

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

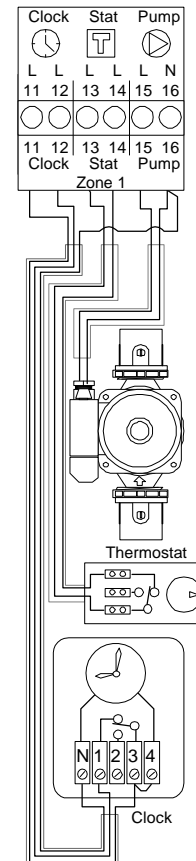
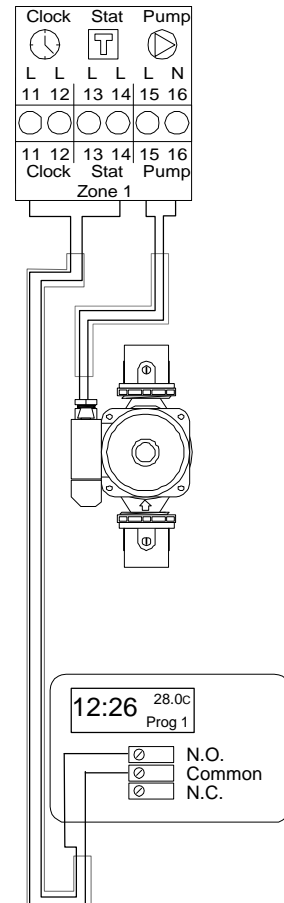


Fig. 9.2



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.

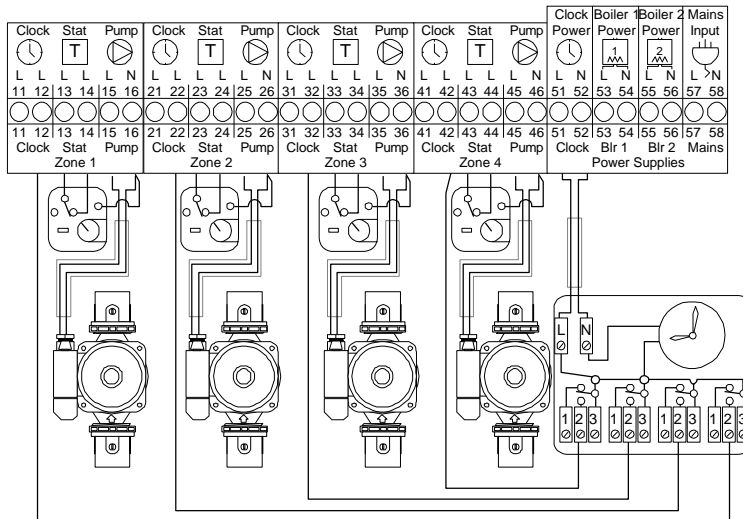


Fig. 9.3

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).

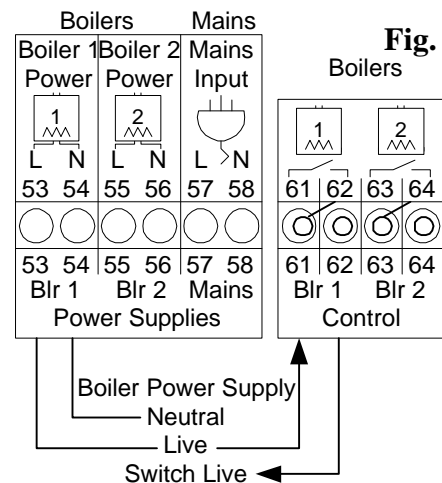


Fig. 9.4

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).

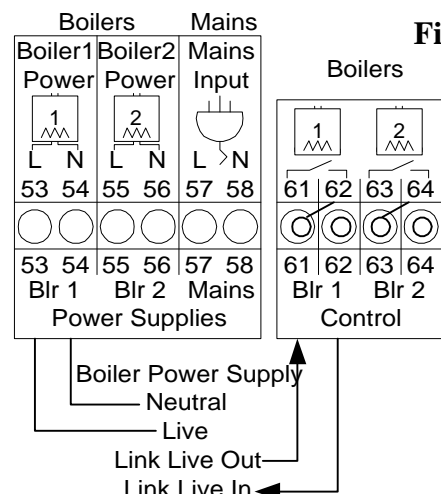


Fig. 9.5

Using an Auxiliary Connection Relay.

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

Fig. 9.6

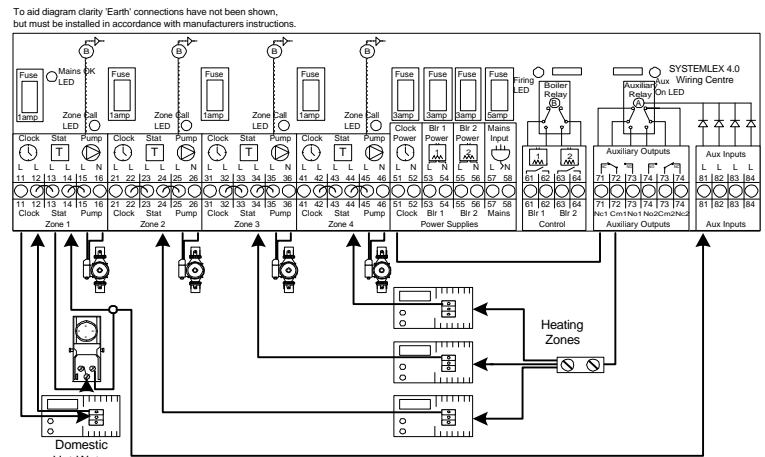
The auxiliary relay connections on the SystemLex are provided as an additional support during the electrical installation of the SystemLink, and serve no function in its normal activities. *They exist solely to help overcome the many installation dilemmas that tend to occur during a heating system wiring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

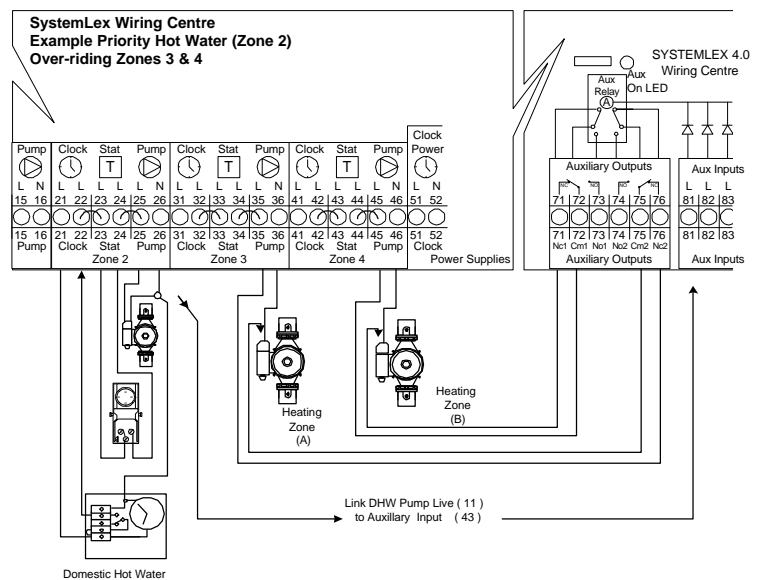


Programmable room thermostats may be used as the time control element on domestic hot water circuits by setting the 'On' temperature to it's highest and setting the 'Set-back' to it's lowest. (E.g. 30°C & 5°C). This decision may be made for instance, to assist the end user by providing only one form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

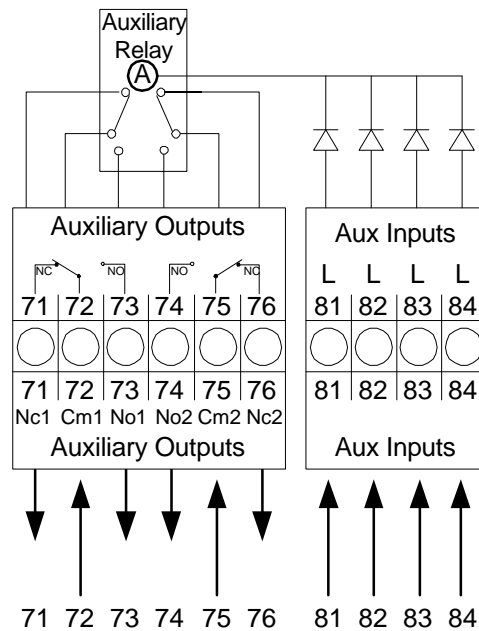
Likewise 75 is normally connected to 76.

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.

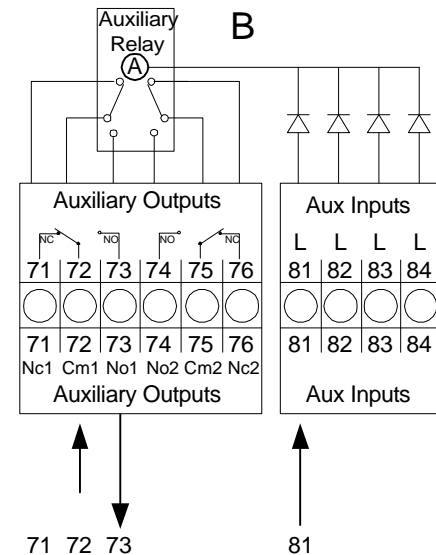
Note that a power input to 72 could not exist at 73, unless it was accompanied by another input at some other terminals from 81 to 84, which would cause the relay to switch from its Normally Closed (NC) position of 72 to 71 to a change over position of 72 to 73.

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.

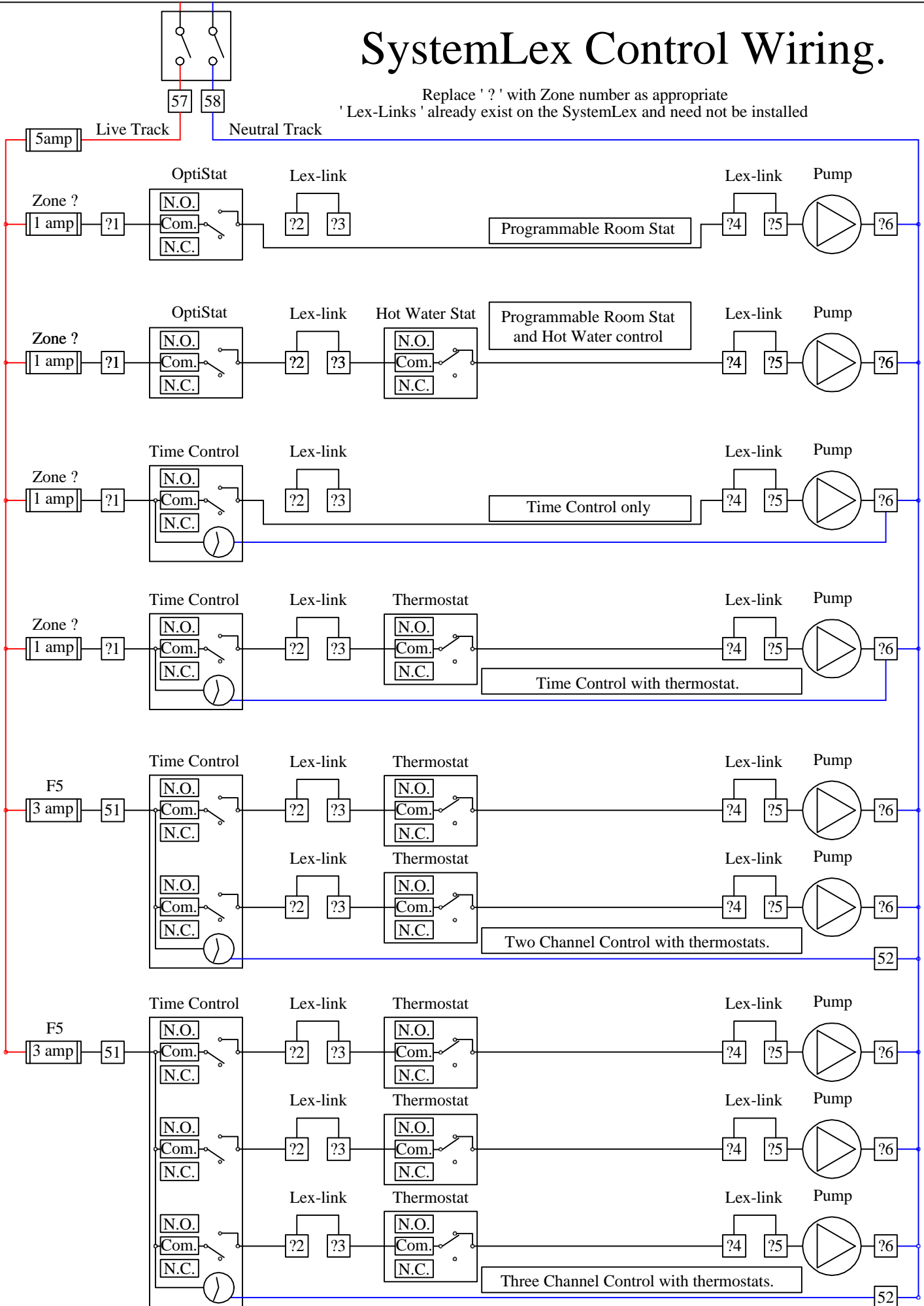
Therefore, power would have to be available at both 72 'AND' at one or more of the switching terminals (81, 82, 83, 84) for an output to exist at 73.

Hence the term "AND GATE".



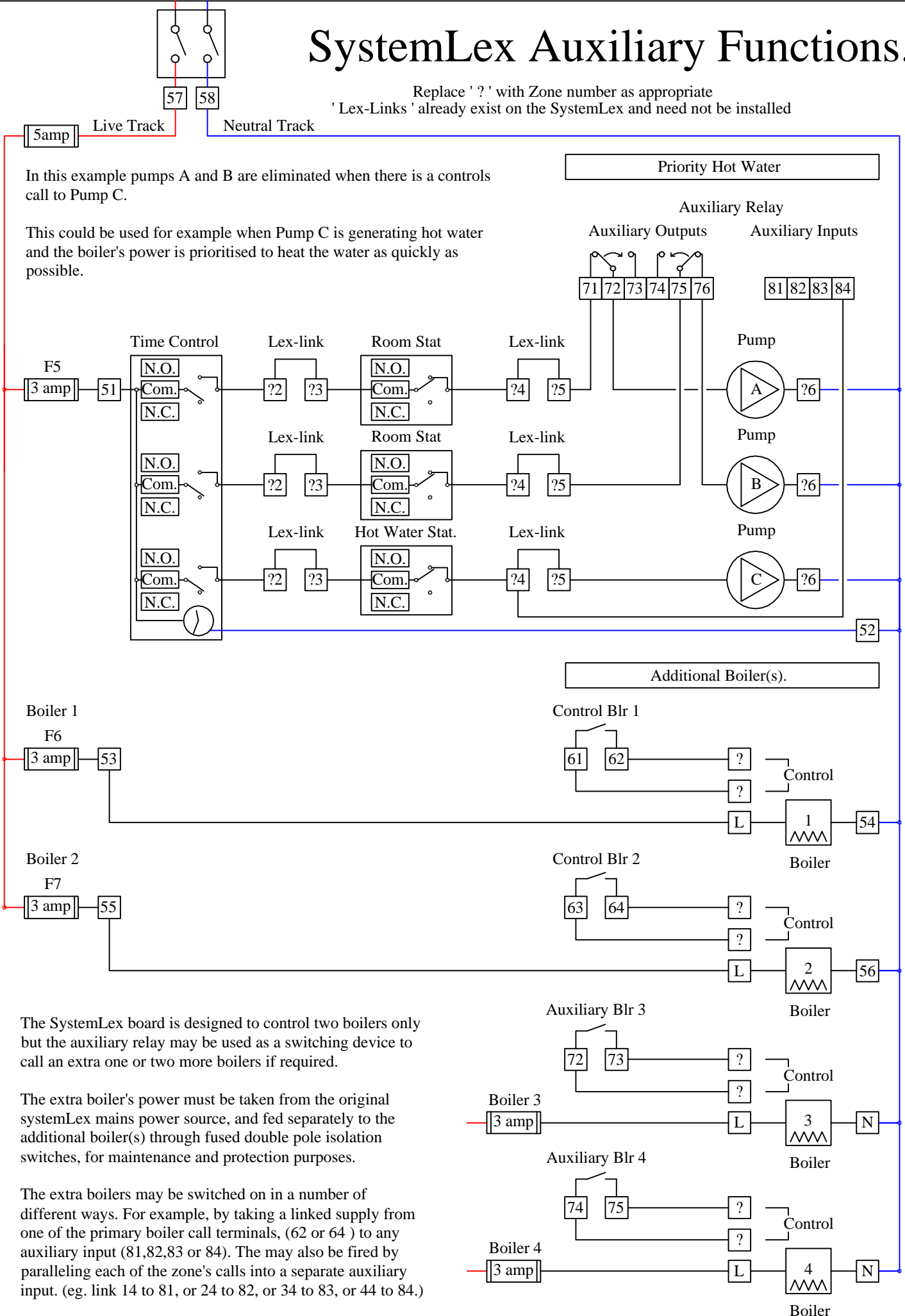
SystemLex Control Wiring.

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



SystemLex Auxiliary Functions.

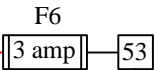
Replace '?' with Zone number as appropriate
'Lex-Links' already exist on the SystemLex and need not be installed



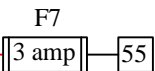
In this example pumps A and B are eliminated when there is a controls call to Pump C.

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.

Boiler 1



Boiler 2



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.

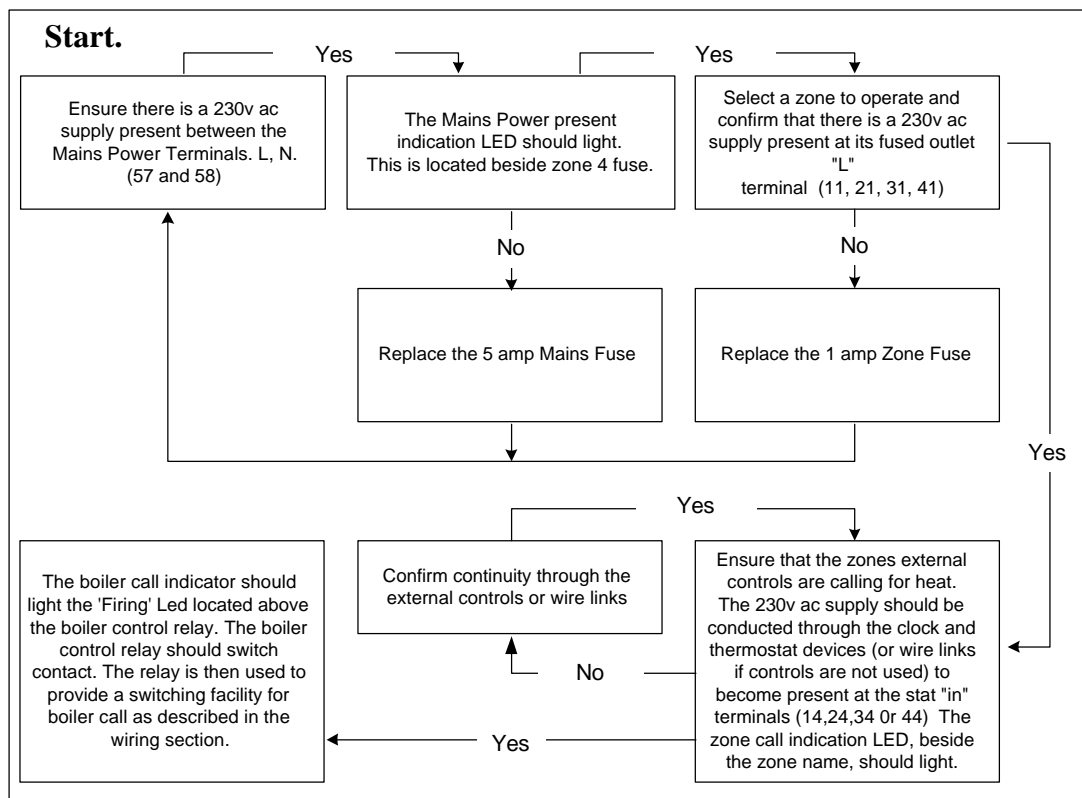
N.B. The safety valve (Fig 1) is set to lift at 3bar / 30m / 45psig.

Checking the Electricity Supply

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

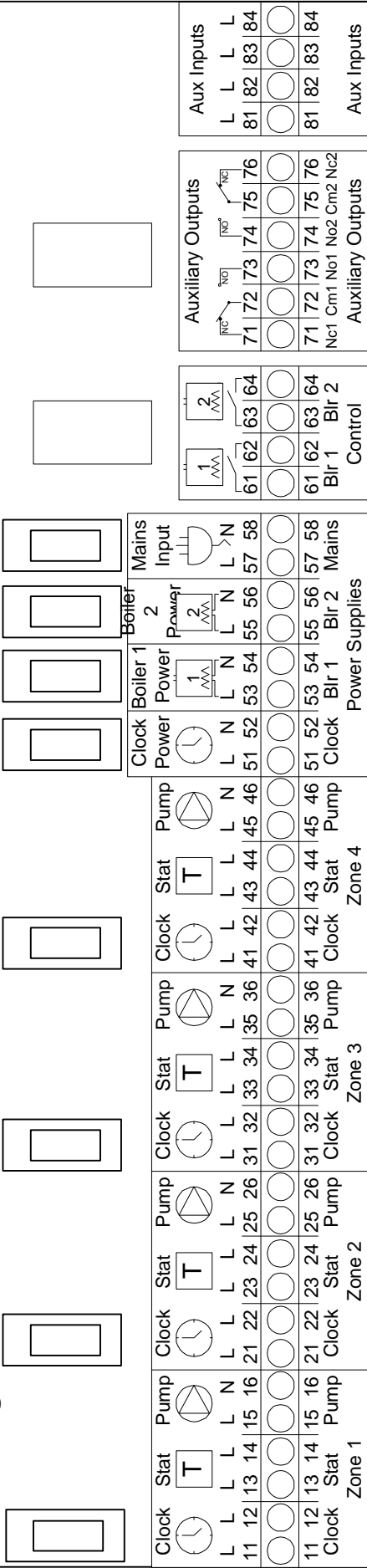
If external controls are fitted (e.g. Time clock or Room Thermostat), ensure that these 'call for heat'.

Electrical Fault Finding on SystemLex Printed Circuit Board



SYSTEMLEX 4.0 Wiring Centre

DANGER HIGH VOLTAGE USE PROPER EARTH PROCEDURES



General Function Contacts.

| Terminal | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Power Supply General | Boiler 1 | Boiler 2 |
|-----------------------|--------|--------|--------|--------|----------------------|------------|----------|
| Clock Supply | 11 | 21 | 31 | 41 | 51 | (Optional) | |
| Switched Clock Input. | 12 | 22 | 32 | 42 | 52 | (Optional) | |
| Output to Thermostat | 13 | 23 | 33 | 43 | | 53 | 55 |
| Input From Thermostat | 14 | 24 | 34 | 44 | | 54 | 56 |
| Pump Live | 15 | 25 | 35 | 45 | 57 | | |
| Pump Neutral | 16 | 26 | 36 | 46 | 58 | | |
| | | | | | | 61 | 63 |
| | | | | | | 62 | 64 |

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 |

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 | Stat | | Pump | Clock | Boiler | Boiler | Mains |
| | | | | | | | | | | | | | | | | | | | |
| L L | L L | | L N | 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 |
| 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 Zone 1 | | | Clock Stat Pump Zone 2 | | | Clock Stat Pump Zone 3 | | | Clock Stat Pump Zone 4 | | | Clock Power | | Boiler Power 1 | | Boiler Power 2 | | Mains Input | |
| 61 | 62 | 63 | 64 | Auxiliary Outputs | | | | Aux Inputs | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 61 | 62 | 63 | 64 | 71 | 72 | 73 | 74 | 75 | 76 | 81 | 82 | 83 | 84 | | | | | | |
| Blr 1 | | Blr 2 | | Auxiliary Outputs | | | | Aux Inputs | | | | | | | | | | | |