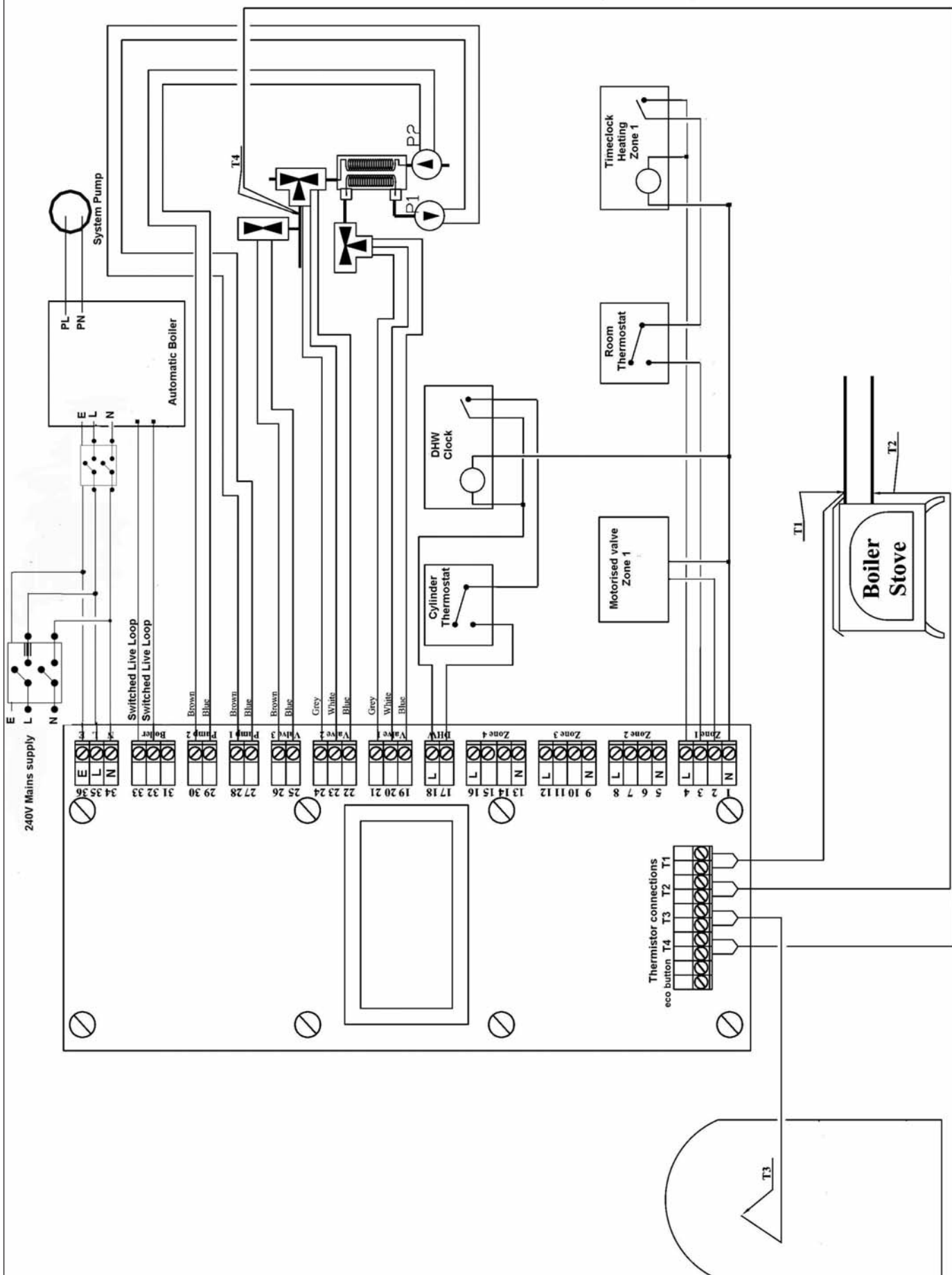


Fig. 12 External wiring connections (only one heating zone shown for clarity)

Method of fixing thermistors

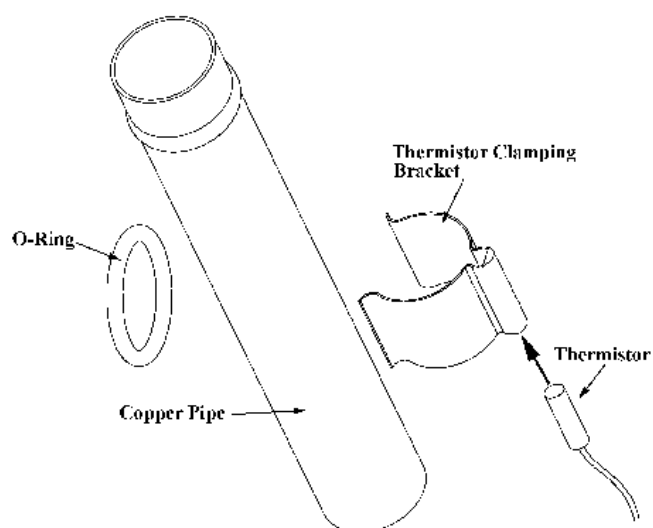


Fig 13

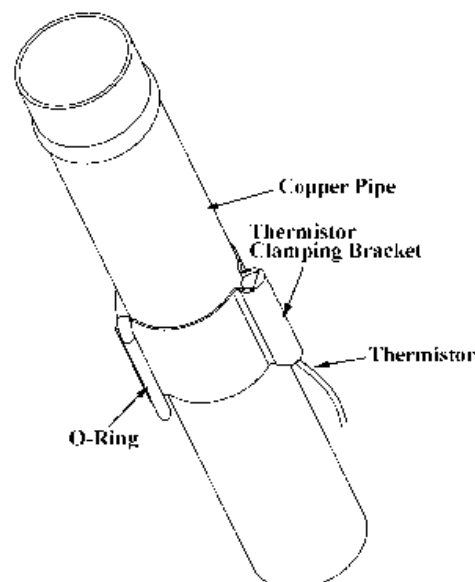


Fig 14

Fitting of thermistor sensors

The unit is supplied with four thermistors, that monitor the temperature of the key water supply pipes to and from the unit, thus allowing the main processor to divert heat through the relevant valves as required. The thermistors are positioned and secured as follows (refer to Figs 12, 13 and 14).

The thermistors are colour-coded to aid connections.

- **T1 (RED)** - Flow pipe on solid fuel unit (as close as possible to the unit).
- **T2 (BLUE)** - Return pipe on solid fuel unit (as close as possible to the unit).
- **T3 (BLACK)** - Against cylinder snugly under insulation, two-thirds down.
- **T4 (WHITE)** - Flow pipe to heating and cylinder immediately after valve 2 (Factory Fitted).

For best performance TH1 and TH2 should be located, as close as possible to the solid fuel appliance.

The thermistors are supplied with a 1.4 metre length and can be extended, using standard heat resistant 0.5mm² electrical cable, with a connection made using a strip connector (cable consists of two cores with no particular polarity or orientation to connecting the cores). Each thermistor is supplied with a mounting bracket, that clips over the water pipe holding the thermistor against the pipe, this bracket is to be secured in place using the O-Ring provided. The clip should then be wrapped tightly in a piece of aluminium foil tape to provide best thermal transfer from the pipe to the thermistor.

INSTALLATION

It is important that a full site survey be carried out to confirm the suitability for Eco-Connect. Installation and commissioning must be by competent persons.

Reference must also be made to the specific requirements contained within the boiler and stove manufacturers instructions.

Although the installation of Eco-Connect is not a 'notifiable' work to the local authority, the installation of the associated appliances will be.

1. Location and Mounting the System

Before mounting the Eco-Connect system, consideration should be given as to the exact location to allow for the following:

- Sufficient space should be allowed for access and to ensure adequate air flow over the unit.
- Adequate room for fitting of unit and ancillary pipework - The unit measures 800mm high x 500mm wide and it is recommended to provide a 1200mm high x 1000mm wide area for fitting of the system to allow for adequate room for working on the unit.
- Solid wall construction to mount system which is capable of supporting its weight (18.5 kg).
- Provision for connection of water pipes to solid fuel appliance so that the gravity feed circuit to the cylinder from the appliance is not affected.
- Provision for connection of water pipes to automatic boiler.
- Provision for connection of water pipes to desired zones & cylinder.
- Provision for connection of electrical feeds to automatic boiler.
- Provision for connection of electrical feeds to zonal heating controls.
- Provision for routing of thermistor probes.
- Wherever possible, adjacent exposed pipework should be insulated.

Positioning of Eco-Connect is critical in relation to the solid fuel appliance and the hot water cylinder so as to ensure gravity circulation. A minimum vertical rise of at least 1 metre, between the stove and Eco-Connect should achieve this. This means that Eco-Connect will be at least 1 metre above the stove, but this may need to increase if there are long runs of near horizontal pipes. The connection to the gravity coil on the cylinder must be at a sufficient height, i.e. above the outlet from Eco-Connect V1, to allow gravity circulation and if necessary an air-release valve may be required or an additional open vent pipe.

To make it easier to accommodate the pipework connections, Eco-Connect can be 'handed' by turning the unit over. To do this, requires the control box to first be unfastened from the heat exchanger (four screws accessed internally) and the box re-mounted upside down.

The position of the PCB display will also have to be reversed, by unscrewing the two plastic screws securing the display to the PCB. The display can then be carefully unplugged and fitted into its new position on the alternative row of terminals. Re-secure with the plastic screws.

The unit is mounted to the wall so that it is oriented with the pumps below the wiring centre with it fixed to the wall using three rawl plugs and fixings screws using the three fixing points on top and bottom edges of the wiring centre case and side of heat exchanger. The unit is also supplied with three pipe support brackets which can be fixed to the water pipes for added support. The brackets are mounted to the wall using the section of threaded bar supplied, with the bar being cut as required for each bracket.

2. Plumbing

New and existing plumbing systems must be fully flushed out and refilled with an appropriate corrosion inhibitor. Inhibitor levels should be checked at 5 year intervals.

Excessive amount of PTFE thread tape should not be used and care taken not to allow strands to enter the Eco-Connect pipework.

There are seven separate water pipe connections to be made to the Eco-Connect unit,

- Flow and return to solid fuel unit
- Flow from automatic boiler

- Flow to radiator circuits
- Flow to coil of cylinder on sealed system
- Flow to cylinder coil or thermalstore on open system. (This provides gravity circuit from solid fuel unit to cylinder)
- Return to heat exchanger. Couples to radiator return, cylinder return and boiler return pipes.

Slumber Conditions

In the event of the flow temperature from the solid fuel appliance exceeding 65°C heat is transferred through the heat exchanger and is pumped to the DHW cylinder. If the DHW temperature exceeds 65°C, this route is closed and the heat is dispersed into heating Zone 1 by default. When designing the heating system, this default heat dump should be borne in mind and Zone 1 is ideal to serve an underfloor heating zone. A zone serving a single radiator is unlikely to prove sufficient for a heat dump.

Typically the Zone 1 heat dump should be capable of handling at least 6 kW, but this will depend on the rated output of the solid fuel appliance. Radiator valves on this circuit must be of the lock-shield type to avoid accidental closure by the owner.

Direct cold water injection is not acceptable as a safety measure in the UK.

COMMISSIONING

- Fill and test system for water leaks.
- Check that the Eco-Connect pumps are set to the medium speed and that the isolating valves are fully opened. Check that temperature sensors are in position.
- Check that cable strain bushes are tight.
- Press and hold the 'Eco' button for 20 seconds. Eco-Connect will go through a short sequence of checking the relay and pump operations, with an appropriate display.
- Light solid fuel appliance and with no demands for hot water or heating confirm that gravity circulation takes place to cylinder. Allow flow temperature to increase until automatic pumped circulation commences at 65°C. Hot water should then be pumped to cylinder.
- Call for hot water and heating, check that mixed mode occurs and that the auto boiler fires.
- Explain operation to owner, stressing the importance of correct operation of the solid fuel appliance and not allowing over-firing to take place. Leave user's instructions with the owner.

Eco-Operation

The operation of the Eco-Connect is automatic, biased to take energy from the renewable source, topped up from the automatic boiler.

This can be overridden by pressing the Eco button. Press the Eco button once and the automatic boiler is held 'OFF' for 6 hours.

Press the Eco button twice in quick succession, and the automatic boiler is OFF permanently until the Eco button is pressed again. The automatic operation is laid out in the flow chart below

To return to automatic operation, press the Eco button once more.

This feature is useful for when it is anticipated that, heat energy will subsequently become available later in the day. e.g. from a solar panel or that the stove will be lit in the afternoon/evening.

Safety

In the event of a power failure or circulating pump failure the water in the stove could reach temperatures up to 100°C if the stove's thermostat also malfunctions or the appliance is not operated correctly. At these temperatures 'pitching' will take place through the feed and expansion tank. If this occurs, check the stove thermostat is working correctly to so as to close off the air-supply. Allow the fire to go out, until power is restored.

On resumption of power, Eco-Connect automatically resets itself without user intervention.

Controller Logic

- * Is there a call for heat to hot water or heating?

A call for heat is present when 230V is received on Terminal 3, 7, 11, 15 or 17.

- * Is there usable heat in the stove?

There is considered to be usable heat in the stove when T1 and T2 exceeds 65°C.

The call for heat from the stove remains present until T2 exceeds T1 or until T1 and T2 are both less than 45°C.

- * Can the stove supply the overall demand?

The stove is considered to have adequate supply of heat when T1 is greater than T4, with T4 greater than 70°.

- * Is there excess heat in the stove?

Excess heat is present when T1 exceeds 85°C.

Relay Functions - See Fig. 14

To test relay operations. Press and hold in the 'Eco' button, then switch on mains supply.

Each relay will operate in turn.

There are 8 relays located on the PCB, each controlling separate functions of external components. An LED illuminates when the relay is operated and is useful for fault finding.

As these checks require the power to be turned on, take care of exposed terminals.

Relay 1 drives Valve 1 to the mid-position. Live on T20, White wire.

Relay 2 drives Valve 1 beyond mid-position to the fully open position. Open to port A. Live on T21, Grey wire.

Valve 1 routes heat from the solid fuel appliance towards either the gravity feed to the cylinder or through the heat exchanger. Consequently both relays 1 and 2 should operate together as there is no need for Valve 1 to stop in the mid-way position. These only operate when the stove flow is above 65°C.

Relay 3 drives Valve 2 to the mid-position. Live ON T23, White wire (Mixed mode).

This occurs when there is a timed demand for heating and/or hot water and the stove is above 65°C.

Relay 4 drives Valve 2 beyond mid-position to the fully open position Live ON T24, Grey wire (Renewable source only).

This occurs when there is a timed demand for heating and/or hot water and the stove is above 70°C, or the 'Eco' function is selected.

Relay 5 drives Valve 3, for the pumped hot water circuit. Live on T26.

This occurs if the stove is above 65°C, cylinder below 65°C, **OR** time-clock is calling for hot water.

Relay 6 controls the Eco-Connect pumps. They are wired in parallel and so come on together. Live on T28 and T30. This occurs whenever the stove is above 65°C.

Relay 7 controls the Automatic boiler, closing the loop between T32 and T33. Whenever there is a demand for heating or hot-water and the stove is below 70°C.

Relay 8 is the 'dumped' control. This puts a live feed to the heating zone 1 external motorised valve on T2, overriding any other time or temperature control on this zone. It only operates if the cylinder is satisfied, yet there is still heat to be lost from the solid fuel appliance.

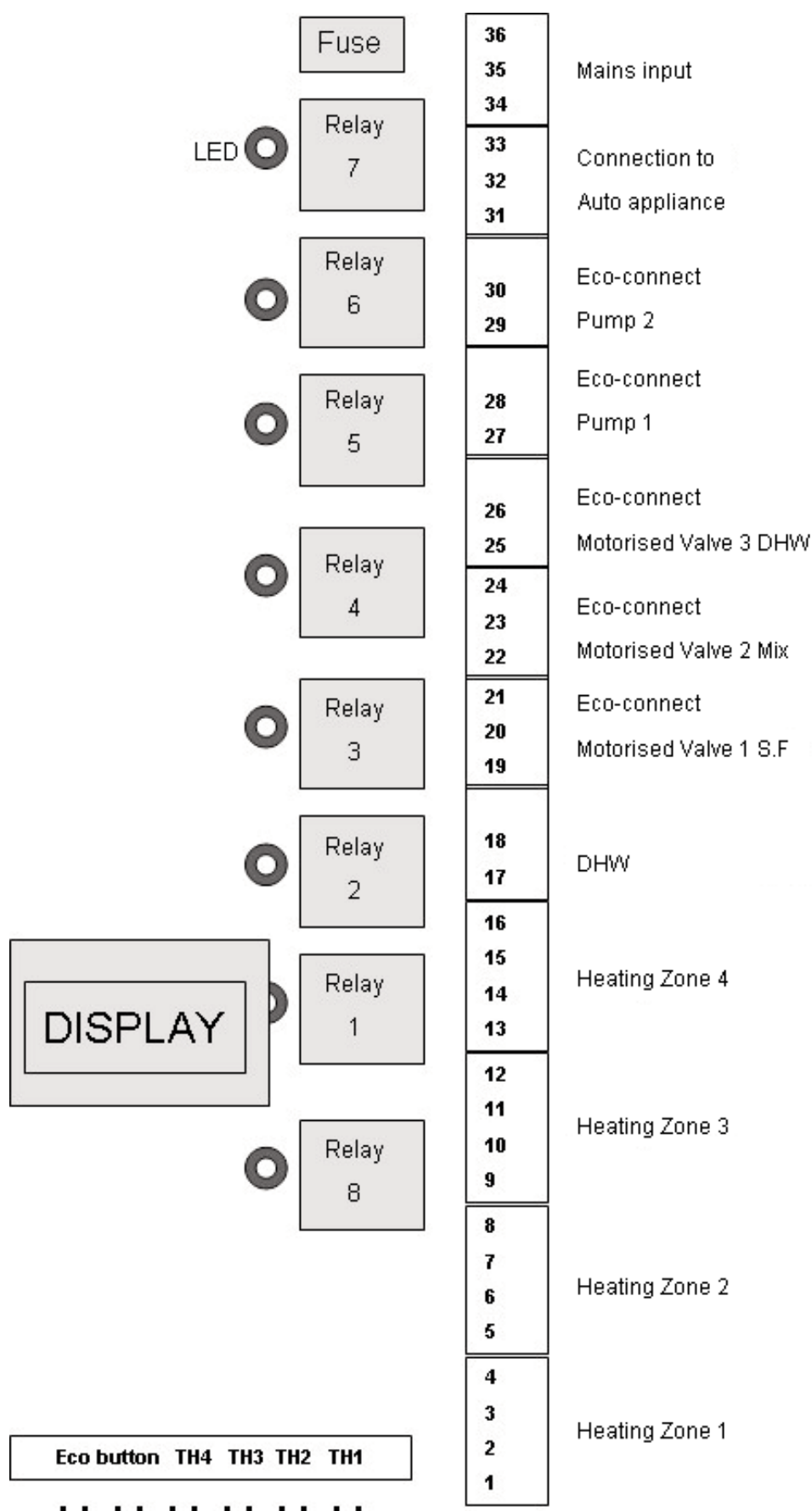
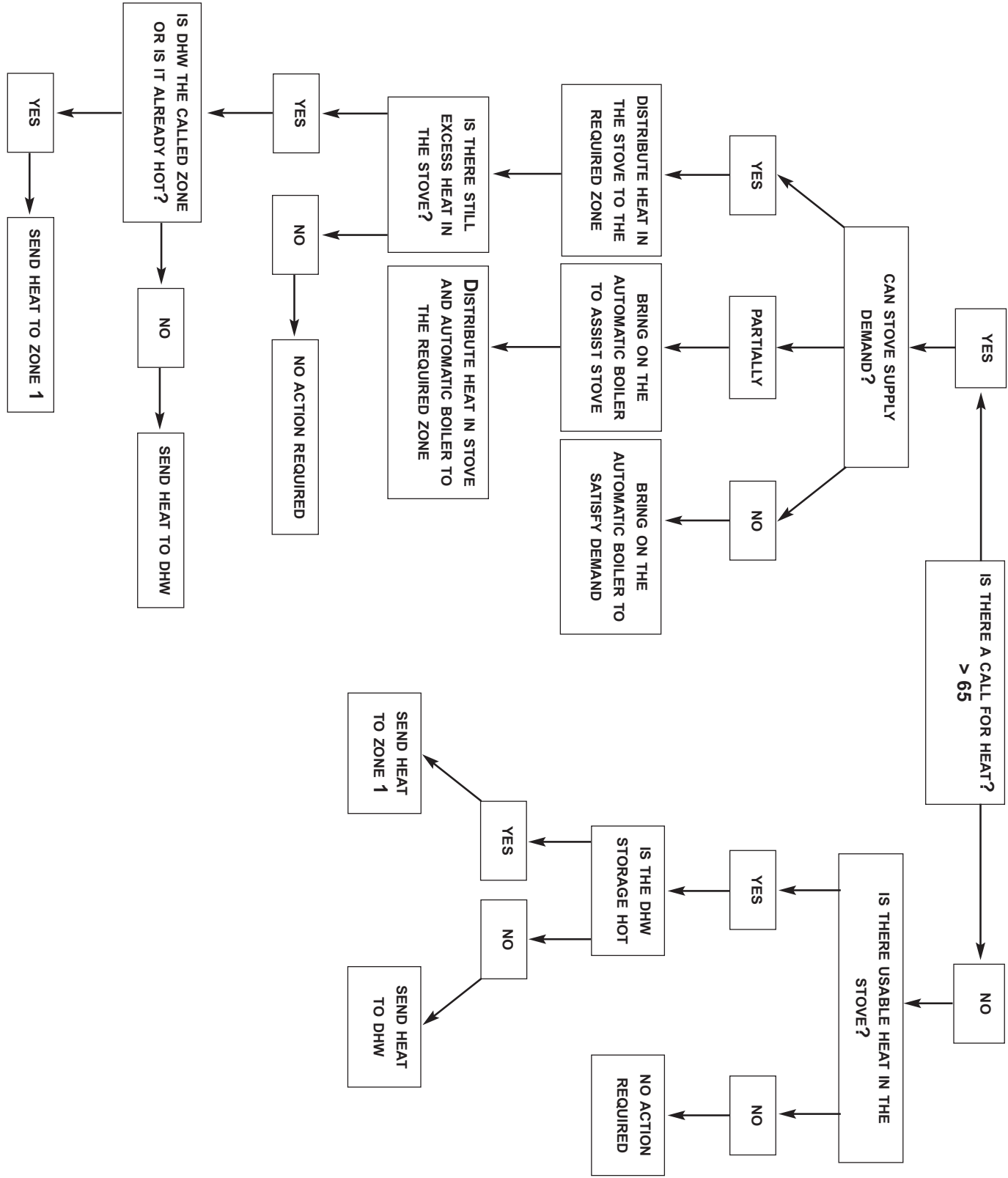


Fig 14

FAULT FINDING



FAULT FINDING - EXTERNAL SYMPTOMS

Overheating of solid fuel appliance

Is solid fuel thermostat being over-fired, e.g. ashpit or fire door left open?

Check solid fuel appliance thermostat setting/operation?

Have radiators on heating zone 1 been accidentally turned off?

Are thermistor sensors correctly attached to the flow and return pipes?

Is electrical supply turned on to Eco-Connect?

Carry out visual check on Eco-Connect as below.

Overheating of hot water

Is thermistor sensor correctly attached to cylinder?

Check cylinder thermostat setting.

Carry out visual check on Eco-Connect as below.

Insufficient hot water or heating

Check cylinder or room thermostat settings.

Is automatic boiler firing? Check boiler control thermostat/time-clock/burner lockout.

Has 'Eco' setting been left set to permanent?

Carry out visual check on Eco-Connect as below.

Visual checks to Eco-Connect

This may require the cover to be removed exposing live terminals and therefore should only be undertaken by a competent person. Use a multi-test meter to check for voltage on the terminals as shown below.

Is there any display showing?

No:-

1. Turn electrical supply off and on again to try and reset Eco-Connect.
2. Check incoming voltage on Terminals 34 and 35.
3. Check internal fuse on PCB, 3 amp rating.

Yes:-

There are a number of 'error' messages which could be displayed.

1. 'Check auto appliance'. - This will occur if there is no appreciable heat gain from the auto appliance after 10 minutes when in 'mixed' mode, by comparing thermistor 1 to thermistor 4.
2. 'Alert. TH # High' - Caused by a short circuit or very high reading on a thermistor or its connection. Eco-Connect continues to operate normally.
3. 'Alert TH # Low' - Caused by an open circuit on a thermistor or its connection. This condition stops any of the internal relays operating.

**For further advice or information contact
your AGA-Rayburn Home Energy
Management Specialist**

With AGA's policy of continuous product improvement, the Company reserves the right to change specifications and make modifications to the appliance described and illustrated at any time.

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