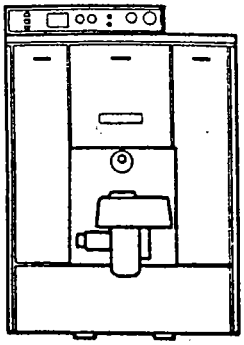
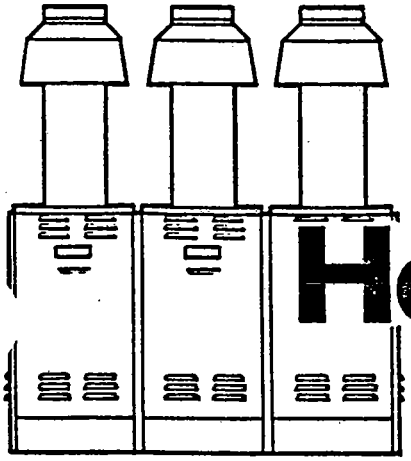
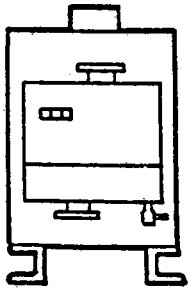
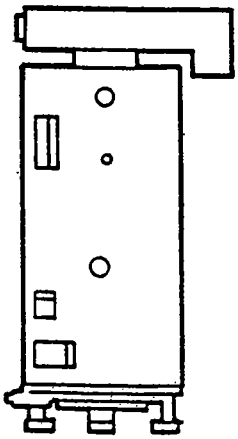


HAMWORTHY
heating products



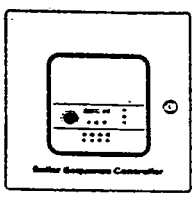
Hamworthy Heating Products





Warmwell Series Gas Fired Condensing Modular Boiler System

Installation, Commissioning and Maintenance Manual.



BS 5750 Part 1
Certificate No. FM 10082

WARMWELL 106/114

75/80

CONDENSING BOILERS FOR HEATING AND DOMESTIC HOT WATER

(WAS PUBLICATION NO. – HPM 2020-0989)

RENUMBERED 500001011-A

NOTE: THIS DOCUMENT RELATES TO THE FOUR VARIANTS OF THE WARMWELL RANGE AS FOLLOWS:–

106/114	HAMWORTHY REF 363311096	:	FULLY AUTOMATIC IGNITION NG
106/114	HAMWORTHY REF 563401006	:	PERMANENT PILOT IGNITION NG
75/80	HAMWORTHY REF 563401007	:	FULLY AUTOMATIC IGNITION NG
75/80	HAMWORTHY REF 563401005	:	PERMANENT PILOT IGNITION NG

C O N T E N T S

1.0 INTRODUCTION

1.1 DESCRIPTION

The Hamworthy Warmwell Series Condensing boilers are manufactured from horizontal cast iron sections nippled at alternate ends to give the unique series water flow through each boiler. The sections are positioned on an insulated basket framework which contains the atmospheric multi-gas, stainless steel, burner bars. The front plate of this framework also acts as the assembly point for the burner bars and burner system, which can be removed as one item. An insulated floor reflector is located between the basket sides beneath the burner bars.

A flue gas baffle is located on the top waterway section to retard the gases before passing into the collector adaptor. This adaptor contains the condense tray to enable condensate to drain via the outlet tube at the rear, to a suitable disposal point. Removable insulated side panels are provided to allow easy access for cleaning.

On top of this adaptor is mounted the secondary condensing section of the boiler, manufactured entirely of high quality aluminium. The assembly consists of finned tubing welded to header plates with dividers to permit a series water flow through the unit, before entering the inlet tapping at the lower rear of the cast iron boiler assembly. Removable side plates are provided to gain access to the finned tubes for cleaning as required. Between this heat exchanger and the collector hood is positioned a distribution plate through which all products of combustion must pass before entering the fan/exhaust assembly.

The fan/exhaust assembly is mounted at the right-hand side of the collector hood to assist in overcoming boiler gas-side resistance. Dilution air is permitted to enter the hood from the opposite side.

An insulating blanket is wrapped around the entire heat exchanger assembly before being enclosed by a flush steel casing supplied for assembly around the boiler. This casing can be fitted after the boiler has been connected, but the gas supply pipework, water pipework and electrical conduit must be positioned correctly. See section 3.2.10, 3.3.6 & 3.4.2.

1.2 TECHNICAL DATA

WARMWELL MODEL NO		75/80 PERM PILOT 75/80 AUTOMATIC	106/114 PERM/PILOT	106/114 AUTOMATIC
INPUT	KW	88.77	124.75	124.75
	Btu/h	302,900	425,650	425,650
OUTPUT AT 40°C RETURN	KW	80.3	114	114
65°C RETURN	KW	74.6	106.0	106.0
WEIGHT (DRY)	Kg	316	411	411
WATER CONTENT	l	41.8	53.6	53.6
MAX WATER PRESS	bar	6.8	6.8	6.8
NOMINAL GAS INLET PRESSURE	mbar	17.5	17.5	17.5
	in wg	7.0	7.0	7.0
MAX GAS INLET PRESSURE	mbar	49	49	49
	in wg	19.7	19.7	19.7
GAS BURNER SETTING PRESSURE	mbar	13.3	9.6	8.3
	in wg	5.3	3.85	3.3
INJECTOR DIA	mm	3.20	4.20	4.40
	in	0.1260	0.1654	0.1732
INJECTOR MARKING		320	420	440
NO OFF BURNERS		5	5	5
WATER FLOW REQUIREMENTS SEE SECT 3.2				

2.0 DELIVERY AND ASSEMBLY

2.1 DELIVERY

The Hamworthy Condensing Boiler is factory assembled into manageable sub-assemblies, tested and delivered, each sub-assembly individually packed and labelled as follows.

2.2 PACKAGING

a) The cast iron UR boiler assembly complete with burner assembly and gas train, on wooden pallet and shrink wrapped.

b) Base to condenser pipework with flexible coupling and union plus drain tube and condense trap packed in heavy duty polythene bags.

c) Secondary heat exchanger assembly including fan assisted flue box, heat exchanger connecting piece and pressure sensing assembly. On wooden pallet with heavy duty cardboard cover.

d) Control bracket assembly including solenoid coil leads in a heavy duty cardboard box.

e) Casing assembly in a cardboard carton.

f) Insulation jacket in polythene bag.

2.3 UNPACKING

Before unpacking the boiler the size can be checked from the data plate which is attached to the fan assisted flue box of the secondary heat exchanger, packed on the wooden pallet with the cardboard cover.

Unpacking must be done with care, preserving the packing material in case a return has to be made. This installers guide should be read through to section 3.1 before starting.

Unpack the UR cast iron boiler section assembly (which is shrink wrapped onto a wooden pallet) and locate in its final position. See section 2.4. Then unpack the remaining items as required.

2.4 LOCATION

The boilers should be positioned on a level fire resistant floor or plinth. When removing from their pallets they should not be jarred or dropped. Check that the floor reflector is located correctly, the insulation is in place on all four sides of the basket and th bottom waterway section is sitting squarely and evenly on the burner basket casting assembly. The boilers should be level, steady and square. Allow adequate space (not normally less than 18") to permit access around the boilers, with space at the rear for flow and return connections, and at least 610 mm (24") in front for servicing.

2.5 ASSEMBLY

With the UR cast iron sections in position, fit the ceramic fibre rope provided to the rope groove in the top section, check that the retarder grid is correctly located on top of the section and that the tie bar nuts and washers which will clamp the condenser unit in place are correctly positioned, see fig 1.

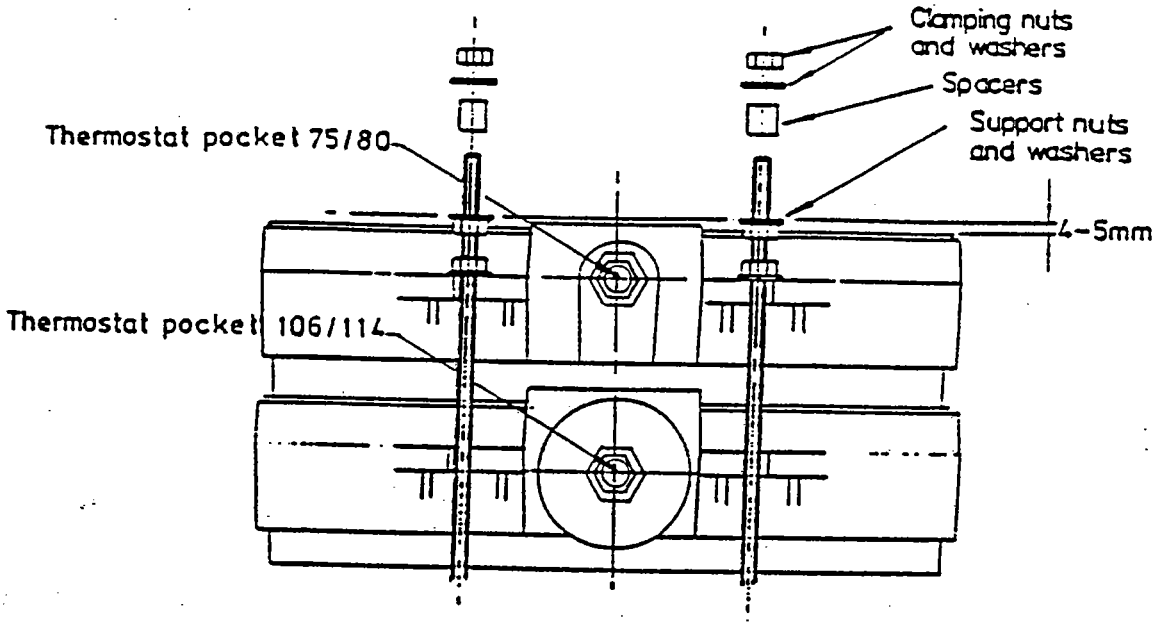


fig. 1

Lift the secondary heat exchanger assembly (50 kg) onto the cast iron sections, locating the securing brackets over the tie bars and ensuring the ceramic fibre rope seal is making a gas tight joint between the assemblies. NOTE: the drain tube and flow and return connections are to be at the rear of the assembly.

Run the support nuts and washers (ref fig 1) up to within 2-3 mm of the securing brackets and assemble and tighten down the clamping nuts and washers.

"Make" the water connection, base section to secondary heat exchanger, see fig 2.

Fit the lower pipe first, making the union connection hand tight, fit the flexible coupling allowing it to slide down the pipe. Fit the top pipe, also hand tight. Line up the ends of the two pipes and position the flexible coupling to bridge the gap and tighten. Tighten the unions to complete the assembly. Finally, with the retaining clamp provided, attach the condensate drain tube and via the trap, pipe to a suitable drain. See clause 5.5.

It is advisable at this stage to connect the boiler to the water supply and check for soundness. See section 3.2.10. Then proceed as follows.

3.6 FITTING THE INSULATION

The insulation jacket should now be fitted to the boiler; it is supplied in two pieces and held in place by velcro strips sewn into the edges of the two halves. A strap passes over the top of the flue box to support the weight of the insulation and care must be taken during unpacking and fitting to avoid damage to the aluminium foil facing.

NOTE: Check that the ceramic fibre board insulation pieces are fitted to both inspection doors before fitting insulation jacket.

The top edge of the insulation jacket should be level with the bottom edge of the flue box, and the bottom of the jacket should terminate at the top of the burner basket.

Take care not to allow the insulation to obstruct the fan motor cooling grill and when fastening the velcro edging tuck the insulation neatly around the water inlet and outlet connections, the condensate drain pipe and thermostat pocket head.

CHECK FOR CONDESATION BLOCKAGE IN SENSING TUBES.

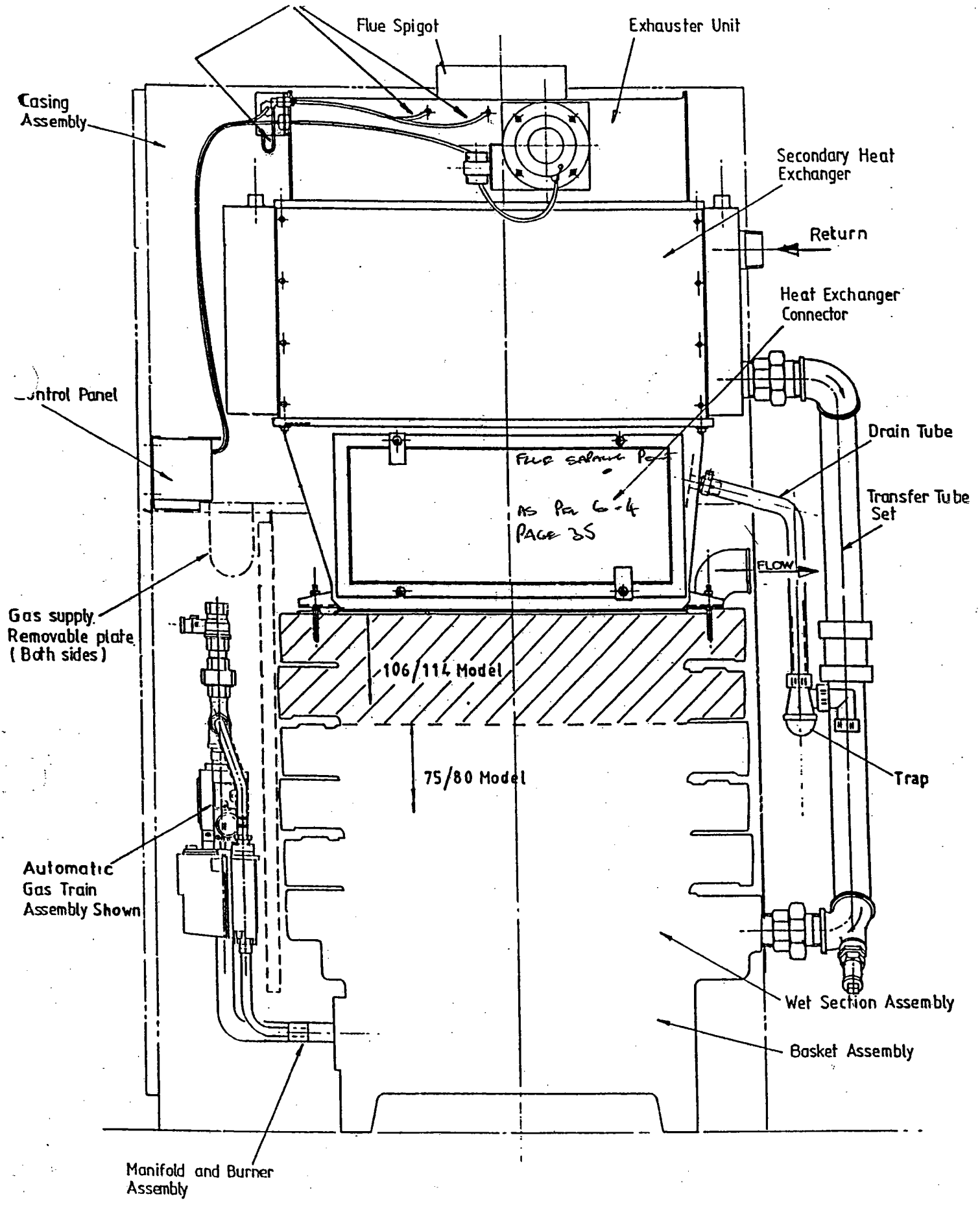


fig 2a

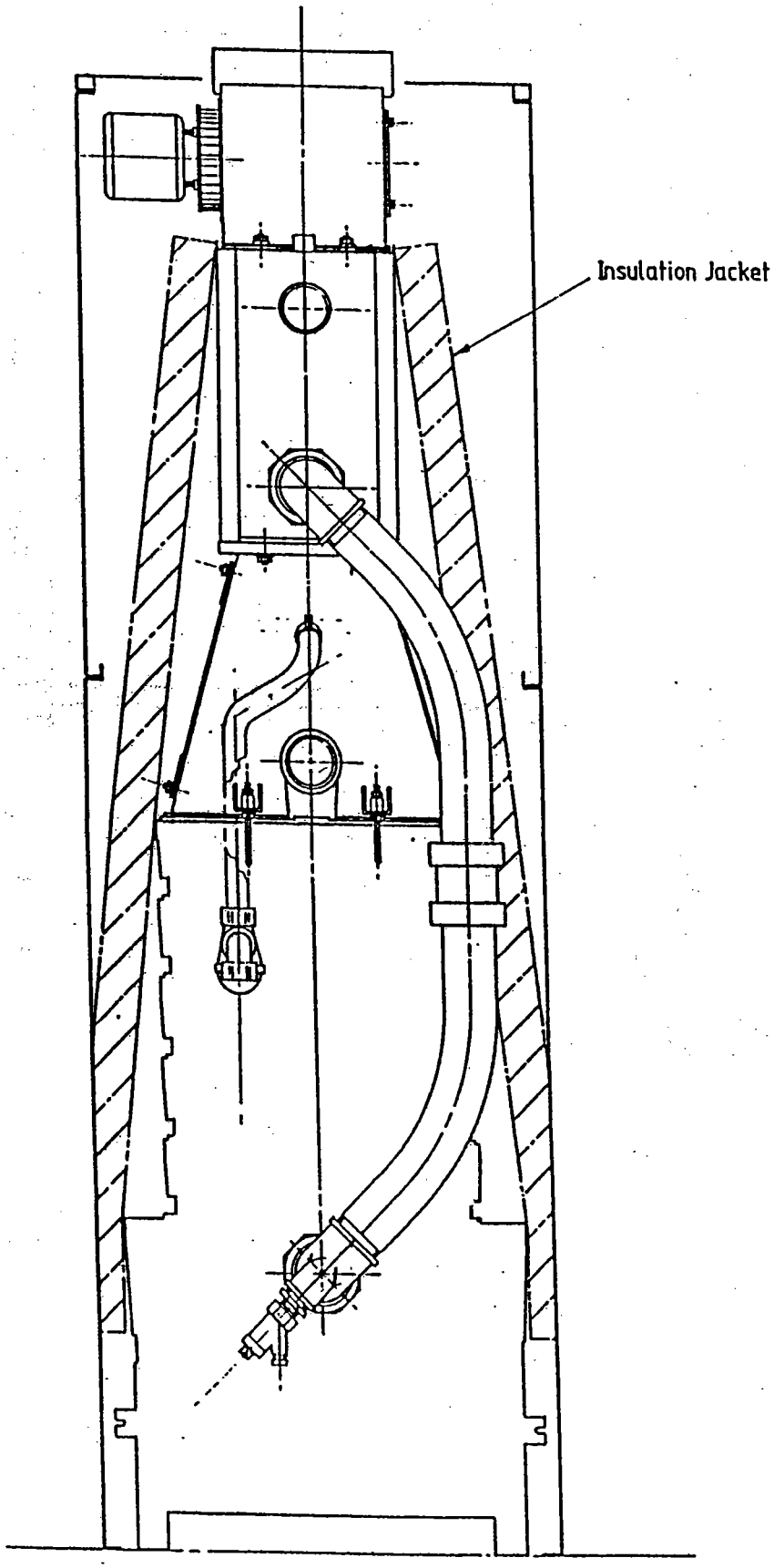


fig.2b

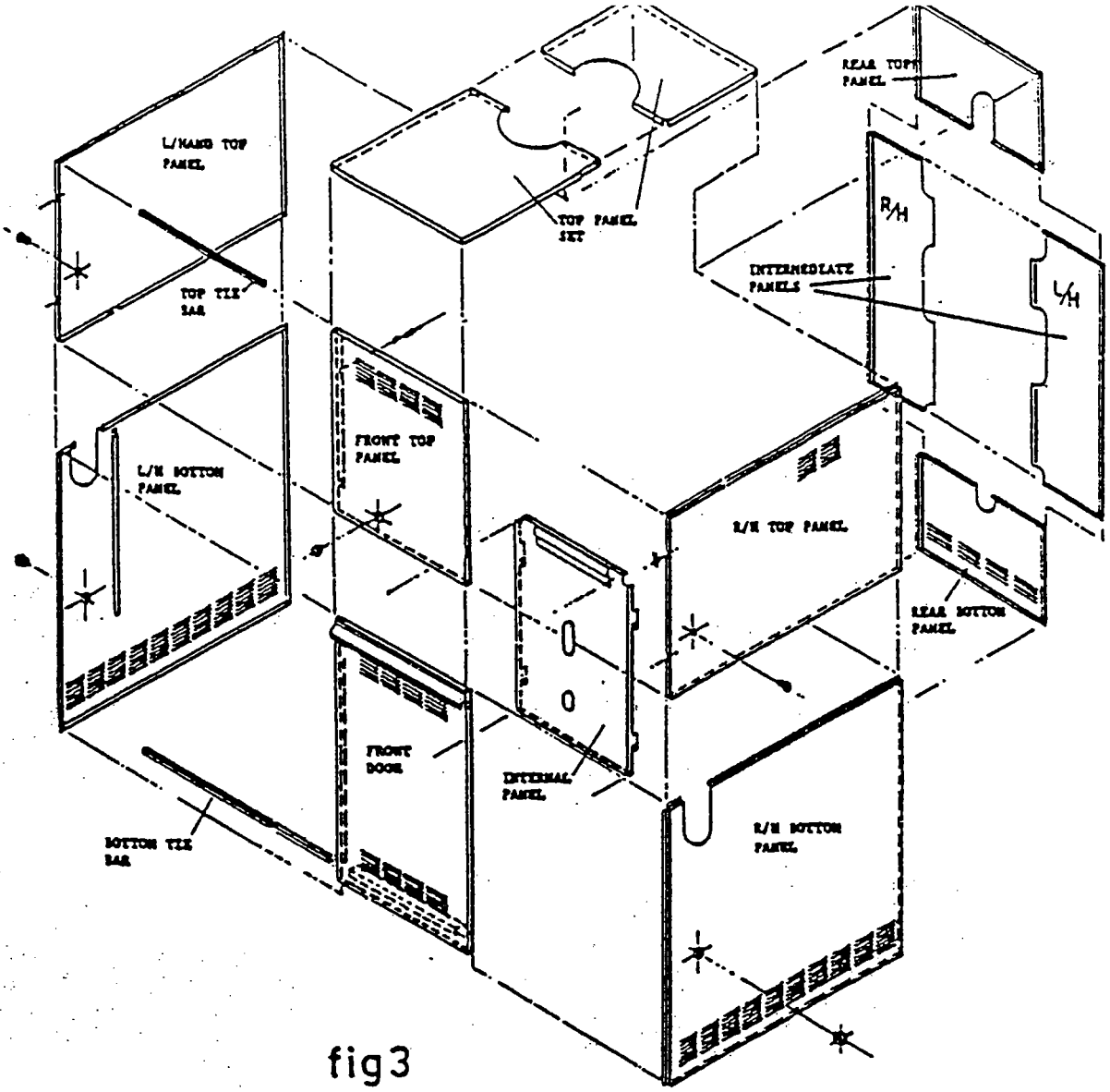


fig3

2.7 FITTING THE CASING REF FIG 3

Unpack the casings set (1 or 2 cartons) and find the assembly instruction sheet. Starting with the bottom rear panel and bottom side panels build up the assembly around the boiler, following the instruction sheet. The white front top panel and the white door should be left in the cartons until the control panel has been fitted and connected and gas pipework installed.

1. Place R/H and L/H bottom panel each side of boiler and attach rear bottom panel and R/H and L/H intermediate panels using no 8 x 3/8 pozi-pan head screws. Join the two intermediate panels with 3 off M4 x 10 pozi-pan head screws.

2. Attach tie bar with no 8 x 3/8 pozi-pan hand screws and fit internal panel (hooks in place).

3. Attach R/H and L/H top panels to intermediate rear panels and fit rear top panel and front tie (at top) using no 8 x 3/8 pozi-pan head screws.

4. Fit control panel to front of casing, behind side panel returns and attach with no 8 x 3/8 pozi-pan head screws.

5. Place in position top panel set (interlocked).

NOTE: Front top panel (attachd by snap in pillars and clips) and front door (hang on) to be unpacked and fitted after commissioning.

2.8 SECONDARY HEAT EXCHANGER ELECTRICAL CONNECTION

The secondary heat exchanger electrical connections to the control panel can now be made. There are two bulkhead spade connectors* in the back plate of the control panel each taking two spade connectors each side, they are clearly marked fan motor and switch, live (L) and neutral (N) as necessary tracing the cables from their facilities. Plug in the appropriate connections and attach the earths to the earth pillar on the left.

* Note: on permanent pilot models the air switch bulkhead spade connection is replaced with 3 way unit and marked appropriately.

2.9 GAS TRAIN AND PILOT BURNER ELECTRICAL CONNECTION

2.9.1 Warmwell Automatic Ignition Model

Remove the two grey plastic covers from either side of the Honeywell VR4900 series gas valve (located to the LH side of the gas train) to expose the terminals.

Identify the two 3-core cables each fitted with two fork crimps and on ring crimp. From the controller base, pass the longer of the two cables through one of the removed grey covers and connect to the relevant terminals of the LH solenoid operators.

Pass the other 3-core cable through the remaining grey cover and connect to the terminals of the RH solenoid operator.

The "ring" connectors must be connected to the earth point. Replace covers and secure to valve operators. Position split "Heyco" bushes onto the cables near the grey cover plates and after compressing onto cables, gently ease into location cut-outs in covers.

Remove the grey cover from the Honeywell VR4705 series pilot gas valve (located centrally above the burner manifold). Pass the 3-core cable, identified with a blue sleeve through the gland plate, fitted in cover and connect the "blue" crimps to the upper solenoid coil spaded terminals and the "red" crimps to the lower solenoid coil terminals. The "ring" connection should be secured to the earth screw adjacent t the lower coil on the valve body. Replace the grey cover, ensuring that the gland plate is correctly located. Position the split "Heyco" bush onto the cable near the gland plate and after compressing onto cable, gently ease into location cut-out.

The remaining 3-core should be connected to the ignition unit mounted on the inner front casing panel. Ensure that the "ring" connector is connected to one of the ignitor mounting screws.

Connect the HT cap to the RH electrode.
Connect the "red" probe wire to the LH electrode.

2.9.2 Warmwell Permanent Pilot Models 106/114 & 75/80

Remove grey plastic cover from solenoid operator to expose the terminals. Pass the 3 core cable through this cover, and after making connections to terminals (fork crimps to screw terminals - "ring" crimp to earth point), refit cover and secure. Position split 'Heyco' bush on to cable near cover plate, and after compressing onto cable, gently ease into location cut out in cover

Remove black plastic cover from gas pressure switch and pass 4 core cable through compression gland adjacent to terminal rail.

Connect the wires to the following terminals:-

Brown wire to common contact (C)
Blue wire to normally open contact (NO)
Black wire to normally closed contact (NC)
Green/Yellow wire to earth point (⏚)

Remove the grey front cover of the thermostat after first pulling off the circular engraved dial.

Unclip and remove the left hand lower light grey section of the control stat to reveal the spade connectors. Pass the 2 core cable through the compression gland and connect the wires - brown to "C" terminal and blue to terminal "1". Refit the lower cover and tighten the cable gland.

Replace front cover and circular dial.

3.0 INSTALLATION

3.1 GENERAL

Installation requirements for gas fired hot water boilers are specified in:

BS 6644:	Installation of Gas Fired Hot Water Boilers - 60 kW to 2 MW
CP 341, 300-307:	Central Heating by low pressure hot water
CP 342:	Centralised hot water supply
	Part 1: Individual dwellings
	Part 2: Buildings other than individual dwellings

British Gas Publication IM/22 - Installation Guide for High Efficiency Condensing Boilers (Industrial and Commercial Applications).

The following notes are of particular importance.

In a combined central heating and hot water system, the hot water storage vessel must be of the indirect cylinder or calorifier type. The hot water storage vessel should be insulated preferably, with not less than 75 mm (3 in) thick mineral fibre, or its thermal equivalent.

Circulating pipework not forming part of the useful heating surface should be insulated to help prevent heat loss and possible freezing, particularly where pipes are run through roof spaces and ventilated cavities. Cisterns situated in areas which may be exposed to freezing conditions, should also be insulated.

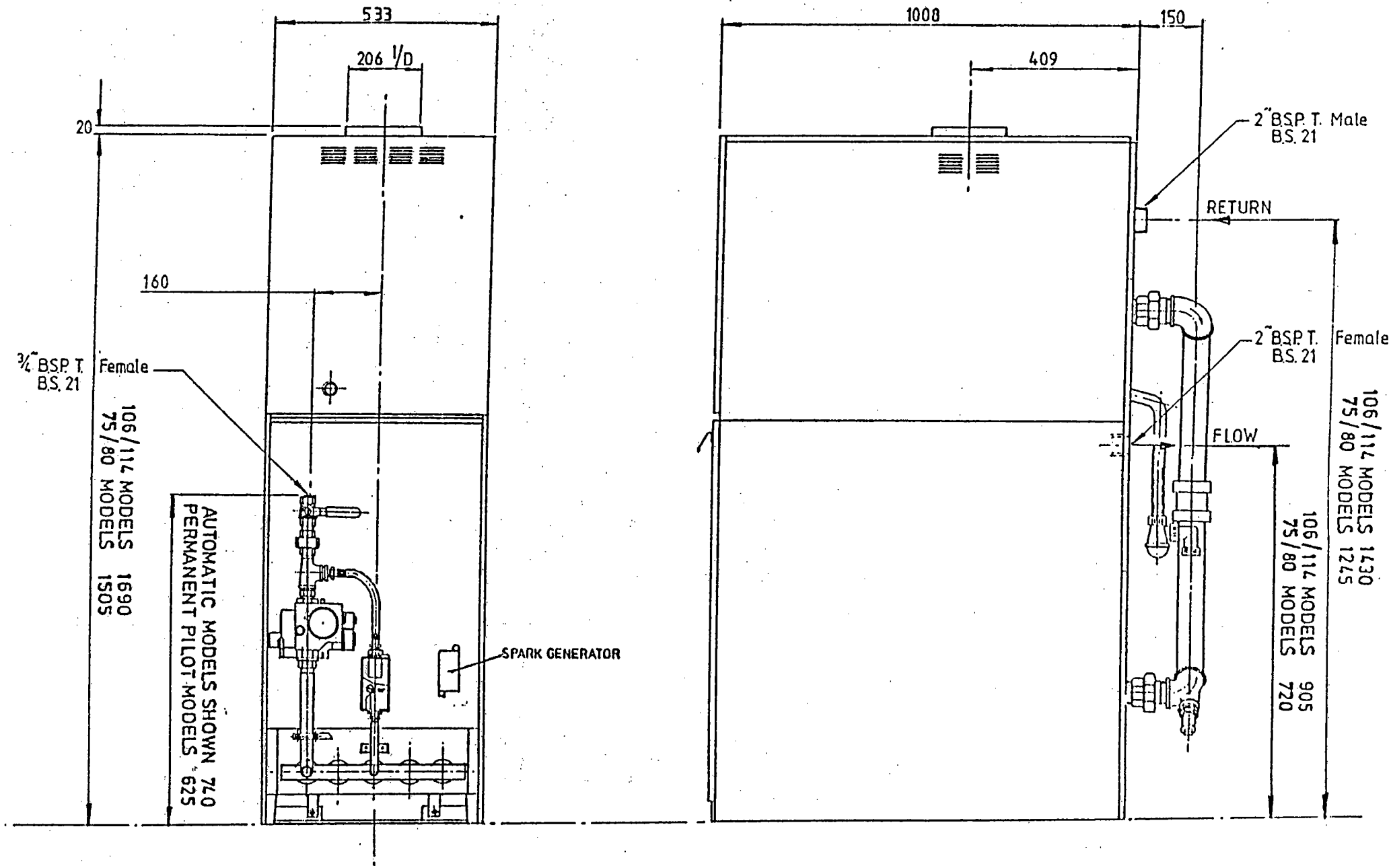
Insulation exposed to the weather should be rendered waterproof.

Draining taps must be located in accessible positions which permit the draining of the whole system, including the boiler and hot water storage vessel.

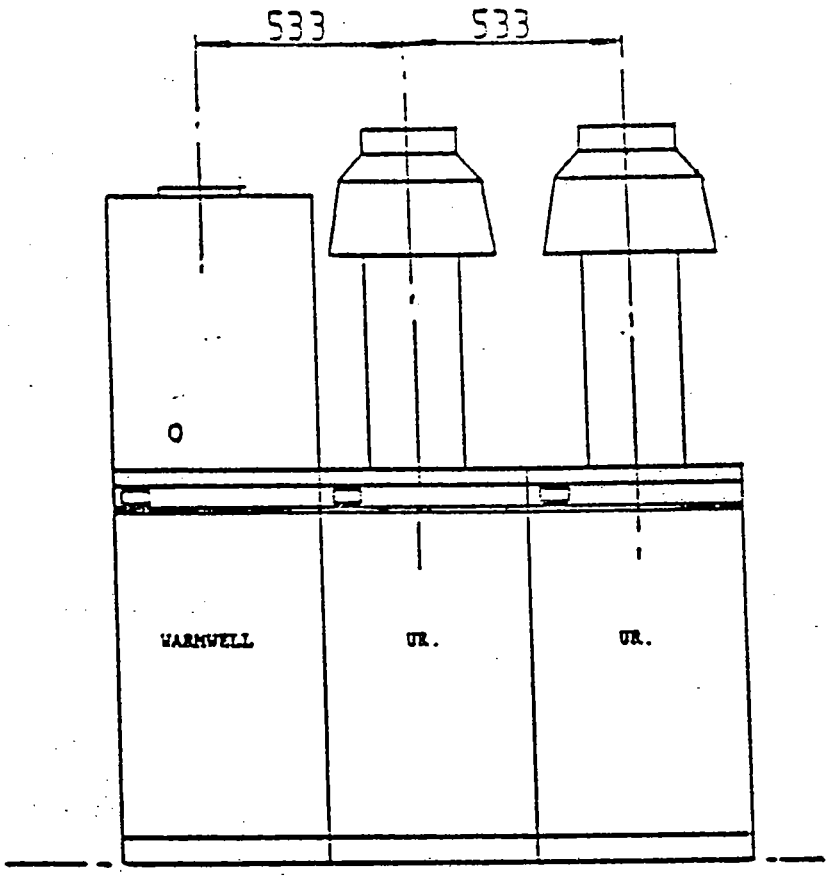
CONNECTIONS

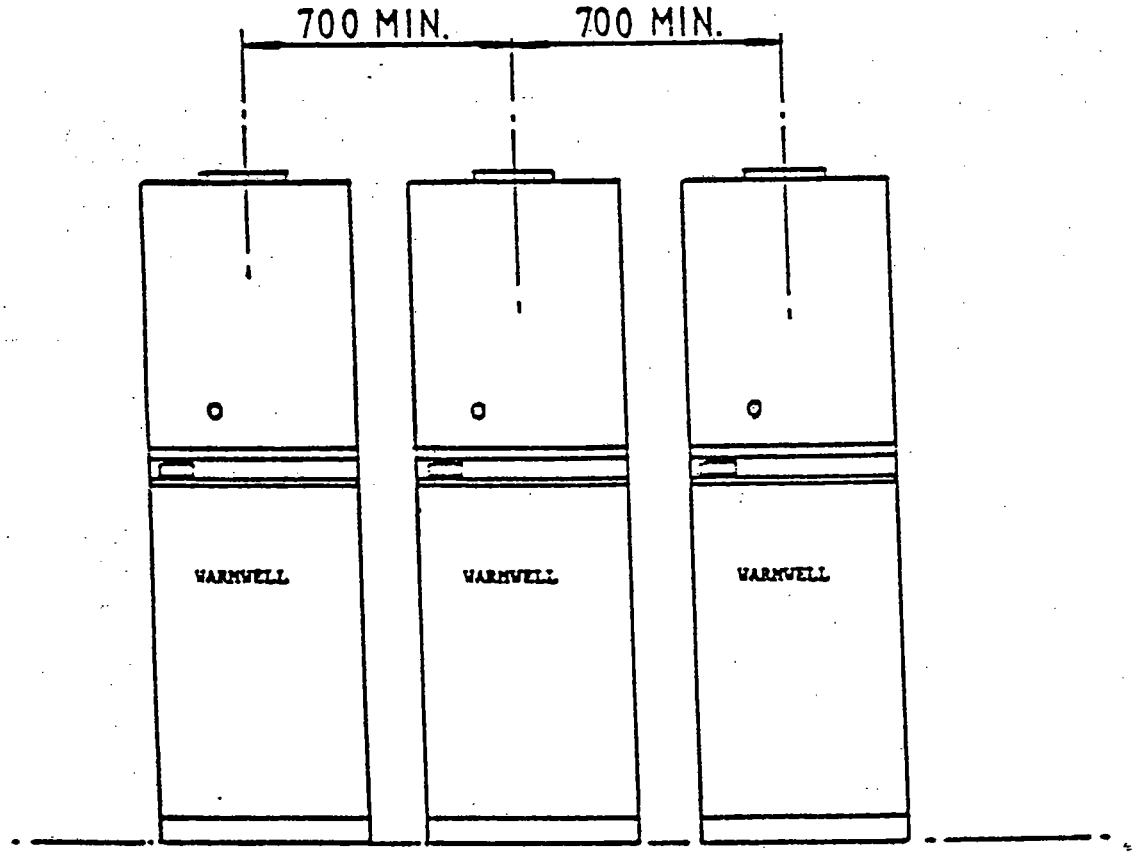
WATER	Water flow Rc2 (2 in BSP Taper Internal Thread) Water Return R 2 (2 in BSP Taper External Thread)
GAS	Gas inlet Rc¾ (¾ in BSP Taper Internal Thread on Gas Cock)
ELECTRICAL	Electrical Supply 240 V 50 Hz single phase fused at 5 amps
FLUE	Nominal Flue Size: WARMWELL 75/80 - 200 mm (8 in) WARMWELL 106/114 - 200 mm (8 in)

TABLE 2



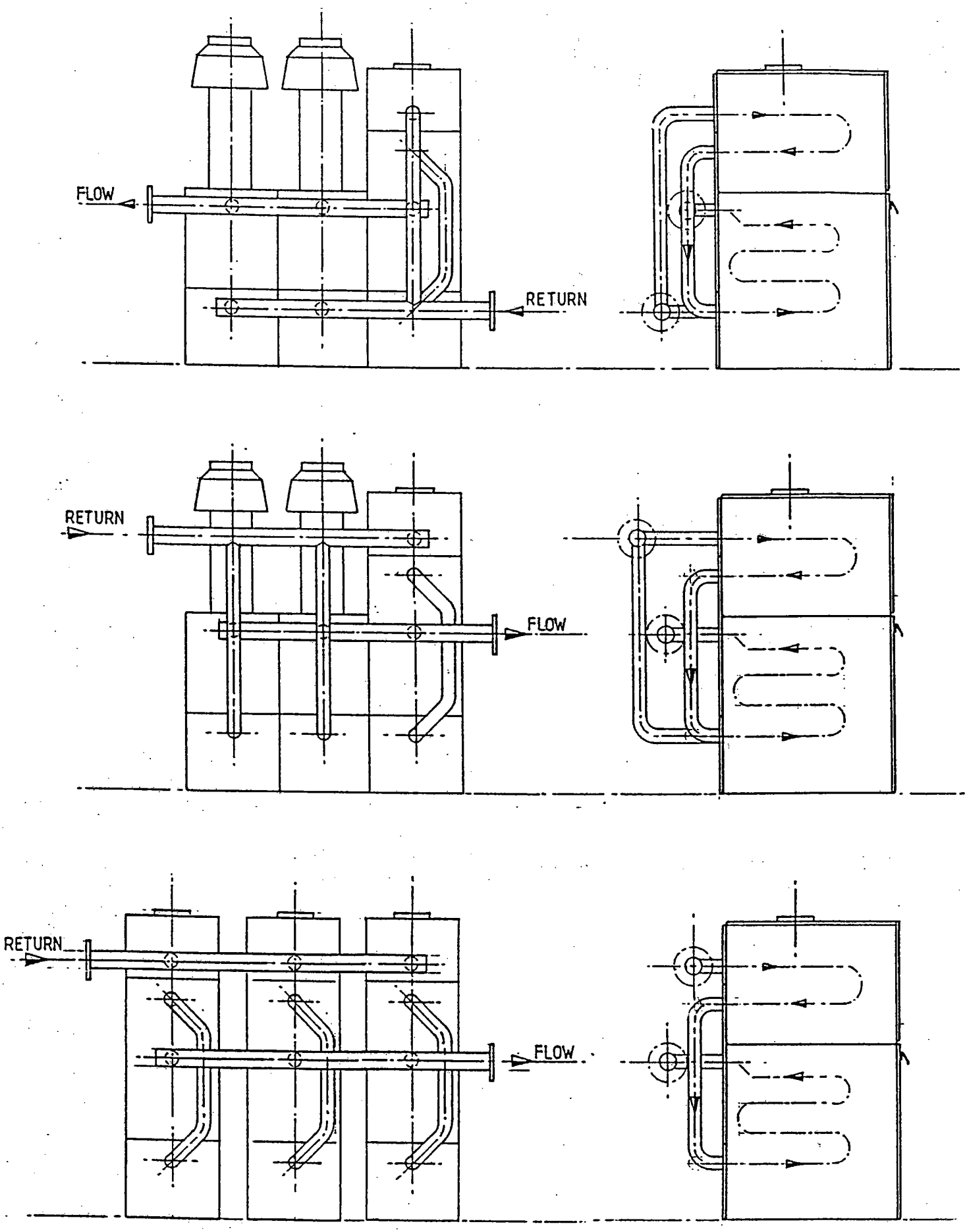
DIMENSIONED VIEWS WARMWELL SERIES BOILERS Fig.4





WARMWELL BOILER MODULAR ARRANGEMENTS

fig.5



ALTERNATIVE PIPEWORK ARRANGEMENTS. (IT SHOULD BE NOTED THAT THEY ALL FOLLOW THE REVERSED FLOW PRINCIPAL, SEE FIG. 8)

fig.6

3.2 WATER CIRCULATION SYSTEM

3.2.1 FEED WATER QUALITY

If the boiler feed water has a high degree of hardness, it is recommended that the water be treated to prevent precipitation of scale or sludge in the boiler water passageways. Details of additives can be obtained from any reliable manufacturer of water treatment or the Local Water Authority.

Pk 9.5
8.5

It should be noted however, that even if the boiler water is of average hardness, not requiring treatment, subsequent draining of a system for repair or constant make-up water due to an undetected leak will cause additional deposits and gradual build-up of scale. It is essential therefore, that leaks are attended to promptly and draining is kept to an absolute minimum. It is recommended that the system be flushed out at least twice when hot before any water treatment is added. If any doubt exists regarding the internal cleanliness of an old system, consideration should be given to the fitting of a coarse filter in the return pipework to the boiler.

3.2.2 WATER FLOW AND PERMITTED OPERATING TEMPERATURES

The most cost effective application of a condensing boiler on "traditional" heating systems is likely to be in combination with one or more non condensing appliances. Although the Warmwell 106/114 boiler has an operating resistance marginally higher and the Warmwell 75/80 marginally lower than their non condensing UR equivalent, the two, subject to the following, may be operated in parallel without the need for balancing valves or shunt pumps.

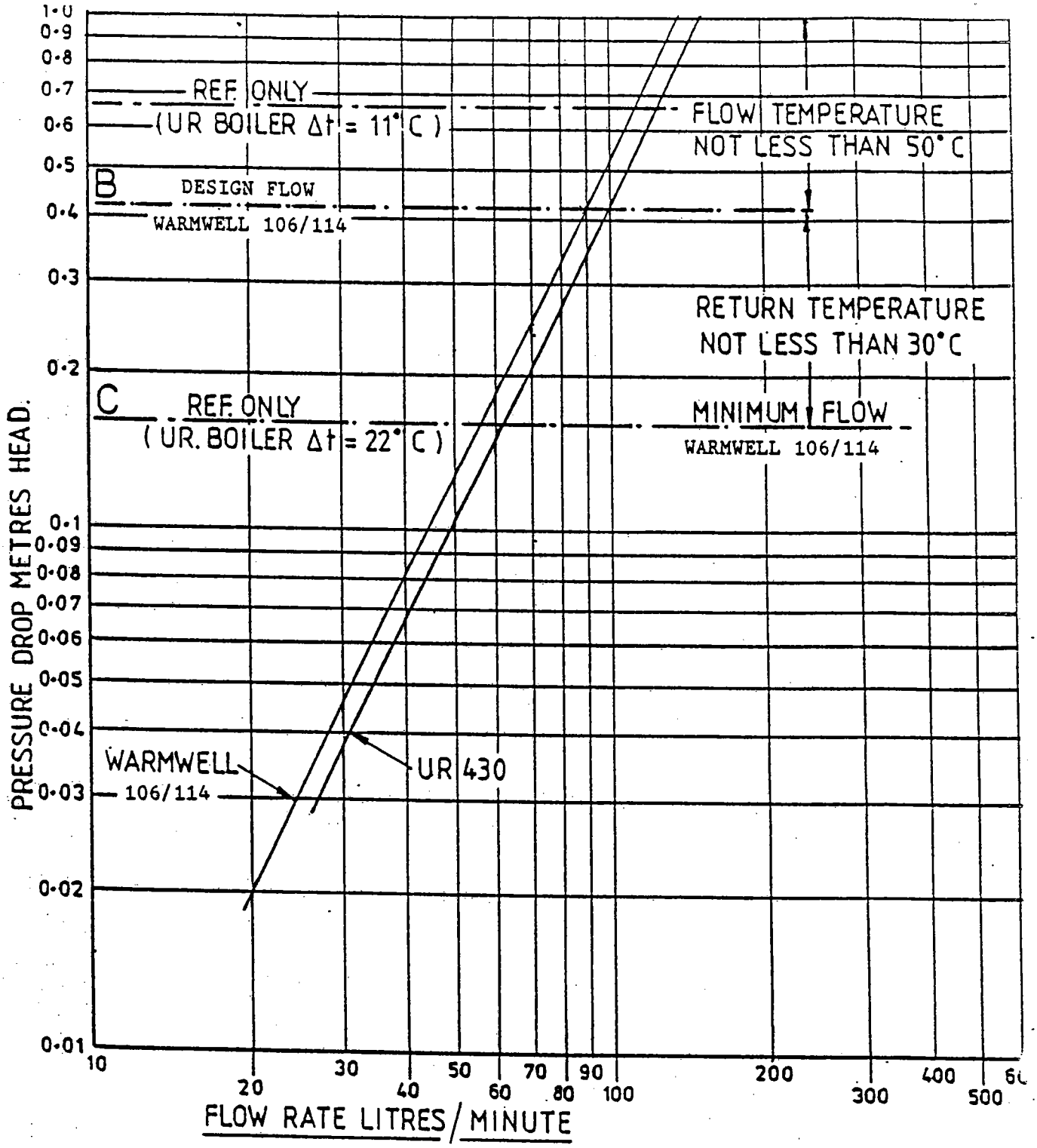
The criteria for normal operation is based on a boiler outflow temperature of not less than 50°C and this is satisfied when the water flow through a Warmwell boiler is between limits B and C shown on figures 7a/7b. It should be noted that at water flows of 90 l/min (106/114 model), 70 l/min (75/80 model) and below, the temperature rise across the boilers will not be less than 20°C and 15°C respectively, and the heating system can be designed for normal operating return flow temperatures of as low as 30/35°C. Operating temperatures for Warmwell boilers may therefore be summarised as follows:-

1. With water flows between the limits of 55 l/min and 90 l/min, the 106/114 boiler may be continuously operated with return water flow temperature down to 30°C.

   With water flows between the limits of 48 l/min and 70 l/min the 75/80 boiler may be continuously operated with return water flow temperature down to 35°C.

2. Where water flows exceed 90 l/min (106/114) or 70 l/min (75/80) the criteria for normal operation should be based on an outflow temperature of not less than 50°C.

3. Underfloor heating, swimming pool and greenhouse systems can operate at much lower continuous flow temperatures than 50°C and such systems may well require that all boilers are of the condensing type and incorporate shunt pumps and mixing valves to meet the above criteria.

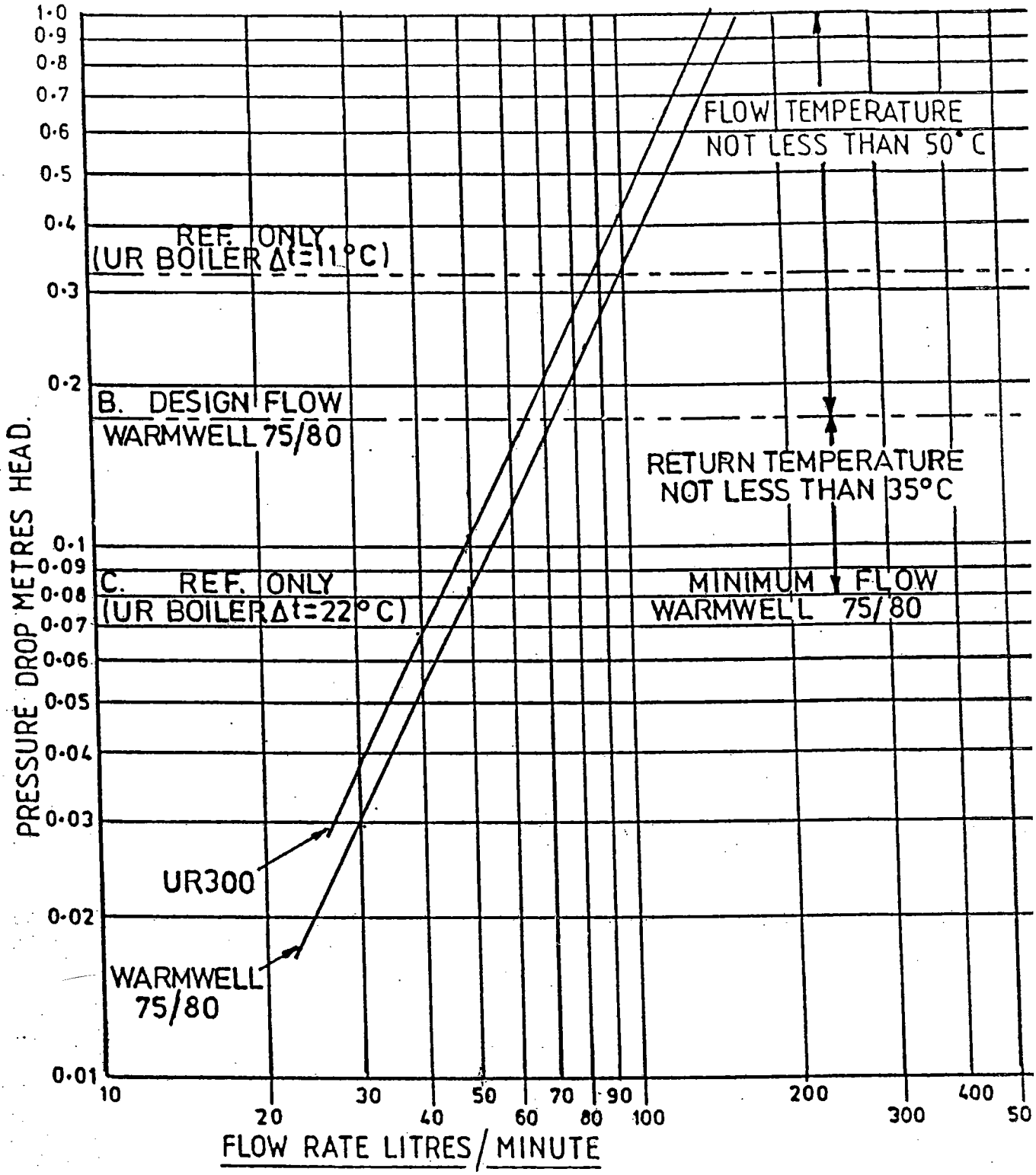


If flow rate between 'B' and 'C', the system RETURN temperature under normal operating conditions may be down to 30°C.

If flow rate above 'B', the FLOW temperature under normal operating conditions should not be less than 50°C.

For reference, the maximum/minimum flows and pressure drops for a non condensing UR 430 Boiler are shown.

fig 7a



If flow rate between 'B' and 'C', the system RETURN temperature under normal operating conditions may be down to 35°C.

If flow rate above 'B', the FLOW temperature under normal operating conditions should not be less than 50°C.

For reference, the maximum/minimum flows and pressure drops for a non condensing UR 300 Boiler are shown.

fig. 7b

3.2.3 WATERSIDE PRESSURE DROP

The waterside pressure drop is shown in Figures 7a & 7b.

NOTE: If boilers are run off time clock control, a pump overrun (not HEL supply) should be fitted which must run for minimum of 3 minutes on shut-down of the boiler.

3.2.4 TEMPERATURE CONTROLS

i) Auto Models

An adjustable control thermostat is supplied fitted to each module, set to operate within the range 50-90°C as standard. However, the thermostat scale is graduated from 50-110°C and therefore if a higher water temperature is required (and providing sufficient head on the water system is available) the thermostat may be adjusted to operate within the range 50-110°C.

For thermostat adjustment procedure see Appendix 1.

An adjustable overheat cut-off device (hand reset limit thermostat) is also fitted to the module and can be set at from 95°C to 130°C depending upon the water temperature requirement (screw driver slot adjustment). The thermostat will be delivered preset to 95°C.

ii) Permanent Pilot Models

a) A twin Honeywell Aquastat is supplied with these models and limit control is factory set at 101°C.

b) Insert the thermostat bulbs into the pocket fitted to the boiler and retain by tightening the screw onto the bracket.

c) Remove the light grey front cover of the thermostat (control and limit) after first pulling off the circular engraved dial to reveal spade connections.

d) Feed 2-core cable from control bracket assembly through the compression gland in the bottom of the control stat (LH). Connect brown cable to terminal "C" and blue cable to terminal "1". Finally tighten compression gland lock nut.

e) Feed the twin ECO leads through gland grommet in the bottom of the limit stat (RH) and after removing the steel clamps to terminals "C" and "1" attach push-on connectors to these points.

f) Replace light grey front cover.

g) Replace circular dial.

3.2.5 MINIMUM WATER SYSTEM PRESSURE

To comply with Guidance Note PM5 from the Health and Safety Executive the minimum static water pressure at the highest point in the circulating system must be calculated as follows:-

If the boilers are to be installed as single units the minimum pressure must be equal to the gauge pressure equivalent to the saturated steam temperature obtained by adding 17°C to the required boiler flow temperature but never less than 2 m (6.5 ft).

eg 1. Required Flow Temperature = 95°C
Safety Margin = 17°C

Equivalent Saturated Steam Temperature = 112°C

From Steam Tables - corresponding Gauge Pressure = 0.5 bar (7.3 psi)
= 5 m (16.8 ft) WC

If the boilers are to be installed in a modular formation (see Fig 2) the minimum pressure must be equal to the gauge equivalent to the saturated steam temperature obtained by adding 17°C to the sum of the required mixed flow temperature and the temperature rise across the boilers.

eg 2. Required mixed flow temperature = 82°C
Temperature rise across boilers (see Table 2) = 11°C
Safety Margin = 17°C

Equivalent Saturated Steam Temperature = 110°C

From Steam Tables: corresponding Gauge Pressure = 0.42 bar (6.1 psi)
= 4.3 m (14 ft) WC

eg 3. Required mixed flow temperature = 82°C
Temperature rise across boilers (see Table 2) = 22°C
Safety Margin = 17°C

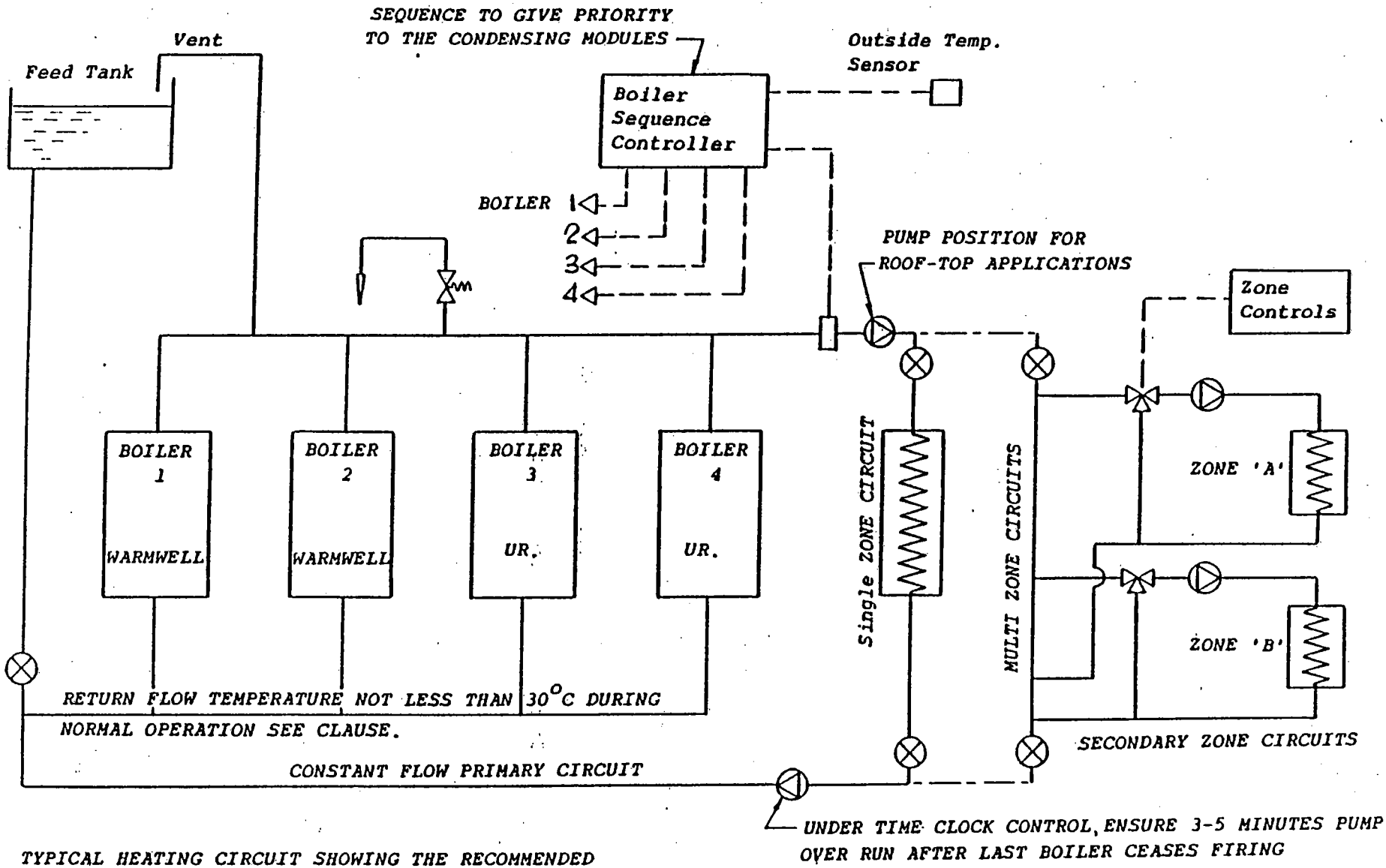
Equivalent Saturated Steam Temperature = 121°C

From Steam Tables: corresponding Gauge Pressure = 1.03 bar (15 psi)
= 10.5 m (34.6 ft) WC

3.2.6 PRESSURE RELIEF VALVE

The most important single safety device fitted to a boiler is its safety valve and each boiler, or in the case of modular installations, each bank of boilers, must be fitted with a pressure relief valve.

Clause 9 of BS 6644 provides comprehensive information for the selection and location of safety valves and attention is drawn to the higher capacity requirements of safety valves for pressurised hot water systems (ref - clause 9.1.3).



TYPICAL HEATING CIRCUIT SHOWING THE RECOMMENDED CONSTANT FLOW PRIMARY CIRCUIT, ALTERNATIVE SINGLE AND MULTI ZONE HEATING CIRCUITS AND PUMP POSITION FOR LOW HEAD ROOF TOP APPLICATIONS AND "REVERSE" FLOW AND RETURN CONNECTIONS TO BOILERS.

NOTE:- SUBJECT TO MEETING THE RECOMMENDED FLOWS, THE CONDENSING WARMWELL BOILERS MAY BE PARALLELED WITH THEIR NON CONDENSING UR EQUI ENTS.

3.2.7 OPEN VENT PIPE AND COLD FEED PIPE

Every boiler or group of boilers should have an open vent pipe and cold feed pipe installed between the boiler and the first water isolating valve. The sizes of these pipes per boiler is:

Open vent - 32 mm (1¼ in)
Cold vent - 25 mm (1 in)

For multiple boiler systems see BS 6644.

3.2.8 THERMOMETER

A thermometer complete with pocket should be fitted in the pipework to indicate water flow temperature.

Drain valves - drain valves complying with BS 2879 should be fitted to each boiler (or system) to facilitate drainage. Emptying time should be not more than 30 minutes.

3.2.9 CIRCULATING PUMP

One or more circulating pumps will be required to circulate the boilers and heating system. Fig 7 shows the hydraulic resistance of the boiler. Pumps should be sited to facilitate servicing.

3.2.10 WATER CONNECTION

Each boiler has one flow and one return tapping

The modules should be connected by flow and return headers but sufficient length of connecting pipe should be allowed to clear the casing before connecting into the headers. The headers should be connected to the system in a "reverse return" arrangement (the water flow in each header is in the same direction) to ensure equal flow in each module. See Figs 6 and 8.

Note: Header connections forced to "mate" can cause nipple leakage. Each isolatable module or bank of modules should be fitted with a drain cock to BS 2879 at the lowest point, a pressure relief valve and an open vent.

An altitude gauge and a temperature gauge should be fitted to the flow header beyond entry of the last module but before any take-offs to different circuits.

On filling, the system should be flushed out until satisfactory conditions are attained. This is especially true on an old system when only the boilers are being changed. If any doubts exist regarding the amount of matter in the system, a filter should be fitted on the return header. When full, remove air from the system and check for leaks and repair.

3.3 GAS

3.3.1 RELATED DOCUMENTS. Gas Safety Installations and Use Regulations 1984

It is Law that all gas appliances are installed by competent persons in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your own interest, and that of safety, to ensure that this law is complied with. (This paragraph is brought to your notice at the request of British Gas.)

The installation of the boiler must be in accordance with the relevant requirements of the Gas Safety Regulations, building regulations, IEE Regulations and the Byelaws of the local water undertaking.

It should also be in accordance with any relevant requirements of the local gas region and local authority and the relevant recommendations of the following documents:

British Standard Codes of Practice

BS 6891: Installation of low pressure gas pipework

BS 6644: Installation of Gas Fired Hot Water Boilers - 60 kW to 2 MW

GAS SUPPLY

3.3.2 SERVICE PIPES

The local gas region must be consulted at the installation planning stage in order to establish the availability of an adequate supply of gas.

An existing service pipe must not be used without prior consultation with the local gas region.

3.3.3 METERS

A new gas meter will be connected to the service pipe by the local gas region, or a local gas region contractor.

An existing meter should be checked, preferably by the gas region, to ensure that it is adequate to deal with the rate of gas supply required.

3.3.4 GAS SUPPLY PIPES

Supply pipes must be fitted in accordance with BS6891. Pipework from the meter to the boiler must be of adequate size. Do not use pipes of a smaller size than the boiler gas connection. The complete installation must be tested for soundness as described in British Gas Publication IM/5.

3.3.5 BOOSTED SUPPLIES

Where it is necessary to employ a gas pressure booster, the controls must include a low pressure cut-off switch at the booster inlet. The local gas region must be consulted before a gas pressure booster is fitted.

3.3.6 GAS CONNECTION

Connect the incoming gas supply to the gas cock on each module. The gas supply pipework should be run across the front of the boilers above the gas cock approximately level with the top of the boiler castings and connecting pipes dropped down to each cock. The union of the gas cock should always be on the burner side of the cock and the connection to the supply should not be forced. The gas supply pipework position is dictated by the knock-out in the side of the casing and this position should be checked as shown in Fig 2a. The gas supply pipework should be purged to ensure it is free from swarf and foreign matter before final connection and

3.4 ELECTRICAL

3.4.1 ELECTRICAL SUPPLY (See Clause 14.1 of BS 6644)

WARNING: THIS APPLIANCE MUST BE EARTHED.

Wiring external to the boiler must be installed in accordance with the IEE Regulations and any local regulations which apply. Wiring must be completed in heat resistant 3 core cable. (Size 1.0 square mm CSA). Boilers are normally supplied for 230/250 volts. 50 Hz fuse rating of each module is 2 amp. External fuses should be 5 amp for all single boiler/battery sizes.

A 5 amp fused isolator having a minimum contact separation of 3 mm on each pole must be utilised and consideration given to an additional thermostat for each module situated in the common flow header, unless a step-controller is fitted when instructions pertaining to the particular controller should be followed.

All electrical conduit and cable-trays etc, should be run at high level if possible and connection to each module following the same path as the gas pipework. This leaves the floor in front of the modules clear, and allows for removal and replacement of a module.

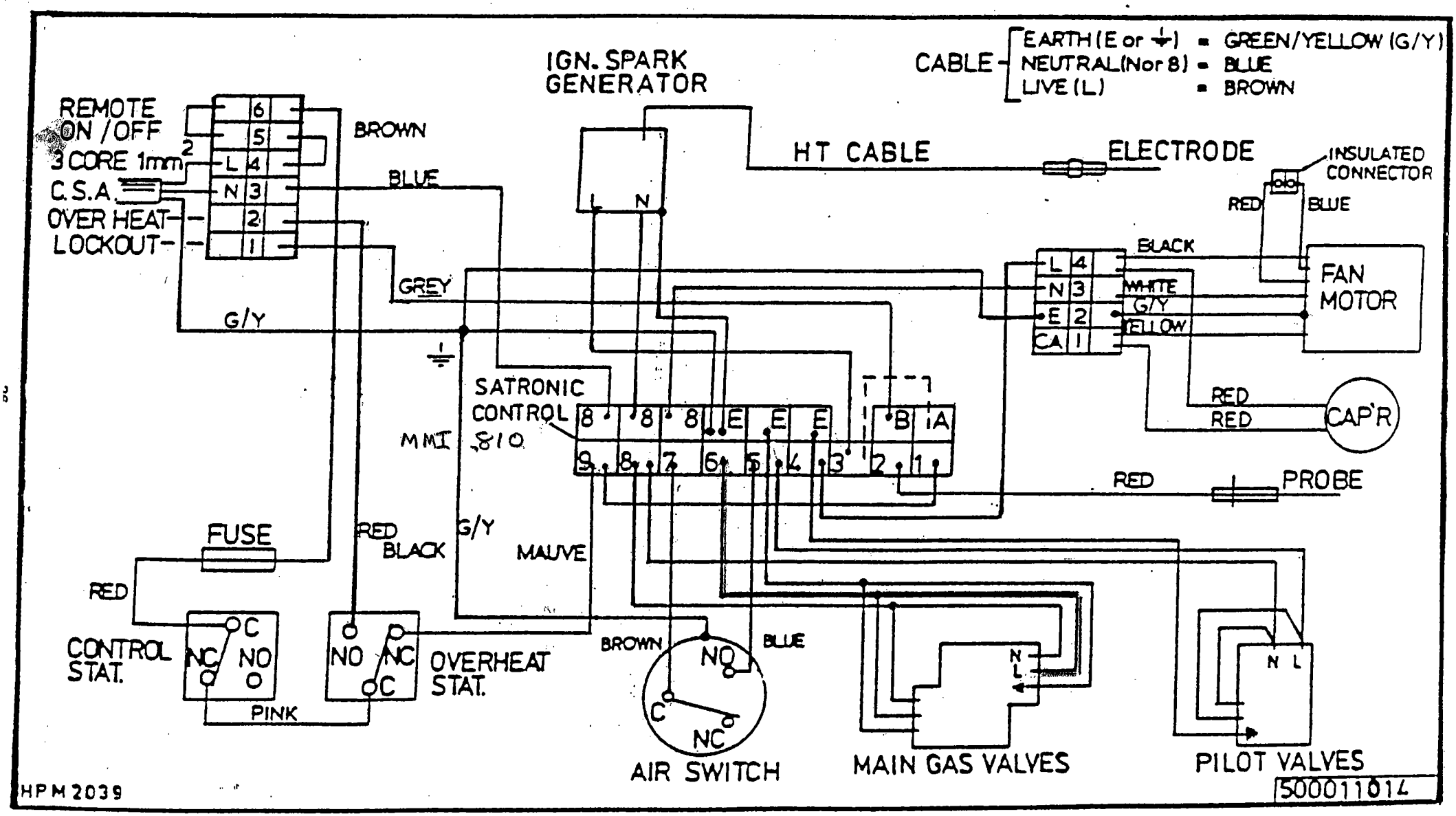
3.4.2 MAINS CABLE CONNECTION

The path of the mains cable is shown in Fig 10 for Auto models and Fig 10a for permanent pilot models - use heat resistant 3 core cable sizes 1.0 square mm CSA.

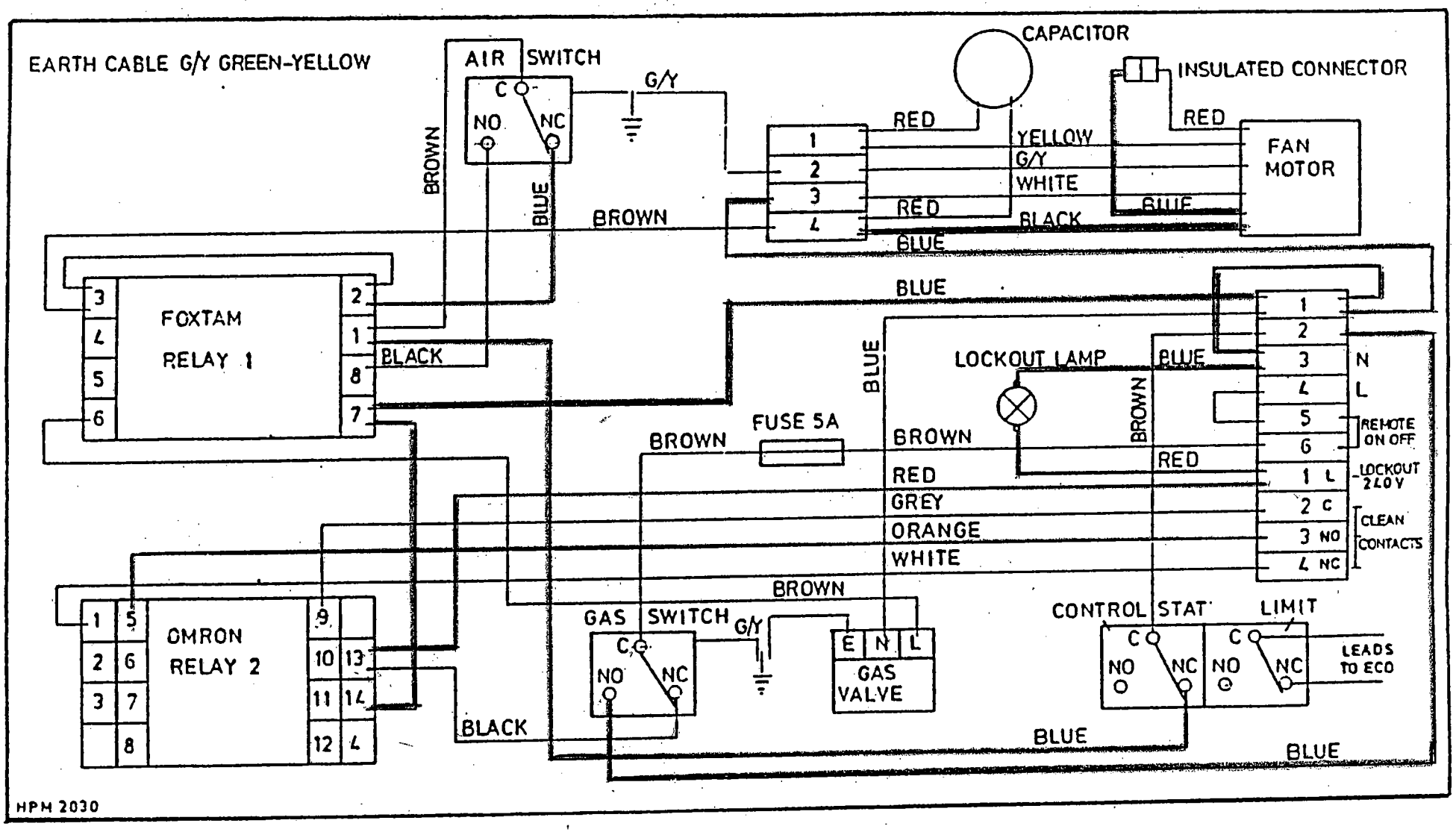
3.4.3 BOILER WIRING DIAGRAM

The boiler wiring diagram is shown in Fig 9 for auto models and Fig 9a for permanent pilot models. This wiring diagram is also found on each boiler cover.

AIR PRESSURE SWITCH SET AT 1.5 mbar.



WIRING DIAGRAM FOR WARMWELL AUTOMATIC SERIES BOILER fig 9



WIRING DIAGRAM FOR WARMWELL PERMANENT PILOT SERIES BOILER fig.9a

4.0 AIR SUPPLY

Detailed recommendations for air supply are given in BS 6644.

The following notes are intended to give general guidance. In all cases there must be provision for an adequate supply of air for both combustion and general ventilation.

4.1 AIR SUPPLY BY NATURAL VENTILATION

The purpose provided space, housing the boiler must have, or be provided with, permanent air vents communicating directly with the outside air, at high level and at low level. Where communication with the outside air is only possible by means of high level air vents, ducting down to floor level for the lower vents should be used. For an exposed boilerhouse, air vents should be fitted preferably on all four sides, but at least on two sides. Air vents should have negligible resistance and must not be sited in any position where they are likely to be easily blocked or flooded or in any position adjacent to an extraction system which is carrying flammable vapour. Grilles or louvres must be so designed that high velocity air streams do not occur within the space housing the boiler.

The air supply requirements stated below are equivalent to those specified in BS 6644. For Natural or Mechanical Ventilation.

The opening shall be fitted with grilles or negligible resistance and shall be sited so that they cannot be easily blocked or flooded. The grilles shall have a total minimum free area as follows:-

Low level (inlet) 540 cm^2 plus 4.5 cm^2 per Kilowatt in excess of 60 kW total rated input.

High level (inlet) 270 cm^2 plus 2.25 cm^2 per Kilowatt in excess of 60 kW total rated input.

4.2 AIR SUPPLY BE MECHANICAL VENTILATION

The supply of air to a space housing the boiler by mechanical means should be by mechanical inlet with natural or mechanical extraction. Mechanical extract ventilation with natural inlet must not be used. Where a mechanical inlet and a mechanical extract system is applied, the design extraction rate should not exceed one third of the design inlet rate.

NOTE: For mechanical ventilation systems an automatic control should be provided to cut off the gas supply to the boiler, in the event of failure of air flow in either inlet or extract fans.

Type of boiler	Flow rate per 1000 kW total rated heat input	
	Inlet air (combustion ventilation)	Extract air (ventilation)
	m^3/S	m^3/S
Natural draught boilers	1.10	0.45
Forced/induced draught boilers	0.90	0.60

Table 3 Mechanical ventilation flow rates

5.0 FLUES

Detailed recommendations for flue systems are given in the British Gas Publication IM 11 "Flues for Commercial and Industrial gas fired boilers and air heaters". Reference should also be made to BS 6644 where applicable.

The following notes are intended to give general guidance only.

5.1 CONDENSING BOILER FLUES

Flue gas temperatures leaving a traditional atmospheric boiler will be typically of the order of 200-250°C and their resultant buoyancy is used to balance the resistance of gases through the boiler and flue systems. With condensing boilers, the gases to be vented are at much lower temperatures which for all practical purposes can be assumed to be equal to the return water flow temperature to the boiler. Additionally, exhaust gases will be leaving the boiler in a saturated or near saturated condition and continuous condensation on the flue walls is to be expected.

5.2 FLUE GAS TEMPERATURE

Due to the sensitivity of a condensing boiler to the system return flow temperature, its flue gas temperature, unlike a traditional atmospheric appliance, will fluctuate widely. On start-up, gases may be only a few degrees above ambient however, under inside/outside temperature compensation control when the return flow temperature to the boilers could be as high as 85°C, the exhaust gas temperature would be at least equal to the return flow temperature and more practically, some 10 degrees higher. To counter this effect, the Warmwell boiler has been designed with spare fan capacity to overcome flue resistance up to a maximum of 0.1" wg. It is therefore recommended that flue design discounts the buoyancy effect of gas temperature but using the simple procedure shown below ensures that the cold air resistance of the flueways does not exceed 0.1 in wg (25 Pascals). On this basis of calculation any buoyancy that the gases may have, becomes a bonus.

5.3 VOLUME AND DUCT LOSSES

The CO_2 levels of the flue gases leaving the condensing section of the boiler will be typically 9%. However this is reduced to approximately 5% CO_2 (106/114 model) and 3-4% CO_2 (75/80 model) by the introduction of dilution air after heat exchanger. For flue calculation purposes, the volume of the flue gases leaving both boilers can be assumed to be 0.08 m^3/sec at 15°C which, in a 200 mm diameter flue, will result in a cold flue velocity of 2.5 m/sec and a velocity pressure (Pv) of 3.75 Pascals. The total flue loss for a single 200 mm I/D flue per boiler may be calculated from equation 1 and it is stressed that the sum of all losses must not exceed 25 Pascals (0.1 in wg). K factors (pressure loss co-efficients) for duct fittings are available in duct and flue system references.

Flue calculation for 200 mm I/D ducts

TOTAL DUCT LOSSES = Pv K + 0.5 L (Pa)

where K = Pressure loss factor for duct fittings
Pv = Velocity pressure = 3.75 Pa
L = Total duct length in metres
0.5 = Pressure loss per metre of duct Pa/m

THE SUM OF ALL LOSSES MUST NOT EXCEED 25 Pa

Example:-

Single flue duct with 2 Mitred elbows (K = 0.36), 2 metres horizontal, 5 metres vertical. Pressure loss factor at exit (K = 1), duct inside dia. 200 mm.

Total losses = 3.75 (2 x 0.36 + 1) + 0.5 x 7 Pa
= 9.95 Pa

5.4 DUCT INSULATION

As the Warmwell flue system design has been based on cold air with no allowances for flue gas buoyancy, insulated flues are not essential, however it is stressed that continuous condensation must be assumed and flueways should be designed accordingly. The recommendations and requirements for Warmwell flues may therefore be summarised as follows:-

5.5 RECOMMENDATIONS AND REQUIREMENTS

a) It is recommended that each individual condensing boiler has its own flue.

b) Exhaust gases will be leaving the condensing boiler in a saturated or near saturated condition and condensation must be anticipated.

c) Flueways should be designed with continuous falls to low points where they must be trapped and drained and all joint sockets should face upwards.

d) As the flueways will be under slight positive pressure (up to possibly 25 Pascals [0.1 in wg]) escaping vapours will condense on outer skins. All joints should therefore be suitably sealed.

e) Flues must be constructed in non-corrodible materials eg, acid resistant stainless steels, aluminiums etc, and attention should be given to the avoidance of accumulations of condensate in crevices and joints.

f) Flues should be as short as practically possible, and short radius bends avoided.

g) Horizontal flue sections make no contribution to buoyancy however, where they are essential to the design, it is important that they should have a continuous slope towards the boiler.

Terminals accentuate the formation of plumes which are to be expected from condensing flues however, provided the flue has been designed for good drainage, a flue terminal is not essential. Nevertheless it may be necessary to fit a wire screen to prevent the ingress of debris.

5.6 DISCONNECTION

Facilities should be made for disconnecting the flue pipe from the boiler for inspection and servicing purposes. Bends with removable covers should be fitted for inspection and cleaning as appropriate.

NOTE: The flue system must be self supporting.

5.7 FLUE DILUTION SYSTEMS

Flue dilution systems are ideally suited to the flueing of combined condensing and non condensing appliances. The very high excess air levels of some 10 times that of a traditional flue, reduces the flue gas dew point to almost that of air thus reducing the level of condensation in the duct to little more than a traditional non condensing installation. For further information on flue dilution systems see British Gas Publication IM/11 - Flues for Commercial and Industrial Gas Fired Boilers and IM/22 - Installation Guide for High Efficiency Condensing Boilers. (Industrial and Commercial Applications.)

6.0 COMMISSIONING

Before attempting to commission any boiler or module ensure that personnel involved are aware of what action is about to be taken and begin by making the following checks:-

a) flueway passages to the chimney are clear

b) flueway passages in the boiler are all clear and clean

c) adequate ventilation, as per Table 3, exists in the boiler house

d) the system is fully charged with water, ready to receive heat, all necessary valves are open and the pump is running and circulating water

e) the pipework and valve arrangements are to Hamworthy recommendations

f) the gas supply pipework is clear of any loose matter, tested for soundness and purged to CP 331/3.

6.1 MODULE CHECKS

On each module, before attempting to light, check:-

a) Gas supply is connected but turned off, cock is closed; unions are tightened, test point caps are secure, burners are correctly positioned and the injectors are tight.

b) Sensing lines from the flue hood are secure at their sampling points and are connected, without twists or kinks to the air pressure switch.

c) Electricity is connected but ensure supply is switched off. The cables from the controller are connected to the relevant valves, fan motor and pressure switch, and the thermostat bulbs are inserted into the pocket with the securing clip in place.

d) The spark generator is mounted securely to the inside front casing panel, the spark electrode is fitted correctly and undamaged, the H.T. cable is undamaged and fitted securely and correctly to the electrode and spark generator.

e) The flame probe is fitted correctly and undamaged and the cable is sound between the probe and the controller base.

f) The fan motor is secure to its mounting, the capacitor is correctly held by the clip provided and the air pressure switch is securely mounted and undamaged.

g) The relays are secure in their bases and the ECO leads are secure at the valve and thermostat. (Permanent pilot models only).

6.2 PROCEDURE FOR INITIAL LIGHTING AND ADJUSTMENT

6.2.1 Auto Models

i) Adjust thermostats to desired settings (ref section 3.2.4) and check time-clock circuits (if fitted) are closed.

ii) Press reset button on control box and depress button on overheat cut-off device (high limit thermostat) - then "switch on" mains electrical supply to the appliance. If a "lockout" condition occurs in the control box when the appliance is first "switched on" (indicated by the control box reset button illuminating orange), this will clear if the reset button is pressed.

WARNING: If a "lockout" condition occurs during the commissioning and running of the boiler, a "reset" should not be attempted without investigating the cause of the "lockout".

Providing the air switch contacts are in the "no air" position the control box will then initiate the start-up sequence which commences with the running of the fan/exhaust unit. During this pre-purge period (lasting 10-15 seconds) the air proving switch contacts will close allowing the ignition device and pilot valves to be energised at the end of the purge period.

Providing the start gas (pilot) flame is established and detected by the flame probe (safety time up to 5 seconds) the spark generator will be de-energised and the main gas valves will open.

6.2.2 Permanent Pilot Models

i) Switch the mains electrical supply to the boiler off

ii) Turn all thermostats to minimum setting (boiler thermostat has off position marked by symbol).

iii) Ensure that the main gas cock has been turned off for at least 5 minutes before attempting to light boiler - then open cock.

iv) Light pilot burner by repeatedly pressing the button on the piezo unit whilst holding the WHITE start button on the control valve (see Fig 12b), fully depressed. Hold white button in for 20 seconds after the pilot is lit before releasing. The pilot burner should remain alight but if it is extinguished, push in the RED stop botton, wait 3 minutes, then repeat.

v) If the pilot does not light after several seconds of repeatedly operating the piezo unit, re-vent the gas line to the outside of the building and check whether both spark and gas are present at the pilot (the WHITE button must be depressed fully).

vi) The pilot can also be ignited by applying a lighted taper to the pilot burner utilising the small hole in the front of the plate (see Fig 13a).

vii) Having established the pilot, release the start button and remove the pilot adjustment cover screw on the control valve (see Fig 12b). Adjust the screw beneath anti-clockwise to obtain optimum flame. The pilot flame should be predominantly blue with little or no yellow tipping. (Replace cover screw.)

viii) After pilot adjustment, check time clock circuits (if fitted) are closed and switch on power supply to the appliance. Adjust thermostats to the required temperature and providing that the air switch contacts are in the "no air" position and the pilot gas pressure switch contact is made, the fan will commence its purge. After approx. 10-15 seconds, the air proving switch contacts will have closed and the main gas valve will open to ignite the main burner.

ix) Relay R_2 is powered to the lock-out condition when the contacts of the gas switch are "broken" and volt free change over contacts are available for external alarms..

6.3 GAS PRESSURE CHECKS

After the boiler has operated for approximately 10 minutes switch off the mains electrical supply, remove the gas pressure test point screw cap on the burner manifold and slacken the test point screw on the downstream boss of the low flame start gas valve, (pilot) connect to suitable manometer and switch the module back on, and measure the gas setting pressures.

Check reading against pressure required by referring to table 1 "Technical Data" or appliance data badge (positioned on front of exhauster unit near pressure switch) and adjust if necessary as follows.

i) Automatic Models

a) Low Flame Start Gas (Pilot) Valve Remove governor cap from the valve assembly, and turn adjusting screw beneath, clockwise to increase and anticlockwise to decrease the pressure (see Fig 12A). Replace screw cap.

b) Main Gas Valve - Burner Adjustment Remove the small metal screw of the step-opening regulator (see fig 12a) and turn the adjusting screw beneath, clockwise to increase and anti-clockwise to decrease the pressure. Replace screw cap.

ii) Permanent Pilot Models

Remove cap from governor (see fig 12b) and turn nylon screw beneath, clockwise to increase and anti-clockwise to decrease the pressure. Replace governor cap.

Remove the manometers and ensure that the test point screw caps are replaced and tightened.

Allow system to warm up and check operation of all thermostats and other controls.

6.4 COMBUSTION CHECKS

NOTE: It is advisable to make a combustion check during initial commissioning. A flue gas sampling point is not provided but it is suggested that a hole of sufficient size, to allow entry of the sampling probe, is drilled in the flue outlet approximately 225-300 mm (9-12 inches) above the collector hood.

For Natural Gas:

NOTE: THESE READINGS WILL BE FOR DILUTED PRODUCTS

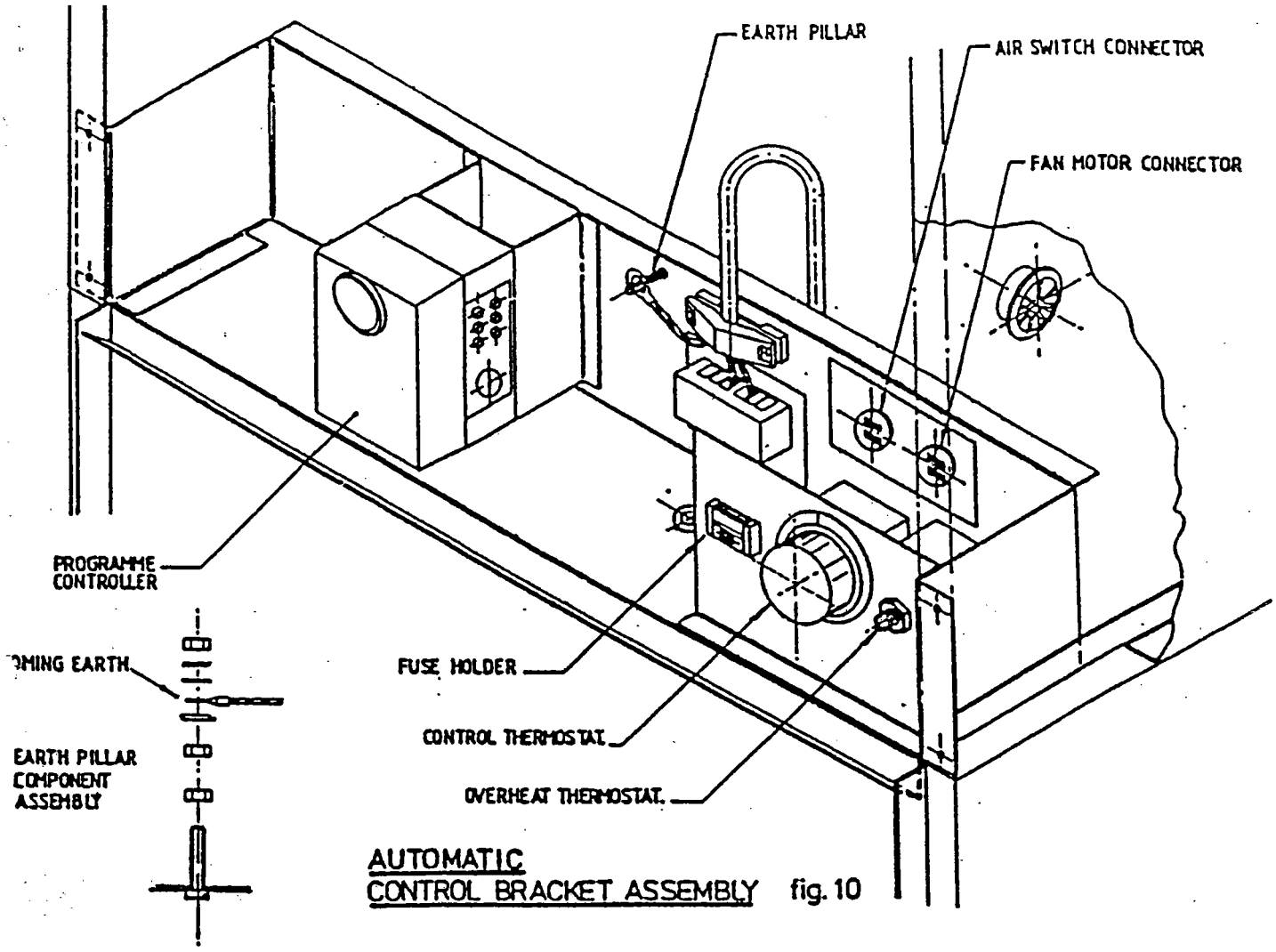
Normal Carbon Dioxide (CO_2) = 5-6% by Volume (106/114 model) or 3-4% by Volume (75/80 model)

Normal Carbon Monoxide (CO) should not exceed 200 ppm or 0.02% by Volume.

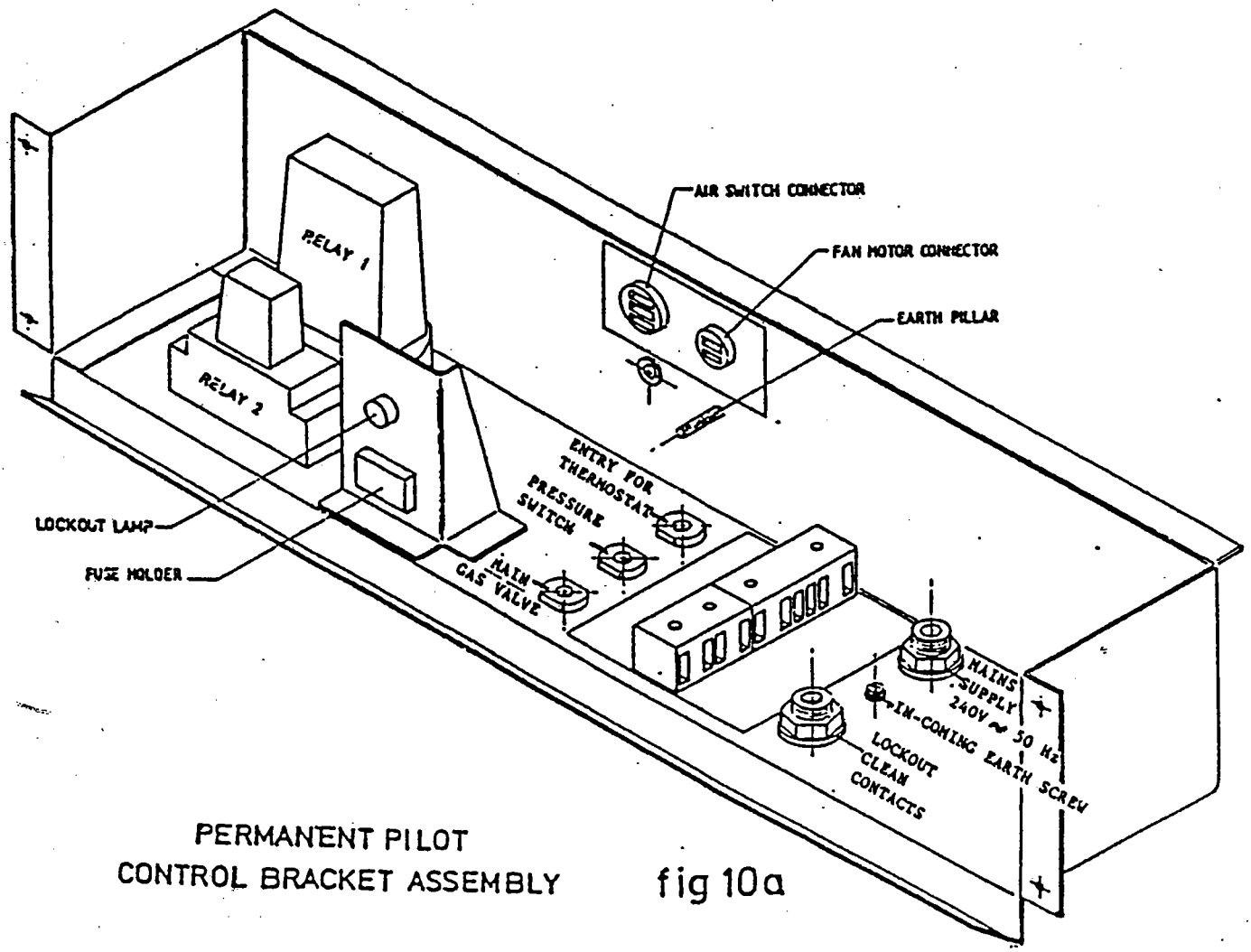
6.5 SYSTEM LEAKS CHECK

Although the boiler receives a gas leak check prior to leaving the factory, transport and installation may cause disturbance to unions and fittings and during commissioning a further test for soundness should be carried out on the boiler gas pipework taking great care not to allow soapy water on or near any electrical parts or connections.

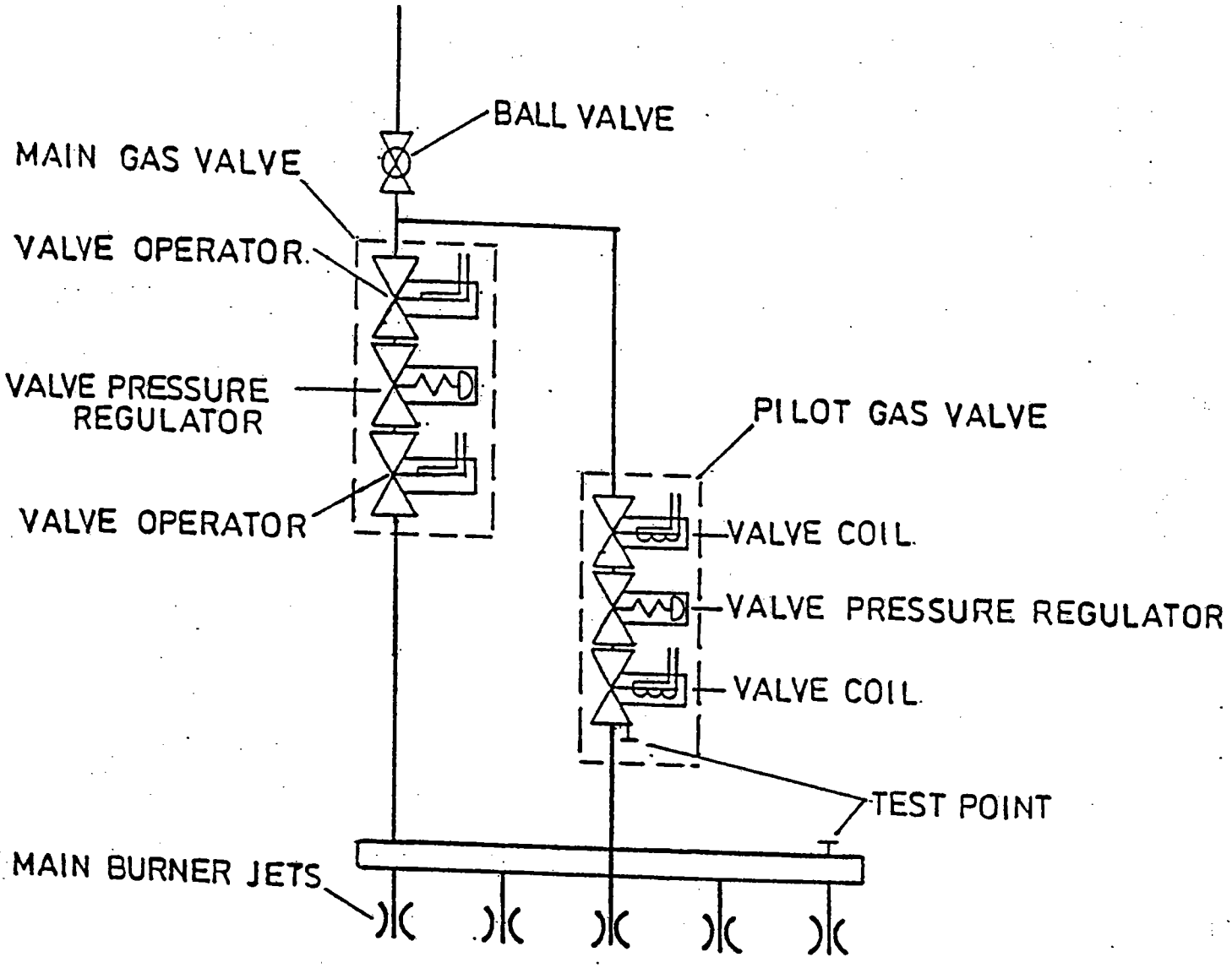
Upon satisfactory completion of the initial lighting and adjustment all subsequent operations involving light-up and shut down should follow the procedure set out on the lighting-up instructions located on the lower inner front casing panel of the boiler and on the users card which should be left with the user or purchaser. Explain to the 'users' the method of economic and efficient operation of the system, and ensure that they are fully conversant with lighting, shutdown and general operation procedures.



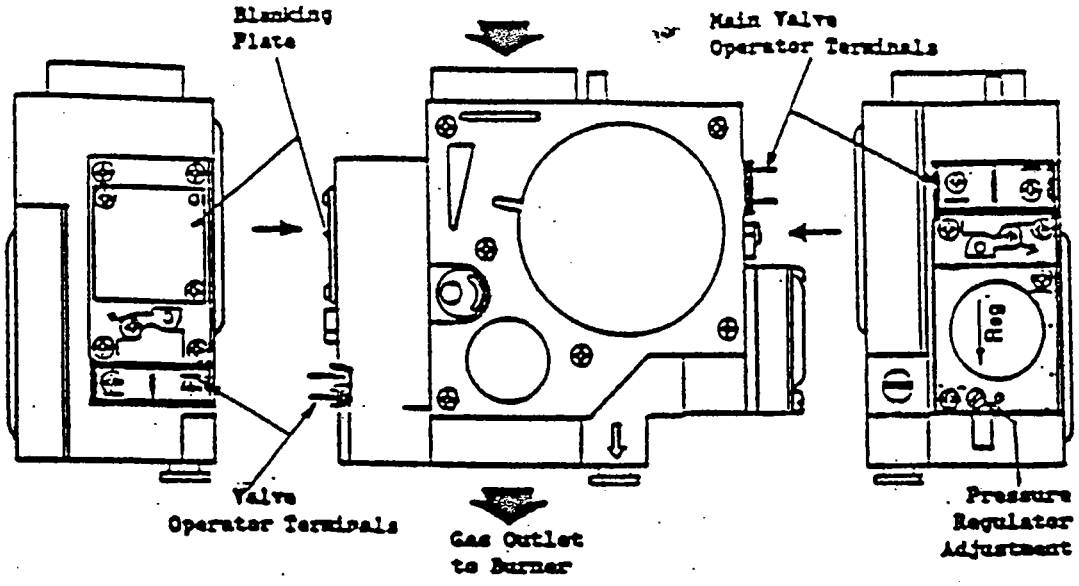
AUTOMATIC
CONTROL BRACKET ASSEMBLY fig. 10



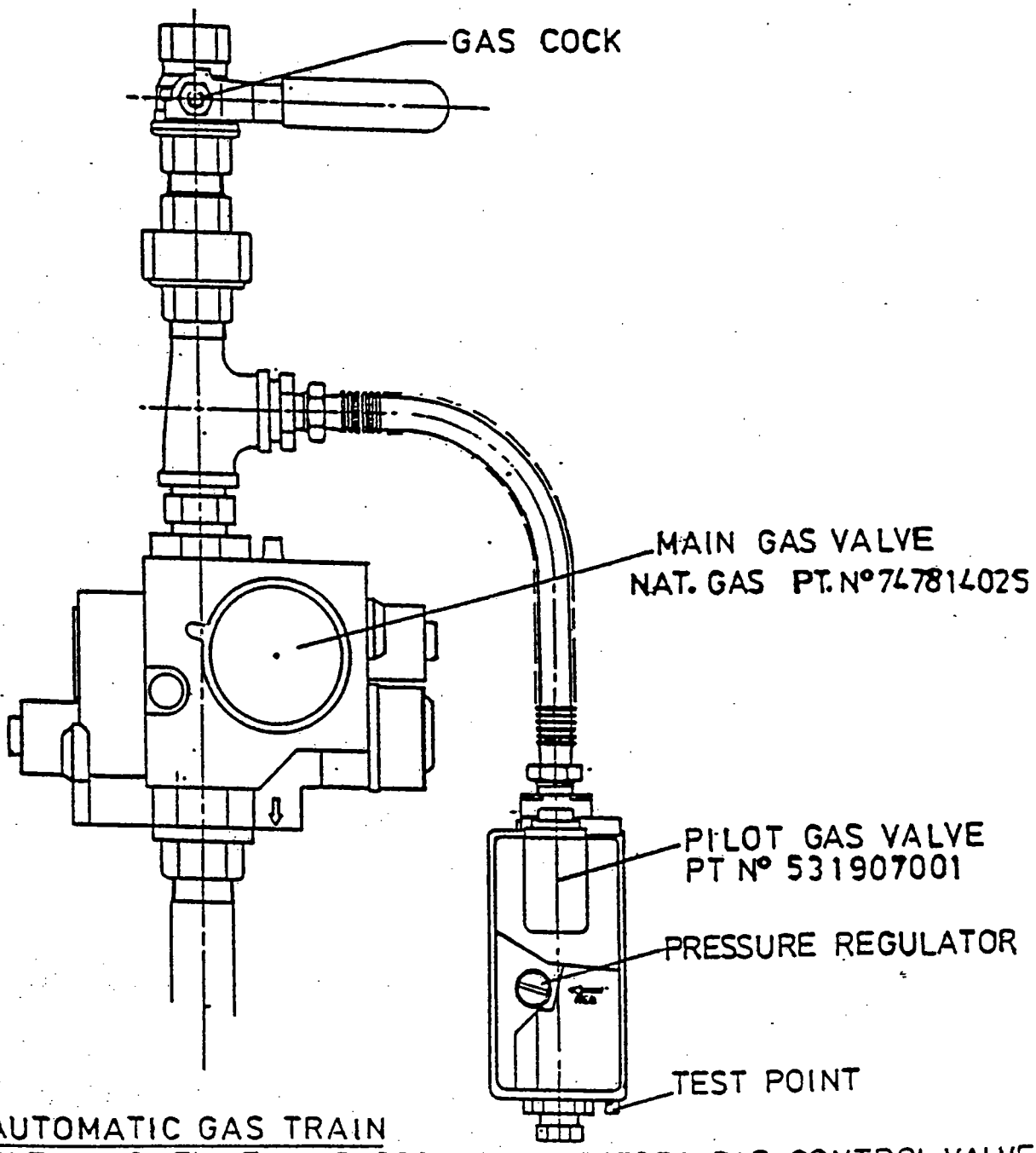
PERMANENT PILOT
CONTROL BRACKET ASSEMBLY fig 10a



AUTOMATIC GAS TRAIN SCHEMATIC fig.12

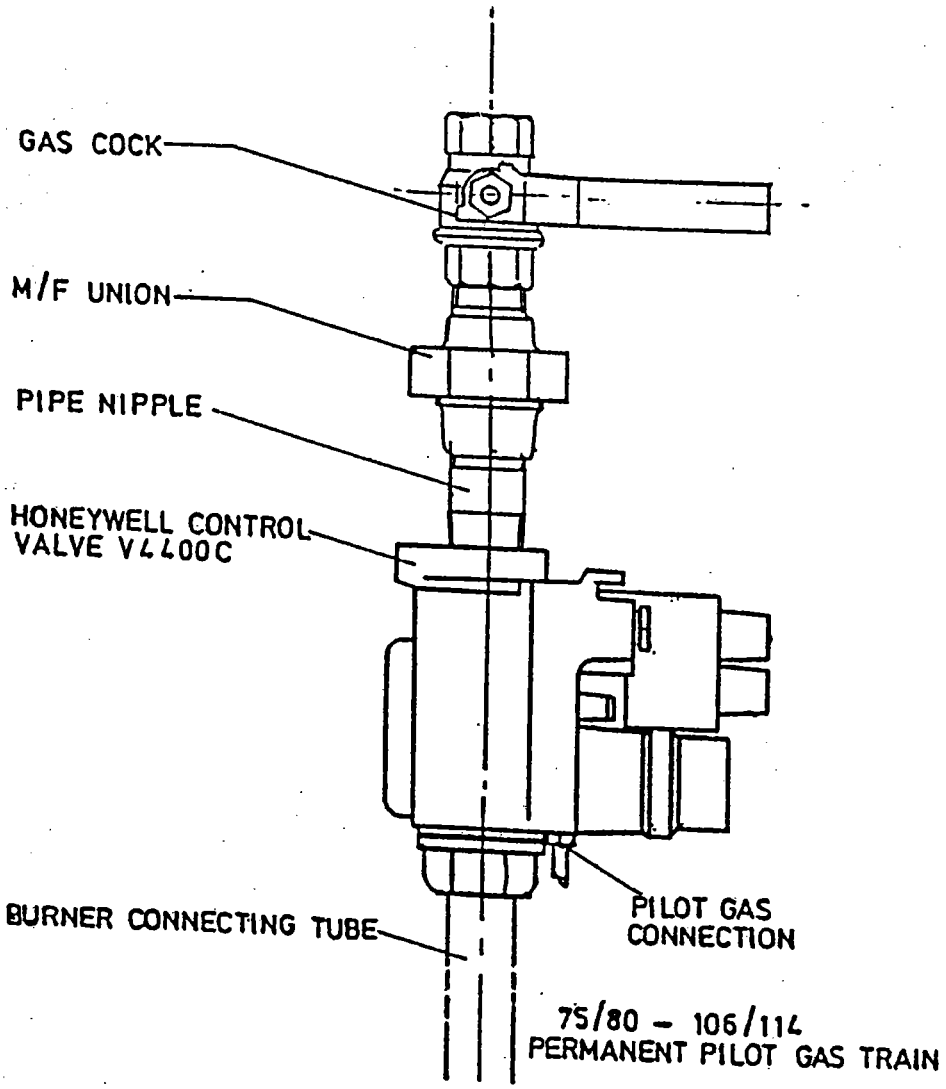


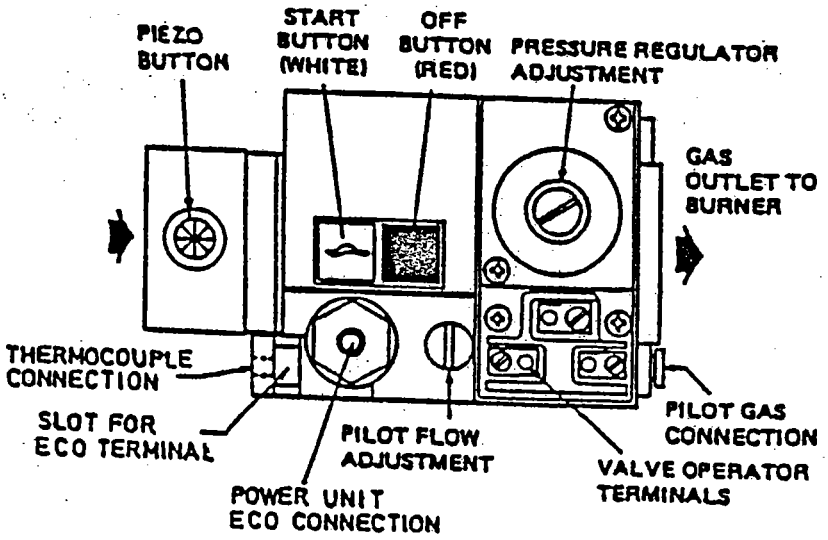
HONEYWELL VR4900C 3/4" GAS CONTROL VALVE



AUTOMATIC GAS TRAIN
WITH HONEYWELL VR4900C AND VR4705A GAS CONTROL VALVES

fig 12a





HONEYWELL V4400C SOFTLITE ¾" GAS CONTROL VALVE

75/80–106/114 PERMANENT PILOT GAS TRAIN
WITH HONEYWELL V4400C GAS CONTROL VALVE fig.12 b

7.0 FAULT FINDING

7.1 SUMMARY OF SAFETY FEATURES

Auto Models

1. Flame failure during a run, results in burner shut-down and lockout within 1 second.
2. Failure to establish and detect flame during the light-up sequence, results in burner shut-down and lockout within 2 – 5 seconds from the initial release of fuel.
3. Air supply failure at any time, results in burner shut-down and immediate lockout.
4. The air pressure proving switch, is checked in both the "no air" and "air supply proved" positions.
   From the initial start up of the burner fan motor, a period of 5 seconds is allowed by the control box for the pressure switch to detect a combustion air supply.
5. Restoration of the power supply after an interruption, results in a full light-up sequence to safely restart the burner. Power failure after a lockout, will not interfere with this condition when the supply has been restored.
6. False flame signals at the start point and during pre-purge result in burner shut-down and lockout.
7. The light-up sequence can only commence providing the cam switches and relay contacts within the control box are at their correct relative positions, and continuity of the lockout relay circuit is proved.

Permanent Pilot Models

a) Failure to establish or detect pilot flame results in tripping of the safety latch of the thermocouple relay within the valve body - preventing any gas from passing through the main valve.

b) Failure of pilot at any time results in loss of pressure at the gas pressure switch and subsequent changing of contacts to energise the lock out relay. This relay is wired in parallel to a lock out lamp which will be illuminated if power supply to the boiler remains on. The relay contacts can be used to operate any remote alarms/lamps etc via clean contacts.

c) The air proving device is checked in both its "no air" and "air proved" conditions. Failure to satisfy these checks results either in prevention of start-up or safety shutdown.

7.2 FAULT FINDING

7.2.1 Auto Models

1. Burner will not start.
   Coloured programme indicator stopped on blue line in white sector.
   a) Check electrical supply is switched on.
   b) Check that thermostat circuit is "calling for heat" and timeswitch circuit (if fitted) is made.
      A supply on terminal 9 will determine this.
   c) Check that the start circuit loop across terminals 9 and 1 is made.

2. Burner will not start.
   Synchronous motor runs, coloured programme indicator rotates but burner does not start.
   Check air pressure proving switch is in correct state ie. "no air" position.

3. Burner starts but goes to lockout.
Programme indicator stopped on red line in blue sector.
a) Check air pressure proving switch. Connections at terminals 5 & 7.
b) Check that a load, eg. start gas valve is connected to terminal 4.
c) Check continuity of start gas coil winding.
d) Check for flame simulation or false flame signal.

4. Burner starts but goes to lockout.
Coloured programme indicator stopped in blue sector.
a) Check for combustion air supply failure.
b) Check for flame simulation, if necessary, change control box.
c) Check for continuity of start gas valve coil circuit.

5. Burner starts, flame established but control box goes to lockout.
Coloured programme indicator stopped at end of yellow sector/start of red sector.
a) Check polarity of wiring for Live and neutral to control box base. Live to terminal 9, Neutral onto terminal 8.
b) Check that flame detection probe is in contact with flame.
c) Check that burner is effectively earthed and bonded to the incoming earth wire from the mains supply.
d) Check that flame probe insulator is not cracked. A cracked insulator will be sufficient to give rise to an a.c. leakage current.
e) Check that flame probe is not in contact with other metallic parts of the burner.
f) Check for interference to the flame signal from the ignition spark. This can be determined by measuring the flame signal current with a dc micro-ammeter. The meter must be connected between terminal 2 and the wiring to the flame probe. Correct polarity of the meter connections must be observed, with the positive side of the meter connected onto terminal 2 at the control box wiring base. If flame is established and the meter tends to move in a reverse direction, this can be an indication that the ignition is causing interference to the flame signal. It may also be an indication that there is insufficient earth contact with the flame.
For reference the pilot signal current should be 8 to 10 μA and the main gas sigal current 15-20 μA.
g) Change the control box if necessary.

6. Burner starts, flame established but control box goes to lockout.
Coloured programme indicator stopped in red sector.
Check that when main gas valve has been switched on, the change in combustion or flame characteristics has not causased the flame to "lift off" the combustion head and hence allow the flame probe to lose contact with the flame.

7. Burner starts, runs but subsequently goes to lockout.
Coloured programme indicator stopped at end of green/start of white sector.
a) Check for interruption in gas supply.
b) Check for failure of combustion air supply failure.
c) Check flame probe position for proper contact with flame.
d) Check flame probe insulator for soundness.
e) If necessary, change control box.

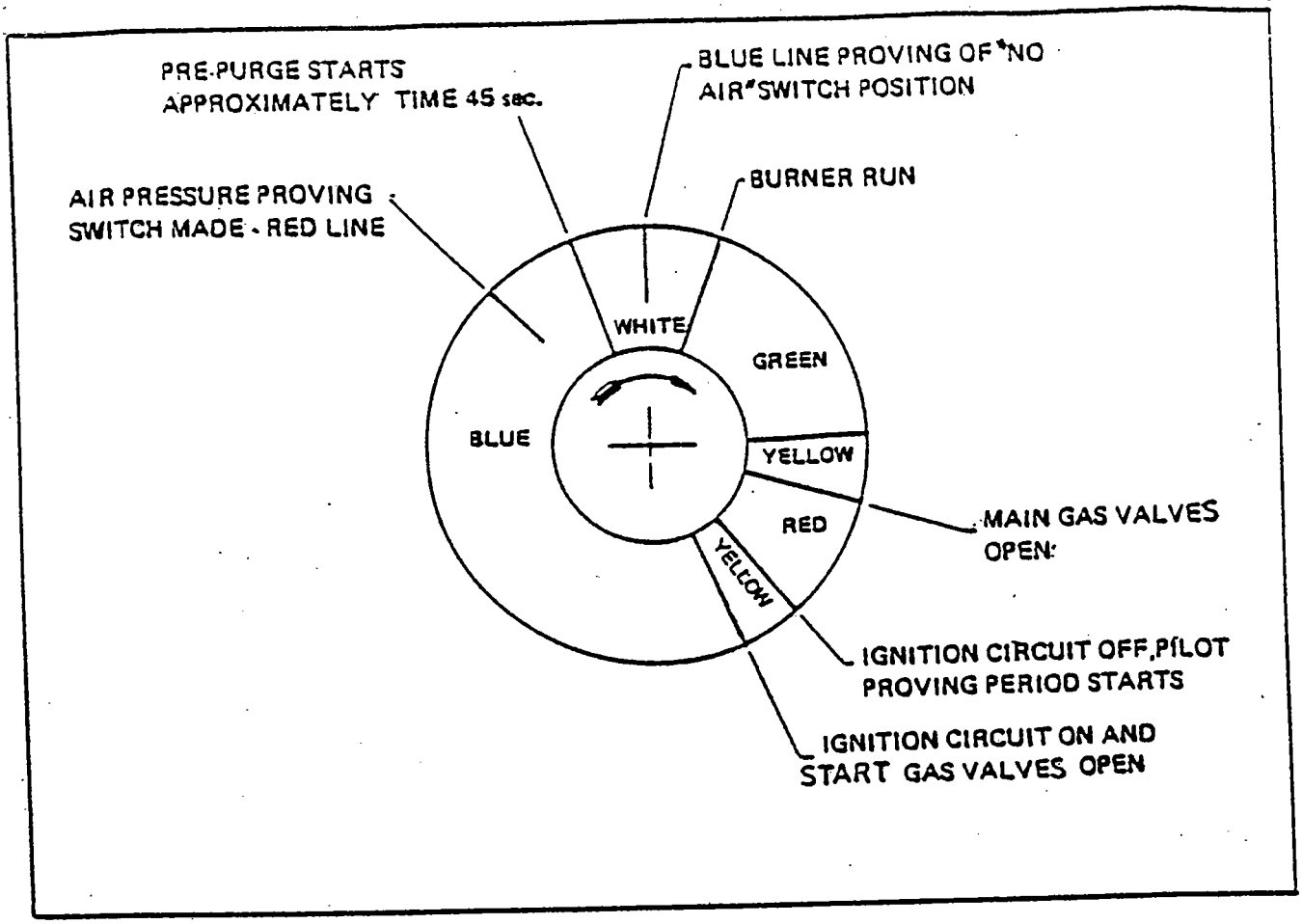
3. Burner starts but goes to lockout.
Programme indicator stopped on red line in blue sector.
a) Check air pressure proving switch. Connections at terminals 5 & 7.
b) Check that a load, eg. start gas valve is connected to terminal 4.
c) Check continuity of start gas coil winding.
d) Check for flame simulation or false flame signal.

4. Burner starts but goes to lockout.
Coloured programme indicator stopped in blue sector.
a) Check for combustion air supply failure.
b) Check for flame simulation, if necessary, change control box.
c) Check for continuity of start gas valve coil circuit.

5. Burner starts, flame established but control box goes to lockout.
Coloured programme indicator stopped at end of yellow sector/start of red sector.
a) Check polarity of wiring for Live and neutral to control box base. Live to terminal 9, Neutral onto terminal 8.
b) Check that flame detection probe is in contact with flame.
c) Check that burner is effectively earthed and bonded to the incoming earth wire from the mains supply.
d) Check that flame probe insulator is not cracked. A cracked insulator will be sufficient to give rise to an a.c. leakage current.
e) Check that flame probe is not in contact with other metallic parts of the burner.
f) Check for interference to the flame signal from the ignition spark. This can be determined by measuring the flame signal current with a dc micro-ammeter. The meter must be connected between terminal 2 and the wiring to the flame probe. Correct polarity of the meter connections must be observed, with the positive side of the meter connected onto terminal 2 at the control box wiring base. If flame is established and the meter tends to move in a reverse direction, this can be an indication that the ignition is causing interference to the flame signal. It may also be an indication that there is insufficient earth contact with the flame.
For reference the pilot signal current should be 8 to 10 μA and the main gas sigal current 15-20 μA.
g) Change the control box if necessary.

6. Burner starts, flame established but control box goes to lockout.
Coloured programme indicator stopped in red sector.
Check that when main gas valve has been switched on, the change in combustion or flame characteristics has not caused the flame to "lift off" the combustion head and hence allow the flame probe to lose contact with the flame.

7. Burner starts, runs but subsequently goes to lockout.
Coloured programme indicator stopped at end of green/start of white sector.
a) Check for interruption in gas supply.
b) Check for failure of combustion air supply failure.
c) Check flame probe position for proper contact with flame.
d) Check flame probe insulator for soundness.
e) If necessary, change control box.



Sequence Controller Programme Indicator Coloured Disc.

CAUSES OF LOCKOUT

If the control box goes to lockout, it is generally performing the function it is designed for.

Causes of lockout can be -

a) No ignition, ignition electrode incorrectly positioned or cracked insulator.

b) No gas supply.

c) Poor combustion.

d) Flame probe incorrectly positioned, cracked insulation, flame probe in contact with earth, moisture present on probe affecting insulation.

e) Live and Neutral connections reversed.

f) Inadequate earth contact with flame.

g) Ignition interference to flame signal.

h) Start Gas valves not properly closed in shutdown position.

i) Faulty control box.

j) High temperature "lock out" - (press green thermostat reset button).

7.2.2 Permanent Pilot Models

Burner will not start.

a) Check that pilot burner is alight and enveloping the tip of the thermocouple.

b) Check for electrical supply to terminal '2' on 6-way terminal block. (This will check that gas pressure switch has changed over and fuse is intact.)

c) Check for electrical supply to terminal '1' on time delay relay base. (This will check that control stat is calling for heat.)

d) Check for electrical supply to terminals '2' and '3' on time delay relay base (this will only be "live" if the air switch is in the "no air" position.)

e) If all of these checks prove satisfactory then the capacitor, motor or associated wiring must be under suspicion.

Burner motor (fan) runs continuously.

a) Check that air switch contacts have changed to "air proved" position and that electrical supply is present at terminal '8' of the time delay relay base. (If not - suspect air switch or sensing line.)

Burner will not light.

a) Check electrical supply voltage is present at terminal '6' of the time delay relay base (a delay of 10 seconds for the making of contacts is in-built).

b) Check for supply voltage at gas valve operator - if present, valve is suspect.

Cause of lock out

a) Loss of gas pressure - pilot diminished or lost.

b) Thermocouple suspect - check all contacts including ECO leads.

c) High temperature cut-out device tripped - relight pilot burner.

d) Gas switch contacts not changed over - check switch.

e) Gas valve not totally closed - suspect seat fouling.

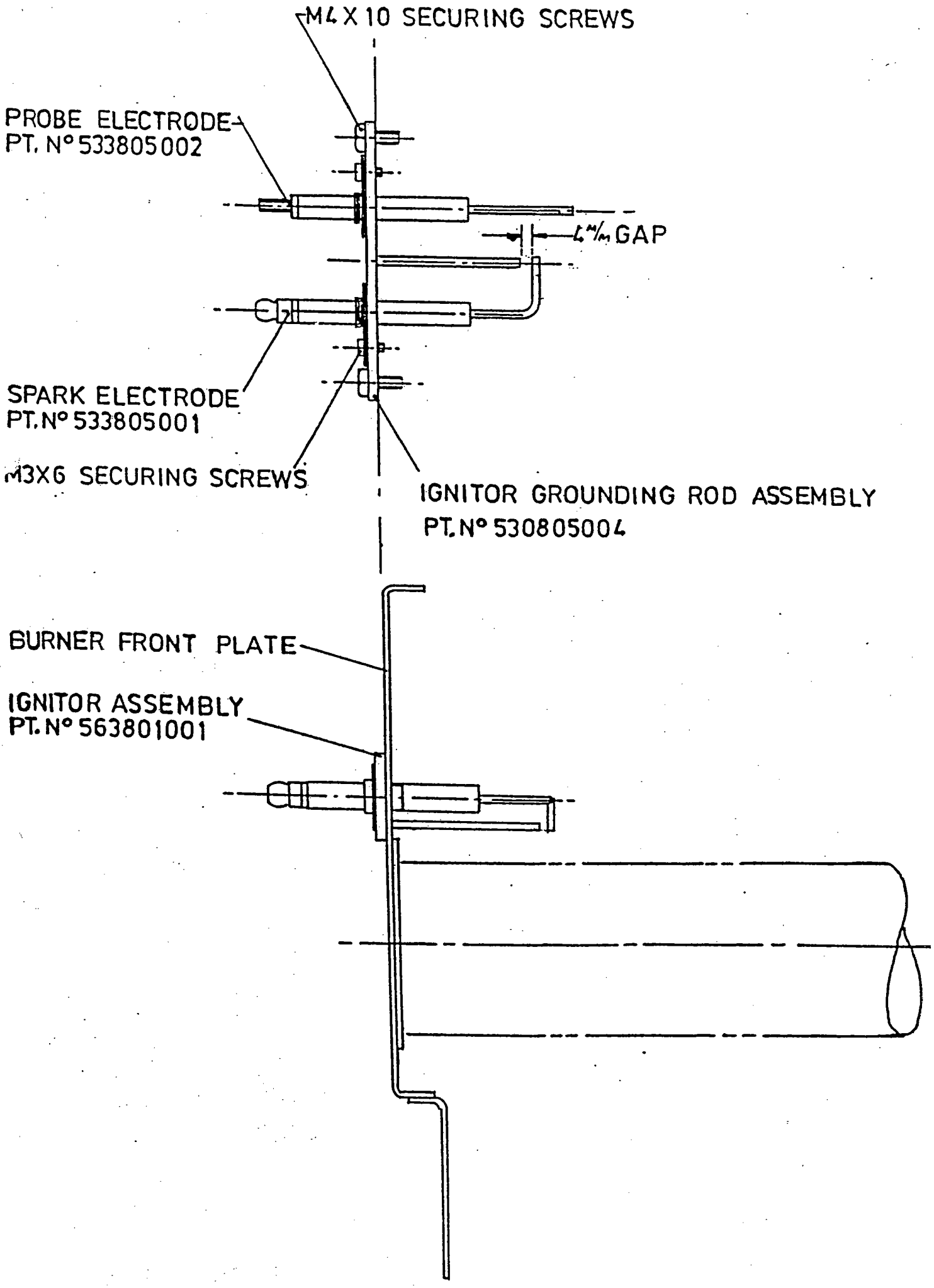
8.0 SERVICING

Regular annual servicing is recommended. Although cleaning of flueways may not be necessary every year it is important that all controls and safety features are checked for correct operation.

WARNING ISOLATE THE ELECTRICAL SUPPLY AND TURN OFF THE GAS SERVICE COCK TO THE MODULE BEING SERVICED.

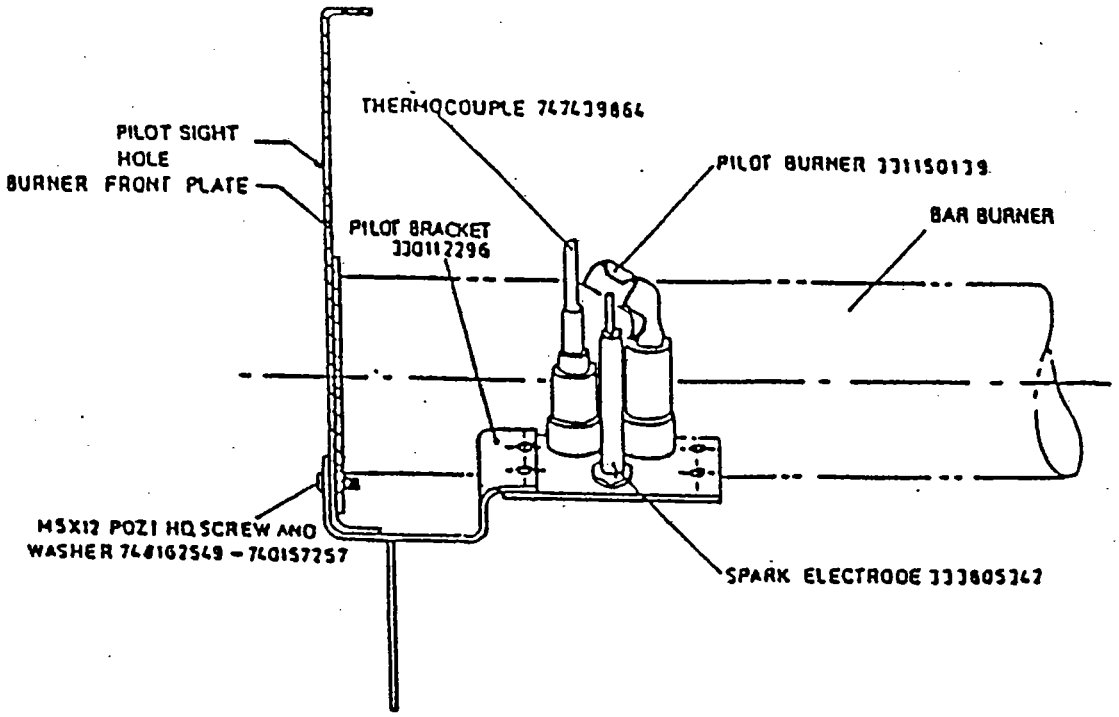
Lift off the lower white casing door to expose the burner system. Pull off the upper white casing door to gain access to the condensing section, air switch and fan motor assembly.

With the service cock off - disconnect the union below it.



FULLY AUTOMATIC BURNER IGNITOR ARRANGEMENT

fig.13



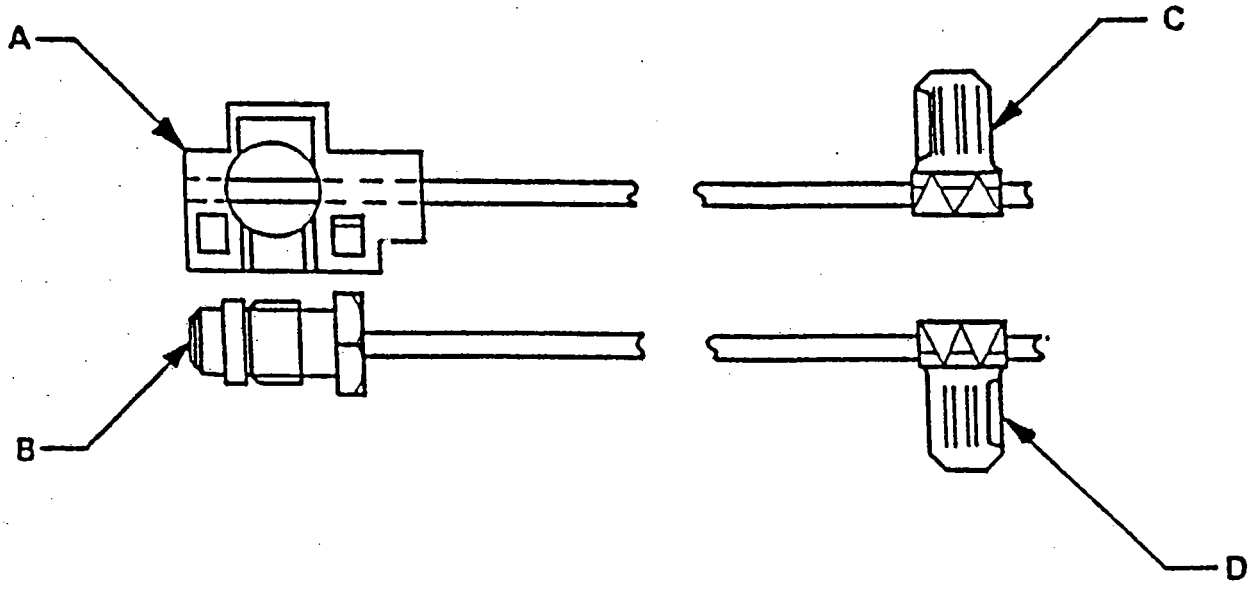
PILOT BURNER ASSEMBLY (PERMANENT PILOT) fig.13 a

Installation of Energy Cut-off Connectors

1) Fit preformed plastic terminal A into the slot provided in the control valve see Fig12 b and insert the thermocouple tip into the threaded connection hole. Tighten the attachment nut with a wrench only ¼ to ½ turn beyond finger tight ensuring that the thermocouple tip engages with the exposed cable in the plastic terminal of the E.C.O. lead.

2) Insert the tip of terminal B into the power unit connection on the control valve see Fig12 b. Tighten the attachment nut with a wrench only ¼ to ½ turn beyond finger tight.

3) Connect spade terminals C and D to the terminals of the overheat cut-off device (high limit thermostat). See Fig. 9a



ENERGY CUT-OFF CONNECTORS (PERMANENT PILOT) fig.14

SERVICING CONT:-

Auto Models

With the power supply off - disconnect the electrical cables to the valves (inside grey covers on LH valve and start gas valve - over centre burner).

At the igniter assembly, disconnect the red cable to the flame probe by pulling off the crimp connector and pull off the HT cap from the RH electrode (see fig 13).

Remove front lower casing tie bar (2 x No. 8 S/T screws).

Slacken and remove the four M6 nuts and washers securing the burner front plate (one either side and two beneath). Release "U" clamp retaining the gas supply pipe to the burner manifold. The complete burner system can now be carefully pulled forward and removed. Check and clean burners with a brush if necessary and inspect ignitor assembly, spark electrode, flame probe and injectors for soundness and cleanliness (see fig 13).

Remove the two sections of the casing top which encircle the flue outlet. Check that the flue system above is self-supporting and remove the slip-collar.

Remove clip securing the thermostat bulbs/capillaries and carefully withdraw bulbs from pocket ensuring that the "contact spring" is removed and retained for later re-fitting. Lift up the inner-front casing panel and carefully remove from its locating slots in the side panels.

Remove all screws securing upper casing assembly and remove entire casing from around condensing section includng the control assembly which must be disconnected from the secondary heat exchanger at the bulk head spades and earth pillar. The appliance insulating jacket can now be removed by releasing the velcro strips at front and back and also the support strap over the top. Carefully unwrap the jacket and place to one side for safety.

Remove the 8 x M8 nuts and washers from the two covers at the sides of the collector/adaptor, taking care not to damage the inset insulation panels, to gain access to the boiler gas passages. Lift and remove the retarder baffle grid located on top of the cast iron boiler section.

The boiler flueways are now exposed and can be brushed through diagonally in both directions, using a brush, to remove any deposits from the finned surfaces.

Remove the 4 x 8 mm nuts and washers securing the flue hood to the top of the condensing section and carefully lift off from the studs. This now exposes the distribution grid which should be inspected for cleanliness and cleared as necessary (take care not to damage in any way the grid or seal strip around the edge).

Remove the 16 x M6 pozi-head screws securing the condensing section side panels and remove to gain access to the finned tube bank. These tubes can now

be cleared by using a brush. Examine the joint seals and replace if damaged or suspect (seal for side panels no. 331214083).

Disconnect and remove the condense discharge tube secured to the collector/adaptor at the rear of the module. Ensure that tube and adaptor pipe are free from obstruction and refit.

Inspect the flue hood assembly and ensure that the fan volute (built in) and impellor are clean and in good condition. Check air switch sensing lines are clear and that the pressure pick up points are free from debris etc.

NOTE; New sealing braid should be fitted around collector/adaptor side plates before assembly and any other damaged or suspect seals/joints replaced.

Lift and remove the floor reflector from beneath the boiler and clean off fallen deposits. Renew if damaged.

Replace and re-assemble all components.

Re-light module in accordance with lighting up instructions.

Permanent Pilot Models

With the power supply off disconnect electrical cable at multi-functional valve. Disconnect the energy cut-off unit by removing the thermocouple at the valve end, and pulling out the cable complete with pre-formed plastic terminal (see fig 14). Disconnect the second ECO cable at the valve by unscrewing the connection into the power unit.

Remove front lower casing tie bar (2 x No 8 S/T screws).

Slacken and remove the four M6 nuts and washers securing the burner front plate (one either side and two beneath). Release "U" clamp retaining the gas supply pipe to the burner manifold. The complete burner system can now be carefully pulled forward and removed (take care not to damage the pilot burner assembly during this movement). Check and clean burners with a brush if necessary and inspect pilot burner, spark electrode, flame probe and injectors for soundness and cleanliness (see fig 13a).

Remove the two sections of the casing top which encircle the flue outlet. Check that the flue system above is self-supporting and remove the slip-collar.

Slacken the screw securing the thermostat (located at side of pocket) and carefully withdraw bulbs from pocket. Lift up the inner-front casing panel and carefully remove from its locating slots in the side panels.

Remove all screws securing upper casing assembly and remove entire casing from around condensing section including the control assembly which must be disconnected from the secondary heat exchanger at the bulk head spades and earth pillar. The appliance insulating jacket can now be removed by releasing the velcro strips at front and back and also the support strap over the top. Carefully unwrap the jacket and place to one side for safety.

Remove the 8 x M8 nuts and washers from the two covers at the sides of the collector/adaptor, taking care not to damage the inset insulation panels, to gain access to the boiler gas passages. Lift and remove the retarder baffle grid located on top of the cast iron boiler section.

The boiler flueways are now exposed and can be brushed through diagonally in both directions, using a brush, to remove any deposits from the finned surfaces.

Remove the 4 x 8 mm nuts and washers securing the flue hood to the top of the condensing section and carefully lift off from the studs. This now exposes the distribution grid which should be inspected for cleanliness and cleared as necessary (take care not to damage in any way the grid or seal strip around the edge).

Remove the 16 x M6 pozi-head screws securing the condensing section side panels and remove to gain access to the finned tube bank. These tubes can now be cleared by using a brush. Examine the joint seals and replace if damaged or suspect (seal for side panels no. 331214083).

Disconnect and remove the condense discharge tube secured to the collector/adaptor at the rear of the module. Ensure that tube and adaptor pipe are free from obstruction and refit.

Inspect the flue hood assembly and ensure that the fan volute (built in) and impellor are clean and in good condition. Check air switch sensing lines are clear and that the pressure pick up points are free from debris etc.

NOTE: New sealing braid should be fitted around collector/adaptor side plates before assembly and any other damaged or suspect seals./joints replaced.

Lift and remove the floor reflector from beneath the boiler and clean off fallen deposits. Renew if damaged.

Replace and re-assemble all components.

Re-light module in accordance with lighting up instructions.

RECOMMENDED SPARES

HAMWORTHY HEATING PART NUMBER		DESCRIPTION
339009345	Auto - All	Control Thermostat - L & G
339011044	Auto - All	Overheat cut-off device (limit stat) L & G
747246236	Auto - All	Sequence Controller - Satronic MM1 810 TF1 852 B
533901007	Auto - All	Spark Generator
530805004	Auto - All	Igniter Grounding Assy
533805001	Auto - All	Spark electrode
533805002	Auto - All	Flame probe
563901011	Auto - All	Flame probe lead
330512511	106/114	420 injector (PP)
532902001	106/114	440 injector (Auto)
330512362	75/80	320 injector (Auto & PP)
333811100	All	Main burner
331299233	All	Collector/adaptor joint to boiler (rope-braid)
333806407	All	Insulation slab - front
333806217	All	Insulation slab - rear
333806266	All	Insulation slab - side
333806258	All	Floor insulated reflector
339007612	All	Insulation hanger - pin and clip
339008347	All	Injector washer (copper/fibre)
747146550	All	Air pressure switch - Dungs
747801253	All	Capacitor - fan motor
747704317	All	Fan motor/impellor assembly
330401384	All	Air inlet grille
331214075	All	Gasket/fan mounting plate
331214083	All	Gasket/seal - condenser side panel
331214067	All	Gasket/seal - exhauster unit
331214091	All	Gasket/seal - collector/adaptor to condenser
332495723	All	Sensing tube - exhauster to switch mounting plate
332495699	All	Sensing tube - switch mounting plate to air switch
339012661	All	Tube adaptor - plastic - straight
339012513	All	Tube adaptor - plastic angled
331299233	All	Sealing braid - side plate of collector/adaptor
333806662	All	Insulation slab - adaptor side covers
531907001	Auto All	Pilot Valve - Honeywell VR4705A
747814025	Auto All	Control valve - Honeywell VR4900C
747809942	PP - All	Control valve - Honeywell V4400C

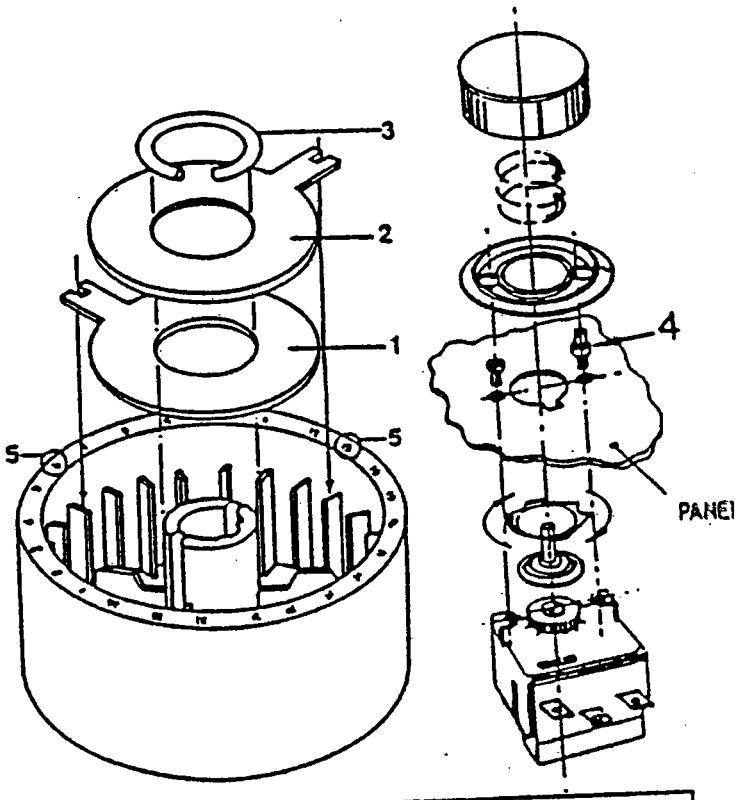
HAMWORTHY HEATING PART NUMBER		DESCRIPTION
747433891	PP - All	Twin Aquastat - Honeywell
747701727	PP - All	Spark Generator (impact type)
363801609	PP - All	Pilot Burner (Honeywell) c/w bracket
747439864	PP - All	Thermocouple
333805342	PP - All	Spark electrode c/w lead
	PP - All	Lockout relay (14 pin)
	PP - All	Delay Relay (8 pin)
747436241	PP - All	Lockout neon (red)
339006960	All	Fuse - 5A
363913180	PP - All	Energy cut-off connector c/w leads
742111245	PP - All	Control valve "O" ring
339009477	PP - All	Gas pressure switch - LDQ 023064

Adjusting the limitation of angle of rotation
Only for thermostats with drum type setting knobs

1. Pull the setting knob off the thermostat spindle.
2. Remove the spring clip (3) and limit stop discs (1) and (2) from inside the setting knob.
3. Insert limit stop disc (1) into the setting knob so that its stop arm locks onto that rib having the guide number (5) which corresponds to the start value of the desired setting range.
4. Insert limit stop disc (2) in the same manner, but this time choosing the rib and guide number which corresponds to the end value of the desired setting range.
5. Replace spring clip (3), thus securing the limit stop discs.
6. Push the setting knob back on to the thermostat spindle so that the stop screw (4) is located within the selected setting range.
7. Rotate the setting knob to the limit stops of both ends of the scale to check the adjusted range against the setting scale.

A. Desired start value of the new setting range in °C. Corresponding guide number for limit stop disc (1).

B. Desired end value of the new setting range in °C. Corresponding guide number for limit stop disc (2).



Setting range °C	Limit stop disc Nr.	Guide Nr. (5)	1	3	5	7	9	11	13	15	17	19	21	23	25	27
50...110	1	A	50	55	60	65	70	75	80	85	90	95	100	105	110	-
	2	B	-	50	55	60	65	70	75	80	85	90	95	100	105	110
80...130	1	A	-	80	85	90	95	100	105	110	115	120	125	130	-	-
	2	B	-	-	80	85	90	95	100	105	110	115	120	125	130	-

Appendix 1. Control Thermostat Setting Procedure