MONITOR FCX

INSTALLATION AND SERVICE MANUAL

Fully Condensing Oil Fired Application Efficiency, Up to 95% efficient

MONITOR PRODUCTS, INC.
P.O. Box 3408 • Princeton, NJ 08543
www.monitorproducts.com

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FCX INSTALLATION AND SERVICE MANUAL

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I. INTRODUCTION

1 - PRODUCT DESCRIPTION

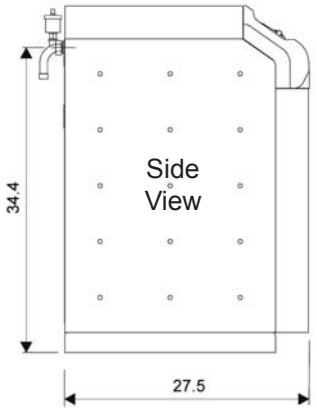
Model FCX oil fired boiler utilizes a sealed combustion system that operates at a temperature at which the flue products will condense. How much the unit condenses depends on return water temperatures. The lower the temperature the more the unit condenses and the high the efficiency. The flue products temperature is so low that the unit is suitable for use with PVC intake / Polypropylene exhaust flue pipes, which are offered as standard options for installation. The FCX is approved for installation with zero clearance to combustible materials by Intertek Testing Services to the UL Standard for Oil Fired Storage Tank Water Heaters (UL 732).

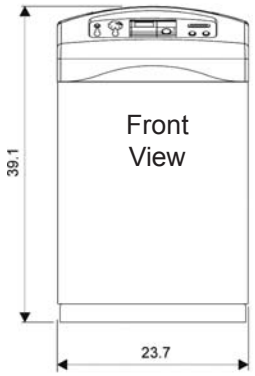
The FCX is completely assembled and provides standard parts as follows:

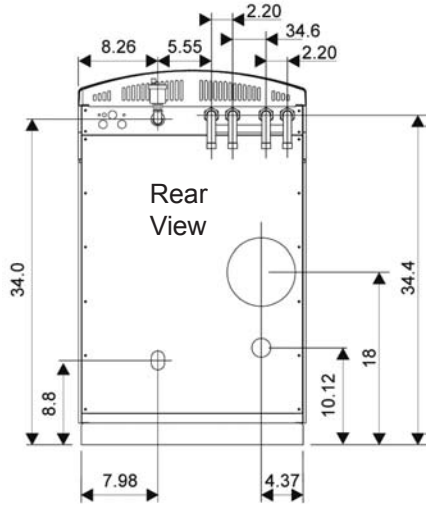
- An enameled steel cabinet with thick insulation
- A completely unitized, thick shelled boiler with combustion chamber and a heat exchanger with a system of removable baffles
- A stainless steel condenser, with condensate drain
- A high efficiency, low emission, gun type oil burner with combustion air fan, integral oil pump, oil heater and primary control
- A control panel assembly and all electrical controls for operation of the boiler, including a water temperature thermometer in circuit 1
- A manual water-mixing valve that can be motorized if desired
- A safety pressure relief valve
- An expansion tank
- A water circulating pump
- Complete internal water piping terminating in connections for two independent water heating circuits.
- Complete internal air piping terminating in a connection to a coaxial flue/combustion air intake system.

Standard options available from Monitor include:

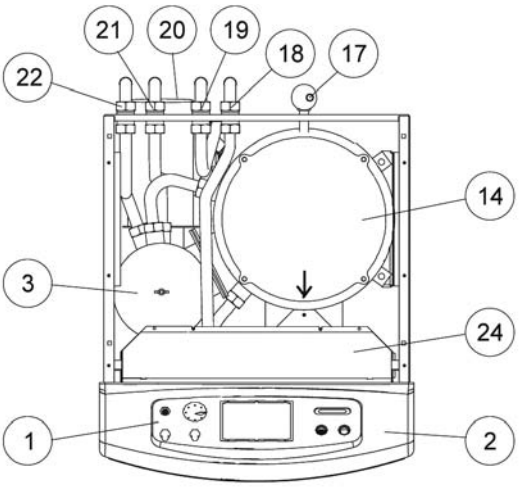
- Coaxial balanced flue system components for connection to the boiler to provide venting of the flue products and combustion air intake.





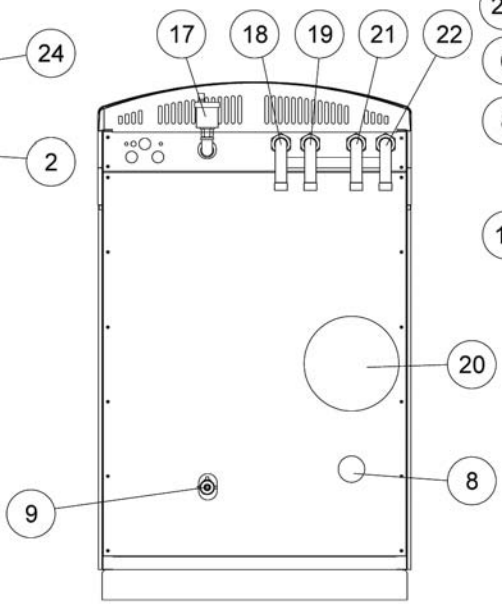


2 - DESIGNATION OF COMPONENTS

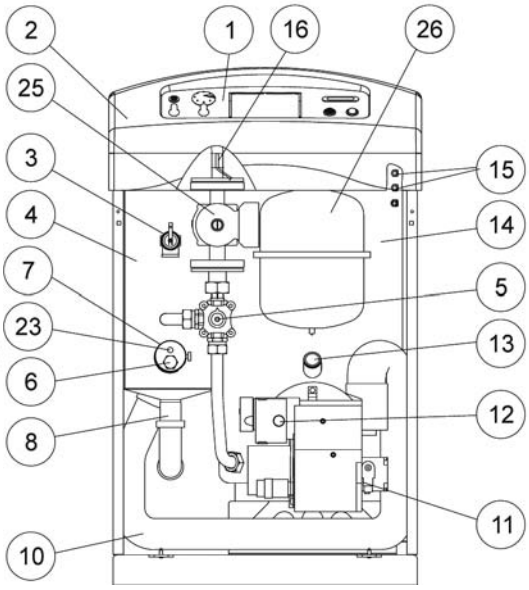


View from above

1) *Control Panel*
2) *Control Panel Cover*
3) *Safety Pressure Relief Valve*
4) *Condenser*
5) *Manual Mixing Valve*
6) *Combustion Product Pressure Test Point*
7) *Condenser Inspection Port*
8) *Condensate Drain*



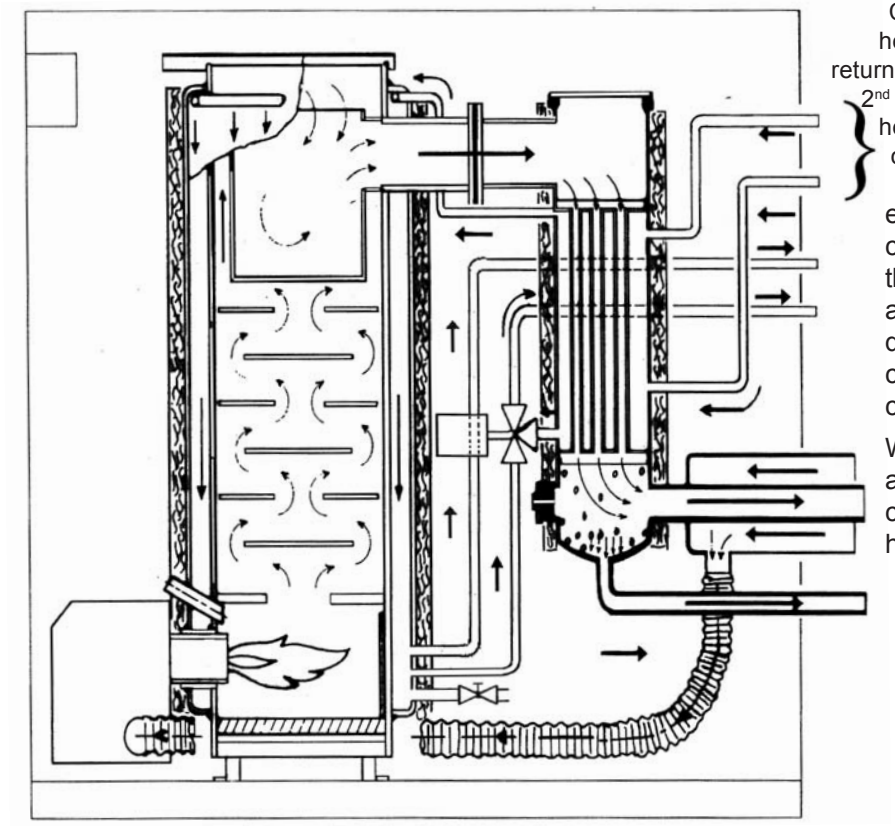
Rear View



Front View

9) *Drain Cock*
10) *Burner Air Inlet Pipe*
11) *Oil Burner*
12) *Safety Light and Reset Button*
13) *Sight Glass*
14) *Boiler Shell*
15) *Pockets for Water Overheating Safety and Thermostat Bulbs Thermostat*
16) *Heating Output Sensor*
17) *Bleed Connection*
18) *First Circuit Heating Output*
19) *Second Circuit heating output*
20) *Combustion Products Flue*
21) *First Circuit Heating Return*
22) *Second Circuit Heating Return*
23) *Well for Combustion Product Overheating Thermostat Bulb*
24) *Protection Plate for Electrical Connections Box*
25) *Circulating pump*
26) *Expansion vessel*

3 - BOILER OPERATION



Combustion air is drawn into the oil burner by the burner fan through the air intake hose connected to the coaxial flue/combustion air intake/ exhaust separator. Heated air from combustion of the oil burner cools as it passes through the boiler heat exchanger, then the secondary heat exchanger condenser. Cooled flue products exit the unit through the center of the flue/combustion air separator tube assembly. Condensate from the flue products is drained from the bottom of the condenser into the condensate drain tube, exiting the unit through the condensate drain system.

Water is circulated through the boiler heat exchanger and condenser circuits where it is heated by the combustion of the oil burner. Two independent water-heating circuits can be connected to the unit:

- The first circuit passes through a three way mixing valve incorporated into the boiler. This valve can either be used manually as supplied or driven by a motorized controller (option).
- The second circuit can supply another heating circuit and/or a domestic hot water indirect storage tank such as BS DHW tanks.

4 - PRODUCT STANDARD RATINGS

Ratings for Model FCX are provided in the following table:

Performance Parameter	Units	Product Rating
Rated Input	BTUH	81,250
Rated Output	BTUH	76,000
Combustion Chamber Length	Inches	8.98
Combustion Chamber Diameter	Inches	11.5
Combustion Chamber Volume	Cu. Inches	915
Combustion Prod. Circuit Volume	Cu. Inches	3051
Flue Pressure Drop	Inches H2O	0.10
Max Heating Service Pressure	Psig	43.5
Max Heating circuit water temp	Deg. F	176
Water Overheating Safety Thermostat Setting	Deg. F	230
Combustion Prod. Overheating Safety Thermostat Setting	Deg. F	248
Heating Circuit Water Capacity	Gallons	4.23
Primary Water Flow Rate (60/80 deg. C)	Gal/hr	254
Water Pressure Drop (at nominal flow rate)	MCE	1.4
Power Absorbed (with burner, without circulator)	KW	0.2
Packaged Weight	Lb.	267

Ratings are for the boiler when connected to standard option coaxial flue system components.

Electrical Power Supply	115 volts, single phase, 60 Hz
Full Load Current	2.0 Amps FLA
Max Fuse/ Circuit Breaker Size	15 Amps

5 - DIAMETER OF PIPE CONNECTIONS

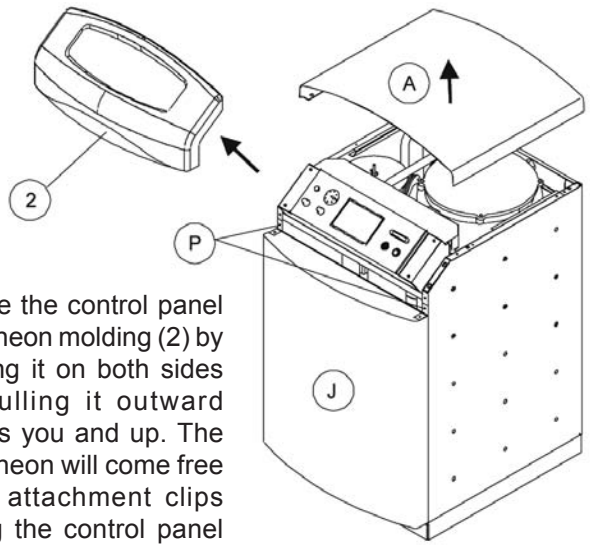
Connection	Diameter	Units
Combustion Products	3.15 / 4.92	Inch
Water Heating Supply/Return	1	Inch
Domestic Hot Water or Second Heating Circuit	1	Inch
Condensate Drain	1 -1/2	Inch
Heating Water Drain	1/2	Inch
Air Bleed	3/8	Inch
Safety Pressure Relief Valve	3/4	inch

II. INSTALLATION

1 - OPENING THE UNIT

To open Model FCX to access for installation, and/or service, follow these steps :

Fig. 4



- Remove the control panel escutcheon molding (2) by grasping it on both sides and pulling it outward towards you and up. The escutcheon will come free of the attachment clips leaving the control panel exposed.
- Remove the top cover of the unit (A) by lifting the cover at the front and rear to free the attachment clips, and then simply lift the cover straight up and off.
- Remove the front panel attachment screws (P), then pull the front panel (J) outward towards you at the top to free it from the attachment clips. Lift the panel up to free it from the lower attachment pins, and simply lift the panel off.

2 - LOCATION OF THE UNIT

Model FCX is a free standing (floor mounted) appliance suitable for installation on combustible flooring. It is approved for installation with zero clearance to combustible walls, ceiling, doors, etc from the cabinet. Standard option coaxial flue components are suitable for installation with zero clearance to combustible materials.

These are operating clearances and it is recommended that additional clearances be considered:

- Sufficient clearance should be provided in back of the unit to facilitate installation and maintenance of water, electrical, flue and condensate drain connections and components.
- Sufficient clearance over the top of the unit should be provided to allow the top to be removed for service.
- Sufficient clearance from the front of the unit should also be provided to facilitate adjustments and service.

There is no need for additional clearance to either side of the unit since there is no access to the unit from either side.

Alternative access measures such as doors, removable wall panels, etc. may be provided if desired.

Choosing the location should also take into account the total flue length to the outdoors (See Flue Connection and Routing). In addition, the choice of location should consider the location of utilities such as electrical supply and sewer access for condensate drainage. Location and routing of water lines is, of course, a significant part of the choice. While Model FCX can be installed in an enclosure such as a closet, ventilation or other means must be provided so that the enclosure temperature does not exceed 113 deg. F (45 deg. C).

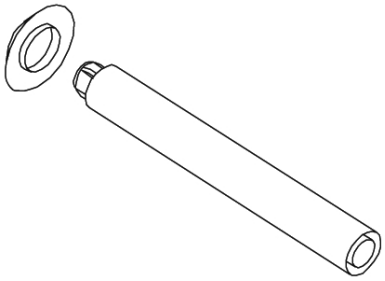
3 - FLUE CONNECTIONS AND ROUTING

Connection of the coaxial flue/combustion air piping system is in the back of the unit to the separator tube assembly. The combustion products are vented from the boiler and condenser through the center of the coaxial tube, while the combustion air is supplied through the outside ring of the coaxial tube. Since the FCX is a condensing boiler, flue products exiting the unit are relatively low temperature, typically from 120 - 212 ° F (49 - 100 ° C), and saturated with humidity. Consequently, an airtight, corrosion resistant flue system must be provided.

Various standard option flue piping components and packages with which to create the flue system are available.

0.98 m Straight Horizontal Flue Kit

Fig. 5



Reference No	Length
MPI Part 2201 (N40.28399)	38.6” (980 mm)

Useful length after assy. - 34.6” (0.88 m)

3 m Angled Horizontal Flue Kit

Fig. 6

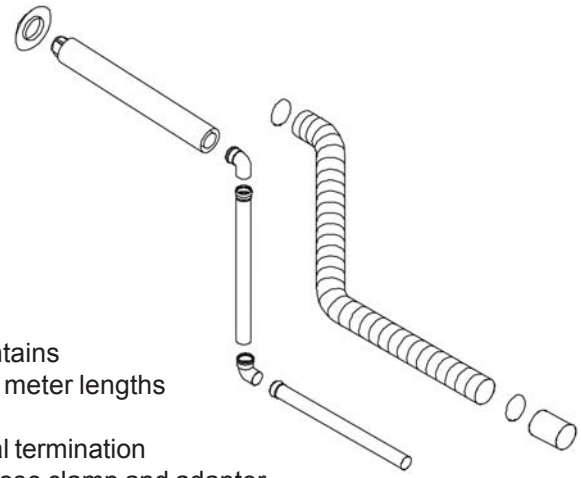
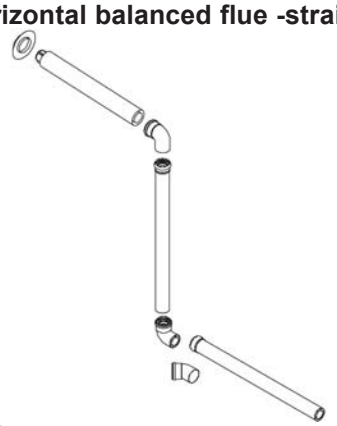


Fig. 6 Contains
2 80 mm/1 meter lengths
2 elbows
1 horizontal termination
1 flexible hose clamp and adapter.
NOTE: If the vertical length is more then 1 meter a 45 degree concentric elbow, #2204 or 1/2 meter extension, #2202, can be used coming out the back of the unit. This kit must be properly supported.

Reference No MPI Part 2209 (V72.28414)

3 m angled horizontal balanced flue -straight

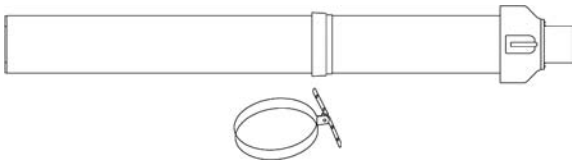
Fig. 7



Reference only

PP/PVC Concentric Vertical Terminal - For Flat or Sloping Roof

Fig. 8

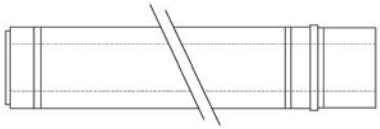


Reference No	Color	Length	I.D.	O.D.
MPI Part 2206	Black	51.9” (1320mm)	3.15” (80mm)	4.92” (125mm)

Useful length under roof flashing - 29.5” (0.75 m)

PP/PVC Concentric Horizontal Extension
- joint fitting -

Fig. 9

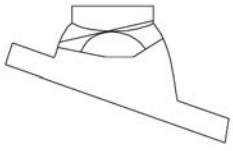


Reference No	Length	I.D.	O.D.
MPI Part 2202 (N40.28397)	19.7” (500 mm)	3.15” (80mm)	4.92” (125mm)
MPI Part 2203 (N40.28398)	39.4” (1000 mm)	3.15” (80mm)	4.92” (125mm)

Useful length after assy. - 17.7” (0.45 m) or 37.4” (0.95 m)

Roof Flange with Adaptable Coupling

Fig. 10

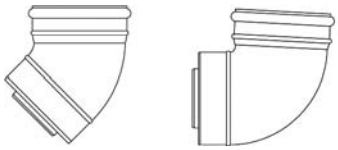


Reference No	Slope	Covering type	Color
9031	25 - 45 deg	Tile/Shingle	Red
9032	25 - 45 deg	Slate - Shingle	Black

PP/PVC Concentric Elbow

- joint fitting -

Fig. 11

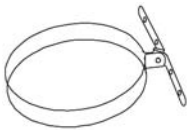


45° bend 90° bend

Reference No	Bend	I.D.	O.D.
MPI Part 2204 (N40.28395)	45 deg	3.15" (80mm)	4.92" (125mm)
MPI Part 2205 (N40.28396)	90 deg	3.15" (80mm)	4.92" (125mm)

Fastening collar (option)

Fig. 12

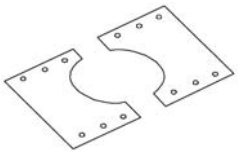


Reference No	Number	Ø mm
MPI Part 2208 (B00.29727)	3	125

Collars are essential to bear the weight of the vertical extensions so that the boiler does not bear the weight, as well as horizontal runs preventing sagging and pooling of condensate.

Polypropylene Roof Plate

Fig. 13



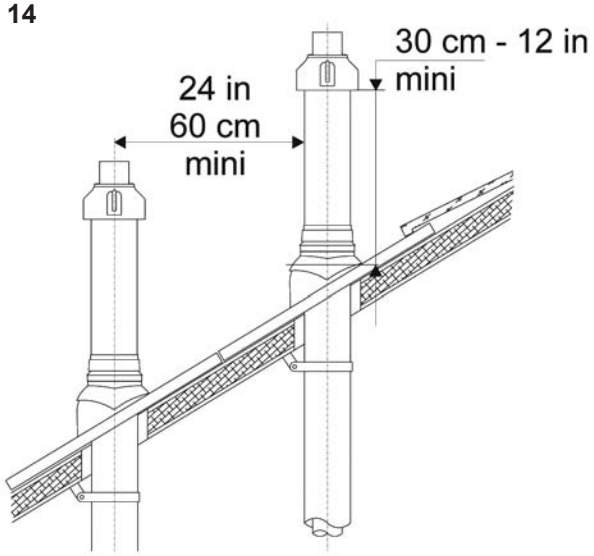
Reference No	Color
MPI Part 2207 (A90.12172)	Black

TYPICAL INSTALLATION EXAMPLES:

The flue/combustion air system piping may be either horizontal or vertical or a combination of both, observing the following:

- The maximum unrestricted horizontal or vertical flue length shall not be more than 16.4 ft (5 m), if using the HeatWise burner.
- For each 90-degree elbow used in the flue system, subtract 3.28 ft (1m) from the total allowable length.
- For each 45-degree elbow used in the flue systems, subtract 1.64 ft (0.5m) from the total allowable length.
- Horizontal runs of the flue system must pitch back 3/4 inch per yard (2 cm per m) of length towards the boiler to ensure proper flue products condensate drainage.
- Termination of a horizontal flue system shall not be less than 2 ft above grade or 1 ft above average snow level as shown in fig. 15 and 16 or as dictated by local codes.
- Do not place the flue terminal less than 6.56 ft. (2 m) from a ventilation hole or opening in a building. NOTE: This is an important concideration if unit is used year round (domestic hot water production) where windows may be open.
- Termination of a vertical flue must provide at least 12 inches (30cm) above the roof jack to the combustion air intake collar.
- If there are two units in the installation with vertical flue systems, the termination of the systems must be separated by 24 inches (60cm).

Fig. 14



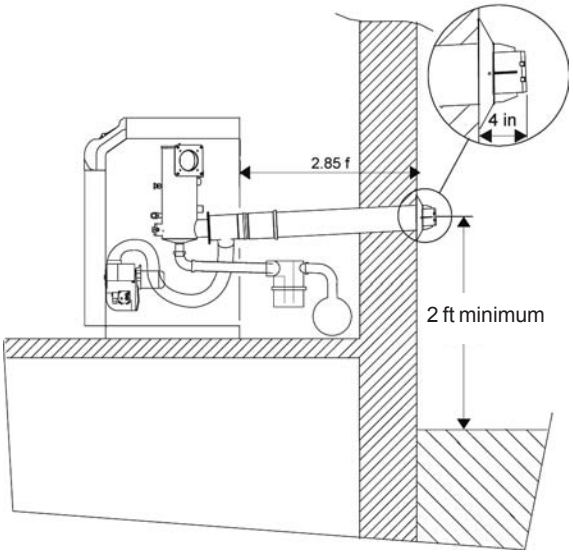
All flue-piping components must be assembled and supported to provide an airtight flue/ combustion air system.

Application of liquid soap over the flue pipes to be joined will aid in assembly of the parts.

Typical installation examples appear in the illustration that follow.

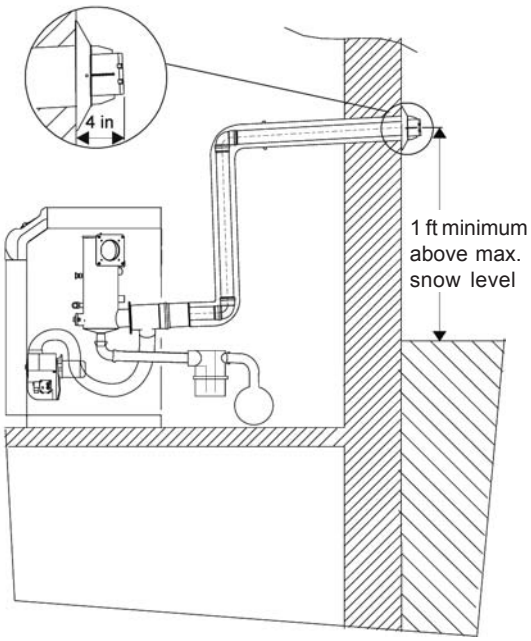
Straight Balanced Flue Configuration

Fig. 15



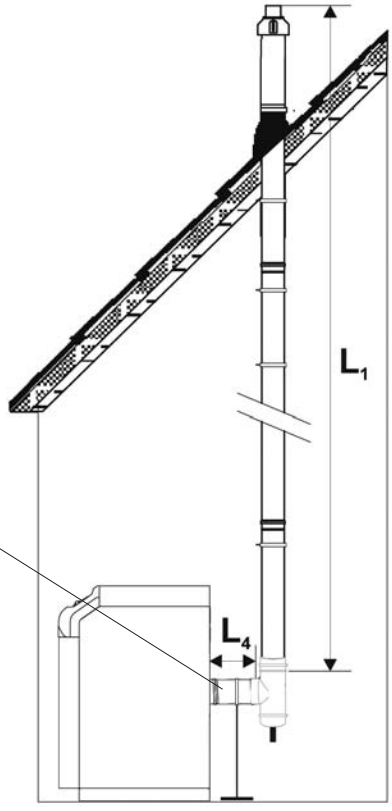
Option: Straight Horizontal Flue Kit

Angled Balanced Flue Configuration
Fig. 16



Option: Angled Horizontal Flue Kit

Fig. 17



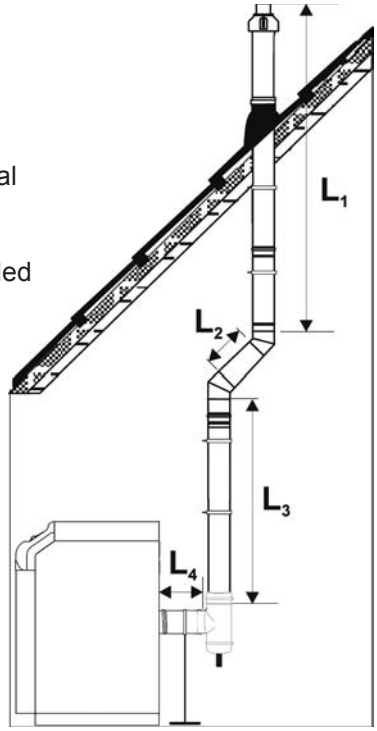
To provide clearance around water connections a 1/2 meter concentric extension can be used

Options:
Condensate Tee
Concentric extensions
1 concentric vertical terminal
1 sleeve tile roof flange
1 roof plate
Adjustable supports as needed

max L = L1 + 3.28 ft (1m) ≤ 16.4 ft (5m)

Fig. 18

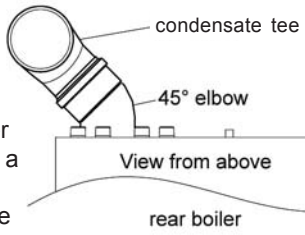
Options:
Condensate Tee
3 Concentric extensions
2 45 deg concentric elbows
1 concentric vertical terminal
1 sleeve tile roof flange
1 roof plate
Adjustable supports as needed



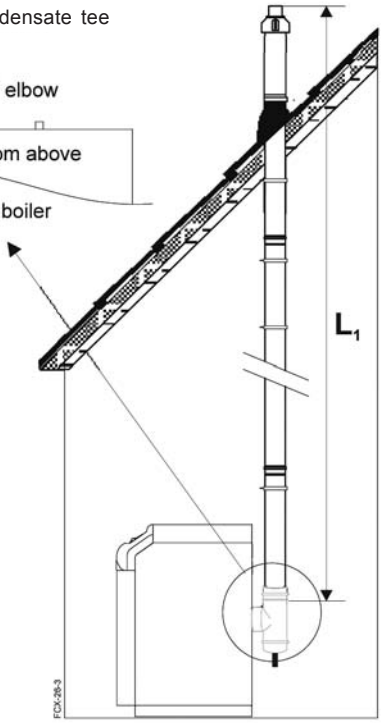
max L = L1 + 1.64 ft (0.5m) + L2 + 1.64 ft (0.5m) + L3 + 3.28 ft (1m) ≤ 16.4 ft (5m)

Fig. 19

To provide clearance around water connections a 45 degree elbow can be used.



IMPORTANT: Vertical lengths longer then 6 ft (2 meters) should use a concentric condensate Tee, #2255, instead of the concentric 90° elbow to eliminate condensate before draining back to the unit. Condensate tee must drain properly. It can be tied into condensate drain of the unit.



Options:
1 45 deg concentric elbow
Condensate Tee
Concentric extensions
1 concentric vertical terminal
1 sleeve tile roof flange
1 roof plate

max L = L1 + 1.64 ft (0.5 m) + 3.28 ft (1m) ≤ 16.4 ft (5m)

Note: Use fastening collars as needed. Support leg can consist of a fastening collar attached to a support such as a 2X6 joist.

4 - ALTERNATIVE FLUE CONNECTIONS

All combustion appliances consume a quantity of air proportional to their capacity. **If unit is installed using inside make up air, ventilation louvers must be installed in confined areas according to code.** To avoid corrosion, the combustion air must not contain any harmful agents. Halogenated hydrocarbons, containing combinations of chlorine or fluorine that are found in solvents, paints, glues, propellants, household cleaning products, etc.

The FCX boiler is a condensing boiler, which means that the combustion products from the appliance are discharged at low temperature (120° to 212°F) and saturated with humidity. Consequently, an airtight, corrosion-resistant flue system must be provided. It is possible to use an existing flue as long as it is lined. The lining must be inserted so that it does not retain any condensate and so that any condensates are transferred to a drain located at the foot of the flue or directly back to the boiler condensate trap. The material for the lining must be chosen specifically for use with a condensing boiler. Suitable materials certified for use in such combustion product systems are 904 L stainless steel, PPS polypropylene, and PVDF. Specialized companies market these systems and indicate the tubing assembly procedures to be applied.

Some flue components available from Monitor Products are as follows:

Flue Connection Adapter -

Adapter is a 4.33 to 3.15 inch (110 to 80 mm) off center reducer.

Fig. 22

Reference No 9103

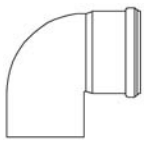
Rigid Polypropylene Tubes

Fig. 23

Reference No	Length inch (m)	Ø inch (mm)
2256	39.37 (1)	3.15 (80)
9049	39.37 (1)	4.33 (110)
9102	78.7 (2)	4.33 (110)

Polypropylene Elbows

Fig. 24



Reference No	Type Elbow	Ø inch (mm)
2259	90°	3.15 (80)
9048	90°	4.33 (110)

Leaf Guard

Fig. 25

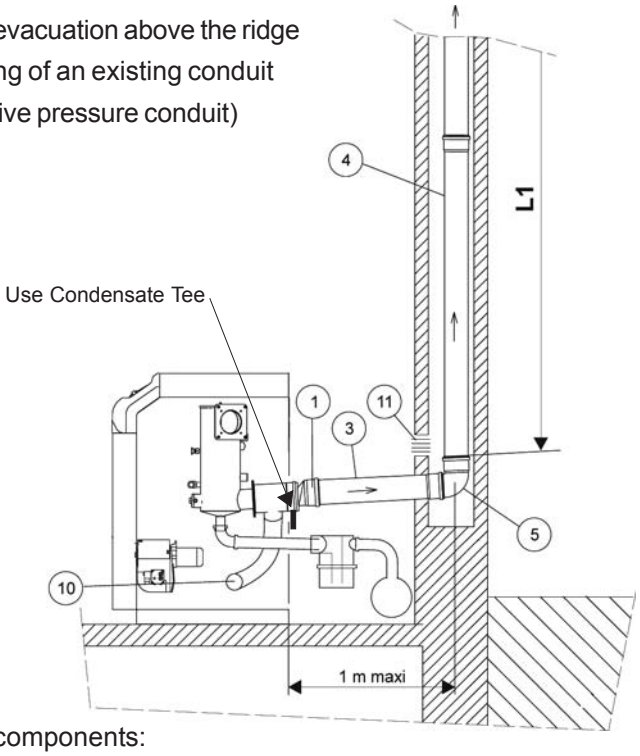
Reference No

2210 4.33" (110)

Should be used on the end of 110 mm piping run

Fig. 27

Roof evacuation above the ridge
(Tubing of an existing conduit
negative pressure conduit)



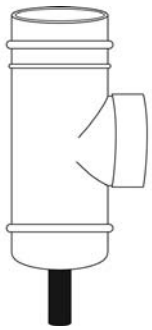
Flue components:
Flue connection kit with off-center reducer (item 1)
4.33 in (110mm) polypropylene tube, 1m long (item 3),
4.33 in (110mm) polypropylene tube, 3m long (item 4),
4.33 in (110mm) 90° polypropylene elbow, (item 5)
L1 ≤ 32.8 ft (10m)

Note:

- With this arrangement, the burner air inlet hose (10) is disconnected from the burner. The burner draws air directly into the unit from the premises in which the boiler is installed. Combustion air must be supplied to the premises with a vent (11) or alternative means. Condensate drains down the inside of the flue into the heat exchanger and out the condensate drain tube.
- If you must deflect the flue system, use 45° degree elbows. Use 45 degree elbows instead of 90° to lessen flue restrictions.

PPtl/PVC Condensate Tee-Joint
- joint fitting -

Fig. 28

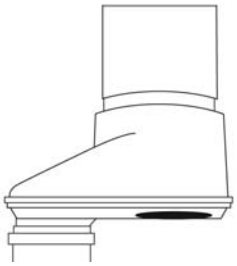


Reference No	Length	I.D.	O.D.
2255	10”	3.15”	4.92”

Length does not include drain spicket
Useful length after assy. 2”

PPtl/PVC Parallel Concentric Adapter (Male/Top)
- joint fitting -

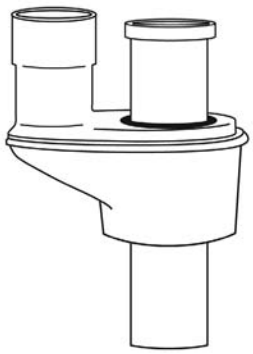
Fig. 29



Reference No	Length	I.D.	O.D.
2253	3.5”	3.15”	4.92”

PPtl/PVC Parallel Concentric Adapter (Female/Bottom)
- joint fitting -

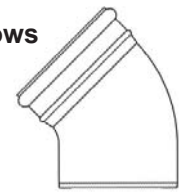
Fig. 30



Reference No	Length	I.D.	O.D.
2254	7”	3.15”	4.92”

45 degree Polypropylene Elbows

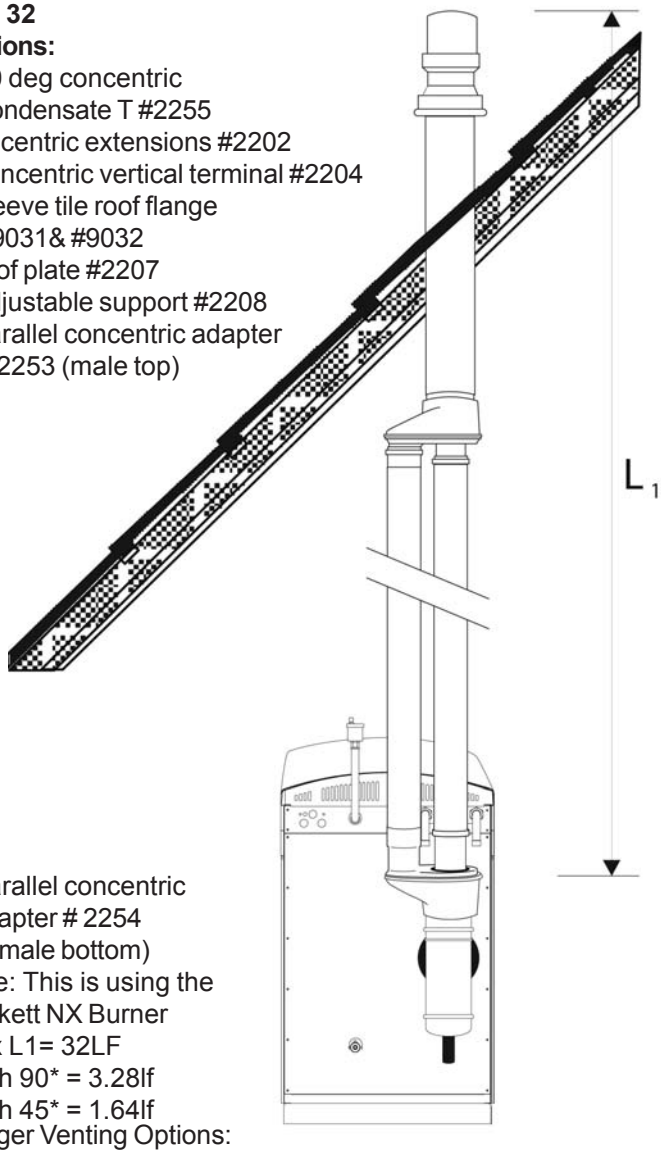
Fig. 31



Reference No	Type Elbow	Diameter
2258	45 degree	3.15”/80mm
2260	45 degree	4.33”/110mm

Typical Installation examples

Fig. 32
Options:
1 90 deg concentric
condensate T #2255
Concentric extensions #2202
1 concentric vertical terminal #2204
1 sleeve tile roof flange
#9031& #9032
1 roof plate #2207
1 adjustable support #2208
1 parallel concentric adapter
2253 (male top)



1 parallel concentric
adapter # 2254
(female bottom)
Note: This is using the
Beckett NX Burner
Max L1= 32LF
Each 90* = 3.28lf
Each 45* = 1.64lf
Longer Venting Options:
Longer exhaust lengths can be achieved by using a Beckett NX burner specifically modified and set up for use with the FCX. When using the Beckett NX burner the maximum unrestricted horizontal or vertical flue length shall be no more then 36 feet if using an 80mm parallel piping system with PPTL/PVC parallel concentric adapters on each end, or no more then 30 feet if using concentric PPTL/PVC end to end. The subtraction of 3.28 feet for 90 degree elbows and 1.6 feet for 45 degree elbows still applies and must be taken into account when figuring what the overall length is. It is recommended that the Heatwise burner be used on overall lengths of less then 16.4 feet and the Beckett be used on lengths of 15 to a maximum of 36 feet.

The Beckett NX burner adapted for use on the FCX must have the following specifications:
The oil line heater is standard with the burner.
The oil pressure is set to (150-155) PSI.
The oil nozzle used is a Danfoss .5-60 degree-AH.

NOTE: Do not use any larger size or supply nozzle with higher pressure

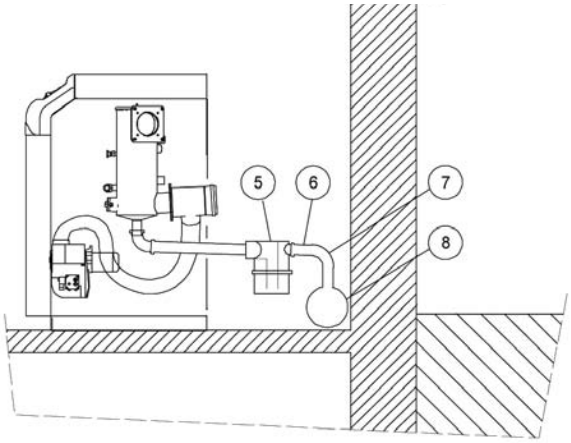
Combustion readings should be CO 11 - 12.5, smoke 0 - .5

5 - CONDENSATE DRAIN CONNECTION

Connection of the condensate drain piping system is to the condensate drain tube in the rear of the unit beneath the flue/combustion air separator tube assembly. The condensate drain tube provided in the unit is 1-19/32 inches (40 mm) outside diameter over which standard 1-1/2 inch trade size schedule 40 PVC pipe can be connected to begin the rest of the drain system. A trap must be provided to prevent leakage of combustion products into the drain. The drain system must pitch downward towards the sewer.

Note: The condensate will not likely require any specific water treatment because of condensate dilution by normal wastewater use. If, however, local regulations require wastewater to have a neutral pH condensate treatment tank can be installed between the trap and the sewer. PH level must be neutralized before entering a septic tank or cesspool.

Fig. 33



NOTE: Make the trap accessible and removable for cleaning and do not down size the condensate drain tube until after the trap, if necessary. If using a condensate pump choose a pump that can hold up to the corrosive effects of the condensate.

6 - WATER CIRCUIT CONNECTIONS

Water circuit connections are made in the back of the unit utilizing the four 1" male pipe thread couplings provided or using other adapters provided. The FCX can be connected to various comfort heating water systems as well as to a domestic hot water heating system if desired, observing that:

- •Water circulating pumps provided in the various circuits must be large enough for each circuit including the pressure drop of the boiler/condenser in the unit. For optimum sound level and power consumption, set the circulator to the speed that is appropriate for the installation flow rate and pressure drop.
- • Isolation valves may be used in the various circuits to facilitate boiler maintenance without having to completely drain each circuit. NEVER place an isolation valve between a pressure relief device and a water tank.
- • The water pressure gauge (not supplied) has to be fitted outside the unit.

The FCX comes equipped with the following standard equipment:

1) 8L expansion Tank (Approx. 2.11 US Gallon with acceptance value of approx. 0.9 gallons) Please refer to expansion tank manufacturers tables to determine tanks that meet your systems requirements. Some radiant systems may require special tanks to meet tubing oxygen requirements.

2) Grundfos UPS1542 Circulator. (see Fig. 35 on page 11 for pump capacities.) Additional pumps or a primary secondary system may need to be set up to meet individual system requirements

3) Safety relief valve. Must be piped away from boiler as per code using rigid pipe that is the same diameter of the relief valve outlet approved for the temperature of the system. Discharge pipe must not cause a hazard or a potential cause of damage to equipmernt.

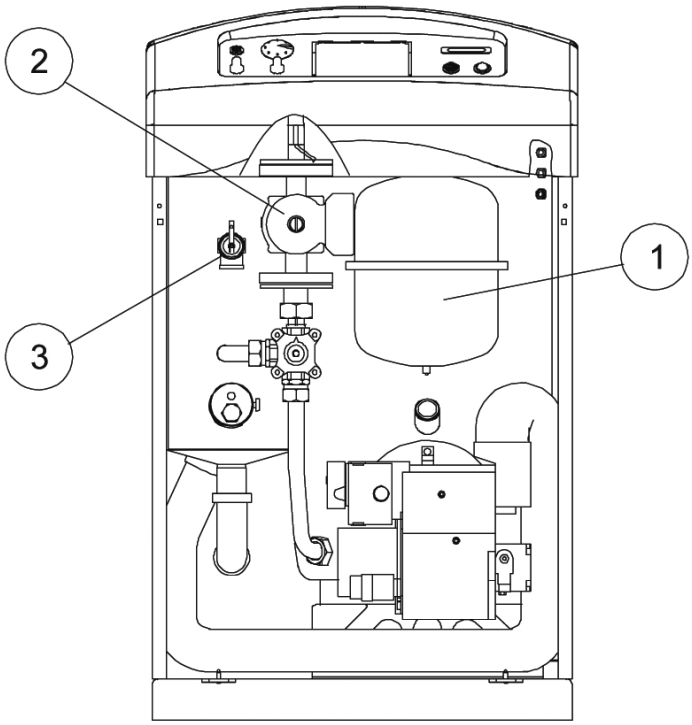
CAUTION:

If the pressure relief valve is not piped down and it opens, damage can occur to the burner.

Fig. 34

1. expansion tank
2. circulating pump
3. safety pressure relief valve

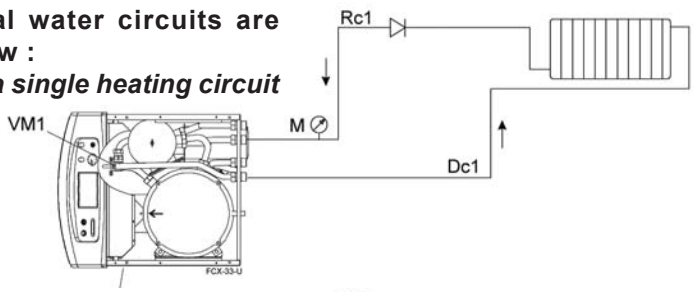
Note: Installed expansion tank is good for up to 25 gallons of system water. An additional expansion tank is required for more than 25 gallons. Size accordingly.



Various typical water circuits are illustrated below :

Connection to a single heating circuit

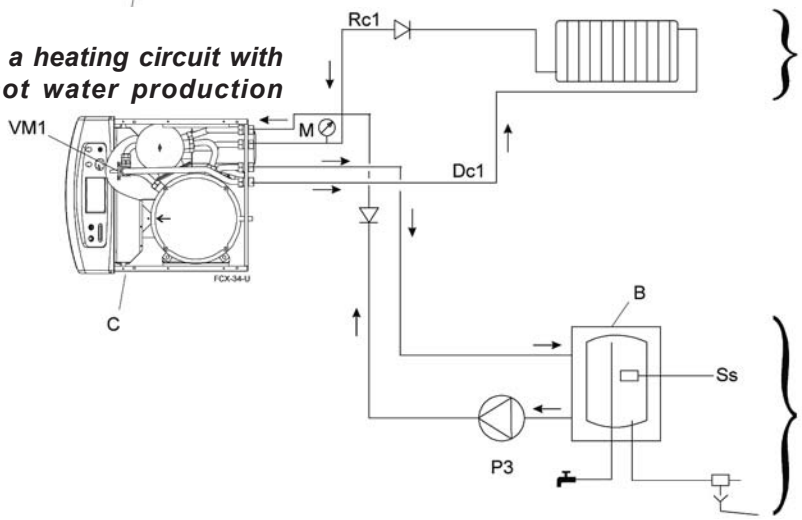
Fig. 35



C1 *C Boiler*
M Pressure gauge
C1 = Radiator circuit, Baseboards, Radiant Panels or Fancoils
VM1 1st circuit mixer valve
Dc1 1st circuit heating outlet
Rc1 1st circuit heating return

Connection to a heating circuit with a domestic hot water production system

Fig. 36

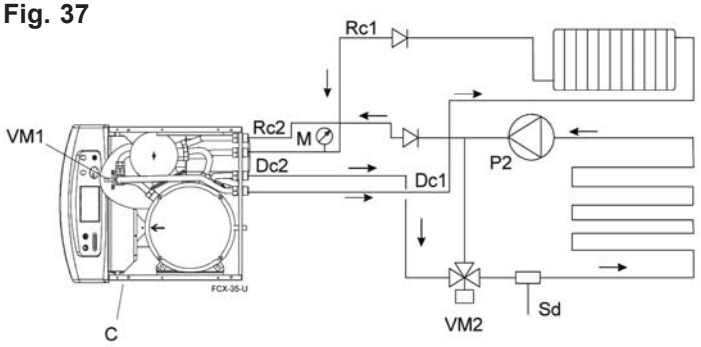


C1 *C Boiler*
M Pressure gauge
C1 = Radiator circuit, Baseboards, Radiant Panels or Fancoils
VM1 1st circuit mixer valve
Dc1 1st circuit heating outlet
Rc1 1st circuit heating return

C3 = Domestic hot water preparation circuit
P3 Domestic hot water pump
C3 *B Domestic hot water production system*
Ss Domestic hot water sensor

Connection to a double heating circuit

Fig. 37

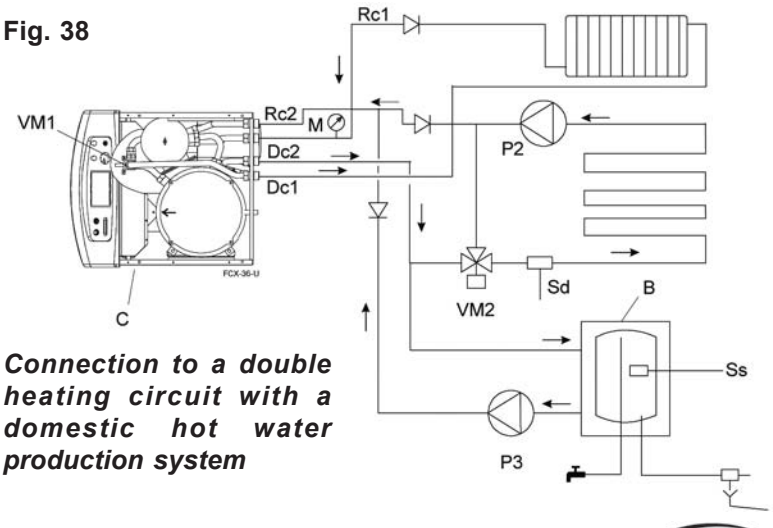


C Boiler
M Pressure gauge
Low Temp
C1 = Radiator circuit
C1 *VM1 1st circuit mixer valve*
Dc1 1st circuit heating output
Rc1 1st circuit heating return

C2 = Underfloor heating circuit
C2 *P2 2nd circuit heating circulator*
VM2 2nd circuit mixer valve
Dc2 2nd circuit heating output
Rc2 2nd circuit heating return
Sd Heating output sensor

Note: If the radiator circuit is high temperature baseboard then the connections at the boiler should be reversed with the baseboard loop using the DC2 circuit and circulator and the underfloor loop using the DC1 circuit which eliminates the need for VM2 since DC1 has one built in. This applies to figs 37 and 38.

Fig. 38



Connection to a double heating circuit with a domestic hot water production system

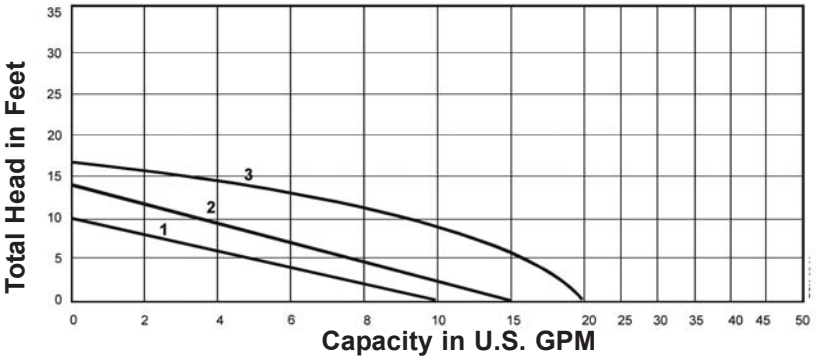
C Boiler
M Pressure gauge
C1 ***C1 = Radiator circuit***
VM1 1st circuit mixer valve
Dc1 1st circuit heating output
Rc1 1st circuit heating return

C2 = Underfloor heating circuit
C2 *P2 2nd circuit heating circulator*
VM2 2nd circuit mixer valve
Dc2 2nd circuit heating output
Rc2 2nd circuit heating return
Sd Heating output sensor

C3 = Domestic hot water production circuit
C3 *P3 Domestic hot water pump*
B Domestic hot water production system
Ss Domestic hot water sensor

6.1 - CIRCULATING PUMP CHARACTERISTICS

Fig. 39



HP range 1/25, 1/12, 1/6
Fluid temp 230°F Maximum
50°F Minimum
Flow Range 10-46 GPM

7 - ELECTRICAL CONNECTIONS

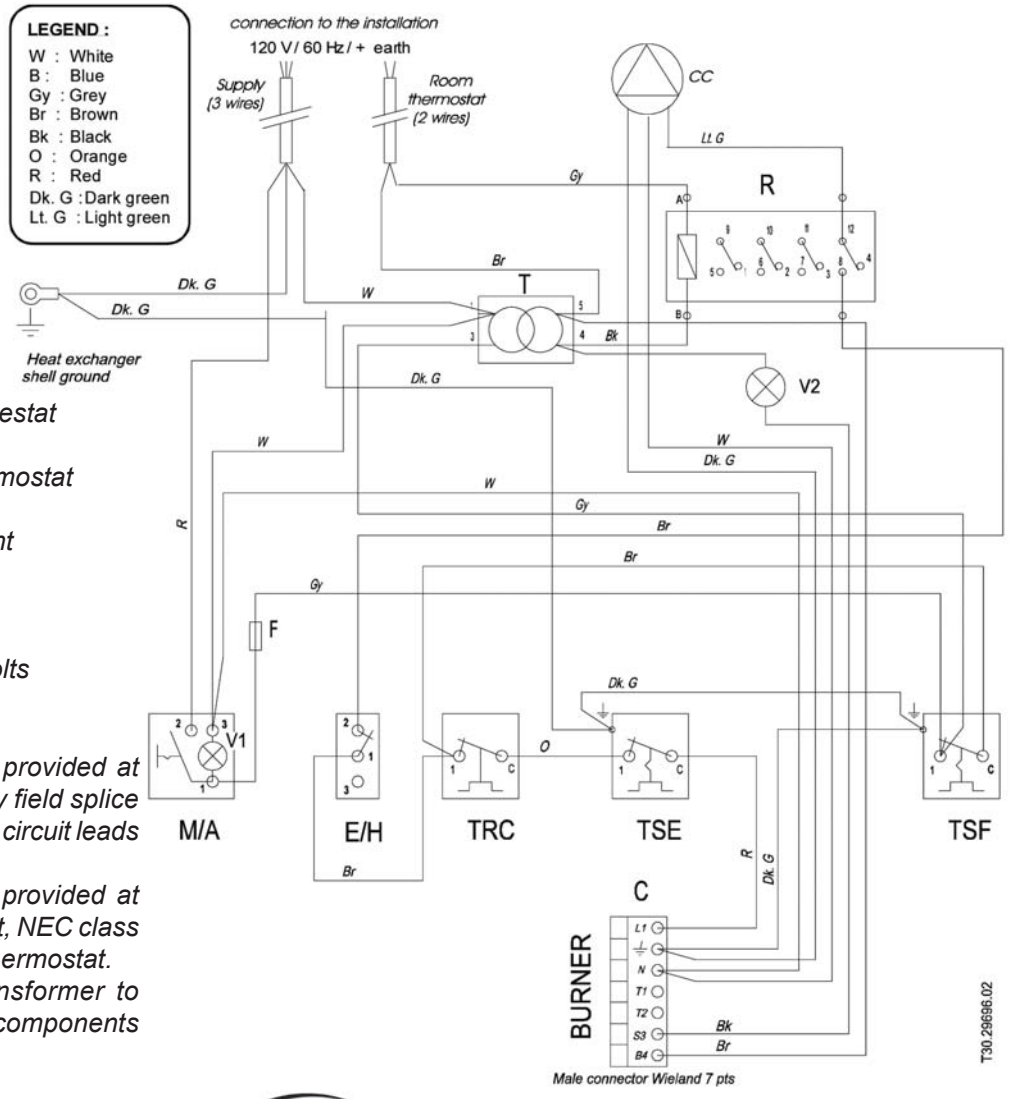
WARNING - ELECTRICAL SHOCK HAZARD! DISCONNECT THE POWER SUPPLY BEFORE ATTEMPTING ELECTRICAL INSTALLATION OF THE UNIT.

Electrical power and control connections are made to pigtail leads that exit through holes in the right rear of the unit (facing the front of the unit).

The power connections must be made in a Listed junction box that is not provided with the unit. All wiring should conform to the National Electrical Code and any applicable local codes and standards. To minimize the likelihood of a heating system shutdown caused by an unrelated electrical circuit fault, the unit and any related electrical components should be connected to a separate branch circuit specifically dedicated for that purpose.

The control circuit connections can be in-air splices made to pigtail leads provided. Control circuit connections are NEC Class 2, intended for connection to a typical room thermostat.

Fig. 40



LEGEND

L: Phase
N: Neutral
M/A: On/Off switch
E/H: Summer/Winter switch
TSE: Overheat safety cutout aquestat
TRC: Adjustable thermostat
TSF: Flue gas safety cutout thermostat
V1: On light
V2: Burner safety shutdown light
C: Burner connector
F: Fuse (6,3 A)
R: Relay
T: Main transformer 120/24 volts
CC: Circulating pump

Notes:

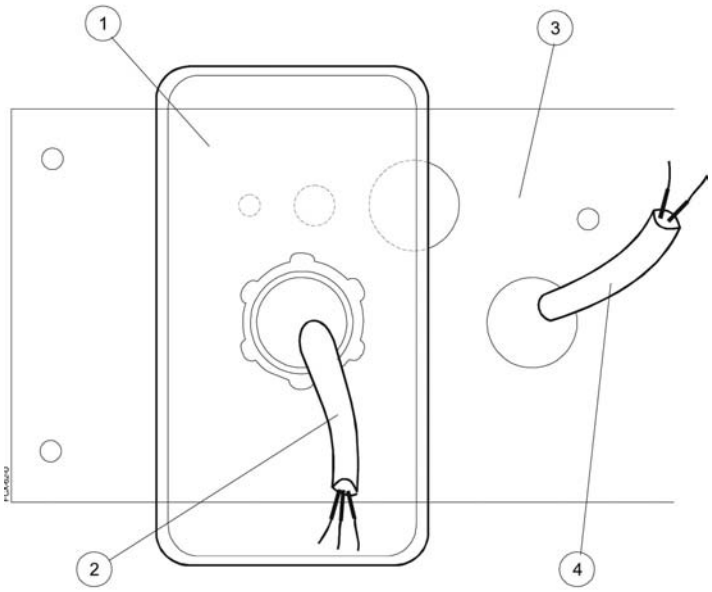
A. Electric power leads factory provided at right rear of unit. Permanently field splice 120-1-60 field provided power circuit leads in NEC junction box.

B. Control circuit leads factory provided at right rear of the unit are 24 volt, NEC class 2 for connection to a room thermostat.

C. Do not use the internal transformer to power any external system components such as a zone valve.

UPPER LEFT REAR CORNER OF UNIT (Facing rear of unit)

Fig. 41



1) Junction box
2) Main Power Pigtail Leads
3) Unit Upper Back Panel
4) Control circuit Pigtail Leads

There are three 7/8" holes in the right rear of the unit. Mount a Listed 2 x 4 inch, “HandiBox” type junction box vertically over the lower left hole (facing the rear of the unit) in such manner that the lower right hole is open. When installing the junction box, center the box vertically over the hole by using the center knockout in the box. Install a 1/2-inch trade size cable connector or insulating bushing through the hole in the unit and through the knockout in the box. Secure the box with screws as required.

Route the factory supplied main power pigtail leads through the connector into the junction box from inside the unit and secure the connector clamp on the wires. Install a second cable or conduit connector in another knockout in the box for the power wiring system as required. Connect the power wires and grounding conductors to the pigtail leads in the box using Listed wire connectors and install a cover.

Route the factory supplied control circuit pigtail leads through the lower right hole from inside the unit. Connect the room thermostat wires to the con-circuit pigtail leads using a suitable Class 2 wiring connection method.

8 - FUEL OIL SUPPLY CONNECTIONS

The buner supplied with the unit is connected to the boiler. Lines are terminated with 3/8-inch reverse flare fittings for connection of the supply from the fuel oil tank. When connecting the line, a 10-micron spinon type oil filter must be installed in the oil supply line to minimize burner contamination.

III. START UP AND OPERATION

1 - PRE-START FINAL SYSTEM CHECK

Before starting normal operation of the boiler and heating system, perform the following final installation procedures:

- Leak-check the flue/combustion air system to minimize the likelihood of leakage.
- Leak-check the entire water system, repairing any leaks that may be found.
- Fill the entire water system with water, treated as desired for the application, including anti-freeze solution if appropriate. Open any shut-off valves in the system
- Fill the condensate drain trap with water
- Leak-check the fuel oil supply system and open any fuel shut-off valves.
- Recheck the power and control circuit connections THEN replace all cabinet access panels
- Energize the electrical power circuit to the unit.

2 - START-UP AND OPERATION

After completing the pre-start final system checks, the system can be started and run through start-up checks and adjustments as required.

1) Start/Stop Switch

2) Summer/Winter Switch
Circulator control inside the boiler

3) Boiler Temperature Control Thermostat
Boiler Temperature adjusted between 140 - 176 deg. F (60 - 80C)

4) Water Outlet Temperature Thermometer (Circuit 1)

5) Water Overheating Safety Thermostat
Burner Cutout

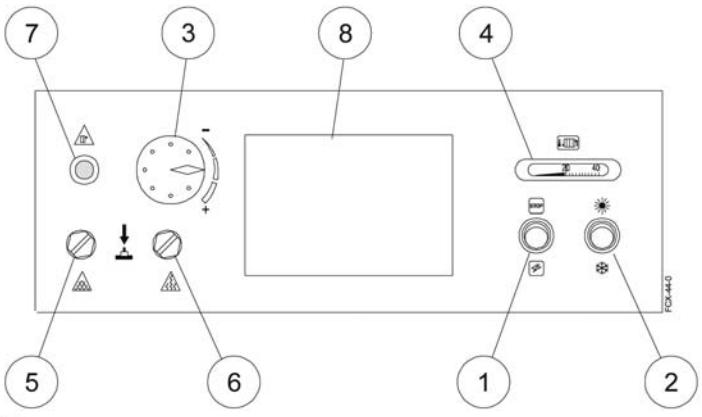
6) Combustion Product Overheating Safety Thermostat
Boiler Shutdown

7) Burner Safety Device Light

8) Slot for Additional Control

Note: overheat thermostats may not physically pop up if tripped. Press the red center with a pointy object such as a pen and listen for an audible click.

Fig. 42



To start the boiler, first make sure the room thermostat is set at a high enough temperature to be closed so that any external water circulating pumps are running. Turn the boiler On-off switch to the “ON” position, and set the Boiler Temperature Control thermostat to its maximum temperature setting.

Turn the Summer-winter switch to “WINTER”. This will start the internal circulating pump. After the start time delay set on the oil burner (for the oil heater) has expired, the burner will start. Reduce the Boiler Temperature Control thermostat setting to make sure the boiler stops properly when controlled by that thermostat. Increase the room temperature thermostat setting to make sure that the circulating pump(s) stop properly.

3 - ADJUSTING THE OIL BURNER

While the oil burner leaves the factory set at the recommended settings, safe operation requires that the burner be checked and adjusted by a qualified, licensed if required, oil service technician using properly calibrated combustion test equipment, vacuum and pressure gages. Run the unit long enough at the burner maximum firing rate to make sure the burner has reached a stable maximum operating temperature. THEN, check the burner and adjust as follows:

Check to determine that the smoke spot number does not exceed 0.5 with a Bacharach or equipment tester control. Adjust the burner as required to be below this maximum.

Check to determine that the CO2 rate is from 11.5 - 13 percent and that there is no CO production. Adjust the burner as required to achieve this operating characteristic.

Measure the temperature of the flue gas exiting the unit to determine that it does not exceed 250 degrees F (120 C).

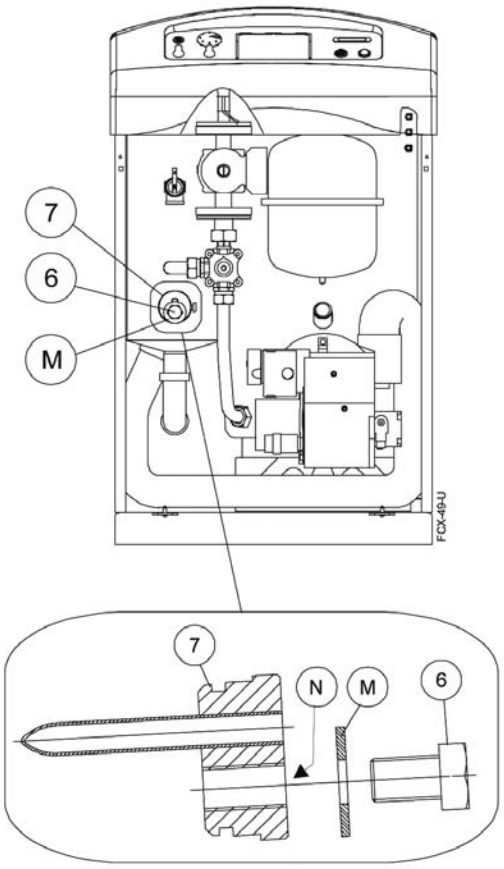
Combustion inspection can be carried out on the unit through the hole (item N) provided in the inspection port (item 7). Be sure to replace the washer (item M) and the test point screw (item 6) properly after inspection.

Factory Settings for the Burner

Burner		**PIONEER - 1**
Oil pump pressure	psig	165-170
Nozzle		0.50 80° AS
Firing Head Adjustment		1.75
Air shutter Adjustment		6-8

For more detailed burner instructions refer to the Heatwise or the Beckett NX burner manual

Fig. **43**



4 - CHECKING THE SAFETY DEVICES

At the time of start-up, check the safety and control devices as follows:

Thermostats:

- Check to see that the thermostat bulbs are correctly positioned in their housings. This is essential to provide temperature sensing to facilitate burner shutdown in the event of overheating,

Flame monitoring:

- Check to make sure that the burner shuts down properly upon the deactivation or disconnection of the flame monitoring device or interruption of the flow of fuel,

Safety Pressure Relief valve:

- Check the safety pressure relief valve in the heating circuit for proper operation.

IV. MAINTENANCE

It is recommend that the boiler and flue/combustion air system be inspected and maintained annually by a qualified technician.

DISCONNECT ALL ELECTRICAL CIRCUITS BEFORE SERVICING THE UNIT CLOSE ANY ISOLATION VALVES THAT MAY BE IN THE WATER SYSTEM SHUT OFF THE FUEL OIL SUPPLY IF SERVICING THE BURNER

To gain access to the inside of the unit, first remove the control panel cover by grasping it on both sides and pulling directly outward towards you and up. Remove any front panel screw(s) and remove the front panel by pulling the top out towards you and then lifting up to free the bottom from the mounting pins. Remove the top cover by simply pulling it up. Remove the electrical terminal block protection plate by removing the screws in the rear and lifting. Remove the control panel cover screws and remove the control panel cover. The water can be bled from the unit by opening the drain-cock on the base of the boiler shell using the valve caps as the valve handle.

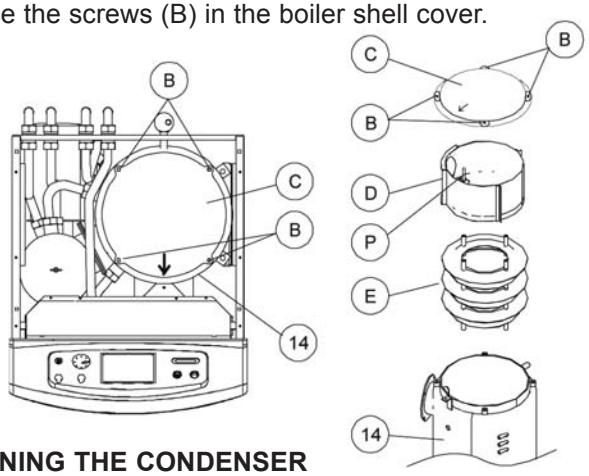
1 - CLEANING THE BOILER SHELL

- Remove the screws (B) from the cast-iron boiler shell cover (C)
- Remove the flue outlet baffle (D)

Note: If vacuuming be careful not to damage insulator, check for deterrieration and replace if needed

- Remove the combustion baffles (E) clean, inspect and replace if deteriorated
- Clean the inner walls of the boiler shell, remove any debrie that may have fallen to the bottom of the chamber
- Reassemble all the parts the way they were removed, positioning the flue outlet (D) with its centering screw (P) towards the front of the boiler, then positioning the boiler shell cover (C) arrow marker opposite the centering screw (P)
- Replace the screws (B) in the boiler shell cover.

Fig. 44

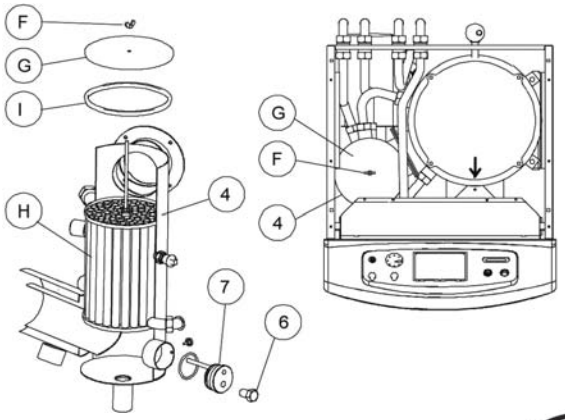


2 - CLEANING THE CONDENSER

- Remove the wing nut (F) from the condenser top cover (G) and remove the cover
- Remove the condenser access plug (7)
- Clean the condenser tubes (H) using a bottle brush or similar tool
- Pour tap water through the condenser tubs to ensure combustion products can flow freely
- Visually inspect vent house tee at condenser outlet for integrity
- Replace the condenser access plug (7) and the top cover (G), making sure that the seal (I) is properly positioned when replacing the cover
- Make sure that the seal (I) on the cover and the access plug is in good condition.
- Inspect and clean the condensate trap(external)

NOTE: If after cleaning the condenser, the temperature of the flue gasses still exceeds 250°F, perform a burner check.

Fig. 41



3 - BURNER MAINTENANCE

Once adjusted properly, regular maintenance of the oil burner is not generally required. A routine examination of the burner should include examination of the burner fan and housing for dirt and the spark electrodes for proper clearances. The nozzle should be replaced after every 1000 gallons of fuel used, due to wear. Replace the fuel filter if necessary. Cleaning and adjustment is always appropriate during periodic inspection. If burner firing rate adjustment is required, follow instructions in “Adjusting the Oil Burner”.

ALWAYS CHECK FOR AND CORRECT ANY FUEL LEAKS

4 - ADDITIONAL COMPONENT MAINTENANCE

Check to see that the safety and regulation devices (safety relief valve, air bleed valve, control box components, etc.) are operating properly. Check that the condensate drain trap is clean. If necessary, remove the bottom of the trap, clean it, replace it and then refill the trap it with water. Also check to see that neither the installation nor the boiler have any water or fuel leaks (leaks may produce a risk for safety and shorten the life-span). If it becomes frequently necessary to add water to maintain pressure in the installation, even though no leaks have been discovered, perform an expansion tank check or if the pressure releif valve drips or pops occasionally.

5 - EXPANSION TANK PRE-INFLATION PRESSURE CHECK

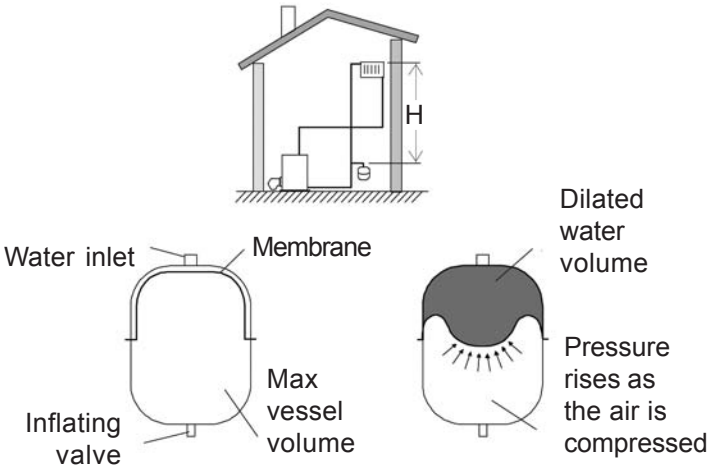
Reduce the pressure in the heating installation by opening the drain cock or the safety valve until the pressure gauge reading is less than 7 - 8 psig (0.5 bar)

Check the pressure in the expansion tank and if necessary bring it back up to pressure. Replace the tank if the membrane is punctured (water present in the inflating valve)

To optimize the efficiency of the expansion tank:

- Adjust its pre-inflation pressure in line with the installation. The pressure must correspond to the static height of the installation (H), the height between the highest point of the installation and the expansion tank, as expressed in psi where 2.41Ft in height = 1 psi
- Adjust the filling pressure of the installation to a value greater than 3 psi (0.2 bar) above the pre-inflation pressure of the tank after totally bleeding any air from the installation.

Fig. 42



6 - COMBUSTION PRODUCT FLUE

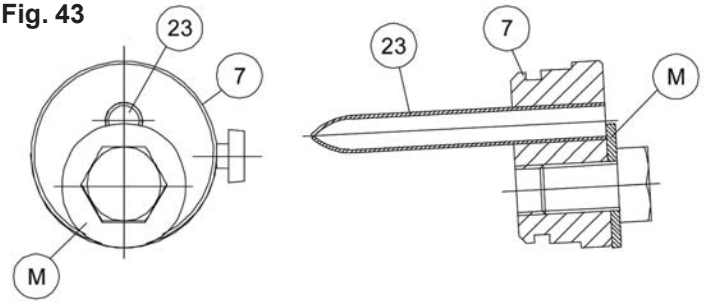
Examine the flue/combustion air system for leaks and obstructions. Leaks can generally be detected by the appearance of condensate stains on the outside of the pipes. Replace any damaged seals if necessary. The flue/combustion air pipe can be cleaned with running water, if necessary, providing that the water flow is not too great to be drained through the condensate drain system. Leave the excess water in the condensate trap when cleaning is completed.

7 - CHANGING A THERMOSTAT OR THE THERMOMETER

Replacement of the thermostats or the thermometer requires removal of the bulb from its location and the control from the control box.

- The bulb for the Boiler Temperature Thermometer is located on the first circuit heating output tube. Remove the bulb from the tube, remove the thermometer mounting screws in the control box and remove the thermometer. Replace the thermometer with another, routing the bulb capillary the same way as the original, replacing the bulb on the tube properly and as securely as possible.
- The bulbs for the Boiler Temperature Control Thermostat and the Water Overheating Safety Thermostat are both located in pockets on the side of the boiler shell. To change either, remove the bulb from the pocket, remove the thermostat mounting screws in the control box and remove the thermostat. Replace the thermostat with another, routing the bulb capillary the same way as the original, replacing the bulb properly into the pocket as far as possible.
- The bulb for the Combustion Product Overheating Thermostat is located in a well provided in the condenser access plug/inspection port. Remove the combustion test point plug and washer from the inspection port to free the thermostat bulb, and remove the bulb from the well. Remove the thermostat mounting screws in the control box and remove the thermostat. Replace the thermostat with another, routing the bulb capillary the same way as the original and replacing the bulb properly into the well as far as possible. Replace the combustion test point plug and washer in the inspection port, securing the bulb in place.

Fig. 43



V. OPERATING FAULTS

During the course of seemingly normal operation, there may be operating faults experienced in the system. Some of the more common faults that may be encountered are:

BURNER FAULT SHUT-DOWN

The burner may shut down for any of several reasons, at which point the burner safety device light (red) on the control panel will be ON and the there will be a green fault indicator light lit on the oil burner. This may be caused by a loss of fuel oil (tank empty?), a fouled oil spray nozzle in the burner, or perhaps a fouled or faulty flame sensor. To attempt a restart after correcting any burner problem and the fuel supply is assured, push the reset button on the burner. The burner should restart after the preset time delay period expires.

OVERHEATING SAFETY THERMOSTAT SHUT-DOWN

Opening of either the Water Overheating Safety Thermostat or the Combustion Product Overheating Thermostat will result in an oil burner shutdown. In either case, the burner safety device light (red) on the control panel WILL REMAIN OFF, and the green fault indicator light on the oil burner will REMAIN OFF. The only way to tell if either device has opened is to check electrically or check the position of the reset button, located under the screw cap over each device.

- The Water Overheating Safety Thermostat may open if the water temperature exceeds 230°F (110°C) in the boiler. This can occur if the water temperature control is near its maximum setting, and or the three way valve is drawing its majority of water out of the secondary condenser. This can be prevented if the water temperature control is turned to a lower temperature, the three way valve is readjusted clockwise or the burner is rewired for a post purge. A faulty water temperature control can also cause a shutdown.

After correcting any fault, either thermostat must be manually reset by removing the screw cap on top and depressing the reset button.

Note: Actuation of the reset button may not be physically visible. If tripped a button will have an audible click when trying to reset.

INLINE OIL HEATER OR THERMOSTAT SHUTDOWN

The heatwise Pioneer Burner is equipped with an inline oil heater, this heats up and closes a thermostat for the burner to get power. If the heater or the thermostat malfunction (one complete unit) it will not allow the burner to start. If the fuel is extremely cold the inline heater may not be able to keep up and may momentarily shut off the burner until the oil gets back to a temperature of 125-130° F.

PHONE (732) 329-0900 • FAX (732) 329-0904

MPI offers technical support to qualified licensed heating contractors during normal business hours. (Monday-Friday 8:30 A.M. to 4:30 P.M. Eastern Time)
To help us serve you properly our technicians will require the following information:

Nozzle manufacturer, G.P.H., angle and pattern.
Pump pressure in PSI Pump vacuum in inchs of Hg

Oil delivery system: 1 pipe or 2 pipe.
Oil Tank: Indoor, outdoor. Above or below pump level.
Smoke reading CO reading in PPM CO 2 reading in %
Flue Outlet Temperature °F
Water Outlet temperature °F Water Return temperature °F

System load: Radiant, high temperature, DHW. Total BTU requirement

VI - MONITOR PRODUCTS, INC. ("MPI") LIMITED WARRANTIES

First year - MPI warrants that its FCX boilers are free from defects in material and workmanship under normal use and service for 1 year from the date of purchase with an additional period of up to 3 months if the unit is not installed at time of purchase.

First through tenth year - MPI warrants that the primary heat exchanger is free from defects in material and workmanship for 10 years from date of purchase.

Parts covered: All product or parts of the FCX manufactured by or for MPI except as provided for herein.

Parts not covered: The following parts are not covered by this warranty: venting kits, fuses, and all parts subject to physical, chemical or freeze damage. The FCX is designed to be fueled with clean, dry, #2 grade or better, home-heating oil. Use of substandard oil or other fuels will void this warranty. Nozzle failure due to water or contaminants in fuel will not be covered.

This warranty does not cover physical, chemical or freeze damage or use of antifreeze other than that approved by MPI. Water of strong acidic or alkaline composition can damage the heat exchanger assembly and will void this warranty. In addition, the ingestion of chlorine or chlorine contaminating fumes or vapors, fluorine or florine containing fumes or vapors, fumes from animal confinement, fumes from beauty parlors, fumes from muriatic acid or other compounds used for cement cleaning, fumes from mechanical parts' cleaning, fumes from dry-cleaning establishments, fumes from laundry, fumes from manufacturing or industrial activity into the combustion-air to the boiler can damage the heat exchanger assembly and will void this warranty of the heat exchanger assembly.

STANDARD PROVISIONS, TERMS AND CONDITIONS THAT ARE COMMON TO ALL MPI INDIVIDUAL PRODUCT WARRANTIES:

These warranties are subject to the condition that the MPI product(s) must have been installed in accordance with manufacturer's instructions. These warranties extend only to the first retail purchaser of the products and only to a product that has not been moved from its original installation site. These warranties do not apply to commercial applications.

In addition to each product warranty listed, MPI **warranties do not cover**:

1) *Components that are part of the heating system but were not furnished by MPI as part of the heating system.*
2) *The workmanship of any installer of MPI's product(s). In addition, this warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.*
3) *Any costs for labor for removal and reinstallation of the alleged defective part, the cost of shipping or transportation to MPI and back to the consumer, if necessary, and any other materials necessary to perform the exchange.*
4) *Replacement parts beyond the balance of the original warranty period.*

REMEDY: If within the applicable warranty period, any pro-duct(s) or part(s) included in this warranty proves to be defective in material and/or workmanship, then MPI shall repair or replace, at its option, the defective product(s) or part(s) and return it to the consumer.

PROCEDURE FOR OBTAINING PERFORMANCE UNDER THIS WARRANTY: In order to obtain performance under this warranty, the original purchaser must promptly (in no event later than thirty (30) days after discovery of the defect) see to the return of the product(s) or part(s) in question, accompanied by a properly filled out MPI warranty claim form (Available from MPI by mail or phone). Any claim made under this warranty must be accompanied by proof of original purchase date, sales invoice or cancelled check showing the serial number as satisfactory evidence. Any replacements are made subject to validation by MPI of in-warranty coverage. An item to be replaced must be made available in exchange for the replacement.

SOLE REMEDY: The remedy and liability for any breach of warranty, express or implied, set forth herein is the sole and exclusive remedy and the limit of liability for any such breach.

EXCLUSIONS AND IMPLIED WARRANTIES: This warranty does not extend to any defect due to the negligence of others. Failure to install, operate or maintain the product(s) in accordance with the installation, operation and maintenance instructions furnished with each new product, unreasonable use, accidents, acts of god, fire, snow, floods, lightning, alteration, ordinary wear and tear, or the use of unauthorized or non-standard parts.

ALL IMPLIED WARRANTIES, IF ANY, ARISING UNDER LAW IN CONNECTION WITH THE SALES BY MPI OF ANY PRODUCT(S) ARE LIMITED IN EXTENT AND DURATION TO THE DURATION OF THIS WRITTEN WARRANTY. THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OTHER THAN AS EXPRESSLY STATED HEREIN. MPI SHALL NOT BE RESPONSIBLE FOR ANY INCIDENTAL, INDIRECT, PUNITIVE, OR CONSEQUENTIAL DAMAGES WHETHER AS A RESULT OF BREACH OF WARRANTY, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE.

Note: Some jurisdictions do not allow: (a) limitations on how long an implied warranty lasts; or (b) the exclusion or limitation of incidental, indirect, punitive or consequential damages, so the above limitations or exclusions may not apply to you.

NO VARIATION OF TERMS: the parties intend that this warranty be the exclusive and final expression of their agreement.

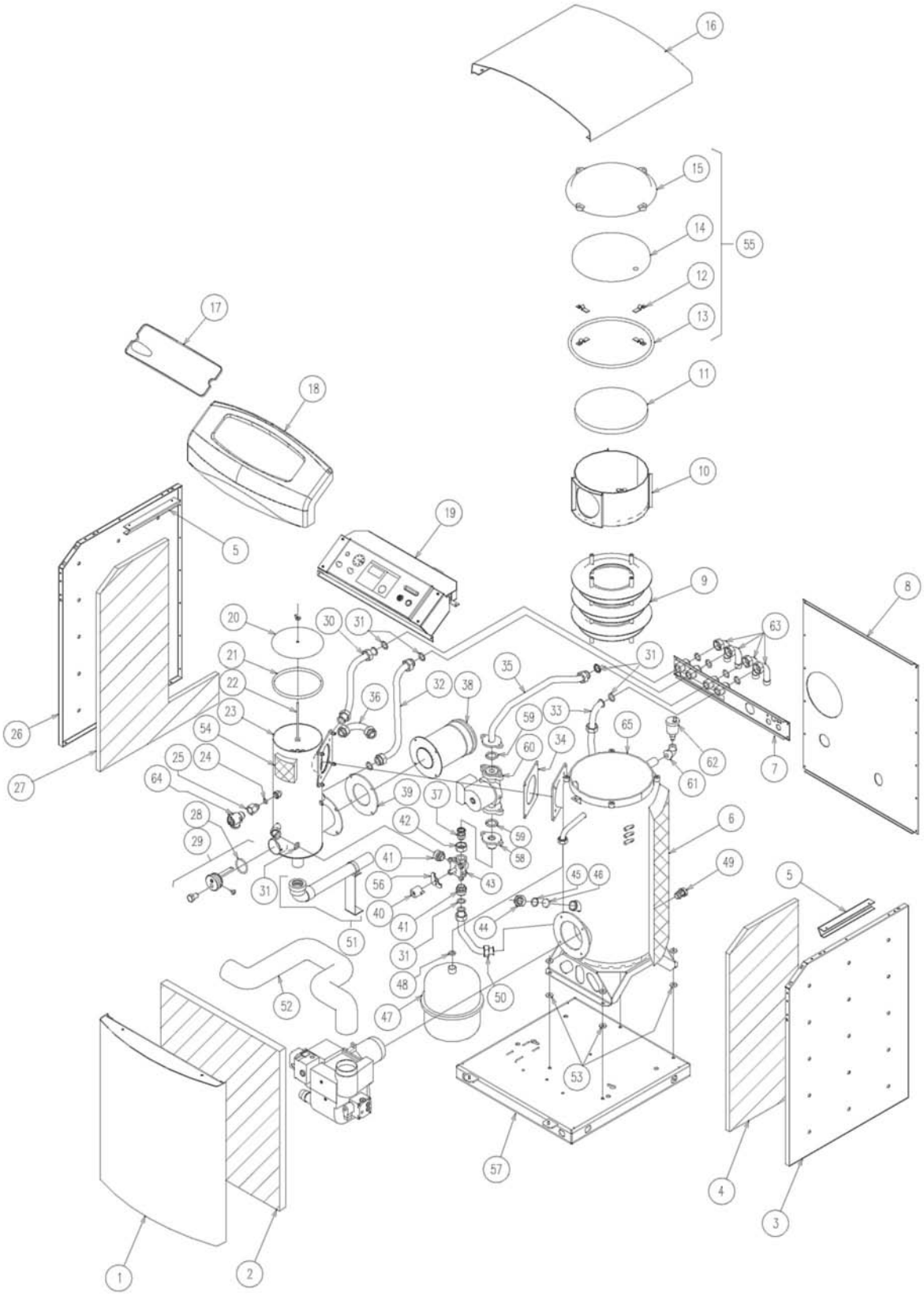
No person has the authority to orally, in writing or in any other way vary the terms, conditions or exclusions of this warranty, or to make any express warranties other than those contained herein.

LEGAL RIGHTS: This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

As part of its policy of continuous product improvement, Monitor Products, Inc. reserves the right to make changes without notice

 COPYRIGHT © 2007

V I I - P A R T S B R E A K D O W N

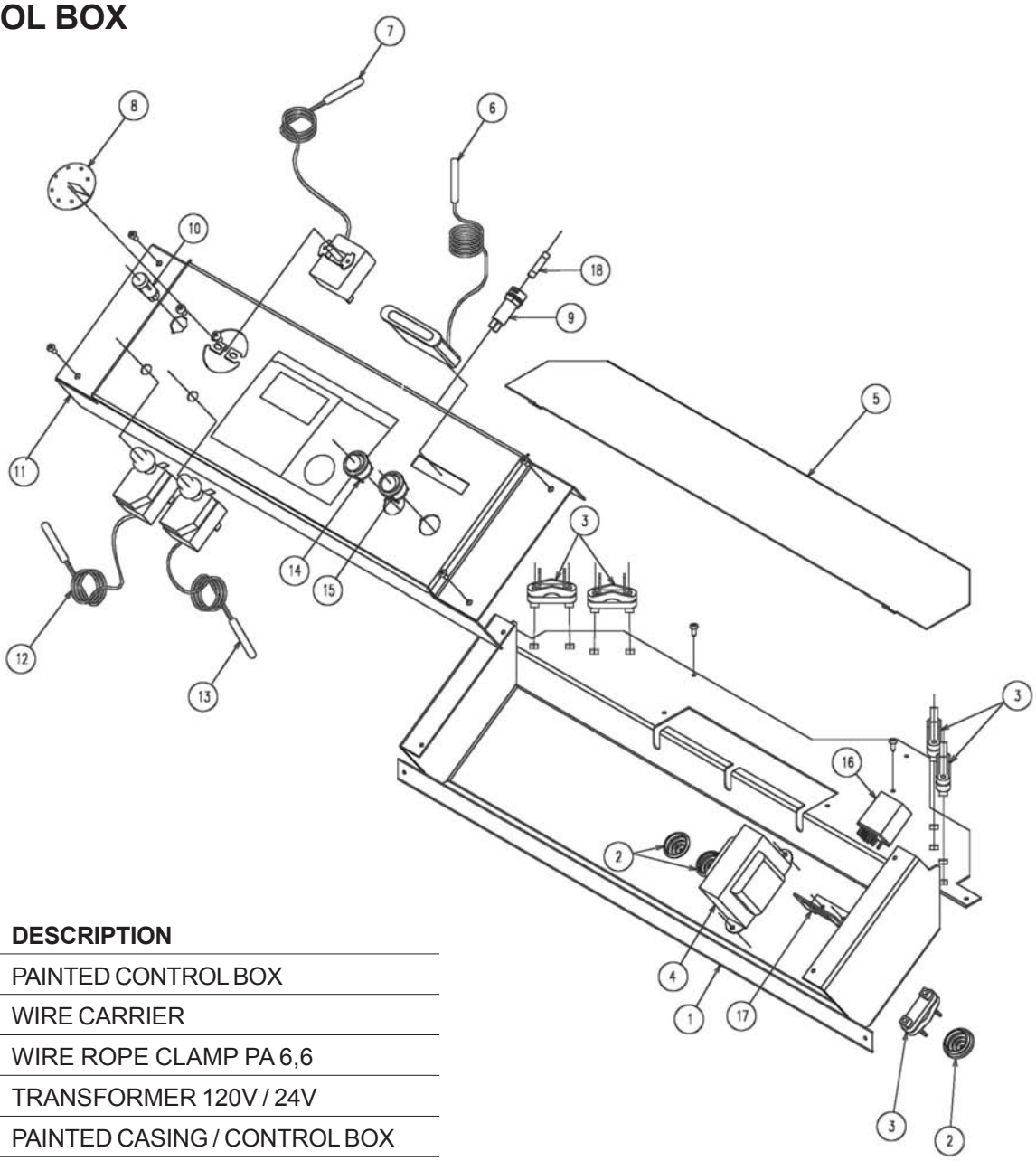


FCX

	MPI PARTS #	DESCRIPTION
1	2300	FRONT COVER EQUIPPED
2	2301	INSULATION FRONT COVER
3	2302	RIGHT HAND SIDE COVER EQUIPPED
4	2303	INSULATION RIGHT HAND SIDE
5	2367	FOLDED NECK
6	2368	INSULATION FOR BOILER SHELL
7	2304	PAINTED CONNECTING FLANGE
8	2305	PAINTED BACK COVER
9	2362	SWIRLERS
10	2369	COMBUSTION CHAMBER
11	2366	MINERAL WOOL 90 KG DISK DIAMETER 262X20
12	2370	FASTENING ANGLE
13	2371	GLASS FIBER INSULATION LG 950-CAST PLATE
14	2306	CERAMIC FIBER INSULATION D.280X20 (300°C)
15	2372	BOILER SHELL COVER- CAST IRON
16	2307	TOP COVER EQUIPPED
17	2308	PROTECTING COVER
18	2309	ABS PROTECTION
19	2359	ELECTR. CONTROL BOX + CABLE
20	2373	CONDENSER COVER
21	2311	TOP RING CONDENSER
22	2312	FASTENING FLANGE FOR CONDENSER COVER
23	2364	CONDENSER (secondary heat exchanger)
24	2313	SEAL AFM34 D. 18,6 X 12 2 MM THICKNESS
25	2360	BRASS CONNECTION M1/2 - F3/4 NPT
26	2314	LEFT HAND SIDE COVER EQUIPPED
27	2315	INSULATION LEFT HAND SIDE
28	2316	NITRILE O'RING D. 50X4 70 SHORE
29	2376	CLEANING CAP FOR CONDENSER EQUIPPED
30	2377S	HEATING RETURN 2. CIRCUIT SHORT
31	2317	SEALING AFM34D 30X21X3
32	2377L	HEATING RETURN 1. CIRCUIT LONG
33	2378	HEATING FLOW 2. CIRCUIT
34	2318	SEALING ON CONDENSER FLANGE
35	2379	HEATING FLOW
36	2380	BOILER SHELL RETURN
37	2381	MALE CONNECTION 3/4
38	2363	ADAPTOR FOR VENTOUSE D.80-125
39	2319	SILICONE SEALING D.162X85X4
40	2320	BLACK HANDLE (FOR H3MG VALVE)
41	2321	REDUCED MESSING NIPPLE M1-M3/4
42	2322	NUT
43	2323	BRASS VALVE
44	2324	NUT FOR FLANGE 1" (FOR PIPE D.22,5)
45	2325	STAINLESS STEEL WASHER 30,4X25,5X0,3
46	2326	SIGHTGLASS PYREX D.30X5
47	9012	EXPANSION TANK, VESSEL 8L MALE 3/4
48	2327	SEALING AFM34 D 24X17X3
49	2328	DRAIN VALVE WITH CAP M 1/2 - M 3/4
50	2383	HEATING FLOW BEFORE 1. CIRCUIT
51	2329	CONDENSATE DISCHARGE
52	2330	AIR FLANGE D.80 LG1500
53	2331	MINERAL CARBOARD WASHER D. 25X8,5X3
54	2384	INSULATION CONDENSER FCX
55	2385	BOILER SHELL COVER EQUIPPED FOR FCX
56	2332	VALVE STOP
57	2386	BASE FOR FCX
58	2387	FLANGE
59	2333	SALMSON SEALING 1 1/2 DIA 44 X 32 X 3
60	2388	CIRCULATING PUMP GRUNDFOSS 115 UPS15.42 F-9H
61	2389	BEND 90° F3/4-F3/8
62	2334	AUTOMATIC DRAIN 3/8 WITH ISOLATING VALVE
63	2335	FLOW/ RETURN BEND F1-F22
64	2336	SAFETY VALVE 30 PSIG MAL/FEM. 3/4 NPT
65	2374	BOILER SHELL; EQUIPED
*	2337	SEAL VITON D.80
*	2338	FIXING PIECE FOR THE COVER (MALE)
*		BOLT (PVC)
*		BAFFLE PLATE F400-F E/FEA-FCX (250X200X1,5)
*		DISK FOR ISOLATION (KERLANE)

* NOT SHOWN ON THE DRAWING

FCX CONTROL BOX



	MPI PART #	DESCRIPTION
1	2340	PAINTED CONTROL BOX
2	2341	WIRE CARRIER
3	2343	WIRE ROPE CLAMP PA 6,6
4	2342	TRANSFORMER 120V / 24V
5	2344	PAINTED CASING / CONTROL BOX
6	2345	THERMOSTAT RECT HORIZ 69X14 LG CAPIL.1500 MM
7	2346	THERMOSTAT 50/70° C SINGLE CONTACT
8	2347	WATER TEMP. CONTROL KNOB
9	2357	FUSE HOLDER WICKMANN REF 19820+19835
10	2349	RED LIGHT 230V - 120) FLAT HEAD
11	2350	CONTROL PANEL + STICKER
12	2351	SAFETY THERMOSTAT 110 CAP 1,5M TG400
13	2352	SAFETY THERMOSTAT 120 CAP 1,5M TG400
14	2353	UNIPOLAR SWITCH D. 23 / GREEN LIGHT
15	2354	UNIPOLAR REVERSIBLE SWITCH D. 23 BLACK
16	2355	OMRON RELAY
17		UPPER FASTENER FOR THE RELAY
18	2356	FUSE 6.3AMP 5X20
*	2358	WIRING FOR FCX
*	2359	ELECTR. CONTROL BOX + CABLE

* NOT SHOWN ON THE DRAWING

VIII - HEAT WISE BURNER

Heat Wise, Inc.
1528 Rocky Point Road
Middle Island, NY 11953

LIMITED WARRANTIES FOR OIL AND GAS BURNERS, MADE BY HEAT WISE AND USED IN INSTALLATIONS

HEAT WISE, INC. ("Heat Wise") warrants to those who purchase its **Oil Burner Model**s for resale or for incorporation into a product of resale, that its burner is free from defects in material and workmanship under normal use and service for thirty-six (36) months from the date of manufacture. **ALL GAS BURNERS** manufactured by Heat Wise will be similarly warranted for thirty-six (36) months from the date of manufacture except where original manufacturer offers a greater warranty. (Reference #6 below). THESE LIMITED WARRANTIES DO NOT APPLY UNLESS THE BURNER COVERED BY IT IS **PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN,** WHO IS LICENSED WHERE STATE AND/OR LOCAL CODES PREVAIL, AND **WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS,** IN ACCORDANCE WITH NFPA #31 OF THE NATIONAL FIRE PROTECTION ASSOCIATION AND IN ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES.

Any **IN-WARRANTY** burner component which is defective in material or workmanship will be either repaired or replaced as follows:

1. Fuel units, motors, transformers, gas valves, and controls should be returned to an authorized service station or distributor of Heat Wise for determination of applicability of this LIMITED WARRANTY as to either repair or replacement, where said service station or distributor is reasonably available in the customer's locality. The manufacturers of burner components regularly publish and distribute listings showing the locations of their network of service stations. Where such local service is NOT available for the burner components described above or other burner parts are involved, these items should be returned, freight prepaid, to HEAT WISE Service Department, 1528 Rocky Point Rd, Middle Island, NY 11953.
2. Burners and/or component(s) determined to be covered under this LIMITED WARRANTY by HEAT WISE shall be repaired or replaced at HEAT WISE's sole option.
3. HEAT WISE is not responsible for any labor cost for the removal and replacement of said burner or burner components and equipment associated therewith.
4. A burner so repaired will then carry the LIMITED WARRANTY equal to the unexpired portion of the original burner LIMITED WARRANTY.
5. If inspection by HEAT WISE does NOT disclose any defect covered by this LIMITED WARRANTY, the burner or burner component(s) will be either repaired or replaced at the expense of the customer and HEAT WISE's regular charges will apply.
6. If the original manufacturer of a burner component offers a warranty greater than either of our LIMITED WARRANTIES described above, then this portion will be added to our LIMITED WARRANTY.

This LIMITED WARRANTY does NOT cover products that have been damaged as the result of an accident, abuse, misuse, neglect, improper installations, improper maintenance or failure to operate in accordance with HEAT WISE's written instructions.

These LIMITED WARRANTIES do not extend to anyone except the first purchaser at retail and only when the burner is in the original installation site.

IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED TO THE DURATION OF THE LIMITED EXPRESS WARRANTIES CONTAINED HERIN.

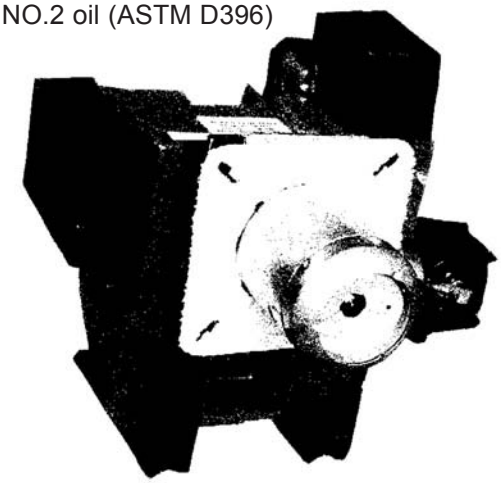
HEAT WISE EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTIAL DAMAGES OF ANY NATURE FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY.

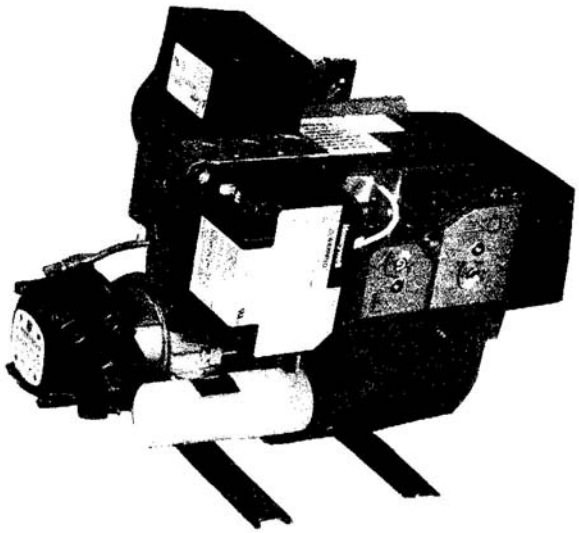
Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you. Also, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. HEAT WISE neither assumes nor authorizes any person to assume for HEAT WISE any other liability or obligation in connection with the sale of these products. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

OPERATING INSTRUCTIONS
FOR
Model PIONEER-1
with FCX Boiler

CAUTION: **For your safety do not store or use gasoline or other flammable vapors and liquids in the vicinity of this unit.**

No.2 Fuel oil firing range 0.5 – 0.7 GPH (US)
Units of No.1 or NO.2 oil (ASTM D396)





c UL us **NY MEA 226-99-E**

Manufactured By: Heat Wise, Inc.,
Production:
1528 Rocky Point Rd, Middle Island, NY 11953

Note: This particular manual is prepared for the FCX boiler. The burner has been set and test fired to achieve optimum performance. Readjustments, increasing or decreasing pump pressure or nozzle size changes will change the long-term performance. Failure to follow the instructions in this manual will void the warranty.

BURNER SPECIFICATIONS

Burner Model	Burner Head	Burner Fan	Firing Range in GPH(US)	Standard	Nozzle
Pioneer 1	FV	120mm	0.5 to 0.7	attachment**	0.5X80° AS

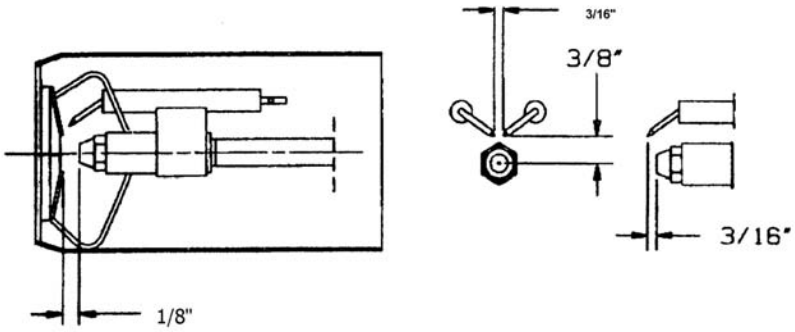
** Outside air attachment can be maximum 3" Dia. X 20' nominal pipe with 4 elbows

1. NOZZLE INSTALLATION

1.1 To service the nozzle, remove the burner from the FCX boiler by unscrewing the burner mounting flange nut. Using a 3 mm allen key, loosen the side screws on the burner housing at either side of the flame tube. Remove the flame tube to expose the nozzle assembly. Now, using a 4 mm allen key, loosen the retention head screw and separate the retention head electrode assembly from the nozzle line. Remember to disconnect the rajah connector from the electrode assembly. Using two 5/8" wrenches, remove the nozzle from the nozzle line. Install a new nozzle and follow the steps backwards to reinstall the burner. Refer to Fig. 1 for the proper electrode setting. **Please see pages 6 and 7 of this manual for a pictorial on this process.**

NOTE: It is important to use two 5/8" wrenches to prevent disorientation of the nozzle line heater.

FIG. 1 ELECTRODE ASSEMBLY



2. WIRING THE BURNER

2.1 Follow the wiring diagram shown in Fig. 2. All the wiring should conform to the National Electric Code (NEC) or the legally authorized code governing your locality. When wiring, be sure that the electric power take-off is connected to a permanently live circuit. The power supply must have a 15-amp circuit breaker or fuse with a service switch located not more than 3 feet from the burner.

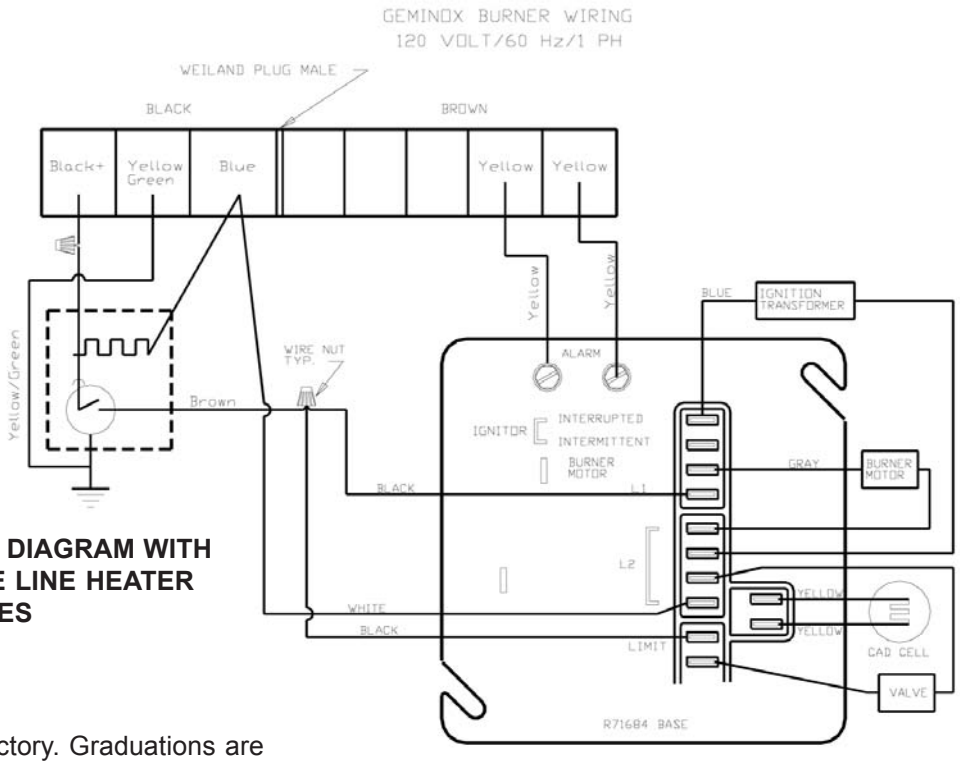
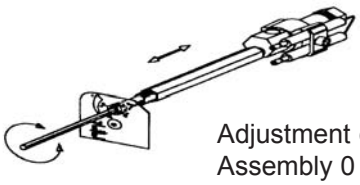


FIG. 2 **WIRING DIAGRAM WITH NOZZLE LINE HEATER IN SERIES**

3. HEAD ADJUSTMENT

3.1 Head adjustment is set at the factory. Graduations are numbered from 1 to 22 on the head adjustment dial (See Fig. 3). By turning the head adjustment screw clockwise, the burner head will move inside the blast tube **AWAY** from the end cone. The head adjustment dial is set at “1.75” at the factory, which is 1 mm away from the tip of the end cone (see Fig. 4) The head position needs to remain at the set distance to ensure proper combustion.

FIG. 3 **HEAD ADJUSTMENT**

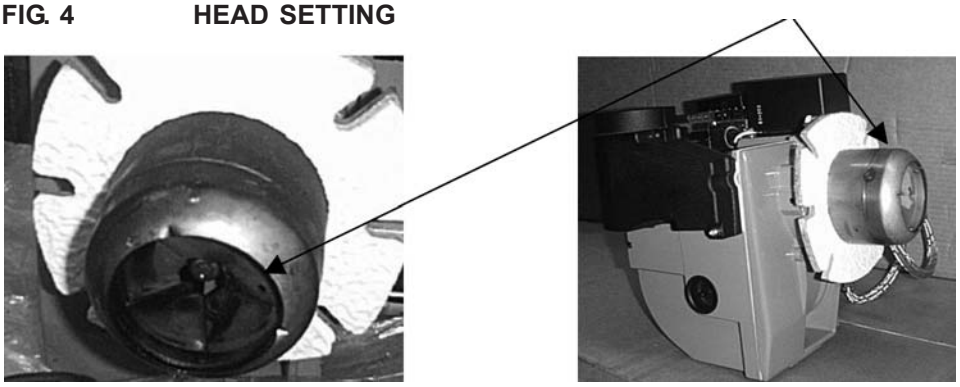


Adjustment of nozzle Assembly 0 - 22

4. AIR SHUTTER ADJUSTMENT

4.1 Air adjustment is set at the factory. Graduations are number from 1 to 32 on the air adjustment dial (see Fig. 5). By turning the air adjustment screw clockwise, the air shutter opening increases. The air adjustment dial is set between “6” and “7”. To achieve proper combustion, the air shutter may need to be adjusted so that combustion analysis achieves 11.5% to 13.5% CO2 (or 2% to 4% O2).

FIG. 4 **HEAD SETTING**



5. NOZZLE LINE HEATER.

The burner comes with *a true nozzle line heater*. It is wired in series to the Honeywell microprocessor control R 7184 P. There is an initial delay while the nozzle line heater brings the oil to the proper operating temperature. Once the oil reaches the proper temperature, the burner control will receive power. See Fig. 6 wiring diagram.

FIG. 5 AIR ADJUSTMENT

Air Adjustment 0 - 22

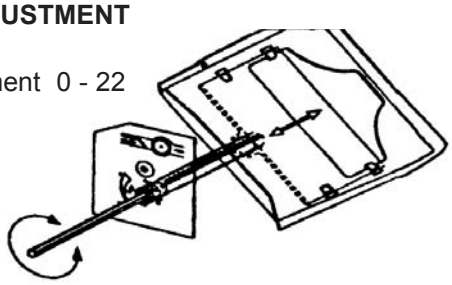
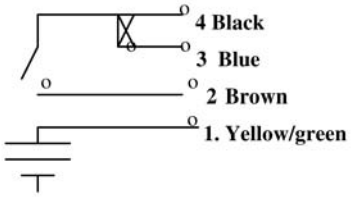


FIG. 6 NOZZLE LINE HEATER WIRING



6. FUEL PUMP

6.1 A standard fuel pump is used on the Pioneer burner. Therefore, it is important that discharge pressure is monitored very closely. It is recommended that a 10 micron filter with a vacuum gauge be installed before the fuel pump using a flexible oil line (the flexible oil line is recommended to easily service the burner) between the fuel pump and filter.

6.2 The fuel pump on the burner is factory set at 165-170 PSI. This pressure is necessary to get the desired oil flow to maximize the nozzle output capacity for the FCX. **Do not exceed 175 PSI.**

6.3 There is a solenoid valve on the fuel pump to initiate a pre-purge after the burner control starts airflow. The Honeywell microprocessor control R 7184 P has a 15- second pre-purge period. Factory wiring does not allow for a post purge. Follow specifications on the R 7184 P control to troubleshoot any control problems.

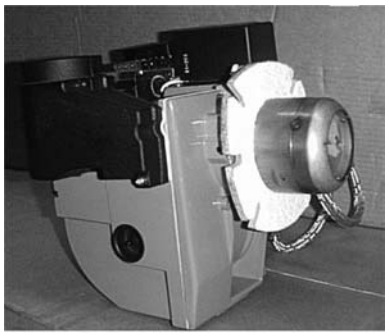
7. FUEL

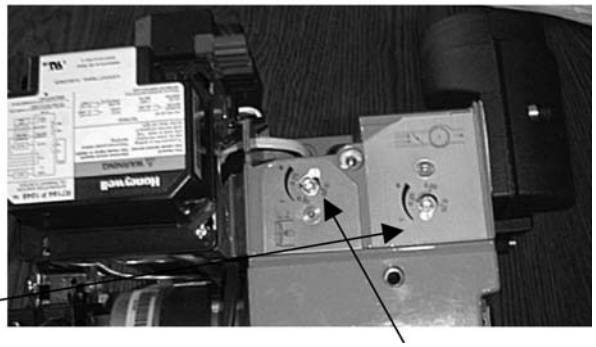
7.1 ASTM D396 No. 1 or No. 2 fuel must be used on the Pioneer burner. A new oil tank is suggested with all installations. If a new oil tank is not installed, then the old oil tank should be less than ten years old and it should be checked thoroughly to ensure that sludge or other microbiological impurities are not present. Oil tanks greater than ten years of age MUST be replaced before the installation is completed. Vacuum readings greater than 5" Hg must be avoided. Refer to the Suntec Installation Service Manual included with this document.

Note: For the installation of the oil tank and oil lines, refer to local codes. Also, some installations may require an Oil Safety Valve (refer to local codes).

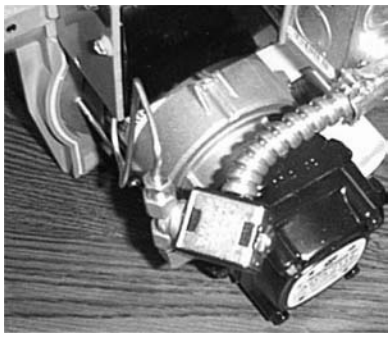
APPROXIMATE SETTINGS						
SEALED COMBUSTION						
Monitor Products			GEMINOX FCX Boiler		(Condensing Boiler)	
Burner Model	Nozzle			PSI	Head Position	Air Opening
	G.P.H.	Degree & Type	Make			
P-1 FV 120 Fan	0.50	80°AS	Danfoss	175	1.75 Flush with end cone	6

Servicing of the Pioneer-1 on the FCX Boiler.



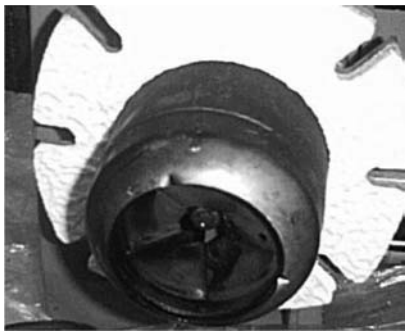


Pioneer-1 Burner with FV head for condensing Boiler. Note: head setting at “1.75” and air setting “6”. **Do not change the head setting.** Air setting may need adjustment.



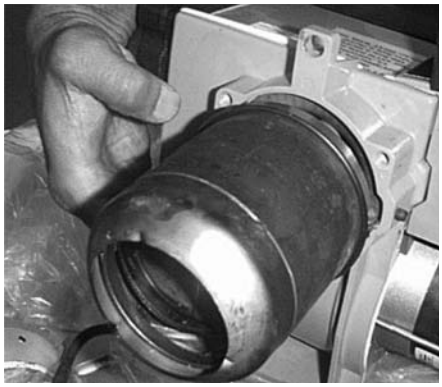
Solenoid valve at an angle with steel oil line

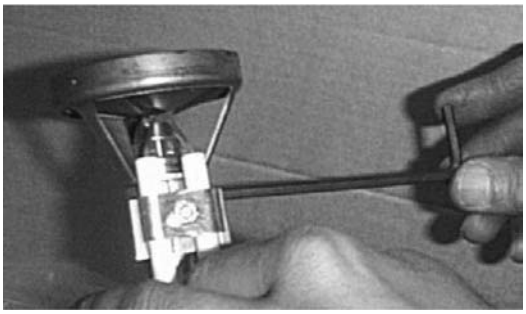
Burner head flush with end cone



Use 3 mm Allen key to remove flame tube loosening set screws on both sides

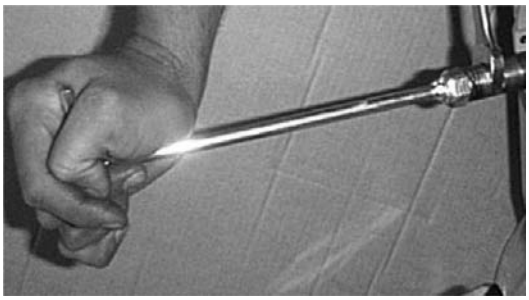
Pull out the flame tube and take precautions to ensure “O” ring is not damaged or lost.





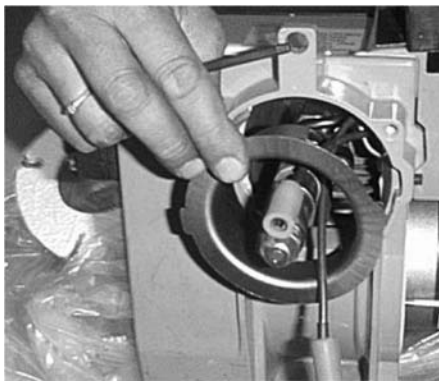
Use a 4 mm Allen key to loosen the retention head. Then separate the retention head from the oil line.

Use two 5/8" wrenches or one wrench and the given nozzle wrench to nozzle.



Proceed with reverse process to reinstall the burner after changing the old nozzle with a new 0.5 X 800 AS nozzle

Removing the air guide



RECORD THE READINGS:

DATE: **INSTALLER:**

NOZZLE SIZE GPH	NOZZLE MANUFACTURER	NOZZLE TYPE	NOZZLE ANGLE
PUMP PRESSURE (PSI)	DRAFT IN THE BREECH (wc)	SMOKE	STACK TEMPERATURE
CARBON DIOXIDE or OXYGEN	DRAFT OVER FIRE (wc)		

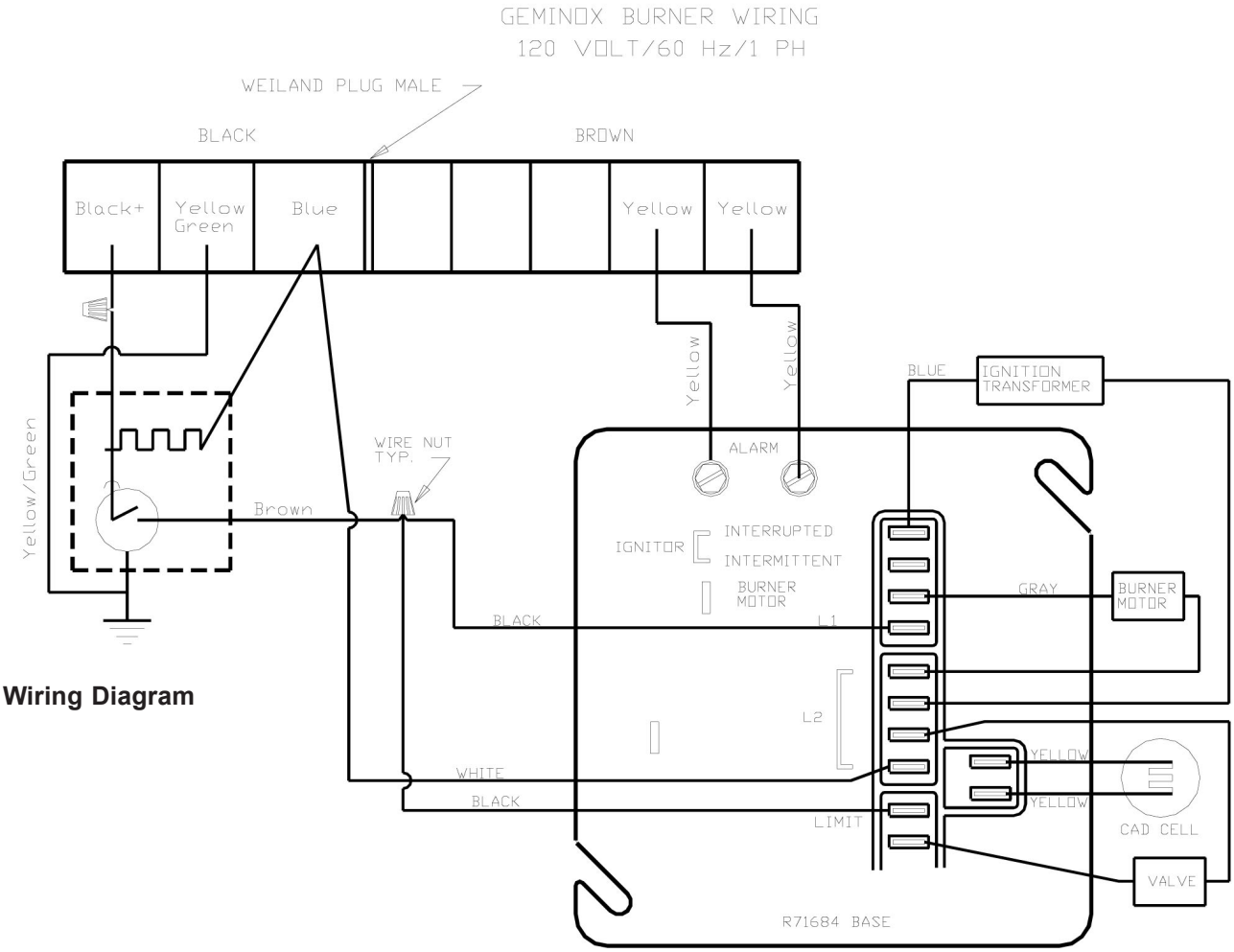


Fig. 7 Wiring Diagram

VACUUM HOLD TEST – If the flame misfires and/or the pump is noisy.

After firing the burner, a vacuum hold test must be performed as a precaution to avoid any leaks that may have occurred during the installation process. To check the vacuum, follow guideline below:

1) Attach a vacuum gauge to the oil line between the tank and the oil pump on the burner, preferably near the oil filter.
2) With the burner firing, slowly shut off the oil line at the oil tank.
3) Watch the vacuum gauge and once it has reached 5" Hg of vacuum shut the burner off. (DO NOT exceed 5" Hg)
4) Wait between five and ten minutes and check the pressure gauge again.
5) If the gauge pressure has gone down, then there is an air leak in the system that needs to be fixed before commissioning the burner. (See Fig 999)

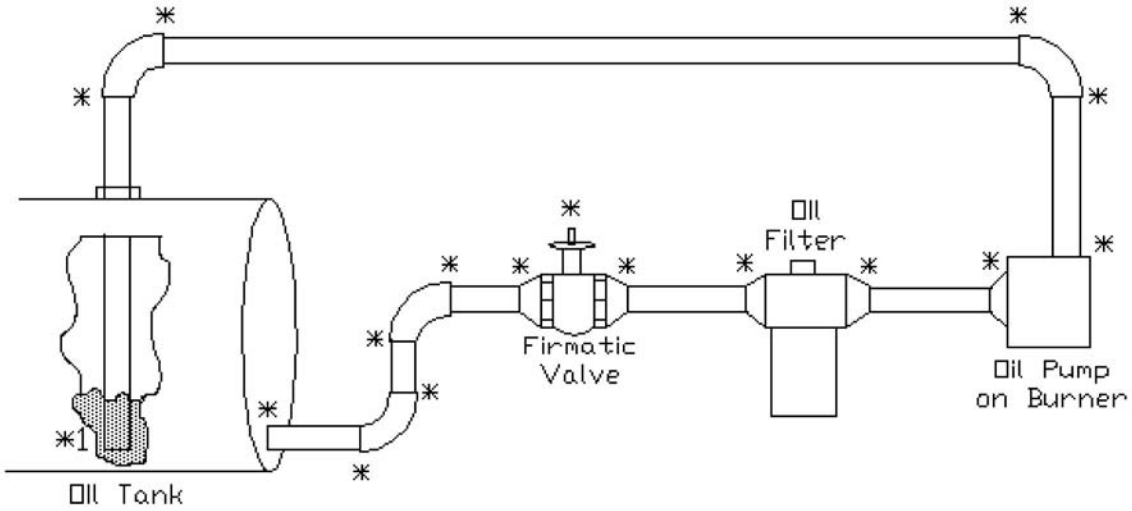
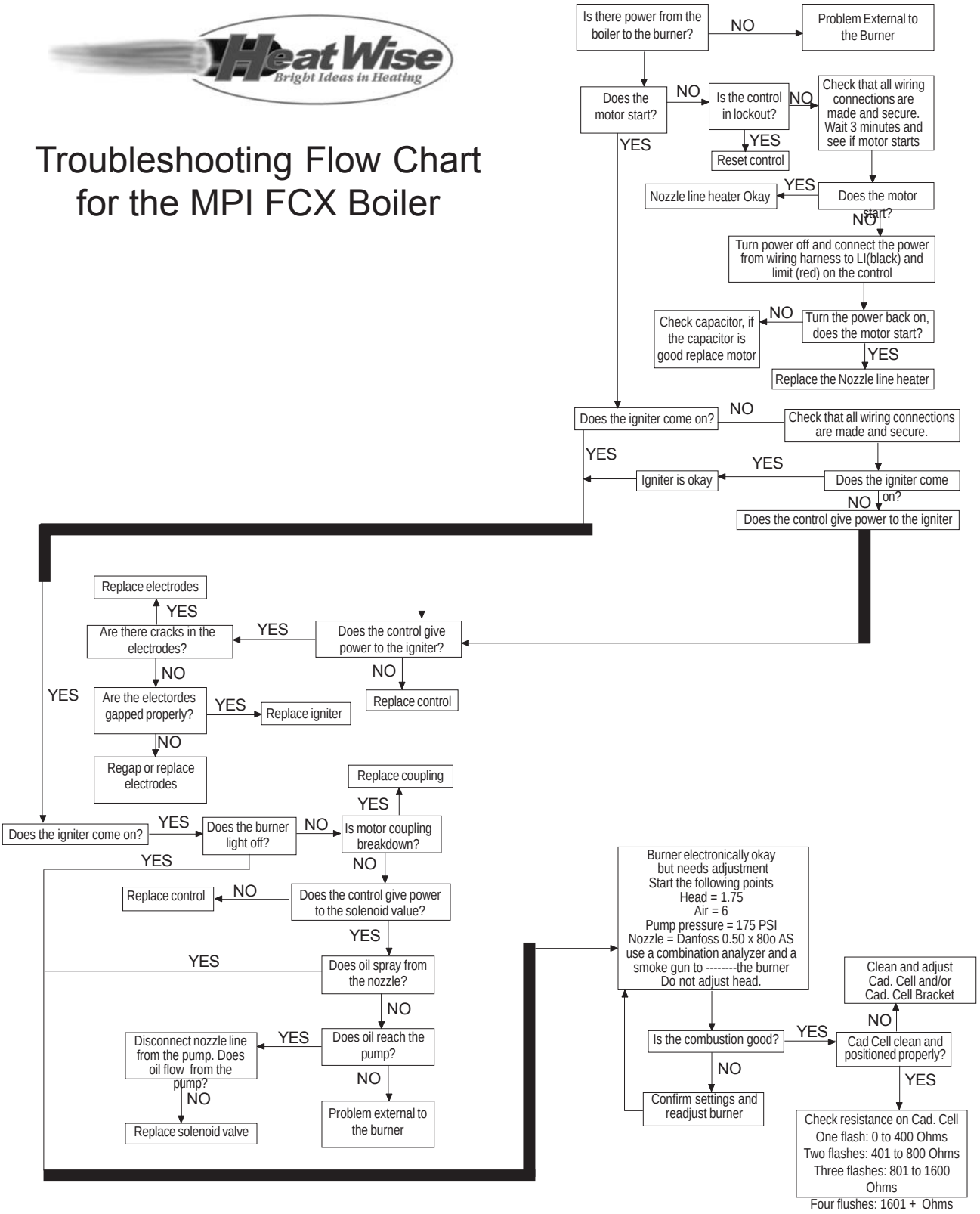


FIG. 8 Air Leaks

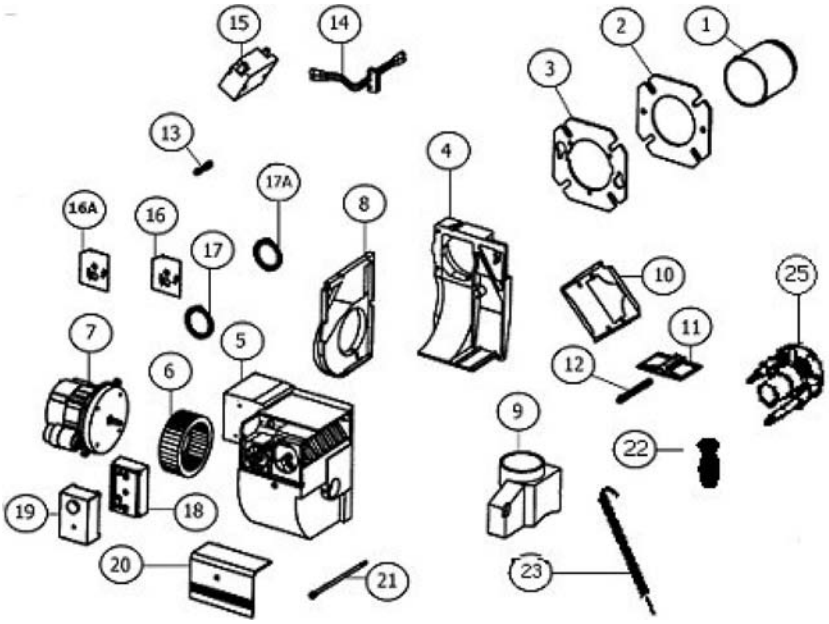
* Check to ensure that fittings are not leaking and that there are no leaks at the stem of the firematic valve and Pump seals including the shaft and gasket areas.
*1 The return oil line in a two-pipe system must always be in oil

Troubleshooting Flow Chart for the MPI FCX Boiler



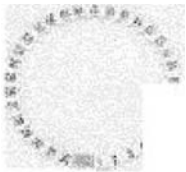
HEAT WISE BURNER

I	ITEM	PART
1	Blast Tube	11764301
2	Flange Gasket	10195-1
3	Adjustable Flange	10195
4	Front piece – Housing	
5	Rear piece – Housing	
6	Fan Wheel	11417603
7	1/6 HP PSC Blower motor	D82132
8	Shielding Plate Housing	
9	Outside Air Boot	11859107
10	Air Regulation Plate	11852201
11	Air Damper	11851001
12	Air Regulation Adjustment screw	11848501
13	Adjustment Screw – Nozzle Line	11912901
14	Ignition Cable	11987901
15	Igniter	41000S
16	Cover Plate - Air Regulation	11887001
16A	Cover Plate - Nozzle Line	11887301
17	Scale - Nozzle Line	11888101
17A	Scale - Air Regulation	11887801
18	Oil Pump	A2VA7116



19	Safety Control R	7184P
20	Plastic Cover Plate	11850001
21	Screw (Long Special)	11750702
22	Oil Nozzle	DAN5AS80
23	Electrode	11593701
25	Retention Head/Brake Plate (complete)	11591201

Blast Tube
11764301
MPI PART # 2526



Scale (Nozzle Assembly)
11888101
MPI PART # 2527

Adjustment Screw
(Nozzle Assembly)
11848401

FV Head
11591201
MPI PART # 2550

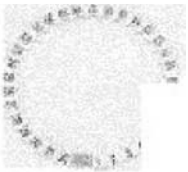
Nozzle Line Pre-Heater
11470605
MPI PART # 2520

Cover Plate (Air)
11887001
MPI PART # 2514

Adjustment Screw
(Air Regulation)
11848501
MPI PART # 2511

Electrode (single)
91593701
MPI PART # 2521

Cover Plate (Nozzle Assembly)
11887301
MPI PART # 2548

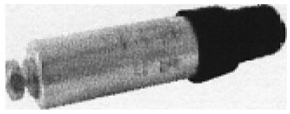


Scale (air)
11887801
MPI PART # 2513

Bushing (for Adjustment Screws)
11847901
MPI PART # 2512

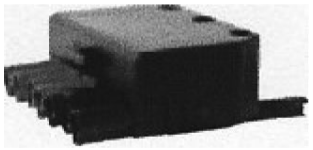
Nozzle Line
11918902
MPI PART # 2519

Flange
11811601
MPI PART # 2501

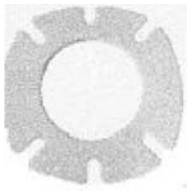


Motor Capacitor
D82132-1
MPI PART # 2547

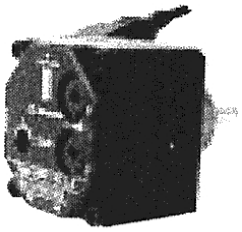
Gasket – Housing
11854401
MPI PART # 2507



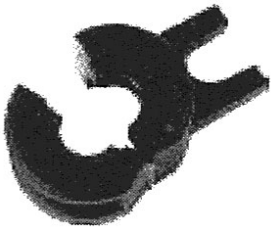
Weiland Plug (Female)
11558608
MPI PART # 2518



Flange Gasket
11819101

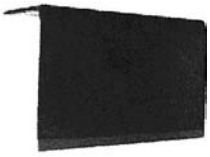


Suntec Pump
A2VA7116
MPI PART # 2542

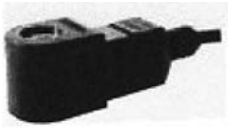


Bushing
11847901
MPI PART # 2512

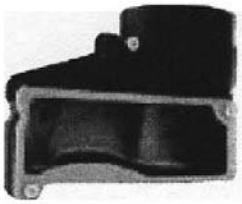
Weiland Plug (Male)
11558500
MPI PART # 2504



Cover Plate (Housing)
11850001
MPI PART # 2506



Solenoid Valve
SVC10FF
MPI PART # 2535



Outside Air Boot
11859107
MPI PART # 2531

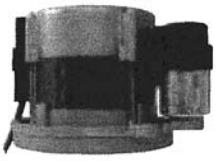
O-Ring
11316835

Long Screw
11750702

Fan Housing Rear
11849702

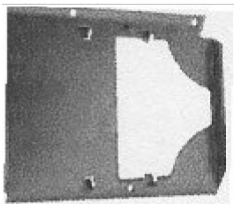
Gasket – Air Boot
91859107
MPI PART # 2533

Air Distributor
11852201



1/6 HP PSC Motor
D82132
MPI PART # 2547

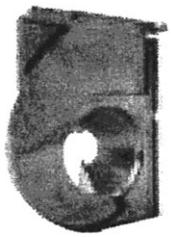
Fan Housing Front
11856902



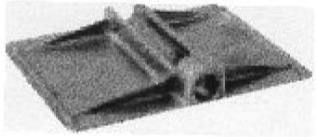
Air Regulation Plate
11852201
MPI PART # 2509

Nozzle
DAN5AS80
MPI PART # 2541

108 mm Fan
11417604
MPI PART # 2515



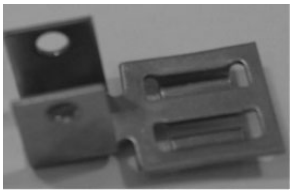
Shielding – Housing
11860801
MPI PART # 2508



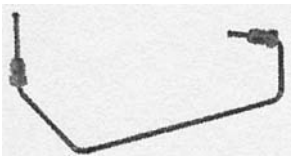
Air Damper
11851001
MPI PART # 2510

110 V Igniter
41000S
MPI PART # 2540

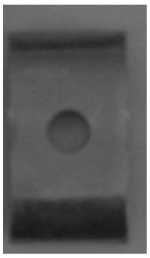
Oil Safety Control
R7184P
MPI PART # 2544



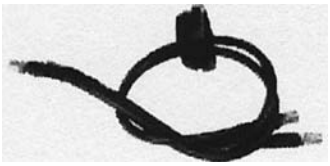
Cd. Cell Bracket
4074BJS
MPI PART # 2549



Oil Connecting Pipe
12027501
MPI PART # 2525



Bracket,
Electrode
Holder
439017224
MPI PART # 2523

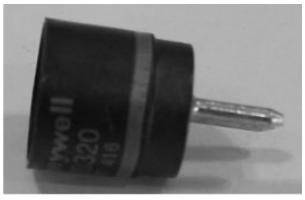


Ignition Cable
12021901
MPI PART # 2524

Cd. Cell Wire
C554A
MPI PART # 2546

Nozzle Key
11346101
MPI PART # 2503

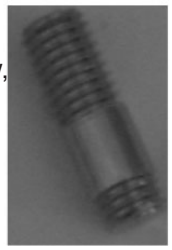
Distance Ring (Spacer)
11593601
MPI PART # 2522



Cd. Cell
120320
MPI PART # 2546

Motor Coupler
V1409

Flexible Oil Line
HW43006
MPI PART # 2539



Stud Screw,
Fixing
Flange
11951701
w/flange

HONEYWELL CONTROL INSTALLTATION INSTUCTIONS

R7184A,B,U INTERRUPTED ELECTRONIC OIL PRIMARY

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INSTALLATION INSTRUCTIONS

APPLICATION

The R7184A,B,P,U Interrupted Electronic Oil Primary is a line voltage, safety rated, interrupted ignition oil primary control for residential oil fired burners used in boilers, forced air furnaces and water heaters. The R7184A,B,P,U used with a cad cell flame sensor,

operates an oil burner and optional oil valve. The primary controls fuel oil, senses flame, controls ignition spark and notifies a remote alarm circuit when in lockout.

The R7184 can be used with both hydronic and forced air systems. When used with hydronic systems, line voltage switching Aquastat® Controllers normally provide for the starting and stopping of the combustion sequences. With forced air systems, both mechanical and electronic low voltage thermostats control the starting and stopping of the combustion process.

Some hydronic and forced air systems now require a delayed valve-on and burner motor-off delay. The R7184 operates an oil valve that prevents the flow of oil when the burner motor is running prior to combustion (delayed valve-on) and when the burner motor is running after combustion (burner motor-off delay).

The R7184 models are intended for use only on oil burning appliances which do not require prepurge and post-purge as a safety related function as defined in UL 296. The valve-on delay and burner motor-off delay in this control are intended only to help establish draft and reduce oil after-drip related problems.

FEATURES

Limited Recycle
This feature limits the number of recycle trials (for each call for heat) to a maximum of three trials. If the flame is lost three times and does not successfully satisfy a call for heat, the R7184 locks out.

Pump Priming Cycle
To facilitate purging air from the oil lines and filters, the R7184 can be placed in a purge routine by pressing and releasing the reset button during the safety check, delayed valve-on , ignition or carry-over periods. The lockout timing will be extended to 4 minutes and the ignition set in the intermittent mode for this cycle only.

The R7184 automatically reverts to its labeled interrupted and safety switch timing states. The pump priming cycle can only be entered if there have been no lockout occurrences since the last successful heat call. To reset the device so that the pump priming cycle can be entered, press and hold the reset button for 30 seconds until the LED flashes twice.

Disable Function
Pressing and holding the reset button will disable all functions until the button is released. The R7184 will restart at the beginning of the normal heat cycle on safety check.

Limited Reset (Restricted Mode)
In order to limit the accumulation of unburned oil in the combustion area, the control can only be reset three times. The reset count returns to zero each time a call for heat is successfully completed.

To reset from restricted mode: Press and hold the reset button for 30 seconds. When the LED flashes twice, the device has reset.

SPECIFICATIONS

Models:
Table 1 lists the major features and the applicable wiring diagram numbers for the R7184.

Timing:
Safe Start Check: 5 seconds (approximately).
Valve-on Delay: 15 seconds.
Burner motor-off Delay: 0, 2, 4, or 6 minutes, fieldselectable using DIP switch positions 1 and 2.
NOTE: For universal R7184U model, valve-on delay and burner motor-off delay timings can be enabled (values as listed) or disabled (values are zero) in the field using DIP switch position 3.

Lockout: 15, 30 or 45 seconds (factory-programmed).
Recycle: 60 seconds (fixed).
Ignition Carryover: 10 seconds (fixed).
R7184A,B,P,U INTERRUPTED ELECTRONIC OIL PRIMARY
69-1233—2 2

Electrical Ratings:
Inputs:
Voltage: 102 to 132 Vac, 120 Vac nominal.
Current: 100 mA plus burner motor, valve and ignitor loads.
Frequency: 60 Hz.
Outputs:
Relay Contacts:
Burner: 120 Vac, 10 full load amperes (FLA), 60 locked rotor amperes (LRA).
Valve: 120 Vac, 1A.
Ignitor: 120 Vac, 360 VA.
Alarm: 30 Vac, 2A.
Thermostat Current Available: 100 mA.
NOTE: Reduce burner FLA rating by Ignitor load. For example, if the ignitor draws 3A (120 Vac, 360 VA), reduce the burner motor FLA to 7A.

Environmental Ratings:
Operating Ambient Temperature: -40°F (-40°C) to +147°F (+64°C).
Shipping Temperature: -20°F (-29°C) to +150°F (+66°C).
Humidity: 90% relative humidity at 95°F (93°C) noncondensing.

Approvals:
Underwriters Laboratories Inc.: Recognized.
Canadian Underwriters Laboratories Inc.

Table 1. R7184 Models.

Model	Valve-on delay (sec)	Burner motor-off delay (min)	Alarm Contacts	Typical Wiring Diagram Fig. reference No.	Thermostat Terminals T-T
R7184A	None	None	None	3,4,5	Yes
R7184B	15	None	None	3,6,7	Yes[c]
R7184P[a]	15	0/2/4/6[b]	Optional	3,6,7	Yes
R7184U	Selectable 0 or 15	Selectable 0 or 0,2,4,6[b]	Yes	3,6,7	Yes

[a]Some select models may have a delay enable/disable switch.
[b]Standard timings. Other timing may be available on select models.
[c]Select models are provided with a T-T jumper which can be disabled by cutting with a pair of side cutting pliers.

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow instructions can damage product or cause a hazardous condition.
2. Check ratings given in these instructions and on product to make sure product is suitable for your application.
3. Make sure installer is a trained, experienced service technician.
4. Use these instructions to check out product operation after installation.

WARNING

Electrical Shock Hazard.

Can cause serious injury or death.
Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

Location

1. Mount on a 4 in. by 4 in. junction box, directly on the main burner or inside the appliance cabinet. In replacement applications, mount in the same location as the old control. See Fig. 1. Make sure the operating temperatures are within the ambient temperature range (see Specifications section).
2. Before mounting the control, make line voltage connections as shown in Fig. 2 through 7. Splice lines with solderless connectors. Do not exceed load ratings shown on the device label.
3. If necessary, use the control as a template to mark and drill new mounting holes.
4. Mount using No. 6 screws (obtained locally).

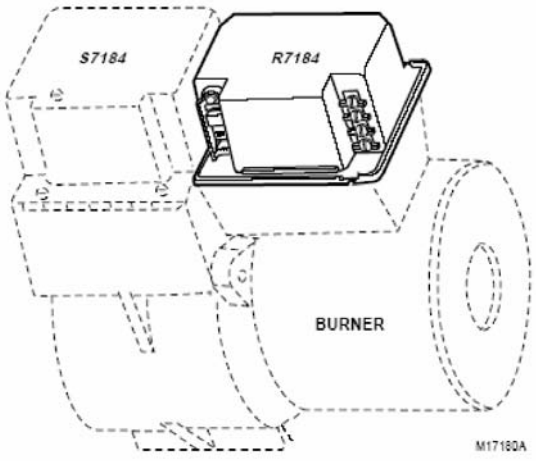


Fig. 1. Mounting R7184 on junction box.

WIRING

1. Make sure wiring complies with all local codes and ordinances.
2. After mounting, make low voltage connections to the screw terminals (see Fig. 2 through 7).
3. Strip leads 3/8 in. (10 mm) and insert under terminal screw. See Fig. 1.
4. Connect thermostat leads to T-T.

Switch Settings

Figure 8 and Table 2 provide the switch settings for the R7184U. **and R7184 for an oil-fired forced air system.**

CHECKOUT

Start System

WARNING
Fire Hazard.
Can cause serious injury or death.
Make sure combustion chamber is free of oil and/or oil vapor before starting system.

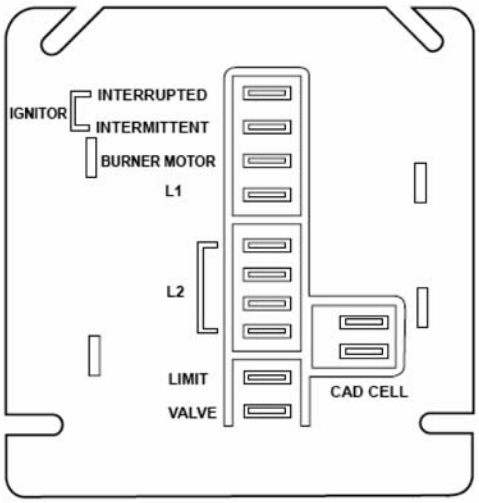


Fig. 2. Wiring terminals.

1. Open hand valve in oil supply line.
2. Make sure system is powered. Check circuit breaker or fuse and close system switch, if provided.
3. Set thermostat to call for heat.
4. Make sure burner lights and operates until call for heat ends.

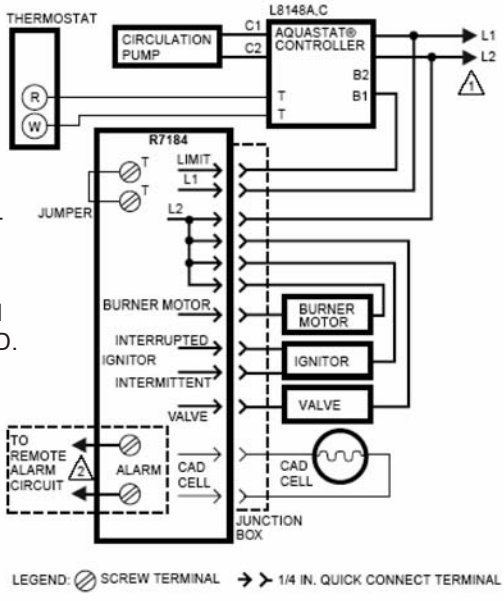
Check Safety Features

Safe Start

1. Place a jumper across cad cell terminals.
2. Follow procedure to turn on burner. Burner must not start, indicator light turns on and control remains in Idle Mode.

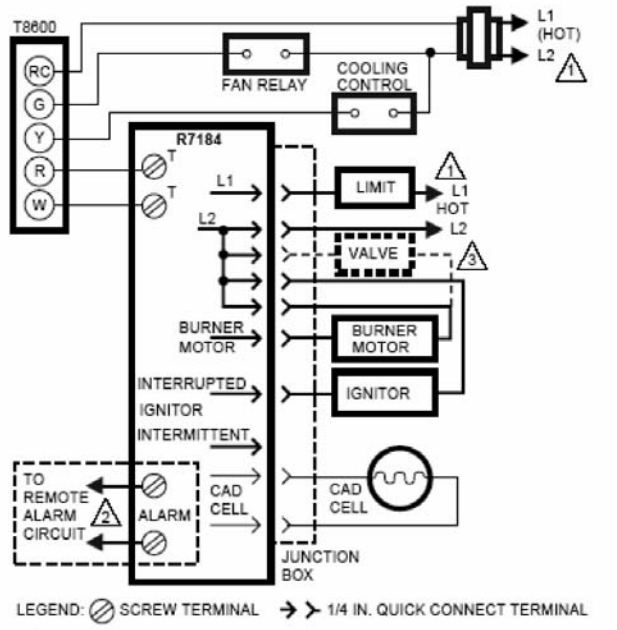
Simulate flame failure:

1. Follow procedure to turn on burner.
2. Close hand valve in oil supply line.
3. Device enters recycle mode.
4. Device tries to restart system after approximately 60 seconds.
5. Safety switch locks out approximately in safety switch timing indicated on label. Indicator light flashes at 1 Hz rate. Ignition and motor stop and oil valve closes.



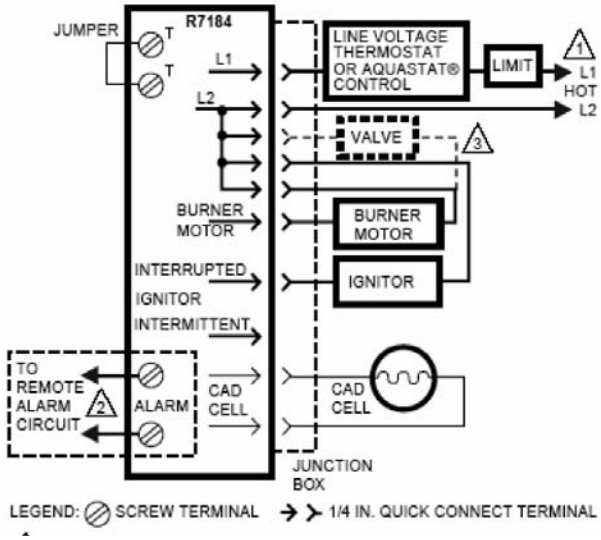
1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2 OPTIONAL FEATURE ON SELECT MODELS.

Fig. 3. Wiring for typical oil-fired boiler.



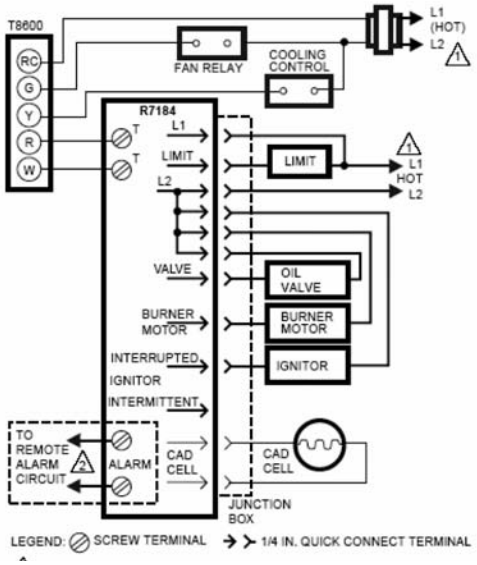
1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2 OPTIONAL FEATURE ON SELECT MODELS.
3 VALVE MAY BE ADDED AS SHOWN.

Fig. 4. Typical wiring diagram for 24 Vac thermostat and R7184 for an oil-fired forced air system.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2 OPTIONAL FEATURE ON SELECT MODELS.
3 VALVE MAY BE ADDED AS SHOWN.

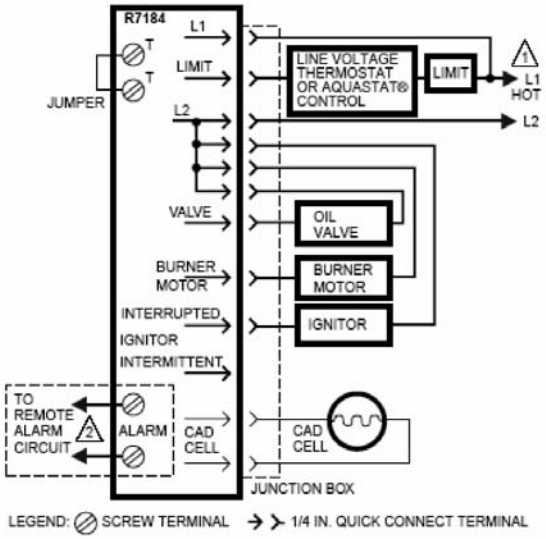
Fig. 5. Typical wiring diagram for line voltage Aquastat® thermostat and R7184 for an oil burner system.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 OPTIONAL FEATURE ON SELECT MODELS.

Fig. 6. Typical wiring diagram for 24 Vac thermostat and R7184 for valve-on delay/burner motor off oil burner system.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 OPTIONAL FEATURE ON SELECT MODELS.

Fig. 7. Typical wiring diagram for line voltage Aquastat® thermostat and R7184B,P,U for valve-on delay/burner motor-off delay oil burner system.

Simulate ignition failure:

1. Follow starting procedure to turn on burner, but do not open oil supply hand valve.

2. Observe that safety switch locks out approximately within safety switch timing as indicated on the label. Indicator light flashes at 1 Hz rate. Ignition and motor stop and oil valve closes.

OPERATION

The R7184 is a microprocessor-based control. The indicator light provides diagnostic information for lockout, recycling and patented cad cell status. There is a manual reset button to exit the lockout mode and enter the idle mode. Operation is shown in Table 4.

TROUBLESHOOTING AND MAINTENANCE

IMPORTANT:

Due to the potential hazard of line voltage, only a trained, experienced service technician should perform the troubleshooting procedure.

This control contains no field-serviceable parts. Do not attempt to take it apart. Replace entire control if operation is not as described.

To completely troubleshoot an oil burner installation, check the burner and oil primary control for proper operation and condition.

The indicator light on the oil primary control provides lockout, recycle and cad cell indications as follows:

1. Flashing at 1 Hz (1/2 second on, 1/2 second off): system is locked out or in restricted mode.

2. Flashing at 1/4 Hz (2 seconds on, 2 seconds off): control is in recycle mode.

3. On: cad cell is sensing flame.

4. Off: cad cell is not sensing flame.

Fig. 8. Switch setting for burner-0ff delay times.

Table 2. Switch Settings and Delays.

Valve-On Delay (seconds)	Delay Timings: Burner Motor-Off Delay (minutes)		DIP Switch Settings			
					S-3 Enable/ Disable	
	R7184U	R7184P	S-1	S-2	R7184U	R7184P
0	0	—	X	X	Off	+
15	0	0.5	Off	Off	On	+
15	2	2	Off	On	On	+
15	4	4	On	Off	On	+
15	6	8	On	On	On	+

X = Don't Care.
+ = S-3 not provided on R7184P models.

Cad Cell Resistance Check

For proper operation it is important that the cad cell resistance is below 1600 ohms. During a normal call for heat, once the control has entered the Run mode, press and release the reset button. Indicator light will flash 1 to 4 flashes. See Table 3 for equivalent cad cell resistance.

Table 3. Cad cell resistance when sensing flame.

Flashes	Cad Cell Resistance in ohms
1	Less than 400
2	More than400 and less than 800
3	More than 800 and less than 1600
4	More than 1600 and less than 5000

Preliminary Steps

1. Check wiring connections and power supply.

2. Make sure power is on to the controls.

3. Make sure limit control is closed.

4. Check contacts between ignitor and the electrodes.

5. Check the oil pump pressure.

6. Check the piping to the oil tank.

7. Check the oil nozzle, oil supply and oil filter.

Check Oil Primary Control

If the trouble is not in the burner or ignition hardware, check the oil primary control by using the following equipment:

1. Screwdriver.

2. Voltmeter (0 to 150 Vac).

3. Insulated jumper wire with both ends stripped.

WARNING
Electrical Shock Hazard.
Can cause serious injury or death.
Troubleshoot with the system powered. Be careful to observe all precautions to prevent electrical shock or equipment damage.

Refer to Table 4 for further troubleshooting information.

Table 4. R7184 Operation.

External Action	R7184 Action
Power applied to control. Thermostat or Aquastat® Control calls for heat.	Internal safety check conducted. If no light or flame is detected and all internal conditions are correct, Control enters Idle mode. **1.** Shorts across T-T terminals (on as call for heat) in warm air system and/or provides power to limit terminals in hydronic system. **2.** Safety Period (4 seconds) internal and external check for flame or light. If flame or light is detected, control remains in Idle mode. **3.** When flame or light is not present: a. R7184A,U (if valve-on delay is disabled) will apply power to the burner motor and ignitor. b. R7184B,P,U (if valve-on delay is enabled) will apply power to the burner motor and ignitor, enter/complete valve-on delay period and then apply power to the valve. **4.** Control enters Trial for Ignition period. a. Monitors burner for flame. b. When flame is not detected: (1) Enters lockout mode (after lockout time of 15, 30 or 45 seconds). (2) Shuts off valve, ignitor and burner motor. (3) Flashes indicator light at 1 Hz (1/2 second on, 1/2 second off). (4) Depress reset button to return to power up sequence. c. When flame is detected, Carry-Over period begins: **5.** Control enters Ignition Carry-Over period (continues to spark for 10 to 30 seconds). a. Turns on indicator light. b. If flame is lost and lockout time has not expired, R7184 returns to Trial for Ignition period. c. If flame is lost and lockout time has expired, R7184 enters Recycle Mode. **6.** Carry-Over time expires; ignitor turns off. **7.** Enters Run Mode: a. Flame is monitored until call for heat ends or flame is lost. If flame is lost: (1) Control enters Recycle Mode. (2) Recycle time starts (60 seconds). (3) Burner and valve are turned off. (4) Indicator light flashes at 1/4 Hz (2 seconds on, 2 seconds off). (5) Returns to Idle mode at end of Recycle mode.
Call for heat is satisfied.	**1.** R7184A,U (if burner motor-off delay is disabled): a. Burner motor and oil valve shut off. b. Indicator light turns off. **2.** R7184B,P,U (if burner motor-off delay is enabled): a. Oil valve shuts off. b. Burner motor runs for selected burner motor-off delay. c. Burner motor turns off. d. Device returns to Idle mode.
Reset button pushed two times without device completing a call for heat.	**1.** R7184 enters Restricted mode. **2.** Indicator light flashes at 1Hz (1/2 second on, 1/2 second off). **3.** Reset device by pressing and holding reset button for a minimum of 30 seconds.

Table 5. Troubleshooting Information .

Procedure	Status	Corrective actions
Condition: Burner does not start with a call for heat.		
1. Check that limit switches are closed and contacts are clean.	—	—
2. Check for line voltage power at the oil primary control. Voltage should be 120 Vac.	— Indicator light is on.	— Cad cell or controller is defective, sees external light
3. Check indicator light with burner off, no call for heat (no flame).	Indicator light is off.	or connections are shorted. Go to step 4. Go to step 5.

Procedure	Status	Corrective Actions
4. Shield cad cell from external light.	Indicator light turns off.	Eliminate external light source or permanently shield cad cell.
	Indicator light stays on.	Replace cad cell with new cad cell and recheck. • If indicator light does not turn off, remove cad cell leadwires from R7184 and recheck. • If indicator light turns off, replace cad cell bracket assembly. Refer to TRADELINE® Catalog for bracket part numbers. • If indicator light does not turn off, replace controller.
5. On warm air systems, jumper thermostat (T to T) terminals on R7184. (On hydronic systems jumper Limit terminal and L1 of R7184.) ***IMPORTANT:*** *First remove one thermostat lead.*	Burner starts.	Trouble in thermostat or limit circuit. Check thermostat or limit wiring connections.
	Burner does not start.	• Disconnect line voltage power and open line switch. • Check all wiring connections. • Tighten any loose connections and recheck. • If burner does not start, replace R7184.
Condition: Burner starts, then locks out on safety with indicator light flashing at 1 Hz rate (1/2 second on, 1/2 second off).		
1. Check that limit switches are closed and contacts are clean.	–	–
2. Check for line voltage power at oil primary control. Voltage should 120 Vac.	–	–
3. Check indicator light with burner no call for heat (no flame).	Indicator light is on.	Cad cell or controller is defective, sees external light or connections are shorted. Go to step 4.
	Indicator light is off.	Go to step 5.
4. Shield cad cell from external light.	Indicator light turns off.	Eliminate external light source or permanently shield cad cell.
	Indicator light stays on.	• Replace cad cell with new cad cell and recheck. • If indicator light does not turn off, remove cad cell leadwires from R7184 and recheck. • If indicator light turns off, replace cad cell bracket assembly. Refer to TRADELINE® catalog for bracket part numbers. • If indicator light does not turn off, replace controller.
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	Burner does not start.	• Disconnect line voltage power and open line switch. • Check all wiring connections. • Tighten any loose connections and recheck. • If burner does not start, replace R7184.
Condition: Burner starts then locks out on safety with indicator light flashing at 1 Hz rate (1/2 second on, 1/2 second off)		
6. Reset oil primary control by pushing in and releasing red reset button.	Indicator light stops flashing.	Go to step 7.
	Indicator light continues to flash at 1 Hz ratea.	Verify that control is not in restricted mode (see footnote a). If not in restricted mode, replace R7184.
7. Listen for spark after burner turns on (after a 2 second delay.	Ignition is off.	Spark ignitor could be defective. Check for line voltage at ignitor terminals. If line voltage is present, replace R7184.
	Ignition is on.	Go to step 8.
	Ignition is on, but no oil is being sprayed into the combustion chamber.	Wait for Valve On Delay to complete (R7184B,P, and U). Check oil valve, oil valve wiring, pump and oil supply.
8. Check indicator light after flame is established, but before oil primary control locks out.	Indicator light is on until the control locks out and starts flashing during lockout.	Replace R7184.
	Indicator light stays off.	Go to step 9.
9. Check cad cell sighting for view of flame. • Disconnect line voltage power and open line switch. • Unplug cad cell and clean cad cell face with soft cloth. Check sighting for clear view of flame. Place cad cell back in socket. • Reconnect line voltage power and close line switch. • Start burner.	Burner locks out.	Go to step 10.
	Burner keeps running.	System is Okay.

Procedure	Status	Corrective Actions
10. Check cad cell. • Disconnect line voltage power and open line switch. • Remove existing cad cell and replace with new cad cell. • Disconnect all wires from thermostat terminals to be sure there is no call for heat. • Reconnect line voltage power and close line switch. • Expose new cad cell to bright light, such as a flashlight.	Indicator light is on. Indicator light is off.	Place control back on burner. Go to step 6. Go to step 11.
11. Check cad cell bracket assembly. • Disconnect line voltage power and open line switch. • Remove cad cell wires from quickconnect connectors on the R7184 and leave control leadwires open. • Apply power to device. • Place jumper across cad cell terminals after burner motor turns on.	Indicator light is on.	Replace cad cell bracket assembly. Refer to TRADELINE® Catalog for bracket part numbers.
	Indicator light is off.	Replace R7184.

Home and Building Control
Honeywell
Honeywell Plaza
P.O. Box 524
Minneapolis, MN 55408-0524

Home and Building Control
Inc. Honeywell Limited-Honeywell Limitée
155 Gordon Baker Road
North York, Ontario
M2H 3N7

R7184A,B,P,U INTERRUPTED ELECTRONIC OIL PRIMARY
Printed in U.S.A. on recycled paper containing at least 10% post-consumer paper fibers.

R7184A,B,P,U Series 5 Interrupted Electronic Oil Primary,EnviraCOM™ Enabled

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INSTALLATION INSTRUCTIONS

APPLICATION

The R7184A,B,P,U Interrupted Electronic Oil Primary is a line voltage, safety rated, interrupted ignition oil primary control for residential oil fired burners used in boilers, forced air furnaces and water heaters. The R7184A,B,P,U used with a cad cell flame sensor,

operates an oil burner and optional oil valve. The primary controls fuel oil, senses flame, controls ignition spark and notifies a remote alarm circuit when in lockout.

The R7184 can be used with both hydronic and forced air systems. When used with hydronic systems, line voltage switching Aquastat® Controllers normally provide for the starting and stopping of the combustion sequences. With forced air systems, both mechanical and electronic low voltage thermostats control the starting and stopping of the combustion process.

Some hydronic and forced air systems now require a delayed valve-on and burner motor-off delay. The R7184 operates an oil valve that prevents the flow of oil when the burner motor is running prior to combustion (delayed valve-on) and when the burner motor is running after combustion (burner motor-off delay).

The R7184 models are intended for use only on oil burning appliances which do not require prepurge and post-purge as a safety related function as defined in UL296. The valve-on delay and burner motor-off delay in this control are intended only to help establish draft and reduce oil after-drip related problems.

The R7184 is EnviraCOM. enabled, making it compatible with EnviraCOM. home networks.

FEATURES

Thermostat(s)

The oil primaries are compatible with both standard thermostats and EnviraCOM. communicating thermostats.

Limited Recycle

This feature limits the number of recycle trials (for each call for heat) to a maximum of three trials. If the flame is lost three times

Pump Priming Cycle

To facilitate purging air from the oil lines and filters, the R7184 can be placed in a purge routine by pressing and releasing the reset button during the safety check, delayed valve-on, ignition or carry-over periods. The lockout timing will be extended to four minutes and the ignition set in the intermittent mode for this cycle only.

The R7184 automatically reverts to its labeled interrupted and safety switch timing states. The pump priming cycle can only be entered if there have been no lockout occurrences since the last successful heat call. To reset the device so that the pump priming cycle can be entered, press and hold the reset button until the light emitting diode (LED) flashes (approximately 30 seconds).

Data Port

Controls are designed to allow networking and upgrade modules to be added in the field by simply plugging them into the data port/network. (See Fig. 2.)

Disable Function

Pressing and holding the reset button will disable all functions until the button is released. The R7184 will restart at the beginning of the normal heat cycle on safety check.

Limited Reset (Restricted Mode)

In order to limit the accumulation of unburned oil in the combustion area, the control can only be reset three times. The reset count returns to zero each time a call for heat is successfully completed.

To reset from restricted mode: Press and hold the reset button for 30 seconds. When the LED flashes twice, the device has reset.

T-T Jumper

Select models have a pre-installed T-T jumper resistor. To remove, use side-cutting pliers to cut the jumper. (See Fig. 2.)

Lockout Mode

The R7184 will enter the lockout mode when:

- Flame is detected during valve-on delay.
- When flame is not established during Trial for Ignition.
- When flame is lost three times in one call for heat.
- When flame is detected during burner motor-off delay period.

Diagnostic LED

The diagnostic LED has four states:

- On.Flame present.
- Off.No flame.
- Two seconds on, two seconds off.Recycle.
- 1/2 second on, 1/2 second off.Lockout.

Cad Cell Resistance

Cad cell resistance can be checked without using an ohmmeter. During the run mode, press and release the reset button. The resulting flashes indicate the resistance. (See Table 3.)

Valve-on Delays/Blower Motor-off Delays

Select models may have fixed or selective delays for valve open or blower motor off. The safety circuits will check for flame during these delays and, if a flame is present, will switch the control to lockout.

SPECIFICATIONS

Models:

Table 1 lists the major features and the applicable wiring diagram numbers for the R7184.

TIming:

Safe Start Check: 5 seconds (approximately).

Valve-on Delay: 15 seconds.

Burner motor-off Delay: 0, 2, 4 or 6 minutes. Field selectable using dual inline programmable (DIP) switch positions 1 and 2. Select models have 0.5, 2, 4, or eight minute delays. (See Fig. 2.)

NOTE: For universal R7184U model, valve-on delay and burner motor-off delay timings can be enabled (values as listed) or disabled (values are zero) in the field, using DIP switch position 3.

Lockout: 15, 30 or 45 seconds (factory-programmed).
Recycle: 60 seconds (fixed).
Ignition Carryover: 10 seconds (fixed).

Electrical Ratings:

Inputs:
Voltage: 102 to 132 Vac, 120 Vac nominal.
Current: 100 mA plus burner motor, valve and ignitor loads.
Frequency: 60 Hz.

Outputs:
Relay Contacts:
Burner: 120 Vac, 10 full load amperes (FLA), 60 locked rotor amperes (LRA).
Valve: 120 Vac, 1A.
Ignitor: 120 Vac, 360 VA.
Alarm: 30 Vac, 2A.
Thermostat Current Available: 100 mA.
EnviraCOM. Current Available: 150 mA.

NOTE: Reduce burner FLA rating by ignitor load. For example, if the ignitor draws 3A (120 Vac, 360 VA), reduce the burner motor FLA to 7A.

Typical Component Wire Color Code:

White: Neutral.
Black: Line.
Orange: Blower/Pump.
Blue or Blue w/White Stripe: Ignitor.
Violet: Valve.
Red: Limit.

NOTE: R7184 is provided with 1/4 in. (6 mm) quick-connect terminals.

Environmental Ratings:

Operating Ambient Temperature: -40°F to +150°F (-40°C to +66°C).
Shipping Temperature: -20°F to +150°F (-29°C to +66°C).
Humidity: 90% relative humidity at 95°F (35°C), noncondensing.

Approvals:

Underwriters Laboratories Inc.: Recognized.
Canadian Underwriters Laboratories Inc.

Table 1. R7184 Models.

Model	Valve-on delay (sec)	Burner motor-off delay (min)	Alarm Contacts	Typical Wiring Diagram Fig. reference No.	Thermostat Terminals T-T
R7184A	None	None	None	3,4,6,7	Yes
R7184B	15	None	None	3,4,5,8	Yes[a]
R7184P[b]	15	0/2/4/6[c] or 0, 5, 2, 4 or 8	Optional	2,3,5,8	Yes
R7184U	Selectable 0 or 15	Selectable 0 or 0,2,4,6[c]	Yes	2,3,5,8	Yes

[a] Select models are provided with a T-T jumper which can be disabled by cutting with a pair of side-cutting pliers. (See Fig. 2.)
[b] Some select models may have a delay enable/disable switch.
[c] Standard timings. Other timing may be available on select models.

INSTALLATION

When Installing This Product.

1. Read these instructions carefully. Failure to follow instructions can damage the product or cause a hazardous condition.
2. Check ratings given in these instructions and on the product to make sure the product is suitable for your application.
3. Make sure the installer is a trained, experienced service technician.
4. Use these instructions to check out the product operation after installation.

WARNING
Electrical Shock Hazard.
Can cause severe injury, death or property damage.
Disconnect power supply before beginning installation to prevent electrical shock or equipment damage. More than one disconnect may be involved.

Location

1. Mount on a 4 in. by 4 in. junction box, directly on the main burner, or inside the appliance cabinet. In replacement applications, mount in the same location as the old control. See Fig. 1. Make sure the operating temperatures are within the ambient temperature range (see Specifications section).

2. Before mounting the control, make line voltage connections as shown in Fig. 2 through 8. Splice lines with solderless connectors. Do not exceed load ratings shown on the device label.

3. If necessary, use the control as a template to mark and drill new mounting holes.

4. Mount the device using No. 6 screws (obtained locally).

WIRING

WARNING
Electrical Shock Hazard.
Can cause severe injury, death or property damage.
Disconnect power supply before beginning wiring to prevent electrical shock or equipment damage. More than one disconnect may be involved.

1. Make sure wiring complies with all local codes and ordinances.

2. Check to make sure that line voltage wiring is properly connected. Refer to oil primary label and appliance wiring diagram for color codes.

3. After mounting make low voltage connections to the screw terminals (see Fig. 2 through 10).

4. Strip leads 3/8 in. (10 mm) and insert under terminal screw.

5. Connect thermostat leads to T-T (or 1, 2, 3 if EnviraCOM™ is present), if required by installation.

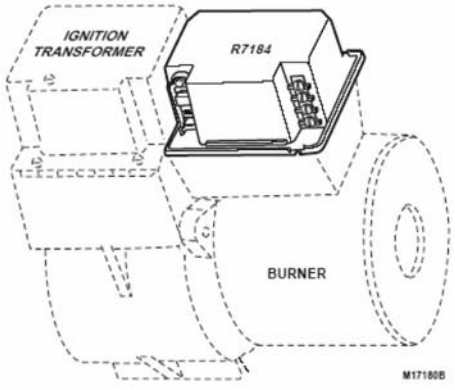


Fig. 1. Mounting R7184 on junction box.

Switch Settings

Fig. 9 and Table 2 provide the switch settings for the R7184P and R7184U.

CHECKOUT

Start System

WARNING
Fire or Explosion Hazard.
Can cause severe injury, death or property damage.
Make sure the combustion chamber is free of oil and/or oil vapor before starting system.

1. Open hand valve in oil supply line.

2. Make sure system is powered. Check circuit breaker or fuse and close system switch, if provided.

3. Set thermostat to call for heat.

4. Make sure burner lights and operates until call for heat ends.

5. Verify that burner turns off when thermostat call for heat is satisfied.

Check Safety Features

Safe Start

1. Place a jumper across cad cell terminals.

2. Follow procedure to turn on burner. Burner must not start, indicator light turns on and control remains in Idle Mode.

Simulate Flame Failure:

1. Follow procedure to turn on burner.

2. Close hand valve in oil supply line.

3. Device enters recycle mode.

4. Device tries to restart system after approximately 60 seconds.

5. Safety switch locks out approximately in safety switch timing indicated on label. Indicator light flashes 1/2 second on, 1/2 second off. Ignition and motor stop and oil valve closes.

Simulate Ignition Failure:

1. Follow starting procedure to turn on burner, but do not open oil supply hand valve.

2. Observe that safety switch locks out approximately within safety switch timing as indicated on the label. Indicator light flashes 1/2 second on, 1/2 second off. Ignition and motor stop and oil valve closes.

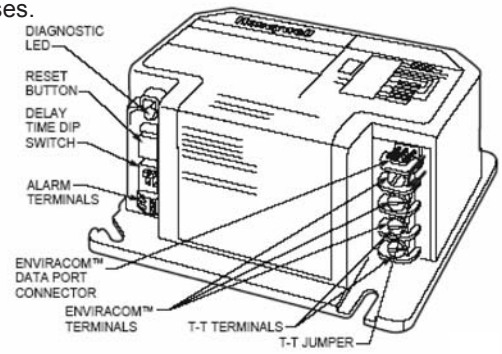


Fig. 2. R7184 terminals, connectors, LED, reset button and DIP switch locations.

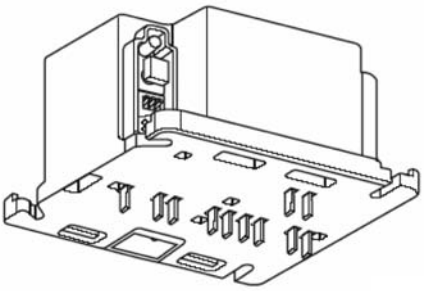
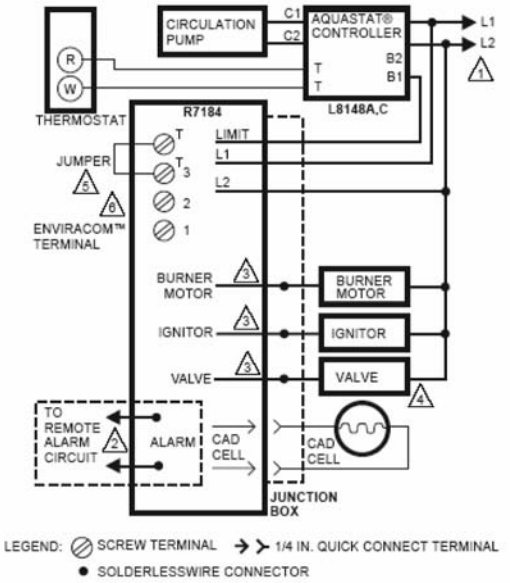


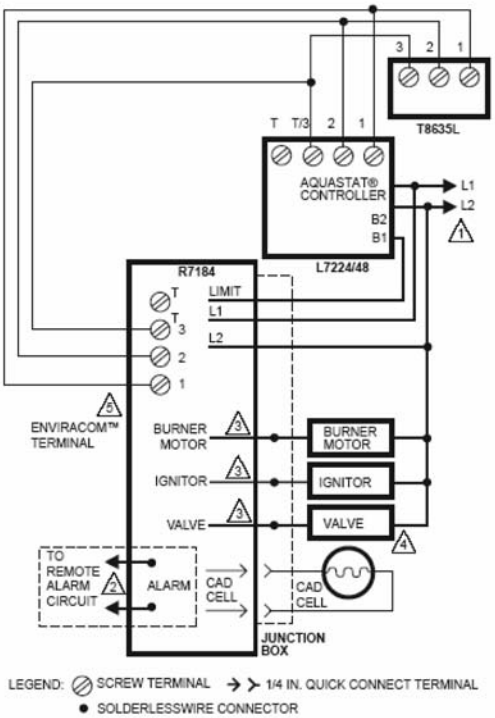
Fig. 3. R7184 wiring connections.

Fig. 4. Alarm terminals. Press the two buttons on the top of the terminal, insert wires, and release buttons.



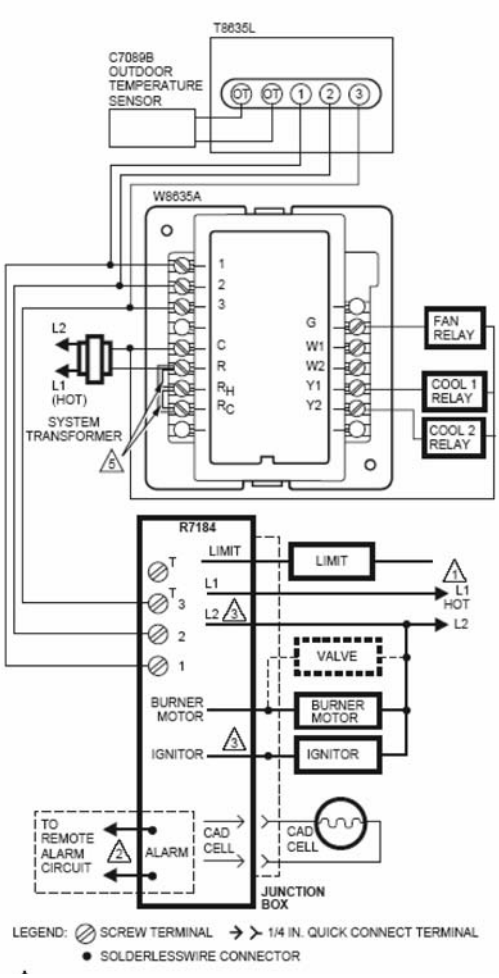
1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2. OPTIONAL FEATURE ON SELECT MODELS.
3. REFER TO DEVICE LABEL FOR WIRE COLOR CODE.
4. VALVE IS OPTIONAL ON SPECIFIC MODELS.
5. SEE FIG. 2.
6. ENVIRACOM™ TERMINAL 3 IS ALSO THE FIRST THERMOSTAT TERMINAL.

Fig. 5. Wiring R7184P,U without EnviraCOM™, for typical oil-fired boiler.



1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2. OPTIONAL FEATURE ON SELECT MODELS.
3. REFER TO DEVICE LABEL FOR WIRE COLOR CODE.
4. VALVE IS OPTIONAL ON SPECIFIC MODELS.
5. ENVIRACOM™ TERMINAL 3 IS ALSO THE FIRST THERMOSTAT TERMINAL.

Fig. 6. Wiring R7184, with EnviraCOM. connections,for typical oil-fired boiler.

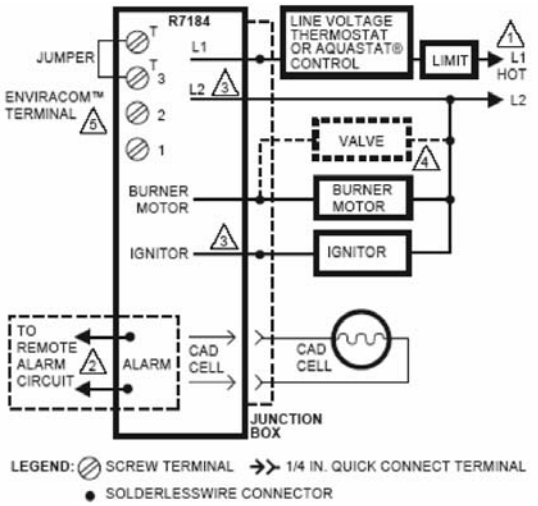


1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2. OPTIONAL FEATURE ON SELECT MODELS.
3. REFER TO DEVICE LABEL FOR WIRE COLOR CODE.
4. VALVE IS OPTIONAL ON SPECIFIC MODELS.
5. FACTORY INSTALLER JUMPERS.
6. ENVIRACOM™ TERMINAL 3 IS ALSO THE FIRST THERMOSTAT TERMINAL.

Fig. 7. Typical wiring diagram for EnviraCOM™ enabled thermostat and R7184 for an oil-fired forced-air system.

IMPORTANT

System as shown in Fig. 7 is phase/polarity sensitive. Make sure all input power is in the same phase.



1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2. OPTIONAL FEATURE ON SELECT MODELS.
3. REFER TO DEVICE LABEL FOR WIRE COLOR CODE.
4. VALVE MAY BE ADDED AS SHOWN ON PRIMARIES THAT DO NOTHAVE A VALVE LOAD.
5. ENVIRACOM™ TERMINAL 3 IS ALSO THE FIRSTTHERMOSTAT TERMINAL.

Fig. 8. Typical wiring diagram for line voltage, EnviraCOM. enabled, Aquastat® and R7184 for an oil thermostat and R7184A,B for an oil burner system.

OPERATION

The R7184 is a microprocessor-based control. The indicator light provides diagnostic information for lockout, recycling and patented cad cell status. There is a manual reset button to exit the lockout mode and enter the idle mode. (See Fig. 2.) Operation is shown in Table 4.

TROUBLESHOOTING AND MAINTENANCE

IMPORTANT

Due to the potential hazard of line voltage, only a trained, experienced service technician should preform the troubleshooting procedures.

This control contains no field-serviceable parts. Do not attempt to take it apart. Replace entire control if operation is not as described.

To completely troubleshoot an oil burner installation, check the burner and oil primary control for proper operation and condition.

The indicator light on the oil primary control provides lockout, recycle and cad cell indications as follows:

1. Flashing at 1/2 second on, 1/2 second off: system is locked out or in restricted mode.

2. Flashing at 2 seconds on, 2 seconds off: control is in recycle mode.

3. On: cad cell is sensing flame.

4. Off: cad cell is not sensing flame.

Cad Cell Resistance Check

For proper operation, it is important that the cad cell resistance is below 1600 ohms. During a normal call for heat, once the control has entered the Run mode, press and release the reset button. See Table 3 for equivalent cad cell resistance and Fig. 11 for an example of the cad cell resistance reading.

Preliminary Steps

1. Check wiring connections and power supply.

2. Make sure power is on to controls.

3. Make sure limit control is closed.

4. Check contacts between ignitor and the electrodes.

5. Check the oil pump pressure.

6. Check the piping to the oil tank.

7. Check the oil nozzle, oil supply and oil filter.

Check Oil Primary Control

If the trouble is not in the burner or ignition hardware, check the oil primary control by using the following equipment:

1. Screwdriver.

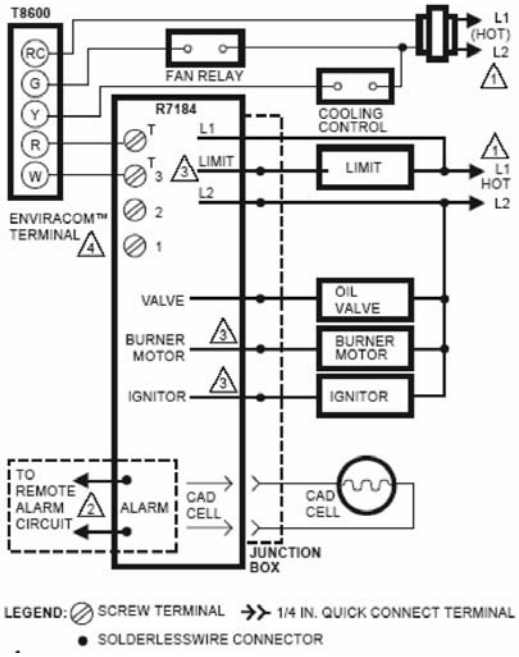
2. Voltmeter (0 to 150 Vac range).

3. Insulated jumper wire with both ends stripped.

WARNING
Electrical Shock Hazard.
Can cause severe injury, death or property damage.

Troubleshoot with the system powered. Be careful to observe all precautions to prevent electrical shock or equipment damage.

Refer to Table 4 for further troubleshooting information.



1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD
2. PROTECTION AS REQUIRED.
3. OPTIONAL FEATURE ON SELECT MODELS.
4. REFER TO DEVICE LABEL FOR WIRE COLOR CODE.
5. ENVIRACOM™ TERMINAL 3 IS ALSO THE FIRST THERMOSTAT TERMINAL.

Fig. 9. Typical wiring diagram for24 Vac thermostat and R7184 for valve-on delay/burner motor off oil burner system.

Table 2. Switch Settings and Delays.

Valve-On Delay (seconds)	Delay Timings: Burner Motor-Off Delay (minutes)		DIP Switch Settings			
					S-3 Enable/ Disable	
	R7184U	R7184P	S-1	S-2	R7184U	R7184P
0	0	—	X	X	Off	b
15	0	0.5	Off	Off	On	
	2	2	Off	On		
	4	4	On	Off		
	6	8	On	On		

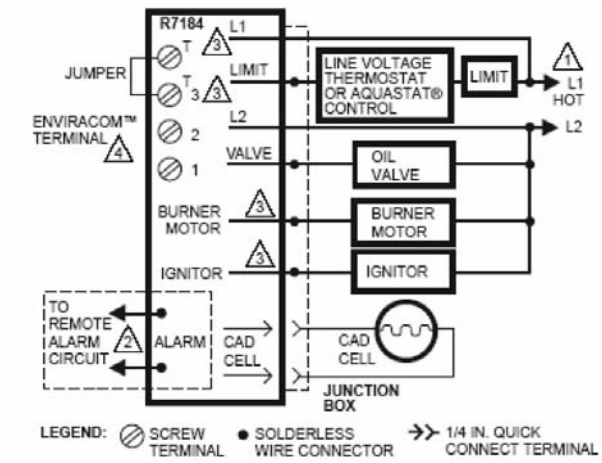
X Don't Care.

[a] Specific models may have different timings. Be sure to check device label.

[b] S-3 not provided on R7184P models.

Table 3. Cad Cell Resistance When Sensing Flame.

Flashes	Cad Cell Resistance in ohms
1	Less than 400
2	More than400 and less than 800
3	More than 800 and less than 1600
4	More than 1600 and less than 5000



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

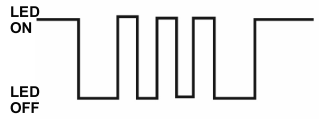
2 OPTIONAL FEATURE ON SELECT MODELS.

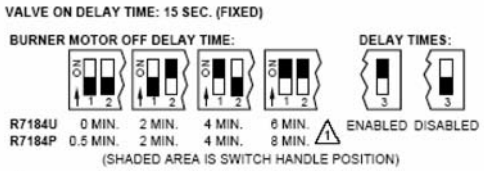
3 REFER TO DEVICE LABEL FOR WIRE COLOR CODE.

4 ENVIRACOM™ TERMINAL 3 IS ALSO THE FIRST THERMOSTAT TERMINAL.

Fig. 10. Typical wiring diagram for line voltage Aquastat® thermostat and R7184P,U for valve-on delay/burner motor-off delay oil burner system.

Fig. 11. Example of 800 to 1600 ohm cad cell resistance reading (3 flashes).





1 SELECT MODELS MAY HAVE DIFFERENT TIMINGS

Fig. 12. Switch settings for burner-off delay times.

Table 4. R7184 Operation.

External Action	R7184 Action
Power applied to control.	Internal safety check conducted. If no light or flame is detected and all internal conditions are correct, control enters Idle Mode.
Thermostat or Aquastat® Control calls for heat.	**1.** Shorts across T-T terminals (on a call for heat) in warm air system and/or provides power to limit terminals in hydronic system. Systems with EnviraCOM™ network may receive a call for heat on network connections 1, 2, 3. **2.** Safety Period (5 seconds) internal and external check for flame or light. If flame or light is detected, control remains in the Idle Mode. **3.** When flame or light is not present: a. R7184A,U (if valve-on delay is enabled) will apply power to the burner motor and ignitor. b. R7184B,P,U (if valve-on delay is enabled) will apply power to the burner motor and ignitor, enter/complete valve-on delay period and then apply power to the valve. **4.** Control enters Trial for Ignition period. a. Monitors burner for flame. b. When flame is not detected: (1) Enters lockout mode (after lockout time of 15, 30, or 45 seconds). (2) Shuts off valve, ignitor and burner motor. (3) Flashes indicator light at 1/2 second on, 1/2 second off. (4) Depress reset button to return to power-up sequence. c. When flame is detected, Carry-Over period begins: **5.** Control enters Ignition Carry-Over period (continues to spark for 10 to 30 seconds. a. Turns on indicator light. b. If flame is lost and lockout time has not expired, R7184 returns to Trial for Ignition period. c. If flame is lost and lockout time has expired, R7184 enters Recycle Mode.

Table 4. R7184 Operation. continued

External Action	R7184 Action
Thermostat or Aquastat® Control calls for heat.	**6.** Carry-Over time expires; ignitor turns off. **7.** Enters Run Mode: a. Flame is monitored until call for heat ends or flame is lost. If flame is lost: (1) Control enters Recycle Mode. (2) Recycle time starts (60 seconds). (3) Burner and valve are turned off. (4) Indicator light flashes at 2 seconds on, 2 seconds off. (5) Returns to Idle Mode at end of Recycle Mode.
Call for heat is satisfied.	**1.** R7184A,U (if burner motor-off delay is disabled): a. Burner motor and oil valve shut off. b. Indicator light turns off. **2.** R7184B,P,U (if burner motor-off delay is enabled): a. Oil valve shuts off. b. Burner motor runs for selected burner motor-off delay time. c. Burner motor turns off. d. Device returns to Idle Mode.
Reset Button pushed two times without device completing a call for heat.	**1.** R7184 enters Restricted Mode. **2.** Indicator light flashes and 1/2 second on, 1/2 second off. **3.** Reset device by pressing and holding reset button for a minimum of 30 seconds.

Table 5. Troubleshooting Information .[a]

Procedure	Status	Corrective Actions
1. Check that limit switches are closed and contacts are clean.	–	–
2. Check for line voltage power at the oil primary control. Voltage should be 120 Vac.	–	–
3. Check indicator light with burner off, no call for heat (no	Indicator light stays on.	Cad cell or controller is defective, sees external ligh or connections are shorted. Go to step 4.
flame).	Indicator light turns off.	• Eliminate external light source or permanently shield cad cell.
4. Shield cad cell from external light.	Indicator light stays on.	• Replace cad cell with new cad cell and recheck. • If indicator light does not turn off, remove cad ce leadwires from R7184 and recheck. • If indicator light turns off, replace cad cell bracke assembly. Refer to TRADELINE® Catalog for bracket part numbers. • If indicator light does not turn off, replace controller.
5. On warm air systems, jumper thermostat terminals (T to T) on R7184. (On hydronic systems, jumper limit terminal and L1 of R7184.)	Burner starts. Burner does not start.	Trouble in thermostat or limit circuit. Check thermostat or limit wiring connections • Disconnect line voltage power and open line switch. • Check all wiring connections. • Tighten any loose connections and recheck. • If burner does not start, replace R7184.
Condition: Burner starts, then locks out on safety with indicator light flashing at 1/2 second on, 1/2 second off.		
1. Check that limit switches are	–	–
closed and contacts are clean. **2.** Check for line voltage at the oil primary control. Voltage	–	–
should be 120 Vac. **3.** Check indicator light with	Indicator light is on.	Cad cell or controller is defective, sees external lighor connections are shorted. Go to step 4.
burner off, no call for heat (no	Indicator light is off.	Go to step 5.
flame).	Indicator light turns off.	Eliminate external light source or permanently shielcad cell.
4. Shield cad cell from external light.	Indicator light stays on.	• Replace cad cell with new cad cell and recheck. • If indicator light does not turn off, remove cad cell leadwires from R7184 and recheck. • If indicator light turns off, replace cad cell bracke assembly. Refer to TRADELINE® Catalog for bracket part numbers. • If indicator light does not turn off, replace controller.

Procedure	Status	Corrective Actions
5. On applications with "valve-on delay", verify that oil valve is closed during the .valve-on delay. period byopening view port and verifying that no flame is present during 15-second.valve-on delay..	Indicator light is on.	• If flame is present, replace valve.
6. On warm air systems, jumper thermostat terminals (T to T) on R7184. (On hydronic systems, jumper limit terminal and L1 of R7184.	Burner starts.	Trouble is in thermostat or limit circuit. Check thermostat or limit wiring connections.
	Burner does not start.	• Disconnect line voltage power and open line switch. • Check all wiring connections. • Tighten any loose connections and recheck. • If burner does not start, replace R7184.
Condition: Burner starts then locks out on safety with indicator light flashing at 1/2 second on, 1/2 second off.		
7. Reset oil primary control by pushing in and releasing red reset button.	Indicator light stops flashing.	Go to step 8.
	Indicator light con-tinues to flash at 1/2 second on, 1/2 second off.	Verify that control is not in restricted mode. If not in restricted mode, replace R7184.
8. Listen for spark after burner turns on (after a 2-second delay).	Ignition is off.	Spark ignitor could be defective. Check for line voltage at ignitor terminals. If line voltage is present replace R7184.
	Ignition is on.	Go to step 9.
	Ignition is on, but no oil is being sprayed into the combustion chamber.	Wait for valve-on delay to complete (R7184B,P, and U). Check oil valve, oil valve wiring, pump and oil supply.
9. Check indicator light after flame is established, but before oil primary control locks out.	Indicator light is on until the control locks out and starts flashing during lockout.	Replace R7184.
	Indicator light stays off.	Go to step 10.
10. Check cad cell sighting for view of flame. a. Disconnect line voltage power and open line switch. b. Unplug cad cell and clean cad cell face with soft cloth. Check sighting for clear view of flame. Place cad cell back in socket. c. Reconnect line voltage power and close line switch. d. Start burner.	Burner locks out.	Go to step 11.
	Burner keeps running.	System is okay.
11. Check cad cell. a. Disconnect line voltage power and open line switch. b. Remove existing cad cell and replace with new cad cell. c. Disconnect all wires from thermostat terminals to be sure there is no call for heat. d. Reconnect line voltage power and close line switch. e. Expose new cad cell to bright light, such as a flashlight.	Indicator light is on.	Place control back on burner. Go to step 6.
	Indicator light is off.	Go to step 12.
12. Check cad cell bracket assembly. a. Disconnect line voltage power and open line switch. b. Remove cad cell wires from quick-connect connectors on the R7184 and leave control lead wires open. c. Apply power to the device. d. Place jumper across cad cell terminals after burner motor turns on.	Indicator light is on.	Replace cad cell bracket assembly. Refer to TRADELINE® Catalog for bracket part numbers.
	Indicator light is off.	Replace R7184.

[a] The EnviraCOM. equipment can prevent the R7184 from turning on. Aquastat® equipment can send a "Force Off" message. A miswired bus will prevent the R7184 from turning on, also.

INSTALLATION INFORMATION

FOR A -2000, A-7000 SINGLE STAGE AND B-8000 TWO STAGE FUEL UNITS

1725 RPM, BLACK LABEL 3450 RPM, WHITE LABEL

Figure 1

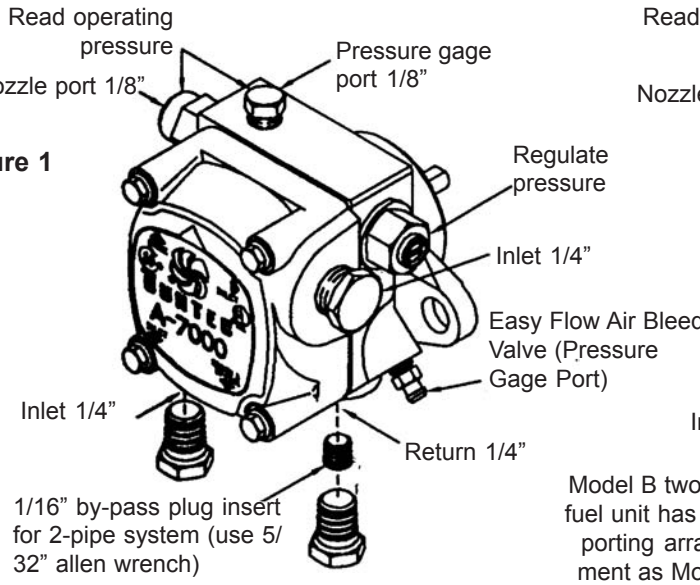
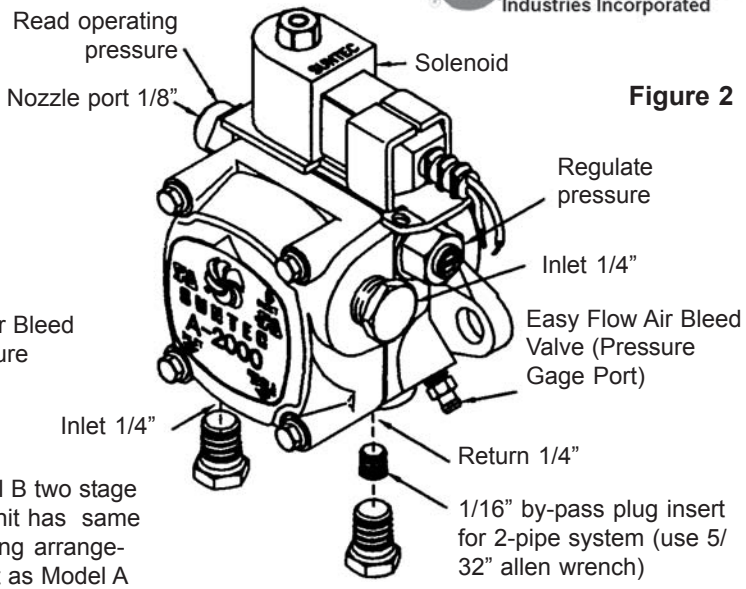


Figure 2



Model B two stage fuel unit has same porting arrangement as Model A

ONE-PIPE SYSTEM • Figure 4

DO NOT INSTALL BY PASS PLUG! Connect inlet line to pump inlet. Start burner, Arrange primary burner control for continuous operation during purging. Open easy flow bleed valve 1 turn CCW. Bleed unit until all air bubbles disappear - HURRIED BLEEDING WILL IMPAIR EFFICIENT OPERATION OF UNIT. Tighten Easy flow bleed valve securely.

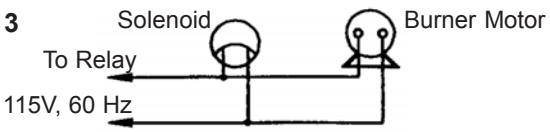
TWO-PIPE SYSTEM • Figure 5

REMOVE 1/16" BY PASS PLUG FROM PLASTIC BAG ATTACHED TO UNIT. Remove 1/4" plug from return port. Insert by - pass plug (See figure 1 or 2). Attach return and inlet lines. Start burner - Air bleeding is automatic. Opening Easy Flow Air Bleed Valve will allow a faster bleed if desired. Return line must terminate 3-4" above supply line inlet (see Figure 5). Failure to di this may introduce air into the system and could result in the loss of prime.

SOLENOID WIRING

DISCONNECT POWER SUPPLY BEFORE WIRING TO PREVENT ELECTRICAL SHOCK OR EQUIPMENT DAMAGE. Lead wire on these devices are long enough to reach the junction box on most burner installations. Note: check the burner manufacturer's installation sheet for correct solenoid wiring. For all other applications, wire solenoid in parallel with burner motor. (See Figure 3). All electrical work should be done according to local and national codes. (Solenoid 115V, 0.1A, 60 Hz)

Figure 3



GENERAL INFORMATION • ALL SYSTEMS

IMPORTANT INFORMATION Long or oversized inlet lines may require the pump to operate dry during initial bleeding period. In such cases, the priming may be assisted by injecting fuel oil into the pump gearset. Under lift conditions, lines and fittings must be air tight. To assure this, "Pipe Dope" may be applied to both the used and unused inlet and both return fittings. DO NOT USE TEFLON TAPE!! DO NOT USE COMPRESSION FITTINGS!

MOUNTING POSITION Model "A" Single Stage Fuel Unit may be mounted in any position. Model "B" Two Stage Fuel Unit may be mounted in any position except upside down (1/8" ports pointed down.

VACUUM CHECK A vacuum Gage may be installed in either of the 1/4" inlet ports or in the 1/8" return port (on single pipe installations)' whichever is most convenient. The Model "A" Pump should be used where the vacuum does not exceed 6" hg single pipe and 12" hg. two pipe. The Model "B" should be used where vacuum is the total of all exceed 17" hg. Reminder, running vacuum is the total of all pressure drops (△P) in the system form tank to inlet of pump.

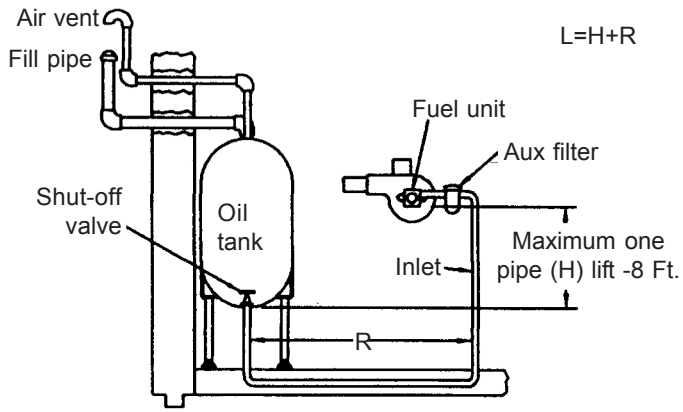
PRESSURE CHECK If a pressure check is made use GAGE PORT OR NOZZLE PORT. DO NOT USE EASY FLOW BLEED VALVE PORT FOR THE 7000 SERIES. The Easy Flow Bleed Valve Port contains pressure higher than operating pressure. Setting pump pressure with gage in the Easy Flow Bleed Valve Port results in WRONG operating pressure. The 2000 series and 7400 series are exceptions (See Figure 2).

CUTOFF PRESSURE Average cutoff pressure for A and B fuel units is 80 psig. To check cutoff pressure, install pressure gage in nozzle port. Run burner for short period of time. Shut burner off. Gage shows cutoff pressure.

• CAUTION •

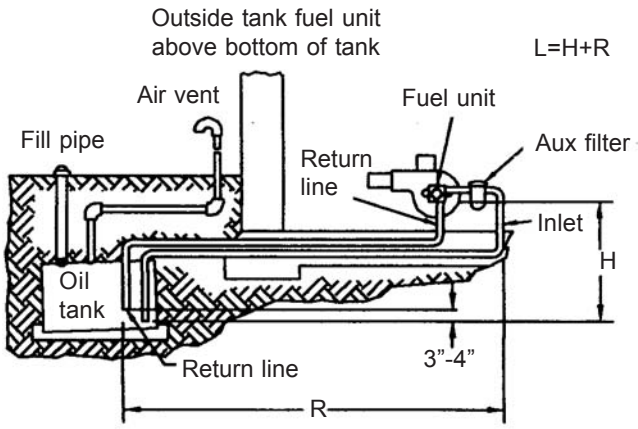
Pressurized or gravity feed installations must not exceed 10 PSI on inlet line or return line at the pump. A Pressure greater than 10 PSI may cause damage to the shaft seal.

ONE-PIPE SYSTEM • MODEL A



The Suntec Model "A" Fuel unit may be installed one pipe with gravity feed Lift.
The maximum allowable lift is 8 ft.-See Figure 4.
Important: One-pipe installations must be absolutely air tight or leaks or loss of prime may result. Bleed line and fuel unit completely. Bleed for 15 seconds after last air is seen from easy flow to be certain lines are air free.
L = Line Length in Feet H = Head in feet Q = Firing rate GPH
3/8" line $L = \frac{6 - .75H}{.0086\ Q}$ 1/2" Line $L = \frac{6 - .75H}{.00218\ Q}$
If tank is above pump, change - to +. Fittings, valves, and filters will reduce total length allowed.

TWO-PIPE SYSTEM • MODEL A AND B



Always terminate return line as shown in figure 5. Line length includes vertical and horizontal lengths.

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2210 Harrison Avenue
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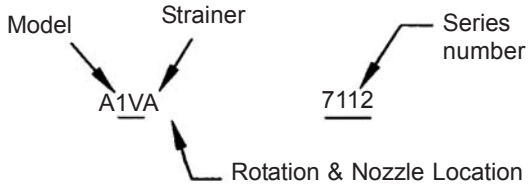
(815) 226-3700

...working harder to serve you even better.

PUMP USAGE IDETIFICATION

IDENTIFICATION EXAMPLE



A

MODEL	Max. nozzle capacity (GPH) at 100 PSI	RPM
A2V-2000	3	3450
A1V-7100	3	1725
A2V-7100	3	3450
A2V-7400	3	3450
A1Y-7900	7	1725
A2Y-7900	7	3450

B

MODEL	Max. nozzle capacity (GPH) at 100 PSI	RPM
B1V-8200	3	1725
B2V-8200	3	3450
B1Y-8900	7	1725
B1Y-8900	7	3450

Strainer Type	U.L. Strainer Rating (GPH)* #2 Fuel Oil
V	3
Y	7
T	23
G	34

Designator	Rotation/Nozzle Location
A	RH/RH
B	RH/LH
C	LH/LH
D	LH/RH

* Max. firing rate not to exceed max. nozzle capacity or strainer rating whichever is LESS. A greater firing rate requires a suitable external strainer.
ALL INSTALLATIONS SHOULD BE MADE WITH LOCAL AND NATIONAL CODES.

A. SINGLE-STAGE • TWO-PIPE MAX. LINE LENGTH (H + R)

Lift "H"	1725 RPM		3450 RPM			
	3/8" OD Tubing	1/2" OD Tubing	3/8" OD Tubing		1/2" OD Tubing	
Fig.5	3 GPM	3 GPM	3 GPM	7 GPM	3 GPM	7 GPM
	86'	100'	84'	71'	100'	100'
0'	80'	100'	78'	66'	100'	100'
1'	75'	100'	73'	62'	100'	100'
2'	70'	100'	68'	57'	100'	100'
3'	64'	100'	63'	53'	100'	100'
4'	59'	100'	57'	48'	100'	100'
5'	54'	100'	52'	44'	100'	100'
6'	49'	100'	47'	39'	100'	100'
7'	43'	100'	42'	35'	100'	100'
8'	37'	100'	36'	31'	100'	100'
9'	32'	100'	31'	27'	100'	100'
10'	26'	100'	26'	22'	100'	87'
11'	21'	85'	21'	18'	83'	70'
12'	-	63'	-	-	62'	52'
13'	-	42'	-	-	41'	35'
14'						

B. TWO-STAGE • TWO-PIPE MAX. LINE LENGTH (H + R)

Lift "H"	1725 RPM				3450 RPM			
	3/8" OD Tubing		1/2" OD Tubing		3/8" OD Tubing		1/2" OD Tubing	
Fig.5	3 GPM	7 GPM	3 GPM	7 GPM	3 GPM	7 GPM	3 GPM	7 GPM
0'	100'	91'	100'	100'	93'	80'	100'	100'
2'	100'	83'	100'	100'	85'	73'	100'	100'
4'	89'	75'	100'	100'	77'	86'	100'	100'
6'	80'	67'	100'	100'	69'	59'	100'	100'
8'	70'	59'	100'	100'	60'	52'	100'	100'
10'	61'	51'	100'	100'	52'	45'	100'	100'
12'	51'	43'	100'	100'	44'	38'	100'	100'
14'	41'	35'	100'	100'	36'	31'	100'	100'
16'	32'	27'	100'	100'	27'	24'	100'	100'
18'	22	-	88'	74'	-	-	76'	65'

BS DOMESTIC WATER HEATERS

I - DESCRIPTION

These domestic water heaters consist essentially of:

- Austenitic stainless steel tank and coil
- Polystyrene insulation easy to remove from the tank
- ABS plastic casing
- Inspection trap
- Thermometer and temperature setting aquastat
- Connector

II - INSTALLATION / ELECTRICAL CONNECTIONS

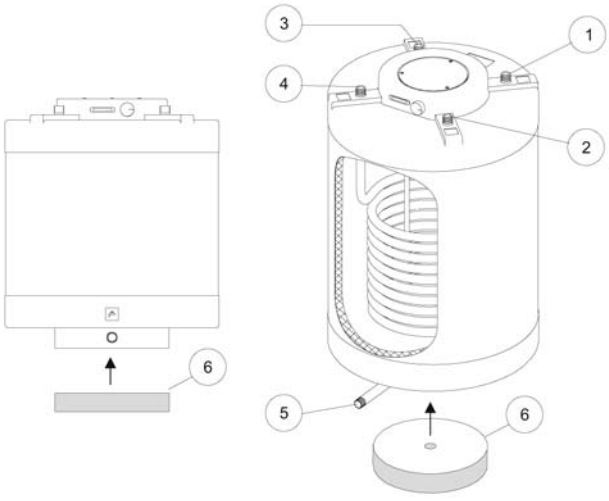
Provision must be made for fitting a pressure relief valve to limit the domestic water pressure to 100 PS I (7 bars) and a domestic water expansion vessel or a French standard domestic water safety unit to carry out the functions of pressure relief valve, non-return valve towards the cold water circuit, expansion vessel drain and stop valve. Never mount a shut-off valve between the safety unit or the pressure relief valve and the tank. Connect the safety unit up to the effluent water drain. Make sure that the maximum primary circuit pressure doesn't exceed 140 PSI (10 bars) on the maximum pressure of the heat generator if less than 140 PSI (10 bars). If the domestic hot water tank has been selected to provide maximum performance , make sure that the output and primary circuit temperature are correct and that the generator power is at least equal to the exchanger power. When the cold water pressure exceeds 60 PSI (4 bars), make provision for a pressure reducer.

Always set the boiler temperature at least 10°C higher than the desired storage temperature in the domestic hot water tank.

Leave sufficient space above the tank to allow access to the inspection trap. The trap seal must be replaced with every inspection.

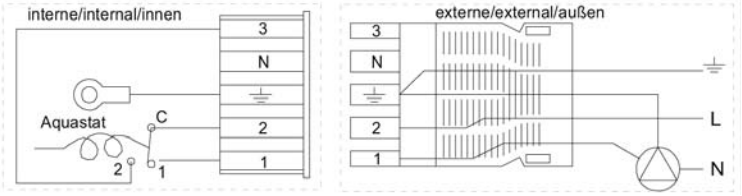
Hydraulic connections :

1. Primary inlet
2. Domestic hot water supply outlet
3. Recycling
4. Primary outlet
5. Domestic hot water supply inlet



> The insulation (6), laid on the top of the tank in the packing, must be fitted to the shell under the tank before the tank is installed.

Electrical connections for BS DHW-Tank (24 Volts/60 Hz)



III - TECHNICAL DATAS

MODELS		***BS 100***	***BS 150***	***BS 200***	***BS 300***
Capacity	litres	100	150	200	300
Heigth	mm	700	925	1150	1600
Diameter	mm	600	600	600	600
Primary connection	pouces		¾	¾	¾ ¾
Domestic and recycled connection	pouces	¾	¾	¾	¾
Boiler/heat exchanger max operating pressure	psi	90	90	90	90
Max domestic hot water pressure	psi	100	100	100	100
Electrical connections		24 volts/ 60Hz on all tanks			
Domestic hot water thermostat 80	°C	20 à 80	20 à 80	20 à 80	20 à
Thermostat différential	°C	6	6	6	6
Inspection trap	mm	100	100	100	100
Ø heat exchanger pipe	mm	25 x 1	25 x 1	25 x 1	25 x 1
Primary capacity	litres	5,1	5,2	10,3	10,7
Max heat exchanger power at Tm=80°C	kW	35	35	60	62
Heat exchangeur surface	dm²	95,8	99	194,8	201,8
Heatlosses (tank at 65 °C)	W	58	77	97	136
BS performance with MZ 25					
Max heat transfer	kW - Btu/h	23,3-79500 on all tanks			
Minimum primary water flow	m3/h	1,0	1,0	1,0	1,0
Primary heat exchanger pressure drop	mbar	55	55	95	95
Reheating time to 60°C	min	15	22	29	44
Continuous domestic water flow	l/min	11,2	11,2	11,2	11,2

MODELS		***BS 100***	***BS 150***	***BS 200***	***BS 300***
Volume drawn in 10 min at 40°C - storage 65°C	litres	173	241	313	476
Volume drawn in 1 hour at 40°C - storage 65°C	litres	731	798	870	1033
BS performance with MZ 20-40					
Max heat transfer	kW - Btu/h	35,0-119000		35,8-122000	
Minimum primary water flow	m3/h	1,5	1,5	1,5	1,5
Primary heat exchanger pressure drop	mbar	120	130	200	210
Reheating time to 60°C	min	10	15	19	28
Continuous domestic water flow	l/mIn	16,8	16,8	17,1	17,1
Volume drawn in 10 min at 40°C - storage 65°C	litres	229	261	313	476
Volume drawn in 1 hour at 40°C - storage 65°C	litres	1067	1098	1169	1332
BS performance with FCX					
Max heat transfer 22,3	kW - Btu/h		22,3	22,3	22,3
Minimum primary water flow	m3/h	1,0	1,0	1,0	1,0
Primary heat exchanger pressure drop	mbar	55	55	95	95
Reheating time to 60°C	min	15	23	30	45
Continuous domestic water flow	l/min	10,7	10,7	10,7	10,7
Volume drawn in 10 min at 40°C - storage 65°C	litres	169	241	313	476
Volume drawn in 1 hour at 40°C - storage 65°C	litres	702	774	846	1009

- Cold water inlet 10°C.
- Primary (boiler) water temperature set at 80°C
- Reheating time in minutes after a 10 mn drawn
- Max hot water tapping at continuous domestic water flow

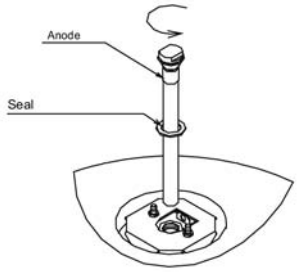
IV – WALL MOUNTING

Wall mounting bracket (for BS 100, BS 150, EBS 100 and EBS 150).

V - CHECK THE ANODE

The anode must be checked once a year :

- Isolate the cold water supply in to installation by using a stop valve.
- Drop the pressure inside the WW-tank by opening a hot water tap.
- Unscrew the anode.
- Check the degree of corrosion stage of the anode. If its weight is under 150 g, replace it with a new one. Replace the sealing joint and screw in the new anode.
- Open the water supply in the installation.



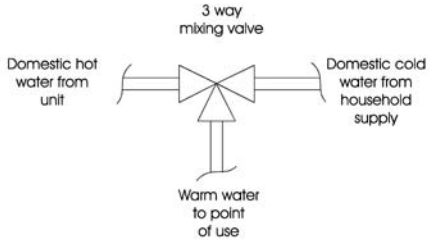
VI - RELIEF VALVE :

A temperature and pressure relief valve listed as complying with the Standard for Relief Valves and Automatic Gas Shut-off Devices for Hot Water Supply Systems, ANSI Z21.22, shall be installed at the time of installation of the heater in the locations provided or specified by the manufacturer. Local codes shall govern the installation of such relief devices. For safe operation of the water heater, the relief valve(s) must not be removed or plugged

Pressure relief valve must be manually operated at least once a year. Precautions must be taken prior to operating the relief valve to assure that hot water discharged from the relief valve will not contact people or damage property.

VII - WARNING

- Toxic chemicals, such as used for boiler treatment, shall not be introduced into the potable water heater used for space heating.
- Hotter water increases the risk of scald injury. Before changing temperature setting see the instruction manual. HOT WATER CAN PRODUCE 3RD DEGREE BURNS - IN 6 SECONDS AT 140° F (60° C) - IN 30 SECONDS AT 130° F (54° C).
- Maximum permissible potable water outlet temperature for this appliance is **180° F.**
- When system requires water for space heating at temperatures higher than required for other uses a means such as a mixing valve shall be installed to temper the water for those uses in order to reduce scald hazard potential. See piping diagram below :



MONITOR PRODUCTS, INC. ("MPI") LIMITED WARRANTIES

BS INDIRECT WATER STORAGE TANK

First year – MPI warrants each BS tank sold by it to be free from defects in material and workmanship for a period of 1 year from date of original purchase with an additional period of up to 3 months if unit was not installed at the time of purchase.

First through tenth year – MPI warrants that the stainless steel tank and heat exchanger is free from defects in material and workmanship for 10 years from date of purchase.

Items not covered: The BS tank is designed to be filled with clean potable water. Corrosion caused by chemically aggressive water voids this warranty.

Homeowner's obligation: The homeowner must show credible written evidence of anode rod inspection and replacement, when necessary, according to the schedule found in the installation instructions.

STANDARD PROVISIONS, TERMS AND CONDITIONS THAT ARE COMMON TO ALL MPI INDIVIDUAL PRODUCT WARRANTIES:

These warranties are subject to the condition that the MPI product(s) must have been installed in accordance with manufacturer's instructions. These warranties extend only to the first retail purchaser of the products and only to a product that has not been moved from its original installation site. These warranties do not apply to commercial applications.

In addition to each product warranty listed, MPI **warranties do not cover:**

1. Components that are part of the heating system but were not furnished by MPI as part of the heating system.
2. The workmanship of any installer of MPI's product(s). In addition, this warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
3. Any costs for labor for removal and reinstallation of the alleged defective part, the cost of shipping or transportation to MPI and back to the consumer, if necessary, and any other materials necessary to perform the exchange.
4. Replacement parts beyond the balance of the original warranty period.

REMEDY: If within the applicable warranty period, any product(s) or part(s) included in this warranty proves to be defective in material and/or workmanship, then MPI shall repair or replace, at its option, the defective product(s) or part(s) and return it to the consumer.

PROCEDURE FOR OBTAINING PERFORMANCE UNDER THIS WARRANTY: In order to obtain performance under this warranty, the original purchaser must promptly (in no event later than thirty (30) days after discovery of the defect) see to the return of the product(s) or part(s) in question, accompanied by a properly filled out MPI warranty claim form (Available from MPI by mail or phone). Any claim made under this warranty must be accompanied by proof of original purchase date, sales invoice or cancelled check showing the serial number as satisfactory evidence. Any replacements are made subject to validation by MPI of in-warranty coverage. An item to be replaced must be made available in exchange for the replacement.

SOLE REMEDY: The remedy and liability for any breach of warranty, express or implied, set forth herein is the sole and exclusive remedy and the limit of liability for any such breach.

EXCLUSIONS AND IMPLIED WARRANTIES: This warranty does not extend to any defect due to the negligence of others. failure to install, operate or maintain the product(s) in accordance with the installation, operation and maintenance instructions furnished with each new product, unreasonable use, accidents, acts of god, fire, snow, floods, lightning, alteration, ordinary wear and tear, or the use of unauthorized or nonstandard parts.

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Note: Some jurisdictions do not allow: (a) limitations on how long an implied warranty lasts; or (b) the exclusion or limitation of incidental, indirect, punitive or consequential damages, so the above limitations or exclusions may not apply to you.

NO VARIATION OF TERMS: the parties intend that this warranty be the exclusive and final expression of their agreement.

No person has the authority to orally, in writing or in any other way vary the terms, conditions or exclusions of this warranty, or to make any express warranties other than those contained herein.

LEGAL RIGHTS: This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

Monitor Products, Inc., P. O. Box 3408, Princeton, NJ 08543
(732) 329-0900

"As part of its policy of continuous product improvement, Monitor Products, Inc. reserves the right to make changes without notice"

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