

# State Commercial Turbo Sandblaster Storage Water Heaters

**Model SBE 75-115, SBE 75-140,  
SBE 100-199T, SBE 70-360,  
SBE 100-400, SBE 80-180,  
SBE 30-225 & SBE 80-500**

## Manual

**INSTALLATION  
MAINTENANCE  
USER INSTRUCTIONS**

This manual contains instructions for the installation, operation and maintenance of your gas-fired water heater. Read the appropriate section carefully before servicing or using the water heater. Then keep it handy for quick future reference by inserting it in the plastic envelope provided on the appliance.

### **▲ WARNING**

**This water heater is equipped for one type of gas only. Check the data plate near the gas control valve for the correct gas. DO NOT USE THIS WATER HEATER WITH ANY GAS OTHER THAN THE ONE LISTED ON THE DATA PLATE. Failure to use the correct gas can cause problems which can result in DEATH, SERIOUS BODILY INJURY OR PROPERTY DAMAGE. If you have any questions or doubts consult your regional gas authority.**

### **IMPORTANT NOTICE**

**THIS HEATER MUST BE LEFT UNDER THE CONTROL OF THE GAS CONTROL VALVE AND THERMOSTAT AT ALL TIMES.**

### **FOR YOUR SAFETY IF YOU SMELL GAS:**

1. Turn off Gas and open windows.
2. Don't touch electrical switches.
3. Extinguish any open flames.
4. Immediately call your local Gas Board.

**FLAMMABLE VAPOURS MAY BE DRAWN BY AIR CURRENTS FROM OTHER AREAS OF THE STRUCTURE TO THIS APPLIANCE.**

### **FOR YOUR SAFETY:**

**DO NOT STORE OR USE PETROL, AEROSOL OR OTHER FLAMMABLE VAPOURS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER ATMOSPHERIC GAS APPLIANCE.**

### **IMPORTANT NOTICE**

**All electrical work should be carried out by a suitably qualified electrician in accordance with the current IEE Regulations for buildings, with due consideration given to cable size and type, and short circuit protection**

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## General Description

The "Turbo Sandblaster" water heater described in this manual is a floor standing, open flued direct fired storage water heater. Each storage vessel is internally lined with a vitreous enamel coating and is fitted with sacrificial aluminum anode rods to protect against hot water corrosion. The tank is insulated with a layer of CFC free foam and is covered by a metal casing finished in a blue stove enamel paint with a dark blue trim. Each unit is equipped with a stainless steel atmospheric burner which is controlled by a fully sequential electronic ignition system, incorporating a flame supervision device. A combined thermostat is installed to regulate the temperature of the water in the tank and the thermostat incorporates an Emergency Cut Off (ECO) device which can be manually reset. Each

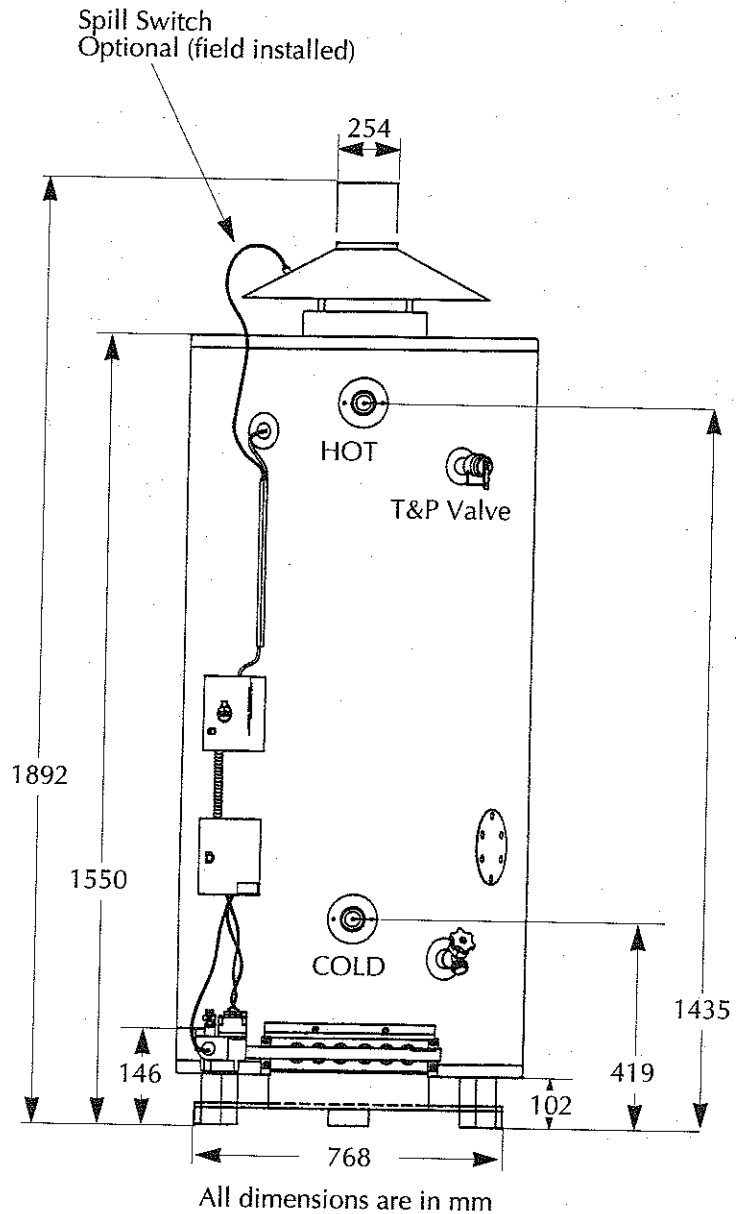
water heater is supplied complete with a drain down tap, an inspection hole at the side of the unit and a combined temperature/pressure relief valve.

The water heater can be fitted to an unvented, direct on mains system, and in such cases it must be installed by a "Competent Person", as laid down in Building Regulations – G3.

# Technical Data

## Technical Data SBE 80-500

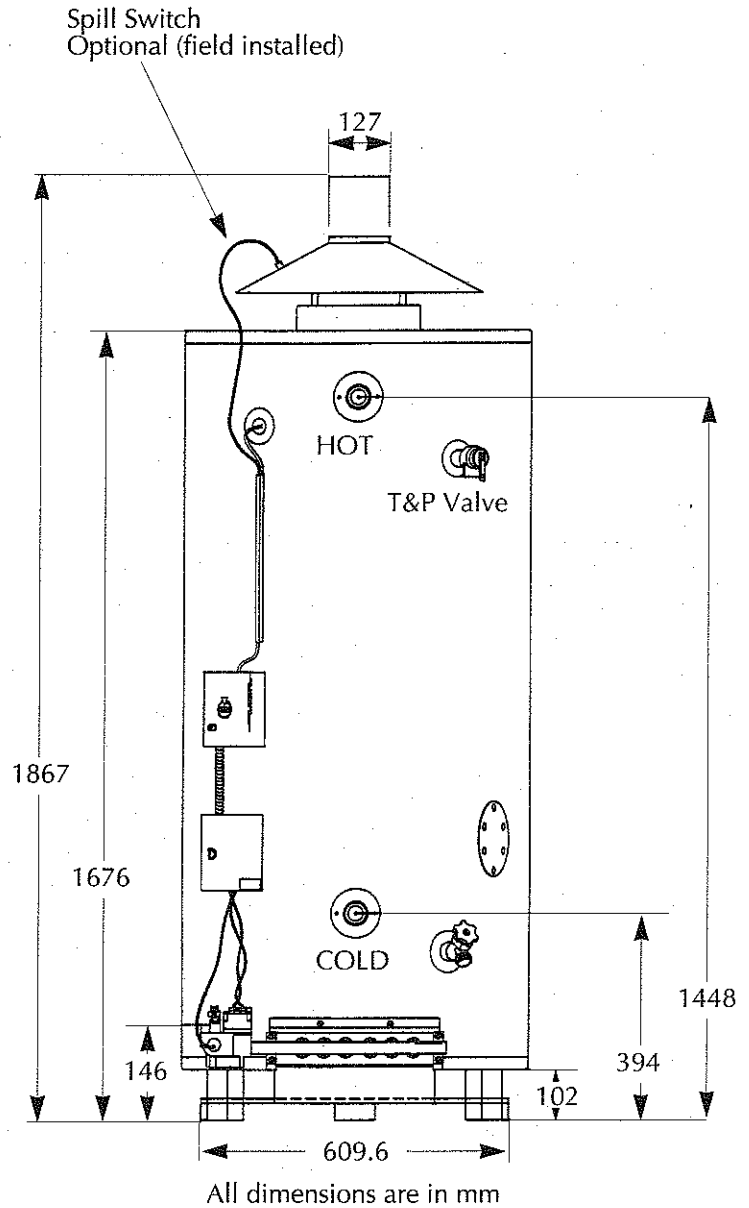
Continuous at 44°C temperature rise	2226 litre/hr	490 UK gal/hr
Storage capacity	303 litres	67 UK gal
Weight filled	728 kg	1600 lb
Time to recover storage with 44°C temperature rise	9 minutes	9 minutes
Input rate	13.75 m <sup>3</sup> /hr	479 ft <sup>3</sup> /hr
Input gross	146.41 kW	500,000 BTu/hr
Output gross	114.19 kW	390,000 BTu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 meters	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Maximum gas pressure	35 mbar	14 in wg
Burner setting pressure	10 mbar	4 in wg
Injector size	3.0mm	-
Approx flue gas	206 m <sup>3</sup> /hr	7185 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	-	1" BSP
Draught diverter outlet size	254mm	10"
Shipping weight	423 kg	930 lbs
MINIMUM CLEARANCE all round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 1030mm	24" 40.5"
Safety Valve	25mm	1"
Electrical Rating	230V on 1 amp or less	-
Supply Fuse Rating	2 amp	-



# Technical Data (cont'd)

## Technical Data SBE 75-140

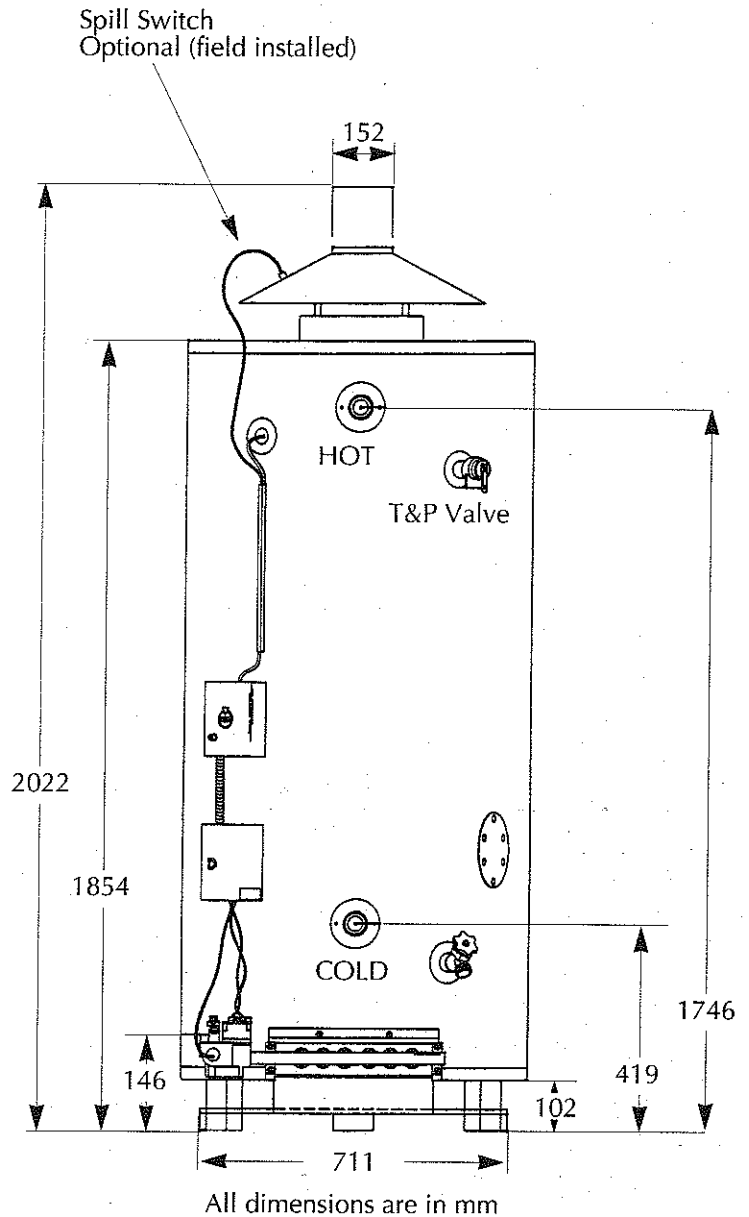
Continuous at 44°C temperature rise	623 litre/hr	137 UK gal/hr
Storage capacity	281 litres	62 UK gal
Weight filled	544 kg	1198 lb
Time to recover storage with 44°C temperature rise	27 minutes	27 minutes
Input rate	3.82 m <sup>3</sup> /hr	135 ft <sup>3</sup> /hr
Input gross	41 kW	140,030 Btu/hr
Output gross	31.98 kW	109,223 Btu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 metres	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Nominal gas inlet pressure (LPG)	27.5 mbar	11 in wg
Maximum gas inlet pressure (natural gas)	35 mbar	14 in wg
Maximum gas inlet pressure (LPG)	35 mbar	14 in wg
Burner setting pressure (natural gas)	10 mbar	4 in wg
Burner setting pressure (LPG)	25 mbar	10 in wg
Injector size (natural gas)	2.6mm	-
Injector size (LPG)	1.65mm	-
Approx flue gas	57.43 m <sup>3</sup> /hr	2030 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	-	¾" BSP
Draught diverter outlet size	127mm	5"
Shipping weight	263 kg	578 lbs
MINIMUM CLEARANCE All round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 1030mm	24" 40.5"
Safety Valve	20mm	¾"
Electrical Rating	230V on 1 amp or less	-
Supply Fuse Rating	2 amp	-



# Technical Data (cont'd)

## Technical Data SBE 100-199T

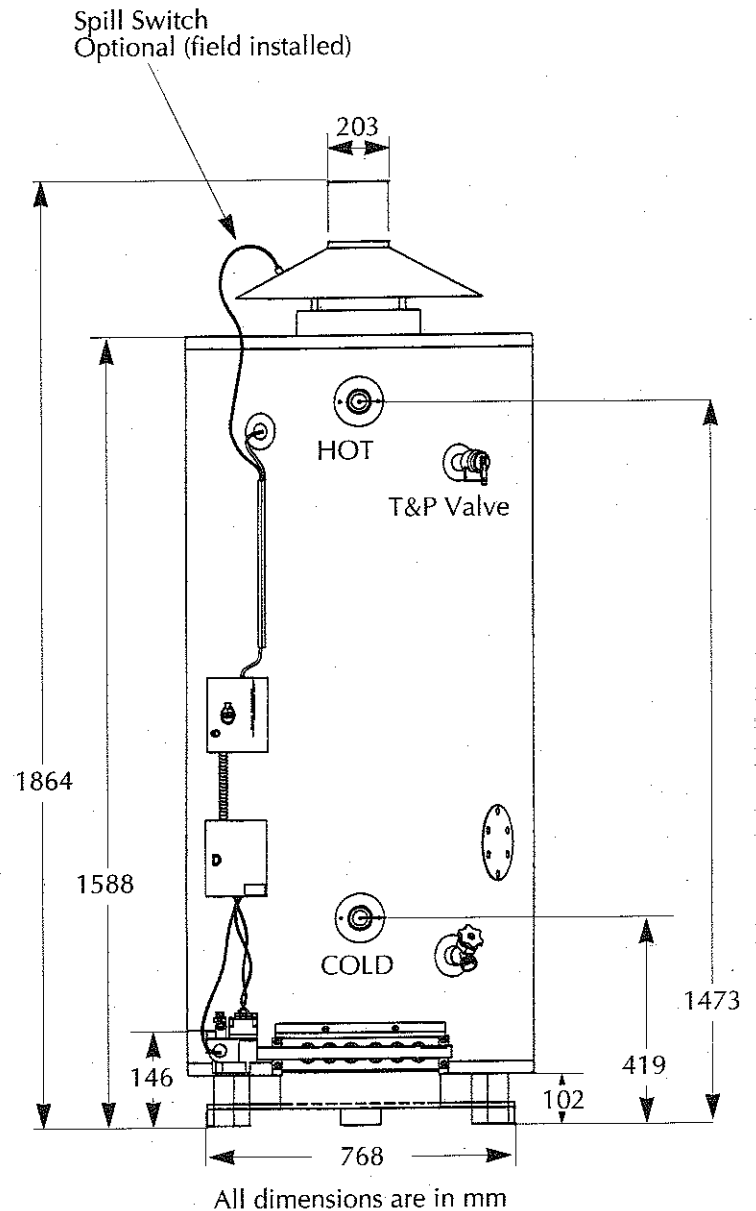
Continuous at 44°C temperature rise	851 litre/hr	187 UK gal/hr
Storage capacity	379 litres	83 UK gal
Weight filled	702 kg	1545 lb
Time to recover storage with 44°C temperature rise	27 minutes	27 minutes
Input rate	5.23 m <sup>3</sup> /hr	185 ft <sup>3</sup> /hr
Input gross	56 kW	191,260 Btu/hr
Output gross	43.68 kW	149,183 Btu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 metres	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Nominal gas inlet pressure (LPG)	27.5 mbar	11 in wg
Maximum gas inlet pressure (natural gas)	35 mbar	14 in wg
Maximum gas inlet pressure (LPG)	35 mbar	14 in wg
Burner setting pressure (natural gas)	10 mbar	4 in wg
Burner setting pressure (LPG)	25 mbar	10 in wg
Injector size (natural gas)	2.5mm	—
Injector size (LPG)	1.50mm	—
Approx flue gas	78.45 m <sup>3</sup> /hr	2773 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	—	¾" BSP
Draught diverter outlet size	153mm	6"
Shipping weight	325 kg	715 lbs
MINIMUM CLEARANCE All round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 1030mm	24" 40.5"
Safety Valve	20mm	¾"
Electrical Rating	230V on 1 amp or less	—
Supply Fuse Rating	2 amp	—



# Technical Data (cont'd)

## Technical Data SBE 100-400

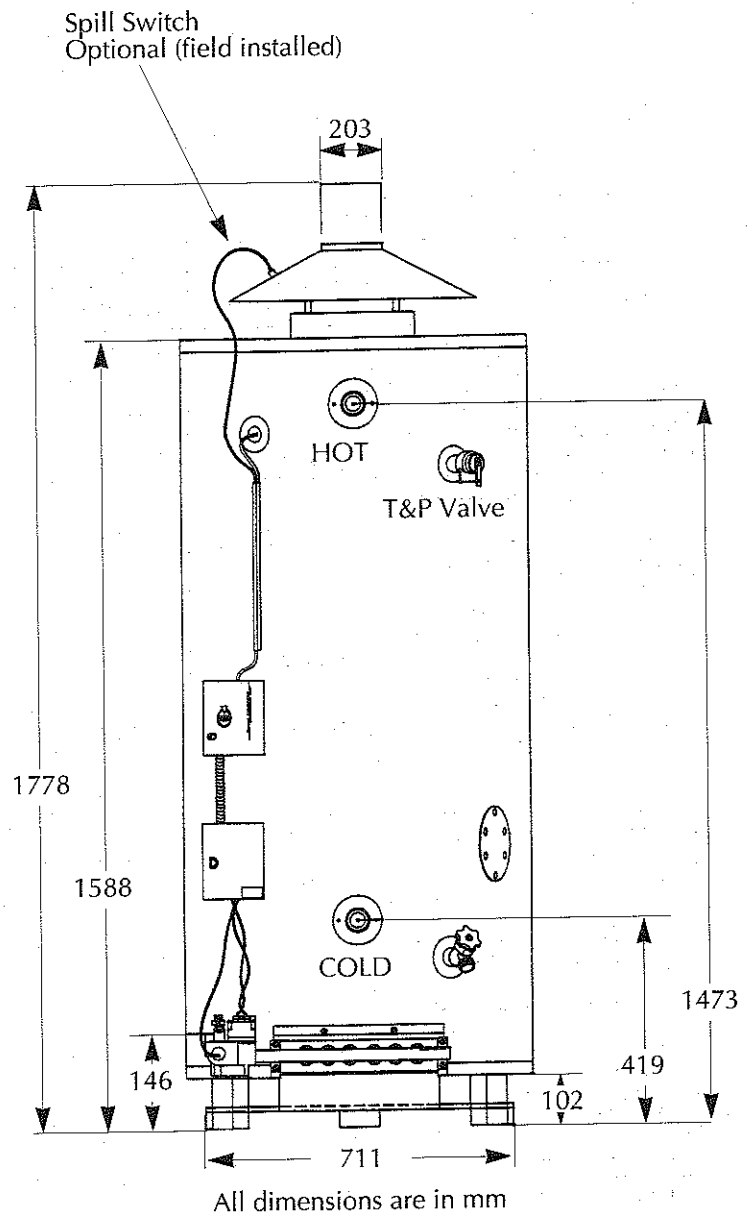
Continuous at 44°C temperature rise	1642 litre/hr	362 UK gal/hr
Storage capacity	379 litres	83 UK gal
Weight filled	773 kg	1700 lb
Time to recover storage with 44°C temperature rise	14 minutes	14 minutes
Input rate	10.08 m <sup>3</sup> /hr	357 ft <sup>3</sup> /hr
Input gross	108 kW	368,820 Btu/hr
Output gross	84.24 kW	287,680 Btu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 metres	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Nominal gas inlet pressure (LPG)	27.5 mbar	11 in wg
Maximum gas inlet pressure (natural gas)	35 mbar	14 in wg
Maximum gas inlet pressure (LPG)	35 mbar	14 in wg
Burner setting pressure (natural gas)	10 mbar	4 in wg
Burner setting pressure (LPG)	25 mbar	10 in wg
Injector size (natural gas)	3mm	-
Injector size (LPG)	1.90mm	-
Approx flue gas	151.30 m <sup>3</sup> /hr	5348 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	-	¾" BSP
Draught diverter outlet size	203mm	9"
Shipping weight	395 kg	870 lbs
MINIMUM CLEARANCE All round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 1030mm	24" 40.5"
Safety Valve	20mm	¾"
Electrical Rating	230V on 1 amp or less	-
Supply Fuse Rating	2 amp	-



# Technical Data (cont'd)

## Technical Data SBE 70-360

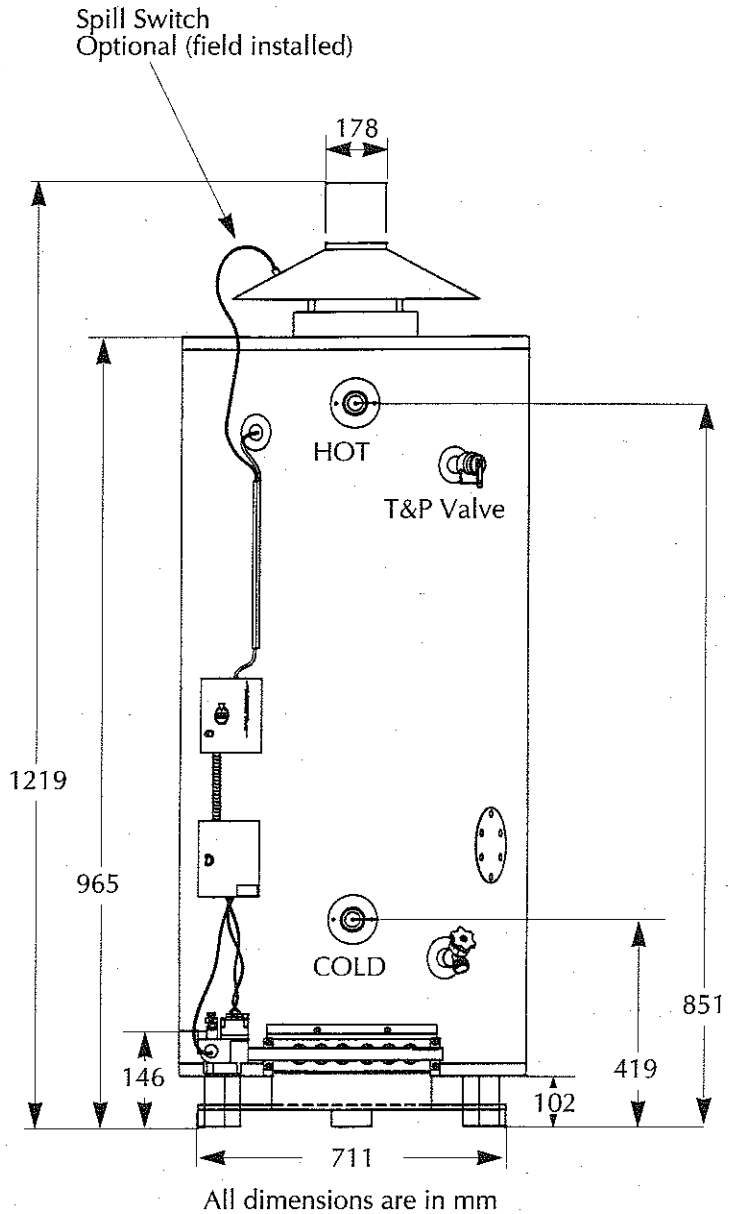
Continuous at 44°C temperature rise	1391 litre/hr	306 UK gal/hr
Storage capacity	265 litres	58 UK gal
Weight filled	611 kg	1345 lb
Time to recover storage with 44°C temperature rise	12 minutes	12 minutes
Input rate	8.55 m <sup>3</sup> /hr	302 ft <sup>3</sup> /hr
Input gross	91.5 kW	312,472 Btu/hr
Output gross	71.37 kW	243,728 Btu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 metres	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Nominal gas inlet pressure (LPG)	27.5 mbar	11 in wg
Maximum gas inlet pressure (natural gas)	35 mbar	14 in wg
Maximum gas inlet pressure (LPG)	35 mbar	14 in wg
Burner setting pressure (natural gas)	10 mbar	4 in wg
Burner setting pressure (LPG)	25 mbar	10 in wg
Injector size (natural gas)	2.8mm	-
Injector size (LPG)	1.70mm	-
Approx flue gas	128.19 m <sup>3</sup> /hr	4531 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	-	¾" BSP
Draught diverter outlet size	203mm	9"
Shipping weight	348 kg	765 lbs
MINIMUM CLEARANCE All round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 1030mm	24" 40.5"
Safety Valve	20mm	¾"
Electrical Rating	230V on 1 amp or less	-
Supply Fuse Rating	2 amp	-



# Technical Data (cont'd)

## Technical Data SBE 30-225

Continuous at 44°C temperature rise	1002 litre/hr	220 UK gal/hr
Storage capacity	114 litres	25 UK gal
Weight filled	351 kg	773 lb
Time to recover storage with 44°C temperature rise	7 minutes	7 minutes
Input rate	6.17 m <sup>3</sup> /hr	217 ft <sup>3</sup> /hr
Input gross	66 kW	225,000 Btu/hr
Output gross	51.38 kW	175,462 Btu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 metres	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Nominal gas inlet pressure (LPG)	27.5 mbar	11 in wg
Maximum gas inlet pressure (natural gas)	35 mbar	14 in wg
Maximum gas inlet pressure (LPG)	35 mbar	14 in wg
Burner setting pressure (natural gas)	10 mbar	4 in wg
Burner setting pressure (LPG)	25 mbar	10 in wg
Injector size (natural gas)	2.50mm	-
Injector size (LPG)	1.50mm	-
Approx flue gas	92.55 m <sup>3</sup> /hr	3255 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	-	¾" BSP
Draught diverter outlet size	178mm	7"
Shipping weight	238 kg	525 lbs
MINIMUM CLEARANCE All round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 508mm	24" 20"
Safety Valve	20mm	¾"
Electrical Rating	230V on 1 amp or less	-
Supply Fuse Rating	2 amp	-

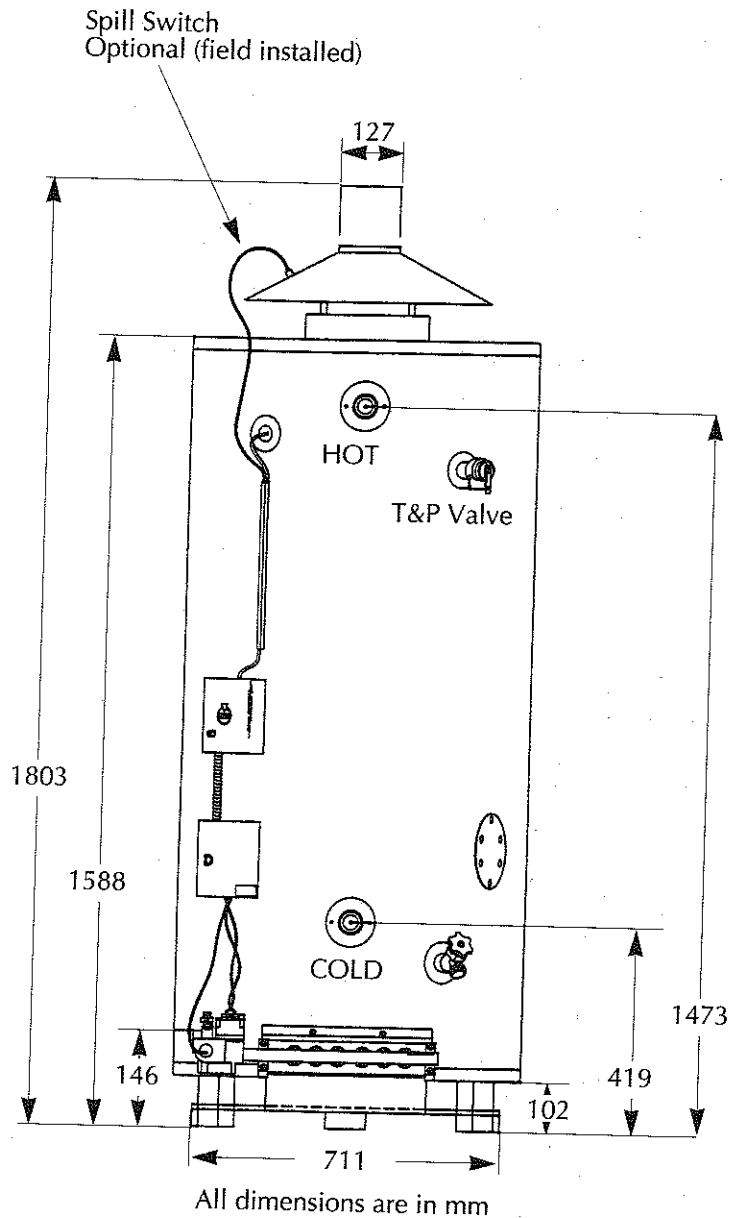




# Technical Data (cont'd)

## Technical Data SBE 80-180

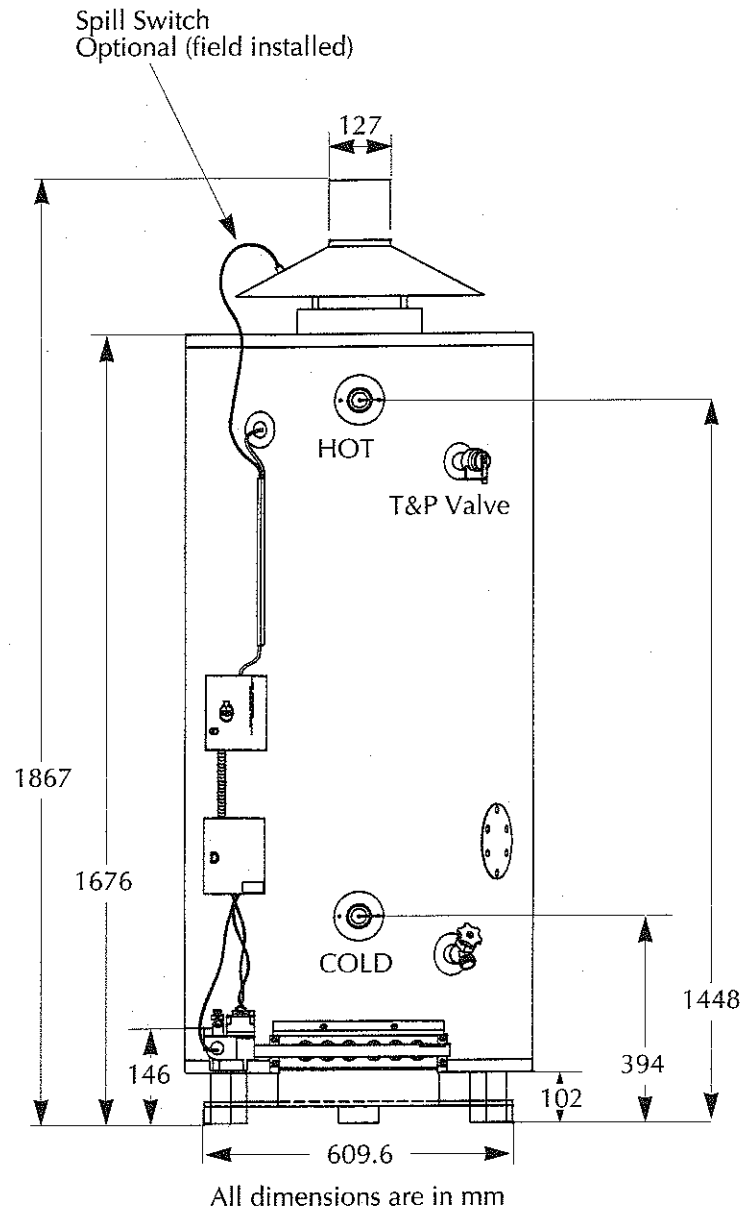
Continuous at 44°C temperature rise	801 litre/hr	176 UK gal/hr
Storage capacity	303 litres	67 UK gal
Weight filled	595 kg	1310 lb
Time to recover storage with 44°C temperature rise	25 minutes	25 minutes
Input rate	4.95 m <sup>3</sup> /hr	174 ft <sup>3</sup> /hr
Input gross	53 kW	180,000 Btu/hr
Output gross	41.10 kW	140,356 Btu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 metres	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Nominal gas inlet pressure (LPG)	27.5 mbar	11 in wg
Maximum gas inlet pressure (natural gas)	35 mbar	14 in wg
Maximum gas inlet pressure (LPG)	35 mbar	14 in wg
Burner setting pressure (natural gas)	10 mbar	4 in wg
Burner setting pressure (LPG)	25 mbar	10 in wg
Injector size (natural gas)	2.15mm	-
Injector size (LPG)	1.30mm	-
Approx flue gas	74.25 m <sup>3</sup> /hr	2610 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	-	¾" BSP
Draught diverter outlet size	127mm	5"
Shipping weight	290 kg	640 lbs
MINIMUM CLEARANCE All round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 1030mm	24" 40.5"
Safety Valve	20mm	¾"
Electrical Rating	230V on 1 amp or less	-
Supply Fuse Rating	2 amp	-



# Technical Data (cont'd)

## Technical Data SBE 75-115

Continuous at 44°C temperature rise	512 litre/hr	112 UK gal/hr
Storage capacity	281 litres	62 UK gal
Weight filled	544 kg	1198 lb
Time to recover storage with 44°C temperature rise	33 minutes	33 minutes
Input rate	3.13 m <sup>3</sup> /hr	110 ft <sup>3</sup> /hr
Input gross	34 kW	115,000 Btu/hr
Output gross	21.2 kW	89,563 Btu/hr
Maximum working head	10.3 bar	150 psig.
Minimum working head	3 metres	10 ft
Nominal gas inlet pressure (natural gas)	17.5 mbar	7 in wg
Nominal gas inlet pressure (LPG)	27.5 mbar	11 in wg
Maximum gas inlet pressure (natural gas)	35 mbar	14 in wg
Maximum gas inlet pressure (LPG)	35 mbar	14 in wg
Burner setting pressure (natural gas)	10 mbar	4 in wg
Burner setting pressure (LPG)	25 mbar	10 in wg
Injector size (natural gas)	2.05mm	—
Injector size (LPG)	1.35mm	—
Approx flue gas	47.09 m <sup>3</sup> /hr	1665 ft <sup>3</sup> /hr
Approx flue gas temperature	238°C	460°F
Water connections—cold inlet —hot outlet	1½ BSP 1½ BSP	1½ BSP 1½ BSP
Open Vent	25mm	1" Minimum
Cold feed pipe	25mm	1" Minimum
Gas connection	—	¾" BSP
Draught diverter outlet size	127mm	5"
Shipping weight	263 kg	578 lbs
MINIMUM CLEARANCE All round	152mm	6"
SERVICE CLEARANCE Front Above	610mm 1030mm	24" 405"
Safety Valve	20mm	¾"
Electrical Rating	230V on 1 amp or less	—
Supply Fuse Rating	2 amp	—



# Installation

## Related Documents

The installation of the storage water heater must be in accordance with the relevant requirements of the Gas Safety (Installation and Use) Regulations: 1984 and Byelaws of the local water Authority, the Model Water Byelaws and the Building Regulations.

Also, it should be in accordance with any relevant requirements of the Local Authority, the local Gas Region, and the requirements of the following British Standard Codes of Practice:

BS 6644	<i>Installation of Gas Fired Hot Water Boilers 60 kw to 2 MW</i>
1M/11	<i>Flues for Industrial and Commercial Gas Fired Boilers</i>
BS 6700	<i>Design, Installation, Testing and Maintenance of services supplying water for Domestic use within buildings and their curtilages</i>
BS 7200	<i>Unvented Hot Water Storage Units and packages</i>

The installation must conform to commercial standards, but the following may be used, where necessary, for further guidance:

BS 5540: Part 1	<i>Flues for Gas Appliances up to 60 kw</i>
BS 5440: Part 2	<i>Air Supply For Gas Appliances up to 60 kw</i>
BS 5546	<i>Installation of Gas Hot Water Supplies for Domestic Purposes (2nd Family Gases).</i>

It is the law that all gas appliances are installed and serviced by competent persons in accordance with the above regulations. It is in your own interest and that of safety to ensure that the law is complied with.

## Location

The location of the storage water heater must permit a satisfactory flue and an adequate air supply. The location must also provide the minimum clearances for servicing and air circulation around the water heater. The water heater must not be installed in a bedroom, bed sitting room, or a room containing a bath or shower. They are considered unsuitable for installation in individual dwellings eg houses, flats or hotel rooms. The floor on which the heater is installed must be flat, level, and of sufficient load bearing capacity to support the weight of the filled water heater with allowance for the weight of additional pipework bearing on the appliance.

Minimum clearances all round the heater should be 150 mm.

A clearance of 600 mm should be accessible at the front of the heater for removal of the burner assembly and 1030 mm above the heater for removal of the flue baffles and anode rods.

The location selected should be as close to the flue stack or chimney as practical and as centralized with the piping system as possible. It should be located in an area not subject to freezing temperatures.

The water heater must not be installed on carpeting. Carpeting must be protected by a suitable panel beneath the appliance extending beyond the full width and depth of the appliance by at least 75 mm in any direction.

Any combustible material adjacent to the heater must be so placed or shielded as to ensure that its temperature does not exceed 65°C.

## Combustion and Ventilation Air Supply

Detailed recommendations for combustion and ventilation air supplies are given in British Standard 6644. The following notes are intended to give general guidance:

The space housing the water heater installation must have permanent air vents communicating directly with the outside air, at high and low level. Where communication with the outside air is possible only by means of high level air vents, ducting down to floor level for the lower vents must be used.

The natural ventilation openings at high and low level should be 4.5 cm<sup>2</sup>/kW at low level and 2.25 cm<sup>2</sup>/kW at high level.

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 a position adjacent to an extraction system which is carrying flammable vapour.

Grilles or louvres should be designed so that high velocity air systems are minimized in the boiler house.

If the water heater is installed in hairdressers premises, barber shops, dry cleaning establishments or laundry facilities, it is imperative that the combustion and ventilation air must not be contaminated. Sprays or materials emitting volatile vapours can be a source of ignition from the permanent pilot burner in the water heater. Propellants of aerosol sprays and fumes of volatile compounds, in addition to being highly flammable, will also change to corrosive hydrochloric or hydrofluoric acid when exposed to the combustion products of the water heater. The results may be hazardous, cause service problems and produce failure.

## Effects of an Extract Fan

If there is any type of extraction fan fitted in the premises, there is a possibility that if adequate air inlet areas from the outside are not provided, spillage of the products of combustion from the water heater flue could occur when the fan is in operation.

Where such installations occur, a spillage test as detailed in BS 5440: Part 1 must be carried out and any necessary corrective action taken.

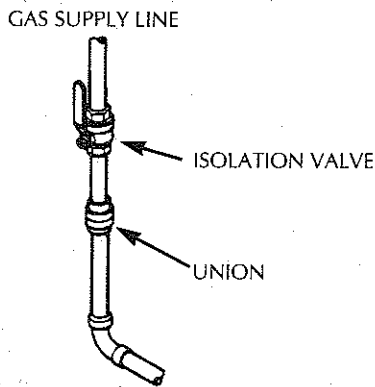
# Installation (cont'd)

## Gas Meter

The gas piping to the water heater is connected to a gas meter by the local Gas Region or the local Gas Regional contractor. An existing gas meter and service should be checked preferably by the local Gas Region to ensure that the meter is adequate to deal with the additional rate of gas supply required.

## Gas Piping

Installation of the gas supply pipes should be in accordance with BS 6891. A gas line of sufficient size should be run to the water heater. Make sure the gas supplied is of the same type as listed on the data badge.



There must be:

- A readily accessible and clearly identified manual isolation valve in the gas supply in accordance with the Gas Safety (Installation and Use) Regulations: 1984
- A ground joint union between the manual isolation valve and the appliance control valve to permit servicing on the water heater.

To prevent damage, care must be taken not to allow the torque to be applied across the gas control when attaching the gas supply pipe to the control valve inlet.

Before commissioning the heater, the installation pipes must be tested for soundness and purged, see BS 6891. When the gas line is tested, it should be disconnected from the gas control valve on the heater and capped. If the gas control is subjected to pressures in excess of 35 m bar (14 in WG), the damage to the gas valve could result in an extremely hazardous condition. The manufacturer of the water heater will not be liable either direct or contingent for incidental or consequential damages in the event these instructions are not followed.

Total Input kw (BTU/h)	Distance from Meter, In Metres (Feet)						
	9 (30)	18 (60)	27 (90)	36 (120)	46 (150)	55 (180)	64 (210)
22 (75,100)	¾	1	1	1	1¼	1¼	1¼
44 (150,000)	¾	1	1	1	1¼	1¼	1¼
59 (200,000)	1	1¼	1¼	1¼	1¼	1¼	1¼
88 (300,000)	1¼	1¼	1¼	1½	1½	1½	1½
117 (400,000)	1¼	1½	1½	1½	2	2	2
147 (500,000)	1¼	1½	2	2	2	2	2
176 (600,000)	1½	2	2	2	2	2	2
220 (750,000)	1½	2	2	2	3	3	3

## Flue System

Detailed recommendations for flues are given in British Standard 6644, BS 5440: Part 1, and 1M/1T. The following notes are intended to give general guidance:

- All flue joints must be made "socket up" to retain any condensate within the flue.
- All products of combustion and flue gases must be completely removed to the outside air without spillage from the draught diverter.
- Horizontal runs of pipes and 90° bends/elbows should be avoided.
- The cross sectional area of the flue serving the water heater must not be less than the area of the outlet of the flue connection on the top of the appliance.
- Observe clearances from all combustible materials, i.e. 50mm except where the flue passes through a non-combustible sleeve where clearance is at least 25 mm.
- Flue pipes and fittings should be constructed from materials, which are asbestos free, robust, durable, corrosion resistant and non-combustible.
- If double wall flue pipe is used, it must be of a type accepted by British Gas.
- The flue pipe should be adequately supported to ensure weight is not transferred to the top of the appliance.
- The flue connecting pipe shall not enter the chimney within 250 mm of its base, shall not protrude beyond its inner face and shall enter with an upward sweep. There must be access to examine and maintain the entry point.

A flue constructed from one of the materials used for flue pipes and fittings referred to, should form the initial connection to the chimney. Alternatively, a chimney may be lined with a stainless steel flexible flue liner or any other liner of acceptable material. The number of joints must be kept to a minimum.

Before connecting a water heater to a flue which has been previously used, the flue should be thoroughly swept clean of any soot and loose material. If a register plate, restrictor plate, damper, etc. is fitted in a chimney flue, it must be removed before connecting the water heater to the flue.

The flue must be terminated in accordance with the relevant recommendations given in BS 5540: Part 1, and BS 6644. A suitable terminal must be fitted to the flue outlet. The terminal should have a minimum resistance to the egress of combustion products and have effective protection against the entry of rain, snow, leaves, birds, etc. The point of termination must not be within 600 mm of an openable window, air vent or other ventilation opening, nor in an area of pressure which will cause downdraught.

# Installation (cont'd)

## Common Flues

Where two or more appliances are to be connected to a common natural draught flue, the appliances shall be installed in the same room, shall have the same type of burner system and the flue shall be sized so as to ensure complete evacuation of the flue products from the whole installation.

All flues, whether single or combined, must have adequate support.

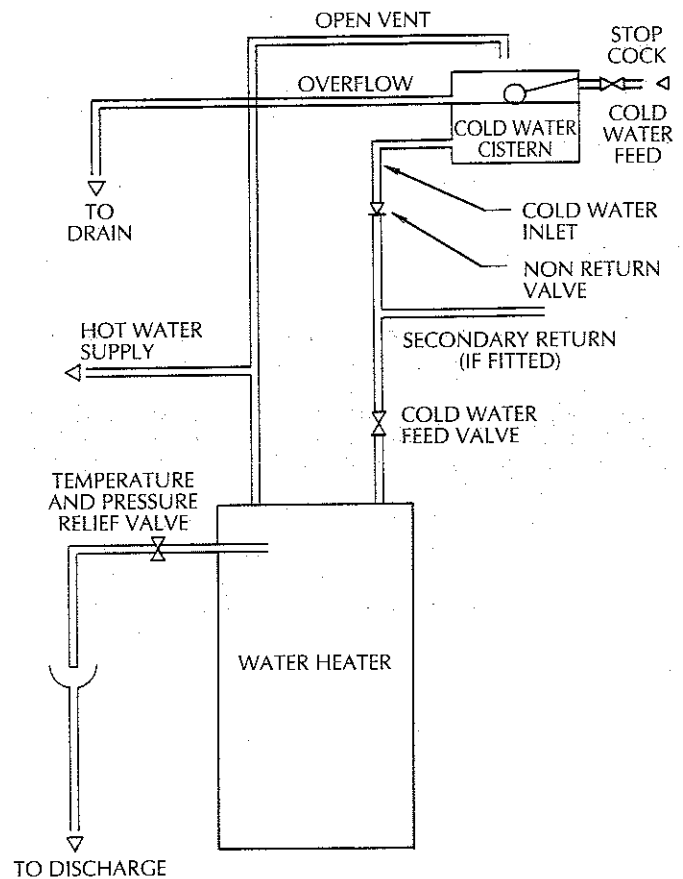
Where one appliance is likely to be used more regularly or for longer periods than others in a group, it shall be connected at the point nearest to the main flue.

When flues are combined, the area of the combined flue should be equal to the area of the largest flue, plus 50% of all the others joining it.

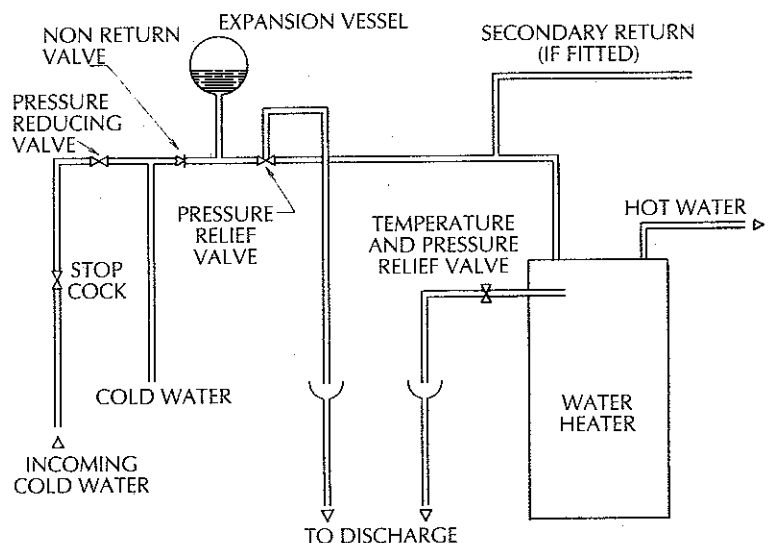
## Water Connections

Detailed recommendations for the water system are given in British Standards 5546 and 6700. The following notes are of particular importance:

- The water heater can be fitted to an open vent system or an unvented system.
- In an open system, the cistern should be fitted with a stop valve and its capacity should be in accordance with the local water byelaws and in addition must always be greater than the hourly recovery of the heater. (See Technical Data Sheet for Recovery Rate)
- It is recommended that copper tubing, complying with BS 2871: Part 1 is used for water carrying pipework.
- All pipes must be supported as shown in BS 6700.
- All pipework situated in areas which may be exposed to freezing conditions should be insulated.
- Drainage taps must be situated in accessible positions which will permit the draining of the whole system. Draining taps should be at least 1/2" nominal size and be in accordance with BS 2879.
- **The Open Vent** must be connected, normally from the top of the flow pipe of the heater, rising continuously to discharge over the cold feed cistern. Its size must not be less than that specified in the Technical Data Table. It must not be valved and must be insulated along any part where freezing may occur.
- **The Cold Feed Pipe** should be valved as shown and not less than the size specified in the Technical Data table.
- Dead legs of hot water to draw off points should be as short as possible and should not exceed the lengths laid down in BS 5546.
- If lengths required are greater than those mentioned, a return circuit must be fitted.



On **Unvented** systems, the equipment must be approved to BS 7206, and must be installed to the manufacturers recommendations. It must also be installed by a "Competent Person", as laid down in the Building Regulations - G3.



# Installation (cont'd)

## Water Treatment

The use of water softening equipment is strongly recommended in all cases where conditions of high or extreme water hardness exist.

When a water treatment plant (water softener) is used in conjunction with State water heaters, it is recommended that the total hardness be reduced to 50-85 mg/l.

High water temperatures generally cause an increase in corrosion and scale forming activity; waters below 60°C scale and corrode less, thus, it is desirable to keep the water temperature as low as possible.

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### IMPORTANT NOTICE

**Warranty on this water heater will not be valid if lime or scale deposits are allowed to accumulate causing failure of the tank due to restricted heat transfer. IN HARD WATER AREAS, CLEANING MUST BE PERFORMED AT LEAST AS OFTEN AS EVERY 90 DAYS. Failure to keep accurate records of dates of each cleaning will constitute lack of proper maintenance and void the warranty.**

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## Temperature and Pressure Relief Valve

For protection against excessive pressures and temperatures in this water heater, a combined temperature/pressure relief valve has been installed. This valve conforms to BS 6238: Part 2: *Safety and Control devices for use in hot water systems - specification for combined temperature and pressure relief valves for pressures from 1 bar to 10 bar*. The valve is marked with the maximum set pressure not to exceed the hydrostatic working pressure of the water heater - 10 bar (150 psi).

The discharge pipe must be fitted with a tundish, with the tundish fitted as close to the valve as possible, but must be within 500 mm of the valve.

The discharge pipe from the tundish should be terminated outside of the building, in a safe place where there is no risk to persons in the vicinity of the discharge, be of metal, and:

- a. be at least one pipe size larger than the nominal outlet size of the valve unless its total equivalent hydrostatic resistance exceeds that of a straight pipe 9 meters long. Bends must be taken into account in calculating the flow resistance.
- b. have a vertical section of pipe at least 300 mm long below the tundish before any elbows or bends in the pipework.
- c. be installed with a continuous fall.
- d. have discharges visible at both the tundish and the final point of discharge, but where this is not practical or possible, there should be clear visibility at one or other of these discharges.

**NOTE:** The discharge will consist of scalding water and possibly steam. Asphalt, roofing felt and non-metallic rainwater goods may be damaged by such discharges.

The relief valve should be manually operated at least once a year. Caution should be taken to ensure that:

1. No one is in front of or around the outlet of the valve discharge pipe, and
2. That the water manually discharged will not cause any damage to property.

# Commissioning and Testing

## General Information

Before lighting the water heater, be certain that the water heater and system are filled with water. Expel air by opening all hot water outlets. Close outlets and inspect system for leaks; repair if necessary.

## Pilot Burner Adjustment

Remove pilot key cap. Turn pilot adjusting screw counter-clockwise to open (clockwise to close), until pilot burns with a strong blue flame. Do not allow pilot flame to rise off or burn lazily. Replace pilot key cap.

## Main Burner Air Adjustment

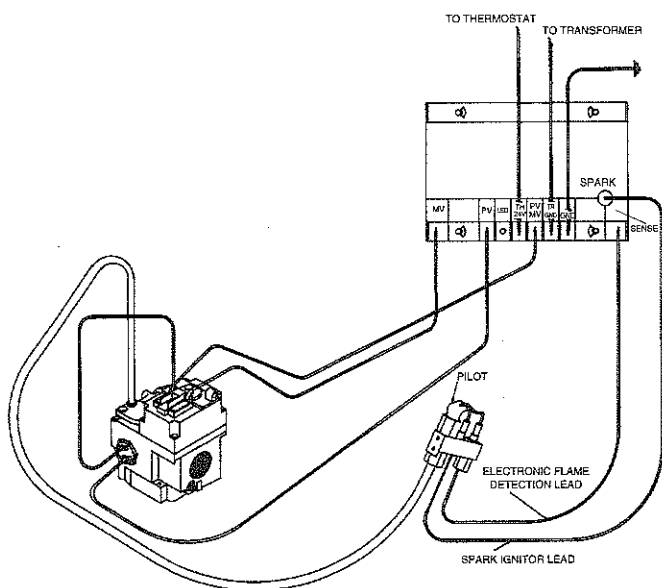
These models have a metered air supply burner which requires no further adjustments.

## Ignition System

These models are equipped with an intermittent ignition system. For the pilot to light and the burner to come on, the water heater's thermostat must call for heat. Then the system will begin sequencing, each section proving itself before actual pilot ignition takes place.

Before the water heater will operate:

1. The control system must be connected to a 240V power supply. This control system has an overall rating of 12 amps or less. The water heater must be securely and adequately earthed. This should be accomplished by using an earthed conductor from the service panel to the ground lug located on the terminal block in the junction box of the water heater.
2. The on/off toggle switch, located on the junction box must be in the "ON" (up) position for the electrical control system of the water heater to operate.
3. The manual E.C.O. must be in the closed position, see "COMPENSATING THERMOSTAT WITH MANUAL E.C.O."

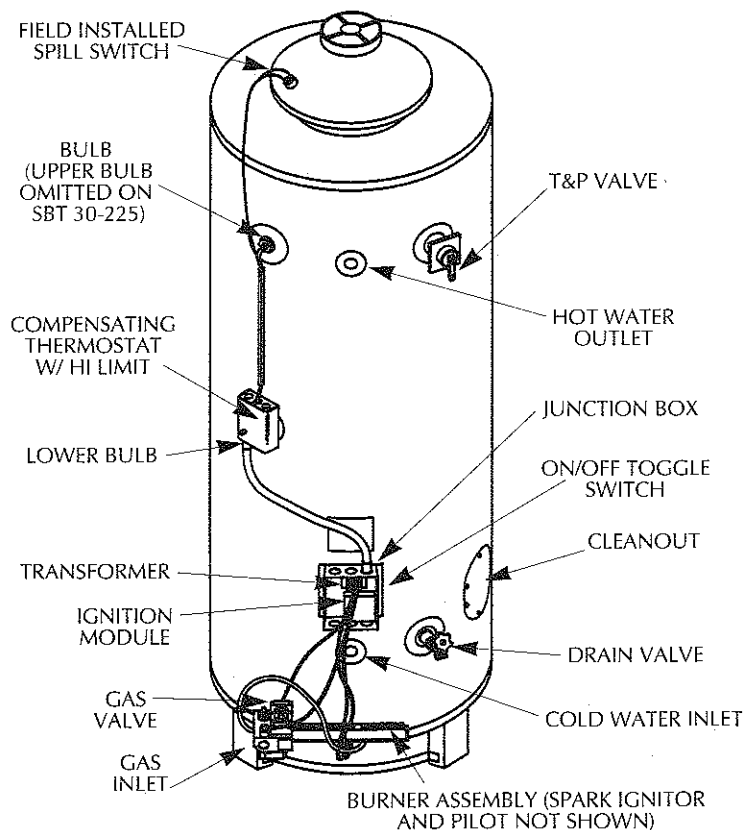


## Operational Sequence

When the thermostat calls for heat, a circuit is completed to the ignition module. The ignition module will then complete a circuit, simultaneously, to the spark ignitor and to the gas pilot valve solenoid. The spark ignitor will begin sparking and the gas pilot solenoid will open allowing gas to pass to the pilot. When pilot flame has been established, the flame sensor in the pilot burner assembly will signal the ignition module, shutting off the spark ignitor. The ignition module will now complete a circuit to the main gas control valve solenoid, which will open, and allow gas to pass to the burner.

During a period when the thermostat is calling for heat and there was an interruption of the pilot flame, the gas valve solenoid will close instantly, shutting off the supply of gas to the burner. The pilot valve solenoid will remain open allowing gas to flow to the pilot. The ignition module will complete a circuit to the spark ignitor, which will begin sparking.

1. If the pilot flame **is** re-established the gas valve will open allowing gas to the burner, and the water heater will resume operation.
2. If the pilot **is not** re-established the pilot and main gas valves solenoids will remain closed. The spark ignitor will discontinue until the water heater is re-sequenced by turning the on/off switch "OFF" and then "ON".



# Commissioning and Testing (cont'd)

## Compensating Thermostat with Manual E.C.O.

The water temperature dial is set at the lowest position during manufacture and must be turned to the desired setting by the user. The faceplate of the thermostat has been labeled with a range of temperature settings. No gas fixed water heater will provide exact water temperature at all times. Some people are more likely to be permanently injured by hot water than others; these include the elderly, children, the infirm, or the handicapped. Before immersing yourself or anyone else in hot water, be sure to check the water temperature.

### ▲ WARNING

**HOTTER WATER INCREASES THE RISK OF SCALD INJURY.**

## Water Temperatures

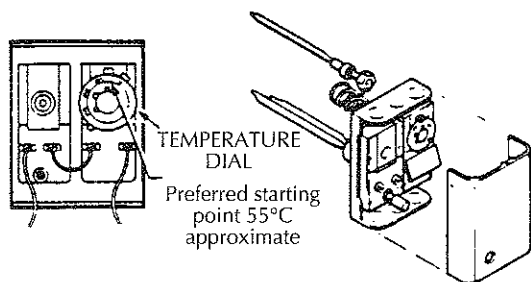
Remember that you can still be scalded with water temperature as low as 45°C.

The 55°C setting is the preferred starting point. For the most efficient operation of the water heater, the thermostat should be set at the lowest point for the consumer's need.

To set the desired temperature, turn the power "OFF", and remove the outer cover on the thermostat. Set the temperature by adjusting the temperature dial, and replace the cover, and turn the power back "ON".

The E.C.O. will activate if the water temperature exceeds 93.3°C and will not reset itself. If it is activated, turn off current to the water heater. Then push the black reset button and restore power to the water heater.

**NOTE: The reset button cannot be reset until the water temperature lowers to 49°C (120°F).**



### ▲ CAUTION

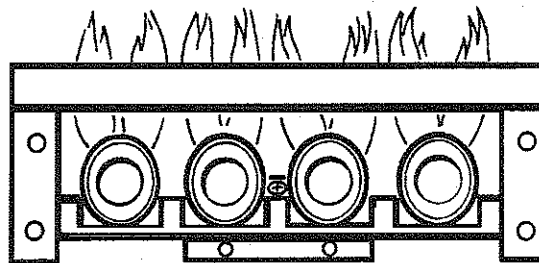
The electrical supply to this water heater must NOT be turned "ON" before the tank is completely full of water and the gas supply is available. Because there is normally a certain amount of air in a gas line when a new water heater has been installed, it may be necessary to re-sequence the water heater several times before it lights on its initial start-up.

Check:

1. The on/off toggle switch, located on the junction box must be in the "ON" (up) position for the electrical control system of the water heater to operate.
2. The manual E.C.O. must be in the closed position, see "COMPENSATING THERMOSTAT WITH MANUAL E.C.O."

## Burner Inspection

At least every 12 months a visual inspection should be made of the main gas burner and pilot burner.



## Main Burner Adjustment

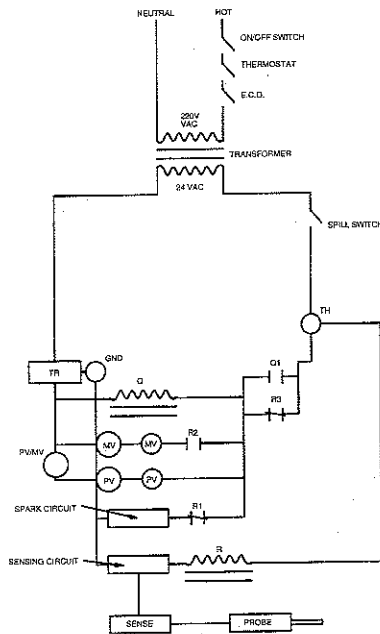
Check the main burner gas pressure by fitting a test nipple in the side of the gas valve, just below where the main burner bar is screwed into the valve. The pressure should be that as stated on the rating plate on the heater or as mentioned in the Technical Data.



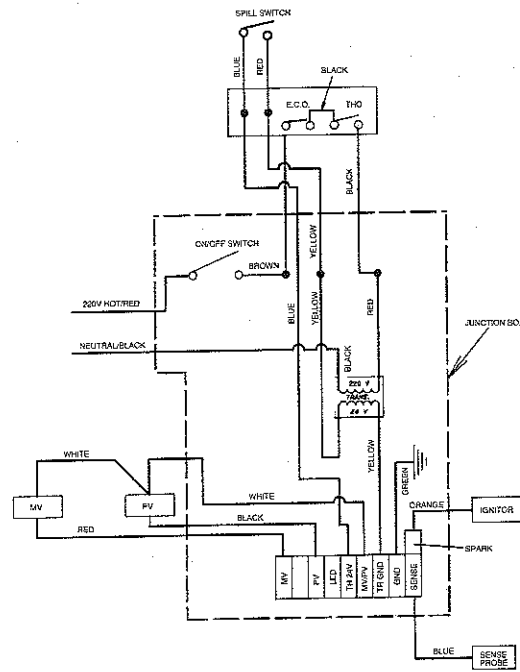
# Commissioning and Testing (cont'd)

## Wiring Diagram

You must provide all wiring of the proper size outside of the water heater. You must conform to the latest IEE Regulations when you install this heater. This water heater must be "earthed" by the installer. Using the screw on the water heater junction box, a wire must be run to connect the water heater to an uninterrupted metallic ground.



This appliance is suitable for fixed wiring only. The supply to this appliance must be provided with a means for disconnection from the supply having a contact separation of at least 3mm in all poles.



## Maintenance

### Servicing Instructions

To prolong the life of the water heater, it is recommended that the unit is serviced at least once a year. The service should be carried out by a qualified service engineer.

#### Before Commencing the service work:

1. Turn off the electricity supply.
2. Turn off the gas tap on the gas control valve.
3. Turn off the main gas isolation cock.
4. Turn off the cold water feed supply to the heater.
5. Open a nearby hot water outlet.
6. Attach a hose to the drain valve, and turn on and run to waste.
7. Disconnect the split flue clip and remove the draught diverter.

#### To Clean the Main Burner Assembly

1. Disconnect the four wires from the gas control valve.
2. Disconnect the "TH" lead and sensor from the ignition module and remove from box.
3. Unscrew the main gas union near the gas control valve.
4. Remove the two retaining screws under the burner tray from the front of the base assembly.
5. Carefully withdraw the burner assembly by pulling straight out until clear of the combustion chamber.
6. Place the burner assembly on the work bench and support the manifold to prevent damage to the pilot supply pipe. Brush the burner flame ports with a stiff bristle brush and remove any scale from inside the burner tubes by tipping upward, giving each a light tap.
7. Check the condition of the flame sensor, ignition electrode and pilot burner and renew if necessary.

# Maintenance

8. Check the pilot supply pipe for tightness at the pilot burner.
9. Clean any deposits from the pilot burner with a small brush.
10. Examine the condition of the burner injectors. To do this, remove the screws securing the burner manifold from the burner assembly. Clean the burner injectors, if necessary, with a soft cloth and wood splinter. Do not attempt to clean with a drill or metallic reamer.
11. Re-assemble the manifold to the burner assembly.
12. Check the condition and operation of the control knob of the gas valve for damage. Replace the entire valve if found damaged.

## To clean the Flueways:

1. Remove the 5 retaining screws from the top cover and remove the cover and the flue collector.
2. Withdraw the flue tube baffles.
3. Examine and repair as necessary, the flue collector/tank top seal.
4. Clean the flue baffles and flue tubes with a suitable stiff brush and remove any deposits from the top of the tank.
5. Clean out all deposits from the combustion chamber floor plate.
6. Replace the flue baffles.
7. Examine the condition of the flue pipe, terminal and supports, giving attention to ensuring that the flueways, including any entry point to a chimney, is clear and unobstructed and that the ventilation/combustion air grilles are clear.

## To check the Anodes:

1. Remove the magnesium anode rods by unscrewing the hexagonal securing nut from the top of the tank, adjacent to the exit of the flue tube. Using the correct sized spanner or socket, remove the anode.
2. Replace the anodes if the diameter is below 9 mm, or if more than 100 mm of the steel core rod is exposed.
3. Using the correct sized spanner or socket, refit the anode using a suitable pipe jointing compound as recommended in BS 5292 on the threads.

## To clean the Storage Tank:

**NOTE:** Ensure a new gasket is available before starting, as it is necessary to renew it before refitting the inspection cover.

1. Remove the hexagon head bolts retaining the inspection cover and with a light tap, free the cover from its flange seating.
2. Remove all evidence of the old gasket material from the cover as well as its flange.

3. Remove all deposits from the base of the storage tank, taking care not to damage the Turbo Force Ring, or the vitreous enamel lining inside the tank. To remove hard scale, it is the recommendation of the manufacturer that water treatment specialists be called in to circulate an approved chemical de-scalent through the tank, so that hardened deposits can be dissolved and removed. (Important Note: Magnesium anode rods must not come in contact with any chemical de-scalent and should therefore be removed while cleaning the tank).
4. Using a new gasket, replace the inspection cover and securing bolts.

## After the Servicing is completed:

1. Replace the flue collector cover and top, pushing firmly into place.
2. Fasten in place, using the 5 retaining screws.
3. Replace the draught diverter and rejoin split flue clip.
4. Insert the burner assembly into the combustion chamber, whilst positioning the pipe between the gas control valve and the burner manifold. Push in fully so that the holes in the mounting bracket underneath the front of the tray align with those in the heater base. Replace the 2 retaining screws.
5. Remake the union at the gas control valve and burner manifold.
6. Re-connect the 4 wires to the gas control valve.
7. Re-connect the "TH" lead and sensor lead from the ignition module.
8. Turn off the drain valve and remove the hose.
9. Turn on the cold water supply to the heater and refill leaving a hot tap open until water is seen to run freely from the tap. Check at other taps for any air locks. Close all hot taps.
10. Check water connection for soundness.
11. Test for gas soundness, with leak detection fluid, any joints or threads broken or disturbed.
12. Recommission the heater.

## Unvented Systems:

If the water heater is fitted to an unvented system, the following actions are required when the unit is serviced.

1. The pressure in the expansion vessel needs to be checked to make sure that it is at the required pressure of 3.5 bar. If the pressure is lower than this the vessel needs to be pumped back up to the correct pressure.
2. The expansion valve requires to be manually tested.
3. The temperature/pressure relief valve fitted to the water heater needs to be manually tested.
4. The line strainer in the combined pressure reducing valve/line strainer needs to be cleaned.

# Maintenance (cont'd)

## Replacement of Parts

### Gas Control Valve:

1. Proceed as instructed for the "Servicing Instructions" steps 1 to 4.
2. Disconnect the 4 wires from the gas control valve.
3. Unscrew the main gas union near the gas valve.
4. Unscrew the nut retaining the pilot tube on the gas valve.
5. Carefully unscrew the gas valve from the main burner bar, taking care that no force is put onto the main burner bar.
6. Replace the gas valve as required.
7. Re-assemble in the reverse order.
8. Recommission the heater.
9. Check for gas soundness on all remade or disturbed joints, with leak detection fluid and seal any leaks found. Recheck for gas soundness following any leaks found.

### Burner Replacement:

1. Proceed as instructed for the "Servicing Instructions", steps 1 to 4.
2. Proceed as instructed for cleaning the main burner assembly in the "Servicing Instructions"; through steps 1 to 5.
3. Place the burner assembly on the work bench and support the manifold to prevent damage to the pilot supply pipe beneath the burner.
4. Remove the 4 screws securing the top plate of the burner tray .
5. Remove the screws securing the manifold to the burner assembly .
6. The individual burner bars can now be lifted clear of the burner tray, leaving only the pilot assembly attached to the tray.
7. Replace the burner bars in the stainless steel tray and reassemble in reverse order.
8. Recommission the heater.
9. Check for gas soundness on all remade or disturbed joints, with leak detection fluid and seal any leaks found. Recheck for gas soundness following any leaks found.
10. Set the thermostat to the desired setting.

### Pilot Assembly:

1. Proceed as instructed for the Burner Replacement steps 1 to 4.
2. Remove the 2 machine screws securing the pilot assembly.
3. If the complete pilot assembly is being replaced, the replacement assembly may be secured in place and the burner assembly re-assembled in reverse order.

**NOTE:** If the pilot gas supply pipe is being replaced, the individual part may be removed from the assembly by disconnecting the compression fittings and tubing nuts.

4. Re-assemble the parts in the reverse order.
5. Turn on the main gas isolation valve and recommission the water heater.

### Combined Thermostat:

1. Proceed as instructed for the "Servicing Instructions" steps 1 to 6.
2. Remove the Grey cover of the combined thermostat.
3. Disconnect the two blue wires which come from the main junction box.
4. With a spanner, carefully unscrew the retaining nut from the top sensor, and then remove the sensor from the tank.
5. With an adjustable spanner, carefully unscrew the combined thermostat from the tank, and remove the thermostat.
6. Fit the new thermostat, taking care not to damage the capillary wires connecting the top sensor to the thermostat.
7. Turn off the drain valve and disconnect the hose pipe.
8. Turn on the cold water feed valve to the heater and refill, leaving a hot tap open until water is seen to run freely. Check at other hot taps for any air locks. Close all hot taps.
9. Recommission the heater.

### Temperature/Pressure Relief Valve:

1. Proceed as instructed for the "Servicing Instructions" steps 1 to 6.
2. Disconnect the discharge pipe from the temperature/pressure relief valve.
3. Unscrew the temperature/pressure relief valve from the tank.
4. Replace as necessary.
5. Re-assemble in reverse order.
6. Turn off the drain valve and disconnect the hose.
7. Turn in the cold water feed valve to the heater and refill, leaving a hot tap open until water is seen to run freely. Check at other hot taps for any air locks. Close all hot taps once the tank is full.
8. Recommission the heater.

# Maintenance (cont'd)

## Ignition Module:

1. Proceed as instructed for the "Servicing Instructions" steps 1 to 4.
2. Remove screw securing the lid to the junction box, and open lid.
3. Disconnect the wires from the ignition module.
4. Remove the 2 screws securing the ignition module.
5. Replace as necessary.
6. Re-assemble in the reverse order.
7. Recommission the heater.

## General Notes

1. To ensure the safe and efficient operation of your water heater, it should be serviced at least once a year, by arrangement with a qualified service engineer. (See item 8 below).
2. Keep the area around the water heater clean and well clear from dust and lint or other combustible materials.
3. Do not place anything on or near the heater and always ensure there is clear passage for combustion and ventilation air to the heater.
4. Do not block or obstruct any purposely made ventilation grilles or ducts.
5. Do not attempt to operate the heater without an adequate or fully functional water supply.
6. If you think the heater is malfunctioning, turn it OFF and seek expert advice and assistance.
7. If a leak of gas is suspected, turn OFF the gas supply and ventilate the area. Contact the local office of British Gas immediately. Do not touch electrical switches and extinguish any open flame.
8. Failure of the water heater tank may occur if scale is allowed to build up. If a water softener is not used, the water heater may need attention as frequently as every three (3) months in hard water areas.  
Failure due to scale build up will invalidate the warranty.
9. Obtain advice from your local gas region before making any alterations which may affect the air supply and ventilation of the water heater. eg. building alterations, fitting extractor fans, etc.

To clean the outer casing of the water heater, wipe the paint clean with a soft damp cloth and dry with a clean dry cloth.

If the water heater is not giving you the service you need:

1. Check that the power is switched on
2. Check the setting of the temperature selection knob and adjust if necessary.
3. Do not dismantle any of the gas components, but seek expert advice and assistance by calling your local Gas Region or Service engineer for service.

## Frost Protection

If the water heater is not to be fully operative during freezing conditions, the entire water system should be completely drained to prevent damage to the heater and pipework from the effects of burst pipes.

## Volatile or Explosive Liquids and Corrosive Solutions

Flammable vapours and corrosive fumes may be drawn by air currents from other areas of the structure to this appliance, therefore, these types of products should not be stored anywhere near the water heater, as the pilot flame could cause a hazardous condition or the life of the heater could be reduced through undue corrosion.

# Users Instructions

## FOR YOUR SAFETY READ BEFORE LIGHTING

### WARNING

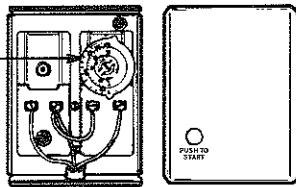
If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- A. This appliance is equipped with an ignition device which automatically lights the pilot. **Do not try to light the pilot by hand.**
- B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not try to light any appliance.
  - Do not touch any electric switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

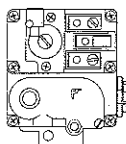
## LIGHTING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Turn off all electrical power to the water heater.
3. Remove thermostat access cover.
4. Set the thermostat to lowest setting.

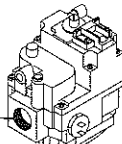
"SHOWN AT LOWEST THERMOSTAT SETTING"



5. This appliance is equipped with an ignition device which automatically lights the pilot. **Do not try to light the pilot by hand.**



GAS INLET



6. Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.
7. At arms length away, set the thermostat to desired setting. The 120°F setting which approximates 120°F is preferred starting point. If hotter water is desired, see instruction manual and "warning" below.
8. Replace thermostat access cover.
9. Turn on all electric power to the appliance.
10. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

### WARNING

Hotter water increases the risk of scald injury. Before changing temperature setting see instruction manual. For operation at outlet water temperature not in excess of 180°F.

## TO TURN OFF GAS TO APPLIANCE

1. Turn off all electric power to the appliance if service is to be performed.
2. Remove thermostat access cover.
3. Set the thermostat to lowest setting.
4. Replace thermostat access cover.

### WARNING

This water heater is equipped for one type gas only. Check the rating plate near the gas control valve for the correct gas. Do not use this water heater with any gas other than the one listed on the rating plate. Failure to use the correct gas can cause problems which can result in death, serious bodily injury, or property damage. If you have any questions or doubts consult your gas supplier or gas utility.

# Troubleshooting

## Fault Finding Chart

CONDITION	CAUSE	REMEDY
<b>No Spark - No Pilot Gas</b>	No Main Power	Turn on Power
	Faulty Transformer	Test and replace
	Faulty Thermostat	Test and replace
	Faulty Limit Switch	Test and replace
	Faulty Ignition Module	Test and replace
	Faulty Wiring	Test Wiring
<b>Spark - but no Pilot Gas</b>	Faulty Ignition Module	Test and replace
	No gas supply to Pilot Valve	Check for availability of Gas
	Manual valve in "OFF" position	Turn Manual Valve to "ON" position. Check Pilot key adjustment.
	Faulty Pilot Valve	Test Gas Valve and replace as necessary
	Restricted Pilot Line or clogged Pilot Injector	Clean Pilot tubing and Injector.
	Broken or shorted Electrode Assembly	Replace Electrode
<b>Pilot Gas - but no Spark</b>	Faulty Ignition Module	Test and replace
	Broken or shorted Electrode Assembly	Replace Electrode
<b>Pilot lit - but Main Burner will not light</b>	Faulty Ignition Module	Test and replace
	Faulty Wiring	Test Wiring
	Low Pilot Flame	Check Inlet Pressure and Pilot Flame, and adjust as necessary
	Improper alignment of Sensor in Pilot Flame	Adjust alignment
	Faulty Main Gas Solenoid Valve in Gas Control	Test Gas Valve and Replace
	Faulty Flame Sensor	Test Sensor and Wiring and replace as necessary
<b>Pilot Cycles On and Off by itself</b>	Faulty Pilot Valve	Test and Replace
	Faulty Wiring	Test Wiring
<b>Main Burner shuts down before desired Temperature is reached</b>	Low Pilot Flame	Check Inlet Pressure and Pilot Flame and adjust as necessary
	Improper alignment of Sensor in Pilot Flame	Adjust alignment
	Pilot Flame being drawn away from Sensor	Check Inlet Pressure. Manual Valve must be full "ON"
	Faulty Limit Stat	Test and Replace

# Troubleshooting (cont'd)

## Problem No. 1: No Spark and No Pilot

### Possible Causes:

- A. No Main Power
- B. Faulty Transformer
- C. Faulty Thermostat
- D. Faulty Limit Switch
- E. Faulty Ignition Module

### Solution:

#### Step 1:

Perform normal system checks of Main Power, Transformer, Thermostat, Limit Switch, and replace faulty component.

#### Step 2:

##### Model SP715A

With the power on and the thermostat set at its highest position, set voltmeter to 24 V scale and attach probes to terminals "TR" and "TH" on the Ignition Module. If you read 24 V and there is still no spark or Pilot Gas, the Ignition Module is defective and must be replaced.

##### Model SP745P

With the power on, turn the thermostat to the lowest setting, wait 10 seconds and return to high setting. Perform test as outlined for Model SP715A.

## Problem No. 2: Spark but no Pilot Gas

### Possible Causes:

- A. No Gas supplied to the Pilot Valve
- B. Manual Valve in the "OFF" position
- C. Restricted Pilot Line or clogged Pilot Injector
- D. Faulty Pilot Valve
- E. Faulty Wiring
- F. Faulty Ignition Module

### Solution:

#### Step 1:

Check for the availability of gas at gas control valve. Make sure the manual valve upstream of the gas control valve in the full "ON" position.

#### Step 2:

No pilot gas could be caused by a clogged pilot injector or pilot tubing. Also check the pilot key adjustment at the gas control valve.

#### Step 3:

With the thermostat turned to its highest setting, set the test meter to 24 V scale. Touch probes to "D" Valve terminals on the Gas Valve. If you do not get a 24 V reading, check the wiring. If the wiring is correct, check the Ignition Module.

#### Step 4:

Connect the probes to the "MV/PV" and "PV" terminals on the Ignition Module. If you do not get 24 V, the Ignition Module must be replaced.

## Problem No. 3: Pilot gas but no spark

### Possible Causes:

- A. Broken or shorted electrode assembly
- B. Faulty Ignition Module

### Solution:

#### Step 1:

Remove wire at "TR" terminal at the Ignition Module, being careful not to touch any metal parts; disconnect the electrode wire "IGN" at the Ignition Module. Connect one end of a jumper wire to terminal "GND" (DO NOT REMOVE EXISTING WIRE). Attach the other end of the jumper wire to the metal blade of a small screwdriver. Position end of metal blade approximately  $\frac{1}{8}$ " from "IGN" terminal. Reconnect "TR" terminal. Sparking should occur between screwdriver blade and "IGN" terminal.

If no sparking occurs, the Ignition Module must be replaced.

#### Step 2:

Check the pilot and electrode assembly for proper electrode gap ( $\frac{3}{32}$ " to  $\frac{1}{8}$ ") or any possible shorting of the electrode to surrounding metal surfaces. Make sure the spark ignitor and electrode connections to the ignition module are tight. The Ignition Module and Pilot Burner must both be chassis ground. If there is still no spark, the pilot and electrode assembly must be replaced.

## Problem No. 4: Pilot Flame is lit but Main Burner does not light

### Possible Causes:

- A. Low Pilot flame
- B. Improper alignment of sensor in pilot flame
- C. Faulty main gas solenoid in gas control valve
- D. Faulty wiring
- E. Faulty Flame Sensor
- F. Faulty Ignition Module

**NOTE:** Wait at least 90 seconds after pilot lights before doing the check out procedures for problem No. 4.

### Solution:

#### Step 1:

With the thermostat on, be sure that the pilot and sensor are properly aligned so that the pilot flame impinges the top  $\frac{3}{4}$ " of the sensor. Be sure that the sensor is pushed all the way into the pilot bracket. Adjust pilot flame with pilot adjustment key, if necessary. Also check the inlet supply pressure and pilot injector. If pilot hood or sensor is bent, the defective unit should be replaced.

#### Step 2:

If the main burner still will not light, make sure the main burner injectors are clear. If injectors are clear, set the voltmeter to 24 V scale and touch probes to the terminals to "TH" and "TR" on the main gas solenoid on the gas control valve. If you read 24 V and the burner will not light, replace the gas control valve.

# Troubleshooting (cont'd)

## Step 3:

BE SURE THE POWER IS "OFF" BEFORE ATTEMPTING THIS TEST.

Set the test meter to "ohm" scale or use a continuity checker. Touch one end of the probes to the tip of the flame sensor, and the other to the SENSE terminal on the Ignition Module. The "ohm" meter should read "ON", continuity should be evident.

If you do not obtain a reading, remove the wiring from the sensor and test both individually. If continuity is not evident replace wiring and/or sensor.

Also, there should be NO continuity between the sensor and the "GND" terminal on the Ignition Module. Test the wiring and sensor individually, to determine which is shorted to ground. Replace or repair.

## Step 4:

If you do not read 24 V at the gas valve after the pilot has been burning several minutes, connect the probes to "MV/PV" and "MV" terminals in the Ignition Module. If you read 24 V, repair or replace the wiring. If you do not read 24 V, replace the Ignition Module.

## Problem No. 5: Pilot cycles on and off by itself

### Possible Causes:

- A. Faulty Pilot Valve
- B. Faulty Wiring

### Solution:

#### Step 1:

With the thermostat set at its highest setting, touch probes to terminals "TH" and "TR" on Main Gas Solenoid Valve of the gas control valve. If you read 24 V, replace the complete Gas Control Valve.

#### Step 2:

If you do not read 24 V, and have tested the gas valve as described above, connect the probes of the voltmeter to "MV/PV" and "NPV" terminals on the Ignition Module. If you read 24 V, repair or replace the wiring. If you do not read 24V, the Ignition Module must be replaced.

## Problem No. 6: Main burner shuts down prior to the thermostat being satisfied.

### Possible Causes:

- A. Low Pilot Flame
- B. Improper position of flame sensor
- C. Pilot flame being drawn away from the sensor when the main burner comes on
- D. Faulty Limit Stat

### Solution:

#### Step 1:

When the main burner comes on, insure that the pilot flame is strong and the sensor is properly aligned and that the pilot flame impinges the top  $\frac{3}{4}$ " of the sensor.

If the pilot flame is drawn away from the sensor when the main burner comes on, the cause could be the inlet gas pressure is too low. Check the inlet gas pressure with the main burner on.

**NOTE:** Low inlet gas pressure to the gas control valve can be caused by several problems and is not within the scope of the procedures outlined in this service guide. Consult your local Gas Utility or Gas Supplier.

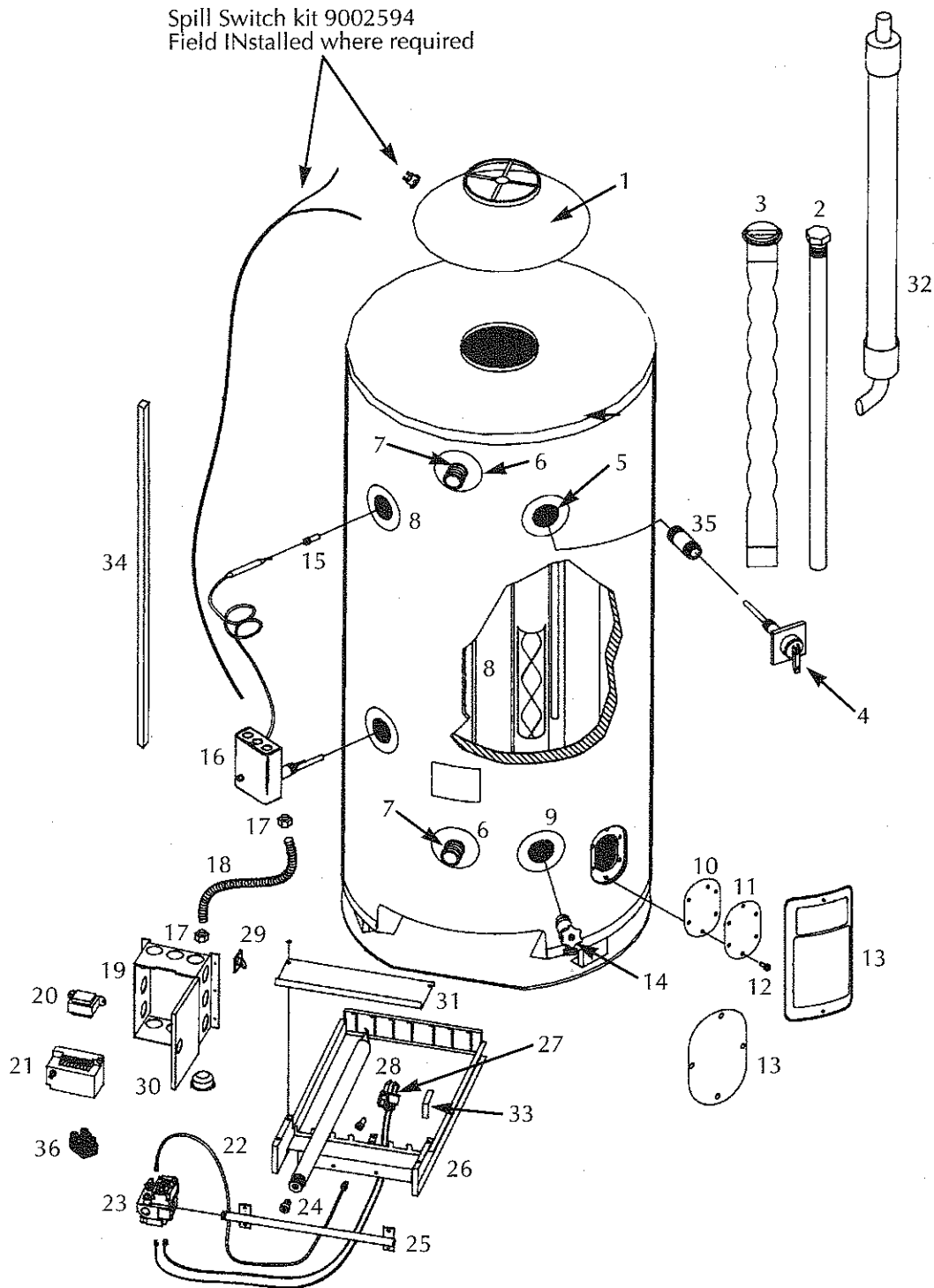
#### Step 2:

The system may be cycling on a faulty limit stat. Using a test meter, set to the 240 Volt scale, and check for a voltage reading across the limit stat when the main burner shuts off. If you get a 24 volt or 240 volt reading on shutdown, replace the defective limit stat.



# *Notes*

# Repair Parts



# Repair Parts (cont'd)

KEY NO.	PART DESCRIPTION	Model Numbers							
		SBE 75-115	SBE75-140	SBE100-199T	SBE70-360	SBE100-400	SBE30-225	SBE80-180	SBE80-500
		Part Numbers							
1	Draught Diverter	1514000	1514000	1514025	1514052	1514051	1514002	1514000	9002220
2	Anode Rod	0160072	0160072	0160014	0160141	0160141	0160140	0160141	9000921
3	Flue Baffle	1514202	1514202	1514020	1514203	1514204	1512345	1500147	1511847
4	T&P Relief Valve	0720053	0720053	0720053	0720128	0720041	0720128	0720053	9001748
5	T&P Flange	0680018	0680018	0680018	0680018	0680018	0680018	0680018	9001653
6	Inlet & Outlet Flange	0680009	0680009	0680009	0680009	0680009	0680009	0680009	0680009
7	Inlet & Outlet Nipple	0560143	0560143	0560149	0560149	0560149	0560149	0560149	9001663
8	Bulb Flange	9001785	9001785	9001785	9001785	9001785	9001785	9001785	9001785
9	Drain Valve Flange	9001763	9001763	9001763	9001763	9001763	9001763	9001763	9001763
10	Access Gasket	0530032	0530032	0530032	0530032	0530032	0530032	0530032	9000926
11	Access Cover	0470089	0470089	0470089	0470089	0470089	0470089	0470089	9000927
12	Access Bolt	0340030	0340030	0340030	0340030	0340030	0340030	0340030	9000928
13	Cleanout Access Cover	0430272	0430272	0470091	0470091	0430272	0470091	0470091	0430272
14	Drain Valve	0170034	0170034	0170034	0170034	0170034	0170034	0170034	9000469
15	Bulb Coupling	0850024	0850024	0850024	0850024	0850024	—	0850024	9000922
16	Thermostat	0180278	0180278	0180278	0180278	0180278	0180337	0180278	9000913
17	Conduit Connector	9000777	9000777	9000777	9000777	9000777	9000777	9000777	9000777
18	Conduit	9000782	9000782	9000782	9000782	9000782	9000782	9000782	9000782
19	Junction Box	9001765	9001765	9001765	9001765	9001765	9001765	9001765	9001765
20	Transformer	9001946	9001946	9001946	9001946	9001946	9001946	9001946	9001946
21	Ignitor-module (Nat.)	0180418	0180418	0180418	0180418	0180418	0180418	0180418	0180418
21	Ignitor-module (LPG)	0180418	0180418	0180418	0180418	0180418	—	—	—
22	Pilot Tubing	9000278	9000278	9000278	9000278	9000278	9000278	9000278	9000278
23	Gas Control (Nat)	0720141	0720141	0720141	0720141	0720140	0720141	0720141	0720140
23	Gas Control (LPG)	0720142	0720142	0720142	0720142	0720142	—	—	—
24	Orifice (Nat)	0230263	0230276	0230254	0230277	0230258	0230254	0230257	0230258
24	Orifice (LPG)	0230264	0230240	0230241	0230253	0230251	—	—	—
25	Gas Manifold	0220149	0220149	0220148	0220150	0220150	0220067	0220067	9001781
26	Burner Support Tray	1514022	1514022	1514019	1513946	1154050	1512134	1512134	9001768
27	Pilot Burner (Nat)	0360076	0360076	0360076	0360076	0360076	0360076	0360076	0360076
27	Pilot Burner (LPG)	0360077	0360077	0360077	0360077	0360077	—	—	—
28	Burner Tube	0200072	0200072	0200072	0200072	0200073	0200045	0200045	0200058
29	On/Off Switch	9001773	9001773	9001773	9001773	9001773	9001773	9001773	9001773
30	Bushing	9001770	9001770	9001770	9001770	9001770	9001770	9001770	9001770
31	Securing Bracket	1513955	1513955	1514018	1514049	1514049	0110340	0110340	9001771
32	Sandblaster Plus	9000471	9000471	9000471	9000471	9000471	9000471	9000471	9000471
33	Shield Pilot	0610080	0610080	0610080	0610080	0610080	0610080	0610080	0610080
34	Channel	0410057	0410057	0410057	0410057	0410057	0410055	0410057	0410057
35	Extension T&P 3/4" x 2"	0560111	0560111	0560111	0560111	0560111	0560111	0560111	0560111
36	Terminal Block	0900059	0900059	0900059	0900059	0900059	0900059	0900059	0900059



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