INSTALLATION

⚠ WARNING Do not install unit heaters in corrosive or flammable atmospheres! Premature failure of, or severe damage to the unit will result!

⚠ WARNING Avoid locations where extreme drafts can affect burner operation. Unit heaters must not be installed in locations where air for combustion would contain chlorinated, halogenated or acidic vapors. If located in such an environment, premature failure of the unit will occur!

Since the unit is equipped with an automatic gas ignition system, the unit heater must be installed such that the gas ignition control system is not directly exposed to water spray, rain or dripping water.

NOTICE: Location of unit heaters is related directly to the selection of sizes. Basic rules are as follows:

MOUNTING HEIGHT: Unit Heaters equipped with standard fan guards must be installed at a minimum of 8 feet (2.4m) above the floor, measured to the bottom of the unit. At heights above 8 feet (2.4m), less efficient air distribution will result. **If a unit is to be mounted below eight (2.4m) from the floor, an OSHA approved fan guard is required on the unit.**

AIRCRAFT HANGARS: Unit Heaters must be installed in aircraft hangars as follows: In aircraft hangars, unit heaters must be at least 10 feet (3.0m) above the upper surface of wings or engine enclosures of the highest aircraft to be stored in the hangar, and 8 feet (2.4m) above the floor in shops, offices and other sections of the hangar where aircraft are not stored or housed. Refer to current ANSI/NFPA No. 409, Aircraft Hangars. In Canada, installation is suitable in aircraft hangars when acceptable to the enforcing authorities.

PUBLIC GARAGES: In repair garages, unit heaters must be located at least 8 feet (2.4m) above the floor. Refer to the latest edition of NFPA 88B, Repair Garages.

In parking structures, unit heaters must be installed so that the burner flames are located a minimum of 18 in. (457mm) above the floor or protected by a partition not less than 18 in. (457mm) high. However, any unit heater mounted in a parking structure less than 8 ft. (2.4m) above the floor must be equipped with an OSHA approved fan guard. Refer to the latest edition of NFPA 88A, Parking structures.

In Canada, installation must be in accordance to the latest edition of CGA B149 “Installation Codes for Gas Burning Appliances and Equipment.”

AIR DISTRIBUTION: Direct air towards areas of maximum heat loss. When multiple heaters are involved, circulation of air around the perimeter is recommended where heated air flows along exposed walls. Satisfactory results can also be obtained where multiple heaters are located toward the center of the area with heated air directed toward the outside walls. Be careful to avoid all obstacles and obstructions which could impede the warm air distribution patterns.

Unit heaters should not be installed to maintain low temperatures and/or freeze protection of buildings. A minimum of 50°F (10°C) thermostat setting must be maintained. If unit heaters are operated to maintain lower than 50°F (10°C), hot flue gases are cooled inside the heat exchanger to a point where water vapor (a flue gas by-product) condenses onto the heat exchanger walls. The result is a mildly corrosive acid that prematurely corrodes the aluminized heat exchanger and can actually drip water down from the unit heater onto floor surface. Additional unit heaters should be installed if a minimum 50°F (10°C) thermostat setting cannot be maintained.

AIR FOR COMBUSTION: The unit heater shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting, and the maintenance of ambient air at safe limits under normal conditions of use. The unit heater shall be located in such a manner as not to interfere with proper circulation of air within the confined space. When buildings are so tight that normal infiltration does not meet air requirements, outside air shall be introduced per Sections 1.3.4.2 and 1.3.4.3 of ANSI Z223.1 for combustion requirements. A permanent opening or openings having a total free area of not less than one square inch per 5,000 BTU/Hr (1.5 kW) of total input rating of all appliances within the space shall be provided.

NOTICE: Unit Heater sizing should be based on heat loss calculations where the unit heater output equals or exceeds heat loss.

INSTALLATION (continued)

CLEARANCES: Each Gas Unit Heater shall be located with respect to building construction and other equipment so as to permit access to the Unit Heater. Clearance between vertical walls and the vertical sides of the Unit Heater shall be no less than 6 inches (152mm). However, to ensure access to the control box, a minimum of 18" (457mm) is required for the control box side. A minimum clearance of 6 inches (152mm) must be maintained between the top of the Unit Heater and the ceiling. The bottom of the Unit Heater must be no less than 12 inches (305mm) from any combustible. The distance between the flue collector and any combustible must be no less than 6 inches (152mm). Also see AIR FOR COMBUSTION and VENTING sections.

NOTICE: Increasing the clearance distances may be necessary if there is a possibility of distortion or discoloration of adjacent materials.

⚠WARNING Make certain that the lifting methods used to lift the heater and the method of suspension used in the field installation of the heater are capable of uniformly supporting the weight of the heater at all times. Failure to heed this warning may result in property damage or personal injury!

⚠WARNING Make sure that the structure to which the unit heater is to be mounted is capable of safely supporting its weight. Under no circumstances must the gas lines, the venting system or the electrical conduit be used to support the heater; or should any other objects (i.e. ladder, person) lean against the heater gas lines, venting system or the electrical conduit for support. Failure to heed these warnings may result in property damage, personal injury, or death.

⚠CAUTION Unit Heaters must be hung level from side to side and from front to back, see Figure 3A, 3B and 3C. Failure to do so will result in poor performance and /or premature failure of the unit.

⚠WARNING Ensure that all hardware used in the suspension of each unit heater is more than adequate for the job. Failure to do so may result in extensive property damage, severe personal injury, or death!

Refer to Figures 3A, 3B and 3C for suspension of units.

Figure 3A

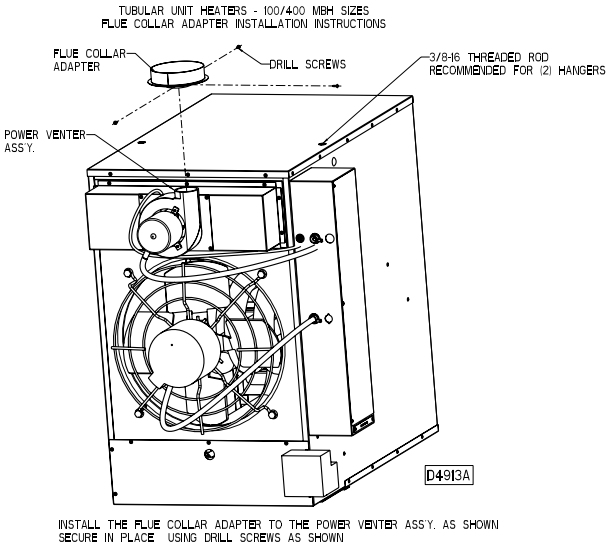
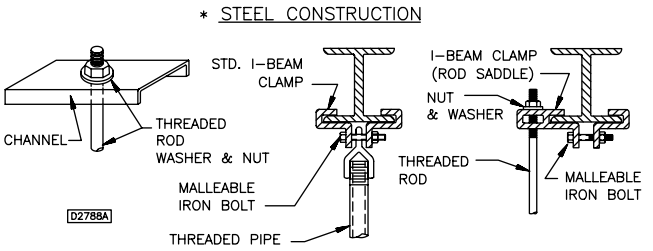
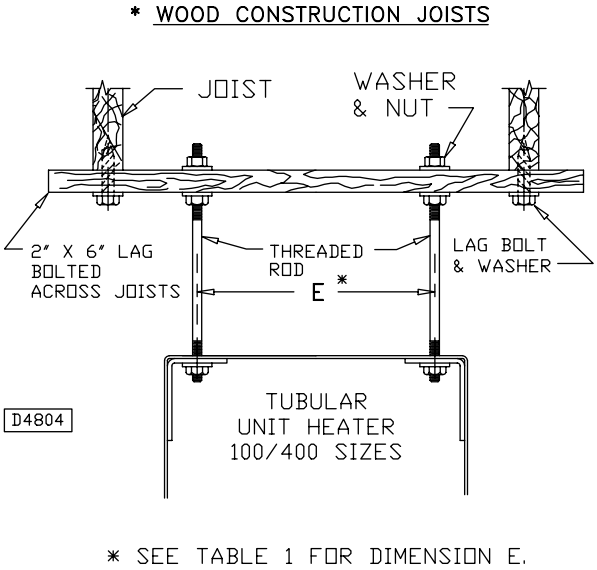


Figure 3B - Heater Mounting*



***All hanging hardware and wood is not included with the unit (To be field supplied).**

Figure 3C



* SEE TABLE 1 FOR DIMENSION E.

GAS PIPING

⚠ WARNING To avoid damage or possible personal injury, do not connect gas piping to this unit until a supply line pressure/leak test has been completed. Connecting the unit before completing the pressure/leak test may damage the unit gas valve and result in a fire hazard.
Do not rely on a shut-off valve to isolate the unit while conducting gas pressure/leak tests. These valves may not be completely shut off, exposing the gas valve to excessive pressure and damage.

PIPE SIZING
To provide adequate gas pressure to the gas unit heater, size the gas piping as follows:

1. Find the cu. ft./hr. by using the following formula:
$$\text{Cu. ft./hr.} = \frac{\text{Input BTU/Hr.}}{1000}$$
2. Refer to Table 3. Match "Length of Pipe in Feet" with appropriate "Gas Input - Cu. Ft./Hr." figure. This figure can then be matched to the pipe size at the top of the column.
   Example:
   It is determined that a 67 foot (20.4m) run of gas pipe is required to connect a 200 MBTU gas unit heater to a 1,000 BTU/cu ft. (0.29kW) natural gas supply.
$$\frac{\text{200,000 BTU/Hr}}{\text{1,000 BTU/cu. ft.}} = 200 \text{ Cu. ft./hr.}$$
   Using Table 3, a 1 inch pipe is needed.

NOTE: See General Safety Information section for English/Metric unit conversion factors.

NOTICE: If more than one unit heater is to be served by the same piping arrangement, the total cu. ft./hr. input and length of pipe must be considered.

NOTICE: If the gas unit heater is to be fired with LP gas, consult your local LP gas dealer for pipe size information.

NOTICE: HEATER INSTALLATION FOR USE WITH PROPANE (BOTTLED) GAS MUST BE MADE BY A QUALIFIED L.P. GAS DEALER OR INSTALLER. HE/SHE WILL INSURE THAT PROPER JOINT COMPOUNDS ARE USED FOR MAKING PIPE CONNECTIONS; THAT AIR IS PURGED FROM LINES; THAT A THOROUGH TEST IS MADE FOR LEAKS BEFORE OPERATING THE HEATER; AND THAT IT IS PROPERLY CONNECTED TO THE PROPANE GAS SUPPLY SYSTEM.

Before any connection is made to the existing line supplying other gas appliances, contact the local gas company to make sure that the existing line is of adequate size to handle the combined load.

Table 3 - Gas Pipe Size

Maximum Capacity of Pipe in Cubic Feet of Gas per Hour (Cubic Meters per Hour) for Gas Pressures of 0.5 psig (3.5 kPa) or Less, and a Pressure Drop of 0.5 Inch Water Column (124.4 Pa)
(Based on a 0.60 Specific Gravity Gas)

Nominal Iron Pipe Size in.	Internal Dia. in.	Length of Pipe, Feet (meters)													
		10 (3.0)	20 (6.1)	30 (9.1)	40 (12.2)	50 (15.2)	60 (18.3)	70 (21.3)	80 (24.4)	90 (27.4)	100 (30.5)	125 (38.1)	150 (45.7)	175 (53.3)	200 (61.0)
1/2	0.622	175	120	97	82	73	66	61	57	53	50	44	40	37	35
		(4.96)	(3.40)	(2.75)	(2.32)	(2.07)	(1.87)	(1.73)	(1.61)	(1.50)	(1.42)	(1.25)	(1.13)	(1.05)	(0.99)
3/4	0.824	360	250	200	170	151	138	125	118	110	103	93	84	77	72
		(10.2)	(7.08)	(5.66)	(4.81)	(4.28)	(3.91)	(3.54)	(3.34)	(3.11)	(2.92)	(2.63)	(2.38)	(2.18)	(2.04)
1	1.049	680	465	375	320	285	260	240	220	205	195	175	160	145	135
		(19.3)	(13.2)	(10.6)	(9.06)	(8.07)	(7.36)	(6.80)	(6.23)	(5.80)	(5.52)	(4.96)	(4.53)	(4.11)	(3.82)
1 1/4	1.380	1400	950	770	660	580	530	490	460	430	400	360	325	300	280
		(39.6)	(26.9)	(21.8)	(18.7)	(16.4)	(15.0)	(13.9)	(13.0)	(12.2)	(11.3)	(10.2)	(9.20)	(8.50)	(7.93)
1 1/2	1.610	2100	1460	1180	990	900	810	750	690	650	620	550	500	460	430
		(59.5)	(41.3)	(33.4)	(28.0)	(25.5)	(22.9)	(21.2)	(19.5)	(18.4)	(17.6)	(15.6)	(14.2)	(13.0)	(12.2)
2	2.067	3950	2750	2200	1900	1680	1520	1400	1300	1220	1150	1020	950	850	800
		(112)	(77.9)	(62.3)	(53.8)	(47.6)	(43.0)	(39.6)	(36.8)	(34.5)	(32.6)	(28.9)	(26.9)	(24.1)	(22.7)
2 1/2	2.469	6300	4350	3520	3000	2650	2400	2250	2050	1950	1850	1650	1500	1370	1280
		(178)	(123)	(99.7)	(85.0)	(75.0)	(68.0)	(63.7)	(58.0)	(55.2)	(52.4)	(46.7)	(42.5)	(38.8)	(36.2)
3	3.068	11000	7700	6250	5300	4750	4300	3900	3700	3450	3250	2950	2650	2450	2280
		(311)	(218)	(177)	(150)	(135)	(122)	(110)	(105)	(97.7)	(92.0)	(83.5)	(75.0)	(69.4)	(64.6)
4	4.026	23000	15800	12800	10900	9700	8800	8100	7500	7200	6700	6000	5500	5000	4600
		(651)	(447)	(362)	(309)	(275)	(249)	(229)	(212)	(204)	(190)	(170)	(156)	(142)	(130)

1. Determine the required Cu. Ft./Hr. by dividing the input by 1000. For SI/Metric measurements: Convert BTU/Hr. to kilowatts. Multiply the units inputs (kW) by 0.0965 to determine Cu. Meters./Hr. 2. FOR NATURAL GAS: Select pipe size directly from the table. 3. FOR PROPANE GAS: Multiply the Cu. Ft./Hr. value by 0.633; then, use the table. 4. Refer to the metric conversion factors listed in the General Safety section for SI Unit measurement conversions.

PIPE INSTALLATION

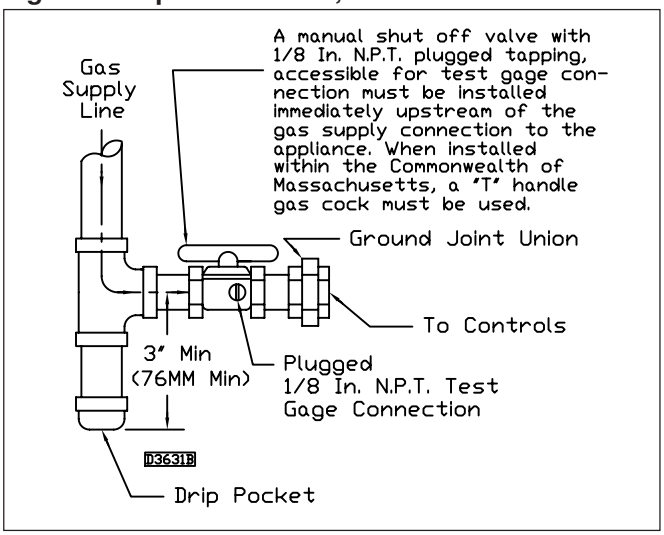
1. Install the gas piping in accordance with applicable local codes.
2. Check gas supply pressure. Each unit heater must be connected to a manifold pressure and a gas supply capable of supplying its full rated capacity as specified in Table 4. A field LP tank regulator must be used to limit the supply pressure to a maximum of 14 in. W.C. (3.5 kPa). All piping should be sized in accordance with ANSI Standard Z223.1-2002, (or the latest edition) National Fuel Gas Code; in Canada, according to CGA B149. See Tables 1 & 3 for correct gas piping size. If gas pressure is excessive on natural gas applications, install a pressure regulating valve in the line upstream from the main shutoff valve.
3. Adequately support the piping to prevent strain on the gas manifold and controls.
4. To prevent the mixing of moisture with gas, run the take-off piping from the top, or side, of the main.
5. Standard Unit Heaters, optional two-stage units are supplied with a combination valve which includes:
   a. Manual "A" valve
   b. Manual "B" valve
   c. Solenoid valve
   d. Pilot safety
   e. Pressure regulator
   Pipe directly into the combination valve (see Figure 4).
6. A 1/8" N.P.T. plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the appliance.
7. Provide a drip leg in the gas piping near the gas unit heater. A ground joint union and a manual gas shutoff valve should be installed ahead of the unit heater controls to permit servicing. The manual shutoff valve must be located external to the jacket. (See Figure 4)
8. Make certain that all connections have been adequately doped and tightened.

⚠ CAUTION Do not over tighten the inlet gas piping into the valve. This may cause stresses that will crack the valve!

NOTICE: Use pipe joint sealant resistant to the action of liquefied petroleum gases regardless of gas conducted.

⚠ WARNING Check all pipe joints for leakage using a soap solution or other approved method. Never use an open flame or severe personal injury or death may occur!

Figure 4 - Pipe Installation, Standard Controls



⚠ WARNING Never use an open flame to detect gas leaks. Explosive conditions may exist which may result in personal injury or death!

The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system in excess of 1/2 psig (3.5 kPa).

The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.5 kPa).

Table 4 - Gas Piping Requirements

SINGLE STAGE GAS PIPING REQUIREMENTS*

GasType	Natural Gas	Propane (LP) Gas
Manifold Pressure	3.5 in. W.C. (0.9 kPa)	10.0 in. W.C. (2.5 kPa)
Supply Inlet Pressure	14.0 in. W.C. Max. (3.5 kPa)	14.0 in. W.C. Max. (3.5 kPa)
	5.0 in. W.C. Min. (1.2 kPa)	11.0 in W.C. Min. (2.7 kPa)

**For single stage application only at normal altitudes.*

ELECTRICAL CONNECTIONS

⚠ WARNING

HAZARDOUS VOLTAGE!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING. Failure to disconnect power before servicing can cause severe personal injury or death.

Standard units are shipped for use on 115 volt, 60 hertz, single phase electric power. The motor name-plate and electrical rating of the transformer should be checked before energizing the unit heater electrical system. All external wiring must conform to the latest edition of ANSI/NFPA No. 70-2002, United States National Electrical Code, and applicable local codes; in Canada, to the Canadian Electrical Code, Part 1, CSA Standard C22.1.

⚠ CAUTION Do not use any tools (i.e. screwdriver, pliers, etc.) across terminals to check for power. Use a voltmeter.

It is recommended that the electrical power supply to each unit heater be provided by a separate, fused, and permanently live electrical circuit. A disconnect switch of suitable electrical rating should be located as close to the gas valve and controls as possible. Each unit heater must be electrically grounded in accordance with the latest edition of the United States National Electrical Code, ANSI/NFPA No. 70-2002, or CSA Standard C22.1. Refer to Figures 5a, 5b, 5c, 5d, 5e, 5f and 5g.

THERMOSTAT WIRING AND LOCATION:

NOTICE: The thermostat must be mounted on a vertical, vibration-free surface, free from air currents, and in accordance with the furnished instructions.

Mount the thermostat approximately 5 feet (1.5m) above the floor, in an area where it will be exposed to a free circulation of average temperature air. Always refer to the thermostat instructions, as well as our unit wiring diagram, and wire accordingly. Avoid mounting the thermostat in the following locations:

1. Cold Areas- Outside walls or areas where drafts may affect the operation of the control.
2. Hot Areas- Areas where the sun's rays, radiation, or warm air currents may affect the operation of the control.
3. Dead Areas- Areas where the air cannot circulate freely, such as behind doors or in corners.

Figure 5a - Low-voltage T Thermostat Wiring Single Stage

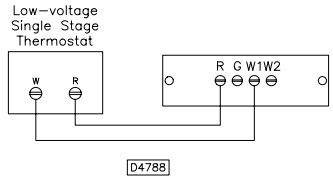


Figure 5b - Low-voltage Thermostat Wiring Two Stage

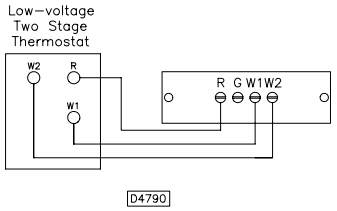
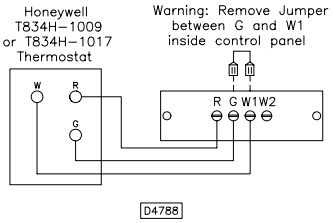


Figure 5c - T834H-1009 or T834H-1017 Thermostat Wiring



THERMOSTAT HEAT ANTICIPATOR ADJUSTMENTS: The initial heat anticipator setpoint should equal the thermostat's current amperage draw when the unit is firing. This setpoint should be measured for the best results. Use the recommended ranges for a guide. If further information is needed, consult your thermostat manufacturer's instructions.

Recommended heat anticipator setting ranges:

Gas Ignition Type	25 ft. (7.6m) T'stat Wiring	50 ft. (15.2m) T'stat Wiring
For Tubular Units:	0.85 to 0.90 A	0.90 to 1.1 A Max. Setting on T'stat

FAN TIME DELAY CONTROL: Leads from the fan time delay control are factory wired to the junction box. The fan time delay control is a time delay relay (approximately 45 seconds ON, 65 seconds OFF). The fan time delay control is rated at 17 amps.

NOTICE: The start-up fan delay should not exceed 90 seconds from a cold start.

IMPORTANT: For all wiring connections, refer to the wiring diagram shipped with your unit (either affixed to the side jacket or enclosed in the installation instructions envelope). Should any original wire supplied with the heater have to be replaced, it must be replaced with wiring material having a temperature rating of at least 105° C.

Should any high limit wires have to be replaced, they must be replaced with wiring material having a temperature rating of 200° C minimum.

ELECTRICAL CONNECTIONS (continued)

Figure 5d & 5e - Tubular Units Equipped with Hot Surface Pilot (Single Stage): 100/400 Unit Sizes with Natural Gas and Propane (LP) Gas

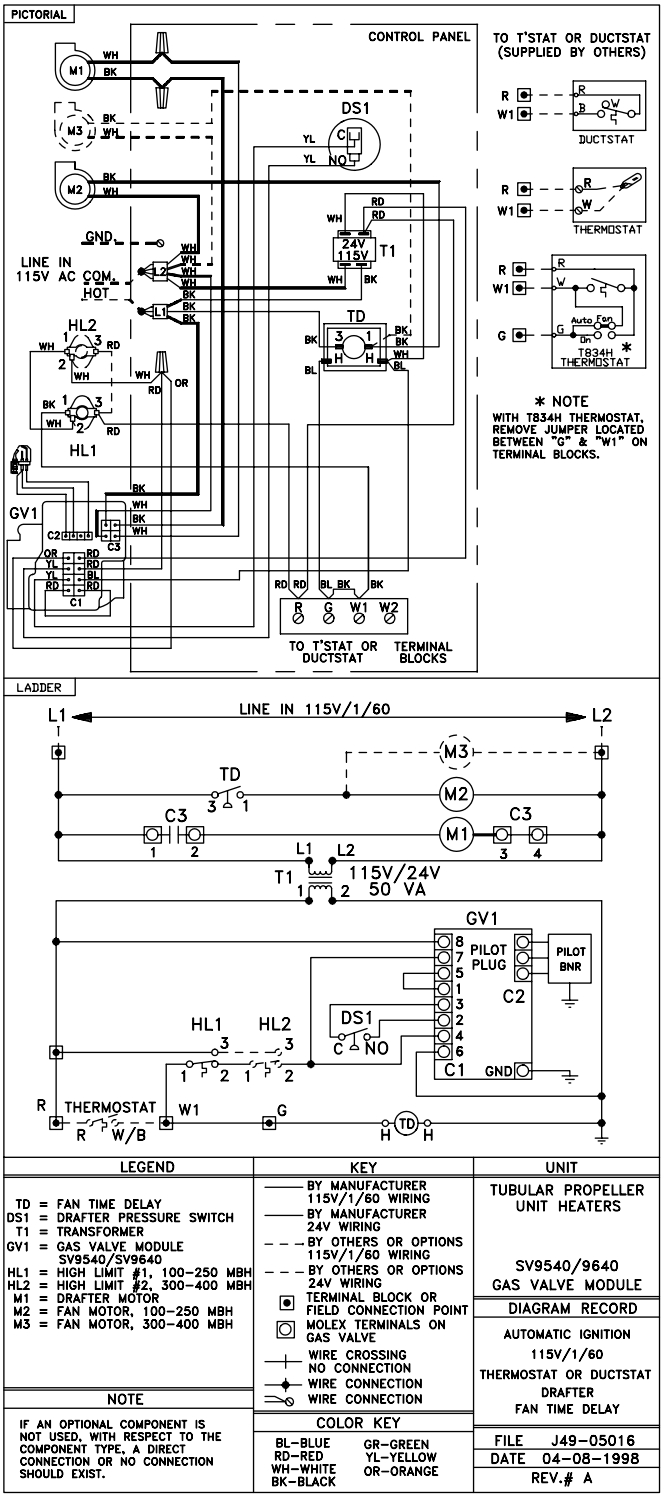


Figure 5d
(Primary)
[HWSV9540/SV9640
Hot Surface Ignition Gas Controls]

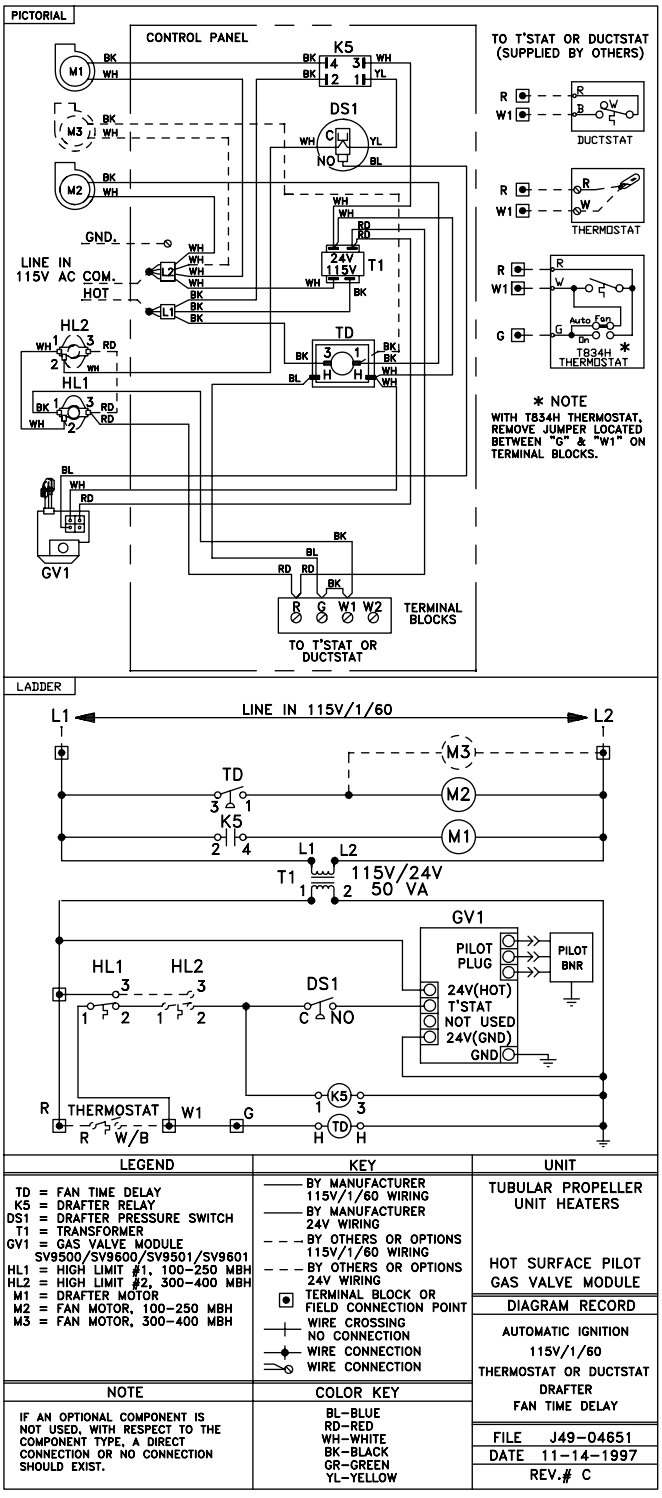
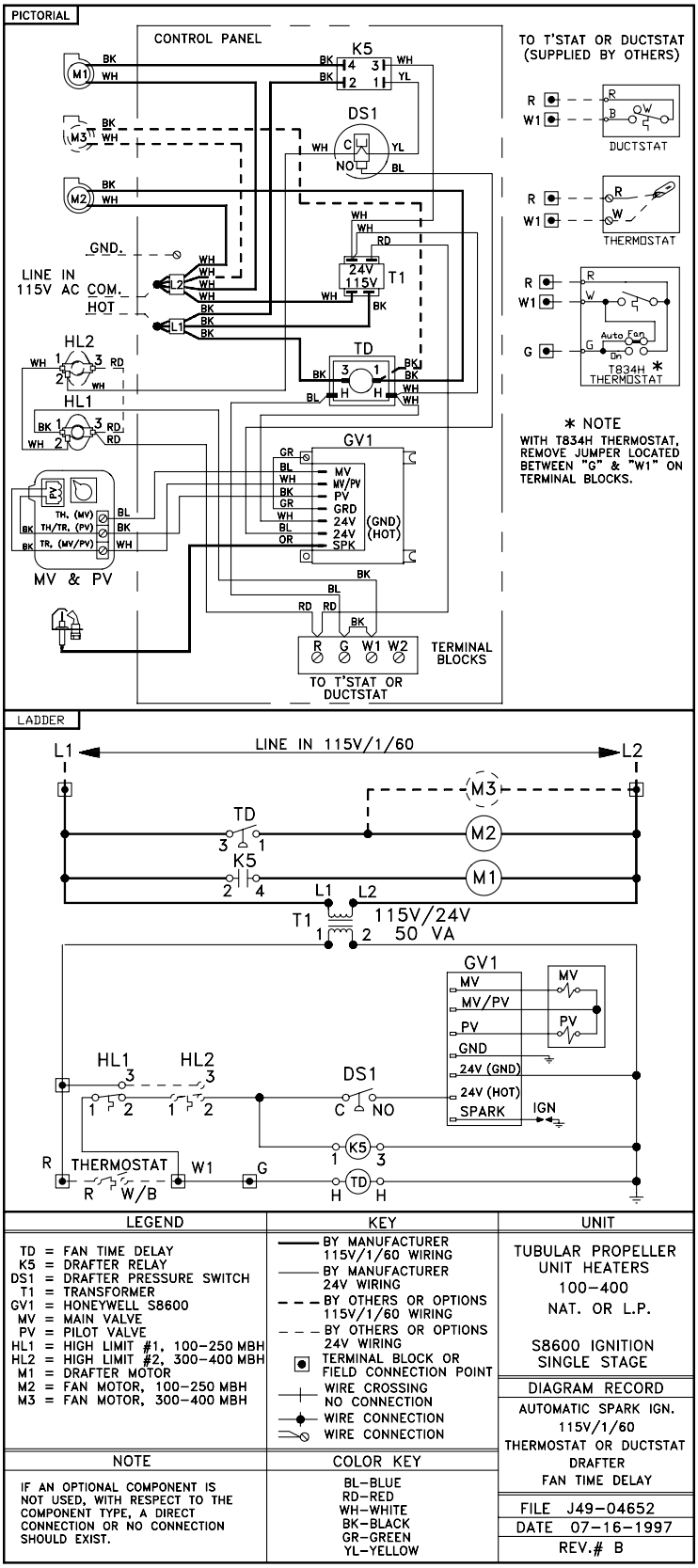


Figure 5e
(Alternate)
[HWSV9500/SV9600/SV9501/SV9601
Hot Surface Ignition Gas Controls]

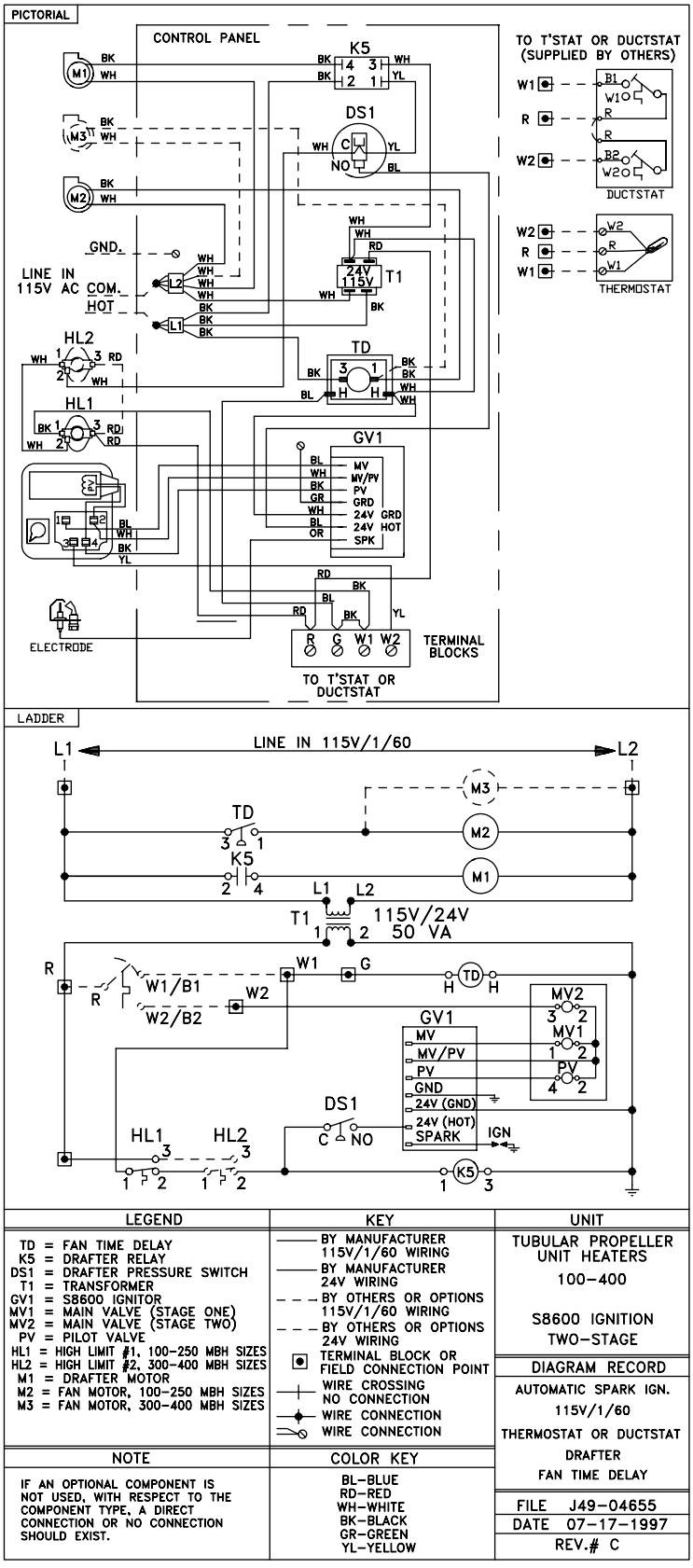
ELECTRICAL CONNECTIONS (continued)

Figure 5f - Tubular Units Equipped with S8600 (Single Stage) Ignition: Optional for Tubular 100/400 Unit Sizes with Natural Gas and Propane (LP) Gas



ELECTRICAL CONNECTIONS (continued)

Figure 5g - Tubular 100/400 Unit Sizes with Optional 2 Stage Ignition



VENTING

ANSI now organizes vented appliances into four categories.

Venting Categories

	Non Condensing	Condensing
Negative Vent Pressure	I	II
Positive Vent Pressure	III	IV

Category I
Includes non-condensing appliances with negative vent pressure, like the traditional atmospheric unit heater.

Category II
Groups condensing appliances with negative vent pressure.

Category III
Appliances are non-condensing and operate with a positive vent pressure.

Category IV
Covers condensing appliances with positive vent pressure.

NOTICE: Category II and IV do not apply to equipment specified within this manual.

All unit heaters must be vented! All Venting installations shall be in accordance with the latest edition of Part 7, Venting of Equipment of the National Fuel Gas Code, ANSI Z223.1, or applicable provisions of local building codes. Refer to page 15 for Canadian installations. Refer to Figures 6, 7, 8A, 8B, 9A and 9B.

⚠WARNING CARBON MONOXIDE! Your venting system must not be blocked by any snow, snow drifts, or any foreign matter. Inspect your venting system to ensure adequate ventilation exists at all times! Failure to heed these warnings could result in Carbon Monoxide Poisoning (symptoms include grogginess, lethargy, inappropriate tiredness, or flu-like symptoms).

VERTICALLY VENTED UNIT HEATERS (CATEGORY I)

Observe the following precautions when venting the unit:

1. Use flue pipe of the same size as the flue connections on the gas unit heater (See Table #1). All heaters should be vented with UL Listed Type B vent, a factory built chimney, or a lined brick and mortar chimney that has been constructed in accordance with the National Building Code.

2. Provide as long a vertical run of flue pipe at the gas unit heater as possible. A minimum of five feet (1.5m) of vertical flue is required. The top of the vent pipe should extend at least two feet (0.61m) above the highest point on the roof. Install a weather cap over the vent opening.

3. Slope horizontal runs upward from the gas unit heater at least 1/4-inch per foot (21mm/m). Horizontal runs should not exceed 75% of the vertical height of the vent pipe, or chimney, above the flue pipe connection, up to a maximum length of 10 feet (3m). Horizontal portions of the venting system shall be supported at maximum intervals of four feet (1.2m). (See Figure 6)

4. Use as few elbows as possible.

5. Tape flue pipe joints with fireproof paper or material.

6. Avoid running vent pipe through unheated spaces.

7. When this cannot be avoided, insulate the pipe to prevent condensation of moisture on the walls of the pipe.

8. Do not damper the flue piping. Failure to open such a damper prior to operating the gas unit heater will result in the spillage of flue gas into the occupied space.

9. Avoid installing units in areas under negative pressure due to large exhaust fans or air conditioning. When required, a flue vent fan should be installed in accordance with the instructions included with the fan.

10. Vent connectors serving Category I and Category II heaters shall not be connected into any portion of mechanical draft systems operating under positive pressure.

HORIZONTALLY VENTED UNIT HEATERS (CATEGORY III)

Horizontal venting arrangements are designed to be used with single wall vent pipe. Horizontal venting arrangements must terminate external to the building using either single wall or double wall (Type B) vent. If single wall vent pipe is used, it must be constructed of 26 gauge galvanized steel or a material of equivalent durability and corrosion resistance for the vent system. For installations in Canada, use pipe constructed from .025 inch thick aluminum or .018 inch thick stainless steel. See Figures 7, 8A and 9A for special installation requirements regarding these venting conditions.

⚠ WARNING Do not use Type B (double wall) vent internally within the building on horizontally vented power vented units!

If double wall venting is used, components which are UL Listed and approved for Category III positive pressure venting systems MUST be used.

A Breidert Type L, Fields Starkap, or equivalent vent cap must be supplied by the customer for each power vented unit. The vent pipe diameter MUST be as specified in Table 1 (“D” Dia. Flue Opening). All unit sizes are factory equipped with the required flue size collar; attach in place (if not mounted to outlet); refer to included vent collar instruction sheet for additional requirements.

Vent Systems - Termination Clearance Requirements

Structure	Minimum Clearances for Termination Locations
Door, window or any gravity air inlet	4 feet below 4 feet horizontally 1 foot above
Forced air inlet within 10 ft.	3 feet above
Adjoining building or parapet	6 feet
Adjacent public walkways	7 feet above grade

The venting system for these appliances shall terminate at least four feet (1.2m) below, four feet (1.2m) horizontal from, or one foot (0.3m) above any door, window, or gravity vent air inlet into the building.

The vent terminal must be at least 12 inches (305mm) from the exterior of the wall that it passes through to prevent degradation of the building material by flue gases.

The vent terminal must be at least 3 feet (1m) above grade, or in snow areas, at least three feet above the snow line to prevent blockage by snow.

Through the wall vent for these appliances shall NOT terminate over public walkways, or over an area where the condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment.

The vent pipe equivalent length must not exceed 50 feet (15.2m). Equivalent length is the total length of straight sections PLUS 15 feet (4.6m) for each 90 elbow and 8 feet (2.44m) for each 45 elbow.

Maintain 6 inches (152mm) between the vent pipe and combustible materials.

The vent terminal must be installed with a minimum horizontal clearance of four feet (1.2m) from electric meters, gas meters, regulators, and relief equipment.

Seal all vent pipe joints and seams to prevent leakage. Use General Electric RTV-108, Dow-Corning RTV-732 silicone sealant; or 3M #425 aluminum foil tape.The vent air system must be installed to prevent collection of condensate. Pitch horizontal pipes downward 1/4 inch per foot (21mm per meter) toward the outlet for condensate drainage

Horizontal portions of the venting systems shall be supported at maximum intervals of four feet (1.2m) to prevent sagging (in Canada, support at 3 feet (1m) maximum intervals).

Insulate single wall vent pipe exposed to cold air or running through unheated areas.

Each unit must have an individual vent pipe and vent terminal! Each unit MUST NOT be connected to other vent systems or to a chimney.

Figure 6 - Vertically Vented Tubular Unit Heater – Category I

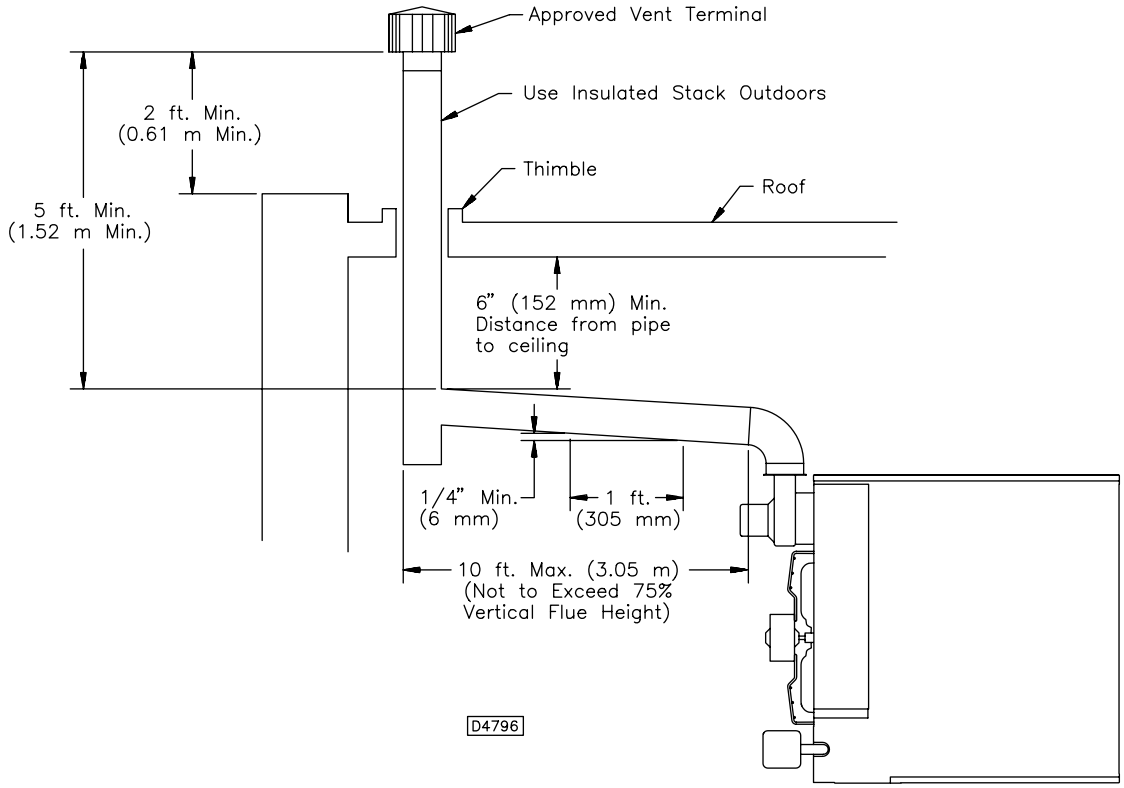
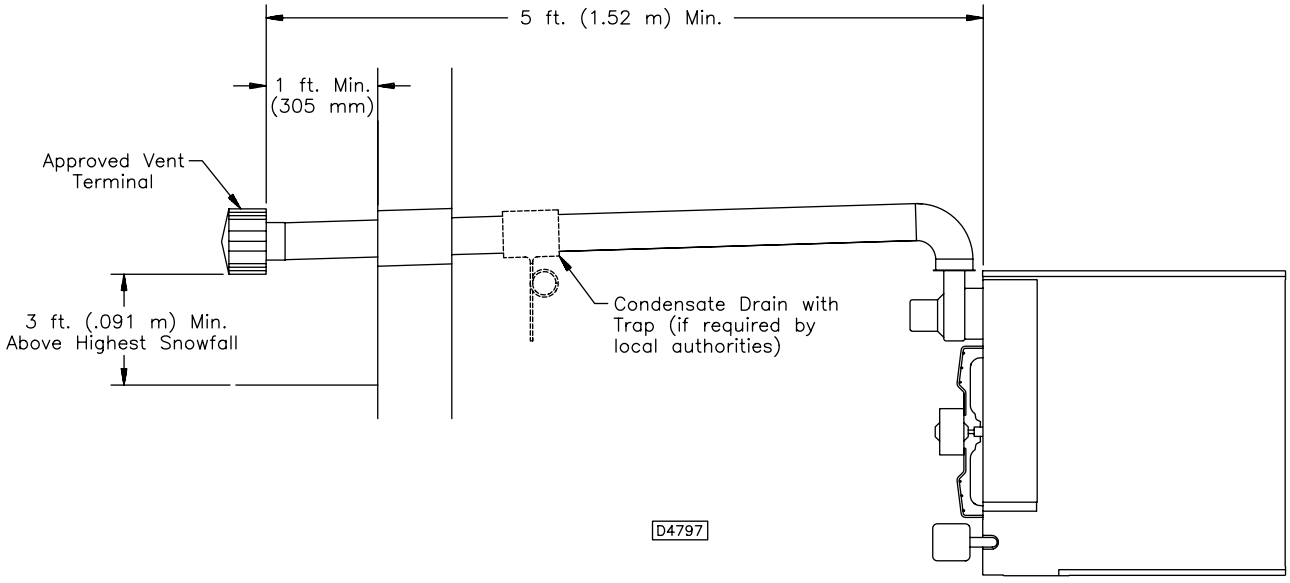


Figure 7 - Horizontally Vented Tubular Unit Heater – Category III



ADDITIONAL REQUIREMENT FOR CANADIAN INSTALLATIONS

REFER TO SPECIFICATION TABLE AND INSTALLATION MANUAL FOR PROPER USAGE.

* The following instructions apply to Canadian installations in addition to installation and operating instructions.

1. Installation must conform with local building codes, or in the absence of local codes, with current CGA B149.1, Installation Codes for Natural Gas Burning Appliances and Equipment, or CGA B149.2, Installation Codes for Propane Gas Burning Appliances and Equipment.
2. Any reference to U. S. standards or codes in these instructions are to be ignored, and the applicable Canadian standards or codes applied

Figure 8A

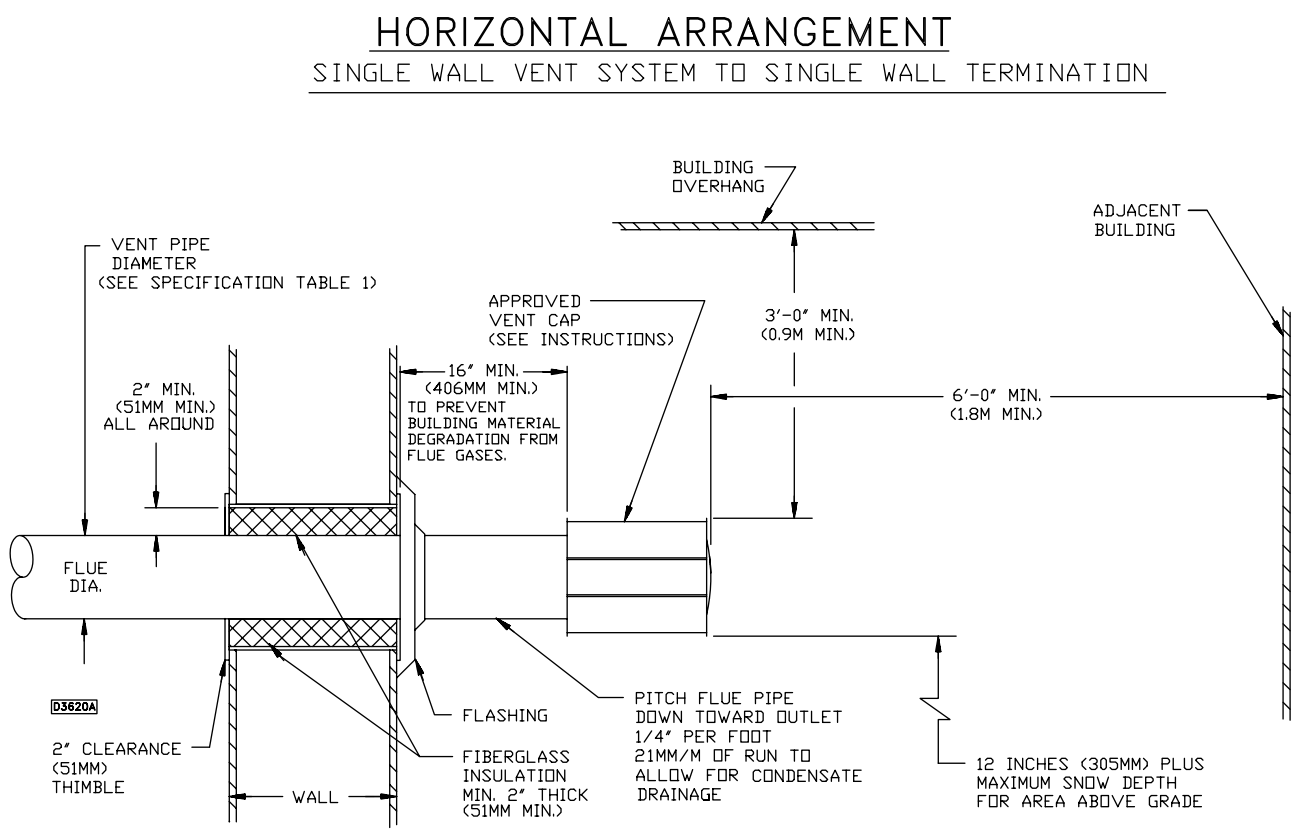
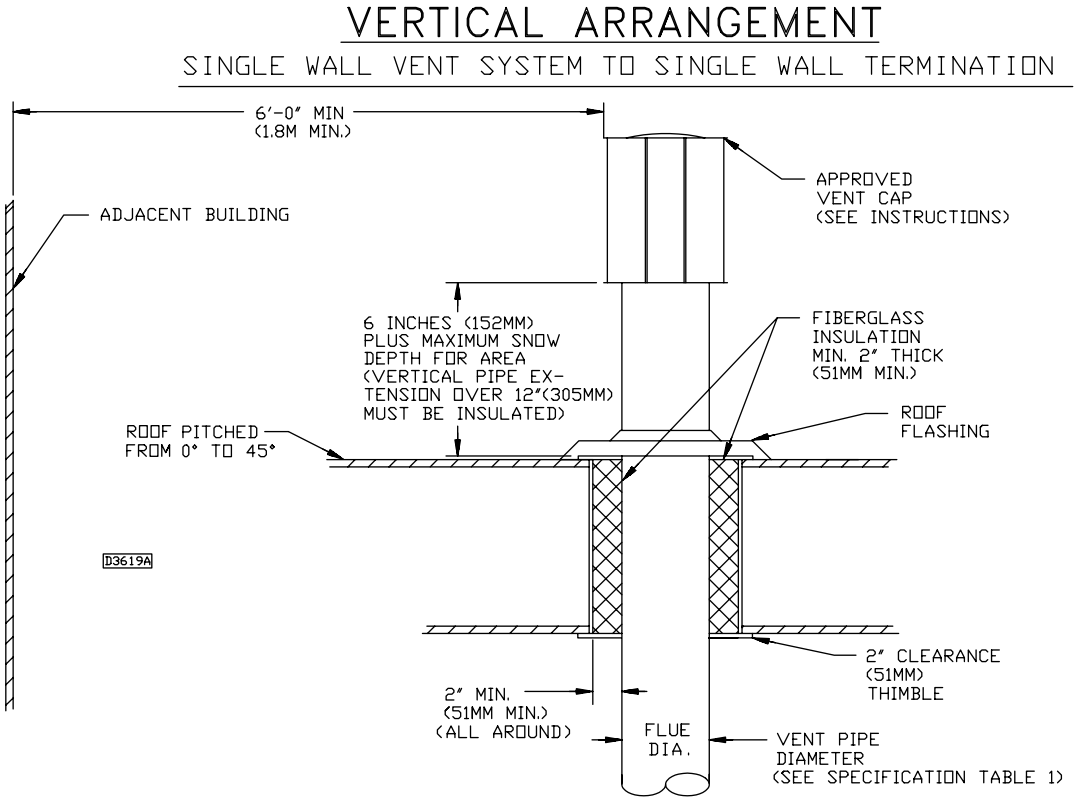


Figure 8B



VENTING (continued)

Figure 9A

HORIZONTAL ARRANGEMENT

SINGLE WALL VENT SYSTEM TO DOUBLE WALL TERMINATION

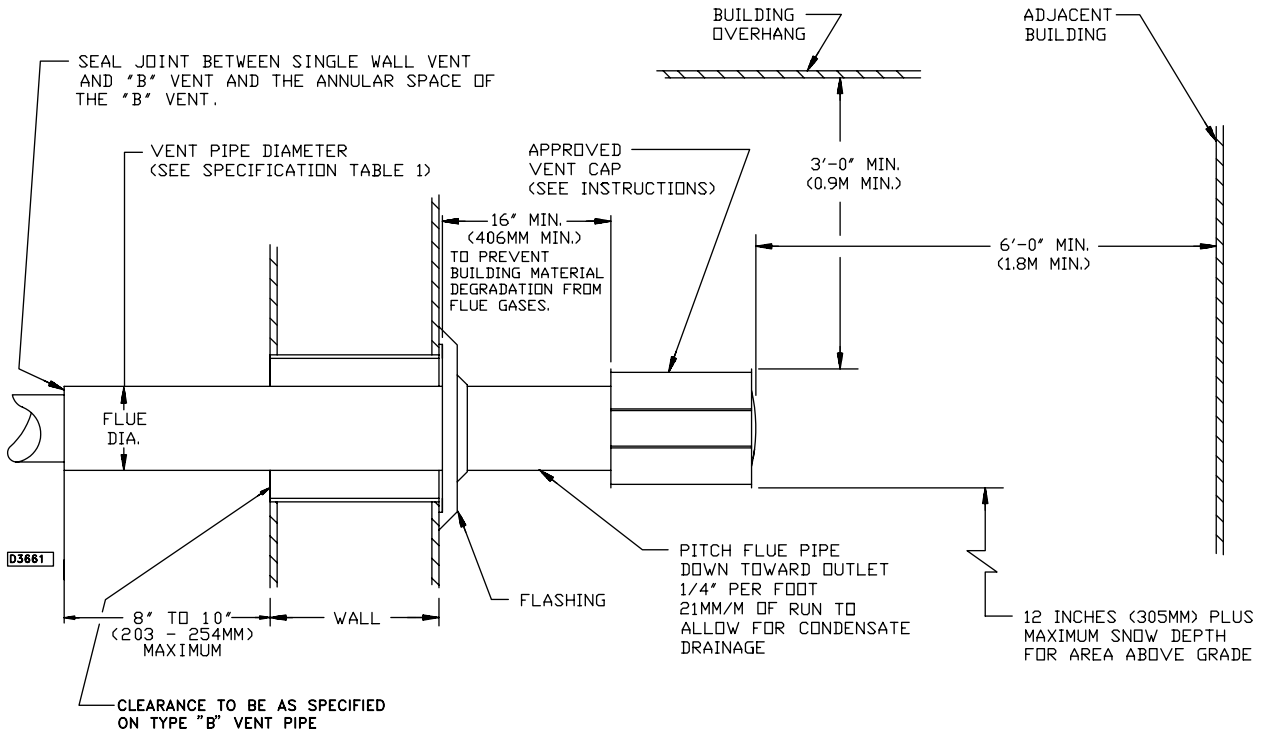
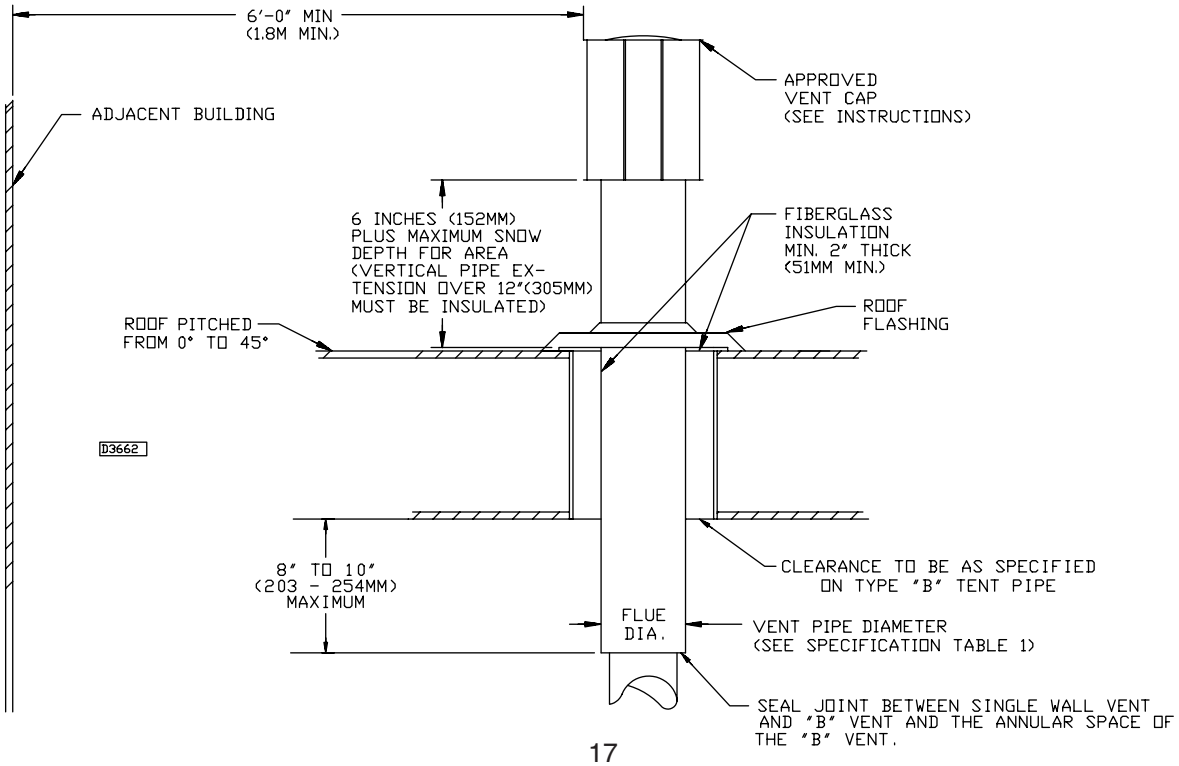


Figure 9B

VERTICAL ARRANGEMENT

SINGLE WALL VENT SYSTEM TO DOUBLE WALL TERMINATION



OPERATION
POWER VENTED PROPELLER UNITS
INTERMITTENT PILOT IGNITION

EXPLANATION OF CONTROLS (See Figure 10):

1. The unit heater is equipped with a power venter system consisting of a power venter motor and blower, pressure switch, and sealed flue collector in place of the conventional draft diverter.
2. The power venter motor is energized by the room thermostat on a call for heat. The pressure switch measures the flow through the vent system and energizes the indirect ignition system when the flow is correct.

⚠ WARNING The pressure switch MUST NOT be bypassed. The unit MUST NOT be fired unless the power venter is operating. An unsafe condition could result.

3. The indirect ignition system consists of an ignition control module, a dual combination gas valve, and a pilot burner. When the pressure switch closes, the pilot valves opens and the pilot burner is ignited by either a spark or hot surface element. When flame sensing circuit senses that the pilot flame is established, the main gas valve is opened to supply gas to the main burners. When the thermostat is satisfied, the vent system is deenergized and both valves are closed to stop all flow of gas to the unit.
4. The limit switch interrupts the flow of electric current to the main gas valve in case the heater becomes overheated.
5. The fan switch delays the operation of the fan until the heater is warmed, then keeps the fan running after the gas has been turned off until the useful heat has been removed. **The startup fan delay must not exceed 90 seconds from a cold start.**
6. The wall thermostat (supplied optionally) is a temperature sensitive switch which operates the vent system and the ignition system to control the temperature of the space being heated. It must be mounted on a vibration free, vertical surface away from air currents, in accordance with the instructions furnished with the thermostat (also refer to Electrical Section).

START-UP (Also refer to lighting instruction plate equipped on the unit)

1. Open the manual valve supplying gas to the unit heater, and with the union connection loose, purge air from the gas line. Tighten the union and check for gas leaks.

⚠ WARNING Never use an open flame to detect gas leaks. Explosive conditions may exist which could result in personal injury or death.

⚠ WARNING Before attempting to light or relight pilot, wait 5 minutes to allow gas which may have accumulated in the burner compartment to escape.

2. Open the manual valve on the unit heater.
3. Turn ON electrical power.
4. The unit should be under the control of the thermostat. Turn the thermostat to the highest point and determine that the power venter motor starts, and the pilot and main burners ignite. Turn the thermostat to the lowest point and determine that the power venter motor shuts off and the pilot and main burners are extinguished.
5. If pilot adjustment is required, remove the pilot adjustment seal cap and adjust the pilot screw to obtain proper flame. Clockwise rotation decreases pilot flame size. Replace the cap.
6. Turn the thermostat to the desired position.
7. See Gas Input Rate and Adjustments sections.

SHUT DOWN

1. Turn the valve selector knob to the “OFF” position.
2. Turn off the electricity.
3. To relight, follow the “start-up” instructions.

See Figure 10 for parts/identification.

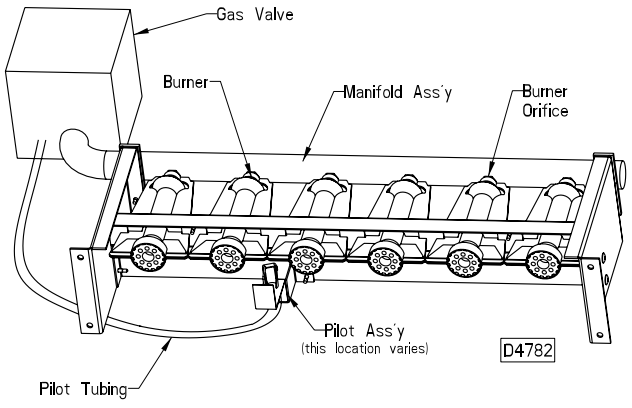


Figure 10 Manifold Assembly

PRIMARY AIR SHUTTER ADJUSTMENT

Primary air adjustment is made at the factory. No field adjustments are necessary.

GAS INPUT RATE

Check the gas input rate as follows (Refer to General Safety Information section for metric conversions).

⚠ CAUTION Never overfire the unit heater, as this may cause unsatisfactory operation, or shorten the life of the heater.

1. Turn off all gas appliances that use gas through the same meter as the unit heater.
2. Turn the gas on to the unit heater.
3. Clock the time in seconds required to burn 1 cubic foot of gas by checking the gas meter.
4. Insert the time required to burn one cubic foot of gas
   into the following formula and compute the input rate.

$$\frac{\text{3600 (Sec. per Hr.) X BTU/Cu. Ft.}}{\text{Time (Sec.)}} = \text{Input Rate}$$

For example:
Assume the BTU content of one cubic foot of gas is 1000, and that it takes 18 seconds to burn one cubic foot of gas.

$$\frac{3600 \times 1000}{18} = 200{,}000$$

NOTICE: If the computation exceeds, or is less than 95% of the gas BTU/hr. input rating (see Table 2), adjust the gas pressure.

Adjust the gas pressure as follows:

1. NATURAL GAS: Best results are obtained when the unit heater is operating at its full rated input with the manifold pressure of 3.5 inches W.C. (0.9 kPa). Adjustment of the pressure regulator is not normally necessary since it is preset at the factory. However, field adjustment may be made as follows:
   a. Attach manometer at the pressure tap plug adjacent to the control outlet.
   b. Remove the regulator adjustment screw cap, located on the combination gas valve.
   c. With a small screwdriver, rotate the adjustment screw counterclockwise to decrease pressure, or clockwise to increase pressure.
   d. Replace regulator adjustment screw cap.
2. PROPANE GAS: An exact manifold pressure of 10.0 inches W.C. (2.5 kPa) must be maintained for proper operation of the unit heater. If the unit is equipped with a pressure regulator on the combination gas valve, follow steps "a" through "d" above. If the unit is not so equipped, the propane gas supply system pressure must be regulated to attain this manifold operating pressure.
3. The adjusted manifold pressure should not vary more than 10% from pressure specified in Table 5.

Table 5 - Main Burner Orifice Schedule*

* INPUT IN 1000 BTU	TYPE OF GAS	NATURAL	PROPANE	NO. OF BURNER ORIFICES
	HEATING VALUE	1075 BTU/Ft^3 (40.1 MJ/m^3)	2500 BTU/Ft^3 (93.1 MJ/m^3)	
	MANIFOLD PRESSURE	3.5" W.C. (0.87kPA)	10" W.C. (2.49 kPA)	
100	FT ^{3}/HR	93	40	4
	ORIFICE DRILL	42	53	
125	FT ^{3}/HR	116	50	5
	ORIFICE DRILL	42	53	
150	FT ^{3}/HR	140	60	6
	ORIFICE DRILL	42	53	
175	FT ^{3}/HR	163	70	7
	ORIFICE DRILL	42	53	
200	FT ^{3}/HR	186	80	8
	ORIFICE DRILL	42	53	
250	FT ^{3}/HR	233	100	10
	ORIFICE DRILL	42	53	
300	FT ^{3}/HR	280	120	12
	ORIFICE DRILL	42	53	
350	FT ^{3}/HR	326	140	14
	ORIFICE DRILL	42	53	
400	FT ^{3}/HR	372	160	16
	ORIFICE DRILL	42	53	

*This schedule is for units at operating at normal altitudes of 2000 ft. (610m) or less.

When installed in Canada, any references to deration at altitudes in excess of 2000 ft. (610m) are to be ignored. At altitudes of 2000 to 4500 ft. (610 to 1372m), the unit heaters must be orificed to 90% of the normal altitude rating, and be so marked in accordance with CSA certification.

TUBULAR UNIT HEATER
HIGH ALTITUDE DERATION

This Tubular Unit Heater has been manufactured utilizing standard burner orifices and a normal manifold pressure setting as per the specifications shown on your unit rating plate.

All unit deration must be done through field adjustments by a qualified technician. Once the proper adjustments are made in the field, attach label #J17-06459 to the unit, and record adjusted manifold pressure, altitude of the unit installation and the technician's name and date on the label using a permanent marker.

Refer to Installation Instruction section on Adjustments-Gas Input Rate for adjusting the manifold pressure.

Table 5A

Altitude (Feet)	NATURAL GAS		PROPANE (LP) GAS	
	Heating* Value BTU/Cu. ft.	Manifold Pressure (In. W.C.)	Heating* Value BTU/Cu. ft.	Manifold Pressure (In. W.C.)
2,000	948	3.5	2,278	8.6
2,500	931	3.5	2,237	8.5
3,000	914	3.3	2,196	8.4
3,500	897	3.2	2,156	8.4
4,000	881	3.2	2,116	8.3
4,500	865	3.2	2,077	8.2
5,000	849	3.1	2,039	8.1
5,500	833	3.1	2,000	8.0
6,000	818	3.0	1,964	7.9
6,500	802	3.0	1,927	7.7
7,000	787	2.9	1,891	7.6
7,500	771	2.9	1,853	7.5
8,000	756	2.8	1,817	7.4
8,500	741	2.8	1,781	7.2
9,000	726	2.7	1,745	7.1
9,500	711	2.7	1,709	6.9
10,000	696	2.6	1,673	6.8

*Notes:
1. Consult local utility for actual heating value.
2. Tables based on heating value of 1,050 BTU/Cu. ft. at sea level.