



hydro flame corporation

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EXCALIBUR 8900-II SERIES

OWNERS MANUAL

IMPORTANT

**READ ALL INSTRUCTIONS
BEFORE OPERATING THE FURNACE**

**TO THE INSTALLER: AFFIX DOCUMENTS
ADJACENT TO THE FURNACE**

**TO THE CONSUMER: KEEP DOCUMENTS
AVAILABLE FOR FUTURE REFERENCE**



This furnace design has been certified by Underwriters Laboratories and the Canadian Gas Association for installation in recreational vehicles. These installation instructions are to be followed to insure safe operation of the furnace. Failure to install the furnace according to the installation instructions contained herein nullifies the furnace warranty.



FOR YOUR SAFETY

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

FOR YOUR SAFETY WHAT TO DO IF YOU SMELL GAS

Do not try to light any appliance. Do not touch any electrical switch. Do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

WARNING:

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

Rev. 11/19/93
Lit #4059H

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OPERATING INSTRUCTIONS

FOR YOUR SAFETY, READ THESE INSTRUCTIONS BEFORE OPERATING THE FURNACE.

WARNING!

WHEN FIRST FIRED, THE FURNACE MAY CIRCULATE FUMES CAUSED BY THE HEATING OF MATERIALS USED IN THE FURNACE MANUFACTURING PROCESS. THESE FUMES MAY CAUSE PHYSICAL IRRITATION IN SOME PERSONS. THE FIRST HEATING OF SOME BUILDING MATERIALS IN THE COACH CAN GIVE OFF FUMES THAT CAN BE FATAL TO BIRDS OR OTHER SMALL ANIMALS AND MAY BE HARMFUL TO HUMANS. OPEN ALL WINDOWS AND DOORS WHEN FIRING THE FURNACE FOR THE FIRST TIME UNTIL THE FUMES HAVE FULLY DISSIPATED TO THE OUTSIDE.

Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because propane is heavier than air and will settle on the floor.

FOR YOUR SAFETY IF YOU SMELL GAS:

1. DO NOT TOUCH ANY ELECTRICAL SWITCHES.
2. TURN OFF MAIN GAS SUPPLY.
3. EXTINGUISH ANY OPEN FLAME.
4. OPEN WINDOWS AND DOORS.
5. DO NOT TRY TO LIGHT ANY APPLIANCE.
6. DO NOT USE ANY PHONE IN YOUR BUILDING.
7. IMMEDIATELY CALL YOUR GAS SUPPLIER FROM A NEIGHBOR'S PHONE. FOLLOW THE GAS SUPPLIER'S INSTRUCTIONS.
8. IF YOU CANNOT REACH YOUR GAS SUPPLIER, CALL THE FIRE DEPARTMENT OR OTHER EMERGENCY SERVICES.

Do not use this appliance if any part has been submerged under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that has been submerged under water.

Do not operate this furnace while the vehicle is in motion.

Should overheating occur or the gas supply fail to shut off, shut off the main gas valve to the appliance before shutting off the electrical supply.

LIGHTING INSTRUCTIONS

Read all safety related information before operating the furnace. This appliance is equipped with a manual gas shut-off and an ignition device which automatically lights the burner. Do not try to light the burner by hand. This furnace will operate at an elevation of 0 to 10,000 feet.

1. Set the thermostat to the lowest setting or turn the thermostat to the "OFF" position.
2. Wait five (5) minutes to clear out any gas. If after 5 minutes you smell gas, STOP! Follow the safety information above. If you do not smell gas, go to the next step.
3. Set the thermostat to desired temperature setting and turn the thermostat to the "ON" position. Allow 40 to 60 seconds for the furnace to begin operating. (It may be necessary to set an RV thermostat to a higher setting than that in a home to achieve a comparable level of comfort. Opening an exterior door or window of an RV results in rapid loss of interior heat.)

If the furnace does not light, repeat steps 1-3. If the furnace does not ignite after three attempts, turn the thermostat to "OFF" and call a qualified service technician or your gas supplier.

SHUT DOWN INSTRUCTIONS

Set the thermostat to lowest setting and turn the thermostat to the "OFF" position.

See supplemental lighting instructions on back page.

SEQUENCE OF OPERATION

DC MODELS

The thermostat controls the operating circuit to the furnace by reacting to room temperature. When room temperature is below the thermostat set point, the contacts close to allow current to flow to the relay.

The circuit breaker limits amperage draw of the motor.

The relay allows current to pass to the motor by closing a switch within the relay. A heater coil within the relay actuates a bimetal disc which closes the relay circuit. A secondary ONE USE THERMAL CUT OFF limit switch is located in the circuit which provides protection in case of overheating.

Current flows to the motor to operate the blower. One end of the motor shaft is for the circulating air wheel and the other end is for the combustion air wheel.

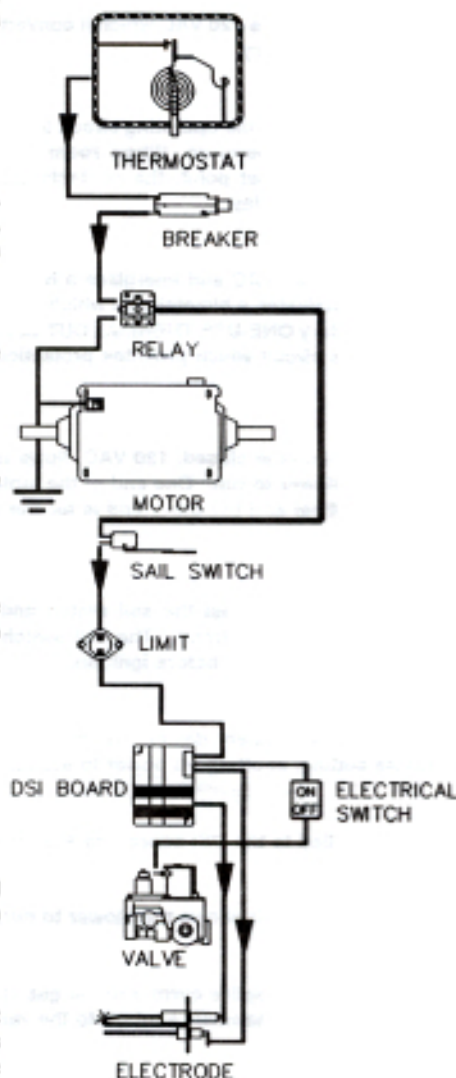
Circulating air blows against the sail switch and closes the contacts, completing the circuit. The sail switch is a safety device that insures air flow before ignition.

The limit switch is a safety device that protects the furnace from overheating. The contacts in the limit switch open at a given temperature setting, shutting off power to the direct spark ignition (DSI) system that controls the gas valve.

As power is applied to the DSI board, the system does the following:

1. A timing circuit allows the blower to purge the chamber.
2. The board supplies current to the gas valve and causes it to open. A manual electrical switch (available 1/15/94) is provided and must be in the on position for current to reach the valve.
3. As the valve opens, the board sends a high voltage spark to the electrode at the burner. The DSI board detects the presence of a flame. If the flame is not sensed after 7 seconds, the board will lock out, shutting off power to the valve.
4. If the system does not ignite and the thermostat remains closed, the blower will remain on until the thermostat is reset manually.

When the thermostat senses the desired room air temperature, the contacts open, removing power from the ignition system and shutting off the gas valve. The blower runs until the heater coil in the relay cools and opens the circuit, shutting off current to the motor.



AC MODELS

MOTOR CIRCUITRY

Power is supplied to the breaker which is placed in line as an overload and safety protector for the furnace.

The capacitor is supplied with 120 VAC which gives the motor an extra power boost on start up.

OPERATING CIRCUITRY

The transformer receives 120 VAC which it converts to 24 VAC for the operating circuitry.

The thermostat controls the operating circuit to the furnace by reacting to room temperature. When room temperature is below the thermostat set point, the contacts close to allow current to flow to the relay.

The relay receives 24 VAC and energizes a heater coil within the relay. This activates a bimetal disc which closes the relay circuit. A secondary ONE-USE THERMAL CUT OFF limit switch is located in this circuit which provides protection in case of overheating.

Once the relay circuit is closed, 120 VAC flows to the motor and allows the blower to run. One end of the motor is for the circulating air wheel and the other end is for the combustion air wheel.

Circulating air blows against the sail switch and closes the contacts, completing the circuit. The sail switch is a safety device that insures air flow before ignition.

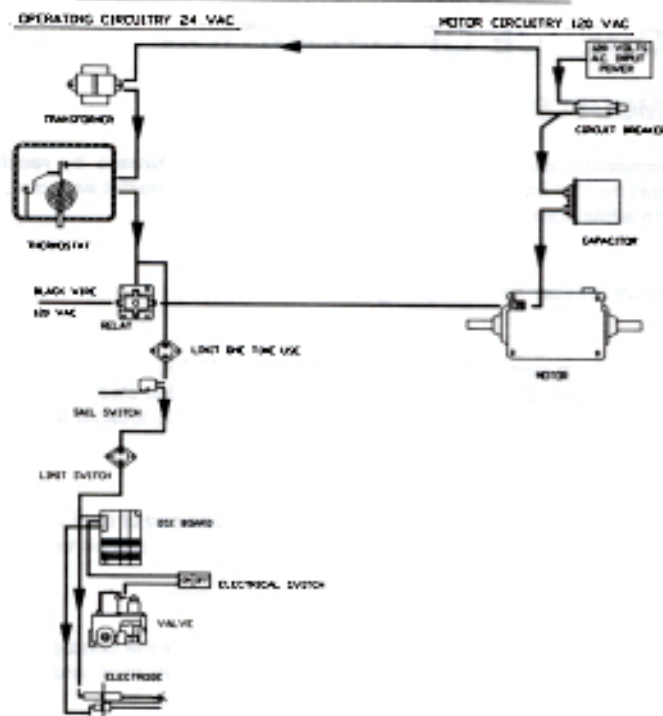
The limit switch is a safety device that protects the furnace from overheating. The contacts in the limit switch open at a given temperature setting, shutting off power to the direct spark ignition (DSI) system that controls the gas valve.

As power is applied to the DSI board, the system does the following:

1. A timing circuit allows the blower to purge the chamber.
2. The board supplies current to the gas valve and causes it to open. There is an electrical switch in line to the valve to allow power to be manually shut off to the valve. This switch must be on for the furnace to operate.
3. As the valve opens, the board sends a high voltage spark to the electrode at the burner. The board detects the presence of a flame. If the flame is not sensed after 7 seconds, the board will lock out, shutting off power to the valve.
4. If the system does not ignite and the thermostat remains closed, the blower will remain on until the thermostat is reset manually.

When the thermostat senses the desired room air temperature, the contacts open, removing power from the ignition system and shutting off the gas valve. The blower runs until the heater coil in the relay cools and opens the circuit, shutting off current to the motor.

SEQUENCE OF OPERATION 8900 AC



GAS SYSTEM SAFETY

All DC units are designed to use propane (LP) gas. AC units are designed to use either LP or natural (NAT) gas. Those set up on LP gas are designed to operate at 11.0 inches Water Column. Those set up on NAT gas are designed to operate at 7.0 inches Water Column. The Water Column measurement should be taken with at least 50 percent of all gas appliances operating.

WARNING!

**AN OVERFILLED PROPANE GAS BOTTLE IS DANGEROUS.
GAS BOTTLES SHOULD BE FILLED BY QUALIFIED GAS SUPPLIERS ONLY.**

Liquid propane gas from an overfilled bottle can be forced through the pressure regulator. This high pressure gas could escape and result in a fire or explosion. To prevent this, please read and adhere to the tank manufacturer's operating instructions located on your tank.

ANNUAL PREVENTIVE MAINTENANCE INSPECTION

The following preventive maintenance and safety checks should be performed by a qualified RV technician once a year, or more, depending on the use of the furnace. **FAILURE TO PROPERLY MAINTAIN THE FURNACE MAY VOID THE FURNACE WARRANTY AND CAN RESULT IN UNSAFE FURNACE OPERATION. PREVENTIVE MAINTENANCE IS NOT COVERED UNDER WARRANTY.**

GAS PRESSURE

Using a U-tube water manometer with the furnace and at least 50 percent of the appliances operating, the pressure should be 11 inches W.C. for propane systems and 7.0 W.C. for natural gas systems. Improper gas pressure can cause the furnace to work inconsistently and create unbalanced combustion.

VOLTAGE

DC models should operate between 10 and 13.5 VDC at the furnace during operation. The power at the furnace needs to be checked with each of the following power sources when applicable: generator, battery, and converter. Low voltage can cause the furnace to overheat and cycle. High voltage can cause unbalanced combustion and excessive motor wear. AC models operate between 100 and 120 VAC at the furnace during operation.

DUCTING

The heat ducts should be clean and clear of obstructions. Check for proper duct connection. Any ducts disconnected from the furnace or outlets must be reattached.

RETURN AIR

The return air passage should be clean and clear of obstructions and meet the minimum square inches as specified in the installation instructions. DO NOT store combustibles in furnace compartment!

COMBUSTION CHAMBER

Check the chamber for internal obstructions, such as wasp or bird nests. The life of the combustion chamber is a function of the amount of time that the furnace has operated. Therefore, it is essential to inspect the chamber for cracks and holes. Have the chamber replaced if it has any cracks or holes - the chamber is not field repairable.

GASKETS

Inspect all gaskets for tight seals. Do not reuse gaskets - always replace with new. Worn gaskets may allow carbon monoxide to enter the living area and cause illness or death.

GAS SUPPLY SYSTEM

Perform a pressure-drop test, according to current ANSI standards, to insure that there are no gas leaks.

AIR WHEEL

The air wheel should be clean and clear of obstructions. Starting the furnace with something in the blower will damage the wheel, making replacement necessary.

WIRE CONNECTIONS

Check the furnace for loose or disconnected wires.

PREVENTIVE MAINTENANCE INSPECTION (CONTINUED)

DOOR SCREEN

Check the door screen for damaged or clogged openings. See 'Door Installation' section for proper installation of door assembly. Clean with warm soapy water.

CONTROL COMPARTMENT

Clean the control compartment.

MOTOR

The motor is lubricated and permanently sealed. It requires no oiling.

SPECIFICATIONS

MODEL NUMBER	8935DCLP-II	8940DCLP-II	8935ACLC-II	8940ACLC-II	8935ACNC-II	8940ACNC-II
INPUT BTU/HR	35,000	40,000	35,000	40,000	35,000	40,000
OUTPUT BTU/HR	27,300	31,200	27,300	31,200	27,300	31,200
TYPE GAS	Propane	Propane	LPG/Nat	Propane	LPG/Nat	Natural
DUCT STATIC PRESSURE*	0.10 W.C.	0.10 W.C.	0.15 W.C.	0.10 W.C.	0.15 W.C.	0.10 W.C.
CASING STATIC PRESSURE*	0.15 W.C.	0.15 W.C.	0.15 W.C.	0.15 W.C.	0.15 W.C.	0.15 W.C.
POWER SUPPLY	12 volt D.C.	12 volt D.C.	120 volt A.C.	120 volt A.C.	120 volt A.C.	120 volt A.C.
12 VOLT D.C. AMPERAGE	11.0 amps	11.0 amps				
120 VOLT A.C. AMPERAGE			3.0 amps	3.0 amps	3.0 amps	3.0 amps
MINIMUM RETURN AIR	80 sq.in.	80 sq.in.	80 sq.in.	80 sq.in.	80 sq.in.	80 sq.in.

*W.C.= Water Column

FURNACE DIMENSIONS	WIDTH	HEIGHT	DEPTH
CASING	16-1/2"	9-1/8"	23-1/2"
DOOR	19-1/4"	9-1/4"	1/4"
RECESS BEZEL	20-9/16"	11-1/2"	

FURNACE WEIGHT	38 pounds
SHIPPING WEIGHT	45 pounds

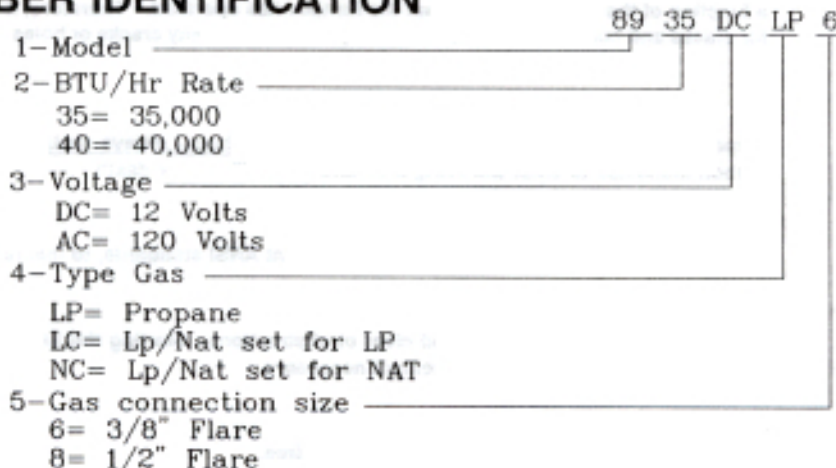
CLEARANCE TO COMBUSTIBLES

3/16 inches to casing; Top= 1/2", bottom= 3/16", sides= 1", casing= 0 from spacers.

1/4 inches to ducting within 3 feet of furnace. U.L. Listed wire-bound vinyl ducts require 0 inches clearance.

1/2 inch to rear of furnace.

MODEL NUMBER IDENTIFICATION



INSTALLATION INSTRUCTIONS

WARNING!

THIS FURNACE MUST BE INSTALLED AND VENTED ACCORDING TO THESE INSTRUCTIONS. IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE INJURY OR PROPERTY DAMAGE. FOR ASSISTANCE OR ADDITIONAL INFORMATION, CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY, OR GAS SUPPLIER.

NEGATIVE PRESSURE PRODUCED BY THE FURNACE CAN AFFECT THE COMBUSTION AIR OR VENTING OF OTHER APPLIANCES IF NOT INSTALLED IN THE PROPER LOCATION.

CRITICAL INSTALLATION INFORMATION

1. Do not install the furnace on material that restricts return air, such as carpet, or any soft material, such as vinyl.
2. Do not install furnace where clearance to combustibles cannot be maintained.
3. Do not modify the furnace in any way.
4. Do not alter the furnace for a positive grounding system.
5. Do not HI-POT this furnace.
6. Do not use a battery charger to supply power to the furnace.
7. Do not use 120 volt AC current with DC models.
8. Do not use the furnace cabinet area as a storage compartment.

The furnace must be installed in accordance with local codes and regulations. In the absence of local codes or regulations, refer to:

U.S.A:

1. Standard for Recreational Vehicles ANSI A119.2 - 1990
2. Standard for Park Trailers ANSI A119.5 - 1988
3. National Fuel Gas Code ANSI Z223.1 - 1988
4. Ground in accordance with National Electrical Code ANSI/NFPA No. 70 1984

Canada:

1. Standard CSA Z240.4 Gas Equipped Recreational Vehicles and Mobile Housing.
2. CSA Standard Z240.6.1 and Z240.6.2 - Electrical Requirements for Recreational Vehicles.
3. CAN/CGA - B149.1 and 2.

FURNACE INSTALLATION

Select a location to install the furnace through an outside wall. Do not install the furnace near tilt-out rooms, slide-outs, doors or other projections which could obstruct furnace exhaust. On single furnace applications, locate the furnace near the midpoint of the coach. Keep the furnace away from wires, pipes, or other objects that may interfere with the installation or operation of the furnace. Do not install the furnace on material that restricts return air, such as carpet, or any soft material, such as vinyl. If installed on carpet or soft material, install the furnace on cleats, or on a wood or metal panel extending the full width and depth of the furnace plus the minimum clearances to combustibles.

Provide the furnace with at least 80 square inches of unrestricted return air from the interior of the coach. Failure to provide the minimum return air requirements nullifies the furnace warranty. If the furnace is installed in an enclosure with zero clearance, cut an opening in the enclosure to meet return air requirements.

WARNING!
COMBUSTION AIR MUST NOT BE DRAWN FROM THE LIVING AREA.

MAXIMUM WALL THICKNESS IS 2-1/2 INCHES.

1. Cut an opening 19-1/2 inches wide by 9-7/8 inches high, with rounded corners, through the exterior wall. Do not over-size the hole as water leakage may result. (See figure #1).
2. Position and secure the mounting brackets to wood framing on each side of the opening, allowing 5/16 of an inch from the bracket face to the outside of the coach. (See figure #1).
3. Remove rain shield prior to installation of the recessed bezel and door assembly.
4. Slide furnace into opening.
5. For information on ducting, refer to pages 15 and 16.

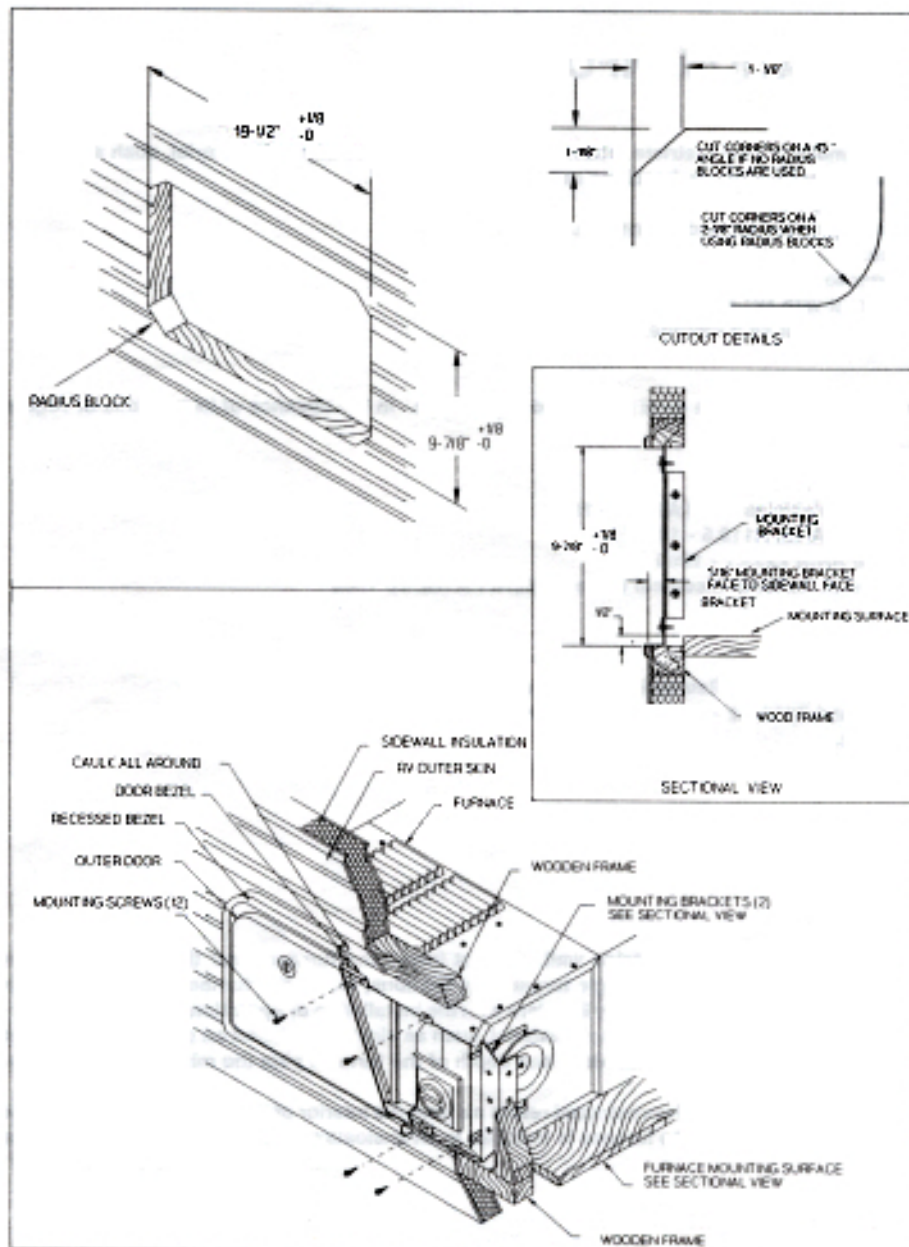


Figure #1

GAS CONNECTION

1. Remove the black slide plate and red gas inlet plug from the furnace.
2. Insert the gas line through the gas inlet plug. **Do not cut gas inlet plug.** (See figure #2.)
3. Connect the gas line to the manifold on the right side of the furnace. **DO NOT twist the valve assembly.**
4. All male pipe threads, other than flare fittings, should be treated with a sealing compound resistant to the action of propane and/or natural gas. **DO NOT put sealing compound on flare fittings.**
5. Slide the inlet plug along the gas line and insert into the control box.
6. Put the slide plate into the control box and over the gas inlet plug.

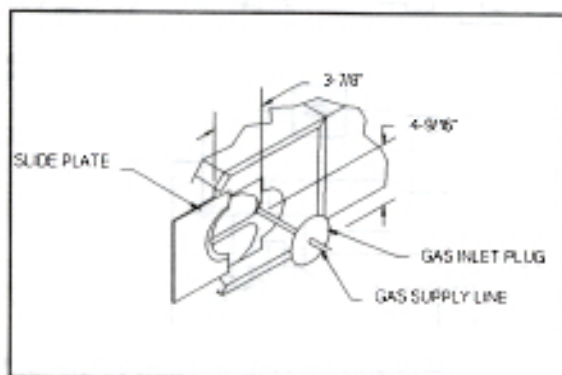


Figure #2

WARNING!

THE FURNACE AND ITS INDIVIDUAL SHUTOFF VALVE MUST BE DISCONNECTED FROM THE GAS SUPPLY PIPING SYSTEM DURING ANY PRESSURE TESTING OF THAT SYSTEM AT TEST PRESSURES IN EXCESS OF 1/2 PSI (3.45kPa). MAXIMUM OPERATING PRESSURE FOR THE SHUT-OFF VALVE IS 13 INCHES WATER COLUMN.

IMPORTANT

SHOULD THE FURNACE OVERHEAT, OR THE GAS SUPPLY FAIL TO SHUT DOWN, TURN OFF THE MANUAL GAS VALVE TO THE APPLIANCE PRIOR TO CUTTING OFF THE ELECTRICAL SUPPLY.

For gas piping and pipe sizing refer to the Federal Mobile Home Construction and Safety Standard, part 280, ANSI/NFPA 54 or ANSI/NFPA 501c-1982 and all state and local codes.

ELECTRICAL CONNECTION

12 VOLT D.C. MODELS

Route the 12 volt DC and the thermostat leads to wires located on the left side of the control box and connect as shown in figure #3. **Make** all wire connections into furnace junction box after field hookups have been made.

Polarity must be observed so that the furnace motor will run in the proper rotation. This unit is designed for negative ground 12 volt DC **ONLY**. Do not attempt to alter to a positive ground system.

Use a minimum of 16 gauge stranded wire to minimize voltage drop. All electrical wiring must comply with NFPA 70 Article 551.

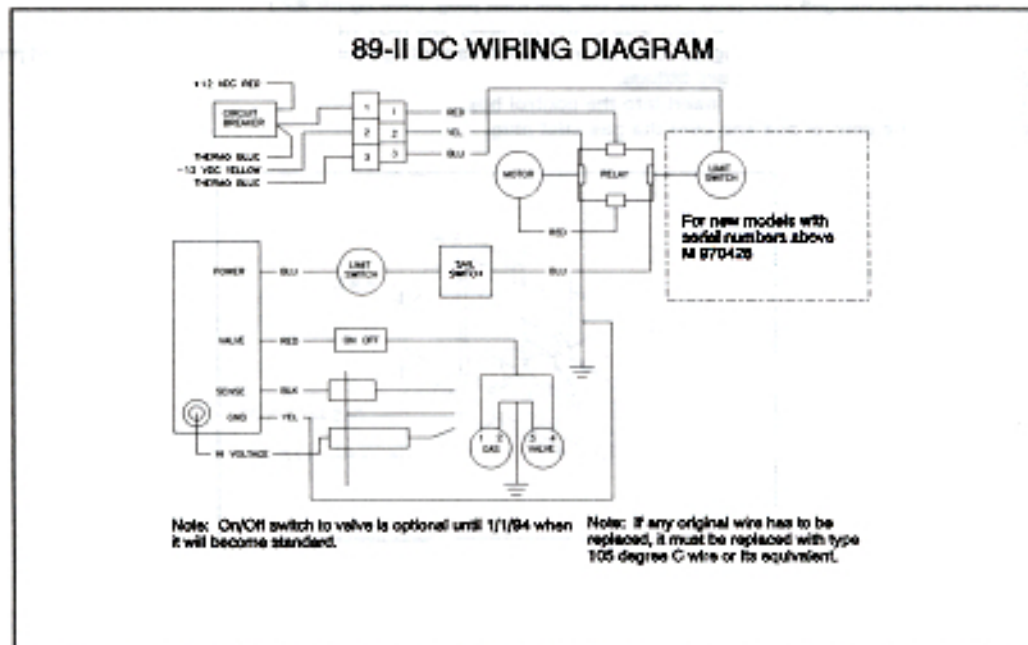
For instructions on thermostat wire hook-ups, refer to page 14.

Supply Leads

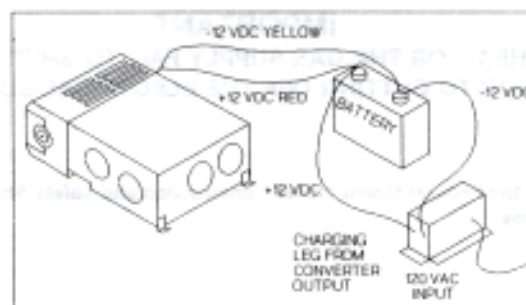
(+) 12 volt DC
 (-) 12 volt DC
 thermostat

Furnace Wiring

to (+) 12 volt DC (red wire)
 to (-) 12 volt DC (yellow wire)
 to thermostat (blue wires)

**Figure #3**

If the furnace power supply is from a converter equipped with a charging port, for best results, wire the converter to the furnace parallel with the battery. This is recommended in order to provide consistent voltage to the furnace and to filter power surges and A.C. spikes. (See figure #4).

**Figure #4****120 VOLT A.C. MODELS**

Route the 120 volt AC and the thermostat leads to wires located on the left side of the control box and connect as shown in figure #5. Push all wire connections into the furnace junction box after field hookups have been made.

All electrical wiring must comply with NFPA 70 Article 551.

For instructions on thermostat wire hook-ups, refer to page 15.

NOTE: This furnace is equipped with a 120 volt A.C. motor. All electrical component parts other than the motor are supplied with power by a transformer inside the furnace at 24 volts A.C.

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Supply Leads Furnace Wiring
 120 volt AC to 120 volt AC (black wire)
 120 volt AC to 120 volt AC (white wire)
 ground to ground (green wire)
 thermostat to thermostat (blue wires)

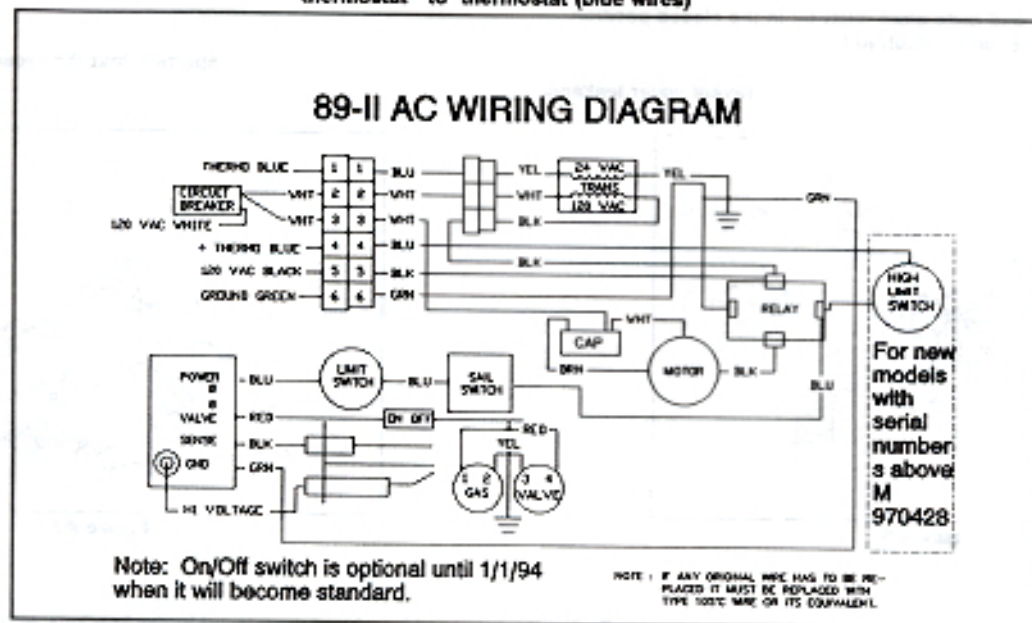


Figure #5

LIMIT SWITCH SAFETY SYSTEM

The following guidelines must be observed at all times for your safety.

1. DO NOT block openings that supply return air to the furnace. DO NOT obstruct the front return air grill with any object that may reduce the air flow.
2. All heat registers must be kept completely open at all times. Any blockage of registers may cause your furnace to overheat and cycle on and off.
3. Always have a qualified technician perform the annual preventative maintenance inspection described in the Owners Manual. If the furnace is used year round, it is recommended that this maintenance be conducted more often.

In case of accidental restriction of return air or blockage of registers, your furnace has been wired so that if it overheats for any reason, the burner will stop operating. The furnace blower will continue operating until a safe temperature inside the furnace has been reached at which time the furnace burner will re-light. If this occurs continuously, check your furnace system for blockage of registers or return air paths.

A secondary ONE-USE THERMAL CUT OFF limit switch has been installed in your furnace. This switch is designed to totally shut down the operations of your furnace in cases where extreme heat conditions have been reached. If this occurs, your furnace will shut the burner off and allow the unit to cool and then a complete shut down will occur. The furnace will not re-light. In this case you should have a qualified technician perform a complete check of your furnace system. This limit switch is not repairable and must be replaced.

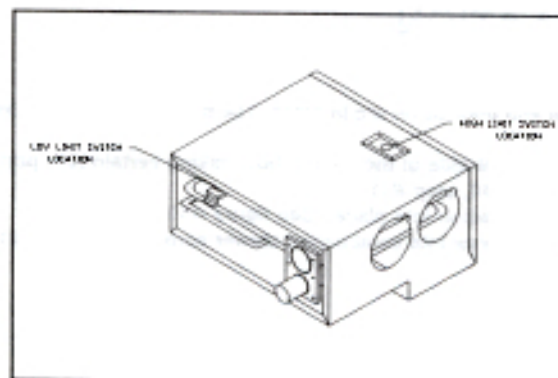


Figure #6

DOOR AND RECESS BEZEL INSTALLATION

1. Apply caulking to the entire mounting surface of the door bezel and recess bezel. Make sure the caulking is tight against the inner flange of the door bezel. (See figure #6).
2. Gas inlet plug and slide plate must be in the closed position.
3. Mount the recess bezel flush to front of the furnace control box.
4. Position the door assembly, allowing the furnace tabs to protrude through the door slots. It is important that the recess bezel and door assembly fit tight against the furnace to prevent water leakage.

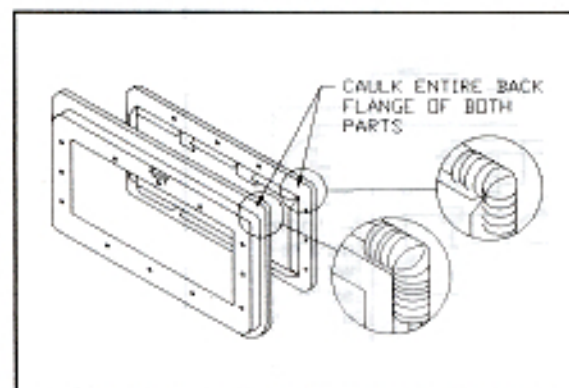


Figure #6

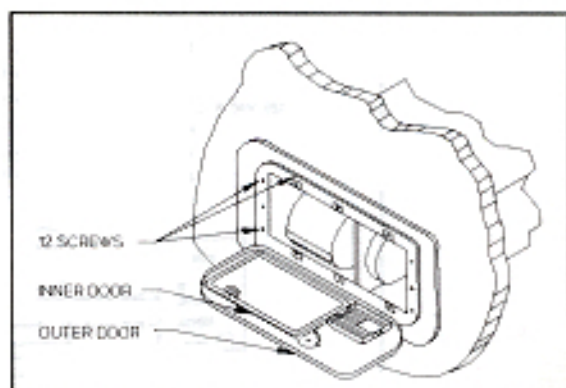


Figure #7

4. Bend the tabs and secure to the coach with six screws. Fasten the recessed bezel and door bezel to the brackets with three self-tapping screws on each side. (See figure #7).
5. Fill tab slots with caulking. (See figure #8)
6. Remove excess caulking from around the recess bezel and door assembly.
7. Visually inspect the door bezel to make sure it is completely sealed.
8. Secure furnace to coach with two screws through the mounting leg holes. (See figure #9).

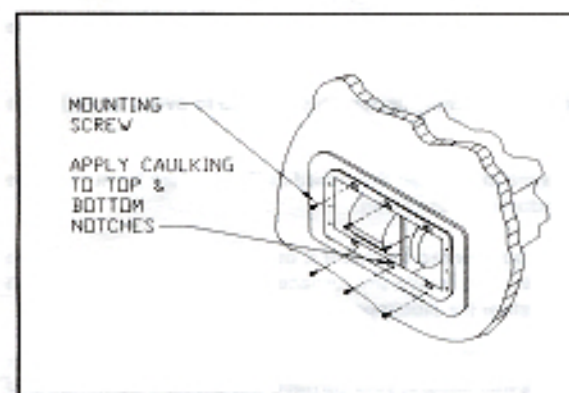


Figure #8

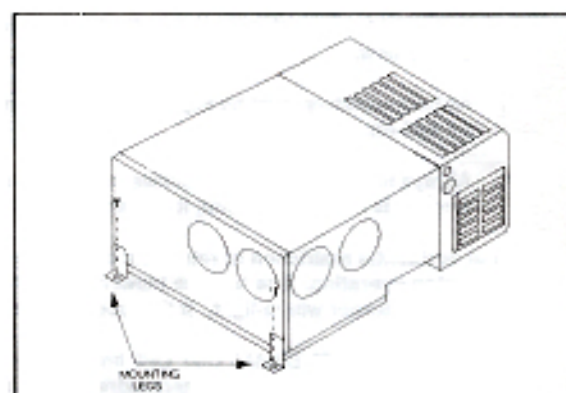


Figure #9

RAIN SHIELD INSTALLATION

Install rain shield after recessed bezel and door bezel are in place. The rain shield must be in place to prevent water leakage.

1. Insert rain shield on a 45° angle into the right side of the control box making certain rear portion of rain shield is positioned under heating element exhaust port. (See figure #10, step #1).
2. Lower the left side of the rain shield and position into place. (See figure #10, step #2).
3. Secure the rain shield with one #8 X 3/8" screw into combustion blower scroll. (See figure #10, step #2.)

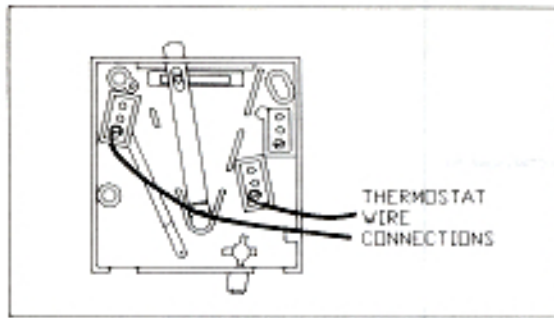


Figure #12

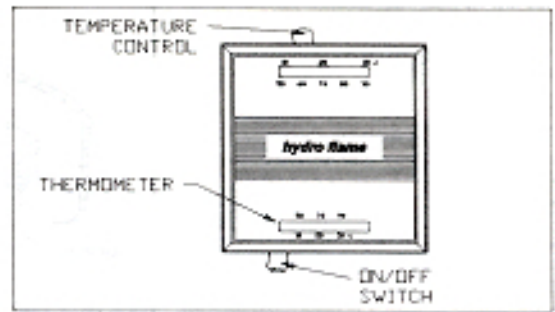


Figure #13

HEAT ANTICIPATOR

The heat anticipator is located on the base plate of the thermostat behind the cover. (See Figure #14.) The purpose of the heat anticipator is to provide flexibility to the heating cycles of the furnace. The heat anticipator is factory set at the highest setting. If a change is desired, as a starting point, set the heat anticipator to the valve ampereage.

To increase the heating cycle time, adjust the anticipator by moving the contact arm to a larger number value.

To shorten the heating cycle time, adjust the anticipator by moving the contact arm to a smaller number value.

HEAT ANTICIPATOR ADJUSTMENTS ARE NOT COVERED UNDER WARRANTY.

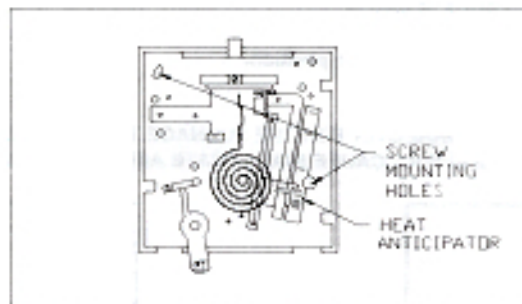


Figure #14

DUCTING OPTIONS

Proper duct installation is critical to the operation of this furnace. When ducts are longer than 9 inches, air temperature at register openings should not exceed 200° F. When four-inch ducts or metal boots less than 9 inches in length are used, temperatures should not exceed 250°F. Ducting systems can include any combination of discharge openings, as long as static pressure and minimum discharge area requirements are met at all times.

Recommended discharge requirements for all models, bottom or side discharge is 48 square inches when static pressure measurement cannot be made. (See Static Pressure Test.)

Each four-inch round duct opening provides 12 square inches of discharge area. Provide an additional 12 square inches of discharge area for each closeable register used. When using flexible ducts, avoid sharp bends or crushed ducts. Stretch all ducts and run them directly to outlets, keeping bends to a minimum.

FOUR-INCH FLEXIBLE DUCTING

1. Remove the cover plates from the desired openings.
2. Attach a duct adapter to each opening by inserting the flange over the casing, locking the tab into the casing slot and turning the adapter 90 degrees. (See Figure #15.)
3. Attach and secure the flexible ducts to the adapters.
4. Run ducts to desired location within the coach and secure to registers.

CONVERTIBLE GAS CONTROL

THE CONVERSION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROVINCIAL AUTHORITIES HAVING JURISDICTION AND IN ACCORDANCE WITH THE REQUIREMENTS OF THE CAN-1B149.1 AND 2 INSTALLATION CODE.

The furnace must be installed in accordance with local codes and regulations. In the absence of local codes or regulations, refer to:

U.S.A:

1. Standard for Recreational Vehicles ANSI A119.2 - 1990
2. Standard for Park Trailers ANSI A119.5 - 1988
3. National Fuel Gas Code ANSI Z223.1 - 1988
4. Ground in accordance with National Electrical Code ANSI/NFPA No. 70 1984

The units that have LC/NC in the model number come equipped with a convertible gas control. Each unit is supplied with two main burner orifices. One will be in place, the other will be attached to the blower housing cover. Each orifice will be clearly marked with a drill size as shown below.

GAS TYPE	LINE BTU/HR	PRESSURE	MANIFOLD PRESSURE	ORIFICE SIZE
Propane (LPG)	40,000	11" W.C.	10.0" W.C.	49 DMS
Natural (Natf)	40,000	7" W.C.	3.8" W.C.	30N DMS
Propane (LPG)	35,000	11" W.C.	10.2" W.C.	51 DMS
Natural (Natf)	35,000	7" W.C.	4.0" W.C.	32N DMS

The pressure settings of the convertible valve are set for natural gas NAT 3.5" W.C. or LP 10.5" W.C., and are not adjustable. Use Loctite #RC609 on orifice threads when installing new orifice.

FOR VALVE CONVERSION:

1. Check the exposed section on the bottom of the adjustment plug to determine whether it is set for natural or propane. NAT is stamped on one end and LP is stamped on the other end of the plug. The type of gas in use will be showing.
2. When LP is showing and NAT is required:
 - A. Unscrew the plug and remove from the valve tower. Do not remove the rod from the tower or make any adjustments.
 - B. Rotate plug and replace into valve tower. NAT should now be showing. Check the rod for proper positioning while tightening the plug into the tower. The plug, which has been factory calibrated for this valve only, should be reinstalled finger tight. Do not use it on any other valve.
3. When NAT is showing and LP is required:
 - A. Unscrew the plug and remove from the valve tower. Do not remove the rod from the tower or make any adjustments.
 - B. Rotate plug and replace into valve tower. LP should now be showing. Check the rod for proper positioning while tightening the plug into the tower. The plug, which has been factory calibrated for this valve only, should be reinstalled finger tight. Do not use it on any other valve.

NOTE: It is essential that the proper main burner orifice for the type of gas being used has been installed.

FOR ORIFICE REPLACEMENT

1. Remove the rain shield.
2. Remove the burner assembly from the control box.
3. Remove the two screws and 3/8" nut holding the burner in place.
4. Use a 7/16" socket to remove the orifice and replace the correct orifice corresponding to the type of gas required as shown above, which corresponds to the regulator plug setting.
5. Replace the burner head with two screws and a 3/8" nut.
6. Reinstall the burner assembly. Burner assembly must seal tight against the control box.
7. Replace the rain shield and four screws.
8. After converting the furnace, place the "converted" sticker, which is provided in your conversion packet, on the rating label, **IN PLAIN SIGHT**.

THERMOSTAT INSTALLATION

The thermostat is very sensitive. **HANDLE WITH CARE AT ALL TIMES.**

1. Locate the thermostat 48 to 54 inches above the floor on an inside wall away from areas of abnormal heat or cold.
2. Run two wires from the furnace to the thermostat location using 22-18 gauge stranded wire.
3. Connect the two wires from the furnace to the back of the thermostat. (See Figure #12.)
4. With the cover removed from the thermostat, mount the base of the thermostat to the wall. (See Figure #14).
5. Turn the thermostat off and snap the cover on; do not pinch the contact wire. (See Figure #13.)

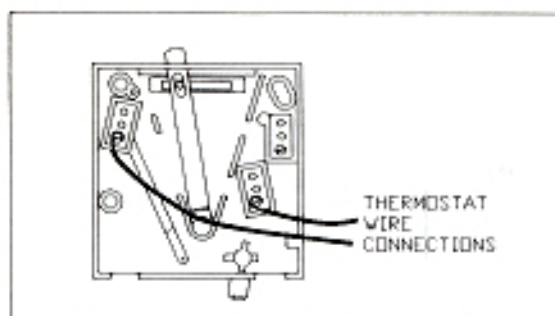


Figure #12

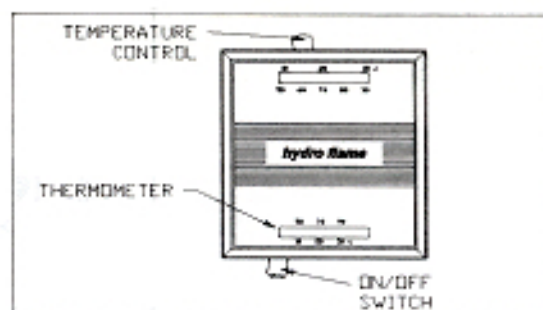


Figure #13

HEAT ANTICIPATOR

The heat anticipator is located on the base plate of the thermostat behind the cover. (See Figure #14.) The purpose of the heat anticipator is to provide flexibility to the heating cycles of the furnace. The heat anticipator is factory set at the highest setting. If a change is desired, as a starting point, set the heat anticipator to the valve amperage.

To increase the heating cycle time, adjust the anticipator by moving the contact arm to a larger number value.

To shorten the heating cycle time, adjust the anticipator by moving the contact arm to a smaller number value.

HEAT ANTICIPATOR ADJUSTMENTS ARE NOT COVERED UNDER WARRANTY.

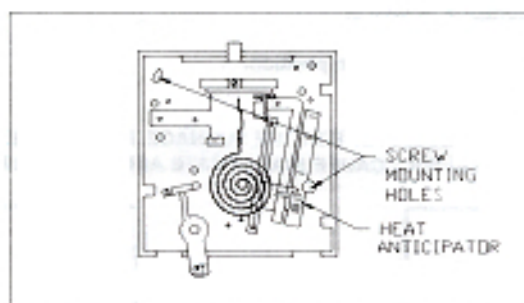


Figure #14

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Proper duct installation is critical to the operation of this furnace. When ducts are longer than 9 inches, air temperature at register openings should not exceed 200° F. When four-inch ducts or metal boots less than 9 inches in length are used, temperatures should not exceed 250°F. Ducting systems can include any combination of discharge openings, as long as static pressure and minimum discharge area requirements are met at all times.

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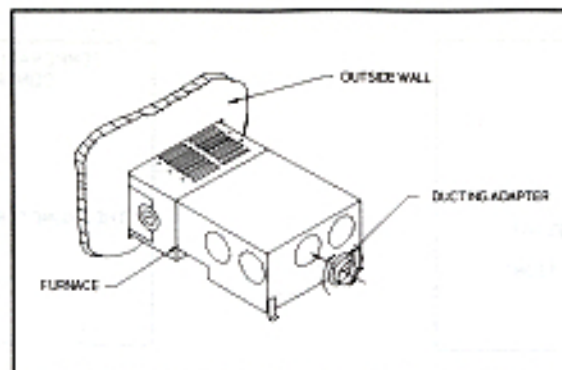


Figure #15

BOTTOM DISCHARGE

1. Remove the bottom discharge cover plate (see figure #16). This ducting option must be connected to a hard ducting system. (If a cutout is required see Figure #17 for dimensions.) If only half of the rectangular knockout is used, additional side ducts must be used to meet the minimum discharge requirement of 48 square inches. A gasket and plenum plate kit are available when attaching the furnace to the plenum.
2. Fasten the plenum plate over the cutout. (See Figure #18.) If a gasket and plenum plate are not used, seal the furnace to the hard ducting system (the seal must be air-tight) and continue at step 5.
3. Position the gasket on the plenum plate. (See figure #18)
4. Set the furnace onto the gasket; the gasket must remain in position.
5. Fasten the two mounting legs to the floor.

HARD DUCTING SYSTEMS MUST BE DESIGNED CORRECTLY FOR THE FURNACE TO OPERATE PROPERLY. UNDERSIZED DUCTING WILL CAUSE LIMITING, WHEREAS OVERSIZED DUCTING WILL CAUSE INADEQUATE AIR FLOW FROM THE REGISTERS.

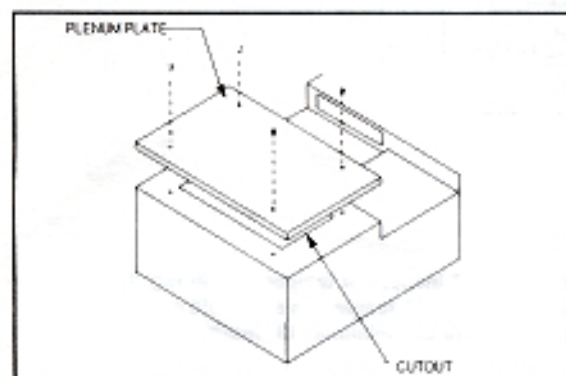


Figure #16

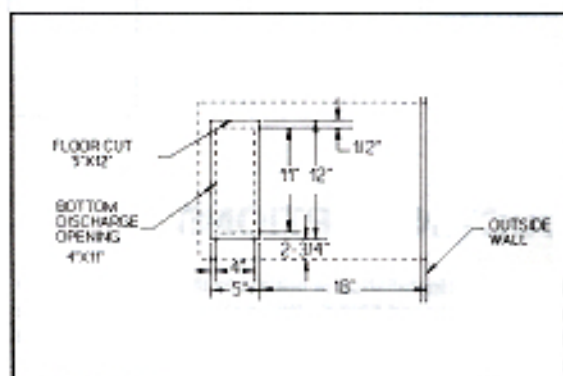


Figure #17

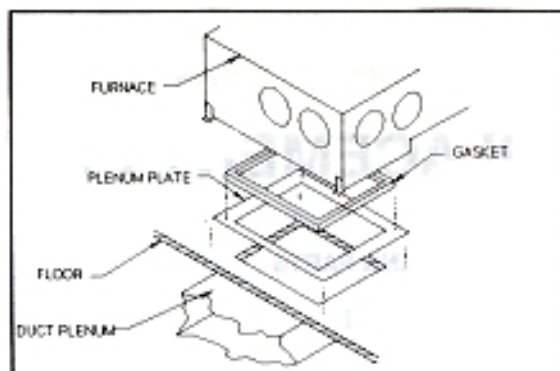


Figure #18

STATIC PRESSURE TEST

With the ducts attached and the furnace operating at 12 volts (for DC models) or 120 volts (for AC models), the casing static pressure should not exceed 0.15 inches Water Column. Voltage greater than 12 volts or 120 volts will cause higher static readings. Reducing the number of duct turns and stretching the ducts will increase air flow and reduce static pressure. Adding ducts or increasing discharge system (hard ducting) will also reduce static pressures.

1. Shut off gas supply to furnace.
2. With the door open, remove the DSI board and static pressure tap plug. (See Figure #19.)
3. Insert the static pressure tube into the hole and attach an incline manometer. With the plastic door closed, the pressure should read 0.15 inches Water Column or less.
4. Remove the pressure tube and replace the static pressure tap plug and DSI board before closing the door.

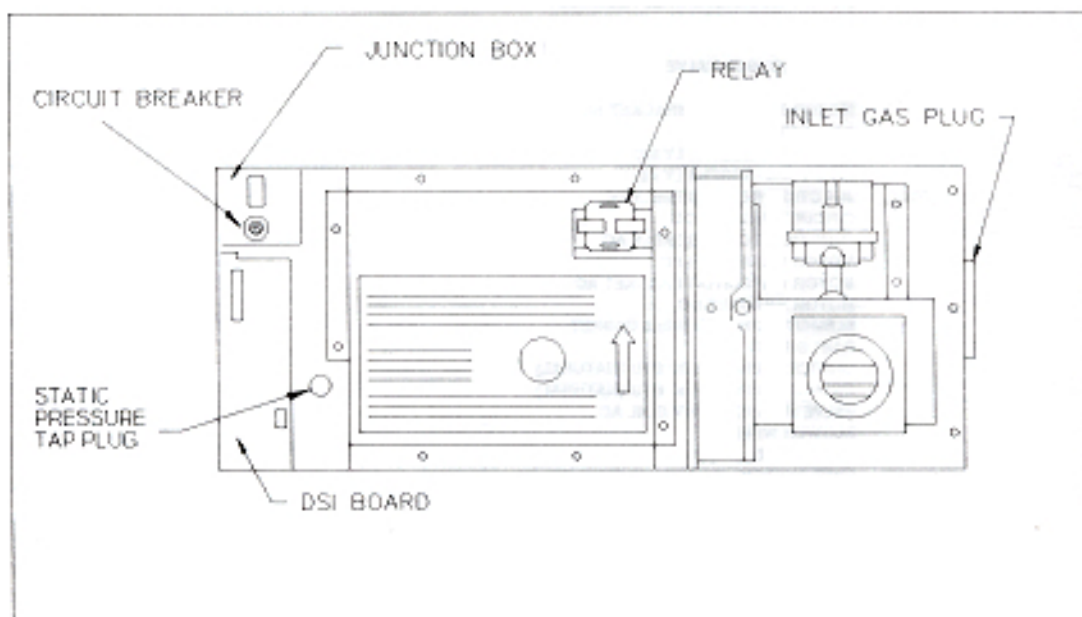


Figure #19

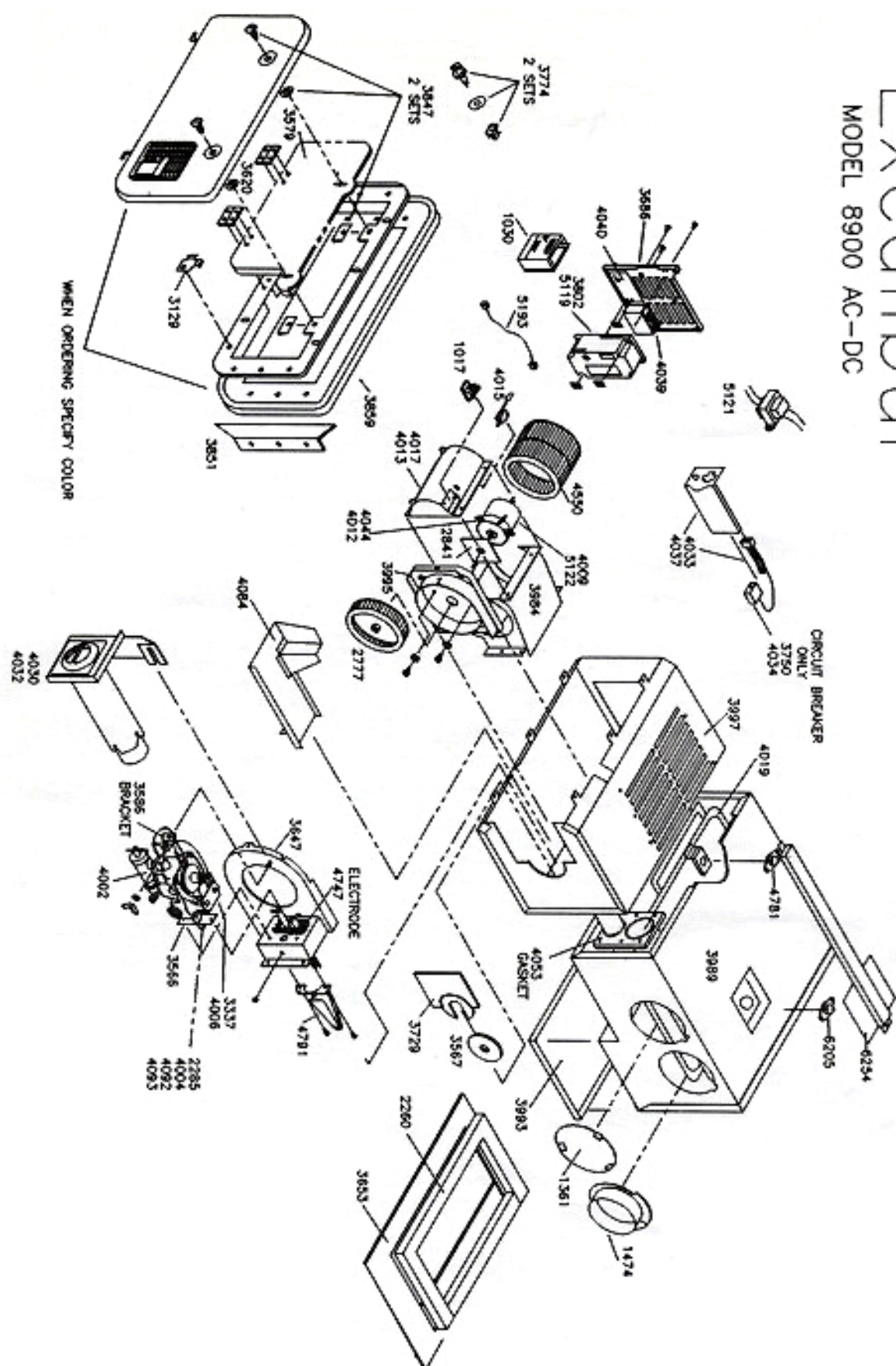
REPLACEMENT PARTS

PLEASE USE ITEM NUMBER WHEN ORDERING PARTS

<u>PART NUMBERS</u>	<u>DESCRIPTION OF PARTS</u>
1017	RELAY
1030	THERMOSTAT
1361	DUCT COVER PLATE
1474	DUCT ADAPTER
2260	BOTTOM GASKET
2285	ORIFICE #51 - 35,000 BTU (PROPANE)
2777	COMBUSTION WHEEL
2841	MOTOR GASKET
3129	DOOR HINGE CLIP
3337	WHITE RODGERS VALVE DC
3475	VALVE REPLACEMENT COIL DC
3586	OUTLET MANIFOLD
3567	GAS INLET PLUG
3579	INNER DOOR
3586	WHITE RODGERS VALVE BRACKET
3620	HINGES (2)
3647	BURNER BOX ASSEMBLY
3653	BOTTOM PLENUM PLATE
3686	DSI BRACKET
3729	SLIDE PLATE
3750	CIRCUIT BREAKER AC
	DOOR & BEZEL ASSEMBLY (SPECIFY COLOR)
	DOOR LATCH SET
3774	FENWAL DSI BOARD DC
3802	DOOR LATCH ASSEMBLY
3847	RECESS PAN MOUNTING BRACKETS
3851	RECESSED PAN (SPECIFY COLOR)
3859	BLOWER HOUSING ASSEMBLY
3984	CASING
3989	BOTTOM DISCHARGE CASING END CAP
3993	MOTOR MOUNTING WALL ASSEMBLY
3995	BRASS SHUT OFF
4002	ORIFICE #49 - 40,000 BTU (PROPANE)
4004	WHITE RODGER VALVE AC
4006	MOTOR DC
4009	MOTOR MOUNTING BRACKET AC
4012	SAIL SWITCH
4015	DRAFT CAP ASSEMBLY DC
4030	DRAFT CAP ASSEMBLY AC
4032	JUNCTION BOX ASSEMBLY DC
4033	CIRCUIT BREAKER DC
4034	JUNCTION BOX ASSEMBLY AC
4037	MOTOR CAPACITOR AC
4039	MOTOR CAPACITOR BRACKET AC
4040	MOTOR BRACKET DC
4044	ELEMENT EXHAUST WALL GASKET
4053	RAIN SHIELD
4084	ORIFICE #30N - 40,000 BTU (NATURAL)
4092	ORIFICE #32N - 35,000 BTU (NATURAL)
4093	VALVE REPLACEMENT COIL AC
4515	BLOWER WHEEL
4550	ELECTRODE
4747	LIMIT SWITCH
4781	BURNER ASSEMBLY
4791	ELEMENT ASSEMBLY
4976	BLOWER BACK ASSEMBLY DC
4977	CONTROL BOX ASSEMBLY
4979	FENWAL DSI BOARD AC
5119	TRANSFORMER ASSEMBLY
5121	MOTOR AC
5122	HIGH VOLTAGE WIRE
5193	BLOWER BACK ASSEMBLY AC
5321	

Excaltibur

MODEL 8900 AC-DC



FOR YOUR SAFETY READ BEFORE OPERATING

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

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- * Evacuate all persons from the vehicle.
 - * Shut off the gas supply at the gas container or source.
 - * Do not touch any electrical switch or use any phone or radio in the vehicle.
 - * Do not start the vehicle's engine or electric generator.
 - * Contact the nearest gas supplier or qualified service technician for repairs.
- * If you cannot reach your gas supplier or qualified service technician, contact the nearest fire department.
 - * Do not turn on the gas supply until the gas leak(s) has been repaired.
- C. Never use tools to turn the gas control valve. If the valve will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove control access panel.
6. Shut "OFF" power with switch provided from valve.
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above. If you don't smell gas, go to the next step.
8. Turn ON power switch provided to valve.
9. Replace control access panel.
10. Turn on all electric power to the appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



NEW "ON" - "OFF" GAS SHUT
OFF VALVE REVISION 1/29/94

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Remove access panel.
4. Shut OFF power with switch provided from valve.
5. Turn off all electric power to the appliance if service is to be performed.



hydro flame corporation

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