

INSTALLATION INSTRUCTIONS

FOR UPFLOW, UPFLOW/HORIZONTAL, AND DOWNFLOW INDUCED DRAFT GAS FURNACES 80PJ AND 80LJ SERIES



RECOGNIZE THIS SYMBOL AS AN INDICATION OF IMPORTANT SAFETY INFORMATION!

▲ WARNING

IF THE INFORMATION IN THESE INSTRUCTIONS IS NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT, CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

▲ WARNING

THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE OR MAINTENANCE, POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, CARBON MONOXIDE POISONING, EXPLOSION, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

▲ WARNING

PROPOSITION 65: THIS PRODUCT CONTAINS CHEMICALS, INCLUDING CARBON MONOXIDE, KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

▲ WARNING

- Do not store or use gasoline or other flammable vapors and liquids, or other combustible materials in the vicinity of this or any other appliance.
- 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.
 - Do not return to your home until authorized by the gas supplier or fire department.
- DO NOT RELY ON SMELL ALONE TO DETECT LEAKS. DUE TO VARIOUS FACTORS, YOU MAY NOT BE ABLE TO SMELL FUEL GASES.
 - U.L. recognized fuel gas and CO detectors are recommended in all applications, and their installation should be in accordance with the manufacturer's recommendations and/or local laws, rules, regulations, or customs.
- Improper installation, adjustment, alteration, service or maintenance can cause injury, property damage or death. Refer to this manual. Installation and service must be performed by a qualified installer, service agency or the gas supplier. In the commonwealth of Massachusetts, installation must be performed by a licensed plumber or gas fitter for appropriate fuel.

DO NOT DESTROY THIS MANUAL. PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE BY A SERVICEMAN.

Before beginning any troubleshooting procedure, complete the following installation checklist. A furnace malfunction is sometimes caused by an improper installation. By completing this checklist, the problem may be found and corrected. Make copies of the checklist and complete one for every Low Profile Furnace service call for your records.

INSTALLATION CHECKLIST

(Refer to this manual for specifics.)

GAS SUPPLY

- _____ Adequate pipe size
- _____ No gas leaks
- _____ Proper supply and manifold gas pressure (check with an accurate U-tube manometer with the furnace and all other gas appliances operating.)

ELECTRICAL

- _____ Correct thermostat and subbase _____ Thermostat model _____ Subbase model
- _____ Correct thermostat mode and setting
- _____ Correct line supply voltage
- _____ Correct power supply polarity is required with electronic ignition
- _____ Correct furnace ground to electrical panel
- _____ DC microamp (μ A) flame signal (hot surface ignition units)
- _____ Correct control voltage
- _____ Measure and set heat anticipator amperage
- _____ Air conditioning low voltage wires connected to terminals "Y" "C" - **not with wire nuts**

VENTING

- _____ Correct vent pipe diameter and length (according to CSA tables) _____ Vent connection size
- _____ Correct venting material (according to CSA tables)
- _____ Correct lining for masonry chimneys
- _____ Adequate clearance from combustibles
- _____ Proper negative pressure reading in the vent
- _____ Vent pipe secured to induced draft blower housing

COMBUSTION AIR

- _____ Proper source of combustion air
- _____ Correct combustion air opening size

FURNACE INSTALLATION

- _____ Adequate clearance from combustibles
- _____ Adequate clearance for service
- _____ Proper air temperature rise (See furnace rating plate)
- _____ External static pressure _____ inches w.c.
- _____ Correct filter(s)
- _____ Correct cooling coil or accessories (if equipped)
- _____ Adequate supply and return air ducting _____ Return Air Duct Size _____ Supply Air Duct Size
- _____ Air ducts sealed to prevent leakage

IMPORTANT: All ICECO products meet current Federal OSHA Guidelines for safety. California Proposition 65 warnings are required for certain products, which are not covered by the OSHA standards.

California's Proposition 65 requires warnings for products sold in California that contain, or produce, any of over 600 listed chemicals known to the State of California to cause cancer or birth defects such as fiberglass insulation, lead in brass, and combustion products from natural gas.

All "new equipment" shipped for sale in California will have labels stating that the product contains and/or produces Proposition 65 chemicals. Although we have not changed our processes, having the same label on all our products facilitates manufacturing and shipping. We cannot always know "when, or if" products will be sold in the California market.

You may receive inquiries from customers about chemicals found in, or produced by, some of our heating and air-conditioning equipment, or found in natural gas used with some of our products. Listed below are those chemicals and substances commonly associated with similar equipment in our industry and other manufacturers.

- Glass Wool (Fiberglass) Insulation
- Carbon Monoxide (CO)
- Formaldehyde
- Benzene

More details are available at the Websites for OSHA (Occupational Safety and Health Administration), at www.osha.gov and the State of California's OEHHA (Office of Environmental Health Hazard Assessment), at www.oehha.org. Consumer education is important since the chemicals and substances on the list are found in our daily lives. Most consumers are aware that products present safety and health risks, when improperly used, handled and maintained.

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IMPORTANT: to insure proper installation and operation of this product, completely read all instructions prior to attempting to assemble, install, operate, maintain or repair this product. upon unpacking of THE furnace, inspect all parts for damage prior to installation and start-up.

SAFETY INFORMATION

▲ WARNING

USE ONLY WITH TYPE OF GAS APPROVED FOR THIS FURNACE. REFER TO THE FURNACE RATING PLATE.

▲ WARNING

INSTALL THIS FURNACE ONLY IN A LOCATION AND POSITION AS SPECIFIED IN THE LOCATION REQUIREMENTS AND CONSIDERATIONS SECTION OF THESE INSTRUCTIONS. PROVIDE ADEQUATE COMBUSTION AND VENTILATION AIR TO THE FURNACE SPACE AS SPECIFIED IN THE VENTING SECTION OF THESE INSTRUCTIONS.

▲ WARNING

PROVIDE ADEQUATE COMBUSTION AND VENTILATION AIR TO THE FURNACE SPACE AS SPECIFIED IN THE COMBUSTION AND VENTILATION AIR SECTION OF THESE INSTRUCTIONS.

▲ WARNING

COMBUSTION PRODUCTS MUST BE DISCHARGED OUTDOORS. CONNECT THIS FURNACE TO AN APPROVED VENT SYSTEM ONLY, AS SPECIFIED IN VENT PIPE INSTALLATION SECTION OF THESE INSTRUCTIONS.

▲ WARNING

DO NOT OPERATE THE SYSTEM FOR EXTENDED PERIODS WITHOUT FILTERS. A PORTION OF THE DUST ENTRAINED IN THE AIR MAY TEMPORARILY LODGE IN THE AIR DUCT RUNS AND AT THE SUPPLY REGISTERS. ANY CIRCULATED DUST PARTICLES WILL BE HEATED AND CHARRED BY CONTACT WITH THE FURNACE HEAT EXCHANGER. THIS SOOTY RESIDUE WILL SOIL CEILINGS, WALLS, DRAPES, CARPETS AND OTHER HOUSEHOLD ARTICLES. SOOT DAMAGE MAY ALSO RESULT WITH, OR WITHOUT, FILTERS IN PLACE, WHEN CERTAIN TYPES OF CANDLES ARE BURNED, OR CANDLEWICKS ARE LEFT UNTRIMMED.

▲ WARNING

NEVER TEST FOR GAS LEAKS WITH AN OPEN FLAME. USE A COMMERCIALY AVAILABLE SOAP SOLUTION MADE SPECIFICALLY FOR THE DETECTION OF LEAKS TO CHECK ALL CONNECTIONS, AS SPECIFIED IN GAS SUPPLY AND PIPING SECTION OF THESE INSTRUCTIONS.

▲ WARNING

ALWAYS INSTALL FURNACE TO OPERATE WITHIN THE FURNACE'S INTENDED TEMPERATURE-RISE RANGE WITH A DUCT SYSTEM WHICH HAS AN EXTERNAL STATIC PRESSURE WITHIN THE ALLOWABLE RANGE, AS SPECIFIED IN DUCTING SECTION OF THESE INSTRUCTIONS. SEE ALSO FURNACE RATING PLATE.

▲ WARNING

WHEN A FURNACE IS INSTALLED SO THAT SUPPLY DUCTS CARRY AIR CIRCULATED BY THE FURNACE TO AREAS OUTSIDE THE SPACE CONTAINING THE FURNACE, THE RETURN AIR SHALL ALSO BE HANDLED BY DUCT(S) SEALED TO THE FURNACE CASING AND TERMINATING OUTSIDE THE SPACE CONTAINING THE FURNACE.

▲ WARNING

WHEN THIS FURNACE IS INSTALLED IN A RESIDENTIAL GARAGE, IT MUST BE INSTALLED SO THE BURNERS AND IGNITION SOURCE ARE LOCATED NO LESS THAN 18 INCHES ABOVE THE FLOOR. THIS IS TO REDUCE THE RISK OF IGNITING FLAMMABLE VAPORS WHICH MAY BE PRESENT IN A GARAGE. ALSO, THE FURNACE MUST BE LOCATED OR PROTECTED TO AVOID PHYSICAL DAMAGE BY VEHICLES. FAILURE TO FOLLOW THESE WARNINGS CAN CAUSE A FIRE OR EXPLOSION, RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

▲ WARNING

USE OF THIS FURNACE IS ALLOWED DURING CONSTRUCTION IF THE FOLLOWING TEMPORARY INSTALLATION REQUIREMENTS ARE MET. INSTALLATION MUST COMPLY WITH ALL INSTALLATION INSTRUCTIONS INCLUDING:

- PROPER VENT INSTALLATION;
- FURNACE OPERATING UNDER THERMOSTATIC CONTROL;
- RETURN AIR DUCT SEALED TO THE FURNACE;
- AIR FILTERS IN PLACE;
- SET FURNACE INPUT RATE AND TEMPERATURE RISE PER RATING PLATE MARKING;
- MEANS FOR PROVIDING OUTDOOR AIR REQUIRED FOR COMBUSTION;
- RETURN AIR TEMPERATURE MAINTAINED BETWEEN 55°F (13°C) AND 80°F (27°C); AND
- CLEAN FURNACE, DUCT WORK AND COMPONENTS UPON SUBSTANTIAL COMPLETION OF THE CONSTRUCTION PROCESS, AND VERIFY FURNACE OPERATING CONDITIONS INCLUDING IGNITION, INPUT RATE, TEMPERATURE RISE AND VENTING, ACCORDING TO THE INSTRUCTIONS.

GENERAL INFORMATION

The 80PJ and 80LJ series furnaces are design certified by CSA for use with natural and propane gases as follows:

As a Category I furnace, it may be vented vertically with type B-1 vent pipe and also may be common vented as described in these instructions.

This furnace should be installed in accordance with the American National Standard Z223.1 - latest edition booklet entitled "National Fuel Gas Code" (NFPA 54) (in Canada, CSA B149.1

and .2 Installation Codes for gas burning appliances), and the requirements or codes of the local utility or other authority having jurisdiction including local plumbing or waste water codes.

Additional helpful publications available from the "National Fire Protection Association" are: NFPA-90A – Installation of Air Conditioning and Ventilating Systems 1985 or latest edition. NFPA-90B – Warm Air Heating and Air Conditioning Systems 1984.

These publications are available from:
National Fire Protection Association, Inc.
Batterymarch Park
Quincy, MA 02269
CSA-INTERNATIONAL
178 Rexdale Blvd.
Etobicoke (Toronto), Ontario
Canada M9W, 1R3

LOCATION REQUIREMENTS AND CONSIDERATIONS

GENERAL INFORMATION

▲ CAUTION

DO NOT USE THIS FURNACE DURING CONSTRUCTION IF AIR LADEN CORROSIVE COMPOUNDS ARE PRESENT SUCH AS CHLORINE AND FLUORINE. OTHERWISE, PROVISIONS MUST BE TAKEN TO PROVIDE CLEAN, UNCONTAMINATED COMBUSTION AND VENTILATION AIR TO THE FURNACE. FURNACE COMBUSTION AND VENTILATION AIR CONTAMINATED WITH THESE COMPOUNDS FORMS ACIDS DURING COMBUSTION WHICH CORRODES THE HEAT EXCHANGER AND COMPONENT PARTS. SOME OF THESE CONTAMINANTS ARE FOUND IN, BUT NOT LIMITED TO, PANELING, DRY WALL, ADHESIVES, PAINTS, STAINES, VARNISHES, SEALERS, AND MASONRY CLEANING MATERIALS.

1. **NOTE:** This furnace is shipped with heat exchanger support brackets installed under the back of the heat exchanger. These may be removed before installation, but it is not required.

LOCATION

▲ WARNING

THIS FURNACE IS NOT APPROVED FOR INSTALLATION IN A MOBILE HOME. DO NOT INSTALL THIS FURNACE IN A MOBILE HOME. INSTALLATION IN A MOBILE HOME COULD CAUSE FIRE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

2. **IMPORTANT:** This furnace is not approved or recommended for installation on its back, with access doors facing upwards.
3. This furnace is suitable for installation in buildings constructed on-site. This heating unit should be centralized with respect to the heat distribution system as much as practicable.
4. **NOTE:** These furnaces are approved for installation in attics, as well as alcoves, utility rooms, closets and crawlspaces.

5. **IMPORTANT:** Support this unit when installed. For attic or crawl space installation, horizontal furnaces may be installed on combustible wood flooring or by using support brackets. See Figure 1.
6. **IMPORTANT:** If installing in a utility room, be sure the door is wide enough to:
 - a. allow the largest part of the furnace to pass; or
 - b. allow any other appliance (such as a water heater) to pass.

FIGURE 1
HORIZONTAL FURNACE INSTALLED W/SUPPORT BRACKETS

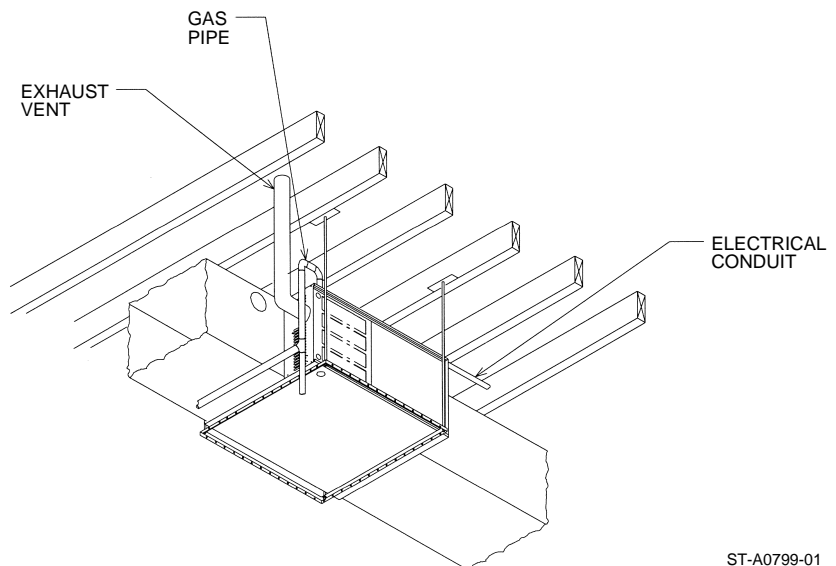
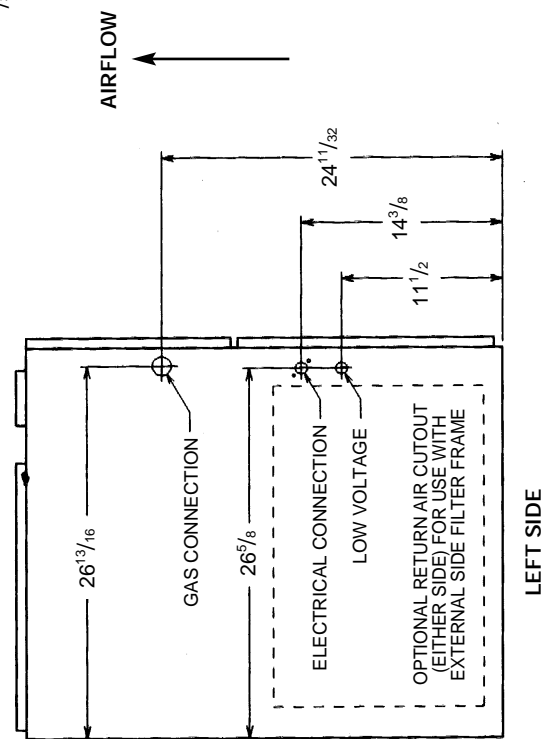
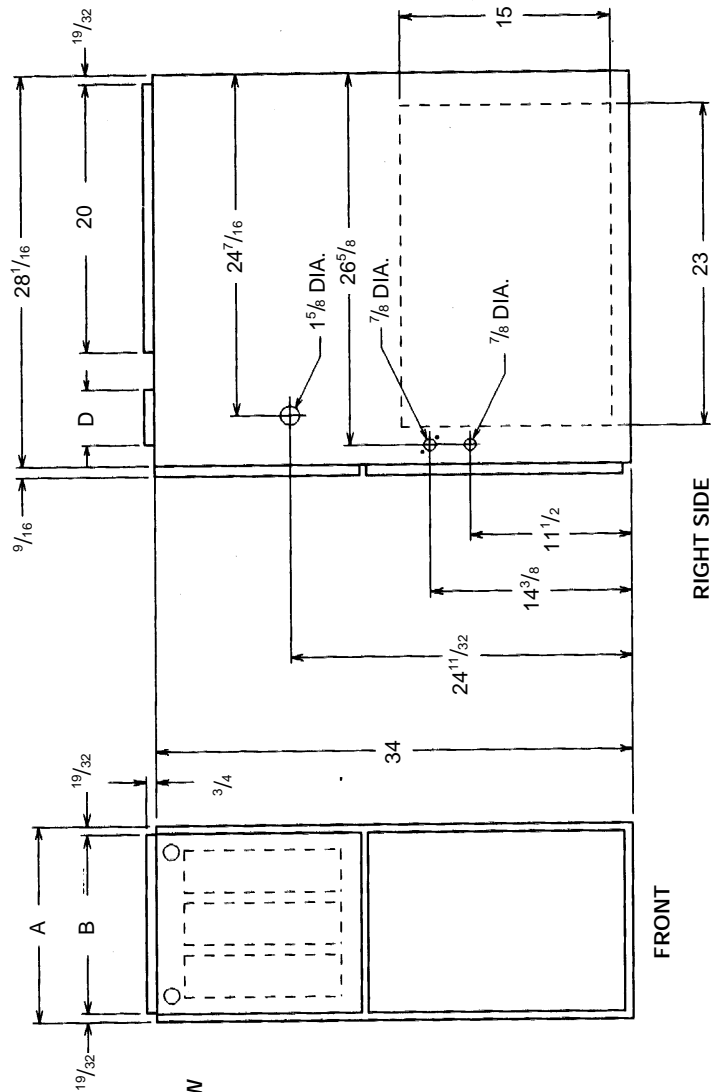
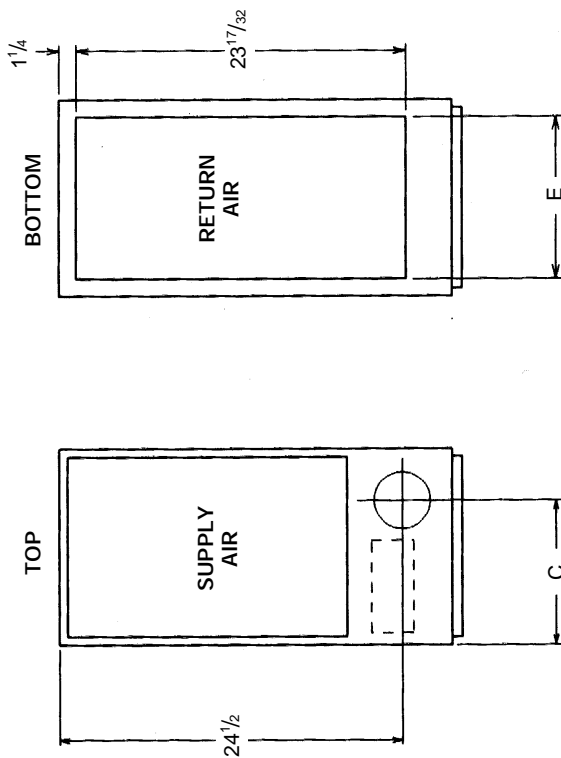


FIGURE 2
UPFLOW AND UPFLOW/HORIZONTAL DIMENSIONS

**CLEARANCE TO COMBUSTIBLE MATERIAL (INCHES)
UPFLOW AND UPFLOW/HORIZONTAL MODELS**

Model	REDUCED CLEARANCE (IN.)					Ship. Wgts.
	A	B	C	D	E	
05	14	12 ^{27/32}	10 ^{3/8}	①	11 ^{1/2}	85 lbs.
07	17 ^{1/2}	16 ^{11/32}	12 ^{1/8}	①	15	105 lbs.
10(A)	17 ^{1/2}	16 ^{11/32}	12 ^{1/8}	①	15	115 lbs.
10(B)	21	19 ^{27/32}	13 ^{1/8}	①	18 ^{1/2}	120 lbs.
12	24 ^{1/2}	23 ^{11/32}	15 ^{5/8}	①	22	140 lbs.
15	24 ^{1/2}	23 ^{11/32}	15 ^{5/8}	①	22	150 lbs.

- ① May require 3" to 4" or 3" or 5" adapter.
- ② May be 0" with type B vent.
- ③ May be 1" with type B vent.



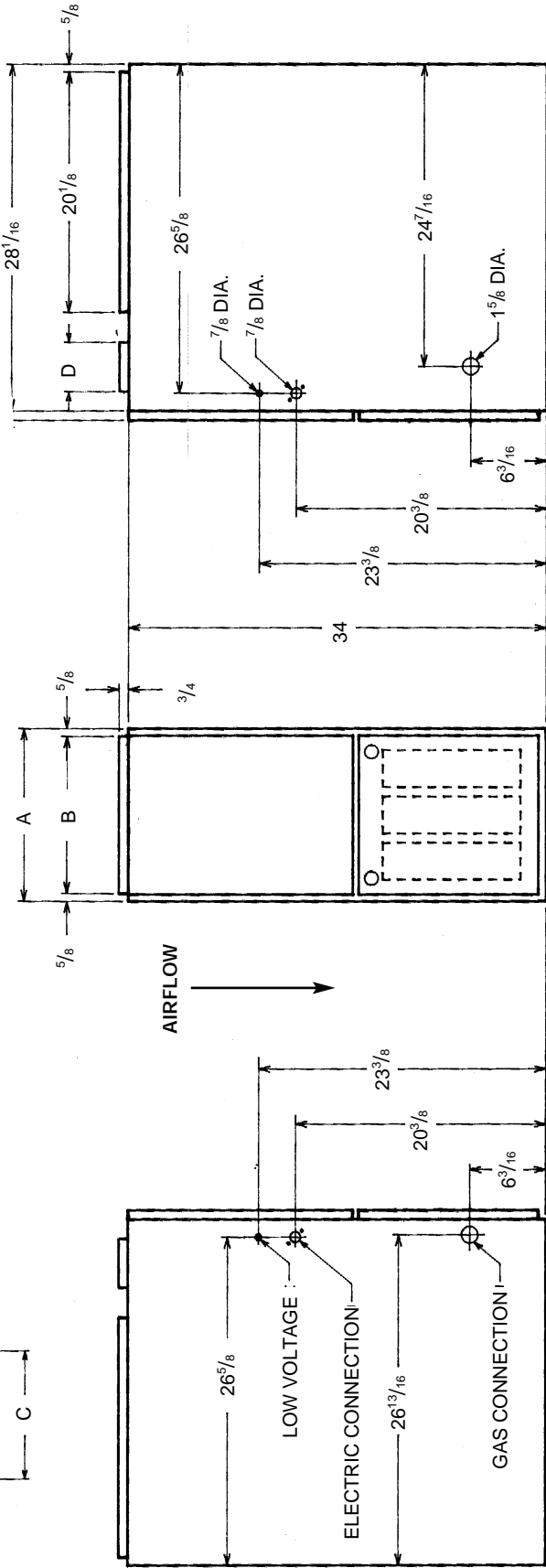
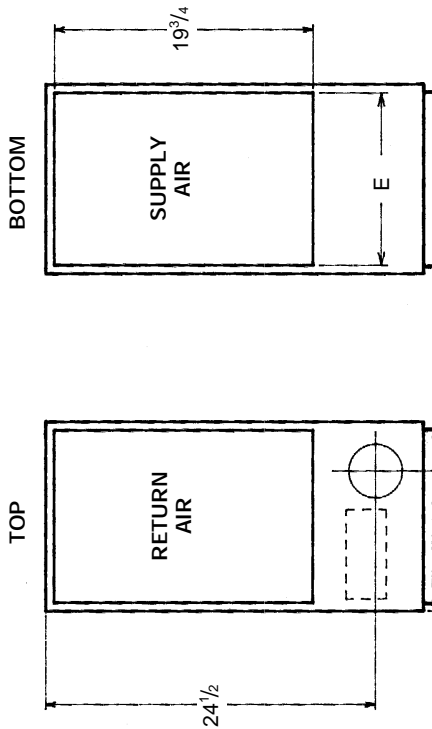
IMPORTANT: This furnace is not approved or recommended for installation on its back, with access doors facing upwards.

**FIGURE 3
DOWNFLOW DIMENSIONS**

**CLEARANCE TO COMBUSTIBLE MATERIAL (INCHES)
DOWNFLOW MODELS**

Model	A	B	C	D	E	REDUCED CLEARANCE (IN.)				Ship. Wgts.		
						Left Side	Right Side	Back	Top		Front	Vent
05	14	12 ^{27/32}	10 ^{3/8}	①	13 ^{1/8}	0	4②	0	1	3	6③	85 lbs.
07	17 ^{1/2}	16 ^{11/32}	12 ^{1/8}	①	16 ^{5/8}	0	3②	0	1	3	6③	105 lbs.
10(A)	17 ^{1/2}	16 ^{11/32}	12 ^{1/8}	①	16 ^{5/8}	0	3②	0	1	3	6③	115 lbs.
10(B)	21	19 ^{27/32}	13 ^{1/8}	①	20 ^{1/8}	0	0	0	1	6	6③	120 lbs.
12	24 ^{1/2}	23 ^{11/32}	15 ^{5/8}	①	23 ^{5/8}	0	0	0	1	3	6③	140 lbs.
15	24 ^{1/2}	23 ^{11/32}	15 ^{5/8}	①	23 ^{5/8}	0	0	0	1	3	6③	150 lbs.

- ① May require 3" to 4" or 3" or 5" adapter.
- ② May be 0" with type B vent.
- ③ May be 1" with type B vent.



NOTE: IN DOWNFLOW CONFIGURATION, OPTIONAL AIR CUTOFF IS NOT PERMITTED.

CLEARANCE – ACCESSIBILITY

The design of forced air furnaces with input ratings as listed in the tables on the following pages are certified by CSA for the clearances to combustible materials shown in inches.

See name/rating plate and clearance label for specific model number and clearance information.

Service clearance of at least 24 inches is recommended in front of all furnaces.

ACCESSIBILITY CLEARANCES, WHERE GREATER, MUST TAKE PRECEDENCE OVER FIRE PROTECTION CLEARANCES.

▲ WARNING

UPFLOW AND HORIZONTAL FURNACES MUST NOT BE INSTALLED DIRECTLY ON CARPETING, TILE OR OTHER COMBUSTIBLE MATERIAL OTHER THAN WOOD FLOORING. INSTALLATION ON A COMBUSTIBLE MATERIAL CAN RESULT IN FIRE CAUSING PROPERTY DAMAGE, SEVERE PERSONAL INJURY OR DEATH.

DOWNFLOW UNIT DESIGN IS CERTIFIED FOR INSTALLATION ON NON-COMBUSTIBLE FLOOR. A SPECIAL COMBUSTIBLE FLOOR SUB-BASE IS REQUIRED WHEN INSTALLING ON A COMBUSTIBLE FLOOR. FAILURE TO INSTALL THE SUB-BASE MAY RESULT IN FIRE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH. THIS SPECIAL BASE IS OFFERED AS AN ACCESSORY FROM THE FACTORY. SEE THE CLEARANCE LABEL LOCATED INSIDE THE FURNACE FOR THE APPROPRIATE MODEL NUMBER.

THE SPECIAL BASE IS NOT REQUIRED WHEN THE FURNACE IS INSTALLED ON TOP OF AN AIR CONDITIONING PLENUM.

A gas-fired furnace for installation in a residential garage must be installed so that the burner(s) and the ignition source are located not less than 18" above the floor and the furnace is located or protected to avoid physical damage by vehicles.

UPFLOW UNIT DESIGN REQUIRES A SOLID METAL BASE PLATE (SEE TABLE 1 OR FURNACE CLEARANCE LABEL FOR PART

NUMBER) BE IN PLACE WHEN THE FURNACE IS INSTALLED WITH SIDE OR REAR AIR RETURN DUCTS. FAILURE TO INSTALL A BASE PLATE COULD CAUSE PRODUCTS OF COMBUSTION TO BE CIRCULATED INTO THE LIVING SPACE AND CREATE POTENTIALLY HAZARDOUS CONDITIONS, INCLUDING CARBON MONOXIDE POISONING.

TABLE 1

FURNACE WIDTH	BASE PLATE NO.	BASE PLATE SIZE
14"	RXGB-D14	11 ⁵ / ₈ " x 23 ⁹ / ₁₆ "
17 ¹ / ₂ "	RXGB-D17	15 ¹ / ₈ " x 23 ⁹ / ₁₆ "
21"	RXGB-D21	18 ⁵ / ₈ " x 23 ⁹ / ₁₆ "
24 ¹ / ₂ "	RXGB-D24	25 ⁵ / ₈ " x 23 ⁹ / ₁₆ "

SITE SELECTION

1. Select a site in the building near the center of the proposed, or existing, duct system.
2. Give consideration to the vent system piping when selecting the furnace location. Be sure the venting system can travel from the furnace to the termination with minimal length and elbows.
3. Locate the furnace near the existing gas piping. Or, if running a new gas line, locate the furnace to minimize the length and elbows in the gas piping.
4. Locate the furnace to maintain proper clearance to combustibles as shown in Figures 2 & 3.

▲ CAUTION

WHEN COILS ARE USED WITH AIR HANDLERS OR FURNACES AND INSTALLED ABOVE A FINISHED CEILING OR LIVING AREA, IT IS RECOMMENDED THAT AN AUXILIARY SHEET METAL CONDENSATE DRAIN PAN BE FABRICATED AND INSTALLED UNDER ENTIRE UNIT. FAILURE TO DO SO CAN RESULT IN PROPERTY DAMAGE.

▲ WARNING

COMBUSTIBLE MATERIAL MUST NOT BE PLACED ON OR AGAINST THE FURNACE JACKET OR WITHIN THE SPECIFIED CLEARANCES OF THE VENT PIPE. THE AREA AROUND THE FURNACE MUST BE KEPT CLEAR AND FREE OF ALL COMBUSTIBLE MATERIALS INCLUDING GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS.

PLACEMENT OF COMBUSTIBLE MATERIALS ON, AGAINST OR AROUND THE FURNACE JACKET CAN CAUSE AN EXPLOSION OR FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH. THE FURNACE OWNER SHOULD BE CAUTIONED THAT THE FURNACE AREA MUST NOT BE USED AS A BROOM CLOSET OR FOR ANY OTHER STORAGE PURPOSES.

DUCTING

Proper air flow is required for the correct operation of this furnace. Too little air flow can cause erratic operation and can damage the heat exchanger. The duct system must carry the correct amount of air for heating and cooling. Position the unit minimize long runs or runs with many turns and elbows.

Size the ducts according to acceptable industry standards and methods. The total static pressure drop (including evaporator coil, if used) of the entire system should not exceed 0.5" w.c. Be sure to have adequate space for unit filter.

IMPORTANT: Some high efficiency filters have a greater than normal resistance to air flow. This can adversely affect furnace operation. **BE SURE TO CHECK AIR FLOW** if using any filter other than the factory-provided filter.

NOTE: DO NOT take return air from bathrooms, kitchens, furnace rooms, garages, utility or laundry rooms, or cold areas.

IMPORTANT: When using outside air, design and adjust the system to maintain a return air temperature above 50°F during the heating season.

▲ WARNING

NEVER ALLOW PRODUCTS OF COMBUSTION OR THE FLUE PRODUCTS TO ENTER THE RETURN AIR DUCTWORK, OR THE CIRCULATING AIR SUPPLY. ALL RETURN DUCTWORK MUST BE ADEQUATELY SEALED AND SECURED TO THE FURNACE WITH SHEET METAL SCREWS, AND JOINTS TAPED. WHEN A FURNACE IS MOUNTED ON A PLATFORM, WITH RETURN THROUGH THE BOTTOM, IT MUST BE SEALED AIRTIGHT BETWEEN THE FURNACE

AND THE RETURN AIR PLENUM. THE RETURN AIR PLENUM MUST BE PERMANENTLY ENCLOSED. NEVER USE A DOOR AS A PART OF THE RETURN AIR PLENUM. THE FLOOR OR PLATFORM MUST PROVIDE SOUND PHYSICAL SUPPORT OF THE FURNACE, WITHOUT SAGGING, CRACKS, GAPS, ETC., AROUND THE BASE AS TO PROVIDE A SEAL BETWEEN THE SUPPORT AND THE BASE.

FAILURE TO PREVENT PRODUCTS OF COMBUSTION FROM BEING CIRCULATED INTO THE LIVING SPACE CAN CREATE POTENTIALLY HAZARDOUS CONDITIONS, INCLUDING CARBON MONOXIDE POISONING THAT COULD RESULT IN PERSONAL INJURY OR DEATH.

DO NOT, UNDER ANY CIRCUMSTANCES, CONNECT RETURN OR SUPPLY DUCTWORK TO OR FROM ANY OTHER HEAT PRODUCING DEVICE SUCH AS A FIREPLACE INSERT, STOVE, ETC. DOING SO MAY RESULT IN FIRE, CARBON MONOXIDE POISONING, EXPLOSION, PERSONAL INJURY OR PROPERTY DAMAGE.

▲ WARNING

BLOWER AND BURNERS MUST NEVER BE OPERATED WITHOUT THE BLOWER DOOR IN PLACE. THIS IS TO PREVENT DRAWING GAS FUMES (WHICH COULD CONTAIN HAZARDOUS CARBON MONOXIDE) INTO THE HOME THAT COULD RESULT IN PERSONAL INJURY OR DEATH.

UPFLOW UNITS

1. Set furnace in place and connect the return duct or return air cabinet to unit. Make the connection air-tight to prevent entraining combustion gases from any adjacent fuel-burning appliances. Unit return air may be connected on the sides or bottom of the return air compartment.

- a. Openings in the side must be cut out the full width of the knockouts on the unit. If using side return air, **THE BOTTOM** base plate must be installed.

NOTE: Where the maximum airflow is 1800 CFM or more, both sides or the bottom must be used for return air.

- b. If using bottom return air, place furnace over return air plenum and seal furnace bottom to return air plenum.

▲ WARNING

A SOLID METAL BASE PLATE, (SEE TABLE 1) MUST BE IN PLACE WHEN THE FURNACE IS INSTALLED WITH SIDE OR REAR AIR RETURN DUCTS. FAILURE TO INSTALL A BASE PLATE COULD CAUSE PRODUCTS OF COMBUSTION TO BE CIRCULATED INTO THE LIVING SPACE AND CREATE POTENTIALLY HAZARDOUS CONDITIONS, INCLUDING CARBON MONOXIDE POISONING OR DEATH.

2. If summer air conditioning is desired, position the indoor coil on the top of the unit. Insure that no air can bypass this coil.
3. Connect the supply air plenum to the furnace plenum opening.

DOWNFLOW UNITS

▲ WARNING

THE DOWNFLOW FURNACE DESIGN IS CERTIFIED FOR INSTALLATION ON A NON-COMBUSTIBLE FLOOR. IF INSTALLED ON A COMBUSTIBLE FLOOR, USE THE SPECIAL BASE SPECIFIED ON THE FURNACE CLEARANCE LABEL. FAILURE TO INSTALL THE SPECIAL BASE MAY RESULT IN FIRE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH. THIS SPECIAL BASE IS SHIPPED FROM THE FACTORY AS AN ACCESSORY.

1. Position the unit over the supply air plenum and connect.
- a. If installing on a combustible floor and not using an evaporator coil box, install the special combustible floor base. See Figure 4.

- b. If summer air conditioning is desired, position the indoor coil on the bottom of the unit. Insure that no air can bypass this coil.
2. Connect the return air ducting to the return air opening at the top of the unit. Make the connection air tight to prevent entraining combustion gases from an adjacent fuel-burning appliance.

HORIZONTAL UNITS

1. Unit can be mounted left or right side airflow configuration.
2. Position the unit on adequate supports or by using support brackets (see Figure 1) and connect supply plenum.
3. If summer air conditioning is desired, position the indoor coil on the supply air side of the unit. Insure that no air can bypass this coil.
4. Secure the four angle brackets shipped with the unit to the return air opening. See Figure 5. Connect the return air ducting to the return air opening at the top of the unit. Make the connection air tight to prevent entraining combustion gases from an adjacent fuel-burning appliance.

NOTE: Do not block furnace access with support rods. Maintain clearances recommended in Figure 2. Allow enough space for proper service, maintenance or replacement of the heat exchanger and blower assembly.

FIGURE 4
COMBUSTIBLE FLOOR BASE

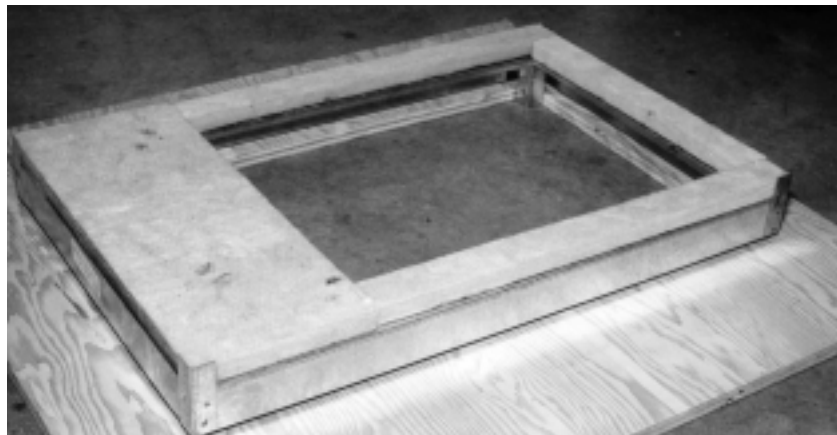
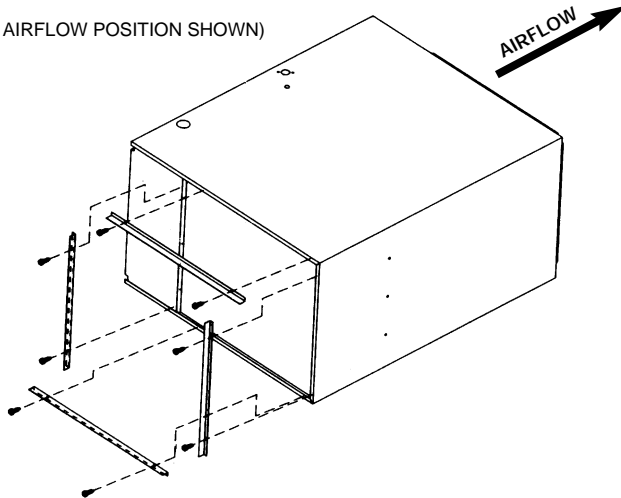


FIGURE 5
HORIZONTAL RETURN AIR DUCT

(LEFT-HAND AIRFLOW POSITION SHOWN)



FOUR ANGLE BRACKETS ARE SHIPPED WITH EACH UNIT THAT CAN BE INSTALLED HORIZONTALLY. THESE BRACKETS MAY BE USED TO SECURE THE RETURN AIR DUCT TO A HORIZONTAL UNIT.

COMBUSTION AND VENTILATION AIR

▲ WARNING

THIS FURNACE AND ANY OTHER FUEL-BURNING APPLIANCE MUST BE PROVIDED WITH ENOUGH FRESH AIR FOR PROPER COMBUSTION AND VENTILATION OF THE FLUE GASES. MOST HOMES WILL REQUIRE THAT OUTSIDE AIR BE SUPPLIED INTO THE FURNACE AREA. FAILURE TO DO SO CAN CAUSE DEATH FROM CARBON MONOXIDE POISONING.

Adequate facilities for providing air for combustion and ventilation must be provided in accordance with section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI, Z223.1 latest edition or CSA B149.1 and .2 or, applicable provisions for the local building codes, and not obstructed so as to prevent the flow of air to the furnace.

OVERTEMPERATURE SAFETY SWITCHES

This furnace is equipped with safety switches in the burner compartment to protect against overtemperature conditions caused by inadequate combustion air supply. The switches are located just above the burners on the furnace center panel on upflow and downflow models and also on each side of the burners on upflow/horizontal and horizontal "only" models, and must be manually reset if tripped. **DO NOT** jumper this switch. If this switch should trip, a qualified furnace installer, service agency or the

gas supplier should be called to check and/or correct for adequate combustion air supply. If this unit is mounted in a closet, the door must be closed when making this check of the installation.

DO NOT reset the overtemperature switch without taking corrective action to assure that an adequate supply of combustion air is maintained under all conditions of operation.

Replace this switch only with the identical replacement part.

COMBUSTION AIR REQUIREMENTS

IMPORTANT: Air for combustion and ventilation must not come from a corrosive atmosphere. Any failure due to corrosive elements in the atmosphere is excluded from warranty coverage.

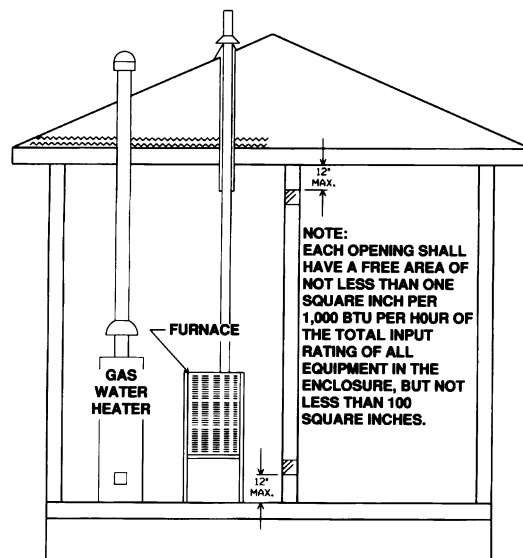
The following types of installation may require **OUTDOOR AIR** for combustion, due to chemical exposures:

- Commercial buildings
- Buildings with indoor pools
- Furnaces installed in laundry rooms
- Furnaces in hobby or craft rooms
- Furnaces installed near chemical storage areas.

Exposure to the following substances in the combustion air supply may also require **OUTDOOR AIR** for combustion:

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine-based swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents (such as perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry acid washing materials

FIGURE 6
AIR FROM HEATED SPACE



NOTE:
EACH OPENING SHALL HAVE A FREE AREA OF NOT LESS THAN ONE SQUARE INCH PER 1,000 BTU PER HOUR OF THE TOTAL INPUT RATING OF ALL EQUIPMENT IN THE ENCLOSURE, BUT NOT LESS THAN 100 SQUARE INCHES.

Combustion air must be free of acid forming chemicals; such as sulphur, fluorine and chlorine. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, air fresheners, paint and varnish removers, refrigerants and many other commercial and household products. Vapors from these products when burned in a gas flame form acid compounds. The acid compounds increase the dew point temperature of the flue products and are highly corrosive after they condense.

⚠ WARNING

ALL FURNACE INSTALLATIONS MUST COMPLY WITH THE NATIONAL FUEL GAS CODE AND LOCAL CODES TO PROVIDE ADEQUATE COMBUSTION AND VENTILATION AIR FOR THE FURNACE. FAILURE TO DO SO CAN CREATE HAZARDOUS CONDITIONS RESULTING IN PROPERTY DAMAGE, BODILY INJURY OR DEATH FROM SMOKE, FIRE OR CARBON MONOXIDE.

Combustion air requirements are determined by whether the furnace is in an open (unconfined) area or in a confined space such as a closet or small room.

**EXAMPLE 1.
FURNACE LOCATED IN AN UNCONFINED SPACE**

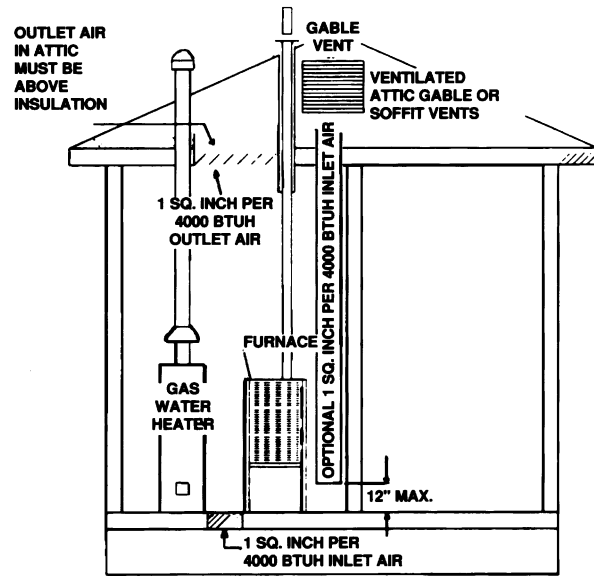
Using indoor air for combustion.

An unconfined space must have at least 50 cubic feet for each 1,000 BTUH of the total input for all appliances in the space. Here are a few examples of the room sizes required for different inputs. The sizes are based on 8 foot ceilings.

BTUH Input	Minimum Sq. Feet With 8' Ceiling	Typical Room Size With 8' Ceiling
50,000	312	14*x24* or 18*x18*
75,000	469	15*x31* or 20*x24*
100,000	625	20*x31* or 25*x25*
125,000	833	23*x34* or 26*x30*
150,000	938	25*x38* or 30*x31*

If the open space containing the furnace is in a building with tight construction (contemporary construction), outside air may still be required for the furnace to operate and vent properly. Outside air openings should be sized the same as for a confined space.

**FIGURE 7
AIR FROM ATTIC/CRAWL SPACE**



**EXAMPLE 2.
FURNACE LOCATED IN A CONFINED SPACE**

A confined space (any space smaller than shown above as “unconfined”) must have openings into the space which are located in accordance with the requirements set forth in the following subsections A and B. Size the openings by how they are connected to the heated area or to the outside, and by the input of all appliances in the space.

If confined space is within a building with tight construction, combustion air must be taken from outdoors or area freely communicating with the outdoors.

A. USING INDOOR AIR FOR COMBUSTION (FIGURE 6)

IMPORTANT: Air should not be taken from a heated space with a fireplace, exhaust fan or other device that may produce a negative pressure.

If combustion air is taken from the heated area, the openings must each have at least 100 square inches of free area. Each opening must have at least one square inch of free area for each 1,000 Btuh of total input in the space. Here are some examples of typical openings required.

Btuh Input	Free Area Each Opening
100,000	100 Square Inches
150,000	150 Square Inches

B. USING OUTDOOR AIR FOR COMBUSTION (FIGURE 7)

IMPORTANT: Never take combustion air from an attic space that is equipped with power ventilation.

The confined space must communicate with the outdoors according to Methods 1 and 2. The minimum air opening dimension shall not be less than 3 inches. When using ducts, they shall be of the same cross-sectional area as the free area of the openings to which they connect.

B: Method 1

Provide two permanent openings, one located within 12 inches of the top and one located within 12 inches of the bottom of the enclosure. Each opening shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

- a. Where directly communicating with the outdoors or where communicating to the outdoors through **VERTICAL DUCTS**, each opening shall have a minimum free area of **1 square inch for each 4000 BTUH** of total appliance input rating in the enclosure (see Figure 7). Here are typical duct sizes:

VERTICAL OUTDOOR AIR OPENING DIMENSIONS		
BTUH Input	Free Area Each Opening	Round Pipe Size
50,000	12.50 sq. inches	4"
75,000	18.75 sq. inches	5"
100,000	25.00 sq. inches	6"
125,000	31.25 sq. inches	7"
150,000	37.50 sq. inches	7"

- b. Where communicating with outdoors through **HORIZONTAL DUCTS**, each opening shall have a minimum free area of **1 square inch for each 2000 BTUH** of total input rating for all equipment in the enclosure (see Figure 8). Here are typical duct sizes:

HORIZONTAL OUTDOOR AIR OPENING DIMENSIONS		
BTUH Input	Free Area Each Opening	Round Pipe Size
50,000	25.00 sq. inches	6"
75,000	37.50 sq. inches	7"
100,000	50.00 sq. inches	8"
125,000	62.50 sq. inches	9"
150,000	75.00 sq. inches	10"

B: Method 2

One permanent opening, located within 12 inches of the top of the enclosure, shall be permitted where the equipment has clearances of at least 1 inch from the sides and back and 6 inches from the front of the appliance. The opening shall directly communicate with the outdoors or communicate through a vertical or horizontal duct to the outdoors or spaces (crawl or attic) that freely communicate with the outdoors and have a minimum free area of:

- a. One square inch for each 3000 BTUH of the total input rating of all equipment located in the enclosure, **AND**
- b. Not less than the sum of the areas of all vent connectors in the confined space.

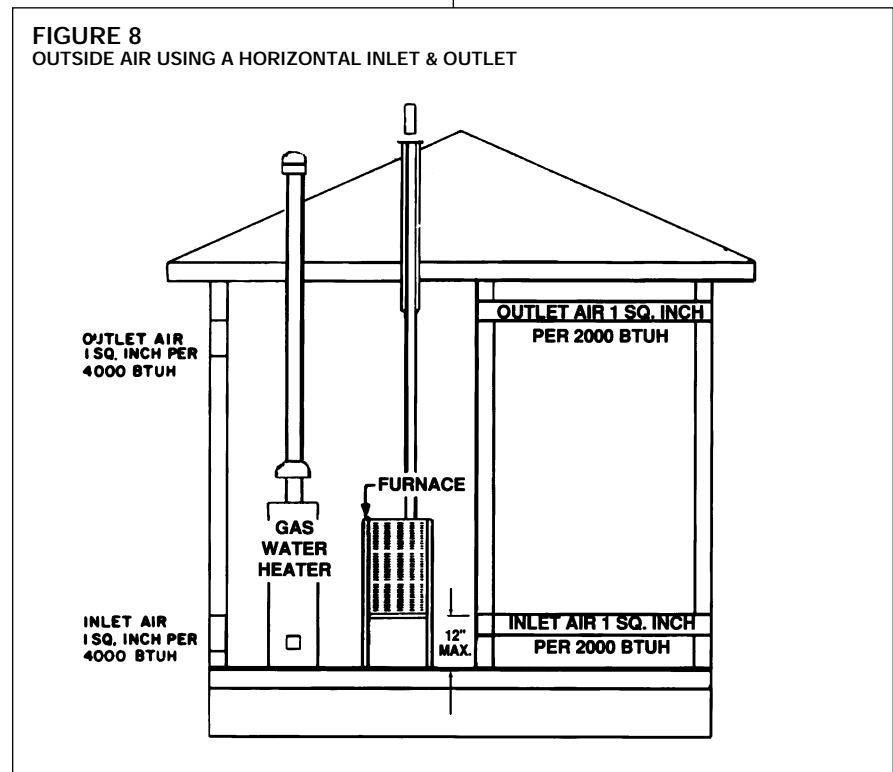
IMPORTANT: If the furnace is in a location with an exhaust fan, there must be sufficient ventilation to prevent the exhaust fan from creating a negative pressure in the room.

Combustion air openings must **NOT BE RESTRICTED** in any manner.

CONSULT LOCAL CODES FOR SPECIAL REQUIREMENTS.

Air opening in the furnace casing front, return air grilles, and warm air registers must not be obstructed.

FIGURE 8
OUTSIDE AIR USING A HORIZONTAL INLET & OUTLET



VENTING

GENERAL INFORMATION

The furnace must be vented in accordance with these instructions, National Fuel Gas Code, ANSI Z223.1 and/or the Natural Gas Installation Code, CSA-B149.1 & .2 and requirements or codes of the local utility or other authority having jurisdiction.

▲ WARNING

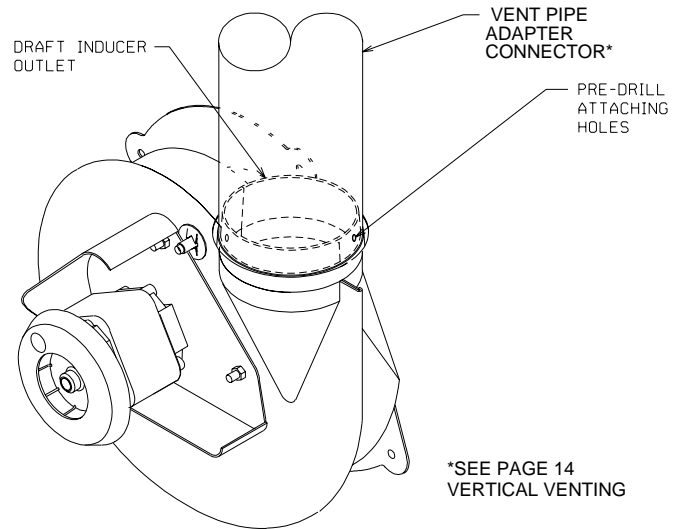
DEVICES ATTACHED TO THE FLUE OR VENT FOR THE PURPOSE OF REDUCING HEAT LOSS UP THE CHIMNEY HAVE NOT BEEN TESTED AND HAVE NOT BEEN INCLUDED IN THE DESIGN CERTIFICATION OF THIS FURNACE. WE, THE MANUFACTURER, CANNOT AND WILL NOT BE RESPONSIBLE FOR INJURY OR DAMAGE CAUSED BY THE USE OF SUCH UNTESTED AND/OR UNCERTIFIED DEVICES, ACCESSORIES OR COMPONENTS.

DRAFT INDUCER

▲ WARNING

VENT PIPE ATTACHING HOLES MUST BE PREDRILLED IN THE DRAFT INDUCER COLLAR TO PREVENT DAMAGING THE INDUCER. DRILL 1/8" DIAMETER HOLES THROUGH THE VENT PIPE AND COLLAR AND USE #8 SCREWS TO ATTACH. SEE FIGURE 9. FAILURE TO FOLLOW THIS WARNING CAN CAUSE RECIRCULATION OF FLUE PRODUCTS CAUSING CARBON MONOXIDE POISONING RESULTING IN PERSONAL INJURY OR DEATH.

FIGURE 9
ATTACHING TO DRAFT INDUCER COLLAR



AO991-01

FURNACE CATEGORY INFORMATION

This furnace is shipped as a Category I type induced draft furnace. A Category I furnace operates with a nonpositive vent pressure and has a vent gas temperature at least 140°F above the dew point of the vent gases. A Category I type may be a draft hood equipped furnace or have a fan assisted combustion system (induced draft). The inducer is used to pull flue products through the combustion chamber and as they leave the furnace, most of the energy has been dissipated. The buoyant effect of the flue gases provides venting to the outdoors.

During the off cycle, the inducer is off and there is very little flow through the vent, cooling the vent. During the on cycle there is no dilution airflow, as with a draft hood type furnace. Although the vent heats up rapidly without dilution air, the flue products contain more water vapor, which results in a higher dew point temperature. It is most **important** that you follow the guidelines in these instructions to prevent the possible formation of condensation in the venting system.

As a Category I furnace it may be vented vertically with type B-1 vent pipe and also may be common vented, as described in these instructions.

IMPORTANT APPLICATION NOTES

When the furnace is used as a replacement, the existing vent system should be inspected to assure that there are no obstructions, blockage, or any signs of corrosion.

NOTE: WHEN THE VENT TABLE PERMITS MORE THAN ONE DIAMETER OF PIPE FOR A CONNECTOR OR VENT, THE SMALLEST PERMITTED DIAMETER MUST BE USED,

VENT PIPE MAY BE TYPE "B-1," EITHER RIGID OR SUITABLE FLEXIBLE CONSTRUCTION THAT CARRIES A U.L. LISTING.

COMMON VENTING IS ALLOWED WITH VERTICAL B-1 VENT SYSTEMS, AND LINED MASONRY CHIMNEYS. FOLLOW THE NATIONAL FUEL GAS CODE, ANSI Z223.1 AND/OR THE NATURAL GAS INSTALLATION CODE, CSA-B149.1 & .2 FOR PROPER INSTALLATION PRACTICES.

SINGLE WALL VENT CONNECTORS TO "B-1 VENT OR MASONRY CHIMNEYS" MAY BE USED UNDER THE GUIDELINES OF THE NATIONAL FUEL GAS CODE, ANSI Z223.1 AND/OR THE NATURAL GAS INSTALLATION CODE, CSA-B149.1 & .2.

The entire length of the vent connector shall be readily accessible for inspection, cleaning and replacement.

"B-1" VERTICAL VENTING

Type "B-1" vents must be installed in accordance with the terms of their listings and the vent manufacturer's instructions.

"B-1" vents must be supported and spaced in accordance with their listings and the manufacturer's instructions. All vents must be supported to maintain their minimum clearances from combustible material.

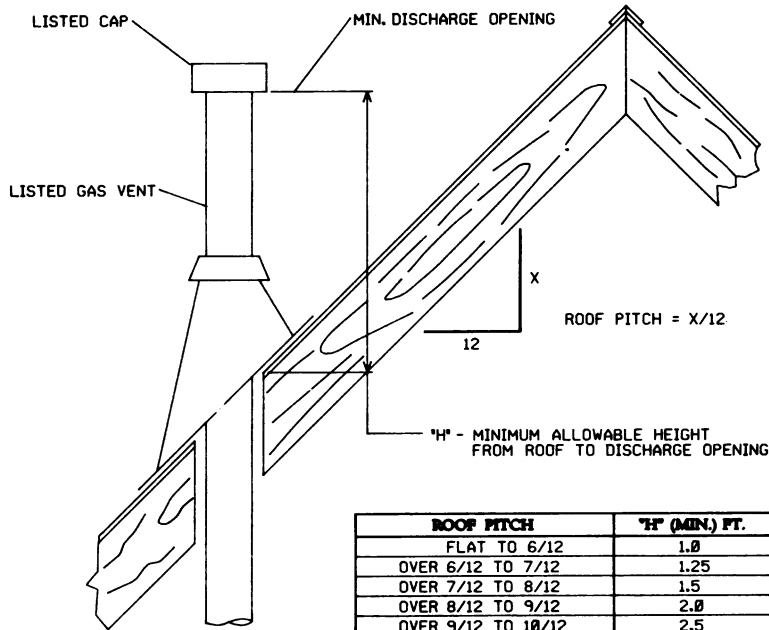
VERTICAL VENTING	
Input	Categorized Furnace Vent Size Required
50K	3"
75K	*4"
100K	*4"
125K	*5"
150K	*5"

*NOTE: All furnaces have a 3" vent connection as shipped from the factory. A 3" to 4" or 3" to 5" vent transition is required on all but the 50,000 BTUH models when vertically vented or common vented with metal vent pipes. **THE VENT TRANSITION CONNECTION MUST BE MADE AT THE FURNACE VENT EXIT.** It must originate with an adapter if required, at the furnace flue collar and terminate either in a listed cap or roof assembly. When common venting, the vent connector size may differ from the above diameters depending on application. See ANSI Z21.47-1993/CSA-2.3-M93 or latest edition tables.

VERTICAL VENT SYSTEMS:

1. A gas vent shall terminate above the roof surface with a listed cap or listed roof assembly. Gas vents 12 inches in size or smaller with listed caps shall be permitted to be terminated in accordance with Figure 10, provided they are at least 8 feet from a vertical wall or similar obstruction. All other gas vents shall terminate not less than 2 feet above the highest point where they pass through the roof and at least 2 feet higher than any portion of a building within 10 feet.
2. A type B-1 gas vent shall terminate at least 5 feet in vertical height above the highest connected equipment draft hood or flue collar.
3. Must rise 1/4" per foot away from the furnace on horizontal runs and be supported with straps or hangers so it has no sags or dips. Supports at 4 foot intervals and at all elbows are recommended.
4. The vent connector must be mechanically fastened to the outlet collar of the furnace with at least (2) sheet metal screws except vent connectors that are B-1 material.

FIGURE 10
TYPICAL VENTING WITH "B-1" VENT



ROOF PITCH	"H" (MIN.) FT.
FLAT TO 6/12	1.0
OVER 6/12 TO 7/12	1.25
OVER 7/12 TO 8/12	1.5
OVER 8/12 TO 9/12	2.0
OVER 9/12 TO 10/12	2.5
OVER 10/12 TO 11/12	3.25
OVER 11/12 TO 12/12	4.0
OVER 12/12 TO 14/12	5.0
OVER 14/12 TO 16/12	6.0
OVER 16/12 TO 18/12	7.0
OVER 18/12 TO 20/12	7.5
OVER 20/12 TO 21/12	8.0

These shall be assembled in accordance with the manufacturer's instructions. See Figure 9.

5. Any angle greater than 45 degrees from the vertical is considered horizontal. The total horizontal distance of a vent plus the horizontal vent connector serving draft-hood equipped appliances shall not be greater than 75 percent of the vertical height of the vent.

NOTE: Refer to the National Fuel Gas Code, ANSI Z223.1 and/or the Natural Gas Installation Code, CSA-B149.1 & .2.

Single appliance venting of a fan assisted furnace into a tile-lined masonry chimney is prohibited. The chimney must be lined with either Type B vent or with a listed, single wall, metal lining system. Reference National Fuel Gas Code, ANSI Z223.1 and/or the Natural Gas Installation Code, CSA-B149.1 & .2. See Figure 11 for typical B-1 vent chase.

▲ WARNING

DO NOT CONNECT THIS FURNACE TO A CHIMNEY USED TO VENT A SOLID FUEL APPLIANCE (WOOD OR COAL). VENTING WITH A SOLID FUEL APPLIANCE CAN LEAD TO IMPROPER FUNCTIONING OF THE UNIT, AND DUE TO SOOTING, THE POSSIBILITY OF FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

HORIZONTAL VENTING SPECIAL VENT SYSTEMS (SVS)

IMPORTANT: It is THE FURNACE MANUFACTURER's position now that new installations of any HTPV pipe used in a category III vent application, including Selkirk's Selvent™ II HTPV product, should cease immediately.

POWER VENT SYSTEMS

When vertical venting is not possible, the only acceptable method for horizontal venting is with the use of Tjernlund model GPAK-1TR or Field Controls models SWG-4R power venter. Type B vent pipe and fittings must be used. Common venting is not permitted.

All application and installation instructions supplied with the power venter must be followed.

Please address all questions regarding power venter installation, agency listings and furnace model compatibility to:

Tjernlund Products, Inc.
(800) 255-4208 or (612) 426-2993

Field Controls L.L.C.
(800) 742-8368 or (919) 522-0214

EXISTING VENT SYSTEMS IMPORTANT RETROFIT VENTING INSTRUCTIONS

If this furnace is a replacement installation, **ALWAYS INSPECT** the existing vent system to be sure there are no obstructions, blockages, or signs of corrosion.

When the existing furnace is removed from a venting system serving other appliances, the venting is likely to be too large to properly vent the remaining attached appliances.

The following steps shall be followed with each appliance that remains connected to the common venting system, while the other appliances that remain connected to the common venting systems are not in operation.

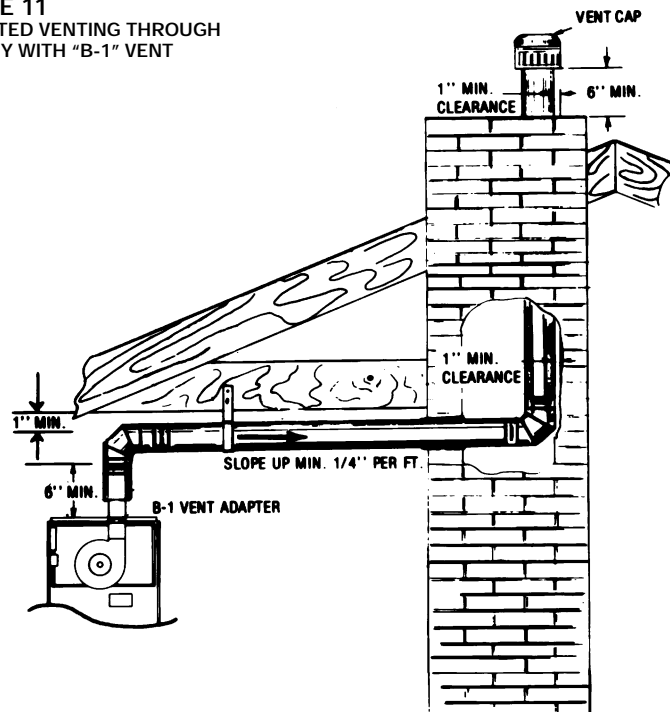
NOTE: When the vent table permits more than one diameter of pipe for a connector or vent, the smallest permitted diameter must be used. 1. Seal any unused openings in the common venting system.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine that there is no blockage, restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors, windows and all doors between the space where the

appliances remaining connected to the common venting system are located. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

4. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. After it has been determined that each appliance that remains connected to the common venting system properly vents (when tested as outlined above) return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.
7. If improper venting is observed during any of the above tests, the common venting system must be resized. Refer to National Fuel Gas Code, ANSI Z223.1 and/or the Natural Gas Installation Code, CSA-B149.1 & .2.

FIGURE 11
DEDICATED VENTING THROUGH
CHIMNEY WITH "B-1" VENT



GAS SUPPLY AND PIPING

GAS SUPPLY

▲ WARNING

THIS FURNACE IS EQUIPPED AT THE FACTORY FOR USE ON NATURAL GAS ONLY. CONVERSION TO LP GAS REQUIRES A SPECIAL KIT SUPPLIED BY THE DISTRIBUTOR OR MANUFACTURER. MAILING ADDRESSES ARE LISTED ON THE FURNACE RATING PLATE, PARTS LIST AND WARRANTY. FAILURE TO USE THE PROPER CONVERSION KIT CAN CAUSE FIRE, CARBON MONOXIDE POISONING, EXPLOSION, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

See the conversion kit index supplied with the furnace. This index identifies the proper LP Gas Conversion Kit required for each particular furnace.

IMPORTANT: Any additions, changes or conversions required for the furnace to satisfactorily meet the application should be made by a qualified installer, service agency or the gas supplier, using factory-specified or approved parts. In the commonwealth of Massachusetts, installation must be performed by a licensed plumber or gas fitter for appropriate fuel.

IMPORTANT: Connect this furnace only to gas supplied by a commercial utility.

IMPORTANT: A U.L. recognized fuel gas and CO detector(s) are recommended in all applications, and their installation should be in accordance with the detector manufacturer's recommendations and/or local laws, rules, regulations or customs.

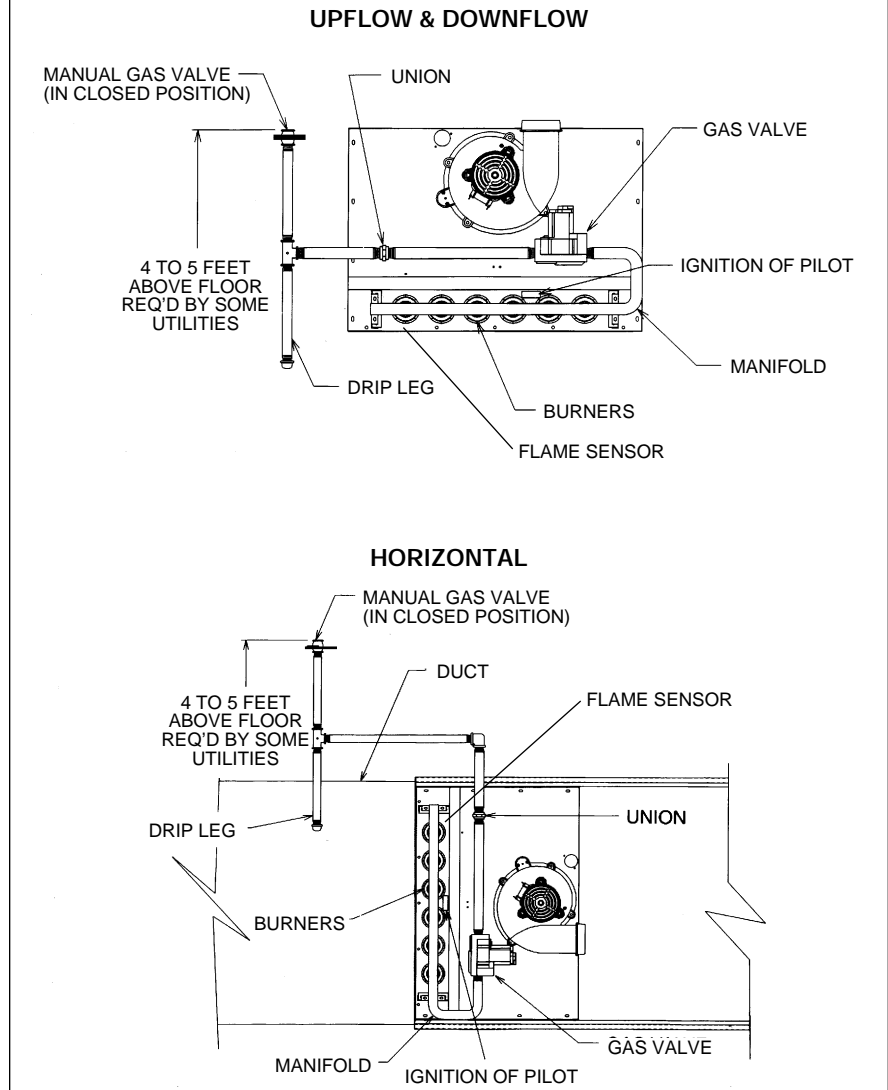
GAS PIPING

Install the gas piping according to all local codes, state codes and regulations of the utility company, whichever holds jurisdiction.

If possible, run a separate gas supply line directly from the meter to the furnace. Consult the local gas company for the location of the manual main shut-off valve. The gas line and manual gas valve must be adequate in size to prevent undue pressure drop and never smaller than the pipe size to the combination gas valve on the furnace. Refer to Table 2 for the recommended pipe size for natural gas and Table 3 for LP gas pipe sizes.

IMPORTANT: It is permissible to run flexible gas connector inside the unit to

FIGURE 12
GAS PIPING INSTALLATION



a piece of black pipe. If local codes allow the use of a flexible gas appliance connector, always use a new listed connector. Do not use a connector which has previously serviced another gas appliance. Massachusetts law limits flexible gas connectors to a maximum of 36".

Install a ground joint union outside the cabinet to easily remove the control valve assembly. Install a manual shut-off valve in the gas line outside the furnace casing. The valve should be readily accessible to turn the gas supply on or off. Install a drip leg in the gas supply line as close to the furnace as possible. Always use a pipe compound resistant to the action of liquefied petroleum gases on all threaded connections.

IMPORTANT: When making gas pipe connections, use a back-up wrench to prevent any twisting of the control assembly and gas valve.

Any strains on the gas valve can change the position of the gas orifices in the burners. This can cause erratic furnace operation.

IMPORTANT: ENSURE that the furnace gas control valve not be subjected to high gas line supply pressures.

DISCONNECT the furnace and its individual shut-off valve from the gas supply piping during **any pressure testing that exceeds 1/2 PSIG (3.48 kPa).**

GAS PRESSURE

IMPORTANT: The maximum gas supply pressure to the furnace should be 10.5" w.c. for natural gas and 13" w.c. for LP gas.

Natural gas supply pressure should operate between 5" to 10.5" w.c. LP gas supply pressure should be 11" to 13" w.c. **This pressure must be maintained with all other gas-fired appliances in operation.**

NOTE: Do not exceed a gas pressure of 13" w.c.

▲ CAUTION

ELEVATIONS ABOVE 2000 FT REQUIRE THAT THE FURNACE INPUT RATING BE ADJUSTED AND THAT THE SIZE OF THE BURNER ORIFICES BE RE-CALCULATED BASED ON ELEVATION AND GAS HEATING VALUE. THE BURNER ORIFICES MAY (OR MAY NOT) NEED TO BE CHANGED. SEE THE SECTION TITLED "HIGH ALTITUDE INSTALLATIONS" OF THIS BOOK FOR INSTRUCTIONS.

▲ WARNING

NEVER PURGE A GAS LINE INTO THE COMBUSTION CHAMBER. NEVER USE MATCHES, FLAME OR ANY IGNITION SOURCE FOR CHECKING LEAKAGE. FAILURE TO FOLLOW THIS WARNING CAN CAUSE AN EXPLOSION OR FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

To check for gas leakage, use an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved method.

LP CONVERSION

NOTE: For installation, see specific LP kit installation instructions.

The valve can be converted to use liquefied petroleum (LP) gas by replacing the pressure regulator spring with the conversion kit spring. This LP kit spring allows the regulator to maintain the proper manifold pressure for LP gas. The correct burner LP orifices are included in the kit.

NOTE: Order the correct LP conversion kit from the furnace manufacturer. Furnace conversion to LP gas must be performed by a qualified technician.

▲ CAUTION

ELEVATIONS ABOVE 2000 FT REQUIRE THAT THE FURNACE INPUT RATING BE ADJUSTED AND THAT THE SIZE OF THE BURNER ORIFICES BE RE-CALCULATED BASED ON ELEVATION AND GAS HEATING VALUE. THE BURNER ORIFICES MAY (OR MAY NOT) NEED TO BE CHANGED. SEE THE SECTION TITLED "HIGH ALTITUDE INSTALLATIONS" OF THIS BOOK FOR INSTRUCTIONS.

NOx MODELS

When converting furnaces equipped with NOx inserts to LP gas, remove the NOx insert assemblies. Steps for removal are listed below:

1. Turn off all electrical power and the gas supply to the furnace.
2. Remove the burner door from the furnace.
3. Remove the igniter assembly – **handle with care.**
4. Remove the two screws attaching the NOx insert retainer brackets to the center panel. Pull the retainer rod.
5. Put the two screws back into the holes in the center panel.
6. Re-install the igniter and burner assemblies.
7. Replace burner door.
8. Turn on electrical power and gas supply to the unit

SETTING GAS PRESSURE

The maximum gas supply pressure to the furnace should be 10.5" w.c. natural gas, or 13" w.c. LP gas. The minimum supply gas pressure to the gas valve should be 5" w.c. natural gas or 11" w.c. LP gas. A properly calibrated manometer is required for accurate gas pressure measurements.

⚠ CAUTION

ELEVATIONS ABOVE 2000 FT REQUIRE THAT THE FURNACE INPUT RATING BE ADJUSTED AND THAT THE SIZE OF THE BURNER ORIFICES BE RE-CALCULATED BASED ON ELEVATION AND GAS HEATING VALUE. THE BURNER ORIFICES MAY (OR MAY NOT) NEED TO BE CHANGED. SEE THE SECTION TITLED "HIGH ALTITUDE INSTALLATIONS" OF THIS BOOK FOR INSTRUCTIONS.

Supply Gas Pressure Measurement. A line pressure tap is on the inlet side of the gas valve.

1. With gas shut off to the furnace at the manual gas valve outside the unit, remove the input pressure tap plug.
2. Connect a U-Tube manometer to the pressure tap. See Figure 13.
3. Turn on the gas supply and operate the furnace and all other gas-fired units on the same gas line as the furnace.
4. Adjust the line gas pressure to supply:
 - A. 5" - 10.5" w.c. for natural gas.
 - B. 11" - 13" w.c. for LP gas.
5. Shut off the gas at the manual gas valve and remove the U-Tube manometer.
6. Replace the pressure tap plug before turning on the gas.

NATURAL GAS:

If the supply gas line pressure is above the operating range, install an in-line gas regulator to the furnace. If supply gas line pressure is below the operating range, either remove any restrictions in the gas supply piping or enlarge the gas pipe. See Table 2.

LP GAS:

If the supply gas line pressure is above the operating range, have the LP supplier reduce the line pressure at the regulator. If supply gas line pressure is below operating range, have the LP supplier adjust the line pressure at the regulator. See Table 3.

NOTE: Depending on the amount of LP vapor and the outdoor ambient temperature, the LP storage tank may require supplemental heat to maintain proper pressure levels.

FIGURE 13

TYPICAL HOSE CONNECTION TO LINE PRESSURE TAP

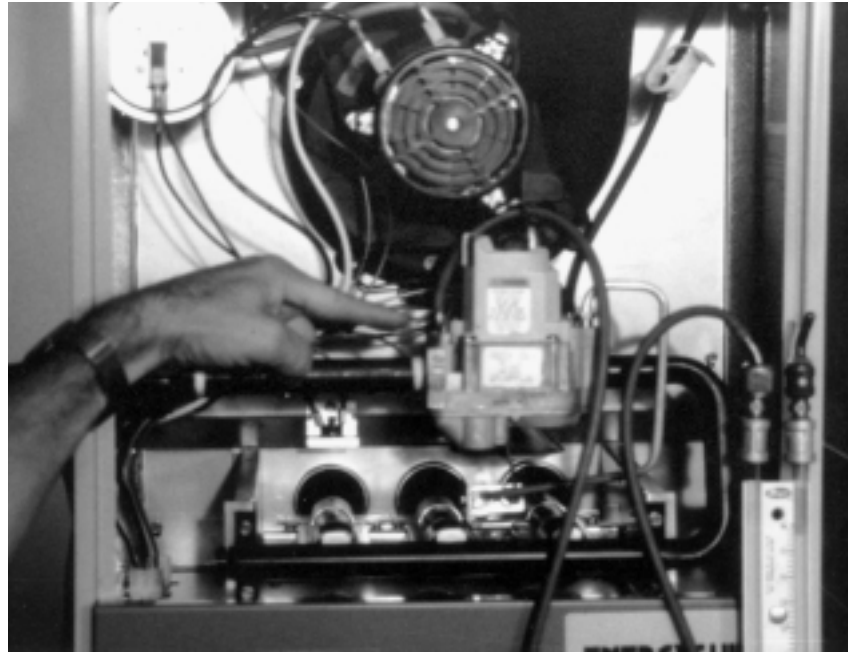


TABLE 2

NATURAL GAS PIPE CAPACITY TABLE (CU. FT./HR.)

Capacity of gas pipe of different diameters and lengths in cu. ft. per hr. with pressure drop of 0.3 in. and specific gravity of 0.60 (natural gas).

Nominal Iron Pipe Size, Inches	Length of Pipe, Feet							
	10	20	30	40	50	60	70	80
1/2	132	92	73	63	56	50	46	43
3/4	278	190	152	130	115	105	96	90
1	520	350	285	245	215	195	180	170
1-1/4	1,050	730	590	500	440	400	370	350
1-1/2	1,600	1,100	890	760	670	610	560	530

After the length of pipe has been determined, select the pipe size which will provide the minimum cubic feet per hour required for the gas input rating of the furnace. By formula:

$$\text{Cu. Ft. Per Hr. Required} = \frac{\text{Gas Input of Furnace (BTU/HR)}}{\text{Heating Value of Gas (BTU/FT}^3\text{)}}$$

The gas input of the furnace is marked on the furnace rating plate. The heating value of the gas (BTU/FT³) may be determined by consulting the local natural gas utility or the LP gas supplier.

TABLE 3

LP GAS PIPE CAPACITY TABLE (CU. FT./HR.)

Maximum capacity of pipe in thousands of BTU per hour of undiluted liquefied petroleum gases (at 11 inches water column inlet pressure).

(Based on a Pressure Drop of 0.5 Inch Water Column)

Nominal Iron Pipe Size, Inches	Length of Pipe, Feet											
	10	20	30	40	50	60	70	80	90	100	125	150
1/2	275	189	152	129	114	103	96	89	83	78	69	63
3/4	567	393	315	267	237	217	196	182	173	162	146	132
1	1,071	732	590	504	448	409	378	346	322	307	275	252
1-1/4	2,205	1,496	1,212	1,039	913	834	771	724	677	630	567	511
1-1/2	3,307	2,299	1,858	1,559	1,417	1,275	1,181	1,086	1,023	976	866	787
2	6,221	4,331	3,465	2,992	2,646	2,394	2,205	2,047	1,921	1,811	1,606	1,496

Example (LP): Input BTU requirement of unit, 150,000
Equivalent length of pipe, 60 ft. = 3/4" IPS required.

ADJUSTING OR CHECKING FURNACE INPUT

▲ CAUTION

ELEVATIONS ABOVE 2000 FT REQUIRE THAT THE FURNACE INPUT RATING BE ADJUSTED AND THAT THE SIZE OF THE BURNER ORIFICES BE RE-CALCULATED BASED ON ELEVATION AND GAS HEATING VALUE. THE BURNER ORIFICES MAY (OR MAY NOT) NEED TO BE CHANGED. SEE THE SECTION TITLED "HIGH ALTITUDE INSTALLATIONS" OF THIS BOOK FOR INSTRUCTIONS.

NATURAL GAS:

The maximum gas supply pressure to the furnace should be 10.5" W.C. for natural gas. The minimum gas supply pressure for purposes of input adjustment to the furnace should be 5" W.C.

A properly calibrated manometer or gauge is required for accurate gas pressure readings.

The manifold pressure should be set at 3.5" W.C. for natural gas. Only small variations in the gas flow should be made by means of the pressure regulator adjustment.

To adjust the pressure regulator:

1. Remove the regulator cap.
2. Turn the adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
3. Replace the regulator cap securely.

LP GAS:

Furnaces for use on LP gas, the LP gas supply pressure must be set between 11.0" and 13.0" W.C. by means of the tank or branch supply regulators. The furnace manifold pressure should be set at 10" W.C. at the gas control valve. For elevations up to 8,000 feet, rating plate input ratings apply. For above 2,000 ft. altitudes and for any necessary major changes in the gas flow rate the orifice spud may need to be changed.

TO CHANGE ORIFICE SPUDS:

1. Shut off the manual main gas valve and remove the gas manifold.
2. Replace the orifice spuds.
3. Reassemble in reverse order.
4. Turn the gas supply back on and check for proper operation and manifold pressure.

Check of input is important to prevent over firing of the furnace beyond its design-rated input. NEVER SET INPUT ABOVE THAT SHOWN ON THE RATING PLATE.

TO CHECK FURNACE INPUT:

1. Make certain that all other gas appliances are shut off, with the exception of pilot burners.
2. Start the furnace
3. Time the meter to measure the time required to burn one cubic foot of gas.
4. Use Table 4 to determine input rate.

ORIFICE ORDERING INFORMATION

Orifice sizes are selected by adding the 2-digit drill size required in the orifice part number. Drill sizes available are 39 through 64; metric sizes available 1.10mm (-90) and 1.15mm (-91):

Orifice Part Number 62-22175-(drill size)

Example 1:

60 drill size orifice required
Part # 62-22175-60

Example 2:

1.15mm drill size orifice required
Part # 62-22175-91

TABLE 4

METER TIME IN MINUTES AND SECONDS FOR NORMAL INPUT RATING OF FURNACES EQUIPPED FOR NATURAL OR LP GAS											
INPUT BTU/HR	METER SIZE CU. FT.	HEATING VALUE OF GAS BTU PER CU. FT.									
		900		1000		1040		1100		2500	
		MIN.	SEC.	MIN.	SEC.	MIN.	SEC.	MIN.	SEC.	MIN.	SEC.
50,000	ONE TEN	1 10	5 50	1 12	12 00	1 15	1 30	1 18	1 12	3 30	20 00
75,000	ONE TEN	0 7	44 12	0 8	48 0	0 8	50 19	0 8	53 48	2 20	0 0
100,000	ONE TEN	0 5	33 24	0 6	36 0	0 6	38 15	0 6	40 36	1 15	30 0
125,000	ONE TEN	0 4	26 19	0 4	29 48	0 5	30 0	0 5	32 17	1 12	12 0
150,000	ONE TEN	0 3	31 36	0 4	24 0	0 4	25 10	0 4	26 20	1 10	0 0

$$\text{Input BTU/HR} = \frac{\text{Heating Value of Gas (BTU/Ft}^3) \times 3600 \times \text{correction factor}}{\text{Time in Seconds (for 1 cu.ft.) of Gas}}$$

ELECTRICAL WIRING

⚠ WARNING

TURN OFF ELECTRIC POWER AT THE FUSE BOX OR SERVICE PANEL BEFORE MAKING ANY ELECTRICAL CONNECTIONS.

ALSO, THE GROUND CONNECTION MUST BE COMPLETED BEFORE MAKING LINE VOLTAGE CONNECTIONS. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK, SEVERE PERSONAL INJURY OR DEATH.

IMPORTANT: The furnace must be installed so that the electrical components are protected from water (furnace condensate).

ELECTRICAL CONNECTIONS

⚠ WARNING

THE CABINET MUST BE PERMANENTLY GROUNDED. A GROUND SCREW IS PROVIDED IN THE JUNCTION BOX FOR THIS PURPOSE. FAILURE TO DO SO CAN RESULT IN FIRE, ELECTRICAL SHOCK, PERSONAL INJURY OR DEATH.

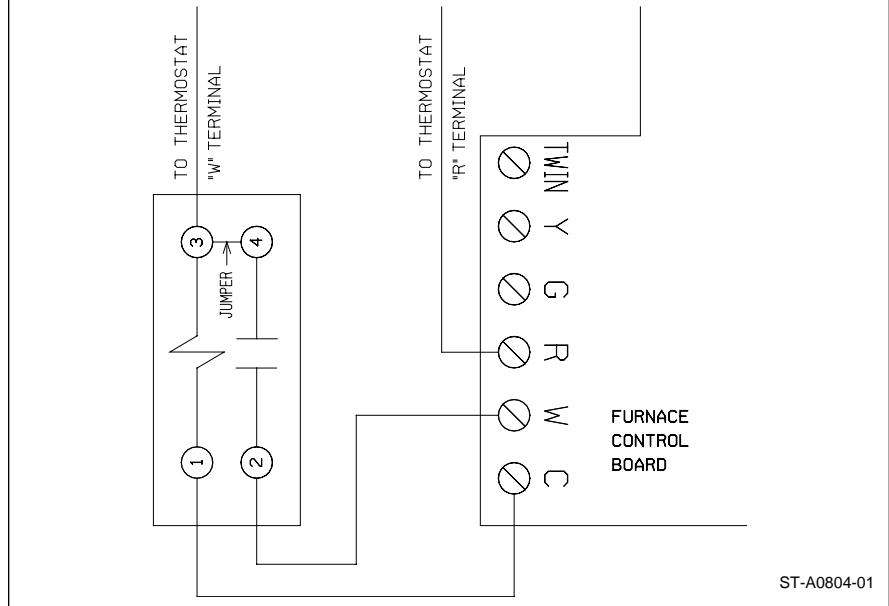
The electrical supply requirements are listed on the furnace rating plate.

Use a separate fused branch electrical circuit containing a properly sized fuse or circuit breaker. Run this circuit directly from the main switch box to an electrical disconnect which must be readily accessible and located within sight of the furnace. Connect from the disconnect to the junction box on the left side of the furnace, inside the control compartment. See appropriate wiring diagram.

NOTE: The electrical junction box inside the furnace control compartment may be relocated to the right side if necessary. A knockout is provided.

NOTE: L1 (hot) and neutral polarity must be observed when making field connections to the furnace. The ignition control on electric ignition models will not sense flame if L1 and neutral are reversed.

FIGURE 14
ISOLATION RELAY



ST-A0804-01

Installation of the electric supply line should be in accordance with the National Electric Code ANSI/NFPA No. 70, latest edition, or Canadian Electrical Code Part 1 - CSA Standard C22.1 and local building codes.

This can be obtained from:

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

Canadian Standards Association
178 Rexdale Blvd.
Etobicoke (Toronto), Ontario
Canada M9W, 1R3

THERMOSTAT

The room thermostat must be compatible with the integrated furnace control on the furnace. All thermostats available from the furnace manufacturer's Parts Department are acceptable. Generally, all thermostats that are not of the "current robbing" type are compatible with the integrated furnace control used.

NOTE: An isolation relay (relay number 42-25104-01) may assist with "current robbing" type thermostat compatibility problems. Use a single-pole, single-throw relay with a 24-volt AC coil. The contacts should be rated for .5 amps minimum at 24 volts. See Figure 14.

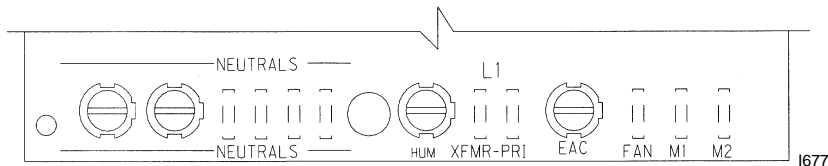
Install the room thermostat in accordance with the instruction sheet in the box with the thermostat. Run the thermostat lead wires inside the control compartment. Connect the thermostat as shown on the wiring diagram. Never install the thermostat on an outside wall or where it will be influenced by drafts, concealed hot or cold water pipes, lighting fixtures, radiation from fireplace, rays of sun, lamps, television, radios or air streams from registers. Refer to the instructions packed with the thermostat for best anticipator adjustment or selection or see below.

HEAT ANTICIPATOR SETTINGS

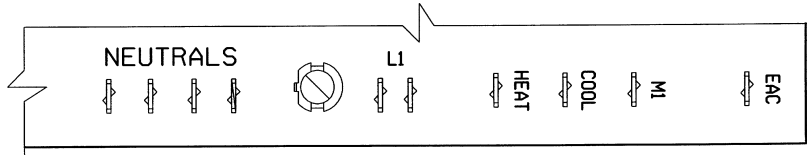
For adjusting the thermostat heat anticipator setting; (a) add the current draw of the various components in the system or (b) using jumper wire, measure the current flow between the R and W thermostat circuits. Set the thermostat heat anticipator according to the current flow measured.

FIGURE 15
LINE VOLTAGE CONNECTIONS

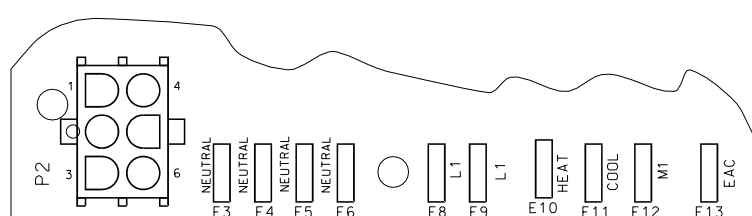
UT ELECTRONIC CONTROLS 1028-928 CONTROL BOARDS



UT ELECTRONIC CONTROLS 1012-925 CONTROL BOARD



INVENSYS CLIMATE CONTROLS ICC-H1MC7



FIELD INSTALLED OPTION ACCESSORIES

ELECTRONIC AIR CLEANER

1. Electronic air cleaner line voltage power can be supplied from the screw terminal "EAC" and a line voltage neutral screw terminal on the control board. See Figure 15.

NOTE: For 80PJ and 80LJ units spade terms only are provided for E.A.C. and humidifier. This will power the electronic air cleaner whenever the circulating air blower is in operation.

HUMIDIFIER

2. Humidifier line voltage power can be supplied from screw terminal "HUM" to a line voltage neutral screw terminal on the control board. See Figure 15. This will power the humidifier whenever the inducer is operating in the heating mode.

NOTE: 80PJ and 80LJ models do not have an output for a humidifier.

NOTE: Maximum current –1.0 amps for each option.

FURNACE TWINNING INSTALLATIONS

IMPORTANT: Twinning of 80PJ and 80LJ units requires an accessory twinning kit. Refer to the furnace specification sheet for proper kit. Do not attempt to twin these models by using the instructions below.

IMPORTANT: Only twin furnaces with identical control boards. 1 thermostat per 2 furnaces.

IMPORTANT: Only bottom returns can be used. No more than two furnaces can share the same supply and return. Furnaces must have same heating and blower capacity. Twinning furnaces must operate off the same phase of power.

Twinning operation of two furnaces, installed side-by-side, connected by a common duct system with main power supplied by the same source, and controlled by a common thermostat can be done with the UT ELECTRONIC CONTROLS 1028-928 integrated control boards.

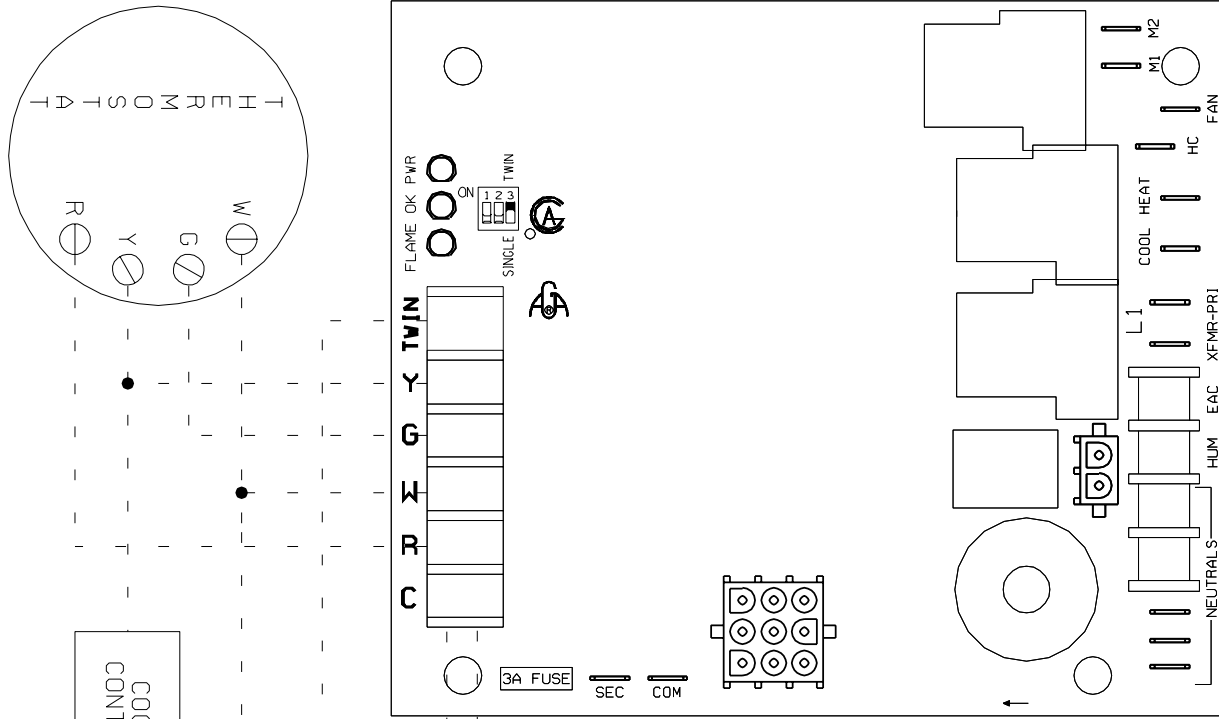
The "OK" LED will flash if twinning is not set up properly.

UT ELECTRONIC CONTROLS 1028-928 CONTROL BOARD

1. Single Stage Operation (See Figure 16)
 - a. Control board "ONE" is on furnace connected to the thermostat.
 - b. The 24 VAC supply to both control boards must be in phase with each other.
 - c. Connect the "C," "W" and "TWIN" terminals to counterparts on each control.
 - d. Both control boards must have switch #3 in the "ON" position.
2. Two Stage Operation (See Figure 17)
 - a. Follow above instructions. Connect "W2" on thermostat to "W" on control board "TWO".

FIGURE 16

UT Electronic Controls 1028-928 CONTROL BOARD, TWINNING CONNECTION -- SINGLE STAGE OPERATION



COOLING CONTACTOR

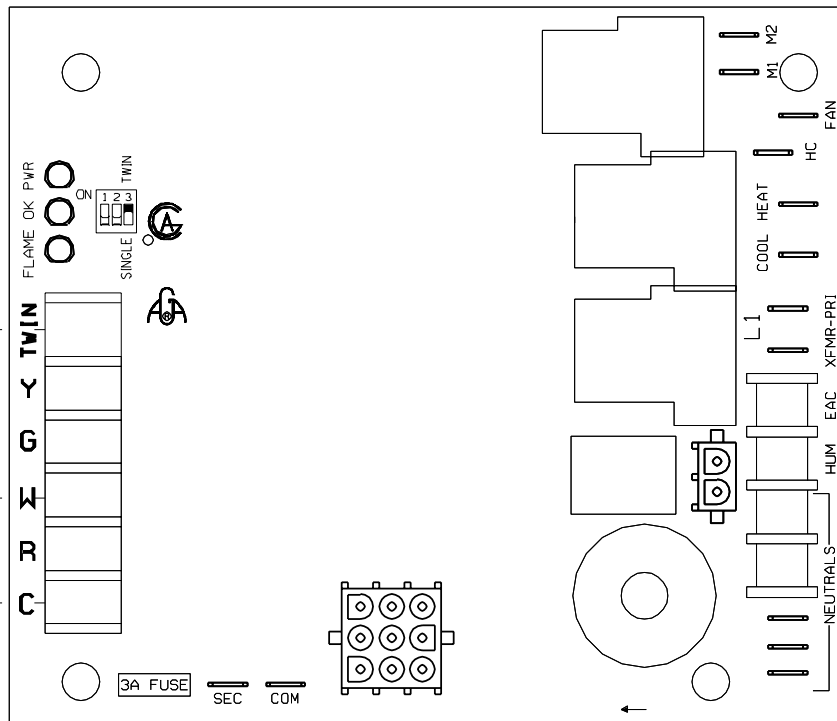
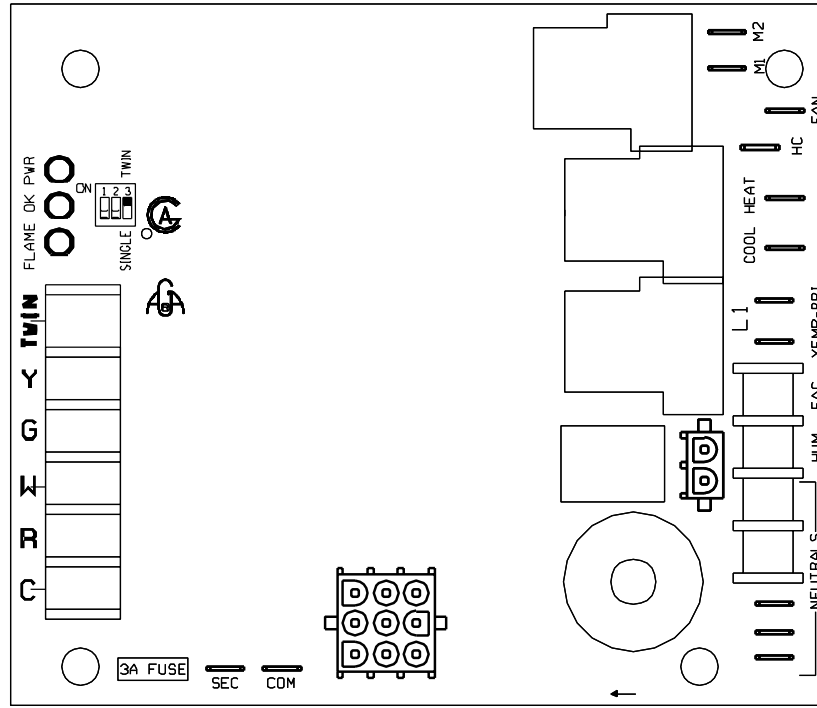
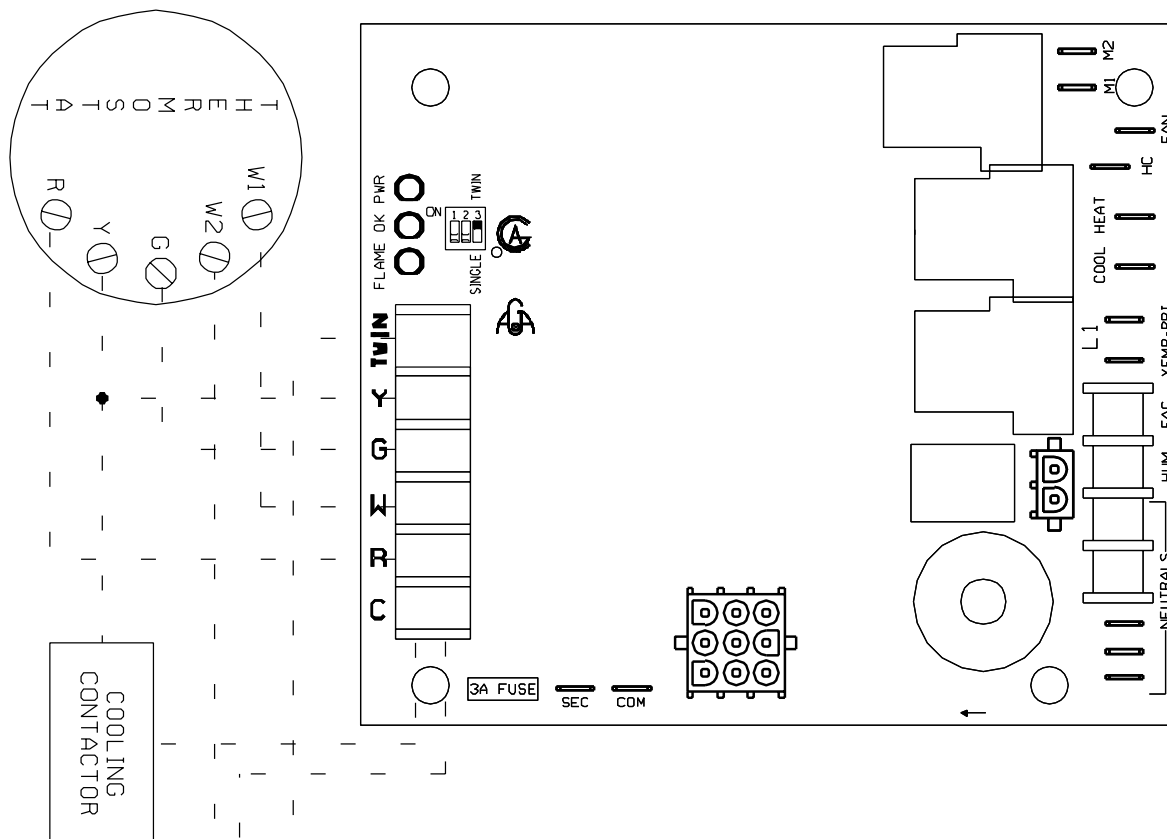


FIGURE 17
 UTEC 1028-928 CONTROL BOARD, TWINNING CONNECTION -- TWO-STAGE OPERATION



80+ HIGH ALTITUDE INSTRUCTIONS

⚠ CAUTION

THE NATIONAL FUEL GAS CODE (NFGC) GUIDELINES SHOULD BE FOLLOWED WHEN CONVERTING THESE FURNACES FOR HIGH ALTITUDE OPERATION.

⚠ CAUTION

ELEVATIONS ABOVE 2000 FT REQUIRE THAT THE FURNACE INPUT RATING BE ADJUSTED AND THAT THE SIZE OF THE BURNER ORIFICES BE RE-CALCULATED BASED ON ELEVATION AND GAS HEATING VALUE. THE BURNER ORIFICES MAY (OR MAY NOT) NEED TO BE CHANGED. THE FOLLOWING EXAMPLES SHOW HOW TO DETERMINE IF AN ORIFICE CHANGE WILL BE NECESSARY AND HOW TO DETERMINE THE NEW ORIFICE SIZE.

IN CANADA, AS AN ALTERNATIVE TO ADJUSTING THE BURNER ORIFICE SIZE, THE MANIFOLD GAS PRESSURE MAY BE ADJUSTED. THIS METHOD IS COVERED LATER IN THIS SECTION. THIS METHOD OF ADJUSTING MANIFOLD PRESSURE MAY ONLY BE USED IN CANADIAN INSTALLATIONS.

34" 80 Plus furnaces installed above 2,000 ft. require the furnace to be de-rated 4% per thousand feet.

NOTE: The factory installed pressure switch is good at all elevations. It will not need to be changed.

NOTE: Factory installed orifices are calculated and sized based on a sea level Natural Gas heating value of 1075 BTU per cubic ft.

Following are examples of orifice sizing using the National Fuel Gas Code Appendix F. For a simplified estimation of orifice size based on heating value and elevation, use Tables 5 and 6. However, calculations are the best method.

Example: 900 BTU/ft³ Regional Natural Gas Heating Value

$$I / H = Q$$

$$25000 / 900 = 27.78 \text{ ft.}^3$$

I = Sea Level input (per burner): 25000
 H = Sea Level Heating Value: 900
 Q = 27.78 ft.³ Natural Gas per hour.

From Table F.1 of *National Fuel Gas Code Handbook, 2002* (3.5" w.c. column).
 Orifice required at Sea Level: #40

From Table F.4 of *National Fuel Gas Code Handbook, 2002*

Orifice required at 5000 ft. elevation (4% de-rate per thousand ft.): #42
 Orifice required at 8000 ft. elevation (4% de-rate per thousand ft.): #44

Example: 1050 BTU/ft³ Regional Natural Gas Heating Value

$$I / H = Q$$

$$25000 / 1050 = 23.81 \text{ ft.}^3$$

I = Sea Level input (per burner): 25000
 H = Sea Level Heating Value: 1050
 Q = 23.81 ft.³ Natural Gas per hour.

From Table F.1 of *National Fuel Gas Code Handbook, 2002* (3.5" w.c. column).
 Orifice required at Sea Level: #43

From Table F.4 of *National Fuel Gas Code Handbook, 2002*

Orifice required at 5000 ft. elevation (4% de-rate per thousand ft.): #45
 Orifice required at 8000 ft. elevation (4% de-rate per thousand ft.): #47

TABLE 5

Natural Gas Orifice Drill Size (4% per 1000 ft. De-Rate)
IMPORTANT: 80+ Models only. Do not use this chart for any 90+ Models.
 Burner Input (per burner) 25,000 BTU @ Sea Level

Annual Avg. Heat Value (btu per ft ³)	Sea level to 1999 ft	2000 to 2999 ft	3000 to 3999 ft	4000 to 4999 ft	5000 to 5999 ft	6000 to 6999 ft	7000 to 7999 ft	8000 to 8999 ft
850	38	39	40	41	41	42	42	43
900	40	41	42	42	42	43	43	44
975	41	42	42	42	43	43	44	44
1075	42	42	43	43	43	44	44	45
1170	43	44	44	44	45	45	46	47

TABLE 6
SUPPLEMENTAL ORIFICE SIZE CHART

80 Plus ONLY models with 25,000 Btu's per Burner. DO NOT USE THIS CHART FOR ANY 90 PLUS MODEL.

NATURAL GAS QUICK REFERENCE CHART FOR ORIFICE SELECTION, AT 3.5" W.C. AND APPROXIMATE FINAL FIRING RATES

Sea Level Orifice Size	Sea Level Cubic Foot at 3.5" W.C.	80 Plus Heat Value at 25,000 Btu's per Burner	ELEVATION CHART (NFG recommended orifice based on 4% derate for each 1000 foot of elevation, based on the intersection of the orifice required at Sea Level and the elevation required below)															
			0-999	1000-1999	2000-2999	3000-3999	4000-4999	5000-5999	6000-6999	7000-7999	8000-8999	9000-9999						
37	30.63	816	37	37	38	39	39	39	40	40	41	42	42	42	42	43	43	
38	29.25	855	38	38	39	40	40	41	41	41	42	42	42	42	43	43	43	
39	28.2	887	39	39	40	41	41	41	42	42	42	42	43	43	43	43	44	
40	27.03	925	40	40	41	42	42	42	42	42	43	43	43	44	44	44	44	
41	25.98	962	41	41	42	42	42	42	43	43	43	43	44	44	44	45	45	
42	24.95	1002	42	42	42	43	43	43	43	43	44	44	44	44	45	45	46	
43	22.39	1117	43	43	44	44	44	44	45	45	45	45	46	46	47	47	47	
44	21.01	1190	44	44	45	45	45	45	46	46	47	47	47	48	48	48	48	
Final Firing Rate per Burner			25,000	24,000	23,000	22,000	21,000	20,000	19,000	18,000	17,000	16,000						

All calculations are performed by using the first three columns of information only. Before beginning any calculations, determine the individual burner Btu size and heating value at Sea Level for the installation site. Each value shown in the Heat Value column is per burner at 3.5" W.C.

NOTE:
Heat Value at Sea Level, for the location of the installation, is available from the Natural Gas Supplier to that site. Orifices for all altitudes are based on Sea Level values.

Divide the individual burner capacity (25,000 for 80 plus) by the Heat Value for the site to determine the Cubic Foot value at Sea Level, or divide burner capacity by the Cubic Foot value for the Heat Value. Once you have either the Cubic Foot Value or the Heat Value you can estimate the Sea Level orifice for the site. To select the corresponding high altitude orifice, locate the site elevation on the chart above and the orifice required at Sea Level from your calculation in the first column. The correct high altitude orifice that must be installed in each individual burner is the intersection of these two points on the chart above.

LP GAS

LP Gas is a manufactured gas that has consistent heating value across most regions.

The NFGC guidelines are used with the following exception:

The recommended LP Gas high altitude orifice selections differ slightly in that the NFGC LP orifice chart, as they are not accurate for ICECO products. The National Fuel Gas Code LP orifices are based on an 11" of water column pressure at the orifice, which differs from ICECO products that use 10" of water column at the orifice. This difference requires a deviation from the NFGC orifice size recommendations. The Sea Level input should still be reduced by 4% per thousand ft. and the orifice size must be selected based on the reduced input selection chart below.

**LP GAS ORIFICE DRILL SIZE
(4% PER 1000 FT DE-RATE)
IMPORTANT: 80+ MODELS ONLY. DO NOT
USE THIS CHART FOR ANY 90+ MODELS.**

Altitude	Input (per burner) 25000	Orifice Size
0 to 2000 ft.	25000	#54
2000'-3000'	24000	#54
3000'-4000'	23000	#54
4000'-5000'	22000	#54
5000'-6000'	21000	#54
6000'-7000'	20000	#54
7000'-8000'	19000	#55
8000'-9000'	18000	#55
9000'-10000'	17000	#55

ORIFICE ORDERING INFORMATION

Orifice sizes are selected by adding the 2-digit drill size required in the orifice part number. Drill sizes available are 39 through 64; metric sizes available 1.10mm (-90) and 1.15mm (-91):

Orifice Part Number 62-22175-(drill size)

Example 1:

60 drill size orifice required
Part # 62-22175-60

Example 2:

1.15mm drill size orifice required
Part # 62-22175-91.

ALTERNATE METHOD FOR CANADIAN HIGH-ALTITUDE DERATE

In Canada, unless an orifice change is specifically mandated by local codes, an alternate method of altitude deration through a reduction in manifold pressure is acceptable as described in Table 7. This information is based on a heating value of 1000 BTU per cubic feet of natural gas, and 2500 BTU per cubic feet of LP gas.

IMPORTANT: Actual input rates must be measured onsite with manifold pressure adjustment to ensure that an actual 10% reduction in input rate is achieved.

Once this field adjustment has been made, the label shown in Figure 18 must be affixed in a conspicuous location on the front of the furnace cabinet.

NOTE: This label is supplied in the information packet shipped with each furnace.

**TABLE 7
ALTERNATE METHOD FOR CANADIAN HIGH-ALTITUDE DERATE**

IMPORTANT: 80+ Models only. Do not use this chart for any 90+ Models.

NATURAL GAS

LP GAS

ALTITUDE	INPUT	OUTPUT	ORIFICE SIZE	MANIFOLD PRESSURE
0' - 2000'	50,000	40,000	#42	3.5" W.C.
	75,000	60,000		
	100,000	80,000		
	125,000	100,000		
	150,000	120,000		
2001' - 4500'	45,000	36,000	#42	2.9" W.C.
	67,500	54,000		
	90,000	72,000		
	112,500	90,000		
	135,000	108,000		

ALTITUDE	INPUT	OUTPUT	ORIFICE SIZE	MANIFOLD PRESSURE
0' - 2000'	50,000	40,000	#54	10" W.C.
	75,000	60,000		
	100,000	80,000		
	125,000	100,000		
	150,000	120,000		
2001' - 4500'	45,000	36,000	#54	8.1" W.C.
	67,500	54,000		
	90,000	72,000		
	112,500	90,000		
	135,000	108,000		

FIGURE 18

MANIFOLD PRESSURE-CHANGE LABEL

THE MANIFOLD PRESSURE OF THIS APPLIANCE HAS BEEN FIELD ADJUSTED TO OBTAIN THE CORRECT INPUT RATING FOR INSTALLATION AT ALTITUDES BETWEEN 2,000 FEET AND 4,500 FEET ELEVATION.

LA PRESSION DU DISTRIBUTEUR D'ALIMENTATION DE CET APPAREIL A ÉTÉ AJUSTÉ SUR LES LIEUX AFIN D'OBTENIR LA BONNE PUISSANCE D'ENTRÉE POUR UNE INSTALLATION ENTRE 2000 ET 4500 PIEDS D'ALTITUDE.

92-24399-01-01

START-UP PROCEDURE

LIGHTING INSTRUCTIONS

This appliance is equipped with either a direct spark ignition device or a hot surface silicon carbide ignition device. This device lights the main burners each time the room thermostat (closes) calls for heat. See lighting instructions on the furnace.

TO START FURNACE

▲ WARNING

1. **BE SURE THAT THE MANUAL GAS CONTROL HAS BEEN IN THE "OFF" POSITION FOR AT LEAST FIVE MINUTES. DO NOT ATTEMPT TO MANUALLY LIGHT THE MAIN BURNERS. FAILURE TO FOLLOW THIS WARNING CAN CAUSE A FIRE OR AN EXPLOSION RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. 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.
5. Remove control door.
6. Move switch to the "OFF" position.
NOTE: Use only your hand to move the gas control switch. Never use tools. If the switch will not move by hand, don't try to repair it; call a qualified service technician. Force or attempted repair may result in a fire or explosion.
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow the safety instructions on the front page of this manual. If you don't smell gas, go to the next step.
8. Move switch from "OFF" position to "ON" position.
9. Replace control door.
10. Turn on all electric power to the appliance.
11. Set the thermostat to desired setting.
12. If the appliance will not operate, follow the instructions below to shut down furnace and call your service technician or gas supplier.

TO TURN OFF GAS TO FURNACE

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove control door.
4. Move switch to the "OFF" position.
5. Replace control door.

▲ WARNING

SHOULD OVERHEATING OCCUR OR THE GAS SUPPLY FAIL TO SHUT OFF, SHUT OFF THE MANUAL GAS VALVE TO THE APPLIANCE BEFORE SHUTTING OFF THE ELECTRICAL SUPPLY. FAILURE TO DO SO CAN CAUSE AN EXPLOSION OR FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

SEQUENCE OF OPERATION

UT ELECTRONIC CONTROLS & INVESYS CLIMATE CONTROLS Integrated Controls with Hot Surface Ignition.

1. Each time the thermostat "W" (Heating) contacts close, the induced draft blower (inducer) begins a prepurge cycle.
2. The air proving negative pressure switch(es) closes.
3. **5 seconds after the pressure switch(es) close, the hot surface igniter begins heating for 30 seconds to full temperature.** The induced draft blower operates for the complete heating cycle.
4. After the 30-second igniter warm up, **the gas valve opens for an 8-second trial for ignition.**
5. The igniter lights the gas burners and **stays energized for the first 7 seconds after the gas valve opens.**
6. 8 seconds after the gas valve opens **the remote flame sensor must prove flame ignition for one second** using the process of flame rectification. If the burners don't light, the system goes through another ignition sequence. It does **this up to four times.**
7. The main blower starts approximately 20 seconds after the burners ignite.
8. When the thermostat "W" (Heat Call) ends, the gas valve closes, the burners go out, the induced draft blower stops after a **10-second post-purge**, and the negative pressure switch(es) open.
9. The main blower continues until timed off by the setting on the integrated furnace control board.

Sequence if the system doesn't light or doesn't sense flame:

1. On a call for heat, the control runs the inducer for 35 seconds to prepurge.
2. 5 seconds into prepurge, the hot surface igniter heats for 30 seconds. The inducer continues to run.
3. After the 30-second igniter warm up, the gas valve opens for an 8-second trial for ignition. The inducer continues and the igniter stays energized.

4. If flame is not sensed during the 8th second after the gas valve opens, the gas valve closes, and the igniter de-energizes.
5. After a 10-second post-purge, the inducer stops and the control verifies that the pressure switch has opened. Once the open pressure switch is confirmed, the control begins the next ignition cycle by energizing the inducer for a pre-purge of 30 seconds. After the 30-second pre-purge, the igniter energizes and begins a 30-second warm-up period (inducer is still running). After a 30-second igniter warm-up period (60 sec. of ind. running), the gas valve opens and the control looks for a flame signal for up to 8 seconds. If no flame is sensed, the control goes into "self-healing" mode, in which the blower and inducer both run for three minutes before another ignition attempt is made.
NOTE: The following applies only to units manufactured before third Quarter 2003: After 5-second inter-purge, the control begins a 30-second pre-purge followed by a 30-second igniter warm-up period (inducer is still running). After the 30-second igniter warm-up period, the gas valve opens and the control looks for a flame signal for up to 8 seconds. If no flame is sensed, the control goes into "self-healing" mode, in which the blower and inducer both run for three minutes before another ignition attempt is made.
6. The control attempts to ignite up to four times (first attempt followed by three retries). After the fourth failure to ignite, the control goes into a one-hour "soft-lockout," during which the control will not respond to the thermostat heat call (W). The lockout can be reset by shutting off main power to the furnace for five seconds, or by turning the heat call (W) from the thermostat off and then back on. Note that second and fourth ignition attempts will have a 30-second pre-purge followed by a 30-second igniter warm-up period. This prevents the igniter from overheating.
7. The above sequence will repeat after a one hour delay. It will continue repeating until ignition is successful or the call for heat is terminated.
8. **To reset the lock out, make and break power either at the thermostat or at the unit disconnect switch for 5 to 10 seconds.** It then goes through another set of trials for ignition.

UT Electronic Controls Direct Spark Ignition

- Each time the thermostat contacts close, the induced draft blower (inducer) begins a prepurge cycle.
- The air proving negative pressure switch(es) closes.
- 30 seconds after the pressure switch(es) close, the spark igniter energizes.** The induced draft blower operates for the complete heating cycle.
- After the spark igniter energizes, **the gas valve opens for a 8 second trial for ignition.**
- The igniter lights the gas burners.
- After the gas valve opens **the flame sensor must prove flame ignition for one second** using the process of flame rectification. If the burners don't light, the system goes through another ignition sequence. It does this **up to four times.**
- The main blower starts 20 seconds after the burners ignite.
- When the thermostat cycle ends, the gas valve closes, the burners go out, the induced draft blower stops after a **10-second post-purge**, and the negative pressure switch(es) open.
- The main blower continues until timed off by the setting on the integrated furnace control board.

Sequence if the system doesn't light or doesn't sense flame:

- On a call for heat, the control runs the inducer for 30 seconds to pre-purge.
- After the 30-second pre-purge, the spark igniter energizes. The inducer continues to run.
- After the spark igniter energizes, the gas valve opens for an 8-second trial for ignition. The inducer continues and the igniter stays energized.
- If flame is not sensed within 8 seconds after the gas valve opens, the gas valve closes, the igniter de-energizes and:
- The inducer completes a 10-second post-purge, the inducer stops, and the control verifies that the pressure switch has opened. Once the open pressure switch is confirmed, the control begins the next ignition cycle by energizing the inducer for a pre-purge of 30 seconds. After the pre-purge, the igniter energizes and the gas valve opens (inducer continues to run). If no flame is sensed on the second attempt, the control goes into a "self-healing" mode, in which the blower and the inducer run for 3 minutes before another ignition attempt is made.

NOTE: The following applies only to units manufactured before third Quarter 2003: After a 30-second inter-purge (inducer runs continuously), the igniter is energized, and the gas valve opens for 8 seconds. If flame is not sensed in 8 seconds, the gas valve is closed and the igniter de-energizes. If no flame is sensed on this second

attempt, the control goes into a "self-healing" mode, in which the blower and inducer run for 3 minutes before another ignition attempt is made.

- The control attempts to ignite up to four times (first attempt followed by three retries). After the fourth failure to ignite, the control goes into a one-hour "soft-lockout" during which the control will not respond to the thermostat heat call (W). The lockout can be reset by shutting off main power to the furnace for five seconds, or by turning the heat call (W) from the thermostat off and then back on.
- The above sequence will repeat after a one hour delay. It will continue repeating until ignition is successful or the call for heat is terminated.
- To reset the lock out, make and break power either at the thermostat or at the unit disconnect switch for 5 to 10 seconds. It then goes through another set of trials for ignition.

SETTING BLOWER TIMINGS

The UT Electronic Controls and Invensys Climate Controls IFC's (integrated furnace controls) have four quick connect terminals for connecting the motor speed leads. These are:

- FAN SPEED — motor runs on this speed when the thermostat is in the "FAN" position.
- COOL — connect desired cooling speed.
- HEAT — connect desired heating speed.
- HEAT/COOL — connect desired speed when heating and cooling speed are the same.

NOTE: This tap (heat/cool) not available on 80PJ or 80LJ.

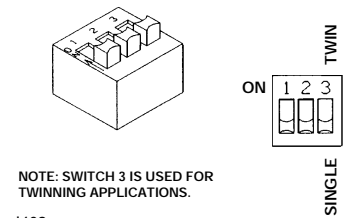
IMPORTANT: Do not connect any motor speeds to "HEAT" or "COOL" if you use the "HEAT/COOL" terminal.

- If heating and continuous speed are the same, jump across "FAN" and "HEAT" terminals.

NOTE: This does not apply to 80PJ or 80LJ models because the heat tap functions as the continuous fan tap as well.

See Figures 18, 19 & 20 for instructions for setting the blower "OFF" timings.

FIGURE 18
UT Electronic Controls 1028-928
BLOWER OFF TIMINGS

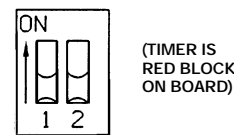


NOTE: SWITCH 3 IS USED FOR TWINNING APPLICATIONS.

1402

OFF TIME	SWITCH 1	SWITCH 2
90 SEC.	OFF	ON
120 SEC.	OFF	OFF
160 SEC.	ON	OFF
180 SEC.	ON	ON

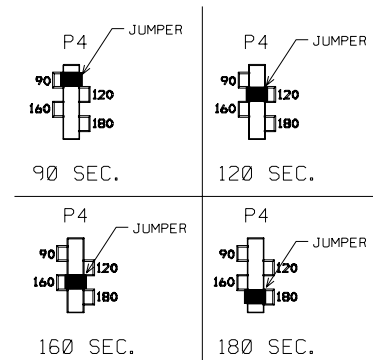
FIGURE 19
UT Electronic Controls 1012-925A
and Invensys Climate Controls
ICC-H1MC7
BLOWER OFF TIMINGS



1335

OFF TIME	SWITCH 1	SWITCH 2
90 SEC.	OFF	ON
120 SEC.	OFF	OFF
160 SEC.	ON	OFF
180 SEC.	ON	ON

FIGURE 20
UT Electronic Controls 1012-925B
BLOWER OFF TIMINGS



GAS FURNACE (DIRECT DRIVE) INSTRUCTIONS FOR CHANGING BLOWER SPEED

⚠ WARNING

DISCONNECT THE ELECTRICAL SUPPLY TO THE FURNACE BEFORE ATTEMPTING TO CHANGE THE BLOWER SPEED. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

The blower motor is wired for blower speeds required for normal operation as shown.

If additional blower speed taps are available (leads connected to "M1" and "M2" on the electronic control), speeds may be changed if necessary to fit requirements of the particular installation. Reconnect the unused motor leads to "M1" or "M2." Check motor lead color for speed designation.

Heating speeds should not be reduced where it could cause the furnace air temperature to rise to exceed the maximum outlet air temperature specified for the unit.

IMPORTANT: Always check air temperature rise after changing the heating speed for any reason.

AIR FLOW

The importance of proper air flow over the heat exchanger cannot be over emphasized.

⚠ CAUTION

IT IS IMPORTANT THAT EACH DUCT SYSTEM BE SIZED AND INSTALLED FOR THE SPECIFIC APPLICATION BY PROPERLY APPLYING THE APPROPRIATE INDUSTRY ACCEPTED STANDARD. IF LESS THAN MINIMUM STANDARDS ARE APPLIED, THE EQUIPMENT USER COULD EXPECT TO EXPERIENCE HIGHER UTILITY BILLS, MAJOR COMPONENT FAILURE, VARYING DEGREES OF AIR NOISE OR OTHER UNSATISFACTORY ISSUES, OVER WHICH THE MANUFACTURER HAS NO CONTROL.

TEMPERATURE RISE CHECK

To determine if the air flow is correct, make a temperature rise check.

1. Insert a thermometer in the supply air duct as close to the furnace as possible yet out of a direct line from the heat exchanger. See Figure 21.
2. Insert a thermometer in the return air duct as close to the furnace as possible.

FIGURE 21
TEMPERATURE RISE MEASUREMENT

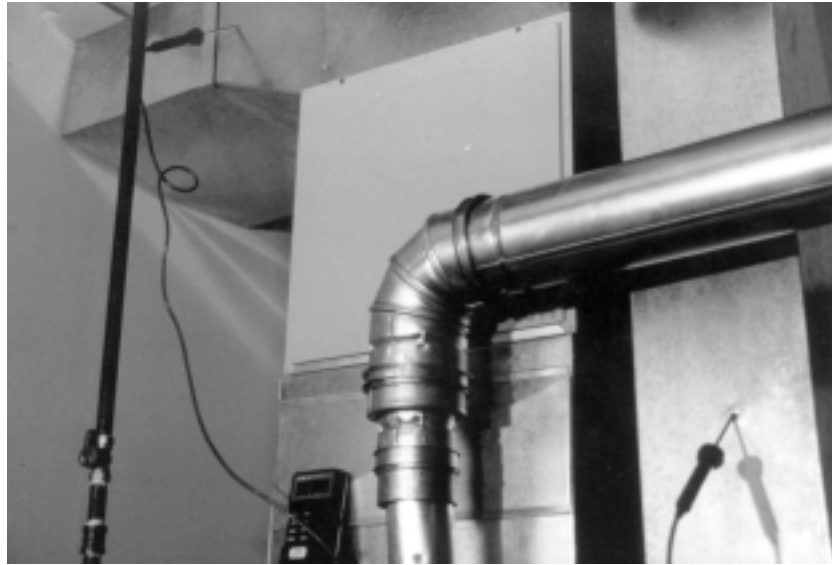


FIGURE 22
TYPICAL FURNACE NAME PLATE


 AIR CONDITIONING DIVISION
 FORT SMITH, ARKANSAS




 CANADIAN ENERGY PERFORMANCE VERIFIED
 VERIFIÉMENT ÉNERGETIQUE VERIFIÉ

MODEL NO./NUMERO DE MODELE: GPN-05NAUER
 SERIAL NO./NUMERO DE SERIE: TEST HFD. DATE 05 /2004

CATEGORY I FORCED AIR FURNACE FOR INDOOR INSTALLATION ONLY. IN A BUILDING CONSTRUCTED ON-SITE. CATÉGORIE I GÉNÉRATEUR D'AIR CHAUD À AIR FORCÉE POUR INSTALLATION À L'INTÉRIEUR SEULEMENT, DANS UN BÂTIMENT CONSTRUIT SUR LE SITE.

ELECTRIC 115 V. 60 HZ. 1 PH., MAXIMUM TOTAL INPUT 6.8 AMPS.
 ELECTRIQUE 115 V. 60 HZ 1 PH., PUISSANCE D'ENTRÉE TOTALE MAXIMUM 6.8 A.
 MAXIMUM OVERCURRENT PROTECTION 15 AMPERES. DISJONCTEUR À MAXIMA 15 A.

HOURLY INPUT RATING DEBIT CALORIFIQUE MAXIMUM Btu/hr (kw)	HOURLY INPUT RATING DEBIT CALORIFIQUE MINIMUM Btu/hr (kw)	FACTORY EQUIPPED FOR AGENCE À L'USAGE POUR FOR GAS / GAZ
50,000 (14.65)		NATURAL / NATUREL

THIS APPLIANCE EQUIPPED FOR ALTITUDES/ CET APPAREIL EST ÉQUIPÉ POUR ALTITUDES COMPOSÉES

ENTRÉE Ø (D) - 2.000 (63.0) (COMMON ONLY) FT. (M)/PIEDS (M)

ORIFICE/ INJECTEUR # 42 DMS (COMMON ONLY) NATURAL GAS/ LP GAS OR PROP./
 LIMET SETTING/LIMITE COUPE-CIRCUIT 145 (63) °F(°C) GAZ NATUREL GAZ DE PÉTROLE
 AUXILIARY LIMET SETTING/ LIQUÉFIÉ OU PROP.

LIMITE COUPE-CIRCUIT AUXILIAIRE 105 (40)(1.5W) °F(°C)	IN. W.C. (kPa)/ PO. C.B. (kPa)	IN. W.C. (kPa)/ PO. C.B. (kPa)
MAXIMUM PERMISSIBLE GAS SUPPLY PRESSURE TO FURNACE PRESSION MAXIMUM D'ALIMENTATION EN GAZ À CHAUDIÈRE	18.5 (2.61)	13.0 (3.23)
MINIMUM GAS SUPPLY PRESSURE FOR PURPOSES OF INPUT ADJUSTMENT PRESSION MINIMUM D' ALIMENTATION EN GAZ POUR LE RÉGLAGE DE PUISSANCE D'ENTRÉE	5.0 (1.24)	11.0 (2.73)
MINIFOLD PRESSURE/PRESSION A LA TUBULURE	5.0 (1.24)	11.0 (2.73)
	3.5 (0.87)	10.0 (2.49)

AIR TEMPERATURE RISE/ AUGMENTATION DE LA TEMPÉRATURE DE L'AIR	25 (14) TO 55 (31) °F(°C)	BLOWER/ SOUFFLEUR	MOTOR FORCE
MAXIMUM EXTERNAL STATIC PRESSURE PRESSION STATIQUE EXTERIEURE MAXIMALE INCHES W.C. (kPa)/PO. C.B. (kPa)		INCH (mm)/PO. (mm)	HP (W)
.10 (.26)		11-6 (279-252)	1/2 (137)
.50 (1.25)		11-6 (279-252)	1/2 (137)

ANSI Z21.47b • CSA 2.3b -2002 CENTRAL FURN. MADE IN THE USA 91-22176-09

BLOWER PERFORMANCE DATA – 80PJ UPFLOW/HORIZONTAL MODELS

MODEL (BTU)	BLOWER SIZE	MOTOR H.P.	BLOWER SPEED	CFM AIR DELIVERY EXTERNAL STATIC PRESSURE INCHES WATER COLUMN						
				.1	.2	.3	.4	.5	.6	.7
50.000	11X6	½	LOW	675	655	635	610	585	555	520
			MED-LO	950	930	905	880	860	830	800
			MED-HI	1115	1090	1070	1040	1015	985	945
			HI	1270	1250	1225	1200	1165	1130	1085
75.000	11X6	½	LOW	970	955	940	910	880	845	805
			MEDIUM	1110	1090	1070	1040	1010	975	935
			HIGH	1265	1240	1210	1175	1140	1100	1055
75.000	11X7	½	LOW	1245	1220	1195	1165	1135	1105	1065
			MEDIUM	1555	1515	1475	1435	1395	1350	1300
			HIGH	1810	1755	1705	1645	1585	1530	1470
100.000	11X7	½	LOW	1050	1040	1030	990	960	920	890
			MEDIUM	1220	1195	1160	1140	1105	1065	1020
			HIGH	1410	1380	1345	1300	1255	1205	1150
100.000	11X10	½	LOW	1295	1275	1250	1225	1195	1165	1135
			MEDIUM	1645	1615	1580	1550	1510	1465	1425
			HIGH	2045	2000	1955	1905	1845	1785	1720
100.000	11X10	¾	LOW	1645	1615	1580	1550	1510	1465	1425
			MEDIUM	2045	2000	1955	1905	1845	1785	1720
			HIGH	2320	2260	2200	2130	2060	1985	1910
125.000	11X10	½	LOW	1280	1275	1265	1245	1215	1185	1145
			MEDIUM	1645	1635	1615	1590	1560	1520	1470
			HIGH	2050	2015	1980	1935	1885	1835	1775
125.000	11X10	¾	LOW	1645	1635	1615	1590	1560	1520	1470
			MEDIUM	2050	2015	1980	1935	1885	1835	1775
			HIGH	2365	2310	2250	2185	2115	2035	1950
150.000	11X10	½	LOW	1270	1250	1220	1195	1165	1135	1105
			MEDIUM	1620	1595	1570	1545	1515	1480	1440
			HIGH	2010	1985	1960	1915	1850	1800	1730
150.000	11X10	¾	LOW	1620	1595	1570	1545	1515	1480	1440
			MEDIUM	2010	1985	1960	1915	1850	1800	1730
			HIGH	2340	2275	2215	2145	2080	2010	1940

92-23671-09-00

BLOWER PERFORMANCE DATA – 80LJ DOWNFLOW MODELS ONLY

MODEL (BTU)	BLOWER SIZE	MOTOR H.P.	BLOWER SPEED	CFM AIR DELIVERY EXTERNAL STATIC PRESSURE INCHES WATER COLUMN						
				.1	.2	.3	.4	.5	.6	.7
50.000	11X6	½	LOW	735	715	690	660	635	605	575
			MED-LO	1025	1015	995	975	955	930	905
			MED-HI	1185	1165	1150	1130	1100	1075	1040
			HI	1345	1330	1310	1295	1265	1235	1205
75.000	11X6	½	LOW	990	975	955	935	905	875	835
			MEDIUM	1140	1125	1105	1080	1050	1020	980
			HIGH	1300	1290	1265	1245	1215	1180	1140
75.000	11X7	½	LOW	1210	1205	1195	1180	1165	1155	1130
			MEDIUM	1580	1560	1550	1530	1495	1465	1430
			HIGH	1915	1880	1825	1790	1740	1675	1600
100.000	11X7	½	LOW	1070	1055	1040	1010	980	945	905
			MEDIUM	1240	1210	1190	1165	1135	1095	1055
			HIGH	1420	1395	1370	1340	1305	1265	1220
100.000	11X10	½	LOW	1330	1295	1285	1245	1225	1205	1160
			MEDIUM	1690	1670	1655	1615	1585	1565	1525
			HIGH	—	2085	2055	2005	1970	1945	1880
100.000	11X10	¾	LOW	1690	1670	1655	1615	1585	1565	1525
			MEDIUM	—	2085	2055	2005	1970	1945	1880
			HIGH	—	2410	2355	2305	2240	2165	2100
125.000	11X10	½	LOW	1330	1295	1280	1240	1215	1210	1175
			MEDIUM	—	1690	1660	1635	1580	1535	1480
			HIGH	—	2090	2035	1985	1930	1850	1785
125.000	11X10	¾	LOW	—	1690	1660	1635	1580	1535	1480
			MEDIUM	—	2090	2035	1985	1930	1850	1785
			HIGH	—	2395	2335	2260	2185	2080	1965
150.000	11X10	½	LOW	1300	1280	1230	1205	1175	1115	1030
			MEDIUM	1675	1650	1620	1570	1545	1485	1425
			HIGH	2105	2075	2035	1990	1955	1900	1815
150.000	11X10	¾	LOW	1675	1650	1620	1570	1545	1485	1425
			MEDIUM	2105	2075	2035	1990	1955	1900	1815
			HIGH	—	—	—	—	—	—	—

92-23671-10-00

3. Operate the furnace.
4. When the thermometer in the supply air duct stops rising (approximately five minutes), subtract the return air temperature from the supply air temperature. The difference is the temperature rise.
5. Compare the measured temperature rise to the approved temperature rise range listed on the furnace name plate. See Figure 22.

If the measured temperature rise is above the approved range, the air flow is too low. More air must be moved by speeding up the blower, by removing

restrictions in the duct system, or by adding more supply or return air duct. If the measured temperature rise is below the approved range, the air flow is too much. Use lower speed tap on the multi-speed blower.

Ideally the measured temperature rise should be in the middle of the range.

IMPORTANT: Some high-efficiency filters have a greater than normal resistance to airflow. This can adversely affect furnace operation. **BE SURE TO CHECK AIRFLOW** if using any filter other than factory-provided filter.

SAFETY FEATURES

LIMIT CONTROL

The high limit cut-off temperature is set at the factory and cannot be adjusted. The temperature setting prevents the air temperature leaving the furnace from exceeding the maximum outlet air temperature, which, if exceeded, will shut the furnace down.

There are several reasons for a limit switch to open and almost always involve low airflow through the furnace.

1. A dirty or restricted air filter.
2. A dirty or restricted cooling coil.
3. Undersized or restricted return air system.
4. Undersized or restricted supply air system.
5. A problem affecting the main blower:
 - A. A wrong speed tap selection.
 - B. Failing motor bearings.
 - C. Low voltage to the motor.
 - D. Dirty blower wheel.
 - E. Wrong motor rotation.
 - F. Blower wheel slipping on the motor shaft.

6. Overfiring the furnace with too much gas pressure.

7. Ventilation problems.

FLAME ROLL-OUT SAFETY SWITCHES

Furnaces are equipped with safety switches to protect against flame roll-out conditions in the burner compartment, which, if tripped, will terminate the heating cycle. In the event of a flame roll-out condition, the switch will shut the furnace down. If a switch is tripped, it must be manually reset. **DO NOT** jumper or reset this switch. If this switch should trip, a qualified installer, service agency or the gas supplier should be called to diagnose and/or correct the source of tripping. If this unit is mounted in a closet, the door must be closed when making this check.

PRESSURE SWITCH

This furnace is equipped with a normally-open pressure switch that monitors pressure conditions within the furnace vent system during the heating cycle.

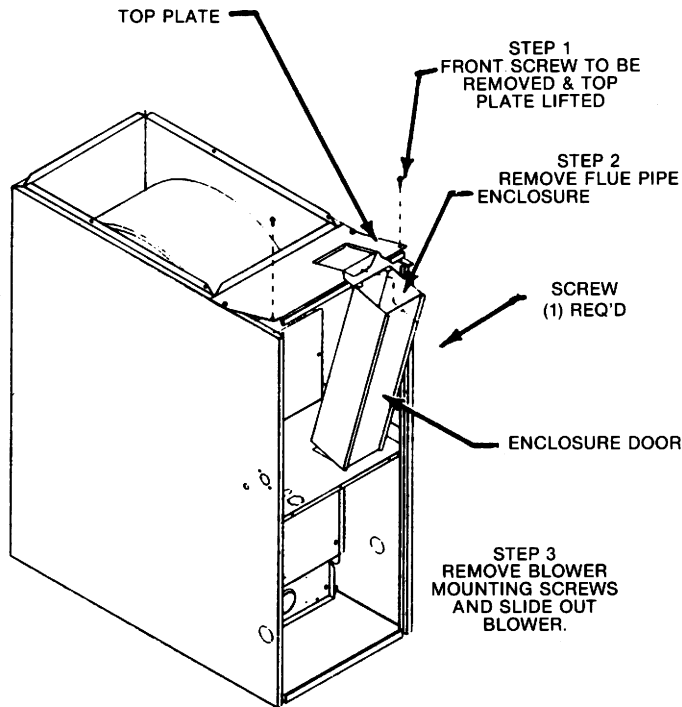
There are several reasons for the pressure switch not to close.

1. An inoperative induced draft blower.
2. A loose or leaky pressure switch hose.
3. A blockage in the vent.
4. Severe downdrafts canceling the draft from the inducer fan.
5. A leaky gasket at the induced draft blower.
6. Improperly sized or installed vent.

The pressure switch contacts must open before the unit can go through another heating cycle.

See troubleshooting chart in this book for troubleshooting recommendations.

FIGURE 23
DOWNFLOW BLOWER REMOVAL



NOTE: FLUE PIPE ENCLOSURE & ENCLOSURE DOOR MUST BE REMOVED FOR BLOWER REMOVAL.

LUBRICATION

The indoor blower motor and induced draft motor are prelubricated by the motor manufacturer and do not require further attention.

The motors must be cleaned periodically by a qualified installer, service agency, or the gas supplier to prevent the possibility of overheating due to an accumulation of dust and dirt on the windings or on the motor exterior. Air filters should be kept clean. Dirty filters can restrict airflow and results in motor overheating.

Reference Figure 22 for proper removal of the blower assembly on downflow models.

MAINTENANCE

⚠ WARNING

DISCONNECT MAIN ELECTRICAL POWER TO THE UNIT BEFORE ATTEMPTING ANY MAINTENANCE. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

FILTERS

NOTE: 80PJ and 80LJ models are not factory equipped with filters. Filters must be field installed.

Filter application and placement are critical to airflow, which may affect the heating and cooling system performance. Reduced airflow can shorten the life of the systems major components, such as motor, limits, elements, heat exchanger, evaporator coil or compressor. Consequently, we recommend that the return air duct system have only one filter location. The most common location will be inside the furnace or air handler or a filter base. For systems with a return air filter grill or multiple filter grills, can have a filter installed at each of the return air openings. **DO NOT DOUBLE FILTER THE RETURN AIR DUCT SYSTEM. DO NOT FILTER THE SUPPLY AIR DUCT SYSTEM.**

If high efficiency filters or electronic air cleaners are used in the system, it is

FIGURE 24
RESIZING FILTERS & FRAME

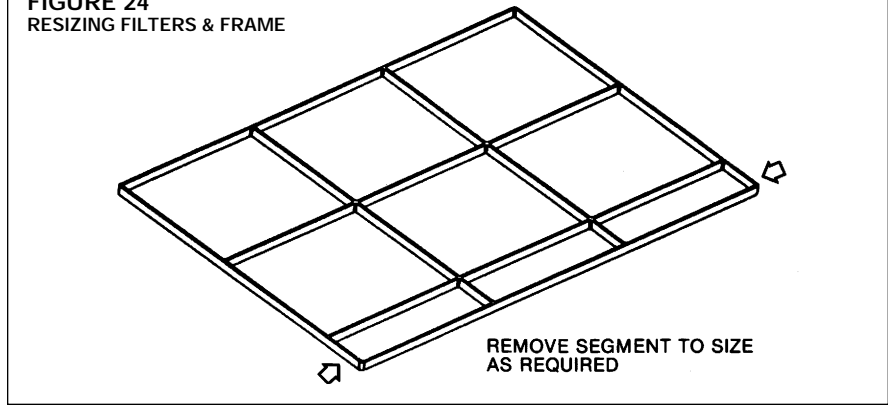


TABLE 8 FILTER SIZES

UPFLOW FILTER SIZES				
FURNACE WIDTH	INPUT BTUH	BOTTOM SIZE	SIDE SIZE	QUANTITY
14	45 & 50	12 1/4" X 25"	15 1/4" X 25"	1
17 1/2"	67, 75 & 100	15 1/4" X 25"	15 1/4" X 25"	1
21"	100	19 1/4" X 25"	15 1/4" X 25"	1
24 1/2"	125 & 150	22 1/4" X 25"	15 1/4" X 25"	1
DOWNFLOW FILTER SIZES				
FURNACE WIDTH	INPUT BTUH	SIZE	QUANTITY	
14"	45 & 50	14" X 20"	1	
17 1/2"	67, 75 & 100	12" X 20"	2	
21"	100	12" X 20"	2	
24 1/2"	125 & 150	14" X 20"	2	

***NOTE:** Some filters must be resized to fit certain units and applications.

FIGURE 25
BOTTOM RETURN

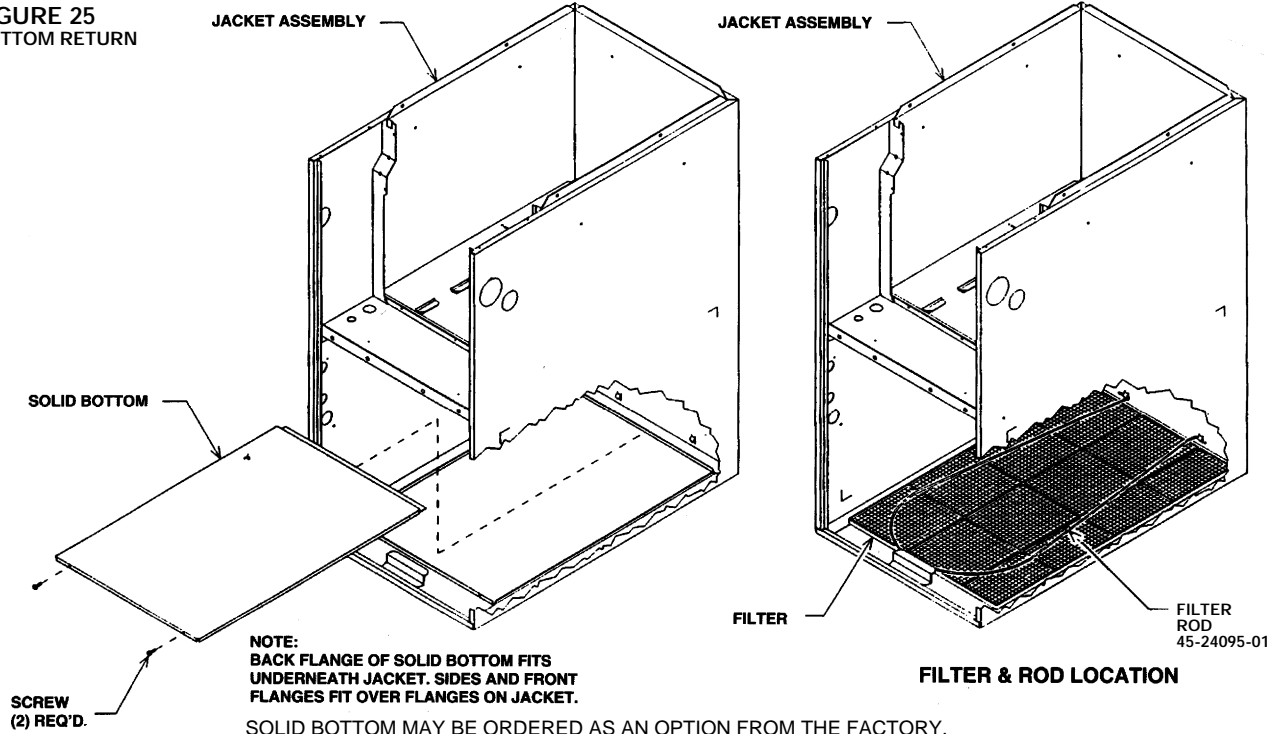
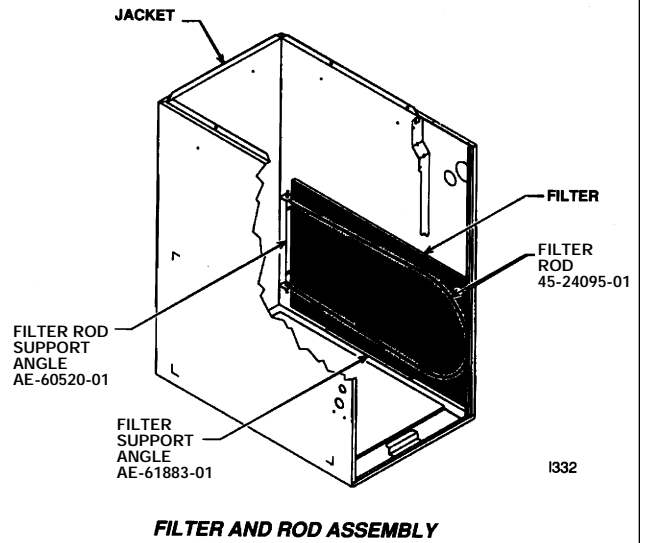
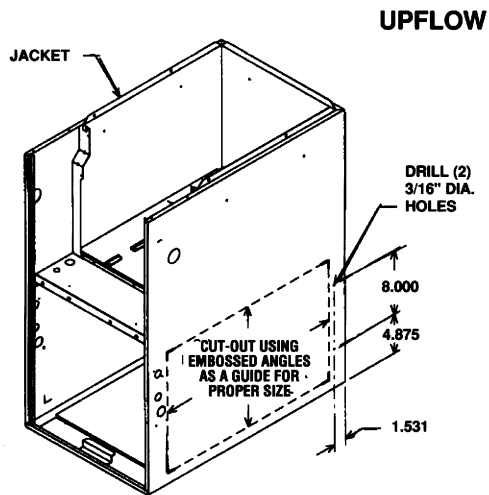
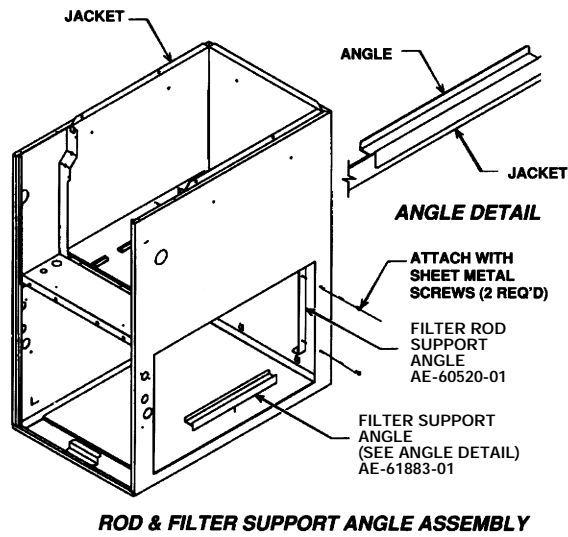


FIGURE 26
FILTER RETAINING ROD (SIDE RETURN)

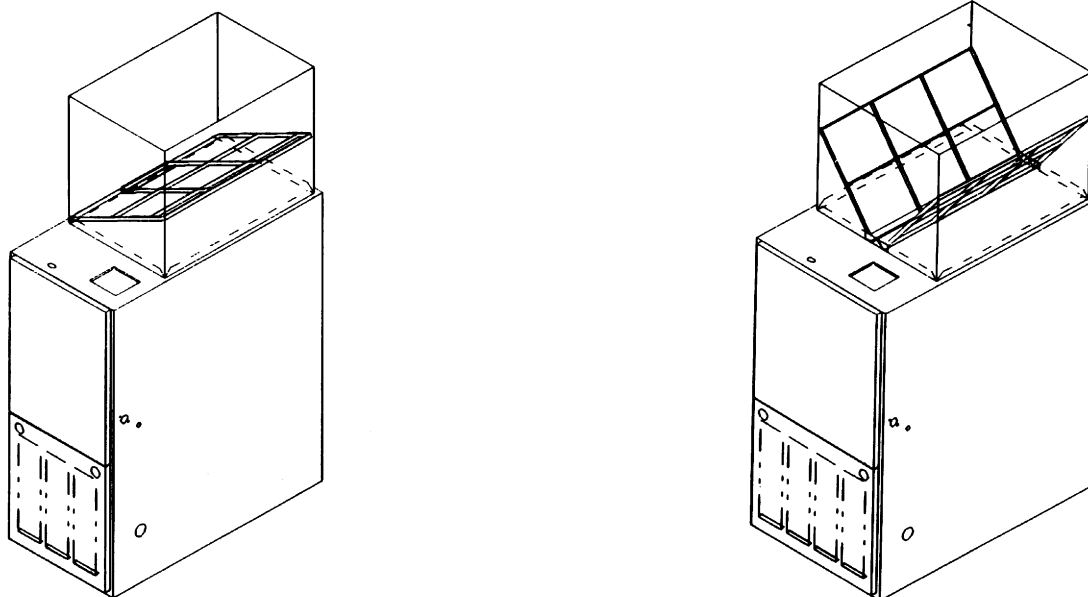


CUT-OUT AND DRILL DETAIL



1332

FIGURE 27
DOWNFLOW FILTER INSTALLATION



important that the airflow is not reduced to maximize system performance and life. Always verify that the systems airflow is not impaired by the filtering system that has been installed, by performing a temperature rise and temperature drop test.

Keep the air filters clean at all times. Vacuum dirt from filter, wash with detergent and water, air dry thoroughly and reinstall.

See Table 8 and Figures 24, 25, 26, and 27 for proper filter sizes and locations.

1. 14"- 50,000 BTUH unit requires removal of 3½" segment of filter and frame to get proper width for a bottom filter.
2. 21"-100,000 BTUH unit requires removal of 3½" segment of filter and frame to get proper width for a side filter.
3. 24½"-125,000 and 150,000 BTUH units require removal of 7" segment of filter and frame to get proper width for a side filter.

IMPORTANT: Do not operate the system without filters. A portion of the dust entrained in the air may temporarily lodge in the air duct runs and at the supply registers. Any recirculated dust particles will be heated and charred by contact with the furnace heat exchanger. This residue will soil ceilings, walls, drapes, carpets, and other household articles.

SYSTEM OPERATION INFORMATION

Advise The Customer To:

1. Keep the air filters clean. The heating system will operate better, more efficiently and more economically.
2. Arrange the furniture and drapes so that the supply air registers and the return air grilles are unobstructed.
3. Close doors and windows. This will reduce the heating load on the system.
4. Avoid excessive use of kitchen & bathroom exhaust fans.
5. Do not permit the heat generated by television, lamps or radios to influence the thermostat operation.
6. Except for the mounting platform, keep all combustible articles three feet from the furnace and vent system.
7. **IMPORTANT:** Replace all blower doors and compartment covers after servicing the furnace. Do not operate the unit without all panels and doors securely in place.
8. Proper operation of the system with constant air circulation.

▲ WARNING

COMBUSTIBLE MATERIAL MUST NOT BE PLACED ON OR AGAINST THE FURNACE JACKET OR WITHIN THE SPECIFIED CLEARANCES OF THE VENT PIPE. THE AREA AROUND THE FURNACE MUST BE KEPT CLEAR AND FREE OF ALL COMBUSTIBLE MATERIALS INCLUDING GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS. PLACEMENT OF COMBUSTIBLE MATERIALS ON, AGAINST OR AROUND THE FURNACE JACKET CAN CAUSE AN EXPLOSION OR FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH. THE FURNACE OWNER SHOULD BE CAUTIONED THAT THE FURNACE AREA MUST NOT BE USED AS A BROOM CLOSET OR FOR ANY OTHER STORAGE PURPOSES.

ANNUAL INSPECTION

The furnace should operate for many years without excessive scale build-up in the flue passageways, however, it is recommended that a qualified installer, service agency, or the gas supplier actually inspect the flue passageways, the vent system and the main and pilot burners for continued safe operation paying particular attention to deterioration from corrosion or other sources.

▲ WARNING

HOLES IN THE VENT PIPE OR HEAT EXCHANGER CAN CAUSE TOXIC FUMES TO ENTER THE HOME RESULTING IN CARBON MONOXIDE POISONING OR DEATH. THE VENT PIPE OR HEAT EXCHANGER MUST BE REPLACED IF THEY LEAK.

- **IMPORTANT:** It is recommended that at the beginning of the heating season and approximately midway in the heating season a visual inspection be made of the main burner flames and pilot flame on standing pilot models for the desired flame appearance by a qualified installer, service agency, or the gas supplier.

- **IMPORTANT:** It is also recommended that at the beginning of the heating season, the flame sensor on hot surface ignition models be cleaned with steel wool by a qualified installer, service agency, or the gas supplier.
- **IMPORTANT:** It is recommended that an annual inspection and cleaning of all furnace markings be made to assure legibility. Attach a replacement marking, which can be obtained through the distributor, if any are found to be illegible or missing.

IMPORTANT: FOR Nox MODELS – At the beginning of the heating season a visual inspection of the Nox device should be made to ensure they have not become obstructed by insects nests or anything else which may effect performance.

REPLACEMENT PARTS

Contact your local distributor for a complete parts list. See enclosed sheet.

TROUBLESHOOTING

Refer to Figure 28 for determining cause of unit problems.

WIRING DIAGRAM

Figures 29 and 30 are complete wiring diagrams for the furnace and power sources.

FIGURE 28
TROUBLESHOOTING FLOWCHART

**INTEGRATED FURNACE CONTROL (IFC)
TROUBLESHOOTING GUIDE**

NOTE: Most failures are not due to the IFC. Double check all other possibilities, including the ground connection, before replacing the IFC.

NOTE: Always verify gas valve inlet and outlet gas pressure.

WARNING

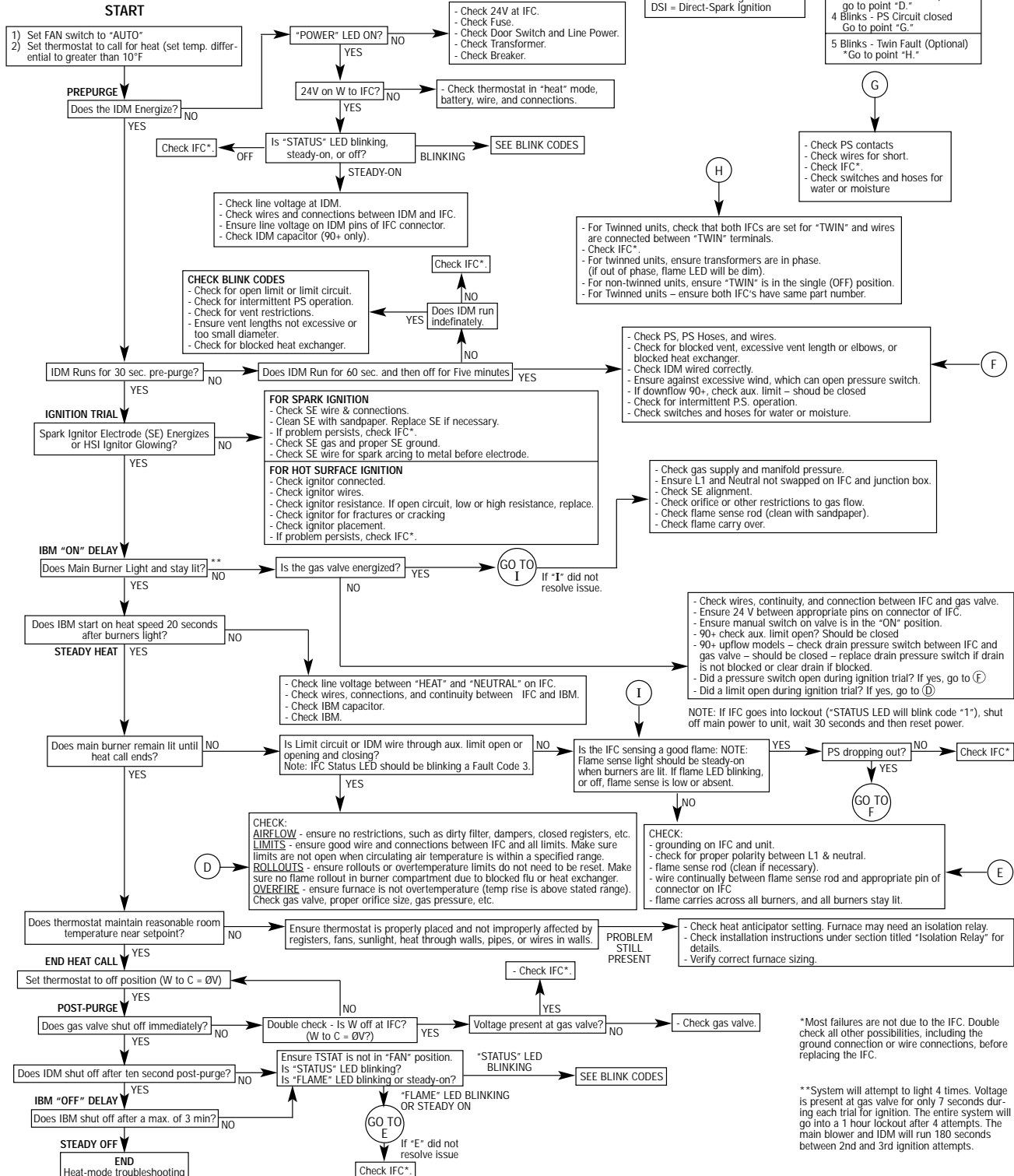
HAZARDOUS VOLTAGE
LINE VOLTAGE CONNECTIONS

DISCONNECT POWER BEFORE SERVICING.
SERVICE MUST BE BY A TRAINED, QUALIFIED SERVICE TECHNICIAN.

FLAME (AMBER) LED CODES
OFF = No Flame Present
RAPID BLINK = Unexpected Flame
SLOW BLINK = Marginal Flame Sense
STEADY ON = Normal Flame Sense

KEY TO ABBREVIATIONS
IBM = Indoor Blower Motor
IDM = Induced Draft Motor
IFC = Integrated Furnace Control
PS = Pressure Switch(es)
SE = Spark Electrode
HSI = Hot-Surface Ignition
DSI = Direct-Spark Ignition

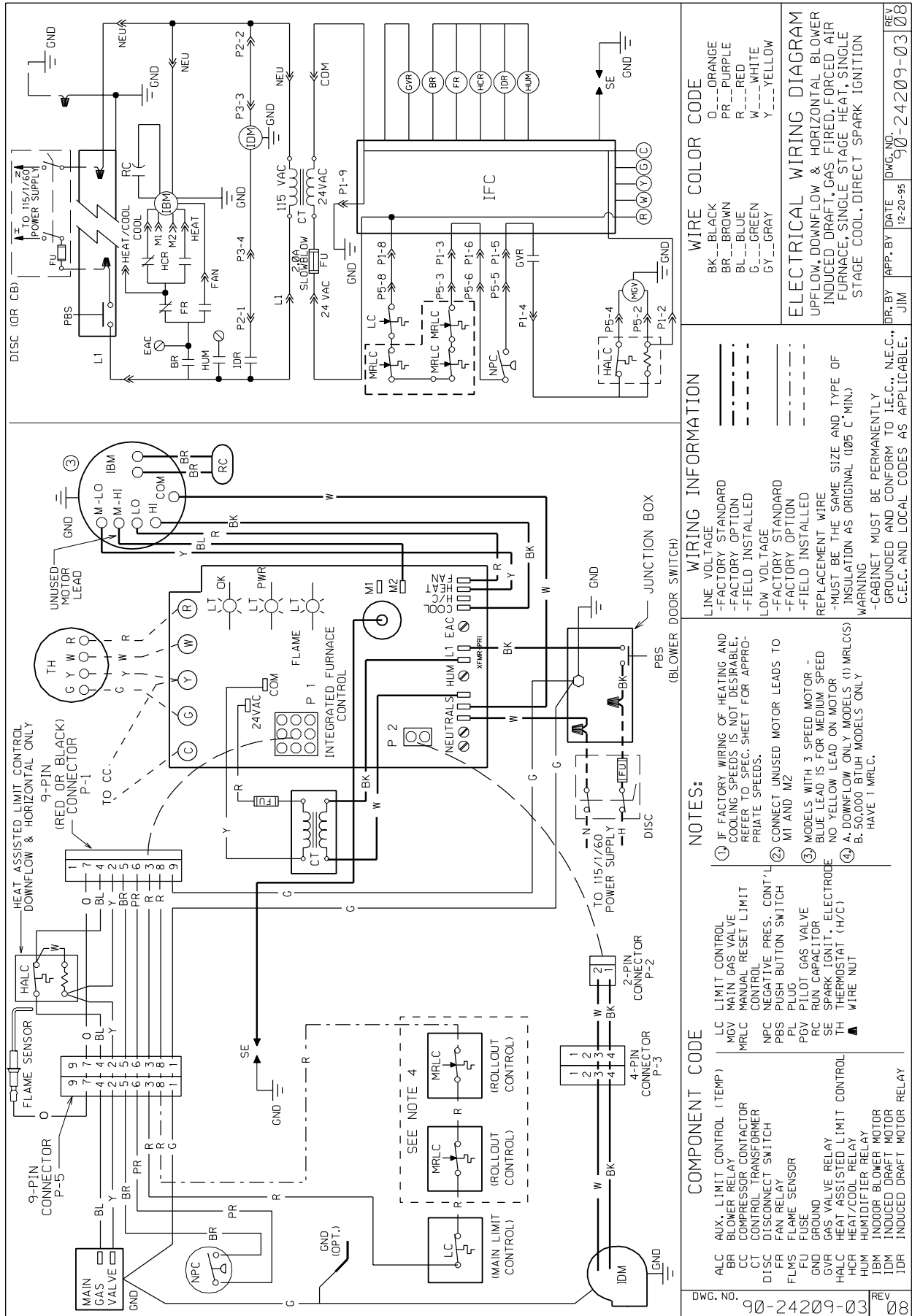
BLINK CODES (GREEN LED)
1 Blink - Soft lockout
Reset System power and start over from beginning
2 Blinks - PS Circuit open
go to point "F."
3 Blinks - Limit circuit open
go to point "D."
4 Blinks - PS Circuit closed
Go to point "G."
5 Blinks - Twin Fault (Optional)
*Go to point "H."



REPEAT THIS PROCEDURE UNTIL TROUBLE-FREE OPERATION IS OBTAINED.

92-101654-01-00

FIGURE 29
FOR MODELS WITH UT ELECTRONIC CONTROLS 1028-928 INTEGRATED FURNACE CONTROL AND DIRECT SPARK IGNITION



WIRE COLOR CODE

BK	BLACK
BR	BROWN
BL	BLUE
R	RED
W	WHITE
GY	GRAY
O	ORANGE
PR	PURPLE
Y	YELLOW

ELECTRICAL WIRING DIAGRAM
 UPFLOW, DOWNFLOW & HORIZONTAL BLOWER
 INDUCED DRAFT, GAS FIRED, FORCED AIR
 FURNACE, SINGLE STAGE HEAT, SINGLE
 STAGE COOL, DIRECT SPARK IGNITION

WIRING INFORMATION

LINE VOLTAGE
 -FACTORY STANDARD
 -FACTORY OPTION
 -FIELD INSTALLED

LOW VOLTAGE
 -FACTORY STANDARD
 -FACTORY OPTION
 -FIELD INSTALLED

REPLACEMENT WIRE
 -MUST BE THE SAME SIZE AND TYPE OF
 INSULATION AS ORIGINAL (105 C MIN.)
 WARNING
 -CABINET MUST BE PERMANENTLY
 GROUNDED AND CONFORM TO I.E.C., N.E.C.,
 C.E.C. AND LOCAL CODES AS APPLICABLE.

- NOTES:**
- IF FACTORY WIRING OF HEATING AND COOLING SPEEDS IS NOT DESIRABLE, REFER TO SPEC. SHEET FOR APPROPRIATE SPEEDS.
 - CONNECT UNUSED MOTOR LEADS TO MI AND MZ
 - MODELS WITH 3 SPEED MOTOR - BLUE LEAD IS FOR MEDIUM SPEED NO YELLOW LEAD ON MOTOR
 - A. DOWNFLOW ONLY MODELS (1) MRLC(S) HAVE 1 MRLC.
 B. 50,000 BTUH MODELS ONLY

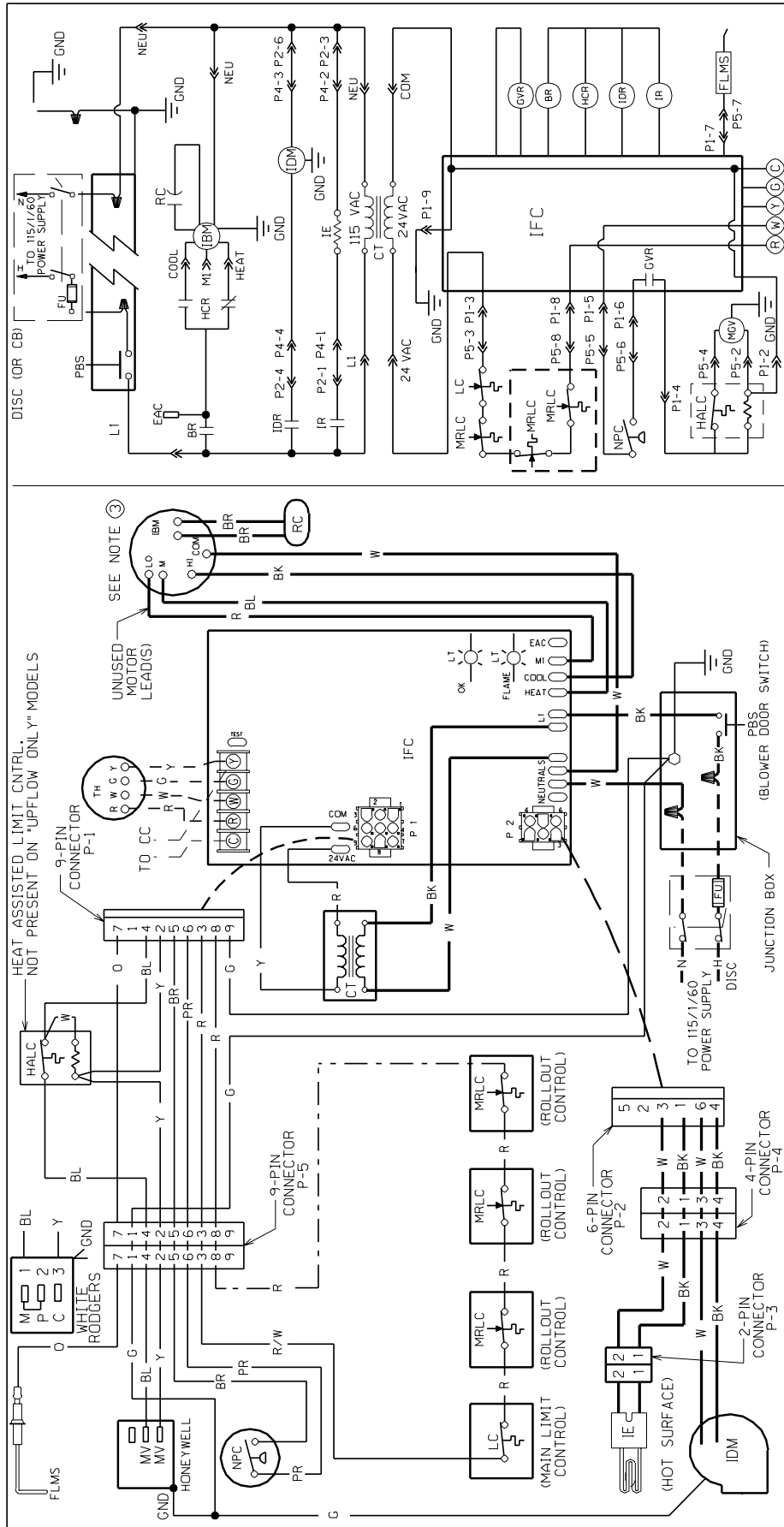
COMPONENT CODE

ALC	AUX. LIMIT CONTROL (TEMP)
BR	BLOWER RELAY
CC	COMPRESSOR CONTACTOR
CT	CONTROL TRANSFORMER
DISC	DISCONNECT SWITCH
FLMS	FAN FLAME SENSOR
FU	FUSE
GND	GROUND
GVR	GAS VALVE RELAY
HALC	HEAT ASSISTED LIMIT CONTROL
HCR	HEAT/COOL RELAY
HUM	HUMIDIFIER RELAY
IDM	INDOOR BLOWER MOTOR
IBM	INDUCED DRAFT MOTOR
IDR	INDUCED DRAFT MOTOR RELAY
LC	LIMIT CONTROL
MGV	MAIN GAS VALVE
MRLC	MANUAL RESET LIMIT CONTROL
NPC	NEGATIVE PRES. CONTROL
PBS	PUSH BUTTON SWITCH
PL	PLUG
PGV	PILOT GAS VALVE
RC	RUN CAPACITOR
SE	SPARK IGNIT. ELECTRODE
TH	THERMOSTAT (H/C)
WIRE NUT	WIRE NUT

DWG. NO. 90-24209-03
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FIGURE 30

FOR MODELS WITH UT ELECTRONIC CONTROLS 1012-925 OR INVENSYS CLIMATE CONTROLS ICC-H1MC7-01 INTEGRATED FURNACE CONTROL AND HOT SURFACE IGNITION



COMPONENT CODE	NOTES:	WIRING INFORMATION	WIRE COLOR CODE
IE	IGNITER ELEMENT	LINE VOLTAGE	BK. BLACK
IFC	INTRGRID FURNACE CONTROL	-FACTORY STANDARD	BR. BROWN
IR	IGNITION RELAY	-FACTORY OPTION	BL. BLUE
LC	LIMIT CONTROL	-FIELD INSTALLED	GY. GREEN
LT	LED OR LIGHT	LOW VOLTAGE	W. WHITE
MGV	MAIN GAS VALVE	-FACTORY STANDARD	Y. YELLOW
MRLC	MAIN RESET LIMIT CONTROL	-FACTORY OPTION	
MV	MAIN VALVE	REPLACE INSTALLED	
NPC	NEG. PRESSURE SWITCH	-FIELD INSTALLED	
PBS	PUSH BUTTON SWITCH	-REPLACEMENT WIRE	
PL	PLUG	-MUST BE THE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (105 C MIN.)	
PR	RUN CAPACITOR	WARNING	
TH	THERMOSTAT (H/C)	-CABINET MUST BE PERMANENTLY GROUNDED AND CONFORM TO I.E.C., N.E.C., C.E.C. AND LOCAL CODES AS APPLICABLE.	
W	WIRE NUT		
FLMS			
INDUCED DRAFT MOTOR			
INDUCED DRAFT RELAY			
UPFLOW & DOWNFLOW MODELS (1) MRLC			
UPFLOW/HORIZONTAL (3) MRLCS			
HORIZONTAL ONLY MODELS (2) MRLCS			



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