TRANE

Installation Operation Maintenance

Gas Heat Module/Section

for Modular and T-Series Climate Changer™ Air Handlers

November 2001 CLCH-SVX04A-EN

Introduction

Product Information

Model and serial numbers for the gas heat module/section are designated on the nameplate located on the piping-side access door inside the module/section. Write the information below for a permanent record of the equipment installed on your job site. The nameplate also contains the original settings that were made when the unit was test fired at the factory. Record and retain these settings in case the unit should ever need adjustment after service repairs.

NOTE: This information is required when ordering repair parts.

Model Number _____

Serial Number _____

Air Handler Sales Order Number _____

Air Handler Serial Number _____

Startup Date _____

Burner Specifications

Maximum Firing Rate _____

Minimum Firing Rate _____

Type of Gas _____

Calorific Value _____

Maximum Inlet Pressure _____

Minimum Inlet Pressure _____

Temperature Rise (°F) _____

Manifold Pressure at Maximum Input _____

Motor and Electrical Specifications

Specification	Input Power	Motor	Control
Volts			
Phase			
Cycle			
MCA		n/a	n/a

General Information

Use this manual to install, startup, operate, and maintain the gas heat module/section for Modular Climate Changer™ (MCC) and T-Series™ Climate Changer air handlers. Carefully review the procedures discussed in this manual to minimize installation and startup difficulties. The startup and adjustment procedures discussed in this manual should be done by *qualified*, *experienced* HVAC and combustion technicians.

Warnings and Cautions

Notice that WARNING and CAUTION appear at appropriate intervals throughout this manual. Read these carefully.

⚠ 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, may result in minor or moderate injury.

CAUTION

...may also be used to alert the reader to a situation that could result in equipment or property only damage.

Contents

Unit Description

The gas heat module/section consists of a drum-and-tube heat exchanger, burner, gas train components, and a control panel for electrical connections. It is an integral part of the entire air-handling system.

An access door is provided for service and maintenance of the burner and gas train components. Depending on the heater size, an external vestibule that extends the width of the gas heat section may be used to house the burner and gas train components (see Table 1). The external pipe vestibule ships attached to the module. Nominal size heaters have gas train components in an internal piping vestibule (see Table 2).

Table 1. Unit sizes having external piping vestibule

Unit Size	Gas Output (MBh)	
	MCC	T-Series
6	200	200
	300	300
8	200	200
	300	300
10	200	360
	360	
12	200	360
	360	560
	560	
14	360	360
	560	560
17	360	360
	560	560
	700	700
21	360	360
	560	560
	700	700
	860	860
	1,150	1,150
25	360	360
	560	560
	700	700
	860	860
	1,150	1,150
30	860	1,150
	1,150	
35	1,150	1,250
	1,250	1,500
	1,500	1,750
	1,750	
40	1,250	1,250
	1,500	1,500
	1,750	1,750

Table 1. Unit sizes having external piping vestibule (continued)

Unit Size	Gas Output (MBh)	
	MCC	T-Series
50	1,250	1,250
	1,500	1,500
	1,750	1,750
	2,000	2,000
66	2,000	2,000
	2,500	2,500
80	2,000	2,000
	2,500	2,500
100	n/a	2,500

Table 2. Unit sizes having internal piping vestibule

Unit Size	Gas Output (MBh)	
	MCC	T-Series
10	300	200
		300
12	300	200
		300
14	200	200
	300	300
17	200	200
	300	300
21	200	200
	300	300
25	300	300
30	300	300
	360	360
	560	560
	700	700
		860
35	360	360
	560	560
	700	700
	860	860
		1,150
40	560	560
	700	700
	860	860
	1,150	1,150
50	560	560
	700	700
	860	860
	1,150	1,150

Table 2. Unit sizes having internal piping vestibule (continued)

Unit Size	Gas Output (MBh)	
	MCC	T-Series
66	700	700
	860	860
	1,150	1,150
	1,250	1,250
	1,500	1,500
	1,750	1,750
80	860	860
	1,150	1,150
	1,250	1,250
	1,500	1,500
	1,750	1,750
100	1,150	1,150
	1,250	1,250
	1,500	1,500
	1,750	1,750
	2,000	2,000
	2,500	

Figure 1. MCC gas heat module (external vestibule)

Figure 2. T-Series gas heat module (internal vestibule)

How the Module/Section Arrives at the Job Site

MCC modules arrive on a wooden skid or, if ordered, a metal base rail. Leave the module mounted to the wood skid until it is installed to help protect it from damage during rigging and handling.

T-Series sections ship with wooden blocks fastened under the base channel. The blocks elevate the section for shipping protection and ease of handling. Leave the wooden blocks attached until the section is placed in its final position to avoid bending the base channel during rigging and handling.

Flue Stack: A stainless-steel flue stack is provided with T-Series sections. It ships inside the section and must be mounted on the duct opening on the side of the unit. The flue stack must be installed on the gas heat section *before* assembling the gas heat section to the air handler. It usually cannot be removed from inside the unit once the unit is assembled. Flue stacks are not included with MCC modules and must be provided in the field.

Protective Covering: The large openings of the module/section are protected by reinforced plastic covering. The covering is held on to the module/section with a wood frame and sheet metal screws. Leave the covering attached to the module/section until it is ready to install to prevent debris from entering the module/section.

Hardware Kit: A hardware kit ships inside the T-Series air handler fan section. This kit contains gasketing, roof joint connection strips, wall panel seam caps, and screws, which are used when fastening the gas heat section to the air handler. Keep the hardware kit with the gas heat section until it is ready to install. Assembly hardware for MCC units ships inside the module in a plastic bag or cardboard box.

Access Doors: MCC access doors are secured for shipment with conduit clamps. Remove and discard the conduit clamps when the module/section arrives.

Instruction Manuals: Individual instruction manuals for all of the gas train components (such as flame-control relay valves, pressure switches, and actuators) ship inside the piping vestibule. Retain these manuals for future repair or troubleshooting.

Contractors' Responsibilities

Installing Contractor

- Unpack the module/section and remove the skid.
- Remove the protective coverings.
- Rig and/or move the module/section to the air handler location. The contractor must provide slings, spreader bars, clevis, hooks, pins, etc. for rigging.
- For T-Series sections, provide a level roof curb or structural steel support system for the air handler. If the section is provided with an external piping cabinet, provide support underneath the external piping cabinet.
- For T-Series sections, install the flue stack. (Install the flue stack on the gas heat section *before* assembling the gas heat section to the air handler.) See Table 7 on page 22 for flue connection sizes.
- Assemble the gas heat section to the air-handling system. Refer to the appropriate Installation, Operation, and Maintenance manual (CLCH-IM-16A for T-Series air handlers or CLCH-IM-15B for MCC air handlers) for specific assembly instructions. These manuals ship inside the fan module/section of the air handler.
- Penetrate the unit casing and connect the supply gas line to the gas train. Gas supply line connection sizes are shown in Table 7 on page 22.
- For MCC sections, install the flue stack, which is field provided.

Electrical and/or Controls Contractor

- Provide power to the gas heat module/section. See the "Wiring" section on page 25 for voltage requirements.
- Provide a binary start–stop signal.
- Provide an analog 0 to 10 Vdc modulating signal. A 0 to 10 Vdc interface module is installed as standard equipment. A 4 to 20 mA interface module is available and may have been installed on the unit for the control signal in lieu of the 0 to 10 Vdc signal.

Receiving Inspection

Upon receipt of the module/section, inspect it for damage that may have occurred during shipment. Report damage immediately to the freight company. *The Trane Company is not responsible for shipping damage.*

- Inspect the access door latches and hinges for damage.
- Open the access door and check for internal, hidden damage. Concealed damage must be reported within 15 days of receipt.
- Locate the hardware kit.
- Locate the flue stack (in T-Series gas heat sections only).
- Do not remove the module/section from the skid at this time.

Storage

T-Series Sections. The T-Series gas heat section is designed for outdoor use and requires no special protection during storage. Select a solid, well-drained area. Concrete or black top surfaces are recommended. If concrete or black top is not available, set the section on wood timbers to prevent dirt, mud, snow, etc. from getting into the section. Keep access doors closed to prevent damage to gas train components. Trane does *not* recommend covering the section with clear or black plastic sheets because this material traps condensed moisture, which can cause equipment damage resulting from rust and corrosion. If needed, cover with a canvas tarp. *The Trane Company warranty does not cover equipment damage due to negligence during storage.*

MCC Modules. Trane recommends indoor storage of the module. If outdoor storage is necessary, select a solid, well-drained area. Concrete or black top surfaces are recommended. If concrete or black top is not available, set the module on wood timbers to prevent dirt, mud, snow, etc. from getting into the module. Keep access doors closed to prevent damage to gas train components. Cover the module with a canvas tarp. Covering the module with clear or black plastic sheets is *not* recommended because this

material traps condensed moisture, which can cause equipment damage resulting from rust and corrosion. *The Trane Company warranty does not cover equipment damage due to negligence during storage.*

Service Clearance Recommendations

A minimum clearance of the module width plus 12 inches on the access door side of the gas heat module/section is recommended for routine maintenance. This clearance provides enough room to replace the heat exchanger in the event of failure. The section side panels must be removed to access the heat exchanger. Refer to the appropriate installation, operation, and maintenance manual (CLCH-IM-15B for MCC units or CLCH-IM-16A for T-Series units) for service clearance recommendations for the air handler.

Installation

⚠ CAUTION

IMPROPER UNIT LIFT!

Do not lift the unit from the top! Lift only from the lifting lugs located at the bottom of unit, follow the lifting instructions provided in the applicable installation, operation, and maintenance manual (CLCH-IM-15B for MCC units or CLCH-IM-16A for T-Series units). Failure to do so can cause product or property damage.

MCC Gas Heat Module Weights and Dimensions

For MCC gas heat modules, refer to Figure 3 and Table 3 for external piping vestibule weights and dimensions and to Figure 4 and Table 4 for internal piping vestibule weights and dimensions.

Figure 3. MCC gas heat module external piping vestibule

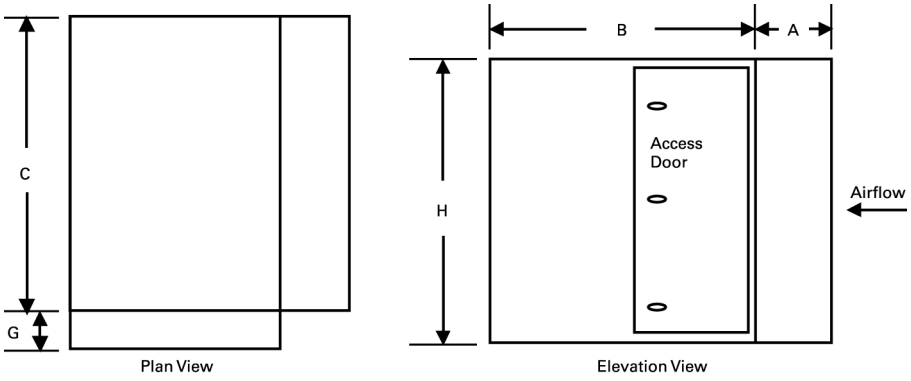


Table 3. MCC unit sizes with external piping vestibule

Unit Size	Output (MBh)	Dimensions (Inches)					Section Weight (lb)
		A	B	C	G	H	
6	200	11.00	41.00	44	15.5	27.25	681
	300	27.25	41.00	49	15.5	32.25	759
8	200	11.00	44.00	48	15.5	31.00	732
	300	34.00	44.00	48	11.0	31.00	815
10	200	15.50	34.00	60	15.5	34.00	804
	360	24.50	34.00	60	15.5	34.00	986
12	200	11.00	38.00	64	15.5	38.00	870
	360	15.50	38.00	64	15.5	38.00	1,081
	560	15.50	38.00	69	15.5	43.00	1,096
14	360	15.50	40.00	68	15.5	40.00	1,126
	560	15.50	40.00	68	15.5	40.00	1,141
17	360	15.50	44.00	74	11.0	44.00	1,101
	560	15.50	44.00	74	15.5	44.00	1,148
	700	15.50	44.00	74	15.5	44.00	1,248

Table 3. MCC unit sizes with external piping vestibule (continued)

Unit Size	Output (MBh)	Dimensions (Inches)					Section Weight (lb)
		A	B	C	G	H	
21	360	11.00	48.50	76	11.0	48.50	1,133
	560	11.00	48.50	76	11.0	48.50	1,148
	700	15.50	48.50	76	15.5	48.50	1,316
	860	15.50	48.50	76	15.5	48.50	1,556
	1,150	15.50	48.50	81	24.5	53.50	1,891
25	360	11.00	54.75	78	11.0	54.75	1,223
	560	11.00	54.75	78	11.0	54.75	1,238
	700	11.00	54.75	78	11.0	54.75	1,338
	860	15.50	54.75	78	15.5	54.75	1,658
	1,150	15.50	54.75	83	24.5	59.75	1,994
30	860	15.50	54.75	91	11.0	54.75	1,683
	1,150	15.50	54.75	91	11.0	54.75	1,983
35	1,150	11.50	62.00	96	11.5	62.00	2,221
	1,250	16.00	62.00	101	31.0	67.00	2,631
	1,500	16.00	62.00	101	31.0	67.00	2,631
	1,750	16.00	62.00	101	31.0	67.00	2,646
40	1,250	16.00	62.00	109	31.0	62.00	2,715
	1,500	16.00	62.00	109	31.0	62.00	2,715
	1,750	16.00	62.00	109	31.0	62.00	2,730
50	1,250	14.50	68.50	120	14.5	74.00	2,848
	1,500	14.50	68.50	120	14.5	74.00	2,848
	1,750	14.50	68.50	120	14.5	74.00	2,863
	2,000	14.50	68.50	120	14.5	74.00	3,193
66	2,500	14.50	84.00	137	29.5	92.00	4,780
80	2,500	14.50	92.00	137	29.5	107.00	5,019

Figure 4. MCC gas heat module internal piping vestibule

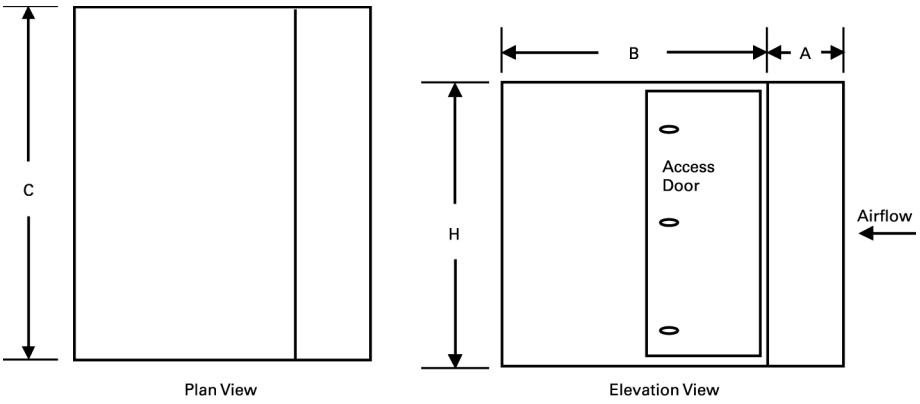


Table 4. MCC unit sizes with internal piping vestibule

Unit Size	Output (MBh)	Dimensions (Inches)				Section Weight (lb)
		A[1]	B	C	H	
10	300	34.0	34.00	60	34.00	782
12	300	34.0	38.00	64	38.00	841
14	200	11.0	40.00	68	40.00	726
	300	34.0	40.00	68	40.00	881
17	200	11.0	44.00	74	44.00	787
	300	24.5	44.00	74	44.00	863
21	200	11.0	48.50	76	48.50	844
	300	15.5	48.50	76	48.50	888
25	300	11.0	54.75	78	54.75	935
30	300	11.0	54.75	91	54.75	986
	360	11.0	54.75	91	54.75	1,126
	560	11.0	54.75	91	54.75	1,141
	700	11.0	54.75	91	54.75	1,241
35	360		62.00	96	62.00	1,170
	560		62.00	96	62.00	1,185
	700	11.5	62.00	96	62.00	1,483
	860	11.5	62.00	96	62.00	1,723
40	560		62.00	109	62.00	1,231
	700	11.5	62.00	109	62.00	1,545
	860	11.5	62.00	109	62.00	1,785
	1,150	11.5	62.00	109	62.00	2,085
50	560		68.50	120	74.00	1,396
	700		68.50	120	74.00	1,496
	860		68.50	120	74.00	1,736
	1,150		68.50	120	74.00	2,036

Table 4. MCC unit sizes with internal piping vestibule (continued)

Unit Size	Output (MBh)	Dimensions (Inches)				Section Weight (lb)
		A[1]	B	C	H	
66	700		84.00	137	92.00	2,015
	860		84.00	137	92.00	2,255
	1,150		84.00	137	92.00	2,555
	1,250		84.00	137	92.00	2,825
	1,500		84.00	137	92.00	2,825
	1,750		84.00	137	92.00	2,840
	2,000	14.5	84.00	137	92.00	3,671
80	860		92.00	137	107.00	2,443
	1,150		92.00	137	107.00	2,743
	1,250		92.00	137	107.00	3,013
	1,500		92.00	137	107.00	3,013
	1,750		92.00	137	107.00	3,028
	2,000	14.5	92.00	137	107.00	3,879
100	1,150		96.00	152	119.50	2,967
	1,250		96.00	152	119.50	3,237
	1,500		96.00	152	119.50	3,237
	1,750		96.00	152	119.50	3,252
	2,000		96.00	152	119.50	3,582
	2,500		96.00	152	119.50	3,997

1. The entire gas heat section is usually comprised of two modules. If there is no dimension in the "A" column, a module in this position is not provided or required.

T-Series Gas Heat Section Weights and Dimensions

For T-Series gas heat sections, refer to Figure 5 and Table 5 for external piping vestibule weights and dimensions and to Figure 6 and Table 6 for internal piping vestibule weights and dimensions.

Figure 5. T-Series gas heat section external piping vestibule

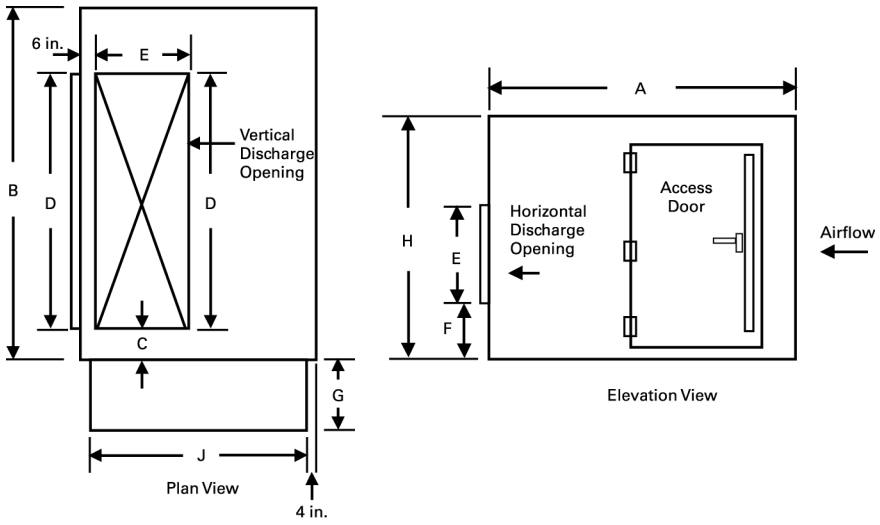


Table 5. T-Series unit sizes with external piping vestibule

Unit Size	Output (MBh)	Dimensions (Inches)									Section Weight (lb)
		A	B	C	H	D	E	F	G	J	
6	200	52.0	50	6	35.00	32.0	20	4	33	46.0	1,279
	300	69.5	50	6	35.00	22.0	28	4	33	63.5	1,289
8	200	52.0	54	6	38.75	22.0	20	4	33	46.0	1,370
	300	69.5	54	6	38.75	22.0	28	4	33	63.5	1,380
10	360	62.0	66	4	41.75	53.0	20	4	33	56.0	1,656
12	360	62.0	70	4	45.75	53.0	20	4	33	56.0	1,709
	560	62.0	70	6	45.75	53.0	20	4	33	56.0	1,724
14	360	62.0	74	4	48.75	53.0	20	4	33	56.0	1,769
	560	62.0	74	6	48.75	53.0	20	4	33	56.0	1,784
17	360	62.0	80	6	52.75	45.5	27	4	33	56.0	1,880
	560	62.0	80	6	52.75	45.5	27	4	33	56.0	1,832
	700	68.5	80	6	52.75	52.0	27	6	33	62.5	1,996
21	360	62.0	82	6	57.25	45.5	32	4	33	56.0	1,831
	560	62.0	82	6	57.25	45.5	32	4	33	56.0	1,845
	700	68.5	82	6	57.25	52.0	27	6	33	62.5	2,047
	860	71.0	82	6	57.25	52.0	27	6	33	65.0	2,305
	1,150	71.0	82	6	57.25	58.0	27	6	33	65.0	2,605
25	360	62.0	84	6	63.50	45.5	32	4	33	56.0	1,930
	560	62.0	84	6	63.50	45.5	32	4	33	56.0	1,945
	700	68.5	84	6	63.50	56.0	27	6	33	62.5	2,147
	860	71.0	84	6	63.50	56.0	27	6	33	65.0	2,422
	1,150	71.0	84	6	63.50	58.0	27	6	33	65.0	2,722

Table 5. T-Series unit sizes with external piping vestibule (continued)

Unit Size	Output (MBh)	Dimensions (Inches)									Section Weight (lb)
		A	B	C	H	D	E	F	G	J	
30	1,150	71.0	97	6	63.50	62.0	27	6	33	65.0	2,823
35	1,250	81.5	102	6	72.75	64.0	32	6	34	75.5	3,487
	1,500	81.5	102	6	72.75	64.0	32	6	34	75.5	3,487
	1,750	81.5	102	6	72.75	64.0	32	6	34	75.5	3,502
40	1,250	81.5	115	6	72.75	66.0	36	6	34	75.5	3,570
	1,500	81.5	115	6	72.75	66.0	36	6	34	75.5	3,570
	1,750	81.5	115	6	72.75	66.0	36	6	34	75.5	3,585
50	1,250	81.5	126	6	85.00	72.0	42	6	40	75.5	3,931
	1,500	81.5	126	6	85.00	72.0	42	6	40	75.5	3,931
	1,750	81.5	126	6	85.00	72.0	42	6	40	75.5	3,946
	2,000	86.5	126	6	85.00	72.0	42	6	40	80.5	4,323
66	2,000	86.5	141	6	97.00	90.0	44	6	40	80.5	4,462
	2,500	97.0	141	6	97.00	90.0	44	6	40	91.0	5,068
80	2,000	86.5	141	6	112.00	102.0	44	6	40	80.5	4,726
	2,500	97.0	141	6	112.00	102.0	44	6	40	91.0	5,340
100	2,500	97.0	156	6	124.50	110.0	55	6	40	91.0	5,738

Figure 6. T-Series gas heat section internal piping vestibule

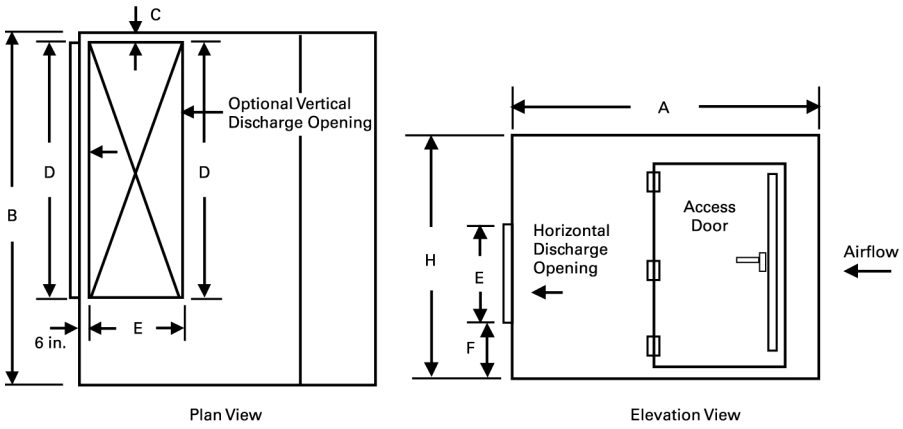


Table 6. T-Series unit sizes with internal piping vestibule

Unit Size	Output (MBh)	Dimensions (Inches)							Section Weight (lb)
		A	B	C	D	E	F	H	
10	200	52.0	66	6	32	20	4	41.75	959
	300	69.5	66	6	28	30	4	41.75	1,030
12	200	52.0	70	6	35	20	4	45.75	1,003
	300	69.5	70	11	28	30	4	45.75	1,046
14	200	52.0	74	6	36	24	4	48.75	1,215
	300	69.5	74	10	28	30	4	48.75	1,175
17	200	52.0	80	6	39	26	6	52.75	1,450
	300	69.5	80	6	32	31	6	52.75	1,745
21	200	52.0	82	6	39	29	6	57.25	1,600
	300	69.5	82	6	32	36	6	57.25	1,810

Table 6. T-Series unit sizes with internal piping vestibule (continued)

Unit Size	Output (MBh)	Dimensions (Inches)							Section Weight (lb)
		A	B	C	D	E	F	H	
25	300	69.5	84	6	36	38	6	63.50	1,895
30	300	69.5	97	6	36	40	6	63.50	1,385
	360	62.0	97	6	53	32	6	63.50	1,400
	560	62.0	97	6	58	32	6	63.50	1,475
	700	68.5	97	6	58	32	6	63.50	1,575
	860	71.0	97	6	58	32	6	63.50	1,992
35	360	62.0	102	6	53	32	6	72.75	1,650
	560	62.0	102	6	64	32	6	72.75	1,661
	700	68.5	102	6	64	32	6	72.75	1,955
	860	71.0	102	6	64	32	6	72.75	2,248
	1,150	71.0	102	6	64	32	6	72.75	2,548
40	560	62.0	115	6	64	32	6	72.75	1,815
	700	68.5	115	6	66	36	6	72.75	1,974
	860	71.0	115	6	66	36	6	72.75	2,378
	1,150	71.0	115	6	66	36	6	72.75	2,678
50	560	62.0	126	6	64	34	6	85.00	2,165
	700	68.5	126	6	66	40	6	85.00	2,415
	860	71.0	126	6	72	42	6	85.00	2,688
	1,150	71.0	126	6	72	42	6	85.00	2,988
66	700	68.5	141	6	66	40	6	97.00	2,540
	860	71.0	141	6	72	45	6	97.00	2,797
	1,150	71.0	141	6	90	44	6	97.00	3,097
	1,250	81.5	141	6	90	44	6	97.00	3,534
	1,500	81.5	141	6	90	44	6	97.00	3,534
	1,750	81.5	141	6	90	44	6	97.00	3,549
80	860	71.0	141	6	72	45	6	112.00	2,811
	1,150	71.0	141	6	102	44	6	112.00	3,111
	1,250	81.5	141	6	102	44	6	112.00	3,715
	1,500	81.5	141	6	102	44	6	112.00	3,715
	1,750	81.5	141	6	102	44	6	112.00	3,730
100	1,150	71.0	156	6	102	44	6	124.50	3,505
	1,250	81.5	156	6	110	44	6	124.50	3,915
	1,500	81.5	156	6	110	55	6	124.50	3,915
	1,750	81.5	156	6	110	55	6	124.50	3,930
	2,000	86.5	156	6	110	55	6	124.50	4,398

Rigging/Lifting

Refer to the appropriate Installation, Operation, and Maintenance manual (CLCH-IM-15B for MCC units or CLCH-IM-16A for T-Series units) for instructions on equipment rigging and lifting. These manuals ship inside the fan module/section of the air handler.

⚠ WARNING

HEAVING OBJECT!

Follow good lifting practices before lifting the unit. These include following instructions in the appropriate Installation, Operation, and Maintenance manual (CLCH-IM-15B for MCC units and CLCH-IM-16A for T-Series units), estimating center of gravity, and test lifting the unit to check the balance and stability. Failure to follow all instructions could result in death or serious injury.

Assembly

Refer to the design engineer's plans and submittals and the factory sales order for the location of the gas heat module/section in the air handler. The gas heat module/section will arrive at the job site as an individual module/section of the air handler. Hardware for fastening the gas heat module/section to the air handler can be found in the gas heat module/section. Final assembly of the air handler should be done at the unit installation site. Refer to the appropriate Installation, Operation, and Maintenance manual (CLCH-IM-15B for MCC units or CLCH-IM-16A for T-Series units) for further instructions on equipment assembly.

Duct Connections

All duct connections to the gas heat module/section should be installed in accordance with the standards of the National Fire Protection Association (NFPA) and the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

MCC Gas Heat Module Discharge

The gas heat module for MCC units normally ships with the discharge air panel completely open. The opening is framed by 2-inch or 2½-inch channels, and ductwork can fasten directly to the channels.

NOTE: A transition piece may be needed to adapt from the open discharge frame to the job site ductwork.

An optional discharge panel with a transition-to-ductwork opening may be installed on the module. Fasten the ductwork directly to the ductwork opening. When using lined ductwork, the insulation should not obstruct the discharge opening.

T-Series Gas Heat Section Discharge

For horizontal or vertical down discharges, a flange is provided to connect the ductwork. When using lined ductwork, the insulation should not obstruct the discharge opening.

Airflow Direction

The airflow direction through the gas heater is important because it prevents localized “hot spots” on the heat exchanger. Airflow from the supply fan should enter on the drum (or primary) side of the heat exchanger (Figure 7) and exit on the tube (or secondary) side (Figure 8). Airflow direction labels (Figure 9), denoting correct airflow direction through the module/section, are provided on the exterior sides of the heating module/section.

Figure 7. Entering air side (drum, or primary) of gas heat module/section

Figure 8. Leaving air side (tube, or secondary) of gas heat module/section

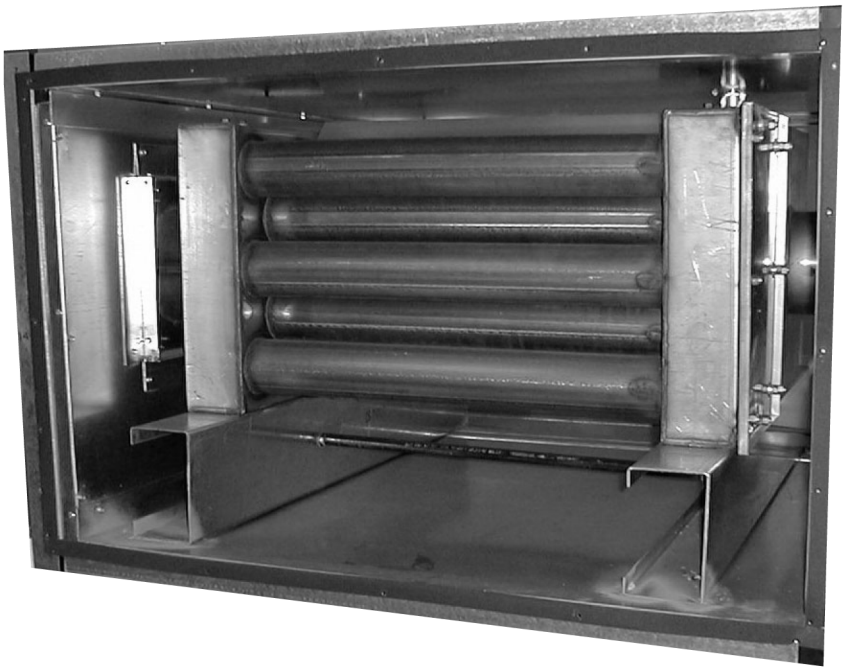


Figure 9. Airflow direction label

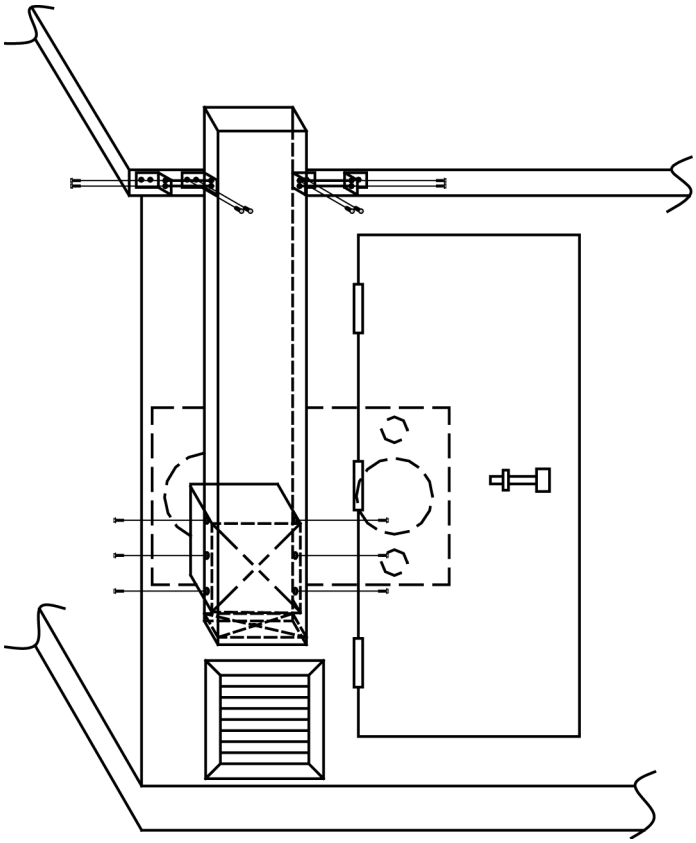
T-Series Flue Stack Installation

The flue stack for T-Series gas heat sections ships inside the gas heat section. It consists of a flue stack, flue extension (where applicable), trim strips, mounting brackets, and screws. Attach the flue stack to the flue tube and secure it to the side of the unit with the trim strips and screws (see Figure 10). See Table 7 for flue connection sizes. Secure the flue assembly to the side wall of the section with the mounting brackets.

Table 7. Flue connection sizes

Gas Output (MBh)	Flue Size (Inch)
200, 560	8 × 8
300, 360	9 × 9
700, 860, 1150, 2000, 2500	12 × 12
1250, 1500, 1750	10 × 10

Figure 10. Flue stack installation



Piping

⚠ WARNING

HAZARDOUS GASES AND FLAMMABLE VAPORS!
Exposure to hazardous gases from fuel substances has been shown to harm. Improper installation, adjustment, alteration, services, or use of this product could cause flammable mixtures. To avoid hazardous gases and flammable vapors, follow proper installation and setup of this product and all warnings as provided in this manual. Failure to follow all instructions could result in death or serious injury.

Gas Piping Recommendations

⚠ WARNING

FLAMMABLE VAPORS!
When connecting to existing gas lines, be sure to valve off the gas supply ahead of connection point. To avoid explosion or possible fire, always purge all residual gas from piping before cutting into existing line or removing threaded fittings. Failure to remove all gas vapors could result in death or serious injury.

Important:
Installation must conform with the American National Standard Z223.1a of the National Fuel Gas Code, latest edition, in the absence of local codes.

- Gas piping should always be done in accordance with local codes.
- Tighten all joints securely.
- Pipe unions should be a “ground joint” type to prevent leakage.
- Provide adequate support for field-installed piping to avoid placing stress on the gas train and controls.
- Run takeoff lines from the side or top of the main gas line to prevent moisture from being drawn into the gas train of the unit.
- Provide a drip leg in the field-installed piping, installing it near the unit.

Proper Gas Pressure

CAUTION

Gas pressure in excess of 14 in. wc at the inlet of the gas train will damage gas train components. Failure to use some type of pressure regulating device will result in incorrect gas supply pressures. This could cause poor gas regulation in the manifold and damage the gas valve. Do not oversize the gas pressure regulator. This can cause irregular pulsating flame patterns and may damage the gas valve.

- To assure sufficient gas pressure at the unit, use appropriately sized gas pipe for unit capacity. Refer to the National Fuel Gas Codebook, Chapter 9, for pipe sizing information.
- Select an appropriately sized gas pressure regulator to assure the required gas supply pressure is maintained at the unit.
- Required gas pressure to the gas train is 7 to 14 in. wc (0.25 to 0.5 psig).
- Gas pressure and volume must be maintained and stable at high fire.
- If the gas pressure regulator serves more than one heating unit, it must be sized appropriately to ensure that the inlet gas pressure at each unit is 7 to 14 in. wc while all burners are firing. Gas pressure must not exceed 14 in. wc when all units are off.
- Check the gas supply pressure before making the final connection to the unit. If the gas pressure is too high, damage to the gas valve could occur.

Wiring

High-Voltage Wiring

Gas Heaters with 200–1,150 MBh Output

Single-phase 120-volt power source is required to operate the control panel, gas valves, actuator, and other electrical parts. Refer to Table 8 for amperage requirements.

- If the optional control power transformer is ordered, provide three-phase line voltage to the control panel. Separate 120-volt power is not required.
- If a forced-draft exhaust fan (optional) is ordered, provide three-phase line voltage to the control panel. Separate 120-volt power is not required.

Table 8. Power supply requirements

Gas Output (MBh)	200–1,150	200–1,150 (with control transformer or forced-draft exhaust fan)	1,250–2,500
Amperage (amps)	11 Amps 120 V Single phase	11/6 Amps 208/460 V Three phase	20/10 Amps 208/460 V Three phase

Gas Heaters with 1,250–2,500 MBh Output

Provide three-phase line voltage to the control panel.

Separate 120-volt power is not required. Refer to Table 8 for amperage requirements.

- Line voltage must be within ±10 percent of what is specified on the nameplate located in the gas heat section.
- Use copper conductors only.
- Avoid routing any wires through the heat exchanger module/ section. The radiation heat from the heat exchanger could damage the wiring.
- Ground the supply power in the heating-section control panel.

Low-Voltage Wiring

The gas heat control system requires a binary signal for on/off control. The control system also requires a 0 to 10 Vdc analog signal for modulation where 10 Vdc is a signal for full heat. A 4 to 20 mA interface module is available and may have been installed on the unit for the control signal in lieu of the 0 to 10 Vdc signal.

Figure 11, Figure 12, and Figure 13 are typical wiring diagrams.

Table 9. Legend for wiring diagrams

Number	Part Name	Settings
EF1	Exhaust Fan Starter	n/a
MOD1	Modutrol Actuator	n/a
AES	Actuator End Switch	n/a
CAFS1	Combustion Airflow Switch	n/a
UVS1	UV Sensor	n/a
GIT1	Gas Ignition Transformer	n/a
PV1	Pilot Valve	n/a
CM1	Combustion Motor	n/a
HFR1	Honeywell Flame Relay	n/a
LFSR1	Low-Fire Start Relay	n/a
LPGS1	Low-Pressure Gas Switch	4 in.
HPGS1	High-Pressure Gas Switch	17 in.
AI1	Airflow Interlock	n/a
HLI1	High-Limit Interlock	n/a
AGV1	Auxiliary Gas Valve	n/a
MGV1	Main Gas Valve	n/a
BTS1	Burner Terminal Strip	n/a
CB1	15A Circuit Breaker	n/a
TRANS1	1.5 Kva Transformer	Opt.[1]
— - —	Field Wiring	n/a
—— - - ——	Power Flame Wiring	n/a
————	Factory Wiring	n/a

1. This part is not standard in gas heat modules/sections with line voltage with an exhaust fan.

Figure 11. 120-volt gas heat wiring diagram

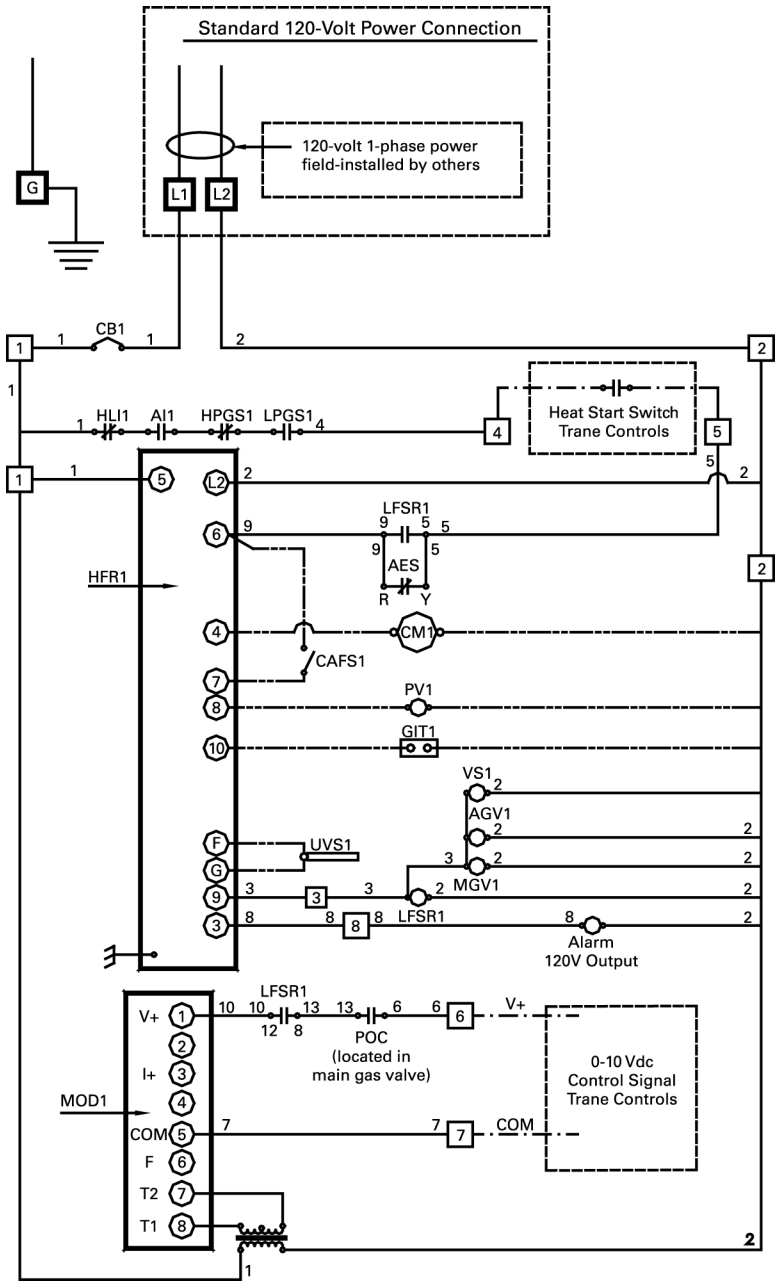


Figure 12. 208- to 460-volt wiring diagram

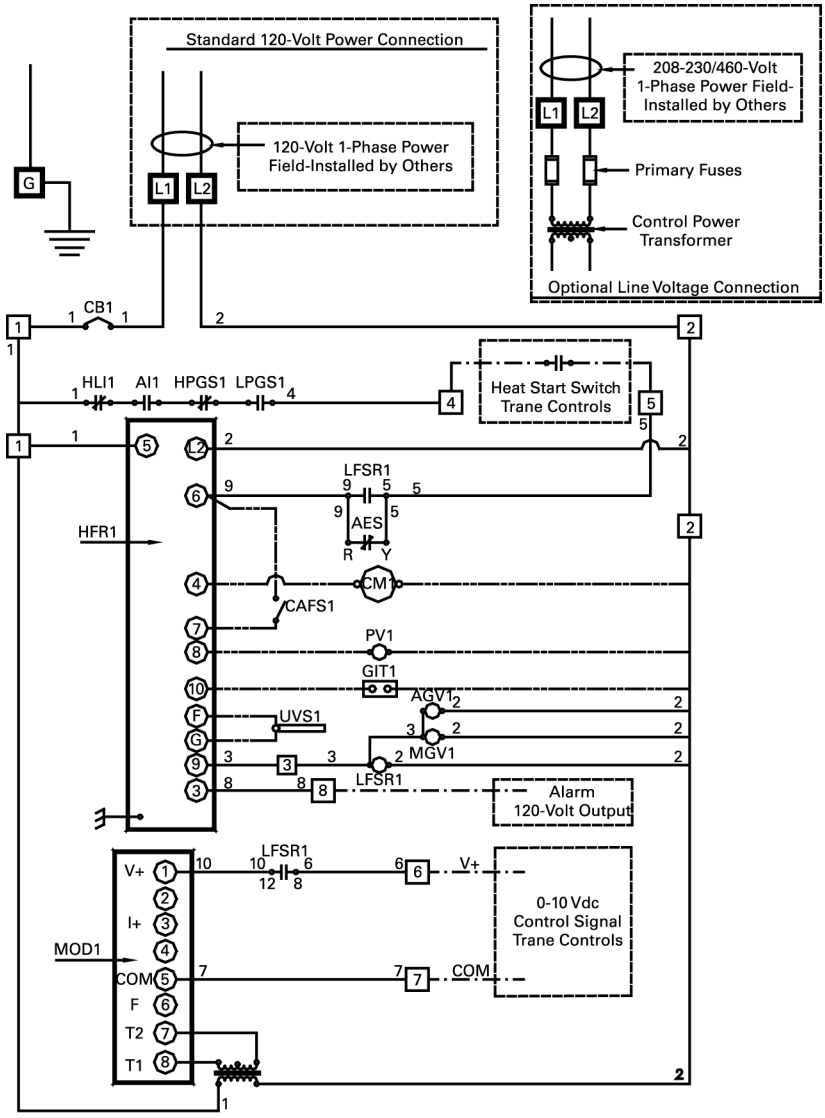
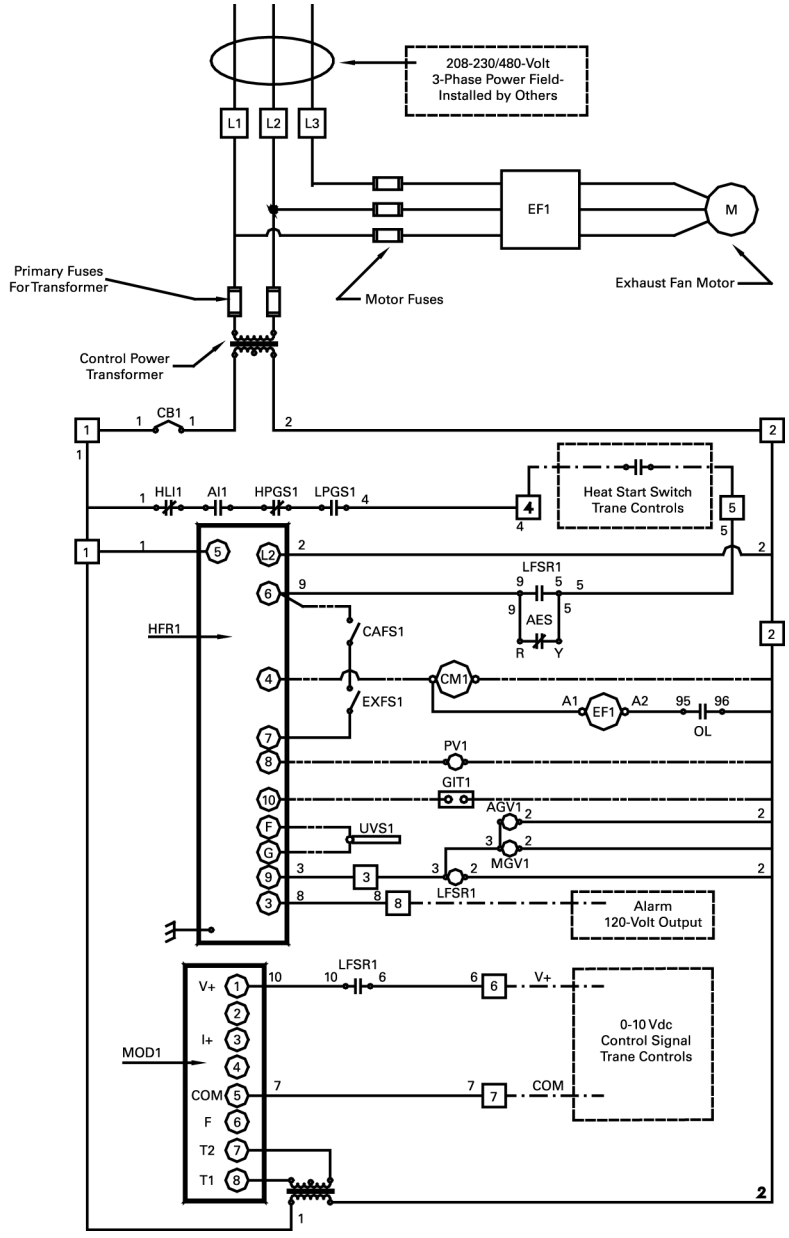


Figure 13. Line voltage with exhaust fan wiring diagram



Operation

⚠ WARNING

PROPER AIR FUEL MIXTURE!
Adjustment of gas train linkages is normally not required and not recommended. Installations at altitudes of 3,000 feet above sea level may require adjustment of the air-fuel linkage for proper combustion. Linkage and air-fuel adjustment, when necessary, should only be done by an experienced, qualified gas heat technician. Improper adjustment of the burner air-fuel mixture could result in death or serious injury.

Gas heat modules/sections have been run-tested in the factory to assure proper operation and ease of startup. The actuator linkages controlling the air–fuel mixture are preset for optimum efficiency and performance.

Thoroughly review all service literature before startup and servicing. The sequence of operation and all details of the flame-safeguard control system can be found in the burner equipment literature. The technical bulletins cover the individual components of the heating system. This literature ships inside the piping vestibule of the gas heat module/section.

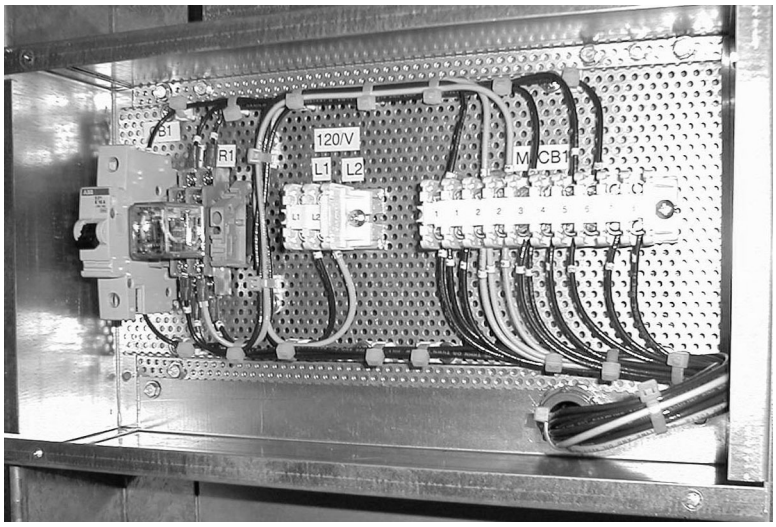
Initial Startup

NOTE: The procedures discussed in this section should be done by qualified technicians who are experienced with gas heating equipment.

Pre-Startup

1. Close all manual gas valves.
2. Move the circuit breaker (CB1) in the control panel to the OFF position.

Figure 14. Circuit breaker



3 Check the air shutter and modulating gas valve linkages for tightness.

4 Attach a manometer to the bleed port on the side of the first manual gas valve in the burner vestibule at the inlet end of the gas train, upstream of the automatic gas valve/regulator. This manometer checks incoming gas pressure and should measure 7 to 14 in. wg.

5 Attach another manometer to the burner manifold to check the burner manifold pressure while the unit is firing.

6 Attach a third manometer to the pilot gas line to check the pilot gas pressure while the unit is firing.

Startup

1 Start the air-handling unit fan. The primary airflow switch contacts (AL1) should close.

2 The high-temperature-limit switch contacts (HL1), the modulating gas valve actuator, and its end switch contacts (AES) should be closed.

3 The building control system should call for heat, closing a contact between terminals four and five.

4 Open the manual gas valve outside the unit next to the gas pressure regulator and bleed air from the piping.

5 Measure the gas pressure at the manual gas valve. The inlet gas pressure should not exceed 14 in. wg. Adjust the gas pressure, if necessary.

6 Open the first manual gas valve in the burner vestibule.

7 Open the manual gas valve in the pilot gas line and bleed the air from the line.

Pre-Purge and Pilot Ignition

Move the circuit breaker (CB1) in the control panel to the ON position. The system should energize, and the combustion blower motor should start, indicating that all of the safety/limit contacts are closed:

- HLI1: high-temperature limit
- AL1: airflow interlock
- HPGS1: high-pressure gas switch
- LPGS1: low-pressure gas switch

The combustion airflow switch (CAFS1) should close, starting the purge timer, the green power light should illuminate on the flame-relay panel, and the prepurge cycle should begin. The combustion air blower should run for approximately four minutes to evacuate the heat exchanger of any combustible gases before the ignition sequence. This prepurge cycle is initiated before every startup.

With the prepurge cycle complete, the ignition transformer and pilot solenoid should be energized, allowing gas to flow to the pilot burner. The pilot should light immediately. The pilot flame gas pressure should be 2.5 to 3 in. wg.

If the pilot does not light within 10 seconds, the flame relay should shut down the system, and the red Flame Failure light should illuminate on the flame relay panel. If the pilot does not light, press the Reset button to clear the fault and repeat the Startup procedure on page 30.

The pilot flame can be viewed through the small sight glass on the burner.

Cycle the pilot on and off several times to ensure its reliability. Turn the circuit breaker (CB1) in the control panel to the Off position.

Main Burner Ignition

1 With the circuit breaker (CB1) in the Off position, open the second manual gas valve located downstream of the automatic gas valve/regulator in the piping vestibule. Note that this valve is just upstream of the modulating gas valve.

2 Turn the circuit breaker (CB1) to the On position. After the pre-purge and pilot cycle, the main gas valve will energize and the main burner will light.

3 The amber Main Flame light should illuminate on the flame-relay panel after the ultra-violet flame sensor has detected the main flame. The flame can be observed through the larger sight glass under the burner. Normal flame color is blue; abnormal color is yellow, indicating a need for adjustments by a qualified technician. Note that smaller sized heaters have the sight glass on the side opposite the piping connection side.

4 Check the flame-signal strength from the ultra-violet sensor. A 0 to 15 Vdc, 10K ohm (minimum) voltmeter is required.

5 Insert the positive probe of the voltmeter into the positive (+) flame-signal test point on the flame relay cover.

6 Connect the negative probe to the negative (-) test point on the flame relay cover. Table 10 shows the desired signal strengths.

7 Allow the burner to ramp up to full fire.

Table 10. Signal strengths

Signal Strength	Ultra-Violet Sensor
Good	5.0–11.0 Vdc
Marginal	1.7–5.0 Vdc
Inadequate	0.0–1.7 Vdc

Final Check Out

1 Check the gas pressure at the burner manifold. It should be the same pressure that is indicated on the Manifold Pressure at Max. Input nameplate at *full fire*. Do not refer to the Power Flame burner nameplate for this value.

2 Adjust the gas pressure at the automatic gas valve/regulator:

- Remove the dust cap on the main gas valve/regulator and turn the adjusting screw. Turn the adjusting screw clockwise to increase the gas pressure; turn the adjusting screw counter-clockwise to decrease the gas pressure.
- If the pressure cannot be maintained at full fire at the setting shown on the nameplate and the regulator is adjusted fully open, contact your local gas utility.

3 Using a gas analyzer, check the emissions in the exhaust gas. Acceptable values are:

- Carbon monoxide (CO)—400 ppm or less
- Efficiency—75 percent or higher

Normal Startup

The gas heat module/section goes through the following routine every time it is started. The air handler fan must be running, and the Power light on the flame-relay module should be illuminated.

NOTE: This procedure should be done by qualified technicians who are experienced with gas heating equipment.

1. A contact closure command (the signal to start) comes from a thermostat or building automation system.
2. The combustion air blower starts and runs for approximately four minutes. This four-minute run is a pre-purge cycle to clear the heat exchanger of combustible gases before ignition.
3. The pilot light ignites, and the Pilot light on the flame-relay module should illuminate. (The pilot flame can be viewed through the small sight glass on the burner.)
4. The pilot flame will burn for 10 seconds, then the Flame light on the flame-relay module should illuminate.
5. The main burner ignites, the modulating gas-valve actuator starts to open, and the Main light on the flame-relay module should illuminate. Note that it could take as long as 30 seconds for the actuator to fully open.
6. The gas-valve actuator slowly modulates open or closed in response to the heat load required in the building.

Normal Shutdown

When the system no longer requires heat, the temperature control system opens the Heat Start contacts. The pilot valve, automatic gas valve/regulator, redundant automatic gas valve, and combustion blower motor immediately de-energize, shutting down the heating system.

The air-handling unit fan should run for a *minimum* of three minutes after heater shutdown to cool the heat exchanger.

Recommendations for Seasonal Shutdown

When the heating system is to be shut down for an extended period of time:

CAUTION

This procedure should be done by qualified technicians who are experienced with gas heating equipment.

- Disconnect the main power to the heating module/section.
- Open circuit breaker CB1 in the control panel.
- Close all manual valves in the gas line.

Recommendations for Seasonal Startup

Important:
The following recommended procedures for seasonal shutdown and startup are important to maintaining your equipment in proper working order. The procedures should be performed by a qualified technician with experience in the servicing of gas heating equipment.

When the heating system is to be started for the first time in the season:

- Disconnect electrical power.
- If the heat exchanger does not have a condensate drain line, connect a hose to the drain valve and drain any accumulated condensate.
- Check all electrical terminals for tight connections.
- Open all manual gas valves and ensure that these valves operate freely.
- Check the air shutter and modulating gas valve linkages for tightness.
- Clean dust, dirt, and debris from the air shutters on the combustion fan and the air inlet louver.
- Check the exhaust flue for debris and clean as necessary.
- Re-connect the power and initiate the startup sequence.

Routine Maintenance

Heating Mode Maintenance

Table 11. Routine maintenance in heating mode

Task	Frequency	Remarks
Unit startup	Daily	Listen to and visually inspect the unit during normal startup.
Unit shutdown	Daily	Listen to and visually inspect the unit during normal shutdown.
Drain condensate from heat exchanger	Weekly	This task only needs to be done if the unit runs for extended hours at low fire.
Clean air inlet louver	Monthly	Use brush and vacuum cleaner
Clean combustion air blower and motor	Monthly	Use brush and vacuum cleaner
Clean exhaust flue	Monthly	Use brush and vacuum cleaner
Clean exterior of heat exchanger	Monthly	Use brush and vacuum cleaner. Visually inspect for cracks, burn-throughs, etc.
Clean combustion air dampers	Monthly	Use brush and vacuum cleaner
Check gas piping for leaks	Yearly	Use soap bubble solution or equivalent leak tester. CAUTION: Do *not* use an open flame to perform a leak test.
Check fuel valves, pilot and main	Weekly	Open limit switches and listen to and visually inspect.
Check combustion safety controls:		
Flame failure	Weekly	Close manual fuel supply for the pilot and the main fuel valves; check safety shutdown timing and record.
Flame signal strength	Weekly	Follow procedure to check flame signal strength in the "Main Burner Ignition" section on page 31.

Service Personnel Maintenance

Allow trained service personnel to perform the following maintenance:

Table 12. Routine maintenance for trained service personnel

Task	Frequency	Remarks
Check flue emissions	Annually	Use a combustion analyzer
Check fuel valves, main	Annually	Perform valve leak test per valve manufacturer's instructions
Check safety controls: • High limit • Airflow • Low gas pressure • High gas pressure	Annually	Refer to control manufacturer's instructions
Inspect burner components	Semiannually	Refer to burner and component manufacturer's manuals
Inspect gas pilot assembly	Annually	Remove and clean

Troubleshooting

Symptom	Probable Cause	Recommended Action
Unit not running, no heat in building.	Loss of power, fuse blown, or circuit breaker tripped	• Check the breaker panel and reset or replace the circuit. • Check the circuit breaker in gas heat control panel and reset.
	Manual gas valve closed	Open the gas valve. *NOTE: There may be more than one manual gas valve in the piping system. Be sure to check all valves.*
	Thermostat not calling for heat	• Repair or replace the thermostat, if defective. • Set thermostat to heating mode.
	Safety switch tripped	Verify that one of the four safety switches has tripped: • *High Limit.* This switch trips due to a high temperature condition in the gas heat section. Allow the air handler fan to run and cool heat exchanger. The switch will automatically reset when the heat exchanger cools. • *Airflow Interlock.* This switch trips when there is no or very low airflow over the heat exchanger. Repair the air handler fan, if necessary. Also, check to see if the unit is running with a variable-frequency drive. The minimum speed may be set too low. • *High Pressure Gas.* This switch trips if there is excessive gas pressure in the gas piping. Adjust the gas pressure regulator or contact the local gas utility. • *Low Pressure Gas.* This switch trips when there is very low gas pressure in the gas piping. Adjust the gas pressure regulator or contact the local gas utility.
	Unit locked out on flame failure; "Alarm" LED illuminated on flame-relay panel.	Press the Reset button to reset the flame relay and attempt to restart the gas heat module/section. If the unit continues to trip-out, see the troubleshooting symptom below.
	Combustion airflow switch contacts may be open	The combustion air motor may be overloaded. Press the Reset button on back side of the combustion air blower motor.
		The combustion air blower motor may be defective. Replace the motor.
		• The modulating gas valve end switch contacts may be open, indicating that the gas valve is not fully closed. Look for jammed linkages and repair as necessary. • Replace the modulating gas valve and actuator.
Unit will not run, locks out on flame failure; "Alarm" LED illuminated on flame relay panel	UV flame sensor not sensing pilot flame	No pilot flame
		• The manual gas valve may be closed; open it. • The flame sensor may be dirty; check the lens for dirt, soot, and so on, and clean the lens, if necessary. • Check the ignition cable and wiring for loose, frayed connections or broken wiring. Repair as necessary. • Pilot solenoid valve may not be opening. • Check for voltage at the pilot solenoid valve. • Check for sufficient gas pressure in the pilot line and adjust the pilot pressure regulator.
	Low flame signal voltage	• Check flame signal voltage per procedure in Start-Up section • The flame sensor may be dirty; check lens for dirt, soot, and so on and clean the lens, if necessary. • The flame sensor may be defective; replace it.

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