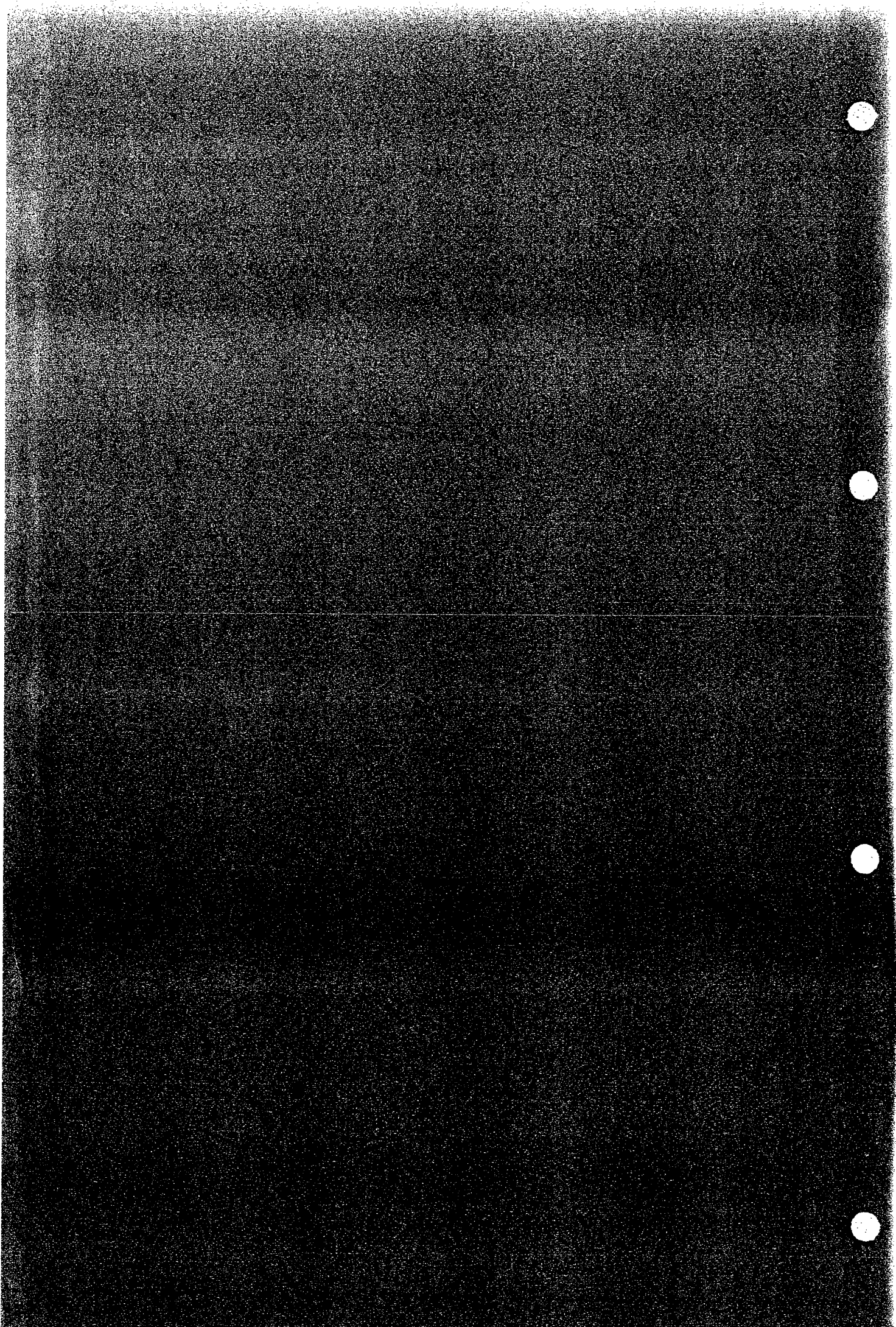


Installers Guide for
DR 35—90 Series
Hot Water Storage
Heaters

Part No. 33551730



DR.35

DR.50

DR.70

DR.90

**HOT WATER STORAGE HEATERS
FOR DOMESTIC HOT WATER**

**INSTALLATION AND COMMISSIONING
INSTRUCTIONS
FOR USE WITH NATURAL GAS ONLY**

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DELIVERY

All heaters are factory assembled and delivered individually packed in a stout cardboard carton and on a wooden pallet with a separate draught diverter.

The exterior casing of the heater is coated with a protective plastic coating which should be peeled off following installation.

To check the size of the heater, refer to the rating label which is attached to the heater casing and mounted directly beneath the junction box assembly.

DESCRIPTION

The Hamworthy DR Series is a range of fully automatic hot water storage heaters designed exclusively for the preparation of hot water and fired by a number of atmospheric multi-gas stainless steel burner bars. The gas control valve and burner bars can be removed from the heater as a complete gas train assembly, being mounted above a tray and positioned beneath the combustion chamber at the base of the heater.

Flue gases from the combustion chamber enter the draught diverter via a number of vertical fire tubes which are individually retarded to ensure maximum heat transfer to water. The draught diverter must be fitted to the heater in an unmodified condition, and provides a horizontal flue outlet connection which is adjustable through 360° in the horizontal plane. The diverter locates on a spigot on the heater flue connector dome and is secured with a stainless steel fixing clamp.

The interior vessel of the heater consists of a fully welded, pressure tested, storage vessel which is thermoglazed with a high quality glass lining on all waterside surfaces. This, together with two removable sacrificial anodes, provides the best possible protection against corrosion. The vessel is fully insulated and is covered by a sheet steel casing.

The connections provided are cold water inlet, hot water outlet, re-circulation with a drain cock, and inspection/cleaning out door.

Automatic water outlet temperature regulation is by means of a control thermostat which for normal operation should be set to a value not exceeding 60°C. Overheat protection is provided by a "dual" limit thermostat (thermal re-set type), one side of which is connected to the main gas valve and the other to the pilot valve via an energy cut-off thermocouple interrupter.

The heaters are manufactured in four sizes, DR.35, DR.50, DR.70 and DR.90, are floor mounted and are designed for providing hot water for commercial and industrial premises. They can be installed in single or multiple units, and are designed to be used in conjunction with one or more Hamworthy ST. Storage Tanks which are available in capacities ranging from 200-1500 litres (44-330 gal).

The hot water storage heaters are British Gas approved (G.C. Nos. 55-351-01, 55-351-02, 55-351-03, 55-351-04), and listed by the National Water Council. The Storage Tanks and their associated electrical wiring do not come within the scope of the British Gas Approval Scheme nor is it required for them to do so.

TECHNICAL DATA

Refer to Table 1.

RELATED DOCUMENTS

The installation of the heater must be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations and the Byelaws of the Local Water Undertaking.

It should also conform with any relevant requirements of the Local Gas Region and Local Water Authority and the relevant recommendations of the following documents:

British Standard Codes of Practice

- CP 331 : Installation of pipes and meters for Town Gas.
Part 3 : Low pressure installation pipes.
- CP 332 : Selection and installation of Town Gas Space Heating.
Part 3 : Boilers of more than 150,000 Btu/h (44 kW)
and up to 2,000,000 Btu/h (586 kW) output.
- CP 342 : Centralised Hot Water Supply.
Part 1 : Individual Dwellings.
Part 2 : Buildings other than Individual Dwellings.

B.S.3456: The Testing and Approval of Domestic Electrical Appliances.
Part 1. Clause 27.3.

B.S.5440: Code of Practice for Flues and Air Supply for Gas Appliances.

British Gas Publications

Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters IM/11.

LOCATION

The heater location should be such that a satisfactory flue system can be connected. An adequate air supply must be provided for combustion and ventilation and sufficient space for servicing provided.

The heater must be installed on a level concrete floor or plinth which is sufficient to support its weight when filled with water (Reference Table 1).

Any combustible material adjacent to the heater and flue system must be so placed or shielded so as to ensure that its temperature does not exceed 65°C (150°F).

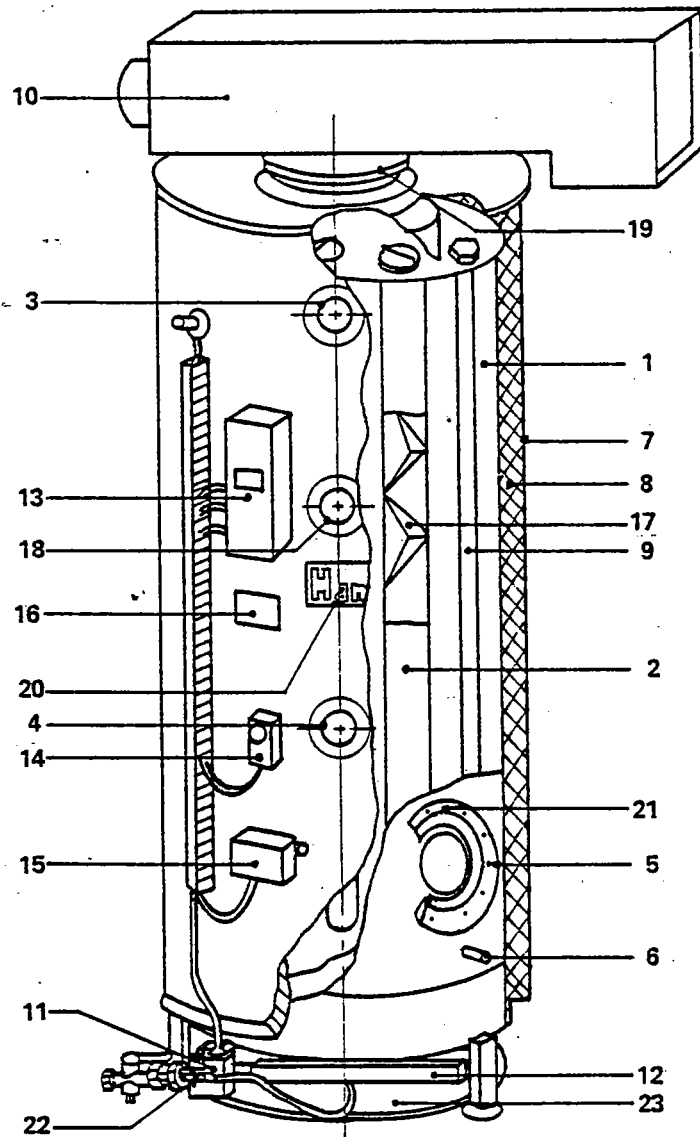
Further details regarding heater location are given in CP 332 : 3.

TABLE 1 – TECHNICAL DATA

MODEL	DR.35	DR.50	DR.70	DR.90
Input (Gross)	45.8 kW	65.3 kW	91.4 kW	116.7 kW
	156,300 Btu/h	222,800 Btu/h	311,900 Btu/h	398,200 Btu/h
Output	33.40 kW	48.50 kW	66.30 kW	87.60 kW
	113,900 Btu/h	165,500 Btu/h	226,100 Btu/h	299,000 Btu/h
Weight (filled)	534 kg	539 kg	549 kg	550 kg
	1178 lb	1189 lb	1211 lb	1212 lb
Maximum Working Head	53 m	53 m	53 m	53 m
	174 ft.	174 ft.	174 ft.	174 ft.
Nominal Inlet gas pressure to the appliance	17.5 mbar	17.5 mbar	17.5 mbar	17.5 mbar
	7 in. w.g.	7 in. w.g.	7 in. w.g.	7 in. w.g.
Maximum gas inlet pressure	50 mbar	50 mbar	50 mbar	50 mbar
	20 in. w.g.	20 in. w.g.	20 in. w.g.	20 in. w.g.
Gas burner operating pressure	10.30 mbar	11.30 mbar	13.7 mbar	12.8 mbar
	4.10 in. w.g.	4.5 in. w.g.	5.5 in. w.g.	5.10 in. w.g.
Injector diameter	3.3 mm	3.3 mm	3.3 mm	3.70 mm 4 inner bars 3.10 mm 2 outer bars
	0.130 in.	0.130 in.	0.130 in.	0.146 in. 4 inner bars 0.122 in. 2 outer bars
Injector marking	330	330	330	370 4 inner bars 310 2 outer bars
Number of burner bars	3	4	5	6
Nominal Flue Size (Diameter)	130 mm	150 mm	175 mm	225 mm
	5 in.	6 in.	7 in.	9 in.
Capacity	325 litres	315 litres	300 litres	260 litres
	71.5 gal	69.3 gal	66 gal	57.2 gal
Recovery Rate Raised Through 44°C (80°F)	650 l/h	945 l/h	1286 l/h	1733 l/h
	143 gal/h	208 gal/h	283 gal/h	381 gal/h

SECTIONED VIEW — DR.35—90 WATER HEATER FIG. 1

1. Inner Vessel
2. Fire Tube
3. Hot water connection
4. Cold water connection
5. Cleaning door flange
6. Drain cock
7. Sheet steel casing
8. Insulation
9. Sacrificial anode
10. Draught diverter
11. Gas control valve
12. Gas burner manifold and burner bars
13. Junction box
14. Control thermostat
15. Limit and Lock-out thermostats
16. Rating label
17. Suspended gas flow retarder
18. Circulation connection
19. Draught diverter securing clamp
20. Hamworthy nameplate
21. Inspection door sealing gasket
22. Piezo electric spark igniter
23. Tray



GAS SUPPLY 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.

METERS

If necessary a new gas meter will be connected to the service pipe by the Local Gas Region, or a Local Gas Region contractor.

GAS SUPPLY PIPES

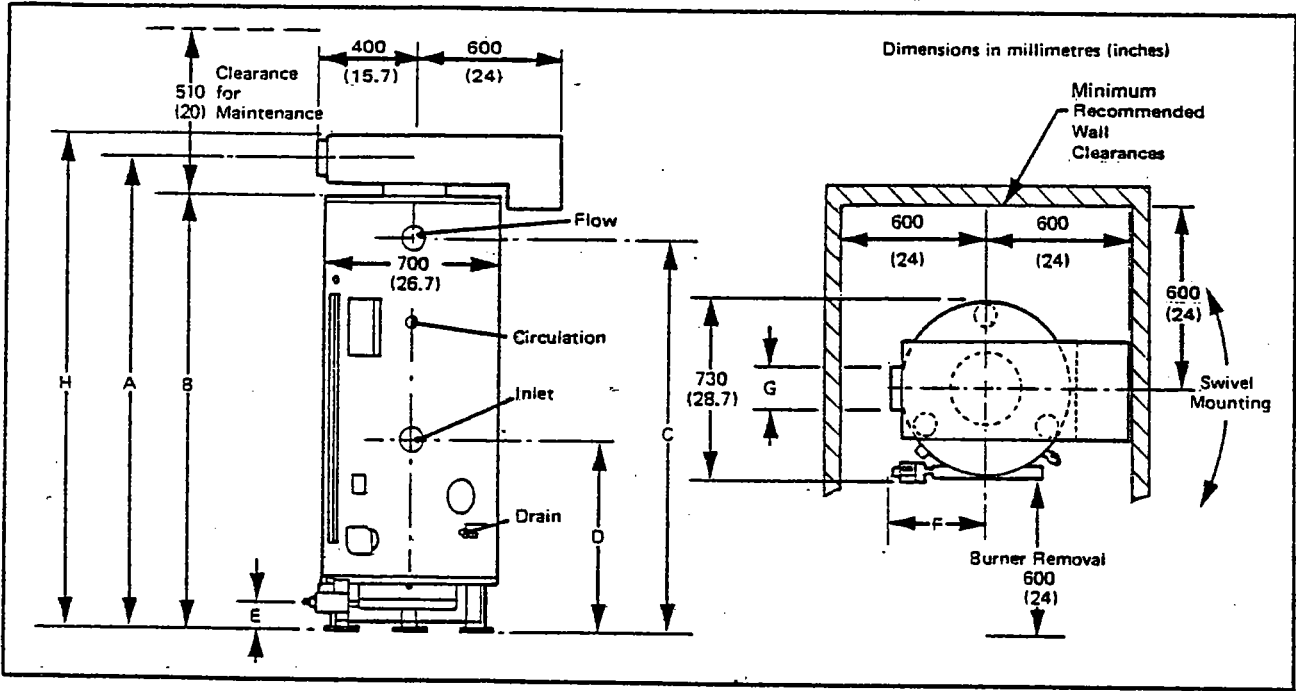
Supply pipes must be fitted in accordance with CP 331 : 3. Pipework from the meter to the heater must be of adequate size and not smaller than the heater gas connection ($\frac{3}{4}$ in. BSP).

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.

FIG. 2

DIMENSIONED VIEWS DR.35-90 WATER HEATER



Dimension	H		A		B		C		D		E		F		I.D. G	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
DR35	1980	78	1905	75	1740	68.5	1570	61.8	760	30	100	4	415	16.3	130	5.1
DR50	1980	78	1895	74.6	1740	68.5	1570	61.8	760	30	100	4	415	16.3	155	6.1
DR70	1980	78	1880	74	1740	68.5	1570	61.8	760	30	100	4	415	16.3	180	7.1
DR90	2100	82.7	1980	78	1760	69.3	1620	63.8	810	31.9	230	9	370	14.6	230	9.1

FLUE SYSTEM

The Hamworthy DR Series Hot Water Heaters are designed to be used with natural draught flues. Flue systems must be designed in accordance with the current regulations and with reference to the British Gas Publication "Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters". The following points should be noted:

The heater must have its correct draught diverter fitted in an unmodified condition before connection into the flue system. Refer to Fig. 6 and Fig. 7.

The flue system must be self supporting.

The heaters must be located as near the flue or flue header (on multi-bank installations) as possible. The distance between the heaters and the chimney must not exceed 2 m (6 ft.).

The flue system must be designed to achieve a minimum suction of 0.05 mbar (0.02 in. w.g.) at the draught diverter outlet. 0.05 mbar (0.02 in. w.g.) is equivalent to 1.5 metres of vertical flue. The flue connection on the heater is intended for sheet metal flues. Where asbestos flues are preferred an adapter ring may be obtained from Hamworthy Engineering Limited at additional cost. In some instances mechanical assistance may be necessary, refer to British Gas Publication "Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters".

The materials for the flue system must be non-combustible, mechanically robust and resistant to internal and external corrosion.

Waste Gas, Volume and Temperatures

It is recommended that the volume and temperature of the exhaust gases used for the design of the flue system is as shown below.

<u>Heater Model</u>	<u>Exhaust Gas Volume at N.P.T.</u>		<u>Nett Exhaust Gas Temp.</u>	
	<u>m³/h</u>	<u>ft³/h</u>	<u>°C</u>	<u>°F</u>
DR.35	67	2350	190	374
DR.50	90	3187	245	473
DR.70	120	4260	214	418
DR.90	161	5696	200	392

TABLE 2. WASTE GAS DATA

AIR FOR COMBUSTION AND VENTILATION

Adequate air for combustion and ventilation must be provided by means of openings at high and low level within the boilerhouse. The air supply requirements specified in BS. CP 332 : 3 are summarised as follows:

NOTE: *Aerosols in hairdressing salons give off vapours as do some industrial processes which can cause rapid corrosion of heater components. It is therefore essential that in these instances combustion air must be ducted from a space where vapours are not present.*

TABLE 3. AIR REQUIREMENTS

<u>Total Input Rating of Heaters</u>	<u>Position of Openings</u>	<u>Free Area of Opening</u> (Air directed from outside)
Installations up to 730 kW 2,500,000 Btu/h	High level	4.5 cm ² per kW (1 in ² per 5000 Btu/h)
	Low level	9.0 cm ² per kW (2 in ² per 5000 Btu/h)
Installations between 730 kW (2,500,000 Btu/h) and 1320 kW (4,500,000 Btu/h)	High level	3300 cm ² 500 in ²
	Low level	6600 cm ² 1000 in ²

NOTE: *High level is considered to be as close to the roof as possible.
Low level is considered to be 6 in. above floor level.*

WATER PIPEWORK INSTALLATION

For details of a typical installation scheme of a DR water heater refer to Fig. 3.

For details of a typical installation scheme of a multi DR water heater refer to Fig. 3a.

Water Connections

- Cold Water Feed : 1½ in. BSP Taper Female Socket
- Hot Water Outlet : 1½ in. BSP Taper Female Socket
- Secondary Circulation : ¾ in. BSP Taper Female Socket

The feed cistern and water supply from the feed cistern must be so sized to ensure that make-up water is equivalent to or exceeds the maximum draw off rate of the heater system and any other system requirements.

The hot water flow pipe for each heater must be fitted with a relief valve ¾ in. in diameter (20 mm) and an open vent 1¼ in. in diameter (32 mm). The vent should rise to discharge over the feed cistern. No isolating valves should be fitted between the water heater and the draw off point for relief valve and vent.

The maximum working head of the heater is 53 m (174 ft.).

Dead legs to water draw off points should be as short as possible and in no case should they exceed the lengths laid down in the Water Bye-Laws. The Water Bye-laws state that the maximum lengths of pipe supplying a hot water draw off tap, measured along the axis of the pipe from the heater, cylinder or tank or from a secondary circuit are as listed below:

- Pipes not greater than 19 mm I/D - Max. dead leg length 12 m
- Pipes in the range 19-24 mm I/D - Max. dead leg length 7.6 m
- Pipes greater than 25 mm I/D - Max. dead leg length 3 m

After installation of the water system has been completed, open the main water supply valve, flush the system and fill the heater. Open the hot water taps and allow air to escape from the system. When the system is free of air close the hot water taps and check for leaks on all the water heater connections including the drain cock and control and limit thermostat pockets.

GAS PIPEWORK INSTALLATION

Remove the $\frac{3}{4}$ in. BSP external/internal gas cock despatched tagged to the heater gas train, and connect it into the internal $\frac{3}{4}$ in. BSP union connection at the inlet of the gas control valve.

NOTE: *The union has parallel machined faces with an integral seal. Before connecting the main gas supply, unscrew the 2 separate halves of the union and check that seal is in position before re-assembly.*

DO NOT CONNECT THE MAIN GAS SUPPLY WITHOUT ENSURING THE SEAL IS IN POSITION.

Connect the incoming gas supply to the gas cock on each heater, observing the notes detailed in paragraph "Gas Supply" and conforming to the requirements of BS. CP 331 Part 3. Before commissioning the complete gas installation must be purged, inspected and pressure tested for soundness to BS. CP 331 Part 3.

NOTE: *DO NOT RUN THE "GAS" PIPEWORK ACROSS THE FRONT OF THE HEATER SINCE THIS WILL PREVENT REMOVAL OF THE GAS TRAIN ASSEMBLY FOR CLEANING.*

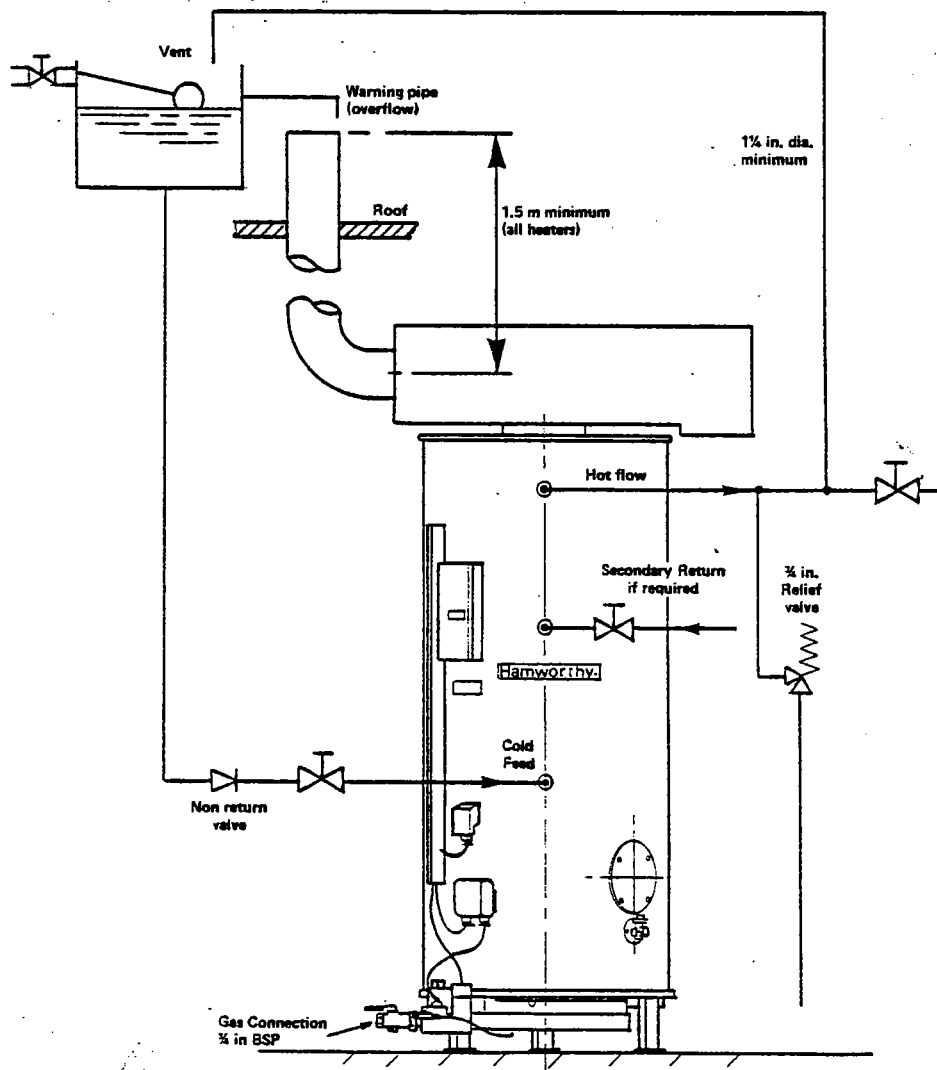
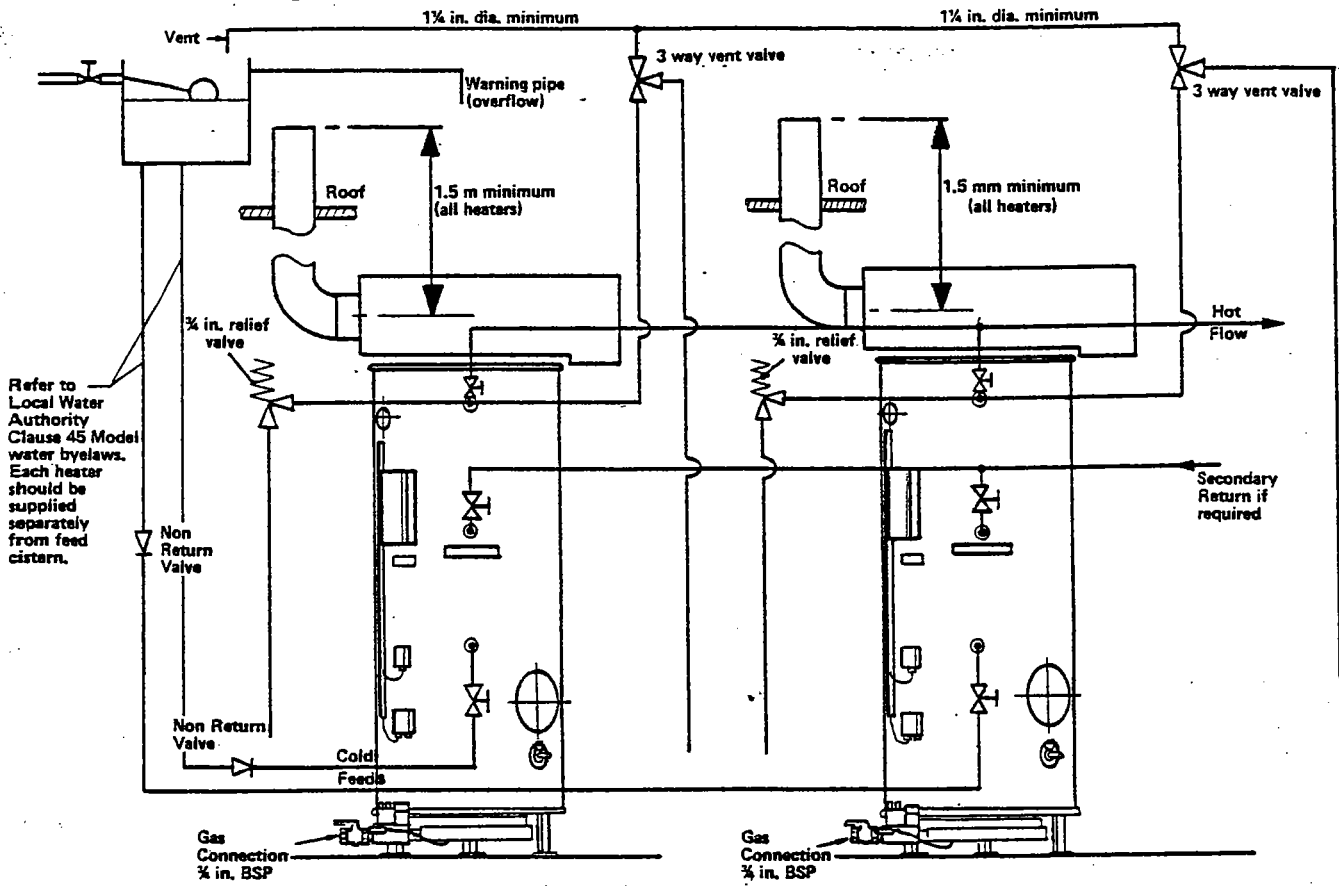


FIG. 3
INSTALLATION SCHEME - ONE DR HEATER ONLY

INSTALLATION SCHEME. MULTIPLE DR HEATER UNITS

FIG. 3A



ELECTRICAL CONNECTION — HEATER

WARNING: THIS APPLIANCE MUST BE EARTHED.

The wiring must be made in accordance with I.E.E. Regulations.

Electrical supply required is 240 volts, 50 Hz. Single Phase fused at 5 amps.

The method of connection to mains electrical supply should facilitate complete isolation of the heaters and should be provided in a readily accessible position.

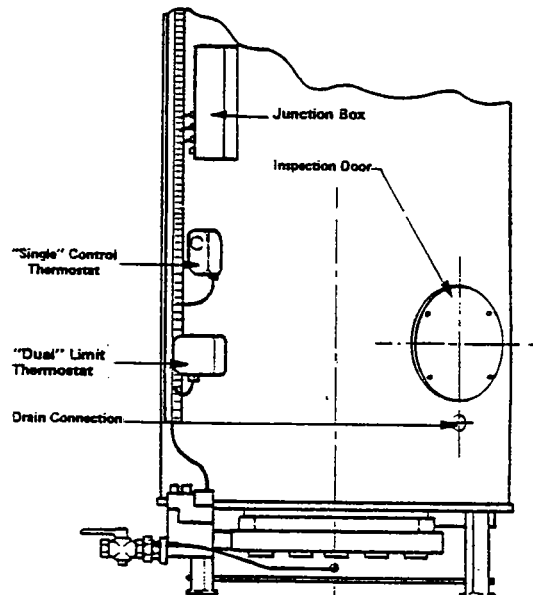
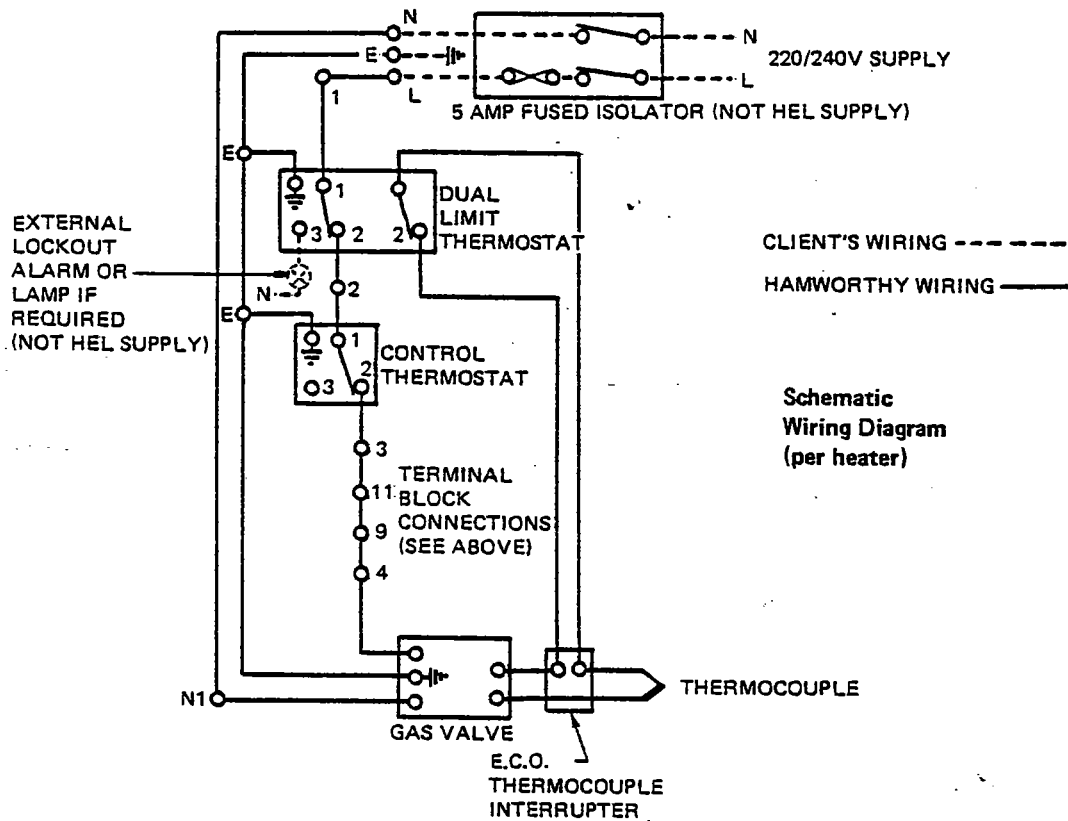
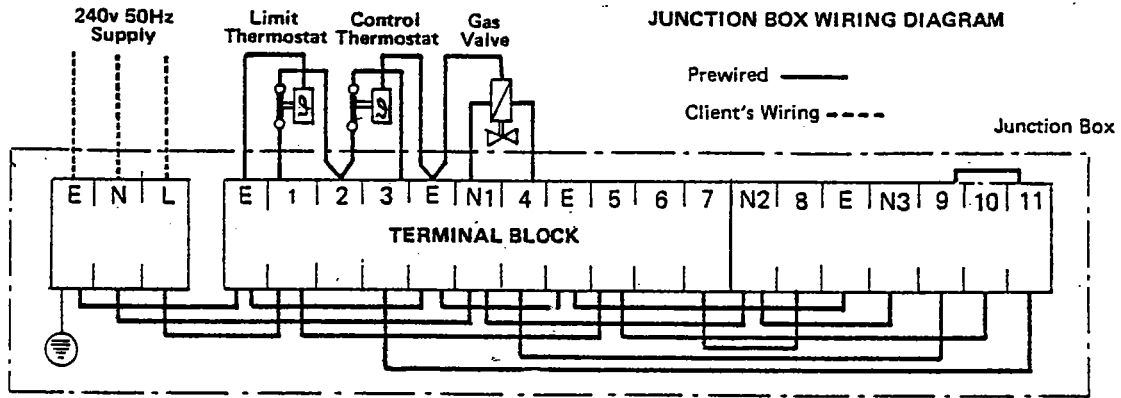
The wiring must be completed in heat resistant 3 core cable sized 1 sq. mm C.S.A.

The method of connection is as follows:

Disconnect the grey plastic trunking cover from the wiring case on the heater casing. Remove the four screws retaining the heater junction box lid to expose the terminal rail and wiring diagram, reference Fig. 4. Feed the 3 core cable supply through the trunking and into the junction box via the spare cable gland compression fitting positioned adjacent to the live, neutral and earth connections in the junction box. The earth wire should be so cut that it is longer than the live and neutral wires, to comply with the requirements of BS. 3456 Part 101 Clause 27.3.

NOTE: *If a DR Heater is to be used in conjunction with a Hamworthy S.T. Storage Tank, further wiring will be required to complete the circuitry for storage tank thermostat and loading pumps, therefore refer to paragraph "Electrical Connections - Storage Tank".*

WIRING DIAGRAMS – DR SERIES HEATER WITHOUT "ST" STORAGE TANK FIG. 4



AUTOMATIC CONTROL

Control Thermostat

The hot water outlet temperature is regulated by a single control thermostat, which senses directly into the heater water jacket and is located at the front left hand side of the heater as detailed in Fig. 4. The thermostat contacts are "normally closed" and are pre-wired back to the heater junction box terminal rail, Ref. Terminals 2 and 3, Fig. 4. The thermostat is connected in series with the main live supply to the Honeywell gas valve and earthed back to the main earthing post within the heater junction box.

During normal operation as the control thermostat is satisfied at the required set water temperature, the gas valve closes and the heater then remains at standby until hot water is drawn off and the thermostat re-calls for heat.

The control thermostat is graduated for a 35-90° Centigrade operation but to comply with Hamworthy Engineering Limited's Recommendation the outlet water temperature should be regulated up to a maximum of 60° Centigrade. The thermostat is fitted with an internal stop restricting the settings between 35 and 65°C.

Limit Thermostats

The Dual limit thermostat consists of two separate pairs of "normally closed" thermal re-set contacts, one pair of which is adjustable in the range 30-90° Centigrade.

Both limit thermostat contacts are pre-wired, including an earthing connection back to the heater junction box.

The adjustable limit thermostat (normally set at 90° Centigrade) forms the first safety "overheat" contact and is pre-wired back to the junction box being connected in series with the control thermostat and the main gas valve, Ref. terminals 1 and 2, Fig. 4. In the event of a control thermostat malfunction, and the limit thermostat subsequently satisfied, the gas valve closes and the heater shuts down.

The fixed 95° Centigrade thermostat forms the second "overheat" contact and is pre-wired in series with the pilot flame thermocouple, via a "Thermocouple Interrupter", Reference Fig. 4. In the event of the Thermocouple Interrupter limit thermostat being activated, the flame signal from the pilot thermocouple to the Honeywell valve is broken, both the pilot and main flame are then extinguished and the heater shuts down under a lockout condition. The limit thermostat will automatically thermally re-set when the problem has cleared but the heater will not re-fire until the pilot flame has been re-established as detailed in the commissioning instructions under the paragraph "Commissioning".

NOTE: *In the event of either overheat limit thermostats being activated, the complete heater installation should be inspected to trace and isolate the cause of the problem before any further firing takes place.*

COMMISSIONING

Checks

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

- a) Flueway passages to the chimney are clear.
- b) Adequate ventilation exists in the boilerhouse, Reference Table 3.
- c) The system is vented fully charged with water and ready to receive heat.
- d) The gas supply pipework is clear of any loose matter, tested for soundness and purged to BS CP 331 Part 3.
- e) Gas supply is connected but turned off, gas cock is closed, unions are tightened (with any seals in position), test points are tight, burners are correctly positioned, injectors are tight and the pilot is connected from the control valve.
- f) Electricity is connected but ensure that the supply is switched off.

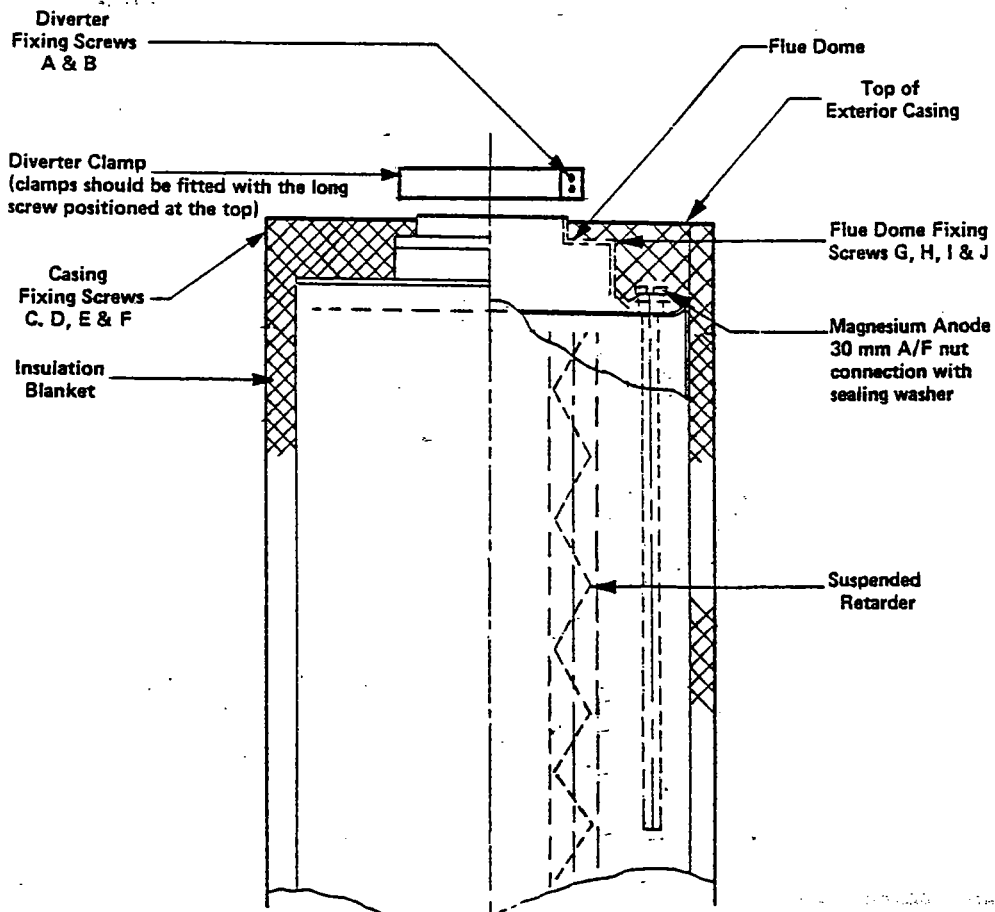
Procedure for Lighting

Turn control thermostat to the minimum setting (35°C) and ensure electrical supply is off.

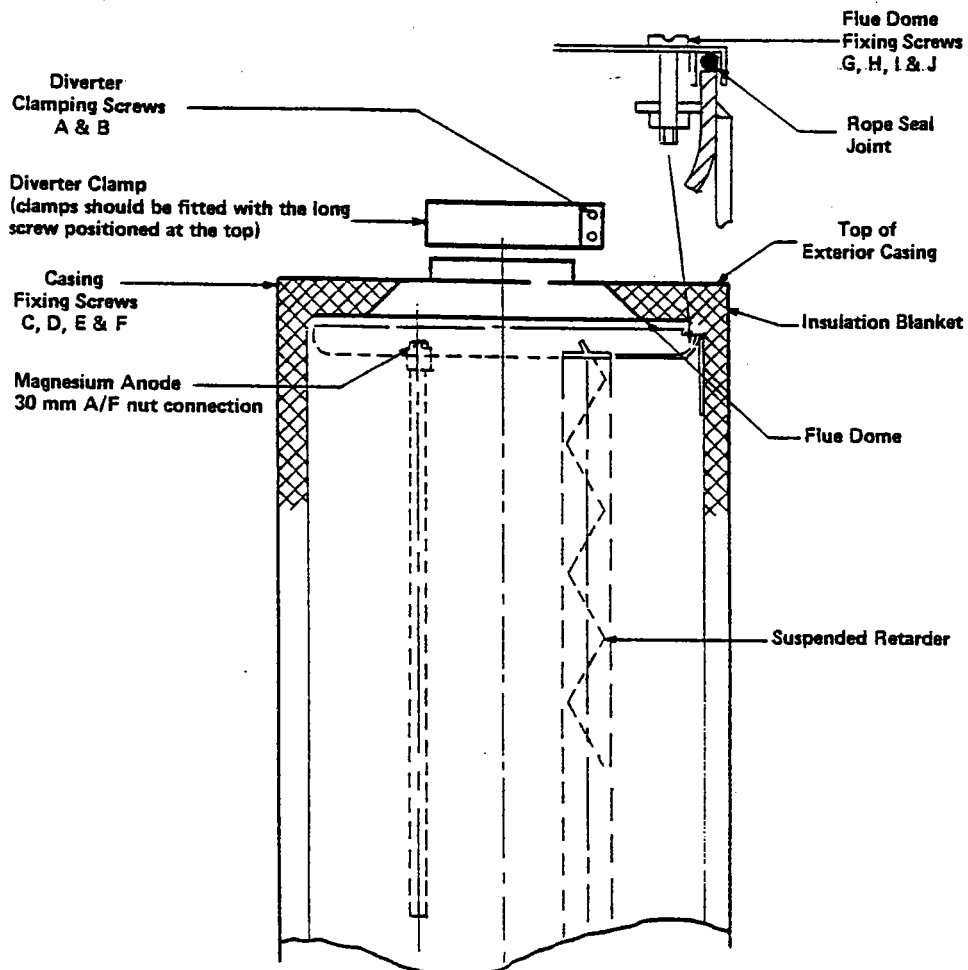
Open heater gas cock.

Depress fully start button (white) on gas valve (allowing gas to pass to the pilot burner) and ignite burner by repeatedly pressing the Piezo electric igniter.

When the pilot is alight, maintain the start button depressed for a further 20 seconds, allowing adequate current to be generated by the thermocouple to hold the pilot valve open.



DR.35-70 HEATER FIG. 6

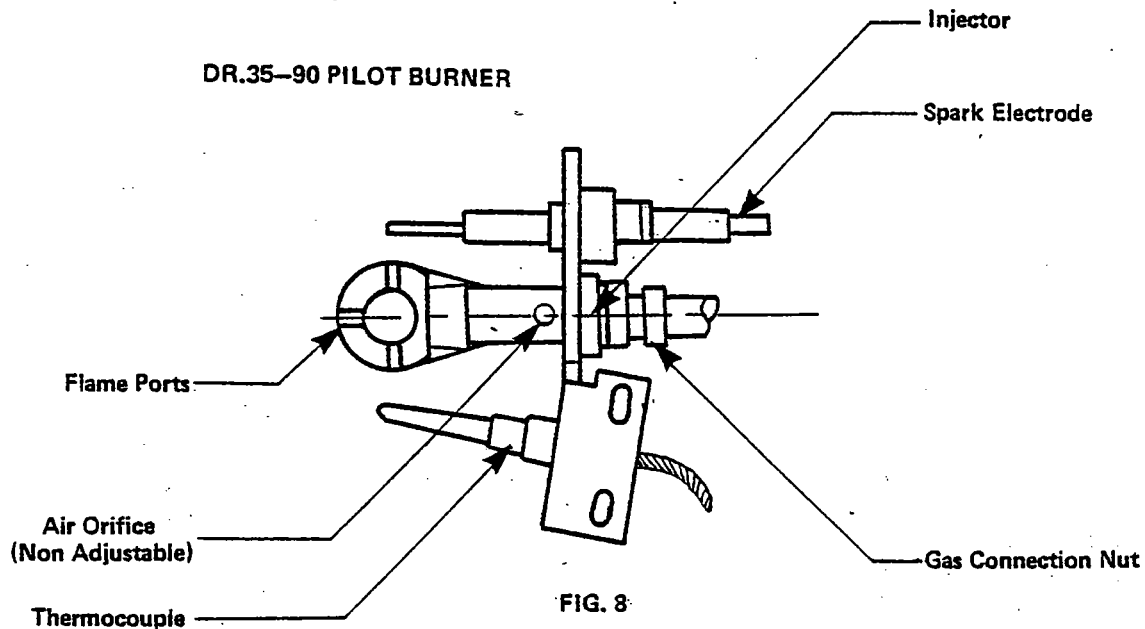


DR 90 HEATER FIG. 7

SERVICING OF DR.35-90 PILOT BURNER

- THERMOCOUPLE:** Check thermocouple for any signs of flame erosion and change as necessary.
- ELECTRODE:** Check electrode for cracks in ceramic or flame erosion at ignition tip and change as necessary.
- CLEANING:** Release the nut securing the gas connection to the pilot burner and withdraw the pilot injector. Check to ensure that the pilot injector burner flame ports and the air injectors are free from the accumulation of dust, by blowing through as necessary.

Replace in reverse order.



Pilot Burner

Inspect the three port pilot burner and thermocouple assembly. If the pilot is heavily contaminated with dust, clean the flame ports and if necessary remove the pilot orifice from the pilot burner, as detailed in Fig. 8. If the thermocouple shows any signs of wear from flame or erosion replace it immediately.

Check the operation of the Piezo electric ignition system. Repeated pressing of the Piezo igniter should generate a spark between the electrode and the pilot burner flame port. If no spark is visible check for damage to the Piezo electric generator, the Piezo cable (possible fracture) and the spark electrode (possible crack in ceramic) and replace as necessary.

NOTE: If the flue gas passages are to be cleaned proceed to the following paragraph before replacing the gas train assembly.

Cleaning of Flue Gas Passageways

To gain access to the heater flueways will require removal of the draught diverter, the top cover ring of the heater casing and the flue collector dome.

Before removing the draught diverter ensure that the main flue system is self-supporting. Slacken and remove the two set screws (A & B Reference Figs. 6 & 7) retaining the draught diverter fixing clamp, remove the clamp and lift the draught diverter horizontally away and clear of the main flue.

Remove the four screws (C, D, E & F, Figs. 6 & 7) retaining the top cover ring of the exterior heater casing, lift the ring clear of the heater and remove the top insulation sections to expose the flue collector dome and the magnesium anodes. (Reference Figs. 6 & 7).

Remove the four screws (G, H, I & J, Figs. 6 & 7) retaining the flue collector dome and lift the dome clear of the heater.

Withdraw each of the suspended flue gas retarders vertically upwards and clear of the firetubes.

NOTE: For heaters installed in buildings with minimum clearance for maintenance (Reference Fig. 2) it may be necessary to flex the retarders as they are withdrawn.

Inspect each of the vertical fire tubes and if there is any scale or extraneous deposits clean each tube through with a stiff brush and collect any debris in the condensate tray at the base of the heater. Clean out condensate tray and replace flue gas dome in reverse procedure. Check rope seal and replace as necessary.

NOTE: *If anodes are to be inspected proceed to the next paragraph before replacing insulation, top casing ring and the draught diverter.*

Inspection of the Heater Waterside Surfaces and Magnesium Anodes

Draining the Heater

Isolate the cold feed, hot flow and circulation connections and 3 way vent if more than one heater. Connect a ½ in. nominal bore hose to the drain cock connection at the bottom right hand side of the heater, run the hose to a convenient drainage point, open the heater drain cock and drain the heater.

Removal of Inspection Door

After checking to ensure that the heater has been fully drained, remove the four screws retaining the exterior (orange) casing panel of the inspection door. Remove the panel and the insulation disc to expose the inspection door flange and fixing bolts. Slacken and remove each of the eight M10 bolts and take off the inspection door flange and the "Klingerite" sealing gasket.

Inspect the interior surfaces of the heater for any signs of calcium deposit.

Providing that exit water flow temperature has been restricted to a maximum of 60° Centigrade, deposits should not normally be present. If any deposits do exist within the heater these can be removed with the aid of a stiff brush and a water jet (directed through the inspection port) and flushed through the drain connection of the heater.

NOTE: *ON NO ACCOUNT SHOULD A METAL SCRAPER BE USED TO REMOVE DEPOSITS SINCE THIS MAY RESULT IN DAMAGE TO THE GLASS LINING.*

After cleaning, replace the inspection door-complete with "Klingerite" gasket, and the eight M10 securing bolts.

Inspection of Magnesium Anodes

NOTE: *ON NO ACCOUNT REMOVE THE MAGNESIUM ANODES WITHOUT CHECKING TO ENSURE THAT THE HEATER IS ISOLATED ON FLOW, FEED AND CIRCULATION WATERSIDE CONNECTIONS.*

Each heater includes two sacrificial magnesium anodes which hang vertically within the heater water jacket and are located in ¾ in. BSP sockets at the top of the heater casing. (Reference Figs 6 & 7).

Release the nuts securing the magnesium anodes (this will require a 30 mm socket spanner complete with extension bar) and withdraw the anodes vertically through the ¾ in. BSP sockets and clear of the heater. Remove the copper/asbestos anode sealing washer and inspect each anode for erosion. If the extent of erosion is sufficient to have reduced the cross-sectional area of the anode by fifty per cent, i.e. the diameter of the anode is less than 15 mm, it should be replaced complete with a new copper/asbestos sealing washer.

Assembly (Following Complete Servicing of the Heater)

Close the heater drain cock and remove the hose connection.

Open the heater cold feed, hot flow and circulation isolation valves and 3 way vent valve if fitted. Allow the system to fill with water.

Check to ensure that there are no leaks from the inspection door sealing gasket, the magnesium anode sealing washers and the drain cock.

Replace the insulation disc over the inspection door flange and refit the exterior casing panel with the four screws.

Replace the insulation ring at the top of the heater and re-attach the top cover ring, draught diverter and diverter fixing clamp in reverse procedure to that detailed in the paragraph headed "Cleaning of Flue Passageways".

Slide the "serviced" gas train assembly beneath the heater, ensuring that the horizontal burner bar bracket fits over the locating hook at the back of the heater. Reconnect the electrical connections to the gas valve, the gas manifold fixing screws and the ¾ in. gas pipework union (complete with the rubber seal) in the reverse procedure to that detailed in the paragraph headed "Removal of Gas Train".

RECOMMENDED SPARES

Description	Hamworthy Part No.
Multi-functional Control Valve ¾ in.	747809942
Control Valve O-ring	742111245
Dual Limit Thermostat complete with Interrupter Leads	747433784
Control Thermostat (35-95°C)	747433776
Thermocouple	339008149
Thermocouple Interrupter Assembly	339008198
Main Injector - DR.35-70	330512537
Main Injector(s) - DR.90	330512552
Inner 4 jets	330512545
Outer 2 jets	742111245
Washer - Main Injector (Copper/Asbestos)	330512578
Pilot Injector (Natural Gas) - DR.35-90	330512578
Pilot Burner Assembly (Natural Gas) DR.35-90	339008073
Piezo Electric Igniter complete with Igniter Cable	339008073
Main Burner Bar - DR.35-70	333811159
Main Burner Bar - DR.90	333811134
Inner 4 bars	333811142
Outer 2 bars	339008966
Inspection Door Sealing Gasket	331064911
Washer - Magnesium Anode (Copper/Asbestos)	339009675
Magnesium Anode	331299183
Flue Dome Rope Seal DR.90 Heater only	747433826
Double Control Thermostat 35-95°C (This thermostat to be used on a DR Heater when coupled to a ST Storage Tank)	

NOTE: Spare thermostats must be ordered direct from Hamworthy Engineering Limited to ensure that the internal stop (restricting range from 35-65°C) is fitted.

HAMWORTHY ST STORAGE TANKS

The Hamworthy ST range of storage tanks are designed exclusively for use with the DR series direct hot water storage heater and are utilised on installations which require the use of large volumes of water over short periods.

Each tank consists of a fully welded, pressure tested vessel, thermoglazed with a high quality glass lining on all waterside surfaces, complete with magnesium anode protection.

The tanks are floor mounting, fully insulated and are suitable up to a maximum water system pressure of 53 m (174 ft.) and are available in six sizes (ST2-15) each of which can be installed with a DR heater in either single or multiple units to give an increased hot water storage capacity ranging from 200-1500 litres (44-330 gal) per tank.

The waterside connections provided with each tank are, a hot water flow outlet and secondary return, and two circulation connections for transferring hot water from the heater to the storage tank. The vessel also includes connections for a control thermostat, a thermometer and a flanged inspection/clean out door and drain.

Hot water is transferred from the heater to the storage tank via a thermostatically controlled loading pump (not H.E.L. supply).

NOTE: The installation of the storage tank must be made in accordance with the relevant British Standard Codes of Practice detailed in paragraph on "Related Documents".

LOCATION

The storage tank must be installed on a level floor or plinth which is sufficient to support the weight when filled with water, Reference Table 5.

INSTALLATION

NOTE: When a DR Water Heater is used in conjunction with a ST Storage Tank the modifications detailed in the following two paragraphs must be completed before connecting the mains electrical supply to the heater or charging the system with water.

Assembly of the Double Control Thermostat into the Heater

The DR Heater is supplied with a single control thermostat which must be removed and replaced by a double thermostat, when the heater is to be used with a Storage Tank.

NOTE: Conversion must be completed before charging the system with water.

Removal is as follows:

Release the two screws retaining the thermostat and remove the cover to expose the thermostat contacts. Unscrew the two wires from the normally closed contacts of the thermostat, disconnect the earth cable and then remove the thermostat complete with pocket from the heater.

Replace this thermostat with the Double Thermostat and pocket assembly which is supplied as a loose item. This thermostat is a Landis & Gyr, H.E.L. Part No. 747433826 (see Spares List). For wiring the double thermostat refer to paragraph headed "Electrical Connections".

Assembly of Single Control Thermostat into the Storage Tank

The single control thermostat and pocket removed from the heater should be fitted into the Storage Tank in the ½ in. BSP socket connection located in the inspection door flange (Reference Table 5). For wiring the Storage Tank thermostat refer to paragraph "Electrical Connections".

Pipework Schemes

For details of typical installation schemes of a DR heater used in conjunction with one or more ST Storage Tanks, refer to Figs. 9 & 10.

Water Connections

For full details of all waterside connections and sizes, refer to Table 5.

The hot water flow pipe for each tank must be fitted with a relief valve ¾ in. in diameter (20 mm) and an open vent 1¼ in. in diameter (32 mm). The vent should rise to discharge over the feed cistern. No isolating valves should be fitted between the water heater and the draw off point for the relief valve and vent.

After the installation of the water system has been completed, open the hot water taps and allow air to escape from the system. When the system is free of air, close the hot water taps and check for leaks on all storage tank connections including the thermometer and control thermostat pockets.

ELECTRICAL CONNECTIONS — STORAGE TANK

Heater Double Control Thermostat

Release the two screws retaining the double thermostat cover and remove the cover to expose the two thermostats.

The left hand thermostat, designated the "Heater Control Thermostat", (Reference Fig. 11) must be wired so that the **normally closed** contact is in series with the gas valve, Reference terminals 2 and 3, Fig. 11.

The right hand thermostat designated the "Pump Thermostat", must be wired so that the **normally open** contact is in series with the loading pump, Reference terminals 6 and 7, Fig. 11.

The wiring should also include an earth connection back to the heater terminal rail.

Storage Tank Thermostat

The thermostat in the Storage Tank (Reference Fig. 11), designated the "Pump Minimum Thermostat", must be wired so that the **normally closed** contact is in series with the loading pump, Reference terminals 5 and 6, Fig. 11.

The wiring should also include an earth connection back to the heater terminal rail.

Loading Pump

Connect a live, neutral and earth supply to the loading pump via a 3 core 1 mm C.S.A. cable, run from Terminal 8, N2 and E on the heater junction box terminal rail.

NOTE: When wiring both the thermostats and the loading pump, access to the heater terminal rail is via the heater trunking cover and the spare compression gland fittings in the heater junction box assembly.

OPERATION

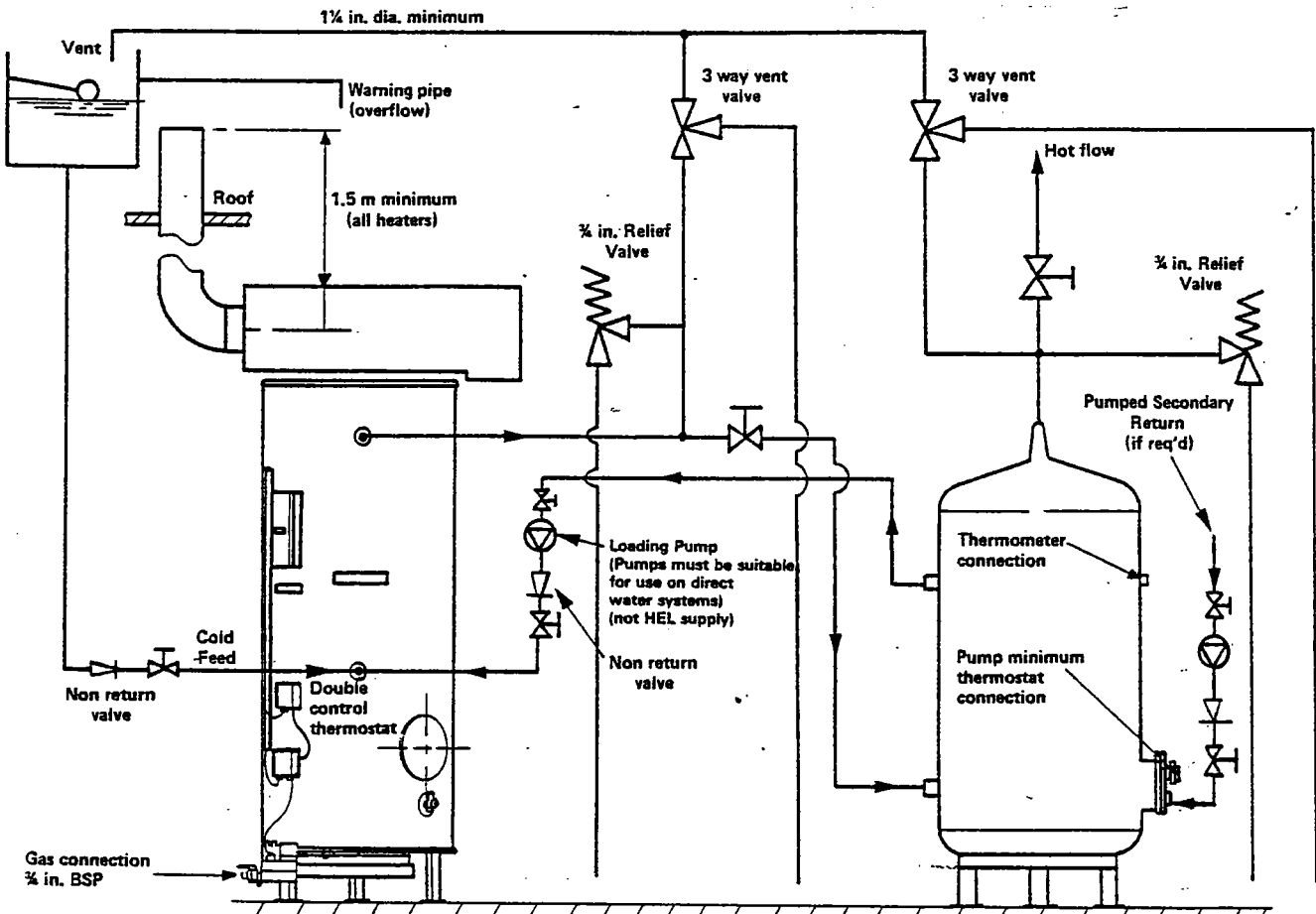
Assuming the required exit water flow temperature delivered from the storage tank is 60°C, the settings of the heater control thermostat, the pump thermostat and the pump minimum thermostat would be typically 60°C, 55°C and 60°C respectively.

During initial light-up (with both the heater and storage tank filled with cold water) the burner ignites and raises the water within the heater to the required control temperature. As the water in the heater reaches 55°C the pump is energised and transfers hot water from the heater to the storage tank. This will result, initially, in a mixed water temperature which will be less than 55°C and therefore the pump will stop, and heater continues to fire up to 60°C. This process will continue until both the heater and storage tank are filled with hot water at 60°C.

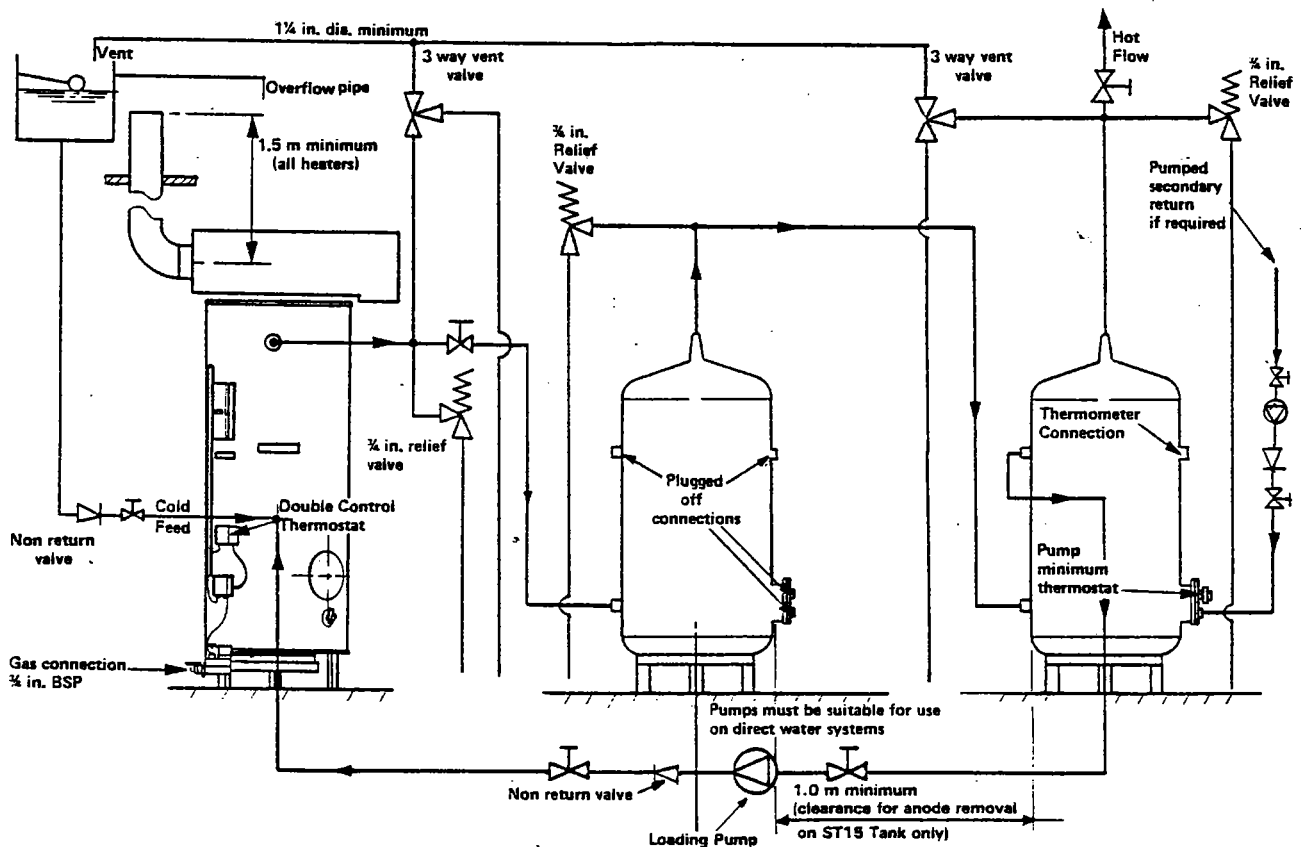
During draw off, the hot water delivered from the storage tank is displaced by hot water from the heater, which is similarly replaced by cold water from the feed cistern. The addition of cold water into the heater is sensed and provides immediate re-heating at full rated output. Therefore, the combination of the heater and storage tank thermostats ensures that the storage tank is maintained charged full with hot water at all times.

SERVICING

Clean and inspect the storage tank magnesium anodes to the instructions previously detailed for "Inspection of the Heater Waterside Surfaces and Magnesium Anodes".



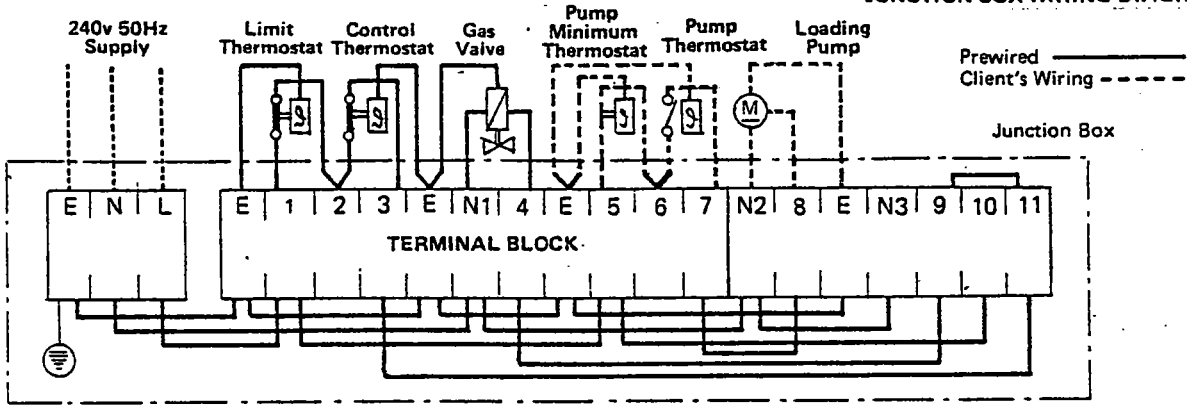
INSTALLATION SCHEME: ONE DR HEATER INSTALLED WITH AN "ST" STORAGE TANK FIG. 9
 (NOTE: For wiring of the loading pump and thermostats refer to Fig. 11)



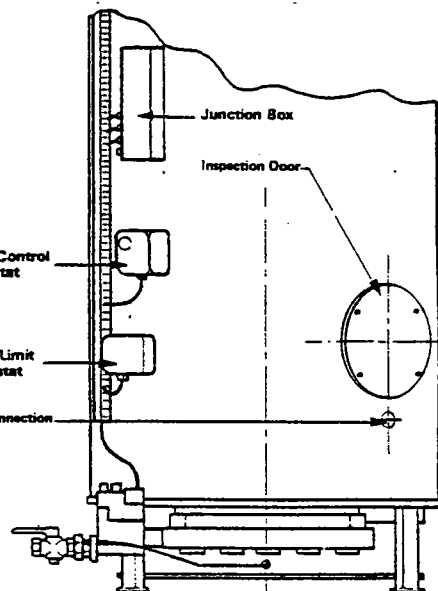
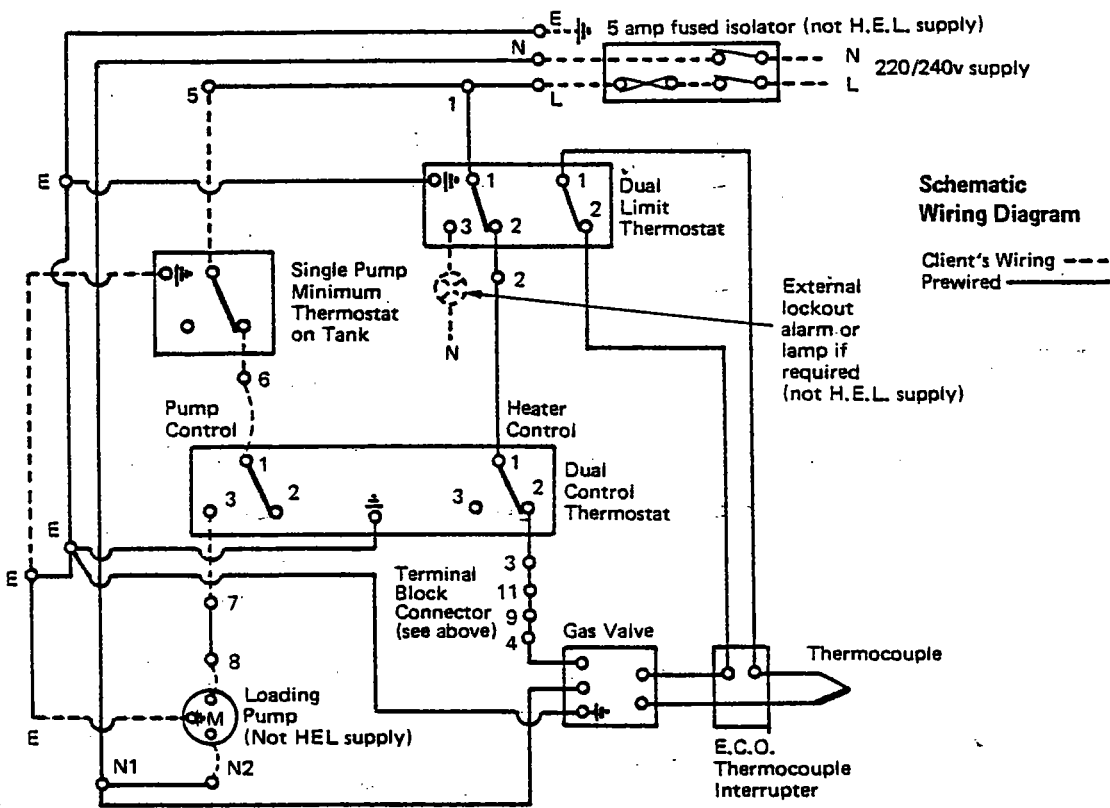
INSTALLATION SCHEME: ONE DR HEATER INSTALLED WITH TWO "ST" STORAGE TANKS FIG. 10
 (NOTE: For wiring of the loading pump and thermostats refer to Fig. 11)

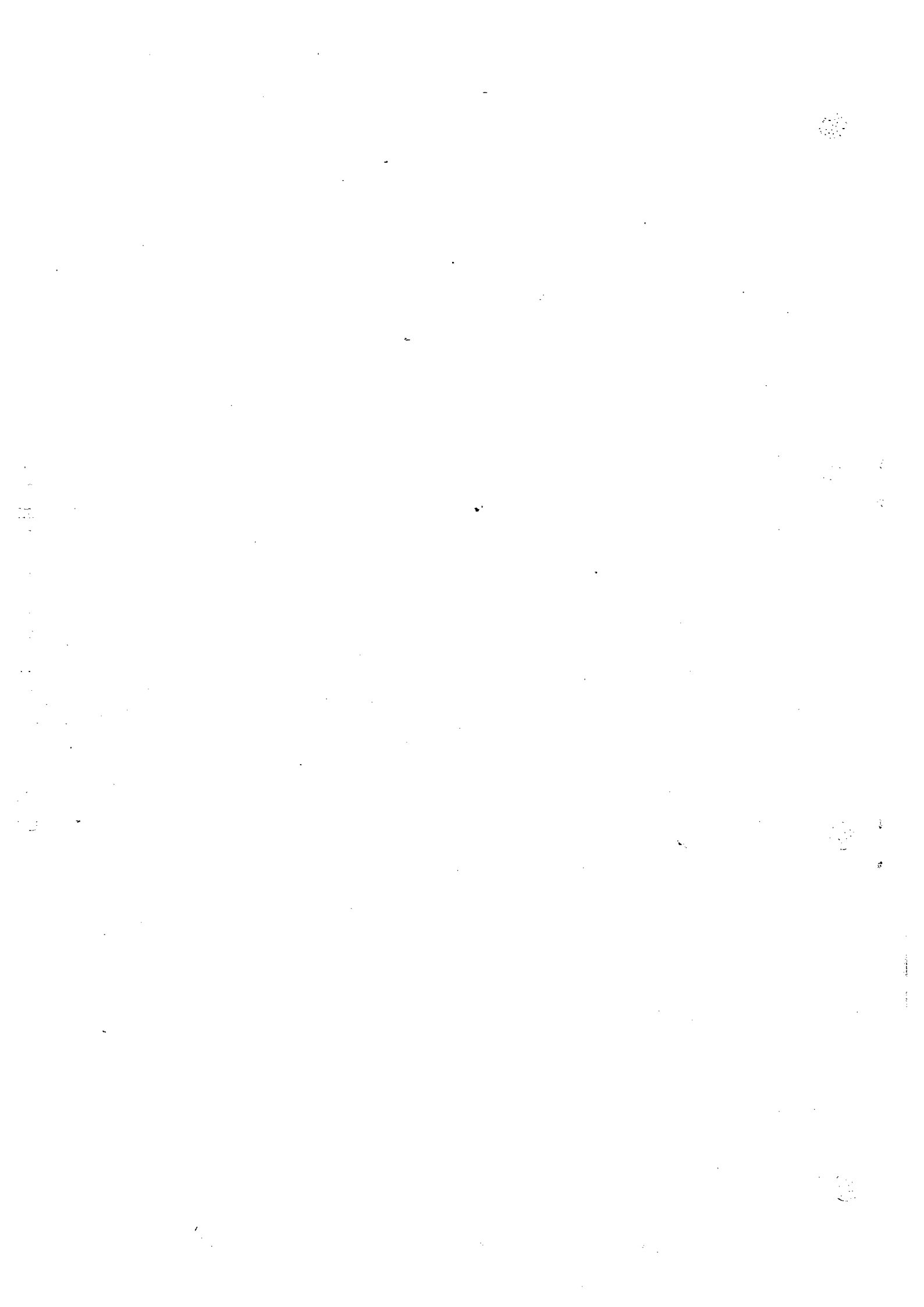
WIRING DIAGRAMS – DR SERIES HEATER WITH "ST" STORAGE TANK FIG. 11

JUNCTION BOX WIRING DIAGRAM



Schematic Wiring Diagram







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