



**INSTALLATION AND
OPERATING INSTRUCTIONS**

FOR

**THE HARDY
Fuel Oil Furnace**

Models D-140 & D-350



**HARDY MANUFACTURING
COMPANY, INC.**

12345 ROAD 505

PHILADELPHIA, MS 39350

PHONE: (601) 656-5866

FAX: (601) 656-4559

www.hardyheater.com

Mountain View Hearth Products
manuals.stove-parts-unlimited.com

INTRODUCTION

Thank you for purchasing the original all stainless steel Hardy Fuel Oil Furnace. It represents the result of many years of Hardy experience and the input of Hardy customers in the production of a top quality furnace. With the purchase of this Hardy Furnace, you can now appreciate the high degree of craftsmanship and reliability that have made The Hardy the leader in the outside Fuel Oil Furnace field. This manual will provide you with a good basic understanding of the installation and operation of this furnace.

THIS MANUAL INCLUDES IMPORTANT SAFETY INFORMATION

Your new furnace should have the following:

- 1 Owners Manual complete with installation and hook-up Instructions
- 2 Warranty & return Warranty Card
- 3 Condenser tank stack with trim (located inside for shipping)
- 4 two (2) sections smoke stack with trim
- 5 Rain cap with spark arrestor screen

Should your furnace not have any of these items or if you have any questions regarding the operation or maintenance of your furnace, please consult your local Hardy Dealer.

Again, thank you for purchasing a Hardy Furnace

Sincerely,

Frank L. Moore
President
Hardy Manufacturing Company Incorporated

Please fill in the following information

Hardy Model _____

Serial Number _____

Date of Purchase _____

Date of Installation _____

Dealer Purchased from _____

Dealer Address _____

Dealer Phone Number _____

Please keep this manual with all other important papers. The information in this manual is necessary for the installation, operation and proper use of this unit. If you should ever have a problem or question please refer to this manual or have it available when you call your Hardy Dealer or Hardy Manufacturing Company Incorporated.

HARDY MANUFACTURING CO., INC.
12345 Rd. 505
PHILADELPHIA, MISSISSIPPI 39350
PHONE: (601) 656-5866 or (601) 656-6948
FAX: (601) 656-4559

SAFETY PRECAUTIONS WARNING

Do not operate this equipment for other than its intended purpose nor other than in accordance with the instructions contained in this manual and all other instructions accompanying the unit.

For units covered by this instruction book, it is important to observe safety precautions to protect yourself from possible injury. Among the many considerations, you are advised to:

- ◆ Observe all safety stickers on the unit
- ◆ This unit must be wired by a qualified electrician in accordance with the National Electrical Code.
- ◆ Never attempt to use gasoline as a fuel for this burner, as it is more combustible and could result in a serious explosion.
- ◆ Always use proper care when installing, operating and maintaining this unit.
- ◆ Do not modify this unit.

Do not substitute parts or repairs which can be provided by your dealer, distributor, or Manufacturing Company.

Failure to heed this warning or any additional warnings on this unit may result in an accident causing personal injury.

THE HARDY OUTSIDE FUEL OIL FURNACE

How does an outside furnace heat my home?

The Hardy outside fuel oil furnace is designed to save the most energy and provide the most comfortable heating available. It heats your home by heating a stainless steel tank filled with water, which surrounds the firebox of the outside furnace. The furnace is basically a nonpressurized boiler with an atmospheric vent. This hot water is then circulated through underground hot water pipes to a water coil inside your existing central duct system.

The Hardy furnace can be connected to any existing hydronic heating system that operates at 180 degrees or less.

How does THE HARDY heat water for household use?

A cold water supply line goes to the outside furnace. The water line connects to a heat exchanger which is mounted on the rear of the outside furnace. The pressure on the supply water line forces water through the heat exchanger when you open a hot water faucet inside the home. As this water passes through the heat exchanger it picks up the heat from the furnace water which is pumped through one side of this heat exchanger and then returns to the furnace to be reheated. The domestic water then goes to the cold water input on your hot water heater. This means the hot water heater will take on hot water instead of cold. This water is not contaminated with the water that passes through your furnace and coil to heat your house.

How do the thermostat controls work?

The only visible addition to the heating system inside your home is the thermostat which is located near the existing thermostat. The two thermostats are installed so that if the outside fuel oil furnace is not in operation, your existing unit will automatically take over to maintain your household temperature. The wall thermostat which regulates the heat from the outside furnace performs two functions; when it senses your need for heat according to your temperature setting, it turns the water pump on to circulate the hot water through the coil and also turns the blower on inside your central unit to force air across the hot coil. This forces hot air into your central duct system. The outside furnace has a hot water thermostat which senses the water temperature of the unit. If the water is not as hot as the thermostat setting (normally set on 170 degrees) then the fuel oil burner is automatically fired until such temperature is attained.

Where should an outside fuel oil furnace be located?

The outside unit should be located at least 10 feet from your home so that all fire danger is removed from your home. The unit may be installed as much as 100 feet away and still heat your house an hot water. If the unit is located more than 100 feet away, you may experience some heat loss on the water going to your hot water heater. Locate the outside furnace where it will be convenient for refueling. All water and power lines are installed underground between the house and the outside fuel oil furnace.

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SECTION I

GENERAL INFORMATION

1-1 Specifications

Type of fuel – #1 or #2 fuel oil

Maximum fuel consumption

HM-140-HW	1.0 GPH
HM-350-HW	2.5 GPH

Furnace rating

HM-140-HW	140,000 BTU/Hr. Input
HM-350-HW	350,000 BTU/Hr. Input

For Outdoor Use Only

Electrical Rating 115 VAC / 60 HZ / 1P
MFS – 20 AMP, MCA – 20 AMP

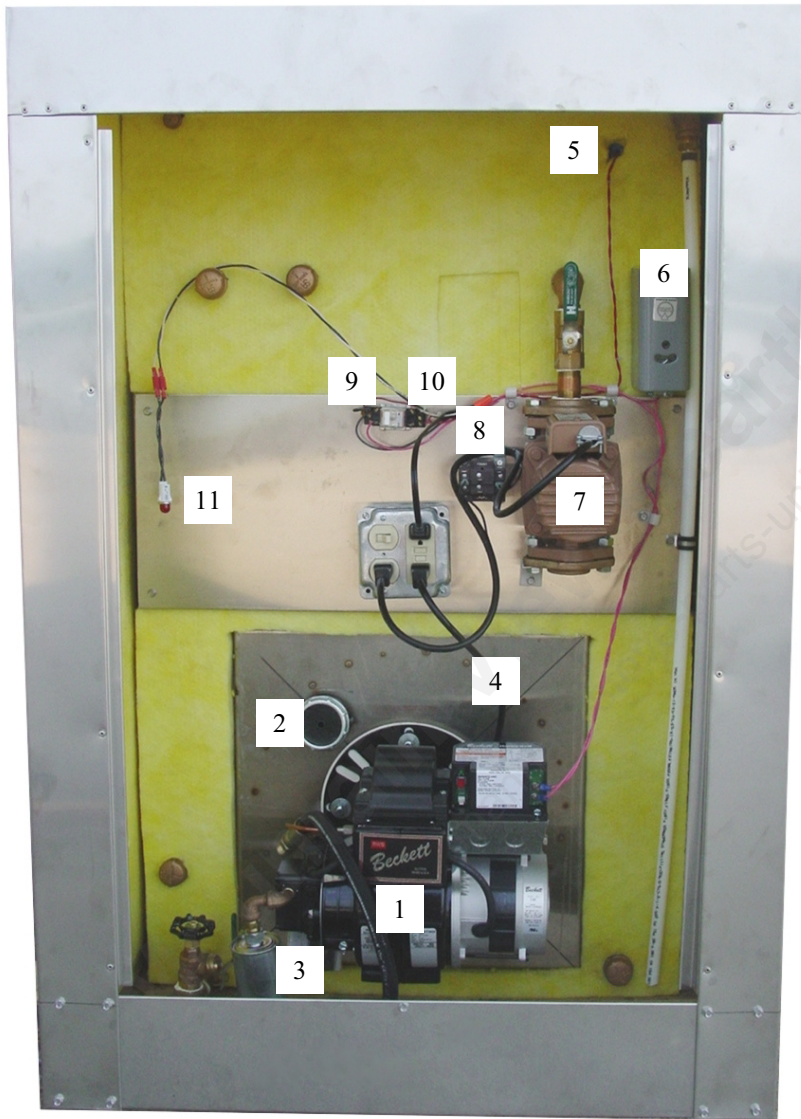
Clearance to combustibles

Top, Rear, Sides	-	36"
Chimney connector	-	36"
Front	-	36"
Flooring	-	Non Combustible

1-2 Furnace Dimensions

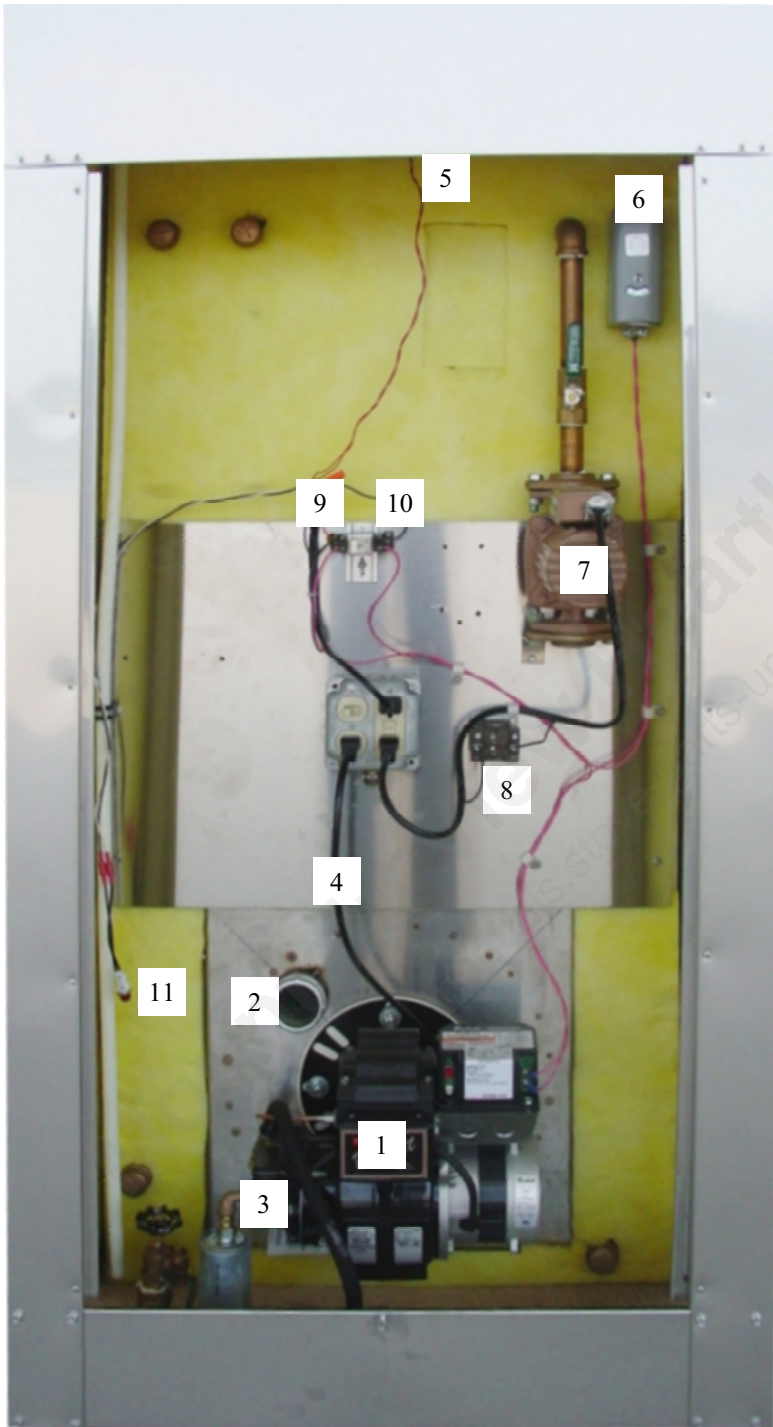
<u>Description</u>	<u>Width</u>	<u>Depth</u>	<u>Height</u>	<u>Weight</u>
HM-140-HW	30"	43 ¾"	48 ½"	368 lbs.
HM-350-HW	30"	59 ¾"	48 ½"	471 lbs.

1-3 Furnace components (Model HM-140-HW)



Ref #	Part #	Description
1	6001.00	Oil Burner
2	31020.00	Sight Glass
3	608.65	Fuel Filter
4	2004.04	Power cord
5	1100.27	Low Water Switch
6	2000.16	Dayton thermostat
7	501.00	Taco 009 Pump
8	2000.52	Relay
9	2000.53	Low Water Lockout relay
10	2000.55	Socket for low water Lockout relay
11	1100.30	Low water light

1-4 Furnace components (Model HM-350-HW)



Ref #	Part #	Description
1	6001.00	Oil Burner
2	31020.00	Sight Glass
3	608.65	Fuel Filter
4	2004.04	Power cord
5	1100.27	Low Water Switch
6	2000.16	Dayton thermostat
7	501.00	Taco 009 Pump
8	2000.52	Relay
9	2000.53	Low Water Lockout relay
10	2000.55	Socket for low water Lockout relay
11	1100.30	Low water light

SECTION II

IMPORTANT NOTES TO OWNERS

2-1 WARRANTY

Fill out the warranty card & return it within 30 days to:

Hardy Manufacturing Co. Inc.
12345 Rd. 505
Philadelphia MS 39350

2-2 CODES

All installations must be made in accordance with National, State, and Local codes which may differ from the manual.

Installation, Operating, and maintenance permits from each of the above authorities may be required, as well as Municipal permits.

2-3 FUEL

This furnace will burn the following approved fuels
#1 & #2 fuel Oil (Diesel)

Do not add the following materials to your fuel oil:

- ◆ Gasoline
- ◆ Cleaning fluids or solvents
- ◆ Oil additives
- ◆ Antifreeze

Do not attempt to start the burner when excess oil, oil vapors, or fumes have accumulated in the firing chamber.

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

Do not install this furnace on a combustible material of any kind.

2-4 MAINTENANCE

Hardy recommends that a factory authorized burner technician service your burner and furnace once a year. Call your Hardy dealer for information concerning "Annual Hardy Furnace Maintenance."

Do not allow unauthorized, untrained personnel to tamper with your furnace.

SECTION III

INSTALLATION OF FURNACE

3-1 GENERAL

The following information is general in nature. Furnace installation must be accomplished by qualified personnel and must comply with all applicable national, state, and local codes.

Select a furnace location which allows safe and easy access for servicing, fuel storage, and refueling equipment.

Furnace must be located a minimum of ten (10) feet from building to be heated, and a maximum of one hundred (100) feet.

Smoke stack must be at least two (2) feet higher than peak or highest portion of roof with in ten (10) feet horizontally of stack.

3-2 PREPARING CONCRETE PAD

Prepare a concrete pad 36" x 60" with a cutout in pad as shown in layout illustration #3A. Install a four (4) inch or six (6) inch Water tight pipe under pad at the pump end of the pad (this is the minimum insulating requirements).

Run water lines, electrical line, and thermostat wire from building to be heated to the furnace through this pipe. Lines required are as follows:

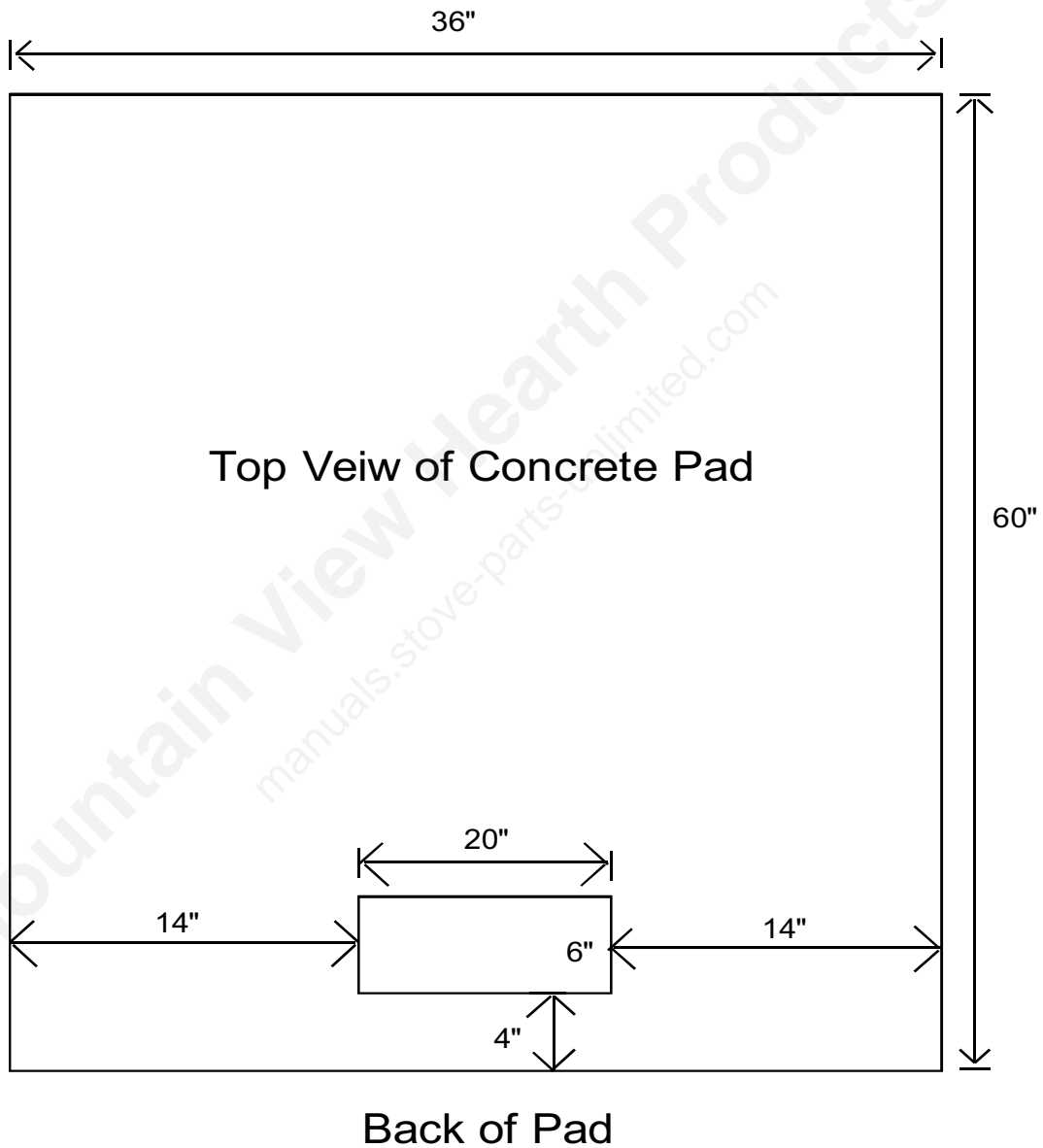
- ◆ 1 12/2 with ground (120 volt / 20 amp) power supply line
- ◆ 2 Hot water lines for each zone (3/4" for forced air systems, 1" for hydronic's.)
- ◆ 2 3/4" hot water lines for domestic hot water if DHW heat exchanger was ordered
- ◆ 1 3 Conductor thermostat wire, at least 18 gauge, for each heat zone.

All water lines will come up at pump end of pad. All lines need to be rated for hot water use.

A 1/2" minimum fuel line will need to be run to the burner from the fuel storage tank. If the fuel storage tank is to be located below the level of the burner, you will need a return line of the same size as the supply. Both of these lines must be rated for use with oil.

Once all lines have been run the cutout in the pad can be filled with sand, up to the level of the pad.

ILLUSTRATION #3A



3-3 PREPARING FURNACE FOR INSTALLATION

Remove the hull from the furnace by lifting the hull straight up, and set it to the side. Cut the shipping straps that attach the furnace to the shipping pallet.

Electrical service will need to be a dedicated 120 volt / 20 amp circuit.

Heating lines will need to be of any pipe or tubing rated 180 degrees Fahrenheit , 100 psi. pressure. Supply pipe for heating system will hook up to the pump, return pipe will go to return fitting, (one is located at pump end of furnace and two are located at burner end of furnace).

Thermostat wires for the heating system control will hook up at the pump end of the furnace.

3-4 FUEL TANK, FUEL PUMP, FUEL LINES

Fuel Oil burners supplied with the Hardy Fuel Oil Furnace are provided with a single stage 3450 RPM fuel unit with the by-pass plug removed for single pipe installations. This is satisfactory where the fuel tank is on the same level horizontally, or above the burner , permitting gravity flow of oil. See illustration #3B. Never exceed 3 PSI pressure to the suction side of the fuel unit. A pressure of 8 PSI may cause damage to the shaft seal and allow it to leak oil. When it is necessary to lift the oil to the burner, a return line should be run between the fuel unit and the fuel tank. (If lift exceeds ten (10) feet, a two stage fuel unit must be used with a return line.) When a return line is used, the by-pass plug must be installed. This is supplied along with an information pump data sheet in a plastic bag attached to the fuel pump unit on the burner. See illustration #3C. When oil lines are installed, continuous runs of heavy wall copper tubing is recommended. Be sure that all connections are absolutely air tight. Check all connection and joints. Flared fittings are recommended. Do not use compression fittings. See pump data sheet for sizing, lift, and length for tubing recommendations, 1/2" copper is normal. Install a tank shut off valve at the fuel tank for servicing.

3-4 FUEL TANK, FUEL PUMP, FUEL LINES (cont.)

ILLUSTRATION #3B

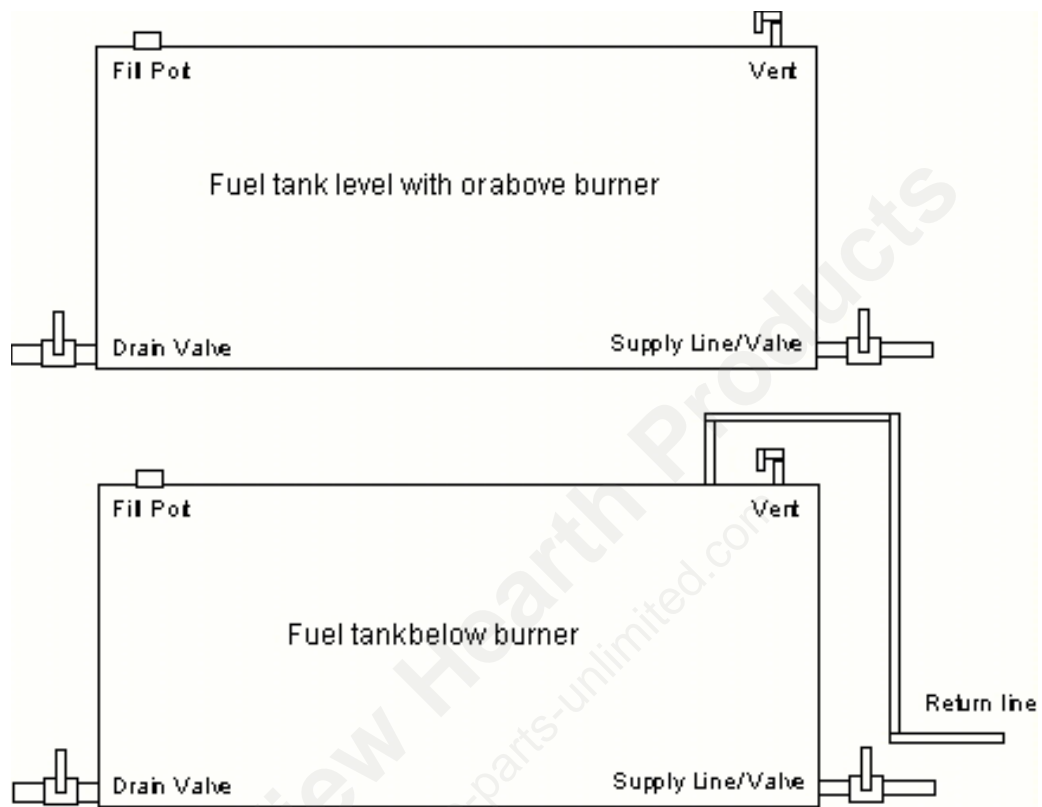
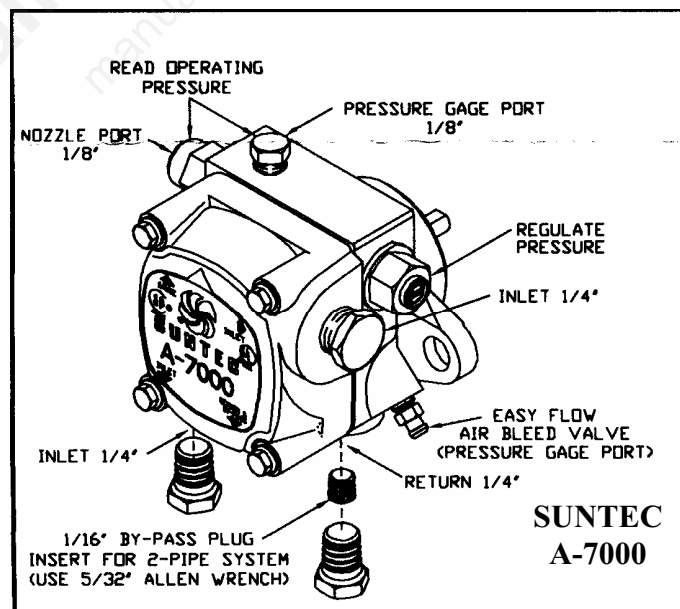


ILLUSTRATION #3C



3-5 CONNECTION OF POWER TO FURNACE

**This unit must be wired by a qualified electrician
In accordance with the National Electric Code
And any City, State, or Municipality codes**

Provide a 120 Volt / 20 Amp. Circuit to the furnace. This circuit will connect to the line side of the Ground Fault Interrupter outlet (GFCI) on the back of the furnace.

The power wire of the circuit will connect to the brass screw, the neutral wire of the circuit will connect to the silver screw, and the ground wire will connect to the green screw.

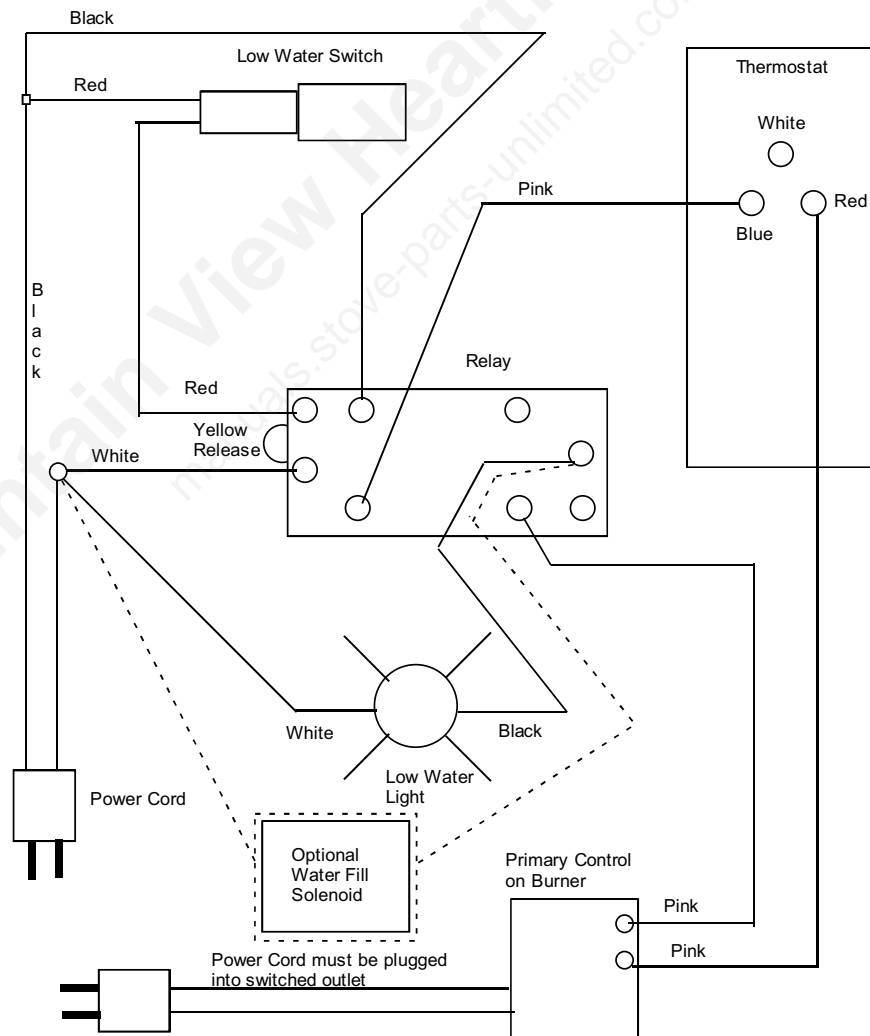
After the wiring is complete check the receptacle with a circuit tester to determine if the polarity is correct, and to make sure you have a good ground.

Press the test button on the GFCI receptacle. The reset button should pop out and the circuit should be interrupted.

Press the reset button to restore the circuit to normal operation

See Illustration #3D for furnace wiring schematic.

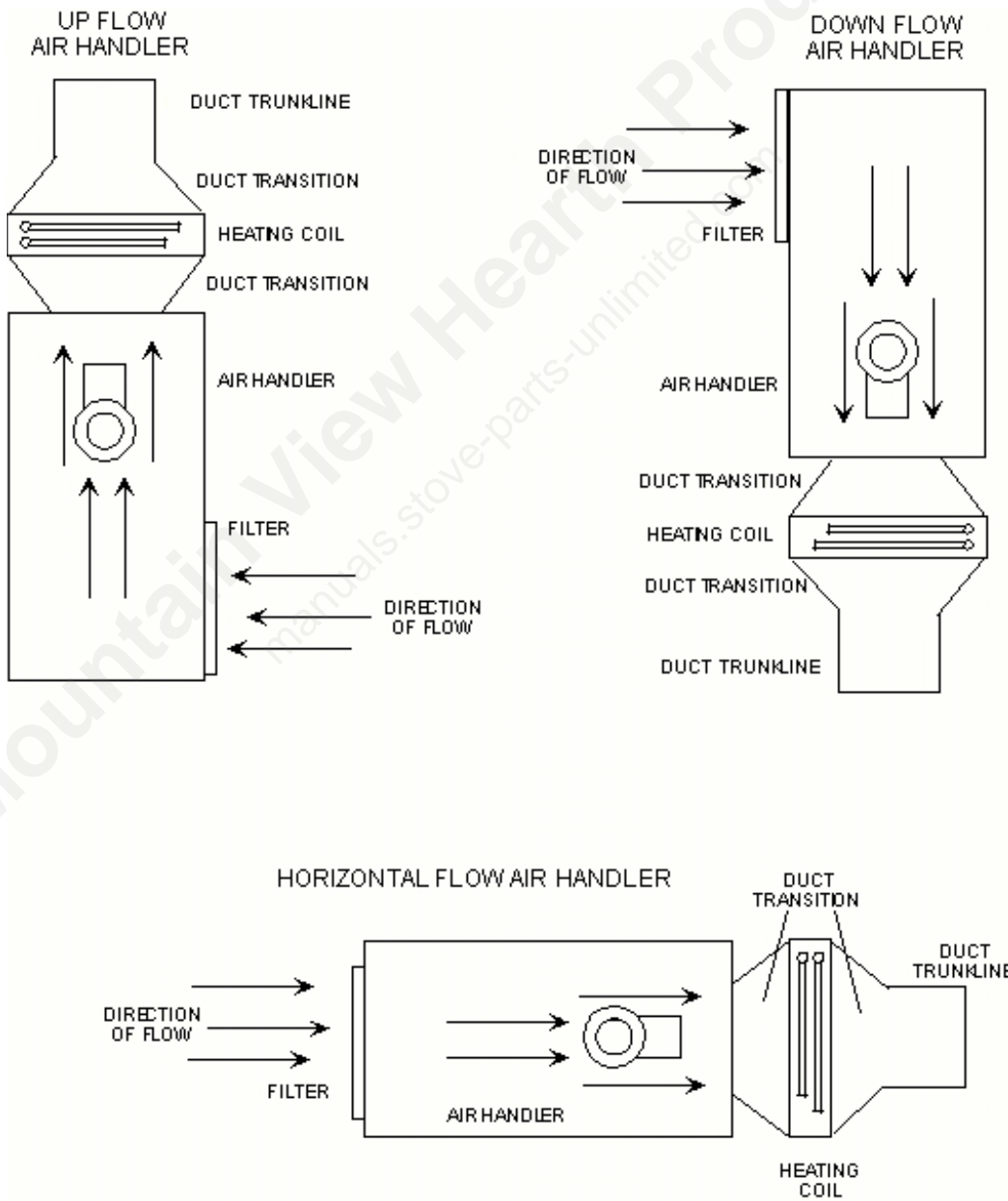
ILLUSTRATION #3D



3-6 INSTALLATION OF HEATING COIL

In a forced air system a heating coil will need to be mounted into the existing duct system. This coil needs to be matched to the blower in your system according to air flow ratings. The water coils sold by Hardy can only be mounted with the water connections of the coil in a horizontal plane. Never try to mount the water connections straight up or down. The water lines to the coil should be connected with the supply line, the one coming from the pump, connected to the fitting on the coil that is farthest away from the blower. The return line, the one going back to the furnace will be the line closest to the blower. This will put the hottest water on the side of the coil that has the air leaving it and going into the duct work. See illustration #3E

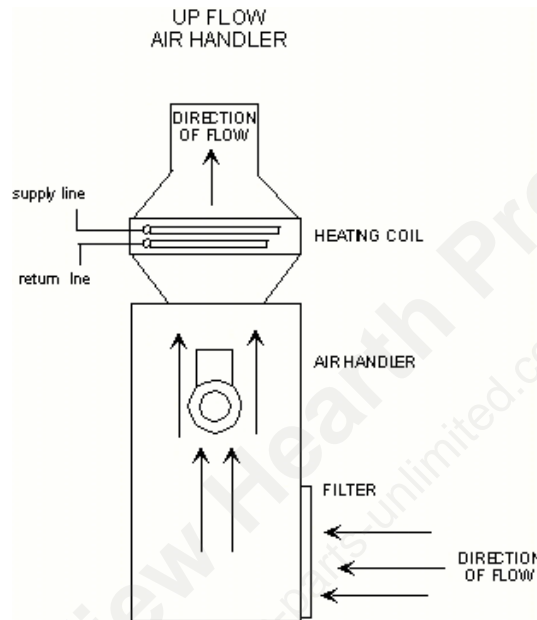
ILLUSTRATION #3E



3-7 PLUMBING OF HEATING COIL

The plumbing of a heating coil mounted in a forced air duct system consist of two water lines, (a supply and a return) normally these will be 3/4" lines. The supply line will come from the pump on the fuel oil furnace to the fitting on the coil that is on the air outlet side of the coil. The return line will connect to the fitting on the coil on the air inlet side of the coil, and to one of the bottom fittings on the fuel oil furnace. See illustration #3F

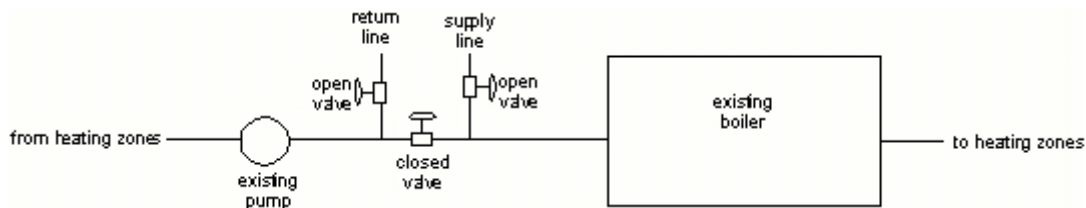
ILLUSTRATION #3F



3-8 PLUMBING OF HYDRONIC HEATING SYSTEM

To connect the Hardy fuel oil furnace to an existing hydronic heating system you will need two lines, (a supply and a return) normally these will be 1" lines. At the existing boiler install two tees and a valve into the return of the existing system. The supply line from the fuel oil furnace will connect to the tee between the valve and the existing boiler, the return line will connect to the tee between the valve and the house system. Shut off valves need to be installed on the two lines from the fuel oil furnace, so that you can isolate it from the original system when needed. See illustration #3G

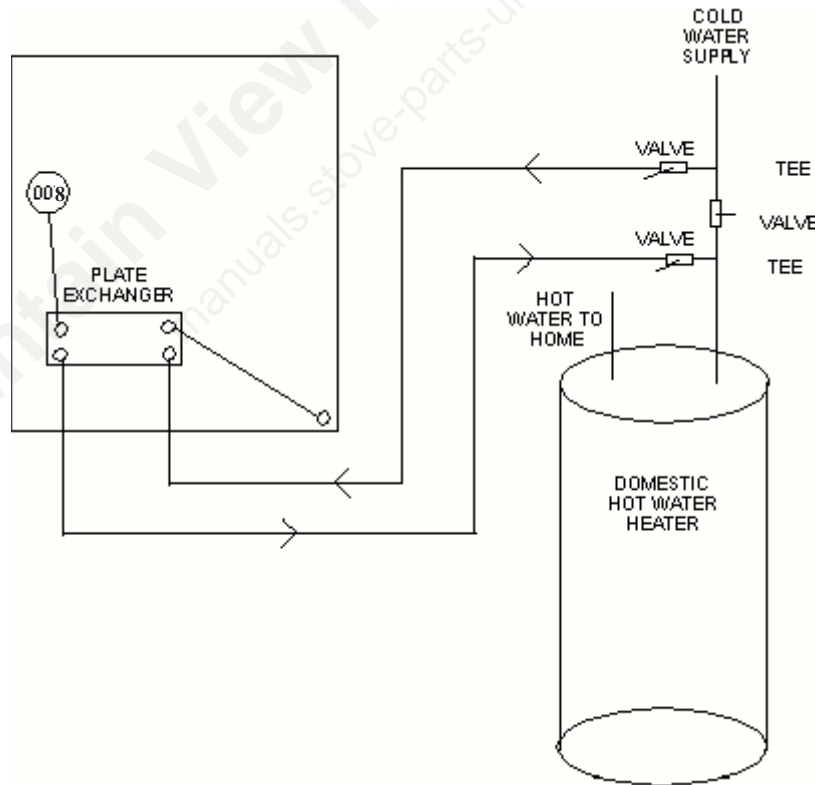
ILLUSTRATION #3G



3-9 INSTALLATION OF DOMESTIC WATER LINES

The cold water supply to your furnace can be picked up from the cold water line supplying your existing hot water heater. This is accomplished by first shutting off the water supply. Install into the cold water supply on the water heater a tee, a shut off valve, and another tee. The first tee will be on the supply side of the shut off valve, and the second tee is on the water heater side of the shut off valve. Out of these tee's you will also want to install shut off valves going to the Hardy fuel oil furnace , this will allow a way to service the hardy with out shutting off all the water to your home. At the Hardy fuel oil furnace connect the supply line to the fitting on the plate heat exchanger that is marked domestic water in. Connect the hot water return line to the fitting on the plate heat exchanger marked domestic water out. The Taco 008 pump feeding the heater side of the plate heat exchanger is wired to run continuously. Close the valve on the cold water supply between the two tee's. Open both valves on the lines going to the Hardy fuel oil furnace. When hot water is used inside the home the cold water will flow through the plate before going into your hot water heater. This will pre-heat your hot water any time the furnace is hot. See illustration #3H

ILLUSTRATION #3H - Optional Installation



SECTION IV

ELECTRICAL INSTALLATION INSTRUCTIONS

4-1 Typical Existing Forced Air system with an existing blower relay

This unit must be wired by a qualified electrician and in accordance with the National Electric Code , and any local, state, or municipal codes.

Run a three conductor thermostat wire from the Hardy fuel oil furnace to the existing central unit in the area to be heated. This wire must be rated for under ground use or run in side a pipe, tubing that meets all codes. The colors normally used are red, green, and white. At the Hardy fuel oil furnace connect the red wire to one side of the low temperature sensor (located under the insulation cutout above the pump). Connect the green wire and a jumper wire (preferably green) to the second terminal of the low temperature sensor. Connect the jumper wire to the pump relay (Honeywell Model R8222D 1006) on the bottom left terminal (#7 in wiring diagrams, actually it is unmarked) Connect the white wire of the thermostat wire to the pump relay (Honeywell Model R8222D 1006) on the bottom right terminal (#8 in wiring diagrams, it is also unmarked).

Inside the home, install a heat only wall thermostat near the existing thermostat. Run a two conductor thermostat wire from this thermostat to the existing central unit. The colors normally used are red and white.

At the central blower unit mount a new relay (Honeywell Model R8222D 1006) close to where the existing thermostat wires are attached to the blower unit.

At the central unit locate the existing 24 volt transformer. One 24 volt line should run from the transformer to the existing thermostat, (usually this is a red wire). Cut this wire and connect the end going to the thermostat to the new relay on terminal #2 (see illustration #4A). Take the red wire going to the new thermostat and the previously cut wire that goes back to the central unit, connect these two wires together and connect them to terminal #1 of the new relay. Connect the white wire of the two conductor thermostat wire that is going to the new thermostat to the red wire of the three conductor thermostat wire going to the Hardy fuel oil furnace.

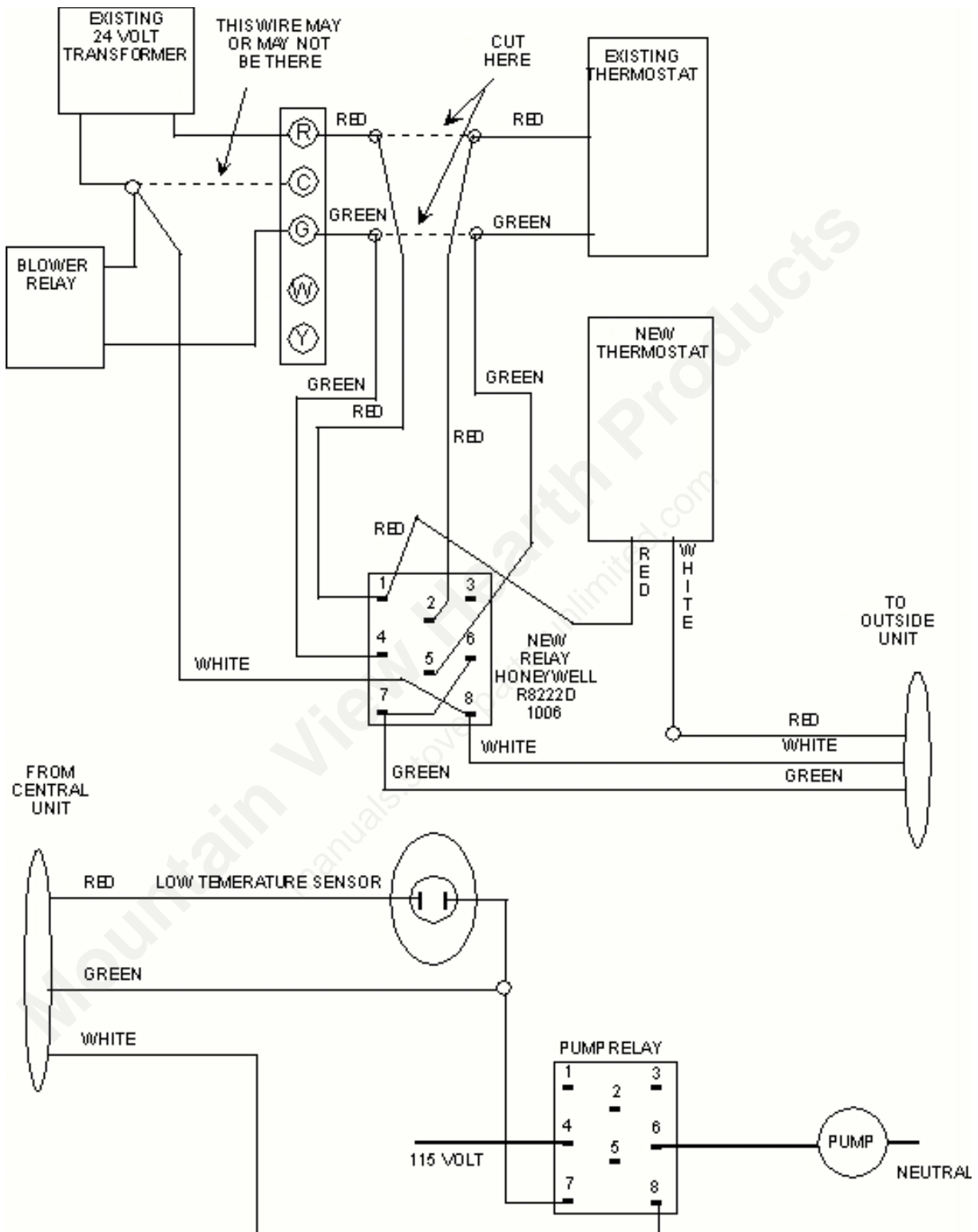
Locate the wire that comes from the fan switch on the existing thermostat and goes to the blower relay in the central unit, (usually this is a green wire). Cut this wire and connect the end going to the thermostat to the new relay on terminal #5. Connect the other end that is going to the central unit to the new relay on terminal #4.

Take the green wire of the thermostat wire going to the Hardy fuel oil unit add a short jumper wire to it and connect both to the new relay on terminal #7. Connect the other end of the short jumper wire to the new relay on terminal #6.

Take the white wire of the thermostat wire going to the Hardy fuel oil unit and add a long jumper to it and connect both to the new relay on terminal #8. Connect the other end of the long jumper wire to the common of the 24 volt transformer. This common connection may be connected to a terminal on the terminal strip of the central unit, if there is no terminal strip trace the wire from the transformer to the existing blower relay and make the connection there.

See illustration #4A for complete wiring diagram

ILLUSTRATION #4A



4-2 Typical Existing Forced Air system without an existing blower relay

This unit must be wired by a qualified electrician and in accordance with the National Electric Code , and any local, state, or municipal codes.

Run a three conductor thermostat wire from the Hardy fuel oil furnace to the existing central unit in the area to be heated. This wire must be rated for under ground use or run in side a pipe, tubing that meets all codes. The colors normally used are red, green, and white. At the Hardy fuel oil furnace connect the red wire to one side of the low temperature sensor (located under the insulation cutout above the pump). Connect the green wire and a jumper wire (preferably green) to the second terminal of the low temperature sensor. Connect the jumper wire to the pump relay (Honeywell Model R8222D 1006) on the bottom left terminal (#7 in wiring diagrams, actually it is unmarked) Connect the white wire of the thermostat wire to the pump relay (Honeywell Model R8222D 1006) on the bottom right terminal (#8 in wiring diagrams, it is also unmarked).

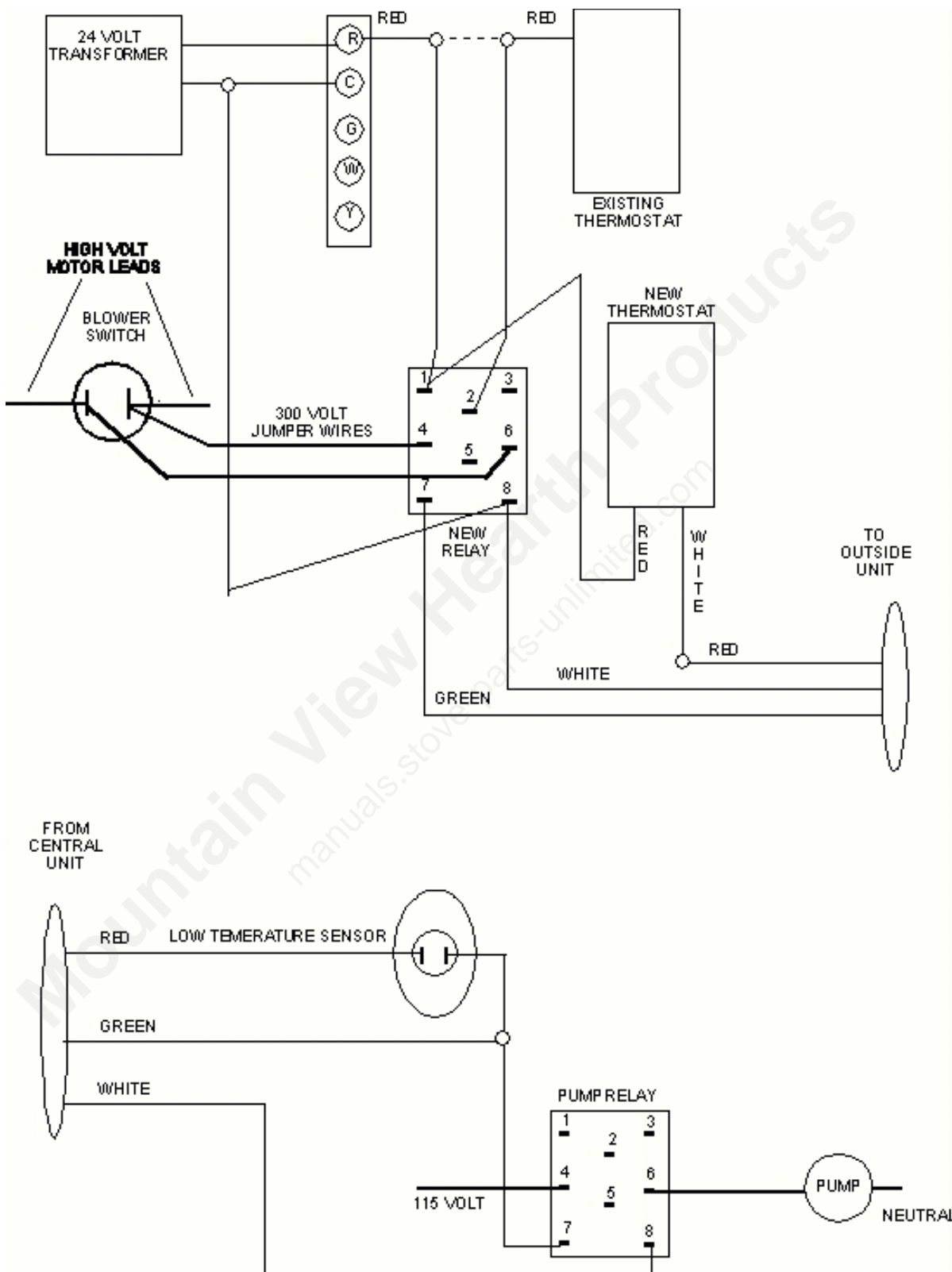
Inside the home, install a heat only wall thermostat near the existing thermostat. Run a two conductor thermostat wire from this thermostat to the existing central unit. The colors normally used are red and white.

At the central blower unit mount a new relay (Honeywell Model R8222D 1006) close to where the existing thermostat wires are attached to the blower unit.

At the central unit locate the existing 24 volt transformer. One 24 volt line should run from the transformer to the existing thermostat, (usually this is a red wire). Cut this wire and connect the end going to the thermostat to the new relay on terminal #2 (see illustration #4B). Take the red wire going to the new thermostat and the previously cut wire that goes back to the central unit, connect these two wires together and connect them to terminal #1 of the new relay. Connect the white wire of the two conductor thermostat wire that is going to the new thermostat to the red wire of the three conductor thermostat wire going to the Hardy fuel oil furnace. Locate the green wire of the three conductor thermostat wire going to the Hardy fuel oil furnace and connect it to the new relay on terminal #7. Take the white wire of the thermostat wire going to the Hardy fuel oil unit and add a long jumper to it and connect both to the new relay on terminal #8. Connect the other end of the long jumper wire to the common of the 24 volt transformer. This common connection may be connected to a terminal on the terminal strip of the central unit, if there is no terminal strip trace the wire from the transformer to the existing blower relay and make the connection there.

Locate the temperature sensor on the blower unit that is normally used to turn on the blower when using the existing gas, oil, or electric system. Using wire rated for 300 volts connect a jumper wire to one side of the sensor and to terminal #4 of the new relay. Connect another jumper to the other side of the sensor and to terminal #6 of the new relay. Do not disconnect the existing wires from the sensor. See illustration #4B

ILLUSTRATION #4B

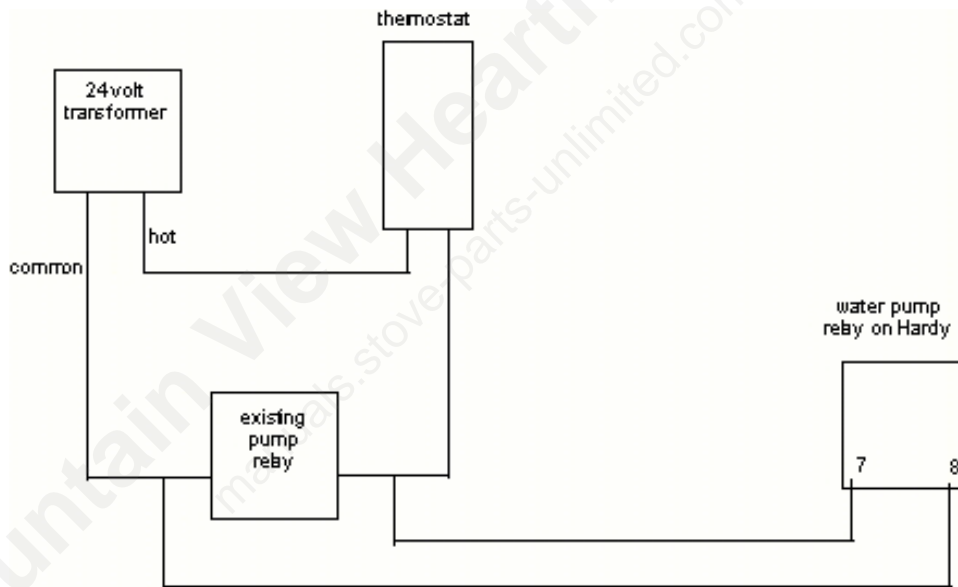


4-3 Typical Existing Hydronic heating system

This unit must be wired by a qualified electrician and in accordance with the National Electric Code , and any local, state, or municipal codes.

To install a Hardy fuel oil furnace to an existing hydronic system, there are two methods currently in use. The first is to a system which uses a 24 volt transformer to control the existing pump. Run a two conductor thermostat wire from the Hardy fuel oil furnace to the existing controls in the house. This wire must be rated for under ground use or run in side a pipe, tubing that meets all codes. The colors normally used are red and white. At the Hardy furnace connect the red wire to terminal #7 of the water pump relay, and the white wire to terminal #8 of the water pump relay. Inside the house connect the red wire to the hot side of the existing pump relay, and the white wire to the common side of the existing pump relay. See illustration #4C.

ILLUSTRATION #4C

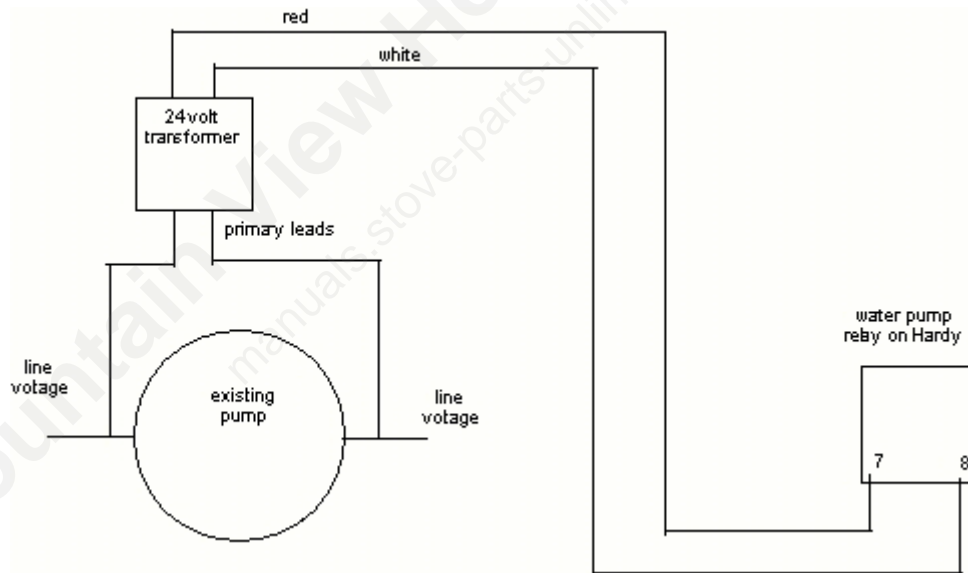


4-3 Typical Existing Hydronic heating system cont.

This unit must be wired by a qualified electrician and in accordance with the National Electric Code , and any local, state, or municipal codes.

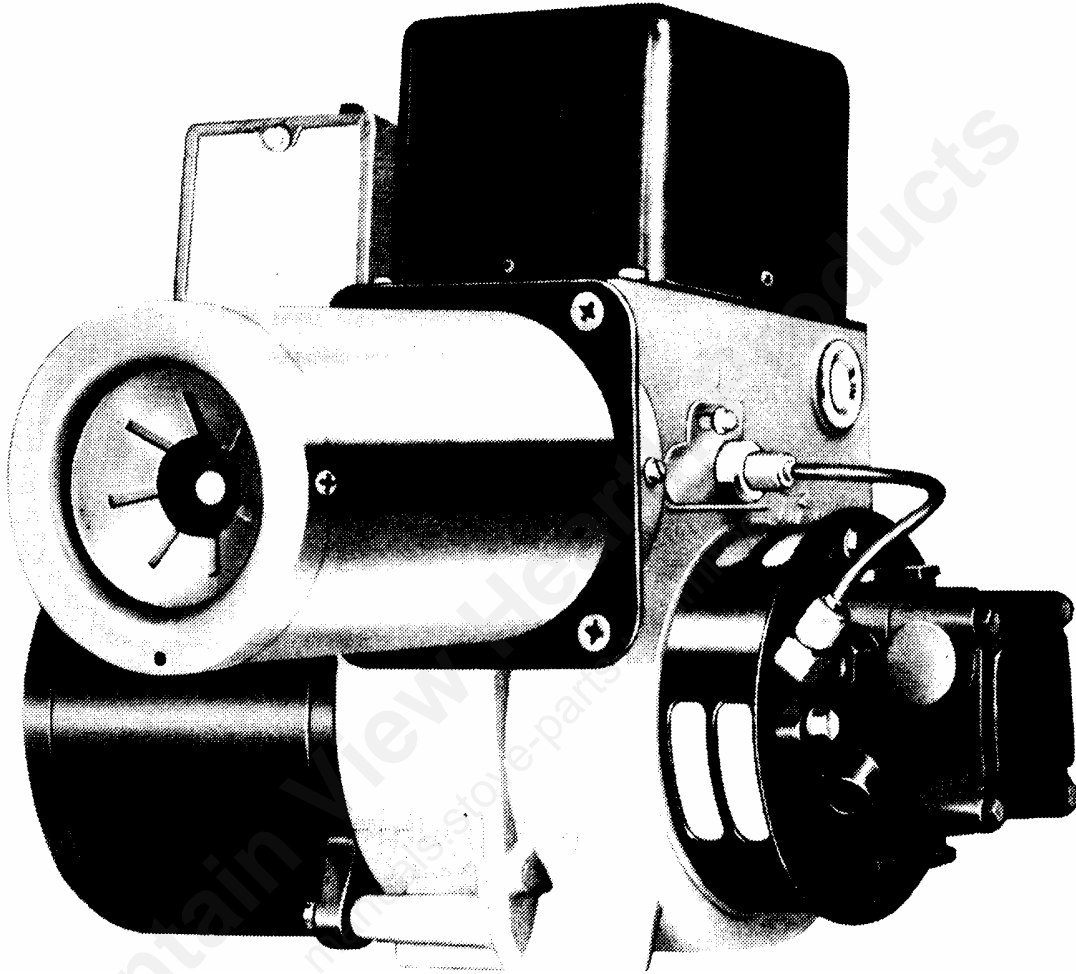
The second method of connecting to an existing hydronic heating system is for a system that does not have a low voltage control system. Run a two conductor thermostat wire from the Hardy fuel oil furnace to the existing controls in the house. This wire must be rated for underground use or run in side a pipe, tubing that meets all codes. The colors normally used are red and white. At the Hardy furnace connect the red wire to terminal #7 of the water pump relay, and the white wire to terminal #8 of the water pump relay. At the existing pump you will need to mount a 24 volt transformer, with the primary voltage matching the pump voltage. Connect the primary side of the transformer to the pump motor leads, this will supply the transformer with power any time the pump is energized. Connect the red thermostat wire to one terminal of the transformer, and the white thermostat wire to the other transformer terminal. See illustration #4D

ILLUSTRATION #4D



SECTION V

FUEL OIL BURNER



TO THE SERVICEMAN:

Before you begin to service the burner take time to work through the following simple checklist. Also instruct the homeowner to follow this checklist before calling a serviceman. It could save you a service call.

- ◆ Be sure there is oil in the tank and all the valves are open.
- ◆ Be sure the thermostat is set above the room temperature.
- ◆ Be sure the furnace has power to it.
- ◆ Be sure the furnace is full of water
- ◆ Reset the Safety Switch on the Burner Primary Control
- ◆ Make sure the blower housing and the fan are clear of any lint or dirt.

If all the above conditions check out fine and the burner runs, but no flame is observed, the fuel unit may be air bound. Follow the instructions on venting the fuel unit.



Prepare burner & site

Prepare burner

Low firing rate baffle

- The AFG Low Firing Rate Baffle (LFRB), item 7, page 11, reduces the air flow (cfm). The LFRB is sometimes used for firing rates under 1.00 GPH as listed in the table below. Refer to the appliance manufacturer's instructions or the Beckett *OEM Specification Guide* part number 6711. Do not omit the LFRB when specified. Omitting the baffle when specified or installing the baffle when not specified could result in poor burner performance.

Burner head type	Low Firing Rate Baffle if specified:
F0	up to 0.65 GPH
F3 or L1	up to 0.85 GPH
F4 or F6	up to 0.90 GPH
V1	up to 1.00 GPH

Burner fuel unit

- Verify that the burner fuel unit is compatible with the oil supply system. For more details, refer to "Connect Fuel Lines" on page 8.

Attach air tube (if not already installed)

If using a flange and gasket, slide them onto the air tube. Then attach the air tube to the burner chassis using the four sheet metal screws provided. See Figure 2 on page 6 for details.

Install burner nozzle (if not already installed)

WARNING Make certain the nozzle is selected for the fuel unit pressure used. For applications with fuel unit pressure above 100 psig, the nozzle rated capacity will be less than the appliance firing rate. Use only the specified spray pattern unless combustion test results indicate the need for a change. Failure to use the correct nozzle size and type can result in unacceptable combustion, possibly causing severe personal injury, death or substantial property damage.

- Remove the plastic plug protecting the nozzle adapter threads.
- Place a 3/4" open-end wrench on the nozzle adapter. Insert the nozzle into the adapter and finger tighten. Finish tightening with a 5/8" open-end wrench. Use care to avoid bending the burner head support legs or electrodes. See **CAUTION**, above right.
- If you remove the head to replace the nozzle (type "L1" or "V1" heads), carefully reconnect the head to the nozzle adapter, making sure to butt the head support to the nozzle adapter shoulder (see Figures 3 and 4, page 7).

If the nozzle is already installed, remove the nozzle line assembly to verify that the nozzle size and spray pattern are correct for the application (per appliance manufacturer's information or Beckett *OEM Specification Guide*, part number 6711. Verify that the electrode tip settings comply with Figure 1.

If the nozzle is not installed, obtain a nozzle of the manufacturer, capacity and spray angle specified in appliance manufacturer's information or Beckett *OEM Specification Guide*, part number 6711. For conversions or upgrades, when information is not available for the application:

- Refer to table below to select the mid-range nozzle spray angle for the head type being used.
- Fire the burner and make sure the combustion is acceptable and the flame is not impinging on chamber surfaces.
- If a shorter flame is needed, select a wider spray angle. If a longer flame is needed, select a narrower spray angle.
- Either hollow or solid spray patterns may be used. If combustion results are not satisfactory with the selected spray pattern, try the other pattern.

Recommended nozzle spray angles	
"F" head	60°, 70° or 80° nozzle
"L1" head	45°, 60° or 70° nozzle
"V1" head	45°, 60° or 70° nozzle

Prepare burner (continued)

Install burner nozzle (if not already installed) (continued)

CAUTION

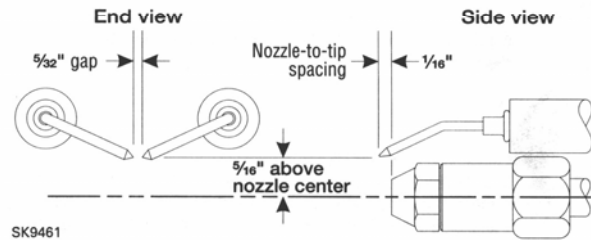
Use care when removing and installing oil nozzles:

- Inspect the nozzle adapter before installing nozzle. If it is grooved or scratched on the sealing surface, replace the nozzle line assembly. Otherwise, oil could leak at the nozzle-adapter joint, causing serious combustion problems.
- Protect the nozzle orifice and strainer when installing. If the orifice gets dirt in it or is scratched, the nozzle will not function properly.
- Do not over-torque the nozzle when installing. This will cause deep grooves in the nozzle adapter, preventing a seal when a new nozzle is installed.
- Use a wrench or vise to hold the nozzle adapter. **DO NOT** attempt to remove or replace nozzle without holding adapter. The nozzle alignment could be seriously damaged. Use a nozzle wrench that secures the adapter or use 3/4" and 5/8" open-end wrenches.
- Do not squeeze the electrodes too tightly when handling the nozzle line assembly. This could change the electrode tip settings or damage the ceramic electrode insulators.
- Carefully check and realign electrode tips after replacing nozzle, ensuring the electrode settings comply with Figure 1.

Check/adjust electrodes

Check the electrode tip settings. Adjust if necessary to comply with the dimensions shown in Figure 1. To adjust, loosen the electrode clamp screw and slide/rotate electrodes as necessary. Securely tighten the clamp screw when finished.

Figure 1 — Electrode settings



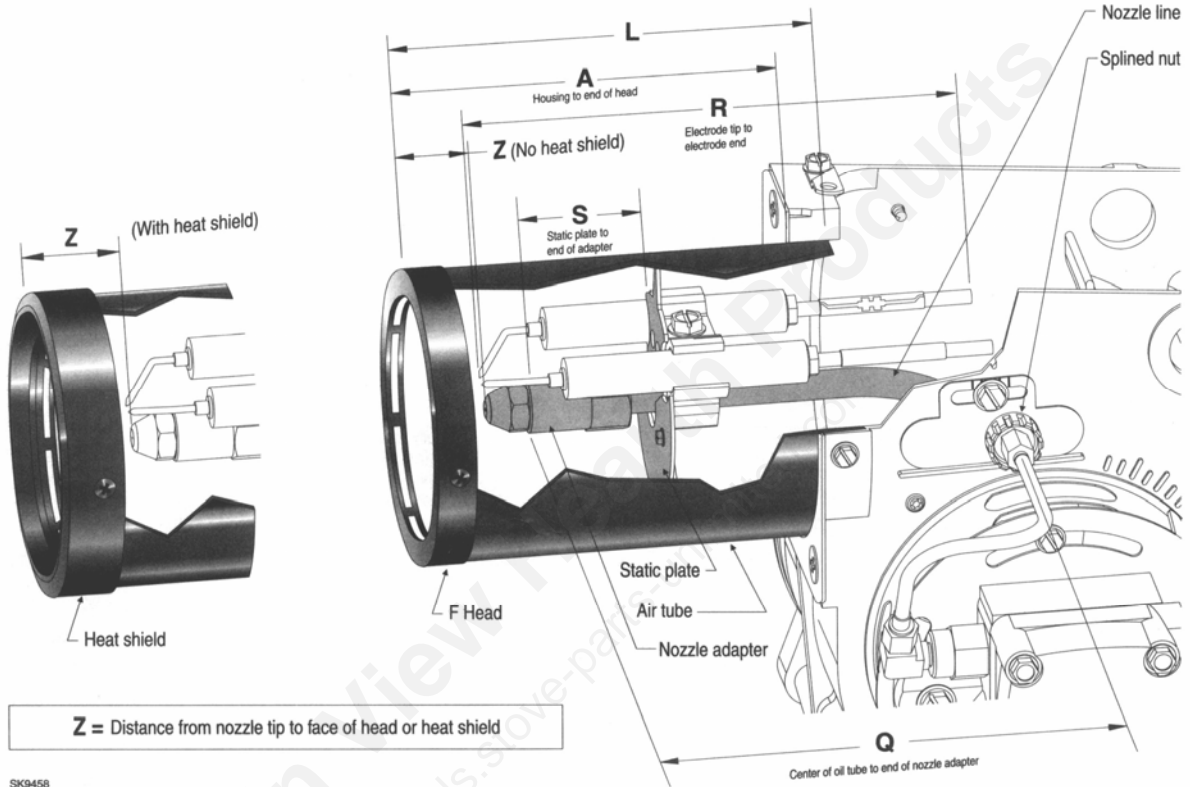
Servicing nozzle line assembly

- Turn off power to burner before proceeding.
- Disconnect oil connector tube from nozzle line.
- Loosen the two screws securing igniter retaining clips and rotate both clips to release igniter baseplate. Then tilt igniter back on its hinge.
- Remove splined nut.
- "F" head air tubes
Remove nozzle line assembly from burner, being careful not to damage the electrodes or insulators while handling. To ease removal of long assemblies (over 9 inches), rotate assembly 180° from installed position after pulling partially out of tube.
- "L1" and "V1" head air tubes
Slide nozzle line assembly forward (further into air tube) so the head clears the venturi opening. Then rotate the nozzle line assembly 90° so the nozzle line end points up. Pull the nozzle line assembly toward you and remove assembly from burner.
- To replace the nozzle assembly, reverse the above steps.

Prepare burner & site

Check/adjust "Z" dimension - "F" head

Figure 2 — "F" heads (plus burner detail for all head styles) (see Table 3 for dimensions)



Z = Distance from nozzle tip to face of head or heat shield

SK9458

- See Figure 2 above. The important "Z" dimension is the distance from the face of the nozzle to the flat face of the head (or heat shield, if applicable). This distance for **F heads** is 1 1/8" (1 3/8" if the air tube has a heat shield). The "Z" dimension is factory set for burners shipped with the air tube installed. Even if factory set, verify that the "Z" dimension has not been changed.
- Use the following procedure to adjust the "Z" dimension, if it is not correct:
 - Turn off power to the burner.
 - Disconnect the oil connector tube from the nozzle line.
 - See Figure 2. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the escutcheon plate to the burner housing.
 - Place the end of a ruler at the face of the nozzle and, using a straight edge across the head, measure the distance to the face of the head. (A Beckett T500 gauge may also be used.)
 - Slide the nozzle line forward or back until this dimension for **F heads** is 1 1/8" (1 3/8" to the face of the heat shield, if applicable).
 - Tighten the hex head screw to secure the escutcheon plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
- Recheck the "Z" dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the "Z" dimension if you replace the air tube or nozzle line assembly.

NOTICE The Beckett Z gauge (part number Z-2000) is available to permit checking the F head "Z" dimension without removing the burner from the appliance.

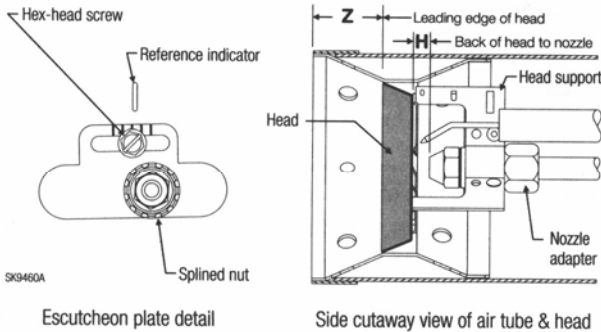
Table 3 — Dimensions for Figures 2, 3 and 4

Dimension (inches)	For usable length, A (inches):		
	F head	L1 head	V1 head
H (nozzle to head), ± 1/32	N/A	1/4	1/4
L (total tube length)	A + 1/2	A + 1/2	A + 1/2
R (electrode length), ± 1/4	A + 2 1/4	A + 1 1/8	A + 1 1/8
S (adapter to static plate), ± 1/16	2 13/16 (note 1)	1 3/8	1 3/8
Q (nozzle line length)	A + 15/16	A + 3/16	A + 3/16
Z (F head — no heat shield)	1 1/8	NA	NA
Z (F head — with heat shield)	1 3/8	NA	NA
Z (L1/V1 head — straight shroud)	NA	1 3/8	NA
Z (L1/V1 head — conic shroud)	NA	1 3/4	1 3/4

Note 1: 1 3/8 for dimension A less than 3 3/8; 1 3/4 for dimension A between 3 3/8 and 4 1/2

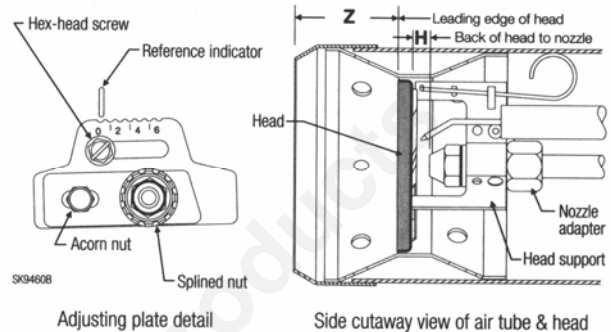
Check/adjust "Z" dimension - "L1" head

Figure 3 — "L1" heads (see Table 3 and Figure 2 for dimensions)



Check/adjust "Z" dimension - "V1" head

Figure 4 — "V1" heads (see Table 3 and Figure 2 for dimensions)



- See Figure 3. The important "Z" dimension is the distance from the leading edge of the head to the end of the air tube. This distance for **L1 heads** is 1 3/8" if the tube has a straight shroud (1 3/4" if the air tube has a conic shroud). The "Z" dimension is factory set for burners shipped with the air tube installed. Even if factory set, verify that the "Z" dimension has not been changed.
- Use the following procedure to adjust the "Z" dimension, if it is not correct:
 - Turn off power to the burner.
 - Disconnect the oil connector tube from the nozzle line.
 - See Figure 3. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the escutcheon plate to the burner housing.
 - Place the end of a ruler at the leading edge of the head and, using a straight edge across the end of the tube, measure the distance to the end of the air tube. (A Beckett T500 gauge may also be used.)
 - Slide the nozzle line forward or back until this dimension is 1 3/8" for **L1 heads** if the air tube has a straight shroud (1 3/4" if the air tube has a conic shroud).
 - Tighten the hex head screw to secure the escutcheon plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
- Recheck the "Z" dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the "Z" dimension if you replace the air tube or nozzle line assembly.

- See Figure 4. The important "Z" dimension is the distance from the leading edge of the head to the end of the air tube. This distance for **V1 heads** is 1 3/4". The "Z" dimension is factory set for burners shipped with the air tube installed. Even if factory set, verify that the "Z" dimension has not been changed.
- Use the following procedure to adjust the "Z" dimension, if it is not correct:
 - Turn off power to the burner.
 - Disconnect the oil connector tube from the nozzle line.
 - See Figure 4. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the escutcheon plate to the burner housing.
 - Loosen the acorn nut. Move the head adjusting plate until the "0" lines up with the reference indicator on the housing, and retighten the hex head screw. Place the end of a ruler at the leading edge of the head and, using a straight edge across the end of the tube, measure the distance to the end of the air tube. Or use a Beckett T500 gauge. Slide the nozzle line forward or back until this dimension is 1 3/4" for **V1 heads**. Tighten the acorn nut.
 - Tighten the hex head screw to secure the escutcheon plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
- Recheck the "Z" dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the "Z" dimension if you replace the air tube or nozzle line assembly.

Set head position adjusting plate ("V1" head only)

- After setting "Z" dimension, loosen head adjusting plate hex head screw and nozzle line splined nut. Move the nozzle line assembly until the burner reference indicator lines up with the head adjusting plate setting number given in Table 3.
- Tighten the hex head screw and splined nut. (DO NOT loosen the acorn nut when setting head position.) Refer to the Beckett *OEM Specification Guide* or manufacturer's instructions for OEM settings.
- The position of the head affects air flow volume and pattern. For most applications, the burner will perform satisfactorily with the air adjustment plate setting of Table 3.
- If combustion results indicate the need for change, adjust the head position adjusting plate forward or back one position at a time to optimize combustion.

Table 3 — Starting adjusting plate settings with "V1" head

Firing rate (GPH)	Adjusting plate setting	Firing rate (GPH)	Adjusting plate setting
0.75 – 1.00	0	2.00 – 2.25	4
1.00 – 1.50	1	2.25 – 2.50	5
1.50 – 1.75	2	2.50 – 2.75	6
1.75 – 2.00	3		

Adjust, pipe & wire burner

Mount burner on appliance

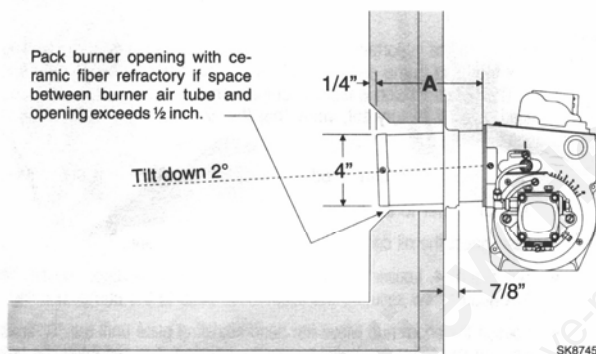
Mounting options

- Bolt the burner to the appliance using the factory-mounted flange or an adjustable flange.

Mounting dimensions

- When using the Beckett universal adjustable flange, mount the air tube at a 2° downward pitch unless otherwise specified by the appliance manufacturer.
- Verify that the air tube installed on the burner provides the correct insertion depth. See Figure 5.
- The end of the air tube should normally be ¼" back from the inside wall of the combustion chamber. Never allow the leading edge of the head assembly to extend into the chamber, unless otherwise specified by the heating appliance manufacturer. Carefully measure the insertion depth when using an adjustable flange. Verify the insertion depth when using a welded flange.

Figure 5 — Mounting burner in appliance



Connect fuel lines

Carefully follow the fuel unit manufacturer's literature and the latest edition of NFPA 31 for oil supply system specifications. If this information is unavailable, use the following basic guidelines.

NOTICE Fuel units with automatic bypass do not require a bypass plug.

WARNING The burner fuel unit is shipped without the bypass plug installed. You must install this plug on two-pipe oil systems. **DO NOT** install the plug in the fuel unit if connected to a one-pipe oil system. Failure to comply could cause fuel unit seal failure, oil leakage and potential fire and injury hazard.

Fuel supply level with or above burner —

The burner may be equipped with a single-stage fuel unit for these installations. Connect the fuel supply to the burner with a single supply line if you want a one-pipe system (making sure the bypass plug is NOT installed in the fuel unit.) Manual venting of the fuel unit is required on initial start-up. If connecting a two-pipe fuel supply, install the fuel unit bypass plug.

WARNING The oil supply inlet pressure to the fuel unit cannot exceed 3 psi. Install a pressure-limiting device in accordance with NFPA 31.

Fuel supply below the level of the burner —

When the fuel supply is below the level of the burner, a two-pipe fuel supply system is required. Depending on the fuel line diameter and horizontal and vertical length, the installation may also require a two-stage pump. Consult the fuel unit manufacturer's literature for lift and vacuum capability.

Connect fuel lines (continued)

Fuel line installation —

- Continuous lengths of heavy wall copper tubing are recommended. **Always use flare fittings. Never use compression fittings.**
- Always install fittings in accessible locations. Fuel lines should not run against the appliance or the ceiling joists (to avoid vibration noise).

WARNING Never use Teflon tape on any fuel fitting. Tape fragments can lodge in fuel line components and fuel unit, damaging the equipment and preventing proper operation.

Fuel line valve and filter —

- Install two high quality **shutoff valves** in accessible locations on the oil supply line. Locate one close to the tank and the other close to the burner, upstream of the filter.

NOTICE Some states require these valves to be fusible-handle design for protection in the event of fire. We recommend this as good industry practice for all installations.

- Install a generous capacity **filter** inside the building between the fuel tank shutoff valve and the burner, locating both the filter and the valve close to the burner for ease of servicing. Filter should be rated for 50 microns or less.

Wire burner

Burner packaged with appliance

- Refer to appliance manufacturer's wiring diagram for electrical connections.

Burner applied at jobsite

- Refer to Figures 6 and 7, page 9, for typical burner wiring, showing cad cell primary controls. Burner wiring may vary, depending on primary control actually used. The oil valve shown in Figures 6 and 7 may be an optional feature.

NOTICE All wiring must be in accordance with the latest revision of National Electric Code NFPA 70 and local codes and regulations.

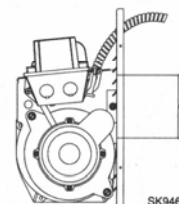
WARNING The wiring diagrams in this manual are for *general reference only*, and apply only to burners equipped with R8184G or R7184 primary controls. For other controls, refer to the control manufacturer's literature or the diagrams supplied with the appliance. Failure to apply correct wiring could result in severe personal injury, death or substantial property damage.

NOTICE The **R7184** primary control with valve-on delay (*prepurge*) and burner motor-off delay (*postpurge*), shown in Figure 7, page 9, requires a constant 120 VAC power source supplied to the **BLACK** wire on the control. The **RED** wire goes to the appliance limit circuit. Please note that other control manufacturers may use different wire colors for power and limit connections.

Covered burners

The mounting plate is not a conduit connection point. Pass conduit and attached connector through the opening in the mounting plate (see illustration at right) and attach it directly to the burner-mounted 4x4 electrical box.

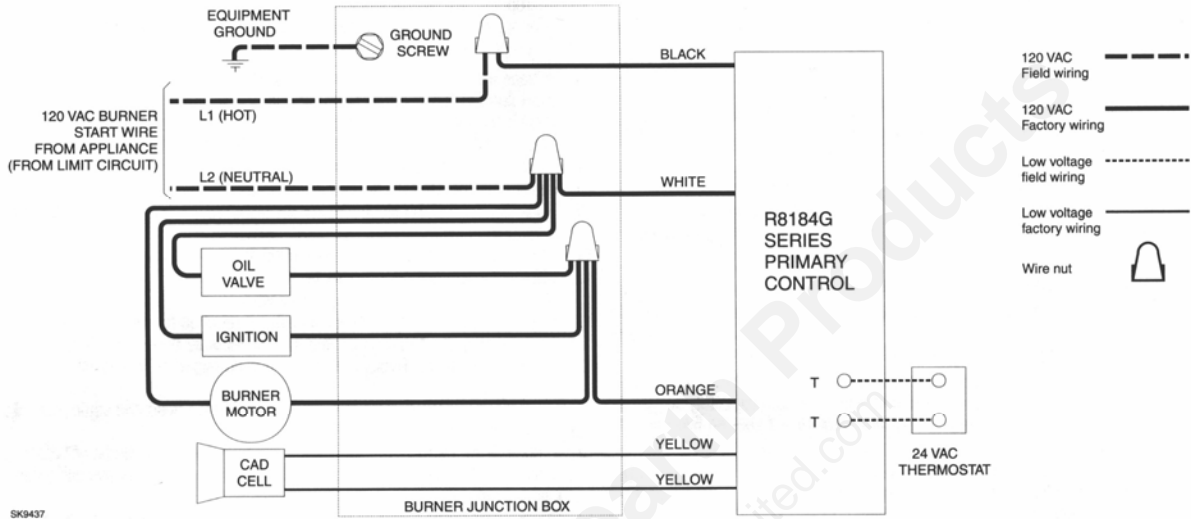
If attaching a burner cover to a previously installed burner, attach the mounting plate and then slide the conduit into the "J" shaped conduit slot.



Adjust, pipe & wire burner

Figure 6 — Typical wiring, R8184G or equivalent primary control

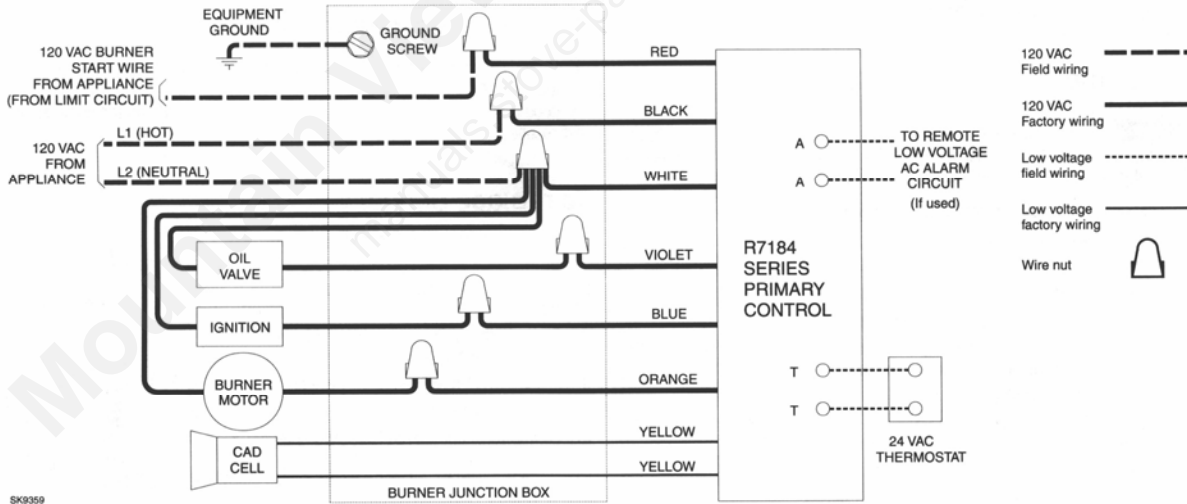
DANGER Electrical shock hazard. Disconnect power before servicing.



SK9437

Figure 7 — Typical wiring, R7184 primary control (R7184P shown)

DANGER Electrical shock hazard. Disconnect power before servicing.



SK9359

Table 5 — R7184 primary control features

Feature	R7184A	R7184B	R7184P
Interrupted ignition	YES	YES	YES
Limited reset, limited recycle	YES	YES	YES
Diagnostic LED, cad cell indicator	YES	YES	YES
Valve-on delay		YES	YES
Burner motor-off delay			YES
Alarm contacts			Optional

Startup & adjust burner

Service & maintain burner

Startup burner/set combustion

WARNING Do not attempt to start the burner when excess fuel or vapor has accumulated in the appliance. Starting the burner under these conditions could result in a puffback of hot combustion gases, high smoke levels, or otherwise hazardous operation.

1. Open the shutoff valves in the oil supply line to the burner.
2. Close air band and partially open air shutter. This is an initial air setting for the pump venting procedure only. Additional adjustments must be made with instruments.
3. Set the thermostat substantially above room temperature.
4. Close the line voltage switch to start the burner. If the burner does not start immediately you may have to reset the safety switch of the burner primary control.
5. **Vent air from fuel unit** as soon as burner motor starts rotating.

To vent the fuel unit, attach a clear plastic hose over the vent plug. Loosen the plug and catch the oil in an empty container. Tighten the plug when all air has been purged from the oil supply system.

- If the burner locks out on safety during venting, reset the safety switch and complete the venting procedure. Note — Electronic safety switches can be reset immediately; others may require a three- to five-minute wait.
- If burner stops after flame is established, additional venting is probably required. Repeat the venting procedure until the pump is primed and a flame is established when the vent plug is closed.
- For R7184 primary controls, see *Technician's Quick Reference Guide*, Beckett part number 61351, for special pump priming sequence.
- Prepare for combustion tests by drilling a 1/4" sampling hole in the flue pipe between the appliance and the barometric draft regulator.

6. **Initial air adjustment** — Using a smoke tester, adjust the air shutter (and air band, if necessary) to obtain a clean flame. Now the additional combustion tests with instruments can be made.

Set combustion with instruments

WARNING The combustion must be adjusted using test instruments. Failure to do so could result in burner or appliance failure, causing potential severe personal injury, death or substantial property damage.

1. Let burner run for approximately 5 to 10 minutes.
2. Set the over-fire or stack draft to level specified by appliance manufacturer (usually -0.01 to -0.02 inches w.c. over-fire for natural draft applications).
3. Follow these four steps to properly adjust the burner:

Step 1: Adjust air until a trace smoke level is achieved.

Step 2: At the trace of smoke level, measure the CO₂ (or O₂). This is the vital reference point for further adjustments.

- Example: 13.5% CO₂ (2.6% O₂).

Step 3: Increase the air to reduce CO₂ by 1 to 2 percentage points. (O₂ will be increased by approximately 1.4 to 2.7 percentage points.)

- Example: Reduce CO₂ from 13.5% to 11.5%. (O₂ — 2.6% to 5.3%.)

Step 4: Recheck smoke level. It should be zero.

- This procedure provides a margin of reserve air to accommodate variable conditions.
- If the draft level has to be changed, recheck the smoke and CO₂ levels. Adjust the burner air if necessary.

4. Once combustion is set, tighten all fasteners on air band, air shutter and head adjusting plate or escutcheon plate.
5. Burner equipped with cover — Reinstall cover and repeat steps 2 and 4 above. If CO₂ increases (O₂ decreases), remove the cover and adjust the air setting so the CO₂ (O₂) with cover on meets the requirements of step 3.
6. Start and stop the burner several times to ensure satisfactory operation. Test the primary control and all other appliance safety controls to verify that they function according to the manufacturer's specifications.

10

Perform annual maintenance

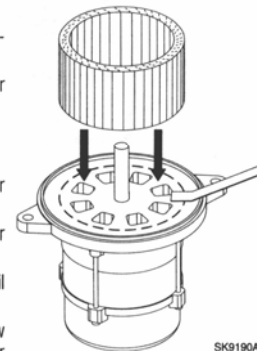
WARNING This equipment must be serviced only by a qualified service agency. The appropriate test instruments must be used. Failure to do so could result in burner or appliance failure, causing potential severe personal injury, death or substantial property damage.

- ❑ Replace the oil supply line filter. The line filter cartridge must be replaced to avoid contamination of the fuel unit and nozzle.
- ❑ Inspect the oil supply system. All fittings should be leak-tight. The supply lines should be free of water, sludge and other restrictions.
- ❑ Remove and clean the pump strainer if applicable.
- ❑ Replace the nozzle with an equivalent nozzle.
- ❑ Clean and inspect the electrodes for damage, replacing any that are cracked or chipped.
- ❑ Check electrode tip settings. Replace electrodes if tips are rounded.
- ❑ Inspect the igniter spring contacts.
- ❑ Clean the cad cell grid surface, if necessary.
- ❑ Make sure low firing rate baffle is in place if required for the burner application. Omitting the baffle can result in unacceptable burner combustion.
- ❑ Inspect all gaskets. Replace any that are damaged or would fail to seal adequately.
- ❑ Clean the blower wheel, air inlet, air guide, retention head and static plate of any lint or foreign material.
- ❑ If motor is not permanently lubricated, oil motor with a few drops of SAE 20 nondetergent oil at each oil hole. DO NOT over oil motor. Excessive oiling can cause motor failure.
- ❑ Check motor current. The Amp draw should not exceed the nameplate rating by more than 10%.
- ❑ Check all wiring for secure connections or insulation breaks.
- ❑ Check the pump pressure and cutoff function.
- ❑ Check primary control safety lockout timing.
- ❑ Check ignition system for proper operation.
- ❑ Inspect the vent system and chimney for soot accumulation or other restriction.
- ❑ Clean the appliance thoroughly according to the manufacturer's recommendations.
- ❑ Check the burner performance. Refer to the section "Set combustion with instruments."

It is good practice to make a record of the service performed and the combustion test results.

To replace blower wheel:

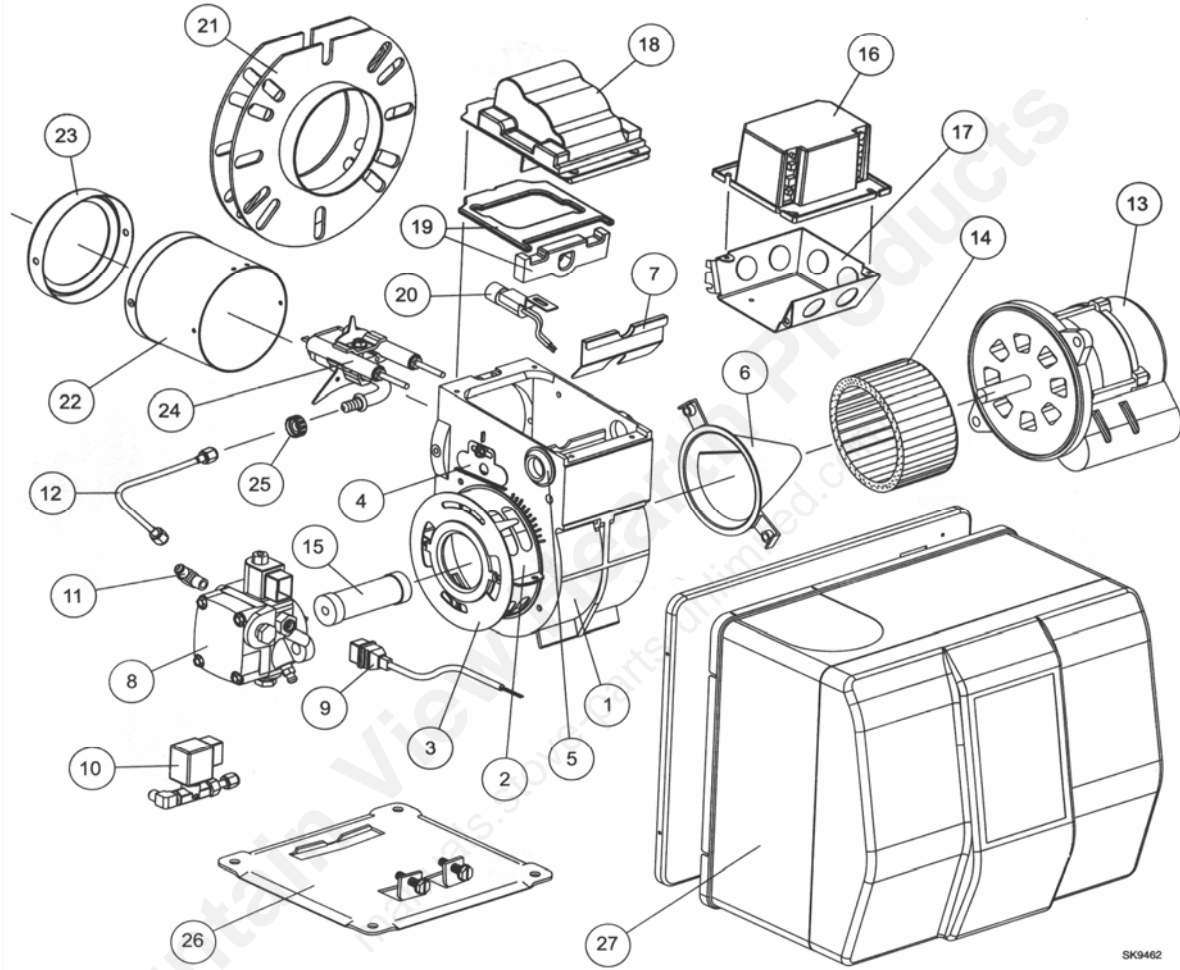
1. Turn off all power to the burner before servicing.
2. Disconnect the wires to the burner motor.
3. Remove the bolts securing the blower motor to the housing.
4. Remove the blower motor and wheel.
5. Remove the existing wheel.
6. As shown at right, slide the new blower wheel onto the shaft.
 - Place a .030" (1/32" ± 1/64") feeler gauge on the motor as shown.
 - Slide blower wheel toward motor until it contacts feeler gauge.
 - Rotate the wheel until the set screw is centered on the flat of the motor shaft.
 - Tighten the set screw to secure the wheel.
7. DO NOT use a motor that has endshield openings outside the blower wheel circumference represented by the dashed line.
8. Install the motor on the burner housing. Tighten screws. Reconnect motor wires.
9. Restore power, start the burner and perform combustion tests. Refer to "**Set combustion with instruments.**"



SK9190A

Service & maintain burner

Replacement parts



SK9462

Reference #	Description	Reference #	Description
1	Burner housing assembly	13	Blower Motor
2	Air Band	14	Blower Wheel
3	Air Shutter	15	Coupling
4	Escutcheon Plate	16	Primary Control
5	Hole Plug	17	Electrical Box
6	Air Guide	18	Igniter
7	Low Firing Rate Baffle	19	Igniter Gasket Kit
8	Pump	20	Cad Cell Detector
9	Valve Cordset	21	Flange
10	Solenoid Valve Kit	22	Air Tube Combination
11	Pump Elbow	23	Heat Shield Kit
12	Connector Tube Assembly	24	Electrode Kit
		25	Splined Nut

The following service procedures will help you become familiar with the R7184 primary controls. For control operation, please refer to the basic control functions described on the back. For further information, wiring instructions, and troubleshooting, please refer to the R7184 Installation Instructions (Honeywell #69-1459, Beckett #61350).

PRIMING THE PUMP

1. Initiate a call for heat.
2. While the ignition is on, press and release the reset button (hold ½ sec. or less). If the control has not locked out since its most recent complete heat cycle, the lockout time will be extended to 4 minutes (45 sec. in earlier units), and the ignition will remain on for the entire heat cycle.
3. Bleed the pump until all froth and bubbles are purged. If prime is not established within the extended lockout time, the control will lock out. Press the reset button to reset the control and to return to step 2.
Note: The reset button can be held for 30 seconds at any time to reset the control's lockout counter to zero and send the control to standby.
4. Repeat steps 2 and 3, if needed, until the pump is fully primed and the oil is free of bubbles. Then terminate the call for heat, and the control will resume normal operation.

RESETTING FROM RESTRICTED LOCKOUT

If the control locks out three times in a row without a complete heat cycle between attempts, the lockout becomes restricted in order to prevent repetitious resetting by the homeowner. To reset, hold down the reset button for 30 seconds (until the LED flashes twice).

DISABLE FUNCTION

Any time the motor is running, press and hold the reset button to disable the burner. The burner will remain off as long as the button is held and will return to standby when released.

LED INDICATOR KEY

LED	STATUS
On	Flame sensed
Off	Flame not sensed
Flashing (½ sec. on, ½ sec. off)	Lockout / Restricted Lockout
Flashing (2 sec. on, 2 sec. off)	Recycle

CAD CELL RESISTANCE CHECK

While the burner is firing, and after the ignition has been turned off, press and release the reset button (hold ½ sec. or less) to check the cad cell resistance. The LED will flash 1 to 4 times, depending on the cad cell resistance (see the chart below), and then return to solid green. For proper operation, it is important that the cad cell resistance is below 1600 Ohms.

LED FLASHES	CAD CELL RESISTANCE
1	0 – 400 Ohms
2	400 – 800 Ohms
3	800 – 1600 Ohms
4	≥ 1600 Ohms

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.	—	—
3. Check indicator light with burner off, 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.	<ul style="list-style-type: none"> • 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: <i>First remove one thermostat lead.</i>	Burner starts.	Trouble in thermostat or limit circuit. Check thermostat or limit wiring connections.
	Burner does not start.	<ul style="list-style-type: none"> • 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 the oil primary control. Voltage should be 120 Vac.	—	—
3. Check indicator light with burner off, 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.	<ul style="list-style-type: none"> • 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: <i>First remove one thermostat lead.</i>	Burner starts.	Trouble is in thermostat or limit circuit. Check thermostat or limit wiring connections.
	Burner does not start.	<ul style="list-style-type: none"> • 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)		

Table 5. Troubleshooting Information (Continued).

Procedure	Status	Corrective Actions
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 rate ^a .	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. <ul style="list-style-type: none"> • 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.
10. Check cad cell. <ul style="list-style-type: none"> • 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.	Place control back on burner. Go to step 6.
	Indicator light is off.	Go to step 11.
11. Check cad cell bracket assembly. <ul style="list-style-type: none"> • Disconnect line voltage power and open line switch. • Remove cad cell wires from quick-connect 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.

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