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HTDM 90+ OMEGA Series

Installation, Operation, Maintenance Manual

Models: 200, 400, 600, 1000, 1500, 2000, 2500, 3000



ATTENTION:

Read this manual, unit submittal sheets and all labels attached to the unit carefully before attempting to install, operate or service these units!

Check unit data plates for type of gas, model number and serial numbers. Retain this document for future reference.

INSTALLERS RESPONSIBILITY

<u>Installer please note</u>: This equipment has been test fired and inspected. It has been shipped free from defects from our factory. However, during shipment and installation, problems such as loose wires, leaks or loose fasteners may occur. It is the installer's responsibility to inspect and correct any problems that may be found.



instanci / Sci vice contractor information	Installer	/Service	Contractor	Information
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Name:		
Company:		
Telephone:		

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IMPORTANT!

Read Before Proceeding!

equipment is complicated This relatively а During installation. apparatus. operation, maintenance or service, individuals mav exposed to certain components or conditions including but not limited to: oils, and materials under pressure, rotating components and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death.

It is the obligation and responsibilities of the operating/service personnel to identify and recognize these inherent hazards to protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property, in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by ownerauthorized operating/service personnel. that this individual possesses expected independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

AWARNING

Personal Protective Equipment (PPE) Required!

Installing/servicing this unit could result in exposure to electrical and mechanical hazards.

- Before installing/servicing this unit, technicians must put on all Personal Protective Equipment (PPE) recommended for the work being undertaken. ALWAYS refer to appropriate MSDS sheets and OSHA guideline for proper PPE.
- If there is a risk of arc or flash, technicians MUST put on all necessary Personal Protective Equipment (PPE) in accordance with NFPA70E or CSAZ462 for arc/flash protection PRIOR to servicing the unit.

A

WARNING

FIRE OR EXPLOSION HAZARD

Failure to fellow safety warnings exactly could result in serious injury, death or property damage.

- Be sure to read and understand the installation operation and service instructions in the manual.

Improper installation, adjustment alteration, service or maintenance can cause serious injury, death or property damages.

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

WHAT TO DO IF SMALL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a phone remote from the building.
 Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the Fire department.
- Installation ans service must be performed by a qualified installer, service agency or gas supplier.

∆WARNING

Proper Field Wiring and Grounding Required!

Proper Field Wiring and Grounding Required!

All filed wring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards.

RECEIVING AND WAREHOUSING

Inspect the unit upon arrival for any shipping damage. If any part is missing or damaged, Mark bill of lading as to damage and notify the carrier at once.

If the unit cannot be installed immediately, store it and its accessories in:

- A clean and dry area
- An area where the unit will not be damaged
- An area where surface water does not accumulate

GENERAL HANDLING INSTRUCTIONS

- ❖ A qualified and experienced crane operator must do all rigging. General rigging methods should be followed in all cases:
- Spreader bars must be used when lifting equipment.
- ❖ Equipment must be lifted simultaneously by all "eye" bolts or channel slots provided on each section at the same time to distribute the loading properly. Damage or injury may result if all provisions for lifting are not utilized at time of lift. When multiple lifting eyes are furnished they are to share the weight of the lift evenly via spreader bar(s).
- ❖ Lifting eyes and channel slots are designed to be lifted vertically. The **MAXIMUM** angle from a vertical lift, which is permitted, is 30 degrees. Single sections only are to be lifted at one time and stacked from the lowest section upward. Sections are designed to be self-supporting in compression only. Do not attempt to hang multiple sections from any structure. The total perimeter base and all frame structure must be supported, and leveled, on high-density concrete or sufficient I-beam steel.
- ❖ For some models the heating and blower sections may be shipped separately. Assemble the sections by aligning the base frames and/or the pre-drilled flanges and secure the assembly with the fasteners provided. Use gasketing material to prevent infiltration at the joints.



FAILURE TO COMPLY WITH THE GENERAL REQUIREMENTS MAY RESULT IN EXTENSIVE PROPERTY DAMAGE, SEVERE PERSONAL INJURY OR DEATH.

GENERAL INSTALLATION NOTES

- ❖ Installation shall conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1 / NFPA 54, or the National Gas and Propane Installation Code, CSA B149.1.
- No alterations are to be made on this equipment.
- Install indoor units in such a way that the gas ignition control system is not directly exposed to water spray, water mist, or dripping water.
- The furnace and operating equipment of the furnace, must not be operated in the prescence of chlorine vapours, When such vapors mix with products of combustion, highly corrosive conpounds will result. These compounds can be the cause of pre-mature equipment failure, and serious equipment damage. In such an event, equipment factory warranty is void.

MARNING

FAILURE TO COMPLY WITH THE GENERAL REQUIREMENTS MAY RESULT IN EXTENSIVE PROPERTY DAMAGE, SEVERE PERSONAL INJURY OR DEATH.

MOUNTING & PLACEMENT

Units must be mounted on a stable leveled surface to ensure there won't be any operational damages, water being trapped in the drain pans, or decreased indoor air quality.

Make sure there is sufficient amount of clearance for doors to open and components to be taken out without any obstructions.

Ducts connected to the furnace shall have removable access panels on both the upstream and downstream sides of the furnace. These openings shall be accessible when the furnace is installed and shall be sized to allow the observation of smoke or reflected light inside the casing to indicate the presence of leaks in the heat exchanger. The covers for the openings shall be attached in such manner as to prevent leaks.

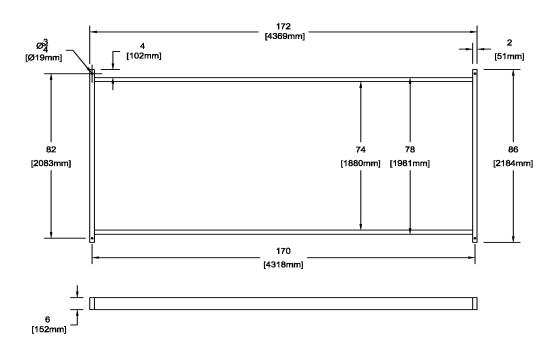
CLEARANCE TO COMBUSTIBLE MATERIALS in inches (mm)

MODEL	TOP	FRONT	BACK	FLOOR	SIDES	FLUE
HTDM 200	0 (0)	0 (0)	0 (0)	3(76)	0 (0)	18(457)
HTDM 400	6(152)	6(152)	4(102)	3(76)	4(102)	18(457)
HTDM 600	6(152)	6(152)	4(102)	3(76)	4(102)	18(457)
HTDM 1000	6(152)	6(152)	6(152)	3(76)	6(152)	18(457)
HTDM 1500	6(152)	6(152)	6(152)	3(76)	6(152)	18(457)
HTDM 2000	6(152)	6(152)	6(152)	3(76)	6(152)	18(457)
HTDM 2500	6(152)	6(152)	6(152)	3(76)	6(152)	18(457)
HTDM 3000	6(152)	6(152)	6(152)	3(76)	6(152)	18(457)

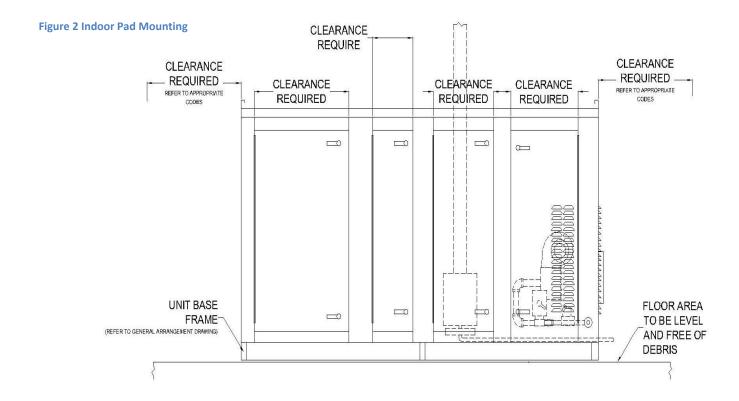
All units installed on the floor has a minimum clearance of 3" (76mm) provided by the base frames of each individual unit. Refer to (Figure 1) for an example base frame.

For service it is advisable to maintain a sufficient area to open all hinges doors fully, refer to (Figure 2). If this unit is to be operated within a confined space or within a building of unusually tight construction, air for combustion and ventilation must be obtained from outdoors or other spaces freely communicating with the outdoors. Refer to current United States and Canadian Fuel Codes.

Figure 1 Indoor Floor Mounting



INDOOR FLOOR MOUNTING



Please refer to (Figure 2) for reference if you are going to mount the unit inside of a building.

OUTDOOR PAD MOUNTING

Please refer to (Figure 3) and (Figure 4) for reference if you are going to mount the unit on a pad on the exterior side of a building. Also refer to (Figure 5) before you put the unit into place.

Figure 3 Outdoor Pad Mounting Side View

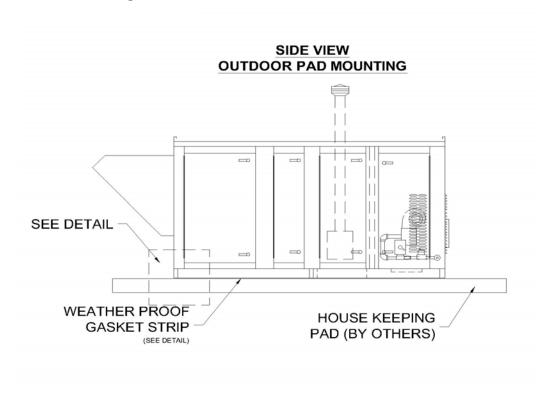
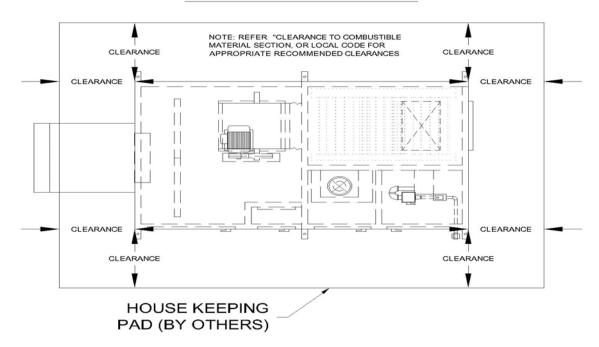


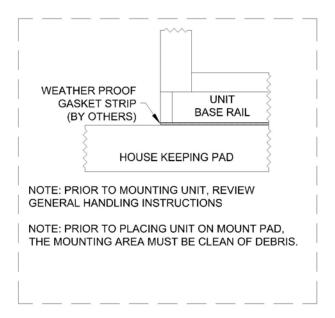
Figure 4 Outdoor Pad Mounting Top View

TOP VIEW OUTDOOR PAD MOUNTING



DETAIL

Figure 5 Detail

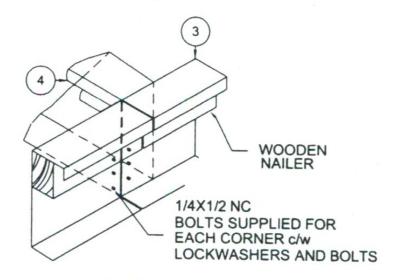


EXTERIOR ROOF TOP MOUNTED

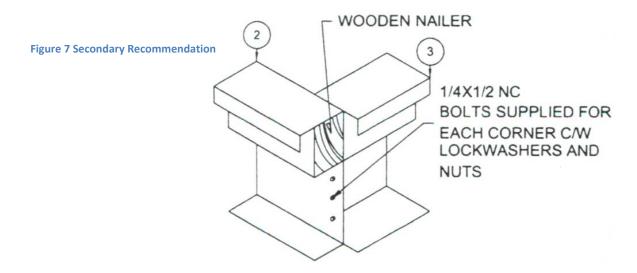
Roof curb should be fully assembled and properly installed onto the roof structure, using best practice techniques. (Note: Roof-Curb Detail Drawings in Section 3 of Unit Manual which you can also refer to (Figure 1) for example.)

Please Note Following Assembly Recommendation (Figure 6).

Figure 6 Assembly Recommendation

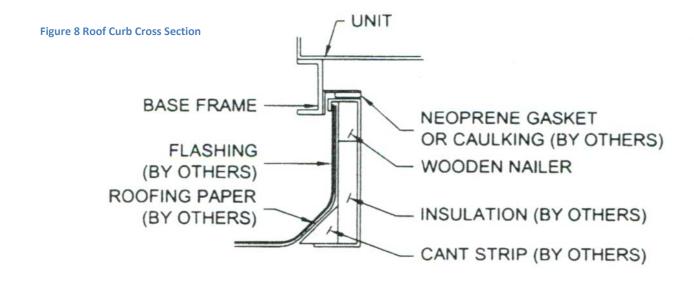


CENTER BRACING BOLTING ASSEMBLY DETAIL #1 Please Note Following Assembly Secondary Recommendation (Figure 7).



Please Note Following Assembly Detail (Figure 8).

CORNER BOLTING ASSEMBLY DETAIL #2



ROOF CURB CROSS SECTION DETAIL AA

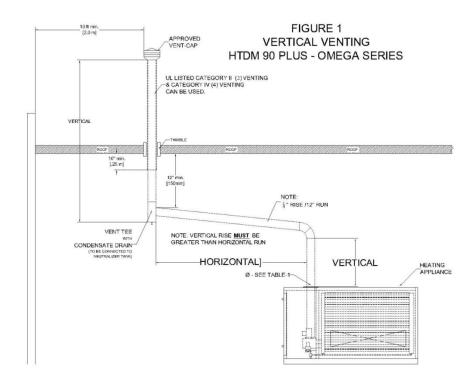


LIFT RIGGING OF UNIT SHALL ONLY BE PERFORMED BY A QUILFIED CRANE RIGGING OPERATOR, OR CONTRATOR. FAILURE TO DO SO MAY RESULT IN: SERIOUS INJURY OR DEATH.

VERTICAL FLUE GAS VENT INSTALLATION NOTES

- Use UL listed category II (2) or category IV (4) for venting pipe.
- Follow pipe Manufacturers sizing guide to ensure accurate selection of venting pipe.
- ❖ Horizontal pipe runs MUST have at least ¼ inch (6mm) rise per 12 inch (305mm) of vent pipe run to ensure proper operation of equipment.
- Where horizontal vent pipe run intersects the vertical vent pipe run, a vent connection tee must be installed. The lowest end of the vent tee must be equipped with a condensate drain connection nipple. A corrosion resistant, pH neutral flexible hose shall be plumbed into the condensate drainage connection prior to the condensate neutralization tank.
- Installer should design the vent pipe runs in such a fashion as to minimize the amount of pipe elbows. (Note: each elbow is equivalent to five (5) feet of straight vent pipe run.) Refer to (Figure 9) Contractor is expected to use most current and best installation practices.
- ♦ Where venting is run through unheated indoor spaces, vent pipe shall be insulated with approved Insulation wrap to prevent flue gas condensation inside the vent pipe run. Insulation shall be a minimum of ½" (12mm) thick, 1-1/2 lb density foil faced fibre glass type.
- ❖ Dampers MUST NOT be used in the flue vent run. Spillage, leakage, of flue vent gasses can result in serious injury, death, or equipment damage.
- Vent connectors, serving Category-1 heaters, must not be connected into any portion of a mechanical draft system operating under positive pressures.

Figure 9 Vertical Venting



HORIZONTAL FLUE GAS VENTING INSTALLATION NOTES

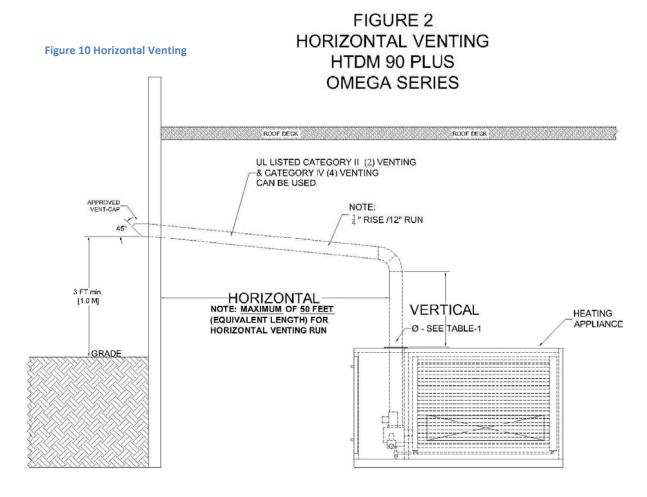
- ❖ Use UL listed category II (2) or category IV (4) for venting pipe.
- Use category I (1) charts for sizing diameter for category II (2) & IV (4). Refer to (Table 1).
- ❖ Horizontal pipe runs MUST have at least ¼ rise per 12 ft of vent pipe to ensure proper operation of equipment.
- ❖ Where horizontal vent pipe run intersects the vertical vent pipe run, a vent connection tee must be installed. The lowest end of the vent tee must be equipped with a condensate drain connection nipple. PVC or CPVC pipe material or other suitable for corrosive condensate fluid shall be plumbed into the condensate drainage connection up stream to the condensate neutralization tank.
- ❖ Installer should design the vent pipe runs in such a fashion as to minimize the amount of pipe elbows. (Note: each elbow is equivalent to five (5) feet of straight vent pipe run.) (Figure 10) Contractor is expected to use most current and best installation practices.
- ❖ Where venting is run through unheated indoor spaces, vent pipe shall be insulated with approved Insulation wrap to prevent flue gas condensation inside the vent pipe run. Insulation shall be a minimum of ½" (12mm) thick, 1-1/2 lb density foil faced fiber glass type.
- ❖ Dampers MUST NOT is used in the flue vent run. Spillage, leakage, of flue vent gasses can result in serious injury, death, or equipment damage.
- ❖ Vent connectors, serving Category-1 heaters, must not be connected into any portion of a mechanical draft system operating under positive pressures.

Table 1 Flue Vent Ø Sizes

FLUE VENT Ø SIZES TABLE - 1

M ODEL	FLUE VENT Ø
HTDM 200-90 PLUS	Ø 4"
HTDM 400-90 PLUS	Ø 4"
HTDM 600-90 PLUS	Ø 6"
HTDM 1000-90 PLUS	Ø 6"
HTDM 1500-90 PLUS	Ø 8"
HTDM 2000-90 PLUS	Ø 10"
HTDM 2500-90 PLUS	Ø 10"
HTDM 3000-90 PLUS	Ø 12"

NOTE: USE CATEGORY 1 CHIMENY SIZING CHARTS TO DETERMINE CHIMENY Ø SIZE



- ❖ The total equivalent length of vent pipe must not exceed 50 ft(15.25m). Equivalent to length is the total length of straight sections, plus 5 ft (1.52m) for each 90 elbow and 2.5 ft (0.76m) for each 45 elbow.
- ❖ An approved Breident Type L, Field Starkap or equivalent vent cap must be provided. Vent cap diameter must be the same as the required vent pipe diameter. The vent terminal must be least 12 in (305mm) from the exterior wall that it passes through to prevent degradation of building material by flue gases. The vent terminal must be located at least 1 ft (305mm) above grade, or in snow areas, at least 3 ft (1m) above snow line to prevent blockage. Additionally, the vent terminals must be installed with a minimum horizontal clearance of 4 ft (1.2m) from electrical meters, gas meters, regulators or relief equipment.

❖ Through the wall, vents shall not terminate over public walkways, or over an area where condensate or vapor could create a nuisance or hazard. Provide vent termination clearances to building or structure features as follows.

Structure	Minimum clearance
Door, Window or gravity inlet	4ft below
	4 ft horizontally
	1 ft above
Forced air inlet within 10 ft	3 ft above
Adjoining building or parapet	6 ft
Adjacent public walkway	7 ft above grade

CONNECTING THE FLUE (VENTING)

When making flue connection to the unit, observe the following recommendations.

The HTDM series of units requires UL listed category II (2) or category IV (4) for venting pipe and/or vent connector. All connections must conform to the requirements of current United States and Canadian codes (Gas Fires Units), and be in accordance with local authorities, which include, but are not limited to:

- The flue must be securely attached to the unit with tight joints.
- ❖ The pipe from the unit to the flue should rise at least ¼" per foot, (76 mm).
 Note: For horizontal runs only
- The flue must be sized to have a cross-sectional area not less than that of the flue collar at the unit, unless the category I (1) chimney chart shows a reduction in diameter being suitable because of the vertical rise.
- Other appliances must not be connected so as to vent through the flue vent run of this unit, refer to category I (1) venting charts for multiple appliances, if multiple appliances of being vented to a common chimney.
- ❖ Do not support the weight of the stack on the flue connection of the heating section.
- Minimize connecting pipe length and the number of bends by locating the unit as close to the flue pipe as possible.
- Maintain clearances between the flue pipe and combustible material that are acceptable to the local authorities having jurisdiction.
- For indoor/outdoor application the flues condensate deposal pipe, located on the unit, shall be piped to an approved condensate neutralization tank and plumbed into appropriate drain. Confirm with local codes and authorities.

PROCEDURE FOR USING THE INDIVIDUAL VENT TABLE

To determine the proper size for an individual vent, apply the table as follows:

- ❖ Determine total vent height and length of lateral, based on appliance and vent location and height to top of vent, as indicated in (Table II). If gas appliances, such as a furnace, have not been chosen or installed, estimate height beginning at 6' above the floor.
- Read down the height column to a height equal to or less than the estimated total height (Table II).
- ❖ Select the horizontal row for the appropriate lateral (L) length. (Table II)

INDIVIDUAL VENTS - TABLE II

	1		3"		Ī	4"		Ĭ	5"		Gas	411		1	7"		ř	8"		Î	10"	
			3		1	10.70	1.	E.	-			-								16	10	
	nu istoria.	. 1000	VO	0.022	v 040						ting I									70 020	201	10000
	Lateral	FA		NAT	FA		NAT	F#		NAT	FA		NAT	FA		NAT	_	N.	NAT	FA		NAT
H (ff)	L (ft)	I Min	Max	Мах	Min	Max	Max	1 Min	Max	Max	I Min	Max	Max	I Min	Max	Max	I Min	Max I	Max	1 Min	Max	Max
6	0	0	78	46	0	152	86	0	251	141	0	375	205	0	524	285	0	698	370	0	1121	570
	2	13	51	36	18	97	67	27	157	105	32	232	157	44	321	217	53	425	285	75	675	455
	4	21	49	34	30	94	64	39	153	103	50	227	153	66	316	211	79	419	279	110	668	445
8	6	25	46	32 50	36	91 165	61 94	47	149 276	100	59	223 415	149 235	78 0	310 583	205 320	93	413 780	273 415	128	661	435
۰	2	12	84 57	40	16	109	75	25	178	120	28	263	180	42	365	247	50	483	322	71	770	515
	5	23	53	38	32	103	71	42	171	115	53	255	173	70	356	237	83	473	313	115	758	503
	8	28	49	35	39	98	66	51	164	109	64	247	165	84	347	227	99	463	303	137	746	490
10	0	0	88	53	0	175	100	0	295	166	0	447	255	0	631	345	0	847	450	0	1377	720
10	2	12	61	42	17	118	81	23	194	129	26	289	195	40	402	273	48	533	355	68	852	560
	5	23	57	40	32	113	77	41	187	124	52	280	188	68	392	263	81	522	346	112	839	547
	10	30	51	36	41	104	70	54	176	115	67	267	175	88	376	245	204	504	330	142	817	525
15	0	0	94	58	0	191	112	0	327	187	0	502	285	0	716	390	0	970	525	0	1596	840
	2	11	69	48	15	136	93	20	226	150	22	339	225	38	475	316	45	633	414	63	1019	675
	5	22	65	45	30	130	87	39	219	142	49	330	217	64	463	300	76	620	403	105	1003	660
	10	29	59	41	40	121	82	51	206	135	64	315	208	84	445	288	99	600	386	135	977	635
	15	35	53	37	48	112	76	61	195	128	76	301	198	98	429	275	115	580	373	155	953	610
20	0	0	97	61	0	202	119	0	349	202	0	540	307	0	776	430	0	1057	575	0	1756	930
	2	10	75	51	14	149	100	18	250	166	20	377	249	33	531	346	41	711	470	59	1150	755
	5	21	71	48	29	143	96	38	242	160	47	367	241	62	519	337	73	697	460	101	1133	738
	10	28	64	44	38	133	89	50	229	150	62	351	228	81	499	321	95	675	443	130	1105	710
	15	34	58	40	46	124	84	59	217	142	73	337	217	94	481	308	111	654	427	150	1078	688
	20	48	52	35	55	116	78	69	206	134	84	322	206	107	464	295	125	634	410	167	1052	665
30	0	0	100	64	0	213	128	0	374	220	0	587	336	0	853	475	0	1173	650	0	1977	1060
	2	9	81	56	13	166	112	14	283	185	18	432	280	27	613	394	33	826	535	54	1351	865
	5	21	77	54	28	160	108	36	275	176	45	421	273	58	600	385	69	811	524	96	1332	851
	10	27	70	50	37	150	102	48	262	171	59	405	261	77	580	371	91	788	507	125	1301	829
	15	33	64	NR	44	141	96	57	249	163	70	389	249	90	560	357	105	765	490	143	1272	807
	20	56	58	NR	53	132	90	66	237	154	80	374	237	102	542	343	119	743	473	160	1243	784
	30	NR_	NR	NR	73	113	NR	88	214	NR	104	346	219	131	507	321	149	702	444	195	1189	745
50	0	0	101	67	0	216	134	0	397	232	0	633	363	0	932	518	0	1297	708	0	2231	119
	2	8	86	61	11	183	122	14	320	206	18	497	314	22	715	445	29	975	645	41	1620	1010
	5	20	82	NR	27	177	119	35	312	200	43	487	308	55	702	438	65	960	605	90	1600	996
	10	26	76	NR	35	168	114	45	299	190	56	471	298	73	681	426	86	935	589	118	1567	972
	15	59	70	NR	42	158	NR	54	287	180	66	455	288	85	662	413	100	911	572	136	1536	948
	20 30	NR NR	NR NR	NR NR	50 69	149	NR NR	63	275 250	169 NR	76 99	440 410	279	97 123	642	401 376	113	888 844	556 522	151	1505	924
100	0	NR NR	NR NR	NR NR	07	218	NR NR	0	407	NR NR	0	665	400	0	605 997	560	0	1411	770	0	1310	249
100	2	NR.	NR.	NR	10	194	NR	12	354	NR	13	566	375	18	831	510	21	1155	700	360	1975	117
	5	NR	NR.	NR	29	189	NR	33	347	NR	40	557	369	52	820	504	60	1141	692	82	1955	115
	10	NR	NR	NR	33	182	NR	43	335	NR	53	542	361	68	801	493	80	1118	679	108	1923	114
	15	NR	NR	NR	40	174	NR	50	321	NR	62	528	353	80	782	482	93	1095	666	126	1892	112
	20	NR	NR	NR	47	166	NR	59	311	NR	71	513	344	90	763	471	105	1073	653	141	1861	110
	30	NR	NR	NR	NR	NR	NR	78	290	NR	92	483	NR	115	726	449	131	1029	627	170	1802	1071
	50	NR	NR	NR	NR	NR	NR	NR	NR	NR	147	428	NR	180	651	405	197	944	575	241	1688	1000

- 1) Regardless of altitude or derating, always design the vent for sea level nameplate input.
 2) "O" lateral applies to vertical vent attached to a top outlet flue collar (see definitions). Any vertical vent starting with a 90 degree elbow at a side outlet must use the 2-foot lateral capacity.
 3) These capacities apply to all-Selkirk vents (no single wall connector material).

INDIVIDUAL VENTS - TABLE II

	1		12"			14"			16"			18"			20"			22"			24"	
			3000			Δ	nnli	nnce	Innu	+ Ra	tina l	n The	MISA	nde .	of Re	. Per	Hou	ır			10000	
Height	Lateral	FA	N	NAT	FA.	N .	NAT		N N	NAT		AN	NAT		IN DI	NAT		AN.	NAT	F4	N	NAT
H (ff)	L (ft)	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	0	0	1645	850	0	2267	1170	0	2983	1530	0	3802	1960	0	4721	2430	0	5737	2950	0	6853	3520
-50	2	103	982	650	138	1346	890	178	1769	1170	225	2250	1480	296	2782	1850	360	3377	2220	426	4030	2670
	4	147	975	640	191	1338	880	242	1761	1160	300	2242	1475	390	2774	1835	469	3370	2215	555	4023	2660
	6	171	967	630	219	1330	870	276	1753	1150	341	2235	1470	437	2767	1820	523	3363	2210	618	4017	2650
8	0	0	1858	970	0	2571	1320	0	3399	1740	0	4333	2220	0	5387	2750	0	6555	3360	0	7838	4010
	2	98	1124	745	130	1543	1020	168	2030	1340	212	2584	1700	278	3196	2110	336	3882	2560	401	4634	3050
	5	154	1110	733	199	1528	1010	251	2013	1330	311	2563	1685	398	3180	2090	476	3863	2545	562	4612	3040
	8	180	1097	720	231	1514	1000	289	2000	1320	354	2552	1670	450	3163	2070	537	3850	2530	630	4602	3030
10	0	0	2036	1060	0	2825	1450	0	3742	1925	0	4782	2450	0	5955	3050	0	7254	3710	0	8682	4450
	2	93	1244	850	124	1713	1130	161	2256	1480	202	2868	1890	264	3556	2340	319	4322	2840	378	5153	3390
	5	149	1229	829	192	1696	1105	243	2238	1461	300	2849	1871	382	3536	2318	458	4301	2818	540	5132	3371
	10	187	1204	795	238	1669	1040	298	2209	1430	364	2818	1840	459	3504	2280	546	4268	2780	641	5099	3340
15	0	0	2380	1240	0	3323	1720	0	4423	2270	0	5678	2900	0	7099	3620	0	8665	4410	0	10393	5300
	2	86	1495	985	114	2062	1350	147	2719	1770	186	3467	2260	239	4304	2800	290	5232	3410	346	6251	4080
	5	140	1476	967	182	2041	1327	229	2696	1748	283	3442	2235	355	4278	2777	426	5204	3385	501	6222	4057
	10	177	1446	936	227	2009	1289	283	2659	1712	346	3402	2193	432	4234	2739	510	5159	3343	599	6175	4019
	15	202	1418	905	257	1976	1250	318	2623	1675	385	3363	2150	479	4192	2700	564	5115	3300	665	6129	3980
20	0	0	2637	1350	0	3701	1900	0	4948	2520	0	6376	3250	0	7988	4060	0	9785	4980	0	11753	6000
	2	81	1694	1100	107	2343	1520	139	3097	2000	175	3955	2570	220	4916	3200	269	5983	3910	321	7154	4700
	5	135	1674	1079	174	2320	1498	219	3071	1978	270	3926	2544	337	4885	3174	403	5950	3880	475	7119	4662
	10	172	1641	1045	220	2282	1460	273	3029	1940	334	3880	2500	413	4835	3130	489	5896	3830	573	7063	4600
	15	195	1609	1018	248	2245	1425	306	2988	1910	372	3835	2465	459	4786	3090	541	5844	3795	631	7007	4575
	20	217	1578	990	273	2210	1390	335	2948	1880	404	3791	2430	495	4737	3050	585	5792	3760	689	6953	4550
30	0	0	3004	1550	0	4252	2170	0	5725	2920	0	7420	3770	0	9341	4750	0	11483	5850	0	13848	7060
	2	74	2004	1310	98	2786	1800	127	3696	2380	159	4734	3050	199	5900	3810	241	7194	4650	285	8617	5600
	5	127	1981	1289	164	2759	1775	206	3666	2350	252	4701	3020	312	5863	3783	373	7155	4622	439	8574	5552
	10	164	1944	1254	209	2716	1733	259	3617	2300	316	4647	2970	386	5803	3739	456	7090	4574	535	8505	5471
	15	187	1908	1220	237	2674	1692	292	3570	2250	354	4594	2920	431	5744	3696	507	7026	4527	590	8437	5391
	20	207	1873	1185	260	2633	1650	319	3523	2200	384	4542	2870	467	5686	3650	548	6964	4480	639	8370	5310
	30	246	1807	1130	305	2555	1585	369	3433	2130	440	4442	2785	540	5574	3565	635	6842	4375	739	8239	5225
50	0	0	3441	1825	0	4934	2550	0	6711	3440	0	8774	4460	0	11129	3635	0	13767	6940	0	16694	100000
	2	66	2431	1513	86	3409	2125	113	4554	2840	141	5864	3670	171	7339	4630	209	8980	5695	251	10788	
	5	118	2406	1495	151	3380	2102	191	4520	2813	234	5826	3639	283	7295	4597	336	8933	5654	394	10737	
	10	154	2366	1466	196	3332	2064	243	4464	2767	295	5763	3585	355	7224	4542	419	8855	5585	491	10652	
	15	177	2327	1437	222	3285	2026	274	4409	2721	330	5701	3534	396	7155	4511	465	8779	5546	542	10570	
	20	195	2288	1408	244	3239	1987	300	4356	2675	361	5641	3481	433	7086	4479	506	8704	5506	586	10488	
	30	232	2214	1349	287	3150	1910	347	4253	2631	412	5523	3431	494	6953	4421	577	8557	5444	672	10328	
100	0	0	3925	2050	0	5729	2950	0	7914	4050	0	10485	5300	0	13454	6700	0	16817	8600	0	20578	
	2	44	3027	1820	72	4313	2550	95	5834	3500	120	7591	4600	138	9577	5800	169	11803	7200	204	14264	
	5	107	3002	1803	136	4282	2531	172	5797	3475	206	7548	4566	245	9528	5769	293	11748	7162	341	14204	
	10	142	2961	1775	180	4231	2500	223	5737	3434	268	7478	4509	318	9447	5717	374	11658	7100	436	14105	
	15	163	2920	1747	206	4182	2469	252	5678	3392	304	7409	4451	358	9367	5665	418	11569	7037	487	14007	
	20	181	2880	1719	226	4133	2438	277	5619	3351	330	7341	4394	387	9289	5613	452	11482	6975	523	13910	
	30	215	2803	1663	265	4037	2375	319	5505	3267	378	7209	4279	446	9136	5509	514	11310	6850	592	13720	
	50	282	2657	1550	350	3856	2250	415	5289	3100	486	6956	4050	572	8841	5300	659	10979	6600	752	13354	8100

- 1) Regardless of altitude or derating, always design the vent for sea level nameplate input.
 2) "O" lateral applies to vertical vent attached to a top outlet flue collar (see definitions). Any vertical vent starting with a 90 degree elbow at a side outlet must use the 2-foot lateral capacity.
- 3) These capacities apply to all-Selkirk vents (no single wall connector material).

CONNECTING THE FLUE (COMBUSTION)

OUTDOOR INSTALLATIONS

AIR FOR COMBUSTION

Openings for combustion air must be provided in a panel (door) with direct access to the vestibule area where the burners and draft inducer are located. This air opening must be of sufficient size to provide a suitable supply of air for combustion to the burner compartment, but not less than one (1) square inch free area per every 800 Btu per hour of the specified maximum input rate. The minimum dimension of any air opening should not be less than 3 inches. Heating appliance must be installed so that air access to inlet opening is unobstructed.

VENTING

The vent termination must be located in accordance with the National Fuel Codes (ANSI Z223.2) in the US or CAN/CGA-B149 Installation code in Canada.

The venting system for outdoor units is a Category 1, with vent products at positive pressure and up to 500 F. The cross-section area of the vent duct or pipe must be at least equal to the discharge area of the draft inducer.

The discharge opening must always be located in the same pressure zone as the combustion air inlet.

- For horizontal discharge, the outlet should be located on the same side of the unit as the combustion air inlet. Never locate the vent outlet on the opposite side from the combustion air inlet opening.
- For horizontal discharge where the flue gases need to be vented vertically, the preferred flue gas discharge should terminate in an exterior flue riser that extends at least to the top of the cabinet and is open at the top and bottom. The riser must be located on the same side of the appliances as the combustion air opening.

INDOOR INSTALLATIONS

AIR FOR COMBUSTION

The furnace must be installed in a location with adequate clearances to provide for an adequate combustion air space, service and inspection, and proper clearance for combustible construction. The furnace shall be located in such a manor that it does not interfere with the circulation of air in the heated space.

All fuel burning equipment must be supplied with air that enters into combustion process and is then vented outdoors. Sufficient air must enter the appliances location to replace the air exhausted through the vent system. Do not install appliances in a confirmed space without providing wall opening to and from this space, if building construction is such that the normal infiltration does not provide sufficient air for combustion and venting, outside air must be introduced in accordance with ANSI Z223.1 (Sect 1.3.4.2 and 1.3.4.3).Install air openings that provide a total free area in accordance with the following.

- 1. Air from inside the building- Opening of a 1 square inch (sq.in) per 1000 Btuh of input, but never less than 100 sq.in.
- 2. Air from outside (ducted) Opening of 1 sq.in. per 2000 Btuh
- 3. Air from inside (Direct opening) Opening of 1 sq.in.per 4000 Btuh.

SEPARATE COMBUSTION SYSTEMS

MTI duct furnace modules may be applied to appliances for operation in separated combustion systems. The module must be mounted with the burner section in a reasonably airtight vestibule compartment, as these systems provide combustion air from outside the heated space and vent products of combustion outdoors. No air openings are to be provided in the vestibule access door or panel and sealing grommets or gaskets should be provided for gas and electrical entry points into the vestibule to provide a reasonably airtight seal.

- 1. A suitable airtight gasket on the vestibule door or access door.
- 2. An observation window in the door to permit observation of ignition and main burner flame during operation and servicing.
- 3. A door or panel interlock switch to insure that door or panel is closed or in place during operation.
- 4. Openings in the vestibule space for attachments of inlet air supply pipe and vent pipe, sized for the Btuh input rating.
- 5. Approved vent terminal on both the supply air inlet and flue gas exhaust. NOTE: The inlet and outlet terminals must be located in the same pressure zone to provide safe appliance operation.

Proper installation of air inlet, and flue gas exhaust piping are essential to the proper operation of the furnace. (See Figure 3 and Figure 4 in appendix C)

HEAT EXCHANGER CONDENSATE DRAIN

The Heat Exchanger unit is provided with a condensate drain. The 3/8" (PLC w/ Braided S.S.) condensate drain connection is located on the underside of the flue discharge box of the heat exchanger. Both indoor and outdoor units **must** have the heat exchanger condensate piped to sanitary sewer drain. The drain line shall be installed in accordance with all plumbing codes. When the heat exchanger is located outdoors, the drain must be run inside the provided condensate drain-line chase of the unit, refer to (Figure 10). The chase shall provide piping access to the interior of the building space (preferably a mechanical room or maintenance room), where the condensate tank will be located for easy maintenance and service. All drain lines from the heat exchanger must be protected from freezing.



WARNING!

Failure to connect the condensate drain can result in uncontrolled condensate drainage into building and/or unit, resulting in standing condensate drainage fluid, which can cause damage to equipment and/or building damage, injury or death. Condensate fluid is high in pH, and is known to corrode and damage, equipment & structure, and may cause other unforeseeable operating problems.



<u>WARNING!</u>

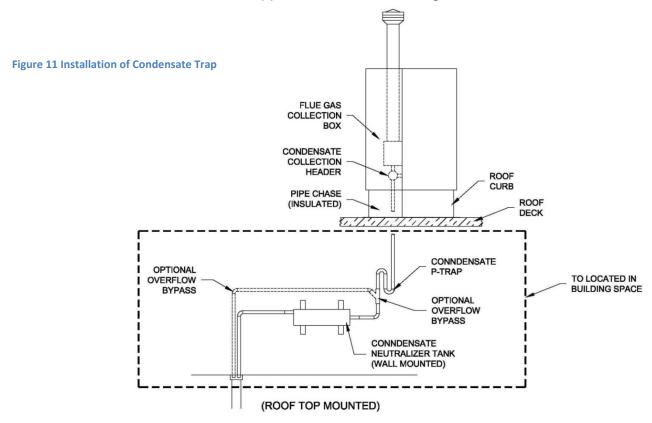
In areas that experience prolonged below freezing outdoor temperatures, the condensate drain line must be routed through a heated space, as provided with condensate drain chase. Failure to protect the condensate drainage pipes from freezing can result in line freeze, condensate freeze-up in/at unit heat exchanger, causing equipment, building, or other damage, injury, or death.

DO NOT DRAIN CONDENSATE ONTO ROOF AREA

INSTALLATION OF THE CONDENSATE DRAIN / TRAP (Shipped Loose)

NOTE: the condensate trap is shipped loose with unit, and requires installation as per plumbing codes before operation of the heat exchanger appliance.

- If the condensate of backing up in the heating exchanger, it will eventually rise within the primary drum, as high as the burner head. If this happened the combustion is going to be very sour because of the changing in pressure inside the drum, and if the condensate rises to the burner it will touch the hot burner plate and cause the burner plate to crack, which will not be covered under warranty. These units should not be operated until it is confirmed that the condensate is draining 100%,
- DO NOT connect the unit gas lines to heater until all the following instructions have been completed.
- ❖ Before unit is placed on roof curb, ensure there is opening to building space (through provided condensate drain chase in unit and roof curb, refer to (Figure 11). Once the unit has been placed on the curb, locate the condensate collection header (located in the condensate drainage chase area). Connect the plumbing drop lines to the provided stainless steel connection nipple at the Heat Exchanger condensate collection header.

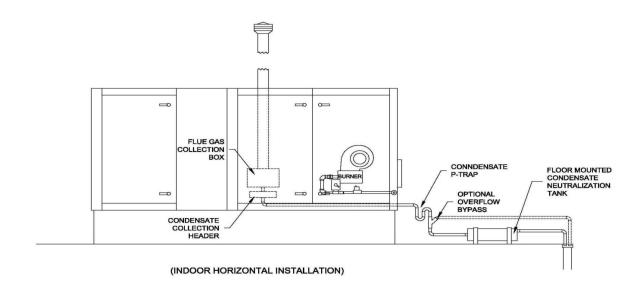


- ❖ In an event of an indoor installation, the condensate neutralization tank must be located at a lower point then the unit condensate drainage connection center line. A p-trap must also be installed, refer to (Figure 12).
- ❖ Determine an appropriate location for condensate neutralization tank to be located in either a mechanical or maintenance room & rigidly mount onto wall or appropriate structure. Ensure there is adequate access area around the condensate

neutralization tank for service & maintenance.

- Connect the condensate trap to the intake nipple of the condensate neutralization tank.
- ❖ Connect the condensate drop line from the unit's heat exchanger condensate collection header outlet, to the intake end of the condensate neutralization tank.
- Connect a drainage line to the discharge nipple on the condensate neutralization tank, run drainage line to sanitary sewer connection as per National and Local plumbing codes.
- Seal all joints and connections with high temperature sealant caulking.

Figure 12 P-trap Installation



CONDENSATE DRAINAGE/NEUTRALIZER INSTALLATION INSTRUCTIONS

All plumbing line for condensate drainage from Heat Exchanger appliance MUST adhere to national and local plumbing codes.

- ❖ Extend condensate drain line from unit, through the condensate drainage chase of unit into the building space. (Preferably a maintenance or mechanical equipment area.)
 Drainage line sizes are to be minimum of ¾" pipe & fitting size. PVC or CPVC pipe material or other suitable for corrosive condensate fluid.
- The condensate line runs shall be sloped (at minimum of 2%) toward the sanitary floor drain.

- The condensate PVC drain line and fittings shall conform to ASTM D1785 / CSA b137
- The condensate CPVC drain line and fittings shall conform to ASTM 2855 / CSA B1347.6
- Use approved methods and material; install all drain lines in accordance with local and National codes.

CONDENSATE NEUTRALIZATION TANK INSTALLATION INSTRUCTIONS

NOTE - Check with your local water authority for regulations regarding discharge of treated condensate to the drain or sewer system.



RISK OF DAMAGE TO APPLIANCE! The neutralization kit inlet and discharge must be at a lower elevation than the condensate drain from appliance.

MARNING!

DO NOT ALLOW EXHAUST FLUE GASSES TO MIGRATE THROUGH THE NEUTRALIZATION TANK.

All condensate drains must have a trap to prevent flue gas leakage. Flue gas leakage can cause injury or death from carbon monoxide.

MARNING!

Connection to the appliance and neutralization kit must be installed to ensure that no condensate backflow into the appliance can occur.

- ❖ The inlet has a center inlet connection port and the outlet connection is off center. Mount the neutralization capsule on the wall or floor securing it with the provided brackets. When mounting capsule in the horizontal position rotate the tube so the outlet is at its lowest point (Figure 10 and 11). The preferred mounting method is in the horizontal position.
- Connections to the appliance and neutralization kit must be installed to ensure that no condensate backflow can occur. Figure 10 and 11)

- Connect the provided hose or corrosion resistant piping and secure it to the floor or wall to prevent movement. Do not route the condensate line through any area that is exposed to freezing temperatures. If traffic poses a risk, install some protection to prevent movement and/or damage.
- ❖ The Y provided is a safety overflow in the event that the condensate drain becomes clogged. Mount as per installation diagram. Ensure that the condensate will flow freely from the appliance drain into the tank then to the drain.
- Access to the discharge is necessary for proper maintenance in order to check the effectiveness of the neutralizing media, using pH test strips.
- ❖ If there is no gravity drain available, install a condensate removal pump (by others) designed for use on condensing boilers and furnaces. The condensate pump must be equipped with an over flow switch to prevent the appliance from running should a failure occur.

CONDENSATE OPERATION AND MAINTENANCE

Operation

When the appliance is in operating mode the condensate will flow through the neutralizing media, raising the pH of the condensate to levels that will aid in preventing corrosion of the domestic drain and the public sewer system.

Maintenance

Monitor the level of the neutralization media in the capsule periodically. Check the pH level at the outlet of the neutralizing kit annually and use a suitable pH test strip paper or an electronic pH meter for precise measurement. The neutralizing media should be replaced when the pH level drops below the minimum level of the local water authority. For replacement media contact your local supplier or factory outlet.

RECOMMENDED CONDENSATE NEUTRALIZTION TANK MAINTENANCE SCHEDULE

UNIT	На	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
	На												
	Нq												
	Нq												
	Нq												
	На												

LIMITED WARRENTY

The condensate tank (if provided with unit) is warranted against defects in materials and workmanship for one year.

ELECTRICAL CONNECTIONS

- When installed, the appliance must be electrically grounded in accordance with local codes, or in the absence of local codes, with the National Electrical Code, ANSI/NFPA, and/or the Canadian Electrical Code, CSA C22.1, if an external source is utilized.
- Control voltage is as indicted on the rating plate.
- Follow the wiring diagram supplied with the unit, (NOTE: when submittal wiring diagrams are provided, the submittal diagrams shall only be used for equipment wiring reference.)
- ❖ If a space thermostat is used with the furnace, locate the thermostat so the cold drafts and hot discharge air streams do not affect the performance of the unit. Do no mount the thermostat on the casing of the unit, as it will be affected by radiated and conducted heat. Refer to the instruction furnished with the thermostat for further details.
- ❖ If any of the original wires as supplied with the unit must be replaced, it must be replaced with type TEW 105 degrees or its equivalent except where noted.
- ❖ Temperature controllers, limit controllers, remote selector switches, door switches or any other auxiliary electrical items must be connected to the terminals provided as shown on the wiring diagram.
- For units shipped in multiple sections, electrical connections between sections are to be made by the installer in the field.
- Field wiring to be done by the installer is denoted by dotted lines on the wiring diagram. Solid lines on the wiring diagram indicate factory wiring by the manufacturer.
- ❖ The unit must be electrically grounded in accordance with local codes, or in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70, and/or the CSA.C22.1 Canadian Electrical code.

NOTE: Due to the nature of transport, installer shall check all contacts and termination points for tightness, and or loose wires.

Figure 13 Standard Wiring Diagram-1

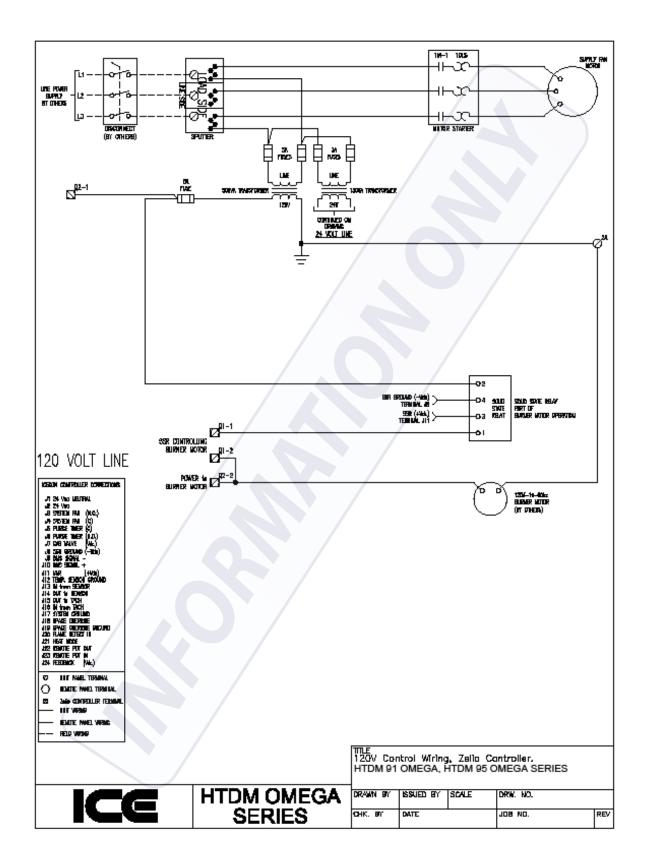
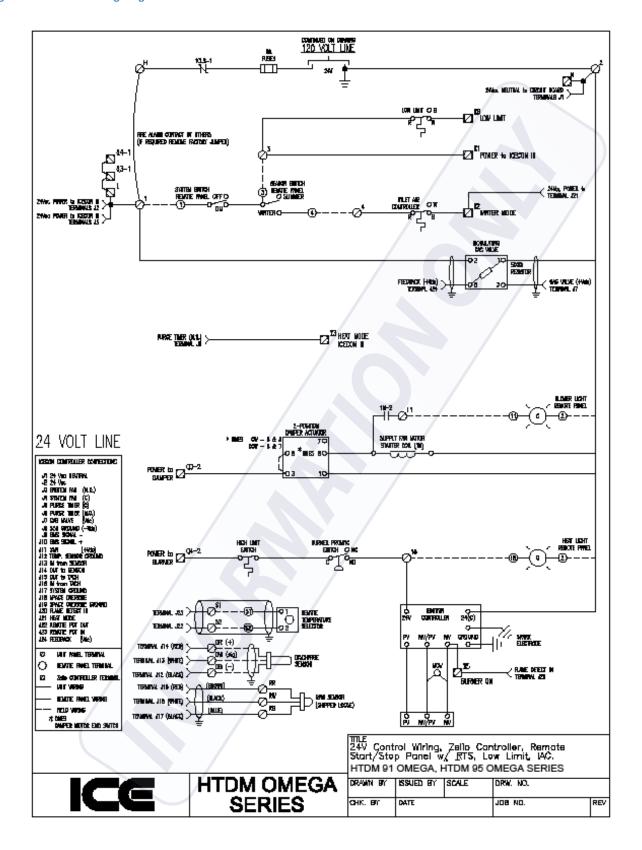
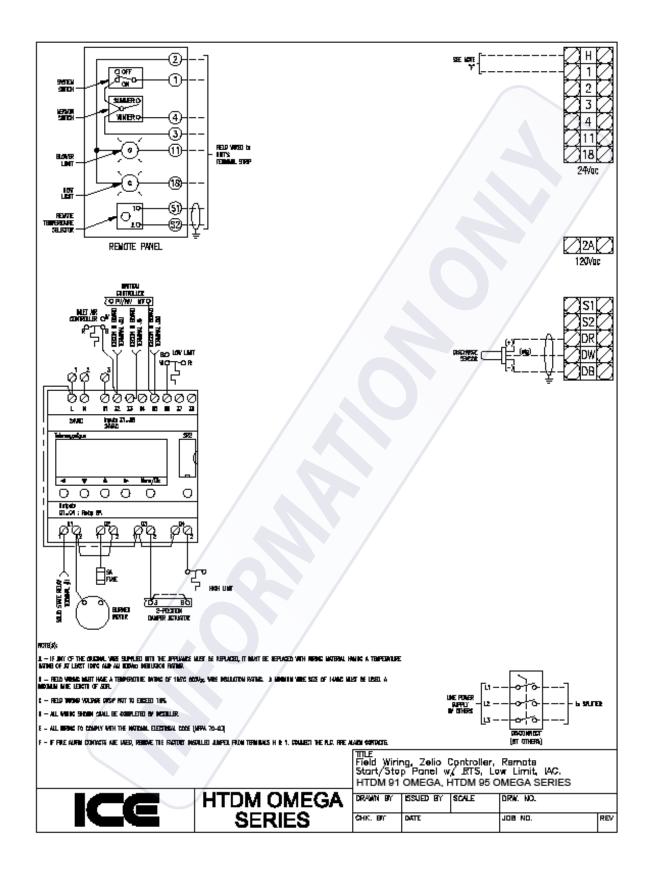


Figure 14 Standard Wiring Diagram-2





GAS PIPING

- ❖ All gas piping should be in accordance with NFPA, National Gas Code, and CAN 1- B149 with the regulation of local authorities having jurisdiction. An emergency manual shut down valve shall be provided upstream of the piping to unit and should be labeled for quick identification. Color coding of gas piping is also recommended.
- ❖ The appliance and the appliances individual shut off valve MUST be disconnected from supply gas piping system during any pressure testing of the supply gas line system when pressures are in excess of ½" p.s.i. [3.5 kPa]. The appliance must be isolated from gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at pressures less than or equal to ½" p.s.i. [3.5 kPa].
- Carefully check the unit rating plate for fuel type and supply pressure.
- If required, locate the high-pressure regulator at least five feet from the unit.
- Gas lines must not be located in such a way as to hinder access to the unit.
- ❖ A minimum 1/8" NPT tapping plug, accessible for testing gauge connection, must be installed immediately upstream of the gas supply connection to the appliance.
- Check for gas leaks with soap and water solution. Never use open flame to check for gas leaks.
- ❖ The appliance and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures of ½ psi (3.5 kPa). The appliance must be isolated from the gas supply system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psi (3.5 kPa).

GAS PIPING/REGULATOR VENTING

High gas pressure regulator (if required), low pressure regulator, pilot pressure regulator, gas pressure switch (if supplied), and normally open vent valve (if supplied) must be vented outside of building for an indoor unit (check with authorities having jurisdiction).

NATURAL GAS AND PROPANE INSTALLATION:

- Installation must be made in accordance with the requirements of the authorities having jurisdiction in the area.
- Check the unit rating plate and confirm fuel type, supply pressure, input rating, and temperature rise.
- Refer to the heater rating plate for determining the minimum gas supply pressure for obtaining the maximum gas capacity for which this heater is specified
- Gas supply pressure higher than the unit rating plate requires an additional field supplied gas regulator.
- ❖ Install an approved shutoff valve on the gas supply in accordance with the requirements of the authorities having jurisdiction. Manufactures specification states a minimum of 3ft from the gas connection (union).
- Gas lines shall not interfere with unit access. The gas line connection at the heater shall have an approved drip leg with screwed cap.
- ❖ A minimum 1/8 inch NPT plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the unit.
- On indoor units any control device (regulator, diaphragm valve, high and low pressure switch, etc.) that requires a bleed or vent line, must be vented in accordance with applicable codes.
- ❖ To obtain specific temperature rise settings, Temperature rise is directly affected by the air flow across the heat exchanger. The unit shall be air balanced (by an approved air balancing contractor) as to provide specified air flow. (see Figures 16 through 20)

TEMPERATURE RISE – AIR FLOW TABLES

		Inlat	lalat		
MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)
		7-10.5	11-13	1532	110
HTDM 200 90 plus OMEGA	200/182	7-10.5	11-13	1685	100
		7-10.5	11-13	1872	90
		7-10.5	11-13	2106	80
		7-10.5	11-13	2407	70
		7-10.5	11-13	2809	60
		7-10.5	11-13	3370	50
		7-10.5	11-13	4212	40
		7-10.5	11-13	5617	30
		7-10.5	11-13	8426	20

Table 4 HTDM 400 Air Flow						
MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)	
	400/364	7-10.5	11-13	3064	110	
		7-10.5	11-13	3370	100	
		7-10.5	11-13	3745	90	
		7-10.5	11-13	4213	80	
HTDM 400 90		7-10.5	11-13	4815	70	
plus OMEGA		7-10.5	11-13	5617	60	
		7-10.5	11-13	6741	50	
		7-10.5	11-13	8426	40	
		7-10.5	11-13	11235	30	
		7-10.5	11-13	16852	20	

MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)
	600/564	7-10.5	11-13	4596	110
		7-10.5	11-13	5056	100
HTDM 600 90 plus OMEGA		7-10.5	11-13	5617	90
		7-10.5	11-13	6319	80
		7-10.5	11-13	7222	70
		7-10.5	11-13	8426	60
		7-10.5	11-13	10111	50
		7-10.5	11-13	12639	40
		7-10.5	11-13	16857	30
		7-10.5	11-13	25278	20

Table 6 HTDM 1000 Air Flow							
MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)		
	1000/910	7-10.5	11-13	7660	110		
		7-10.5	11-13	8426	100		
		7-10.5	11-13	9362	90		
		7-10.5	11-13	10532	80		
HTDM 1000 90		7-10.5	11-13	12037	70		
plus OMEGA		7-10.5	11-13	14043	60		
		7-10.5	11-13	16852	50		
		7-10.5	11-13	21065	40		
		7-10.5	11-13	28086	30		
		7-10.5	11-13	42130	20		

Table 7 HTDM 1500 Air Flow						
MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)	
		7-10.5	11-13	11490	110	
	1500/1365	7-10.5	11-13	12639	100	
HTDM 1500 90		7-10.5	11-13	14043	90	
		7-10.5	11-13	15799	80	
		7-10.5	11-13	18056	70	
plus OMEGA		7-10.5	11-13	21065	90 80 70 60 50	
		7-10.5	11-13	25278	50	
		7-10.5	11-13	31597	40	
		7-10.5	11-13	42130	30	
		7-10.5	11-13	63194	20	

Table 8 HTDM 2000 Air Flow								
MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)			
		7-10.5	11-13	15320	110			
	2000/1820	7-10.5	11-13	16852	100			
		7-10.5	11-13	18724	90			
		7-10.5	11-13	21065	80			
HTDM 2000 90		7-10.5	11-13	24074	70			
plus OMEGA		7-10.5	11-13	28086	60			
		7-10.5	11-13	33704	50			
		7-10.5	11-13	42130	40			
		7-10.5	11-13	56173	30			
		7-10.5	11-13	84259	20			

Table 9 HTDM 2500 Air Flow						
MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)	
		7-10.5	11-13	15320	110	
		7-10.5	11-13	16852	100	
	2500/2275	7-10.5	11-13	18724	90	
		7-10.5	11-13	121065	80	
HTDM 2500 90		7-10.5	11-13	24074	70	
plus OMEGA		7-10.5	11-13	28086	60	
		7-10.5	11-13	33704	50	
		7-10.5	11-13	52662	40	
		7-10.5	11-13	70216	30	
		7-10.5	11-13	105324	20	

Table 10 HTDM 3000 Air Flow

MODEL	INPUT/OUTPUT MBH	Inlet Pressure Natural Gas WC	Inlet Pressure Propane WC	AIR CAPACITY CFM	TEMPERATURE RISE (Deg-F)
		7-10.5	11-13	15320	110
		7-10.5	11-13	16852	100
		7-10.5	11-13	18724	90
		7-10.5	11-13	21065	80
HTDM 3000 90	3000/2730	7-10.5	11-13	24074	70
plus OMEGA		7-10.5	11-13	28086	60
		7-10.5	11-13	33704	50
		7-10.5	11-13	63194	40
		7-10.5	11-13	84259	30
		7-10.5	11-13	126389	20

NOTE: AIR-FLOW REQUIEMENTS MAY DIFFER FROM ABOVE BASE CHARTS. FOR SPECIFIC AIR FLOW AND TEMPERATURE RISE REFER TO EQUIPMENT SUBMITTAL PACKAGE. OR CONSULT FACTORY.

HEAT TRANSFER FLUIDS

The coil(s) (when provided) have been selected for use with a specific heat transfer fluid as shown on the Submittal Record. Use of other fluids will result in different performance and can damage the coil(s).

It is imperative to properly select and apply heat transfer fluids used in heating and cooling systems. Untreated, improperly treated or improper use of fluids or use of fluids not approved for use in commercial heating and cooling systems can damage coils and system components. For selection and application of heat transfer fluids, always follow the manufacturers' recommendations including treatment, mixing and filling. Warranty will be void if coil damage results from misapplication or improper treatment of the heat transfer fluid.

Some systems may use CPVC piping. Do not use propylene glycol with CPVC.

COOLING COILS

Cooling coils (when provided) are installed in the air stream, condensation will form on coil surface and provisions must be made to properly dispose of condensate liquid. Condensate drains are located on the exterior of the unit (See Submittal Package for Details). The condensate should be disposed of according to local or national plumbing codes.

GENERAL OPERATING INSTRUCTION

- 1) Refer to the rating plate for fuel input and supply pressures.
- 2) Do not attempt to start the burner if the unit is full of vapor or gas, or if the combustion chamber is very hot.
- 3) Do not leave combustible material near the unit.
- 4) Shut off the manual fuel supply valve if the burner has been shut down for an extended period of time.
- 5) Do not start unit unless all the access doors are securely in place.
- 6) Refer to literature regarding controls, gas valves and other components.

START-UP PROCEDURES

PRE-CHECKS

- 1. Ensure the main disconnect switch is in the "off" position.
- 2. Ensure the burner on-off switch is in the "off" position.
- 3. Check all electrical and gas connections and tighten if necessary
- **4.** Check main rating plate voltage against the supplied voltage to disconnect.
- 5. Check main blower by rotating blower shaft by hand to ensure it is free to turn.
- **6.** Tighten bearing set screws, and pulley set screws.
- 7. Remove shipping blocks from vibration isolators (if equipped)
- 8. Check for loose items shipped inside blower section (if supplied) and remove.
- 9. Check heater outlets for obstruction.
- 10. Check all fuse blocks to determine that correct fusing is installed.
- 11. Check the supply fan motor thermal overload setting against the rating plate value.
- 12. Check building system gas supplies and be sure all lines are purged of air,
- 13. Check building system gas supply pressure.

CAUTION

GAS UNITS

At maximum input the gas pressure must fall within the range specified on the unit rating plate.

Optional high and low gas pressure switched (if supplied) must be reset.

14. Check all piping for tightness and correct any signs of leaks.



Fire or explosion hazard can cause property damage, severe injury, or death. Check for gas leaks with rich soap and water solution any time work is done on a gas line. Never use an open flame to detect gas leaks.

START-UP

- 1) Turn on power to the unit.
- 2) Enable the unit (Fan Only)
- 3) Ensure supply blower rotation is correct.
- 4) Check supply blower motor amps against rating plate values. If actual figure is significantly different that the rating plate value, take corrective actions with respect to duct work and accessories external to the unit
- 5) Set thermal overloads to appropriate motor performance after all adjustments have been made.
- 6) Enable burner.
- 7) Verify unit's sequence of operation corresponds to sequence provided in the supplied literature.
- 8) Refer to start-up check list and field report for settings that are to be checked on the unit.

Note: Factory set pre purged timer is set to "65 seconds".

- 9) Combustion analysis must be completed, to ensure proper operation of heat exchanger.
- 10) Disable burner. Ensure the burner shuts down as per the sequence of operation.
- 11) Disable unit. Ensure the unit shuts down as per the sequence of operation.

SHUT DOWN

1. EMERGENCY SHUT DOWN

- a) Set disconnect switch to "off' position.
- b) Close the manual main fuel valve.
- c) Set the unit controls to the "off" position.

2. SERVICE SHUT DOWN

- a) Set the unit controls to the "off" position.
- b) Close the manual main fuel valve.

MAINTENANCE

Regular maintenance is necessary to ensure the efficient operation and long life of this unit. This maintenance should be performed by or supervised by qualified service personnel. A maintenance schedule should be prepared for the unit based on its application and location.

- 1. For checking gas leak tightness of safety, use a rich soap and water solution and spray/apply on the points of connection.
- 2. Turn shut off valve on and wait, if air bubbles form, turn shut off valve closed.
- 3. Repeat steps 1 and 2 until no more air bubbles form.

Note: It is important to check at least an annual basis.

RECOMMENDED QUARTERLY MAINTENANCE

MARNING

Fire or explosion hazard can cause property damage, severe injury, or death. Check for gas leaks with rich soap and water solution any time work is done on a gas line. Never use an open flame to detect gas leaks.

∆WARNING

Personal Protective Equipment (PPE) Required!

- 1) Replace air filters if necessary. Replace filters only with type equivalent to those supplied with the unit by the factory. Location of filter access panels are marked on the unit. To replace filters, remove service panel or open blower door, slide out dirty filters and replace with same size filters in order to prevent possibility of dust collecting inside of unit. Filter sizes are written on the filters and rating plate. For a complete list of filters sizes, contact manufacturer.
- 2) Inspect blower wheels and housing, clean if necessary.
- 3) Check for loose connections in the wiring.
- 4) Check the voltage at the unit while it is in operation.
- 5) Inspect all contactor to ensure that they are clean and making good contact.
- 6) Check all belts. Adjust or replace as necessary.
- 7) Check motor amperage draws against rating plate values.
- 8) Check all bearings and lubricate if necessary.
- 9) Check all dampers, linkages and damper actuators; adjust and tighten as required.
- 10) Inspect combustion fan assembly for wear,
- 11) Inspect combustion blower wheel for cleanliness.

- 12) Check the fuel supply pressure to the unit.
- 13) Check operation of all safety controls.
- 14) Check the flame sensor signal.
- 15) Check the manifold pressure.

RECOMMENDED YEARLY MAINTENANCE



Fire or explosion hazard can cause property damage, severe injury, or death. Check for gas leaks with rich soap ans water solution any time work is done on a gas line. Never use an open flame to detect gas leaks.

∆WARNING

Personal Protective Equipment (PPE) Required!

- 1) Perform the recommended quarterly maintenance.
- 2) Check Flame Sensor and Igniter.
 - a. Remove attached wires; be sure to note the terminals so as to ensure proper reassembly.
 - b. Remove flame sensor and igniter from the burner assembly, using appropriate tools.
 - c. Visually inspect the flame sensor and igniter for cracks in the porcelain, warping of the rods, or corrosion build up. If these parts show any ware it's the manufacture recommendation to replace this device(s).
- 3) Complete a combustion analysis report, to ensure proper operation of heat exchanger.
- 4) Ensure the unit shuts down as per the sequence of operation.

- 5) Inspect Burner assembly, clean & service if required.
- 6) Ensure gas has been turned off to the unit and a site specific lock out procedure is in place.
- 7) Remove flame sensor and igniter
- 8) Remove gas line connection at burner assembly.
- 9) Remove the combustion fan.
- 10) Remove all fastening bolts from the burner box and keep at hand for re-use.
- 11) Remove burner box from unit.
- 12) Remove all old gasket material from burner box flanges, and attachment flanges.
- 13) Inspect burner and burner orifices for residue, debris or corrosion.

Note: Orifices shall be cleaned with an <u>approved</u> orifice cleaning tool. **(DO NOT DRILL, REEM, OR ALTER THE ORIFICES IN ANY WAY.)**

- 14) Ensure no debris from cleaning process is left inside the burner box.
- 15) Re-install the burner box. Install a new burner box gasket. Ensue all mounting bolts are in place. Use high temperature silicone to seal the burner to the mounting flanges.
- 16) Re-install combustion fan. Install a new gasket. Ensue all mounting bolts are in place.
- 17) Re-install flame rod and igniter.

MARNING

Failure to replace all fasteners, seals, or removed components may result in serious injury, death, and/or severe equipment damage.

- 18) Redo combustion analysis report and compare to previous one, to ensure proper operation of heat exchanger.
- 19) Inspect and clean the condensate collection and disposal systems to ensure proper drainage.
- 20) Ensure the unit shuts down as per the sequence of operation.

ICECONIII

POWER

HEAT MODE

AUTO

SETUP ERROR

SYSTEM ERROR

ERROR CODES:

SYSTEM ERROR PLUS ERROR LIGHT

ERROR 1 -AIR PROVING ERROR

ERROR 2 -FLAME ERROR

ERROR 3 -HIGH LIMIT ERROR

ERROR 1 & 2 -LOW LIMIT ERROR

ERROR 1 & 3 -VALVE ERROR

ERROR 1

ERROR 2

ERROR 3

NORMAL START-UP SEQUENCE

1) Call For Heat

The ICECON controller will indicate power by illuminating the power LED (light emitting diode). The combustion blower is ramped to full speed. Upon proof of closer of the modulating gas valve the auto heating light is energized.24VAC power is sent

to the purge timer coil. Upon the timing out of the purge timer the combustion blower will ramp to minimum speed for trial for ignition.

2) Trial for Ignition

Upon timing out the combustion blower drops to low speed and the ignition controller is powered. The pilot line solenoid is powered opening the pilot gas flow to the burner. Simultaneously the ignition controller initiates spark. Upon proof of flame ignition controller opens the main gas valves allowing gas to flow to the modulating gas valve, simultaneously sending a 24VAC signal to the ICECON2 controller. Upon receiving the 24VAC signal the board will enter System Preheat.

3) System Preheat

System preheat is indicated by a flashing Heat Mode LED. During this stage the ICECON controller will ramp the firing valve and combustion blower to midrange without energizing the main supply fan. Preheat lasts approximately 60 seconds. Upon completion of the system pre-heat the main supply fan energizes and the unit will begin to operate in one of the following modulation modes

HEAT MODES

1) Factory Set Discharge Temperature, no field adjustment.

The unit will adjust the firing rate to maintain the factory set discharge temperate. The Power, Heat Mode and Auto LEDs are illuminated to indicate this condition.

2) RTS (Remote Temperature Selector)

There are two temperature ranges for the RTS', 40-90F and 90-120F. The unit will modulate to maintain the temperature selected on the RTS.

3) External Modulation Control

The ICECON controller is capable of responding to a 0-10Vdc or 4-20mA signals. To configure the ICECON controller to respond to an external signal the RSP and Mod/std check boxes (In the software interface) must not be checked. The control signal connects to terminals J3-25 and J3-26. The ICECON controller will remain in control of errors and will lock out if any error condition occurs. The BMS has complete control over the discharge temperature.

The BMS supplier must supply the ICECON controller with either 0-10 VDC or 4-20 mA signal. The signal is to be supplied to terminals J25 and J26. After normal startup sequence is finished the auto led will remain de-energized. The unit will now only respond to the BMS signal and is unable to self adjust to changes in conditions.

The ICECON controller will respond to the incoming signals and modulate to a corresponding firing rate. The firing curve is composed of discrete steps. Each step is controlled by a trigger voltage or current that once reached the combustion will move to the next combustion step.

When tuning a BMS system the following points must be considered:

How ICECON Controller Responds to External Modulation Control

The ICECON controller automatically scales the incoming signal to the internal combustion curve that has been programmed at the factory. The curve is made of discrete steps. There are dead- bands in the signal in which the unit will not modulate with an increase or decrease in the control signal.

Once a signal is received the controller will modulate to the corresponding firing point. During this transition the ICECON controller will not respond to changes in the control signal. As a result the Control system must be tuned for a very slow response. Poor temperature control will result if the system is not tuned correctly.

Switching From mA control signal to VDC

Remove the ICECON control cover plate. In the lower right hand area of the circuit board there is a small black jumper labeled "4-20mA enable". This jumper is left in place when receiving a 4- 10 mA signal and is removed when using a 0-10 Vdc signal.

AVAILABLE OPTIONS (Software controlled)

1) Space Override

Units equipped with this option will modulate normally in one of the above heat modes until continuity is sensed between terminals J19 and J21. Upon sensing continuity unit will de- energize the auto indicator LED and ramp to full fire until the contacts are opened. Regular heat mode operation will be resumed once the contacts between J19 and J21 are opened.

2) Low Limit

The unit will shut down the supply fan if the duct temperature falls below the factory set point.

3) System Preheat

The unit can use a built in time delay before the contacts to the main supply fan are energized. This will allow a preheating of the heat exchanger to insure that only warm air will be supplied to the space.

Preheat operation begins with a normal trial for ignition. Once flame has proven the unit will modulate to the midpoint of the firing range. The heat mode led will indicate the preheat cycle by flashing. The unit will remain at the midpoint until the preheat cycle is ended. Once ended the main supply fan contacts will energize and normal heat mode operation will begin.

4) Standby mode

Standby mode is to be used in conjunction with an on/off thermostat or when periodic heating is required. In Standby mode the ICECON is continually powered. The unit will indicate standby mode by flashing the power LED. In this mode the heat cycle will remain powered down until there is a call for heat from indicated by a 24VAC signal on terminal J22. Upon a call for heat a normal start up sequence is ran and the unit will then enter heat mode. Once the call for heat is satisfied and the 24VAC signal is lost on terminal J22 the ICECON controller will exit heat. The unit will enter a post heat purge. During this time the combustion blower and firing valve are ramped to full fire. Upon completion of the post heat purge the burner and combustion blower are shut down. The main supply fan will remain in operation for a period of time to allow for cooling of the heat exchanger.

5) Fan on in Standby Mode

With this option the main supply fan will remain in operation regardless of the call for heat when the Standby option is selected. During transition between heat and standby operation the supply fan may cycle on and off for a short duration.

ERROR SIGNALS

1) High Limit Error

This condition will occur when the ICECON controller has a duct temperature greater than the factory set point or the discharge sensor contacts are in the open condition. This condition is indicated by the illumination of LED numbers 5 and 8. The unit will indicate the high limit error and will lock until reset.

Led numbers 5 and 8 will illuminate. The main supply blower will remain energized until the duct temperature falls below the factory set safe shut down temperature. The combustion blower will remain at max RPM until the unit is reset.

2) Low Limit Error

The low limit lock out condition occurs when the air temperature in the duct work has fallen below a factory set position. This condition is indicated by the illumination of LED numbers 5, 6 and 7. Upon a drop in duct air temperature the unit will lock out and shut down the burner. The main supply fan will be de-energized to stop the flow of unheated air form entering the space. The combustion blower will run at the max RPM setting.

3) Air Proving Error

Air proving error occurs when the tachometer stops sending a signal to the ICECON controller. This condition is indicated by the illumination of LED numbers 5 and 6. The fan operation must be checked as well as the function of the tachometer sensor itself. Improper operation will cause poor and irregular combustion. The unit must be reset to reinitiate.

4) Flame Error

Flame error occurs when the flame signal is lost to the ICECON controller. Lock occurs after the fourth attempt during trial for ignition and in any instance in which flame is lost after heat mode has been achieved. The unit must be reset to reinitiate.

5) Valve Error

Valve error occurs when the ICECON controller looses communication with the modulating gas valve or abnormal operation of the modulating gas valve has been detected. This condition is indicated by the illumination of LED numbers 5, 6 and 8. The unit will lock out and will require resetting to reinitiate.

Trouble Shooting

AIR PROVING ERROR	The ICECON controller has lost the Tachometer signal. Check combustion blower operation. Check tachometer sensor operation (see section ******). Check ICECON fuses
FLAME ERROR	The ICECON controller has lost the 24 VAC on terminal J22. Check gas supply Check ignition module for proper operation Check all fail safes for proper operation Check valves, manual and solenoid, for proper operation Check ICECON fuses
HIGH LIMIT ERROR	The ICECON controller has received a temperature reading above the factory set value. Check main blower and dampers for proper operation. Check discharge sensor for correct attachment. Open contacts on the Discharge sensor terminals will cause indication of a high limit condition. Check ICECON fuses
LOW LIMIT ERROR	The ICECON controller has detected a temperature below that set by the as the low limit. Check unit for proper operation. Check discharge sensor. Continuity between the white and black terminals will return a -51 degree F signal. Check ICECON fuses
VALVE ERROR	The ICECON controller has

lost communication with the modulating gas valve.Check that valve is powered and operating correctly.
• Check for signal (0-10VDC) on terminal J11. The unit will not fire until valve has proven closed (<=2.0 VDC signal on terminal J11)
• Check ICECON fuses

NO DISPLAY ON ICECON2 CONTROLER	Board requires 24VAC on terminal J2 for operation. Check fuses on both the control panel and Circuit board and replace as necessary. Verify correct wiring, wiring connections and grounding of the electrical components.
BOARD WILL NOT ENTER HEAT MODE	ICECON requires 24VAC on terminal J12 to enter heat mode. Board requires a 2.0 VDC signal on terminal J11 before initiating trial for ignition.
	Flame has not proven. (ICECON) requires a 24VAC signal on terminal J22 before entering heat mode. The controller will use 4 trials for ignition before indicating "flame error".
UNIT WILL NOT MODULATE	Check for free rotation of the modulating valve Check for correct feedback signal
SUPPLY FAN DOES NOT INGAGE	Check for power on terminal J5 on the ICECON controller. If power is trace unit wiring as per diagram to determine fault. Check for power on terminal J6. If power is not present trace wiring as per diagram to determine fault. If power is present on J6 but not J5 the system is not calling for the supply air.

Tachometer Test Procedure

Disconnect power to the combustion blower. Engage a heat cycle so that the board locks out on an air proving error.

- Verify approximately 5 VDC between terminals J2-17 and J2-18. If voltage is not present disconnect all tachometer leads from the board and recheck. If power is now present replace the tachometer and verify wiring is correct. If power is still absent replace the ICECON controller and verify wiring.
- Ensure that the magnet is not aligned with the end of the tachometer. Approximately 5Vdc should be between J2-18 and J2-16.
- Rotate the combustion blower wheel until the magnet is aligned with the tachometer. The voltage between J2-18 and J2-16 should now be zero. If this is not the case check the distance from the tachometer and the magnet. This space should not exceed 1/8th of an inch. If required adjust to the correct pacing. If the systems remain the same the magnet will have to be remove and reversed as the tachometer is polarity sensitive.

Discharge Sensor and RSP (Remote Set Point) Test

Once the combustion curve has been set up and the board configured for stand alone the operation of the discharge sensor and RSP must be verified. To accomplish this the computer must be connected to an active ICECON controller. With the system in heat mode activate the "Tools" pull down menu and select "I/O view".

A new screen is no displayed. On the lower right there are three buttons, "Read", "5 second read" and "Exit". "Read" performs a one-time read of the variables. "5 second read" performs a read function every 5 seconds. "Exit" closes the I/O screen. Click the "5 second read" button.

Compare the value of the discharge sensor reading with a known temperature. At this time if a discharge reading of 281°F is displayed there is an open circuit in the discharge sensor circuit and the unit will lock out on "High Limit Error". The discharge sensor reading should be stable with less than 1-2° fluctuations at steady state conditions.

Turn the RSP counter clockwise until the physical stop is reached. A value of 40 when a 40-90°F RSP is being used and 90 when a 90- 120°F RSP is used should be displayed in the RSP value (This may take up to 30 seconds).

Turn RSP clockwise until the physical stop is reached. The upper limit of the RSP should be displayed. Verify a mid point and align the pot to the correct temperature scale position. To do this, use a small screwdriver to loosen the knob and reposition such that the arrow points to the correct temperature. Retighten the knob.

The low temperature scale should have an ohm range of 0- 5000Ω resistance range. The High temperature range RSP should have $100k\Omega$ - $200k\Omega$ resistance range.

Wiring

J1	24 VAC Neutral
J2	24 VAC
J3	Normally opened contact to purge timer coil
J4	24VAC for purge timer common
J5	Normally opened contact to supply fan
J6	24VAC for supply fan common
J7	Solid state relay (+ VDC)
J8	Solid state relay (- VDC)
J9	Modulating gas valve control signal(2-10 VDC)
J10	Modulating gas valve ground (24VAC common)
J11	Modulating gas valve feedback signal (2-10 VDC)
J12	Heat mode/ Standby (Switched 24VAC)
J13	Temperature Sensor Ground (-VDC)
J14	Temperature Sensor Supply (+ 5VDC)
J15	Temperature Sensor Signal (+VDC)
J16	Tachometer Sensor Signal (+VDC)
J17	Tachometer Sensor Supply (+ 5VDC)
J18	Tachometer Sensor Ground (-VDC)
J19	Space override contact
J20	System Ground
J21	Space override contact
J22	Flame detect in (24VAC)
J23	Remote temperature selector contact
J24	Remote temperature selector contact
J25	Building management in
J26	Building management in

Programming the HTDM ICECON controller

To correctly configure the ICECON series of controllers the ICECON software must be used to communicate with the controller. Factory training is required. Changes to the control program can cause poor combustion, improper or undesired operation.

Software identification

For the ICECON controllers the icecon1.7b version of the software must be used. This software can be identified by the seven configuration check boxes in the top right hand corner of the main screen. The original software only had 3 configuration boxes.

Setting up the Software

To establish communication ensure that the ICECON controller is in either "Stand-By" mode (indicated by flashing power led), in "Heat Mode" (indicated by both "Power" and "Heat Mode" leds illuminated) or locked in an error condition

When first installed the program will not be configure to your system. To properly configure the software you must chose the correct COM port for the serial cable connection on your computer. To begin activate the "Settings" pull down menu and select "ComPort". Select the COM port if known.

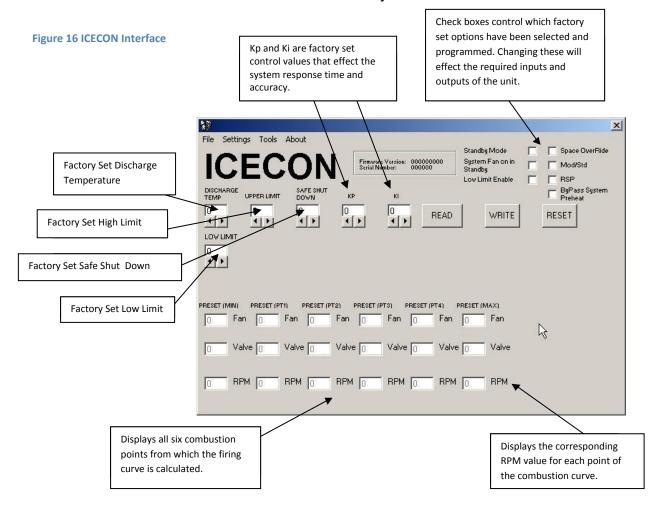
If the COM port configuration on you computer is not known you must connect to an active ICECON controller. Once this is accomplished activate the "Settings" pull down menu and select "ComPort". Begin by selecting the initial COM port "COM 1". Allow 30-45 seconds for the software to communicate. If the board continues to indicate "Board not communicating" then try another COM port.

If communication cannot be established ensure that only one application of the ICECON software is running. Check that the correct communication cable is being used (9-pin, straight through cable with gender changer) and is connected to both the computer and ICECON controller.

Once configured the software will store the correct COM port. This procedure will only be necessary upon initial installation of the software.

The Main Interface

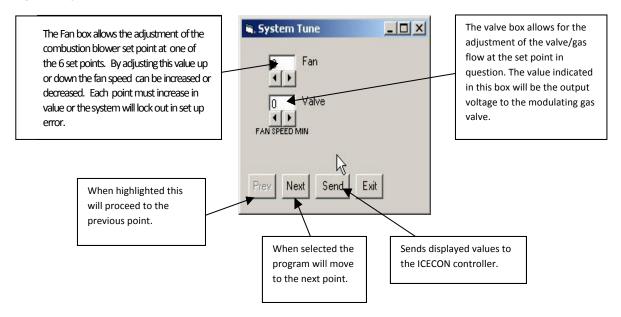
This screen provides a view of the current settings contained in the ICECON controller. Various control values such as the high and low limits can be adjusted in this environment. The options that the controller is currently configured with are displayed in the upper right corner and are indicated by a check mark in the corresponding box. The combustion curve settings, six in total, located at the bottom of the screen cannot be adjusted in this environment.



System Tune Interface

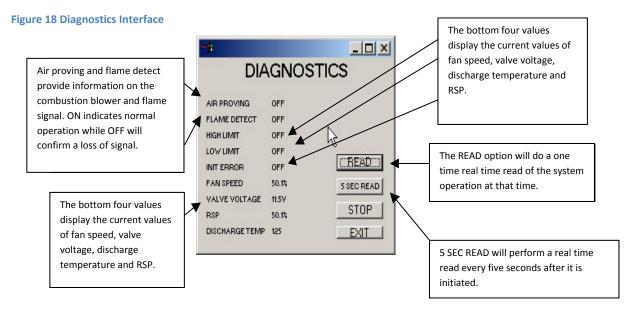
To access the combustion settings activate the tools pull down menu and select the system tune option. The screen displayed in figure 2 is now visible. Adjustments to the combustion curve can be made to any of the six points. The previous screen will not be updated until the user has left system tune mode.

Figure 17 System Tune Interface



I/O View

The I/O view option located in the tools menu is used as a real time diagnostic tool. The system will communicate a provide status of system safeties and operating points.



ICECON III Configuration

The main configuration for the board is contained in the seven check boxes located in the top right corner of the main screen.

1. ByPass System Preheat

Once checked the preheat cycle will be eliminated. The preheat cycle will take place once main flame has been established. The burner will be ramped to a mid point in the firing range and remain there for approximately 45 seconds. Once complete the output on J1- 5(usually used to energize the supply fan) will be energized. The ICECON controller is now ready for modulation.

2. RSP

Once checked the ICECON II controller will look for a remote temperature dial for the temperature set point. The remote temperature dials are available in two ranges 40– 90°F and 90-120°F. This is only used during standalone operation and cannot be used when a building management system (BMS) or other source is being used to provide the modulation control. When not checked the ICECON II controller will maintain the temperature indicated in the "Discharge Temperature" set point box.

3. Mod/std.

This when checked activates the internal modulation control routines. When checked the system will not respond to a BMS signal.

4. Space Override

When checked the ICECON controller will monitor terminals J3-20 and J3-21 for continuity. When continuity is detected the system will ramp to full fire and remain at this point, regardless of discharge temperature, until continuity is lost.

5. Standby Mode

When checked the ICECON controller will operate in both heating and non-heating modes. To enter a heating cycle 24 VAC must be present on terminal J2-12. When not checked board is only to be power during a heating cycle.

6. System Fan on in Standby

Once checked the output on J1-5 will be energized in both "Standby" and "Heat" modes. A delay will be experienced during transitions between the two modes.

7. Low Limit

When checked the low limit sensing routines are energized. During "Heat Mode" if a temperature is sensed below the low limit set point the J1-5 output will be deenergized. There is a non-adjustable 3-minute delay upon initiation of a heat cycle.

Set Points

Located beneath the ICECON logo are six set points. They are as follows:

- 1. Discharge Temperature. This box is used to introduce a positive offset from the RSP set point. It is used for calibration of the discharge sensor and in the event that no RSP is being used will indicate the temperature to be maintained.
- 2. Upper Limit. This temperature is the set point at which the ICECON controller will deenergize J1-3 (Burner on output) to shut off the heat when the discharge sensor detect any temperature above this value. Once this has occurred the unit will indicate "High Limit Error".
- 3. Safe Shut Down. Upon tripping on a "High Limit Error" J1-5 (Supply fan output) will remain energized until the discharge sensor detects a temperature below this set point.
- **4. Kp**. This is used for controlling the aggressiveness of the temperature response. The higher this value the faster the response and greater chance of temperature overshot. The default value is 70.
- **5. Ki**. This is used to control the temperature response and is an error multiplication factor. The default is 2.

6. Low Limit. When a temperature below this set point is detected, after a 3-minute interval time delay, the ICECON controller will de-energize J1-5 and J1-3 and lock out on "Low Limit Error".

Combustion Set Points

Located across the bottom of the main screen of the ICECON application are the six combustion set points. Each point has three parameters that describe each point. The "Fan" box contains a number that controls the cycle time of the solid-state relay and trial control signal. This number will determine the speed at which the combustion fan will rotate when firing at the corresponding firing point.

The fan rotation speed is indicated by the "RPM" box. This value is read in from the tachometer sensor as the combustion points are configured. This value is used by the software as a reference to ensure that the correct fan speed is maintained. Once configured the RPM values must maintain a 200-rpm separation between points and increase as you move from left to right across the screen.

The "Valve" box contains the valve set points. This will represent actual DC voltage being sent to the modulating gas valve. These points must increase as you transition from left to right across the main screen. The valve functioning range is 2 to 10 VDC.

Altering Combustion Set Points

Calibrating the Tachometer

Before altering any points the main firing valve should be switched to the closed position. When adjusting combustion points it is possible to override the internal stepping functions.

To begin setting up the combustion curve access the "Tools" pull down menu and select the "System tune" function. This gives direct access to the combustion curve set points. The first point (low fire) is displayed. To override the system and force the system to low fire press the "Send" button.

The combustion fan will adjust to the appropriate speed and the modulation gas valve will track to the correct voltage. It is important to notice that the valve voltage does not correspond to the voltage that was displayed on the main screen, it is in fact double. This is just how it is at this time so live with it. When the main screen is displayed the actual voltage to being sent the valve is displayed (1/2 system tune voltage). Once the valve has reached the low fire set point allow 10 seconds for sufficient sampling time of the fan speed.

Click the "Next" button and the system will now display the second combustion point. Press "Send" to drive the system to this combustion point. Allow the actuator to travel and stop at the correct voltage. Allow 10 seconds to achieve an accurate rpm reading. Repeat the process until the high fire set point is reached. Press "Exit" to return to the main screen. After a few second the system will update the combustion points and the updated tachometer readings will be displayed.

Adjusting Combustion Points

The following tachometer and valve set points provide a rough guideline.

Point #1: 1200-1800 rpm, 2.5Vdc (5.0Vdc in system tune) Point #2: 1800-2200 rpm, 3.5Vdc (7.0Vdc in system tune) Point #3: 2200-2500 rpm, 4.5Vdc (9.0Vdc in system tune) Point #4: 2400-2700 rpm, 5.5Vdc (11.0Vdc in system tune) Point #5: 2600-3000 rpm, 6.5Vdc (13.0Vdc in system tune) Point #6: 3000-3400 rpm, 8.0Vdc (16.0Vdc in system tune)

It is very critical to maintain a minimum 200rpm separation between combustion points. Once this rough curve has been established override this system to high fire. Open the firing valve and set the manifold pressure. Shut the firing valve and force the system to low fire. Reopen the firing valve when the system is at low fire. Walk the system through each point in the combustion curve and check combustion making adjustments to the gas valve voltage as necessary. Once complete exit system tune and recheck complete curve. If the curve is satisfactory press the "Write" button. Confirm that the program has been updated by clicking the "Read" button. High fire should be running between 5-7% oxygen, 7-9% CO2 while at low fire that number will vary from 18-20% oxygen, 0.1-1% CO2. Remember as the dirt accumulates the combustion fan performance will drop off so allow excess oxygen during initial factory set up.

Saving a ICECON Program

Once a HTDM has been configured and all the combustion points have been set (these will vary from unit to unit) it is time to save an electronic copy. Activate the file pull down and click "Save as". A new screen will pop up displaying the directory in which the file will be saved, the type of file being saved (*.ice.....don't change this) and the name of the file to be saved. Change the name of the file to something meaningful (job number for example). Click the save button and the file has been saved. This should be done whenever working on a unit that has been in operation and should be used as a base line for adjustments.

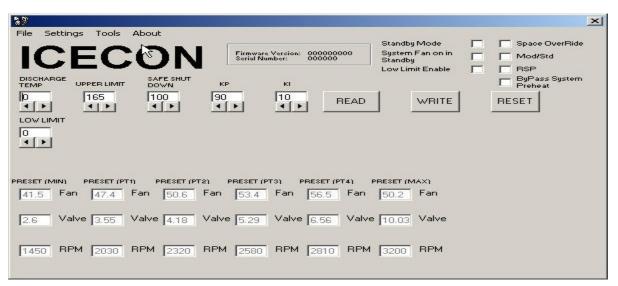
<u>Uploading a ICECON File to a Controller</u>

Connect the computer to the ICECON controller and establish communication. At this time the program that has been stored in the controller will be displayed. To load an existing program open the "File" pull down menu and click the "Open" function. Locate the file to be loaded and select it. At this time the program to be loaded is displayed on the ICECON interface screen. To upload this to the board click the "Write" button. This will overwrite the information stored with the program displayed on the interface. To confirm that the information has been uploaded press the "Read" button and the stored information will be displayed. Some programs may not be compatible and will cause the "Board not communicating" to be displayed. Try an alternate program.

Error Codes of the ICECON Controller

- 1. High Limit Error. The high limit error will occur when the discharge sensor detects a temperature above the upper limit set point. A false high limit trip can occur when the discharge sensor in not connected, as an open circuit in will default the temperature reading to 281°F. This is characterized by the system entering heat cycle, purging, lighting and approximately 5 seconds after main flame has proven, locking out on high limit.
- 2. Low Limit Error. This occurs when the discharge sensor detects a temperature below the low limit set point. A false reading can be created if there is continuity (i.e. a dead short) between terminals J2-13 and J2-15. In this case the board will be receiving and false temperature reading of 58°F.
- 3. Valve Error. This will occur if the ICECON controller loses communication with the ball valve. To operate the controller must receive the feedback signal form the ball vale whenever the ICECON III controller is powered.
- **4. Air Proving Error**. If the signal from the tachometer is lost the board will lock out on this condition. To check for proper operation of the tachometer perform the Tachometer test located in the following section.
- **5. Flame Detect Error**. If the ICECON controller has not detected a flame (i.e. receiver a 24Vac signals on terminal J3-22).
- **6. Setup Error**. This error occurs when the Combustion points have been incorrectly configured.

Figure 19 ICECON Controller



Separated Combustion Systems

HM duct turnace modules may be applied to appliances for operation in separated combustion systems. The module must be mounted with the burner section in a reasonably airtight vestibule compartment, as these systems provide combustion air from outside the heated space and vent the products of combustion outdoors. No air openings are to be provided in the vestibule access door or panel and sealing grommets or gaskets should be provided for gas and electrical entry points into the vestibule to provide a reasonably airtight seal.

1.) A suitable airtight gasket on the vestibule door or access panel.

2.) An observation window in the door to permit observation of ignition and main burner flame during operation and servicing.

3.) A door or panel interlock switch to insure that door or panel is closed or in place during operation.

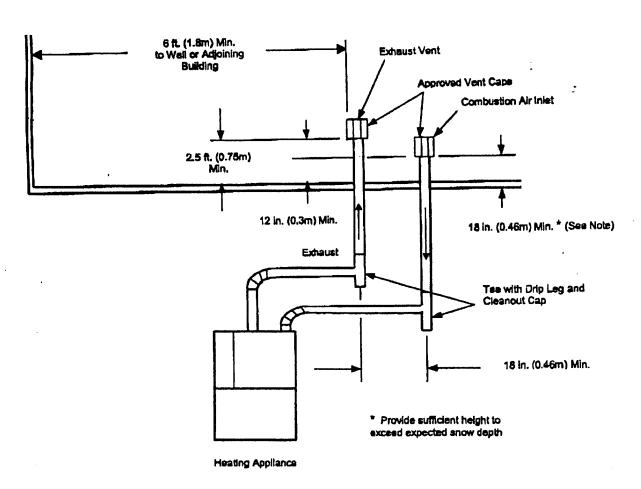
4.) Openings into the vestibule space for attachment of inlet air supply pipe and vent pipe, sized for the Bluh input rating. Approved vent terminals on both the supply air inlet and flue gas exhaust. NOTE: The inlet and outlet terminals must

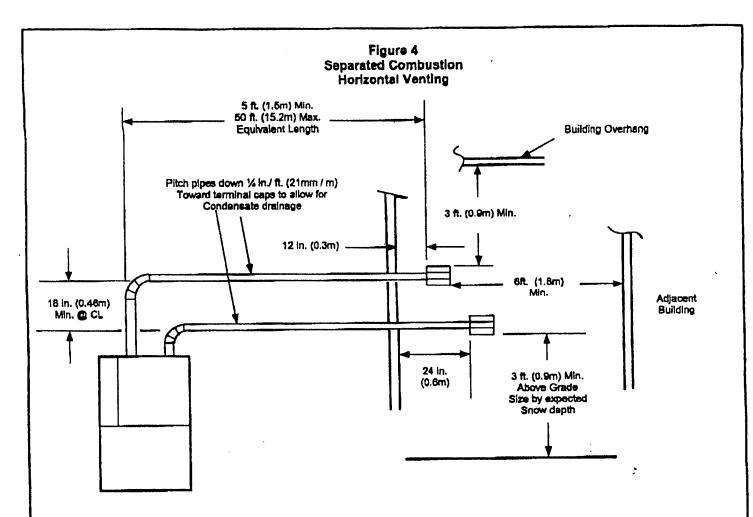
be located in the same pressure zone to provide for safe appliance operation.

6.) Instructions covering installation and operation for the separated combustion system must be included in the appliance manufacturer's Installation and Operation Manual.

Proper installation of air injet and flue gas exhaust piping are essential to proper operation of the appliance. See Figures 3 and 4. for recommended installation.

Figure 3 Separated Combustion **Vertical Venting**





Reference to the following information <u>must be included</u>
In the instructions which the OEM provides with the finished product in which the duct furnace module is installed.

- Gas Code ANSI Z223.1, applicable NFPA standards and any local codes or ordinances that apply to the ticular product class.
- A statement to cover replacement wiring " If any original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 90 oC (194 oF).
- A WARNING that the duct furnace is not certified or suitable for use in drying or process applications. Use in such applications voids any warranty and manufacturer disclaims any responsibility for the duct furnace and/or application
- A WARNING that the Gas-fired duct furnaces are not designed for use in hazardous atmospheres containing, flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne substances containing silicone.
- AWARNING that the presence of childrine vapors in the combustion air supply to gas fired heaters presents a supplied to modern hazard.
- WARNING: The use and storage of gasoline or other flammable vapors and liquids in the vicinity of this
 appliance is hazardous.
- o WARNING labels attached to exterior of cabinet as required by Z83.8 Sections 1.32.4 and 1.32.5
- Safety, lighting, operating and shutdown instructions