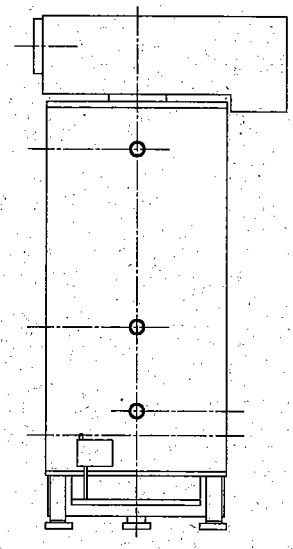

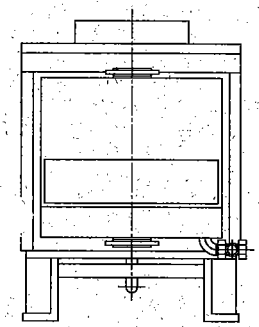

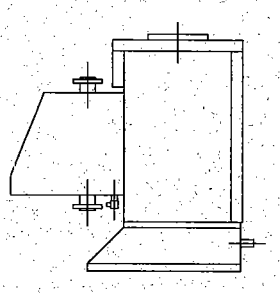

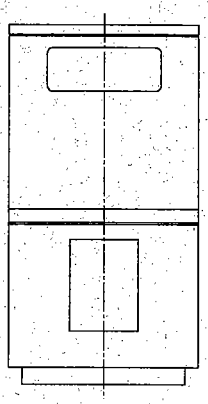

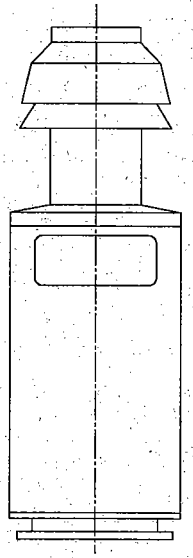

Installation, Commissioning and Servicing Instructions

Marshall

Boiler Sequence Control System

IMPORTANT NOTE
THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE INSTALLING, COMMISSIONING, OPERATING OR SERVICING EQUIPMENT.

BS EN ISO 9001:1994
Certificate No. FM 10082

HAMWORTHY
heating products

Customer Services

TECHNICAL ENQUIRIES ☎ 01202 662527 / 662528

To supplement the detailed technical brochures, technical advice on the application and use of products in the Hamworthy Heating range is available from our technical team in Poole and our accredited agents.

SITE ASSEMBLY ☎ 01202 662555

Specialist teams are available for on site assembly of the full range of Hamworthy boilers (excluding Lulworth). Boiler sections for site assembly must be positioned within the boiler house prior to the arrival of the assembly team and provide sufficient space for safe working. Handling sections into boiler houses other than at ground level may be subject to additional charges.

The normal assembly price does not include for the fitting of boiler casings or the burner, however this can be carried out at the time of build at additional cost.

Providing the facilities are available on site, a hydraulic test will be carried out within the terms of BS779. Upon completion a certificate of assembly and test will be issued.

COMMISSIONING ☎ 01202 662555

Commissioning of equipment by Hamworthy Heating's own engineers, accredited agents or specialist sub-contractors will ensure that the equipment is operating safely and efficiently. Hamworthy commissioning reports provide a detailed record of the original status of the plant, which is essential for future routine maintenance and trouble free operation.

Standard warranty terms provide for the free of charge replacement of defective parts, but does not include labour. When the equipment is commissioned and routinely maintained by Hamworthy Heating under a Service Maintenance Agreement then the warranty terms will cover both parts and labour.

MAINTENANCE AGREEMENTS ☎ 01202 662555

Regular routine servicing by Hamworthy Heating's engineers ensures trouble free operation and optimum efficiency. The frequency of visits required is variable, dependent upon the equipment type and usage. Annual service agreements are available on all Hamworthy products to meet individual requirements.

Planned maintenance of equipment by routine servicing reduces operational costs considerably below that associated with repair or breakdown approach.

BREAKDOWN SERVICE, REPAIR, REPLACEMENT ☎ 01202 662555

Even when the commissioning and routine servicing has been carried out to the highest standard there are always occasions when the unexpected breakdowns occur. Hamworthy provide a rapid response breakdown, repair or replacement service through head office at Poole and accredited agents located throughout the UK.

SPARE PARTS ☎ 01202 662525

A comprehensive spare parts service is operated from our factory in Poole, providing replacement parts for both current and discontinued products. In some instances spares may be available from accredited agents.

Delivery of parts and components is normally from stock within 7 days. However, a 24 hour delivery service is available for breakdowns and emergencies for the additional cost of the courier. Please contact our spares team, providing details of product type, serial number, model or any other identifying marks or codes to determine part requirements wherever possible.

MARSHALL

BOILER SEQUENCE CONTROL SYSTEM WITH OPTIMISING TIME CONTROL AND OUTSIDE TEMPERATURE COMPENSATION

INSTALLATION, COMMISSIONING AND SERVICING INSTRUCTIONS

NOTE: THESE INSTRUCTIONS SHOULD BE READ AND UNDERSTOOD BEFORE ATTEMPTING TO INSTALL, COMMISSION OR OPERATE THE MARSHALL SYSTEM.

THE MARSHALL SYSTEM IS INTENDED FOR USE ONLY IN COMMERCIAL/LIGHT INDUSTRIAL APPLICATIONS.

THIS BOILER SEQUENCE CONTROL SYSTEM COMPLIES WITH THE ESSENTIAL REQUIREMENTS OF THE ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 89/336/EEC AMENDED BY 91/263/EEC AND 92/31/EEC AND THE LOW VOLTAGE DIRECTIVE 73/23/EEC AMENDED BY 93/68/EEC.

PUBLICATION NO. 500001082
ISSUE 'B'
MARCH 2000

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1.0 INTRODUCTION

1.1 This boiler sequence control system must be installed by a competent person.

All installations must conform to the relevant IEE and Building Regulations as well as any local regulations which apply. HSE requirements must also be taken into account when installing any equipment.

Failure to comply with the above may lead to Prosecution.

1.2 The Marshall is a microprocessor based, modular control system designed for direct mounting in the Hamworthy modular boiler range. Each Marshall system consists of a Master controller mounted in the lead boiler module and up to eight Slave controllers fitted in each of the remaining modules. Each controller can operate in either an on/off or high/low sequence depending on the control requirements of the boiler it is fitted to.

Each controller is wired directly to the boiler control panel it is mounted in, minimising the required on site wiring. The communication connections between the Marshall Master and Slave controllers are by shielded, 2 core, twisted pair cable. The controllers are connected in series using a simple plug and socket arrangement (see Figure 1/Page 17). The insertion flow temperature sensor (or optional strap-on sensor) and optional room temperature and external temperature sensors are connected in the same way.

1.3 Control Features

1.3.1 Time Clock - 7 day timer with 4 `Active' (on) period settings per day. An external time clock can be connected to override the in-built clock.

1.3.2 Programmable Override - The Marshall system can be programmed on screen to override to 'Active' or 'Standby' for a given period of time.

1.3.3 Remote Override Facility - A remote switch can be connected to the Marshall Master controller, which when closed will cause the Marshall system to override to 'Active' for the duration that the switch is closed.

1.3.4 Weekly Shift Sequencing - The lead boiler is shifted every 7 days (at midnight on Sunday), to ensure even usage of the boilers. The correct firing sequence for both on/off and high/low boilers is maintained whichever is the lead boiler. This function can be disabled to maintain a fixed sequence.

1.3.5 High/Low Sequencing Options – When high/low boilers are controlled, the Marshall system provides the option to step boilers on in a low, high, low, high sequence, or to step all boilers on at low fire and then step them to high fire.

1.3.6 Outside Temperature Compensation - This function requires the optional external temperature sensor. The compensation function adjusts the water flow temperature setting in relation to the outside air temperature. As the outside air temperature falls the heat loss from a building increases, so to compensate for this the Marshall controller will increase the water flow temperature, thus increasing the heat input to the building and maintaining the desired comfort level. If this function is not utilised, the Marshall will control to a fixed water flow temperature.

1.3.7 Summer Shutdown – This option requires the optional external temperature sensor. Should the outside air temperature rise above a programmable set point, the Marshall timeclock is overridden to prevent unnecessary operation of the heating system.

1.3.8 Optimiser - This function requires the optional room temperature sensor. The optimiser function adjusts the heating start time in relation to the difference between the actual room temperature and the desired room temperature. The colder the actual room temperature is, so the earlier the heating is started. In this way the heating is switched on as late as possible to achieve the desired room temperature at the required time (the timeclock settings represent the time at which the desired room temperature is to be achieved).

The optimiser includes a self-learning function to tune the system to each installation. The self-learning function can be disabled.

The optimiser also provides a `Standby' (night-setback) temperature setting, such that the room temperature is prevented from falling below this point overnight.

A further feature provided by this function is the ability to adjust the 'Active' or 'Standby' room temperature setting for the current timeclock period, after which it will revert to its programmed setting.

If the optimiser function is not utilised the heating is started at the times specified by the timeclock.

1.3.9 Frost Protection - When the Marshall is in Standby (off/night-setback) mode, this function fires the boilers to maintain a minimum flow water temperature, to prevent freezing of the heating system water.

Additionally, if an external temperature sensor is connected the circulation pump will be started at an outside air temperature below an adjustable set point, thus providing two stage frost protection.

1.3.10 Pump Overrun - A circulation pump overrun timer function is included to make use of the residual boiler heat when the heating is switched off at the end of an Active period, or when the desired room temperature is achieved (Optimiser function only).

Table 1 - Technical Data

	MASTER	SLAVE
Supply Voltage	~230V 50Hz	
Power Consumption	6W Max.	
Boiler Control Relay Rating	~250V, 3A resistive	
Circulation Pump Signal	~230V, fused @ 2A	-
Weight	0.52kg	0.41kg
GENERAL DATA		
Sensor Connection Cable	Shielded 2 core (Beldon 8451)	
Maximum Sensor Cable Run	500m	
Data Memory and Timeclock Battery Back-up	10 years minimum at 25°C	

1.3.11 Pump Maintenance – Should the heating not operate during any given week, the circulation pump is run for 1 minute at midnight on the Sunday of that week.

1.3.12 Holiday Override - This function overrides the timeclock during the selected holiday periods, preventing the heating system from operating. A maximum of 5 holiday periods can be entered.

1.3.13 Manual Holiday Override – The Marshall timeclock can also be overridden manually via the keypad. The control remains in holiday mode until it is reset via the keypad.

1.3.14 Data Logging The Marshall control provides logging of hours run for each boiler module, and data relating to the performance of the compensation and optimiser functions.

1.3.15 Safety Interlock Circuit - This function allows the connection of external system safety devices, such as flue exhaust fan proving switch, pressurisation unit safety circuit, etc, to the Marshall System. If the circuit is broken by any of the safety devices the Marshall controller prevents the boilers from firing, and a warning message is displayed on screen.

1.3.16 Hand/Auto Circuit - This is an additional circuit fitted to each boiler which overrides the Marshall system, returning control to the boiler thermostat, for the purposes of boiler commissioning and servicing, or to run the heating system in the event of a Marshall fault. When the Master unit is set to `Hand' the circulation pump will also run.

Note! The boiler thermostats MUST be adjusted to a safe control temperature, if this function is utilised.

2.0 TECHNICAL DATA

2.1 Overall dimensions are shown for reference in Figure 2/Page 18.

2.2 Technical data information is shown in Table 1/Above.

3.0 DESCRIPTION OF OPERATION

3.1 Communication

When power is supplied to the Marshall controllers, the Master controller displays a number of start-up messages and then initiates its communication sequence, which continues for the duration that the power is supplied. The Master controller communicates with each of the Slave controllers and the sensors in turn, in a continuous sequence.

At each communication the Master controller instructs the Slave controller as to whether the boiler it controls should be off or firing (and at high or low fire if the boiler is of that type). The `COMMUNICATING' indicator on the Slave controller fascia flashes on to indicate that communication is taking place. When a sensor is interrogated it returns its current temperature reading to the Master controller.

3.2 Basic Operation (Compensation and Optimiser Functions Not Utilised)

3.2.1 When the internal (or external) timeclock calls for the heating system to operate the Master controller changes from `Standby' (off) to `Active' mode. This is indicated on the Master controller `system temperature screen' (refer to section 1.0: RUN MODE DISPLAY SCREENS, of the Marshall Users Operating Instructions - HHL No. 500001083). The heating circulation pump is started and the lead boiler is switched on (at low fire if the boiler has high/low controls). This is indicated on the Master controller `system status screen'.

3.2.2 The boilers sequence on at intervals determined by the `boiler on delay' setting (see Section 5.2:Programming). The firing of the boilers is indicated on the Master controller system status

screen. A small flame symbol represents a boiler on at low fire, and a large flame symbol represents a boiler on at high fire.

The boiler modules will sequence on in the order determined by the 'firing sequence' setting (see Section 5.2:Programming). The sequence order for a 3 boiler module system for the 2 different settings is shown in Table 2/Below. Table 2 also shows the operation of the 'weekly shift' function which changes the lead boiler each week at midnight on Sunday.

Table 2 – Boiler Module Firing Sequence

	Boiler 1		Boiler 2		Boiler 3	
	Low	High	Low	High	Low	High
Firing Sequence Setting '00'						
1st week	1	2	3	4	5	6
2nd week	5	6	1	2	3	4
3rd week	3	4	5	6	1	2
4th week	1	2	3	4	5	6
Firing Sequence Setting '01'						
1st week	1	4	2	5	3	6
2nd week	3	6	1	4	2	5
3rd week	2	5	3	6	1	4
4th week	1	4	2	5	3	6
Firing Sequence Setting '01' with 1 On/Off Boiler						
1st week	1	3	2	4		5
2nd week	2	4	1	3		5
3rd week	1	3	2	4		5

3.2.3 Whilst the boilers are firing the control monitors the rate of change of the water temperature. If this exceeds an upper limit, i.e. the water temperature is climbing too fast, the boilers are sequenced off at intervals determined by the 'boiler off delay' setting (see Section 5.2:Programming), until the rate of temperature change falls below the upper limit. The upper limit reduces as the water temperature approaches the required set point. This feature prevents the possibility of high temperature overshoots in fast response systems, which could have lead to nuisance boiler over-temperature lockouts.

3.2.4 When the required fixed flow temperature is achieved the boilers are sequenced off at intervals determined by the `boiler off delay'. The boilers then sequence on and off to maintain the required flow temperature.

3.2.5 At the end of the `Active' period, as determined by the internal or external timeclock, all of the boilers are switched off. The circulation pump overrun function operates, allowing the pump to continue running for a period determined by the `pump overrun time' setting (see Section 5.2:Programming). A countdown time is displayed on the Master controller `system status screen', when this reaches zero the circulation pump is switched off.

3.3 Outside Air Compensation Function Operation

With the compensation function utilised the Master controller also continuously monitors the outside air temperature by interrogating the external temperature sensor. The Master controller automatically adjusts the water flow temperature set point in relation to the outside air temperature, between the maximum and minimum flow temperature settings (user adjustable, see Section 5.2 Programming). The relationship between the outside air temperature and the water temperature set point is determined by the `flow temperature slope' and 'flow temperature offset' settings (see Section 5.2:Programming).

3.4 Optimiser Function Operation

3.4.1 The optimiser function provides two room temperature comfort level settings - `Active' and `Standby' (night setback temperature). Refer to Section 3:Program Mode Functions, of the Marshall Users Operating Instructions (HHL No. 500001083) for setting information.

Whilst in Standby mode, if the room temperature, as measured by the room temperature sensor, falls below the Standby temperature setting the heating system operates as described in Section 3.2:Basic Operation. When the required Standby temperature is achieved the boilers are shut down and the pump overrun function operates.

3.4.2 When the optimiser function is utilised the internal timeclock settings become the times at which the building is to reach the required Active temperature, rather than the times at which the heating is switched on.

At a set time before the Active period start time (determined by the `maximum preheat time' setting, see Section 5.2:Programming) the Master controller notes the current room temperature . Based on this and the required Active temperature setting, the controller determines when to start the heating system such that the Active temperature is just reached at the start of the Active period.

The heating start time is determined by the `rate of change' setting (see Section 5.2:Programming) which allows a time (in minutes) per °C of required temperature rise.

Example:

Maximum preheat time setting	= 3 hours
Active period start time	= 8.00 am
Rate of change setting	= 20 min/°C
Active temperature setting	= 21°C
Current room temperature (i.e. at 5.00 am)	= 15°C
Required temperature rise	= 21-15 = 6°C
Preheat time	= 6 x 20 = 120 mins = 2 hrs
Heating start time	= 6.00 am

If the calculated preheat time is equal to or greater

than the `maximum preheat time' setting, the heating is started immediately.

3.4.3 Once started the heating system operates as described in Section 3.2:Basic Operation, until the Active temperature is achieved, when the boilers are shutdown and the pump overrun function operates.

For the remainder of the Active period the Marshall system operates to maintain the room temperature at the Active temperature setting.

3.4.4 The optimiser self-learning function adjusts the `rate of change' setting each day, dependent on whether the Active temperature was achieved by the Active period start time or not. If the Active temperature was achieved the `rate of change' setting is reduced by 1 minute/°C, if not the setting is increased by 1 minute/°C. In this way the optimiser function tunes itself to each installation.

The self-learning function can be disabled, to maintain a constant `rate of change' setting.

3.4.5 If an external timeclock is utilised the optimiser preheat function is disabled and the heating starts at the timeclock settings. The Active and Standby room temperature control functions are retained.

3.5 Override Function Operation

Refer to section 2.0:Run Mode Functions of the Marshall User's Instructions for details of the operation of the three override functions -

Override comfort level setting (optimiser only)
Override timeclock
Remote override switch (optional)

3.6 Frost Protection Function Operation

If the outside air temperature falls below the 'two stage frost protection' setting (see Section 5.2:Programming) the circulation pump is started in order to prevent the freezing of remote sections of the heating system pipework. When the outside air temperature rises above this setting the pump overrun function will operate and the pump will stop. This function will only operate if an external temperature sensor is fitted.

If the water flow temperature falls below the `flow frost protection' setting (see Section 5.2:Programming) the heating system is operated to raise the water temperature above the `flow frost protection' temperature setting. When this is achieved the boilers are shutdown and the pump overrun function operates.

3.7 Safety Interlock Circuit Operation

If any of the devices connected to the safety interlock circuit break the circuit, the boilers are immediately shutdown and prevented from firing until the fault condition is removed. The safety interlock circuit automatically resets itself and allows the boilers to fire. When the safety circuit operates the legend `LOCKED' is displayed on the Master controller `system status screen', alternating with the flame symbols.

3.8 Hand/Auto Circuit Operation

Each boiler is fitted with a hand/auto switch (see Figure 3/Page 19). When in the auto position the boiler runs under the control of the Marshall system as previously described. In the hand position, the Marshall system is overridden and the boiler runs under the control of its own thermostat(s). If hand mode is used the boiler thermostats MUST be reset to a safe temperature setting.

Note! On some boilers the hand/auto switch is located within the boiler control panel, therefore before obtaining access to the switch the boiler MUST be electrically isolated.

The Master controller boiler also controls the circulation pump. When this boiler is set to hand mode the circulation pump runs continuously. It MUST be ensured that the circulation pump is running when any of the boilers are run in hand mode.

Note! When in hand mode any external safety devices connected to the Marshall Master control (flue fan interlock, pressurisation unit safety circuit, etc.) are overridden, therefore the boilers must NOT be run unsupervised in this mode.

4.0 INSTALLATION

NOTE! IF IN ANY DOUBT CONSULT A QUALIFIED ELECTRICIAN.

4.1 Supply

4.1.1 The Master and Slave controls are supplied as a kit. Full fitting instructions are included.

4.1.2 Ensure that the Master controller is fitted to the lead boiler, preferably the top or left hand most one, dependent on boiler configuration and installation. This is particularly important when a combination of condensing (Warmwell) and standard atmospheric (Purewell) boilers are installed. In this situation the Warmwell must be the lead boiler, therefore the Master controller is fitted to it.

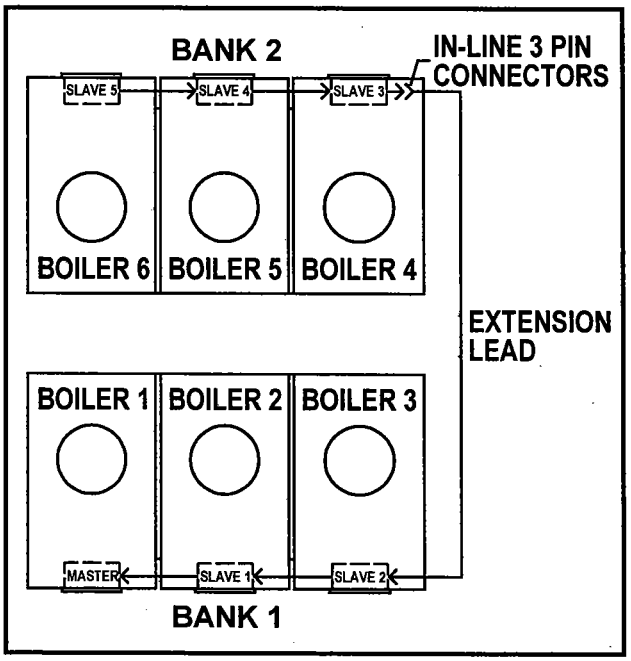
4.2 Interconnections

4.2.1 When all of the Marshall controls are installed, drop down the fascia of the last boiler. Unwind the black lead at the rear of the Marshall Slave controller and pass the black plug through the oval slot in the rear of the boiler control panel. Route the lead within the boiler casing into the next boiler control panel, via its oval slot. Insert the plug into the socket in the rear of the Marshall controller in this control panel, ensure the correct plug orientation.

Repeat this procedure for the remaining Slave controllers (if any), connecting the last Slave to the Master controller. Note! Remove and retain the spare plug supplied with the Master controller.

4.2.2 If the Marshall system is installed into a boiler system consisting of multiple banks of boilers (see Figure 4/Below), the communication lead from the Slave controller in the first boiler of the second bank (boiler 4 in Figure 4) is required to connect to the Slave controller in the end boiler of the first bank (boiler 3 in Figure 4). To enable this connection the communication lead from boiler 4 must be extended and routed between the 2 banks within cable conduit. HHL can supply a communication lead extension kit (HHL Part No. 563605129) for this purpose.

Figure 4 - Twin Boiler Bank Connection Schematic



Remove and retain the 3 pin plug from the existing Slave lead (Slave 3 in the example in Figure 4), and cut the cable back to within 200 mm of the Slave housing.

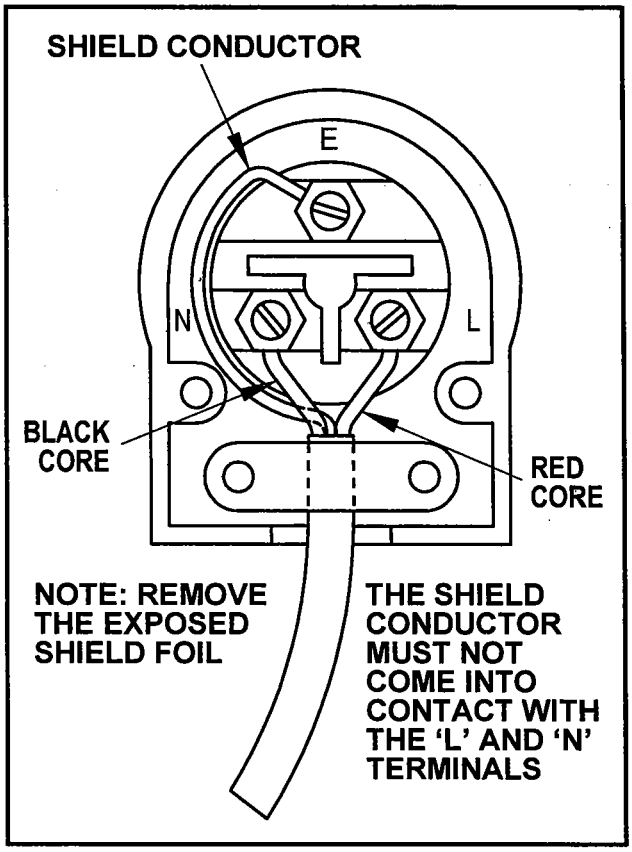
Fit the in-line plug connector supplied with the extension kit to the cable as detailed on the instruction sheet supplied.

Route the extension cable as required between the two boilers (boilers 3 and 4 in the example in Figure 4).

Fit the in-line socket connector to the end of the cable in the boiler with the modified lead (boiler 4 in Figure 4), and connect the plug and socket connectors, ensuring that the locking latch engages.

Fit the 3 pin plug removed from the Slave lead to the other end of the cable (in boiler 3 in Figure 4). Refer to Figure 5/Above for plug wiring details. Insert the plug into the socket in the rear of the Slave controller.

Figure 5 - Plug Wiring Details



4.3 Safety Interlock Circuit

This circuit operates at safety extra low voltage and MUST only be connected to volt free switching devices.

Connect all of the required safety devices in series (see Figure 6/Page 20) between terminals 33 and 34 within the Master controller boiler control panel. These are located adjacent to the boiler mains supply terminals.

Note! If it is not intended to utilise this circuit, a wire link MUST be fitted across terminals 33 and 34. Failure to comply will prevent operation of the Marshall system.

A minimum cable size of 0.75 mm^2 is recommended for this circuit. Refer to the IEE Regulations for the correct cable specification.

4.4 External Timeclock (Optional)

This circuit operates at safety extra low voltage and MUST only be connected to a volt free switching timeclock.

Connect the timeclock to terminals 31 and 32 within the Master controller boiler control panel (see Figure 6/Page 20). A minimum cable size of 0.75 mm^2 is recommended for this circuit. Refer to the IEE Regulations for the correct cable specification.

4.5 Remote Override Switch (Optional)

The remote override feature is not available when an external timeclock is connected to the Marshall system.

This switch is connected across terminals 31 and 32 on the side panel of the Master controller boiler control panel (see Figure 6/ page 20). A minimum cable size of 0.75mm² is recommended for this circuit. Refer to the IEE Regulations for the correct cable specification.

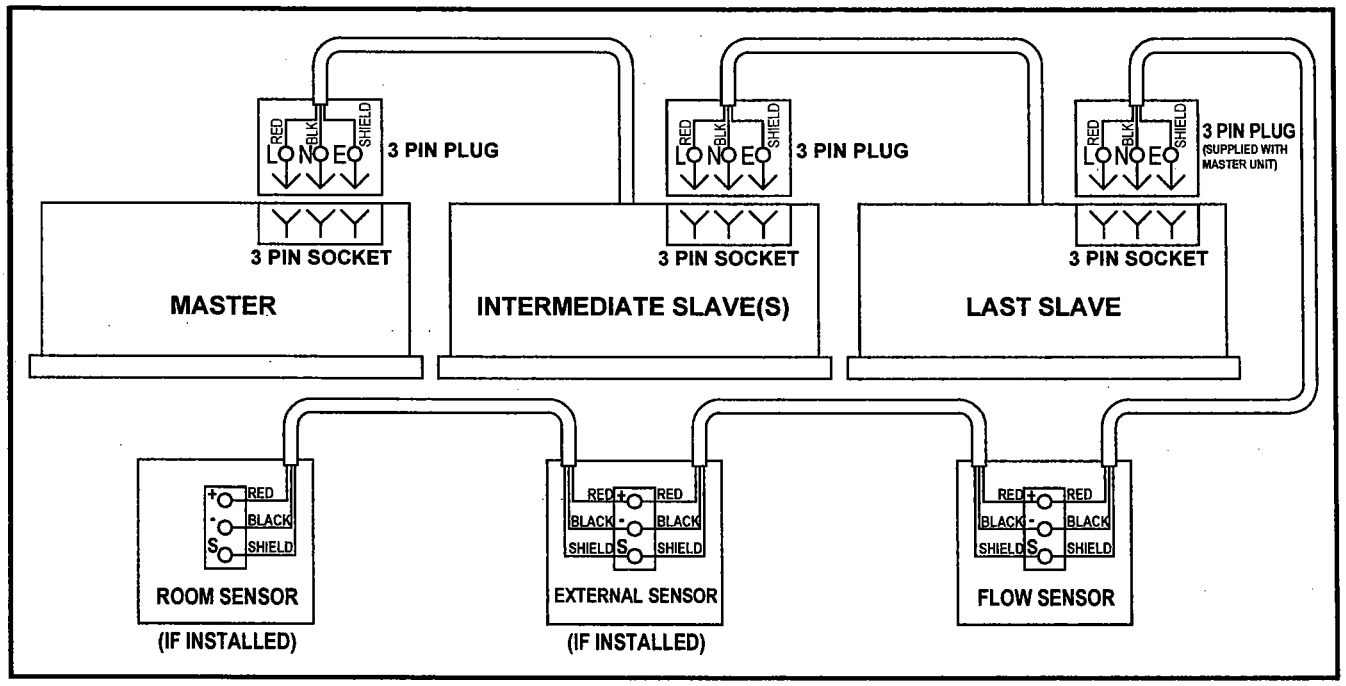
Note! This circuit operates at safety extra low voltage, mains voltages MUST NOT be fed onto these terminals.

4.6 Circulation Pump

The circulation pump must be connected to the electrical supply via a fused isolator with a minimum contact separation of 3 mm in all poles.

A ~230V 50Hz circulation pump control signal, fused at 2A, is provided at terminal 21 in the Master controller boiler control panel (see Figure 6/Page 20). This signal is to be utilised to control a suitably rated starting relay or contactor and overload, dependent on the type and rating of the circulation pump.

Figure 7 - Sensor Wiring Details



4.7 Temperature Sensors

4.7.1 General

The temperature sensors are wired using 2 core, screened cable (Beldon 8451 specification), HHL Part No. 533901259).

The sensors connect to the Marshall system via the 3 pin socket in the rear of the last Slave controller. The spare 3 pin plug supplied with the Master controller is used for this purpose. Refer to Figure 5/Page 5 for plug wiring details.

Note! The sensor connection cable shield conductor must not come into contact with any of the electronic components on the sensor PCB.

If the optional room and external sensors are utilised, they are wired in series. Refer to Figure 7/Above for sensor wiring details.

Note! The sensors can be wired in any order.

The flow and external sensor housings incorporate a cable inlet threaded to accept a 20 mm cable gland or conduit connector. When fitted with such a connector the external sensor is IP65 rated.

It is strongly recommended that the sensor cables are routed separately from mains power cables.

4.7.2 Water Flow Temperature Sensor

The standard flow sensor is an insertion type consisting of a brass probe mounted to a plastic housing. The sensor is supplied with a brass pocket with a ½" BSP parallel thread (see Figure 8/Page 21).

The sensor must be installed at the outlet of the flow header from the boiler system. There must be no connections taken from the flow header between the boilers and the sensor position.

Fit the sensor pocket to a ½" BSP socket welded to the flow header, allowing an insertion depth to the centre line of the pipe (see Figure 8/Page 21). Alternatively, the sensor can be installed at a pipe bend as shown in Figure 8/Page 21.

Insert the sensor probe into the pocket and fix in place with the locking screw on the side of the pocket.

An optional `strap on' type sensor is available as an alternative to the standard sensor. If this sensor is utilised it must be firmly fixed to the flow header pipe with the strap and hooks supplied (See Figure 9/Page 22), to ensure a good contact between the surface of the pipe and the sensor.

When fitted, wire the sensor as shown in Figure 7/Page 6 and replace the sensor housing cover.

4.7.3 External Temperature Sensor

The optional external sensor should be mounted on an outside, north facing wall, away from any air vents, pipes, illuminated signs or any other device that could affect the ambient temperature of the outside air.

The sensor can be fixed to the wall utilising the mounting holes in its plastic housing, or held in place by the cable conduit (see Figure 10/Page 23).

Note! Ensure that a suitable cable gland or conduit connector is utilised to provide the required sealing of the sensor housing.

When fitted, wire the sensor as shown in Figure 7/Page 6 and replace the sensor housing cover.

4.7.4 Room Temperature Sensor

The optional room sensor should be mounted on an internal wall, at a point where it will not be subject to draughts from outside, and also where it will not be exposed to direct sunlight, in order to ensure that the sensor reading is representative of the actual ambient room temperature.

The sensor should be mounted at a height of approximately 1.5 m above floor level. It can be mounted directly to the wall or be mounted to a standard flush mounting switchbox. Refer to Figure 11/Page 24).

Note! When mounting onto a switchbox countersunk screws must be used.

When fitted, wire the sensor as shown in Figure 7/Page 6, and replace the sensor housing cover, ensuring that the red LED indicator on the sensor PCB locates in the hole in the cover.

5.0 COMMISSIONING

5.1 Pre-Commissioning Checks

5.1.1 Carry out the electrical and gas installation and water circulation system checks as detailed in the commissioning section of the boilers' Installation, Commissioning and Maintenance Manuals.

5.1.2 Check the circulation pump control circuit connections and ensure the pump electrical supply is connected.

Note! Wiring MUST be checked by a suitably competent person.

5.1.3 Check the external timeclock/remote override switch and safety interlock circuit connections (if utilised).

5.1.4 With the boiler control panel fascias dropped down (refer to boiler manuals for method), check the Marshall communication lead connections.

Set the 16 position, rotary switch in the rear of the first Slave controller (see Figure 12/Page 25), next to the Master controller boiler, so that the arrow on the switch points to the `1' position.

Set the rotary switch of the second Slave controller (if applicable) to the `2' position and repeat for the remaining Slave controllers (if any), incrementing the switch setting by 1 position each time.

Close the boiler fascias.

5.1.5 Check the sensor wiring connections for polarity (see Figure 7/Page 6) and check that the shield conductor of the cable is not in contact with any of the sensor PCB components.

Check that the 16 position rotary switch on the flow sensor PCB is set to the `2' position.

Check that the rotary switch on the external sensor PCB (if fitted) is set to the `3' position.

Check that the rotary switch on the room sensor PCB (if fitted) is set to the `1' position.

Replace the sensor housing covers after these checks.

5.1.6 Set the hand/auto switch of each boiler to `hand'. Ensure that the boilers are set to their off position, then switch on the electrical supplies to the boilers.

When the electrical supply to the Master controller boiler is switched on the circulation pump will run. Ensure that this is the case.

The boilers can now be commissioned as detailed in their Installation, Commissioning and Maintenance Manuals. **Note!** The boilers must NOT be run unsupervised in hand mode.

5.1.7 When all of the boilers have been commissioned, remove the control fuse from each boiler and isolate their electrical supplies, set the hand/auto switch on each boiler to `auto' and set the boiler control and high/low (if applicable) thermostats to 90°C, so that they do not affect control of the boilers. Replace the boiler front casing doors.

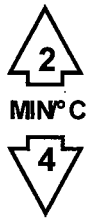
5.1.8 Reconnect the electrical supplies to the boilers and check that the Marshall Master controller display is operational and that the `Communicating' indicators on the Slave controllers flash on in a continuous sequence. If any of the controllers are not operating check their electrical connections and fuses (refer to the electrical schematic in the boiler installation manuals) and the communication lead connections.

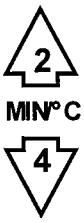
5.1.9 The Marshall system can now be programmed.

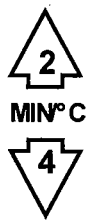
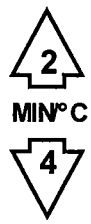
5.2 Programming

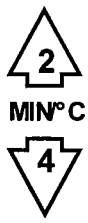
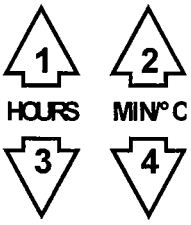
Operation	Key	Display
5.2.1 Enter Programme Mode		
1) To enter programme mode press the PROG key and the code entry screen will be displayed.	PROG	Enter Code to Continue :0000
2) Enter the first two digits of the code using the left hand up/down arrow keys and the second two digits using the right hand up/down arrow keys. **Note!** The engineers code is factory pre-set and is written on a label attached to the Master controller fascia. Remove and dispose of this label after commissioning the system.	1 HOURS 3 / 2 MIN°C 4	Enter Code to Continue :1111
3) To enter the code press the PROG key. If the code entered is incorrect an error message is displayed and the unit will return to Run mode. When the correct code is entered the unit will display the Engineers Setup Menu screen.	PROG	THE CODE ENTERED WAS INCORRECT 1) DATA 2) SETUP 3) CODE 4) C-LOG
5.2.2 Setup Option		
1) To input the Setup option settings press the `2' key. The `internal/external clock' setting screen is displayed.	2	CLOCK? INT.(00) EXTERNAL(01):01
2) Use the right hand up/down arrow keys to select `00' for the Marshall internal timeclock, or `01' if an external timeclock is to be used.	2 MIN°C 4	CLOCK? INT.(00) EXTERNAL(01):00
3) Press PROG to enter the new setting. The `number of boilers' setting screen is displayed.	PROG	ENTER NUMBER OF BOILERS(1-9):06
4) Use the right hand up/down arrow keys to enter the correct number of boilers in the system.	2 MIN°C 4	ENTER NUMBER OF BOILERS(1-9):04
5) Press PROG to enter the new setting. The `number of hi/lo boilers' setting screen is displayed.	PROG	NUMBER OF HI-LO BOILERS(0-4):04
6) Use the right hand up/down arrow keys to enter the number of high/low control boilers in the system. **Note!** If the boilers are all on/off set this to zero. If the boilers are all high/low set this to its maximum setting. If a combination of on/off and high/low boilers are installed enter the appropriate high/low figure, but note that the high/low boilers must be first in the firing sequence.	2 MIN°C 4	NUMBER OF HI-LO BOILERS(1-4):01

Operation	Key	Display
7) Press PROG to enter the new setting. The `fixed or variable flow' setting screen is displayed.	PROG	FIXED FLOW (04) VARIABLE(05):04
8) Use the right hand up/down arrow keys to enter `04' for a fixed water flow temperature control setting or `05' for a variable (compensated) water flow temperature control setting (Note! Requires external sensor).	2 MIN°C 4	FIXED FLOW (04) VARIABLE(05):05
9) Press the PROG key to enter the new setting and return to the Engineers Setup Menu screen.	PROG	1) DATA 2) SETUP 3) CODE 4) C-LOG
5.2.3 Data Option		
1) To input the Data option settings press the `I' key. the `room sensor calibration' setting screen is displayed.	1	ROOM SENSOR <10> NOW READING :17
2) To calibrate the room sensor (if installed) a calibrated digital thermometer with an air temperature probe is required. Take a temperature reading at the installed room sensor position, e.g. 21°C. Note the Marshall sensor reading, e.g. 17°C. In this example the sensor is reading 4°C too low. The sensor calibration setting works in ½°C steps, therefore in this example the setting must be increased by 8 to correct the sensor reading. Use the right hand up/down arrow keys to adjust the calibration setting.	2 MIN°C 4	ROOM SENSOR <18> NOW READING :17
3) Press the PROG key to enter the new setting and display the `flow sensor calibration' setting screen.	PROG	FLOW SENSOR <10> NOW READING :14
4) The flow sensor is calibrated using the same procedure used to calibrate the room sensor. Use a calibrated digital thermometer with a surface temperature probe to obtain a water flow temperature reading.	2 MIN°C 4	FLOW SENSOR <15> NOW READING :14
5) Press the PROG key to enter the new setting and display the `external sensor calibration' setting screen.	PROG	EXT. SENSOR <10> NOW READING :17
6) If installed the external sensor is calibrated using the same procedure used to calibrate the room sensor.	2 MIN°C 4	EXT. SENSOR <08> NOW READING :17
7) Press the PROG key to enter the new setting and display the 'maximum override' setting screen.	PROG	ENTER MAXIMUM OVERRIDE :00

Operation	Key	Display
8) Use the right hand up/down arrow keys to set the maximum override time, in hours. This is the maximum duration that the user can override the internal timeclock. (See also section 2.4:Override Timeclock, in the Marshall Users Operating Instructions). Setting this to '00' will disable this function.		ENTER MAXIMUM OVERRIDE :04
9) Press the PROG key to enter the new setting and display the `upper temperature offset' setting screen.		ENTER UPPER TEMP OFFSET LIMIT:01
10) Use the right hand up/down arrow keys to set the upper temperature offset limit, in °C. This is the maximum amount by which the user can increase the room comfort level setting. (See also section 2.3:Override Comfort Level Setting in the Marshall Users Operating Instructions). **Note!** If a room sensor is not installed this setting can be ignored.		ENTER UPPER TEMP OFFSET LIMIT:02
11) Press the PROG key to enter the new setting and display the `lower temperature offset' setting screen.		ENTER LOWER TEMP OFFSET LIMIT:02
12) Use the right hand up/down arrow keys to set the lower temperature offset limit, in °C. This is the maximum amount by which the user can decrease the room comfort level setting. **Note!** If a room sensor is not installed this setting can be ignored.		ENTER LOWER TEMP OFFSET LIMIT:04
13) Press the PROG key to enter the new setting and display the `optimiser' setting screen.		OPT(00) TIME(01) OPT FIX (02):01
14) Use the right hand up/down arrow keys to select `00' to enable the optimiser with self learning function, `01' to disable the optimiser, or `02' to enable the optimiser without the self learning function.		OPT(00) TIME(01) OPT FIX (02):00
15) Press the PROG key to enter the new setting and display the `maximum preheat' setting screen.		ENTER MAXIMUM PREHEAT hrs :06
16) Use the right hand up/down arrow keys to enter the optimiser maximum preheat time, in hours. This setting determines the earliest time at which the heating can start. The maximum setting is 9 hours. **Note!** If the `optimiser' setting (see 14 above) is set to `01' (optimiser disabled) this setting screen is not displayed. Also if an external timeclock is used this screen can be ignored.		ENTER MAXIMUM PREHEAT hrs :03
17) Press the PROG key to enter the new setting and display the `rate of change' setting screen.		ENTER RATE OF CHANGE m/°C :10

Operation	Key	Display
18) Use the right hand up/down arrow keys to enter the optimiser rate of change ratio in minutes/°C. this setting is used to determine the heating start time (see Section 3.4/Optimiser Function Operation). The higher the setting the earlier the heating will start. If the self learning option is utilised a setting of `20' is recommended as the Marshall will `learn' the optimum value. The maximum setting is 46 minutes/°C. **Note!** If the `optimiser' setting (see 14 above) is set to `01' (optimiser disabled) this setting screen is not displayed. Also if an external time clock is used this screen can be ignored.		ENTER RATE OF CHANGE m/°C :20
19) Press the PROG key to enter the new setting. If the compensation function is enabled the `flow temperature slope' setting screen is displayed (see step 20), otherwise the `maximum flow temperature' setting screen is displayed (see Step 26).		ENTER FLOW TEMP. SLOPE <1-4> :01 ENTER MAXIMUM FLOW TEMP. :80
20) Use the right hand up/down arrow keys to set the flow temperature compensation slope. Figure 13/Page 26 shows the relationship between outside air temperature and water flow temperature set point for the different settings. A setting of '01' selects a slope of 1 to 1, a setting of '02' selects a slope of 2 to 1 and so on. **Note!** If the compensation function is not enabled this screen is not displayed.		ENTER FLOW TEMP. SLOPE <1-4> :02
21) Press the PROG key to enter the new setting and display the `flow temperature offset' setting screen.		ENTER FLOW TEMP. OFFSET<1-40>:00
22) Use the right hand up/down arrow keys to set the flow temperature compensation slope offset. Figure 13/Page 26 shows the effect of the offset setting on the compensation slope. Each increase of '1' of this setting will reduce the compensated flow temperature by 1°C. **Note!** If the compensation function is not enabled this screen is not displayed.		ENTER FLOW TEMP. OFFSET<1-40>:20
23) Press the PROG key to enter the new setting and display the `minimum flow temperature' setting screen.		ENTER MINIMUM FLOW TEMP. :00
24) Use the right hand up/down arrow keys to enter the minimum water flow temperature set point, in °C. When Purewell boilers are installed the return water temperature should not be below 50°C, therefore set the minimum flow water temperature accordingly. However , when Warmwell boilers are installed this setting can be set lower to allow them to condense. **Note!** If the compensation function is not enabled this screen is not displayed.		ENTER MINIMUM FLOW TEMP. :50
25) Press the PROG key to enter the new setting and display the `maximum flow temperature' setting screen.		ENTER MAXIMUM FLOW TEMP. :80

Operation	Key	Display
26) Use the right hand up/down arrow keys to enter the maximum water flow temperature, in °C. If the compensation function is utilised this is the maximum compensated flow temperature, if the compensation function is not utilised this is the flow temperature set point. **Note!** If Purewell boilers are installed this must not be set lower than 65°C.		ENTER MAXIMUM FLOW TEMP. :82
27) Press the PROG key to enter the new setting and display the `boiler on delay' setting screen.		BOILER ON DELAY <1=15 secs> :08
28) Use the right hand up/down arrow keys to enter the boiler on delay time. (Each 1 of the setting represents 15 seconds, thus a setting if `04' will give a delay of 60 seconds). this is the time delay between each step sequencing on. An initial setting of `16' (4 minutes) is recommended.		BOILER ON DELAY <1=15 secs> :16
29) Press the PROG key to enter the new setting and display the `boiler off delay' setting screen.		BOILER OFF DELAY <1=15 secs> :12
30) Use the right hand up/down arrow keys to enter the boiler off delay time. (Each 1 of the setting represents 15 seconds, thus a setting of `04' will give a delay of 60 seconds). This is the time delay between each step sequencing off when the required flow temperature is achieved. An initial setting of `04' (1 minute) is recommended.		BOILER OFF DELAY <1=15 secs> :04
31) Press the PROG key to enter the new setting and display the `firing sequence' setting screen.		FIRING SEQUENCE (SEE MANUAL):00
32) Use the right hand up/down arrow keys to select '00' for the low, high, low, high firing sequence, or '01' for the low, low, high, high firing sequence. Refer to Table 2/Page 3 for sequence operation.		FIRING SEQUENCE (SEE MANUAL):01
33) Press the PROG key to enter the new setting and display the `weekly shift' setting screen.		WEEKLY SHIFT(01) OR FIXED(00):00
34) Use the right hand up/down arrow keys to select `01' for the weekly lead boiler shift, or `00' for the fixed boiler sequence. **Note!** If a combination of Warmwell and Purewell boilers are installed, it is desirable that the Warmwell is always the lead boiler, to benefit from its high efficiency, therefore select `00' for the fixed sequence.		WEEKLY SHIFT(01) OR FIXED(00):01
35) Press the PROG key to enter the new setting and display the `frost protection' setting screen.		ENTER FLOW FROST PROTECTION :10

Operation	Key	Display
36) Use the right hand up/down arrow keys to enter the frost protection temperature, in °C. This is the minimum water temperature to prevent freezing.		ENTER FLOW FROST PROTECTION :08
37) Press the PROG key to enter the new setting and display the `pump overrun' setting screen.		PUMP OVERRUN TIME <MINS> :10
38) Use the right hand up/down arrow keys to enter the circulation pump run on time, in minutes. 20 minutes for this setting is recommended.		PUMP OVERRUN TIME <MINS> :20
39) Press the PROG key to enter the new setting and display the `two stage frost protection' setting screen.		TWO STAGE FROST PROTECTION :00
40) Use the right hand up/down arrow keys to enter the outside air temperature, in °C, at which the circulation pump is started, in order to prevent remote sections of the system pipework from freezing. **Note!** This function will only operate if an external temperature sensor is installed.		TWO STAGE FROST PROTECTION :02
41) Press the PROG key to enter the new setting and display the `summer shutdown' setting screen.		ENTER EXTERNAL OFF TEMP :00
42) Use the right hand up/down arrow keys to enter the outside air temperature, in °C, at which the system is to be overridden to Standby during the Summer. Setting this to '00' disables the function. **Note!** This function will only operate if an external temperature sensor is installed.		ENTER EXTERNAL OFF TEMP :20
43) Press the PROG key to enter the new setting and return to the Engineers Setup Menu screen.		1) DATA 2) SETUP 3) CODE 4) C-LOG
5.2.4 Code Option		
1) To change the User setup code press the `3' key from the Engineers Setup Menu screen. The `user code' setting screen is displayed.		PLEASE ENTER NEW USER CODE :0000
2) Enter the new user code, using the left hand up/down arrow keys for the first two digits and the right hand up/down arrow keys for the second two digits.		PLEASE ENTER NEW USER CODE :1234
3) Press the PROG key to enter the new code and return to the Engineers Setup Menu screen.		1) DATA 2) SETUP 3) CODE 4) C-LOG

Operation	Key	Display
5.2.5 C-Log Option		
Press the '4' key to display the Data Logging Menu screen.		1) BLRS 2) PREV 3) OPT 4) COMP
5.2.5.1 View Current Boiler Hours Run Readings		
1) Press the '1' key to display hours run readings at low fire for the first boiler. If the boiler is an on/off type then this screen is not displayed and the high fire hours run screen is shown as in 3 below.		BLR1 LOW :0015h SINCE 30-04-98
2) To return to the Data Logging Menu screen at any time whilst viewing the hours run readings, press the RUN key.		1) BLRS 2) PREV 3) OPT 4) COMP
3) Press the PROG key to view the next hours run screen.		BLR1 HIGH :0016h SINCE 30-04-98
4) Press the PROG key repeatedly to view the remaining hours run screens, when the last screen has been viewed, the Data Logging Menu screen is displayed.		1) BLRS 2) PREV 3) OPT 4) COMP
5.2.5.2 Reset Current Boiler Hours Run Readings		
1) Press the '1' key to display the first hours run reading screen. Note: the readings can be reset with any of the current hours run reading screens displayed.		BLR1 LOW :0015h SINCE 30-04-98
2) Press the '4' key to initiate the reset. A confirmation screen is displayed.		RESET PRESS PROG CANCEL PRESS RUN
3) To confirm the reset press the PROG key, the current readings are copied to the previous readings and then reset to zero. The Data Logging Menu screen is displayed.		1) BLRS 2) PREV 3) OPT 4) COMP
4) To cancel the reset press the RUN key, the Data Logging Menu screen is displayed.		1) BLRS 2) PREV 3) OPT 4) COMP
5.2.5.3 View Boiler Hours Run Readings for Previous Period		
1) Press the '2' key to display hours run readings at low fire for the first boiler. If the boiler is an on/off type then this screen is not displayed and the high fire hours run screen is shown as in 3 below.		BLR1 LOW :0015h DURATION:020days
2) To return to the Data Logging Menu screen at any time whilst viewing the hours run readings, press the RUN key.		1) BLRS 2) PREV 3) OPT 4) COMP
3) Press the PROG key to view the next hours run screen.		BLR1 HIGH :0016h DURATION:030days
4) Press the PROG key repeatedly to view the remaining hours run screens, when the last screen has been viewed, the Data Logging Menu screen is displayed.		1) BLRS 2) PREV 3) OPT 4) COMP

Operation	Key	Display
5.2.5.4 View Optimiser Function Performance Readings		
1) Press the '3' key to display the minimum room temperature, in °C, recorded overnight, and the maximum room temperature recorded during the day.		ROOM TEMPERATURE NMIN:14 DMAX:23
2) Press the PROG key to display the 'OPT ON' time (the time at which the heating was switched on in the morning), and the 'SET PT' time (the time at which the required room temperature was reached).		OPT ON AT- 06:30 SET PT AT- 08:15
3) Press the PROG key to return to the Data Logging Menu screen.		1) BLRS 2) PREV 3) OPT 4) COMP
5.2.5.5 View Compensation Function Performance Readings		
1) Press the '4' key to display the minimum and maximum outside air temperatures, in °C, recorded during the day.		EXT. TEMPERATURE MIN:12 MAX:22
2) Press the PROG key to display the highest and lowest water flow temperature set points used by the control during the day.		FLOW TEMP SET PT MIN:59 MAX:82
3) Press the PROG key to return to the Data Logging Menu screen.		1) BLRS 2) PREV 3) OPT 4) COMP
5.2.5.6 Exit Data Logging Option		
Press the RUN key from the Data Logging Menu screen to return to the Engineers Setup Menu screen.		1) DATA 2) SETUP 3) CODE 4) C-LOG
5.2.6 End Programming		
Press the RUN key from the Engineers Setup Menu screen to return to Run mode, the Marshall unit will implement any setting changes.		ACTIVE (22):21 WATER (70):17

5.3 Marshall Operation Checks

5.3.1 Re-check the accuracy of the sensor readings, with the calibrated digital thermometer. If necessary re-adjust the sensor calibration settings as described in section 5.2.3 steps 1 to 6.

5.3.2 Set the boiler to its on condition. Dependent on the water flow temperature the boilers will fire and sequence off when the required flow temperature is achieved.

5.3.3 Observe the system as the boilers sequence on and off. Check that the firing sequence is correct.

If the heating system has a fast response time, it may be desirable to increase the `boiler on delay' setting as described in section 5.2.3 step 28. However, if a slow response is observed the setting can be decreased.

5.3.4 When the boilers are firing, check the operation of the safety interlock circuit (if utilised). When a fault condition is simulated, the boilers will be shutdown and the legend `LOCKED' will be displayed on the `system status screen' (refer to Section 1.0: Run Mode Screens, of the Marshall Users Instructions), alternating with the flame symbols. When the fault condition is removed the system will reset and the boilers will fire.

5.3.5 If an external time clock is utilised, check that the Marshall system responds correctly when it switches on and off.

5.3.6 When these checks have been carried out, enter the settings into the Marshall Control Settings Table on page 27.

5.3.7 The Marshall system should now be demonstrated to the owner or their representative. The Marshall Users Operating Instructions should be presented and the setting procedure detailed therein should be carried out.

This Installers Guide and the Users Operating Instructions should then be handed over and be kept in a safe place for easy reference.

6.0 FAULT FINDING

General fault finding is shown in Table 4/Pages 28 & 29. If the Marshall system still cannot be operated satisfactorily after following the chart, consult your local office of Hamworthy Heating for assistance.

Note! Before carrying out any work ensure that the boiler is electrically isolated.

IF IN ANY DOUBT CONSULT A QUALIFIED ELECTRICIAN.

7.0 SERVICING

7.1 The Marshall system requires no regular servicing. However, an annual check of the systems operation can be useful to highlight any possible problems.

7.2 To allow servicing of the boilers, use should be made of the hand/auto circuit. Set the hand/auto switches of the boilers to be serviced to `hand' to allow manual control.

When servicing is finished the hand/auto switches must be returned to `auto'.

Note:-

1) The Master controller boiler must be set to `hand' to ensure that the circulation pump runs continuously whilst servicing is carried out.

2) The boilers must NOT be run unsupervised in hand mode.

3) The boiler thermostats must be reset to prevent boiler overheating during this operation.

8.0 RECOMMENDED SPARES

SPARES ITEM	PART NO
Fuse T2A	533922002

Figure 1 - Marshall Connection Schematic

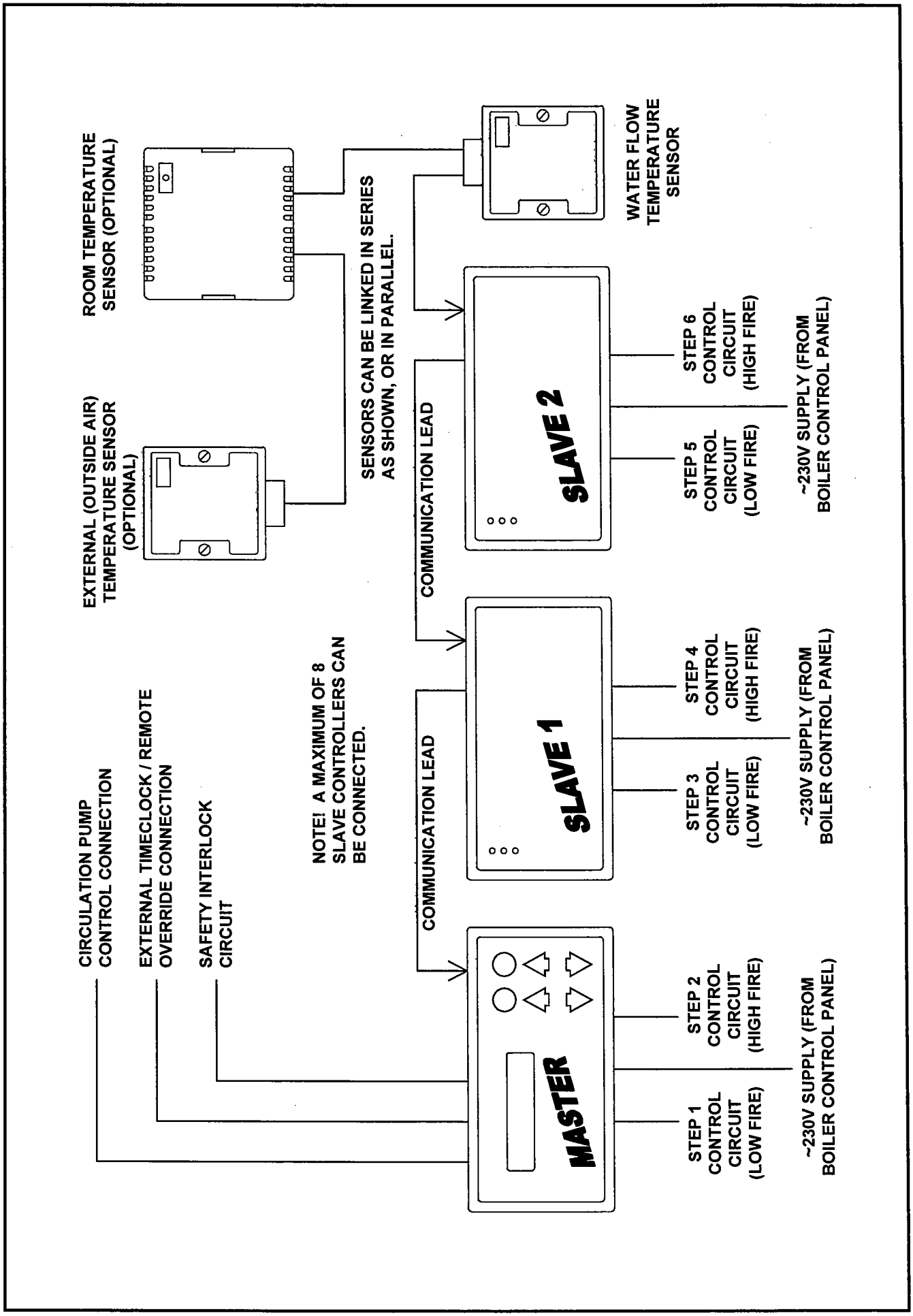


Figure 2 - Overall Dimensions

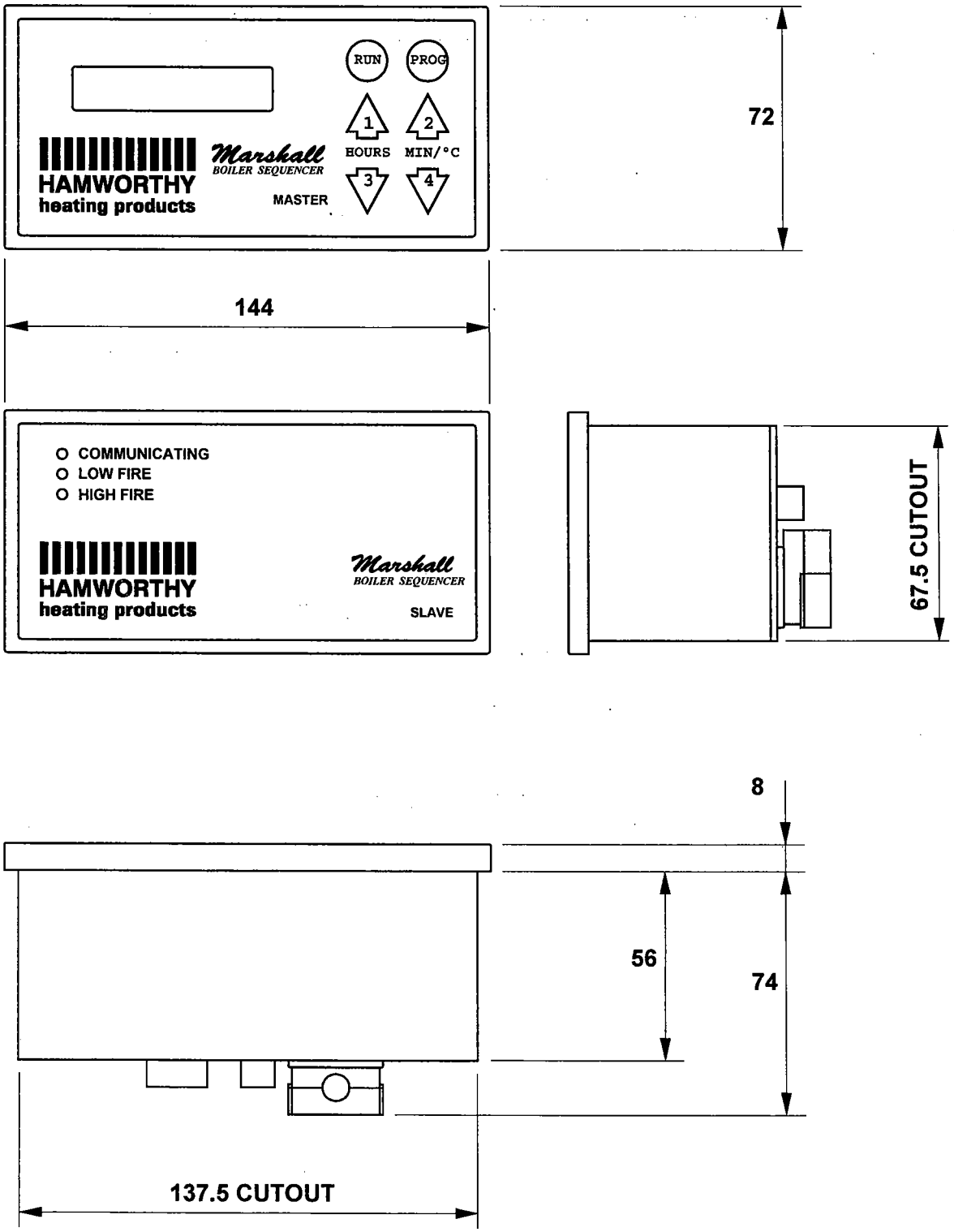
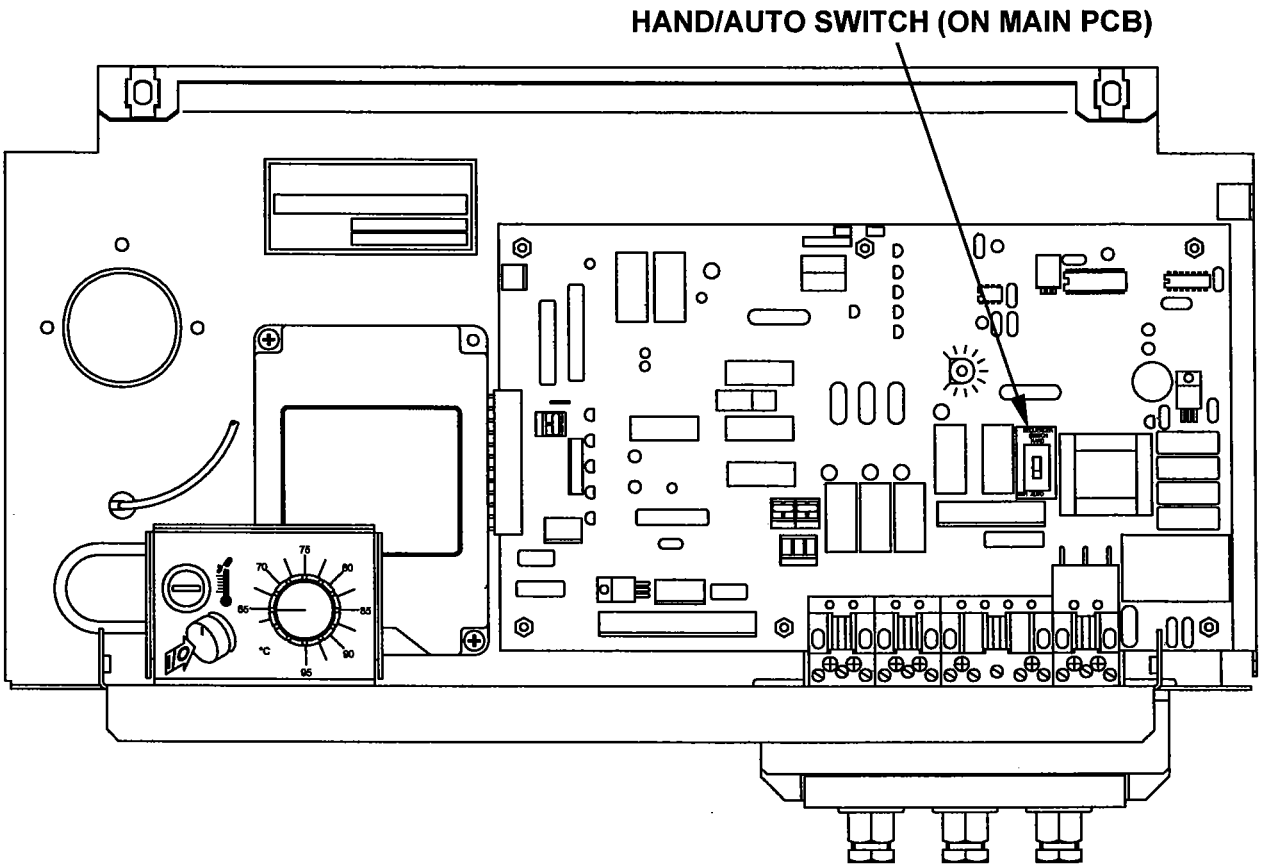
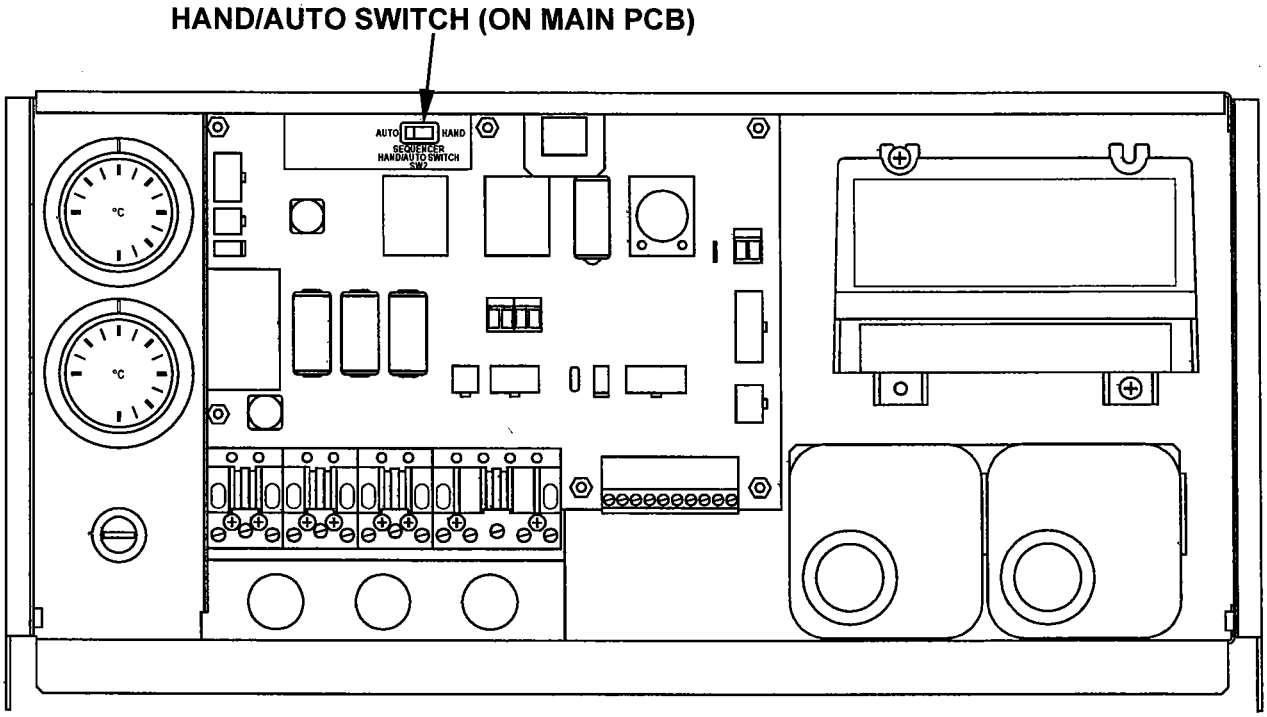


Figure 3 - Location of Hand/Auto Switch

PUREWELL AND WARMWELL AUTOMATIC BOILERS



WESSEX M SERIES BOILERS



CONTROL PANELS SHOWN WITH FASCIA PANEL REMOVED

Figure 6 - Site Wiring Connections

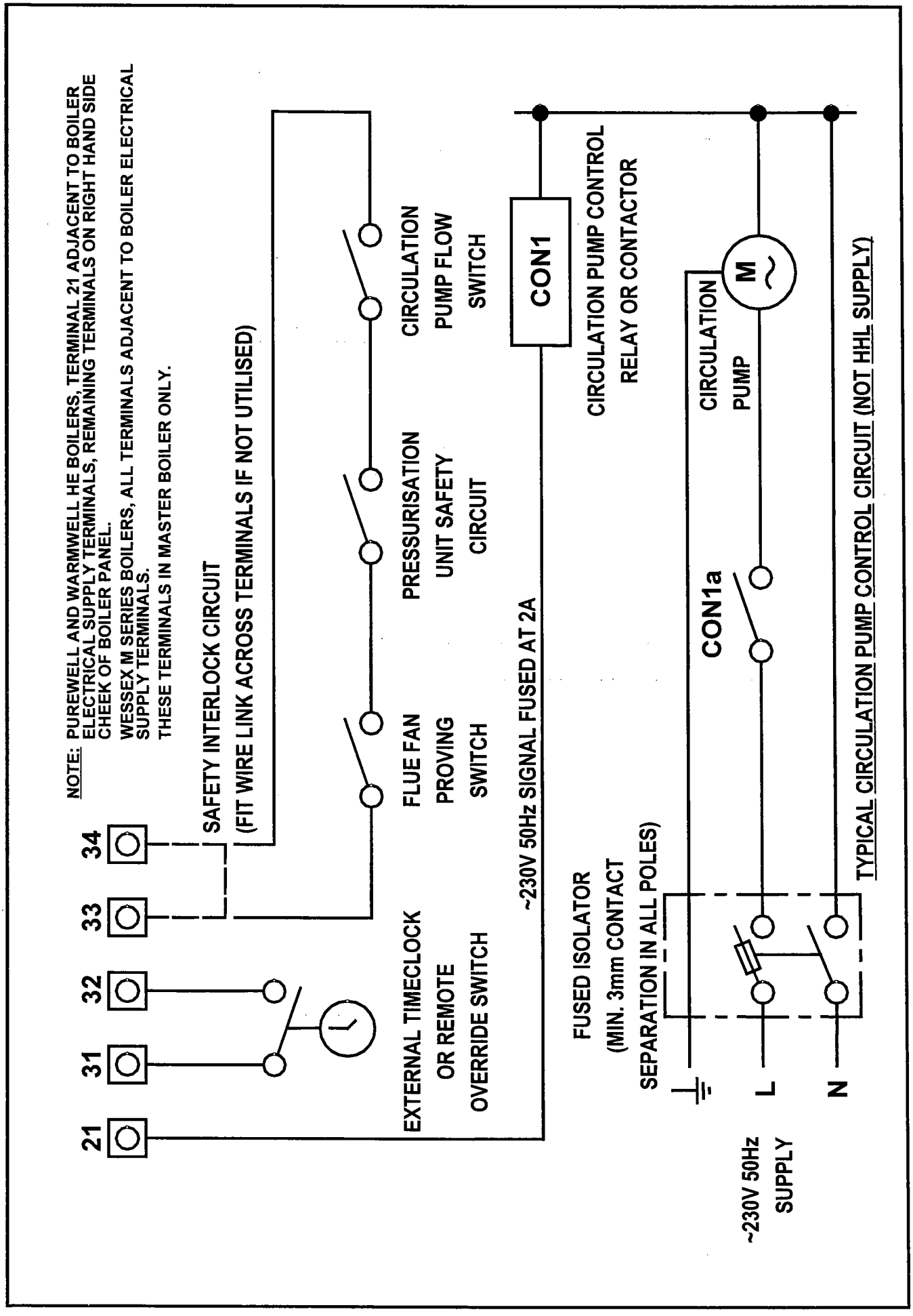
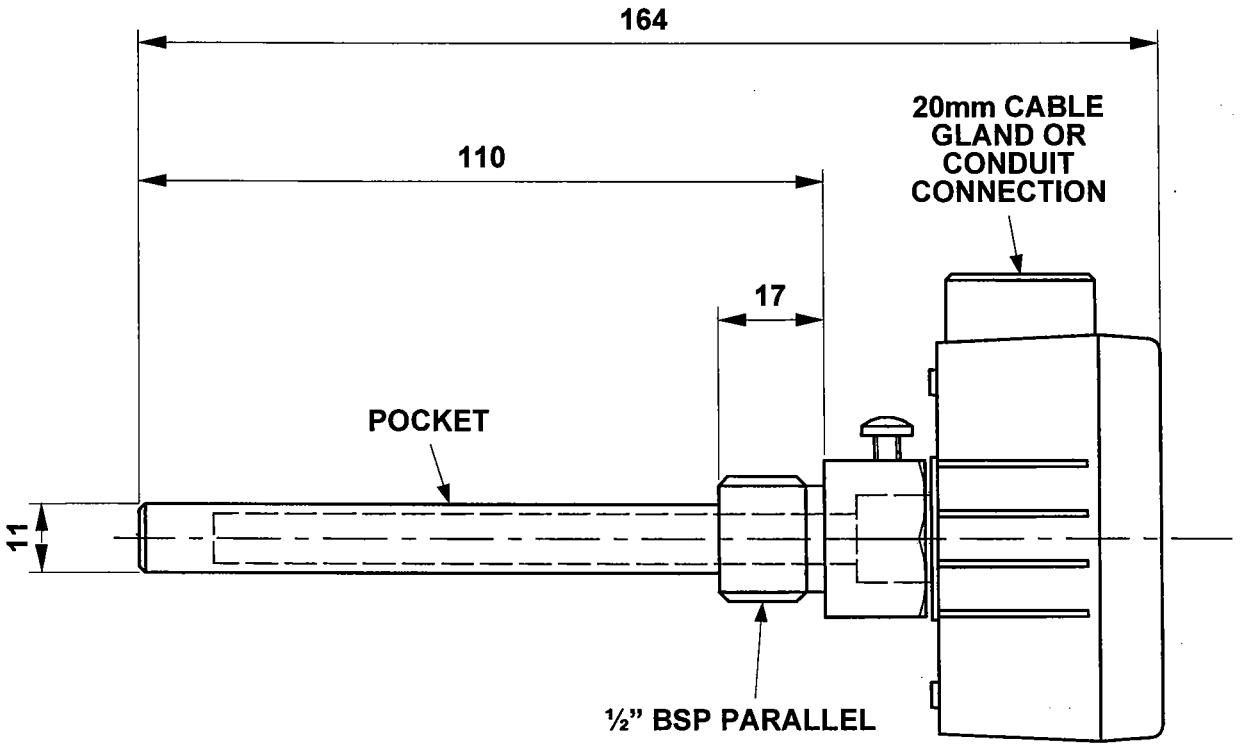
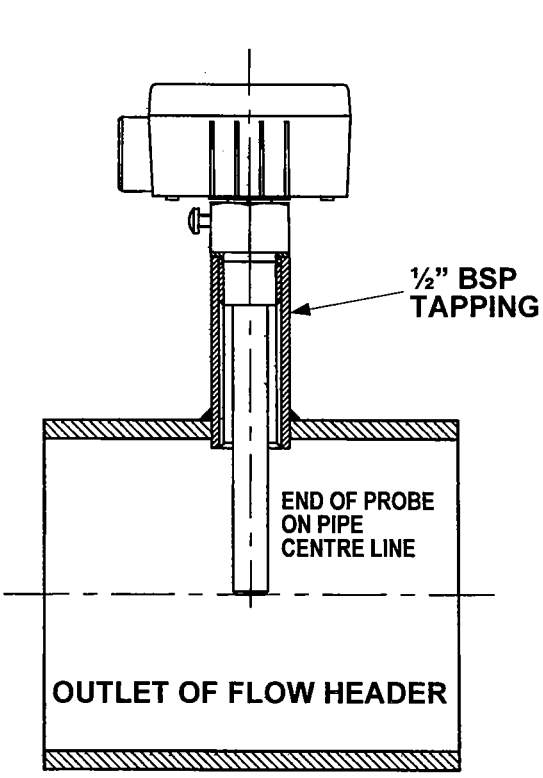


Figure 8 - Insertion Flow Sensor

DIMENSIONS



INSTALLATION INTO WATER FLOW HEADER



(ALTERNATIVE METHOD)

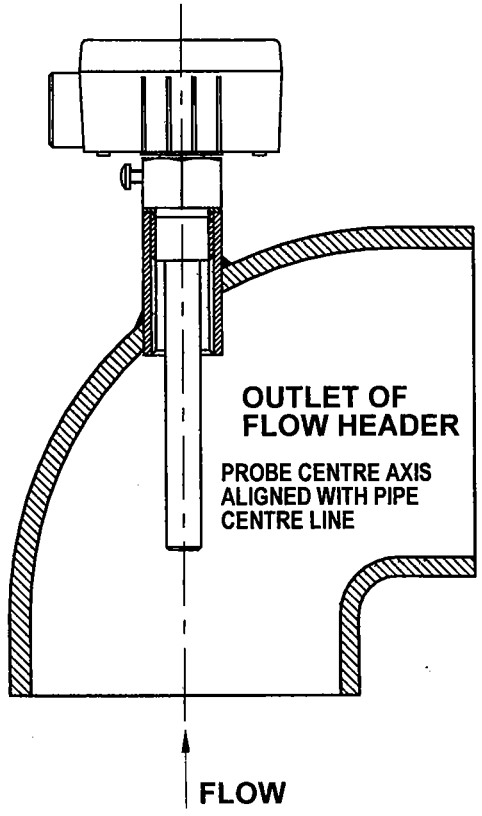
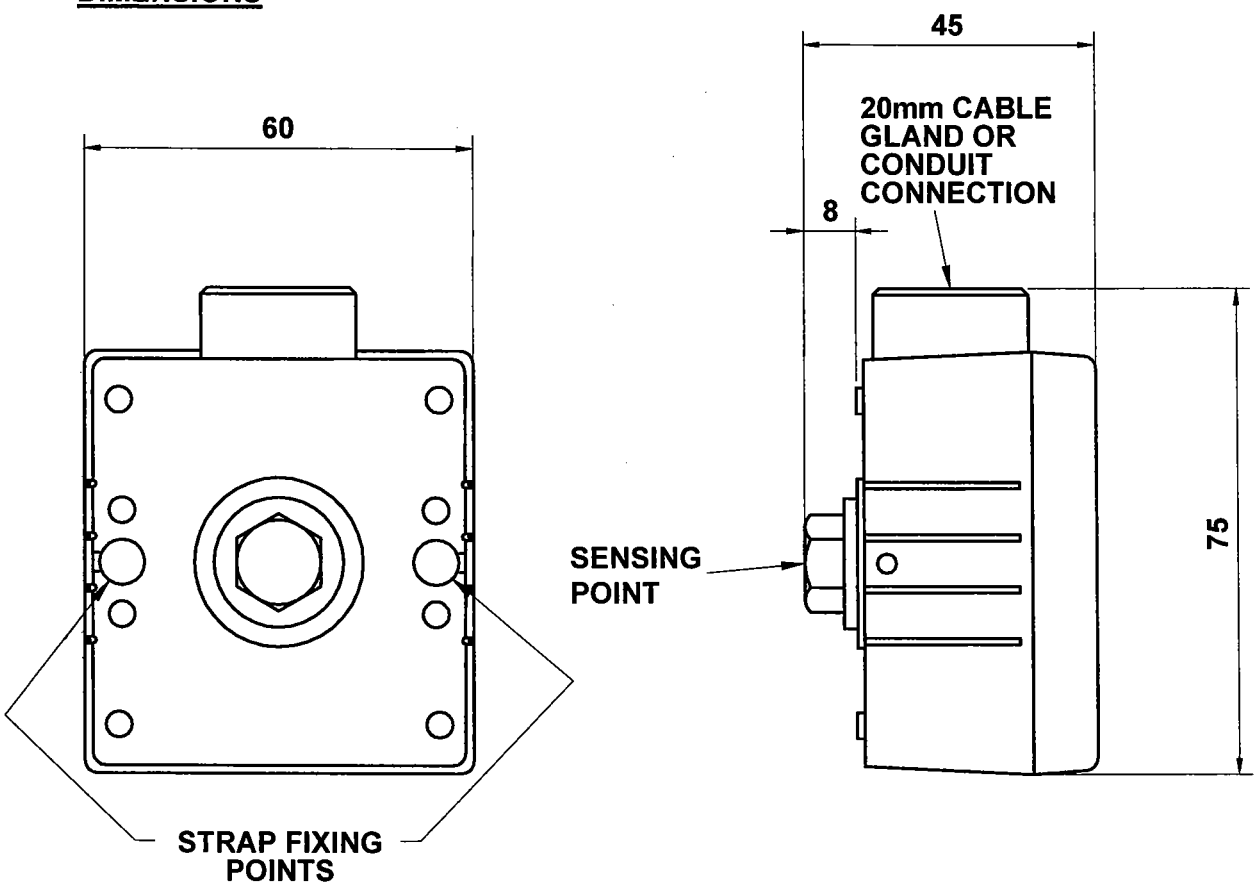
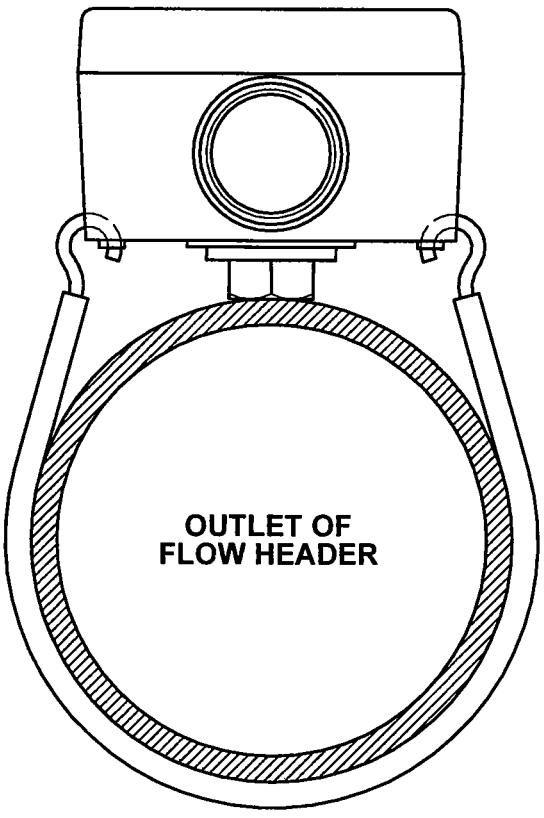


Figure 9 - Strap-on Flow Sensor

DIMENSIONS



INSTALLATION TO WATER FLOW HEADER



CUT STRAP TO CORRECT LENGTH AND SCREW IN FASTENING HOOKS. ENSURE A FIRM AND CLEAN CONTACT BETWEEN THE SENSOR AND THE SURFACE OF THE FLOW HEADER.

NOTE: MEASURE REQUIRED UNSTRETCHED STRAP LENGTH, THEN REDUCE BY 20mm TO PRODUCE A TIGHT FIT TO THE PIPE.

Figure 10 - External Sensor

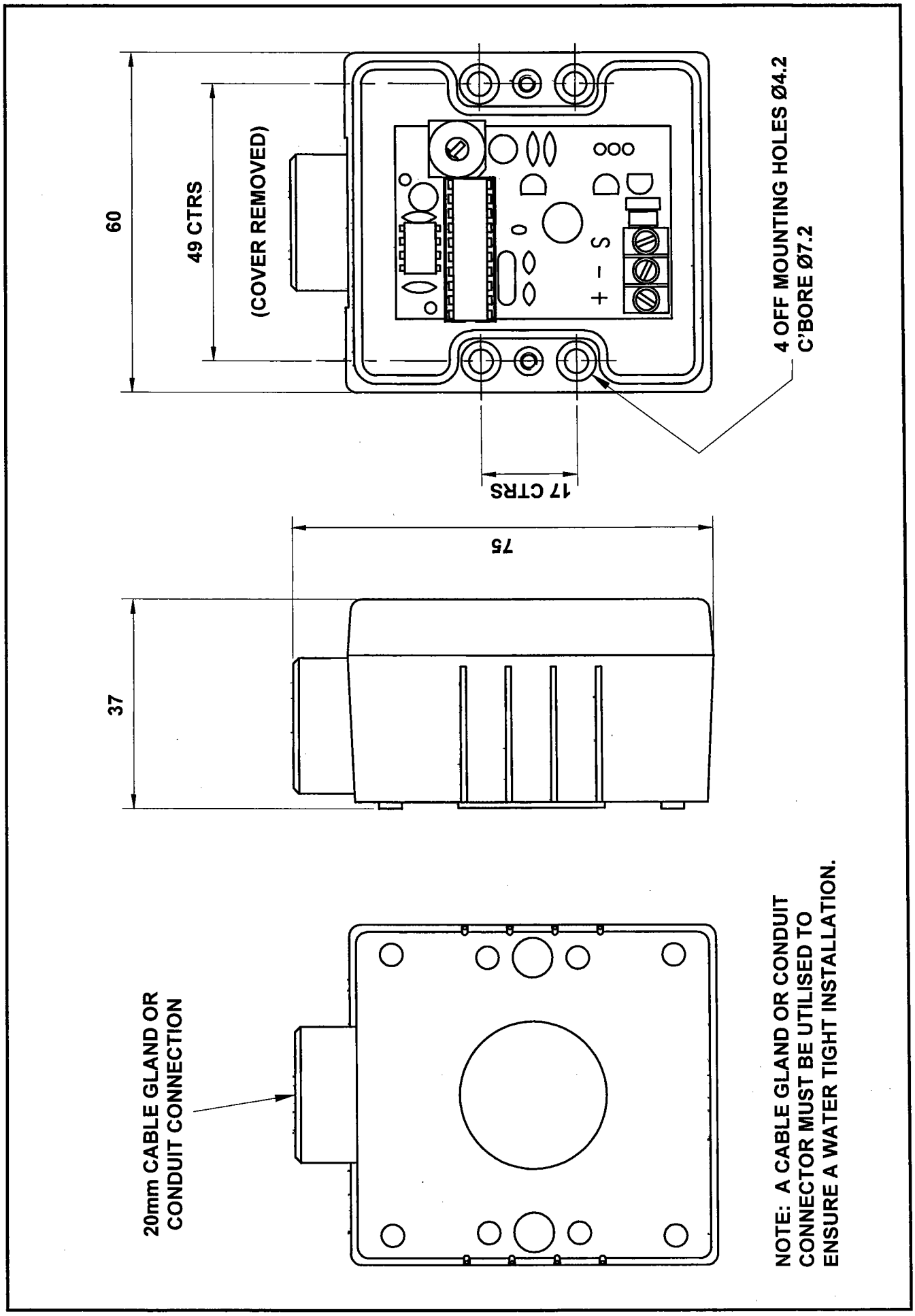


Figure 11 - Room Sensor

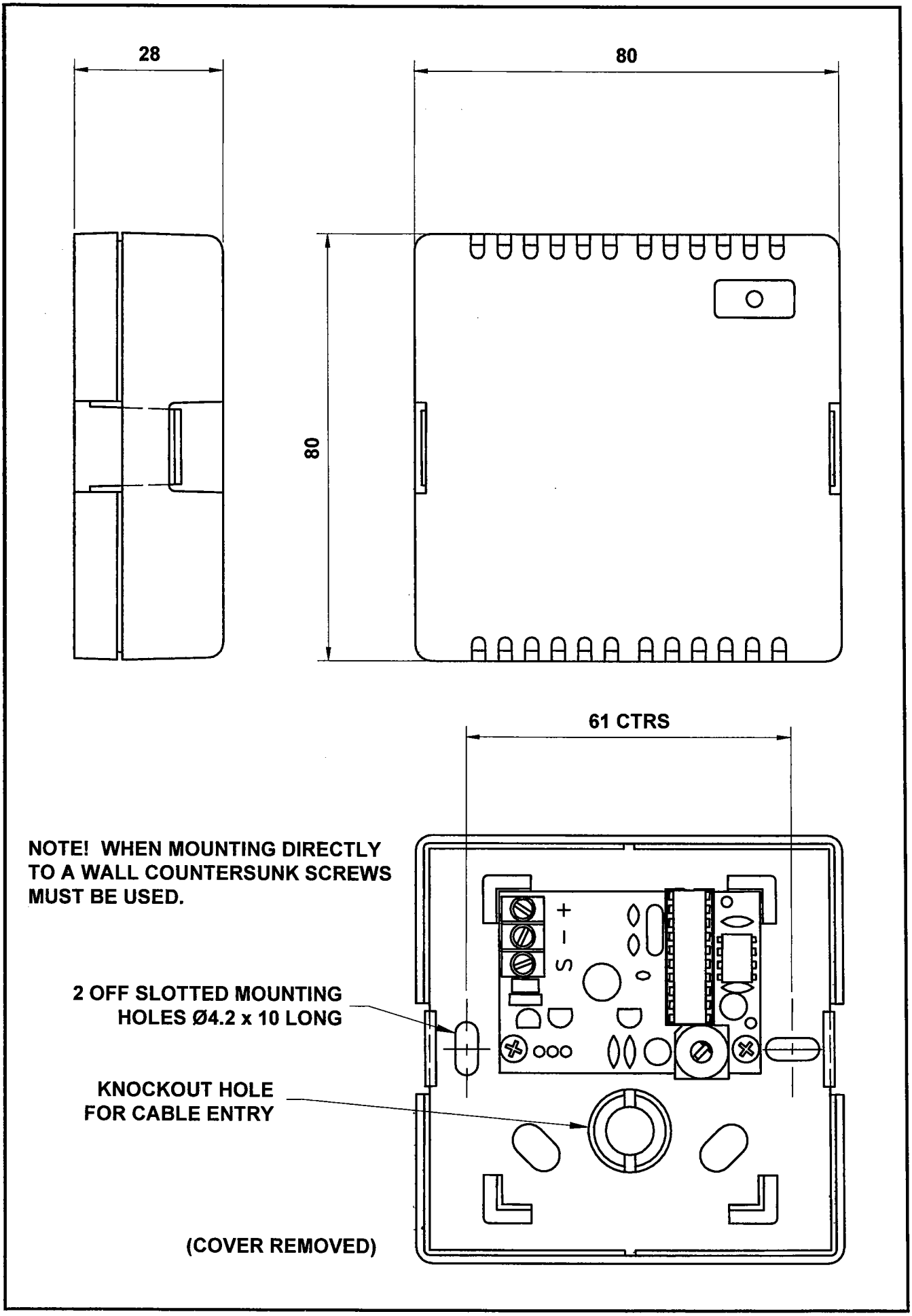


Figure 12 - Slave Controller Sequencing Rotary Switch

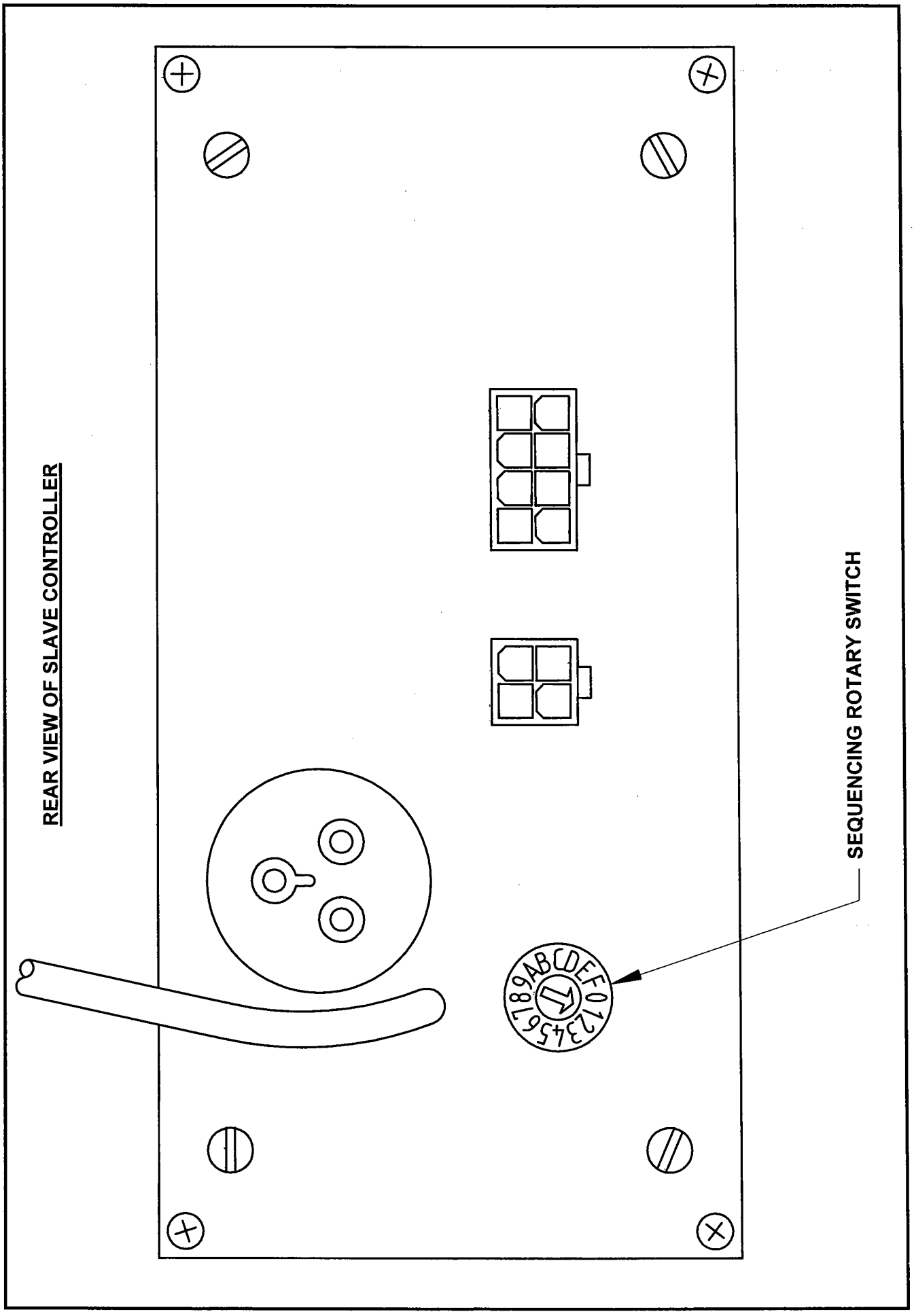


Figure 13 - Marshall Compensation Function Characteristic Graph

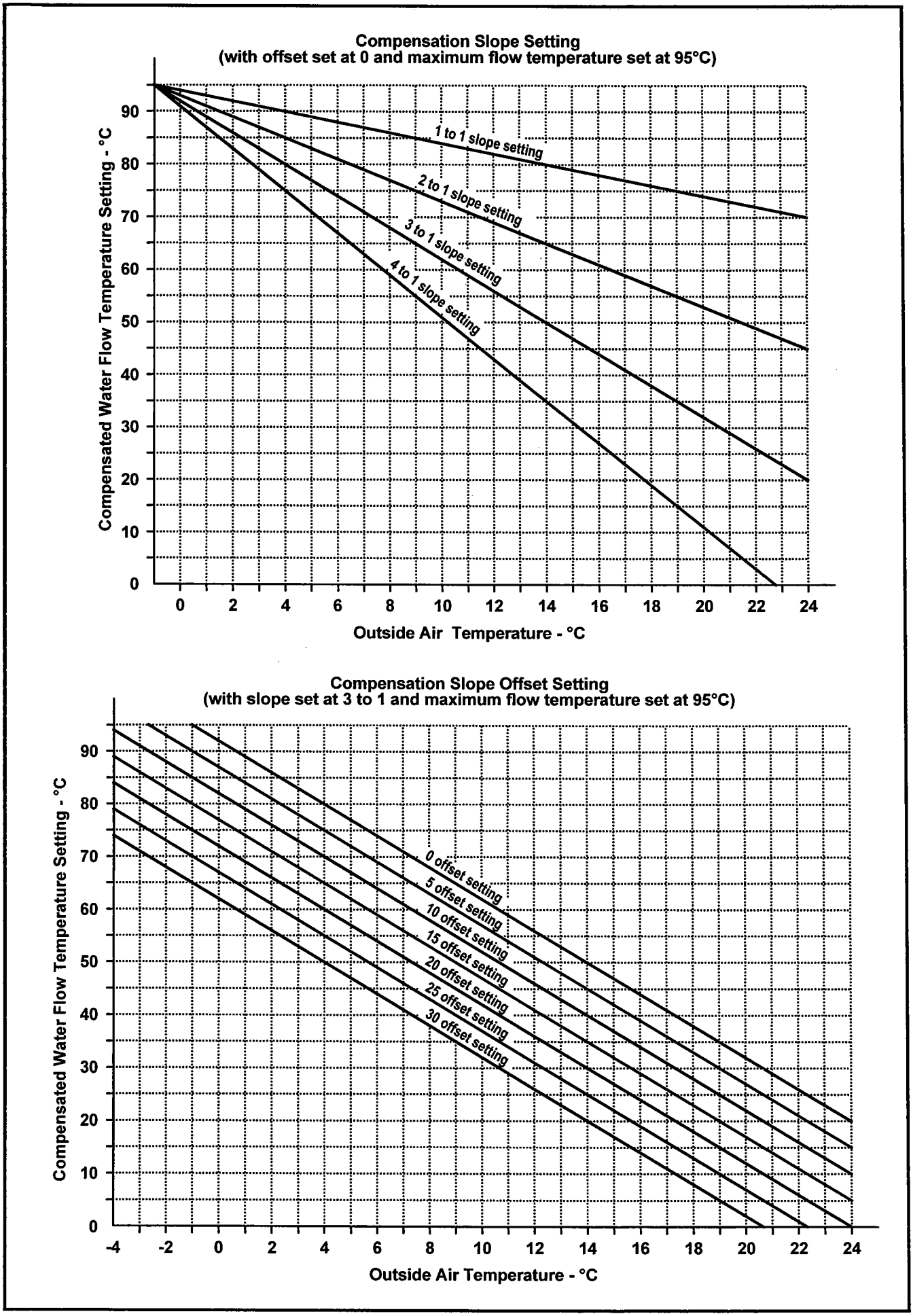


Table 3 - Marshall Settings

SETUP	
Timeclock Setting – Internal (00) or External (01)	
Number of Boilers	
Number of High/Low Boilers	
Compensation Function Setting - Fixed Flow (04) or Variable Flow (05)	
DATA	
Room Sensor Calibration Setting	
Flow Sensor Calibration Setting	
External Sensor Calibration Setting	
Maximum Override Setting	Hours
Upper Temperature Offset Limit	°C
Lower Temperature Offset Limit	°C
Optimiser Setting - Optimiser (00), Timer (01) or Fixed Optimiser (02)	
Maximum Preheat Time	Hours
Rate of Change Setting (Fixed Optimiser only)	Min/°C
Flow Temperature Slope Setting	
Flow Temperature Slope Offset Setting	
Minimum Flow Temperature	°C
Maximum Flow Temperature	°C
Boiler On Delay Setting	
Boiler Off Delay Setting	
Firing Sequence – Low, High, Low, High (00) or Low, Low, High, High (01)	
Sequence Setting - Fixed (00) or Weekly Shift (01)	
Frost Protection Setting	°C
Pump Overrun Time	Min
Two Stage Frost Protection Setting	°C
Summer Shutdown Temperature	°C
CODE	
User's Code	

Table 4 - Fault Finding (page 1 of 2)

Fault	Cause	Remedy
The heating system does not operate	Mains power is not supplied	Check mains supply fuses and isolators
	Marshall master controller fuse is blown	Replace fuse
	Safety interlock circuit interrupted (the system status screen displays a 'LOCKED' legend)	Check the connected safety devices and remedy the fault
	The flow temperature sensor is not communicating (sensor reads '??' and system status screen displays a 'FAULT' legend)	Check the flow sensor communication lead connections
		Check that the 16 position rotary switch on the flow sensor PCB is set to '2'
	'Active' room comfort level setting overridden to a lower value.	Reset to correct value (refer to section 2.3 of the Marshall User's Instructions)
	Timeclock overridden to 'Standby'.	Reset override time (refer to section 2.4 of the Marshall User's Instructions)
	The holiday override function is operating	Cancel the holiday function (refer to section 3.5 of the Marshall User's Instructions)
	A manual holiday period is in operation	Cancel the manual holiday period (refer to section 2.6 of the Marshall User's Instructions)
	A high outside air temperature has caused the summer shutdown function to operate	Increase the summer shutdown function setting temperature (refer to section 5.2.3 step 42)
Individual boilers will not fire	The boiler's Marshall controller fuse is blown	Replace fuse
	The boilers slave controller is not communicating with the master controller (the slave controllers 'communicating' indicator is lit continuously)	Check the communication lead connections
		Reset the power supply to the master and slave controllers
	The slave controller's sequencing, 16 position rotary switch is set incorrectly	Set the switch correctly (refer to section 5.1.4)
	Refer also to the boiler's Installation , Commissioning and Maintenance Manual	
The boilers' temperature limiters repeatedly operate	The 'boiler off delay' setting is too high – the boilers take too long to sequence off	Reduce the 'boiler off delay' setting (refer to section 5.2.3 step 30)
	The circulation pump is not running	Check the pump and pump control circuit
	If a 'strap-on' type flow sensor is fitted, poor sensor contact with the water flow header is causing a high lag in sensor response	Remount the sensor ensuring a good contact with the flow header (HHL recommend a suitable heat sink compound be used e.g. R.S.554-311)
		Replace the strap-on sensor with an insertion sensor (HHL part no. 533901265)
The boiler firing sequence is incorrect	The slave controller sequencing, 16 position rotary switches are set incorrectly	Set the switches correctly (refer to section 5.1.4)

Table 4 – Fault Finding (page 2 of 2)

Fault	Cause	Remedy
The heating system is unable to achieve the desired room comfort level	If the outside temperature compensation function is utilised, the 'slope' and 'offset' settings are incorrect.	Use a lower slope or reduce the slope offset setting (refer to section 5.2.3 step 20)
	Incorrect positioning of the room sensor is causing an elevated room temperature reading, causing the Marshall system to shut down before the required room comfort level is achieved	Reposition the room sensor correctly as described in section 4.7.4
	Incorrect positioning of the external temperature sensor is causing an elevated outside air temperature reading, thus reducing the water flow temperature	Reposition the external sensor correctly as described in section 4.7.3
	The maximum flow temperature setting is set too low	Increase the maximum flow temperature setting (refer to section 5.2.3 step 26)
The room temperature is too high	If the outside temperature compensation function is utilised, the 'slope' and 'offset' settings are incorrect.	Use a higher slope or increase the slope offset setting (refer to section 5.2.3 step 20)
	The maximum flow temperature setting is too high	Reduce the maximum flow temperature setting (refer to section 5.2.3 step 26)
	If the outside temperature compensation function is utilised, the external sensor is not communicating (external sensor reads '??' and flow temperature set point remains constantly at 80°C)	Check the external sensor communication lead connections
		Check that the 16 position rotary switch on the external sensor PCB is set to '3'
	If fitted the room temperature sensor is not communicating (sensor reads '??')	Check the room sensor communication lead connections
		Check that the 16 position rotary switch on the room sensor PCB is set to '1'
	Incorrect positioning of the room temperature sensor is causing an unrepresentative room temperature reading	Reposition the room sensor correctly as described in section 4.7.4

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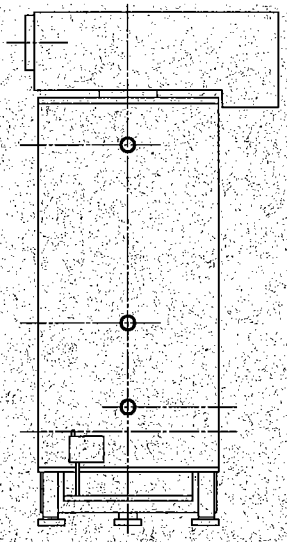
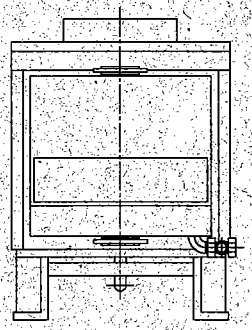
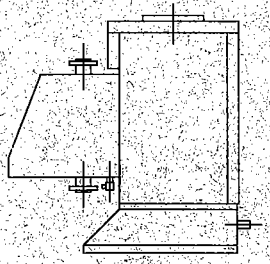
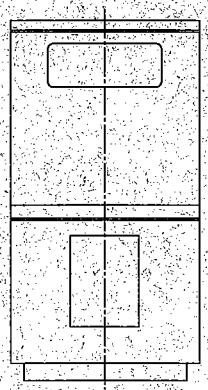
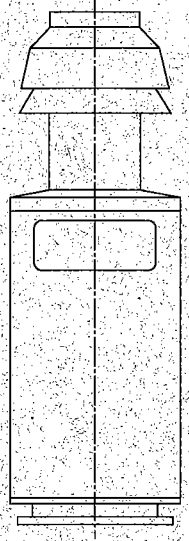
For all other areas, or for further advice, please contact Hamworthy Heating head office service department in Poole, telephone 01202 662500.











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