

# 940 ESO

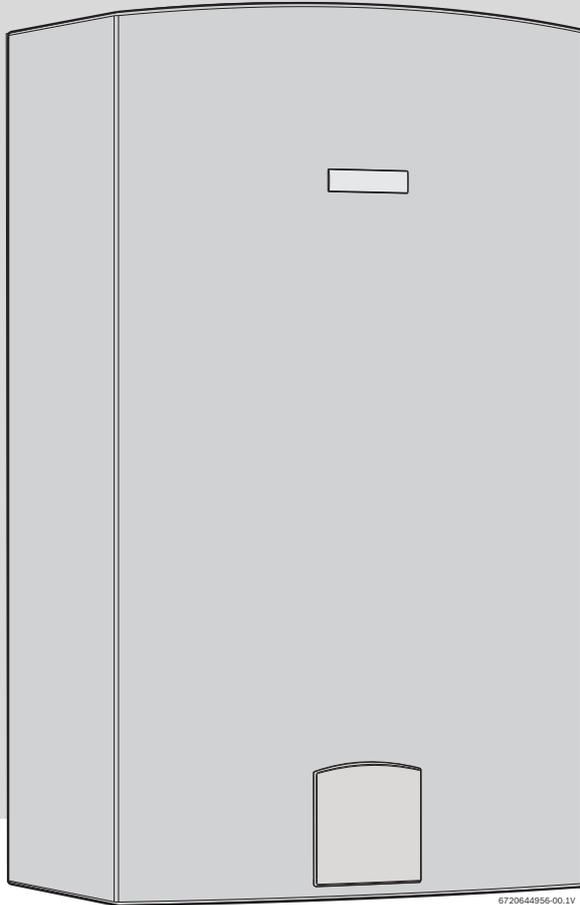


**For Outdoor Installations Only**

**Temperature Modulated with Electronic Ignition**

**Suitable for heating potable water and space heating**

**(Intended for variable flow applications)**



6720644956-00.1V



# BOSCH



**940 ESO - Natural Gas**

**940 ESO - Liquefied Petroleum (LP) Gas**

**Warning:** If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or death. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

In the Commonwealth of Massachusetts this product must be installed by a licensed plumber or gas fitter.

Upon completion of the installation, these instructions should be handed to the user of the appliance for future reference.

### What to do if you smell gas

- Close gas valve. Open windows.
- Do not try to light any appliance.
- Do not touch any electrical 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.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

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# 1 Warning

## For your safety

Do not store or use gasoline or other flammable, combustible or corrosive vapors and liquids in the vicinity of this or any other appliance.



**Warning:** Carefully plan where you install the heater. Correct installation location and proper combustion air supply are very important. If a gas appliance is not installed correctly, fatal accidents can result, such as carbon monoxide poisoning or fire.



**Warning:** Exhaust gas must be vented to outside.



**Warning:** Field wiring connections and electrical grounding must comply with local codes, or in the absence of local codes, with the latest edition of the National Electric Code, ANSI/NFPA 70, or in Canada, all electrical wiring must comply with the local codes and the Canadian Electrical Code, CSA C22.1 Part 1.



**Warning:** Shock hazard: line voltage is present. Before servicing the water heater, unplug power supply cord from outlet. Failure to do so could result in severe personal injury or death.



**Warning:** The heater must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures equal to or more than 0.5 psig.



**Warning:** The appliance should be located in an area where leakage of the heater or connections will not result in damage to the area adjacent to the appliance. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance. The pan must not restrict combustion air flow.



**Warning:** The maximum inlet gas pressure must not exceed the value specified by the manufacturer and the minimum value listed is for the purpose of input adjustment.



**Warning:** If a water heater is installed in a closed water supply system, such as one having a backflow preventer in the cold water supply line, means shall be provided to control thermal expansion. Contact the water supplier or local plumbing inspector on how to control this situation.



**Warning:** Keep appliance area clear and free from combustible materials, gasoline and other flammable vapors and liquids.



**Warning:** Do not obstruct the flow of combustion and ventilation air.



**Warning:** Precautions must be taken prior to manually operating the relief valve to avoid contact with hot water coming out of the relief valve and to prevent water damage.



**Caution:** Label all wires prior to disconnection when servicing controls. Wiring errors can result in improper and dangerous operation. Verify proper operation after servicing.



**Warning:** If a relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation. Do not plug the relief valve.



**Warning:** If the water heater is used in a space heating application, all piping and components connected to the water heater must be suitable for use with potable water.



**Warning:** Toxic chemicals, such as those used for boiler treatment, shall not be introduced into the potable water used for space heating.

## Warning

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**Warning:** A water heater which will be used to supply potable water shall not be connected to any heating system or component(s) previously used with a nonpotable water heating appliance.

FCC:

This device complies with Part 15 of the FCC rules.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

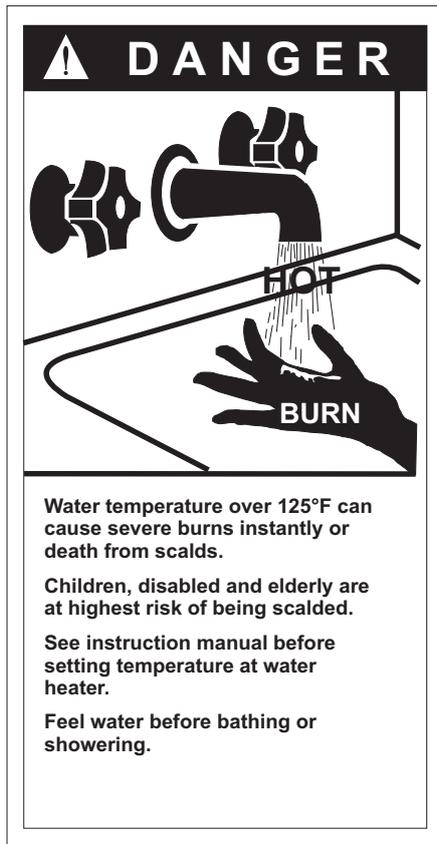


Fig. 1

## 2 Appliance details

### 2.1 Features

#### Parts

- Key Pad interface control
- High power pre-mix compact burner with low NOx emissions
- Modulating Gas Valve with constant gas:air ratio control
- Modulating water valve for improved comfort and temperature control.

High quality materials for long working life

- Copper heat exchanger
- High efficiency Ceramat Burner
- Compact space saver: mounts on a wall with a supplied bracket.

#### Features

- Real-time diagnostics for troubleshooting/informational purposes
- LCD Display with backlight
- On/Off and Temperature control switches
- Reset button
- Program button (Selectable temperature default)
- Failure codes for easy diagnostics and repair
- Easily removable one-piece cover
- Built in freeze prevention<sup>1)</sup>.

#### Accessories (Bosch part #)

- Optional wireless remote control accessory to operate with the appliance (TSTAT2)
- Cascading kit (7709003962)
- External water filter (8703305356)
- Gas conversion kit (8719002176)
- Pipe Cover (PTPCES)
- Recess box (7736500043)
- Pressure relief valve (FWL-2).



BOSCH is constantly improving its products, therefore specifications are subject to change without prior notice.

1) The freeze prevention kit is designed to provide protection for the water heater down to approximately 5°F for short term conditions only. It will not protect the appliance in areas where the temperature is routinely expected to be below freezing.  
- The freeze prevention kit will not protect plumbing outside the appliance from freezing. Precautions should be taken.

### 2.2 Specifications (Technical data)

Approved in US/Canada

#### Capacity

Maximum flow rate: 7.15 GPM (27 l/min) at a 45°F (25°C) rise.

#### Maximum output

160,500 Btu/h (47.0 kW)

#### Maximum input

199,000 Btu/h (58.3 kW)

#### Efficiency in %

Thermal efficiency > 82%

#### Min. Input

19,900 Btu/h (5.8 kW)

#### Temperature Control

Selection range: 100°F (38°C) - 140°F (60°C)

Default temperature: 122°F (50°C)

Stability: +/- 2°F (+/- 1°C)

#### Gas Requirement

Gas connection (inches) - 3/4"

Inlet gas pressure under operation (with a high hot water flow rate)\*

- Propane: 8" - 13" water column
- Natural Gas: 3.5" - 10.5" water column.

\* To measure gas pressure, see Measuring Gas Pressure, chapter 6.6, page 24.

#### Water

- Hot water connection (inches) - 3/4"
- Cold water connection (inches) - 3/4"
- Water valve material: Polymer (PPS) (Polypropylene Sulfid)
- Minimum water flow: 0.5 gallon/minute (1,9 l/m).  
Note: Activation varies with inlet water temperatures from 0.5 - 1.6 gallon/minute (1.9 - 6.1 l/m).
- Minimum recommended water pressure: 30 PSI (2.07 bar).
- Minimum well pressure 40 psi, see page 20.
- Connections:
  - Bottom of heater

#### Combustion

- NOx ≤ 40 Ng/J (Nanograms of NOx (calculated as NO<sub>2</sub>) per Joule of heat output).
- CO ≤ 250 ppm (measured)
- CO<sub>2</sub> level set from factory, see chapter 9.4, page 33.

**Dimensions**

- Depth (in): 11 1/4" (286 mm)
- Width (in): 17 7/8" (452 mm)
- Height (in): 30 1/2" (775 mm)
- Weight: 67 pounds (30.5 kg).

**Gas types**

Natural Gas.  
LP Gas.

**Voltage**

120 V AC (60 Hz) nominal

**Amperage**

Idle - 40 mA  
Operation - ≤ 2.5 A

**Noise**

45 - 65 db (A)

**Safety devices**

- Flame failure device (ionization flame rod sensor)
- Over heat prevention (temperature limiter)
- Inlet temperature sensor
- Outlet temperature sensor
- Back flow temperature sensor.

**Water protection**

IP X4 (protection against water drops)



If appliance is installed at elevations above 2000ft, refer to Section 8.8.1 Fan speed adjustment.

**2.3 Unpacking the heater**

In order for proper installation, this water heater must be installed with the outdoor kit (BTOK) accessory.

Before installing the unit, be certain you have the correct heater for your type of Gas: Propane or Natural Gas. Identification labels are found on the shipping box, and on the rating plate which is located on the right side panel of the cover.

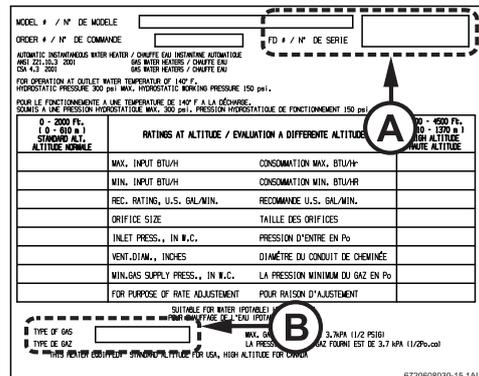


Fig. 2 Rating plate

- A Serial number
- B Type of gas

The box includes:

- 940 ESO
- Bracket for wall hanging the heater
- Installation manual (manual can be downloaded at [www.boschpro.com](http://www.boschpro.com))
- Product registration card
- Energy Guide label (in the front cover).

Please complete and return the enclosed product registration card.

**The 940 ESO is not approved or designed for:**

- **Manufactured (mobile) homes, boats or any mobile installation. (Modular homes are acceptable for installation).**
- **Use above 8000 ft A.S.L. altitude (see page 29).**
- **Outdoor installation without installation of Outdoor kit (BTOK) or Recess Box (7 736 500 043).**
- **Applications where inlet water temperature is higher than 140°F (60°C). A 3-way valve or mixing valve must be installed before the appliance if inlet water temperature exceeds this limit.**

### To remove front cover

- ▶ Loosen the two Phillips head screws located on bottom rear of cover (see Fig. 3).

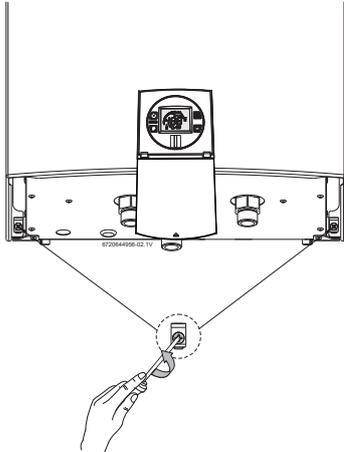


Fig. 3 Loosen the two screws

- ▶ Lift front cover panel upward and remove.

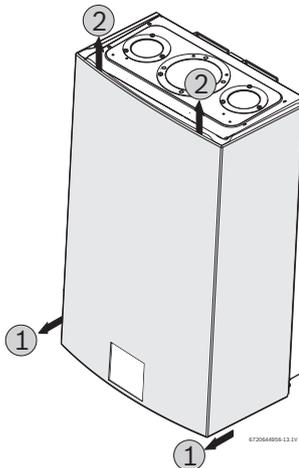


Fig. 4 Remove the front cover

### To remove combustion cover (service only)

- ▶ Open the four clips and remove the combustion cover see Fig. 5.

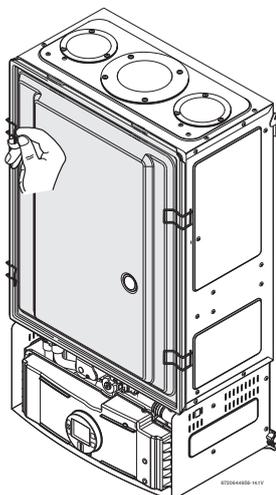
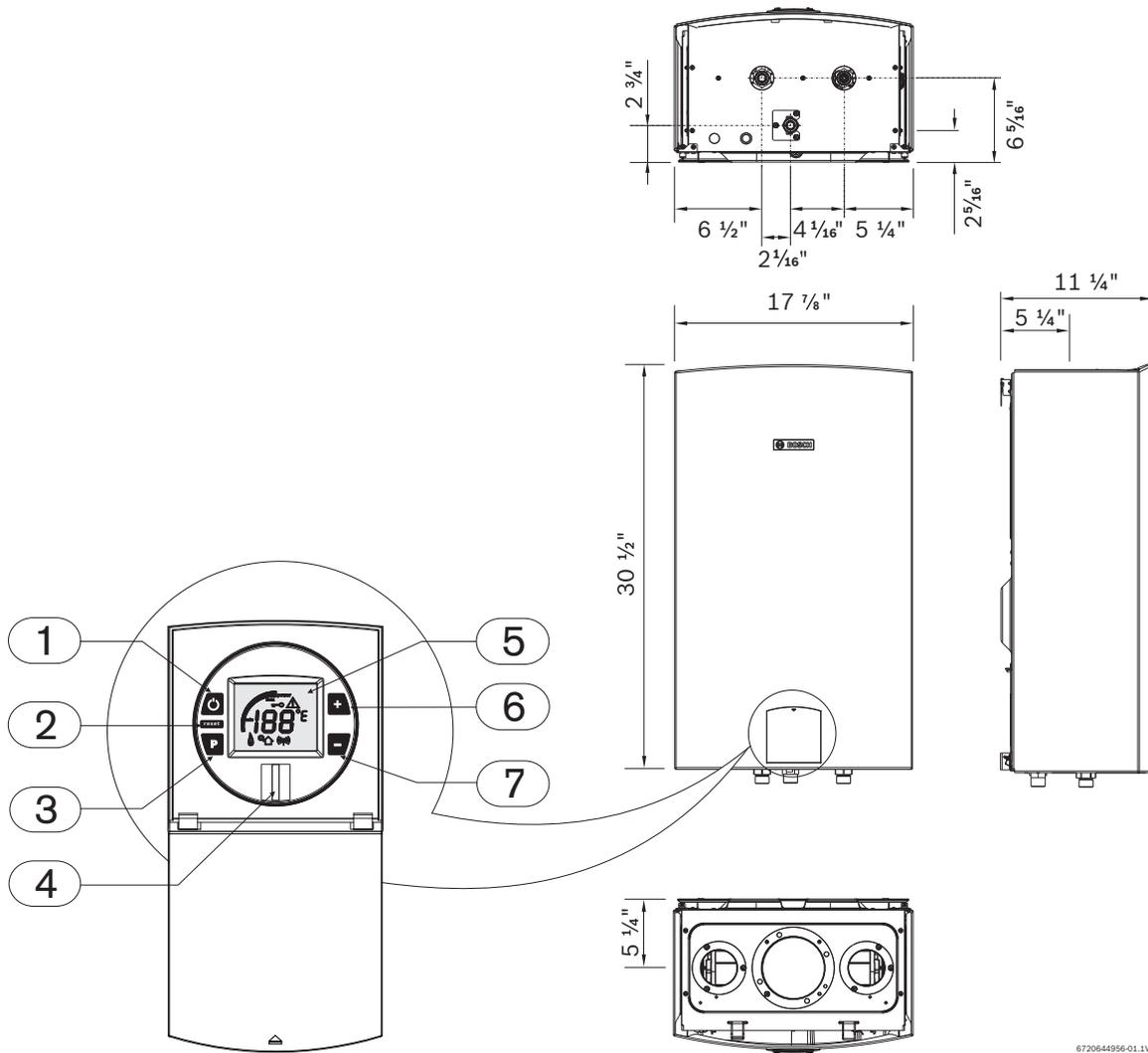


Fig. 5 Remove the combustion cover

## 2.4 General rules to follow for safe operation

- ▶ **1.** You must follow these instructions when you install your heater. In the United States: The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code ANSI Z223.1/ NFPA 54.  
In Canada: The Installation must conform with CGA B149.(1,2) INSTALLATION CODES and /or local installation codes.
- ▶ **2.** Carefully plan where you install the heater. If not installed correctly, fatal accidents can occur, such as carbon monoxide poisoning or fire.
- ▶ **3.** The water heater must be installed outdoors using the outdoor kit and/or recess box accessory.
- ▶ **4.** You must vent your heater so that the exhaust gases discharge to the outdoors.
- ▶ **5.** The appliance and its gas connection must be leak tested before placing the appliance in operation. The appliance must be isolated from the gas supply piping system by closing its individual manual gas shutoff valve (not supplied with heater) during any pressure testing at pressures in excess of 1/2 Psig (3.5 kPa).
- ▶ **6.** Keep water heater area clear and free from combustibles and flammable liquids. Do not locate the heater over any material which might burn.
- ▶ **7. Correct gas pressure** is critical for the proper operation of this heater. Gas piping must be sized to provide the required pressure at the maximum output of the heater, while all the other gas appliances are in operation. Check with your local gas supplier, and see the section on connecting the gas supply, see chapter 6.1.
- ▶ **8.** Should overheating occur or the gas supply fail to shut off, turn off the gas supply at the manual gas shut off valve, on the gas line. Note: manual gas shutoff valve is not supplied with the heater but must be field installed.
- ▶ **9.** Do not use this appliance if any part has been underwater. 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 underwater.
- ▶ **10.** Failure to install heater correctly may lead to unsafe operation and void the warranty.

## 2.5 Dimensions and Minimum installation clearances



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Fig. 6 Dimensions

- 1 On/Off button
- 2 Reset button
- 3 Program key
- 4 Power ON or stand-by LED
- 5 LCD display
- 6 Up button
- 7 Down button

## 3 Installation requirements

### 3.1 Specialized tools

The following specialized tools may be required for installation:

- Manometer
- Multi-meter
- Combustion Gas Analyzer.

### 3.2 Introduction

Please follow these instructions. Failure to follow instructions may result in:

- ▶ Damage or injury.
- ▶ Improper operation.
- ▶ Loss of warranty.

If you are unable to perform the tasks required to install this heater properly, please contact a locally licensed plumber or gas technician.

### 3.3 Proper location for installing your heater

Carefully select the location of the water heater. For your safety and for proper heater operation, follow the guidelines below:

- ▶ **1.** Locate the heater where gas and plumbing connections are feasible and convenient.
- ▶ **2.** The hot water lines should be kept short and insulated to save energy. Centrally locating the water heater is recommended to keep hot water distribution times even throughout the structure.



**Warning:** The water in this water heater is cold and always remains cold except for the times the burner is on. In the event of power outage in conjunction with freezing temperatures, it is recommended that the heater be drained.  
See chapter 9.2, page 32 "Winterizing" for draining instructions.



**Warning:** Flammable materials, gasoline, pressurized containers, or any other items or articles that are potential fire hazards must NOT be placed on or adjacent to the heater. The appliance area must be kept free of all combustible materials, gasoline and other flammable vapors and liquids.

## 4 Installation using Outdoor Kit (BTOK)

### 4.1 Warnings



**Danger:** The top of the outdoor kit will get very hot during operation. Keep away from children. Install heater in a location where the top of the kit cannot be reached by small children.



**Danger:** Flue gas will be released through the outdoor kit. Flue gas is very hot and contains carbon monoxide. The outdoor kit cannot be installed on a water heater mounted indoors. To prevent risk of fire and carbon monoxide poisoning, maintain all clearances indicated in these instructions.



**Danger:** Do not place or store any combustible material within 5 feet of the appliance. Maintain specified clearance to combustibles on the wall where the appliance is installed and any adjacent walls or overhang. Observe all clearances required in this manual.



**Danger:** Surface temperature of the kit is less than 140°F, except highest top surface which may reach 300°F.



**Warning:** Do not mount water heater directly onto vinyl siding, see Fig. 14.



**Danger:** the freeze prevention kit on the appliance is designed to provide protection from temperatures down to approximately 5°F for short term conditions only. **It will not protect the appliance in areas where the temperature is routinely expected to be below freezing.** The freeze prevention kit will not protect plumbing outside the appliance from freezing. Precautions must be taken:

- ▶ Always drain the water heater if it will be exposed to long term freezing conditions.



**Danger:** the water in this appliance is cold and always remains cold except for the times when the burner is on. In the event of power outage in conjunction with freezing temperatures, it is recommended that the heater be drained.



**Warning:** Damage to the appliance from freezing is not covered under the manufacturer's warranty.

#### Outdoor kit (BTOK) includes:

- Supports (2) with screws
- Sealing gasket
- Control panel shield
- Outdoor vent cap.

### 4.2 Installing outdoor vent cap on the appliance

#### Replace the control panel shield

- ▶ Loosen the two Phillips head screws located on bottom rear of cover (see Fig. 3).

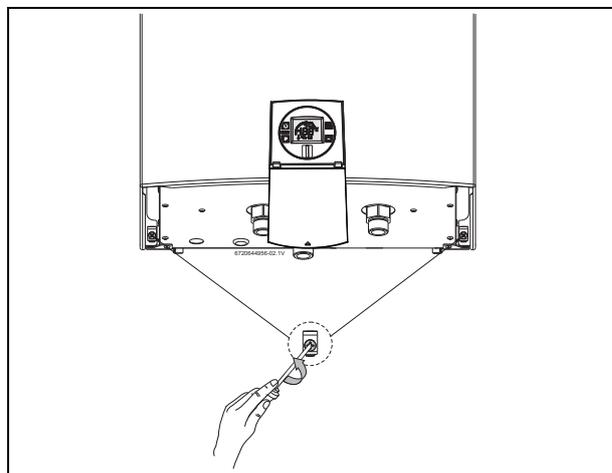


Fig. 7 Loosen the two screws



**Warning:** The control panel shield must always remain closed, except when making adjustments, to prevent damage to heater from weather.

- ▶ **1.** Attach the supports (A) to the appliance by fastening with the four provided screws, as shown in Fig. 8.

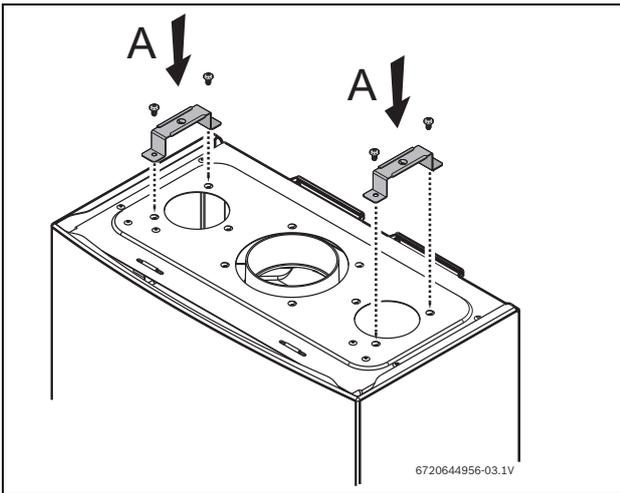


Fig. 8

Before mounting the outdoor kit in the appliance:

- ▶ **3.** Attach the gasket provided with the kit as shown in Fig. 9.

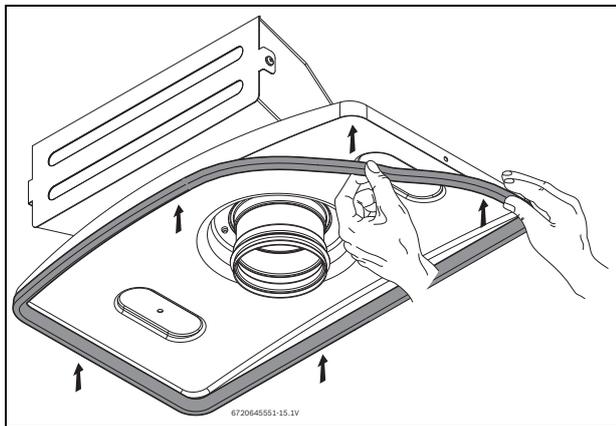


Fig. 9

- ▶ Position the outdoor vent cap on the top of the appliance, as shown in Fig. 10.

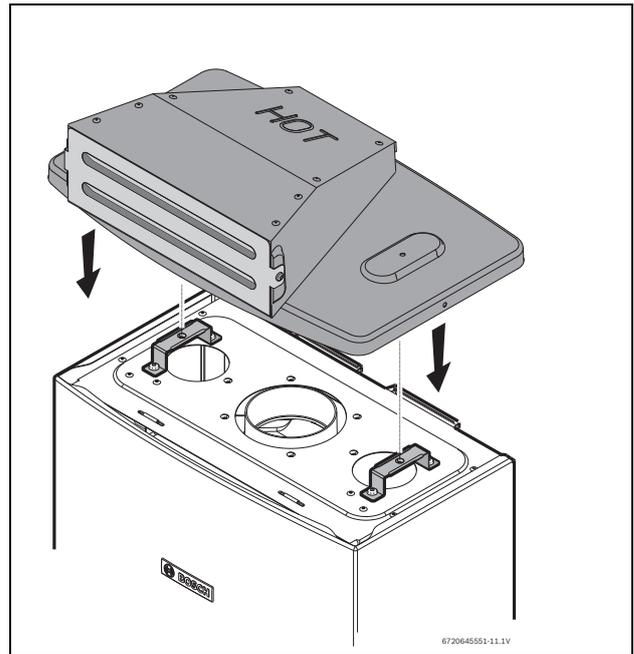


Fig. 10

- ▶ Attach the outdoor vent cap to the appliance by fastening the two provided screws and washers, see Fig. 11.

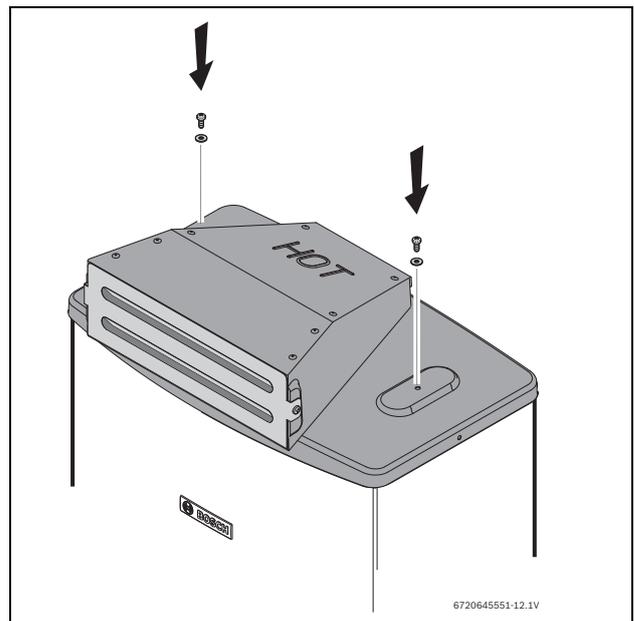


Fig. 11



**NOTE:** Once this kit is installed, the outdoor vent cap will need to be removed before removing the front cover.

### 4.3 Selecting heater location

Before proceeding, read the water heater installation manual. If the information in that manual is not followed exactly, a fire, explosion or poisoning by carbon monoxide may result causing property damage, personal injury or death.

- ▶ Choose an outside wall for the installation. Installation on a wall protected by an overhang above is recommended.
- ▶ Size the water and gas connections according to the instructions in the water heater installation manual. Use unions when connecting both water lines and gas supply line to the heater.

#### Minimum clearances

If the appliance is installed under an overhang, there must be a 36" clearance from the top of the appliance and the mounting area must be open in front and on the sides of the appliance.

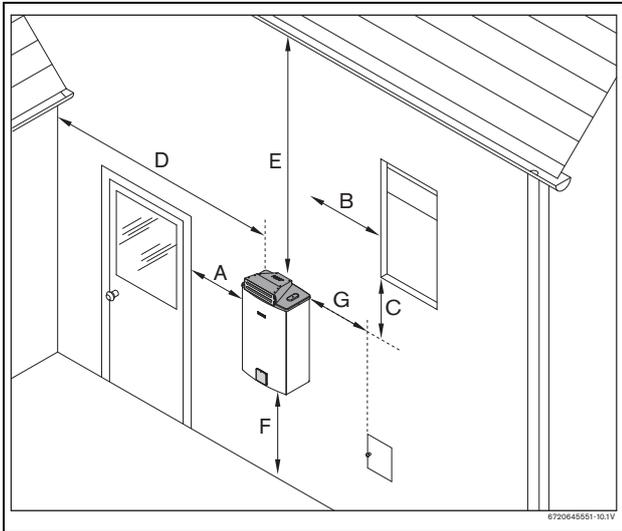


Fig. 12



**Best practice note:** The clearances in Fig. 12 and table 1 are the minimum allowed by the standard.

When possible consider maximizing the clearances A, B, C, D and E to allow for the effects of wind and frequently used door and window openings.

Ref.	Description	Min. distances
A	Directly below or adjacent to an opening; operable windows, doors and any fresh air openings	≥ 1 ft
B		
C		
D	From any adjacent wall	≥ 1 ft
E	Below a gutter, sanitary pipework, eaves or overhang	≥ 3 ft
F	Above ground	≥ 1 ft
G	From a gas meter or gas regulator	≥ 3 ft

Table 1 Clearances

#### 4.4 Mounting instructions

- ▶ The water heater is approved for installation directly on an outside wall. Secure the wall mounting bracket provided with the water heater to a wall surface. See Fig. 13.
- ▶ The installation method of the mounting bracket will depend on the type of mounting surface. Due to the varieties of building siding or surfacing, the installer must decide on how best to support and level the heater on an outside wall. It is recommended that horizontal or vertical support boards or plywood sheathing (1/2" minimum) first be attached to the wall surface. The heater must also be kept level on the wall surface.

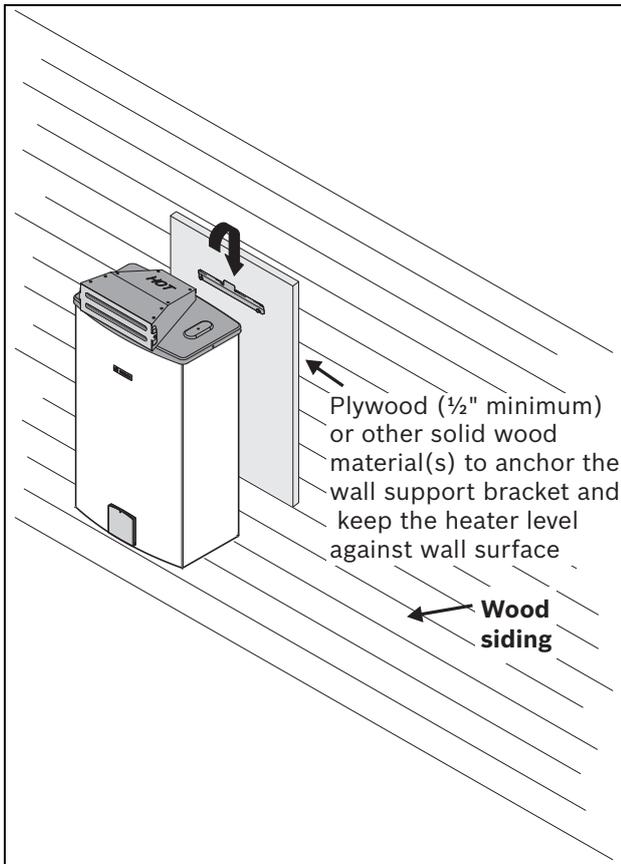


Fig. 13 Installation on wood siding

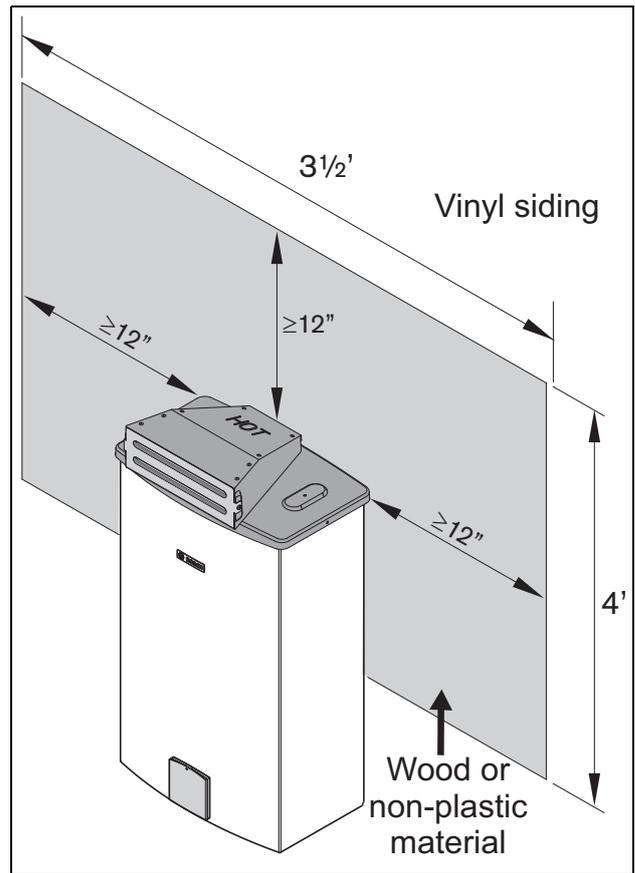


Fig. 14 Installation on vinyl siding



**Warning:** Do not mount heater directly to vinyl siding. With vinyl siding, a 3 1/2' x 4' area of the siding must first be removed and then replaced with wood or other non-plastic material. See Fig. 14.

## 5 Installation using the Recess Box (7 736 500 043)

### 5.1 Heater placement and clearances



**Warning:** The water heater with recess box accessory is intended for an outdoor installation only.

The water heater is approved for installation on a combustible wall (see chapter 4.4 Mounting installation) provided the floor covering below the heater is noncombustible. For installations in an alcove or closet, maintain the minimum clearances to combustible and non-combustible materials. See chapter 2.5, page 8.

#### Do not install the Recess box:

- Under a deck or patio.
- Side of the building with prevailing winter winds.
- Close to plants or trees.
- In areas where people or animals can accidentally touch louvered exhaust openings.
- Maintain a clean area in front of the appliance of 4 feet (1,2m).

The Recess box should be installed so the discharge vent maintains the minimum allowable clearances as required by the local authority. Where no local requirement exists, maintain the following minimum suggested clearances from building openings as shown in Fig. 15.

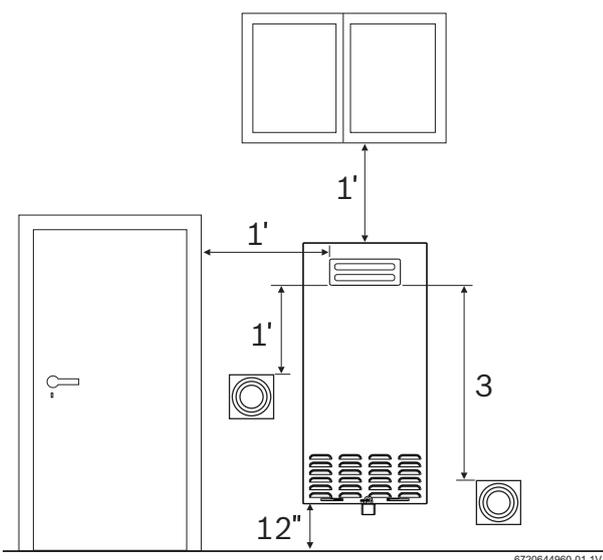


Fig. 15 Discharge vent clearances



Top, front, and side clearances noted on the front cover of the water heater are not applicable when installed in a Recess box.



**Warning:** Improper installation! This recess box has been designed to be mounted in a wall cavity with exhaust vent discharging to the outdoors. Do not install the recess box in another configuration. Damages resulting from an improper installation will not be covered by Bosch limited warranty.

#### 5.1.1 Wall cavity

##### Dimensions of Recess Box

When building the wall cavity for the recess box, make preparations for the water and gas lines and electrical wires as well.

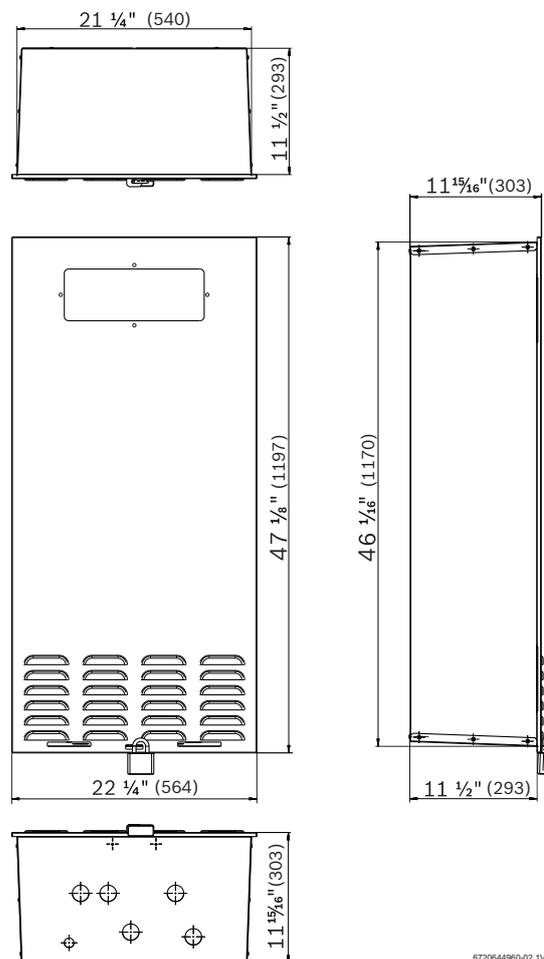


Fig. 16 Recess box dimensions in inches (mm)

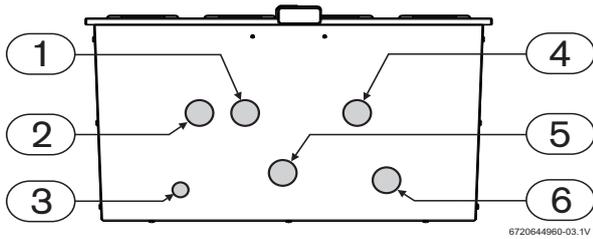


Fig. 17 Recess box plumbing/electrical openings

- 1 Hot water opening
- 2 Pressure relief valve opening
- 3 Electrical opening
- 4 Cold water opening
- 5 Gas opening
- 6 Condensing opening<sup>1)</sup>

► Secure the wall mounting bracket provided with the heater to the wall surface. The heater must be kept level on the wall surface, see Fig. 19, page 15.

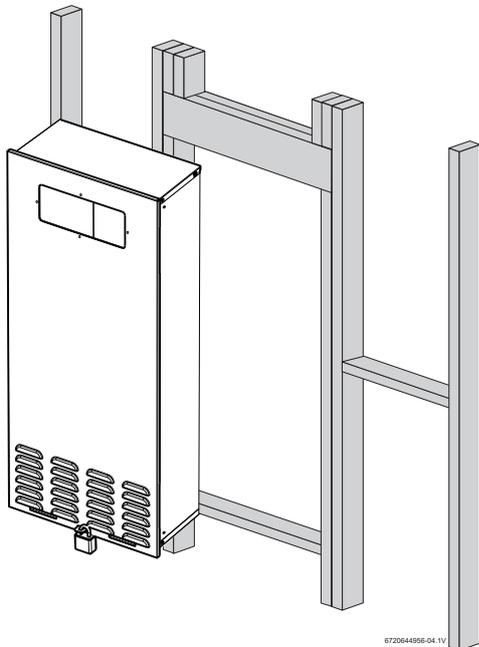


Fig. 18 Support boards

► Hang water heater on wall mounting bracket. Ensure heater is level.



**Caution: Ensure the outdoor kit (BTOK) accessory has been installed on the water heater prior to operating -see section 4.2.**

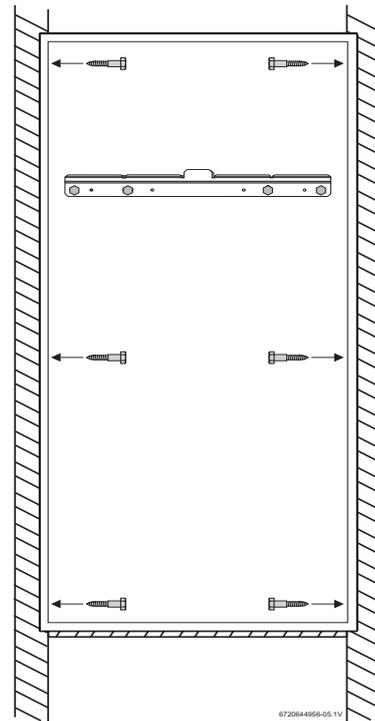


Fig. 19 Leveling the mounting bracket and screwing the recess box on the studs

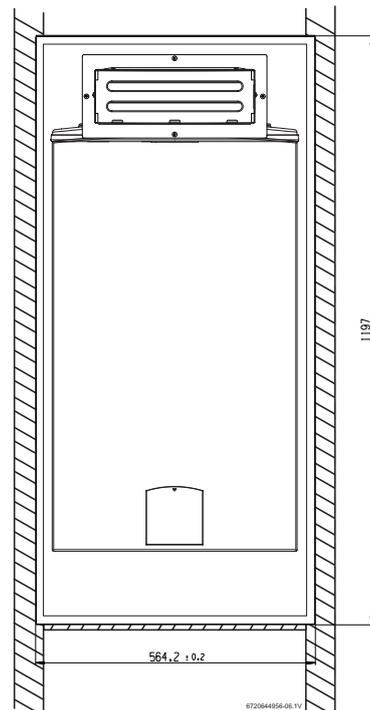


Fig. 20 Mounting the heater inside recess box

1) Not used with this appliance.

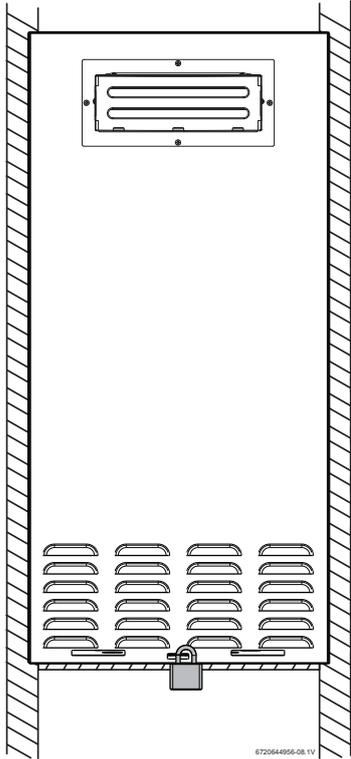


Fig. 21 Close the recess box cover with Padlock



**Warning:** Appliance must be installed vertically.

## 6 Installation instructions

### 6.1 Gas piping & connections

Before connecting the gas supply, check the rating plate on the right side of the heater to be sure that the heater is rated for the same gas to which it will be connected.

In the United States: The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code ANSI Z223.1/NFPA 54.

In Canada: The Installation must conform to CSA B149 INSTALLATION CODES and/or local installation codes.



**Warning:** DO NOT connect to an unregulated or high pressure propane line or to a high pressure commercial natural gas line.



**Warning:** The heater must be isolated from the gas supply piping system during any pressure testing of that system at test pressures equal to or more than 0.5 psig. If overpressure has occurred, such as through improper testing of the gas lines or malfunction of the supply system, the gas valve must be checked for safe operation.

#### GAS CONNECTIONS

- ▶ Install a manual gas shut off valve on the gas supply line within easy reach of the appliance.
- ▶ Install a union when connecting gas supply.
- ▶ **The minimum internal diameter required for any appliance connector is 3/4", see Fig. 24 for more details on pipe sizing.**
- ▶ Undersized flexible appliance connector not permitted.
- ▶ National Fuel Gas Code requires that a sediment trap (drip leg) be installed on gas appliances not so equipped. The drip leg must be accessible and not subject to freezing conditions. Install in accordance with the recommendations of the serving gas supplier, see Fig. 22.

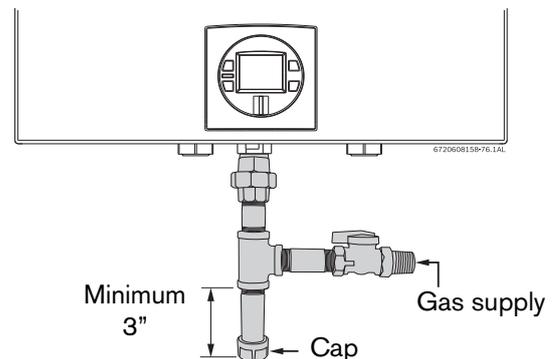


Fig. 22 Gas connection (drip leg)

Once connections are made, check for gas leaks at all joints. Apply some gas leak detection solution to all gas fittings. Bubbles are a sign of a leak. A combustible gas detector may also be used to detect for leaks.



**Danger:** If you have a leak, shut off the gas. Tighten appropriate fittings to stop leak. Turn the gas on and check again with a gas leak detection solution. Never test for gas leaks using a match or flame.

### GAS LINE SIZING

The gas supply piping for a single heater should be sized for a maximum draw of 199,000 BTUH. Measure the length of gas supply line and use the tables in Fig. 24, page 19 or the gas line manufacturer's sizing tables to determine the pipe diameter necessary to accommodate the 199,000 BTU demand of the heater. If there are more gas appliances on the line, size the gas line according to the total maximum amount of BTU input rating for all appliances.

**Note:** Undersizing the gas line may result in diminished hot water flow rate and temperature. See chapter 6.6, page 24 for the procedure to confirm gas pressure. Proper gas pressure must be confirmed at time of installation.

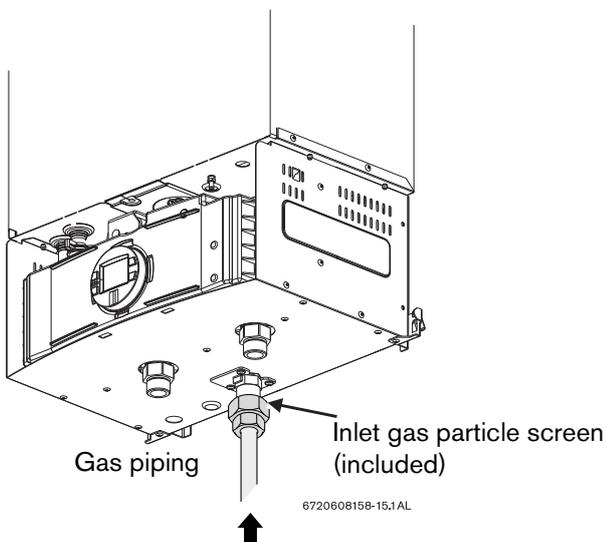


Fig. 23

### FOR NATURAL GAS

Maximum Capacity of pipe in Cubic Feet of Gas per Hour for Gas Pressure of 0.5 Psig or less and a Pressure drop of 0.3" in Water Column (0.75mbar). (Based on a 0.60 Specific Gravity Gas) Btu numbers given in thousands.

Follow boxed numbers for piping just one 940 ESO (example: 3/4" B.I. Natural Gas pipe for 10 ft (3.0m). will handle 278,000 btu's (81.5 kWh). For multiple appliances combine the total maximum btu input load and then refer to applicable chart below.

Nominal Iron Pipe Size, inches	Internal Diameter inches	Length of Black iron Pipe , Feet													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
1/4	0.364	32	22	18	15	14	12	11	11	10	9	8	8	7	6
3/8	0.493	72	49	40	34	30	27	25	23	22	21	18	17	15	14
1/2	0.622	132	92	73	63	56	50	46	43	40	38	34	31	28	26
3/4	0.824	<b>278</b>	190	152	130	115	105	96	90	84	79	72	64	59	55
1	1.049	520	<b>350</b>	<b>285</b>	<b>245</b>	<b>215</b>	195	180	170	160	150	130	120	110	100
1 1/4	1.380	1050	730	590	500	440	<b>400</b>	<b>370</b>	<b>350</b>	<b>320</b>	<b>305</b>	<b>275</b>	<b>250</b>	<b>225</b>	<b>210</b>
1 1/2	1.610	1600	1100	890	760	670	610	560	530	490	460	410	380	350	320
2	2.067	3050	2100	1650	1450	1270	1150	1050	990	930	870	780	710	650	610

Length of Flexible Corrugated Stainless Steel Tubing (CSST), Feet Tube size, inches	EHD*						
		10	20	30	40	50	60
1/2	18 EHD	82	58	47	41	37	34
3/4	23 EHD	161	116	96	83	75	68
1	30 EHD	<b>330</b>	<b>231</b>	188	162	144	131
1 1/4	37 EHD	639	456	<b>374</b>	<b>325</b>	<b>292</b>	<b>267</b>

\* EHD = Equivalent Hydraulic Diameter. The greater the value of EHD, the greater the gas capacity of the tubing.

### FOR LP GAS

Maximum Capacity of Pipe in Thousands of BTU per Hour of Undiluted Petroleum Gases (at 11 inches Water Column Inlet Pressure) (Based on a Pressure Drop of 0.5 Inch Water Column).

\* EHD = Equivalent Hydraulic Diameter. The greater the value of EHD, the greater the gas capacity of the tubing.

Nominal iron pipe Inches	Black Iron Pipe Length of Pipe, Feet										
	10	20	30	40	50	60	80	100	125	150	200
1/2	<b>291</b>	<b>200</b>	160	137	122	110	94	84	74	67	58
3/4	608	418	<b>336</b>	<b>287</b>	<b>255</b>	<b>231</b>	197	175	155	140	120
1	1145	787	632	541	480	434	<b>372</b>	<b>330</b>	<b>292</b>	<b>265</b>	<b>227</b>

Length of Flexible Corrugated Stainless Steel Tubing (CSST), F Tube size inches	EHD*					
		10	20	30	40	50
1/2	18 EHD	129	91	74	64	58
3/4	23 EHD	<b>254</b>	183	151	131	118
1	30 EHD	521	<b>365</b>	<b>297</b>	<b>256</b>	<b>227</b>

Maximum Capacity of Semi-Rigid (flexible, non corrugated) Tubing in Thousands of BTU per Hour of Undiluted Liquefied Petroleum Gases (at 11 inches Water Column Inlet Pressure).

(Based on a Pressure Drop of 0.5 Inch Water Column)

\* Source National Fuel Gas Code NFPA 54, ANSI Z223.1 - No Additional Allowance is necessary for an ordinary number of fittings

Outside diameter Inch	Copper Length of Tubing, Feet									
	10	20	30	40	50	60	70	80	90	100
3/8	39	26	21	19	-	-	-	-	-	-
1/2	92	62	50	41	37	35	31	29	27	26
5/8	<b>199</b>	131	107	90	79	72	67	62	59	55
3/4	329	<b>216</b>	181	145	131	121	112	104	95	90

Fig. 24

## 6.2 Water connections



**Warning:** This heater is not approved for preheated water applications above 140°F (60°C). See chapter 6.4 for approved recirculating application.



**Warning:** In applications where inlet water temperature can exceed 140°F (60°C), a 3-way valve or mixing valve must be installed before the appliance to prevent water exceeding 140°F (60°C) from entering the appliance.

- ▶ When facing the heater, the 3/4" cold connection is on the bottom right and the hot connection is on the bottom left. Centrally locating the water heater is recommended to keep hot water distribution times even throughout the structure.

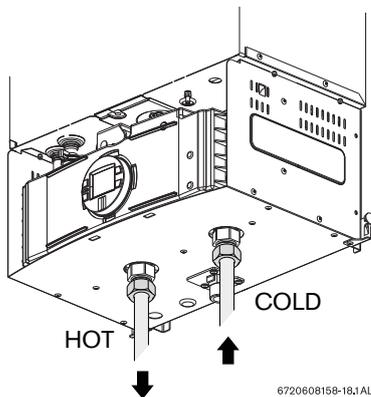


Fig. 25

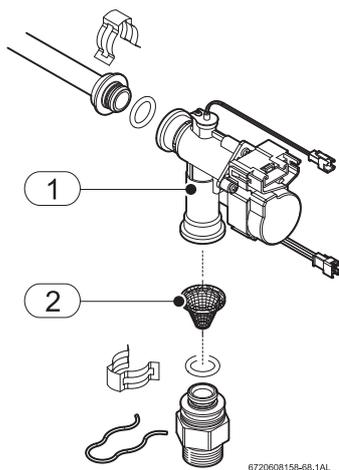


Fig. 26 Water filter

- 1 Water valve with engine
- 2 Water filter

- ▶ **The use of unions when connecting both water pipes to the inlet and outlet connections is required. This will facilitate any necessary servicing.**

- ▶ Plastic or PEX type plumbing line materials are not suitable for connecting directly to the water heater.
- ▶ Although water piping throughout the building may be other than copper, we recommend that copper or suitably rated stainless steel flex line piping be used for the water connections for 1.5' on either side of the water heater (follow local codes if more stringent).
- ▶ **Never sweat any piping directly to or beneath the water connections, as damage can occur to the internal water valve from heating of the pipe.**
- ▶ **Keep water inlet and outlet pipes to no less than 3/4" (19.05mm) diameter to allow the full flow capacity.**
- ▶ If the cold and hot connections to the heater are reversed, the heater will not function. Be certain there are no loose particles or dirt in the piping. Blow out or flush the lines before connecting to the water heater.
- ▶ Full port shutoff valves should be installed on both the cold water supply and hot water outlet lines to facilitate servicing the heater (see Fig. 27).
- ▶ For installation on a private well system with the use of a pressure tank, the lowest pressure range setting recommended is 40-60 psi (2.75 and 4.15 bar).

## 6.3 Water quality

Water quality can have an impact on appliance longevity and may not be covered under the manufacturer's warranty.

For water analysis data call your local water department, or if on a well, have well water analyzed periodically. If water quality exceeds one or more of the values specified below, Bosch recommends consulting a local water treatment professional for water softening/conditioning options.

Description	Max. Levels	
pH	pH	6.5 - 8.5
TDS (total Dissolved	mg/l or ppm	500
Total hardness	mg/l or ppm	100
Aluminum	mg/l or ppm	2.0
Chlorides	mg/l or ppm	250
Copper	mg/l or ppm	1.0
Iron	mg/l or ppm	0.3
Manganese	mg/l or ppm	0.05
Zinc	mg/l or ppm	5.0

Table 2

### Connecting the pressure relief valve (PRV)

A listed pressure relief valve must be installed at the time of installation. **No valve is to be placed between the PRV and the heater.** No reducing coupling or other restriction may be installed in the discharge line. The discharge line must be a minimum of 4" above a drain and installed such that it allows complete drainage of both the PRV and the line. The discharge line must be placed where it will not cause any damage.

The location of the PRV must be readily accessible for servicing or replacement, and be mounted as close to the water heater as possible. See Fig. 27. To install the PRV, a suitable fitting connected to an extension on a "T" fitting can be sweated to the hot water line.

Support all piping.

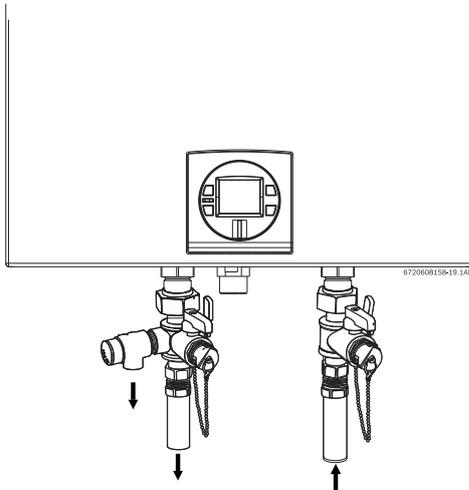


Fig. 27 Plumbing Connections (with shutoff valves) and Pressure Relief Valve

### 6.4 Domestic hot water recirculation

Although recirculation directly through the tankless water heater is allowed, temperature stability is improved by recirculating through a mini-tank as shown in Fig. 28. By using the design in Fig. 28, there is no recirculation of hot water through the tankless water heater and therefore, does not affect the heat exchanger warranty. Direct recirculation through the tankless water heater is permissible, however, the heat exchanger warranty is reduced; contact Bosch Thermotechnology for further installation requirements. The following drawing is provided to outline one possible recirculation design using the water heater in conjunction with an Ariston mini tank water heater. This schematic is for illustration only and must not be used for actual installation without appropriate engineering and technical advice from a properly licensed professional in the locality where the installation is made.

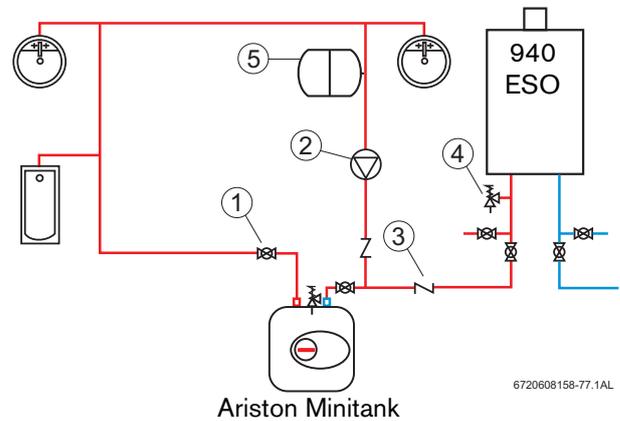


Fig. 28 Recirculation application

- 1 Full port isolation valve
- 2 Circulator (pump on timer)
- 3 Check valve
- 4 PRV
- 5 Expansion tank

The use of a small electric mini-tank water heater (4-6 gallon size) should be used for this application and designed so the pump will circulate the water through the mini-tank and the building's hot water return loop only. Timed or thermostatically controlled operation of the pump is commonly done. Contact Bosch Thermotechnology if further information is needed.

### 6.5 Space heating applications



**Warning:** If the set point temperature is above 120 F means should be undertaken to protect users of potable water from scalding.



**Warning:** Propylene glycol may be used for freeze prevention ONLY on the space heating side of the heat exchanger. Do not use ethylene glycol (automotive antifreeze).



**Warning:** The use of a flow switch may be used to ensure DHW priority and to prevent “cold-blow” situations when the Bosch tankless water heater is used with an air-handling system. The flow switch should be used to disable the blower on the air-handling system when domestic water is used.



**Warning:** ensure the primary pump is sized to provide adequate flow for the system heat load.



For Pump sizing please refer to the pressure drop curves, Fig. 29. Also remember to account for system piping pressure loss. Recommendation for primary pump size for adequate flow through the water heater (minimum of 1.7 GPM).

Bosch tankless water heaters are allowed to be used in combination DHW and space heating applications (open-loop setup). It is not allowed to use Bosch tankless water heater in a space heating only application (closed-loop setup). Bosch supports combination DHW and space heating in an open loop configuration if plumbed similar to Fig. 30. Use of a Bosch tankless water heater in a combination DHW and space heating application will result in the product warranty being reduced to 3 years.

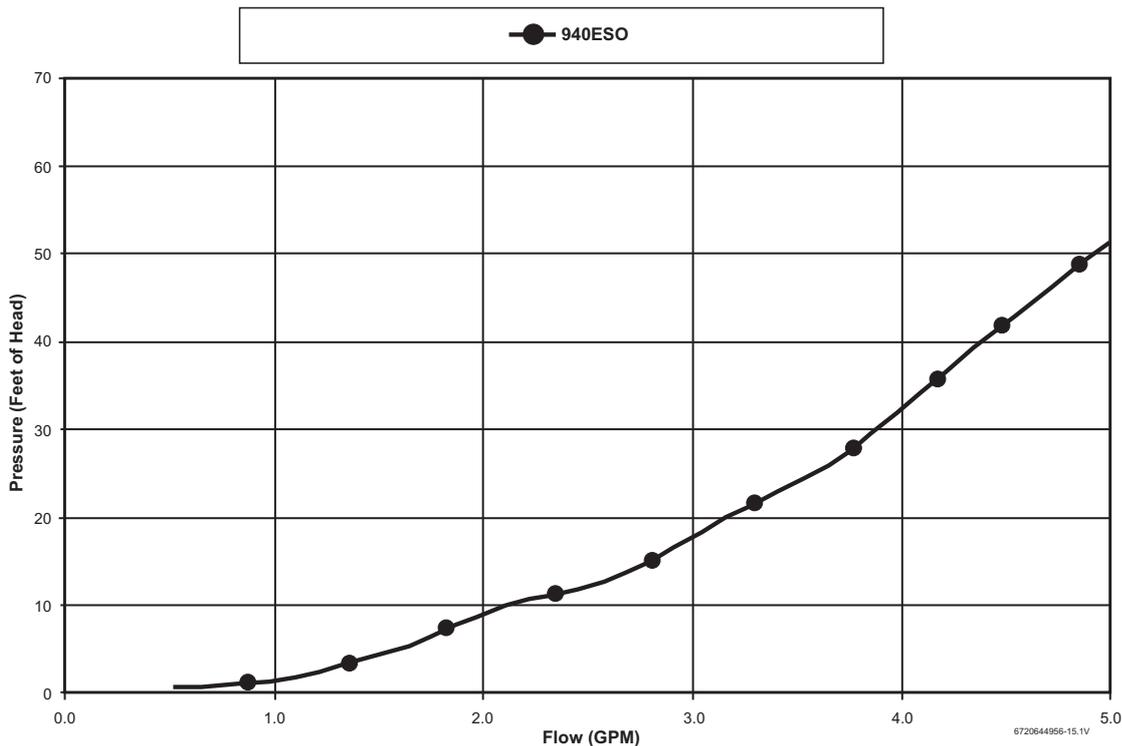
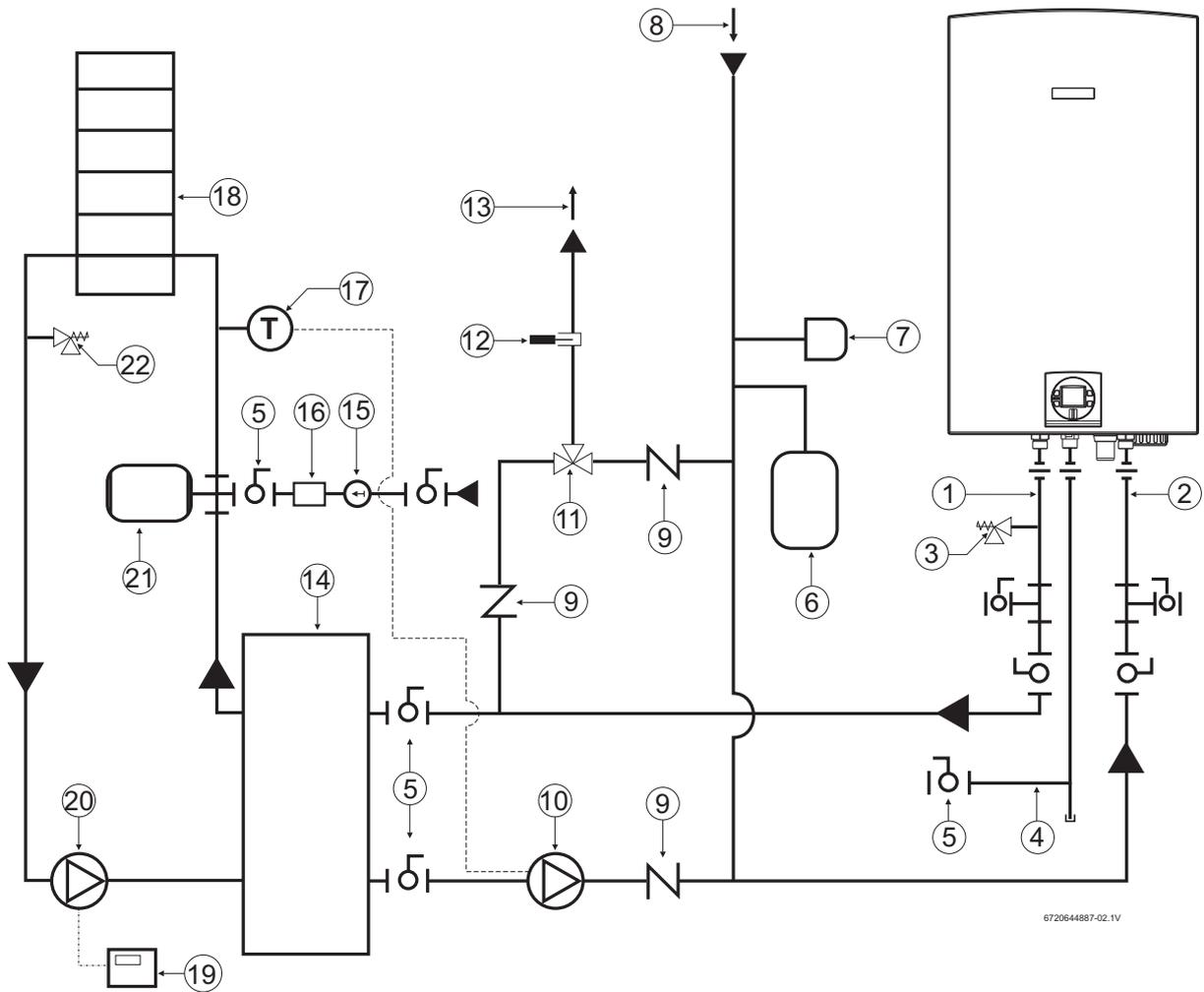


Fig. 29 Pressure drop curve



6720644887-02.1V

Fig. 30 Space heating diagram

- 1 Hot water outlet
- 2 Cold water inlet
- 3 Pressure relief valve
- 4 Gas supply
- 5 Shut off gas valve
- 6 Thermal expansion tank (as required)
- 7 Atmospheric vacuum breaker
- 8 Cold inlet
- 9 Check valve
- 10 Pump
- 11 Thermostatic mixing valve
- 12 Thermometer (optional)
- 13 DHW outlet
- 14 Water to water heat exchanger
- 15 Backflow preventer
- 16 Automatic water feed
- 17 Thermostat
- 18 Space heating zone
- 19 Zone controller
- 20 Space heating pump
- 21 Expansion tank
- 22 Pressure relief valve

## 6.6 Measuring gas pressure

Confirm gas pressure upon installation.

### Connecting manometer

- ▶ Shut off gas supply at installer supplied shutoff valve for this water heater.
- ▶ Remove front cover and locate inlet gas pressure measuring point (see Fig. 32).
- ▶ Loosen screw inside left test point fitting (do not remove) and connect manometer tube to test point. Remove screw completely if correct size tapping is available.

### Static Pressure Test

- ▶ Turn gas supply back on.
- ▶ Record static gas pressure reading in table 4.

### Operating Pressure Test

- ▶ Press ON/OFF button to turn off the appliance.
- ▶ Press and hold "Program" (P) button and press ON/OFF button to turn appliance ON.

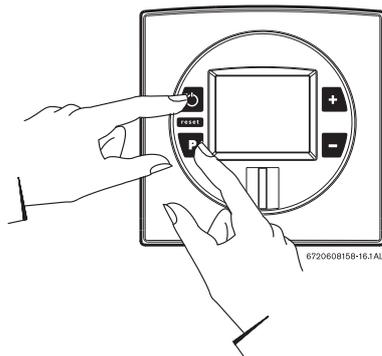


Fig. 31

- ▶ As soon as '188' is displayed, release "Program" **P**, button and the display should read P2.
- ▶ Press **+** or **-** until P1 appears.

**Note: While in this mode the appliance will run constantly at maximum power and allow maximum water flow.**

For inlet gas pressure adjustment consider the following table:

Gas type	NG	LPG
$p_{in}$	3.5" WC	8" WC

Table 3 Minimum inlet gas pressure under full operation

- ▶ Turn on high volume of hot water flow (at least 6 gpm) and heater will ignite. If heater display reverts to P2, open more hot water fixtures to allow sufficient flow. Press **+** until P1 reappears on display.
- ▶ Operate all other gas appliances (except this heater) on same gas piping system at maximum output.

- ▶ Record lowest operating gas pressure reading in table 4.

Gas pressures lower than 3.5" W.C. for Natural Gas or 8" W.C. for LPG will result in insufficient degree rise to the hot water being used, reduced hot water volume, possible error code faults and must be corrected. See Gas Connections, chapter 6.1, page 17.

P1 fan speed:

Factory default: NG: 48, LP: 46

Lowering P1 fan speed reduces the maximum BTU input.

As a temporary measure if the gas pressure in P1 is below specification, lower P1 fan speed incrementally until minimum inlet gas pressure reaches specified range (table 3). After upgrading gas line, reset appliance to P1 factory default setting (NG: 48, LP: 46) or setting from Section 8.8.1.

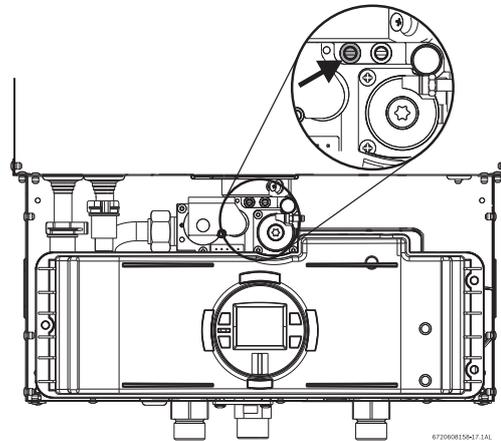


Fig. 32 Gas pressure test port (left tapping)

#### Static Gas Pressure Reading (see Chapter 6.6)

enter here: \_\_\_\_\_ Date: \_\_\_\_\_

#### Operating Gas Pressure Reading (see Chapter 6.6)

enter here: \_\_\_\_\_ Date: \_\_\_\_\_

Table 4

## 7 Electrical connections

### 7.1 Electrical power supply



**Warning:** For safety reasons, disconnect the power supply cord to the heater before any service or testing is performed.



**Warning:** This heater must be electrically grounded in accordance with the most recent edition of the National Electrical Code, NFPA 70. In Canada, all electrical wiring to the heater should be in accordance with local codes and the Canadian Electrical Code, CSA C22.1 Part 1. Do not rely on the gas or water piping to ground the metal parts of the heater.

The water heater requires an electrical power supply from a 120VAC / 60Hz properly rated receptacle and must be properly grounded.

The heater is wired as shown in the wiring diagram (chapter 12, Fig. 60).

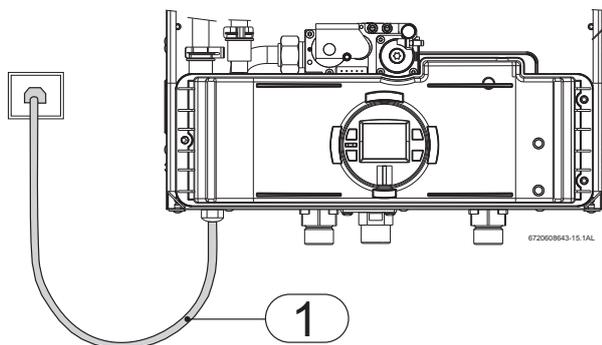


Fig. 33

Note: Outlet appliance is plugged in to should be clear from possible water damage.

### 7.2 Position of the fuses in control unit

To check fuses, proceed as follows:

- ▶ Remove the front cover, see Fig. 4, page 7.
- ▶ Remove the three screws on front of the control unit.

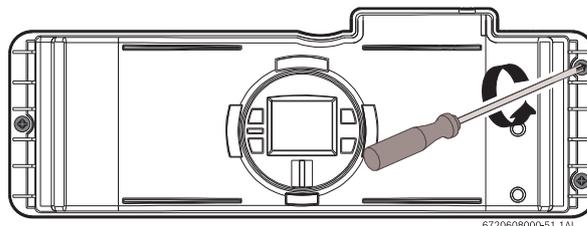


Fig. 34

- ▶ Pull control unit free to access and remove the six screws from the back cover of the control unit, see Fig. 35, pos. 2.
- ▶ Check the fuses in the printed circuit board, see Fig. 35, pos. 3.

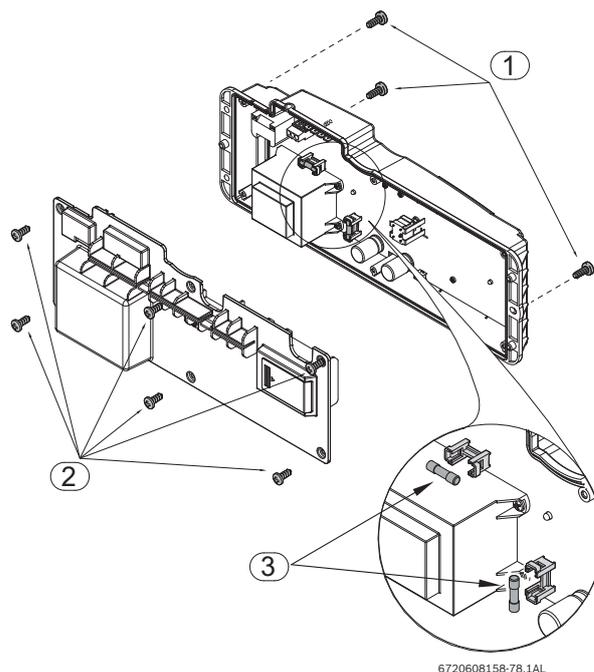


Fig. 35 Location of fuses

- ▶ After verifying the fuses mount all parts in reverse order.

## 8 Operation instructions

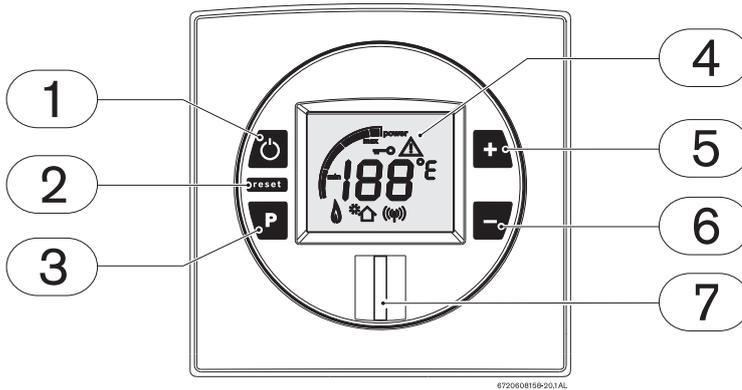


Fig. 36

- 1 On/Off button
- 2 Reset button
- 3 Program Key
- 4 LCD display
- 5 Up button
- 6 Down button
- 7 LED - Power On indicator or Stand-by

### 8.1 Description of LCD display

**Warning:** Do not use any cleaning or corrosive agent to clean the window.

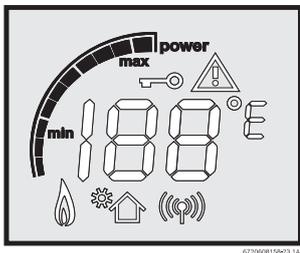


Fig. 37 Power bar indicator (input)

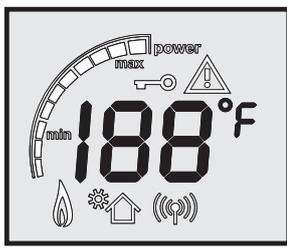


Fig. 38 Temperature indicator

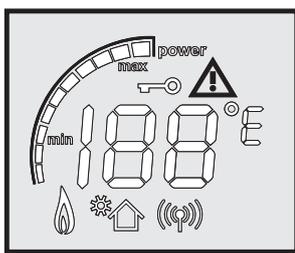


Fig. 39 Error indicator

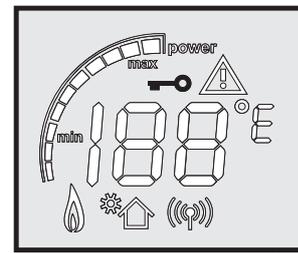


Fig. 40 Lock indicator (only with remote control)

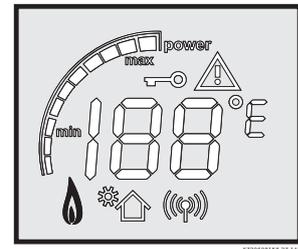


Fig. 41 Flame indicator

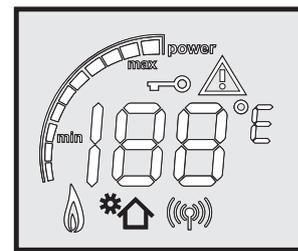


Fig. 42 Solar mode indicator (see chapter 8.4, page 27)

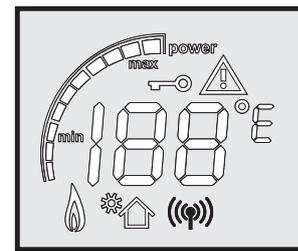


Fig. 43 Remote control indicator

## 8.2 For your safety read before operating your water heater



**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 electronic ignition for lighting the main burner. When turning the heater on, follow these instructions exactly.

**B.** Before operating the unit, press the On/Off button.

### 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 neighbors phone. Follow the gas supplier's instructions.
- ▶ If you cannot reach your gas supplier, call the fire department.

**C.** Use only your hand to press the on/off control switch. Never use tools. Follow these instructions exactly. If control switch is jammed, close the gas supply and call a qualified service technician. Attempted forceful 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.

## 8.3 Power

### On

- ▶ To start the appliance press the On/Off button.

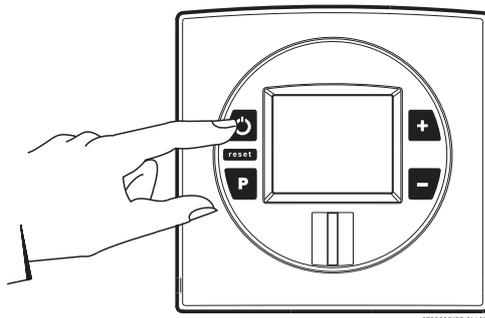


Fig. 44

### Off

- ▶ To shut down the appliance press the On/Off button again.

## 8.4 Temperature selection

To select output water temperature:

- ▶ Press buttons **+** or **-** in order to reach desired temperature.

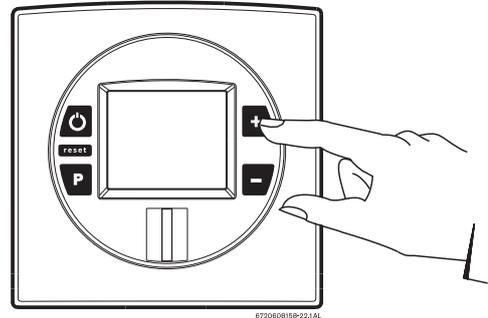


Fig. 45

### Setting the water temperature

The desired temperature of the hot water can be adjusted on the front control panel of the heater.

The water heater has an electronically controlled gas valve that modulates the burner input in response to both varying hot water flow rates and/or changes in any incoming and outgoing water temperatures.

### Saving water resources:

- ▶ Make sure you close all the taps after any use. Avoid leaving the taps dripping. Repair any leaking tap.
- ▶ Define the temperature you want, in the appliance or with the remote control. This way you have the precise water flow needed (mixing cold water to regulate temperature will increase the water flow with consequent waste of water)

### Solar mode

The water heater will not ignite if inlet water temperature exceeds the set temperature on the appliance. In this condition, the solar mode indicator will show on the LCD display. See Fig. 42, page 26.

**Warning:** In applications where inlet water temperature can exceed 140°F (60°C), a thermostatic or mixing valve must be installed before the appliance to prevent water exceeding 140°F (60°C) from entering the appliance.

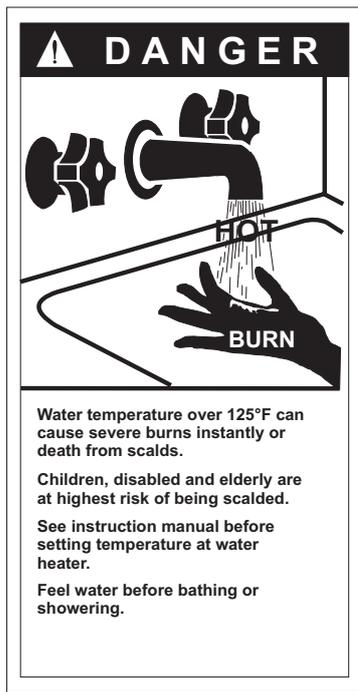


Fig. 46

### 8.5 Use of optional remote control accessory (part no. TSTAT2)

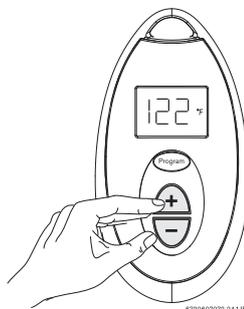


Fig. 47 Remote control

The wireless remote control accessory (Fig. 72, component 13) and the temperature selector buttons on the front of the water heater operate identically. Contact your distributor to order the remote control accessory. Modification of the water heaters interior

control unit (Fig. 72, component 16) is required when programming the remote control with this heater.



**NOTE:** up to 6 remote controls can be programmed for one single water heater, each with a range distance of 98 ft (30 m).

### 8.6 Operation

- ▶ When a hot water tap is opened, main burner ignites and LCD displays the symbol .

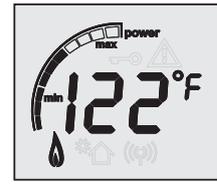


Fig. 48

- ▶ LCD blinks until selected temperature is reached.

### 8.7 Reset button

If the LCD shows the error symbol do not shut off power or unplug the heater. See the error code on LCD and consult "Troubleshooting" section.

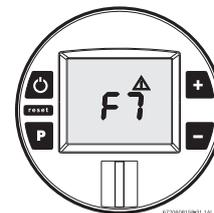


Fig. 49

After following instructions indicated in "Troubleshooting" section.

- ▶ press reset firmly in order to return heater to normal operation.

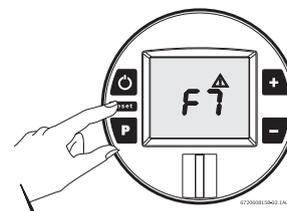


Fig. 50 Reset button

If the problem persists, contact your installer.

## 8.8 Fan speed

### 8.8.1 Fan speed adjustment

#### IMPORTANT! Installation adjustment:

After installing the water heater, the fan speed values for minimum power (P2) and maximum power (P1) may need adjustment due to variations in altitude.

Failure to make necessary adjustments to fan speed values may result in improper operation of the appliance.

Use the equivalent vent length value to determine the appropriate fan speed value found in the Table 5. Refer to page 29 on how to adjust the fan speeds if an adjustment is necessary. After changing fan speed values, proceed to section 9.4 to confirm CO<sub>2</sub> values are within specified ranges.

#### Fan speed adjustment

Altitude (above sea)	Minimum power fan speed (P2)	Natural Gas	Liquid propane	
		Maximum power fan speed (P1)	Maximum power fan speed (P1)	
0 - 2000 ft (0 - 610 m)	7	No modification required	No modification required	For operation at elevations above 2,000 ft (610 m) the equipment ratings shall be reduced at the rate of 4% for each 1,000 ft (305 m) above sea level
2000 - 4500 ft (610 - 1372 m)	8*	48*	47*	
4500 - 8000 ft (1372 - 2439 m)	9*	49*	48*	

\* Above 2000 ft, CO<sub>2</sub> levels must be checked with a combustion gas analyzer, see section 9.4 for instructions.

Table 5 Fan speed adjustment

#### Adjusting minimum power fan speed (P2)

To select fan speed:

- ▶ Press ON/OFF button into OFF.
- ▶ Press and hold "Program" button **P** and press ON/OFF button to turn appliance ON.

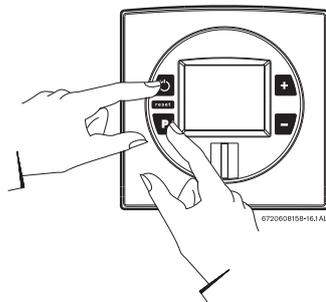


Fig. 51

- ▶ As soon as '188' is displayed, release "Program" button **P**, and the display should read P2.
- ▶ Press **+** or **-** to choose the fan speed suitable with your installation, see Table 5.
- ▶ Press and hold (± 5 sec.) "Program" button **P** until the display flashes, then the selected value is memorized.



Do not set P2 to greater than 9.

#### Adjusting maximum power fan speed (P1)

To select fan speed:

- ▶ Press ON/OFF button into OFF.
- ▶ Press and hold "Program" button **P** and press ON/OFF button to turn appliance ON.

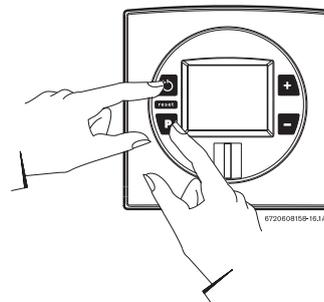


Fig. 52

- ▶ As soon as '188' is displayed, release "Program" button **P**, and the display reads P2.
- ▶ Press the minus button **-** to display P1.
- ▶ Press "Program" button **P** to enter P1 adjustment. The current setting will appear on the display.
- ▶ Press **+** or **-** to choose the fan speed suitable with your installation, see Table 5.
- ▶ Press and hold (± 5 sec.) "Program" button **P** until the display flashes, then the selected value is memorized.



Proceed directly to Section 9.4 to confirm CO<sub>2</sub> values are within range.

### **Attention residents of the Commonwealth of Massachusetts:**

In the Commonwealth of Massachusetts the following regulation went into effect on 12/30/2005:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.

a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. **SIGNAGE.** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

4. **INSPECTION.** The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and

signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

(b) **EXEMPTIONS:** The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and

2. Product approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) **MANUFACTURERS REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM REQUIRED.** When the manufacturer of Product Approved side wall horizontally mounted gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for the installation of the equipment and the venting shall include:

1. Detailed instructions for the installation of the venting system or the venting system components; and

2. A complete parts list for the venting system design or venting system.

(d) **MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.** When the manufacturer of a product approved side wall horizontally vented gas fueled equipment does not provide the parts for the venting of flue gases, but identifies "special venting systems," the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and

2. The "special venting systems" shall be product approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all products approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

## 8.9 Program button

Program button can be used on the appliance and in the remote control.

### Programming “Program” function

Programming actions are similar for both controls (appliance control pad and wireless remote control).

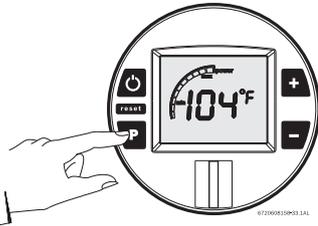


Fig. 53 “Program” key

### Memorizing selected temperature

- ▶ Press buttons **+** or **-** to select temperature to be memorized.
- ▶ Hold “Program” button for 3 seconds to save temperature.

When LCD stops blinking, temperature is saved in memory.

### Using “Program” function

In order to select memorized temperature

- ▶ Press “Program” key.

LCD shows pre-memorized temperature, which is now the hot water selected temperature.

## 8.10 Locked condition

This condition is only valid for appliances with one or more remote controls installed.

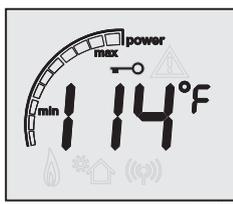


Fig. 54 Locked condition

Whenever LCD shows  the temperature setting cannot be adjusted because the appliance is in use by a user which already selected a different temperature. Appliance will be automatically unlocked after closing the hot water tap.

## 9 Maintenance and service



**Warning:** Always turn off the electrical power supply, turn off the manual gas shut off valve and turn off the water shut off valves whenever servicing.



### Caution:

- ▶ Check and clean the complete water heating system once a year.
- ▶ Carry out a maintenance overhaul if necessary. Immediately repair defects to avoid damage to the system.

### Annual maintenance table

		Every year
1.	Inspect venting system	X
2.	Inspect Combustion chamber	X
3.	Inspect burner	X
4.	Inspect water filter	X

Table 6 Annual maintenance

The unit should be checked once a year by a gas technician. If repairs are needed, the repairs should be done by a gas technician.

## 9.1 Annual maintenance

(To remove front cover, see page 7.)

### Venting System

- Venting system - remove outdoor vent cap and inspect inside of flue pipe for any blockage or restriction. Observe burner flames during heater operation. Inspect the combustion air opening for blockage or debris. Inspect outdoor vent cap louvers for blockage or debris.

### Combustion chamber

- Inspect burner observation window (Fig. 65, #10) for cracks or spillage of flue gases. Observe burner flames during heater operation. Flames should be steady and blue with no signs of yellowing. Yellow burner flames are an indication of improper combustion. Refer to Section 3.3 of this manual to ensure that exhaust system and combustion air supply meets manufacturer's specifications.

### Pressure relief valve

- Manually open the pressure relief valve to ensure proper operation.

### Inlet water filter

- Verify the inlet filter screen is clean and undamaged. The inlet water filter is located above the 3/4" cold water inlet on the right side of the appliance (See Fig. 26, page 20). Close installer supplied cold water shutoff and supplied water shutoffs, carefully remove inlet and outlet clips on watervalue. Remove water valve to access filter. Clean or replace if damaged.

### Descaling

- In areas where the water supply has a high mineral content (see Table 2, page 20), the heat exchanger should be periodically flushed with a descaling solution. Scale build up will shorten the life of the water heater and damage resulting from scale is not covered under warranty. Refer to section 9.3 for detailed instructions on descaling the heat exchanger.

### Fin coils

- Inspect heat exchanger fincoil for soot build-up or blockage. To access fincoil outdoor vent cap must be removed. With cap removed and inspect fincoil below with a flashlight. If there is evidence of soot build-up or blockage, the heat exchanger should be removed by a professional and cleaned thoroughly. To remove the heat exchanger, consult service bulletin at [www.boschpro.com](http://www.boschpro.com).

## 9.2 Winterizing for seasonal use

Installation instructions state that the water heater must not be installed in a location where it may be exposed to freezing temperatures. If the heater must be left in a space which is likely to experience freezing temperatures, all water must be drained from the heater. If precautions are not taken, resulting damage will not be covered under the warranty. NOTE: Use of agents such as anti-freeze is not permitted as they may cause damage to the water heater's internal components.

1. Press ON/OFF switch on the water heater to turn OFF the heater and unplug power supply cord. The display should be blank.
2. Shut off gas supply to heater.
3. Shut off the water supply to the water heater using installer supplied shutoff valve.
4. Open hot water taps to drain the plumbing system. If water continues to flow after 5 minutes, a plumbing crossover is present and must be corrected before proceeding.
5. Open service valves (if available) or disconnect inlet and outlet water pipes from the water heater. Place a small bucket underneath the water heater to catch residual water remaining inside the water heater.
6. Using an air compressor, blow short bursts of air (100psi max) through the outlet water connection until there is no water present coming through the inlet water connection of the heater.
7. Reconnect water fittings and return heater to service when danger of freezing has passed.

## 9.3 Mineral scale build-up

Periodic descaling may be necessary in areas with high mineral content in the water. Scale buildup in the heat exchanger may result in lower flow rates, error codes of

A7 and E9 and boiling sounds (knocking and banging) in the heat exchanger.

### Descaling using a pump

1. Disconnect electrical supply from the water heater.
2. Shut off the water supply to the water heater using (installer supplied) shutoff valve.
3. Open hot water taps to drain and relieve pressure from the plumbing system.
4. Drain water from the unit's heat exchanger by disconnecting inlet and outlet water connections from the heater.
5. Connect a line (A) from the outlet of the circulating pump (installer supplied) to the inlet water fitting on the water heater (see Fig. 55).
6. Using another line (B), connect to the water outlet fitting on the water heater. Route the other end of this line into a descaling reservoir.
7. Using a 3rd line (C) from the descaling reservoir, connect to the inlet side of circulating pump. Install a filter on the end of this line in the descaling reservoir.
8. Make sure all connections are "water tight."
9. Fill tank with descaling solution so both lines inside are submersed. We recommend straight white vinegar. If using a commercial descalant, refer to manufacturer's instructions on dilution with water.
10. Operate the circulating pump.
11. Make sure there are no leaks and the solution is flowing from the descaling reservoir through the heater and returning to the reservoir.
12. Run solution through the heater until the solution returning to the descaling reservoir comes out clear. (Changing to a fresh solution may be necessary during this process).
13. Disconnect all lines and drain all solution from heat exchanger. Properly discard of solution.
14. Position a container below the hot water outlet and connect cold water supply. Open cold water supply isolation valve and flush heat exchanger with clean water.
15. Shut cold water shutoff valve and reconnect hot water supply to the water heater.

16.Reconnect electrical supply to unit, open water shutoff valves, and return the unit to service.

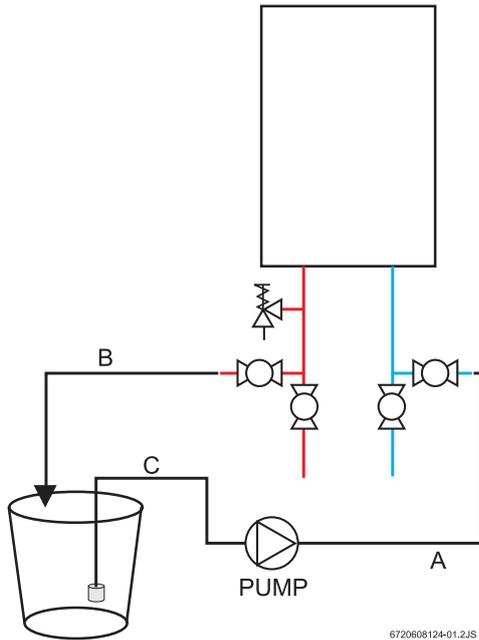


Fig. 55

### 9.4 Adjusting CO<sub>2</sub>

The CO<sub>2</sub> can only be adjusted by a certified gas technician with a calibrated CO<sub>2</sub> analyzer.

**i** CO<sub>2</sub> adjustment is required in Natural Gas installations where energy content is less than 900 BTU/cuft, and in installations with repeated unresolved EA and EC errors (ref. to page 39 “Problem solving”).

**Caution:** One factor that may affect CO<sub>2</sub> levels is improper gas pressure. Please see Chapter 6.6 for the procedure to measure gas pressure and record your findings below:

Static Gas Pressure:  “ WC

P1 Operating Pressure:  “ WC

The P1 minimum operating gas pressure is 3.5" WC for Natural Gas and 8" WC for Propane. Do not proceed in adjusting CO<sub>2</sub> until pressure is at or above these levels, but not to exceed 10.5" WC for Natural Gas and 13" WC for Propane.

#### A. Once Gas Pressure is adequate

- ▶ Press ON/OFF button to turn off the heater.
- ▶ To measure CO<sub>2</sub> on this appliance, a measuring port is available under the louvered grill on the front of the outdoor vent cap.

- ▶ To access measuring port, remove two screws on either side of the louvered grill.
- ▶ Pull louvered grill free from vent cap.
- ▶ Insert CO<sub>2</sub> analyzer probe into the measuring port. The tip of the probe should be in the center of the flue pipe (approx 1.5" inserted). Avoid air gaps between probe and measuring port as they can alter readings.

**Warning:** Outdoor vent cap will get very hot during operation.

- ▶ Ensure the vent cap is cool before performing the procedure below.

- ▶ When measuring is complete, replace louvered grill with screws.

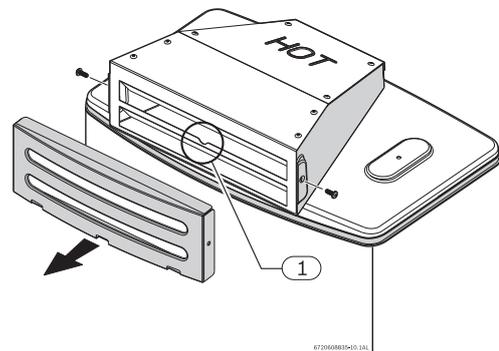


Fig. 56

1 Measuring port

- ▶ While holding the Program (P) button in, press the ON/OFF button to turn ON the heater (see Fig. 57). As soon as ‘188’ flashes on the display, release the Program button. The display should now read P2. Press ‘-’ button until “P1” appears on display.

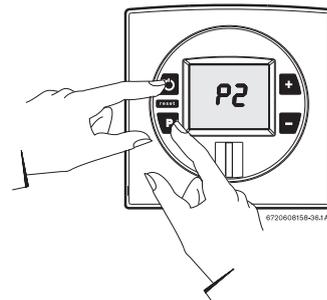


Fig. 57

#### B. Measuring CO<sub>2</sub> (combustion cover must be installed):

- ▶ Open all hot water taps to achieve a flow rate of at least 6 gallons per minute. (1 tub and 2 sinks should be sufficient). If heater display reverts back to P2, open more hot water fixtures to allow sufficient flow.
- ▶ Press ‘+’ until P1 reappears on display.
- ▶ Record the CO<sub>2</sub> reading in P1 below. (Analyzer reading may take several minutes to stabilize).

- ▶ Press the '+' button until P2 appears. Unit will ramp down to low fire and the flow should decrease.
- ▶ Record the CO<sub>2</sub> reading in P1 and P2 below.

P2 CO<sub>2</sub> Reading:  % CO<sub>2</sub>

P1 CO<sub>2</sub> Reading:  % CO<sub>2</sub>

Note: When making adjustments, make sure combustion cover is installed.

		CO <sub>2</sub> range (%)	Max. CO level (measured)
<b>Nat. Gas</b>			
<b>max. input</b>	P1	7.5 % - 8.1 %	< 250 ppm
<b>min. input</b>	P2	2.3 % - 2.6 %	< 60 ppm
<b>LP Gas</b>			
<b>max. input</b>	P1	8.7 % - 9.3 %	< 250 ppm
<b>min. input</b>	P2	2.7 % - 3.0 %	< 60 ppm

\* Values above are for climate controlled conditions. Inputs such as gas pressure, heating value of the gas, humidity and temperature of combustion air all impact CO and CO<sub>2</sub> values. Changes in these inputs can result in different CO and CO<sub>2</sub> values on the same appliance.

Table 7 CO<sub>2</sub> & CO target numbers

**C. Adjusting CO<sub>2</sub>:**

**Note:** P1 adjustment will change the P2 reading. Confirm the P1 value BEFORE adjusting the P2 level.

- If P1 CO<sub>2</sub> level is off:
  - ▶ Loosen yellow painted Phillips screw (1) and cover should rotate down (2) revealing a recessed brass slotted screw. Fig. 58.
  - ▶ Turning the slotted screw counter clockwise will raise P1 CO<sub>2</sub> levels and clockwise will lower P1 CO<sub>2</sub> levels. Adjustments to the slotted screw will also change P2 CO<sub>2</sub> levels.
  - ▶ After bringing the P1 CO<sub>2</sub> readings in proper range, press the '+' button to enter the P2 mode. Verify CO<sub>2</sub> readings in P2 mode.
- If P2 CO<sub>2</sub> level is off:
  - ▶ Remove yellow painted #40 Torx cover from the front of the gas valve. (Fig. 59) A plastic #40 Torx screw will be revealed.
  - ▶ Turning the plastic #40 Torx screw counter clockwise will lower P2 CO<sub>2</sub> levels and clockwise will raise P2 CO<sub>2</sub> levels.

**Note:** This screw adjustment is very sensitive and should be made in small increments. It may take several minutes for readings to stabilize.

3. Verify both P1 and P2 CO<sub>2</sub> readings are within the ranges specified in table 7. Repeat steps 1 and 2 as necessary until CO<sub>2</sub> values are within the specified ranges.
4. Once CO<sub>2</sub> values are within the specified ranges, verify the CO readings on P1 and P2 do not exceed values shown in table 7. If values exceed this limit, inspect vent system and fin coils (chapter 9.1, page 31) for blockage.

**D. Returning to Service:**

1. Return slotted screw cover to original position and tighten Phillips screw.
2. Reinstall Torx cover.
3. Remove CO<sub>2</sub> analyzer probe and reinstall flathead screw with gasket in exhaust collar.
4. Press ON/OFF button to turn OFF the heater and then turn ON the heater.
5. Heater is ready for normal operation.

**Final Readings**

P2 CO<sub>2</sub> Reading:  % CO<sub>2</sub>

P1 CO<sub>2</sub> Reading:  % CO<sub>2</sub>

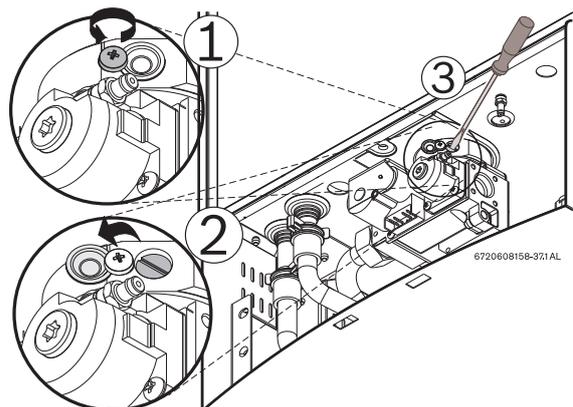


Fig. 58 Adjusting P1 CO<sub>2</sub> level

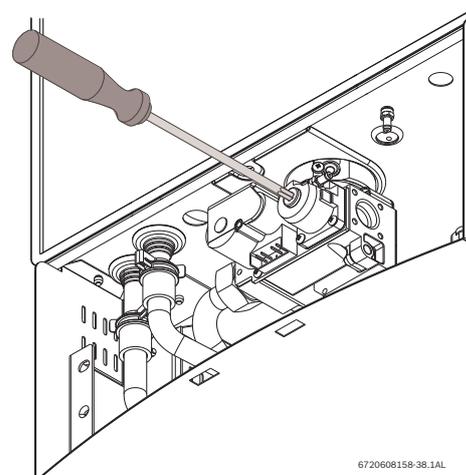


Fig. 59 Adjusting P2 CO<sub>2</sub> level

## 9.5 Program values

This section describes details on programming the appliance. For most applications, the factory default values will provide robust and stable operation. Only adjust the factory settings if the installation requires changes as indicated in the appropriate section of this manual.

Refer to chapter 9.6 Control board diagnostics (page 36) regarding how to access these P-modes.



**Caution: Misadjusted program values can lead to appliance malfunction, errors, and service calls.**

Program	Description	Factory Default	MIN	MAX	Comment
P1	Maximum Power	NG:48, LP:46	21	NG:50, LP:49	see chapter 6.6, page 24. note: reducing P1 values below maximum will reduce maximum power of the appliance.
P2	Minimum Power	7	7	20	see chapter 8.8.1, page 29
P3	Remote Controls installed	_0	_0	6	see chapter 8.5, page 28
P4	Access to Diagnostic Mode	E	0d	10f	see chapter 9.6, page 36
P5	Cascade Mode	NO	NO	CC	contact Bosch for details
P6	Temperature Unit	°F	°F	°C	
P7	Appliance Type	NO	Cd	NO	Condensing / Non-condensing*
P8	Back light	dE	dE	ON	dE turns back light off after 60 seconds from last button pushed, ON turns backlight on permanently
P9	Fan Purge				runs secondary and primary fan when P9 is selected by depressing the "P" - button
PH	Cascading type	IC	IC	SC	This menu is only available when cascade mode is select CC. Contact Bosch Water Heating for details.
PC	Master/Slave mode	CS	CS	CM	

Table 8 Program values, factory default settings and ranges.

\* Incorrect setting causes errors.

### 9.6 Control board diagnostics

1. Turn on/off switch on water heater to off (O) position.
  - ▶ Press and hold the program 'P' button while pushing the on/off button to the on (I) position. The display will cycle through a startup procedure including the software version.
  - ▶ Release the 'P' button when '188' appears on the display. The display should read 'P2' when the program button is released. If not, repeat process.
  - ▶ Press and release the '+' button on the control panel until the display reads 'P4'. You are now in the diagnostic mode of the control board.
  - ▶ When the display reads 'P4', press and release the 'P' button once again and the display should read 'E'.
  - ▶ Use the '+' and '-' button on the control board to cycle through different diagnostic modes available.
  - ▶ Once in the selected diagnostic mode of your choice, press and release the 'P' button to display the diagnostic information.
  - ▶ EXAMPLE: to read the flow rate in gallons per minute while the unit is flowing water, cycle to the '3d' mode and press the 'P' button. A reading of 25 on the display would indicate the heater is reading a flow rate of 2.5 gallons/minute.
  - ▶ Once the information is obtained, press the 'P' button again to return to the diagnostic mode menu and scroll to addition diagnostic information.
  - ▶ To exit the diagnostic mode of the heater, use the '+' or '-' button until the display reads 'E'.
  - ▶ Press the 'P' button once again and the display should read P4.
2. Press the on/off button off (O) and back on (I) again to return heater to normal function.

Diagnostic menu	
E	Entry/Exit into sub-modes
0d	Set-point temperature
1d	Inlet water temperature (°F)
2d	Outlet water temperature (°F)
3d	Water flow (gallons/min)
4d	Gas type (LP or NG)
5d	Fan speed (Hz)
6d	Burner power (%)
7d	Maximum power (kW)
8d	Back flow temperature (°C)
9d	Not used, setting 00

Table 9

1F	Most recent error/failure
2F	2nd most recent error
3F	3rd most recent error
4F	4th most recent error
5F	5th most recent error
6F	6th most recent error
7F	7th most recent error
8F	8th most recent error
9F	9th most recent error
10F	10th most recent error
H0	Numbers of hours - mode 0
H1	Numbers of hours - mode 1
H2	Numbers of hours - mode 2

Table 9

#### 9.6.1 Working hours

To see how many hours the appliance has worked, please enter the “Diagnostic menu” (chapter 9.6);

- ▶ Select the sub-mode “H0”.  
Write the number that shows in the display.
- ▶ Select the sub-mode “H1”.  
Write the number that shows in the display.
- ▶ Select the sub-mode “H2”.  
Write the number that shows in the display.

After checking the sub-modes H0, H1 and H2, introduce the values in the table below;

Working hours		
Number in H0	_____	_____ +
Number in H1	_____ (X 100) =	_____ +
Number in H2	_____ (X 10 000) =	_____ +
(H0 + H1 + H2) = <b>Total of hours</b>		_____

Table 10

#### Example:

Calculation of number of working hours,

Working hours		
Number in H0	<u>60</u>	<u>60</u> +
Number in H1	<u>5</u> (X 100) =	<u>500</u> +
Number in H2	<u>0</u> (X 10 000) =	<u>0</u> +
(H0 + H1 + H2) = <b>Total of hours</b>		<u>560</u>

Table 11

## 10 Troubleshooting



**Warning:** If you are unable to perform the tasks listed below, or need additional assistance please contact your original installer or licensed gas technician.



Inside the heater it is normal to find unplugged wire connectors. These connections are for adding accessories such as cascading or freeze prevention.

### 10.1 Introduction

Many of the questions customers ask regarding operation of this unit can be answered by following the troubleshooting steps as outlined below. Visit our web site at [www.boschpro.com](http://www.boschpro.com) for more detailed troubleshooting and service bulletins. For best results, perform each step before proceeding to the next. The suggested solutions may require that the cover be taken off. (See Page 7. Fig. 3).

### 10.2 Burner does not ignite when hot water is turned ON

1. If the display is blank, verify power to outlet. (120VAC/60Hz properly grounded circuit required). Verify that the heater ON/OFF button is turned ON.
2. Verify the fuses in the control board are good. See Section 7.2, page 25 of the installation manual for fuse locations.
3. Make sure cold water inlet connection is plumbed to the right side of heater when facing unit. See Fig. 25, page 20.
4. A minimum of 0.5 gallons per minute (GPM) (1.9 l/m) is required to activate the heater. A quart container should fill in 25 seconds or less to activate heater. In areas of warm inlet water temperatures, the heater may increase activation rate to as high as 1.6 gallons per minute (GPM) to prevent overshooting of set temperature.
5. Clean inlet filter screen per chapter 9.2, page 32.
6. Inspect the water path for obstructions. Make sure all showerheads, faucet aerators and whole house filters are clear of debris.
7. The heater activates when the water flow through the unit is at or above the required minimum of 0.5 GPM (1.9 l/m). A crossover in the plumbing creates back pressure on the water flowing through the heater. Therefore, a higher flow rate than normal is needed to force the heater to activate. To check for a plumbing crossover, shut off the cold water supply to the water heater. Then open all of the hot water taps served by the heater. Wait 10 minutes and check for water flow at taps. There should be no water flowing. Any continuous flow of water, small or large, indicates a

crossover is present and must be corrected. Consult a professional plumber for help in correcting a crossover. Failing single lever faucets and mixing valves are common causes of plumbing crossovers.

8. With the ON/OFF switch turned to OFF (O) position and the power supply cord unplugged, remove the unit's front cover (See Page 7. Fig. 3). Check wire connections between the water valve, control unit and electrode set. See chapter 15.2, page 49 for location of these parts.
9. Water heater in solar mode. If inlet water temperatures exceed the water heater's set temperature, the burners will not ignite and the solar mode indicator will show on the display. See Fig. 42, page 26.

### 10.3 Water is too hot

1. Selected temperature on the unit is set too high. To lower output temperature, see chapter 8.4, page 27.
2. Clean inlet filter screen per chapter 9.1, page 31.
3. Inspect the water path for obstructions. Make sure all showerheads, faucet aerators and whole house filters are clear of debris.
4. Confirm the heater's gas type coincides with the type of gas being supplied. See Fig. 2, page 6 for location of rating plate.
5. Avoid restrictive outlets. Clean all showerheads and faucet aerators. It may be necessary to upgrade to higher flow rate shower heads if allowable by local code.
6. In areas where the water has a high mineral content, periodic descaling may necessary. See chapter 9.3, page 32 for directions.
7. Ensure the outlet temperature sensor is making contact and firmly mounted on the hot water pipe.

### 10.4 Water is not hot enough

1. Selected temperature on the unit is too low. To raise output temperature, see chapter 8.4, page 27.
2. Clean inlet filter screen. See chapter 9.1, page 31.
3. Inspect the water path for obstructions. Make sure all showerheads, faucet aerators and whole house filters are clear of debris.
4. Confirm the heater's gas type coincides with the type of gas being supplied. See Fig. 2, page 6 for location of rating plate.
5. Check inlet gas particle screen for blockage at gas inlet connection on bottom of unit.
6. Verify gas pressure is in accordance with specifications in chapter 6.6, page 24. A gas pressure reading is needed to proceed further. Contact your original installer or a local certified gas technician to obtain this reading.
7. Cold water is mixing into the hot water lines (plumbing crossover). A plumbing crossover can unintentionally

mix cold water with the hot water leaving the heater. The end result is a cooler water temperature than desired. To check for a plumbing crossover, shut off the cold water supply to the water heater. Then open all of the hot water taps served by the heater. Wait 10 minutes and check all taps for water flow. There should be no water flowing. Any continuous flow of water, small or large, indicates a crossover and must be corrected. Consult a professional plumber for help in correcting a crossover. Failing single lever faucets and mixing valves are common causes of plumbing crossovers.

8. Ensure the outlet temperature sensor is making contact and firmly mounted on the hot water pipe.

### 10.5 Low water flow/pressure

1. Too many hot water applications are being used simultaneously or too much flow is demanded. The water heater will effectively support two 2.0-2.5 GPM shower heads simultaneously or multiple sink applications. Greater draws will result in a water pressure drop and reduced flow at taps.
2. Ensure that gas pressure is in accordance with specifications in chapter 6.6, page 24. A gas pressure reading is needed to proceed further. Contact your original installer or a local certified gas technician to obtain this reading. If gas pressure is inadequate, the water heater will close its motorized water valve, reducing the hot water flow rate in an attempt to reach the selected output temperature.
3. If selected temperature on the unit is set too high for the demanded flow rate, the water heater will close its motorized water valve, reducing the hot water flow rate in an attempt to reach the selected output temperature. Lowering the selected temperature will allow the motorized water valve to open up for increased water flow rate.
4. Clean inlet filter screen per chapter 9.1, page 31.
5. Inspect the water path for obstructions. Make sure all showerheads, faucet aerators and whole house filters are clear of debris.

### 10.6 Hot water temperature fluctuates or goes cold at tap

1. Hot water is very hot out of the tap, requiring mixing of cold water in order to attain a useable hot water temperature. The addition of too much cold water will overpower the hot water flow from the tankless water heater.  
This slows the flow within the tankless water heater, decreasing it below activation point, which shuts off the burners. The end result is nothing but cold water coming out of the outlet.  
Consult [www.boschpro.com](http://www.boschpro.com) for a detailed service bulletin on overcoming temperature fluctuations.
2. Unbalanced pressure in water lines. Any restriction in the water heater, such as a clogged inlet filter screen, can result in unequal pressures between the cold and

hot water lines. In such cases, when mixing in the higher pressure cold water at the tap, the lower pressure hot water can be overpowered. This will shut down the burners because the hot water flow rate fell below the minimum flow rate required for activation. Verify inlet filter screen is clean and clear of debris. See chapter 9.1, page 31 for inlet filter cleaning instructions.

3. Heater deactivated by temperature balancing valves. If the outlet water temperature is set too high, the heater can produce temperatures that are too hot. A temperature balance shower valve will automatically mix in cold water to reduce the hot water temperature. In the event of any temperature instability at a fixture using a temperature balancing valve, refer to the valve manufacturer for instructions on internal adjustment setting. An adjustment should be made to minimize the amount of cold water the valve is adding. Additionally, the temperature setting on the heater can be lowered to prevent the temperature balance valve from mixing in too much cold water.
4. Inlet water pressure is erratic due to fluctuating supply water pressure. For installation on a private well system with the use of a pressure tank, the lowest pressure range setting recommended is 40-60 psi (2.75 - 4.15 bar). Consult your installer or local plumber for effective ways to maintain constant water pressure to the water heater when on a well system.

### 10.7 Noisy burner/heater during operation

1. Sealed combustion leak. Make sure combustion cover is securely fastened. Ensure the outdoor cap is properly sealed with supplied gasket. Leaky seals create improper combustion resulting in noise.
2. Blocked venting. Ensure exhaust gases are properly discharging to the outdoors via the louvered openings on the outdoor cap and/or recess box.
3. Lack of adequate combustion air. Lack of combustion air will result in unstable burner flames and noise. Ensure adequate combustion air is provided to the unit in accordance with specifications in Section 5.1, page 14, Combustion Air Requirements.
4. Lack of adequate gas pressure. Inadequate gas pressure will cause the fuel-to-air mixture (CO<sub>2</sub>) to be out of adjustment. This will result in unstable burner flames and noise. Ensure gas pressure is in accordance with specifications in section 6.6, page 24 Measuring Gas Pressure. A gas pressure reading is needed to proceed further. Contact your original installer or a local certified gas technician to obtain this reading.
5. Verify proper CO<sub>2</sub> readings per chapter 9.4, page 33. CO<sub>2</sub> adjustments must be done by a certified gas technician with a calibrated combustion gas analyzer.

## 11 Problem solving

### 11.1 Error code diagnostics



To remove error code from the display, press the reset button.

Display	Cause	Solution
A2	Fault in the flue gas limiter. Temperature above 230°F (110°C) inside the cabinet.	<ol style="list-style-type: none"> <li>1. Check continuity of the flue gas limiter (see Fig. 65, page 47). Go to steps two and three to determine air box temperature sensor fault and replace it.</li> <li>2. Check for flue gas leakage around the top and bottom seals of heat exchanger use mirror to check around the rear as well as the viewing window.</li> <li>3. Check that flue gas limiter connector and spade connections are secure.</li> <li>4. Unplug heater and check the wiring harness connections inside the control board.</li> </ol>
A3	Appliance selection on "P7" mode is not correct.	<ol style="list-style-type: none"> <li>1. Check "P7" mode: the water heater requires setting "NC".</li> <li>2. Check jumper and connection on sensor at upper right hand corner of heat exchanger.</li> <li>3. Measure jumper resistance, must be 115-125 ohms.</li> </ol>
A4	Backflow temperature sensor defect - happens if sensor is disconnected or short circuit.	<ol style="list-style-type: none"> <li>1. Check blackflow temperature sensor connection. See Fig. 65, page 47.</li> <li>2. Replace backflow temperature sensor.</li> <li>3. Check sensor (ref. page 45, chapter 13).</li> </ol>
A7	Outlet temperature sensor fault (Temperature below 36°F or above 210°F).	<ol style="list-style-type: none"> <li>1. Check red wire connections at hot water temperature sensor. Clean terminals with an eraser. If badly corroded, replace sensor and wire harness. See Fig. 65, page 47.</li> <li>2. Sensor may trip if water temperature drops below 36°F to protect heater from freezing conditions. Any damage due to freezing conditions is not covered under warranty.</li> <li>3. In areas where water has a high mineral content, periodic descaling may be necessary.</li> <li>4. Check sensor (ref. page 44, chapter 13).</li> </ol>

Table 12

\* By installer or service technician only.

Display	Cause	Solution
<p>(Flashing)</p> 	<p>Outlet temperature sensor not sensing expected output temperature. (Status message, not an error).</p>	<ol style="list-style-type: none"> <li>1. Check that the sensor is firmly attached to the hot water pipe (see Fig. 71, page 53).</li> <li>2. Ensure that outlet temperature sensor is not placed on any bends in the hot water pipe or misreading may occur.</li> <li>3. Check gas pressure. Low gas pressure may prevent the heater from reaching desired output temperature.</li> <li>4. Check supply voltage. It must be 120VAC and properly grounded.</li> <li>5. Possible defective control unit call Bosch Water Heating for further instructions.</li> </ol>
	<p>Primary fan rotation too low on operation.</p>	<ol style="list-style-type: none"> <li>1. Disconnect power supply cord and check wire connection on back side of primary fan and the connectors on the control board (see Fig. 72, page 54).</li> <li>2. Check supply voltage. It must be 120VAC and properly grounded.</li> <li>3. Check vent openings. A blockage may cause this failure.</li> <li>4. Check gas pressure. Low gas pressure may cause the fan to change its speed to meet desired temperature.</li> <li>5. Possible defective control unit call Bosch Water Heating for further instructions.</li> </ol>
	<p>No rotational speed sensor signal from primary fan.</p>	<ol style="list-style-type: none"> <li>1. Disconnect power supply cord and check wire connections on back side of primary fan and the two connectors on the control board (see Fig. 72, page 54).</li> <li>2. Check supply voltage. It must be 120VAC and properly grounded.</li> <li>3. Possible defective component in fan or defective control unit call Bosch Water Heating for further instructions.</li> </ol>
<p>(Flashing)</p> 	<p>Water flow signal over specified maximum value. Water flow &gt; 10 gallon/min. (Status message, not an error).</p>	<ol style="list-style-type: none"> <li>1. Disconnect power supply cord and check wire connections on water valve and the two connectors on the control board (see Fig. 72, page 54).</li> <li>2. Excessive water pressure and flow. Ensure water pressure is less than 150psi and flow rate is below 10 gallons per minute.</li> </ol>
	<p>Over-temperature detected by outlet temperature sensor on hot water pipe. Temperature &gt; 185°F</p>	<ol style="list-style-type: none"> <li>1. Check that the sensor is firmly attached to the vertical section of the hot water pipe (see Fig. 71, page 53).</li> <li>2. Check red wire connections at outlet temperature sensor. Clean terminals with an eraser. If badly corroded, replace sensor and wire harness.</li> <li>3. In areas where water has a high mineral content, periodic descaling may be necessary. See chapter 9.3, page 32 for directions.</li> <li>4. Check sensor (ref. page 44, chapter 13).</li> </ol>

Table 12

\* By installer or service technician only.

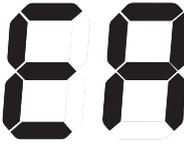
Display	Cause	Solution
	Cold water temperature sensor fault.	<ol style="list-style-type: none"> <li>1. Check connector on wires coming from top of watervalue for a secure connection. See Fig. 65, page 47.</li> <li>2. Sensor may trip if water temperature drops below 36°F to protect heater from freezing conditions Any damage due to freezing conditions is not covered under warranty.</li> <li>3. Check sensor (ref. page 44, chapter 13).</li> </ol>
	Backflow temperature sensor over 309°F. The appliance will close the burner and lock.	<ol style="list-style-type: none"> <li>1. Check combustion air and exhaust vent piping for blockage.</li> <li>2. Check if secondary fan connections are disconnected.</li> <li>3. Check vent openings. A blockage may cause this failure.</li> <li>4. Call Bosch Water Heating for further instruction.</li> </ol>
	Overheat sensor (ECO) open circuit (resets when cooler temperatures are detected 220°F/ 104°C).	<ol style="list-style-type: none"> <li>1. Disconnect power supply cord and check wire connections on overheat sensor (top right of heat exchanger) and the two connectors on the control board. See Fig. 65, page 47.</li> <li>2. Check white wire connections at overheat sensor. Clean terminals with an eraser. If badly corroded, replace sensor and wire harness.</li> <li>3. Check vent openings. A blockage may cause this failure.</li> <li>4. In areas where water has a high mineral content, periodic descaling may necessary, see chapter 9.3.</li> <li>5. Unplug power supply cord to the water heater. Open a hot water tap for several minutes to allow cold water to pass through heat exchanger. Close hot water tap and disconnect lead wires to overheat sensor. Using a multimeter, check continuity through overheat sensor contacts. Replace sensor if open.</li> </ol>
	No flame ionization detected with water flow.	<ol style="list-style-type: none"> <li>1. Verify that all manual gas shut off valves are open.</li> <li>2. Check gas type, see Fig. 2, page 6.</li> <li>3. Reset error code and open a water tap to cycle the heater in an effort to purge air on new installations. Cycling hot water tap on and off multiple times may be necessary. If heater still faults with EA error code, have a licensed gas technician properly purge air out of the gas line leading to the water heater.</li> <li>4. Check three wire connections to ignition group on the lower front of the heat exchanger are secure.</li> <li>5. Check gas pressure, see chapter 6.6, page 24.</li> <li>6. Check vent openings for blockage. Improper venting may cause premature failure of the flame sensor rod.</li> <li>7. Check that the minimum power fan speed has been adjusted to the proper value. See page 29.</li> <li>8. Observe inside the viewing window of the heat exchanger when a hot water tap is opened. Sparking should be followed by a steady blue flame. If flame is unstable or yellow with proper gas pressure, confirm CO<sub>2</sub> readings per section 9.4.</li> </ol>

Table 12

\* By installer or service technician only.

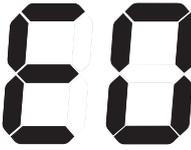
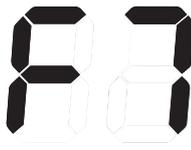
Display	Cause	Solution
	Ionization failure during operation.	<ol style="list-style-type: none"> <li>1. Check gas type, see Fig. 2, page 6.</li> <li>2. Check three wire connections to ignition group on the lower front of the heat exchanger are secure.</li> <li>3. Check vent openings for blockage. Improper venting may cause unstable burner flames and loss of flame ionization.</li> <li>4. Check that the minimum power fan speed has been adjusted to the proper value. See page 29.</li> <li>5. Check gas pressure, see section 6.6, page 24.</li> <li>6. Check and adjust CO<sub>2</sub> readings, see section 9.4, page 33.</li> </ol>
	Internal hardware/software failure.	<ol style="list-style-type: none"> <li>1. Disconnect power supply cord and check the two wire and ground connections on control board as well as ground connection on heater chassis.</li> <li>2. Pushing the wrong combination of buttons on the control unit can create confusion among the microprocessors inside. In this case, the error code should not happen more than once or twice. Turn off the water heater. Turn water heater back on and try resetting error code. Use the reset button (  ) to reset any error codes.</li> <li>3. Possible defective control unit. Call Bosch Water Heating for further instructions.</li> </ol>
	Ionization error at standby.	<ol style="list-style-type: none"> <li>1. Loose connection to the flame ionization rod. Verify that the thinner wire leading from the control unit is securely connected to the flame sensor located on the lower front of the heat exchanger. See Fig. 65, page 47.</li> <li>2. Flame ionization rod or control unit may be damaged. Contact Bosch Water Heating for further instruction.</li> </ol>
	Gas leakage error, gas valve circuit not closing properly.	<ol style="list-style-type: none"> <li>1. Disconnect power supply cord and check wire connections on gas valve and the two connectors on the control board.</li> <li>2. Flow water out of a hot water tap above the minimum activation point of 0.5 GPM. Measure voltage at the gas valve wire plug connection. The voltage should measure 24VDC between the left pair of wires and 24VDC between the right pair of wires when the unit is operating. If voltage is not proper, contact Bosch Water Heating for further instruction.</li> <li>3. Gas valve may be defective, contact Bosch Water Heating for further instruction.</li> </ol>

Table 12

\* By installer or service technician only.

## 12 Electrical diagram

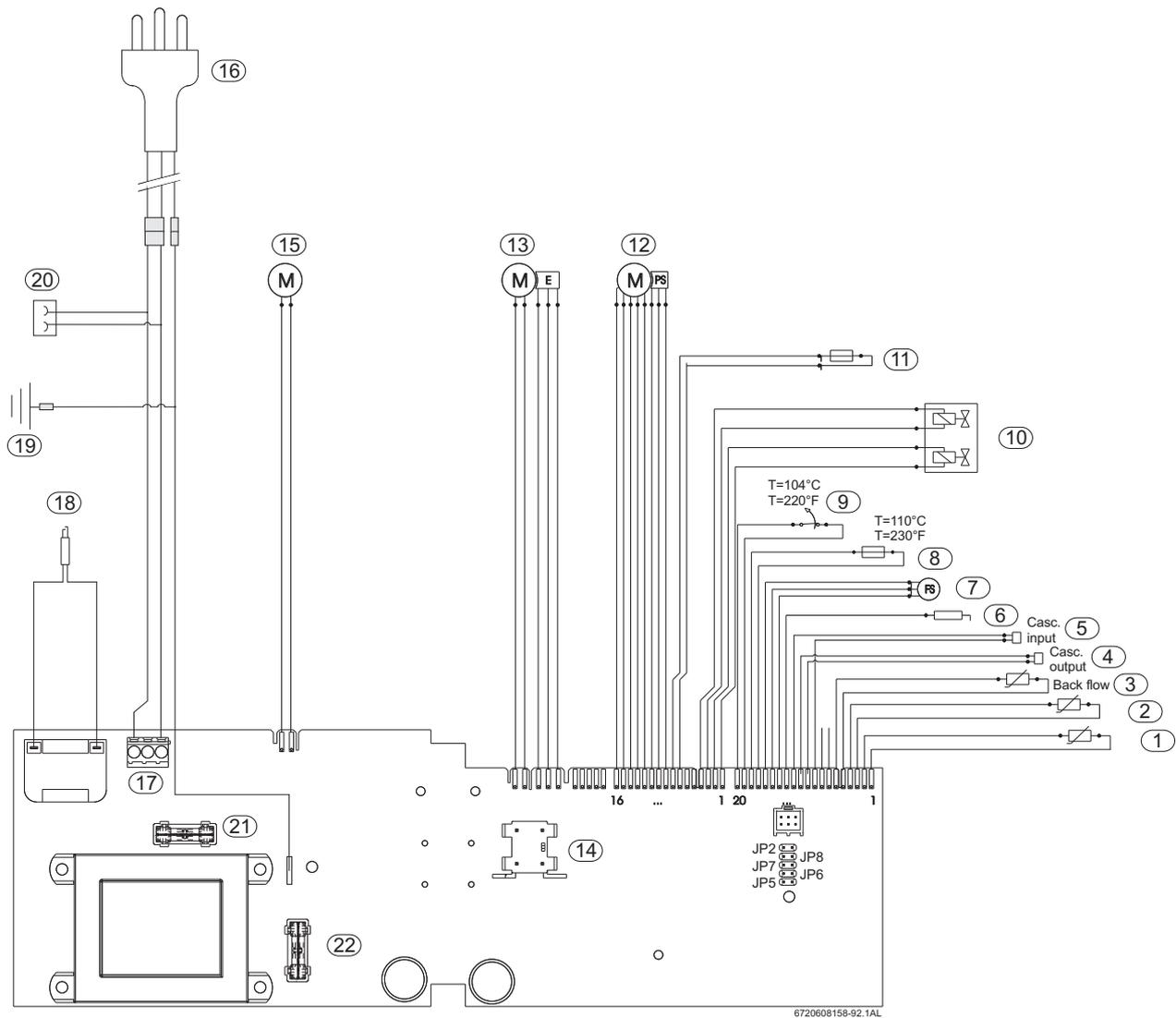


Fig. 60 Electrical scheme

- 1 Inlet water temperature sensor
- 2 Outlet water temperature sensor
- 3 Backflow temperature sensor
- 4 Cascading output connection
- 5 Cascading input connection
- 6 Ionization sensor
- 7 Water flow sensor
- 8 Flue gas limiter
- 9 Heat exchanger overheat sensor (ECO)
- 10 Gas valve
- 11 Jumper resistance
- 12 Water valve
- 13 Primary fan
- 14 ON/OFF switch
- 15 Secondary fan
- 16 AC plug
- 17 Main connection
- 18 Ignition electrodes
- 19 Ground post
- 20 Antifreeze kit connection
- 21 Fuse
- 22 Fuse

### 13 Sensor resistance charts

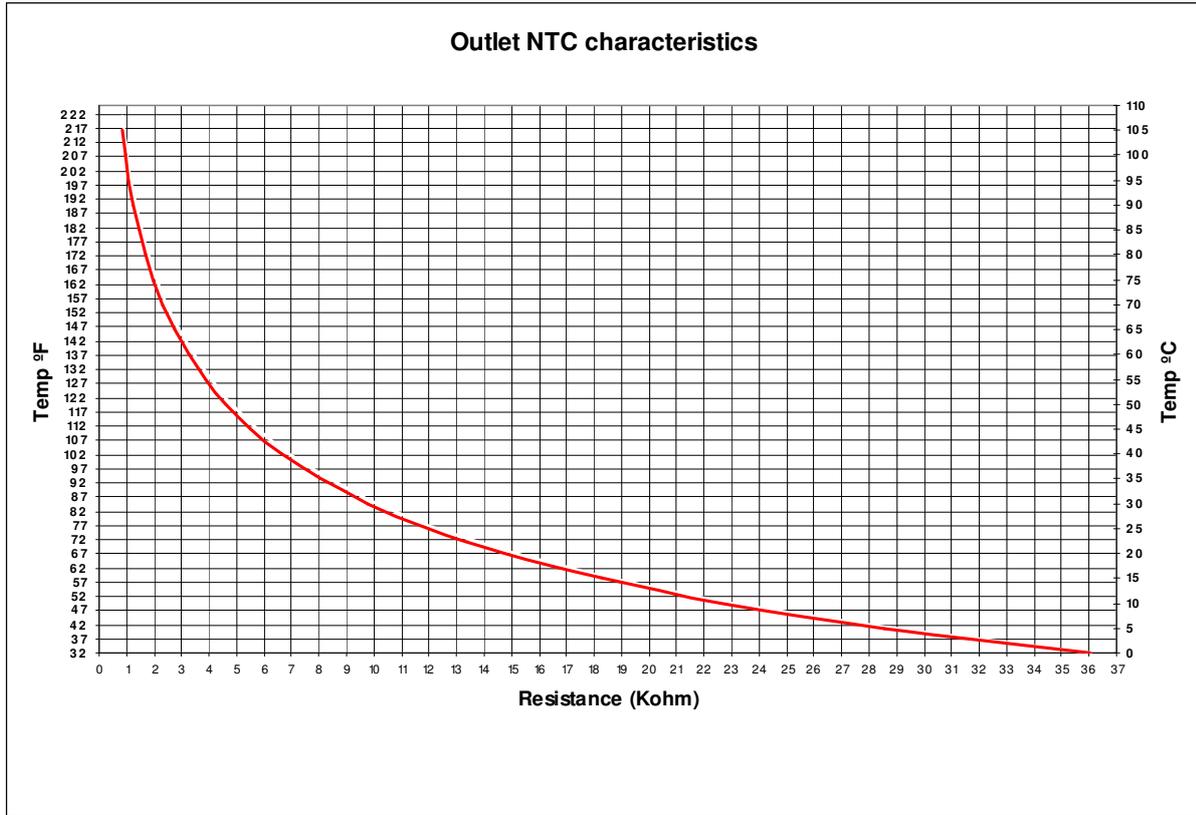


Fig. 61

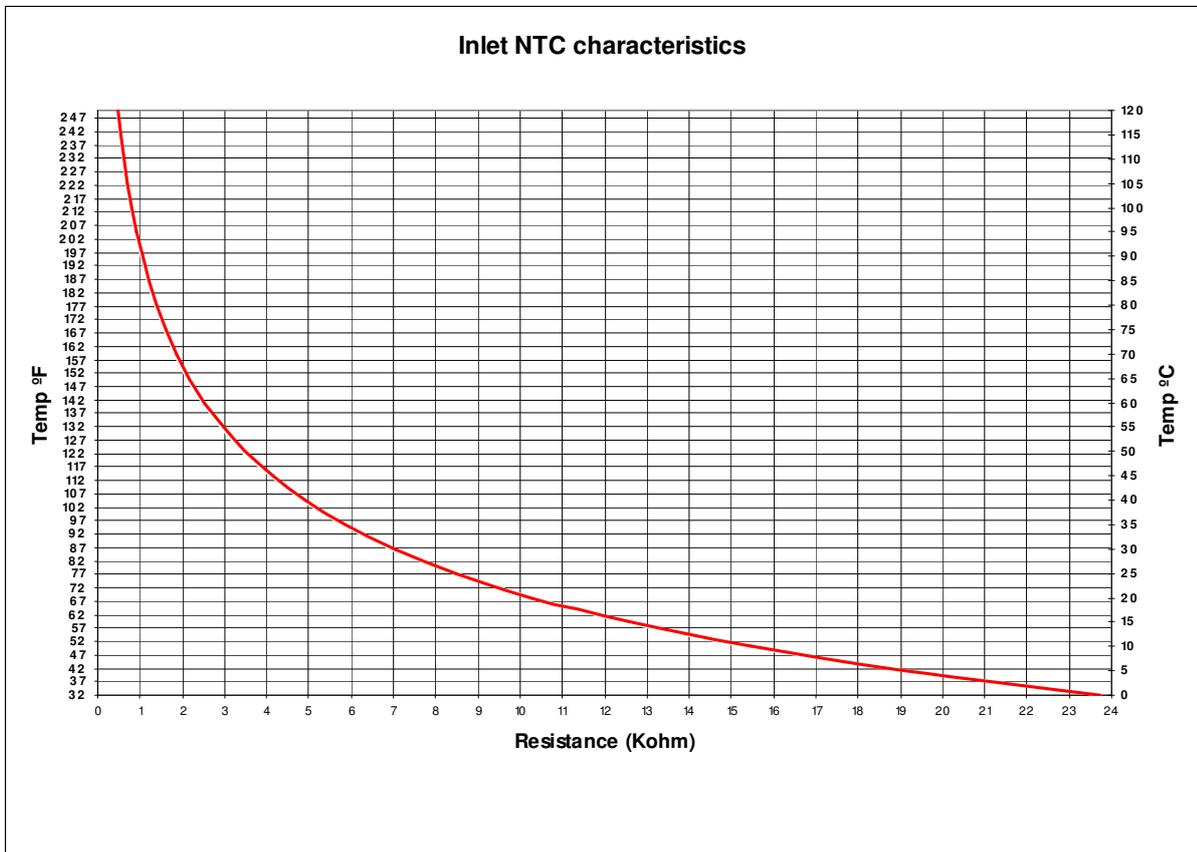


Fig. 62

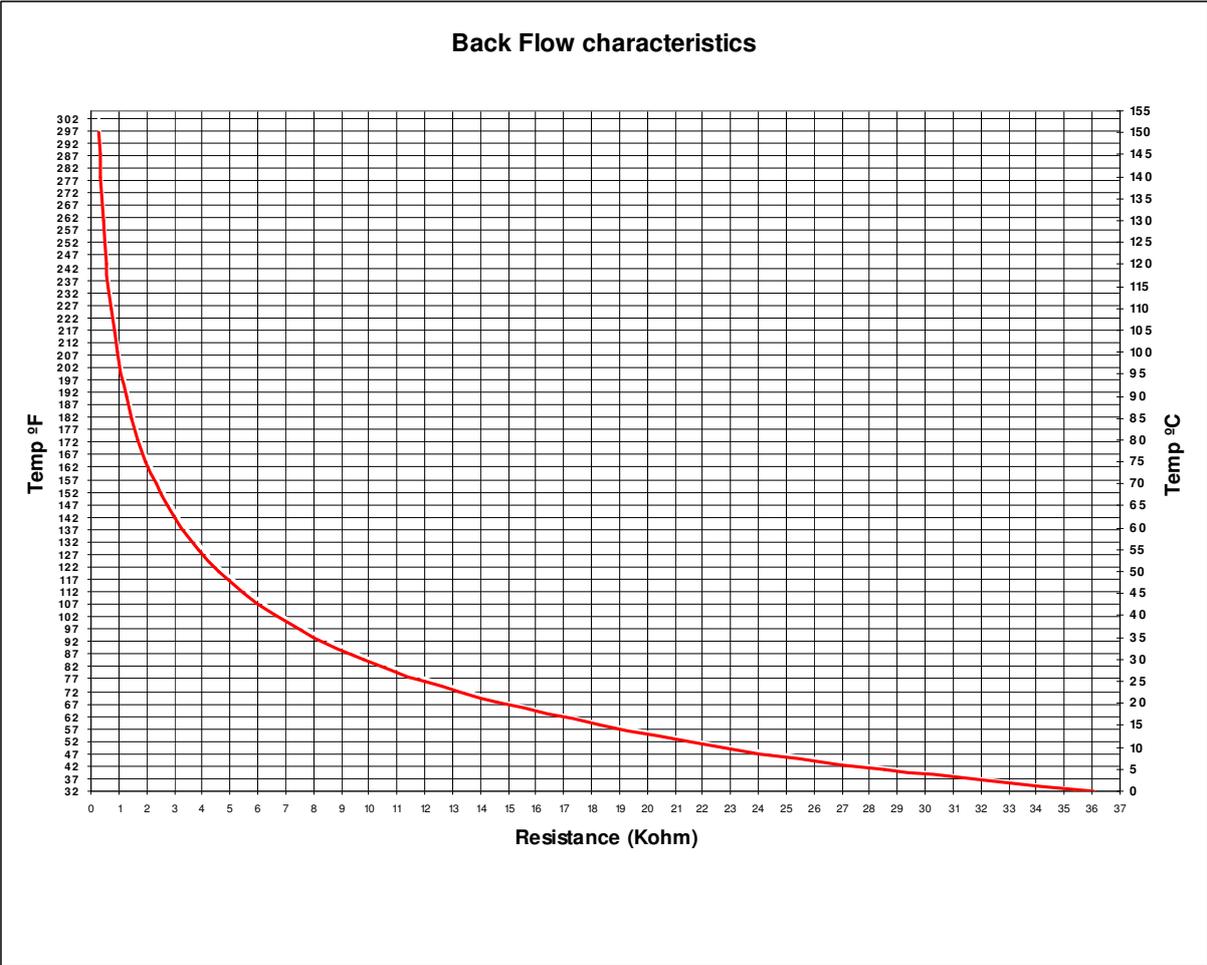


Fig. 63

# 14 GWH 940 ESO Functional scheme

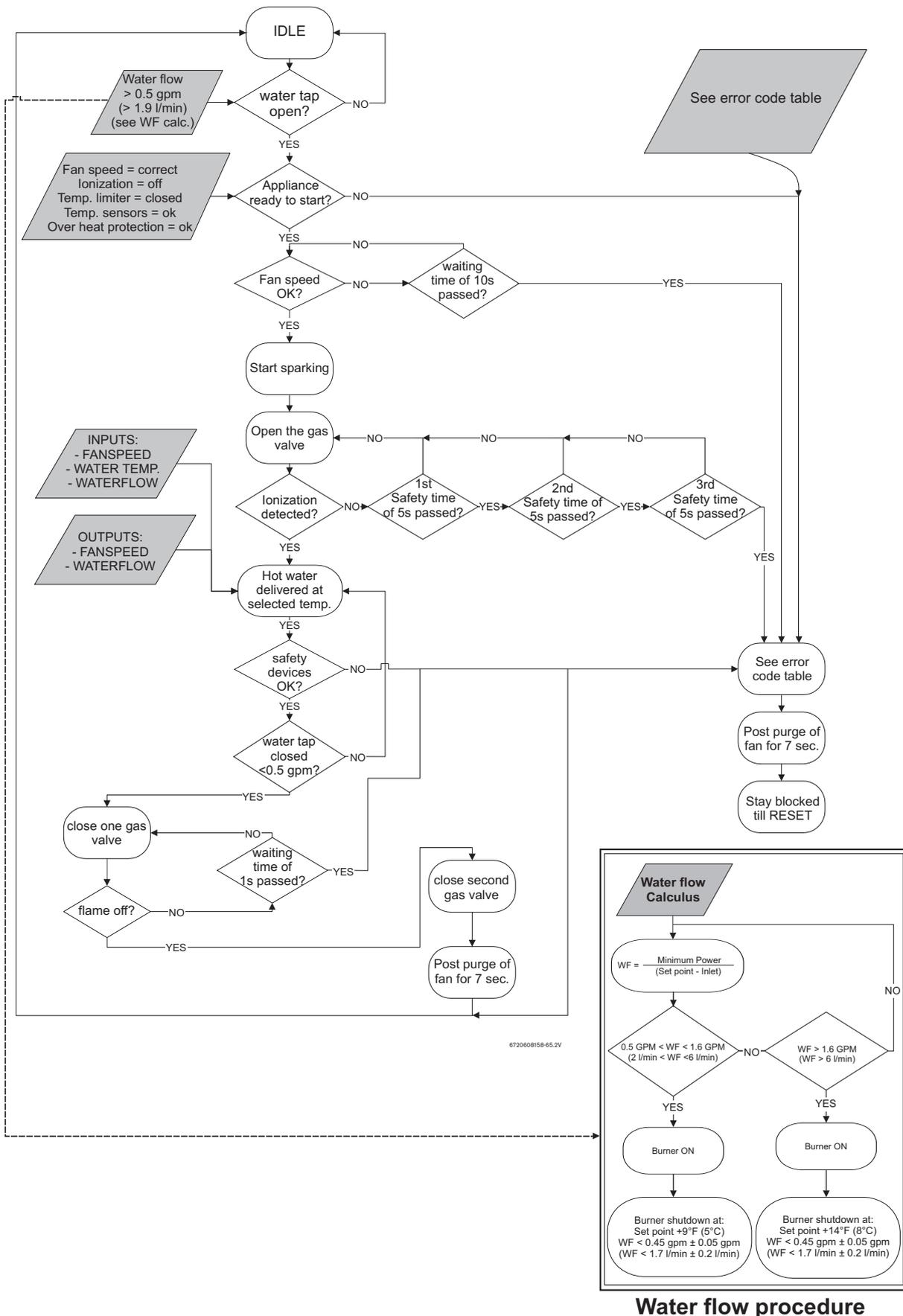


Fig. 64 Functional scheme

## 15 Interior components diagram and parts list

### 15.1 Interior components

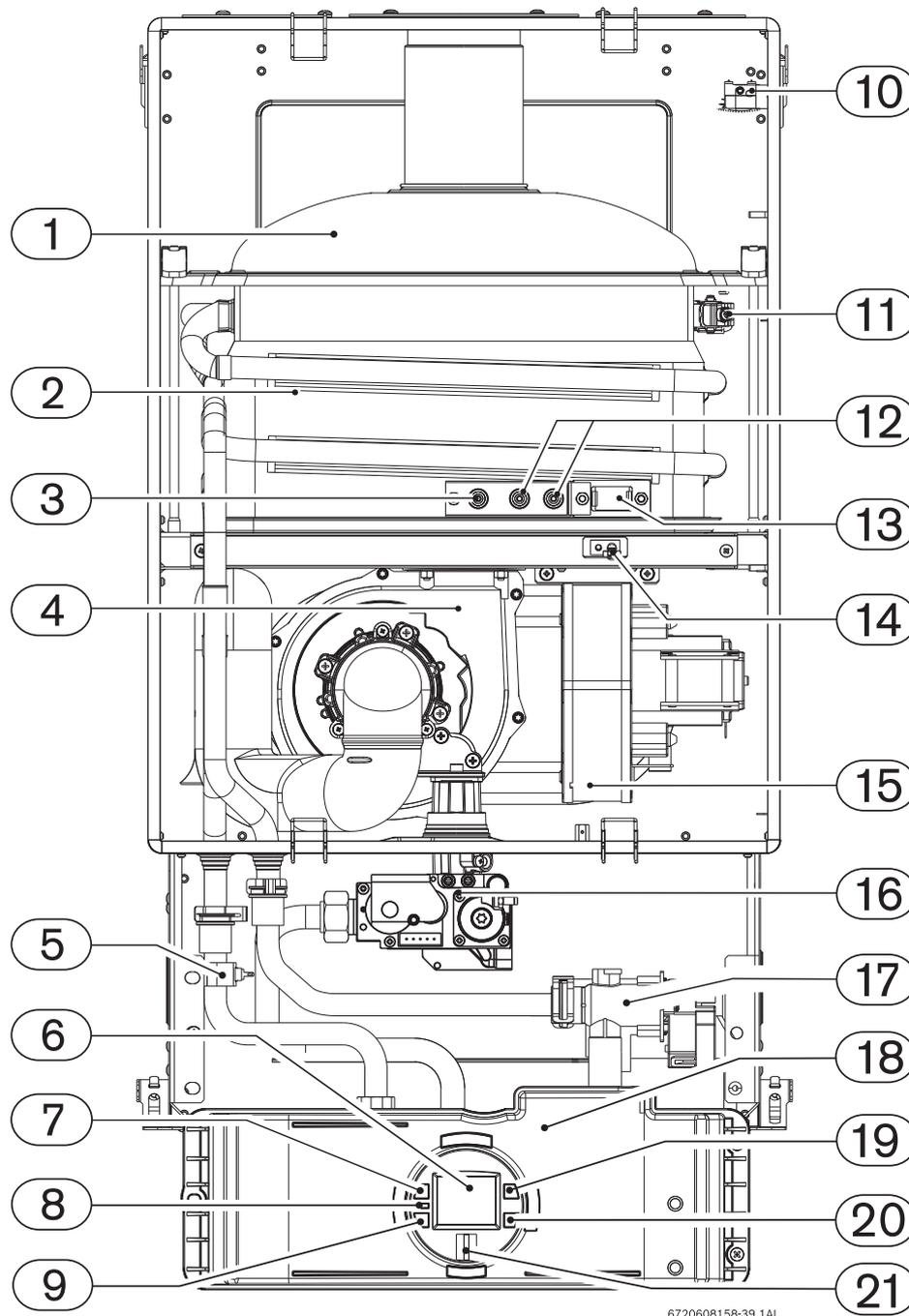


Fig. 65 Components

1	Flue gas collector	12	Ignition electrodes
2	Heat exchanger	13	Observation window
3	Flame sensor	14	Backflow temperature sensor
4	Primary fan (Mixer)	15	Secondary air fan
5	Outlet temperature sensor	16	Gas valve
6	LCD display	17	Water valve with engine and temperature sensor
7	On/Off button	18	Control unit
8	Reset button	19	Up button
9	Program key	20	Down button
10	Flue gas limiter	21	LED
11	Heat exchanger overheat sensor		

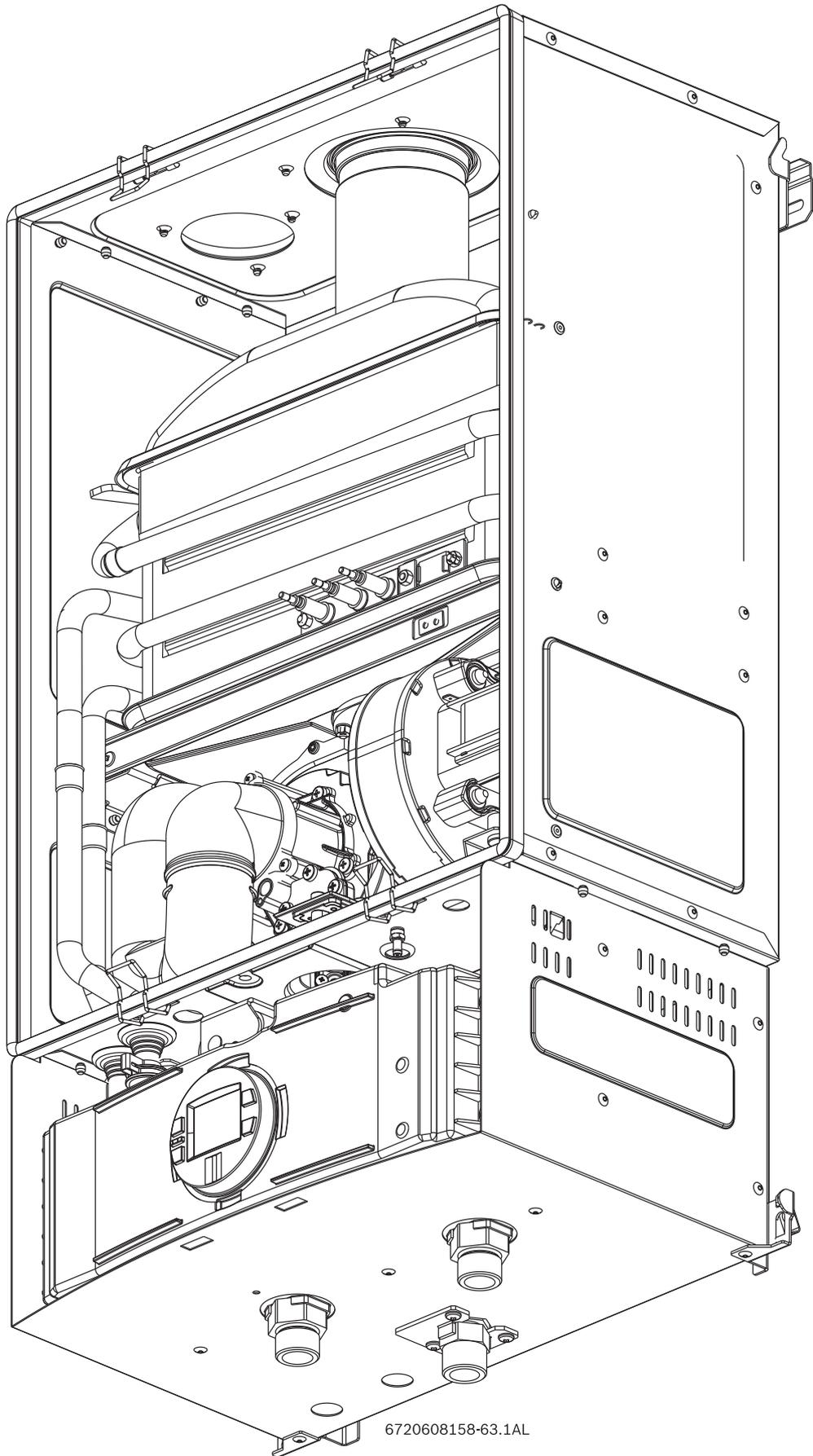
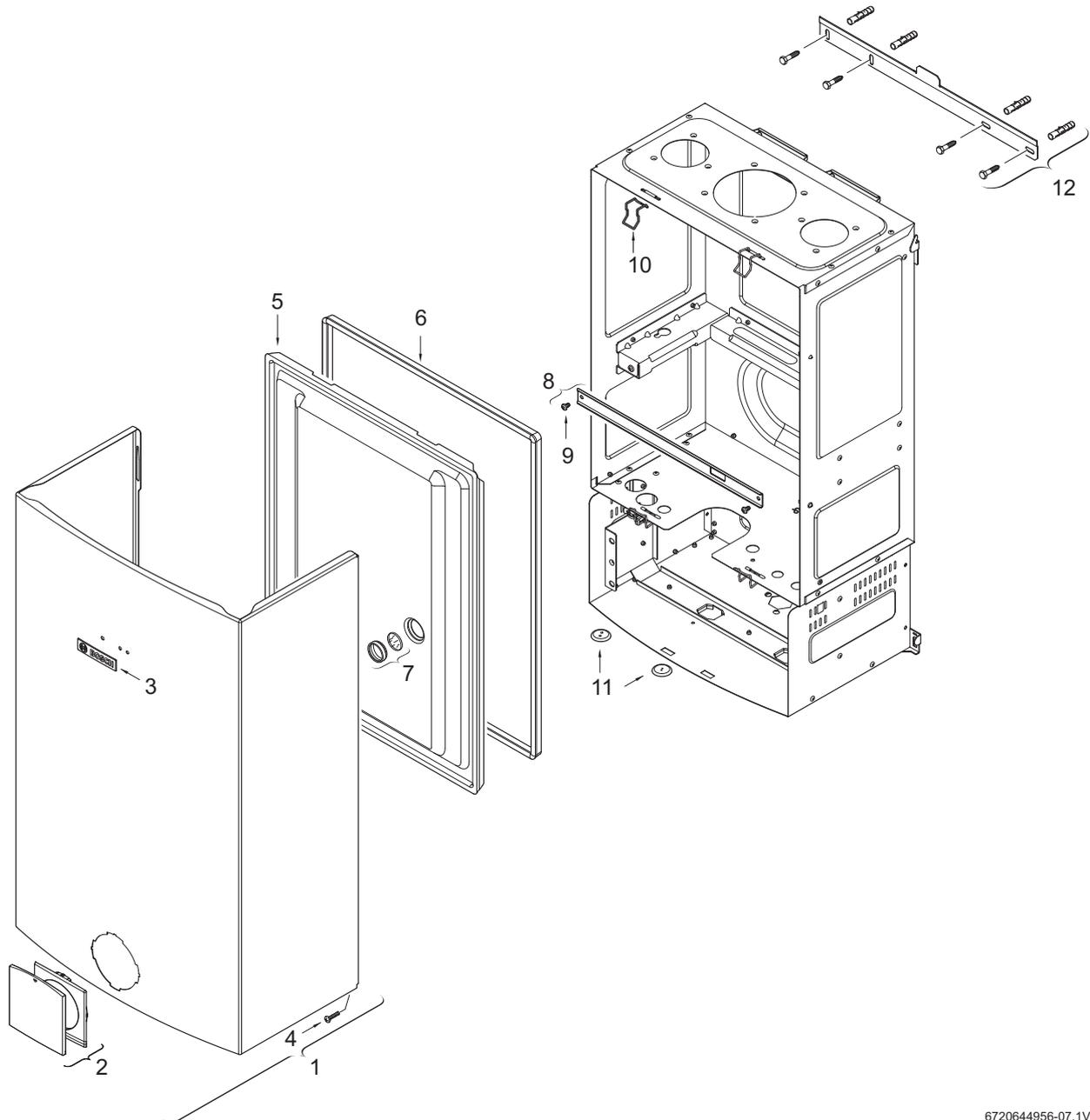


Fig. 66 Appliance overview

## 15.2 Components diagram

### 15.2.1 Group 1



6720644956-07.1V

Fig. 67 Components Diagram

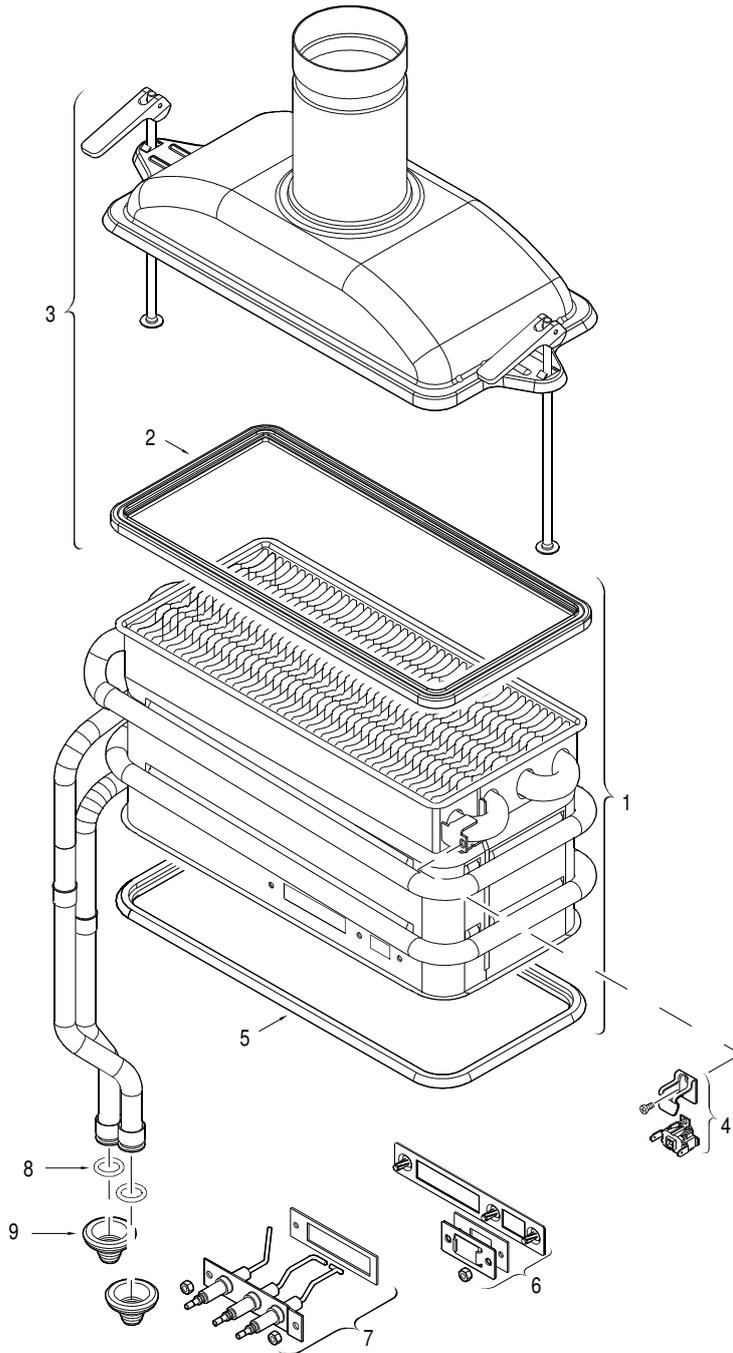
Item	Description	Reference
1	Front cover	8 705 431 408
2	Cover shield	8 705 506 907
3	Trade mark badge	8 701 103 140
4	Cover screw	8 703 401 170
5	Combustion cover	8 700 506 300
6	Combustion cover gasket	8 704 701 084
7	Observation window	8 705 600 003
8	Holding bracket	8 708 104 103
9	Screw	8 703 403 012

Table 13

Item	Description	Reference
10	Combustion cover clip	8 701 201 032
11	Grommet set	8 710 203 039
12	Mounting bracket	8 701 309 164

Table 13

15.2.2 Group 2



6720902974.AA JF

Fig. 68 Components Diagram

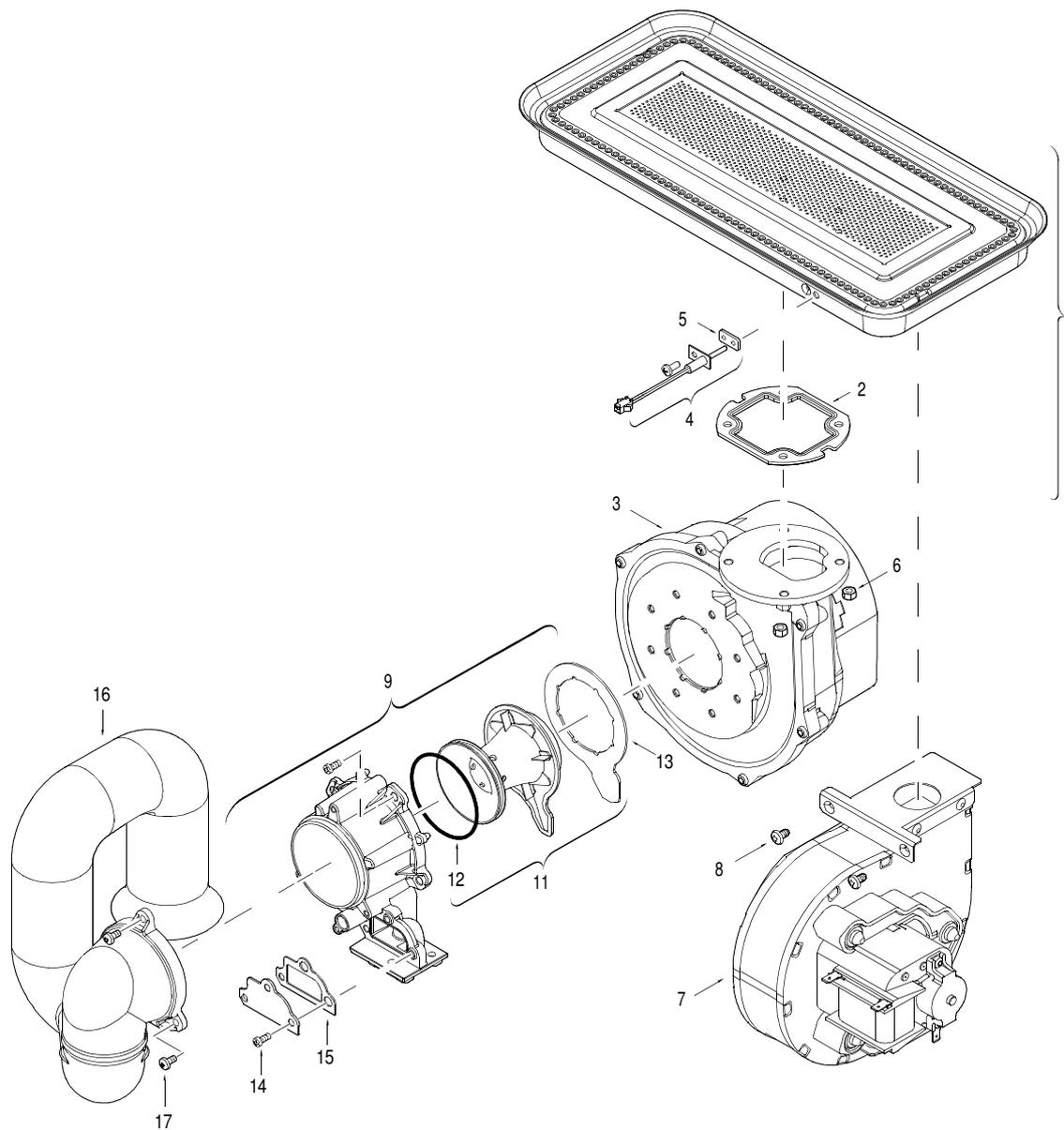
Item	Description	Reference
1	Heat exchanger	8 705 406 422
2	Heat exchanger top gasket	8 704 701 052
3	Flue gas collector	8 705 700 153
4	Overheat sensor (ECO)	8 707 206 204
5	Heat exchanger bottom gasket	8 704 701 054

Table 14

Item	Description	Reference
6	Site window	8 701 000 401
7	Ignition group	8 701 302 249
8	Heat exchanger O-ring	8 700 205 147
9	Rubber grommet	8 710 303 027

Table 14

15.2.3 Group 3



6720902975.AA JF

Fig. 69 Components Diagram

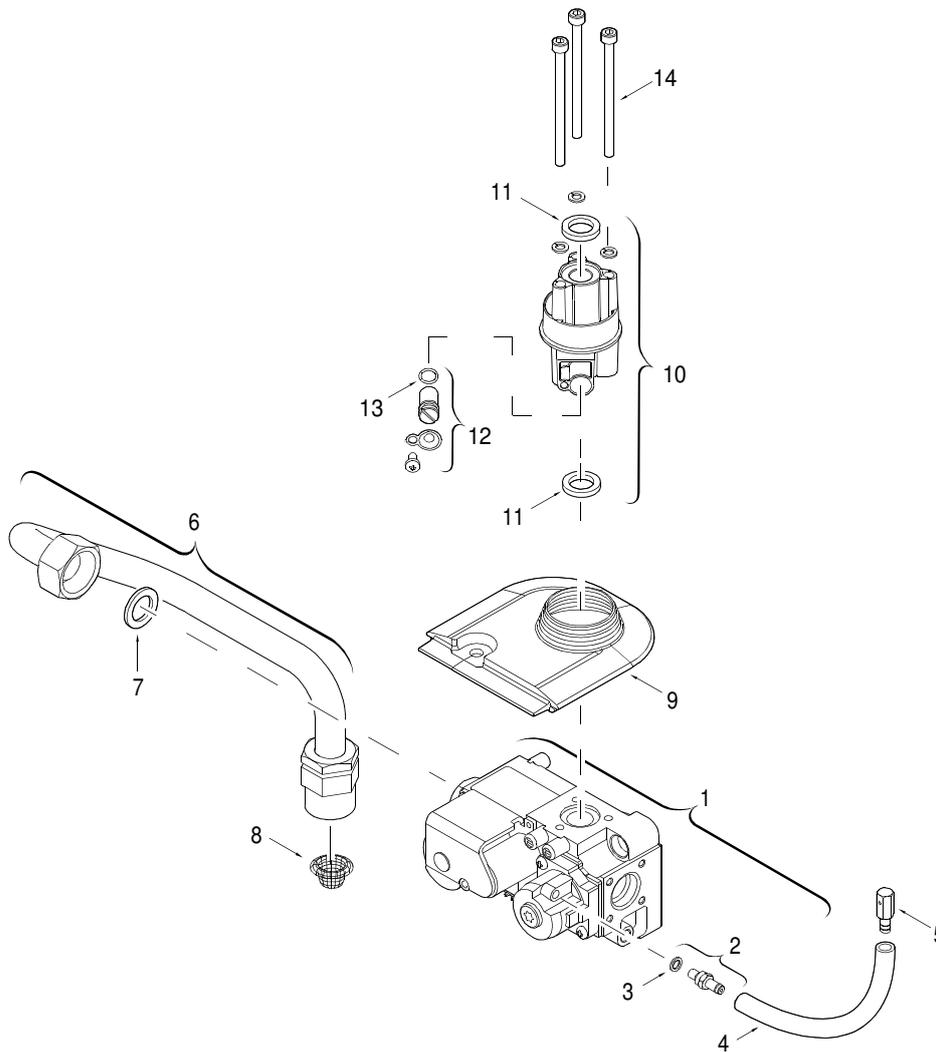
Item	Description	Reference
1	Main burner	8 708 120 699
2	Burner gasket	8 704 701 087
3	Primary fan	8 707 204 071
4	Backflow temperature sensor	8 707 206 459
5	Washer	8 704 701 097
6	Fan mount nut	2 915 011 006
7	Secondary fan - NG	8 707 204 094
7	Secondary fan - LPG	8 707 204 072
8	Screw	8 703 403 012

Table 15

Item	Description	Reference
9	Gas / Air Mixer	8 705 700 170
10	Air duct O-ring	8 700 205 149
11	Venturi	8 700 306 226
12	O-ring	8 700 205 224
13	Mixer / Fan gasket	8 704 701 059
14	Screw	2 910 642 150
15	Plate gasket	8 701 004 049
16	Air supply duct	8 705 700 155
17	Screw	2 910 952 122

Table 15

15.2.4 Group 4



6720608158-73.1AL

Fig. 70 Components Diagram

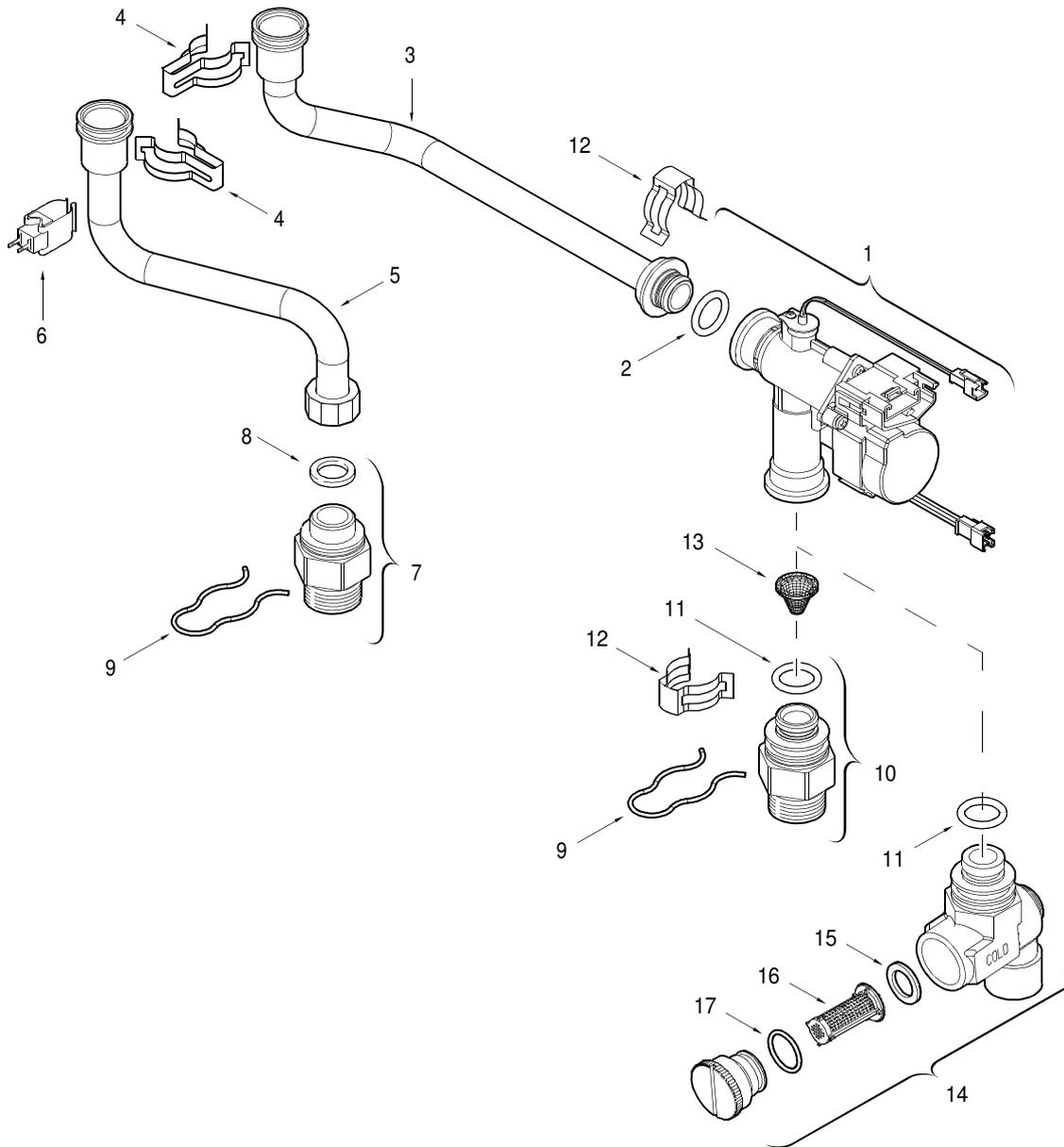
Item	Description	Reference
1	Gas valve	8 707 021 019
2	Pressure tapping	8 703 404 219
3	Washer	8 700 203 041
4	Pressure balance tube	8 700 703 136
5	Pressure balance nut	8 703 300 041
6	Gas supply pipe	8 700 715 389
7	Gas valve washer	8 700 103 014

Table 16

Item	Description	Reference
8	Gas filter	8 700 507 002
9	Gasket	8 704 701 085
10	Gas / Fan connector	8 705 202 140
11	Washer	8 704 701 062
12	Regulation screw	8 703 404 220
13	O-ring	8 700 205 009
14	Screw	2 910 149 181

Table 16

15.2.5 Group 5



6720902977.AA JF

Fig. 71 Components Diagram

Item	Description	Reference
1	Water valve with engine	8 708 505 024
2	O-ring	8 700 205 147
3	Cold water pipe	8 700 715 394
4	Pipe connection clip	8 701 201 028
5	Hot water pipe	8 700 715 469
6	Temperature sensor	8 700 400 015
7	Outlet fitting	8 703 305 349
8	Inlet / Outlet washer	8 710 103 045
9	Wireform spring	8 701 300 025

Table 17

Item	Description	Reference
10	Inlet fitting	8 703 305 348
11	O-ring	8 700 205 157
12	Water valve clip	8 716 102 607
13	Water filter	8 700 507 001
14	Inlet fitting with filter (optional)	8 703 305 356
15	Washer (optional)	8 700 103 764
16	Water filter (optional)	8 700 507 059
17	O-ring (optional)	8 700 205 231

Table 17

15.2.6 Group 6

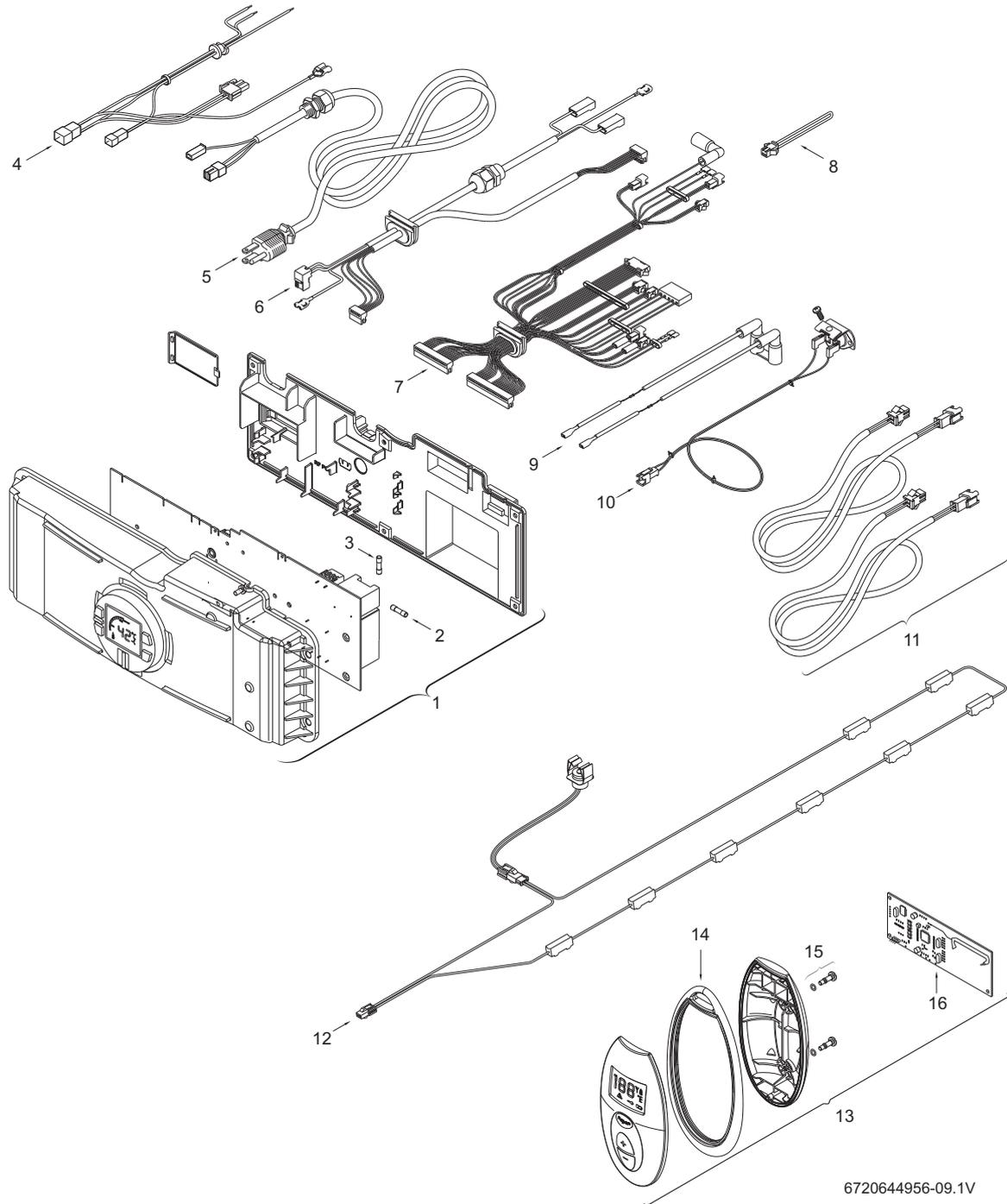


Fig. 72 Components Diagram

Item	Description	Reference
1	Control unit	8 707 207 368
2	Fuse T2.5A	1 904 521 342
3	Fuse T1.6A	8 700 609 008
4	Power supply cables	8 704 401 371
5	Power supply cord	8 704 401 378
6	Fan cables	8 704 401 347
7	Wire harness	8 704 401 348
8	Jumper	8 704 401 376

Table 18

Item	Description	Reference
9	Electrode cables	8 704 401 346
10	Flue gas limiter	8 700 400 032
11	Kit intelligent cascading (optional)	7 709 003 962
12	Freeze prevention kit (optional)	7 709 003 665
13	Remote control (optional)	TSTAT2
14	Shaped seal (optional)	8 700 201 012
15	Screw (optional)	8 703 401 109
16	Printed circuit transceiver (optional)	8 708 300 123

Table 18

## 16 Protecting the environment

### Packing

The packing box may be fully recycled as confirmed by the recycling symbol .

### Components

Many parts in the heater can be fully recycled in the end of the product life. Contact your city authorities for information about the disposal of recyclable products.

### Saving water resources:

- ▶ Make sure you close all the taps after any use. Avoid leaving the taps dripping. Repair any leaking tap.
- ▶ Define the temperature you want, in the appliance or with the remote control. This way you have the precise water flow needed (mixing cold water to regulate temperature will increase the water flow with consequent waste of water).

## 17 Limited Warranty

### General

BOSCH PRO tankless water heaters are warranted by the Manufacturer (BOSCH) through *Bosch Thermotechnology Corp.*

*Bosch Thermotechnology Corp.* will furnish a replacement heat exchanger and will furnish a replacement of any other part which fails in normal use and service within the applicable periods specified below, in accordance with the terms of this warranty. The *Bosch Thermotechnology Corp.* replacement will be warranted for the unexpired portion of the original warranty. This warranty will be valid only for water heaters in possession of the original purchaser as recorded on the warranty card.

### The Heat Exchanger

If the heat exchanger fails within Fifteen (15) years after the original installation and operation, *Bosch Thermotechnology Corp.* will furnish a replacement heat exchanger. However, if the water heater is used within an approved hot water recirculation and supplied with circulated water, this heat exchanger warranty is limited to three (3) years from date of original installation and operation. If the water heater is installed in other than a single family dwelling, this heat exchanger warranty is limited to two (2) years from date of original installation and operation.

### Exceptions

This warranty will not apply:

- **1.** to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with the printed instructions provided;
- **2.** to damage or abuse, accident, neglect or freezing and other acts of nature;
- **3.** to damage resulting from operation with either the flame sensor rod or overheat sensor removed;
- **4.** to failure of the heat exchanger resulting from the operation of the water heater in a corrosive atmosphere or at water temperatures exceeding the maximum rating, or if the water heater is not supplied with potable water;
- **5.** to defects or damage cause by any attachment or modification, including any energy-saving device;
- **6.** to damage resulting from scale deposits and/or highly mineralized / unsoftened water supply.

### All Other Parts

If any other part fails within five (5) years after original installation and operation, *Bosch Thermotechnology Corp.* will furnish a replacement part free of charge.

### Service Labor Costs

This warranty does not cover any labor costs associated with service, removal or re-installation of part(s). All such costs must be borne by the Purchaser. Additionally, this warranty does not cover any labor costs associated with service, removal, installation or re-installation of the original water heater or a replaced water heater.



NOTE: the water heater must be free of damaging scale deposits and not subject to gas pressures greater than those shown on the rating plate, which must not be altered, defaced or removed.

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### How to Make a Claim

Any claim for warranty parts should be made to your local dealer or distributor:

### BOSCH THERMOTECHNOLOGY CORP.

50 Wentworth Avenue  
Londonderry, NH 03053  
Tel. 866-330-2730  
www.boschpro.com

In most cases, the dealer or distributor will be able to promptly honor your claim and subsequently notify *Bosch Thermotechnology Corp.*. However, all replacements are made subject to validation by *Bosch Thermotechnology Corp.* of in-warranty coverage. The damaged or defective item must be made available in exchange for the replacement.

### Miscellaneous

No one is authorized to make any other warranties on behalf of *Bosch Thermotechnology Corp.*. It is expressly understood that the replacement warranty of *Bosch Thermotechnology Corp.* shall be in lieu of any and all other warranties, express or implied, including warranties of merchantability or fitness for a particular use or purpose, and further that *Bosch Thermotechnology Corp.* shall not be liable for any loss or damage directly or indirectly arising from the use of the hot water heater, or for any consequential damages arising from such use (including damages from water leakage). *Bosch Thermotechnology Corp.* sole liability with respect to any defect shall be for the replacement of the defective part(s). Some states do not allow such limitations and exclusions, so the above may not apply to you.

This warranty gives specific legal rights. You may also have other rights which vary from state to state.









### Installer Checklist to be completed by installer upon installation

Serial Number \_\_\_\_\_  
 (8 digit serial number is located on rating plate on right side panel)

Gas Pressure Reading\*      Static \_\_\_\_\_      Operating \_\_\_\_\_

Building Water Pressure      \_\_\_\_\_      Range if on Well system \_\_\_\_\_

Installing Company \_\_\_\_\_

Installer name \_\_\_\_\_

Address \_\_\_\_\_

Phone \_\_\_\_\_

\* See Chapter 6.6, page 24 and gas pressure table (to be filled out by installer)

Installation manual should be left with the owner after the installation is tested and completed

Replacement Parts available from:

#### **BOSCH THERMOTECHNOLOGY CORP.**

50 Wentworth Avenue  
Londonderry, NH 03053  
Tel. 866-330-2730  
www.boschpro.com

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