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August, 2019

INSTALLATION AND SERVICE MANUAL low temperature hot water unit heaters



Motors are designed for continuous duty. They can operate in a maximum ambient temperature of 104°F (40°C).

The model number of each unit heater indicates its rated Btu/Hr. capacity/1000 entering air temperature. For example an HCH 67 has an output of 67,000 Btu/Hr. at 140°F entering water temperature and 60° entering air temperature.



CAUTION

A qualified installation and service agency must perform all installation and service of these appliances, and the use of this manual is solely and specifically intended for that purpose.

Inspection On Arrival

1. Inspect unit upon arrival. In case of damage, report it immediately to transportation company and your local factory sales representative.
2. Check rating plate on unit to verify that power supply meets available electric power at point of installation.
3. Inspect unit received for conformance with description of product ordered (including specifications where applicable).

General Information

Installation and service instructions in this manual are applicable to the low temperature hot water unit heaters which should be installed in their proper applications for their most effective function as overhead heating units.

The copper coils are warranted for operation at hot water pressures up to 150 lbs. per sq. in. gauge, and or temperatures up to 180°F. Canadian Standards Association (CSA) requirements state that explosion-proof units may not be used with a fluid temperature in excess of 329°F and still maintain their explosion-proof rating, for national electric code ignition temperature rating T3B for grain dust.

THIS MANUAL IS THE PROPERTY OF THE OWNER.
PLEASE BE SURE TO LEAVE IT WITH THE OWNER WHEN YOU LEAVE THE JOB.


SPECIAL PRECAUTIONS / TABLE OF CONTENTS / SI (METRIC) CONVERSION FACTORS

SPECIAL PRECAUTIONS


THE INSTALLATION AND MAINTENANCE INSTRUCTIONS IN THIS MANUAL MUST BE FOLLOWED TO PROVIDE SAFE, EFFICIENT AND TROUBLE-FREE OPERATION. IN ADDITION, PARTICULAR CARE MUST BE EXERCISED REGARDING THE SPECIAL PRECAUTIONS LISTED BELOW. FAILURE TO PROPERLY ADDRESS THESE CRITICAL AREAS COULD RESULT IN PROPERTY DAMAGE OR LOSS, PERSONAL INJURY, OR DEATH. THESE INSTRUCTIONS ARE SUBJECT TO ANY MORE RESTRICTIVE LOCAL OR NATIONAL CODES.

HAZARD INTENSITY LEVELS


- 1. **DANGER:** Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.
- 2. **WARNING:** Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
- 3. **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.
- 4. **IMPORTANT:** Indicates a situation which, if not avoided, MAY result in a potential safety concern.

**DANGER**

Appliances with power codes 01, 02, 04, 05, and 10 must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

**WARNING**

- 1. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
- 2. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
- 3. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
- 4. When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting Modine Manufacturing Company. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by Modine will be at the owner's risk.

**CAUTION**

- 1. Do not install units below 8 feet measured from the bottom of the unit to the floor.
- 2. A qualified installation and service agency must perform all installation and service of these appliances, and the use of this manual is solely and specifically intended for that purpose.
- 3. Do not reuse any electrical component which has been wet. Replace component.
- 4. Ensure that the supply voltage is within +10% and -5% from rated voltage listed on the nameplate.
- 5. Heaters are designed for use in heating applications with ambient temperatures between 0°F and 100°F in hot water applications.

IMPORTANT

- 1. Start-up and adjustment procedures must be performed by a qualified service agency.
- 2. To check most of the Possible Remedies in the troubleshooting guide listed in Table 11.1, refer to the applicable sections of the manual.

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SI (METRIC) CONVERSION FACTORS

Table 2.1

To Convert	Multiply By	To Obtain	To Convert	Multiply By	To Obtain
"W.C.	0.249	kPa	feet	0.305	m
°F	(°F-32) x 5/9	°C	Gal/Hr.	0.00379	m ³ /hr
Btu	1.06	kJ	Gal/Hr.	3.79	l/hr
Btu/ft ²	37.3	kJ/m ²	gallons	3.79	l
Btu/hr	0.000293	kW	Horsepower	746	W
CFH (ft ³ /hr)	0.000472	m ³ /min	inches	25.4	mm
CFH (ft ³ /hr)	0.00000787	m ³ /s	pound	0.454	kg
CFM (ft ³ /min)	0.0283	m ³ /min	psig	6.89	kPa
CFM (ft ³ /min)	0.000472	m ³ /s	psig	27.7	"W.C.

UNIT LOCATION / UNIT MOUNTING

UNIT LOCATION

DANGER

Appliances with power codes 01, 02, 04, 05, and 10 must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

1. Units should not be installed in atmospheres where corrosive fumes or sprays are present.
2. Be sure no obstructions block air intake or air discharge of unit heater.
3. Locate horizontal delivery unit heaters so air streams of individual units wipe the exposed walls of the building with either parallel or angular flow without blowing directly against the walls. Heaters should be spaced so the air stream from one supports the air stream from another heater. See Figure 3.1.
4. Columns, machinery, partitions, and other obstacles should not interfere with air streams from unit heaters.
5. Unit heaters installed in a building exposed to a prevailing wind should be located to direct a major volume of heated air along the windward wall of the building.
6. Horizontal delivery unit heaters with 90° hoods should generally be located in the central area of the space to be heated. Place horizontal delivery units without hoods along the walls of the same building where heat loss is usually greatest. See Figure 3.3.
7. Arrange horizontal delivery units so they do not blow directly at occupants. Air streams from this type of unit should be directed down aisles, into open spaces on the floor, or along exterior walls.
8. When only Horizontal delivery units with 90° hoods are installed, they should be located so exposed walls are blanketed by their air streams. See Figure 3.2.

Figure 3.1 - Horizontal Delivery Unit Location

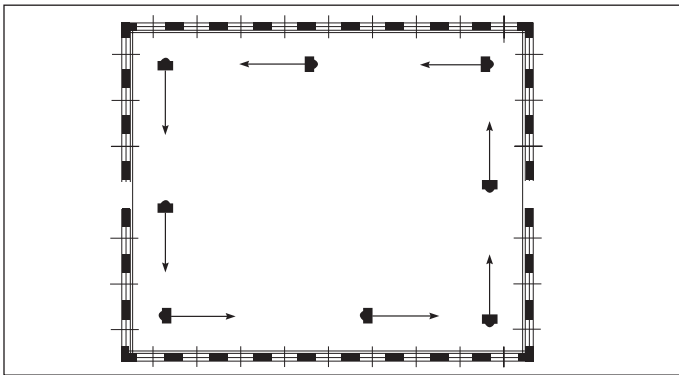


Figure 3.2 - Unit Locations of Horizontal Units With 90° Hoods In Narrow Buildings

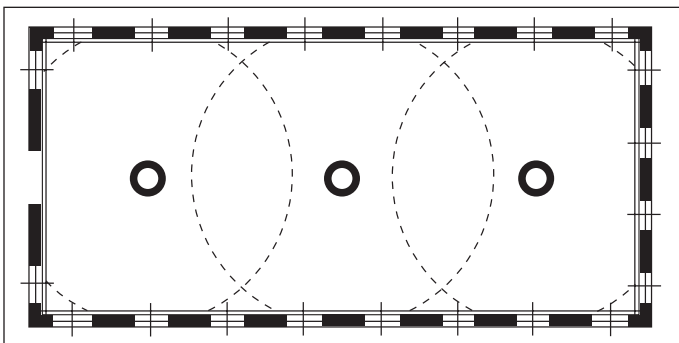
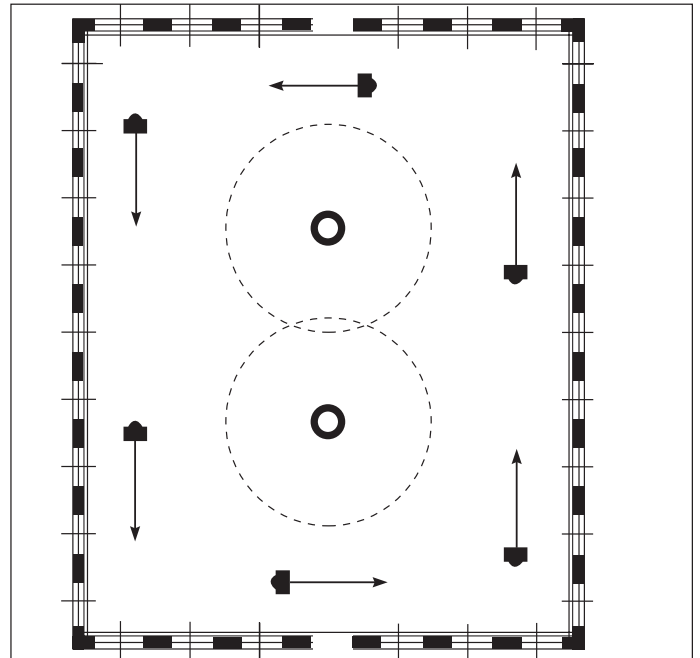


Figure 3.3 - Combination Horizontal and Vertical Delivery Unit Installation



UNIT MOUNTING

CAUTION

Do not install units below 8 feet measured from the bottom of the unit to the floor.

Do not install unit above recommended maximum mounting heights. Height at which unit heaters are installed is critical. Maximum mounting heights for all units are listed in Table 4.1 and the height dimensions are shown in Figures 4.3 and 4.4. Maximum mounting heights for horizontal models are given for units with or without optional air deflectors. The data in Table 4.1 is based on operating conditions of 140°F entering water with 60°F entering air. When operating conditions are other than those above, refer to Figure 4.2 for maximum mounting height correction factor. To obtain the maximum mounting at actual operating conditions, multiply the appropriate factor from Figure 4.2 by the mounting height in Table 4.1. The maximum mounting height for all units is that height above which the unit heater will not deliver heated air to the floor at standard rating conditions.

Deflector Mounting

If an optional air deflector has been furnished, it is always shipped separately and can be attached to the unit before suspension. Vertical louvers for horizontal units can also be added and positioned before installation. Refer to mounting instructions which are furnished with each deflector.

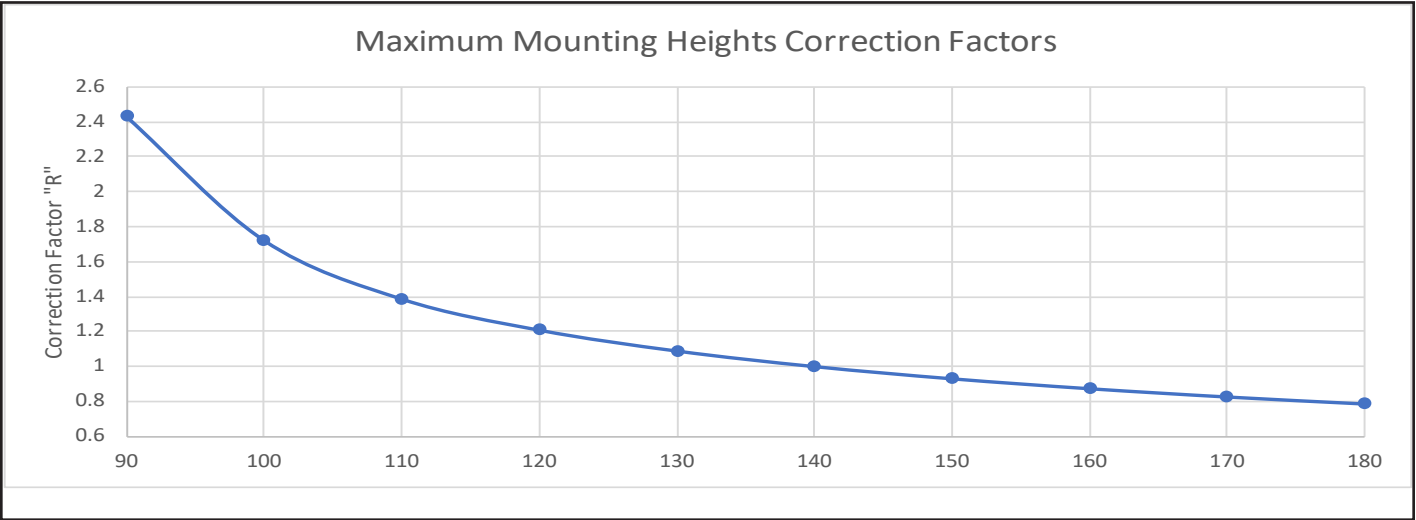
UNIT MOUNTING

Table 4.1 - Maximum Mounting Heights

Horizontal Type ①		Downward Deflector Hood ②		
Model No.	Max Mounting Height (ft)	30°	60°	90°
		Max Mounting Height (ft)	Max Mounting Height (ft)	Max Mounting Height (ft)
HCH 22	8	14	15	32
HCH 39	8	12	12	35
HCH 67	9	16	16	24
HCH 104	11	19	19	40
HCH 170	11	19	19	52
HCH 195	11	18	18	41

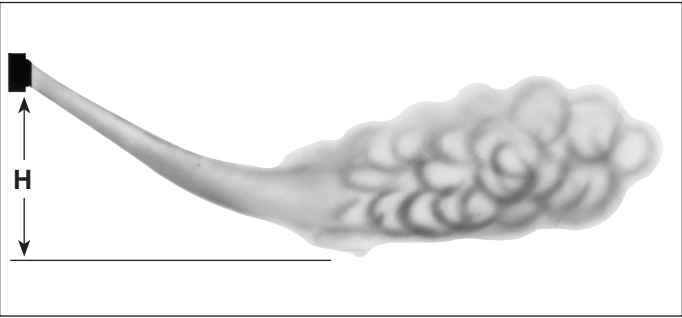
① With horizontal louvers opened 30° from the vertical plane.
② Mounting heights are maximum for heaters operating at standard conditions. Heights listed for Downward Deflector Hoods are with deflectors in fully-opened position. Refer to Figure 4.2 for correction of mounting heights under other operating conditions. Maximum mounting height will be reduced as entering air temperatures exceed 60°F.

Figure 4.2 - Maximum Mounting Heights Correction Factors



These correction factors are to be used as multipliers to correct the maximum recommended mounting heights of unit heaters when operated with water at other than average temperature of 140°F.

Figure 4.3 - Horizontal Unit Delivery

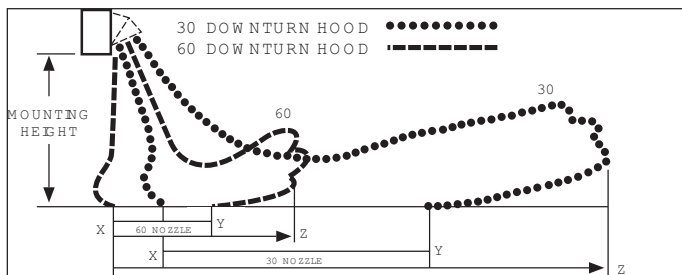


HOT WATER PERFORMANCE DATA

Table 5.1 - Performance Data - 30°, 60° and 90° Downward Deflector Hoods

Mounting Height to Bottom of Heater	30° Downward Hood For Propeller Units					
	HCH					
	HCH 22	HCH 39	HCH 67	HCH 104	HCH 170	HCH 195
	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z
8'	13 26 31	10 21 24	15 30 35	19 36 42	19 36 42	18 34 40
10'	13 25 29	8 18 22	14 29 34	18 35 41	18 35 41	16 33 39
12'	10 23 27	5 14 17	13 27 32	16 34 39	16 34 39	15 32 37
14'	8 19 21	-	11 25 29	15 32 38	15 32 38	14 30 35
16'	-	-	8 21 25	13 30 35	13 30 35	12 27 32
18'	-	-	-	11 26 31	11 26 31	9 23 28
20'	-	-	-	-	-	-

Mounting Height to Bottom of Heater	60° Downward Hood For Propeller Units					
	HCH					
	HCH 22	HCH 39	HCH 67	HCH 104	HCH 170	HCH 195
	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z
8'	0 28 32	0 21 25	0 32 37	0 38 44	0 38 44	0 36 42
10'	0 26 30	0 18 21	0 30 35	0 37 43	0 37 43	0 35 40
12'	0 22 26	0 12 14	0 28 32	0 35 41	0 35 41	0 33 38
14'	0 17 20	-	0 24 28	0 32 38	0 32 38	0 30 35
16'	-	-	0 18 22	0 29 34	0 29 34	0 26 31
18'	-	-	-	0 24 29	0 24 29	0 20 24
20'	-	-	-	-	-	-



Mounting Height to Bottom of Heater	90° Downward Hood For Propeller Units					
	HCH					
	HCH 22	HCH 39	HCH 67	HCH 104	HCH 170	HCH 195
8'	65	74	43	92	133	93
10'	58	66	39	82	119	84
12'	53	61	36	75	108	76
14'	49	56	33	70	100	71
16'	46	53	31	65	94	66
18'	43	50	29	61	88	62
20'	41	47	28	58	84	59
22'	39	45	26	56	80	56
24'	37	43	25	53	77	54
26'	36	41	-	51	74	52
28'	35	40	-	49	71	50
30'	33	38	-	48	69	48
32'	-	37	-	46	66	47
34'	-	36	-	45	64	45
36'	-	-	-	43	63	44
38'	-	-	-	42	61	43
40'	-	-	-	41	59	42
42'	-	-	-	-	58	-
44'	-	-	-	-	57	-
46'	-	-	-	-	55	-
48'	-	-	-	-	54	-
50'	-	-	-	-	53	-

HOT WATER PERFORMANCE DATA

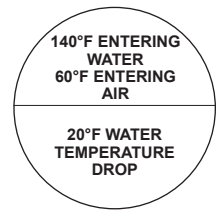


Table 6.1 - Performance Data for Units at Standard Conditions of 140°F Entering Water and 60°F Entering Air High Motor Speed

Model No.	Btu/hr	Water Data			Air Data					Motor Data	
		GPM	Pressure Drop (Ft. of Water)	Min/Max GPM	Maximum Mounting Height (ft.) ①	Heat Throw or Spread @ Max. Height ①	CFM	Outlet Velocity (Fpm)	Final Air Temp. (°F)	Hp	Approx. RPM
HCH 22	21,688	2.2	4.90	0.8 / 10	8	27	370	408	60	1/25	1,550
HCH 39	38,547	3.9	1.50	1.4 / 18	8	28	660	409	60	1/25	1,550
HCH 67	66,875	6.7	2.60	2.6 / 31	9	33	1,150	456	60	1/6	1,075
HCH 104	104,204	10.4	4.80	4.1 / 48	11	39	1,830	503	60	1/6	1,075
HCH 170	169,564	17.0	7.40	6.8 / 77	11	42	2,780	475	60	1/3	1,140
HCH 195	194,917	19.5	10.40	8.0 / 88	11	40	3,200	455	60	1/3	1,140

Figure 6.2 - Model Dimensions HCH 22-195

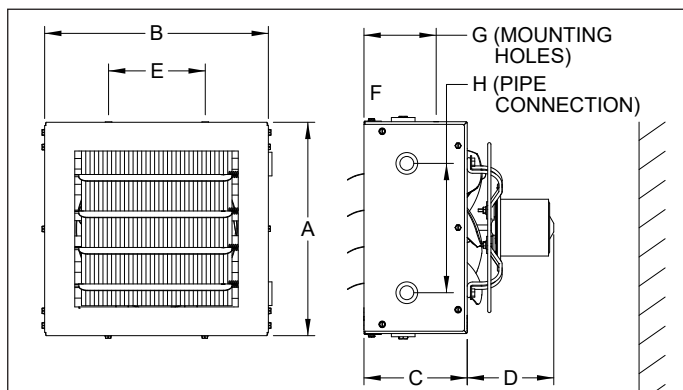


Table 6.3- Model Dimensions HCH 22-195 ①

Model Number	A	B	C	D		E	F		G	H	Connections Copper Tube OD (in.)	Fan Diameter (in.)	Shipping Wt. lb.
				115V Std. Motor	Exp. Motor		Inlet	Outlet					
HCH 22	14.5	20.2	8.4	7	11.5	11.0	3.1	5.7	6.5	7.2	0.5	9	32
HCH 39	18.5	24.5	8.4	7	11.5	15.0	3.1	5.7	6.6	13.2	0.875	12	46
HCH 67	22.5	29.0	9.7	10	16	18.5	3.1	5.7	6.7	17.2	1.125	14	80
HCH 104	26.5	33.0	9.7	8.5	15	21.0	3.2	5.8	6.7	21.2	1.125	18	93
HCH 170	34.5	39.5	11.2	10.5	16	22.0	3.2	5.8	6.7	29.2	1.375	19	145
HCH 195	34.5	45.5	11.2	10.5	16	24.0	3.2	5.8	6.7	29.2	1.375	20	160

① All dimensions in inches.

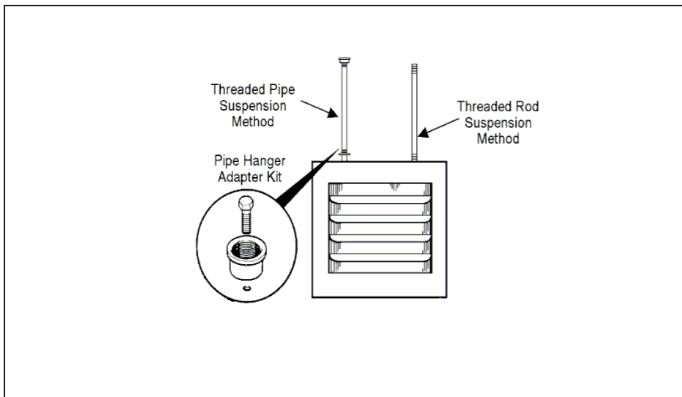
UNIT SUSPENSION / INSTALLATION

UNIT SUSPENSION

Horizontal delivery units. All horizontal delivery units, have two 1/2"-13 tapped holes in the top for unit suspension. Piping support hangers or clamps are recommended and should be placed as close to the unit heater as possible. See Figure 7.1.

Note: A pipe hanger adapter kit as illustrated in Figure 7.1 is available as an accessory from Modine. The kit consists of two drilled 3/4" I.P.S. pipe caps and two capscrews to facilitate threaded-pipe suspension. One kit will mount applicable units.

Figure 7.1 - Unit Suspension



Piping - See Figure 8.1

1. Branch piping to and from unit heater should include swing joints to allow for expansion and contraction of the piping without placing a strain on the unit heater element.
2. Install pipe unions and shut-off valves in lines to and from each unit heater to allow maintenance or replacement of unit without shutting down and draining entire system. For hot water systems, include a balancing valve in return line for water flow regulation. A drain valve should also be provided below each unit heater to allow removal of water from the heating coil if located in an area subject to freezing.
3. Hot water systems, rapid air removal is required because entrained air is a cause of corrosion. Hot water systems should be equipped with suitable air vent valves for rapid and complete removal of air at the high points and ends of both supply and return mains.
4. Install a scale pocket at bottom of unit heater to collect dirt and scale as shown in illustrations. Pipe diameter must be the same size as unit connections and about 6" long.
5. Provide adequate pipe hangers, supports, or anchors to secure the piping system independently of the unit heater.

Electrical Connections

WARNING

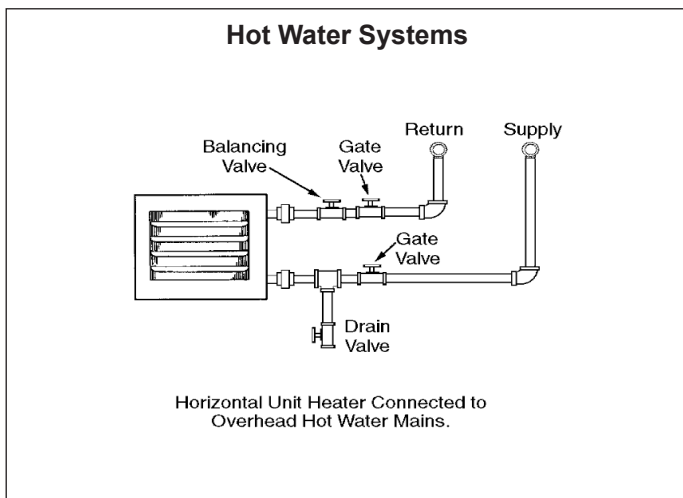
1. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
2. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
3. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.

CAUTION

1. Do not install units below 8 feet measured from the bottom of the unit to the floor.
 2. Do not reuse any electrical component which has been wet. Replace component.
 3. Ensure that the supply voltage is within +10% and -5% from rated voltage listed on the nameplate.
-
1. Installation of wiring must conform with local building codes, or in the absence of local codes, with the National Electric Code ANSI/NFPA 70 - Latest Edition. Unit must be electrically grounded in conformance to this code. In Canada, wiring must comply with CSA C22.1, Electrical Code.

INSTALLATION / OPERATION

Figure 8.1 - Suggested Piping Arrangements ①



① Arrangements shown are recommendations only. Where horizontal units are shown, vertical units can be substituted or vice versa. For modifications to piping suggestions shown, refer to your local plumbing authority.

Electrical Connections (Cont.)

2. Electric wiring must be sized to carry the full load amp draw of the motor, starter, and any controls that are used with the unit heater. All units with power codes 04, 05, 09, or 10 (polyphase motors) must be provided with suitable overcurrent protection in circuit supplying heater at installation. Overcurrent protectors should be sized based on motor current rating shown on the unit serial plate, and applicable national electric code procedures.

All units are provided with an electrical junction box. Junction boxes are either integral to the motor or attached to the unit casing. Units with explosion-proof motors have an explosion-proof junction box attached to the motor.

Any damage to or failure of Modine units caused by incorrect wiring of the units is not covered by Modine's standard warranty.

3. Location of room thermostat, when supplied, should be in the natural circulating path of room air. Mount thermostat about five feet above floor level where it will not be affected by heat from the unit or other sources of drafts that would prevent it from properly controlling room temperature. See instructions packed with the thermostat.

OPERATION

Prior to Operation

1. Make sure fuses are installed in fused disconnect switches.
2. Check all electrical connections to assure they are secure.
3. Check rigidity of unit mounting. Tighten all fasteners, if necessary.
4. Inspect piping, strainers, traps, fittings, etc.

Initial Start-Up

1. Set thermostat to lowest position.
2. Turn on power supply to unit.
3. Open return gate valve, and then open supply gate valve to unit.
4. Raise thermostat setting to desired position.
5. Adjust louvers (if provided) for desired heat distribution.
6. To insure proper sequence of operation, cycle unit on and off a few times by raising and lowering thermostat setting.
7. Check for proper rotation of fan. All fans must rotate in a counterclockwise direction when viewed from the back of the unit heater.

Automatic Control Operations

Install one of the following operating systems for continuous automatic control.

Intermittent Fan Operation — Hot Coil

A room thermostat starts and stops the fan motor. An aquastat is sometimes strapped to the return piping to prevent fan operation when heat is not being supplied to the unit heater.

Continuous Fan Operation — Intermittent Hot/Cold Coil

A room thermostat controls a valve which opens to allow hot water to supply the unit and closes to shut off the supply when the thermostat is satisfied.

OPERATION

Figure 9.1 - Horizontal Delivery Unit Cutaway ①

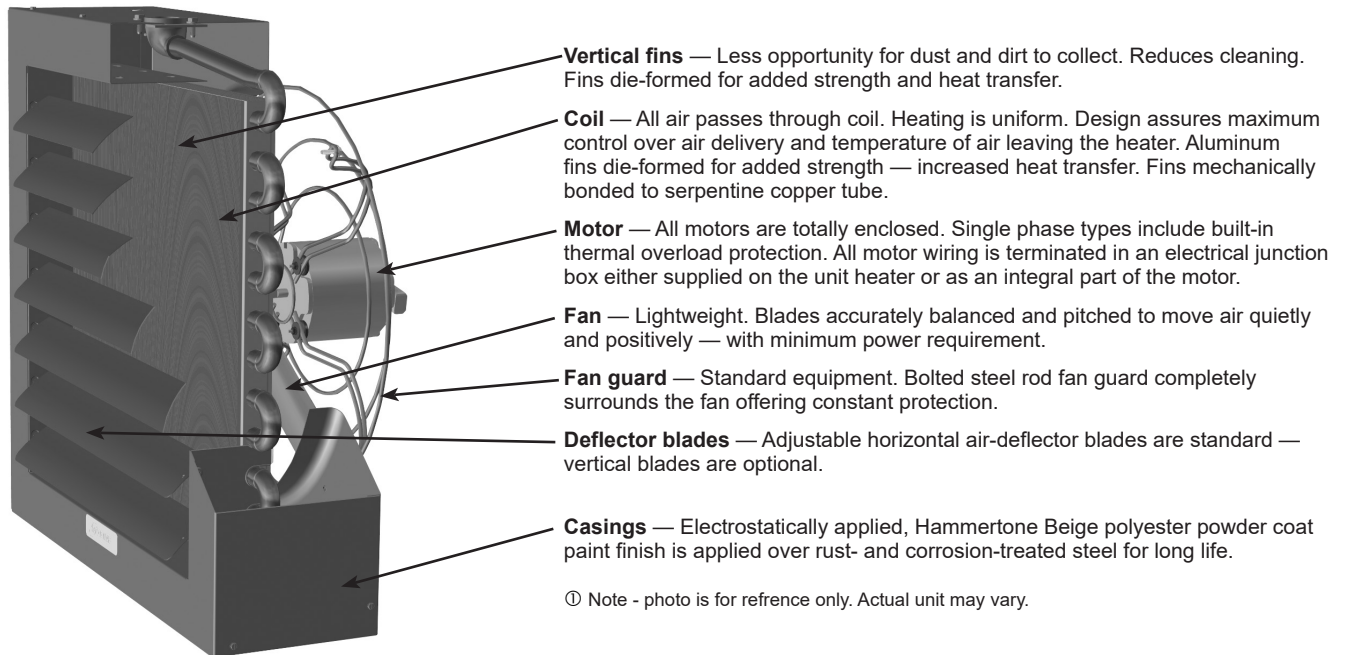


Figure 9.2 - Typical Horizontal Unit with Standard Junction Box

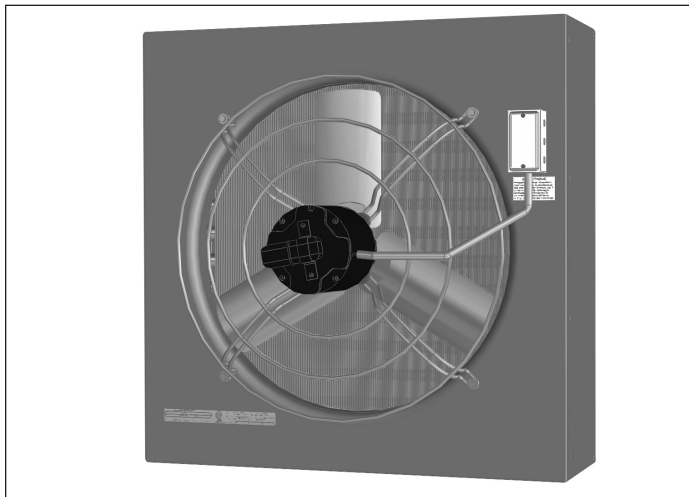


Figure 9.3 - Horizontal Unit with Optional Fingerproof Fan Guard



MOTOR DATA / SERVICE

SERVICE



WARNING

When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting Modine Manufacturing Company. Refer to the rating plate on the unit for complete unit substitution of parts or controls not approved by the factory will be at the owner's risk.



CAUTION

1. A qualified installation and service agency must perform all installation and service of these appliances, and the use of this manual is solely and specifically intended for that purpose.
2. Do not reuse any electrical component which has been wet. Replace component.

IMPORTANT

To check most of the Possible Remedies in the troubleshooting guide listed in Table 11.1, refer to the applicable sections of the manual.

Heating equipment should be serviced before each heating season to assure proper operations. The following items may be required more frequently based on the environment in which the unit is installed and frequency of equipment operation.

Before any service, BE SURE TO TURN OFF THE WATER SUPPLY AT THE MANUAL SHUT-OFF VALVES AND TURN OFF ALL ELECTRIC POWER TO THE HEATER.

Motors

1. Remove grease and dirt on motor during each inspection or lubrication.
2. Lubricate motor according to manufacturer's instructions located on the motor. When no motor oiling instructions are on the motor, oil the motor every two thousand hours of operation with SAE20 motor oil for units in normal applications. Adjust oiling according to usage and atmosphere.
3. Some motors do not have oil fittings. These motors are lubricated for long life and do not require further lubrication.
4. A change in line voltage higher or lower than motor nameplate rating may cause overheating and serious motor damage. Check plant voltage conditions. A separate manual starter with thermal overload protection device is recommended for those units that do not have motors with built-in overload protection.

Coils

1. Clean coil at least once a year; more often under unfavorable conditions. Unless coil is kept reasonably free of dirt, lint and grease, its original heating capacity will be reduced — possibly to a serious degree, and motor damage may result.

Two commonly used cleaning methods are:

- Loosen dirt by brushing fins on side where air enters coil and then turn on fan to blow dirt from unit.
- Use high pressure air hose to loosen dirt by blowing from side where air leaves coil (side adjacent to louvers on blow-through units; side adjacent to fan on draw-through units).

SERVICE / TROUBLESHOOTING

2. For thorough cleaning of coil, remove motor and fan and spray a mild alkaline cleaning solution over the coil. After a few minutes, follow by a hot water rinse. (A steam gun can be used for spraying cleaning solution and hot water.)
3. Coils subjected to corrosive fumes should be checked and cleaned frequently.
4. Provide controlled water treatment — don't use excess of boiler compounds. Contact your boiler compound supplier for proper usage or the services of a water treatment laboratory.
5. Periodic internal flushing of the coils is recommended in areas where water supply is suspected of causing scale. Use an alkaline-chelant solution and introduce it at the main pump of the hydronic system. Flush thoroughly.

NOTE: USING INORGANIC OR MINERAL ACIDS SUCH AS MURIATIC (HYDROCHLORIC) ACID, EVEN THOUGH INHIBITED, MAY LEAD TO SEVERE DAMAGE, INCLUDING CORROSION AND LEAKAGE.

6. De-aerate boiler feed-water (particularly if large amount of new water is used).
7. Ensure rapid continuous and adequate condensate drainage by properly sized and installed traps and piping. Check traps for sticking. Clean strainers ahead of traps. (When traps don't work, condensate accumulates in unit heater coil; water hammer results.)
8. Adequately vent each unit.

Casings

1. Periodic cleaning of casings is recommended to remove dirt, grease and corrosive substances that may injure finish. Rusted or corroded spots should be cleaned and repainted.
2. Tighten fan guard and motor bracket. Check fan for proper clearance, free rotation and firm connection to shaft.
When servicing is complete, tag unit to indicate date of inspection, lubrication and cleaning.

Replacement Parts

When requesting parts please contact your local representative. Please have full model and serial number available.

Table 11.1 - Troubleshooting

<p>Fails to Maintain Temperature</p> <ol style="list-style-type: none">1. Undersized unit heater, boiler, pump or piping.2. Unit heater mounted too high — heated air not delivered to floor.3. Thermostat — improper location or setting, or not functioning.4. Dirty or clogged coil. <p>Unit Blows Cold Air</p> <ol style="list-style-type: none">1. Manual shut-off valve closed.2. Insufficient or lack of hot water.3. Aquastat not functioning.4. Improper venting.5. Pump undersized or not operating (hot water system). <p>Does Not Operate When Heat Needed</p> <ol style="list-style-type: none">1. Defective motor or electrical connections.2. Thermostat, aquastat or pressure limit control not functioning. <p>Fails to Deliver Heat to Floor</p> <ol style="list-style-type: none">1. Units mounted too high.2. Operating on low speed.3. Final air temperature too high.4. Louvers not adjusted properly.5. Undersized unit heater (insufficient air delivery).6. Wrong type of unit (may require vertical delivery).7. Cross ventilation or drafts.8. Obstructions to air flow.	<p>Noisy Unit</p> <ol style="list-style-type: none">1. Loose bolts or screws.2. Fan blade bent, out of balance.3. Dirt accumulation on fan blades.4. Fan hub or blade rivets loose.5. Motor shaft bearing worn.6. Motor mounting bent, fan not positioned properly.7. Conduit too rigid, transmits vibration noise.8. BX cable touching unit heater, chatters as casing vibrates. <p>Employees Complain of Hot Blast</p> <ol style="list-style-type: none">1. Air stream aimed directly at employees.2. Louvers not adjusted properly.3. Excessive final air temperature. <p>Unit Operates Too Long</p> <ol style="list-style-type: none">1. Thermostat installed on cold wall or other improper location.2. Aquastat or pressure limit control not functioning properly.3. Unit is undersized. <p>Frequent Motor Failure</p> <ol style="list-style-type: none">1. Voltage fluctuations too high or too low.2. Excessive or insufficient lubrication.3. Wiring to motor undersized.4. Improper electrical connections.5. Motor operating in too high air temperature.6. Restricted air flow due to clogged coil or closed louvers.7. Fan out of balance.8. Unbalanced voltage on 3ϕ power. <p>Coil Failure/Unit Leaks</p> <ol style="list-style-type: none">1. Severe internal corrosion from feedwater.2. Type of boiler treatment.3. Entrained air causing water hammer.4. Continuous operation above 150 PSI (375°F)5. Loose connection.
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COMMERCIAL WARRANTY

Seller warrants its products to be free from defects in material and workmanship, EXCLUSIVE, HOWEVER, of failures attributable to the use of materials substituted under emergency conditions for materials normally employed. This warranty covers replacement of any parts furnished from the factory of Seller, but does not cover labor of any kind and materials not furnished by Seller, or any charges for any such labor or materials, whether such labor, materials or charges thereon are due to replacement of parts, adjustments, repairs, or any other work done. This warranty does not apply to any equipment which shall have been repaired or altered outside the factory of Seller in any way so as, in the judgment of Seller, to affect its stability, nor which has been subjected to misuse, negligence, or operating conditions in excess of those for which such equipment was designed. This warranty does not cover the effects of physical or chemical properties of water or steam or other liquids or gases used in the equipment.

BUYER AGREES THAT SELLER'S WARRANTY OF ITS PRODUCTS TO BE FREE FROM DEFECT IN MATERIAL AND WORKMANSHIP, AS LIMITED HEREIN, SHALL BE IN LIEU OF AND EXCLUSIVE OF ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, WHETHER ARISING FROM LAW, COURSE OF DEALING, USAGE OF TRADE, OR OTHERWISE, **THERE ARE NO OTHER WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, WHICH EXTEND BEYOND THE PRODUCT DESCRIPTION CONFIRMED BY BUYER AND SELLER AS OF THE DATE OF FINAL AGREEMENT.**

This warranty is void if the input to the product exceeds the rated input as indicated on the product serial plate by more than 5% on gas-fired and oil-fired units, or if the product in the judgment of SELLER has been installed in a corrosive atmosphere, or subjected to corrosive fluids or gases, been subjected to misuse, negligence, accident, excessive thermal shock, excessive humidity, physical damage, impact, abrasion, unauthorized alterations, or operation contrary to SELLER'S printed instructions, or if the serial number has been altered, defaced or removed.

BUYER AGREES THAT IN NO EVENT WILL SELLER BE LIABLE FOR COSTS OF PROCESSING, LOST PROFITS, INJURY TO GOODWILL, OR ANY OTHER CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND RESULTING FROM THE ORDER OR USE OF ITS PRODUCT, WHETHER ARISING FROM BREACH OF WARRANTY, NONCONFORMITY TO ORDERED SPECIFICATIONS, DELAY IN DELIVERY, OR ANY LOSS SUSTAINED BY THE BUYER.

BUYER'S REMEDY FOR BREACH OF WARRANTY, EXCLUSIVE OF ALL OTHER REMEDIES PROVIDED BY LAW, IS LIMITED TO REPAIR OR REPLACEMENT AT THE FACTORY OF SELLER, ANY COMPONENT WHICH SHALL, WITHIN THE APPLICABLE WARRANTY PERIOD DEFINED HEREIN AND UPON PRIOR WRITTEN APPROVAL, BE RETURNED TO SELLER WITH TRANSPORTATION CHARGES PREPAID AND WHICH THE EXAMINATION OF SELLER SHALL DISCLOSE TO HAVE BEEN DEFECTIVE; EXCEPT THAT WHEN THE PRODUCT IS TO BE USED BY BUYER AS A COMPONENT PART OF EQUIPMENT MANUFACTURED BY BUYER, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO ONE YEAR FROM DATE OF SHIPMENT FROM SELLER. FOR GAS-FIRED PRODUCTS INSTALLED IN HIGH HUMIDITY APPLICATIONS AND UTILIZING STAINLESS STEEL HEAT EXCHANGERS, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO TEN YEARS FROM DATE OF SHIPMENT FROM SELLER.

These warranties are issued only to the original owner-user and cannot be transferred or assigned. No provision is made in these warranties for any labor allowance or field labor participation. Seller will not honor any expenses incurred in its behalf with regard to repairs to any of Seller's products. No credit shall be issued for any defective part returned without proper written authorization (including, but not limited to, model number, serial number, date of failure, etc.) and freight prepaid.

OPTIONAL SUPPLEMENTAL WARRANTY

Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years on certain compressors. Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years or nine (9) years on certain heat exchangers.

EXCLUSION OF CONSUMABLES & CONDITIONS BEYOND SELLER'S CONTROL

This warranty shall not be applicable to any of the following items: refrigerant gas, belts, filters, fuses and other items consumed or worn out by normal wear and tear or conditions beyond Seller's control, including (without limitation as to generality) polluted or contaminated or foreign matter contained in the air or water utilized for heat exchanger (condenser) cooling or if the failure of the part is caused by improper air or water supply, or improper or incorrect sizing of power supply.

<u>Component</u> Applicable Models	"APPLICABLE WARRANTY PERIOD"
<u>Heat Exchangers</u> Gas-Fired Units	TEN YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN ONE HUNDRED TWENTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
<u>Heat Exchangers</u> Low Intensity Infrared Units <u>Compressors</u> Condensing Units for Cassettes	FIVE YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN SIXTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
<u>Burners</u> Low Intensity Infrared Units <u>Other</u> Components excluding Heat Exchangers, Coils, Condensers, Burners, Sheet Metal	TWO YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TWO YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN THIRTY MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
<u>Heat Exchangers/Coils</u> Indoor and Outdoor Duct Furnaces and System Units, Steam/Hot Water Units, Oil-Fired Units, Electric Units, Cassettes, Vertical Unit Ventilators, Geothermal Units <u>Compressors</u> Vertical Unit Ventilators, Geothermal Units <u>Burners</u> High Intensity Infrared Units <u>Sheet Metal Parts</u> All Products	ONE YEAR FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN ONE YEAR FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN EIGHTEEN MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST

As Modine Manufacturing Company has a continuous product improvement program, it reserves the right to change design and specifications without notice.



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