The Blueray® System

Operation Maintenance and Installation Instructions BR-60 BR-75

Installer Note:

For on the job installation or service questions Call Toll Free 800-233-3144 (in PA, call 717-385-0731 collect). Installer note section on insufficient chimney draft pages 15 & 16.

DECEMBER 1980

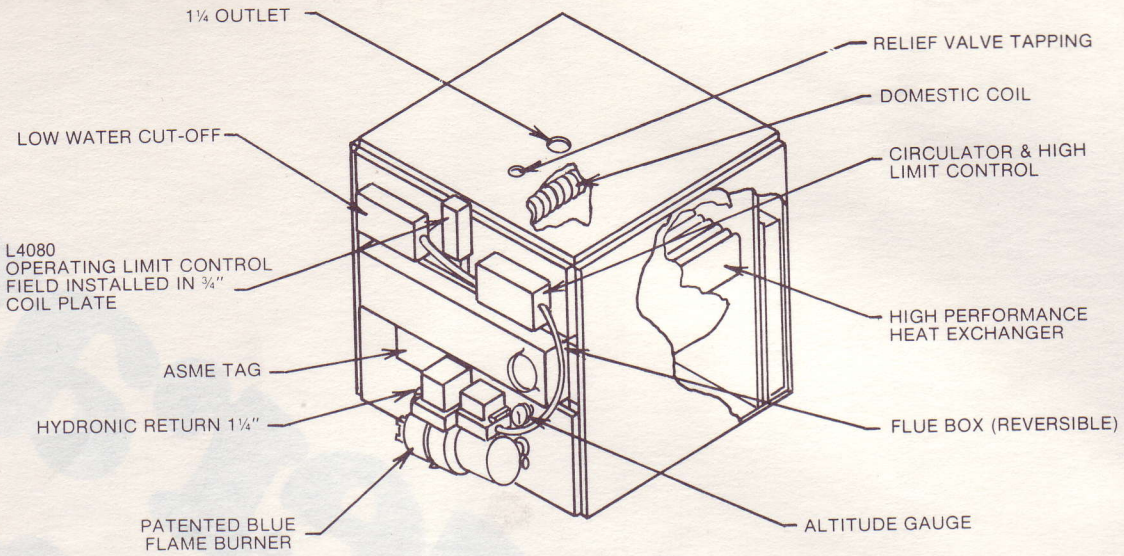

FIGURE 1

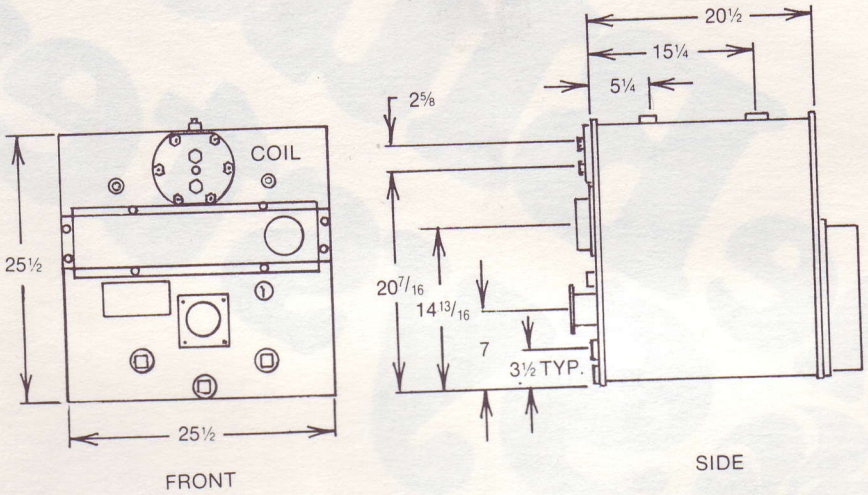

FIGURE 2

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BLUERAY SYSTEMS, INC.

Route 61, Schuylkill Haven, PA 17972 / 717-385-0731 — 800-233-3144

Principle of Operation

Blueray represents the latest technology in commercially available residential oil burners. Blueray burners are capable of operating at excess air levels as low as 5% and always operate with zero smoke. With the Blueray hot water hoiler, average system utilization efficencies of 84% are maintained throughout the heating season.

The Blueray burner is constructed with conventional gun type burner components. The unique burner head design, in combination with the specially constructed combustion chamber, enables the system to burn oil with a blue flame. Blue flame combustion is accomplished when oil droplets in the liquid state are vaporized and burn as a vapor. The mechanisms for this process are illustrated in the sketch below (Fig. 3).

All combustion air entering the combustion chamber must pass through the air jet orifices in the air metering plate. This jet pumping action creates an area of low pressure near the burner head thus drawing back some of the combustion gases in the chamber. These relatively hot gases mix with the incoming combustion air, preheat and vaporize the atomized oil prior to its combustion. The entire mixture becomes chemically correct for combustion along a plane where the flame front is illustrated.

The advantages of blue flame combustion include, the absence of smoke and soot generation and the ability to operate at low excess air levels as illustrated below (Fig. 4). Properly installed and adjusted, Blueray boilers provide years of trouble free and efficient service.

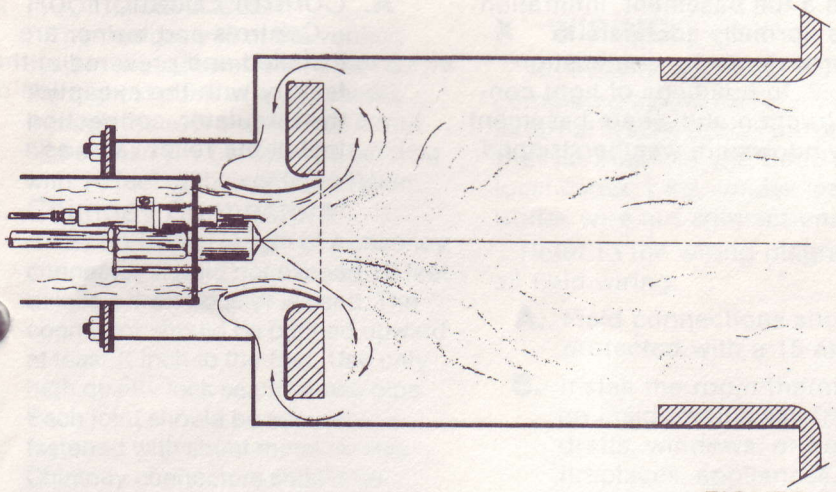


FIGURE 3

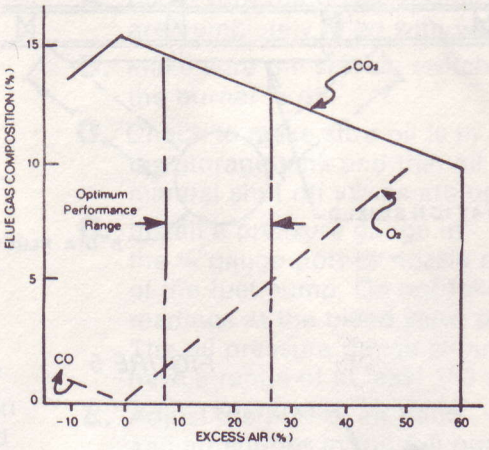


FIGURE 4

Installation

I GENERAL

The Blueray boiler is a high quality, high efficiency oil fired device. The boiler must be installed by a qualified Blueray dealer and in accordance with local codes and ordinances.

II PACKING LIST

1—Pyrostat 1—Warranty
1—Relief Valve 1—Jacket Assembly
1—Altitude Gauge 1—Draft Regulator
1—Burner and Hydronic Controls including low water cut-off

III FREIGHT CLAIMS

All units should be inspected for damage upon arrival. Concealed damage claims should be filed immediately against the carrier by the consignee. The carrier is responsible for taking prompt action on all claims.

IV SIZING

A complete heat loss calculation of the structure is necessary to choose the proper size unit to install. The boiler should be sized to within 25% of the actual calculated heat loss of the structure. Oversizing will result in short cycling and inefficient operation. The Blueray boiler has a large water content allowing for ample domestic hot water. Domestic hot water requirements should not affect sizing.

Replacement boilers should not be sized from the firing rate of the old boiler. A recent DOE sponsored study indicates 65% of the heating units in U.S. homes are substantially oversized.

V. BOILER LOCATION

The boiler should be located on a dry, level surface near the chimney on concrete blocks. It is important to locate the boiler near the chimney to effect the shortest possible run of smoke pipe. Allow clearance from combustible materials, listed as follows. Clearance should be provided to permit access to the rear target wall for servicing.

Minimum Clearances to Combustible Materials

6 in. *from the top of the boiler*
0 in. *from either side*
24 in. *from the front*
* 9 in. *from the chimney connector*
9 in. *from the rear*
0 in. *from the floor*

**If 9" clearance cannot be maintained from the flue pipe, use a radiation shield as shown in Fig. 5.*

Where space permits, allow ample clearance for access to the rear target wall.

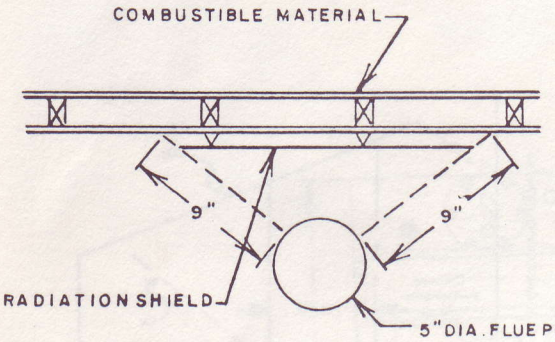


FIGURE 5

VI AIR FOR COMBUSTION AND VENTILATION

The unit must be installed where provisions exist for combustion and ventilation air. Ordinarily, provisions may be furnished by the following methods:

A. Utility Room or Alcove

In building of tight construction, including most modern homes, you should provide an opening, connecting to a well ventilated attic, crawl space, or directly with the outdoors. The opening should have a minimum free opening of 30 square inches and should terminate below burner level.

Basement

1. Where a boiler is installed in a full basement, infiltration is normally adequate to provide air for combustion.

2. In buildings of tight construction and where basement windows are weatherstripped, one opening communicating with a well ventilated attic or with the outdoors should be provided. The opening should have a minimum free area of 30 square inches.

C. Special Conditions

Where a boiler is located in an area in which the operation of exhaust fans, kitchen ventilation systems, clothes dryers, or fireplaces may create conditions of unsatisfactory combustion or venting, special provisions should be made for additional air for combustion subject to the authority having jurisdiction.

VII CONTROL LOCATION AND PIPING

A. Control Location

Controls and burner are installed and prewired at the factory with the exception of the circulator connection. Install the relief valve as

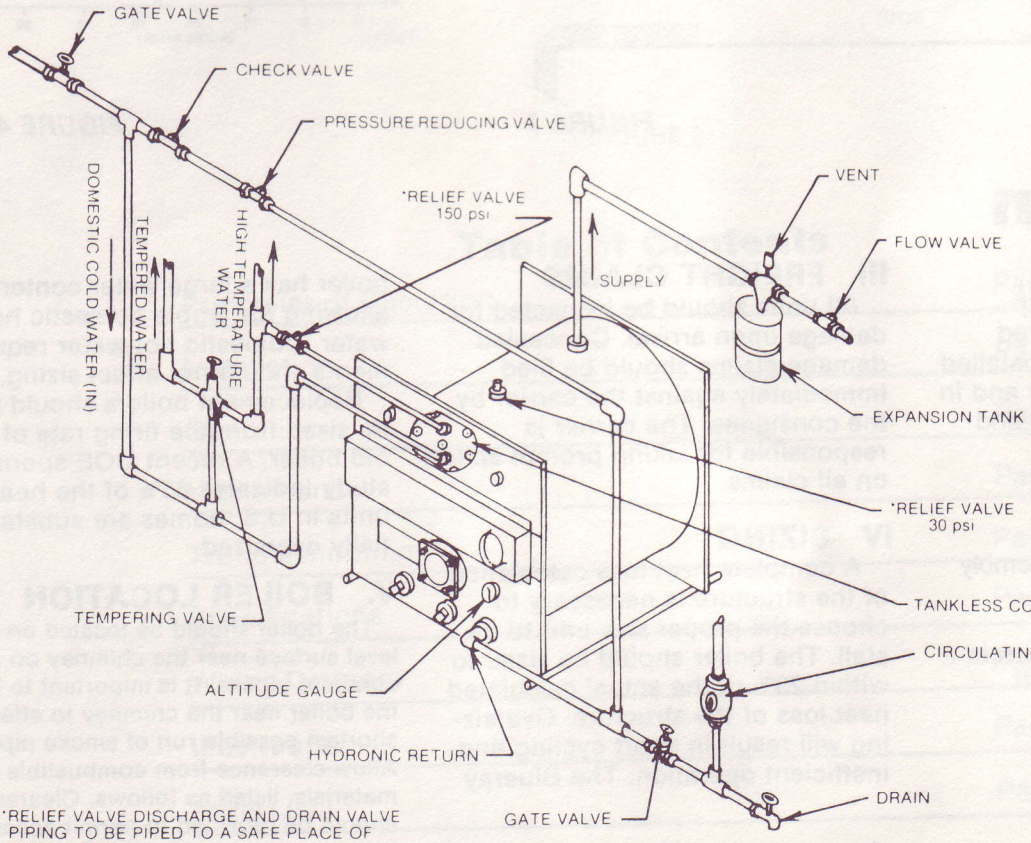


FIGURE 6 Boiler Piping

described in section B. Relief valve and drain piping should be piped to a place of safe discharge.

B. Boiler Piping

The recommended locations of pumps, expansion tanks, etc. are illustrated in Figure 6. Relief valve and drain piping should be piped to a place of safe discharge.

C. Tankless Heater Piping

The tankless heater may be connected as shown in Figure 6. A mixing valve may be used to reduce the water temperature at kitchen or bathroom taps. High temperature water for a dishwasher may be obtained by piping as shown.

The nuts that secure the tankless coil flange should be tightened before the boiler is filled with water, after initial firing and every year during annual maintenance.

VIII FLUE SYSTEM

A. Roof Clearances

The flue gas exit of the venting system should be at least 3 feet above the highest point where it passes through the roof and at least 2 feet higher than any portion of a building with 10 feet of the venting system.

B. Chimney Connectors

The horizontal length of a chimney connector should not exceed 10 feet unless a draft booster is used. The connector should be pitched upward at least ¼ inch to the foot. Use only high quality lock seam smoke pipe. Each joint should be securely fastened with sheet metal screws. Chimney connectors should be positioned to effect the shortest possible run of smoke pipe to the chimney.

C. Draft Regulator

The draft regulator must be in float position and installed near the flue outlet as shown below. The pyrostat should be installed in the fitting provided below the draft regulator.

D. Vent Cap

Install a U.L. listed vent cap where the possibility of down drafts exist.

IX FUEL SYSTEM

All piping systems should conform with pump manufacturers specifications which are attached to each new pump. The burner is capable of burning #1 or #2 heating oil. NEVER USE CRANK-CASE OIL, WASTE OIL, OR GASOLINE. In general, the following criteria apply to all systems.

Use #1 heating oil where outside tanks are used in climates where temperatures are frequently below zero.

The following criteria apply to all systems:

A. Oil lines should not be smaller than ⅜" O.D. copper tubing.

B. Oil lines must be absolutely air tight. Use only flared joints and use pipe dope on all threaded joints. Do not use teflon tape on fuel system joints. Check all joints and connections for leaks.

C. Fit the fuel suction line with a high quality cartridge type strainer.

D. Install swing type check valves in the suction line of two pipe fuel systems. (horizontal mount)

X WIRING

All internal electrical wiring is completed at the factory. All external wiring must conform with the National Electric Code and any local codes. Line voltage leads utilize wire nut connections.

Refer to the wiring diagrams for all field wiring.

A. Field connections should be protected with a 15 amp fuse.

B. Install the room thermostat on an inside wall away from cold drafts, windows, or heat from fireplaces, appliances, or sun light. Set the heat anticipator at .2 amps. Connect the thermostat leads to the "TT" terminals on the circulator control.

C. Connect the pyrostat to the primary control "FF" terminals using the low voltage wiring provided. Jump "TT" on the primary control.

D. Install a separate fused disconnect switch near the unit so power can be shut off for servicing.

E. Ground the equipment using the ground screw provided in the unit junction box.

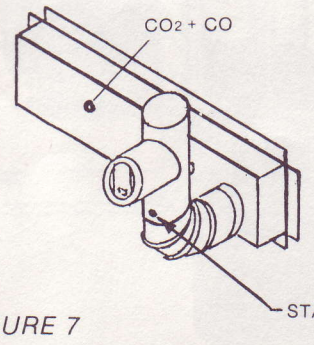


FIGURE 7

XI WARRANTY

The Blueray limited warranty is not applicable unless these installation instructions are followed.

Operation

I START UP

A. Make sure the boiler and piping are completely filled with water.

B. Make sure the service switch to the burner is off.

C. Check to make sure oil is in the storage tank and that all manual shut off valves are open.

D. Install a pressure gauge in the ⅛"gauge port or nozzle port of the fuel pump. Do not take readings at the bleed valve port. The oil pressure gauge should have a range of at least 150 psi.

E. Adjust the burner air band and air shutter to the full open position.

F. Push the safety reset button on the primary control and release.

G. Adjust the thermostat to call for heat. Turn the service switch on and the burner should start. If the burner fails to start, refer to the troubleshooting section of this manual.

H. With the burner running, place a container under the fuel pump bleed port. Open the bleed port and allow oil to run until a *clear stream of oil flows.* Close and tighten the bleed port.

START UP ADJUSTMENTS

Equipment Required

1. CO_2 analyzer (absorption type)

2. Draft Gauge
3. Fuel pressure gauge (0-150 lb.)
4. Vacuum gauge
5. Stack thermometer
6. CO Analyzer

B. Burner Adjustment

Allow the burner to operate steadily for at least five minutes before making the following adjustments:

1. Sampling Hole—Pumch a ¼" sampling hole in the flue pipe between the flue box and the draft regulator, and in the flue box as shown in Fig. # 7. Locate the hole as close as possible to the flue box. All test readings should be taken from these points.

2. Draft—Take a draft reading from the flue pipe sampling hole. Adjust the barometric draft regulator. Draft should be set for negative .01 to .02" w.c. in float position.

3. Pump Pressure—Adjust the pump discharge pressure to 100 psi.

4. Vacuum—Check vacuum level and assure that single stage pumps do not operate beyond 10" of vacuum and two stage pumps beyong 15" of vacuum. One line fuel systems may be preferable when vacuums approach 75% of manufacturers' ratings on 2 pipe systems.

5. CO_2—Take a CO_2 reading using a chemical absorption type instrument at the flue pipe sampling hole. Make sure the CO_2 instrument has fresh fluid and is used properly. Use an 8" sampling probe to assure the the flue sample is taken within the flue box. It is important to obtain a non-diluted sample to assure proper burner adjustment. If the CO_2 reading is less than 12½%, close down the air band until a reading of 12½ to 13½% is obtained. DO NOT SET THE CO_2 ABOVE 13½% AS HAZARDOUS PRODUCTS MAY RESULT, UNDETECTED BY SMOKE. If the CO_2 cannot be brought into range, refer to the troubleshooting guide. There should be no CO.

6. The Flame—The flame may be viewed through the burner sight port. Since the flame is non-luminous (non light emitting), colors may vary as the combustion chamber refractory begins to glow. Acceptable operation is indicated by either of the following:

a. A deep blue flame.
b. A pink, reddish, or dull yellow flame.
c. A blue flame with a small number of yellow streaks.

If the flame appears nearly all yellow, refer to the troubleshooting section of this manual.

7. Oil Leaks—Turn the service switch off. Remove the oil pressure gauge, and replace the gauge plug. Check all oil lines for leaks.

C. Operating and Limit Controls.

The boiler is fitted with a combination boiler temperature limit and circulator control. The control will not permit a boiler water temperature in excess of 235° F. The circulator portion of the control will not permit the circulator to operate until the boiler water

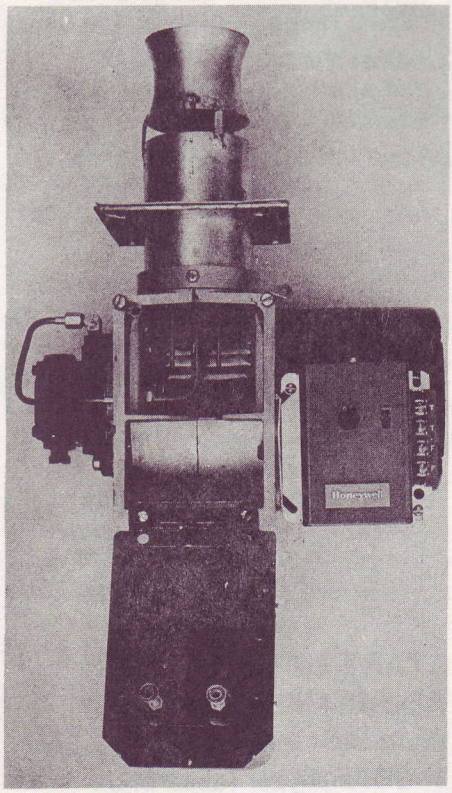


FIGURE 8

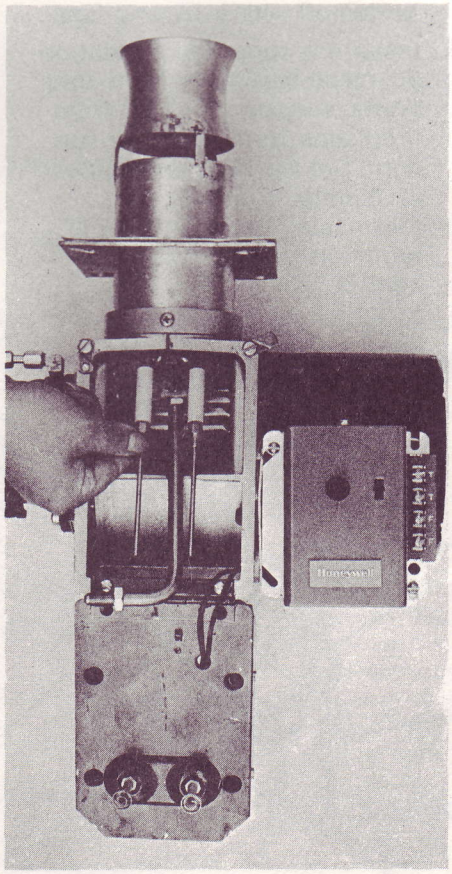


FIGURE 9

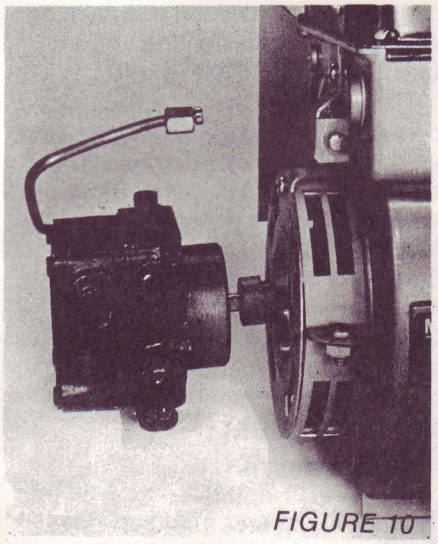


FIGURE 10

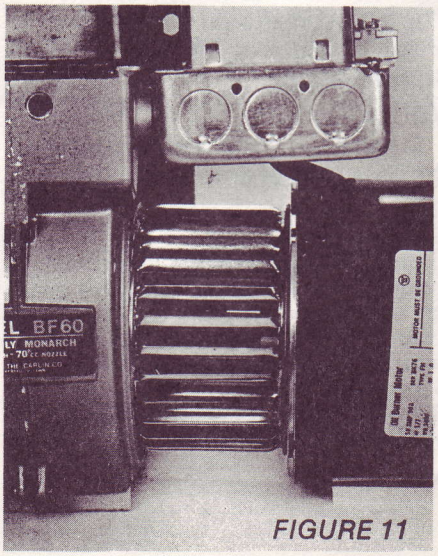


FIGURE 11

reaches the low temperature setting. The high and low limits should be set at 205° F and 180° F respectively. These should be preset at the factory, but should be checked by the installer. An additional limit control (L4080B) provided by the installer limits the boiler temperature to 190° F during normal operation.

D. Thermostat

Set the heat anticipator at .2 amps.

Locate thermostat centrally within the zone to be heated on inside wall away from drafts.

E. Low Water Cut-Off

A Low water cut-off is supplied on all Blueray boilers.

F. Zone Valves

Zone Valves should be installed on return lines and wired per manufacturers specifications.

III BURNER DISASSEMBLY

Caution: Turn off the power and Oil Supply.

A. Ignition Transformer Removal

1. Remove the two locking screws on the burner housing.
2. Unfasten the primary relay from the junction box. Remove the transformer lead wires from the wire nuts.
3. Remove the two screws that secure the transformer hinge to the burner housing.

B. Combustion Head Removal

1. Disconnect the oil line as shown in Figure 8. Remove the nozzle line thumb nut and loosen the nozzle line adjusting screw.
2. Remove the combustion head assembly as shown in Figure 9.

C. Oil Pump Removal

1. Remove the pump inlet and return lines.
2. Remove the two bolts securing the pump to the burner housing as shown in Figure 10.

D. Motor and Blower Wheel Removal

1. Disconnect the motor wiring leads from the junction box.
2. Remove the two motor flange bolts from the burner housing. Pull the motor and blower wheel from the burner housing as shown in Figure 11.

IV BURNER SERVICING

CAUTION: TURN OFF THE POWER AND OIL SUPPLY.

1. Remove the combustion head assembly. Clean the nozzle line and adaptor without wiping dirt over the nozzle orifice. Clean and dress the electrodes and dress the air metering plate. Check the electrode settings and set as shown in Figure 12.
2. Clean the inside of the air tube of any lint or dirt accumulation.
3. Clean the blower wheel. Dirt and lint on the impeller blades reduce blower efficiency.
4. Clean combustion air openings around the air shutter and air band.
5. Reassemble the burner in the same manner it was disassembled. Refill tube with oil before reassembly. Install the air metering plate and nozzle.

assembly into the air tube. Make sure the nozzle specifications and air metering plate specifications match the rating plate on the burner. The nozzle line should be loosely secured to the nozzle line adjusting slide with a thumb nut. The assembly should be driven up tightly using the nozzle line adjusting screw. The thumb nut and oil line fitting should then be tightened. *The air metering plate should be secure enough that no movement can be felt when applying pressure to the electrode buss bars.* Make sure the ignition transformer terminals make good contact with the buss bars. Secure the transformer to the housing with two locking screws.

6. Replace the in line oil filter periodically.
7. Open the oil supply and return lines from the tank and turn the power on to the burner.
8. Check out the operation of the oil burner primary control, and hydronic control.
9. Follow the start up adjustments outline in pages 5, 6 and 7 before leaving the customer's house.

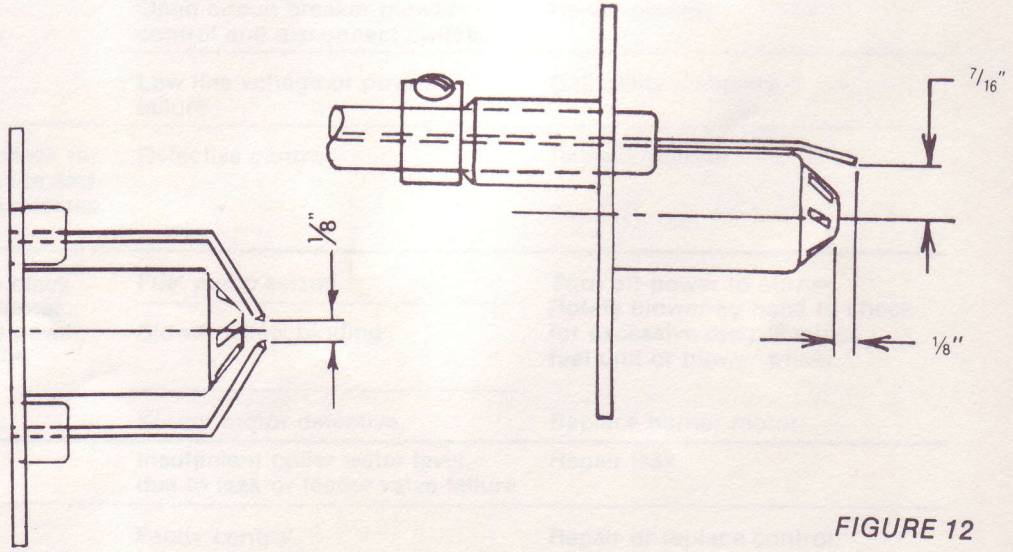


FIGURE 12

Maintenance

I IMPORTANT

ESCAPING GASES ARE DANGEROUS. The entire flue and venting system should be inspected at least once a year by a qualified serviceman.

II NOZZLES

Nozzles (constant capacity only) should be inspected every year for plugged distributor slots or plugged orifices. If it is necessary to replace the nozzle, be sure to use only cc nozzles that meet the specifications for that burner.

III ELECTRODES

Dress and reset the electrodes to the specs. on Fig. 12.

IV OIL FILTERS

The oil filter cartridge should be replaced annually.

V LUBRICATION

Lubricate the burner and circulator motors once every two years with a few drops of SAE-10 non-detergent oil.

VI BOILER

The tubular portions of the heat exchanger should be inspected internally for scale accumulation once every year. If the burner is operating normally, there should be no soot accumulation. Should the tubes require scale removal, use a flexible handle wire brush and a vacuum cleaner. Be careful not to damage internal refractory parts of the combustion chamber and the target wall.

VII GASKETS

Check the target wall and flue box seals for evidence of leakage. If any is found replace the seals and/or tighten the nuts. After boiler is restarted tighten the nuts on the water coil annually to prevent any leaks.

VIII WIRING

Check the electrical wiring for damage or frayed insulation.

Blueray Troubleshooting Guide

TROUBLE: BURNER DOES NOT START

SOURCE	PROCEDURE	CAUSES	REMEDY
Thermostat	Check thermostat settings.	Thermostat set too low.	Turn thermostat up
		Thermostat on "Off" or "Cool".	Switch to "Heat".
	Jump TT terminals on hydronic control. If burner starts, fault is in Thermostat circuit.	Open thermostat wires.	Repair or replace wires.
		Loose thermostat connectors.	Tighten connection.
		Faulty thermostat.	Replace thermostat.
		Thermostat not level.	Level thermostat.
		Dirty thermostat contacts.	Clean contacts.
Hydronic Control	Check hydronic control vs. boiler temp. If water temp. is low problem is in hydronic control	Faulty or defective hydronic control	Repair or replace
Circuit Overloads	Check burner motor overload switch.	Burner motor tripped on overload.	Find source of overload and repair.
	Check primary control safety switch.	Primary tripped on safety.	Reset safety switch
Power	Check power disconnect switch and main disconnect switch.	Switch open.	Close switch.
		Tripped breaker or blown fuse.	Reset breaker or replace fuse.
Pyrostat	Jump the FF terminals on primary control. If the burner starts, fault is in detector circuit.	Dirty contacts	Clean contacts
		Open pyrostat wires	Repair or replace wires.
		Detector contacts out of step.	Place detector contacts in step.
		Faulty pyrostat.	Replace pyrostat.
Primary Control	Check for line voltage between the black and white leads. No voltage indicates no power to the control.	Limit control switch open.	Check limit setting (200F).
			Jump terminals — if burner starts replace control.
		Open circuit breaker blower control and disconnect switch.	Repair circuit.
		Low line voltage or power failure.	Call utility company.
	Push reset button then check for line voltage between orange and white leads. No voltage indicates a faulty control.	Defective control.	Replace control.
Burner	**Check for voltage at the black and white leads to the burner motor. Voltage indicates power to motor and a fault in the burner.**	Fuel pump seized.	Turn off power to burner. Rotate blower by hand to check for excessive drag. Replace fuel unit or blower wheel.
		Blower wheel binding	
		Burner motor defective.	Replace burner motor.
Low Water Cut-off	Check boiler water level	Insufficient boiler water level, due to leak or feeder valve failure	Repair leak
	By-pass control. If burner starts fault is in control.	Faulty control	Repair or replace control.

Note: Saturation Cleanup Proceedure on "no start" calls requires total dismantling unit and wipe down of internal heat exchanger areas.

TROUBLE: BURNER FIRES, BUT OPERATES WITH LOW CO_2

SOURCE	PROCEDURE	CAUSES	REMEDY
Poor Flue Gas Sample	Insert CO_2 probe into heat exchanger tube. If reading is greater by ½% or more, sample was being diluted near flue box or sampling line.	Leak in flue system.	Sample CO_2 in heat exchanger.
		Leak in sampling line.	Seal flue system leak.
			Repair or replace sampling line.
Heat Exchanger Seals	Check target wall flue box and burner flange for evidence of leakage	Secondary air leakage	Repair or replace gasket and/or tighten nuts.
Combustion Air	Reduce combustion air supply.	Too much combustion air.	Close air band to raise CO_2.
Air Metering Plate	Check for loose play by applying pressure to buss bars.	Air metering plate not driven up tightly to end of blast tube.	Loosen thumb nut. Drive metering plate assembly up tight. Secure thumb nut.
	Check for correct metering plate specifications. Plate specifications should match firing rate of boiler.	Incorrect metering plate installed.	Install metering plate stamped for firing rate specified for boiler.
Testing Method	Using a chemical absorption type, device, let instrument set after a test before venting. If CO_2 reading increases ½% fluid is weak.	Weak fluid	Replace fluid in testing device.
		Cold fluid	Allow fluid to reach room temperature before testing.
		Improper use of analizer	Review manufacturers recommended procedure
Nozzle	Inspect nozzle for partially plugged orifice and distributor slots.	Partially plugged orifice or distributor	Replace nozzle (cc only) with nozzle specified on burner housing.
		Partially plugged strainer.	
		Poor spray pattern.	
Pump	Install pressure gauge in gauge port of fuel pump. Pressure should be 100 psi.	Pump discharge pressure incorrectly set.	Set pressure at 100 psi.
		Poor cut-in	Replace pump

TROUBLE: BURNER FIRES BUT PULSATES

SOURCE	PROCEDURE	CAUSES	REMEDY
Heat Exchanger Seals	Check target wall flue box and burner flange for evidence of leakage	Secondary air leakage	Repair or replace gasket and/or tighten nuts.
Combustion Air	Inspect installation for combustion air provisions.	Improper installation	Provide openings that freely communicate with outside.
	Open air band wide and take CO_2 reading	Improper adjustment	Adjust CO_2 level - start with the air band wide open.
	Check burner fan, air shutter and air bands for fouling	Fouled burner fan	Clean burner fan
		Fouled air intakes	Clean air intakes
Oil Supply	Bleed pump; inspect for air leaks or water contamination	Air leak in fuel system	Repair leak - use only flaired joints.
		Water in oil tank.	Remove water from tank
Pump Pressure	Install pressure gauge in gauge port of fuel pump. Pressure should be 100 psi.	Pump discharge pressure incorrectly set.	Set pressure at 100 psi.
		Coupling worn	Replace coupling.
		Poor cut in	Replace pump.
Nozzle	Inspect nozzle for partially plugged orifice and distributor slots.	Partially plugged orifice or distributor	Replace nozzle with nozzle specified on burner housing.
		Partially plugged nozzle strainer	
		Poor spray pattern.	
Air Metering Plate	Check for loose play by applying pressure to buss bars.	Air metering plate not driven up tightly to end of blast tube.	Loosen thumb nut. Drive metering plate assembly up tight. Secure thumb nut.
	Check for correct metering plate specifications. Plate specifications should match firing rate of boiler	Incorrect metering plate installed.	Install metering plate stamped for firing rate. specified for boiler
Draft	If draft regulator is used draft should be .01-.02	Draft too high	Install 2nd draft regulator
Draft	Inspect Regulator Setting	Regulator closed or flapping	Set in float position.
Draft Regulator	Inspect draft regulator for correct location on flue system.	Improper installation.	Move draft regulator to correct location.
Boiler Restriction	Check boiler passages for fouling.	Boiler fouled.	Clean boiler.
Draft	Take a draft reading. Draft should be .01-.02".	Down drafts.	Install vent cap.
		Insufficient draft.	Incease draft setting.

TROUBLE: INSUFFICIENT HEAT

SOURCE	PROCEDURE	CAUSES	REMEDY
Circulator	Check settings on operating control	Circulator short cycling	Adjust Differential
	Check if circulator is operational	Operating control defective	Repair or replace operating control
Thermostat	Check thermostat settings	Settings too low	Increase setting
	Check thermostat location	Bad location due to heat build up	Move thermostat to a better location
	Check thermostat calibration	Out of calibration	Recalibrate
Flow or Zone Valves	Check flow valve for sticking in partially closed position.	Flow valve not opening fully.	Clean or replace flow valve.
Radiation	Check for air in radiators	Radiators airbound	Bleed radiators
	Check to see if radiators are sized properly	Radiators inadequate	Install adequate radiation.
	Check to see if radiation dampers are open	Closed or partially closed dampers	Open dampers
	Check to see if radiation is being blocked by drapes, furniture, wall to wall carpeting, etc.	Radiation being blocked	Remove interfering item
Boiler	Determine structure heat load	Boiler too small	Additional heating capacity required.
Piping	Check to see if piping is sized properly	Piping inadequate	Install adequate piping
Tankless Coil	Check usage of domestic hot water	Demand too large	Install flow regulator
			Additional boiler capacity required.
Boilers Passages	Check boiler for fouling or scale accumulation	Insufficient heat transfer	Clean boiler
Burner	Check pump pressure with pressure gauge	Insufficient pump pressure	Increase pressure to 100 psi
Nozzle	Check nozzle for size and spray angle	Wrong nozzle indicated	Install specified nozzle
	Check nozzle for plugged orifice, scored surface	Nozzle underfiring due to defective nozzle	Replace nozzle

TROUBLE: BURNER STARTS BUT DOES NOT ESTABLISH FLAME

SOURCE	PROCEDURE	CAUSES	REMEDY
Oil Supply	Check tank for oil	Empty tank.	Fill tank.
	Check for water in oil tank using a dip stick coated with litmus paste.	Water in oil tank.	Remove water from tank.
	Listen for pump whine.	Fuel supply valve closed.	Open valve.
Oil Line and Filter.	Open pump bleed port and start burner. Milky oil or no oil indicates loss of prime.	Air leak in fuel system.	Repair leak. Use only flared fittings. Do not use Teflon tape on oil fittings.
	Listen for pump whine.	Oil filter plugged.	Replace filter cartridge.
		Plugged pump strainer.	Clean strainer.
		Restriction in oil line.	Repair oil line.
Oil Pump	Install pressure gauge in port of fuel pump. Pressure should be 100 psi.	Pump worn — Low presure. Motor overloads.	Replace pump.
		Coupling worn or broken.	Replace coupling.
		Pump discharge pressure set to low.	Set pressure at 100 psi.
Air Metering Plate	Check for loose play by apply pressure to buss bars.	Air metering plate not driven up tightly to end of blast tube.	Loosen thumb nut. Drive metering plate assembly up tight. Secure thumb nut.
	Check for correct metering plate specifications. Plate specifications should match firing rate of Boiler.	Incorrect metering plate installed.	Install metering plate stamped for firing rate specified for furnace.
Ignition Electrodes	Remove air metering plate assembly and inspect electrodes and buss bars.	Carboned and shorted electrodes.	Clean electrodes.
		Eroded electrode tips.	Dress up tips and reset electrodes.
		Incorrect electrode settings.	
Ignition Transformer	Connect transformer leads to line voltage. Listen for spark. Check that transformer terminals are not arcing with buss bars. Check that transformer is properly grounded.	No spark or weak spark.	Replace transformer.
		Line voltage below 102 volts.	Call utility company.
Nozzle	Inspect nozzle for plugged orifice and distributor slots.	Plugged orifice or distributor.	Replace nozzle with nozzle specified on burner housing.
		Plugged nozzle strainer.	
		Poor spray pattern.	
	Inspect nozzle for correct size and specifications.	Incorrect nozzle installed.	

TROUBLE: BURNER FIRES, BUT THEN FAILS ON SAFETY

SOURCE	PROCEDURE	CAUSES	REMEDY
Pyrostat & primary control	Take stack temperature. If gross temperature is more than 250°F fault is in pryostat or primary control. After burner fires open pyrostat circuit if flame looks O.K. If burner continues to operate, fault is in pyrostat circuit. If burner locks out, fault is in primary control.	Short in wiring	Repair short
		Faulty pyrostat	Replace pyrostat
		Fault primary control	Replace primary control
Poor Fire	Inspect flame for shape and uniformity of color.	Unbalanced fire.	Replace nozzle with specified nozzle.
		Air metering plate not driven up tightly to end of blast tube.	Loosen thumb nut. Drive metering plate assembly up tight. Secure thumb nut.
		Incorrect air metering plate installed.	Install metering plate stamped for firing rate specified for furnace.
		Too little combustion air.	Increase combustion air.
Boiler	Take a draft reading at flue box and read draft over the fire with a long probe inserted through the heat exchanger tube. Difference should not exceed .01".	Plugged Boiler	Clean out boiler

TROUBLE: BURNER FIRES, BUT THEN LOSES FLAME

Oil Supply	If burner loses flame prior to the primary control locking out, fault is in fuel system.	Air leak in fuel system	Repair leak — use only flarred fittings.
		Water in oil tank.	Strip tank of all water
		Fuel supply valve closed.	Open valve.
		Restriction in oil line.	Clear oil line restriction.
		Plugged fuel filter.	Replace filter cartridge.
		Plugged pump strainer.	Clean strainer.
		Cold oil due to outside tank with outside ambient temperature below 0°F	Use #1 heating oil.
Poor Fire	Inspect flame for stability.	Unbalanced fire.	Replace nozzle with specified nozzle.
		Air metering plate not driven up tightly to end of blast tube.	Loosen thumb nut. Drive metering plate assembly up tight. Secure thumb nut.
		Incorrect air metering plate installed.	Install metering plate stamped for firing rate specified for boiler.
		Too little combustion air.	Increase combustion air.

TROUBLE: COMBUSTION GAS ODORS

SOURCE	PROCEDURE	CAUSES	REMEDY
Poor burner adjustment — delayed or heavy starts	Check burner adjustments using instruments and gauges	Wrong CO_2 adjustment	Adjust CO_2 to 12½-13½% CO_2
			Start with the air band wide open. Obtain gas sample at flue box with fresh fluid in tester.
		Wrong draft adjustment	Adjust draft for .01-.02" w.c. The draft regulator should be in float when the boiler is running
		Wrong nozzle	Install nozzle specified.
		Wrong pump pressure	Adjust pressure to 100 PSIG
		Air metering plate not driven up tightly to end of blast tube.	Loosen thumb nut. Drive metering plate assembly up tight. Secure thumb nut.
		Incorrect metering plate installed	Install metering plate stamped for firing rate specified for boiler.
	Inspect nozzle for plugged orifice and distributor slots.	Plugged orifice or distributor	Replace nozzle (cc only) with nozzle specified on burner housing. Assure the fuel system is fitted with a high quality in line fuel filter.
		Plugged nozzle strainer.	
		Poor spray pattern	
	Check electrodes and ignition transformer	Wrong settings	Adjust to proper settings
		Carbon on electrodes	Clean
		Burnt electrode wires	Replace
		Cracked porcelains	Replace
		Weak spark	Replace transformer
	Check fuel system for air leaks by bleeding fuel unit	Defective fuel line fittings	Repair leaks. Use only flared fittings.
Insufficient chimney draft	Inspect venting system to assure shortest possible run of vent pipe	Restrictive venting system	Rework venting system to affect shortest possible run
			Install a draft inducer near the chimney base and a burner oil delay valve.
	Check stack temperature for a minimum 300° F net	Burner under firing	Adjust pump pressure to 100 PSIG
			Replace nozzle
		Hydronic control set too low	Adjust low setting for no less than 140° F.
	Check if odor can be detected around flue pipe seams on cold start-ups only	Cold chimney	Seal flue pipe with high temperature duct tape.
			Install an extension in the draft regulator tee.
			Install a draft inducer near the chimney base and burner oil delay valve.
	Inspect the outside for leaks. Inspect the inside for obstructions. Inspect the top of the chimney for proper height and surrounding obstacles. Measure chimney draft with draft gauge.	Chimney not high enough	Raise chimney or install a draft inducer and delay valve.
		Obstructed or partially obstruct flue.	Clean and remove obstruction
		Overhanging trees or other obstacles	Remove obstacles if possible. If not, raise chimney or install a draft inducer and delay valve
		Leaks in chimney	Seal
		Unused openings not properly sealed	Seal
		Loose fittings or broken cleanout door.	Repair or replace

TROUBLE: CARBONING OF METERING PLATE

SOURCE	PROCEDURE	CAUSES	REMEDY
Nozzle	Inspect nozzle for plugged orifice and distributor slots.	Plugged orifice or distributor	Replace nozzle with nozzle specified on burner housing
		Plugged nozzle strainer	
		Poor spray pattern.	
	Inspect nozzle for correct size and specifications	Incorrect nozzle installed.	
Ignition Electrodes	Remove air metering plate assembly and inspect electrodes and buss bars.	Incorrect electrode settings.	Dress up tips and reset electrodes.
Combustion Air	Inspect installation for combustion air provisions.	Improper installation.	Provide openings that freely communicate with outside.
	Opening air band wide and take CO_2 reading.	Improper adjustment	Adjust CO_2 level - start with the air band wide open.
Pump Pressure	Install pressure gauge in gauge port of fuel pump. Pressure should be 100 psi	Pump discharge pressure incorrectly set.	Set pressure at 100 psi.
Air Metering Plate	Check for loose play by applying pressure to buss bars.	Air metering plate not driven up tightly to end of blast tube.	Loosen thumb nut. Drive metering plate assembly up tight. Secure thumb nut.
	Check for correct metering plate specifications. Plate specifications should match firing rate of furnace.	Incorrect metering plate installed.	Install metering plate stamped for firing rate specified for furnace.
Oil Supply	Bleed pump; inspect for air leaks or fuel contimination.	Air leak in fuel system.	Repair leak — use only flared joints.
		Water in oil tank	Strip tank of water exceeding 2" in depth.

TROUBLE: TOO MUCH HEAT

SOURCE	PROCEDURE	CAUSE	REMEDY
Circulator	Check to see if operating control is working properly	Circulator does not stop running.	Repair operating control
Thermostat	Check thermostat settings and calibration	Thermostat set too high	Reset thermostat
		Thermostat defective	Replace thermostat
		Thermostat out of calibration	Recalibrate
Flow or Zone Valves	Check to see if flow valve operating properly	Flow valve dirty and stuck	Clean flow valve.
		Flow valve defective	Replace flow valve.

TROUBLE: INSUFFICIENT DOMESTIC HOT WATER

SOURCE	PROCEDURE	CAUSE	REMEDY
Tankless Coil	Check coil for fouling	Hard water scaling	Install water softener and clean coil
Operating Control	Check operating control setting	Setting too low	Set operating control to 190° F
Boiler surfaces	Check boiler surfaces for fouling	Boiler fouled	Clean boiler

TROUBLE: HIGH NET STACK TEMPERATURES

SOURCE	PROCEDURE	CAUSE	REMEDY
Nozzle	Check pump pressure with pump gauge	Nozzle overfiring due to high pump pressure	Reduce pump pressure to 100 psi.

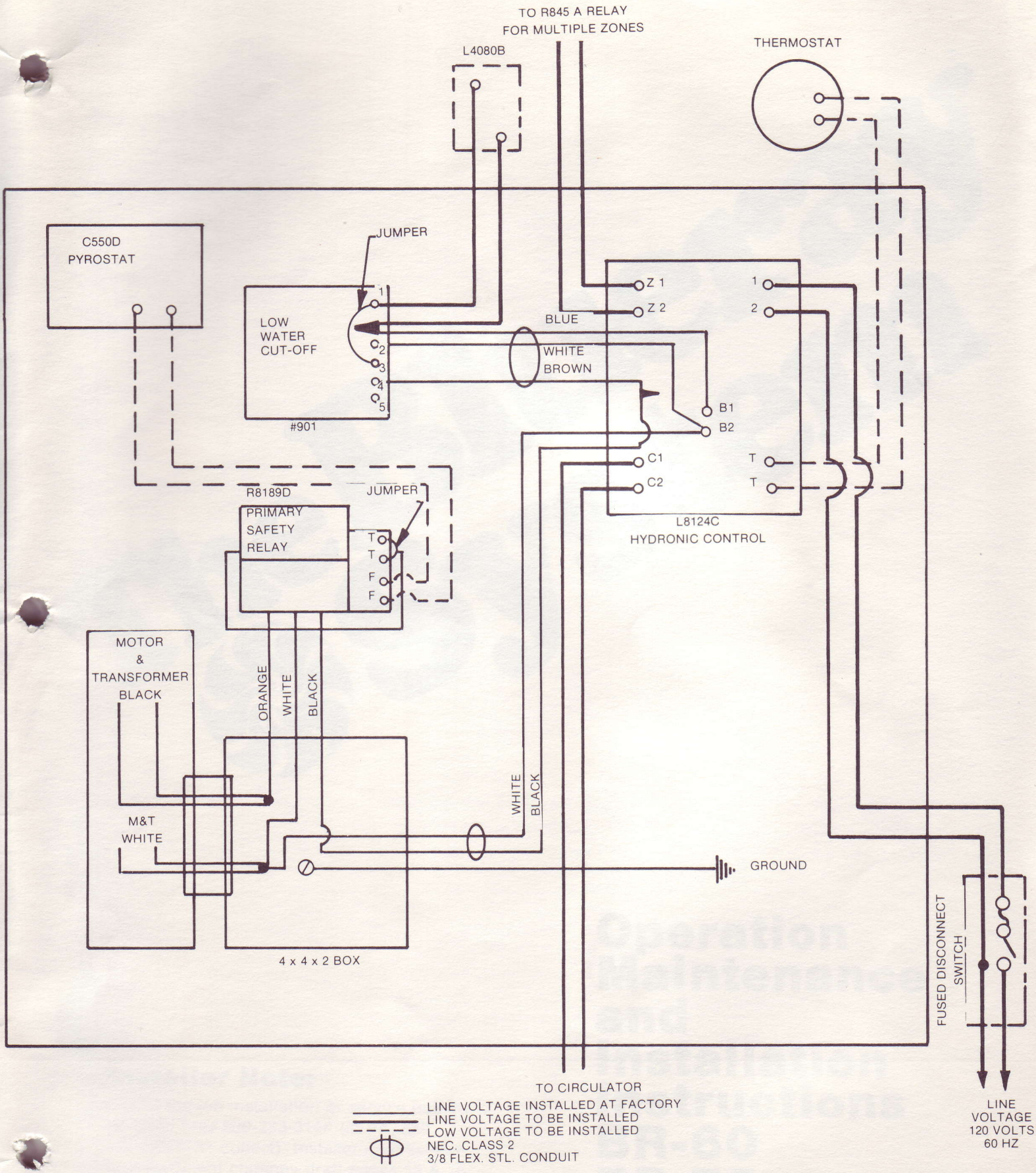
TROUBLE: FLUE CONDENSATION

SOURCE	PROCEDURE	CAUSE	REMEDY
Low net stack temperature	Inspect nozzle for correct size and type	Incorrect nozzle installed	Replace nozzle with nozzle specified on burner housing
	Determine source of condensate	Boiler flue gas condensation	**Maintain boiler water temp. between 160 and 185° F. Maintain the draft regulator in a float position. Reduce heat transfer surface by plugging 1-2 tubes with suitable refractory material.**

Specifications

MODEL	BR-60	BR-75
DOE Heating Capacity (Btu/Hr.)[1]	73,000	90,000
SBI Net Rating (Btu/Hr.)	63,500	78,300
SBI Input (Btu/Hr.)[2]	84,000	105,000
Nozzle (Monarch cc)	.60 - 70°	.75 - 70°
Air Metering Plate	.60B	.75 B
Draft in Stack (in w.c.)	.015"	.015"
CO_2 (Nominal)	13½	13½
Net Stack Temperature (°F)	350°F	350°F
Combustion Chamber Diameter (I.D.)	9"	10½"
Heat Exchanger Tubes (number)	12	15
Flue Diameter	5"	5"
Fuel Pump[3]	A2VA7116	A2VA7116
Pump Pressure (psi)	100	100
Fan Clearance	3/16"	3/16"
Fan Size	4-3/4 x 2-15/16	4-3/4 x 2-15/16
Flame Sensor (Honeywell)	C550D1005	C550D1005
Primary Relay (Honeywell)	R8189D1007	R8189D1007
Thermostat Heat Anticipator (amps)	.2	.2
Hydronic Control (Honeywell)	L8124A1005	L8124A1005
Cabinet Width	27	27
Cabinet Depth	26	26
Cabinet Height	27	27
Flue Height C/L	15"	15"
Supply Fitting	1¼	1¼
Return Fitting	1¼	1¼
Approximate Shipping Weight (lbs.)	400	425
Electronic Low Water Cut-off (McDonald Miller)	#901	#901

1 - Based on DOE test procedures.
2 - Based on 140,000 Btu/Gal.
3 - Sundstrand fuel unit or equivalent.



WIRING DIAGRAM FOR BR-.60/.75

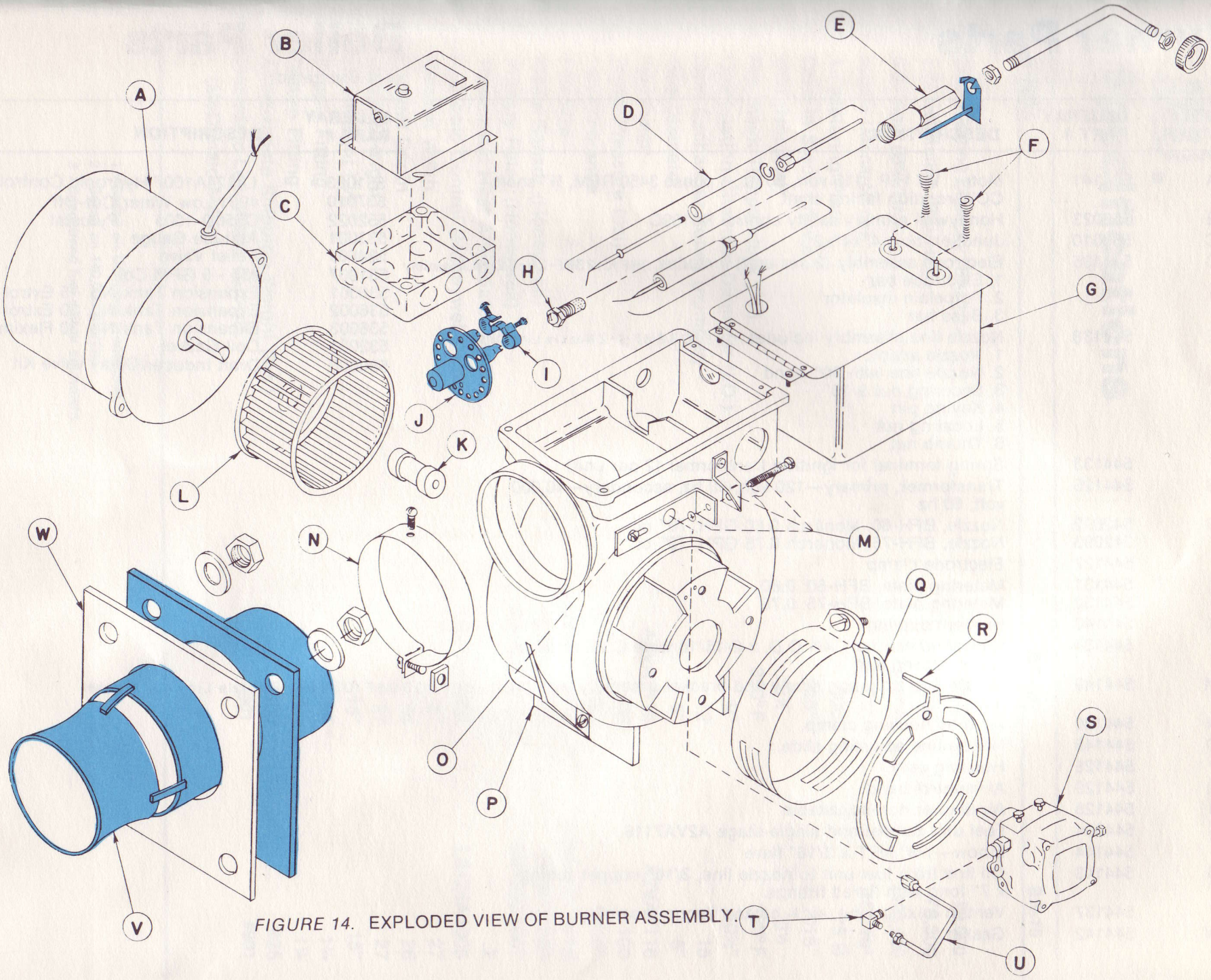


FIGURE 14. EXPLODED VIEW OF BURNER ASSEMBLY.

Burner Parts

CODE LETTER	BLUERAY PART #	DESCRIPTION
A	544141	Motor, 1/7 H.P., 115 volt, 60 hz, 1 phase 3450 RPM, ½" shaft, CCW rotation facing shaft.
B	552023	Honeywell primary safety control R8189D
C	563010	Junction box; 4"x4"x2
D	544135	Electrode assembly (2 per unit) includes: CBF10123BF-25-5 Elec. Assembly 1. Electrode bar 2. Porcelain insulator 3. Buss bar
E	544138	Nozzle line assembly includes: CBF1038BF-1-2 Nozzle Line Assembly 1. Nozzle adaptor 2. Nozzle line with 90° bend 3. Securing nut 9/16" 4. Keying pin 5. Locating nut 6. Thumb nut
F	544133	Spring terminal for ignition transformer (2 per unit)
G	544125	Transformer, primary—120 volt, 60 hz, secondary—10,000 volt, 60 hz
H	542092 542093	Nozzle, BFH-60: Monarch 0.60 GPH, 70° cc Nozzle, BFH-75: Monarch 0.75 GPH, 70° cc
I	544127	Electrode clamp
J	544131 544132	Metering plate, BFH-60: 0.60 Metering plate, BFH-75: 0.75
K	544140	Burner coupling
L	544134	Blower wheel (fan), 4¾ O.D. x 2-15/16 wide C.W. rotation facing closed end.
M	544149	Nozzle line adjusting screw and bracket assembly with push nut — CBF1038BF1038BF-2 Nozzle Line Adj. Bracket
N	544130	Air tube housing clamp.
O	544148	Nozzle line adjusting slide.
P	544126	Housing only.
Q	544129	Air control band
R	544128	Air shutter non-adjustable
S	544504	Fuel unit Sundstrand single-stage A2VA7116.
T	544144	Elbow—1/8" NPT x 3/16" flare
U	544143	Oil line from fuel unit to nozzle line, 3/16" copper tubing x 7" long with flared fittings.
V	544137	Venturi mixing tube, air tube and flange assembly.
W	544142	Gasket.

Boiler Parts

(not illustrated)

BLUERAY PART #	DESCRIPTION
551023	L8124A1007 Hydronic Control
537010	#901 Low Water Cut-Off
552022	C550D-1005 Pyrostat
533001	Altitude Gauge
534001	Relief Valve
531007	#55 - 5 GPM Coil
536001	Expansion Tank-No. 15 Extrol
536002	Expansion Tank-No. 30 Extrol
536003	Expansion Tank-No. 30 Fleximatic
532001	Coil Gasket
580003	Draft Inducer/Delay valve Kit