



Installation, Operation, and Maintenance

Vertical Steam and Hot Water Unit Heaters

J30-11112

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

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TRANE
TECHNOLOGIES™



Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE

Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury.

Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER** PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.

⚠ WARNING**Follow EHS Policies!**

Failure to follow instructions below could result in death or serious injury.

- All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.
- Non-Trane personnel should always follow local regulations.

⚠ WARNING**Cancer and Reproductive Harm!**

This product can expose you to chemicals including lead and bisphenol A (BPA), which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

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Model Number Description

Digit 1, 2, 3— Product Type

UHP = Vertical Steam or Hot Water Unit Heater

Digit 4 — Development Sequence

B

Digit 5, 6, 7— Capacity/Coil Type

042 = 42,000 BTU/HR
064 = 64,000 BTU/HR
080 = 80,000 BTU/HR
102 = 102,000 BTU/HR
122 = 122,000 BTU/HR
146 = 146,000 BTU/HR
166 = 166,000 BTU/HR
202 = 202,000 BTU/HR
252 = 252,000 BTU/HR
280 = 280,000 BTU/HR
336 = 336,000 BTU/HR
384 = 384,000 BTU/HR
500 = 500,000 BTU/HR
600 = 600,000 BTU/HR
720 = 720,000 BTU/HR

Digit 8 — Voltage

1 = 115/1/60
4 = 208/3/60
5 = 230/3/60
6 = 460/3/60

Digit 9 — Motor Type

E = Explosion Proof
T = Totally Enclosed

Digit 10 — Design Sequence

A

Digit 11 — Tube Material

A = Copper

Digit 12 — Fan Guard

0 = Standard Fan Guard
1 = OSHA Fan Guard
4 = None

Digit 13 — Special Coating

0 = No Special Coating
A = Phenolic Coating (Baked)
B = Epoxy
C = Epoxy Phenolic

Digit 14 — Disconnect Switch

0 = None
1 = Disconnect switch

Digit 15— Thermostats (Line Voltage)

0 = None
C = Line Voltage Thermostat with Fan Switch
D = Programmable Line Voltage Thermostat with Fan Switch

Digit 16 — Thermostat Cover

0 = None
A = Locking Thermostat Cover

Digit 17 — Manual Starter

0 = None
1 = Manual Starter

Digit 18 — Steam and Hot Water Control

0 = None
1 = Strap on Hot Water Control
2 = Steam Pressure Control (Open on rise in pressure)
3 = Steam Pressure Control (Close on rise in pressure)
4 = 5.0 Amp Speed Control Switch (Capacities 042 – 102 only)
5 = Options 1 and 4
6 = Options 2 and 4
7 = Options 3 and 4

Digit 19 — Vertical Louver

0 = None
B = Louver Cone Diffuser
C = Louver Cone Diffuser with Coating



General Information

Description

Vertical hydronic unit heaters are designed for installation requiring down flow air delivery, offered in 15 sizes ranging from 41,300 to 705,000 BTU/Hr. (11.7 to 205.1 kW), and use with steam or hot water. Low output (increased airflow) units are available for high ceiling applications.

The designs are certified by ETL to CSA-C22.2, UL1995, and UL 60335-2-40. **Do not alter these units in any way and do not attach any ductwork to these units.**

Figure 1. Top view



Figure 2. Bottom view



UL 60335-2-40 Summary Information

Clearance Requirements

Provide sufficient clearance around units for maintenance purposes. This includes at least 7 inches above all Vertical Unit Heaters even though the motor is removable through

the bottom. To provide efficient airflow to the unit, maintain a clearance of 2 feet (0.61m) around all sides of the unit.

Electrical Connections

Standard units are shipped for use on 115 volt, 60 hertz single phase electric power. The motor nameplate and electrical rating on the transformer should be checked before energizing the unit heater electrical system. All external wiring must conform to ANSI/NFPA No. 70, National Electrical Code (or the latest edition) and applicable current local codes; in Canada, to the Canadian Electrical Code, Part 1 CSA Standard C22.1. The short circuit current rating (SCCR) for this unit is 5kA.

Disconnection must be incorporated in fixed wiring.

See "Motors," p. 34 and "Wiring Diagrams," p. 35 for additional wiring details.

Figure 3. Manual control with single phase motor

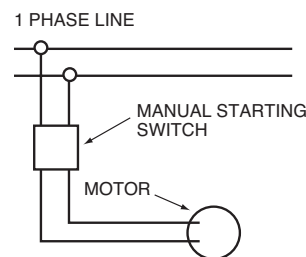
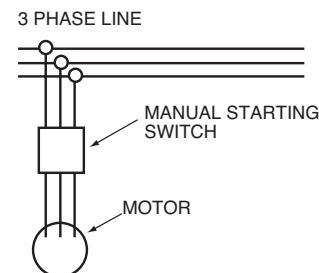


Figure 4. Manual control with three phase motor



Hydronic Requirements

All Vertical Unit Heaters are shipped fully assembled and may be used for steam or hot water applications. Fans are balanced and motors are pre-lubricated. Coils are factory tested at 400 PSIG (2758 kPa) under water.

- **USA:** Under maximum conditions, coils are rated for 75 PSI (517 kPa) for steam pressure and up to 225 PSI (1551 kPa) or 325°F (162.8°C) for hot water.
- **Canada:** Under maximum conditions, coils are rated for 15 PSI (103 kPa) for steam pressure and up to 225 PSI (1551 kPa) or 325°F (162.8°C) for hot water.

Safety Information

WARNING

Safety Hazard!

Failure to follow instructions below could result in death, serious injury, and equipment or property damage.

Do not alter the unit heater.

WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

NOTICE

Unit Damage!

Failure to follow instructions below could result in damaging the unit.

Verify all power sources conform to the requirements of the unit heater.

WARNING

Electrical Shock Hazard!

Failure to follow instructions below could result in death or serious injury, or property damage.

Do not depend upon a thermostat or other switch as sole means of disconnecting power when installing or servicing heater. Always disconnect power at main circuit breaker.

WARNING

Rotating Components!

Failure to follow instructions below could result in death or serious injury.

Keep hands, clothing, and jewelry away from moving parts. Check the equipment for foreign objects before starting the equipment.

Follow installation instructions CAREFULLY to avoid creating unsafe conditions. All external wiring must conform to applicable current local codes, and to the latest edition of the National Electric Code, ANSI/NFPA No. 70. In Canada, all external wiring must conform to the Canadian Electric Code, Part 1 CSA Standard C22.1. All wiring should be done and checked by a qualified electrician, using copper wire only. All steam or water connections should be made and leak-tested by a suitably qualified individual, per instructions in this manual. Also follow procedures listed on the [“Equipment Startup,” p. 46](#).

Because these units are installed in most instances higher than 8 feet, proper type of ladders or scaffolding should be used, as set up by OSHA requirements. Never place a ladder against the unit for support.

In industrial plants, professional maintenance crews should service this equipment.

All Vertical Unit Heaters are shipped fully assembled and may be used for steam or hot water applications. Fans are balanced and motors are prelubricated. Coils are factory tested at 400 PSIG (2758 kPa) under water.

- **USA:** Under maximum conditions, coils are rated for 75 PSI (517 kPa) for steam pressure and up to 225 PSI (1551 kPa) or 325°F (162.8°C) for hot water.
- **Canada:** Under maximum conditions, coils are rated for 15 PSI (103 kPa) for steam pressure and up to 225 PSI (1551 kPa) or 325°F (162.8°C) for hot water.

Each unit is packaged individually and marked for proper identification. Use normal care in handling and during installation to prevent damage to the coils fins, fan and casing. Do not set Vertical Unit Heater on floor with the weight of the unit resting against the fan blades. In this position, the blades may be damaged.

To meet ETL and OSHA requirements, units mounted below 8 feet from the floor must be equipped with an OSHA fan guard.

Dimensional Data

Figure 5. Sizes 42 to 80

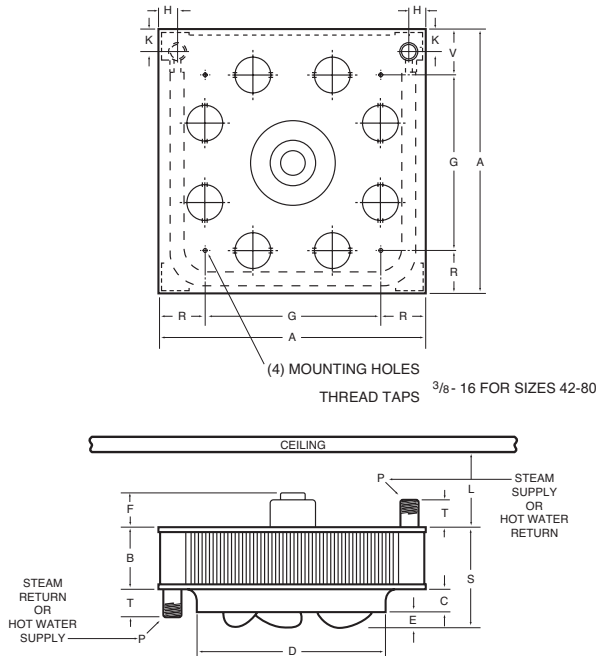


Figure 6. Sizes 102 to 720

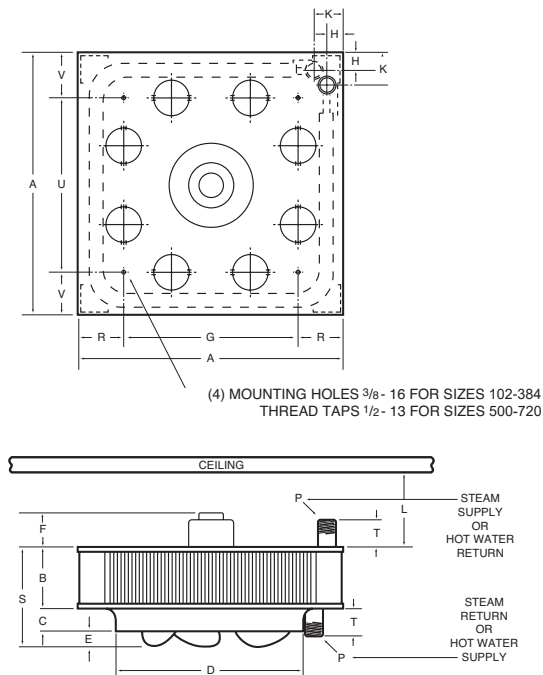


Table 1. Roughing in dimensional data — size 42 to 80

Unit Size	Fan Dia. inches (mm)	A inches (mm)	B inches (mm)	C inches (mm)	D inches (mm)	E inches (mm)	F inches (mm)	inches (mm)	H inches (mm)	K inches (mm)	L Min inches (mm)	P NPT inches (mm)	R inches (mm)	S inches (mm)	T inches (mm)	U inches (mm)	V inches (mm)	Ap- prox. Ship Wt. lbs (kg)
42	11-1/4 (286)	18-1/4 (464)	4-5/8 (117)	1-1/4 (32)	11-3/4 (298)	3/4 (19)	4 (102)	11 (279)	1-3/8 (35)	1-7/8 (48)	7 (178)	1-1/2 (38)	3-5/8 (92)	6-5/8 (168)	2-3/4 (70)	11 (279)	3-5/8 (92)	32 (15)
64	13-1/2 (343)	21-1/4 (540)	4-5/8 (117)	1-5/8 (41)	14 (356)	1 (25)	4 (102)	14 (356)	1-3/8 (35)	1-7/8 (48)	7 (178)	1-1/2 (38)	3-5/8 (92)	7-1/8 (181)	2-3/4 (70)	14 (356)	3-5/8 (92)	40 (18)
80	13-1/2 (343)	21-1/4 (540)	6-1/8 (156)	1-5/8 (41)	14 (356)	1 (25)	3 (76)	14 (356)	1-3/8 (35)	1-7/8 (48)	7 (178)	1-1/2 (38)	3-5/8 (92)	8-5/8 (219)	2-3/4 (70)	14 (356)	3-5/8 (92)	43 (20)

Table 2. Roughing in dimensional data — size 102 to 720

Unit Size	Fan Dia. inches (mm)	A inches (mm)	B inches (mm)	C inches (mm)	D inches (mm)	E inches (mm)	F inches (mm)	inches (mm)	H inches (mm)	K inches (mm)	L Min inches (mm)	P NPT inches (mm)	R inches (mm)	S inches (mm)	T inches (mm)	U inches (mm)	V inches (mm)	Ap- prox. Ship Wt. lbs (kg)
102	16-3/4 (425)	25-1/4 (641)	6-1/8 (156)	2 (51)	17-1/2 (445)	1-1/8 (29)	3 (76)	17 (432)	1-3/8 (35)	2-3/4 (70)	7 (178)	1-1/2 (38)	4-1/8 (105)	9-1/8 (232)	2-3/4 (70)	17 (432)	4-1/8 (105)	63 (29)
122	16-3/4 (425)	25-1/4 (641)	6-1/8 (156)	2 (51)	17-1/2 (445)	1-3/4 (44)	3 (76)	17 (432)	1-3/8 (35)	2-3/4 (70)	7 (178)	1-1/2 (38)	4-1/8 (105)	9-3/4 (248)	2-3/4 (70)	17 (432)	4-1/8 (105)	64 (29)
146	19-3/4 (502)	29-1/2 (749)	6-1/8 (156)	2-3/8 (60)	20-5/8 (524)	1-1/4 (32)	4 (102)	20-1/2 (521)	1-3/4 (44)	3-1/2 (89)	7 (178)	2 (51)	4-1/2 (114)	9-5/8 (244)	2-3/4 (70)	20-1/2 (521)	4-1/2 (114)	80 (36)
166	19-3/4 (502)	29-1/2 (749)	6-1/8 (156)	2-3/8 (60)	20-5/8 (524)	1-3/4 (44)	4 (102)	20-1/2 (521)	1-3/4 (44)	3-1/2 (89)	7 (178)	2 (51)	4-1/2 (114)	10-1/8 (257)	2-3/4 (70)	20-1/2 (521)	4-1/2 (114)	80 (36)
202	19-3/4 (502)	29-1/2 (749)	7-5/8 (194)	2-3/8 (60)	20-5/8 (524)	2 (51)	4 (102)	20-1/2 (521)	1-3/4 (44)	3-1/2 (89)	7 (178)	2 (51)	4-1/2 (114)	12 (305)	2-3/4 (70)	20-1/2 (521)	4-1/2 (114)	86 (39)
252	25-1/4 (641)	37-1/2 (953)	7-5/8 (194)	3 (76)	26-3/8 (670)	1 (25)	3-1/2 (89)	28 (711)	1-3/4 (44)	3-1/2 (89)	7 (178)	2 (51)	4-3/4 (121)	11-5/8 (295)	2-3/4 (70)	18 (457)	9-3/4 (248)	134 (61)
280	25-1/4 (641)	37-1/2 (953)	7-5/8 (194)	3 (76)	26-3/8 (670)	1-1/4 (32)	3-1/2 (89)	28 (711)	1-3/4 (44)	3-1/2 (89)	7 (178)	2 (51)	4-3/4 (121)	11-3/4 (298)	2-3/4 (70)	18 (457)	9-3/4 (248)	139 (63)
336	25-1/4 (641)	37-1/2 (953)	7-5/8 (194)	3 (76)	26-3/8 (670)	2-1/8 (54)	4 (102)	28 (711)	1-3/4 (44)	3-1/2 (89)	7 (178)	2 (51)	4-3/4 (121)	12-3/4 (324)	2-3/4 (70)	18 (457)	9-3/4 (248)	139 (63)
384	25-1/4 (641)	37-1/2 (953)	9-1/8 (232)	3 (76)	26-3/8 (670)	2 (51)	3-1/2 (89)	28 (711)	1-3/4 (44)	3-1/2 (89)	7 (178)	2 (51)	4-3/4 (121)	14-1/8 (359)	2-3/4 (70)	18 (457)	9-3/4 (248)	146 (66)
500	30-1/2 (775)	42 (1067)	9-1/8 (232)	3-1/2 (89)	31-1/4 (794)	1-5/8 (41)	3 (76)	30 (762)	2-1/4 (57)	4-1/4 (108)	7 (178)	2-1/2 (64)	6 (152)	14-1/4 (362)	3 (76)	30 (762)	6 (152)	294 (133)
600	30-1/2 (775)	42 (1067)	12-1/8 (308)	3-1/2 (89)	31-1/4 (794)	2-1/8 (54)	3 (76)	30 (762)	2-1/4 (57)	4-1/4 (108)	7 (178)	2-1/2 (64)	6 (152)	17-3/4 (451)	3 (76)	30 (762)	6 (152)	307 (139)
720	30-1/2 (775)	42 (1067)	13-5/8 (346)	3-1/2 (89)	31-1/4 (794)	3 (76)	4 (102)	30 (762)	2-1/4 (57)	4-1/4 (108)	7 (178)	2-1/2 (64)	6 (152)	20-1/4 (514)	3 (76)	30 (762)	6 (152)	366 (166)



Steam Performance Units

Table 3. Standard units

Unit Size	Output BTU/HR (kW)	Conden- sate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
					HP ^(b) (kW)	RPM			
042	41,300 (12.1)	43 (19.5)	172 (16.0)	124 (51)	1/40 (.019)	1550	595 (.278)	877 (4.455)	I
	33,600 (9.8)	55 (24.9)	140 (13.0)	131 (55)		1150	436 (.203)	658 (3.343)	
064	65,500 (19.2)	68 (30.8)	273 (25.4)	121 (49)	1/20 (.037)	1550	989 (.462)	1005 (5.105)	I
	52,800 (15.5)	55 (24.9)	220 (20.5)	129 (54)		1150	706 (.329)	727 (3.693)	
080	80,600 (23.6)	83 (37.6)	336 (31.3)	122 (50)	1/20 (.037)	1550	1200 (.560)	1200 (6.198)	II
	65,100 (19.1)	67 (30.4)	271 (25.2)	130 (54)		1150	858 (.400)	894 (4.542)	
102	101,800 (29.8)	106 (48.0)	424 (39.4)	123 (51)	1/8 (.093)	1070	1490 (.695)	980 (4.978)	II
	87,900 (25.8)	91 (41.2)	366 (34.0)	129 (54)		850	1180 (.551)	783 (3.944)	
122	124,400 (36.4)	129 (58.4)	518 (48.2)	124 (51)	1/6 (.124)	1100	1790 (.835)	1170 (5.944)	III
146	152,000 (44.5)	157 (71.1)	633 (58.9)	123 (51)	1/6 (.124)	1100	2220 (1.036)	1045 (5.309)	III
166	173,000 (50.7)	179 (81.1)	720 (67.0)	121 (49)	1/6 (.124)	1100	2620 (1.223)	1230 (6.248)	IV
202	210,200 (61.6)	208 (94.2)	838 (78.0)	118 (48)	1/4 (.186)	1100	3200 (1.493)	1495 (7.595)	III
252	249,800 (73.2)	260 (117.8)	1040 (96.7)	115 (46)	1/4 (.186)	1100	4180 (1.951)	1205 (6.121)	IV
280	283,800 (83.2)	294 (133.2)	1180 (109.8)	119 (48)	1/2 (.373)	1100	4430 (2.067)	1275 (6.477)	IV
336	333,400 (97.7)	345 (156.3)	1390 (129.3)	119 (48)	3/4 (.559)	1140	5210 (2.431)	1500 (7.620)	IV
384	386,000 (113.1)	400 (181.2)	1610 (149.8)	118 (48)	3/4 (.559)	1140	6140 (2.865)	1770 (8.992)	IV
500	496,000 (145.3)	514 (232.8)	2070 (192.6)	117 (47)	1–1/2 (1.119)	1175	8020 (3.743)	1640 (8.331)	IV



Steam Performance Units

Table 3. Standard units (continued)

Unit Size	Output BTU/HR (kW)	Conden- sate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
					HP ^(b) (kW)	RPM			
600	585,000	605	2440	117	1-1/2	1175	9450	1930	IV
	(171.4)	(274.1)	(227)	(47)	(1.119)		(4.410)	(9.804)	
720	705,000	729	2940	119	3	1165	11,000	2250	IV
	(206.6)	(330.2)	(273.5)	(48)	(2.237)		(5.133)	(11.430)	

Notes:

1. Constant speed units are rated at capacities shown in regular type; capacities shown in italic faced type apply only to units with multi-speed motors.
2. Performance data based on 2 psi (13.8 kPa) steam pressure at heater with air entering @60°F (16°C).
3. To determine BTU per hour capacities at various steam pressures and entering air temperatures, use correction factors from Steam Correction Factors table. Final temperatures at new conditions can be calculated by applying basic formula.

^(a) Equivalent Direct Radiation

^(b) Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

Table 4. Low output standard vertical units with all air ports open

Unit Size	Output BTU/HR (kW)	Conden- sate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
					HP ^(b) (kW)	RPM			
042L	34,800	36	145	108	1/40 (.019)	1550	668	950	I
	(10.2)	(16.3)	(13.5)	(42)			(.312)	(4.826)	
	2600	27	108	111	1/20 (.037)	1150	470	672	I
	(7.6)	(12.2)	(10.0)	(44)			(.219)	(3.414)	
064L	57,200	59	238	104	1/20 (.037)	1550	1200	1190	I
	(16.8)	(26.7)	(22.1)	(40)			(.560)	(6.045)	
	45,800	48	191	109	1/20 (.037)	1150	862	858	I
	(13.4)	(21.7)	(17.8)	(109)			(.402)	(4.359)	
080L	68,000	71	283	106	1/20 (.037)	1550	1360	1350	II
	(19.9)	(32.2)	(26.3)	(41)			(.635)	(6.858)	
	55,000	57	229	111	1/20 (.037)	1150	995	992	II
	(16.1)	(25.8)	(21.3)	(44)			(.464)	(5.039)	
102L	85,400	89	356	108	1/8 (.093)	1070	1640	1050	II
	(25.0)	(40.3)	(33.1)	(42)			(.765)	(5.334)	
	71,200	74	296	111	1/8 (.093)	850	1290	827	II
	(20.9)	(33.5)	(27.5)	(44)			(.602)	(4.201)	
122L	111,000	115	462	107	1/6	1100	2180	1390	III
	(32.5)	(52.1)	(43.0)	(42)	(.124)		(1.017)	(7.061)	
146L	125,000	130	524	109	1/6	1100	2180	1390	III
	(36.6)	(58.9)	(48.7)	(43)	(.124)		(1.017)	(7.061)	
166L	149,000	154	620	107	1/6	1100	2920	1340	IV
	(43.7)	(69.8)	(57.7)	(42)	(.124)		(1.3663)	(6.807)	

Table 4. Low output standard vertical units with all air ports open (continued)

Unit Size	Output BTU/HR (kW)	Conden- sate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
					HP ^(b) (kW)	RPM			
220L	176,800 (51.8)	183 (82.9)	736 (98.5)	108 (42)	1/4 (.186)	1100	3390 (1.582)	1560 (7.925)	III
252L	214,900 (63.0)	224 (101.5)	895 (83.3)	104 (4)	1/4 (.186)	1100	4500 (2.100)	1270 (6.452)	IV
280L	251,800 (73.8)	260 (117.8)	1050 (97.7)	106 (41)	1/2 (.373)	1100	5040 (2.352)	142012 (7.214)	IV
336L	291,000 (85.3)	302 (136.8)	1210 (112.6)	107 (42)	3/4 (.559)	1140	5700 (2.660)	1610 (8.179)	IV
384L	344,000 (100.8)	356 (161.3)	1430 (133.0)	108 (42)	3/4 (.559)	1140	6600 (3.080)	1870 (9.500)	IV
500L	428,000 (125.4)	446 (202.0)	1785 (166.0)	102 (39)	1–1/2 (1.119)	1175	9380 (4.377)	1860 (9.449)	IV
600L	515,000 (150.9)	533 (241.4)	2140 (199.1)	106 (41)	1–1/2 (1.119)	1175	10,300 (4.807)	2060 (10.465)	IV
720L	620,000 (181.7)	642 (290.8)	2580 (240.0)	108 (42)	3 (2.237)	1165	11,900 (5.553)	2380 (12.090)	IV

Notes:

1. Constant speed units are rated at capacities shown in regular type; capacities shown in italic faced type apply only to units with multi-speed motors.
2. Performance data based on 2 psi (13.8 kPa) steam pressure at heater with air entering @60°F (16°C).
3. To determine BTU per hour capacities at various steam pressures and entering air temperatures, use correction factors from Steam Correction Factors table. Final temperatures at new conditions can be calculated by applying basic formula.

^(a) Equivalent Direct Radiation

^(b) Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

Steam Calculations And Correction Factors

Table 5. Steam calculations

				EXAMPLE: – UNIT SIZE _____ 42 Steam Pressure _____ 10 PSI Entering Air Temp. _____ 40°F
1.	Capacity	A. For 2 lbs. steam, 60°F entering air	Read output directly from Table 3, p. 11: 41,300 BTU/HR.	
		B. For higher steam pressures and/or EAT's above or below 60°F	Multiply output from Table 3 by appropriate correction factor from Table 6, p. 14.	41,300 x 1.27 = 52,451 BTU/HR
2.	Final Air Temperature	A. For 2 lbs. steam, 60°F entering air	Read temperature directly from Table 3, p. 11: 124°F.	
		B. For capacities calculated in 1.B. (above)	Output from 1.B. $\frac{1.085 \times \text{CFM from Table 3, p. 11}}{1.085 \times 595} + \text{EAT} = \text{Final Air Temp}$	$\frac{52,451}{1.085 \times 595} + 40 = 121.0^\circ\text{F}$



Steam Performance Units

Table 5. Steam calculations (continued)

3.	Final Air Volume	A. For 2 lbs. steam, 60°F entering air	$\frac{460 + \text{Final Air Temp from Table 3, p. 11}}{530} \times \text{Nom. CFM from Table 3, p. 11} = \text{Final Air Volume}$	$\frac{460 + 124}{530} \times 595 = 655 \text{ CFM}$
		B. For final air temperatures calculated in 2.B. (above)	$\frac{460 + \text{Final Air Temp 2.B.}}{530} \times \text{Nom. CFM from Table 3, p. 11} = \text{Final Air Volume}$	$\frac{460 + 121.0}{530} \times 595 = 652 \text{ CFM}$
4.	Condensation Per Hour	A. For 2 lbs. steam, 60°F entering air	Read lbs. per hour from Table 3, p. 11: 43 lbs./hr	
		B. For capacities calculated in 1.B. (above)	$\frac{\text{Output from 1.B.}}{\text{Latent heat from Table 7, p. 14}} = \text{lbs. per hour of condensate}$	$\frac{52,451}{953} = 55 \text{ lbs./hr}$

Table 6. Steam correction factors based on 2 lbs. steam 60°F EAT

Entering air temperature °F (°C)	Steam pressure (saturated) – lbs per square inch (kPa)									
	0 (.0)	2 (13.8)	5 (34.5)	10 (68.9)	15 (103.4)	20 (137.9)	30 (206.8)	40 (275.8)	50 (344.7)	75 (517.1)
30° (-1°)	1.18	1.22	1.27	1.34	1.40	1.45	1.53	1.61	1.67	1.79
40° (4°)	1.11	1.15	1.20	1.27	1.32	1.37	1.46	1.53	1.59	1.71
50° (10°)	1.03	1.07	1.12	1.19	1.25	1.30	1.39	1.46	1.52	1.64
60° (16°)	0.96	1.00	1.05	1.12	1.18	1.23	1.32	1.39	1.45	1.57
70° (21°)	0.90	0.93	0.98	1.05	1.11	1.16	1.25	1.32	1.38	1.49
80° (27°)	0.83	0.86	0.91	0.98	1.04	1.09	1.18	1.25	1.31	1.42
90° (32°)	0.76	0.80	0.85	0.91	0.97	1.02	1.11	1.18	1.24	1.36
100° (38°)	0.69	0.73	0.78	0.85	0.90	0.96	1.04	1.11	1.17	1.29

Table 7. Properties of saturated steam

	Steam pressure in lbs per square inch gauge (kPa)									
	0 (.0)	2 (13.8)	5 (34.5)	10 (68.9)	15 (103.4)	20 (137.9)	30 (206.8)	40 (275.8)	50 (344.7)	75 (517.1)
Steam Temperature-°F (°C)	212.0	218.5	227.1	239.4	249.8	258.8	274.0	286.7	297.7	319.9
	(100.0)	(103.6)	(108.4)	(115.2)	(121.0)	(126.0)	(134.4)	(141.5)	(147.6)	(159.9)
Latent Heat of Steam-Btu/lbm (KJ/Kg)	970	966	961	953	946	940	929	920	912	891
	(2256)	(2247)	(2235)	(2217)	(2200)	(2186)	(2161)	(2140)	(2121)	(2072)

Notes:

- *Ratings apply only to free inlet and discharge without diffusers.*
- *All motors are constant speed and operate at top speed as indicated in motor data. Sizes 42 through 102 can be run at reduced speed with addition of optional variable speed switch. This switch is factory-calibrated for low and high speed ratings, with intermediate speeds infinitely controllable. Sizes 166 through 720 operate at constant speed as indicated in motor data.*
- *For specific motor data refer to motor specifications in [Table 18, p. 25](#) and [Table 19, p. 25](#).*
- *To correct for entering air temperatures, use 1° temperature rise for each foot in mounting height. As an example, 60°F air is required at work area (5 ft. above floor) units are to be mounted at (20 ft.) above floor. Mounting height (20 ft.) minus work height (5 ft.) equals differential (15 ft.) or, 15° rise in air temperature at unit air inlet. Correct for actual inlet air temperature of 75°F (60°F + 15°F = 75°F EAT) on [Table 6, p. 14](#).*



Hot Water Performance Data

Table 8. Standard output units

Unit Size	Water Temp Drop °F (°C)	Output BTU/HR (kW)	Conden- sate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
						HP ^(b) (kW)	RPM			
042	10° (5.6°)	28.8 (8.4)	5.93 (0.374)	0.37 (0.113)	104.6° (40.3°)	1/40 (0.019)	1550	595 (0.278)	877 (4.455)	I
	20° (11.1°)	22.7 (6.7)	2.34 (0.148)	0.06 (0.018)	95.2° (35.1°)					
	30° (16.7°)	16.7 (4.9)	1.15 (0.073)	0.02 (0.006)	85.9° (29.9°)					
042 ^(c)	10° (5.6°)	22.9 (6.7)	4.71 (0.297)	0.24 (0.073)	108.3° (42.4°)	1/40 (0.019)	1150	436 (0.203)	658 (3.343)	I
	20° (11.1°)	18.1 (5.3)	1.87 (0.118)	0.04 (0.012)	98.3° (36.8°)					
	30° (16.7°)	13.4 (3.9)	0.92 (0.058)	0.01 (0.003)	88.4° (31.3°)					
064	10° (5.6°)	48.1 (14.1)	9.92 (0.626)	1.05 (0.320)	104.8° (40.4°)	1/20 (0.037)	1550	989 (0.462)	1005 (5.105)	II
	20° (11.1°)	39.6 (11.6)	4.08 (0.257)	0.19 (0.058)	96.9° (36.1°)					
	30° (16.7°)	31.1 (9.1)	2.14 (0.135)	0.06 (0.018)	89.0° (31.7°)					
064 ^(c)	10° (5.6)	38.1 (11.2)	7.85 (0.495)	0.67 (0.204)	109.7° (43.2°)	1/20 (0.037)	1150	706 (0.329)	727 (3.693)	II
	20° (11.1°)	31.5 (9.2)	3.24 (0.204)	0.13 (0.040)	101.1° (38.4°)					
	30° (16.7°)	24.8 (7.3)	1.71 (0.108)	0.04 (0.012)	92.4° (33.6°)					
080	10° (5.6°)	58.7 (17.2)	12.11 (0.764)	0.98 (0.299)	105.1° (40.6°)	1/20 (0.037)	1550	1200 (0.560)	1220 (6.198)	II
	20° (11.1°)	48.4 (14.2)	4.99 (0.315)	0.18 (0.055)	97.2° (36.2°)					
	30° (16.7°)	38.1 (11.2)	2.62 (0.165)	0.05 (0.015)	89.3° (31.8°)					
080 ^(c)	10° (5.6°)	46.5 (13.6)	9.59 (0.605)	0.63 (0.192)	110.0° (43.3°)	1/20 (0.037)	1150	858 (0.400)	894 (4.542)	II
	20° (11.1°)	38.5 (11.3)	3.97 (0.250)	0.12 (0.037)	101.2° (38.4°)					
	30° (16.7°)	30.5 (8.9)	2.09 (0.132)	0.03 (0.009)	92.7° (33.7°)					
102	10° (5.6°)	77.2 (22.6)	15.91 (1.004)	2.06 (0.628)	106.6° (41.4°)	1/8 (0.093)	1070	1528 (0.713)	980 (4.978)	II
	20° (11.1°)	68.3 (20.0)	7.03 (0.443)	0.44 (0.134)	101.2° (38.4°)					
	30° (16.7°)	59.3 (17.4)	4.08 (0.257)	0.16 (0.049)	95.8° (35.4°)					

Table 8. Standard output units (continued)

Unit Size	Water Temp Drop °F (°C)	Output BTU/HR (kW)	Conden- sate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
						HP ^(b) (kW)	RPM			
102 ^(c)	10° (5.6°)	63.7 (18.7)	13.13 (0.828)	1.43 (0.436)	108.6° (42.6°)	1/8 (0.093)	850	1208 (0.564)	783 (3.978)	II
	20° (11.1°)	56.5 (16.6)	5.82 (0.367)	0.31 (0.095)	103.1° (39.5°)					
	30° (16.7°)	49.2 (14.4)	3.38 (0.213)	0.11 (0.034)	97.6° (36.4°)					
122	10° (5.6°)	94.9 (27.8)	19.55 (1.233)	3.04 (0.927)	108.9° (42.7°)	1/6 (0.124)	1100	1790 (0.835)	1170 (5.944)	III
	20° (11.1°)	83.7 (24.5)	8.63 (0.544)	0.65 (0.198)	103.1° (39.5°)					
	30° (16.7°)	72.5 (21.2)	4.98 (0.314)	0.23 (0.070)	97.3° (36.3°)					
146	10° (5.6°)	117.6 (34.5)	24.24 (1.529)	4.32 (1.318)	108.8° (42.7°)	1/6 (0.124)	1100	2220 (1.036)	1045 (5.309)	III
	20° (11.1°)	105.2 (30.8)	10.84 (0.684)	0.96 (0.293)	103.7° (39.8°)					
	30° (16.7°)	92.8 (27.2)	6.38 (0.402)	0.36 (0.110)	98.5° (36.9°)					
166	10° (5.6°)	132.4 (38.8)	27.29 (1.722)	3.67 (1.119)	106.6° (41.4°)	1/6 (0.124)	1100	2620 (1.223)	1230 (6.248)	IV
	20° (11.1°)	118.6 (34.7)	12.22 (0.771)	0.81 (0.247)	101.7° (38.7°)					
	30° (16.7°)	104.8 (30.7)	7.20 (0.454)	0.30 (0.092)	96.9° (36.1°)					
202	10° (5.6°)	156.2 (45.8)	32.20 (2.031)	5.02 (1.531)	105.0° (40.6°)	1/4 (0.186)	1100	3200 (1.493)	1495 (7.595)	III
	20° (11.1°)	139.7 (40.9)	14.40 (0.908)	1.11 (0.339)	100.2° (37.9°)					
	30° (16.7°)	123.2 (36.1)	8.47 (0.534)	0.41 (0.125)	95.5° (35.3°)					
252	15° (8.3°)	188.9 (55.3)	25.95 (1.637)	3.92 (1.196)	101.8° (38.8°)	1/4 (0.186)	1100	4162 (1.942)	1205 (6.121)	IV
	20° (11.1°)	180.1 (52.8)	18.56 (1.171)	2.10 (0.641)	99.9° (37.7°)					
	30° (16.7°)	162.7 (47.7)	11.18 (0.705)	0.82 (0.250)	96.0° (35.6°)					
280	15° (8.3°)	215.4 (63.1)	29.60 (1.867)	5.02 (1.531)	104.8° (40.4°)	1/2 (0.373)	1100	4430 (2.067)	127 (6.477)	IV
	20° (11.1°)	205.4 (60.2)	21.17 (1.335)	2.68 (0.817)	102.7° (39.3°)					
	30° (16.7°)	185.3 (54.3)	12.73 (0.803)	1.04 (0.317)	98.5° (36.9°)					



Hot Water Performance Data

Table 8. Standard output units (continued)

Unit Size	Water Temp Drop °F (°C)	Output BTU/HR (kW)	Condensate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
						HP ^(b) (kW)	RPM			
336	15° (8.3°)	254.9 (74.7)	35.03 (2.210)	6.88 (2.098)	105.1° (40.6°)	3/4 (0.559)	1140	5210 (2.431)	1500 (7.620)	IV
	20° (11.1°)	242.9 (71.2)	25.03 (1.579)	3.67 (1.119)	103.0° (39.4°)					
	30° (16.7°)	218.9 (64.1)	15.04 (0.949)	1.42 (0.433)	98.7° (37.1°)					
384	15° (8.3°)	294.7 (86.3)	40.49 (2.554)	6.60 (2.013)	104.2° (40.1°)	3/4 (0.559)	1140	6140 (2.865)	1770 (8.992)	IV
	20° (11.1°)	280.8 (82.3)	28.94 (1.826)	3.52 (1.074)	102.2° (39.0°)					
	30° (16.7°)	253.1 (74.2)	17.39 (1.097)	1.36 (0.415)	98.0° (36.7°)					
500	20° (11.1°)	368.1 (107.9)	37.93 (2.393)	5.81 (1.772)	102.3° (39.1°)	1-1/2 (1.119)	1160	8020 (3.743)	1640 (8.331)	IV
	30° (16.7°)	333.6 (97.7)	22.92 (1.446)	2.29 (0.698)	98.3° (36.8°)					
600	15° (8.3°)	451.2 (132.2)	62.00 (3.911)	8.78 (2.678)	104.0° (40.0°)	1-1/2 (1.119)	1160	9450 (4.410)	1930 (9.804)	IV
	20° (11.1°)	431.1 (126.3)	44.43 (2.803)	4.72 (1.440)	102.0° (38.9°)					
	30° (16.7°)	391.0 (114.6)	26.86 (1.694)	1.86 (0.567)	98.1° (36.7°)					
720	20° (11.1°)	519.4 (152.2)	53.52 (3.376)	5.29 (1.613)	103.5° (39.7°)	3 (2.237)	1165	11,000 (5.133)	2250 (11.430)	IV
	30° (16.7°)	470.9 (138.0)	32.35 (2.041)	2.08 (0.634)	99.5° (37.5°)					

Notes:

- Performance based on 200°F (93.3°C) EWT, 20°F (11.1°C) TD, 60°F (15.6°C) EAT.
- Performance at 10°F (5.6°C) & 30°F (16.7°C) TD is also shown.
- For capacities at other conditions, use the correction multipliers in the tables in "Hot Water Calculations and Correction Factors," p. 21.

^(a) Equivalent Direct Radiation

^(b) Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

^(c) Speed controller option is required for reduced ratings.

Table 9. Low output units standard vertical unit with all air ports open

Unit Size	Water Temp Drop °F (°C)	Output BTU/HR (kW)	Condensate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
						HP ^(b) (kW)	RPM			
042L	10° (5.6°)	23.9 (7.0)	4.92 (0.310)	0.26 (0.079)	92.9° (33.8°)	1/40 (0.019)	1550	668 (0.312)	950 (4.826)	I
	20° (11.1°)	18.9 (5.5)	1.95 (0.123)	0.04 (0.012)	86.1° (30.1°)					
	30° (16.7°)	14.0 (4.1)	0.96 (0.061)	0.01 (0.003)	79.3° (26.3°)					
042L ^(c)	10° (5.6°)	16.7 (4.9)	3.45 (0.218)	0.13 (0.040)	92.8° (33.8°)	1/40 (0.019)	1150	470 (0.219)	672 (3.414)	I
	20° (11.1°)	13.5 (4.0)	1.39 (0.088)	0.02 (0.006)	86.4° (30.2°)					

Table 9. Low output units standard vertical unit with all air ports open (continued)

Unit Size	Water Temp Drop °F (°C)	Output BTU/HR (kW)	Conden- sate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m ³ /s)	Outlet Velocity FPM (m/s)	Sound Rating
						HP ^(b) (kW)	RPM			
064L	10° (5.6°)	41.5 (12.2)	8.56 (0.540)	0.80 (0.244)	91.9° (33.3°)	1/20 (0.037)	1550	1200 (0.560)	1190 (6.045)	II
	20° (11.1°)	34.2 (10.0)	3.53 (0.223)	0.15 (0.046)	86.3° (30.2°)					
	30° (16.7°)	27.0 (7.9)	1.85 (0.117)	0.04 (0.012)	80.7° (27.1°)					
064L ^(c)	10° (5.6°)	32.4 (9.5)	6.68 (0.421)	0.50 (0.153)	94.7° (34.8°)	1/20 (0.037)	1150	862 (0.402)	858 (4.359)	II
	20° (11.1°)	26.9 (7.9)	2.77 (0.175)	0.09 (0.027)	88.7° (31.5°)					
	30° (16.7°)	21.3 (6.2)	1.46 (0.092)	0.03 (0.009)	82.8° (28.2°)					
080L	10° (5.6°)	48.9 (14.3)	10.09 (0.637)	0.69 (0.210)	93.2° (34.0°)	1/20 (0.037)	1550	1360 (0.635)	1350 (6.858)	II
	20° (11.1°)	40.5 (11.9)	4.17 (0.263)	0.13 (0.040)	87.4° (30.8°)					
	30° (16.7°)	32.0 (9.4)	2.20 (0.139)	0.04 (0.012)	81.7° (27.6°)					
080L ^(c)	10° (5.6°)	38.5 (11.3)	7.94 (0.501)	0.44 (0.134)	95.7° (35.4°)	1/20 (0.037)	1150	995 (0.464)	992 (5.039)	II
	20° (11.1°)	32.0 (9.4)	3.29 (0.208)	0.08 (0.024)	89.6° (32.0°)					
	30° (16.7°)	25.4 (7.4)	1.75 (0.110)	0.02 (0.006)	83.5° (28.6°)					
102L	10° (5.6°)	63.7 (18.7)	13.13 (0.828)	1.43 (0.463)	93.5° (34.2°)	1/8 (0.093)	1070	1752 (0.818)	1050 (5.334)	II
	20° (11.1°)	56.5 (16.6)	5.82 (0.367)	0.31 (0.095)	89.7° (32.1°)					
	30° (16.7°)	49.2 (14.4)	3.38 (0.213)	0.11 (0.034)	85.9° (29.9°)					
102L ^(c)	10° (5.6°)	54.5 (16.0)	11.24 (0.709)	1.06 (0.323)	93.5° (34.2°)	1/8 (0.093)	850	1499 (0.700)	827 (4.201)	II
	20° (11.1°)	48.5 (14.2)	4.99 (0.315)	0.23 (0.070)	89.8° (32.1°)					
	30° (16.7°)	42.4 (12.4)	2.91 (0.184)	0.08 (0.024)	86.1° (30.1°)					
122L	10° (5.6°)	83.7 (24.5)	17.24 (1.088)	2.40 (0.732)	95.4° (35.2°)	1/6 (0.124)	1100	2180 (1.017)	1390 (7.061)	III
	20° (11.1°)	73.9 (21.7)	7.62 (0.481)	0.51 (0.156)	91.3° (32.9°)					
	30° (16.7°)	64.2 (18.8)	4.41 (0.278)	0.18 (0.055)	87.1° (30.6°)					



Hot Water Performance Data

Table 9. Low output units standard vertical unit with all air ports open (continued)

Unit Size	Water Temp Drop °F (°C)	Output BTU/HR (kW)	Condensate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
						HP ^(b) (kW)	RPM			
146L	10° (5.6°)	95.4 (28.0)	19.66 (1.240)	2.92 (0.891)	97.3° (36.3)	1/6 (0.124)	1100	2360 (1.101)	1080 (5.486)	III
	20° (11.1°)	85.5 (25.1)	8.81 (0.556)	0.65 (0.198)	93.4° (34.1)					
	30° (16.7°)	75.6 (22.2)	5.20 (0.328)	0.24 (0.073)	89.5° (31.9)					
166L	10° (5.6°)	112.3 (32.9)	23.15 (1.460)	2.70 (0.824)	95.4° (35.2)	1/6 (0.124)	1100	2920 (1.363)	1340 (6.807)	IV
	20° (11.1°)	100.7 (29.5)	10.38 (0.655)	0.60 (0.183)	91.8° (33.2)					
	30° (16.7°)	89.2 (26.1)	6.13 (0.387)	0.22 (0.067)	88.1° (31.2)					
202L	10° (5.6°)	135.8 (39.8)	27.98 (1.765)	3.85 (1.174)	96.9° (36.1)	1/4 (0.186)	1100	3390 (1.582)	1560 (7.925)	III
	20° (11.1°)	121.8 (35.7)	12.52 (0.790)	0.85 (0.259)	93.0° (33.9)					
	30° (16.7°)	107.3 (31.4)	7.37 (0.465)	0.32 (0.098)	89.2° (31.8)					
252L	10° (5.6°)	168.5 (49.4)	34.72 (2.190)	6.75 (2.059)	94.5° (34.7)	1/4 (0.186)	1100	4507 (2.103)	1270 (6.452)	IV
	20° (11.1°)	153.8 (45.1)	15.85 (1.000)	1.56 (0.476)	91.4° (33.0)					
	30° (16.7°)	139.1 (40.8)	9.56 (0.603)	0.61 (0.186)	88.4° (31.3)					
280L	10° (5.6°)	188.9 (55.3)	25.95 (1.637)	3.92 (1.196)	94.5° (34.7)	1/2 (0.373)	1100	5040 (2.352)	1420 (7.214)	IV
	20° (11.1°)	180.1 (52.8)	18.56 (1.171)	2.10 (0.641)	92.9° (33.8)					
	30° (16.7°)	162.7 (47.7)	11.18 (0.705)	0.82 (0.250)	89.7° (32.1)					
336L	10° (5.6°)	220.9 (64.7)	30.35 (1.915)	5.26 (1.604)	95.7° (35.4)	3/4 (0.559)	1140	5700 (2.660)	1610 (8.179)	IV
	20° (11.1°)	210.6 (61.7)	21.70 (1.369)	2.81 (0.857)	94.1° (34.5)					
	30° (16.7°)	189.9 (55.6)	13.05 (0.823)	1.09 (0.332)	90.7° (32.6)					
384L	10° (5.6°)	260.7 (76.4)	35.82 (2.260)	5.24 (1.598)	96.4° (35.8)	3/4 (0.559)	1140	6600 (3.080)	1870 (9.500)	IV
	20° (11.1°)	248.5 (72.8)	25.61 (1.616)	2.80 (0.854)	94.7° (34.8)					
	30° (16.7°)	224.2 (65.7)	15.40 (0.971)	1.09 (0.332)	91.3° (32.9)					
500L	20° (11.1°)	310.5 (91.0)	32.00 (2.019)	4.23 (1.290)	90.5° (32.5)	1-1/2 (1.119)	1160	9380 (4.377)	1860 (9.449)	IV
	30° (16.7°)	281.7 (82.5)	19.35 (1.221)	1.67 (0.509)	87.7° (30.9)					

Table 9. Low output units standard vertical unit with all air ports open (continued)

Unit Size	Water Temp Drop °F (°C)	Output BTU/HR (kW)	Condensate lbs/hr (kg/hr)	EDR ^(a) Sq. Ft. (Sq. m)	Final Air Temp °F (°C)	Motor		Nominal CFM (m³/s)	Outlet Velocity FPM (m/s)	Sound Rating
						HP ^(b) (kW)	RPM			
600L	10° (5.6°)	394.4 (115.6)	54.19 (3.418)	6.83 (2.083)	95.3° (35.2)	1-1/2 (1.119)	1160	10,300 (4.807)	2060 (10.465)	IV
	20° (11.1°)	377.0 (110.5)	38.85 (2.451)	3.68 (1.122)	93.7° (34.3)					
	30° (16.7°)	342.2 (100.3)	23.51 (1.483)	1.45 (0.442)	90.6° (32.6)					
720L	20° (11.1°)	453.7 (132.9)	46.76 (2.950)	4.11 (1.254)	95.1° (35.1)	3 (2.237)	1165	11,900 (5.553)	2380 (12.090)	IV
	30° (16.7°)	411.7 (120.6)	28.28 (1.784)	1.62 (0.494)	91.9° (33.3)					

Notes:

- Performance based on 200°F (93.3°C) EWT, 20°F (11.1°C) TD, 60°F (15.6°C) EAT.
- Performance at 10°F (5.6°C) & 30°F (16.7°C) TD is also shown.
- For capacities at other conditions, use the correction multipliers in the tables in "Hot Water Calculations and Correction Factors," p. 21.

^(a) Equivalent Direct Radiation

^(b) Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

^(c) Speed controller option is required for reduced ratings.

Hot Water Calculations and Correction Factors

Table 10. Hot water calculations

				Example: Unit Size — 42 Entering Water Temp. — 160°F Entering Air Temp. — 40°F Water Temperature Drop — 10°F
1.	Capacity at 20°F TD	A. For 200°F EWT, 60°F EAT	Read output directly from Table 8, p. 16 and Table 9, p. 18, 22,700 BTU/HR	
		B. For EWT and/or EAT above or below standard	Multiply output from Table 8, p. 16 and Table 9, p. 18 by factor from Table 11, p. 22.	22,700 x .878 = 19,931 BTU/HR.
2.	Capacity at other TD's	For TD's from 5 to 60°F	Multiply output obtained in 1. A. or 1.B. by appropriate factor from Table 12, p. 22	1.A. - 22,700 x 1.15 = 26,105 BTU/HR. OR 1.B. - 19,931 x 1.15 = 22,921 BTU/HR.
3.	GPM at other TD's	For TD's from 5 to 60°F	Multiply GPM of unit for 20°F TD from Table 8, p. 16 and Table 9, p. 18 by appropriate factor from Table 12, p. 22	2.34 x 2.30 = 5.38 GPM (Applies only to units with Std. 200°F EWT, 60°F EAT) For all others calculate using formula GPM = $\frac{\text{BTU}}{500 \times \text{TD}}$
4.	Pressure loss at other TD's	For TD's from 5 to 60°F	Multiply P.D. of unit for 20°F TD from Table 8, p. 16 and Table 9, p. 18 by appropriate factor from Table 12, p. 22	.06 x 5.00 = .30 Ft. H ₂ O



Hot Water Performance Data

Table 11. Hot water conversion factors based on 200°F entering water, 60°F entering air, 20°F temperature drop

Entering Air Temperature °F (°C)	Entering water temperature — 20°F water temperature drop										
	100° (38°)	120° (49°)	140° (60°)	160° (71°)	180° (82°)	200° (93°)	220° (104°)	240° (116°)	260° (127°)	280° (138°)	300° (149°)
30° (-1)	0.518	0.666	0.814	0.963	1.120	1.268	1.408	1.555	1.702	1.850	1.997
40° (4)	0.439	0.585	0.731	0.878	1.025	1.172	1.317	1.464	1.609	1.755	1.908
50° (10)	0.361	0.506	0.651	0.796	0.941	1.085	1.231	1.375	1.518	1.663	1.824
60° (16)	0.286	0.429	0.571	0.715	0.857	1.000	1.143	1.286	1.429	1.571	1.717
70° (21)	0.212	0.353	0.494	0.636	0.777	0.918	1.060	1.201	1.342	1.483	1.630
80° (27)	0.140	0.279	0.419	0.558	0.698	0.837	0.977	1.117	1.257	1.397	1.545
90° (32)	0.069	0.207	0.345	0.483	0.621	0.759	0.897	1.035	1.173	1.311	1.462
100° (38)	0	0.137	0.273	0.409	0.546	0.682	0.818	0.955	1.094	1.230	1.371

Note: To obtain the BTU capacity for conditions other than those in the basic capacity tables, multiply the basic rating (200°F entering water, 60°F entering air,) by the proper constant from the above tables.

Table 12. Hot water BTU, GPM, and pressure loss factors based on standard conditions of 200°F entering water, 60°F entering air, and 20°F water drop

Use factors from this table to obtain approximate results	TEMPERATURE DROP °F (°C)								
	5 (3)	10 (6)	15 (8)	20 (11)	25 (14)	30 (17)	40 (22)	50 (28)	60 (33)
To obtain BTU for other Water Temperature Drops, multiply basic BTU rating by applicable Factor.	1.25	1.15	1.08	1.00	0.94	0.90	0.83	0.76	0.72
To obtain GPM for other Water Temperature Drops, multiply basic GPM rating by applicable Factor.*	5.00	2.30	1.44	1.00	0.74	0.59	0.40	0.30	0.24
To obtain Pressure Loss Feet of Water for other temperature Drops, multiply Basic loss at 20°F drop by Factor.	10.00	5.00	2.00	1.00	0.60	0.40	0.20	0.13	0.07

Table 13. Minimum water flow — GPM

UNIT SIZE	42	64	80	102	146	166	202	252	336	384
MIN. GPM (L/s)	.55 (.035)	.55 (.035)	.55 (.035)	.55 (.035)	.82 (.052)	.82 (.052)	1.10 (.069)	1.10 (.069)	1.10 (.069)	1.10 (.069)

Table 14. Heating capacity factors for various rates of water flow

% of Rated Water Flow	25%	50%	75%	100%	125%	150%	175%
Btu/Hr Heating Capacity	0.80	0.89	0.96	1.00	1.04	1.07	1.10



Sound Ratings

The performance data listed in [Table 3, p. 11](#), [Table 4, p. 12](#), [Table 8, p. 16](#), and [Table 9, p. 18](#) include sound ratings. The ratings provide a guide in determining the acceptable degree of loudness in particular occupancy situations.

Certain general rules apply to specific selection of unit heaters with regard to degree of quietness (or loudness):

- The greater the fan diameter, the higher the sound level.
- The higher the motor RPM, the higher the sound level. Note that on most units the lower the speed mode results in lowering the sound rating one increment.
- Selecting a larger number of smaller units generally results in lower overall noise levels than fewer large units.

All vertical steam and hot water unit heater motors, whether fan guard or shelf-mounted, are isolated from the mechanical mount by resilient isolators. This mounting along with balanced fan blades and excellent overall construction integrity, provides the utmost in quiet operation

The following table outlines sound ratings for various applications. The lower the number, the quieter the unit and the lower the sound requirement.

Table 15. Sound rating

Type of area	Sound Rating
Apartment, assembly hall, classrooms churches, courtrooms, executive offices, hospitals, libraries, museums, theatres	I
Dining rooms, general offices, recreation areas, small retail stores	II
Restaurants, banks, cafeterias, department stores, public buildings, service stations	III
Gymnasiums, health clubs, laundromats, supermarkets	IV
Garages, small machine shops, light manufacturing	V
Factories, foundries, steel mills	III-VII ^(a)

^(a) Depending on specific use in these facilities, size of operation, and other factors.



Corrections When Using Glycol Solution in System

Table 16. Corrections when using glycol solution in system

		Propylene glycol
Heat transfer @180°F with no increase in flow rate	20% solution	.97 ^(a)
	50% solution	.90 ^(a)
G.P.M. Req'd. @180°F, 20° Δ t (no correction to pump curve)		1.10% ^(a)
Pump Head Req'd. @180°F w/increase in G.P. M.		1.23% ^(a)
Specify gravity (water = 1.0)		1.045-1.055 ^(a)
Pounds/gallons at 60°F (water = 8.3453 Pound/Gallon)		8.77
pH at 50% by volume		9.5
Freezing point by volume	55%	-28°F (-33.3°C)
	40%	-13°F (-25°C)
	30%	+ 4°F (-15.6°C)
	20%	+ 17°F (-8.3°C)

^(a) Compared to water

Table 17. Approximate factors at varying altitudes

Altitude	Factor
Sea level - 1000 ft. (0 - 305 m)	1.00
1000 ft. - 3000 ft. (305 - 914 m)	.958
3000 ft. - 5000 ft. (914 - 1524 m)	.929
5000 ft. - 7000 ft. (1524 - 2134 m)	.900
7000 ft. - 10000 ft. (2134 - 3048 m)	.871



Motor Data

All motors are constant speed and operate at top speed as indicated in motor data. Motors through 1/8 H.P. can be run at reduced speed with addition of optional variable speed switch. This switch is factory-calibrated for low and high speed ratings, with intermediate speeds infinitely controllable. Sizes 166 through 720 operate at constant speed as indicated in motor data.

Stated draw is Full Load (FLA). AMP draw varies by motor manufacturer $\pm .2$ AMPS. Verify FLA on motor data plate.

Note: Select appropriate AMP, MCA, and MOP for the multiple voltage motors. For example, the AMP, MCA, and MOP for size 40 with a 230 volt Totally Enclosed motor is 1.1, 1.4, and 2.5 respectively.

Important: For units with explosion proof motors, junction box is field provided.

Table 18. Standard (totally enclosed) motor type

Unit Size	AMP	MCA	MOP	HP	RPM
115/1/60					
42	1.23 ^(a)	1.6	2.8	1/40 ^(b)	1550
64	2.1 ^(a)	2.6	4.7	1/20 ^(b)	1550
80					
102	1.2 ^(a)	1.5	2.7	1/8 ^(b)	1070
122	2.3 ^(a)	2.9	5.2	1/6	1100
146					
166					
202	3.6 ^(a)	4.5	8.1	1/4	1100
252	3.6 ^(a)	4.5	8.1	1/4	1100
280	5.4 ^(a)	6.8	12.2	1/2	1100
208-230/460/3/60					
42	0.98-1.1/ 0.55 ^(c)	1.2-1.4/ 0.7	2.2-2.5/ 1.2	1/6	1140
64	0.98-1.1/ 0.55 ^(c)	1.2-1.4/ 0.7	2.2-2.5/ 1.2	1/6	1140
80					
102	0.98-1.1/ 0.55 ^(c)	1.2-1.4/ 0.7	2.2-2.5/ 1.2	1/6	1140
122	0.98-1.1/ 0.55 ^(c)	1.2-1.4/ 0.7	2.2-2.5/ 1.2	1/6	1140
146					
166					
202	1.2-1.4/ 0.7 ^(c)	1.5-1.8/ 0.9	2.7-3.2/ 1.6	1/4	1140
252	1.2-1.4/ 0.7 ^(c)	1.5-1.8/ 0.9	2.7-3.2/ 1.6	1/4	1140
280	1.8-2.0/ 1.0 ^(c)	2.3-2.5/ 1.3	4.1-4.5/ 2.3	1/2	1140

Table 18. Standard (totally enclosed) motor type (continued)

Unit Size	AMP	MCA	MOP	HP	RPM
336	3.1-3.2/ 1.6 ^(c)	3.9-4.0/ 2.0	7.0-7.2/ 3.6	3/4	1140
384	3.5-3.6/ 1.8 ^(c)	4.4-4.5/ 2.3	7.9-8.1/ 4.1	1	1155
500	5.0-4.4/ 2.2 ^(c)	6.3-5.5/ 2.8	11.9- 11.3/5.6	1-1/2	1160
600					
720	9.6-8.2/ 4.1 ^(c)	12.0- 10.3/5.1	22.3- 22.1/11.0	3	1165

Note: Sizes 336 through 720 are not available for either Totally Enclosed or Explosion Proof with Overload 115/1/60 motor types.

- (a) These motors have automatic thermal overload protection or impedance protection.
- (b) Optional variable speed switch is available.
- (c) These motors are without thermal overload protection. Motors without thermal overload protection must be installed with the optional manual starter or other field provided overload protection.

Table 19. Explosion proof with thermal overload motor type

Unit Size	AMP	MCA	MOP	HP	RPM
115/1/60					
42	3.8 ^(a)	4.8	8.6	1/6	1140
64	3.8 ^(a)	4.8	8.6	1/6	1140
80					
102	3.8 ^(a)	4.8	8.6	1/6	1140
122	3.8 ^(a)	4.8	8.6	1/6	1140
146					
166					
202	4.4 ^(a)	5.5	9.9	1/4	1140
252	4.4 ^(a)	5.5	9.9	1/4	1140
280	7.8 ^(a)	9.8	17.6	1/2	1140
208-230/460/3/60					
42	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
64	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
80	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
102	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
122	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175



Motor Data

Table 19. Explosion proof with thermal overload motor type (continued)

Unit Size	AMP	MCA	MOP	HP	RPM
146	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
166	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
202	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
252	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
280	2.2-2.3/ 1.1 ^(a)	2.8-2.9/ 1.4	5.0-5.2/ 2.5	1/2	1175
336	3.1-3.2/ 1.6 ^(a)	3.9-4.0/ 2.0	7.0-7.2/ 3.6	3/4	1145
384	3.1-3.2/ 1.6 ^(a)	3.9-4.0/ 2.0	7.0-7.2/ 3.6	3/4	1145
500	4.6-4.7/ 2.3 ^(a)	5.8-5.9/ 2.9	10.4- 10.6/5.2	1-1/2	1175
600	4.6-4.7/ 2.3 ^(a)	5.8-5.9/ 2.9	10.4- 10.6/5.2	1-1/2	1175
720	10.0/5.0 (b) (c)	12.5/6.3	22.5/11.3	3	1150

Note: Sizes 336 through 720 are not available for either Totally Enclosed or Explosion Proof with Overload 115/1/60 motor types.

- ^(a) These motors have automatic thermal overload protection or impedance protection.
- ^(b) These motors are 230/460 volts only.
- ^(c) These motors are without thermal overload protection. Motors without thermal overload protection must be installed with the optional manual starter or other field provided overload protection.



Installation

⚠ WARNING

Heavy Objects!

Failure to properly lift unit could result in death or serious injury or possible equipment or property damage.

Verify that the lifting and suspension methods used during field installation can uniformly support the heater's weight at all times.

⚠ WARNING

Heavy Objects!

Failure to properly lift unit could result in death or serious injury or possible equipment or property damage.

Verify the heater is mounted to a structure that can support its weight. Do not use piping or electrical conduit for support, and do not lean objects like ladders against the heater or its conduit.

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death, serious injury, and equipment or property damage.

- Confirm all hardware used in the suspension of each unit heater is more than adequate for the job.
- Do not use washers between the unit nutsert and jam nut. Use of a washer may cause the nutsert to dislodge from the unit.

NOTICE

Unit Damage!

Failure to follow instructions below could result in damaging the unit.

Unit heaters must be hung level from side to side and from front to back.

It is assumed that the design engineer has selected, sized, and located in the area to be heated by the design engineer. However, the information given here may be of additional help to the installer.

Vertical unit heaters should be located to give spot heating or a circulatory distribution, preferably near the outer perimeter of the building. The units should be spaced to properly blanket the areas with warm air. Place the units at points of greatest heat loss. Blanket outside doorway and provide ample coverage of window areas. Keep units away from obstructions that will impede the full and natural air delivery of the units.

Install unit heaters to meet ETL and OSHA requirements. Vertical Unit Heaters mounted lower than 8 feet (2.4 meters) from the floor must be equipped with an OSHA fan

guard. Weldnuts are provided at the top of all units for suspension purposes. The unit should be suspended from connections provided in the unit by means of rods. The rods should then be attached to solid supports of the building.

Units must hang level vertically and horizontally.

Provide sufficient clearance around units for maintenance purposes. This includes at least 7 inches above all Vertical Unit Heaters even though the motor is removable through the bottom. To provide efficient airflow to the unit, maintain a clearance of 2 feet (0.61m) around all sides of the unit. Maximum altitude for this unit is 14,000 feet (4,267 meters) unless otherwise noted. For altitudes higher than 14,000 feet (4,267 meters), contact a customer service representative.

Isolators are not required but may be desirable for some applications. Refer to [Table 20, p. 27](#) for unit weights.

Table 20. Vertical unit heaters unit weights

Unit Size	Approx. Ship Weight lbs. (kg)
42	32 (15)
64	40 (18)
80	43 (20)
102	63 (29)
122	64 (29)
146	80 (36)
166	80 (36)
202	86 (39)
252	134 (61)
280	139 (63)
336	139 (63)
384	146 (66)
500	294 (133)
600	307 (139)
720	366 (166)

Example

[Table 23, p. 31](#) lists maximum mounting height and floor spread data of warm air coverage at floor level with louver cone diffusers. Correction factors for various water temp. and PSI of steam are in [Table 24, p. 31](#).

An approximation of the floor spread when operating on other than 2 psi (13.8 kPa) steam or 219°F (104°C) hot water may be obtained by ratioing the new floor spread and the maximum mounting height to that at 2 psi (13.8 kPa) steam or 219°F (104°C) hot water.

The following is an example:

Installation

Determine the floor spread and the maximum mounting height of a std. size 80 unit heater with a cone diffuser set at 90 degrees, operating on 280°F (138°C) hot water.

From [Table 23, p. 31](#), maximum mounting height of a size 80 at 219°F (104°C) hot water is 18.5 ft. (5.64 m) with floor coverage of 14.0 ft. (4.27 m) diameter. The maximum mounting height correction factor at 280°F (138°C) hot water is 0.80.

$$18.5 \text{ ft. (5.64 m)} \times 0.80 = 14.8 \text{ ft. (4.51 m)}$$

Maximum mounting height of a size 80 using 280°F (138°C) hot water.

"X" = floor spread of size 80 using 280°F (138°C) hot water.

$$X = 14.8 \times 14.0 / 18.5 \text{ (4.51} \times 4.27 / 5.64 \text{)}$$

$$X = 207.2 / 18.5 \text{ (63.15} / 5.64 \text{)}$$

$$X = 11.2 \text{ ft. (3.41 m)}$$

Table 21. Maximum mounting height in feet (meters) with and without louver cone diffuser

Unit Size	2 (0.61)	5 (1.52)	10 (3.05)	50 (15.24)	75 (22.86)
	Steam Pressure PSI (kPa)				
42	10.5 (3.2)	10.0 (3.0)	10.0 (3.0)	9.0 (2.7)	8.0 (2.4)
	12.5 (3.8)	12.0 (3.7)	12.0 (3.7)	11.0 (3.4)	10.0 (3.0)
42(a)	7.5 (2.3)	7.5 (2.3)	7.5 (2.3)	7.5 (2.3)	7.5 (2.3)
	9.0 (2.7)	8.5 (2.6)	8.5 (2.6)	7.5 (2.3)	7.5 (2.3)
42L	12.5 (3.8)	12.0 (3.7)	12.0 (3.7)	10.5 (3.2)	9.5 (2.9)
	14.5 (4.4)	14.0 (4.3)	13.5 (4.1)	12.0 (3.7)	11.5 (3.5)
42L(a)	9.0 (2.7)	8.5 (2.6)	8.5 (2.6)	7.5 (2.3)	7.5 (2.3)
	10.5 (3.2)	10.0 (3.0)	10.0 (3.0)	9.0 (2.7)	8.5 (2.6)
64	12.0 (3.7)	11.5 (3.5)	11.5 (3.5)	10.0 (3.0)	9.5 (2.9)
	14.5 (4.4)	14.0 (4.3)	14.0 (4.3)	12.0 (3.7)	11.5 (3.5)
64(a)	9.5 (2.9)	9.0 (2.7)	9.0 (2.7)	8.0 (2.4)	8.0 (2.4)
	11.5 (3.5)	11.0 (3.4)	11.0 (3.4)	9.5 (2.9)	9.0 (2.7)
64L	15.0 (4.6)	14.5 (4.4)	14.5 (4.4)	12.5 (3.8)	12.0 (3.7)
	19.0 (5.8)	18.5 (5.6)	18.5 (5.6)	16.5 (5.0)	16.0 (4.9)

Table 21. Maximum mounting height in feet (meters) with and without louver cone diffuser (continued)

Unit Size	2 (0.61)	5 (1.52)	10 (3.05)	50 (15.24)	75 (22.86)
	Steam Pressure PSI (kPa)				
64L(a)	11.5 (3.5)	11.0 (3.4)	11.0 (3.4)	9.5 (2.9)	9.0 (2.7)
	14.0 (4.3)	13.5 (4.1)	13.5 (4.1)	12.0 (3.7)	11.5 (3.5)
80	15.0 (4.6)	14.5 (4.4)	14.0 (4.3)	12.0 (3.7)	11.5 (3.5)
	18.5 (5.6)	18.0 (5.5)	17.5 (5.3)	15.5 (4.7)	15.0 (4.6)
80(a)	11.0 (3.4)	10.5 (3.2)	10.5 (3.2)	9.0 (2.7)	8.5 (2.6)
	13.5 (4.1)	13.0 (4.0)	13.0 (4.0)	11.5 (3.5)	11.0 (3.4)
80L	18.0 (5.5)	17.5 (5.3)	17.5 (5.3)	15.0 (4.6)	14.0 (4.3)
	22.0 (6.7)	21.0 (6.4)	21.0 (6.4)	19.0 (5.8)	18.0 (5.5)
80L(a)	13.0 (4.0)	12.5 (3.8)	12.0 (3.7)	11.0 (3.4)	10.5 (3.2)
	17.0 (5.2)	16.5 (5.0)	16.0 (4.9)	14.0 (4.3)	13.5 (4.1)
102	14.0 (4.3)	13.5 (4.1)	13.0 (4.0)	11.5 (3.5)	11.0 (3.4)
	17.0 (5.2)	16.5 (5.0)	16.0 (4.9)	14.0 (4.3)	13.5 (4.1)
102(a)	11.0 (3.4)	10.5 (3.2)	10.5 (3.2)	9.5 (2.9)	9.0 (2.7)
	13.5 (4.1)	13.0 (4.0)	13.0 (4.0)	12.0 (3.7)	11.5 (3.5)
102L	17.5 (5.3)	17.0 (5.2)	16.5 (5.0)	15.0 (4.6)	14.5 (4.4)
	21.5 (6.6)	21.0 (6.4)	20.5 (6.2)	18.5 (5.6)	17.5 (5.3)
102L(a)	15.0 (4.6)	14.5 (4.4)	14.5 (4.4)	13.0 (4.0)	12.5 (3.8)
	18.5 (5.6)	18.0 (5.5)	18.0 (5.5)	16.0 (4.9)	15.0 (4.6)
122	16.0 (4.9)	15.5 (4.7)	15.5 (4.7)	14.0 (4.3)	13.5 (4.1)
	19.5 (5.9)	19.0 (5.8)	18.5 (5.6)	17.0 (5.2)	16.0 (4.9)
122L	21.0 (6.4)	20.5 (6.2)	20.0 (6.1)	17.5 (5.3)	17.0 (5.2)
	26.0 (7.9)	25.5 (7.8)	25.0 (7.6)	22.5 (6.9)	21.5 (6.6)

Table 21. Maximum mounting height in feet (meters) with and without louver cone diffuser (continued)

Unit Size	2 (0.61)	5 (1.52)	10 (3.05)	50 (15.24)	75 (22.86)
	Steam Pressure PSI (kPa)				
146	15.5 (4.7)	15.0 (4.6)	14.5 (4.4)	13.0 (4.0)	12.0 (3.7)
	19.0 (5.8)	18.5 (5.6)	18.0 (5.5)	16.0 (4.9)	15.5 (4.7)
146L	18.0 (5.5)	17.5 (5.3)	17.5 (5.3)	15.0 (4.6)	14.0 (4.3)
	22.5 (6.9)	22.0 (6.7)	21.5 (6.6)	18.5 (5.6)	18.0 (5.5)
166	18.0 (5.5)	17.5 (5.3)	17.0 (5.2)	14.5 (4.4)	14.0 (4.3)
	22.5 (6.9)	22.0 (6.7)	21.5 (6.6)	19.0 (5.8)	18.0 (5.5)
166L	22.0 (6.7)	21.5 (6.6)	21.0 (6.4)	18.5 (5.6)	17.5 (5.3)
	27.5 (8.4)	27.0 (8.2)	26.5 (8.1)	23.5 (7.2)	22.5 (6.9)
202	22.0 (6.7)	21.5 (6.6)	21.0 (6.4)	18.5 (5.6)	17.5 (5.3)
	27.5 (8.4)	27.0 (8.2)	26.5 (8.1)	24.0 (7.3)	23.0 (7.0)
202L	25.5 (7.8)	25.0 (7.6)	24.5 (7.5)	22.0 (6.7)	21.0 (6.4)
	31.5 (9.6)	31.0 (9.4)	30.5 (9.3)	27.0 (8.2)	26.0 (7.9)
252	20.0 (6.1)	19.5 (5.9)	19.0 (5.8)	17.0 (5.2)	16.0 (4.9)
	25.0 (7.6)	24.0 (7.3)	23.5 (7.2)	20.5 (6.2)	19.5 (5.9)
252L	24.0 (7.3)	23.5 (7.2)	23.0 (7.0)	20.0 (6.1)	19.0 (5.8)
	29.5 (9.0)	28.5 (8.7)	28.0 (8.5)	24.5 (7.5)	23.5 (7.2)
280	21.0 (6.4)	20.5 (6.2)	20.0 (6.1)	17.5 (5.3)	17.0 (5.2)
	26.0 (7.9)	25.5 (7.8)	25.0 (7.6)	22.0 (6.7)	21.0 (6.4)
280L	25.5 (7.8)	25.0 (7.6)	24.5 (7.5)	21.0 (6.4)	20.0 (6.1)
	32.0 (9.8)	31.0 (9.4)	30.0 (9.1)	26.0 (7.9)	25.0 (7.6)
336	24.0 (7.3)	23.0 (7.0)	22.0 (6.7)	20.0 (6.1)	19.0 (5.8)
	30.0 (9.1)	29.0 (8.8)	28.0 (8.5)	25.0 (7.6)	24.0 (7.3)

Table 21. Maximum mounting height in feet (meters) with and without louver cone diffuser (continued)

Unit Size	2 (0.61)	5 (1.52)	10 (3.05)	50 (15.24)	75 (22.86)
	Steam Pressure PSI (kPa)				
336L	29.0 (8.8)	28.5 (8.7)	28.0 (8.5)	25.0 (7.6)	24.0 (7.3)
	36.0 (11.0)	35.0 (10.7)	34.0 (10.4)	30.0 (9.1)	29.0 (8.8)
384	28.5 (8.7)	28.0 (8.5)	27.5 (8.4)	24.0 (7.3)	23.0 (7.0)
	35.5 (10.8)	35.0 (10.7)	34.0 (10.4)	30.0 (9.1)	29.0 (8.8)
384L	32.5 (9.9)	31.5 (9.6)	30.5 (9.3)	27.5 (8.4)	26.5 (8.1)
	41.0 (12.5)	40.0 (12.2)	39.0 (11.9)	35.0 (10.7)	33.5 (10.2)
500	29.5 (9.0)	29.0 (8.8)	28.5 (8.7)	25.0 (7.6)	24.0 (7.3)
	36.5 (11.1)	36.0 (11.0)	35.5 (10.8)	32.0 (9.8)	30.5 (9.3)
500L	35.0 (10.7)	34.0 (10.4)	33.0 (10.1)	29.0 (8.8)	28.0 (8.5)
	43.5 (13.3)	42.5 (13.0)	41.5 (12.6)	35.0 (10.7)	34.0 (10.4)
600	34.0 (10.4)	33.0 (10.1)	32.0 (9.8)	28.0 (8.5)	27.0 (8.2)
	42.5 (13.0)	41.5 (12.6)	40.5 (12.3)	36.0 (11.0)	34.5 (10.5)
600L	37.0 (11.3)	36.0 (11.0)	35.0 (10.7)	31.0 (9.4)	30.0 (9.1)
	46.5 (14.2)	45.5 (13.9)	44.5 (13.6)	39.0 (11.9)	37.0 (11.3)
720	38.5 (11.7)	37.5 (11.4)	36.5 (11.1)	32.0 (9.8)	30.5 (9.3)
	48.0 (14.6)	47.0 (14.3)	46.0 (14.0)	40.0 (12.2)	39.0 (11.9)
720L	42.5 (13.0)	41.5 (12.6)	40.5 (12.3)	35.0 (10.7)	33.5 (10.2)
	53.0 (16.2)	52.0 (15.8)	51.0 (15.5)	44.0 (13.4)	42.0 (12.8)

Notes:

1. L = low output model with all air ports open
2. Figures in bold face show maximum mounting height with louver cone diffusers set vertically.
3. Data based on 60°F (15.6°C) entering air temperature. In providing for the use of diffusers, adjustment of a LCD to deflect air toward horizontal immediately lowers the mounting height limit.

(a) Low speed

Table 22. Maximum spread

Unit Size	42	64	80	102	122	146	166	202	252	280	336	384	500	600	720
Spread ft (m)	15 (4.6)	17 (5.2)	20 (6.1)	24 (7.3)	26 (7.9)	27 (8.2)	28 (8.5)	32 (9.8)	35 (10.7)	37 (11.3)	45 (13.7)	50 (15.2)	54 (16.5)	57 (17.4)	60 (18.3)

Note: The spread is the diameter of the comfort zone at floor level. The above table represents the spread for standard units without a louver cone diffuser and mounted at its maximum height at 2 PSI (13.8 kPa) steam pressure and 60°F (16°C) entering air. (See Table 21, p. 28 for maximum mounting heights.)

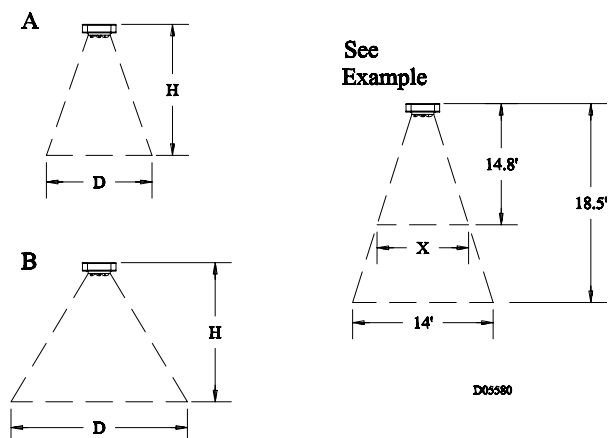
Figure 7. Diffuser cone examples


Table 23. Maximum mounting height and diameter at floor (based on 60°F EAT and 219°F EWT or 2 PSI steam)

Unit Size	Diffuser Cone 90° ^(a)				Diffuser Cone 45° ^(b)			
	Standard		Low Output		Standard		Low Output	
	H ft (m)	D ft (m)	H ft (m)	D ft (m)	H ft (m)	D ft (m)	H ft (m)	D ft (m)
42	12.5 (3.8)	11.0 (3.4)	14.5 (4.4)	16.0 (4.9)	9.0 (2.7)	20.0 (6.1)	11.0 (3.4)	25.0 (7.6)
64	14.5 (4.4)	12.0 (3.7)	19.0 (5.8)	19.0 (5.8)	10.0 (3.0)	24.0 (7.3)	12.0 (3.7)	29.0 (8.8)
80	18.5 (5.6)	14.0 (4.3)	22.0 (6.7)	23.0 (7.0)	12.5 (3.8)	26.0 (7.9)	15.0 (4.6)	31.0 (9.4)
102	17.0 (5.2)	18.0 (5.5)	21.5 (6.6)	26.0 (7.9)	11.0 (3.4)	31.0 (9.4)	14.0 (4.3)	35.0 (10.7)
122	19.5 (5.9)	19.0 (5.8)	26.0 (7.9)	29.0 (8.8)	13.0 (4.0)	33.0 (10.1)	16.0 (4.9)	38.0 (11.6)
146	19.0 (5.8)	20.0 (6.1)	22.5 (6.9)	30.0 (9.1)	12.0 (3.7)	39.0 (11.9)	15.5 (4.7)	44.0 (13.4)
166	22.5 (6.9)	21.0 (6.4)	27.5 (8.4)	31.0 (9.4)	13.0 (4.0)	42.0 (12.8)	18.0 (5.5)	48.0 (14.6)
202	27.5 (8.4)	25.0 (7.6)	31.5 (9.6)	35.0 (10.7)	14.0 (4.3)	45.0 (13.7)	21.0 (6.4)	53.0 (16.2)
252	25.0 (7.6)	27.0 (8.2)	29.5 (9.0)	38.0 (11.6)	13.0 (4.0)	47.0 (14.3)	19.0 (5.8)	55.0 (16.8)
280	26.0 (7.9)	29.0 (8.8)	32.0 (9.8)	40.0 (12.2)	15.0 (4.6)	50.0 (15.2)	21.0 (6.4)	60.0 (18.3)
336	30.0 (9.1)	34.0 (10.4)	36.0 (11.0)	47.0 (14.3)	18.0 (5.5)	55.0 (16.8)	24.0 (7.3)	66.0 (20.1)
384	35.5 (10.8)	39.0 (11.9)	41.0 (12.5)	52.0 (15.8)	20.0 (6.1)	59.0 (18.0)	28.0 (8.5)	71.0 (21.6)
500	36.5 (11.1)	42.0 (12.8)	43.5 (13.3)	57.0 (17.4)	24.0 (7.3)	65.0 (19.8)	30.0 (9.1)	76.0 (23.2)
600	42.5 (13.0)	45.0 (13.7)	46.5 (14.2)	60.0 (18.3)	26.0 (7.9)	70.0 (21.3)	34.0 (10.4)	78.0 (23.8)
720	48.0 (14.6)	46.0 (14.0)	53.0 (16.2)	63.0 (19.2)	28.0 (8.5)	75.0 (22.9)	38.0 (11.6)	87.0 (26.5)

^(a) See 7Diffuser cone examples, p. 30 example A.

^(b) See 7Diffuser cone examples, p. 30 example B.

Table 24. Mounting height correction factors

Water Temperature	°F	150	160	170	180	190	200
	(°C)	(66)	(71)	(77)	(82)	(88)	(93)
Steam Pressure	PSI	—	—	—	—	—	—
	(kPa)	—	—	—	—	—	—
Correction Factor		1.32	1.27	1.23	1.18	1.14	1.09
Water Temperature	°F	210	219	227	239	250	259
	(°C)	(99)	(104)	(108)	(115)	(121)	(126)
Steam Pressure	PSI	—	2	5	10	15	20
	(kPa)	—	(13.8)	(34.5)	(68.9)	(103.4)	(137.9)

Table 24. Mounting height correction factors (continued)

Correction Factor		1.05	1.00	0.97	0.94	0.89	0.86
Water Temperature	°F	267	280	287	298	307	320
	(C°)	(131)	(138)	(142)	(148)	(153)	(160)
Steam Pressure	PSI	25	35	40	50	60	75
	(kPa)	(172.4)	(241.3)	(275.8)	(344.7)	(413.6)	(517.1)
Correction Factor		0.83	0.80	0.76	0.73	0.70	0.69

Note: To meet OSHA requirements, units mounted lower than 8 feet from the floor must be equipped with an OSHA fan guard.

Piping

To provide proper coil operation, follow all piping recommendations listed in this manual.

Threaded pipe headers are provided on all Vertical Units for piping connections. See [Figure 7, p. 30](#). Connections are given in [Figure 5, p. 8](#) and [Figure 6, p. 8](#) and [Table 1, p. 9](#) and [Table 2, p. 10](#).

Follow standard practices and codes when installing the piping. Provide swing joints for expansion purposes, unions and shut-off valves for servicing purposes and as illustrated in [Figure 8, p. 32](#) through [Figure 11, p. 33](#), valves and traps for control purposes. Use 45 degree angle run-offs from all supply and return mains.

Dirt pockets should be the same pipe size as the return tapping of the unit heater. Pipe size in the branch-off should be the same size as the tapping in the traps. Beyond the trap, the return lateral pipe should be increased one size up to the return main.

Important: Properly support all piping to unit. Do not allow piping to place a strain on the coil or unit. Noise or coil failure may occur.

It is assumed that the type of system to be used has been selected by design engineer. The sketches shown are for different type of steam systems or hot water systems. For sizing of piping, traps, and filter, consult ASHRAE guides of the manufacturer's literature on these products.

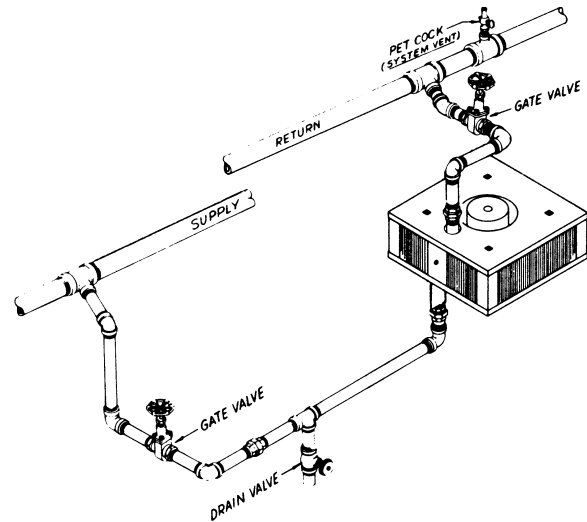
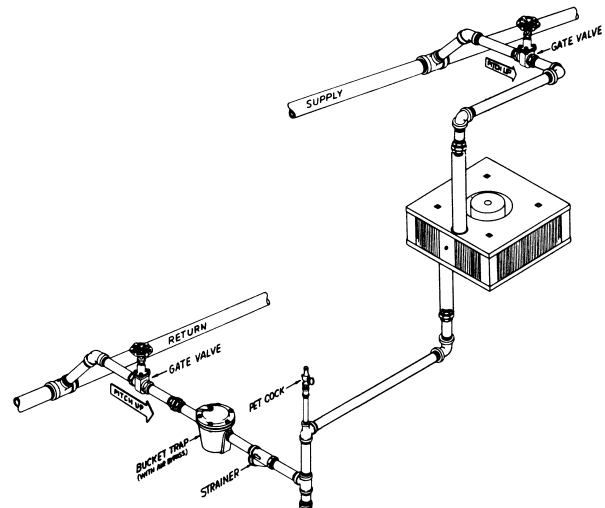
Figure 8. Forced hot water

Figure 9. High pressure steam


Figure 10. Low pressure steam (gravity)

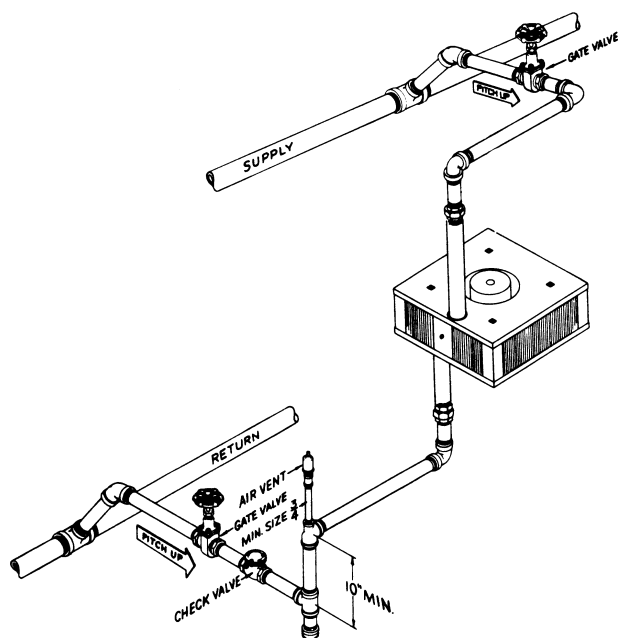
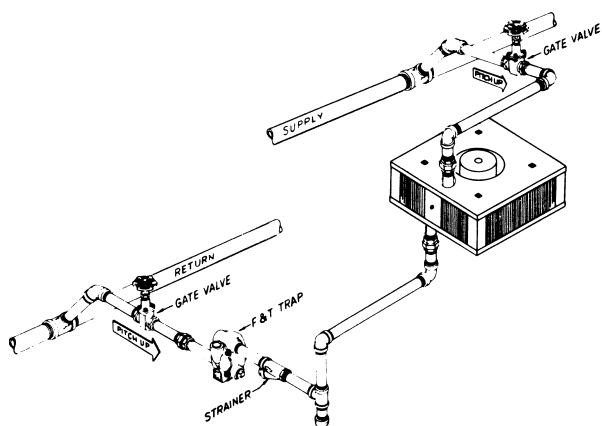


Figure 11. Low pressure vapor or vacuum





Electrical Connections

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

Standard units are shipped for use on 115 volt, 60 hertz single phase electric power. The motor nameplate and electrical rating on the transformer should be checked before energizing the unit heater electrical system. All external wiring must conform to the latest edition of the National Electric Code, ANSI/NFPA No. 70 and applicable current local codes; in Canada, to the Canadian Electrical Code, Part 1 CSA Standard C22.1. The short-circuit current rating (SCCR) for this unit is 5kA.

Disconnection must be incorporated in fixed wiring.

It is recommended that the electrical power supply to each unit heater be provided by a separate, fused and permanently live electrical circuit. A disconnect switch of suitable electrical rating for each unit heater should be located as close to the controls as possible. Each unit heater must be electrically grounded in accordance with the latest edition of the National Electric Code, ANSI/NFPA No. 70 or and applicable current local codes; In Canada to the Canadian Electrical Code, Part 1, CSA C22.1.

Operation

Most basic unit heater systems are controlled by a room thermostat. Locate thermostat on inner wall or column so that optimum control could be obtained for that area. Set the thermostat for desired temperature.

On steam systems, a low limit may be used to prevent fan from blowing cold air unless the heater has steam passing through the coil.

Small hot water systems could have the circulating pump controlled directly by the room thermostat. On large systems, zone valves could be used to control the individual unit heater where constant water circulation is used on the main system

Thermostat Wiring and Location

NOTICE

Equipment Damage!

Failure to follow instructions below could result in equipment damage.

Follow the provided instructions to mount the thermostat on a vertical vibration-free surface free from air currents.

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

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

Important: For all wiring connections, refer to the wiring diagram on the motor nameplate. Should any original wire supplied with the heater have to be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C.

Motors

The standard 115/1/60 motors provided on Vertical Unit Heaters are totally enclosed, Class B insulated and have built-in thermal overload protection.

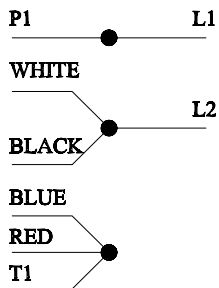
Vertical Units 42 through 80 use sleeve type bearings. Vertical Units 122 through 280 use permanent split capacitor motors with ball bearings.

All sleeve bearing motors have oil holes to allow lubrication. Ball bearing motors are permanently lubricated although some three phase or special motors have removable plugs which will allow field installation of grease fittings. The standard 42 through 102 motors can be converted to variable speed operation with the addition of the solid state speed control.

See [Figure 12, p. 35](#) through [Figure 26, p. 37](#) for typical wiring diagrams.

Wiring Diagrams

Figure 12. Fan motor connections low voltage with protector select rotation (CCW shown) (Marathon)



For CW Rotation Interchange
(Red and black lead)

Figure 14. Fan motor connections 115/1/60 constant speed, two lead (GE, Marathon, Universal)

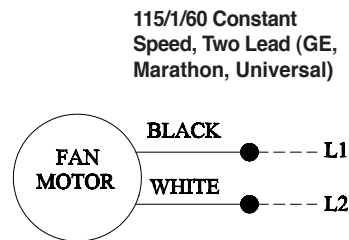


Figure 13. Fan motor connections low voltage CCW internal (Marathon)

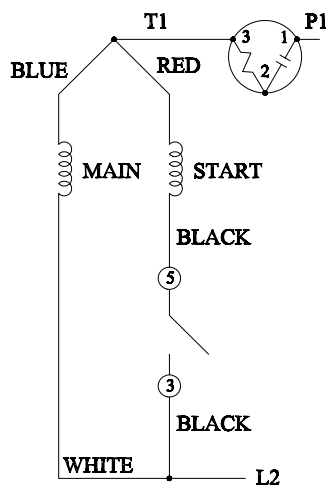
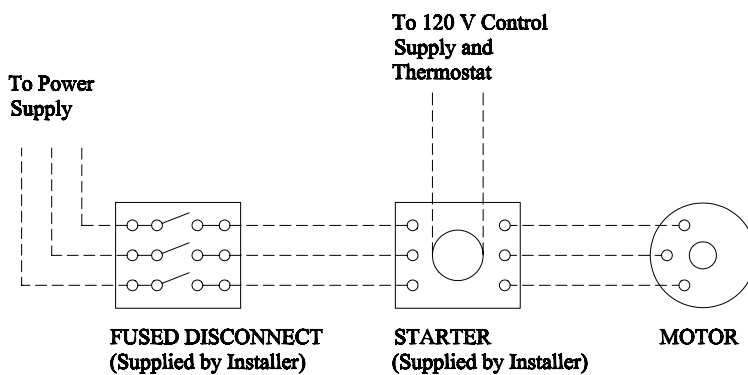


Figure 15. Fan motor connections 3 phase wiring



Note: Motors without overload protection must be installed with the optional manual starter or other field provided overload protection. See *"Motor Data," p. 25* to identify motors without overload protection.

Wiring Installation

Notes:

- When using a speed controller, always locate the thermostat between the speed controller and the line, not between the motor and the controller.
- For internal wiring and over-load protection on all starters, consult the control manufacturer for details.
- When using thermostatic control with a manual starter, confirm that the electrical rating of the thermostat is sufficient to carry the motor current.

Figure 16. Manual control with single phase motor

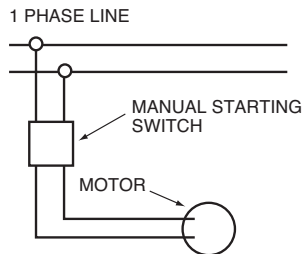


Figure 17. Thermostatic control with manual starter

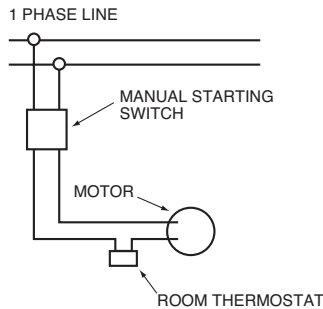


Figure 18. Thermostatic control with reverse acting controller and manual starter

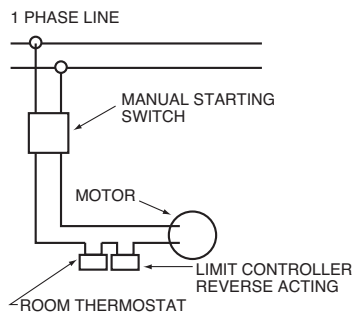


Figure 19. Thermostatic control using magnetic starter operating several units

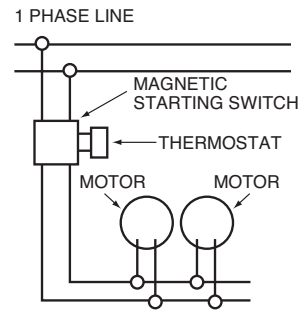


Figure 20. Three position selector switch used for either manual or thermostatic control

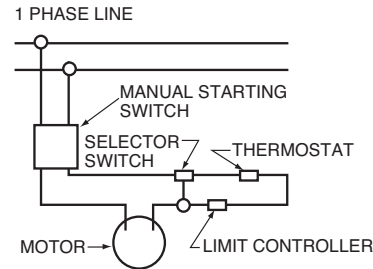


Figure 21. Three position selector switch built into magnetic starter for manual or thermostatic control

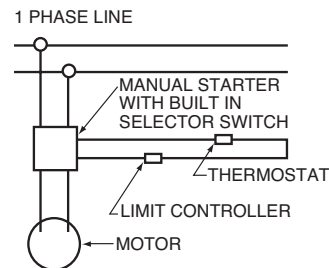


Figure 22. Speed controller with manual starting switch

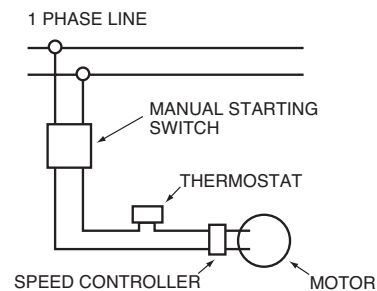


Figure 23. Speed controllers with magnetic starting switch for operating several units

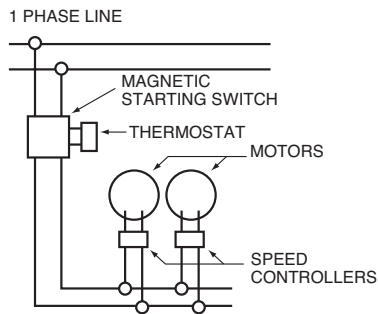


Figure 24. Manual control with three phase motor

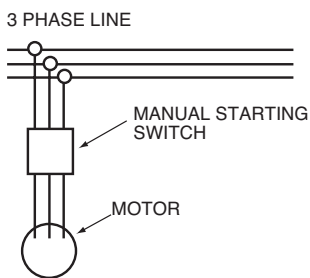


Figure 25. Thermostatic control with limit controller for three phase motor

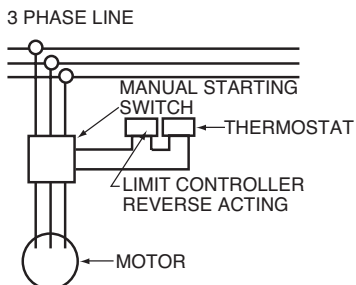
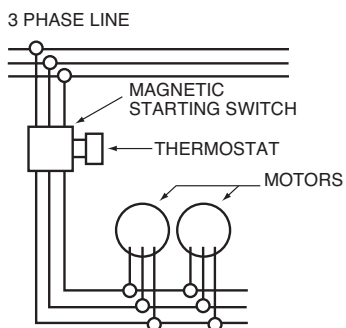


Figure 26. Thermostatic control of several three phase units



Options

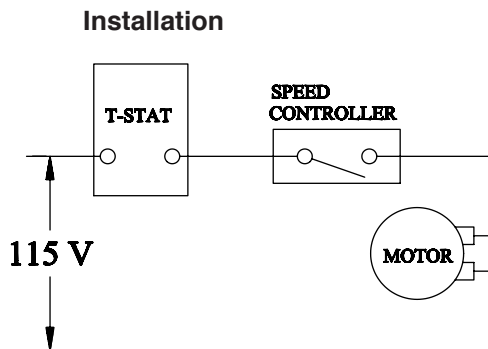
Important: When using electrical accessories, always refer to the accessory manufacturer's installation manual for proper use, location, and wiring instructions.

Variable Speed Control

115 Volt Only (optional)

The solid state speed controller may be installed at any convenient location and is suitable for surface or flush type mounting. A standard electrical single or double gang wall box is recommended as in Figure 27, p. 38.

Figure 27. Wiring diagram of speed control installation



Installation procedure:

1. Attach the control's leads to the electrical leads in the control box using wire nuts. The speed control is to be wired in series with the motor. See wiring diagram in Figure 27, p. 38.
2. Make certain wire nuts are tight with no copper wire being exposed.
3. Place wires and wire nuts back into box allowing room for the control to fit in box also.
4. Mount speed control to box using number 6 flathead screws provided.

Setting the control:

1. Turn the control shaft fully clockwise. If the motor is not running at the desired low speed, adjust the trim on the face of the control for low speed setting using a small screwdriver.
2. Rotate the control shaft counter clockwise. The speed will increase smoothly from minimum to maximum and then switch off.

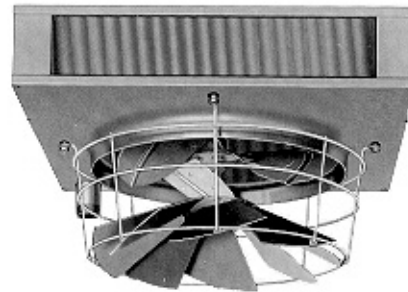
Vertical Louver Cone Diffuser (optional)

Washers and bolts are provided with each louver cone diffuser. Attach the diffuser to the bottom of the unit heater as shown in Figure 28, p. 38. Mounting holes are provided in the unit base plate.

Adjust the diffuser to provide the desired air pattern.

Important: To meet ETL and OSHA requirements, units mounted below 8 feet (2.4m) must be equipped with an OSHA fan guard. Vertical unit heaters can support either an OSHA fan guard or the Louvered Cone Diffuser - both items cannot be installed on the same unit.

Figure 28. Louver cone diffuser attached to vertical unit heater



Strap-On Water Control

A SPDT strap-on type hot water control with 100° to 240°F (38 to 116°C) rated at 10 amps at 120V is also available. Control can be used for direct or reverse acting applications as high or low limit.

Steam Pressure Control

SPDT switch opens on a rise in pressure. Control is automatically reset, has a range of 0 to 15 PSI (0 to 103 kPa), and has an adjustable differential. Other actions, ranges, circuits, and manual reset models are available on request.

Thermostats

Line voltage wall thermostats are in stock for immediate shipment. All models are SPST with bimetal thermometer, LCD display, push button controls, 44 to 95°F (7 to 35°C) range, and selector switches. Standard duty models with auto-off-fan switching are available. Optional, 7-day programmable thermostats are also available. Available line voltage thermostats are for use with 115-1-60 supply voltage units only.

Wall Mounted Speed Controllers

Motors up to and including 1/8 HP (115V) can be operated at reduced speeds by addition of optional speed controller. Controller is 5 amps, pre-set at factory for maximum and minimum speeds, with intermediate speeds infinitely controllable. All 1/3, 1/2 HP, and 230V motors operate only at rated speed and CFM.

Manual Starters

Single and three-phase models are available. Standard models are single-speed, toggle-operated, NEMA Type 1 and are surface-mounted.

Note: *While these manual starters can be used with explosion-proof motors, they do not meet requirements for use in explosion-proof applications.*

Maintenance

⚠ WARNING

Electrical Shock Hazard!

Failure to follow instructions below could result in death or serious injury, or property damage.

Open all disconnect switches and secure in that position before servicing the unit.

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death, serious injury, or property damage.

All rotating fans must stop before servicing.

Motor Lubrication

Sleeve Bearings

Motors with oilers or oil holes are lubricated before shipment with a high grade of electric motor oil. Refill when necessary, with the motor at stand-still, until oil reaches the proper level.

Use SAE 20W non-detergent oil for motors operating in ambient temperatures of 32°F to 100°F (0°C to 38°C). Above 100°F (38°C), use an SAE 30W to SAE 50W non-detergent oil. Below 32°F (0°C), a SAE 10W non-detergent oil will be required.

The frequency of oiling will depend upon operating conditions and length of running time. Inspect the oilers or oil holes when cleaning the unit. If the unit has a fractional horse-power motor, lubricate at least once a year. Under high ambient conditions or constant fan operation, fractional horse-power motors should be lubricated every 90 days. On those motors without oilers or oil holes, follow the instructions given on the motor nameplate.

Ball Bearings

Ball bearing motors are pre-lubricated and normally not equipped with grease fittings. However, motors are equipped with removable grease plugs to allow installation of grease fittings if desired by the owner.

Motor manufacturers do not recommend or require on the job lubrication of ball bearing motors. If on-the-job lubrication is required by the owner, use the following procedure:

1. With the motor at a stand-still, remove the vent and grease plugs.
2. Install grease fitting and add grease sparingly.
3. Remove the old grease from the vent relief chamber.
4. Operate the motor a few minutes before reinstalling the vent plug to allow excess grease to escape.

If there is evidence of grease working out around the motor shaft, less grease should be added and the greasing

periods lengthened. If grease continues to appear, take the motor to the motor manufacturer's authorized service station for repair.

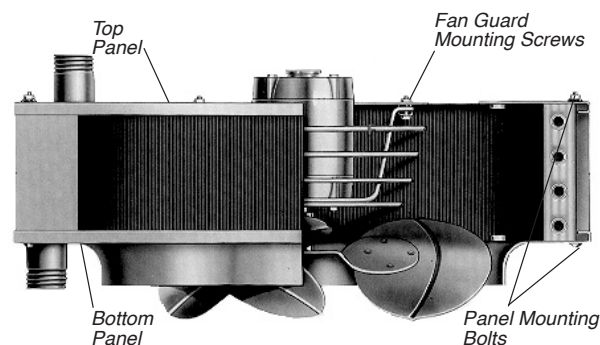
Note: Consult local motor manufacturer's service facility for information on type of grease and oil to be used.

Fan and Motor Assembly

For cleaning or maintenance purposes, the fan and motor assembly may be removed easily from the Unit Heater. The motor is attached to the fan guard which is, in turn, mounted to the top or back panel of the unit as shown in Figure 29, p. 40.

On Vertical Units, reach up through the fan and remove the fan guard mounting screws. Lower the motor, fan, and fan guard assembly down through the fan outlet. If desired, the top and bottom panels may be removed from the coil by taking out the four panel mounting bolts. See Figure 29, p. 40.

Figure 29. Cross section view



Cleaning the Unit

The unit casing, fan, diffuser, and coil should be cleaned thoroughly once a year. Coil heat transfer efficiency depends on cleanliness. The following recommended procedures may be performed when lubricating the motor and cleaning the coil.

1. Wipe all excess lubricant from the motor, fan, and casing. Clean the motor thoroughly. A dirty motor will run hot and eventually cause internal damage.
2. Clean the coil:
 - a. Loosen the dirt with a brush on the fan side of the coil. Operate the motor allowing the fan to blow the loosened dirt through the unit.
 - b. Use air pressure or steam on the side of the coil away from the fan.

Note: A piece of cheesecloth or a burlap bag may be used to collect the large particles during the cleaning process.

3. Clean the casing, fan blades, fan guard, and diffuser using a damp cloth. Any rust spots on the casing should be cleaned and repainted.
4. Tighten the fan guard, motor frame and fan bolts. Check the fan for clearance in the panel orifice and free rotation.

Troubleshooting

Table 25. Troubleshooting

Symptoms	Possible Cause(S)	Corrective Action
Leaking coil	Frozen coil	Replace
	Defective coil	Replace
	Corrosion	Replace
	Leak in joint	Braze joint if joint is exposed where leak has occurred.
Poor output on steam	Check for air in coil	Repair or replace thermostatic air vent.
	Lint on coil fins	Clean coil and fins. Check filter and clean.
Poor output on steam or hot water	No circulation of water through coil	Check circulation pump. Check for blocked tubes.
	Short cycling of motor	Check voltage and correct. Check for linted coil and clean. Check for defective overload and repair or replace motor.
	Backward rotating motor	On single phase motor replace motor. On three phase motor, reverse two leads to change rotation.
Noisy or vibrating unit	Damaged fan blade	Change fan blade.
	Dirty fan blade	Clean fan blade.



Limited Warranty

Vertical Steam and Hot Water Unit Heaters

The Manufacturer warrants to the original owner (hereinafter "Owner"), or entity designated by Owner to file claim on Owner's behalf, e.g. distributor, installation contractor, end-user ("Owner Designate") at the original installation site ("Site") that the components that comprise the VERTICAL STEAM AND HOT WATER UNIT HEATERS ("Product" or "Products") will be free from defects in material and workmanship for a period of for one (1) year from the date of shipment from the factory.

All warranty claims are subject to, and contingent upon, Owner or Owner Designate following the terms of the Warranty Claim Service Procedure and additional conditions set forth below. Failure to follow the Warranty claim service procedure will void the warranty

Warranty claim service procedure:

Owner or Owner Designate should perform the following for prompt warranty service:

- Notify the installer, who in turn should notify the distributor, promptly upon discovery of a condition believed to be caused by a defect in manufacture.
- Owner must first obtain a Return Material Authorization ("RMA") and shipping instructions from the Manufacturer before returning any Products or components thereof.
- Products or components thereof must be returned to the Manufacturer's factory address set forth when obtaining the RMA, fully prepaid at sender's expense, and risk of loss or damage, including packaging, transportation and any applicable VAT and import duty costs, Warranty excludes all Expenses associated with the prepaid return of Products to Manufacturer and remain the responsibility of the sender. Collect shipments will be refused.
- Manufacturer shall evaluate the returned Products or components thereof purported to be defective due to defects in material or Manufacturer's workmanship and will determine in its reasonable and sole discretion if indeed such defects have occurred.
- If indeed the Product or portion thereof is determined to be defective due to defects in material or Manufacturer's workmanship, Manufacturer shall either repair or replace, at its option, the portion of the Product deemed defective. Any warranty credits will be subject to verification of a defect by the manufacturer and any returned Products or components thereof shall become the property of the Manufacturer.
- Repaired or replacement Products or components thereof shall be returned to Owner on a pre-paid basis with reasonable standard freight and transit insurance covered by Manufacturer. The repair or replacement of a Product shall not extend the effective period of the original warranty on the Product.

Additional Conditions:

- All Products are inspected prior to shipment from factory. If Products or components thereof received are damaged, claims must be made to the delivering carrier, and such damages should be noted on the bill of lading. Claims for shortages must be noted on the bill of lading and the factory notified immediately.
- Returned Products or components thereof will be subject to a minimum of 25% restock/handling charge if Manufacturer's evaluation determines Products or components returned are not defective due to defects in material or Manufacturer's workmanship.

EXCLUSIONS TO WARRANTY COVERAGE (all exclusions will be determined in the sole discretion of Manufacturer):

- On-site labor or services including but not limited to those of those of the Manufacturer or any expenses for removal of Products for evaluation or reinstallation of replacement Products all of which are the responsibility of Owner.
- Any damage caused by fire or other casualties; flooding from hurricanes or otherwise exposure to the elements; settlement, distortion, collapse or cracking of any foundation area, beams or pipes surrounding the Product.
- Damage due to corrosion by chemicals, including halogenated hydrocarbons, precipitated in the air.
- Damage associated with or caused by the installation of the Products regardless of whether the installer, provided by the Owner, is considered, or was authorized by Manufacturer, to be a qualified contractor, to perform the installation. The installation contractor is solely and exclusively responsible for its own work and the results thereof.
- Damage or loss occurring during original shipment of Product to Owner or return of Products to Manufacturer for warranty evaluation. All expenses associated with the prepaid return of Products to Manufacturer for warranty evaluation are the responsibility of the sender.
- Damage, whether unintentional or not, from misuse or neglect.
- Products that were not properly installed, maintained (serviced annually) or operated by a qualified contractor in accordance with the Manufacturer's furnished written instructions, and meets the good practice as defined by the industry's accepted authority, or were altered or modified in anyway by any person other than those authorized in writing by the Manufacturer to do so.
- Auxiliary Products or components thereof furnished by the Manufacturer but manufactured by another party,



Limited Warranty Vertical Steam and Hot Water Unit Heaters

("Third Party Items") which may be incorporated in the Products shall bear no warranties other than the warranties extended by and enforceable against the original manufacturer of the Third Party Items at the time of shipment to Owner). Other parts or any other components of the Products not specifically listed herein.

THIS WARRANTY IS THE EXCLUSIVE WARRANTY APPLICABLE TO THE PRODUCT(S) HEREIN AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, OF ANY KIND AND SUPERSEDES ALL OTHER WARRANTIES, INCLUDING THOSE CONTAINED IN OTHER DOCUMENTS WHICH MIGHT HAVE BEEN INCLUDED WITH THE PRODUCTS AT THE TIME OF SHIPMENT. THE REMEDIES UNDER THIS WARRANTY ARE EXCLUSIVE TO THE ORIGINAL OWNER ("OWNER") AT THE ORIGINAL PLACE OF INSTALLATION AND MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANYONE TO OFFER OR ASSUME FOR IT ANY OTHER OBLIGATIONS. IN NO EVENT SHALL MANUFACTURER, INC. BE LIABLE FOR ANY DIRECT DAMAGES THAT EXCEED THE SALE PRICE OF THE PRODUCT(S) OR SECTIONS OR COMPONENTS THEREOF FOUND BY THE MANUFACTURER TO BE DEFECTIVE, OR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, PUNITIVE OR INCIDENTAL DAMAGES OF ANY KIND, OR ON-SITE LABOR, EXPENSES OF ANY KIND, LOST PROFITS, LOST OPPORTUNITIES, OR SIMILAR DAMAGES OF ANY KIND; AND REGARDLESS OF THE LEGAL THEORY OR CAUSES OF ACTION BY WHICH CLAIMS FOR ANY SUCH DAMAGES AS SET FORTH IN THE ENTIRETY OF THE DOCUMENTS RELATED TO THE SALE OF THE PRODUCTS ARE ADVANCED, WHETHER OR NOT MANUFACTURER HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH DAMAGES.

In the interest of product improvement, we reserve the right to make changes without notice.

OSHA Fan Guard/Louver Cone Diffuser Installation

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death, serious injury, or property damage.

Do not mount either the Louver cone diffuser or OSHA fan guard while unit is in operation. Disconnect all power supplies to the unit before installing the diffuser or the fan guard.

The figures below show how both the OSHA Fan Guard and the Louver Cone Diffuser are installed on the Vertical Steam and Hot Water Unit Heater. [Figure 30, p. 45](#) and [Figure 31, p. 45](#) detail how the louver cone diffuser and OSHA guard are attached to the unit. [Figure 32, p. 45](#) and [Figure 33, p. 45](#) show full views of the vertical steam and hot water unit with a Louver Cone Diffuser and OSHA Fan Guard attached.

Important: To meet ETL and OSHA requirements, units mounted below 8 feet (2.4m) must be equipped with an OSHA fan guard. Vertical unit heaters can support either an OSHA fan guard or the Louvered Cone Diffuser - both items cannot be installed on the same unit.

The same screws and washers are provided with both the OSHA fan guard and Louver Cone Diffuser. The screws and washers are used in conjunction with the nutserts to support the wire guard or diffuser to the orifice panel (bottom of vertical unit).

Figure 30. Louver cone diffuser

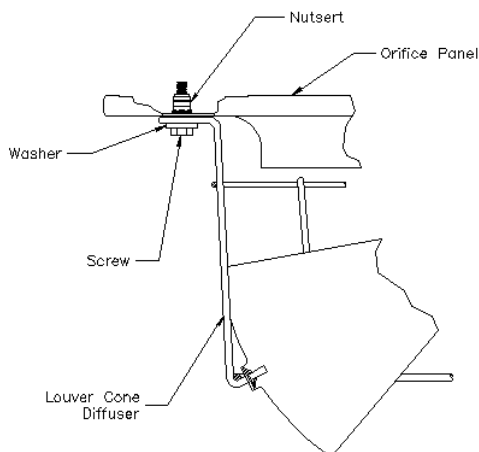


Figure 31. OSHA fan guard

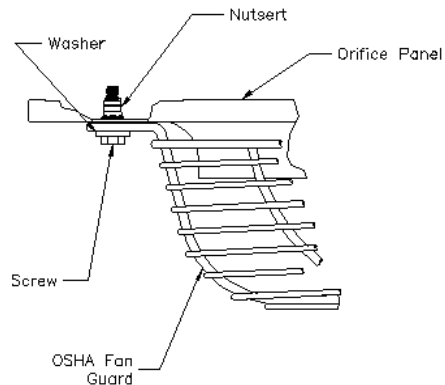


Figure 32. Vertical unit with louver cone diffuser

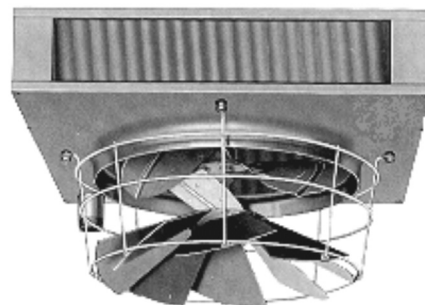


Figure 33. Vertical unit with OSHA fan guard





Equipment Startup

Customer _____ Job Name and Number _____

Pre-Inspection Information with power and water/steam/off

Type of equipment: Unit heater

Serial Number _____

Model Number _____

Name Plate Voltage: _____

Name Plate Amperage: _____

Steam Hot Water Rating _____ BTU at _____ °F
_____ kw at _____ °C

- ☐ Are all panels in place?
- ☐ Has the unit suffered any external damage? Damage: _____
- ☐ Does the piping and electric wiring appear to be installed in a professional manner?
- ☐ Has the piping and electric been inspected by the local authority having jurisdiction?
- ☐ Is the supply properly sized for the equipment?
- ☐ Were the installation instructions followed when the equipment was installed?
- ☐ Have all field installed controls been installed?
- ☐ Does the user understand all the controls on this equipment? If not, contact the wholesaler or rep. DO NOT start this equipment unless the user fully understands the operation of this equipment.

Fan With power on

- ☐ Check voltage. L1 _____ L2 _____ L3 _____
- ☐ Check fan rotation.
- ☐ Check motor amps. L1 _____ L2 _____ L3 _____



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