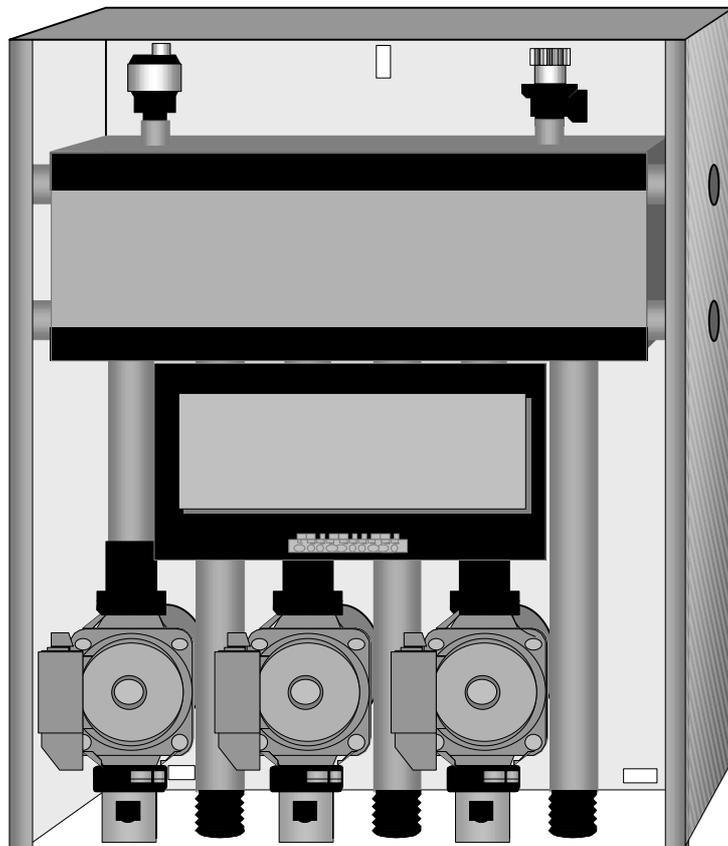


SystemLink®

The Energy Efficient Zone Control System for Central Heating

Installation Manual

The instructions contained in this manual must be adhered to. The installer must carefully read these instructions, prior to installation and commissioning.



Heat where you want it

When you want it.

Patented.

CONTENTS

Section 1:	Introduction	Page 2
Section 2:	Product Dimensions	Page 3
Section 3:	Technical Specifications	Page 4
Section 4:	General Requirements	Page 5
Section 5:	Ancillary Heating Equipment	Page 6
Section 6:	Boiler Connection	Page 7
Section 7:	System Applications	Page 8
Section 8:	Underfloor Heating Applications	Page 13
Section 9:	Installation (Electrical)	Page 15
Section 10:	Commissioning and Fault Finding	Page 24

SECTION 1: INTRODUCTION

In an era when we are all under pressure to reduce energy waste, both for cost and environmental reasons, zoned central heating makes sense.

Heating only the areas of your home or commercial building where heat is required at a particular time and controlling both the ambient temperature and hot water generation is obviously energy efficient. In Ireland, since July 1st, 1998, zoning is a requirement by law in all new buildings. In addition, where a building is over 100m², provision must also be made for time and temperature control of both living and sleeping areas.

Up to now, however, zoning has not been an easy task. Complex electrical panels, the inaccuracy of thermostatic control valves, complicated pipe work and electrical specifications have all contributed to the reluctance of many people to zone their systems.

A new product, designed and manufactured in Ireland has changed all that.

SystemLink is a complete central heating zone control system, designed and manufactured in Ireland. It gives independent time and temperature control over multiple zones and hot water generation. It is efficient and easy to install, providing a complete plumbing and electrical solution to zoning in a small attractively housed unit.

SystemLink is particularly suited to systems where high velocity is required such as 'Micro-bore', TKM and Under-floor heating because it uses an individual pump for each zone. This means independent pump speeds may be selected to closely match a particular zone's water velocity requirements.

SystemLink incorporates circulating pumps, automatic de-aeration, safety valve, built-in bypass, pump isolation valves, pressure neutralisation chamber, connections for multiple boilers and a pre-configured electronic control centre.

The system is available in 3 zone and 4 zone configurations as standard. Multiple units may be used to easily handle more complex requirements.

SystemLink contains two patented elements, which form the heart of this unique system. These are the SystemZone water distribution manifold and the SystemLex electronic time/temperature central wiring control unit.

SystemZone isolates and controls heating water distribution circuits. In a standard, simple installation, one or two boilers may be connected to the SystemZone. It also has connection points for ancillary safety devices, safety valves and expansion tanks. This integral part of the system has an unobstructed internal baffle system and contains no moving parts for long-term trouble free use. SystemZone also eliminates the need for motorised valves, non-return valves and a system bypass.

SystemLex, the internal electronic control system, is designed to make electrical installation as easy as possible. It is powered from the mains supply, but individual zones are fused for safety.

The installations detailed in section 6 of this manual are intended to provide a basic understanding of some of the many alternative heating system designs which are possible to realise with SystemLink technology. Sample system designs are included for sealed and open systems using 3 and 4 zone SystemLink units to control one and multiple boilers, back-boilers, banks of boilers, multiple radiator circuits, under-floor heating circuits and domestic hot water.

SECTION 2: PRODUCT DIMENSIONS

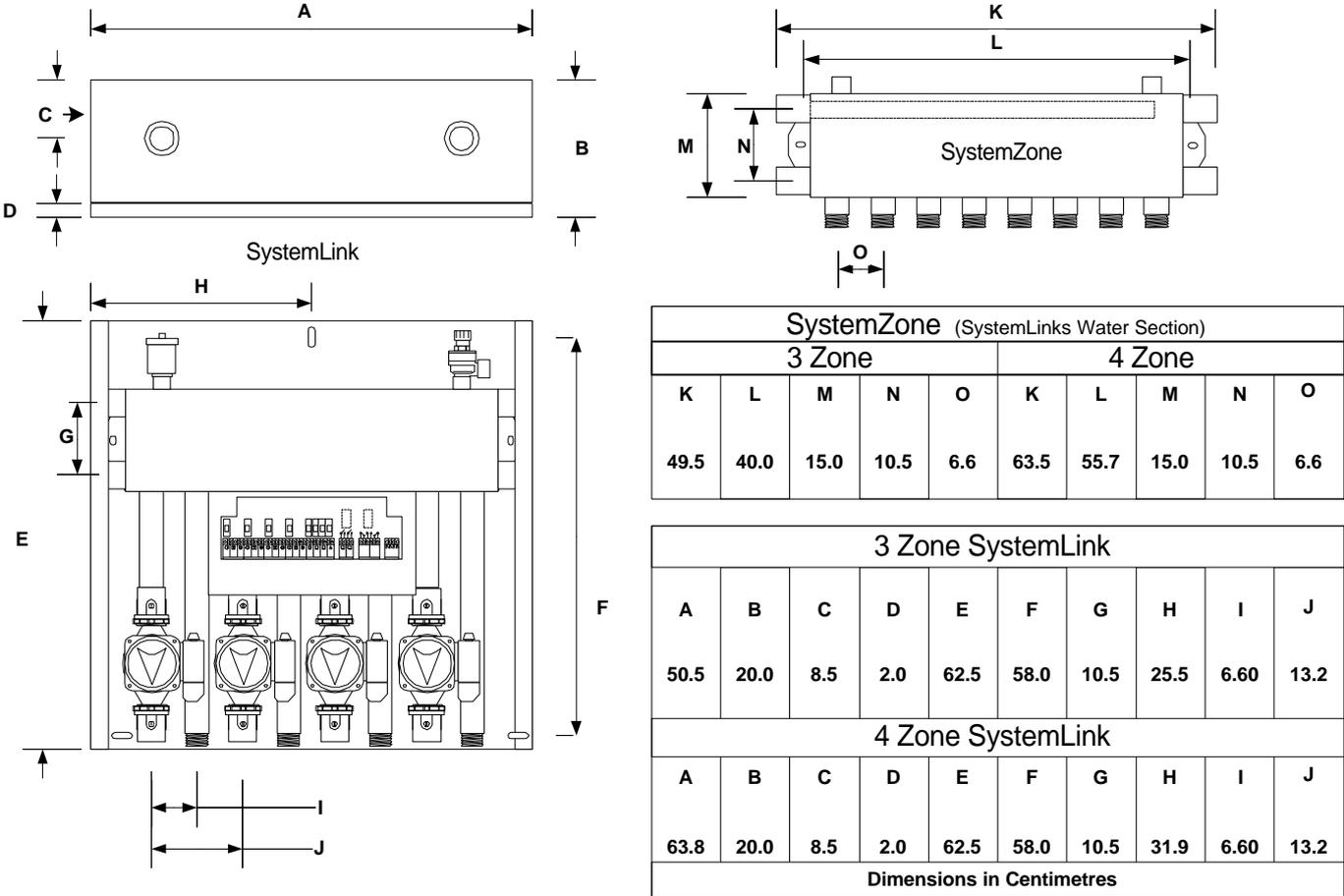
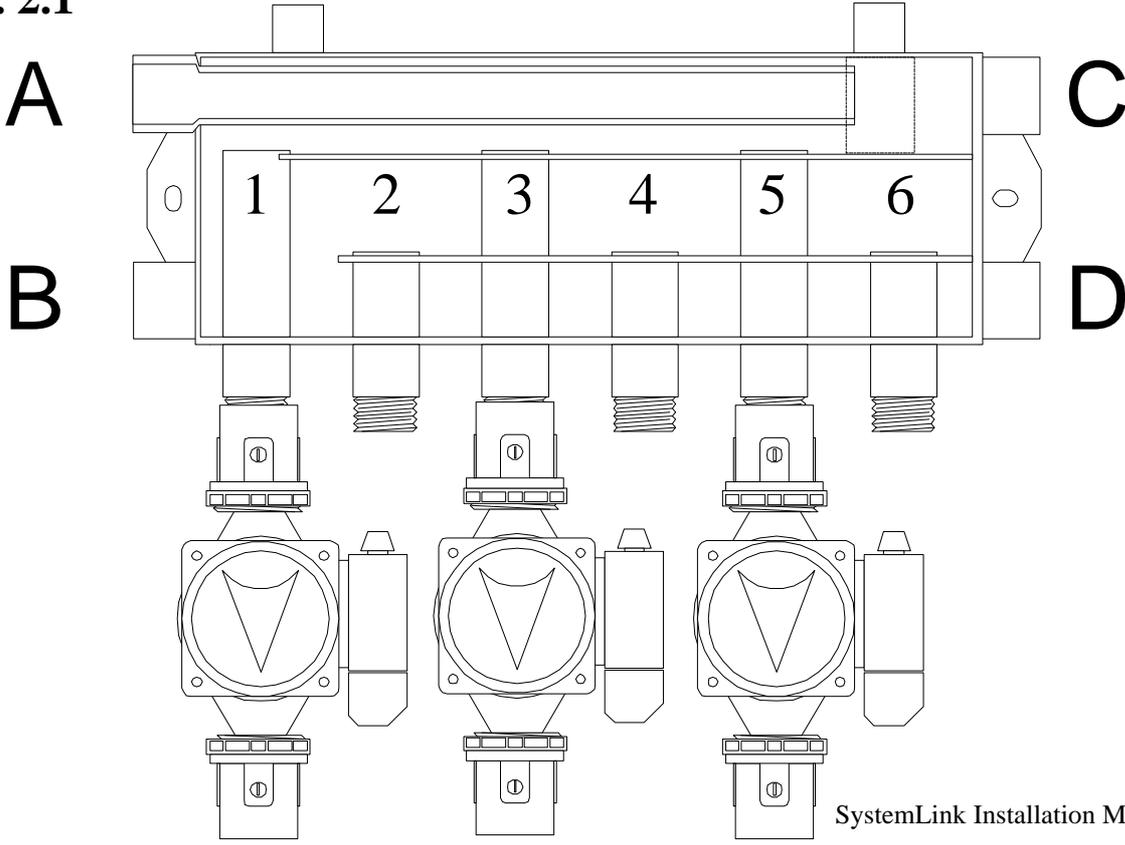


Fig. 2.1



SECTION 3: TECHNICAL SPECIFICATIONS

Connection Sizes (Standard 3 and 4 zone SystemLink units)

All flow and return to and from boilers or heating zones are 1" BSP (internal) and 1/2" connections for ancillary equipment such as safety valves, automatic air-vents etc.

Connection Types

The horizontal connections A, B, C, D (Fig 2.1) are 1" female iron.

The vertical connections 1,2,3,4,5,6, (and 7,8 in the 4-zone unit) are 1" male iron.

Connections 1,3,5 (and 7 in the 4-zone unit) are supplied with circulation pumps attached. The outward connection from the pump isolation valves is female iron.

Clearances

Minimum clearance space around the unit is dependent on installers' choice of equipment. Appropriate space should be made available as per local regulations and equipment manufacturer's specification. Space must be sufficient to allow suitable working space for initial connection and subsequent maintenance and further development of the installation, as may be required. The SystemLink should be installed at a minimum of 1 metre above ground to enable heat stratification. This will prevent inadvertent circulation of heated water and consequently unrequired zone heating. (If this minimal height cannot be achieved, then potential inappropriate water circulation can be prevented by the inclusion of non-return valves on the outward zone pipe-work -See Section 5: Ancillary Heating Equipment). As access is gained to the unit's mechanisms from the front, the unit must be located so as to provide for the removal of the front cover and in such a position as to allow for plumbing and electrical installation and maintenance activities.

Noise Prevention

It is recommended that the unit be mounted on a solid block wall to minimise noise and vibration due to circulation pump activity.

Electrical Details

Mains supply 230v ~ 50Hz, fused at 13amps.

The SystemLink is supplied with a SystemLex Printed Circuit Board to cater for the electrical attachment to the proposed heating systems controls requirements. This PCB has a total of eight built-in sub fuses to provide a lower rate of fuse protection to the various electrical components in the system. The SystemLex PCB is further explained within this manual

Power Consumption (*SystemLink unit only*): 250 Watts.

Performance

The unit's internal pumps determine the unit's outward duty performance. Specifications and performance details for the pumps are provided in the pump manufacturer's data manual, which is supplied with the unit. The supply of heated water to the SystemLink for further zone distribution should correspond to the combined output from the internal pumps.

- The pumps are equipped with a rotary switch at the terminal box cover to enable manual multi-speed control.
- In min speed setting, the rotating speed is reduced to 40...70% of nominal max speed. The power input is reduced to approx. 50%.
- Pumps are supplied with isolation valves to enable maintenance without system draining, if required.

Permissible Fluids for SystemLink's pumps

- Heating water to VDI 2035
- Water and water/glycol mixtures up to a ratio of 1:1. Glycol mixtures require a re-assessment of pump hydraulic data in line with the increased viscosity and depending on mixing ratios.
- Only approved makes of additives with corrosion inhibitors must be used in strict compliance with manufacturers' instructions.

For use of other kinds of fluids consult the pump manufacturer for advice.

SECTION 4: GENERAL REQUIREMENTS

Safety

The instructions contained in this manual must be adhered to. It is imperative that the installer carefully read these instructions, prior to installation and commissioning.

A competent person, in accordance with local Building Regulations and current I.E.E. Wiring Regulations, must install the appliance. Installation should also be in accordance with any relevant requirements of the Local Authority.

Boilers and other equipment used in conjunction with the SystemLink unit should be installed by a registered installer and in accordance with the manufacturer's stipulations in terms of location, commissioning and safety requirements.

Location of Appliance

The SystemLink unit may be installed in any room or internal space, though particular attention should be given to the requirements of current I.E.E. electrical regulations with respect to the installation of electrical equipment in a room or internal space containing a bath or shower. Where the SystemLink is installed in a room containing a bath or shower, any electrical switch or appliance control utilising mains electricity should be located in such a position that a person using the bath or shower cannot touch it.

Water Circulation

Detailed recommendations are given in BS6798, 1987 and BS9449, 1990 (for small-bore and micro-bore central heating systems). The following notes are given for general guidance;

- Where possible, pipes should have a gradient to ensure that air is carried naturally to air-release points and that water flows naturally to drain taps.
- It should be noted that the SystemLink's water section (SystemZone) is constructed to act as a natural collection/release point for air.
- Except where providing useful heat, pipes should be insulated to prevent heat loss and to avoid freezing. Particular attention should be paid to pipes passing through ventilated spaces in roofs and under floors.

System Design

System Design is covered extensively from Section 6 to Section 9

Cold Feed Supply. Open System.

The cold feed supply should firstly be directed downwards from the connection 'Tee' point and then rise upwards to a connection point at the lower side of the feed tank. This downward loop is formed to help prevent an inadvertent thermo-syphoning of the hot system's water rising and so cause the cold feed tank to heat. This loop will not only prevent energy wastage but also will greatly reduce the evaporation from the cold feed tank and accordingly lessen the 'Top Up' and potentially harmful corrosion effects of replacement fresh mains water.

The boiler's connection pipe-work must be sized in accordance with boiler manufacturer's instructions. The size of the cold feed tank is related to the total water content of the system, as it has to accommodate approximately 1/25th of this amount. However, for all systems up to 24Kw output, a tank size of 45-litre nominal and 18 liters actual capacity is suitable.

The height of the expansion pipe (e.g. Fig. 7.3) should be maximised to eliminate the potential for pitching over on system start-up. A minimum height of 1 metre is desirable.

Electrical Supply

This appliance is supplied for operation on a 230v ~ 50Hz electricity supply. It should be protected with a 13amp fuse.

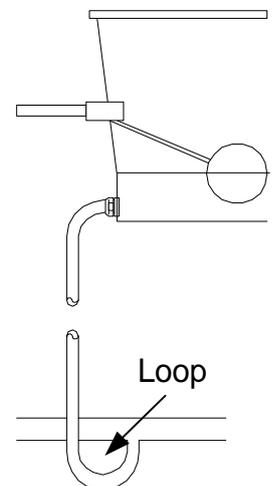
THIS APPLIANCE MUST BE EARTHED.

The method of connection to the mains electricity must allow complete isolation from the supply. The preferred method is by using a fused double-pole switch, with a contact separation of at least 3mm. The switch must supply the SystemLink and all immediate electrical control circuits (e.g. boilers, programmers, room thermostats).

Domestic Hot Water Equipment.

SystemLink offers a uniquely versatile and effective installation method to attach to and operate domestic hot water generation equipment with maximum installation ease and productiveness. The desired flow rate is easily set to the SystemLinks variable potential by the simple switching of the rotary speed selection switch on the zones circuit pumps. This will provide for simple attachment to DHW equipment ranging from conventional coiled cylinders, high recovery cylinders or plate heat exchangers. SystemLinks controls printed circuit board (SystemLex) is designed to greatly simplify the attachment of both time and temperature controls with the added advantage of pre-planned design strategies such as Hot Water Priority easily accomplished.

Fig. 5.0



SECTION 5: ANCILLARY HEATING EQUIPMENT.

Draining Taps

Draining taps should be included in any system design and must be located in accessible positions to permit draining of the entire system. The taps must be at least 15mm nominal size and manufactured in accordance with BS2789, 1980.

Air Release Points

These must be fitted at all high points where air will naturally collect and must be sited to facilitate complete filling of the system.

Non-Return Valves

- Non-return valves are required on SystemLink's outward zone flow pipe-work only when the zone to be piped is at a higher level than the SystemLink. In that situation, a non-return valve positioned in *front* of the zone pump will prevent the creation of a gravity fed, thermo-syphoning loop, which would cause continued supply of heated water to the radiators in that zone, even when the zone's pump is no longer required and has been switched off. The decision to use a flap or spring loaded return valve is at the installers' discretion. Where a flap-type valve is to be used, care must be taken to ensure that the orientation of the valve will cause the gate to fall to a closed position when the valve is not being pumped through.
- If the DHW Cylinder is to be located below the SystemLink it would be advisable to fit a non-return valve on the flow connection to the cylinder (Fig. 7.1) to prevent the heated water rising towards the SystemLink, causing the cylinder to lose heat.
- In a solid fuel and oil/gas interlink situation, a non-return valve will be required if the oil or gas boiler is to be located close to the height of the SystemLink. This is to prevent the slight drift of heat from the back boiler to the oil or gas boiler. The non-return valve should be located between the oil or gas boiler and its' returning pump. It should not be located on the boiler's flow as it could interfere with the boiler's safe operation.
- Where boilers' outputs are simply combined to create one large output, non-return valves are not required. Should the situation occur where a number of the boilers are to be eliminated from the circuit, due for instance, to modulating control call, then non-return valves should be located in *front* of the pumps on the return to prevent inadvertent heat movement through the out-of-circuit boilers.

The SystemLink should be installed at a minimum of 1 metre above ground to enable heat stratification. This will prevent inadvertent circulation of heated water and consequent unrequired zone heating. (If this minimal height cannot be achieved, then potential inappropriate water circulation can be prevented by the inclusion of non-return valves on the outward zone pipe-work.

System Expansion Safety

The installer must ensure that no obstructions, such as isolation valves etc., are put in the path between the water being heated by the boiler and the safety pressure vessels' connection port or any other form of water expansion equipment.

It would generally be regarded as good practice to connect the pressure vessel directly to the boiler, but it may be connected to the SystemLink, if a spare outlet port is available. Fig. 5.2 below is an illustration of the SystemLink's water section (SystemZone). It is not obstructed internally, so the expansion pathway is clear. The return water collection area (circled in Fig.5.2) is open to all other areas within the unit.

Condensing Boilers

The SystemZone unit is ideally suited to use with condensing boilers because of its' unique method of separating the hot boiler flow water and the cooler zone return water. This is particularly so, when two boilers are inter-connected as in Fig. 7.4 and only one is actually required to maintain raised water temperatures. The directional water flow diagram in Fig. 5.2 defines clearly how the coolest water collected from the zone returns at the end of the middle chamber is primarily available for re-direction into the boiler's return path. As the efficiency of a condensing boiler is reliant on the coolest returning supply, the SystemZone unit maximises the opportunity.

Fig. 5.1

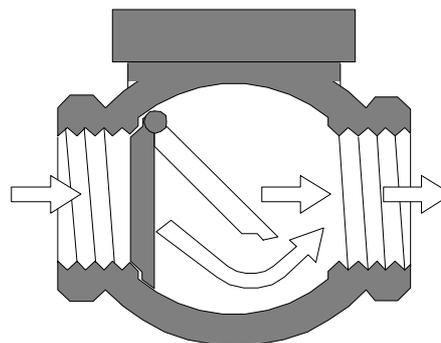
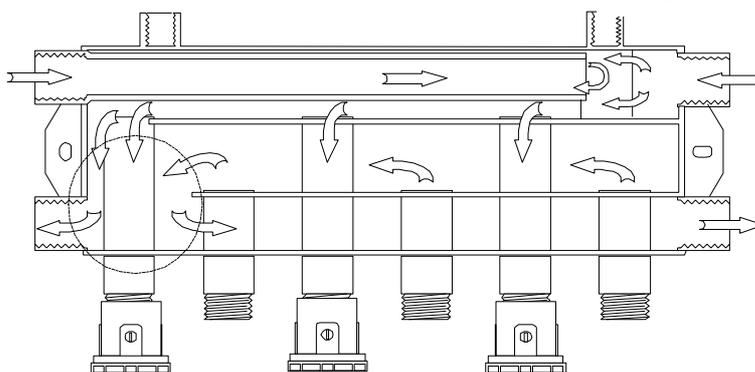


Fig. 5.2



SECTION 6: BOILER CONNECTION

The diagrams below depict the ways in which boilers may be connected to the SystemLink to satisfy different design demands

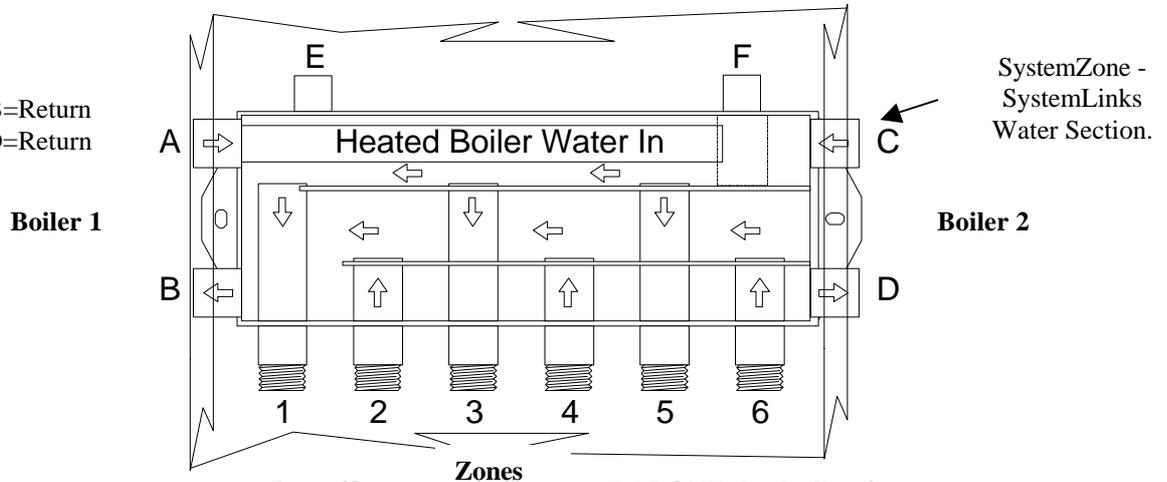
Standard side boiler connection arrangement

Used where single or dual boilers are connected to the SystemLink.

(Fig. 6.1 Zone Flows 1,3,and 5 Zone Returns 2,4,and 6. Boiler Flows, A, C. Boiler Returns, B, D)

Fig. 6.1

Boiler 1: A=Flow, B=Return
Boiler 2: C=Flow, D=Return



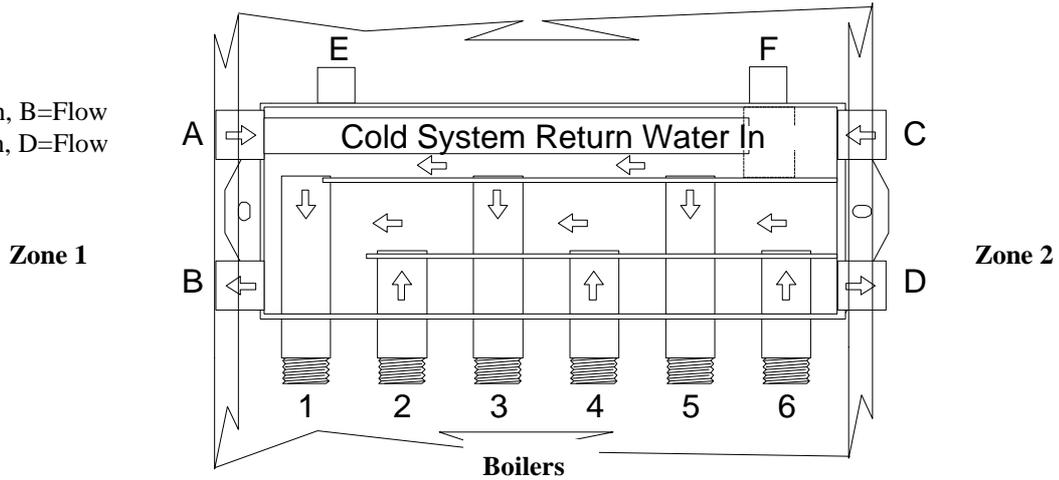
Multiple boiler arrangement connections (SystemLink mounted ABOVE the boilers)

Used where more than two boilers are to be connected to the SystemLink in a modular arrangement and where the SystemLink is to be mounted above the interconnected boilers.

(Fig. 6.2 & 6.3 Boiler Returns 1,3,and 5 Boiler Flows 2,4,and 6. Zone Flows B, D. Zone Returns A, C.)

Fig. 6.2

Zone 1: A=Return, B=Flow
Zone 2: C=Return, D=Flow

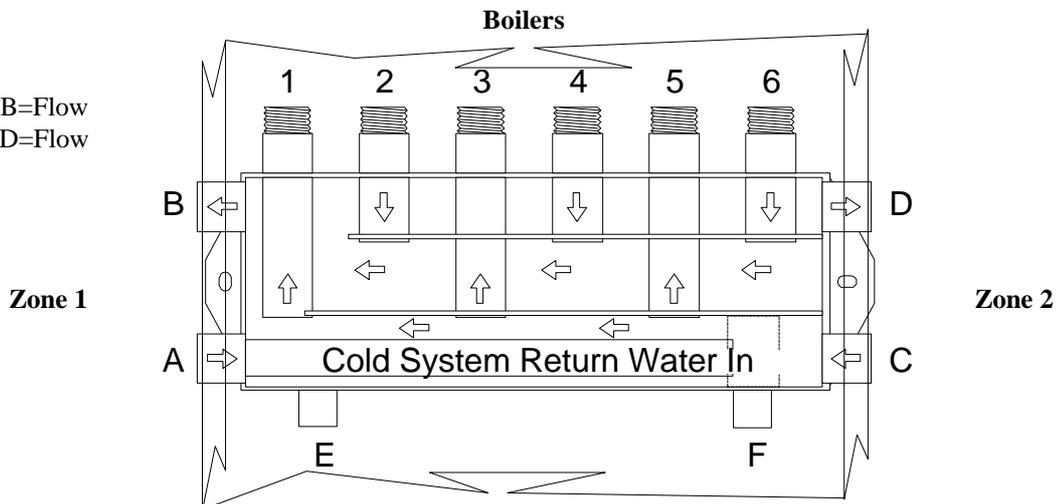


Multiple boiler arrangement connections (SystemLink mounted BELOW the boilers)

This inverted modular design should be used where more than two boilers are to be connected to the SystemLink in a modular arrangement and where the SystemLink is to be mounted below the interconnected boilers.

Fig. 6.3

Zone 1: A=Return, B=Flow
Zone 2: C=Return, D=Flow



SECTION 7: INSTALLATION (PIPE WORK)

System Applications

The decision to use an open or sealed system design is entirely at the discretion of the installer as the SystemLink unit will work equally well with both types of system. The choice of system must, however, be fully compliant with the recommendations of the manufacturer of the particular boilers to be used.

General Recommendations:

All pumps in the system pump away from the SystemLink.

Zone Pumps are to be located on the *Zone Flows* only.

Boiler Pumps are to be located on the *Boiler Returns* only.

The boiler pump must deliver an adequate volume of water to cater for the total outward zone requirements

Sealed System: 3 Zone unit with one boiler, two radiator zones and domestic hot water.

Installation is as per Fig. 7.1. Motorised valves are not required. Non-return valves may be required in certain circumstances. See Section 5, Ancillary Heating Equipment for details.

Radiators are installed as normal with appropriate valves. However SystemLink used in conjunction with room thermostats in each Zone eliminates the need for thermostatic radiator valves except where individual control, other than radiator ON/OFF within the Zone is required.

Connect the boiler heating flow to port A or C and the boiler heating return to B or D on the SystemLink as described in Fig. 6.1.

Blank off unused boiler connection ports.

Install the boiler circulation pump on the boiler heating return to pump *away* from the SystemLink unit.

Identify Zone connections from Fig. 2.1. Connection 1 is the FLOW to zone 1. Connection 2 is the RETURN from zone 1). Connect zone radiator circuit flow to connection 1 and zone radiator circuit return to connection 2.

Connect radiators in all other zones to their relevant zone flow and return connections in the SystemLink unit in the same way. (E.g. Zone 2: Flow is Connection 3, Return is Connection 4).

Blank off any unused Zone flow and return ports.

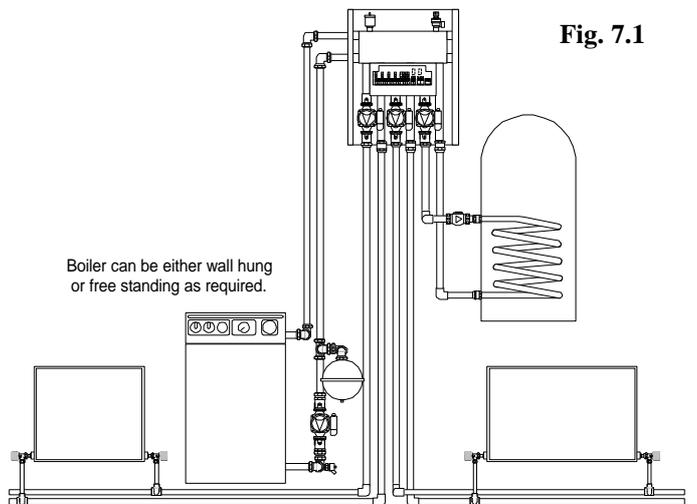


Fig. 7.1

Expansion Vessel Sizing and Location

If required, fit a system expansion vessel to the SystemLink's boiler return or the unused boiler return connection. Do not fit a valve or other obstruction on the boiler flow, or in any position that may interfere with the expansion of heating system water. The SystemZone unit itself is entirely unobstructed to enable unhindered water pressure activity. The expansion vessel should be connected to the SystemLink using;

Up to 24Kw (80,000 Btu/h) - 15mm (1/2") pipe work

Over 24Kw (80,000 Btu/h) - 22mm (3/4") pipe work

If the DHW Cylinder is to be located below the SystemLink unit it would be advisable to fit a non-return valve on the flow connection to the water store (as shown above) to prevent the heated water rising upwards towards to the SystemLink and losing heat.

Sealed System:

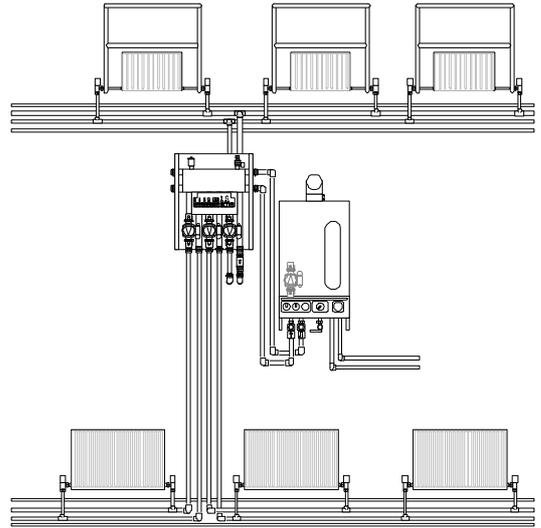
3 Zone unit, installed with one combination boiler, providing instant hot water, two radiator zones and a towel rail zone.

The installation is as Fig. 7.1, except that a 'Towel Rail Zone' has replaced the domestic hot water cylinder, in this illustration. Non-Return valves may be required. See Section 5: Ancillary Equipment.

This type of boiler will have an internal pump for central heating output. An additional pump is not required from the boiler to the SystemLink.

The Domestic Hot Water pipe-work should comply with boiler manufacturers' specifications. It should be noted that the operational principle of combination boilers is that they eliminate all central heating output when in hot water generating mode. Consequently, the heating circuits will tend to cool during periods when the boiler's heating output is diverted to hot water generation (when a tap or shower is drawing a hot supply).

Fig. 7.2



Open System.

Open System: 4 Zone unit with an inter-connected boiler and cooker supplying two radiator zones, one underfloor zone and a domestic hot water cylinder.

Pipe-work arrangement for each boiler is as Fig. 7.1, with a requirement for just one set of cold feed and expansion pipes.

Motorised valves are not required.

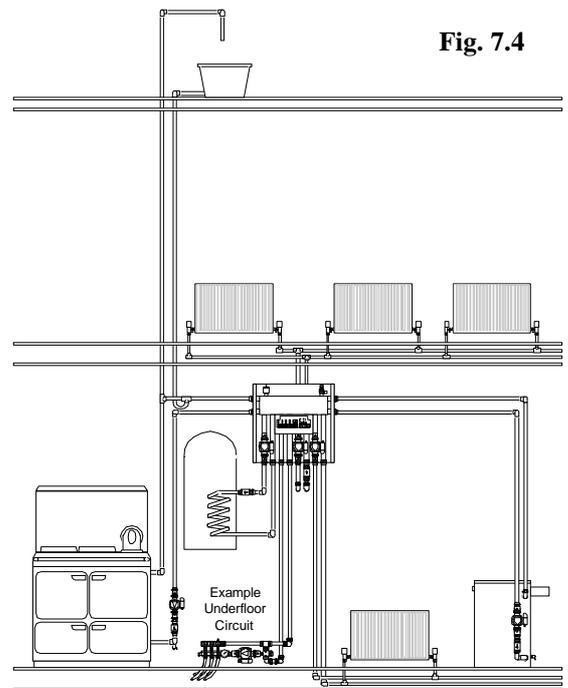
Non-Return valves may be required. See Section 5: Ancillary Heating Equipment.: Non Return Valves.

The expansion/vent-pipe should rise to a position directly above the feed and expansion tank. The expansion pipe-work arrangement should comply with Section 4: General Requirements on system expansion safety.

The 4th zone is used for an underfloor heating circuit.

Note:

The pump for the underfloor circuit (Zone 2) has been removed from the SystemLink in accordance with the instructions detailed in Section 8: Underfloor Heating Applications.



Open System:

3 zone with Range Style Cooker, Pumped Solid Fuel Stove, 2 Radiator Zones and Dual-Coil DHW Cylinder

Motorised valves are not required. (Installation as per Fig. 7.5)

Connect the Cooker to the SystemLink using a pipe-work arrangement as per Fig. 7.1.

Connect the SystemLink to the other flow and return connections on the solid-fuel stove, as shown;

Flow from the solid fuel stove to a SystemLink port

(Fig. 6.1: A or C).

Return from solid fuel stove to a SystemLink port
(Fig. 6.1: B or D).

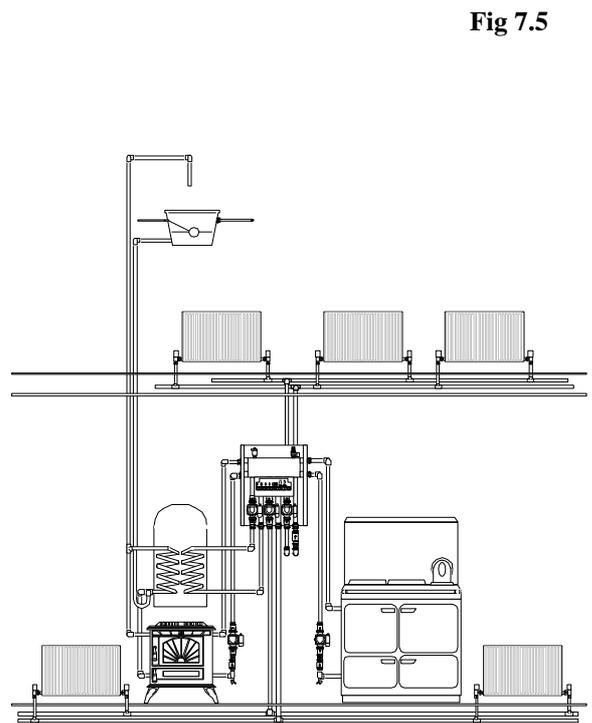
The expansion/vent-pipe should rise to a position directly above the feed and expansion tank. The expansion pipe-work arrangement should comply with Section 4 General Requirements on system expansion safety.

The primary return should then be directed through a dedicated DHW cylinder-heating coil to provide the pre-requisite 'Heat Leak' circuit for solid fuel appliances.

The cold feed should be connected to the solid fuel back boiler's primary return as shown graphically on Page 5.

Note:

Non-return valves may be required. See Section 5: Ancillary Heating Equipment.: Non Return Valves.



Modular Boiler Interconnection Arrangement

Where the requirement exists for a modular boiler arrangement, standard SystemLink boiler connection protocol is not followed. Instead, connection is as per either **Fig. 6.2** or **Fig. 6.3**.

This diagram below shows boilers with flows from the top and returns to the bottom of the units but the entry/exit points on other boilers may be differently arranged. This will not affect the function of the SystemLink but note that circulation pumps must always be on the return path to the boilers. This will ensure an open path to system expansion points and will ensure that the scheme is compliant with all current installation standards and requirements.

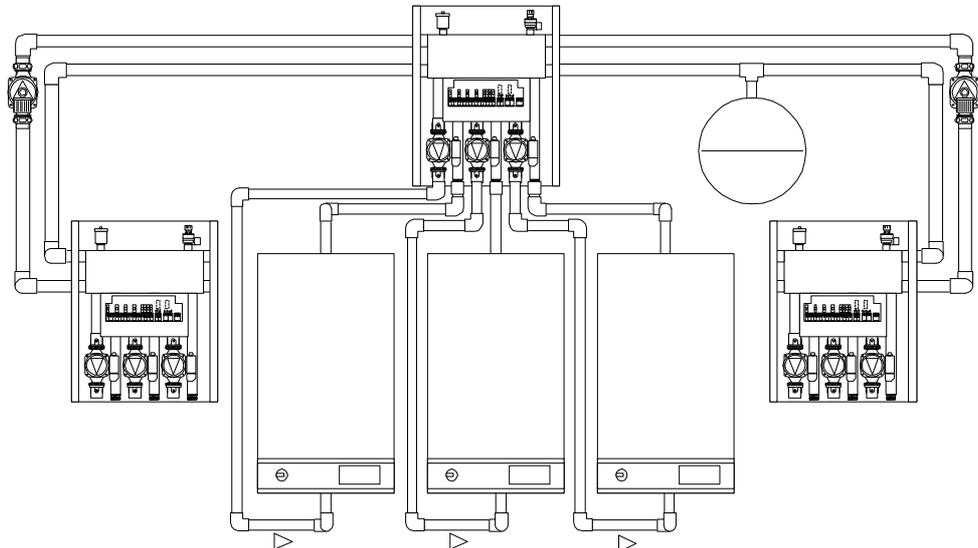


Fig. 7.6

The boiler pumps, which are on the connecting pipe-work from the SystemLink to the boiler, serve only one function. This is to deliver heated water to the central SystemLink, for further distribution to remote zones, or to hot water generating equipment that may be installed.

It is important to note that the patented principle of SystemLink's operation is that no water activity will take place either to or from a zone, unless a demand is created by the action of a pump on that specific zone's circuit. For this reason, pumps are required on the paths to any remote areas of the system.

Where boilers' outputs are simply combined to create one large output, non-return valves are not required. Should the situation occur where a number of the boilers are to be eliminated from the circuit, due for instance, to modulating control call, then non-return valves should be located in *front* of the pumps on the return to prevent inadvertent heat movement through the out-of-circuit boilers.

The SystemLink de-aeration function will play an active role in venting air from the boilers. The boilers in this particular drawing do not have internal pumps. Where boilers have internal pumps, the SystemLink pumps should be removed prior to installation. SystemLink spanners, specially designed for removing the pumps are available from your SystemLink stockist on request.

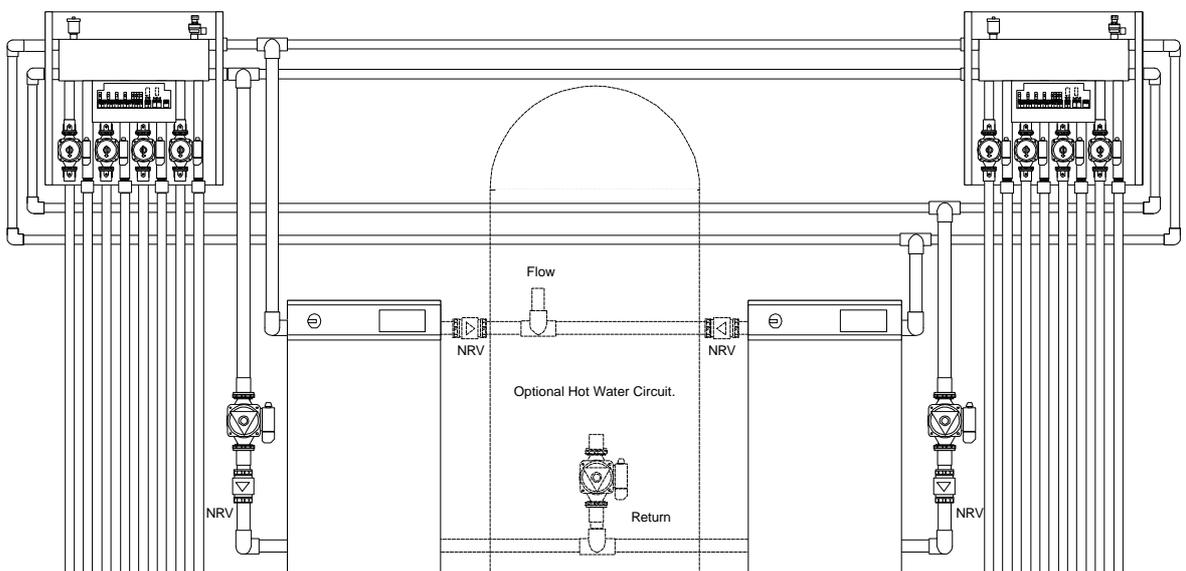


Fig. 7.7

Modular Boiler Interconnection Arrangements.

Grouped Boilers in a Modular Arrangement.

This is similar to the previous arrangement (Fig. 7.7) and may be used to combine banks of modular boilers. Note that the SystemLink has been mounted off the wall on threaded rawl

bolts so that the boiler pipe work passes down behind the unit in a neat arrangement. The reason for this arrangement is so that the pipes enter the SystemLink from underneath in order to create a heat lock within the SystemLink and so prevent inadvertent heat transmission to boilers that are not being called into action. This particular drawing shows boilers with internal pumps. Where boilers have internal pumps, the SystemLink unit's pumps should be removed prior to installation.

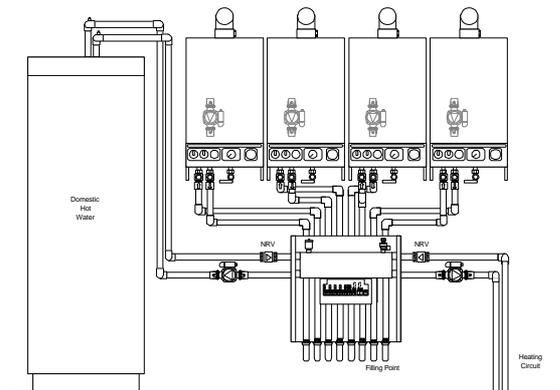


Fig. 7.8

Combining Groups of Multiple Boilers in a Modular Arrangement.

Groups of multiple boilers may be interconnected to form an extremely energy efficient modular arrangement (Fig. 7.9 below) where boilers not being called will remain cold and out of the heating circuit until they are required.

The general pump delivering heat from this arrangement must be sized to deliver the full total of the combined boilers maximum output.

Typically, speed control pumps are most appropriate for the arrangement.

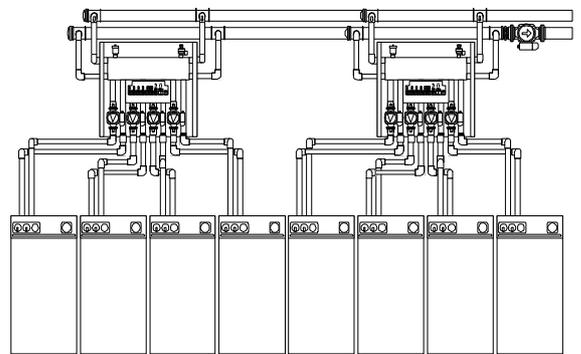


Fig. 7.8.1

Special Order Units for Commercial Applications.

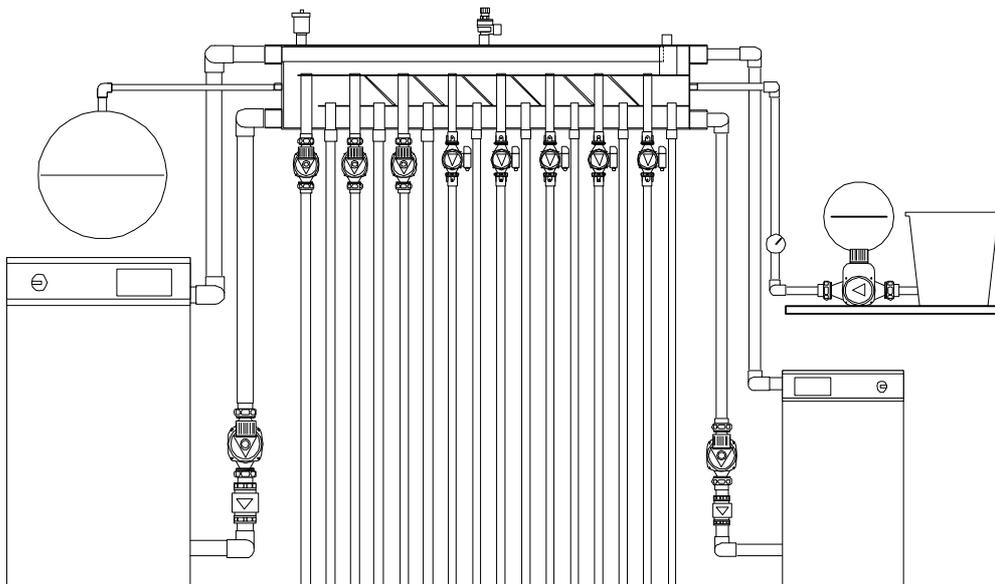


Fig. 7.9.1

Special order SystemZone Units are available to cater for larger applications on request. The diagram above shows a combined boiler plan where a high output (e.g.300 / 400 Kw) boiler is inter-connected with a smaller boiler (e.g. 75Kw.). The smaller boiler is then used to maintain output temperature at the desire level by simple setting its thermostat to a slightly higher point. This scheme will not only provide a back-up heat source but the smaller boiler could also be used to supply a smaller heat load, say Summer Hot Water, when required. This layout has regularly resulted in substantially lower fuel consumption along with an associated decrease in running costs.

SECTION 8: UNDERFLOOR HEATING APPLICATIONS

Underfloor heating With SystemLink

SystemLink is very easily adapted to suit Underfloor heating installations. The SystemLink water manifold (SystemZone) when used as a central distribution point will act perfectly to nullify all other water movement activities within that particular zone, and will allow only the desired amount of flow to satisfy the underfloor heating demand.

The pumped water from the heat source is collected in the SystemZone unit and from there it is drawn through the underfloor heat distribution network by the underfloor manifold circulation pump. This pump will have unhindered access to the heated water and so a constantly stable flow velocity will always be available throughout the underfloor pipe work. This constant flow is a critical factor in a correctly installed underfloor scheme.

Individually Temp. / Time Controlled Zones

The schematic on the right describes how three independently temperature controlled zones can simply be attached to the SystemLink.

Note that the SystemLinks internal pumps have been removed, as they are not required, and will actually interfere with the correct function of this plan.

This layout will therefore provide for separately controllable heating arrangements and would be most suitable for buildings where different floor constructions require variable flow temperature to match their specific demands.

Each section can have separate control of; water flow temperature, air temperature and time set points.

The boiler should be connected in accordance with Fig 7.1

Individually Time Controlled Zones.

The installation on the right could be used where a common flow temperature is required to deal with a multi-zone application. This will require that all the zones will have a uniform heat gain requirement, with identical construction methods and U. values.

The SystemZone will primarily direct the return water from the floor towards the return boiler connection, and so cater perfectly for a uniform temperature rise to each floor heating circuit.

This layout will not suit all boiler types, as the pump will only act through the boiler when heat is required in the floor circuit. Boilers that require a continuous bypass should not be used, unless another pumped circuit such as the hot water cylinder is used to overcome the bypass problem. Each section can have separate time and ambient temperature control.

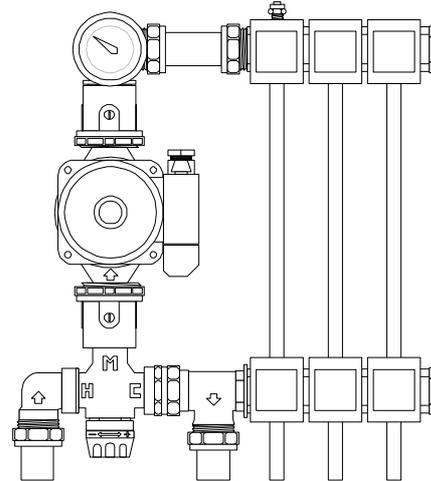
The boiler should be connected in accordance with Fig. 7.1

Note

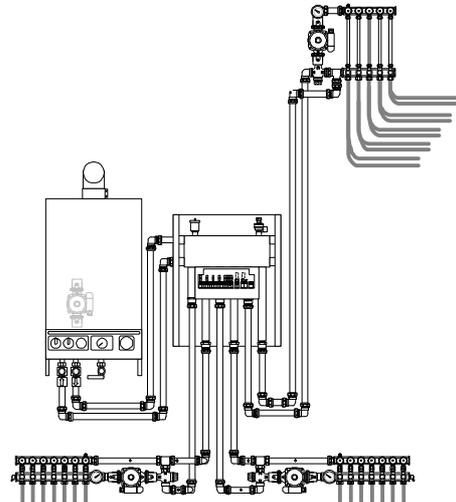
Pumps can remain within the SystemLink unit when there are no temperature mixing valves on the Underfloor Manifolds. The temperature mixing valves shown on the under-floor heating manifolds are located to ensure that some of the water returning from the floor circuit is again mixed with SystemLink's flow output to facilitate a correct flow temperature setting.

Example Underfloor Manifold.

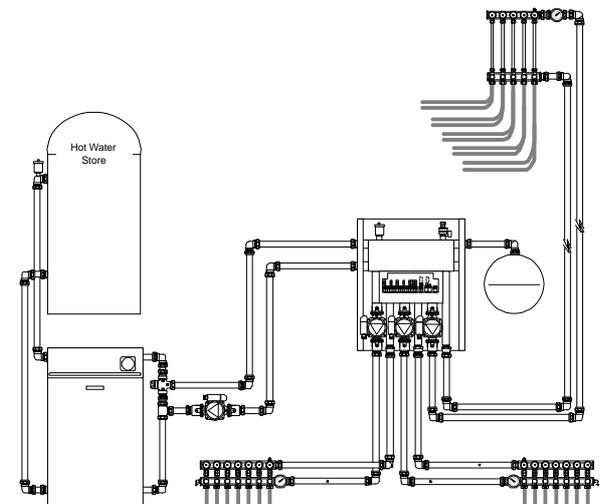
Fig 8.1



Temperature mixed Manifolds to SystemLink 3.



Constant Temperature Manifolds / SystemLink 3.



Underfloor Heating Schematics. (Continued)

Individually Time Controlled Zones.

SystemLink can be used to combine many different sorts of heating equipment in a very simple fashion.

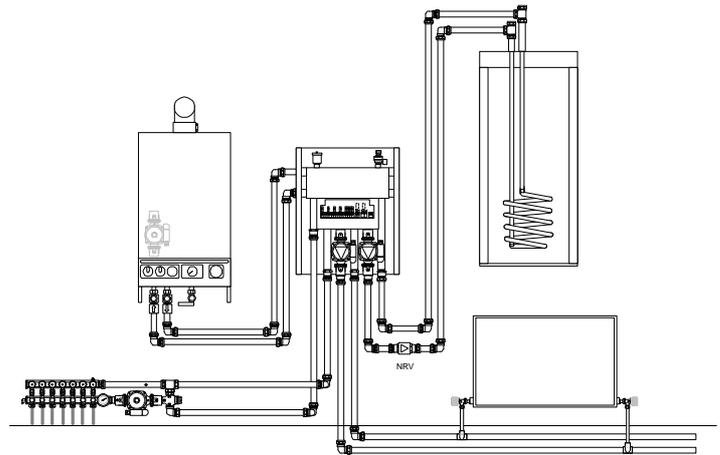
The installation on the right shows how a 3 Zone SystemLink unit may be used to combine the required output for a Floor Heating Circuit, a Radiator Circuit, and a Domestic Hot water Cylinder.

Note that SystemLinks left-hand circuit internal pump has been removed to facilitate the correct circulation to the underfloor heating circuit but that SystemLinks other pumps remain in position. They are used to distribute heat to both the hot water and radiator circuits.

Also note that a Non Return Valve has been located on the domestic hot water 'Flow' in accordance with the instructions in Section 5: Ancillary Heating Equipment. Each section can have separate time and ambient temperature control.as required

The boiler should be connected as depicted and in accordance with Fig..7.1

Multi-Choice Systems.



Note:

All pumps are positioned to pump away from the SystemLink unit.

SystemZone & SystemLink Combinations

Both the SystemLink and SystemZone products can quite easily be combined to form a comprehensive, yet simple installation solution. The example below shows clearly how this may be achieved. Some of the benefits of such a layout are as follows:

Only the selected boilers will heat as they are called into circuit. This is accomplished without the use of the typically complicated, motorised or non-return valve arrangement.

The combined output from the boilers can either be conducted to the hot water calorifier and underfloor zones together or arranged separately in a priority hot water plan.

Each pump can be sized and set to cater for an exact output to suit.

There are no mechanical obstructions to interfere with the correct operation, or extra safety features required, to complete this type of installation satisfactorily.

Multi-zone Application.

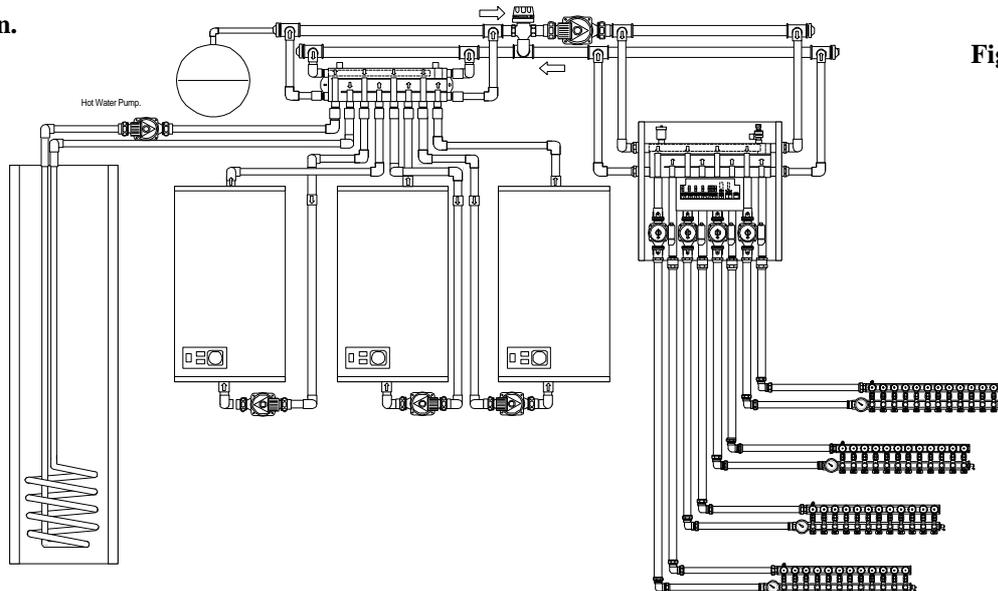


Fig. 8.5

SystemLink / SystemZone Connections to Underfloor Heating

Fig. 8.6 shows the water activity in a 3 zone SystemZone unit when boiler(s) are attached at the side connections (A,B,C,D).

The direction of water flow at the side ports (A, B, C, D) may change depending on the attachment configuration of boiler(s) and zones (see examples below).

SystemZone is also available in 2 zone and 4 zone configurations.

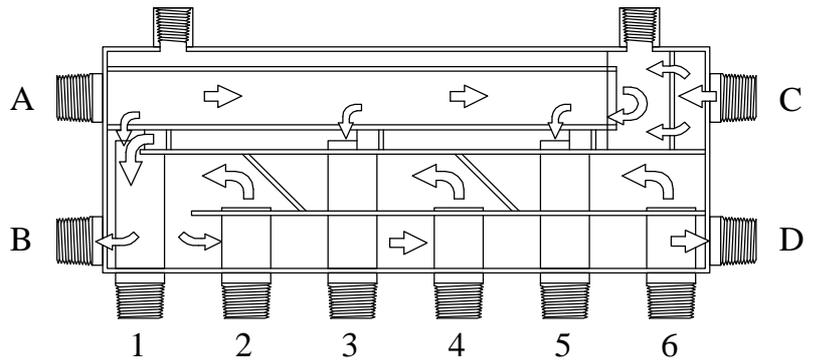


Fig. 8.6

Method 1 - Boilers at Side Connections.

(Fig. 8.7)

In this example, one boiler (not shown) has been connected to ports A and B. Where one or two boilers are required to be attached to the SystemZone side connections they are typically connected as follows; (ref. fig. 8.6)

Flow from boiler 1 into A,
Return to boiler 1 into B,
Flow from boiler 2 into C,
Return to boiler 2 into D.

Zone flow and returns are then attached in pairs as follows;
Flows to zones into ports 1,3,5 (7 in 4 zone unit)
Returns from zones into ports 2,4,6, (8 in 4 zone unit).

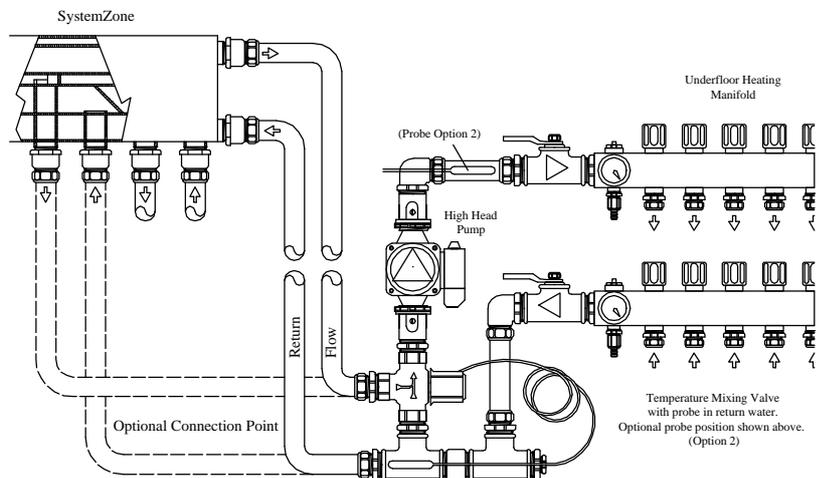


Fig. 8.7

In Fig. 8.7, the optional boiler ports (in this instance C and D), are used as an extra heating zone. The flow to the zone comes from C and returns at D.

IMPORTANT
See explanation on flow/return changes

Method 2 - Boilers at Bottom Connections.

(Fig. 8.8)

Where it is decided to collect multiple boilers at the bottom ports of the SystemZone with the zones at the side connections, the port allocations change.

Returns from the SystemZone to the boilers should be attached to 1,3,5, (7 in 4 zone unit)

Flows from the boilers should be attached to 2,4,6, (8 in 4 zone unit).

Also note that in this instance, the direction of the flows at the side connections change so that:

Ports B and D are now flows to zones

Ports A and C are returns from zones.

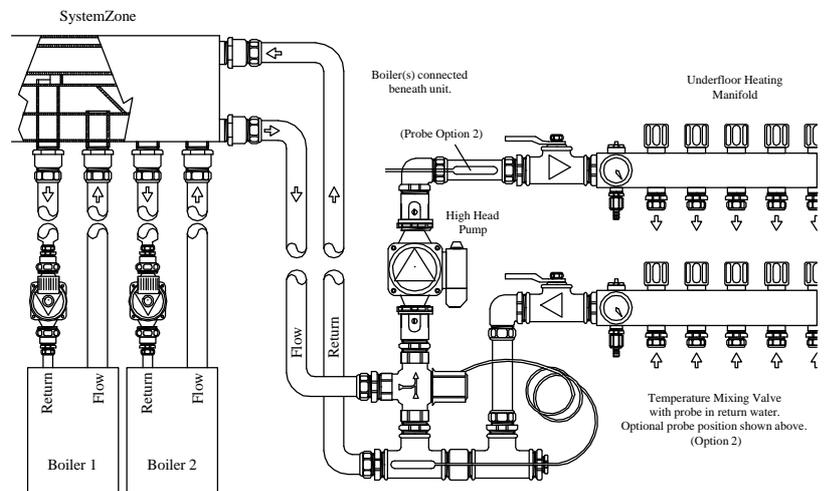


Fig. 8.8

SECTION 9: INSTALLATION (ELECTRICAL - SYSTEMLEX)

All numbers in the Electrical Installation and Attachment of Controls sections refer to the SystemLex diagram, Page 25

SystemLink's wiring centre, SystemLex, is pre-configured to automatically fire the boiler(s) only when one or more time/temperature zone controls call for heat, eliminating the need for a separate boiler clock.

Wiring external to the SystemLex printed circuit board MUST be in accordance with current statutory wiring regulations and any local regulations that apply. The power supply must be 230Vac~50Hz, Single Phase. Attaching the SystemLex board to more than one phase will cause irreparable damage. To ensure single phase, we recommend that power be introduced only at the mains input terminals (57, 58) and that all other mains inputs be derived from suitable outputs on the board itself.

Devices attached to SystemLink MUST be properly earthed in accordance with manufacturer's specifications. The method of connection to the mains electricity supply MUST facilitate complete electrical isolation of the entire installation. A fused double pole switch, with at least 3mm (1/8") contact separation in both poles, serving only the SystemLex panel should be used. The point of connection to the mains should be readily accessible and, if possible, adjacent to the SystemLink unit.

The SystemLex Printed Circuit Board within the SystemLink will then provide for:

- Zones 1-4:** 4 sets of terminals, to which external time and temperature controls may be attached, fused at 1 amp
- Power Supply:** 1 set of terminals for electrical mains supply connection fused at 5amps, (57, 58);
A general control power supply to facilitate use of a multi-zone clock, fused at 3amps (51, 52);
2 sets of terminals for power supply connection to the boilers, fused at 3amps. (53, 54 and 56, 56).
- Control:** 2 sets terminals to provide either Switched or Voltage Free control to boilers (61, 62 and 63, 64).
- Auxiliary Outputs:** 2 sets of auxiliary Output Relay terminals to facilitate auxiliary functions (71, 72, 73 and 74, 75, 76).
- Auxiliary Input:** 4 auxiliary input terminals (81, 82, 83, 84). to receive 230Vac supplies, any one of which will cause the auxiliary double pole relay to switch contacts, without back feeding to any other input.

Note:

Under no circumstances, should high and low voltage circuits be conducted through contacts on the same relay, as this would not comply with minimum clearance requirements specified by international wiring regulations. If a control is required on a circuit of different voltage than the primary circuit, the auxiliary control relay should be used.

CONNECTING TO THE SYSTEMLEX

Main Electrical Supply

The main electrical supply should be attached to the 'Power Supply' on SystemLex as follows;

- 1) Connect the 'Live' input from the external Double Pole Switch to the SystemLex Power Supply 'L' terminal (57)
- 2) Connect the 'Neutral' input from the external Double Pole Switch to the SystemLex Power Supply 'N' terminal (58).

Boiler with Permanent power Supply

A boiler with permanent power supply should be attached to SystemLex board in accordance with manufacturer's instructions and with the following connection method;

- 1) Connect the 'Live' output from the SystemLex Power Supply (53 or 55) to the boiler's permanent live point if required. This connection is fused (3amps) on the SystemLex.
- 2) Connect the 'Neutral' output from SystemLex Power Supply (54 or 56) to the boiler's neutral 'N' terminal.

Switched Power Supply Boiler Connection

A switched power supply may be provided to a boiler as follows;

- 1) Connect the 'Live' output from the SystemLex Power Supply (53 or 55) to the appropriate 'Control-com' (common) terminal on the SystemLex (61 or 63).
- 2) Connect the 'Switch Live' output from the SystemLex 'Control-NO (normally open) terminal (62 or 64) to the boiler's Switch Live terminal. The 'Switch Live' will automatically energise when any zone calls.

'Voltage Free' Boiler Connection

'Voltage Free' connection may be provided to the boiler as follows;

- 1) Connect the output from the boilers' control panel to the appropriate SystemLex control (61 or 63).
- 2) Connect the Input to the boiler's control panel to the appropriate SystemLex control (62 or 64).

ATTACHING TIME CONTROL DEVICES TO SYSTEMLEX

Single Zone Clock (Zone 1)

- 1) Connect Live input on clock to SystemLex Live in appropriate zone (11, 21, 31 or 41).
- 2) Connect Live output from clock to SystemLex 'Clock In' in appropriate zone (12, 22, 32 or 42)
- 3) Connect Neutral (N) from clock to the SystemLex 'Pump Neutral' (16, 26, 36 or 46) or the SystemLex general 'Control

Multiple Zone Clock

- 1) Connect Live input on clock to SystemLex Power Supply 'L' terminal (51)
- 2) Connect Live outputs from clock to SystemLex 'Clock In' terminals in appropriate zones (12, 22, 32 or 42)
- 3) Connect Neutral (N) from clock to the SystemLex Power Supply 'N' terminal (52).

Note: *Only SystemLex Power Supply terminals 51, 52 should be used for multi- zone electrical loads as they are fused at a higher 3amp rating.*

Single Zone Programmable Thermostat (Zone 1)

- 1) Connect Live input on programmer to SystemLex 'Clock- Live' terminal in appropriate zone (11, 21, 31 or 41).
- 2) Connect Live output from programmer to SystemLex 'Stat- In' terminal in appropriate zone (14, 24, 34 or 44).
- 3) Connect Neutral (N) from programmer to the SystemLex 'Pump Neutral' (16, 26, 36 or 46) or the SystemLex 'Control

Note: *When using a battery operated device, it will not be necessary to use either the SystemLex 'Clock -In' or 'Stat -Out' terminals (12, 13 in zone 1). Instead, the switch live from the thermostat should be connected directly to the SystemLex 'Stat- In' terminal (14 in zone 1). If a single zone programmable thermostat is to be wired to another zone, the same procedure should be followed in accordance with the terminal identification chart on page 22*

Hot Water Thermostat (e.g. in Zone 2)

- 1) Connect the Common terminal on the thermostat to the SystemLex 'Stat- Out' terminal (23).
- 2) Connect the output from the thermostat to the SystemLex 'Stat- In' terminal (24).
If a thermostat is to be wired to another zone, the same procedure should be followed in accordance with the terminal identification chart on page 22

Room Thermostat (e.g. in Zone 2)

- 1) Connect the Common terminal on the thermostat to the SystemLex 'Stat- Out' terminal (23).
- 2) Connect the output from the thermostat to the SystemLex 'Stat- In' terminal (24).
If a thermostat is to be wired to another zone, the same procedure should be followed in accordance with the terminal identification chart on page 22

Note: *Thermostats should be wired to break circuit on temperature rise. If a thermostat is not to be used in a given zone's wiring arrangement, then it will be necessary to link a wire across the particular zone's SystemLex 'Stat- Out' and 'Stat- In' terminals (e.g. zone 3, terminals 33, 34). Alternatively, the clock's switch live, should be connected directly to the particular zone's SystemLex 'Stat- In' terminals (14, 24, 34 or 44). This clock arrangement is similar to the method used above for a single zone programmable thermostat*

Example Use of SystemLex Wiring Centre.

Wiring Clock & Thermostats

The wiring configuration on the left should be used when separate time control and thermostat control units are to be configured in an 'in-series' fashion with the SystemLex.

Fig. 9.1 shows connections to Zone 1 on the SystemLex but of course other zones can be wired in the same way if required.

- Terminal 11 is provided with power from the 1 amp fuse located directly above the Zone clock connections. This power source is used to energise the clock motor and also to provide the required power to the clock's switch common.
- When the clock switches, power is directed back to terminal 12 on the SystemLex.
- Terminal 2 on the SystemLex is already connected to terminal 13 by an electrical track at the rear of the board.
- Terminal 13 & 14 are used to connect the zone thermostat (Water or Ambient).

If the Clock and thermostat are calling for heat, Terminal 15 is energised and the zone LED above the Pump Neutral lights. The pump should then run, and the double pole boiler control relay make contact, causing the boiler to fire.

Wiring Time-Temperature Control. (Battery Powered) (Fixed Time or Proportional Controllers)

The wiring configuration on the left (Fig. 9.2) should be used when a combined Time/Thermostat control unit is required. This example shows how such a unit can be connected to Zone 1 on the SystemLex but of course other zones can be wired in the same way if required.

- Terminal 11 is provided with power from the 1 amp fuse, located directly above the zone clock connections.
- This power source is used to provide power for the clock switch only.
- Should the Clock Thermostat switch "On", it's switch live supply should be connected directly to terminal 14, bypassing terminals 12 & 13, as they are not required in this instance.

The control unit depicted here is an OptiStat Time/Temperature programmer. It is most suitable for the ambient control of radiator heating systems. The unit has an internal temperature sensor. This type of controller may also be used to control the time generation of domestic hot water but, in that case, the OptiStats temperature settings must be over-ridden by adjusting the control set-points to 30°C (normal) and 5°C (set-back).

In this instance the water temperature must be controlled by the inclusion of a cylinder thermostat in series with the OptiStat controller. The OptiStat controller must then be connected across the zone clock terminals (eg. Zone 1, 11 & 12) and the cylinder thermostat across the zone 'Stat' terminals (eg. Zone 1, 13 & 14).

Fig. 9.1

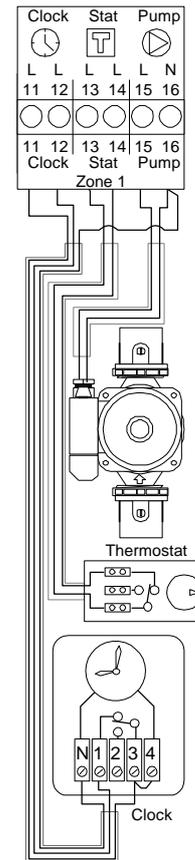
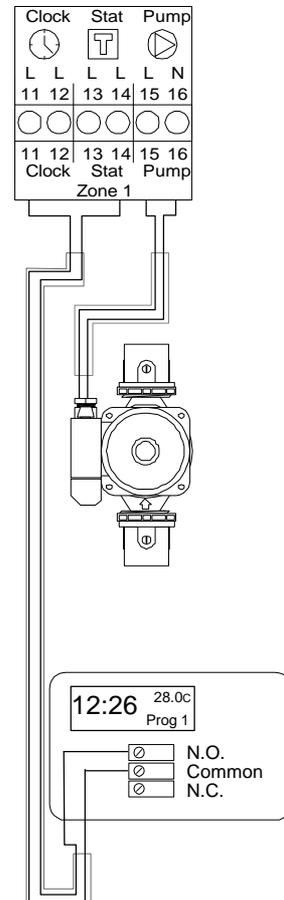


Fig. 9.2



Multi Zone Programmer Connections.

The schematic on the left shows how a multi-channel time control can be used with the SystemLex. The drawing shows a four Channel programmer but units with fewer output zones can also be used.

- The time control is energised through SystemLex terminals 51 (live) and 52 (Neutral).
- The power supply from terminal 51 is also connected to the clock switch common connections.
- Each clock switched output is connected to the SystemLex board from the normally open terminals. Those switch lives are connected to the SystemLex board at the zone clock input connections. (E.g. terminal 12, 22, 32 and 42).

Each SystemLex Zone also includes a thermostat connected across the zones 'Stat' terminals (e.g. 13 and 14 in Zone 1). This can control the temperature of a hot water store or the ambient conditions in the particular zone as required.

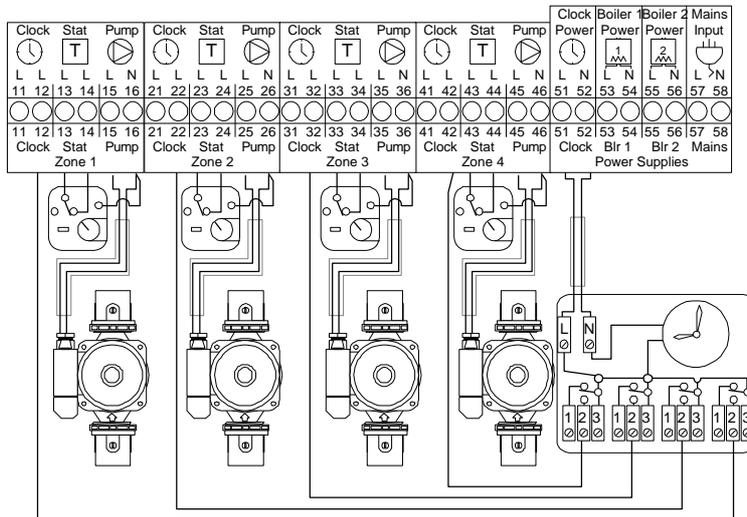


Fig. 9.3

Boilers with 'Switch Live' call.

Fig. 9.4 shows how a boiler requiring a 'switch live' should be connected.

- A link must be provided connecting the permanent power, which is available at terminals 53, to terminal 61 which, is a common connection of the boiler control relay switch.
- Terminal 54 provides the Neutral for that boiler.
- The 'switch live' output is then provided by any zone call, as the on-board electronics are configured to energise the coil of the boiler control relay when heat demand is received.
- As a result, the relay will change contacts and the live at 61 will be switched out at terminal 62 (Blr 1).

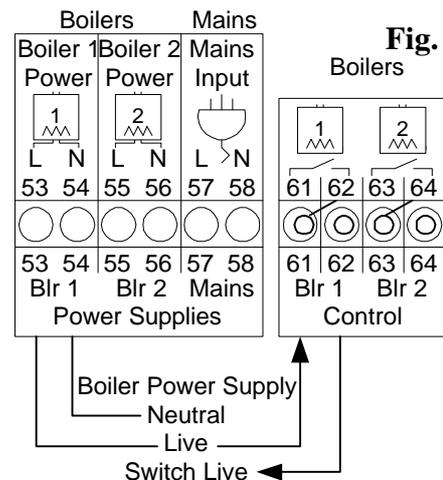


Fig. 9.4

If a second boiler is to be used, it may be supplied power from boiler 2 connections (55, 56) in the same way, with the link providing power from 55 to 63 and the switch live being delivered from terminal 64.

Boilers with 'Voltage Free' call.

Fig. 9.5 shows how a boiler requiring a 'Voltage Free switch medium' should be connected.

- Permanent mains power is connected from terminals 53 and 54 (Blr 1) and 55 and 56 (Blr 2).
- The switch control is provided when a zone calls and the connection at 61, is switched to 62 (Blr 1), or the connection at 63 is switched to 64 (Blr 2), to fire the boiler(s).

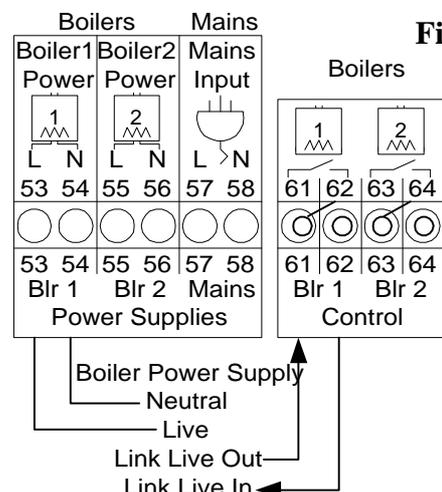


Fig. 9.5

Using an Auxiliary Connection Relay.

E.g., to 'Prioritise' a particular zone.

Fig. 9.6

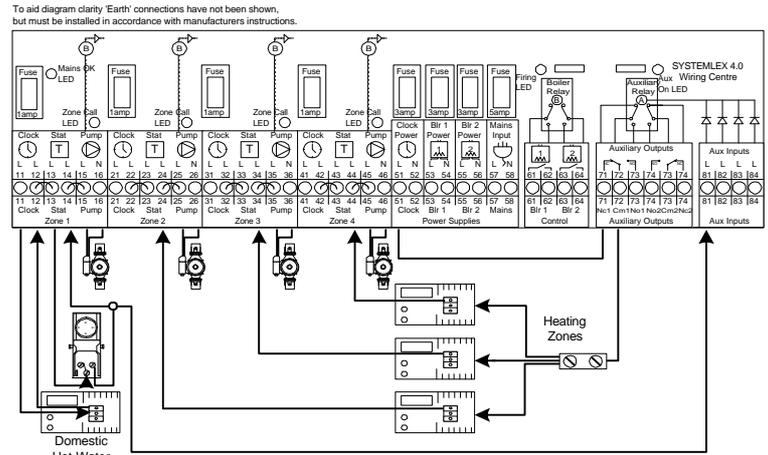
The auxiliary relay connections on the SystemLex are provided as an additional support during the electrical installation of the SystemLink, and serve no function in its' normal activities. *They exist solely to help overcome the many installation dilemmas that tend to occur during a heating system wiring installation.*

Figure 9.6 describes an installation where 3 battery operated ambient temperature controllers are supplied switching power by the general clock terminal live (51).

The supply is firstly conducted through one of the auxiliary relays' normally closed sets of contacts (71, 72). Therefore, the power supplied to zones 2, 3 & 4 depend on contacts 71 and 72 remaining closed.

If then, The Hot Water Circuit (Zone 1) is called, it will operate as described in Fig. 8.1, but the additional switch live from the zone 'Stat Call' to auxiliary input terminal 81, will cause relay contacts 71 and 72 to open, disabling the heating power supply.

This action will prevent the operation of zones 2, 3 and 4 and so the only activity allowed is the generation of domestic hot water in zone 1.

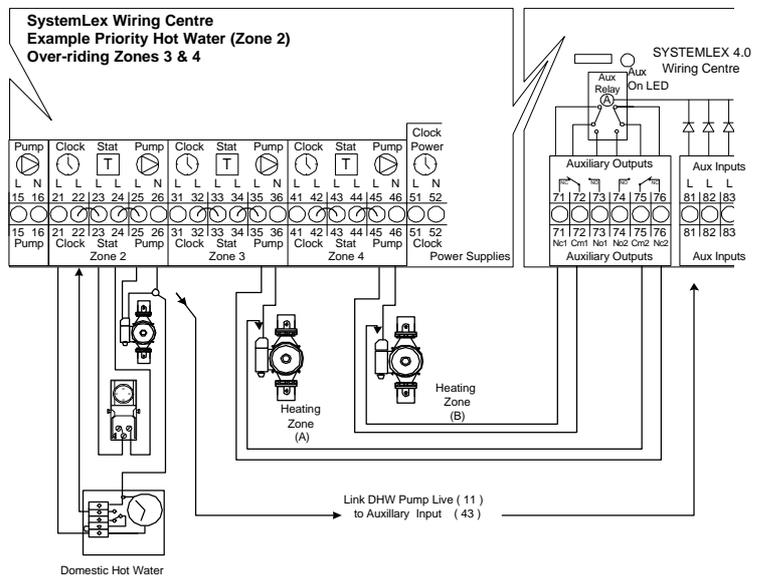


Programmable room thermostats may be used as the time control element on domestic hot water circuits by setting the 'On' temperature to it's highest and setting the 'Set-back' to it's lowest. (E.g. 30°C & 5°C). This decision may be made for instance, to assist the end user by providing only one form of time controller to learn. The controller must be located away from the hot water's heat emission.

Fig. 9.7

This type of overriding control is only possible because the battery-operated programmers will continue to keep time, even though their switching supply is disconnected.

An alternative method to prioritise a zone if the controllers require a constant power supply is shown in Fig. 9.7 and described below. The basic difference is that only two of the zone 'pump' switch lives can be broken through the auxiliary relay. In this example zone 3 & 4 pumps are broken.



The two independent sets of auxiliary relay 'Normally Closed' contacts are used to provide overriding control on a maximum of the two selected zones.

When power is directed to the auxiliary relay input terminal 81, the heating disconnection occurs.

Zone 2 is now prioritised and when calling, it will act on the Auxiliary Relay to disconnect the power supply at the circulating pumps in zones 3 and 4.

Sample Auxiliary Relay Functions

'OR GATE' Relay Set-up.

Fig. 9.8

E.g. to energise extra equipment

In example A (Fig 9.8), if Power (AC or DC) is presented to terminal 72, It will output at 71 (N.C. - Normally Closed Contact)

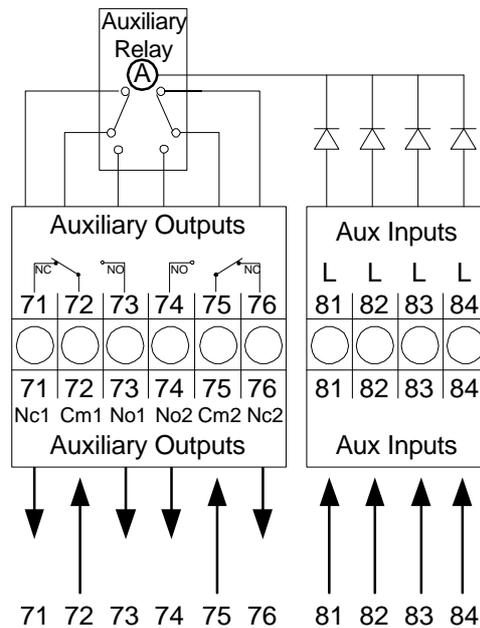
Likewise 75 is normally connected to 76.

If then, AC. power is applied to any terminal from 81 to 84, the power that was exiting at 71 will now change over to 73, as the relay switches contacts and what was exiting at 76 will changeover to 74.

Any 230Vac power entering the input terminal 81 to 84 will cause the relay to change over but the inputs will not back feed on each other.

Therefore power connected to terminal 81, OR 82, OR 83, OR 84 will cause the relay to act.

Hence the term "OR GATE".



'AND GATE' Relay Set-up.

Fig. 9.9

E.g. to selectively fire an additional boiler

In example B (Fig 9.9), if an output is required to say, fire a second boiler, when more than one selected zone is calling then an 'AND GATE' arrangement could be used.

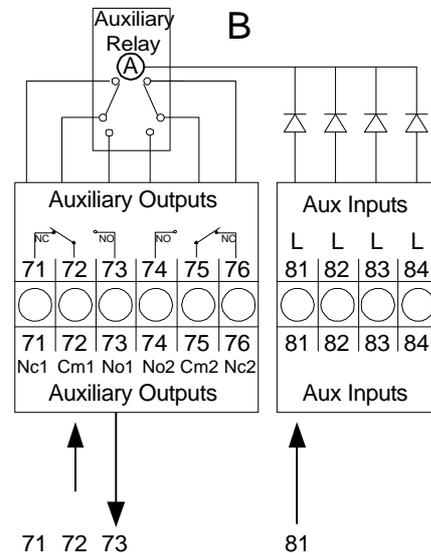
Note that a power input to 72 could not exist at 73, unless it was accompanied by another input at some other terminals from 81 to 84, which would cause the relay to switch from its Normally Closed (NC) position of 72 to 71 to a change over position of 72 to 73.

Likewise, if no power was present at the Common terminal '72' when another input was presented to one of the switching inputs (81, 82, 83, 84) then the relay would switch contacts but there would not be an output at terminal 73.

This would of course also relate to the second set of changeover contact at terminals 75, 76 changing to 75, 74 requiring an additional mains power input at terminals 81 to 84.

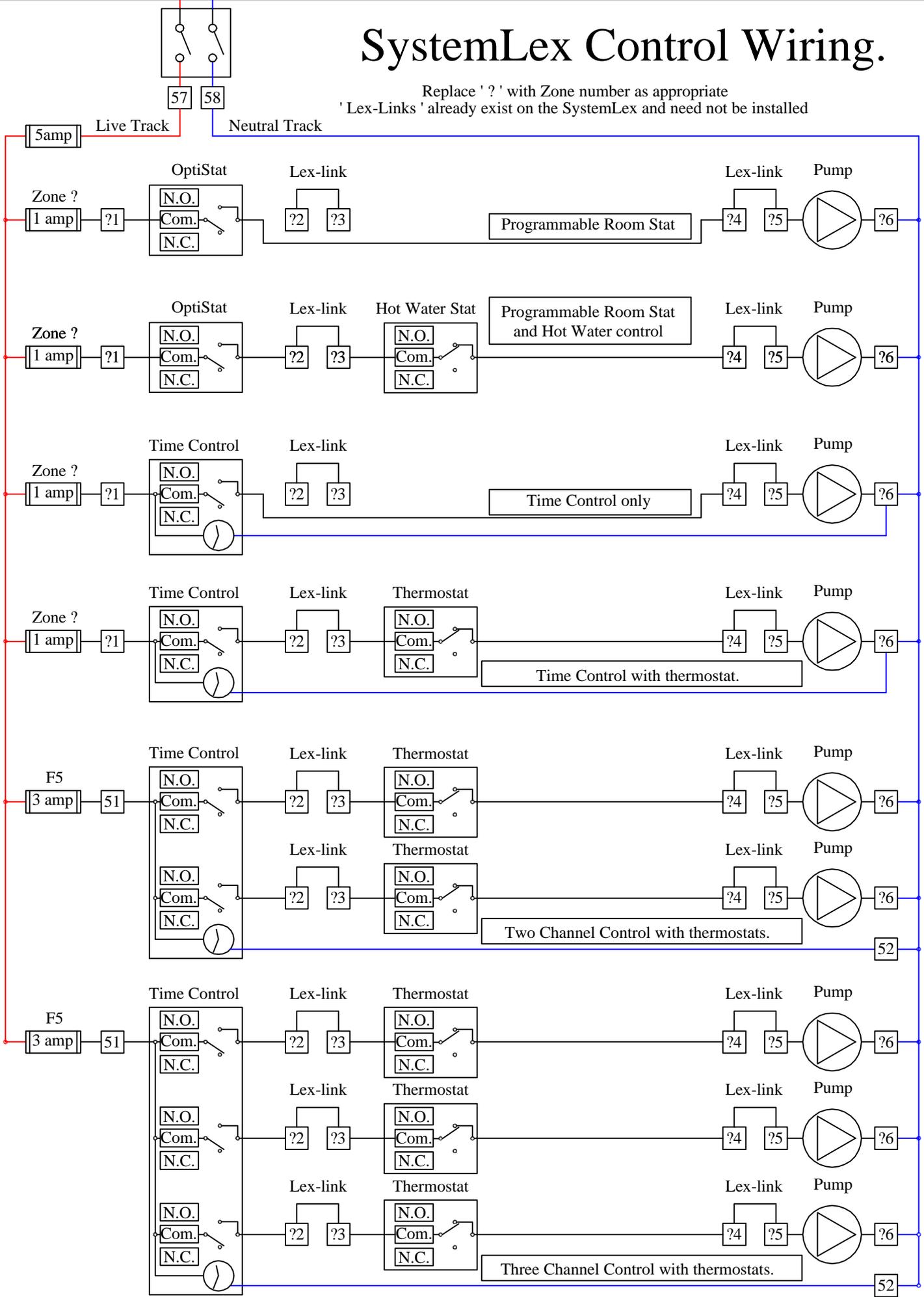
Therefore, power would have to be available at both 72 'AND' at one or more of the switching terminals (81, 82, 83, 84) for an output to exist at 73.

Hence the term "AND GATE".



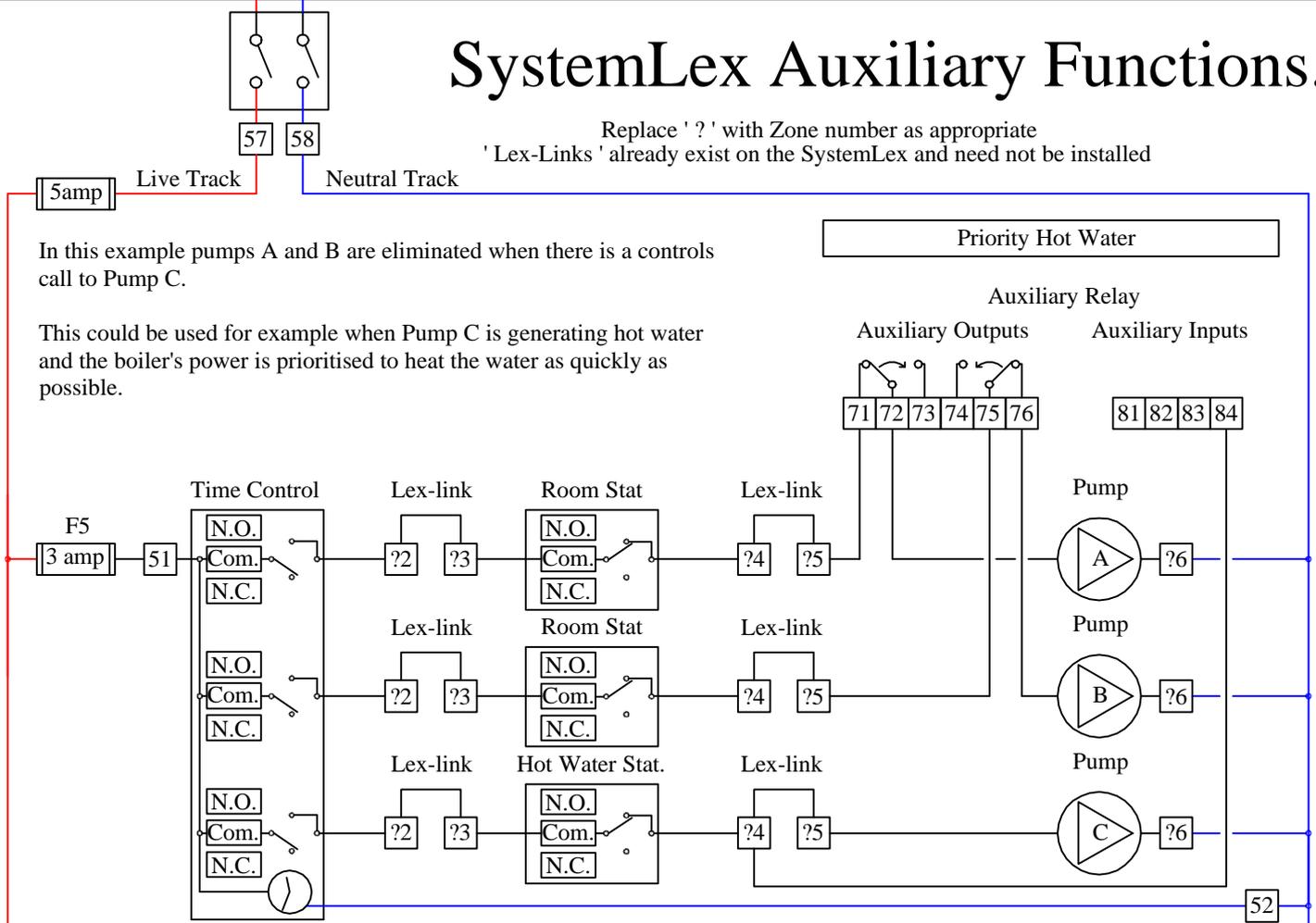
SystemLex Control Wiring.

Replace '?' with Zone number as appropriate
 'Lex-Links' already exist on the SystemLex and need not be installed



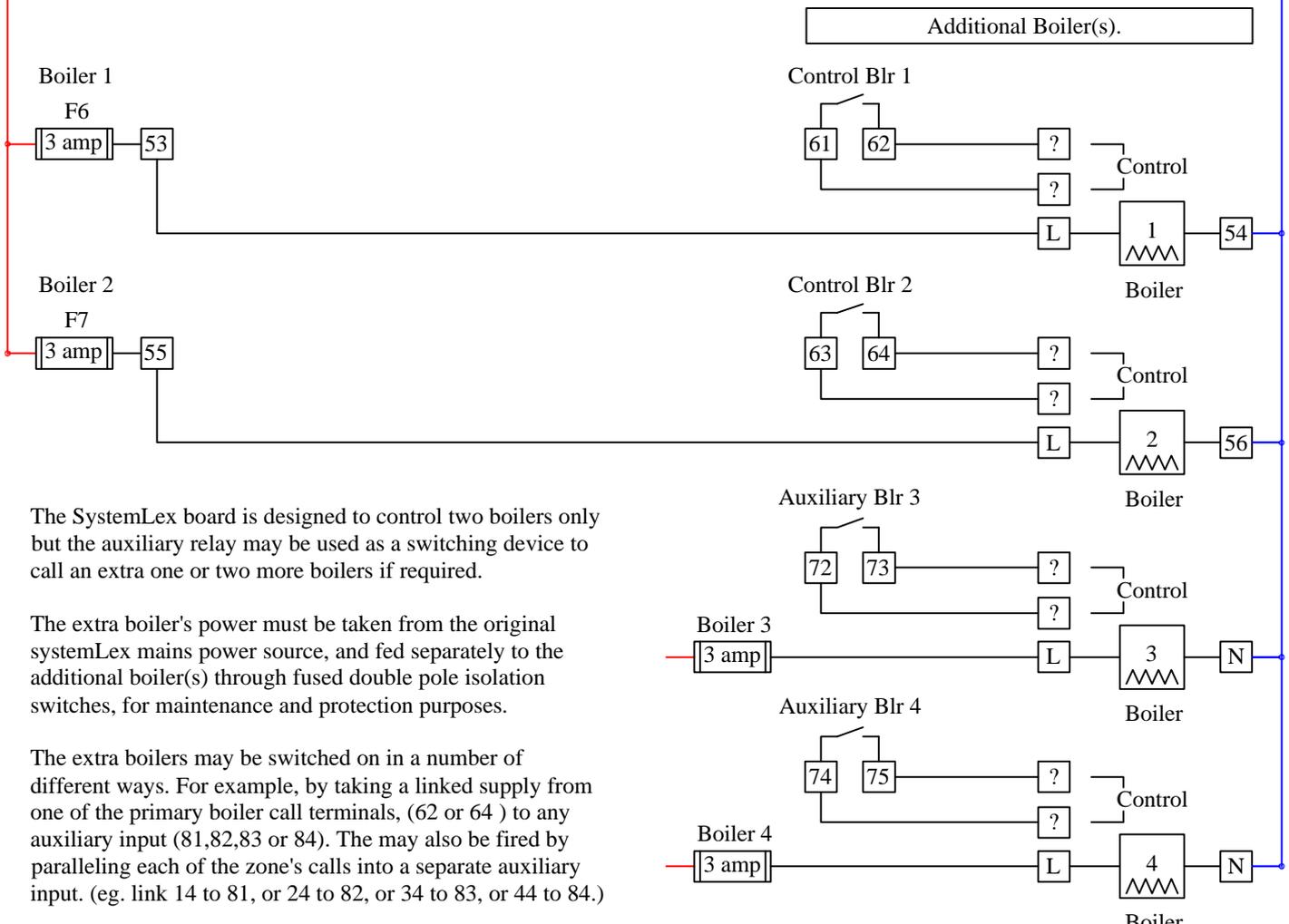
SystemLex Auxiliary Functions.

Replace '?' with Zone number as appropriate
'Lex-Links' already exist on the SystemLex and need not be installed



In this example pumps A and B are eliminated when there is a controls call to Pump C.

This could be used for example when Pump C is generating hot water and the boiler's power is prioritised to heat the water as quickly as possible.



The SystemLex board is designed to control two boilers only but the auxiliary relay may be used as a switching device to call an extra one or two boilers if required.

The extra boiler's power must be taken from the original systemLex mains power source, and fed separately to the additional boiler(s) through fused double pole isolation switches, for maintenance and protection purposes.

The extra boilers may be switched on in a number of different ways. For example, by taking a linked supply from one of the primary boiler call terminals, (62 or 64) to any auxiliary input (81,82,83 or 84). They may also be fired by paralleling each of the zone's calls into a separate auxiliary input. (eg. link 14 to 81, or 24 to 82, or 34 to 83, or 44 to 84.)

SECTION 10 COMMISSIONING AND FAULT-FINDING.

Initial Flushing of the SystemLink Unit and Pipe-Work.

Heating component manufacturers generally recommend that a system be adequately flushed to prevent damage by grease or

Where possible, isolate any appliance that could be damaged by the movement of debris through the circulation pipe-work.

- 1) Connect the water supply temporarily to a return pipe and a drainpipe to the flow, then flush the entire system until the drain discharges clean water (for at least five minutes).
- 2) Drain the system by opening the drain taps at all low points. Close the drain taps and open all the appliances to the system. Begin the initial filling of the SystemLink and pipework.
- 3) Unscrew the black cap on the automatic air valve one full turn from closed position. Leave open permanently. If the air valve does not release the trapped air within the SystemZone unit, the system pumps will not circulate the system water and they may become irreparably damaged. It is therefore essential to ensure that the air valve has operated successfully throughout the plant operation.
- 4) Close all air release taps on the central heating system.
- 5) Gradually fill the system.
- 6) Starting with the lowest radiator, open each air release tap in turn, closing it only when clear water, free of bubbles, flows out. In the same way release air from any high points in the pipe-work.
- 7) Continue filling the pipe-work until at least 1.5 bar registers in a sealed system or, if the system is open, until header tank has filled to an appropriate capacity.
- 8) Inspect the pipe-work for water soundness and remedy any leaks discovered.

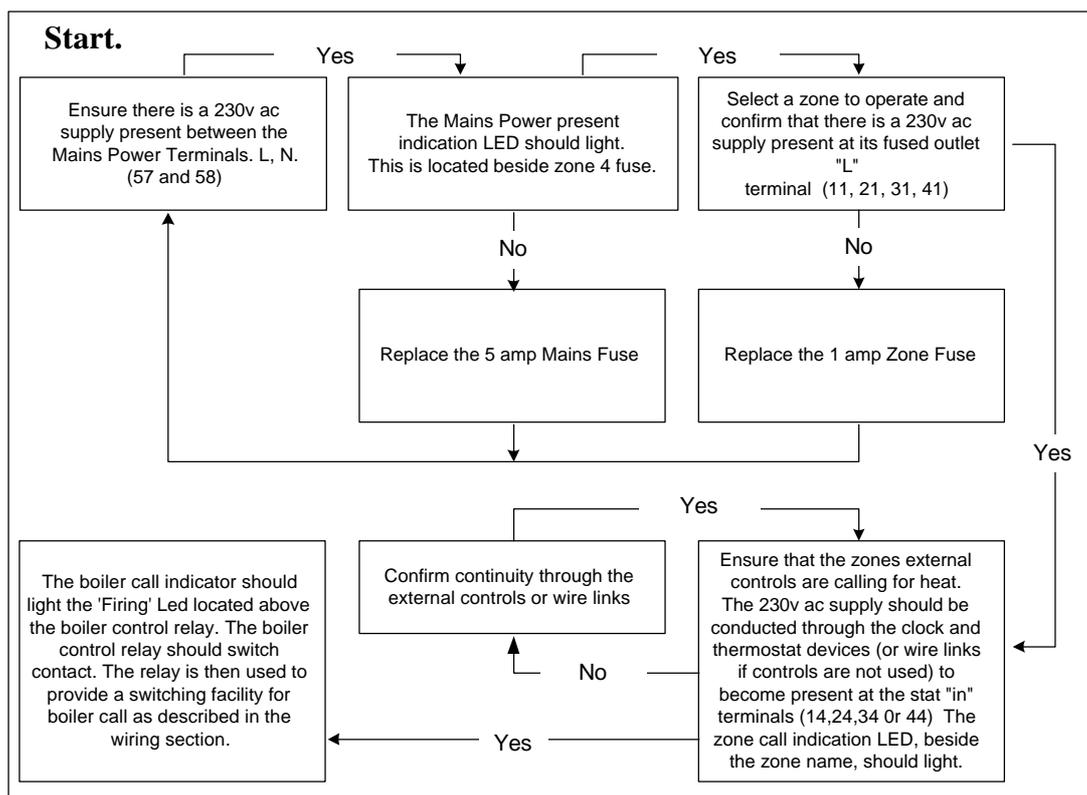
N.B. The safety valve (Fig 1) is set to lift at 3bar / 30m / 45psig.

Checking the Electricity Supply

- 1) Carry out preliminary checks for continuity, polarity and resistance to earth.
- 2) Switch on the mains electricity.

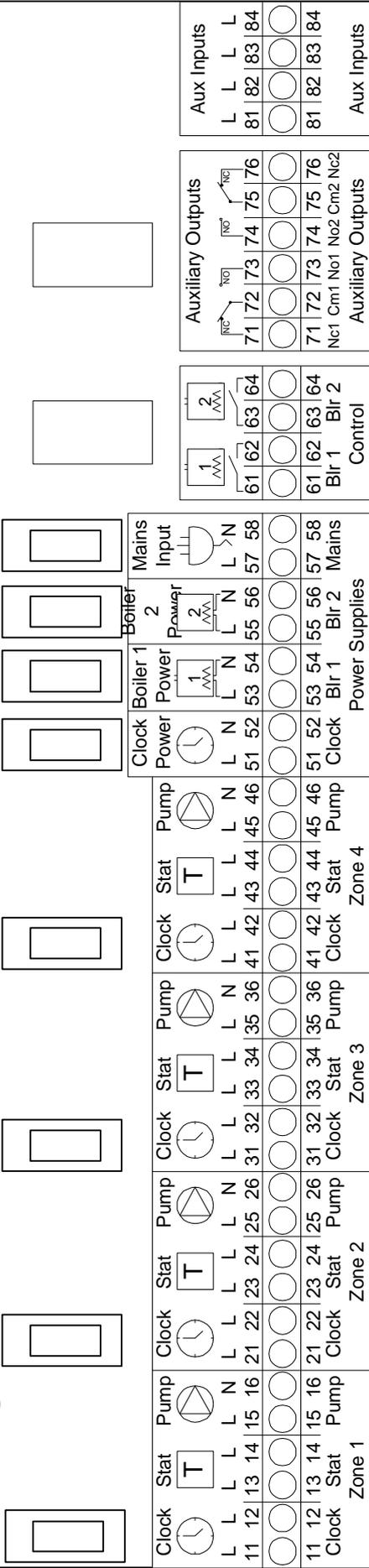
If external controls are fitted (e.g. Time clock or Room Thermostat), ensure that these 'call for heat'.

Electrical Fault Finding on SystemLex Printed Circuit Board



SYSTEMLEX 4.0 Wiring Centre

DANGER HIGH VOLTAGE USE PROPER EARTH PROCEDURES



Zone Control Connections

Terminal	Zone 1	Zone 2	Zone 3	Zone 4
Clock Supply	11	21	31	41
Switched Clock Input.	12	22	32	42
Output to Thermostat	13	23	33	43
Input From Thermostat	14	24	34	44
Pump Live	15	25	35	45
Pump Neutral	16	26	36	46

General Function Contacts.

Terminal	Power Supply General	Boiler 1	Boiler 2
General Controls Live	51	(Optional)	
General Controls Neutral	52	(Optional)	
Boiler Power Supply Live		53	55
Boiler Power Supply Neutral		54	56
Main Power Input Supply Live	57		
Main Power Input Supply Neutral	58		
Boiler (Voltage Free) "Common" Contact		61	63
Boiler (Voltage Free) "Normally Open" Contact		62	64

Auxiliary Function Contacts.

Inputs	Input 1	Input 2	Input 3	Input 4	Outputs (Relay Contacts)	Left	Right
	81	82	83	84	Voltage Free "Common"	72	75
					Voltage Free "Normally Open"	73	74
					Voltage Free "Normally Closed"	71	76

WIRING RECORD.

Please detail Installation wiring scheme and leave this manual with the property owner.

SYSTEMLEX 4.0 Wiring Centre												DANGER HIGH VOLTAGE USE PROPER EARTH PROCEDURES												
Clock	Stat		Pump	Clock	Stat		Pump	Clock	Stat		Pump	Clock	Boiler Power		Boiler Power	Boiler Power	Mains Input							
L L	L L		L N	L L	L L		L N	L L	L L		L N	L N	L N		L N	L N	L N							
11 12	13 14		15 16	21 22	23 24		25 26	31 32	33 34		35 36	41 42	43 44		45 46	51 52	53 54		55 56	57 58				
Clock Stat Pump			Clock Stat Pump			Clock Stat Pump			Clock Stat Pump			Clock			Blr 1 Blr 2		Mains		Blr 1 Blr 2		Auxiliary Outputs		Aux Inputs	
Zone 1			Zone 2			Zone 3			Zone 4			Power Supplies			Control		Auxiliary Outputs		Aux Inputs					