

## Installation and Service Instructions

### Gas Fired Hot Water Boiler G\_224 E

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#### Important

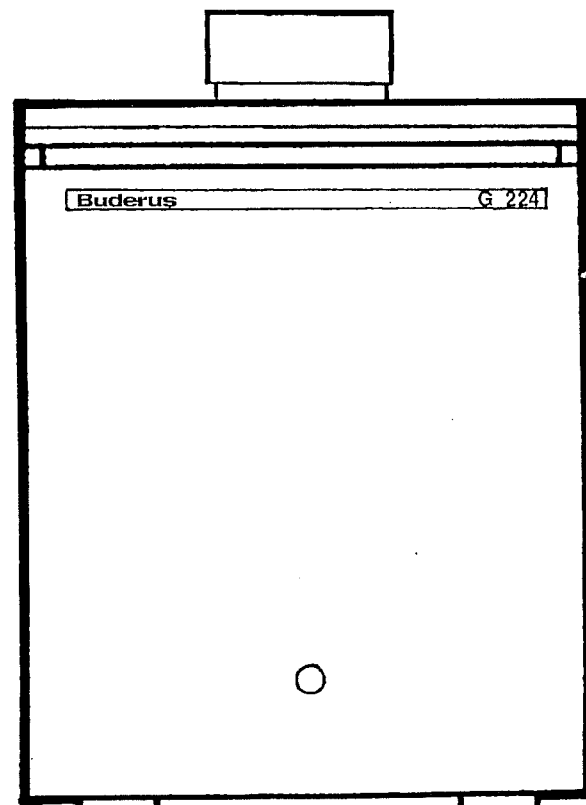
Read this manual carefully before lighting burners.

#### Important

All installation, assembly and maintenance work must be carried out exclusively by a fully trained gas service specialist, a specialised contractor or the gas supplier.

#### Caution

The Users Manual is included in this booklet which must be left with the owner. Review this information with the owner and be sure they receive all instructions.



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## Standards

ANSI Z21.13	- 1987	Gas-Fired Low Pressure Steam and Hot Water Boilers
Z21.13 a	- 1989	Gas-Fired Low Pressure Steam and Hot Water Boilers
Z21.13 b	- 1990	Gas-Fired Low Pressure Steam and Hot Water Boilers
CGA 4.9	- 1969	Gas-Fired Steam and Hot Water Boilers
CGA 3.3	- 1976	Industrial and Commercial Gas Designed Atmospherical Fired vertical Flue Boiler and Hot Water Supply Heaters
CAN 1 - 2.17	M51	Gas-Fired Appliances for Use at High Altitudes
CSA C 22.2	No. 3 - 1988	Electrical Features of Fuel - Burning Equipement
CSA C 22.2	No. 0 - M 1991	General Requirements - Canadian Electrical Code, Part II

Where inquiries exist concerning boilers already delivered, the boiler model reference and boiler serial number must be quoted. Part identification is provided at the rear of this manual. If further information is required please contact the BUDERUS area representative.

\* The G\_224 E series boilers are gas fired, natural draft, open vented central heating units which cover a range of heat outputs from 40,560 BTU/H to 419,200 BTU/H.

The boilers are floor mounted and intended for heating residential or commercial premises. They may be used in conjunction with an indirect storage heater for domestic hot water production.

The boilers are fitted with aspirating multi-bar burners and have an integral draft hood which must be connected to an open-vent system.

It is essential that a pump is fitted in the circulation system which must be kept in operation at all times when a boiler is in use.

The components of the ignition gas system must not come into contact with water because a result of leaks are possible and electrical malfunctions.

\* For boilers G\_224 E – 17 through 64 the output ratings have been determined during factory tests and have not been validated by A.G.A. and C.G.A.

## General Instructions

The G\_224 E (17 through 128) series boilers are certified by A.G.A. for use with natural gas and liquified petroleum gases.

The G\_224 E (17 through 128) series boilers are also certified by C.G.A. for use with natural gas and propane gas.

**NOTE:** The installation must comply with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code, the local utilities and any additional national, state, insurance, or local code requirements having jurisdiction. Boilers must be installed in accordance with our instructions so as to void our warranty.

The boiler is designed for hot water operation only.

Max working pressure is 58 psi.

Max. working temperature is 230 °F.

The installation must conform to the requirements of the authority having jurisdiction, or in the absence of such requirements, to the National Fuel Gas Code, ANSI z 223.1-1988.

In Canada, the installation must conform with local codes or in absence of local codes, with the current CAN/CGA-B149 installation code.

Where required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

## **Chimney and vent**

The flue pipe diameter must be not less than shown in dimension table (page 6, Size D). It should pitch upward at least 1/4" per foot to the chimney connection. The end of the pipe must not project beyond inside surface of chimney flue. The chimney must be of proper size and height for rating of the boiler to be attached to it. It should be clean and any dirt accumulation removed from bottom. Minimum distance from surface of flue pipe to combustible material must be six inches.

## **Air supply**

Sufficient clean air must be available to the boiler room at all times.

For installation in an enclosed utility or boiler room without an outside wall, a minimum of a 1 square inch opening for each 1,000 Btu per hour of boiler input with not less than a 100 square inch opening should be provided.

In confined areas without good ventilation, openings directly to the outside with a minimum free area of 1 square inch for each 4,000 Btu of boiler input must be provided. For additional information, refer to section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z 223.1-1988 or applicable provisions of local building codes or CAN/CGA B 149 Canadian Installation Codes.

## **Read instructions carefully**

Proper installation and adjustment of the burners and control equipment is necessary for the safest and most efficient operation of the gas boiler. The ratings shown on the rating and instruction plate mounted on the front bulkhead behind the front door should not be exceeded.

Read this book carefully and also the instructions on the instruction plate, before attempting to light the burners.

## **Boiler location**

Boiler is for indoor installation only. Boiler sizes up to 73 may be installed in alcoves, boiler of larger sizes (92 to 128) must be installed in a space larger in comparison to the size of the boiler.

Locate the boiler as close as possible to the chimney, on a level foundation.

The boiler must not be installed on carpeting.

Allow at least 33½ inches in front for removal and servicing of burners. See chart on page 6 for clearance required for controls and jacket assembly.

The minimum clearance between the side and back jacket panels or draft hood and any adjacent combustible building structure must not be less than 14 inches to the left or right side of the boiler and 14 inches to the back of the boiler. The boiler may be installed on combustible flooring materials. The minimum permissible clearance to the ceiling above the jacket of the boiler is 37 inches.

A minimum clearance of one inch shall be provided between all hot water pipes and combustible construction.

A minimum clearance of 6 inches shall be provided between the vent pipe and any adjacent combustible wall. This applies when the pipe penetrates the rear wall or ceiling as well.

## **Warning!**

Do not remove the boiler base plate (see fig. 6, page 9).

## WATER CONNECTIONS

VK	Heating Supply	1 1/2"
RK	Heating Return	1 1/2"
RSL	Cold feed and expansion	1 1/4"
VSL	Pressure relief valve connection	1 1/4"
VS	Storage tank flow	1"
EL	Heating water drain (either hand)	1/2"

**NOTE:**

Connections must be made as illustrated in Figure 3.

boiler room, allowance should be made for:

1. Clearance for burner with drawal at the front.
2. R.H. and L.H. clearance for easy boiler assembly and servicing (12 inches) minimum for single boiler installation.
3. Clearance at the rear for pipework and flue.
4. Sufficient clearance for servicing, on all sides of the boiler.

## Ratings

Model / Size	Input Rating
G_ 224 E	Btu/h
17	71 900
21	87 900
27	112 900
31	128 700
35	144 900
45	186 700
55	228 400
64	266 400
73	301 200
92	378 300
116	476 000
128	524 000

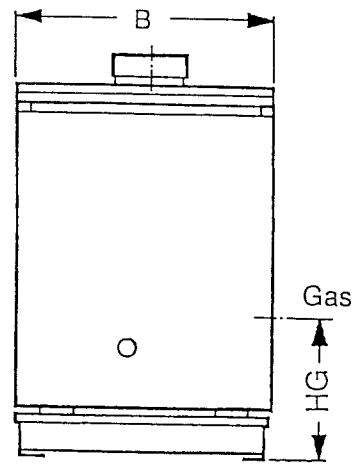


Fig. 1

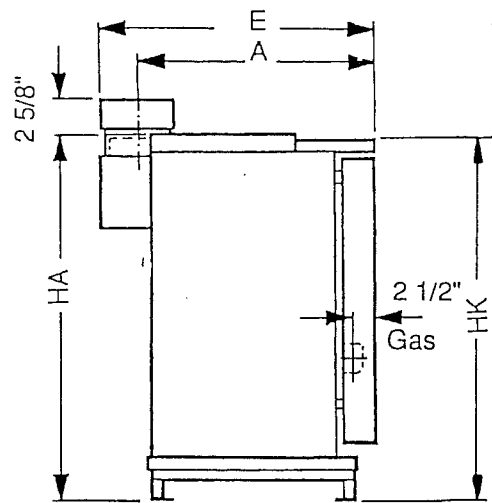


Fig. 2

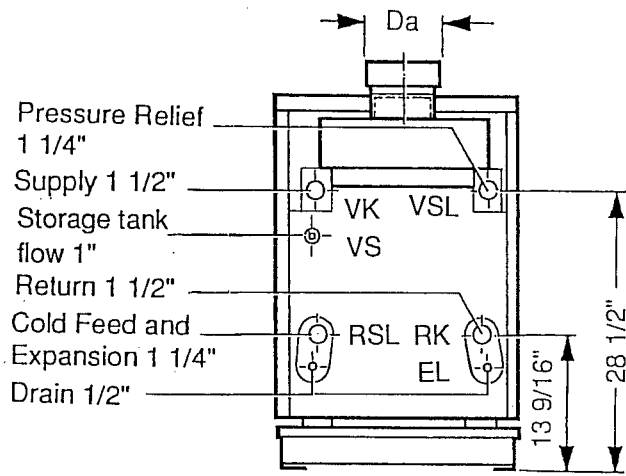


Fig. 3

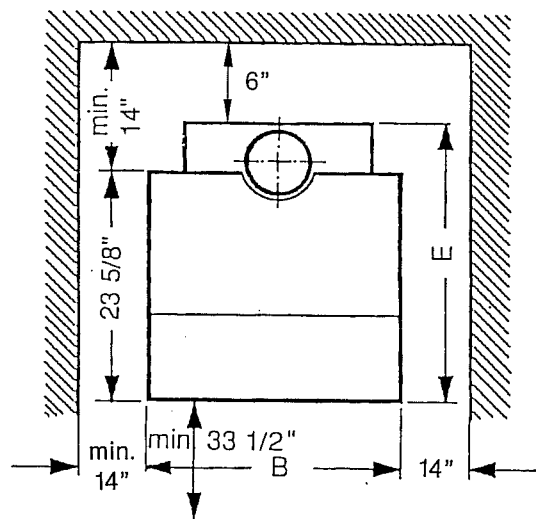


Fig. 4

### Variable Dimensions

Model / Size	Overall height HA	Overall depth E	Jacket width B	Jacket height HK	Flue centre A	Flue diam. Da	G. l. height HD
G_224 E ...	in	in	in	in	in	in	in
17	38 5/8	26 3/4	15	37 5/16	24 1/16	5	14 11/16
21	38 5/8	26 3/4	15	37 5/16	23 11/16	5	14 11/16
27	38 5/8	26 3/4	15	37 5/16	23 11/16	5	14 11/16
31	38 5/8	27 5/16	18 1/2	37 5/16	23 7/8	6	14 11/16
35	38 5/8	27 5/16	18 1/2	37 5/16	23 7/8	6	14 11/16
45	38 5/8	28 1/2	22	37 5/16	24 1/2	7	14 11/16
55	38 5/8	28 1/2	25 1/2	37 5/16	24 1/2	7	14 11/16
64	41	29 1/2	27 1/2	39 5/8	25 1/16	8	14 11/16
73	41	29 1/2	31 1/8	39 5/8	25 1/16	8	23 4/16
92	41	30 1/2	38 3/16	39 5/8	25 3/8	9	23 4/16
116	41	31 1/2	45 1/4	39 5/8	26 1/16	10	23 4/16
128	41	32 1/2	48 13/16	39 5/8	26 9/16	12	23 4/16

Size G_224 E...	Natural / Propane		Burners	Control Valves Pilot Burners	Connection NPT in	
	in wg	0 - 2000 ft 2001 - 4500 ft				
17	4.17 / 10,6	390/250	360/225	1	1	3/4
21	4.17 / 10,6	430/270	400/250	1	1	3/4
27	4.00 / 10,5	350/220	320/200	2	1	3/4
31	4.29 / 10,5	370/230	340/210	2	1	3/4
35	4.02 / 10,5	400/250	370/230	2	1	3/4
45	4.06 / 10,4	370/230	340/210	3	1	3/4
55	4.17 / 10,2	350/225	320/205	4	1	3/4
64	4.13 / 10,6	380/240	350/220	4	1	3/4
73	4.12 / 10,4	360/230	330/210	5	2	1 1/4
92	4.13 / 10,4	370/240	340/220	6	2	1 1/4
116	4.02 / 10,2	390/250	360/230	7	2	1 1/4
128	4.21 / 10,2	380/240	350/220	8	2	1 1/4

### Boiler Water Content and Dry Weight

Model / Size G_224 E...	Boiler Water Content US Gal	Dry Weight lbs
17	3	247
21	4	309
27	4	309
31	5	381
35	5	381
45	6	452
55	7	536
64	8	639
73	9	725
92	11	877
116	13	1038
128	14	1111

### Hydraulic Resistance

Model / Size G_224 E...	Hydraulic Resistance at 20°F Difference in wg
17	4.3
21	6.2
27	10.4
31	12.0
35	16.1
45	22.1
55	25.3
64	28.9
73	32.1
92	44.1
116	54.2
128	60.2

#### Note

G\_224 E - 17 to 64 boilers the gas supply pipeworks must pass through the cut out in the right hand side of the front door.

The gas supply pipework can be arranged to left or right with G\_224 E - 73 to 128.

## BOILER LOCATION

Boiler is for indoor installation only. Boiler sizes 17 to 73 may be installed in alcoves, boiler of larger sizes (92 to 128) must be installed in a space larger in comparison to the size of the boiler.

### Boiler Foundation

Locate the boiler on a level foundation. The weight of the boiler when it is full of water is substantial; ensure that a solid base foundation is established prior to installing the appliance. The boiler must not be installed on carpeting.

### Packing

G\_224 E - 17 through 55 boilers are delivered completely assembled with boiler jacket and insulation in position. Each unit is palletized and protected by cardboard.

G\_224 E / (64 through 128) boilers are supplied with the sections assembled and palletized but with the boiler jacket and insulation packed separately for site assembly.

### Unpacking parts before assembly

Unpack all boxes and cartons and check all parts received against packing lists. Every boiler is carefully inspected and tested before shipment from the factory and is delivered to the carrier in good condition. In case of damage or shortage, notify your carrier agent promptly. Examine all packing material carefully before discarding.

### Boiler transport

Deliver boiler in crate to site  
Undo bending straps  
Lift off cardboard box  
Take off front and top panels  
Slide boiler to right or left hand side. Before doing so, take off the lateral wooden boards,  
Lift boiler under base plate. Place pipes under boiler and transport boiler to operating location.  
Maneuver the boiler to its final location.

### Important

Protect sheet metal work, gas pipework, burner and controls at all times.

Never lift the boiler by any of these components.

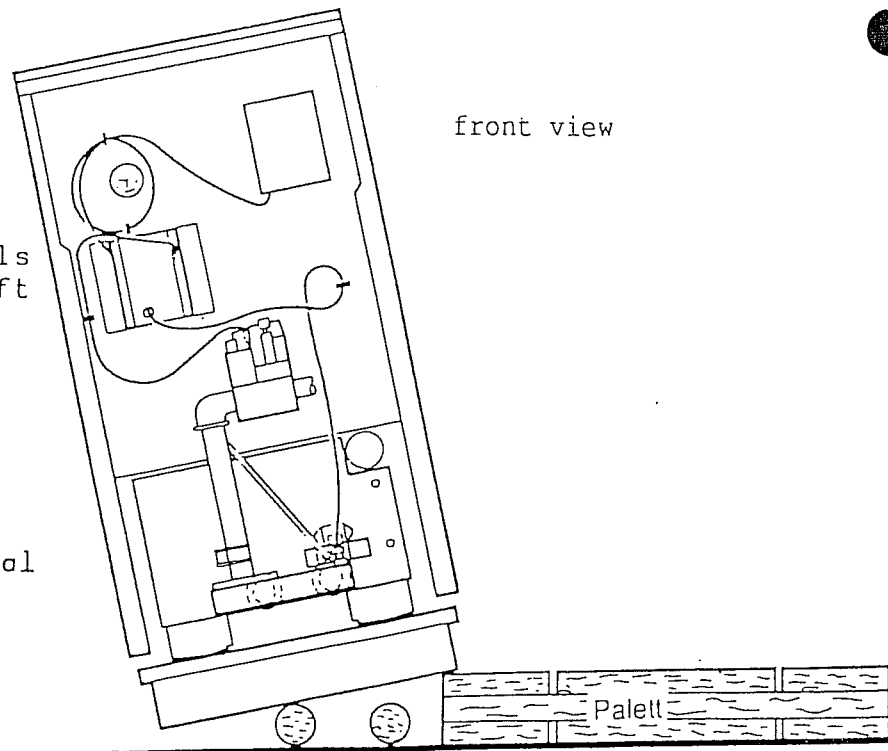


Fig. 5

flue hood cover, baffle plate and shield plate unassembled.  
These items should be assembled as indicated below.  
Boiler size 17 to 64 has the draft hood assembled at the factory.

Boiler viewed from the rear

Attach draft hood (1) onto the back of flue hood (2) using the self tapping screws (3) provided. Place the baffle plate \*) (4) on top of the flue-ways (5) to cover the front of the boiler. Fit the flue hood cover (6) using the wing nuts (7) provided, to the top of the flue hood (2). Position flue adapter (9) on draft hood (1).

\*) The baffle plate isn't part of all boiler sizes (only size 27 - 31).

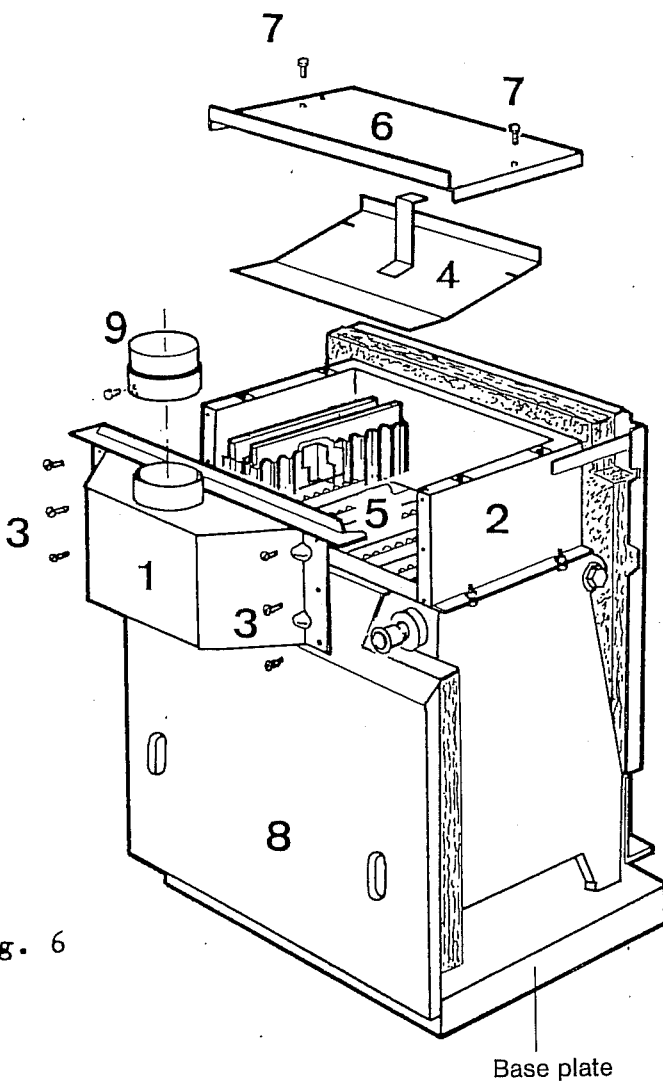


Fig. 6

Base plate

Do not remove the boiler base plate

## WATER CONNECTIONS

### Pressure relief valve

A pressure relief valve is provided with each boiler. This valve may be found inside the boiler box, in a separate container. This relief valve must be installed without alteration as indicated below. For continued safe operation, the pressure relief valve must NEVER be clogged. The outlet (discharge) of the relief valve should be piped to a safe area near a drain or other suitable collection area.

Installation must be done according to Fig. 3 and Fig. 7 to 9 of this notice.

Make sure that the pressure relief valve is installed in the proper tapping as indicated below:

The relief valve outlet should be located near the floor, close to a drain when available. Do not locate the relief valve discharge to any area where freezing temperatures could occur.

Refer to Fig. 3 for installation.

- |  |  |
|--|--|
| 1 Reduction 1 1/4" - 3/4" inside threading | 4 Elbow 3/4" inside/ outside threading |
| 2 Pipe 3/4" x 4, 8"                        | 5 Pipe 3/4" x 12"                      |
| 3 Elbow 3/4" inside threading              | 6 Relief valve 3/4"                    |
|  | 7 Relief outlet                        |

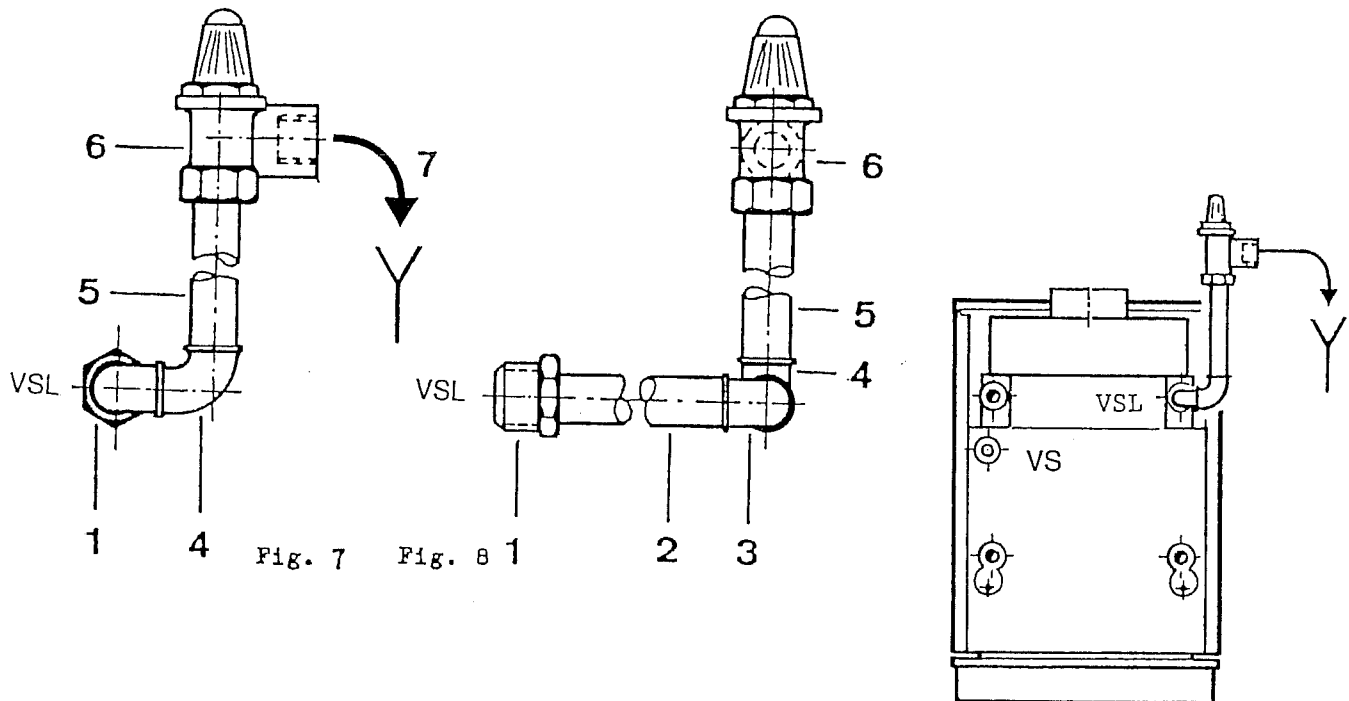


Fig. 9

## WATER CONNECTIONS

Connections must be made as illustrated in Fig. 9. Plug all unused tappings.

### HYDROSTATIC PRESSURE TEST OF BOILER

The individual sections and the complete boiler have been pressure tested at the factory; however, the boiler should be visually checked at the joints to ensure that no leaks occur.

### WATER CIRCULATION SYSTEM

#### General

It is essential that the water circulation system incorporate a pump, which must be in operation all times when the boiler is in operation. The use of horizontal pipe runs should be avoided whenever possible in order to prevent air collecting in the system. If horizontal runs are unavoidable the pipe should rise upwards in the direction away from the boiler.

At least once per year, the low water cutoff device must be inspected for proper operation. The instructions provided with the device must be consulted to ensure proper procedures are followed. Float type devices must be flushed out at least yearly to ensure smooth operation.

### Stop Valves

To facilitate servicing, isolating valves should be fitted on each side of a circulating pump, radiators, etc.

The boiler when used in connection with a refrigeration system, must be installed in a way that the chilled medium is located in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.

The boiler piping system of a hot water heating boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

### Frost Protection

Consideration should be given to fitting a anti-freeze thermostat which should be set to operate at a temperature of approximately 39°F.

### Water Treatment

The need for water treatment will depend upon the chemical analysis of the water and the operating conditions. As with all efficient low water content boilers, particular attention is required in hard water areas.

### S I Z E G A S S U P P L Y P I P I N G

The gas supply piping must be sized to provide the proper inlet gas pressure when the boiler is operating at the indicated rated input. For natural gas, the inlet gas pressure to the manual main shut-off gas valve (if supplied) should be 7 inwg to 10,5 inches water column.

For L.P. gases (Propane in Canada), the inlet gas pressure to the manual main shut-off gas valve (if supplied) should be 11.0 to 14.0 inches water column.

The gas supply must be installed in accordance with local codes, or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1-1988.

In Canada, the gas piping must be installed in accordance with local codes, or in the absence of local codes, with the current CAN/CGA-B149 installation code.

Determine the measured length for piping from the gas meter to the boiler. Add to the measured length the additional length for each elbow or tee fitting. Refer to the Pipe Delivery Schedule Table and determine the correct pipe size.

PIPE DELIVERY SCHEDULE TABLE

Pipe Delivery Schedule

* Adjusted Length of Gas Supply Piping in Feet	o) Capacity of Pipe Sizes in Cubic Feet of Gas per Hour					Additional Length of Pipe to Be Added for Each Elbow or Tee Bend in Piping	
	1"	1 1/4"	1 1/2"	2"	2 1/2"	Pipe Size in Inches	Additional Length of Pipe in Feet
10'	520	1050	1600	3050	4800	1"	2.2'
20'	350	730	1100	2100	3300	1 1/4"	2.9'
30'	285	590	890	1650	2700	1 1/2"	3.3'
40'	245	500	760	1450	2300	2"	4.3'
50'	215	440	670	1270	2000	2 1/2"	5.1'
75'	175	360	545	1020	1650	-	-
100'	150	305	460	870	1400	-	-
150'	120	250	380	710	1130	-	-

\* Include measured length of gas supply and allowance in feet for number and size of fittings.

o) Flow capacity determined from Dr. Pole's Formula: Specific Gravity-0,60; Pressure Loss-0,30" W.C.

The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi.

The boiler must be isolated from the gas piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi.

The boiler and its gas connection must be leak tested before placing the boiler in operation.

Connect the gas meter to the gas control. Where the gas connection size is smaller than the calculated pipe size reduce the gas supply piping only at the inlet to the gas valve. A drip leg must be installed at the inlet of the gas connection to the boiler. The local utility may require that the drip leg be extended all the way to the floor. We strongly recommend a manual main shut-off gas valve which should be located in the gas supply piping according to the local utility requirements. The gas supply piping must be supported by external hangers; not by the boiler or its accessories. Refer to figures on page 13.

When turning on gas supply do not omit test for gas leaks as described on page 19. This test must be conducted before placing the boiler in operation.

Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the boiler when the boiler underwent tests specified in Z21.13-1991.

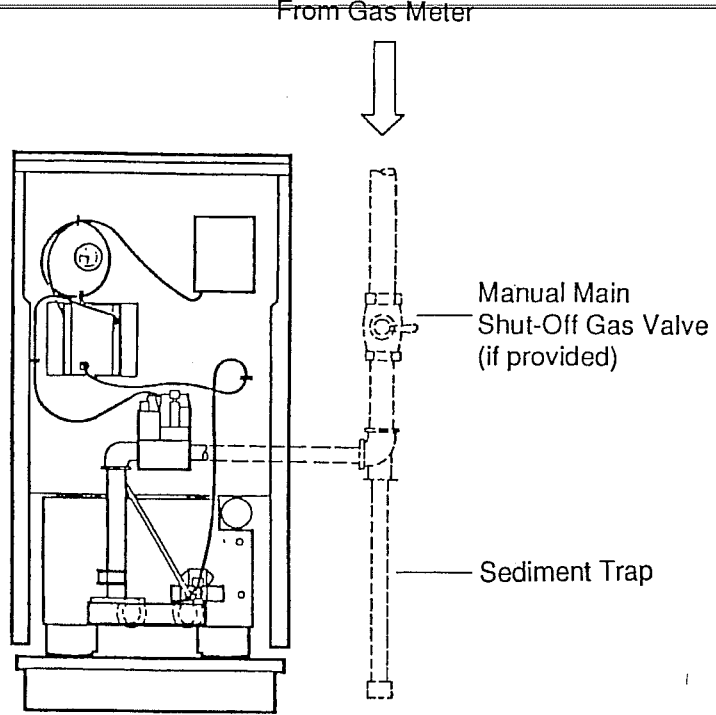


Fig. 10  
**G\_ 224 E, Size 17 to 64**  
 (One Burner Assembly)

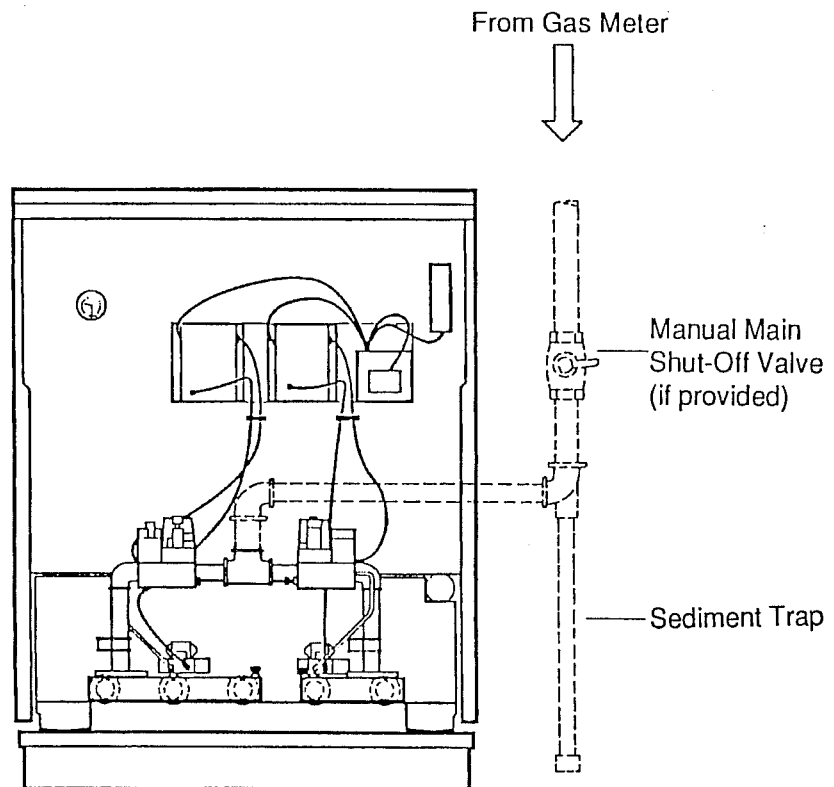


Fig. 11  
**G\_ 224 E, Size 73 to 128**  
 (Two Burner Assembly)

## ELECTRICAL SUPPLY

An external 120 VAC power supply must be available at or near the boiler location. Provisions are made in the boiler jacket for using flexible or semi-rigid conduit. An extension cord is not to be employed to feed electrical power to this boiler.

This appliance must be electrically grounded in accordance with the requirements of the authority having jurisdiction, or in the absence of such requirements, with the National Electrical Codes, ANSI/NFPA no. 7-1990.

It is suggested that a dedicated power supply be provided for the boiler. The circulating pump installed with the system must not be connected to the same electrical circuit as the boiler. Wiring diagrams for this unit may be found at the rear of this manual.

In Canada, electrical connections to the boiler must be made in accordance with local codes or in the absence of local codes, with CSA C22.1, Canadian Electrical Code, Part 1.

### VENT CONNECTION (also refer to CHIMNEY AND VENT, Page 3)

The draft hood is incorporated at the rear of the boiler. A separate draft diverter is not required.

Fit the vent pipe on to the integral draft hood as indicated below.

Connect from the draft hood outlet to the chimney or vent with full-sized (same diameter as draft hood outlet) breeching. Where the installation permits, vertical venting of the combustion gases to the outside from the draft hood outlet will afford best performance at lowest total cost. Where the boiler must be connected to a chimney or remote vent the horizontal breeching should slope upward at least 1/4 inch per lineal foot toward the chimney or vent. A vertical height of 3 feet to 5 feet of breeching before any elbow or horizontal breeching is recommended to reduce chances of flue gas spillage at the draft hood. Long horizontal breechings, excessive numbers of elbows or tees, or other obstructions which restrict the flow of combustion gases must be avoided.

Vent installation must be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1-1988 or applicable provisions of local building codes.

In Canada, the installation must conform with local codes or in the absence of local codes, with the current CAN/CGA-B149 installation code.

Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.

All horizontal runs of vent pipe must be prevented from sagging. Plumbers tape or other suitable support fixtures must be used to support the weight of all horizontal runs of pipe. It is suggested that the vent pipe be supported every 4 feet. Do not pierce the skin of the vent pipe with any type of mechanical fastener!

1. ~~The venting system shall terminate at least 3 feet~~  
above any forced air inlet located within 10 feet.
2. The venting system shall terminate at least 4 feet below, 4 feet horizontally from or 1 foot above any door, window or gravity air inlet into any building.
3. The vent terminal shall terminate at least 5 feet in vertical height above the highest connected equipment draft hood or flue collar.
4. Ensure that the height of the vent pipe and terminal assembly is sufficient to preclude blockage by drifting snow.
5. There should not be any building materials within 5 feet of the vent terminal in order to prevent degradation of these materials caused by the flue products.
6. The terminal of a venting system must be a minimum distance of 4 feet horizontally from, and in no case above or below, unless a 4 foot horizontal distance is maintained from electric meters, gas meters, regulators and relief equipment.
7. Appliances with flue damper (size 17 - 64).
  - Installation of the flue damper behind the integral draft hood (see fig. 012, page 16).
  - Wiring (see connection diagramm).
  - To make correct maintenance possible, the minimum clearance in fig. 4, page 6 must be maintained.
  - The boiler must be installed so that the setting of the flue damper can be easily seen.
  - Check performance of the flue gas regulating valve: Burner must only start when the flue damper is fully open.
  - When the motor actuator is removed, the flue damper must be in the "OPEN" position.

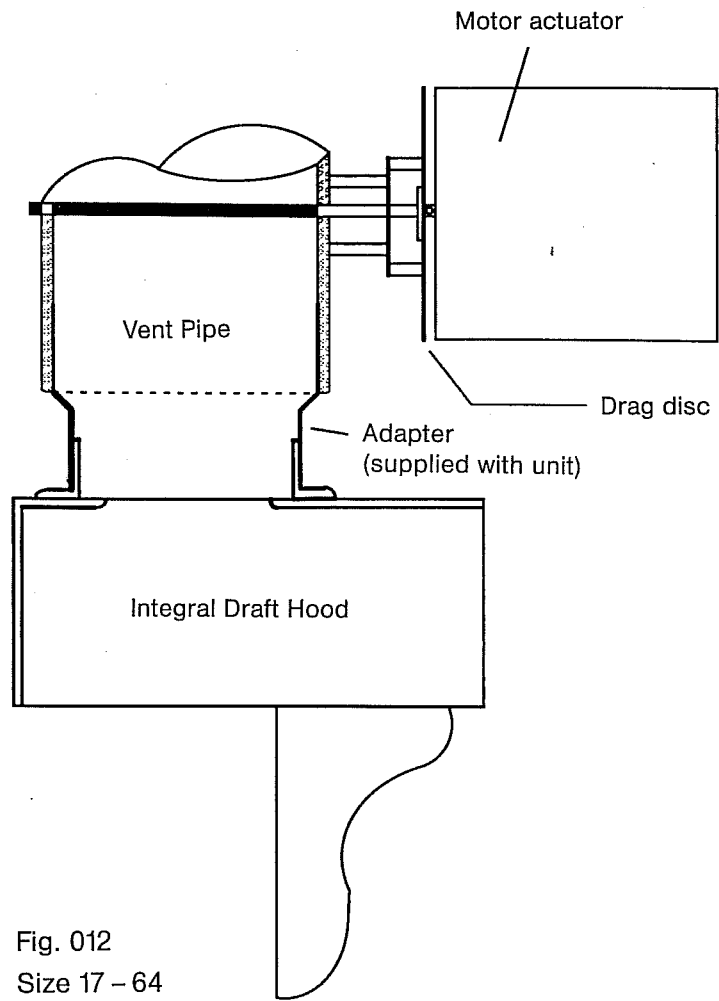


Fig. 012  
Size 17 - 64

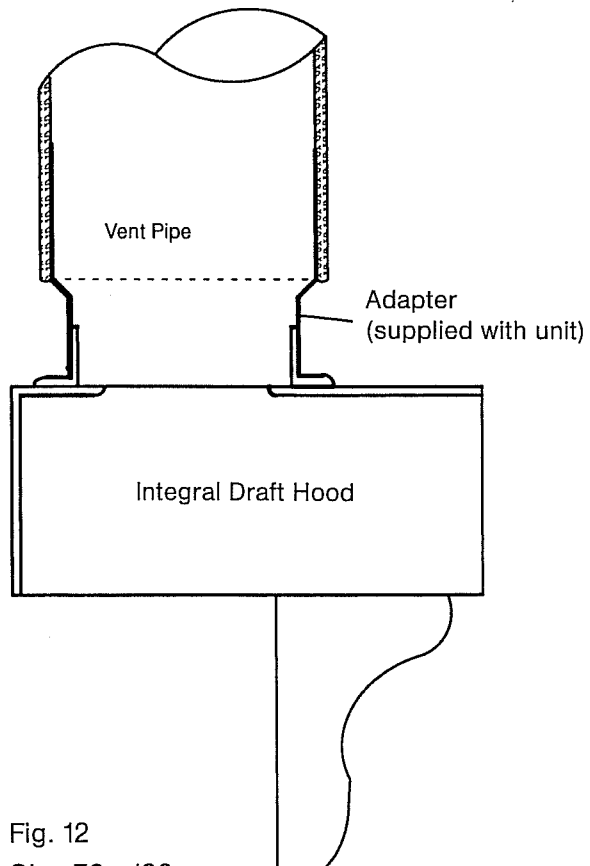


Fig. 12

supported from the ceiling, roof or adjacent wall

### COMMON VENTING SYSTEM

If an existing boiler is removed from a common venting system, this system is likely to be too large for proper venting of the appliances remaining connected to it.

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

- Seal any unused openings in the common venting system.
- Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
- Test for leakage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
- After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.
- Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1-1988. When resizing any portion of the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z223.1-1988.  
In Canada common venting installations must conform with CAN/CGA B 149 Installation codes for gas burning appliances.

### DISCONNECTION OF VENT

Facilities should be made for disconnecting the vent pipe from the boiler for inspection and cleaning by means of a split socket. Bends should be fitted with removable covers where appropriate for inspection and cleaning purposes.

### CONDENSATION

Prevention of condensation within the vent should be an important factor in the design of the vent system. In order to minimize condensation the use of double walled vent pipe or insulation is recommended for new installations.

## Jacket Assembly

Jackets of G\_ 224 E - 17 to 64 boilers are factory assembled.

With G\_ 224 E - 73 to 128 boilers, remove the jacket and insulation from the cardboard carton and assemble as indicated below.

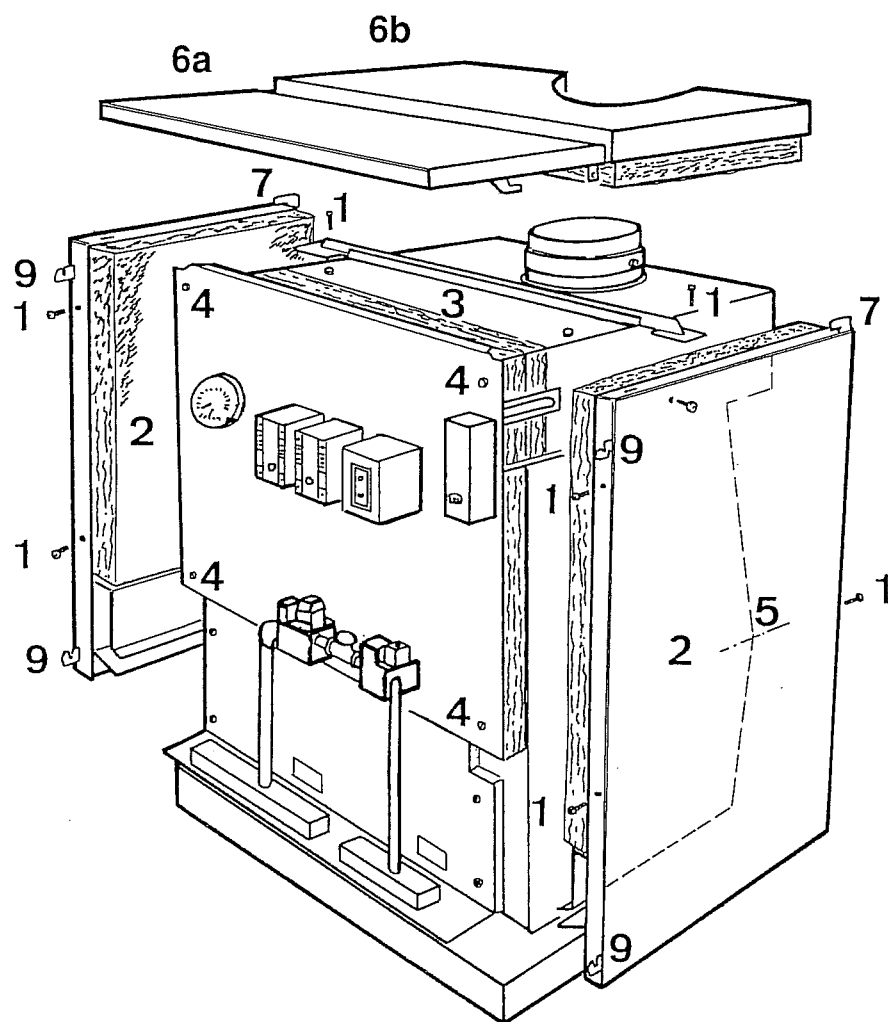


Fig. 13

Position side panels (2) on the top cross member (3) and screw panels to front bulkhead (4) using the self tapping screws (1) provided. Align panels and screw to cross member and rear bulkhead (5).

Attach front top panel (6a) and top panel (6b) to hooks (7) at the top of the side panels

The front door is placed on to the hooks (9) projecting from the edges of the side panels.

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

- A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not light the pilot by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not light any appliance.
  - Do not touch any electric switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
- E. In starting a new installation or if gas lines have been disconnected after servicing and cleaning the boiler) air must be purged from the gas piping.
- Turn on gas supply.
  - Loosen the inlet pressure tap (see fig. below).
  - Connect a tube and lead the flowing gas into outside.
  - Disconnect tube and shut off the inlet pressure tap.

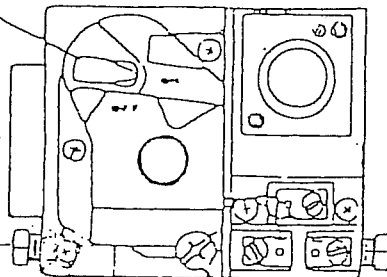
## OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
  2. Set the thermostat to lowest setting.
  3. Turn off all electric power to the appliance.
  4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not light the pilot by hand.
  5. Remove control access panel.
  6. Push in gas control knob slightly and turn clockwise to "OFF."
- NOTE: Knob cannot be turned to "OFF" unless knob is pushed in slightly. Do not force.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
  8. Turn gas control knob counterclockwise to "ON."
  9. Replace control access panel.
  10. Turn on all electric power to the appliance.
  11. Set thermostat to desired setting.
  12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

GAS CONTROL  
KNOB SHOWN  
IN "ON" POSITION

GAS INLET

INLET  
PRESSURE  
TAP



## TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove control access panel.
4. Push in gas control knob slightly and turn clockwise to "OFF." Do not force.
5. Replace control access panel.

BEFORE STARTING THE BOILER

1. Be sure the boiler of heating system is filled with water to proper level.
2. In starting a new installation or if gas lines have been disconnected (after servicing and cleaning the boiler) air must be purged from the gas piping.
  - Loosen the inlet pressure tap (see fig. page 19)
  - Connect a tube and lead the flowing gas into outside
  - Disconnect tube and shut off the inlet pressure tap
3. Turn off the power supply.
4. Before starting the system, turn thermostat to its lowest setting.
5. Turn gas control knob clockwise to OFF. Do not attempt to relight pilot or start burner until combustion chamber has been thoroughly purged of possible gas accumulation. Wait at least 5 minutes for all unburned gas to vent.

TO START BOILER (LIGHTING INSTRUCTIONS)

NOTE: In the event of failure of any component, the system containing the failed component will not operate or will go into safety lockout. The system is completely self-checking on every call for heat each component must be functioning properly to permit operation. If system does not perform as outlined after completing CHECKOUT, refer to SERVICE to determine cause.

1. Turn on main manual shut off valve to boiler, if provided.
2. Turn on the power supply.
3. Turn gas control knob counterclockwise completely. Depress knob and continue to turn counterclockwise until you reach the ON position.
4. Set thermostat above room temperature to **ignite the heater**.
  - Spark should turn on and pilot gas valve should open at once.
  - Spark ignition should cut off when pilot flame is established.
  - Main gas valve should open and main burner ignites after gas reaches burner ports.
5. Repeat steps 3 and 4 for second control, if unit employs two separate controls.
6. Set thermostat to desired temperature.

NOTE: It may be necessary to try ignition 2 or 3 times in order to purge any air from the pilot line. If problems occur with start up, refer to troubleshooting guide.

TO SHUT DOWN BOILER (TEMPORARILY OR EMERGENCY)

1. Turn gas control knob clockwise to "OFF".
2. Turn off power supply.
3. Turn off main manual shut-off valve, if provided.
4. Turn thermostat to its lowest setting.

SAFETY SHUT OFF CHECKOUT PROCEDURE

With the boiler in operation, remove the orange colored ignition cable from the gray colored ignition module. Within 8 seconds, the main burners will be extinguished. This indicates proper operation of the flame sensing safety circuit. If the main burners continue to operate when this cable is removed, shut the power supply to the boiler, and refer to "Operation and Checkout" procedure on page 7 of the users information manual which accompanies this boiler.

gray colored ignition module. Within .8 second, the main burners will be extinguished. This indicates proper operation of the flame sensing safety circuit. If the main burners continue to operate when this cable is removed, shut the power supply to the boiler off, and refer to "Operation and Checkout" procedure on page 8 of the owners manual which accompanies this boiler.

THE BOILER SHOULD NEVER BE SHUTDOWN IF FREEZING CONDITIONS ARE EXPECTED.

### IMPORTANT

1. This appliance must be grounded.
2. Do not obstruct air vents, ducts, grilles or other openings in the boiler room and ensure the free passage of ventilation and combustion air to the boiler.
3. Keep area surrounding boiler free and clear from combustible materials, gasoline and other flammable liquids.

### WATER TREATMENT

Where necessary water treatment should be carried out whenever the system is drained and refilled.

### MAINTENANCE

At least once a year a periodic inspection of the boiler by a qualified service agency is necessary. On this occasion boiler has to be checked as described in INSTALLATION AND SERVICE INSTRUCTIONS, paragraphs SERVICE, CLEANING, and CHECKOUT.

All flue product carrying areas of the boiler, its vent system, and main and pilot burners shall be examined for continued safe operation. Particular attention shall be given to deterioration from corrosion or other sources.

### TEST FOR GAS LEAKS

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#### WARNING

#### DO NOT OMIT THIS TEST

With main burner in operation, paint pipe joints, pilot gas tubing connections, and valve gasket lines with soapy water solution. Bubbles indicate gas leakage. To stop leak, tighten joints and screws or replace the gasket. Never use an open flame to check for gas leaks.

---

Caution: Since some leak detection solutions, including soap and water may cause corrosion or stress cracking, the gas piping should be rinsed with clear clean water after testing, unless it has been determined that the leak test solution is non-corrosive.

Illustration for Honeywell VR 8440 P with Intermittent pilot  
G\_ 224 E

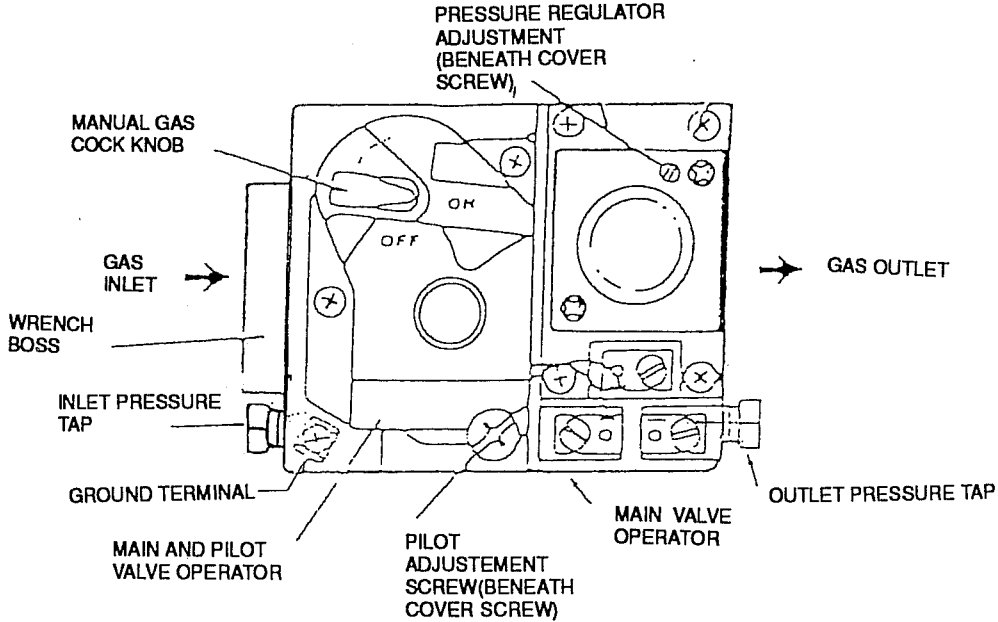


Fig. 14

Details" gives information regarding correct manifold pressures and orifice sizes for all boiler models. Each boiler is equipped from the factory with the correct orifice, to achieve the proper input. The only variable item to be considered in determining the proper input rating is the gas supply pressure and the manifold pressure.

### IMPORTANT

It is imperative that you do not exceed the input rating listed on the chart on page 5 of this manual. The American Gas Association has certified the design of these boilers only at the input rates listed in this manual. This certification should be considered void if these input rates are exceeded.

Refer to page 22 of this manual for the location of the inlet pressure taps for the VR 8440 P Honeywell control. Ensure that the main gas supply to the boiler is shut off before removing this pressure tap.

Refer to page 22 of this manual for the location of pressure taps and method of connecting the manometer to the boiler manifold(s).

When you have completed the check of the manifold pressure, re-check all pressure tap plugs for gas leaks, as directed on page 19 of this manual.

Refer to the illustration below for an approximation of how the pilot and main burner flames should appear. The flame characteristic should be checked periodically to help ensure continued safe and efficient operation. If the flames are noisy or show an appreciable amount of "lifting" above the surface of the burner, then the gas pressure and/or orifice size may be too large. If the flames are primarily yellow in color, and are soft and lazy; then an inadequate gas pressure is likely, or the burner opening may be blocked. For further cleaning and service procedures, refer to the Owners Information Manual.

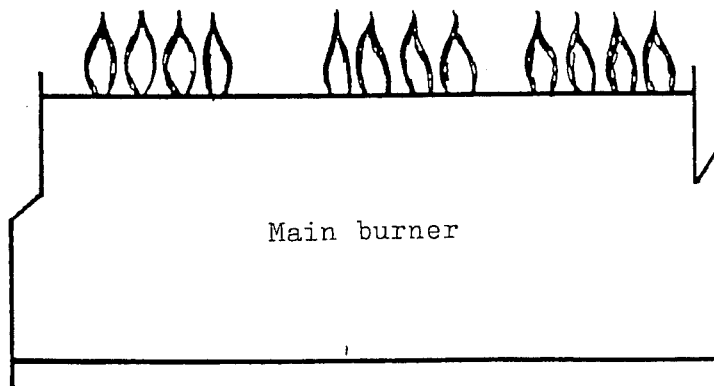


Fig. 16

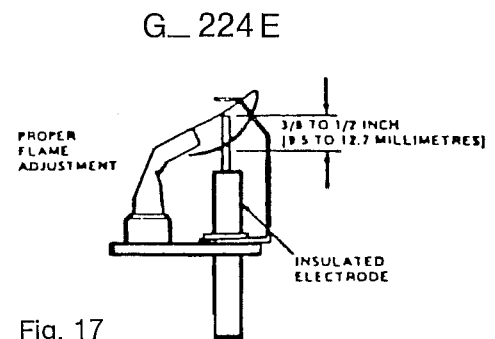
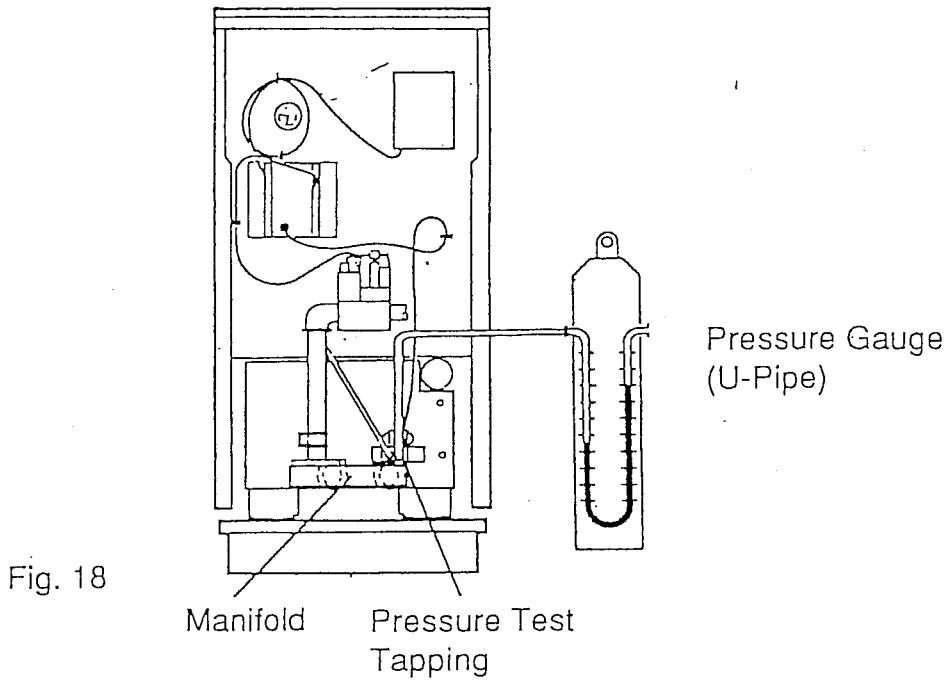
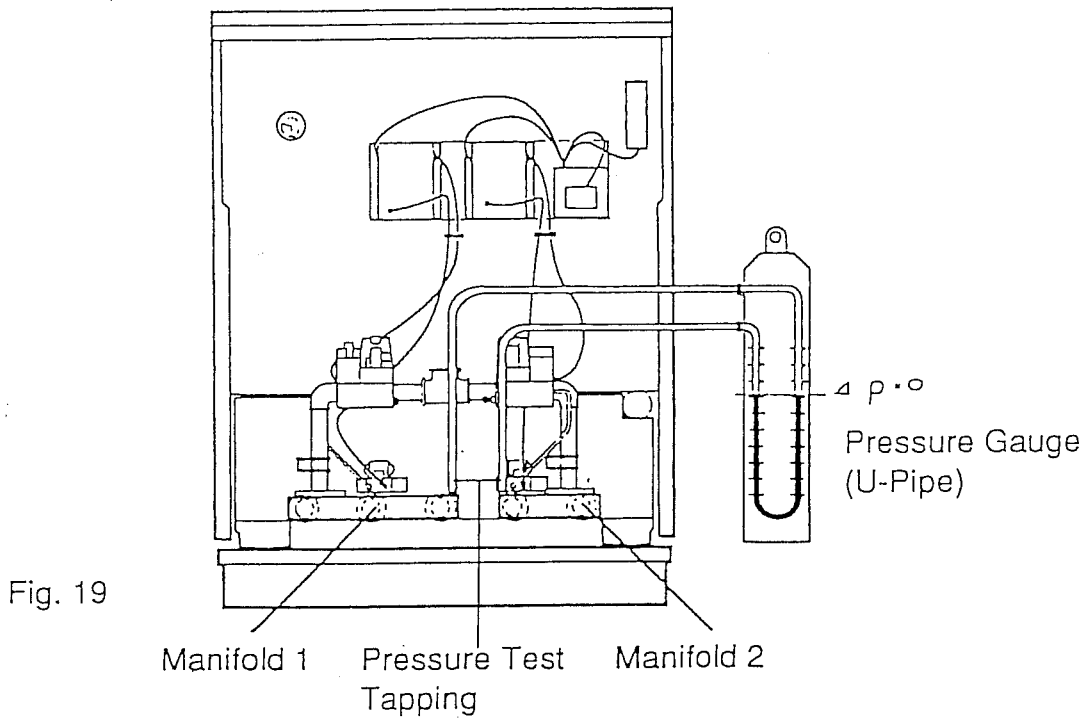


Fig. 17

G<sub>224</sub> E Size 17 to 64  
(One Burner Assembly)

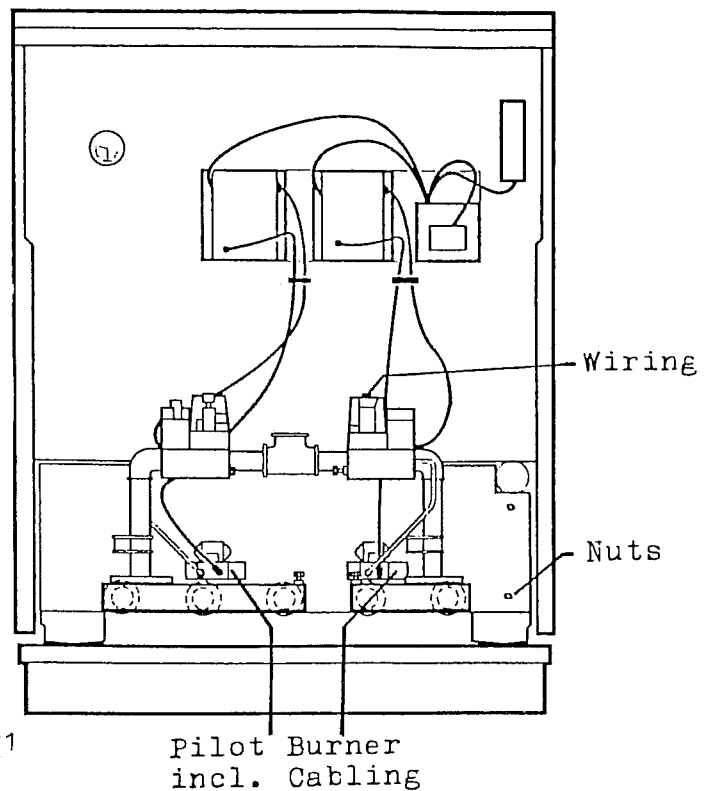
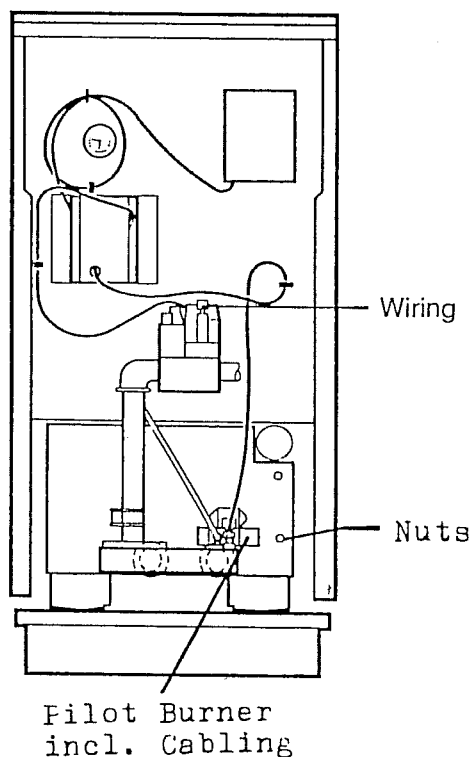


G<sub>224</sub> E, Size 73 to 128  
(Two Burner Assemblies)



It is advisable to clean any dirt or corrosion from the heating surfaces of the boiler at least once a year to maintain highest efficiency.

1. Turn main manual shut-off valve to closed position.
2. Switch OFF the electrical power supplied to the boiler.
3. Remove the front door.
4. Release the gas supply pipe union from the gas control.
5. Pull cable(s) off the control module(s).
6. Remove the four nuts holding the combustion chamber access door and carefully slide out the complete burner unit.
7. Lift up boiler top cover at the front and unhook at the rear.
8. Unscrew the wing nuts holding the vent hood cover and remove it.
9. Remove baffle plate lying on top of the vent ways, remember its located orientation to facilitate re-installation.
10. Sweep through the flue-ways, using a brush.
11. Replace baffle plate, vent hood cover, and boiler top cover.
12. Brush or vacuum the deposits from combustion chamber at the bottom of the boiler.
13. To clean the burners, use a soft bristle brush or a clean cloth.
14. Inspect the pilot burner and electrodes for damage or wear.
15. Ensure that the main burner ports are clean.
16. Inspect the ceramic fibre insulation on the combustion chamber access door and replace if damaged.
17. Replace burner assembly in the boiler combustion chamber, reversing the order followed during initial disassembly. Ensure that all four securing nuts and lock washers are in place and tightened securely. Re-connect the gas supply to the boiler, procedures refer to installation and service instructions for the procedure to follow, to check for gas leaks in the connections.
18. Inspect the external electrical wiring and thermostat capillaries for damage and reconnect (observe matching color markings).
19. Check that all nuts and fittings have been replaced and are tight.



## Conversion of the Burner Assembly to Liquefied Gas

Prior to converting the burner assembly to liquefied gas check what kind of altitude the burner is provided for (see marking according to altitude 0 up to 4500 ft in table "Gas Settings and Burner Details"). Following the data of this table choose injectors for liquefied gas.

The conversion to another altitude is carried out by exchanging the orifices (see table "Gas Settings and Burner Details"). Gas pressure may not be changed.

If the burner is to be operated with a different gas, proceed as follows:

1. Close gas shut off valve and isolate system from electrical power.

2. Exchange main orifices and pilot orifice(s).

The main orifices are marked as follows:

natural gas N = yellow

liquefied gas N = green

Do not omit new fibre (washers).

For main orifices diameters see table "Gas Settings and Burner Details".

Pilot orifices:

natural gas: Typ BCR 18

liquefied gas: Typ BBR 10

3. Gas control valve "Honeywell" VR 8440

Conversion parts have to be ordered from your supplier.

The following step-opening pressure regulator can be used:

natural gas with VR 8440: V 5307 A 1034

liquefied gas with VR 8440: V 5307 A 1026.

For operation with liquefied gas the step-opening pressure regulator must be installed and the regulating screw must be screwed in completely.

### FITTING A COMPLETE PILOT ASSEMBLY

1. Disconnect H.T. cable from the end of the electrode (G\_ 224 E series).
2. Loosen the compression fittings holding the pilot gas pipeline at both ends then remove the compression fittings from pipework.
3. Remove the two screws holding the pilot assembly plate to the burner carrier plate. Reassemble the replacement pilot assembly in reverse order and start up the boiler. Use bracket and orifice of faulty pilot. Do not omit gas leak test, refer to installation and service instructions.

### FITTING A HONEYWELL PILOT ORIFICE

1. Remove pilot burner as explained above.
2. Pull out assembly, then carefully push out the old, damaged orifice and insert new one.
3. Reassemble in reverse order and start up the boiler. Do not omit gas leak test, page 8.

### FITTING INSULATION TO BURNER CARRIER PLATE

1. Remove the complete burner unit as indicated in "Servicing of Boiler".
2. Remove the damaged insulation and scrape the surface of the metal clean.
3. Apply appropriate adhesive preferable furnace cement (available from the dealer where you purchased the replacement insulation), to the combustion chamber access door and press new insulation into position.
4. Reassemble in reverse order and start up the boiler. Do not omit gas leak test, page 8.

### FITTING OF MAIN BURNER ORIFICES

Use original BUDERUS orifices only.

1. Carefully unscrew the orifice and remove the fibre gasket.
2. Clean the orifice.  
**Do not damage or enlarge the orifice hole, under any circumstances!**
3. Check that any replacement is the correct size. Refer to page 8.
4. Reassemble in reverse and start up the boiler.

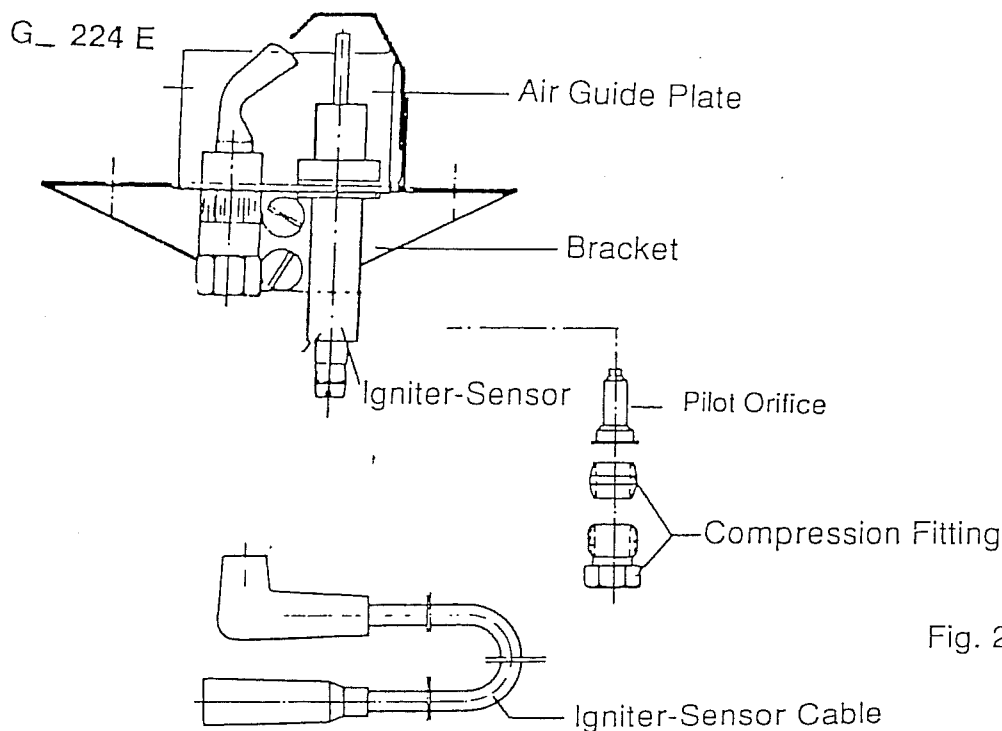


Fig. 22

# TROUBLESHOOTING AND SERVICE

## GENERAL

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### MAIN BURNER PRODUCES SMOKE

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- |                                    |   |
|------------------------------------|---|
| 1. Inadequate air for combustion   | Check air supply into boiler room is adequate - refer to "Air Supply", page 3, Installation and Service Instructions. |
| 2. Primary air supply restricted   | Clean burners and primary air opening - refer to "Cleaning" page 24.  |
| 3. Main burner orifices wrong size | Replace with correct size - refer to table on page 7, Installation and Service Instructions.                          |
- 

### INSUFFICIENT HEAT OUTPUT

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- |                                    |  |
|------------------------------------|--|
| 1. Inlet gas pressure inadequate   | Check gas pressure setting - refer to tables on page 7, 22 and 23 Installation and Service Instructions. |
| 2. Main burner orifices blocked    | Check orifices - refer to page 7, Installation and Service Instructions.                                 |
| 3. Main burner orifices wrong size | Replace with correct size - refer to table on page 7 "Installation and Service Instructions".            |
- 

## S 86 INTERMITTENT PILOT SYSTEM TROUBLESHOOTING

### IMPORTANT

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1. Always de-energize the system for at least 1 minute before recycling for further test.
  2. If performance of any component is found to be unsatisfactory, be sure to review the general installation requirements (starting on page 3, Installation and Service Instructions), before replacing.
  3. The following service procedures are only for a basic Intermittent Pilot system. On all installations, refer to the appliance manufacturer's service instructions for the specific installation.
  4. The electronic S 86 control module cannot be repaired. If troubleshooting procedure indicates a malfunction in the S 86 G, the S 86 G control module must be replaced.
  5. Intermittent Pilot system should be serviced only by trained and experienced personnel.
-

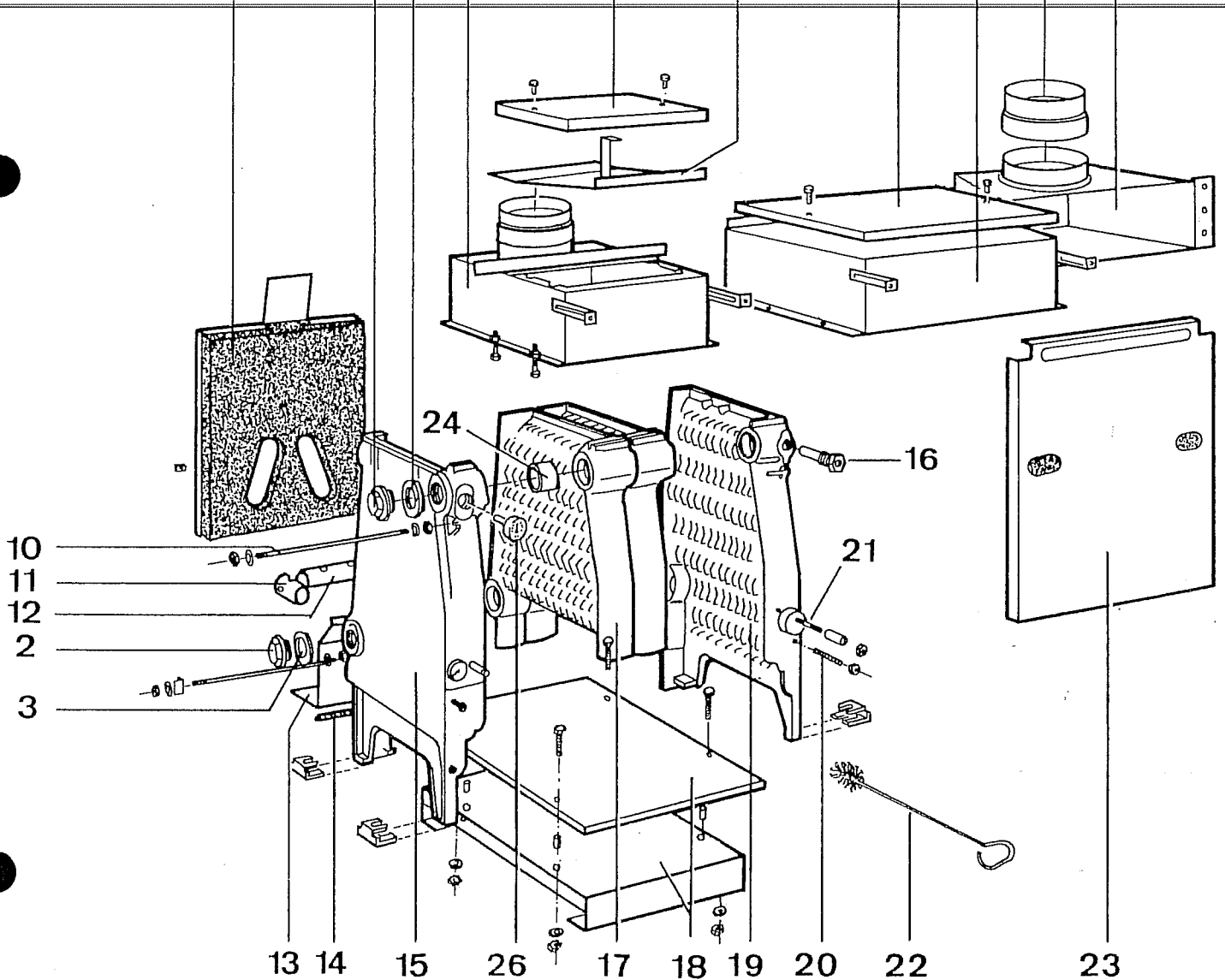


Fig. 22

Parts List

- |    |   |    |                      |
|----|---|----|----------------------|
| 1  | Rear Bulkhead   | 13 | Shield Plate         |
| 2  | Plug  | 14 | Sealing Rope         |
| 3  | Gasket  | 15 | Left End Section     |
| 4  | Draft Hood for Boiler Size  | 16 | Sensor Pocket        |
| 5  | Draft Hood Cover for Boiler Size 12 up to 55  | 17 | Middle Section       |
| 6  | Baffle Plate - for Size 12, 14, 17 (Canada only) For Size 21 through 50, USA and Canada | 18 | Non Combustible Base |
| 7  | Draft Hood Cover for Boiler Size 64 up to 128   | 19 | Right End Section    |
| 8  | Flue Collector for Boiler Size 64 up to 128   | 20 | Stud                 |
| 9  | Draft Hood for Boiler Size 64 up to 128   | 21 | Stud                 |
| 10 | Tie Bar   | 22 | Cleaning Brush       |
| 11 | Connecting Piece for Inlet Water Distributing Pipe for Boiler Size 31 up to 128         | 23 | Front Bulkhead       |
| 12 | Inlet Water Distributing Pipe for Boiler Size 31 up to 128                              | 24 | Conical Nippel       |
|    |   | 25 | Flue Adapter         |
|    |   | 26 | Thermomanometer      |

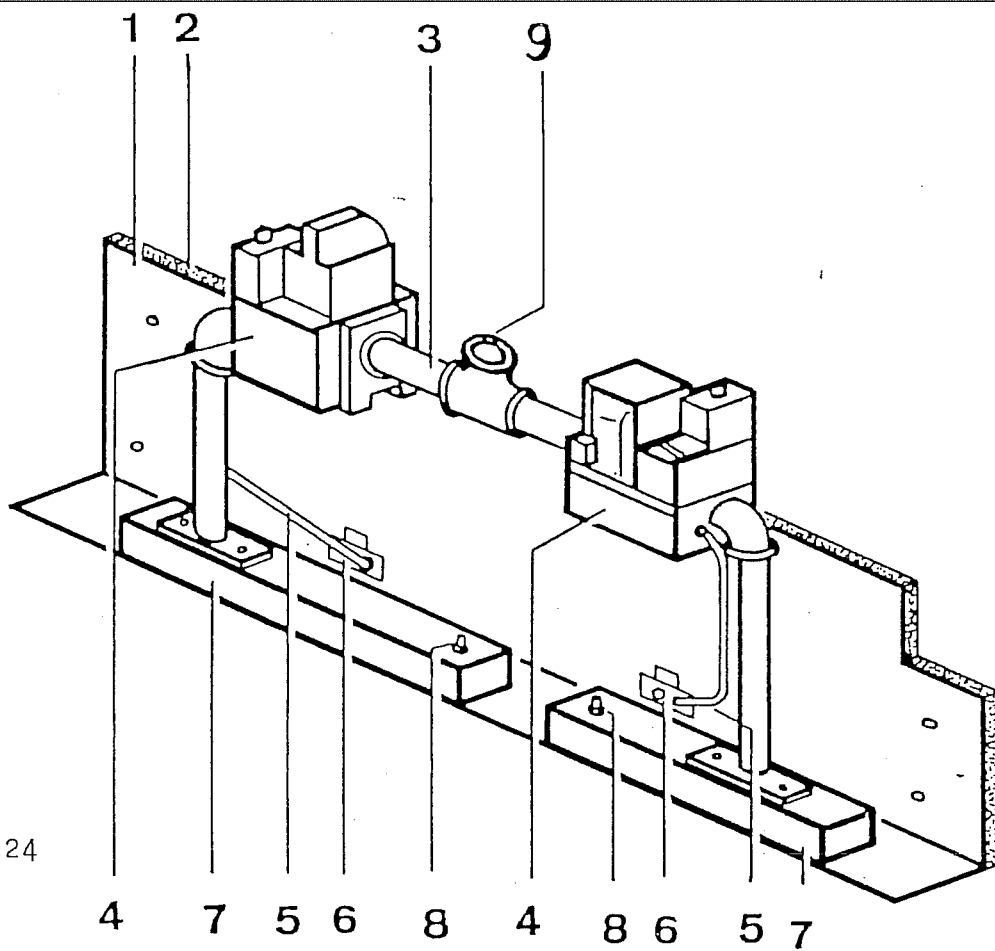
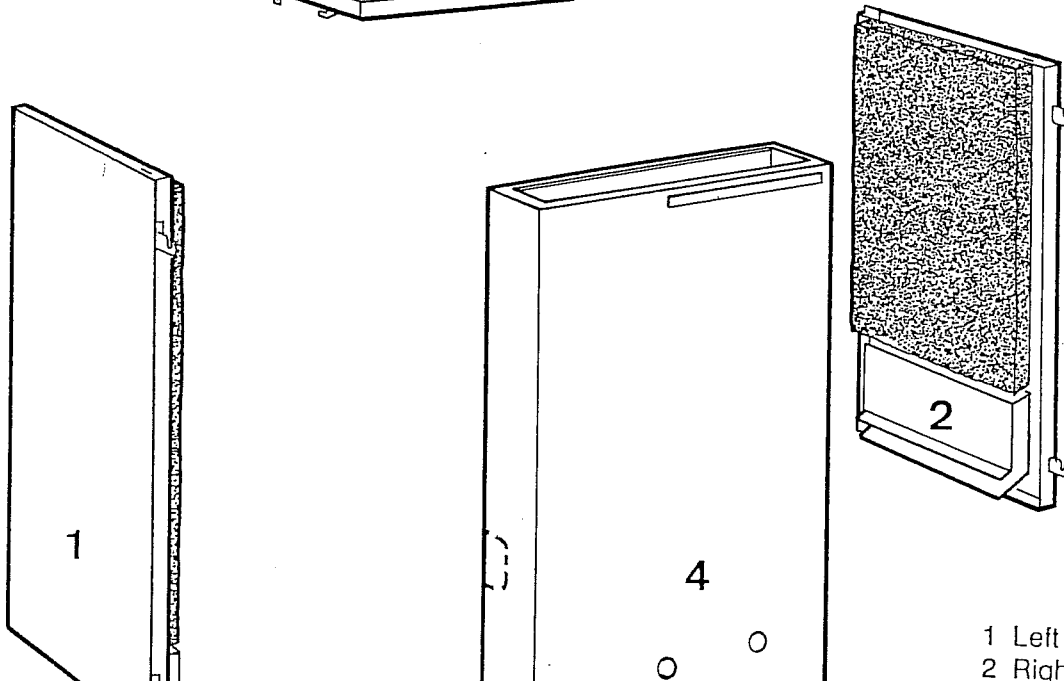
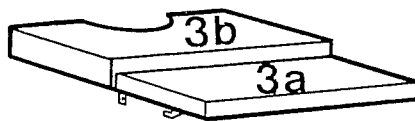


Fig. 24

- |                                     |                            |                         |
|-------------------------------------|----------------------------|-------------------------|
| 1 Combustion Chamber<br>Access Door | 4 Gas Combination<br>Valve | 7 Manifold              |
| 2 Insulation                        | 5 Pilot Tubing             | 8 Pressure Test<br>Plug |
| 3 Gas Piping                        | 6 Pilot Burner             | 9 Supply Connection     |



1 Left Side Panel  
2 Right Side Panel

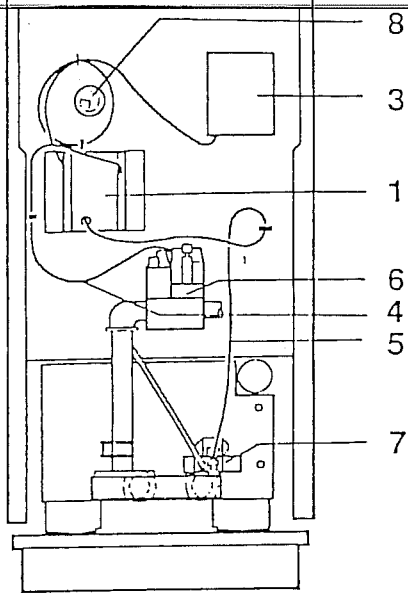


Fig. 26 Size 17 to 64

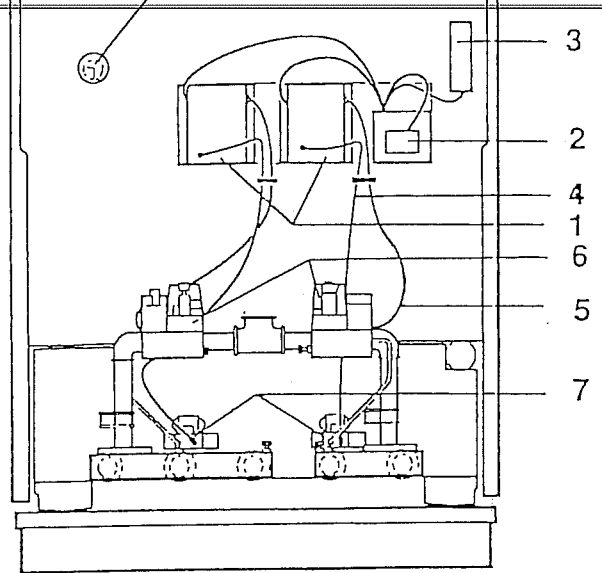


Fig. 27 Size 73 to 128

	Pos.	Name	Part.-Nbr.:	Nbr.:	Boiler G_ 224 E
1	1	Intermittent Pilot Control Modul(s) S 86 H		1	Size 17 to 64
2				2	Size 73 to 128
3	2	Transformer AT 87 A Honeywell		1	Size 73 to 128
4	3	High/limit Control Aquastat L8148E-Honeywell		1	Size 17 to 128
5				1	Size 73 to 128
6	4	Igniter-Sensor Cable		1	Size 17 to 64
7				2	Size 73 to 128
8	5	Connection Cable Module-Control Valve		1	Size 17 to 64
9				2	Size 73 to 128
10	6	Combination Gas Control, VR 8440 P, with 1.2" step open regulator - Honeywell		1	Size 17 to 64
11				2	Size 73 to 128
12	7	Pilot Burner Q345A F35 Honeywell		1	Size 17 to 64
13				2	Size 73 to 128
14	8	Thermomanometer		1	Size 17 to 128

Replacement Parts for the Entire Boiler are Available from the Factory, or your Local service company.

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**Boiler installed by:**  
(contractor's address)

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**Boiler installed on:**  
(date of installation)

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**Buderus**  
HYDRONIC SYSTEMS

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