Product Catalog

Force-Flo™ Cabinet Heater
Air Terminal Devices

Horizontal and Vertical
Sizes 02–12

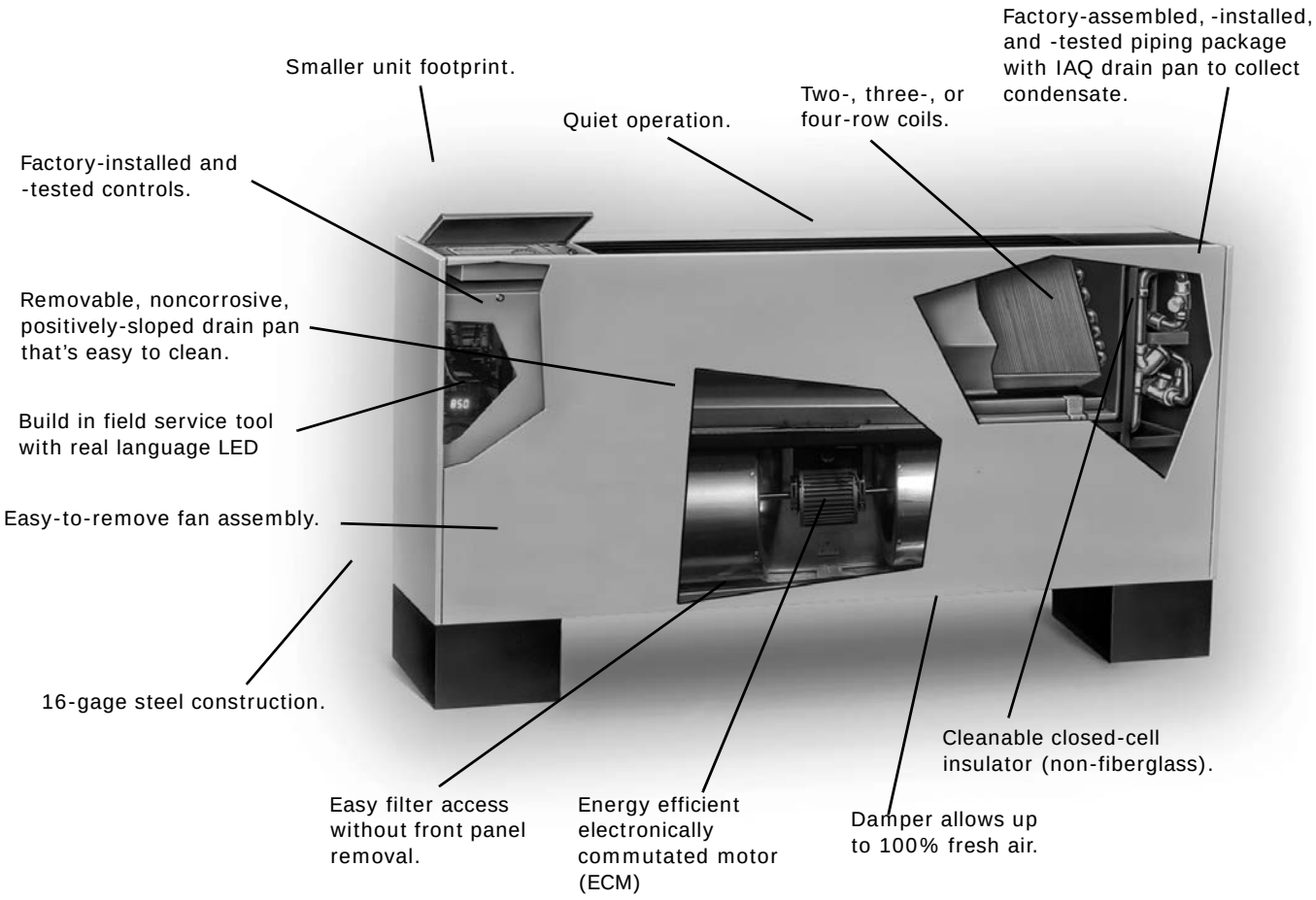
May 2012

CAB-PRC001-EN

Introduction

Trane has redesigned the traditional cabinet heater to lead the industry in:

- **indoor air quality (IAQ) features**
- **easy installation and maintenance**
- **high quality and durability**
- **advanced controls**



Revision History

The revision of this literature dated 08 May 2012 includes information for Tracer™ UC400 controls, coil performance updates, and revised performance table formats per new AHRI listing requirements.

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Features and Benefits

The Force-Flo cabinet heater meets the standards of today's market, as well as the anticipated needs of tomorrow's market. The tradition that company founder Reuben Trane began in 1913 continues with the latest generation of cabinet heaters from Trane.

The Force-Flo cabinet heater is the leader in these key areas:

- Energy Efficiency
- Indoor Air Quality (IAQ)
- Controls
- Flexibility
- Quality
- Serviceability

Today's HVAC market is concerned with issues such as indoor air quality (IAQ) and CFCs that demand a change in HVAC products. In addition, renovation has overtaken new construction in the cabinet heater market - demanding a design that caters to renovation issues. Trane is concerned with these issues, too. That's why we designed the Force-Flo cabinet heater as an integral part of the company's system solutions with standard IAQ-related features that comply with ASHRAE 62.

Energy Efficiency

Trane's commitment to providing premium quality products has led to the exclusive use of Electronically Commutated Motors (ECM) in all fan coil models. These brushless DC motors incorporate the latest technology for optimized energy efficiency, acoustical abatement, maintenance free and extended motor life. Each motor has a built-in microprocessor that allows for programmability, soft ramp-up, better airflow control, and serial communication.

- Trane units equipped with ECMs are significantly more efficient than the standard Permanent Split Capacitor (PSC) motor.
- Lower operating costs on average of 50 percent (versus a PSC motor).
- The Reduced FLA feature allows units to ship with a nameplate FLA rating much lower than a typical ECM unit.

IAQ Design

- Closed-cell insulation is standard on all units to help prevent fiberglass in the airstream.
- Easy filter access encourages frequent changing.
- Force-Flo cabinet heaters have a blow-thru design.

Controls

- This is the industry's first solution that is factory mounted, wired and programmed for infinite modulation of fan speed based on space loads, using the UC400.
- Auto Fan Speed control with the Tracer ZN520 ramps the fan speed up and down to meet space loads.
- All controls are factory-mounted and tested to minimize field setup and improve reliability.
- Controls are wired with a 24 Vac transformer to keep only a single source power connection requirement to the unit.
- All wall-mounted zone sensors require only low voltage control wiring from the device to the unit control box. (No line voltage.)
- The random startup feature helps reduce electrical demand peaks by randomly staggering multiple units at startup.
- Occupied/unoccupied operation allows the controller to utilize unoccupied temperature setpoints for energy savings.

- Warm-up energy feature is standard with Trane controls.
- Continuous fan or fan cycling is available with Tracer ZN010 or ZN510.
- Monitor unit operation using Tracer SC building management system with Tracer ZN510.
- To customize unit control, Tracer TU or Rover™ software will allow field modification of Tracer ZN510, ZN520 and UC400 default settings.
- Maximize cabinet heater system efficiency with modulating valves on units with Tracer ZN520 and UC400.

Flexibility

- Two-, three-, and four row hot water coils allow greater design flexibility. Steam distributing or electric heat coils are also available.
- Fan motors are available for either high static (0.4-inch external static pressure) or free discharge applications.
- Piping is factory-assembled, -mounted, and -tested. Units are also available without piping.
- Factory piping options include interconnecting piping, control valves, and end valves. Deluxe piping also has unions and a strainer.
- Control options range from a simple fan speed switch to a DDC controller that can tie into a Tracer SC building automation system.
- The extended end pocket option adds 8 inches (20 cm) to the piping end of cabinet style units.
- Slope-top vertical cabinet units are an excellent application for school and dormitories to prevent items from being placed on top of the units.
- Vertical wall hung units are used in vestibules, bathrooms, stairwells, or other applications when the unit cannot be installed on the floor.
- Inverted unit models allow heating to circulate from the bottom of the unit.

Quality

- Coils and piping packages are air and leak-tested before mounting on the unit.
- Coil piping connections are also air and leak-tested after mounting on the unit.
- All control end devices and moving components (fans and motors) are computer-tested after units are complete.

Serviceability

- Touch-safe control box.
- Integrated user interface with real language LED display.
- Built-in tachometer.
- Filters are easily removable and changed without removing the front panel on vertical cabinet units.
- Motors are easy to disconnect from the fan board, allowing easy service.
- The manual output test function is an invaluable troubleshooting tool. By simply pressing the test button on the Tracer ZN510, ZN520, or ZN010; service personnel can manually exercise outputs in a pre-defined sequence.

Model Number Descriptions

Force-Flo Cabinet Heater Model Number Description

Following is a complete description of the cabinet heater model number. Each digit in the model number has a corresponding code that identifies specific unit options.

Note: *Some options may not be available with all cabinet styles. Contact your local Trane representative for more information.*

Digit 1, 2 - Unit Type

FF = Force-Flo

Digit 3 - Cabinet Type

A = Vertical Concealed
B = Vertical Cabinet
C = Horizontal Concealed
D = Horizontal Cabinet
E = Horizontal Recessed
F = Vertical Wall Hung Cabinet
H = Vertical Recessed
J = Vertical Cabinet Slope Top
M = Inverted Vertical Cabinet
N = Inverted Vertical Recessed

Digit 4 - Development Sequence

"B"

Digit 5, 6, 7 - Unit Size

020	040	080
030	060	100
		120

Digit 8 - Unit Voltage

1	=	115/60/1	6	=	230/60/3
2	=	208/60/1	7	=	480/60/3
3	=	277/60/1	8	=	110–120/50/1
4	=	230/60/1	9	=	220–240/50/1
5	=	208/60/3	A	=	220–240/50/3
			B	=	380–415/50/3

Digit 9 - Piping System/ Placement

A = No Piping, RH
B = No Piping, LH
E = No Piping, RH, Extended End Pocket
F = No Piping, LH, Extended End Pocket
J = With Piping Package, RH
K = With Piping Package, LH
L = With Piping Package, RH, Extended End Pocket
M = With Piping Package, LH, Extended End Pocket

Digit 10, 11 - Design Sequence

"M0"

Digit 12 - Inlets

A = Front Toe Space
B = Front Bar Grille
C = Front Stamped Louver
D = Bottom Stamped Louver
E = Bottom Toe Space
F = Back Duct Collar
G = Back Open Return
H = Back Stamped Louver
J = Top Duct Collar

Digit 13 - Fresh Air Damper

0 = None
A = Manual, Bottom Opening
B = Manual, Back Opening
C = Manual, Top Opening
D = Auto, 2-Position, Bottom FA Opening
E = Auto, 2-Position, Back FA Opening
F = Auto, 2-Position, Top FA Opening
K = No Damper, Bottom Opening
L = No Damper, Back Opening
M = No Damper, top Opening

Digit 14 - Outlets

A = Front Duct Collar
B = Front Bar Grille
C = Front Stamped Louver
D = Front Quad Grille
E = Bottom Duct Collar
F = Bottom Stamped Louver
G = Top Quad Grille
H = Top Bar Grille
J = Top Duct Collar

Digit 15 - Color

0 = No Paint (Concealed Units Only)
1 = Deluxe Beige
4 = Driftwood Grey
2 = Soft Dove
5 = Stone Grey
3 = Cameo White
6 = Rose Mauve

Digit 16 - Tamperproof Locks/ Leveling Feet

0 = None
B = Keylock Access Door
C = Keylock Panel and Access Door
D = Leveling Feet
F = Keylock Access Door w/Leveling Feet
G = Keylock Panel and Access Door w/Leveling Feet

Digit 17 - Motor

A = Free Discharge ECM
B = High Static ECM

Digit 18 - Coil

G = 2-Row Hot Water
H = 3-Row Hot Water
J = 4-Row Hot Water
N = Electric Heat, Single-Stage
U = Electric Heat, Two-Stage
V = Electric Heat, Low kW, One-Stage
W = Steam Distributing

Digit 19 - Coil Series

1 = 108 fpf (Steam Only)
2 = 144 fpf (Hot Water Only)

Digit 20 - Coil Air Vent

A = Automatic Air Vent
M = Manual Air Vent

Digit 21, 22, 23 - Electric Heat kW (208 V derate)

000 = No Electric Heat
010 = 1.0 kW (0.75 kW)
020 = 2.0 kW (1.5 kW)
030 = 3.0 kW (2.3 kW)
045 = 4.5 kW (3.3 kW)
060 = 6.0 kW (4.5 kW)
075 = 7.5 kW (5.7 kW)
090 = 9.0 kW (6.6 kW)
100 = 10.0 kW
105 = 10.5 kW (7.9 kW)
110 = 11.0 kW (9.0 kW)
120 = 12.0 kW
135 = 13.5 kW (10.2 kW)
150 = 15.0 kW
180 = 18.0 kW (13.5 kW)
200 = 20.0 kW (15.0 kW)

Digit 24 - Not Used

0

Digit 25 - Disconnect Switch

0 = None
D = Disconnect Switch

Model Number Descriptions

Digit 26 - Filter

0 = None
1 = 1″ Throwaway Filter
2 = 1″ Throwaway MERV 8 Filter
3 = 1″ Throwaway, 1 Extra
4 = 1″ Throwaway MERV 8, 1 Extra
5 = 1″ Throwaway, 2 Extras
6 = 1″ Throwaway MERV 8, 2 Extras
7 = 1″ Throwaway, 3 Extras
8 = 1″ Throwaway MERV 8, 3 Extras
A = 1″ Throwaway MERV 13 Filter
B = 1″ Throwaway MERV 13, 1 Extra
C = 1″ Throwaway MERV 13, 2 Extras
D = 1″ Throwaway MERV 13, 3 Extras

Digit 27 - Main Control Valve

0 = None
1 = Field Supplied Analog valve
A = 2-Way, 2-Position, NO (30 psig)
B = 3-Way, 2-Position, NO (28 psig)
C = 2-Way, 2-Position, NC (30 psig)
D = 3-Way, 2-Position, NC (20 psig)
E = 2-Way, 2-Position, NO (50 psig)
F = 3-Way, 2-Position, NO (28 psig)
G = 2-Way, 2-Position, NC (60 psig)
H = 3-Way, 2-Position, NC (28 psig)
J = 2-Way, Mod., 0.7 Cv (60 psig)
K = 3-Way, Mod., 0.7 Cv (60 psig)
L = 2-Way, Mod., 1.5 Cv (60 psig)
M = 3-Way, Mod., 1.5 Cv (60 psig)
N = 2-Way, Mod., 2.5 Cv (60 psig)
P = 3-Way, Mod., 2.5 Cv (60 psig)
Q = 2-Way, Mod., 4.0 Cv (60 psig)
R = 3-Way, Mod., 4.0 Cv (60 psig)
X = Field-Supplied, NO
Y = Field-Supplied, NC
Z = Field-Supplied 3-Wire Modulating

Digit 28 - Not Used

0

Digit 29 - Piping Packages

0 = None
A = Basic Ball Valve supply and Return
B = Basic Ball Valve Supply/Manual Circuit Setter
C = Basic Ball Valve Supply and Return w/Auto Circuit Setter
D = Deluxe Ball Valve Supply and Return
E = Deluxe Ball Valve Supply/Manual Circuit Setter
F = Deluxe Ball Valve Supply and Return w/Auto Circuit Setter

Digit 30 - Control Type

A = Fan Speed Switch
E = Tracer ZN010
F = Tracer ZN510
G = Tracer ZN520
H = Customer Supplied Terminal Interface
J = Tracer UC400, Single Zone VAV

Digit 31 - Control Option

D = Unit-Mounted Fan Mode Switch
K = Wall-Mounted Fan Mode Switch
V = Unit-Mounted Fan Speed Switch w/Setpoint Dial Zone Sensor
W = Wall-Mounted Fan Speed Switch w/Setpoint Dial Zone Sensor
X = Unit-Mounted Fan Speed Switch w/Wall-Mounted Setpoint Dial Zone Sensor
Y = Unit-Mounted Fan Speed Switch & Wall-Mounted Setpoint Dial w/Comm.
Z = Unit-Mounted Fan Speed Switch, On/Cancel, Setpoint Dial w/ Comm.
1 = Wall-Mounted On/Cancel w/ Comm.
2 = Wall-Mounted Fan Speed Switch, Setpoint Dial, On/Cancel w/ Comm.
0 = Without Control Option
3 = Unit-Mounted Low Voltage Fan Speed Switch (Off /Hi /Med /Low)
4 = Wall-Mounted Digital Zone Sensor (OALMH, Setpoint, On/Cancel, Comm Jack)
5 = Wall-Mounted Digital Zone Sensor (On/Cancel, Comm Jack)
6 = Wireless Zone Sensor
7 = Wireless Display Sensor, Unit-Mounted Receiver

Digit 32 - Not Used

0

Digit 33 -FLA Motor Option

0 = Standard FLA ECM Mode
A = Reduced FLA ECM Mode

Digit 34 - Future Control Functions

0 = None

Digit 35 - Control Function #3

0 = None

Digit 36 - Control Function #4

0 = None

Digit 37 - Control Function #5

0 = None

Digit 38 - Control Function #6

0 = None

Digit 39 - Projection Panels and Falsebacks

0 = None
A = 5/8″ Standard Recessed Panel (Vertical Recessed Units Only)
B = 2″ Projection Panel
C = 2.5″ Projection Panel
D = 3″ Projection Panel
E = 3.5″ Projection Panel
F = 4″ Projection Panel
G = 4.5″ Projection Panel
H = 5″ Projection Panel
J = 5.5″ Projection Panel
L = 2″ Falseback
K = 6″ Projection Panel
M = 3″ Falseback
N = 4″ Falseback
P = 5″ Falseback
Q = 6″ Falseback
R = 7″ Falseback
T = 8″ Falseback

Digit 40 - Main Autoflow gpm

A	=	0.5	H	=	3.5
B	=	0.75	J	=	4.0
C	=	1.0	K	=	4.5
D	=	1.5	L	=	5.0
E	=	2.0	M	=	6.0
F	=	2.5	N	=	7.0
G	=	3.0	P	=	8.0

Digit 41 - Not Used

0

Digit 42 - Subbases

0 = None
A = 2″ Subbase
B = 3″ Subbase
C = 4″ Subbase
D = 5″ Subbase
E = 6″ Subbase
F = 7″ Subbase

Digit 43 - Recessed Flange

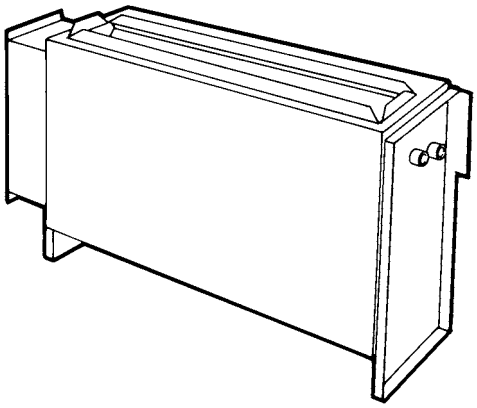
0 = None
A = Recessed Flange

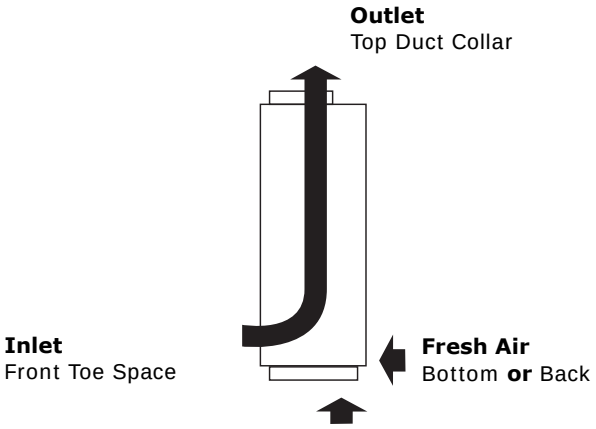
Digit 44 - Wall Boxes

0 = None
A = Anodized Wall Box

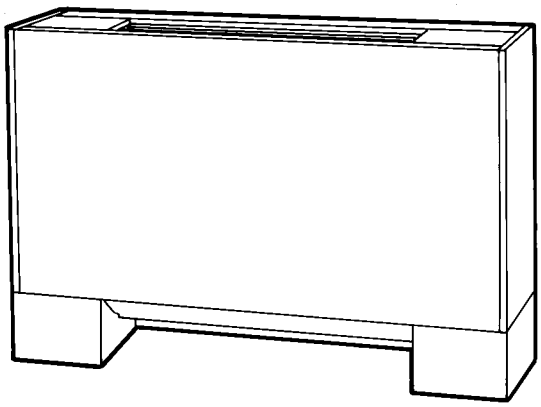
General Data

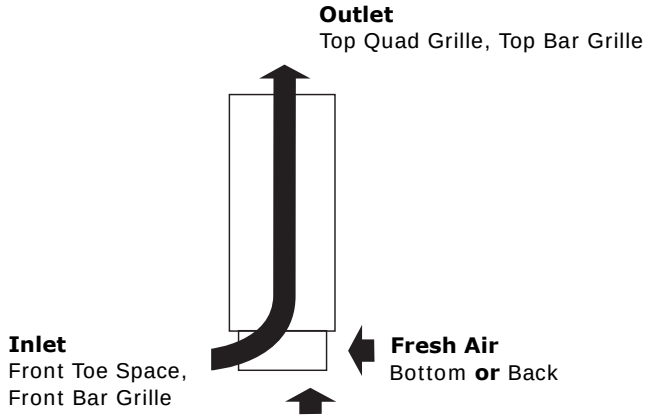
Model A, Vertical Concealed

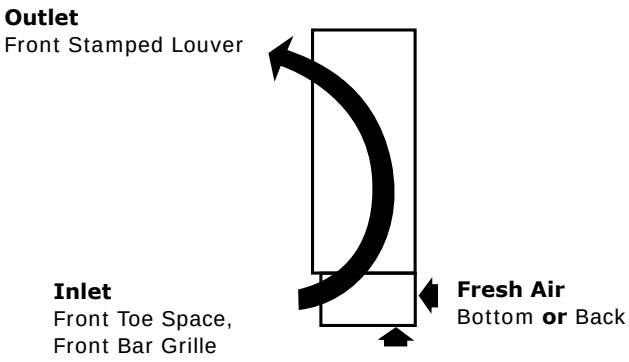




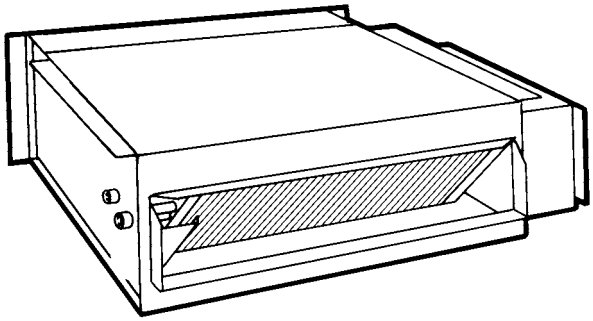
Model B, Vertical Cabinet

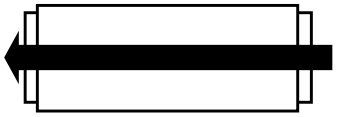






Model C, Horizontal Concealed

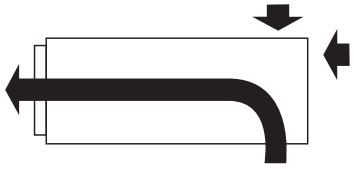




Outlet
Front Duct Collar

Inlet
Back Duct Collar

Fresh Air
N/A



Fresh Air
Top **or** Back

Outlet
Front Duct Collar

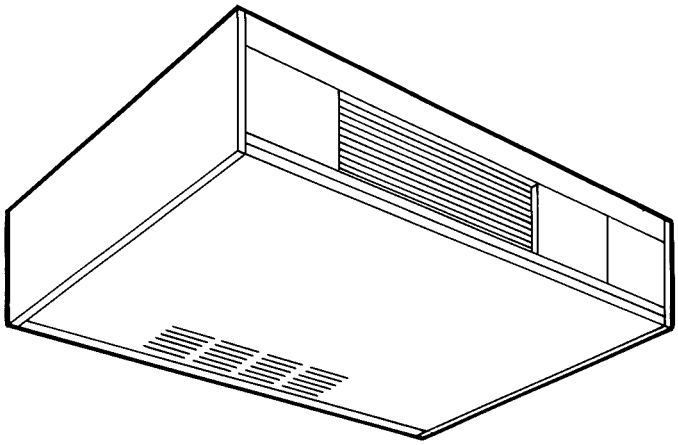
Inlet
Bottom Toe Space

Outlet
Front Duct Collar

Inlet
Open Return
No Filter

Fresh Air
N/A

Model D, Horizontal Cabinet



Fresh Air
Top **or** Back

Outlet
Front Quad
Grille, Front Bar Grille

Inlet
Bottom Stamped
Louver

Fresh Air
N/A

Outlet
Front Duct Collar

Inlet
Back Stamped
Louver

Fresh Air
Top **or** Back

Outlet
Front Duct Collar

Inlet
Bottom Stamped
Louver

Fresh Air
N/A

Outlet
Front Quad
Grille, Front Bar Grille

Inlet
Back Duct
Collar

Fresh Air
N/A

Outlet
Front Quad
Grille, Front Bar Grille

Inlet
Back Stamped
Louver

Fresh Air
N/A

Outlet
Front Duct Collar

Inlet
Back Duct
Collar

Fresh Air
Top **or** Back

Outlet
Bottom Stamped
Louver

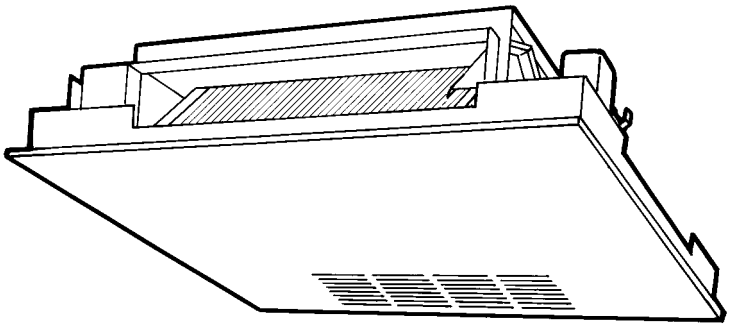
Inlet
Bottom Stamped
Louver

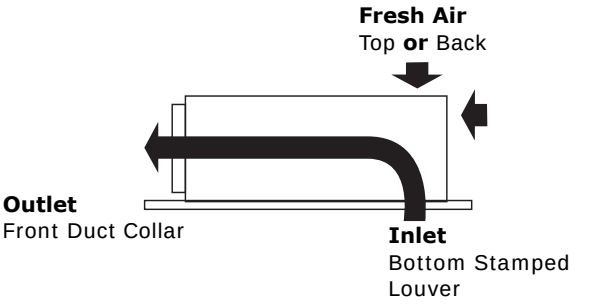
Fresh Air
N/A

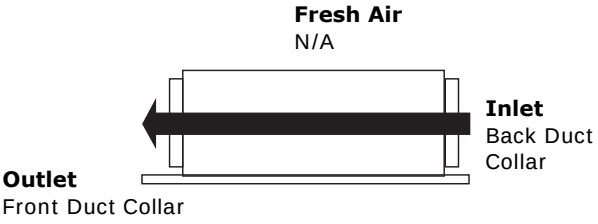
Outlet
Bottom Stamped
Louver

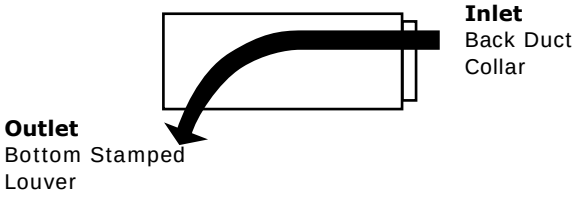
Inlet
Back Duct
Collar **or**
Stamped
Louver

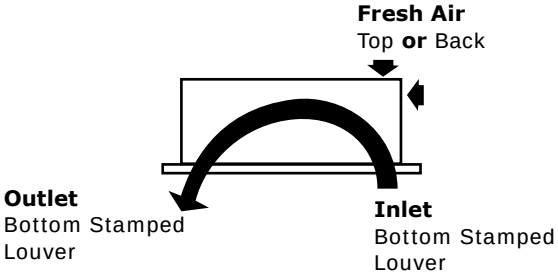
Model E, Horizontal Recessed



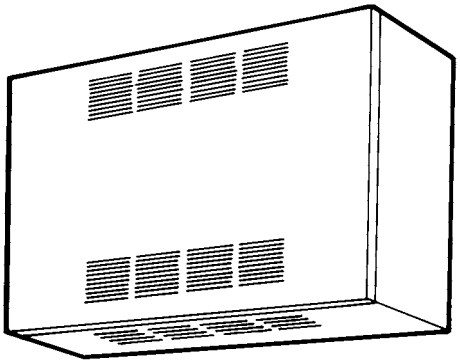


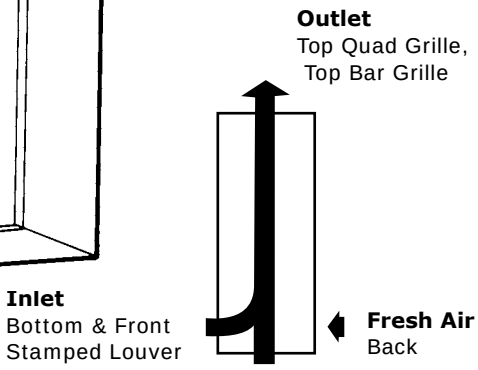


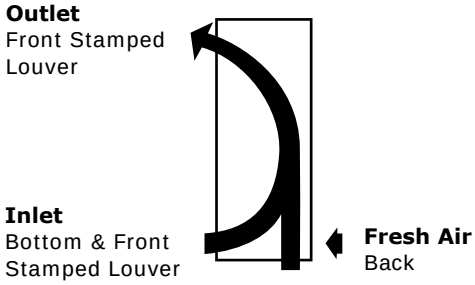




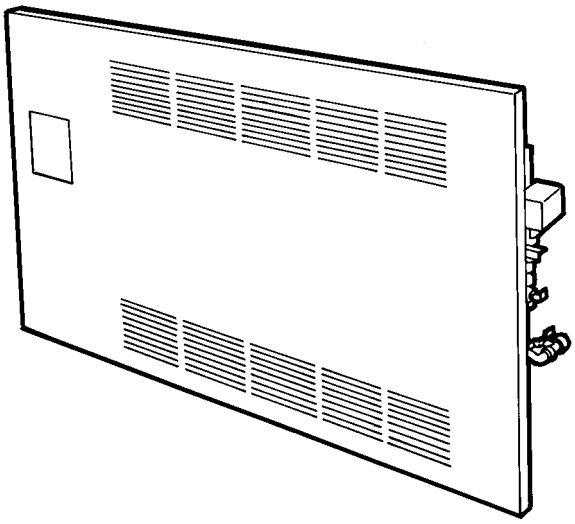
Model F, Vertical Wall Hung Cabinet

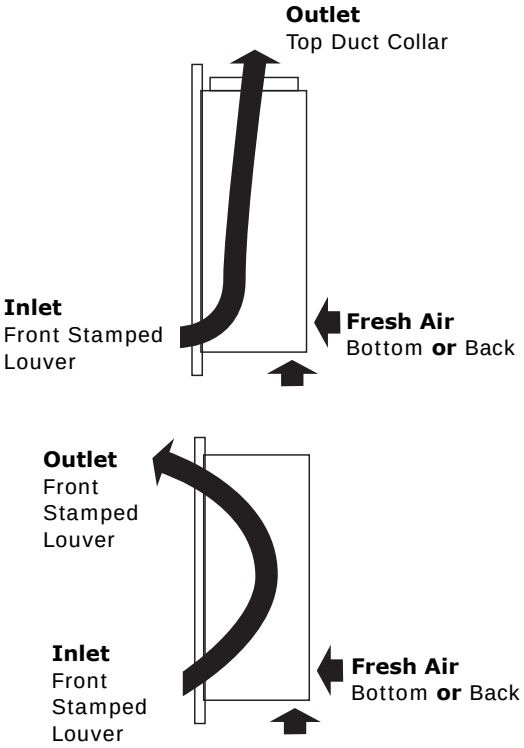




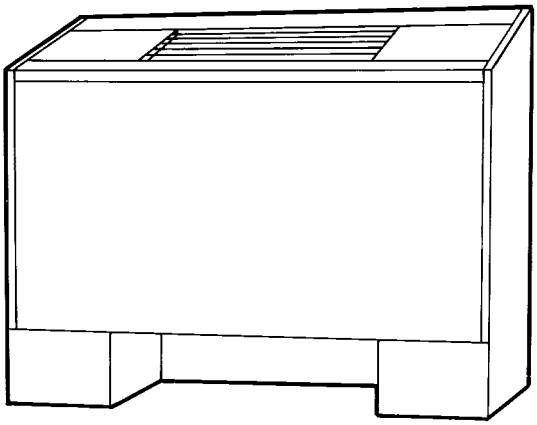


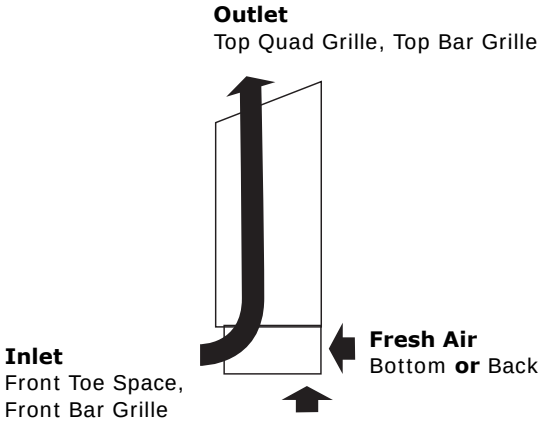
Model H, Vertical Recessed



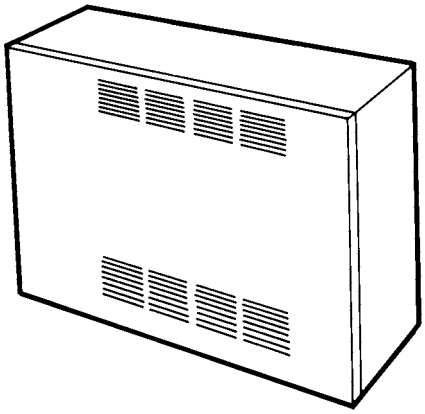


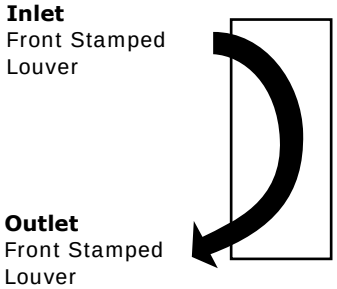
Model J, Vertical Cabinet Slope Top

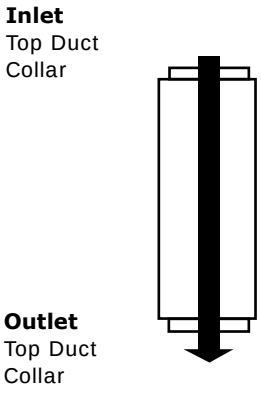




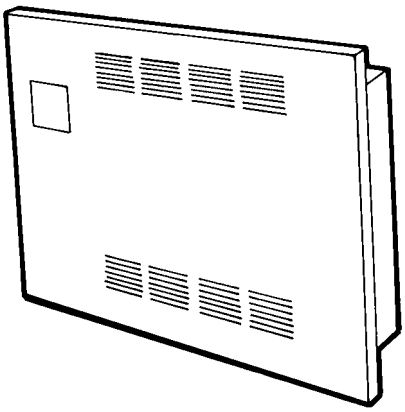
Model M, Inverted Vertical Concealed







Model N, Inverted Vertical Recessed



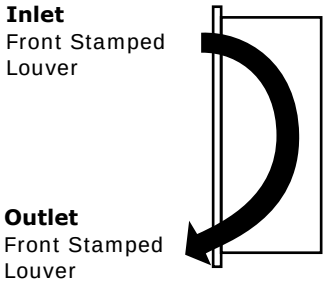


Table 1. Force-Flo cabinet heater general data

Unit Size	02	03	04	06	08	10	12
Coil Data							
Face Area-ft^2	0.8	0.8	1.1	1.6	2.1	3.2	3.2
LxDxH-in.							
2-Row	15x1.7x8	15x1.7x8	20x1.7x8	29.5x1.7x8	38x1.7x8	57x1.7x8	57x1.7x8
3-Row	15x2.6x8	15x2.6x8	20x2.6x8	29.5x2.6x8	38x2.6x8	57x2.6x8	57x2.6x8
4-Row	15x3.5x8	15x3.5x8	20x3.5x8	29.5x3.5x8	38x3.5x8	57x3.5x8	57x3.5x8
Volume-gal.							
1-Row	0.06	0.06	0.08	0.11	0.14	0.21	0.21
2-Row	0.12	0.12	0.15	0.22	0.28	0.42	0.42
3-Row	0.18	0.18	0.23	0.33	0.42	0.62	0.62
4-Row	0.24	0.24	0.30	0.44	0.56	0.83	0.83
Fins/ft							
2-Row	144	144	144	144	144	144	144
3-Row	144	144	144	144	144	144	144
4-Row	144	144	144	144	144	144	144
Fan/Motor Data							
Fan Quantity	1	1	1	2	2	3	3
Size-Dia.” x Width”	6.31x4	6.31x6.5	6.31x7.5	6.31x6.5	6.31x7.5	(1) 6.31x7.5 (2) 6.31x6.5	6.31x7.5
Motor Quantity	1	1	1	1	1	2	2
Filter Data							
1” TA and Pleated Media							
Quantity	1	1	1	1	1	1	1
Size-in.	8-7/8x19-1/8	8-7/8x19-1/8	8-7/8x24-1/8	8-7/8x33-5/8	8-7/8x42-1/8	8-7/8x61-1/8	8-7/8x61-1/8
1” Fresh Air Filter (Only on Cabinet Styles D, E, and H with Bottom Return and Fresh Air Opening)							
Quantity	1	1	1	1	1	1	1
Size-in.	5-1/2x19-1/8	5-1/2x19-1/8	5-1/2x24-1/8	5-1/2x33-5/8	5-1/2x42-1/8	5-1/2x61-1/8	5-1/2x61-1/8

Table 2. Cabinet heater air flow

		ESP				
		FD Motor	High Static Motor			
Unit Size	Coil	0.05	0.1	0.2	0.3	0.4
02	2R144	246	344	314	283	251
	3R144	242	352	319	284	249
	4R144	222	326	295	263	230
03	2R144	313	410	380	350	319
	3R144	309	391	358	324	290
	4R144	276	360	330	299	267
04	2R144	381	446	410	373	336
	3R144	365	544	506	467	427
	4R144	340	506	470	434	397
06	2R144	609	757	700	642	582
	3R144	604	880	824	766	707
	4R144	557	812	760	706	652
08	2R144	790	1014	950	885	819
	3R144	724	992	927	861	794
	4R144	676	930	870	808	745
10	2R144	1015	1284	1199	1113	1024
	3R144	1052	1456	1360	1262	1162
	4R144	988	1366	1276	1183	1089
12	2R144	1105	1424	1330	1234	1134
	3R144	1074	1514	1419	1320	1219
	4R144	993	1421	1330	1238	1144

Note: This is data is based on horizontal concealed model only, with duct inlet, duct outlet and no filter, dry coil, all voltages except 208 V.

Electric Heat

All Force-Flo cabinet heaters, except inverted models M and N, are available with electric heating coils as a standard option.

Coil Construction

Electric heat coils are open wire type with a nickel chromium element design.

Power Supply

Units have single-point power since the electric heating elements operate on line voltage. Electric heat is available as 208/60/1, 230/60/1, 277/60/1, 208/60/3, or 480/60/3. Electric heat coils operate on the same voltage as the unit, except for units with 480/60/3 electric heat. In this case, the unit operates at 277/60/1, thus requiring a 4-wire supply. All fans and motors are single phase. In addition, all control options are 24-volt, utilizing a factory-installed transformer.

Power Supply Location

All electric heat cabinet heaters have a terminal block for main power on the unit's right-hand side.

Control Type

Single-stage electric heat units are controlled by either Tracer UC400, ZN010, ZN510, or ZN520 control options. Two-stage electric heat is controlled by the Tracer UC400, ZN520 only. Both control options use PWM (pulse-width modulation) outputs to calculate the electric heat output

based on the capacity request and the electric heat cycles per hour. For example, if the electric heat cycles per hour is configured for six cycles (as Trane recommends) the controller bases the output on or off time on six 10-minute periods. If the capacity request is 40 percent, the controller controls the electric heat output on for approximately four minutes each period.

Safety Features

- Fan/valve operation to ensure safe operation and to ensure that two modes of heat are not operating simultaneously.
- All Force-Flo units with standard electric heat are UL listed.
- Units require only a single-point electrical connection.
- All electric heating coils are interlocked with the fan motor switch. Therefore, electric heat operation is only possible when the fan is running.
- Each unit has a transformer, eliminating the need for field installation of a stepdown transformer.
- Unit-mounted quiet magnetic relays are supplied on all unit voltages.
- A line-break high temperature cutout with automatic reset is provided as an integral part of the elements to de-energize the electric heat in the event of an overheat condition.

Factory-Installed Piping Packages

Force-Flo cabinet heaters have standard piping packages available as a factory built and installed option. Factory built assures all piping packages are fully tested under water for leaks and are built within strict tolerances. Factory-installed means that supply and return pipes are the only field connections required. The installer doesn't have to sweat connect piping packages onto coil connections in a tight end pocket. Field connections are brought to a point near the exterior of the unit for easy access.

Piping Package Components

Force-Flo piping packages consist of a variety of components for each application. The following section provides a detailed description of the piping components. Following this section are additional illustrations and specifications.

Piping System/Placement

Factory piping packages are available with right or left hand connections. A simple coil connection (a unit without a piping package) is also available in either a right or left hand configuration for those applications requiring field piping.

Interconnecting Piping

Interconnecting piping refers to the copper piping that attaches the coil connections and all other components such as control valves, end valves, etc. Piping is 1/2" nominal OD copper and extends near the unit exterior to one inlet and one outlet connection.

Deluxe or Basic Piping Package

The basic piping package includes only the main components of the piping package: interconnecting piping, control valves, and end valves.

The deluxe piping package also includes a strainer on the entering water pipe and unions at the coil connections along with the basic components listed above. The strainer body is cast brass construction, with a stainless steel mesh strainer that is easily removed for cleaning. The unions are forged brass construction and close with a minimum amount of effort.

End Valves

Each piping package includes a ball valve for the entering water pipe and one of the following end valves on the leaving water pipe: ball valve, manual circuit setter, or an auto circuit setter. These valves serve as the field connection points on all Force-Flo piping packages.

Ball Valves

Ball valves, also known as stop or end valves, allow the unit to be cut off for service purposes. These valves have a two-inch handle that rotates 90° to a fully open position. The valve body is cast brass, and the ball is polished brass with a Teflon® seat. Ball valves are available as end valves on both the entering and leaving water pipes.

Manual Circuit Setter

In lieu of a ball valve on the leaving water pipe, a manual circuit setter, also known as a manual flow control valve, acts as both a flow setting device and a stop valve. This valve allows water flow through the cabinet heater to be set quickly and accurately.

The manual circuit setter includes Schrader ports in the valve body. These ports are used to measure the pressure drop across the valve. This pressure drop can be compared to factory supplied curves that relate the pressure drop to a specific flow rate. This valve also has a memory stop that helps find the correct setting quickly.

Auto Circuit Setter

An auto circuit setter is an automatic flow control device available on the leaving water pipe. The auto circuit setter includes a cartridge within the valve body that is sized to allow a specific flow rate through the coil. This valve sets flow through the coil without any action required by a system piping balancer. The auto circuit setter is available on the leaving water pipe with a ball valve.

The auto circuit setter also includes two P/T's plugs in the valve body to allow measurement of the pressure drop temperature through the valve.

Control Valves

Piping packages are available with or without control valves. All control valve options are factory mounted and wired to the Force-Flo unit controls.

Two-Way/Two-Position Valves

These valves will either fully open or close in response to a 24 Vac signal from the Tracer controller. Control valves are direct-acting valves. The control valve is factory mounted in the leaving water pipe downstream of the coil. Always use some means of relieving pump head pressure with two-way valve applications. Normally open or normally closed valves are available.

Three-Way/Two-Position Valves

These valves will either allow full water flow through the coil or divert the flow through a bypass line. The valves respond to a 24 Vac signal from the Tracer controller. Control valves are direct acting valves. All three-way valve packages include a balance fitting in the bypass line to allow flow balancing in the bypass position. Three-way valves are factory mounted in the leaving water pipe downstream of the coil. Normally open or normally closed valves are available.

Two-Way Modulating Valves

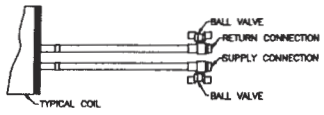
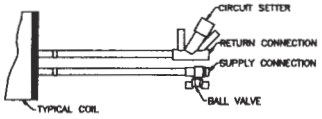
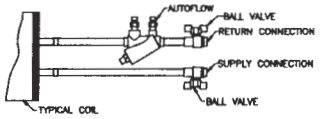
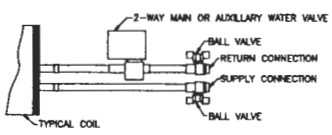
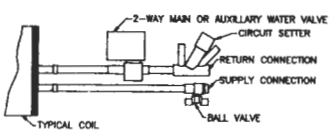
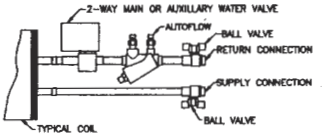
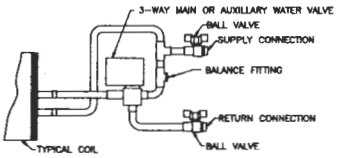
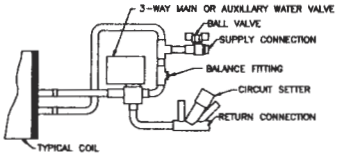
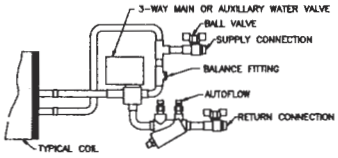
These valves modulate the water flow through the coil in response to a signal from the Tracer controller. Modulating valves are three-wire floating point equal percentage valves, and are factory mounted in the leaving water pipe downstream of the coil.

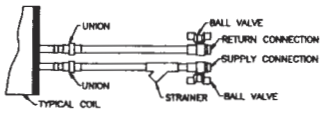
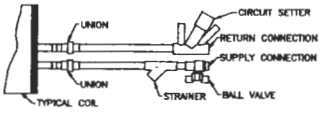
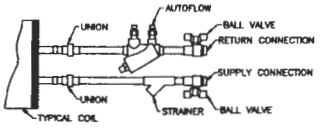
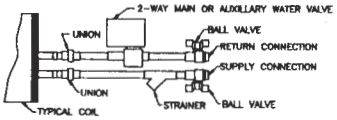
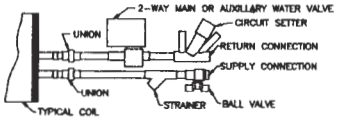
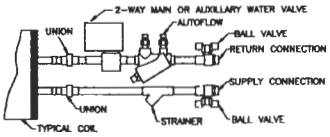
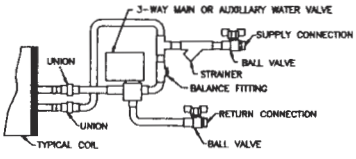
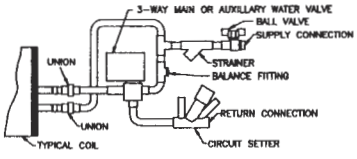
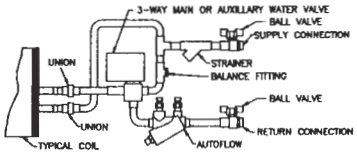
Three-Way Modulating Valves

These valves modulate the water flow through the coil in response to a signal from the Tracer controller. Three-way valves allow water that is directed through the coil to mix with water directed through the bypass line. This mixture exits through the leaving water pipe. Modulating valves are

three-wire floating point equal percentage valves, and are factory mounted in the leaving water pipe downstream of the coil.

Figure 1. Piping package options

Digits 27,28	Digit 29		
Main/Aux. Control Valve	Basic (A)	Circuit Setter (B)	Auto Flow Valve (C)
BASIC			
None 0			
2-Way A, C, E, G, J, L, N, Q			
3-Way B, D, F, H, K, M, P, R			

DELUXE	(D)	(E)	(F)
None 0			
2-Way A, C, E, G, J, L, N, Q			
3-Way B, D, F, H, K, M, P, R			

Selecting the Correct Modulating Valve Size

Modulating valves are available in any of four port sizes: 0.7, 1.5, 2.5 or 4.0 Cv (coefficient of flow values). The coefficient of flow is defined as the volume of water flow through a control valve in the fully open position with a 1 psig differential across the valve. Calculate the coefficient of flow using the formula:

Cv = Q/square root ΔP where:

Cv = flow coefficient
Q = flow rate (gpm)
ΔP = pressure drop across the valve or coil (psig).

For good control, the valve Cv should be approximately equal to the Cv of the water coil.

Modulating Valve Selection Example

Assume a size 06 vertical cabinet heater is selected to operate at the following conditions:

EWT = 180°F
LWT = 150°F
EAT = 70°F

The coil selection is a four-row coil. Select the best modulating valve size for this unit.

1. Find the ΔP across the water coil. Refer to the ARI performance table to determine the ΔP across the water coil or use the Trane Official Product Selection System, TOPSS™, selection program. The water pressure drop is found to be 5.7' of water at a flow rate of 3.59 gpm. This converts to a pressure drop of 2.47 psig (1.0 feet of water = 0.4328 psig.)
2. Calculate the Cv of the water coil.

   Cv = gpm/Square root ΔP.
   Cv = 3.59/Square root 2.47
   Cv = 2.29

   Therefore, select the 2.5 Cv valve because it is closest to the water coil.

Table 3 and Table 4, p. 21 illustrate possible valve selections at ARI conditions for horizontal concealed units with a high static motor and vertical cabinet units with a free discharge motor. For other applications, use TOPSS to determine flowrate and make calculations using the formulas above.

Table 3. Modulating valve selections for horizontal concealed units, high static motor, 70°F EAT, 180°F EWT, 30°F ΔT

Unit Size	Coil	gpm	Coil WPD	Coil Cv	Valve Cv
02	2-Row	1.19	6.0	0.74	0.7
	3-Row	1.52	13.8	0.62	0.7
	4-Row	1.59	3.8	1.24	1.5
03	2-Row	1.53	10.3	0.72	0.7
	3-Row	1.82	4.3	1.33	1.5
	4-Row	1.98	6.2	1.21	1.5
04	2-Row	1.73	3.3	1.45	1.5
	3-Row	2.57	9.1	1.29	1.5
	4-Row	2.81	13.4	1.17	1.5
06	2-Row	2.87	9.9	1.39	1.5
	3-Row	3.96	5.9	2.48	2.5
	4-Row	4.37	8.2	2.32	2.5

Table 3. Modulating valve selections for horizontal concealed units, high static motor, 70°F EAT, 180°F EWT, 30°F ΔT (continued)

Unit Size	Coil	gpm	Coil WPD	Coil Cv	Valve Cv
08	2-Row	3.71	4.7	2.60	2.5
	3-Row	4.74	9.1	2.39	2.5
	4-Row	5.22	12.7	2.23	2.5
10	2-Row	4.71	8.1	2.52	2.5
	3-Row	6.50	18.1	2.32	2.5
	4-Row	7.13	25.3	2.15	2.5
12	2-Row	5.48	11.4	2.47	2.5
	3-Row	7.19	14.5	2.87	2.5
	4-Row	7.83	10.5	3.67	4.0

Table 4. Modulating valve selections for vertical cabinet units, free discharge motor, 70°F EAT, 180°F EWT, 30°F ΔT

Unit Size	Coil	gpm	Coil WPD	Coil Cv	Valve Cv
02	2-Row	1.06	4.8	0.74	0.7
	3-Row	1.31	10.5	0.61	0.7
	4-Row	1.34	2.8	1.22	1.5
03	2-Row	1.40	8.8	0.72	0.7
	3-Row	1.70	3.8	1.33	1.5
	4-Row	1.81	5.3	1.20	1.5
04	2-Row	1.71	3.2	1.45	1.5
	3-Row	2.12	6.4	1.27	1.5
	4-Row	2.28	9.1	1.15	1.5
06	2-Row	2.70	8.9	1.38	1.5
	3-Row	3.31	4.2	2.46	2.5
	4-Row	3.59	5.7	2.29	2.5
08	2-Row	3.39	4.0	2.58	2.5
	3-Row	4.11	6.9	2.38	2.5
	4-Row	4.45	9.4	2.21	2.5
10	2-Row	4.32	6.8	2.52	2.5
	3-Row	5.55	13.4	2.30	2.5
	4-Row	6.00	18.3	2.13	2.5
12	2-Row	4.99	9.6	2.45	2.5
	3-Row	6.10	10.5	2.86	2.5
	4-Row	6.48	7.3	3.65	4.0

Performance Data

Force-Flo cabinet heater performance data is grouped based on performance. Unit performance is impacted by the unit model and the airflow inlet and outlet configuration. Table 5 summarizes the performance groups.

Table 5. Force-Flo performance groupings

UNIT TYPE	Motor Type	Filter	Static	Performance Tables
Horizontal Concealed	Free Discharge	NO	0.05	Table 7 & Table 8
Horizontal Recessed	Free Discharge	NO	0.05	
Vertical Recessed	Free Discharge	NO	0.05	
Inverted Vertical Recessed	Free Discharge	NO	0.05	
Vertical Concealed	Free Discharge	NO	0.05	Table 9 & Table 10
Horizontal Cabinet	Free Discharge	YES	0.00	Table 11 & Table 12
Vertical Cabinet	Free Discharge	YES	0.00	
Inverted Vertical Cabinet	Free Discharge	YES	0.00	
Vertical Slope Top	Free Discharge	YES	0.00	Table 13 & Table 14
Horizontal Concealed	High Static	NO	0.20	Table 15 & Table 16
Horizontal Recessed	High Static	NO	0.20	
Vertical Recessed	High Static	NO	0.20	
Horizontal Cabinet	High Static	NO	0.20	
Vertical Concealed	High Static	NO	0.20	Table 17 & Table 18

Table 6. Steam properties

Steam Pressure (psig)	2	5	10	15
Saturated Temperature (°F)	219	227	239	250
Latent Heat (Btu/lb)	965	960	952	945

Note: Q/ITD = MBh / (saturated steam temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different saturated steam or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Horizontal Concealed, Horizontal Recessed, Vertical Recessed, Inverted Vertical Recessed

Heating performance is based on 70°F entering air temperature, 180°F entering hot water temperature with a 30°F ΔT. All performance measured on high speed tap, 115 V, 0.05 ESP, without filter. Free discharge EC motor.

Table 7. Hot water performance—free discharge EC motor

			Hot Water Coils				
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Flow Rate (gpm)	WPD (ft H_20)	Motor Power (W)
020	2HC	246	16.68	0.15	1.11	5.65	37
	3HC	242	20.15	0.18	1.34	2.37	37
	4HC	222	21.48	0.20	1.43	3.33	37
030	2HC	313	19.63	0.18	1.31	7.53	39
	3HC	309	24.17	0.22	1.61	3.30	39
	4HC	276	25.69	0.23	1.71	4.61	39
040	2HC	381	24.00	0.22	1.60	2.74	58
	3HC	365	30.04	0.27	2.00	5.55	58
	4HC	340	32.47	0.30	2.16	8.01	58
060	2HC	609	38.29	0.35	2.55	7.70	79
	3HC	604	47.34	0.43	3.15	3.74	79
	4HC	557	51.54	0.47	3.43	5.09	79
080	2HC	790	48.10	0.44	3.20	3.48	122
	3HC	724	58.70	0.53	3.91	6.13	122
	4HC	676	63.95	0.58	4.26	8.42	122
100	2HC	1015	66.94	0.61	4.46	7.51	145
	3HC	1052	86.01	0.78	5.73	9.10	145
	4HC	988	94.57	0.86	6.30	10.52	145
120	2HC	1105	70.88	0.64	4.72	8.37	160
	3HC	1074	87.35	0.79	5.82	9.38	160
	4HC	993	94.97	0.86	6.33	10.60	160

Note: Q/ITD = MBh / (entering water temp - entering air temp) When Δ T and gpm remain constant.To determine heating capacities at a different entering water or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Table 8. Steam coil performance—free discharge EC motor

			2 PSIG			5 PSIG			
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Motor Power (W)
020	Steam	228	15.13	0.102	131	16.02	0.102	135	37
030	Steam	275	16.59	0.111	126	17.57	0.112	129	39
040	Steam	345	21.77	0.146	128	23.06	0.147	132	58
060	Steam	544	33.92	0.228	128	35.94	0.229	131	79
080	Steam	701	43.58	0.292	127	46.18	0.294	131	122
100	Steam	933	62.02	0.416	131	65.72	0.419	135	145
120	Steam	990	63.85	0.429	129	67.66	0.431	133	160

Note: Q/ITD = MBh / (saturated steam temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different saturated steam or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Vertical Concealed

Heating performance is based on 70°F entering air temperature, 180°F entering hot water temperature with a 30°F ΔT. All performance measured on high speed tap, 115 V, 0.05 ESP, without filter. Free discharge EC motor.

Table 9. Hot water performance—free discharge EC motor

			Hot Water Coils				
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Flow Rate (gpm)	WPD (ft H_20)	Motor Power (W)
020	2HC	211	14.91	0.14	0.99	4.64	37
	3HC	205	17.63	0.16	1.17	1.86	37
	4HC	192	18.93	0.17	1.26	2.65	37
030	2HC	272	17.89	0.16	1.19	6.40	39
	3HC	270	21.92	0.20	1.46	2.76	39
	4HC	247	23.48	0.21	1.56	3.92	39
040	2HC	340	22.21	0.20	1.48	2.37	58
	3HC	328	27.65	0.25	1.84	4.77	58
	4HC	309	29.98	0.27	2.00	6.94	58
060	2HC	535	35.16	0.32	2.34	6.58	79
	3HC	531	43.07	0.39	2.87	3.13	79
	4HC	499	47.13	0.43	3.14	4.30	79
080	2HC	697	44.29	0.40	2.95	2.98	122
	3HC	646	53.90	0.49	3.59	5.22	122
	4HC	612	58.94	0.54	3.93	7.23	122
100	2HC	891	61.04	0.55	4.07	6.31	145
	3HC	913	77.24	0.70	5.14	7.39	145
	4HC	870	85.08	0.77	5.67	8.68	145
120	2HC	980	65.32	0.59	4.35	7.17	160
	3HC	958	80.12	0.73	5.34	7.94	160
	4HC	899	87.46	0.80	5.83	9.12	160

Note: Q/ITD = MBh / (entering water temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different entering water or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Table 10. Steam coil performance—free discharge EC motor

			2 PSIG			5 PSIG			
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Motor Power (W)
020	Steam	203	14.27	0.096	135	15.11	0.096	139	37
030	Steam	250	15.83	0.106	128	16.76	0.107	132	39
040	Steam	317	20.90	0.140	131	22.13	0.141	134	58
060	Steam	496	32.43	0.218	130	34.35	0.219	134	79
080	Steam	642	41.72	0.280	130	44.20	0.282	134	122
100	Steam	846	59.00	0.396	134	62.52	0.398	138	145
120	Steam	909	61.19	0.411	132	64.84	0.413	136	160

Note: Q/ITD = MBh / (saturated steam temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different saturated steam or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Horizontal Cabinet, Vertical Cabinet, Inverted Vertical Cabinet

Heating performance is based on 70°F entering air temperature, 180°F entering hot water temperature with a 30°F ΔT. All performance measured on high speed tap, 115 V, 0 ESP, throwaway filter. Free discharge EC motor.

Table 11. Hot water performance—free discharge EC motor

			Hot Water Coils				
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Flow Rate (gpm)	WPD (ft H_20)	Motor Power (W)
020	2HC	222	15.46	0.14	1.03	4.94	37
	3HC	217	18.46	0.17	1.23	2.02	37
	4HC	204	19.96	0.18	1.33	2.92	37
030	2HC	280	18.23	0.17	1.21	6.61	39
	3HC	277	22.37	0.20	1.49	2.87	39
	4HC	256	24.14	0.22	1.61	4.12	39
040	2HC	349	22.63	0.21	1.51	2.46	58
	3HC	338	28.30	0.26	1.89	4.98	58
	4HC	320	30.86	0.28	2.06	7.31	58
060	2HC	544	35.56	0.32	2.37	6.72	79
	3HC	541	43.64	0.40	2.91	3.21	79
	4HC	510	48.02	0.44	3.20	4.45	79
080	2HC	706	44.67	0.41	2.98	3.02	122
	3HC	659	54.74	0.50	3.65	5.38	122
	4HC	627	60.13	0.55	4.01	7.51	122
100	2HC	912	62.09	0.56	4.14	6.51	145
	3HC	933	78.56	0.71	5.23	7.64	145
	4HC	893	86.94	0.79	5.79	9.02	145
120	2HC	996	66.08	0.60	4.40	7.32	160
	3HC	976	81.29	0.74	5.41	8.16	160
	4HC	921	89.25	0.81	5.95	9.47	160

Note: Q/ITD = MBh / (entering water temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different entering water or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Table 12. Steam coil performance—free discharge EC motor

			2 PSIG			5 PSIG			
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Motor Power (W)
020	Steam	203	14.27	0.096	135	15.11	0.096	139	37
030	Steam	250	15.83	0.106	128	16.76	0.107	132	39
040	Steam	317	20.90	0.140	131	22.13	0.141	134	58
060	Steam	496	32.43	0.218	130	34.35	0.219	134	79
080	Steam	642	41.72	0.280	130	44.20	0.282	134	122
100	Steam	846	59.00	0.396	134	62.52	0.398	138	145
120	Steam	909	61.19	0.411	132	64.84	0.413	136	160

Note: Q/ITD = MBh / (saturated steam temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different saturated steam or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Note: *The steam coil option is not available on the Horizontal Cabinet or Horizontal Recessed models.*

Vertical Slope Top Cabinet

Heating performance is based on 70°F entering air temperature, 180°F entering hot water temperature with a 30°F ΔT. All performance measured on high speed tap, 115 V, 0 ESP, throwaway filter. Free discharge EC motor.

Table 13. Hot water performance—free discharge EC motor

			Hot Water Coils				
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Flow Rate (gpm)	WPD (ft H_20)	Motor Power (W)
020	2HC	206	14.62	0.13	0.97	4.48	37
	3HC	200	17.31	0.16	1.15	1.80	37
	4HC	190	18.75	0.17	1.25	2.61	37
030	2HC	262	17.42	0.16	1.16	6.10	39
	3HC	260	21.31	0.19	1.42	2.63	39
	4HC	242	23.05	0.21	1.54	3.79	39
040	2HC	330	21.75	0.20	1.45	2.28	58
	3HC	320	27.12	0.25	1.81	4.61	58
	4HC	304	29.59	0.27	1.97	6.77	58
060	2HC	512	34.09	0.31	2.27	6.22	79
	3HC	508	41.67	0.38	2.78	2.94	79
	4HC	483	45.89	0.42	3.06	4.09	79
080	2HC	665	42.88	0.39	2.86	2.80	122
	3HC	623	52.44	0.48	3.49	4.96	122
	4HC	596	57.65	0.52	3.84	6.94	122
100	2HC	856	59.29	0.54	3.95	5.97	145
	3HC	873	74.56	0.68	4.97	6.91	145
	4HC	839	82.51	0.75	5.50	8.21	145
120	2HC	940	63.45	0.58	4.23	6.78	160
	3HC	923	77.85	0.71	5.19	7.51	160
	4HC	876	85.55	0.78	5.70	8.76	160

Note: Q/ITD = MBh / (entering water temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different entering water or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Table 14. Steam coil performance—free discharge EC motor

			2 PSIG			5 PSIG			
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Motor Power (W)
020	Steam	191	13.83	0.093	137	14.64	0.093	141	37
030	Steam	237	15.42	0.103	130	16.33	0.104	134	39
040	Steam	303	20.42	0.137	132	21.63	0.138	136	58
060	Steam	472	31.62	0.212	132	33.49	0.213	135	79
080	Steam	611	40.71	0.273	131	43.13	0.275	135	122
100	Steam	801	57.40	0.385	136	60.81	0.387	140	145
120	Steam	867	59.74	0.401	134	63.30	0.403	137	160

Note: Q/ITD = MBh / (saturated steam temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different saturated steam or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Horizontal Concealed, Horizontal Recessed, Vertical Recessed, Horizontal Cabinet

Heating performance is based on 70°F entering air temperature, 180°F entering hot water temperature with a 30°F ΔT. All performance measured on high speed tap, 115 V, 0.20 ESP, without filter. High static EC motor.

Table 15. Hot water performance—high static EC motor

			Hot Water Coils				
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Flow Rate (gpm)	WPD (ft H_20)	Motor Power (W)
	2HC	314	19.68	0.18	1.31	7.18	84
	3HC	319	24.71	0.22	1.65	3.28	84
200	4HC	295	27.07	0.25	1.80	4.83	84
	2HC	380	22.14	0.20	1.47	8.85	91
	3HC	358	26.79	0.24	1.78	3.80	91
300	4HC	330	29.52	0.27	1.97	5.65	91
	2HC	410	25.18	0.23	1.68	2.85	110
	3HC	506	37.80	0.34	2.52	8.05	110
400	4HC	470	41.89	0.38	2.79	12.12	110
	2HC	700	41.80	0.38	2.78	8.63	162
	3HC	824	58.43	0.53	3.89	5.36	162
600	4HC	760	65.21	0.59	4.34	7.59	162
	2HC	950	53.86	0.49	3.59	4.16	298
	3HC	927	69.93	0.64	4.66	8.20	298
800	4HC	870	77.84	0.71	5.19	11.67	298
	2HC	1199	74.76	0.68	4.98	8.90	252
	3HC	1360	103.27	0.94	6.88	12.55	252
1000	4HC	1276	113.35	1.03	7.55	9.41	252
	2HC	1330	79.76	0.73	5.31	10.07	314
	3HC	1418	106.27	0.97	7.08	13.26	314
1200	4HC	1330	116.96	1.06	7.79	10.00	314

Note: Q/ITD = MBh / (entering water temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different entering water or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Table 16. Steam coil performance—high static EC motor

			2 PSIG			5 PSIG			
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Motor Power (W)
020	Steam	290	17.00	0.114	124	18.01	0.115	127	84
030	Steam	348	18.52	0.124	119	19.62	0.125	122	91
040	Steam	383	22.91	0.154	125	24.27	0.155	128	110
060	Steam	653	37.03	0.249	122	39.24	0.250	125	162
080	Steam	890	48.80	0.328	121	51.73	0.329	124	298
100	Steam	1140	68.37	0.459	125	72.47	0.462	129	252
120	Steam	1252	71.49	0.480	123	75.79	0.483	126	314

Note: Q/ITD = MBh / (saturated steam temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different saturated steam or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Note: *The steam coil option is not available on the Horizontal Cabinet or Horizontal Recessed models.*

Vertical Concealed

Heating performance is based on 70°F entering air temperature, 180°F entering hot water temperature with a 30°F ΔT. All performance measured on high speed tap, 115 V, 0.20 ESP, without filter. High static EC motor.

Table 17. Hot water performance—high static EC motor

			Hot Water Coils				
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Flow Rate (gpm)	WPD (ft H_20)	Motor Power (W)
	2HC	274	17.95	0.16	1.20	6.11	84
	3HC	274	22.13	0.20	1.47	2.68	84
200	4HC	258	24.31	0.22	1.62	3.97	84
	2HC	341	20.70	0.19	1.38	7.86	91
	3HC	319	24.76	0.23	1.65	3.29	91
300	4HC	299	27.36	0.25	1.82	4.92	91
	2HC	377	23.84	0.22	1.59	2.58	110
	3HC	455	35.17	0.32	2.34	7.05	110
400	4HC	429	39.04	0.35	2.60	10.66	110
	2HC	632	39.23	0.36	2.61	7.68	162
	3HC	733	54.10	0.49	3.60	4.63	162
600	4HC	687	60.53	0.55	4.03	6.60	162
	2HC	865	50.88	0.46	3.39	3.73	298
	3HC	845	65.58	0.60	4.37	7.26	298
800	4HC	800	73.06	0.66	4.87	10.36	298
	2HC	1089	70.18	0.64	4.68	7.90	252
	3HC	1206	95.02	0.86	6.33	10.68	252
1000	4HC	1145	104.37	0.95	6.95	8.02	252
	2HC	1218	75.51	0.69	5.03	9.07	314
	3HC	1291	99.64	0.91	6.64	11.71	314
1200	4HC	1223	109.80	1.00	7.31	8.85	314

Note: Q/ITD = MBh / (entering water temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different entering water or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Table 18. Steam coil performance—high static EC motor

			2 PSIG			5 PSIG			
SIZE	COIL	Airflow (cfm)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Total Capacity (MBh)	Q/ITD	Heating LAT (°F)	Motor Power (W)
020	Steam	257	16.06	0.108	128	17.01	0.108	131	84
030	Steam	317	17.75	0.119	122	18.80	0.120	125	91
040	Steam	356	22.12	0.148	127	23.44	0.149	131	110
060	Steam	598	35.51	0.238	125	37.63	0.240	128	162
080	Steam	820	46.97	0.315	123	49.78	0.317	126	298
100	Steam	1045	65.56	0.440	128	69.48	0.443	131	252
120	Steam	1159	68.93	0.463	125	73.06	0.465	128	314

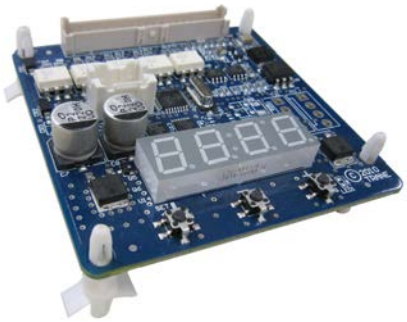
Note: Q/ITD = MBh / (saturated steam temp - entering air temp) When Δ T and gpm remain constant. To determine heating capacities at a different saturated steam or entering air temperature, compute the new ITD and multiply it by the new Q/ITD shown.

Controls

ECM Engine Controller

The Electronically Commutated Motor (ECM) engine controls and reports the performance of up to two Trane Brushless DC (BLDC) motors.

Figure 2. ECM engine controller



- The engine also coordinates the operation of the fan in response to electric heat behavior and electric behavior in response to hydronic heat behavior.
- The engine incorporates a user interface that allows adjustment of certain unit parameters and provides constant feedback on motor operation.
- The engine integrates service and troubleshooting tools.
- The engine integrates a versatile configurable auxiliary temperature sensor.
- The engine incorporates various safety and lockout features, such as maintaining proper fan speeds if electric heat is called for.

Status Display

Figure 3. Status display

The ECM engine board contains a four-digit, seven-segment display that is used to present information in a format close to real-world language, while having a small-form factor. Most characters are immediately recognizable; however, please consult Table 19 and Table 20 for the graphical representation of each alphanumeric character.

Table 19. Screen representation of alphabetical characters

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	b	C	d	E	F	g	H	I	J	H	L	m	n	O	P	q	r	S	t	U	u	W	H	y	Z

Table 20. Screen representation of numeric characters

1	2	3	4	5	6	7	8	9	0
1	2	3	4	5	6	7	8	9	0

Control Options

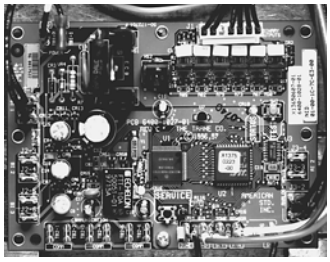
Force-Flo cabinet heaters are available with four different control options:

- Manual three-speed fan switch
- Tracer ZN010
- Tracer ZN510
- Tracer ZN520
- Tracer UC400

Fan speed switch

Tracer ZN010 control board

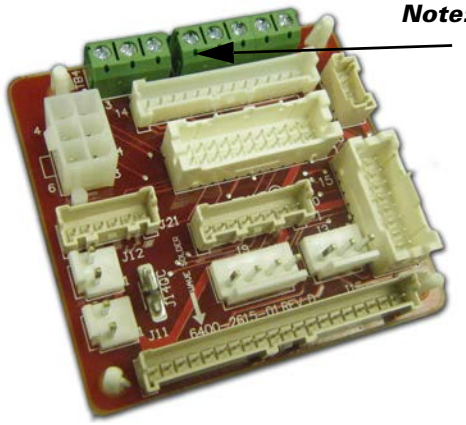
Tracer ZN510 control board



Manual Fan Mode Switch

Model Number Digit 30 = A and Digit 31 = D or K

Figure 4. Adapter board



Note: *Customer Low-Voltage Interface for Fan Speeds, Variable Fan Speed, and 24 Vac Supply*

The adapter allows direct customer interfacing through the use of terminal strips. Standard interfacing includes:

- Fan Speeds (H, M, L) (for wall mounted fan speed switches)
- Variable speed (0–10V) inputs

The standard adapter board eliminates many separate wiring harnesses in the panel and allows simple, mistake-proofed single-plug interfacing of:

- The ECM engine controller
- Transformers
- Motors
- Valves
- Dampers
- Electric heat control
- Fan speed switches
- Main power (except electric heat)

The manual fan mode switch is available for fan-coil units that do not have Trane factory-mounted control packages. This four-position switch (off, high, medium, low) allows manual fan mode selection and is available unit or wall mounted. The unit-mounted option (Digit 31 = D) operates on line voltage. The wall-mounted option (Digit 31 = K) is low-voltage and has three 24-volt relays using a factory-wired transformer and relays to control the fan motor.

Customer Supplied Terminal Interface (CSTI)

Figure 5. CSTI adapter board

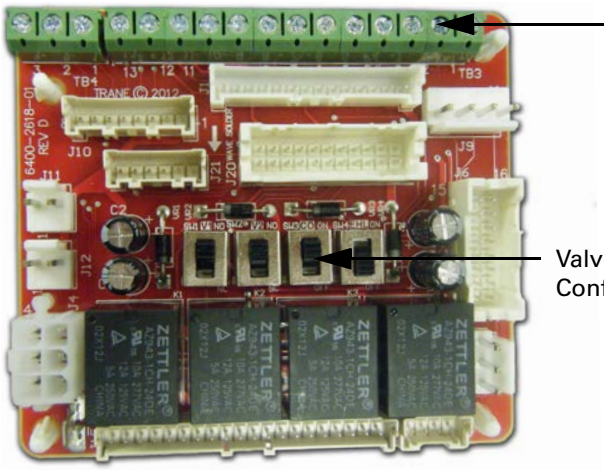
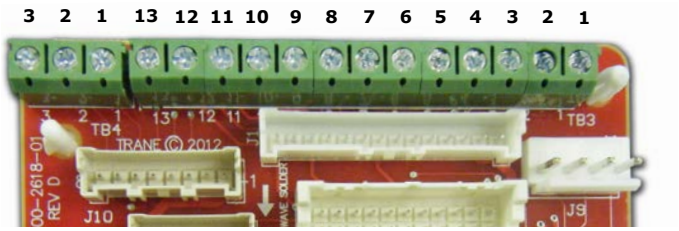


Figure 6. CSTI adapter board field connections



1. VSP 10V
2. VSP 0–10V
3. VSP DC COM

1. 24 Vac Y (hot)
2. 24 Vac Y (gnd)
3. High
4. Medium
5. Low
6. V1Op/Cooling
7. V1C1 (not std)
8. Not used
9. Not used
10. V2Op/EH1St/Heating
11. V2C1/EH2St (not std)
12. Damper Open
13. Dmp Cl (not std)

The control interface is intended to be used with a field-supplied, low-voltage thermostat or controller. The control box contains a relay board which includes a line voltage to 24-volt transformer, quiet contactors (for electric heat units), and an optional disconnect switch. All end devices are wired to a low-voltage terminal block and are run-tested, so the only a power connection and thermostat connection is needed to commission the unit. Changeover sensors and controls are provided whenever a change-over coil is selected. When N.O. valves are selected, inverting relays are provided for use with standard thermostats.

The CSTI adapter board provides all the hookups of the standard adapter board, but in addition, provides hookups for valve control (main and auxiliary coils), electric heat control, and damper control. Screw terminal blocks provide convenient access to fan controls and to end device control. In addition, a courtesy 10-Vdc supply is provided for use with an external potentiometer or rheostat. The 10-Vdc supply supports up to 10 mA draw.

Tracer Controls

The Tracer family of controllers (Tracer ZN010, ZN510, ZN520, and UC400) offer the combined advantages of simple and dependable operation with the latest Trane-designed controller. Standard control features include options normally available on more elaborate control systems. All control options are available factory-configured or can be field-configured using Trane service software. For more detailed information, refer to CNT-IOP-1 (for Tracer ZN010 or ZN510) or CNT-SVX04A-EN (for Tracer ZN520), or UNT-SVX07D-EN (for Tracer UC400), or the most recent version of the publication

Tracer ZN010, Model Number digit 30 = E

Tracer ZN010 is a stand-alone microprocessor controller.

Tracer ZN510, Model Number digit 30 = F

Tracer ZN510 can be used as either a stand-alone or communicating microprocessor controller.

Tracer ZN520, Model Number digit 30 = G

Tracer ZN520 controller can be used in a stand-alone application or as part of a Trane Integrated Comfort™ System (ICS).

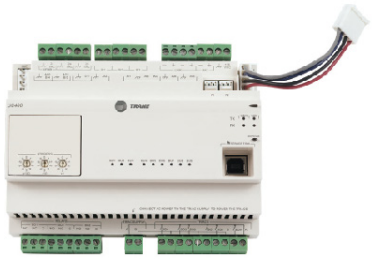
In the stand-alone configuration, Tracer ZN520 receives operation commands from the zone sensor. The zone sensor module is capable of transmitting the following information to the controller:

- Timed override on/cancel request
- Zone setpoint
- Current zone temperature
- Fan mode selection (off-auto-high-med-low)

For optimal system performance, Force-Flo units can be linked to an Integrated Comfort System (ICS) building automation system controlled by Tracer SC. The controller is connected to the building automation system with a LON Talk communications network. The Trane ICS system can monitor or override Tracer ZN520 control points. This includes such points as temperature and output positions.

Tracer UC400, Model Number Digit 30 = J

Figure 7.



The UC400 controller can be used in a stand-alone application or as part of a Trane Integrated Comfort™ System (ICS).

In the stand-alone configuration, UC400 receives operation commands from the zone sensor and/or the auto changeover sensor (on auto changeover units). The entering water temperature is read from the auto changeover sensor and determines if the unit is capable of cooling or heating. The zone sensor module is capable of transmitting the following information to the controller:

- Timed override on/cancel request
- Zone setpoint
- Current zone temperature
- Fan mode selection (off-auto-high-med-low)

For optimal system performance, fan-coil units can operate as part of an Integrated Comfort System (ICS) building automation system controlled by Tracer SC. The controller is linked to the building automation system using BACnet MS/TP. The building automation system can monitor or override UC400 control points. This includes such points as temperature and output positions.

Service Software

A windows-based software package option allows field service personnel to easily monitor, save, download, and configure Tracer unit controllers directly or through a communication link from a portable computer. When connected over the communication link, the service software can view any Tracer ZN controller that is on the same communication link. See Tracer TU or Rover literature for more details.

Sequence of Operation

Fan Speed Switch

Off: Fan is turned off, two-position damper option spring-returns closed.

High, Medium, Low: Fan runs continuously at the selected speed. The two-position damper option opens to an adjustable mechanical stop position.

Tracer ZN010 and ZN510

Off: Fan is off; control valves and fresh air damper option close.

Auto (Fan Cycling): Fan and fresh air damper cycle with control valve option to maintain setpoint temperature. In heating mode it cycles from off to low (factory default that can be field-adjusted using Rover service software). When heating is not required, the fan is off and the fresh air damper option closes. The fan can also be field-configured (using Rover) to run at a user-defined speed when the fan speed switch is in the auto position.

Low, Medium, High (Continuous Fan): Fan operates continuously while control valve option cycles to maintain setpoint temperature. Fresh air damper option is open.

Tracer ZN520

Off: Fan is off; control valve options and fresh air damper options close.

Auto: Fan speed control in the auto setting allows the modulating (three-wire floating point) control valve option and three-speed fan to work cooperatively to meet precise capacity requirements, while minimizing fan speed (motor/energy/acoustics) and valve position (pump energy). As the capacity requirement increases at low fan speed, the water valve opens. When the low fan speed capacity switch point is reached, the fan switches to medium speed and the water valve repositions to maintain an equivalent capacity. The reverse sequence takes place with a decrease in required capacity.

Low, Medium, High: The fan will run continuously at the selected speed and the valve option will cycle to meet setpoint.

Tracer UC400

Off: Fan is off; control valve options and fresh air damper options close.

Auto: Fan speed control in the auto setting allows the modulating (three-wire floating point) control valve option and three-speed fan to work cooperatively to meet precise capacity requirements, while minimizing fan speed (motor/energy/acoustics) and valve position (pump energy). As the capacity requirement increases at low fan speed, the water valve opens. When the low fan speed capacity switch point is reached, the fan switches to medium speed and the water valve repositions to maintain an equivalent capacity. The reverse sequence takes place with a decrease in required capacity.

Low, Medium, High: The fan will run continuously at the selected speed and the valve option will cycle to meet setpoint.

Occupied Mode

In Occupied Mode, the UC400 controller maintains the space temperature based on the occupied space temperature setpoint ± occupied offset. The controller uses the occupied mode as a default mode when other forms of occupancy request are not present and the fan runs continuously. The outdoor air damper, if present, will close when the fan is OFF. The temperature setpoints can be local (hard wired), communicated, or stored default values (configurable using the Tracer TU service tool).

Unoccupied Mode

In unoccupied mode, the UC400 controller attempts to maintain the space temperature based on the unoccupied heating or cooling setpoint. The fan will cycle between high speed and **OFF**. In

addition, the outdoor air damper remains closed, unless economizing. The controller always uses the stored default setpoint values (configurable using the Tracer TU service tool), regardless of the presence of a hard wired or communicated setpoint value.

Timed Override Control

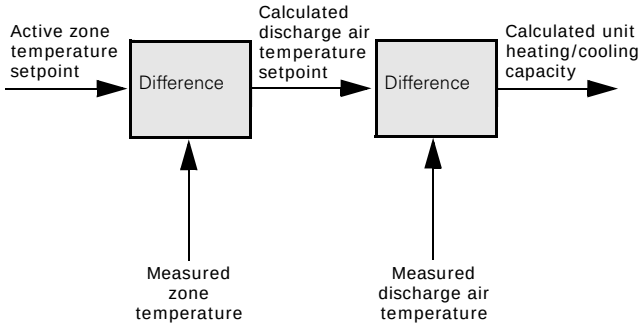
If the UC400 controller has a timed override option (**ON/CANCEL** buttons), pushing the **ON** button initiates a timed override on request. A timed override on request changes the occupancy mode from unoccupied mode to occupied bypass mode. In occupied bypass mode, the controller controls the space temperature based on the occupied heating or cooling setpoints. The occupied bypass time, which resides in the UC400 controller and defines the duration of the override, is configurable from 0 to 240 minutes (default value of 120 minutes). When the occupied bypass time expires, the unit transitions from occupied bypass mode to unoccupied mode. Pushing the **CANCEL** button cancels the timed override request. In addition, it will end the timed override before the occupied bypass time has expired and transition the unit from occupied bypass mode to unoccupied mode.

If the controller is in any mode other than unoccupied mode when the **ON** button is pressed, the controller still starts the occupied bypass timer without changing to occupied bypass mode. If the controller is placed in unoccupied mode before the occupied bypass timer expires, the controller is placed into occupied bypass mode and remains in this mode until either the **CANCEL** button is pressed on the Trane zone sensor or the occupied bypass time expires.

Zone Temperature Control

The UC400 controller has three methods of zone temperature control:

- **Cascade zone control**—used in the occupied, occupied bypass, and occupied standby modes. It maintains zone temperature by controlling the discharge air temperature to control the zone temperature. The controller uses the difference between the measured zone temperature and the active zone temperature setpoint to produce a discharge air temperature setpoint. The controller compares the discharge air temperature setpoint with the discharge air temperature and calculates a unit heating/cooling capacity accordingly (refer to the illustration below). The end devices (outdoor air damper, valves, and so on) operate in sequence based on the unit heating/cooling capacity (0–100 percent).



  If the discharge air temperature falls below the discharge air temperature low limit setpoint, (configurable using the Tracer TU service tool), and the cooling capacity is at a minimum, the available heating capacity is used to raise the discharge air temperature to the low limit.

- **Simplified zone control**— if discharge air temperature failure occurs, then simplified zone controls runs. In the unoccupied mode, the controller maintains the zone temperature by calculating the required heating or cooling capacity (0–100%) according to the measured zone temperature and the active zone temperature setpoint. The active zone temperature setpoint is determined by the current operating modes, which include occupancy and heat/cool modes.
- **Discharge air temperature control**— is the backup mode that runs *only* if there is not valid zone temperature. In this mode, the active space temperature setpoint is used as the discharge air temperature setpoint.

Important: *This is not a normal operating mode. The source of the invalid zone temperature needs to be corrected to restore normal operation.*

Table 21. Controller input/output summary

	ZN010	ZN510	ZN520	UC400
Binary Outputs				X
3-Speed Fan	X	X	X	X
2-Position Hydronic Valve	X	X	X	X
2-Position Fresh Air Damper	X	X		X
1-Stage Electric Heat	X	X	X	X
3-Wire Economizer Damper			X	X
3-Wire Hydronic Valve			X	X
2-Stage Electric Heat			X	X
Reheat (hydronic or electric)			X	X
Generic	X	X	X	**
Binary Inputs				
Condensate Overflow Detection	X	X	X	X
Low Temperature Detection	X	X	X	X
Occupancy	X	X	X	X
Generic Input	X	X	X	**
Analog Inputs				
Zone Temperature	X	X	X	X
Setpoint	X	X	X	X
Fan Mode: Auto, High, Medium, Low	X	X	X	X
Entering Water	X	X	X	X
Discharge Air	X	X	X	X
Outside Air			X	X
Generic			X	**
Analog Outputs				
Variable speed fan				X
Field supplied analog valves				X

Note: The generic input and output are for use with a Tracer Building Automation System only.

Table 22. Controller function summary

	ZN010	ZN510	ZN520	UC400
Control Functions				
Entering Water Temp. Sampling (Purge)	X	X	X	X
Auto Changeover	X	X	X	X
Fan Cycling	X	X		
Warm-Up	X	X	X	
Pre-Cool	X	X	X	
Data Sharing (Master/Slave)		X	X	
Random Start	X	X	X	X
Dehumidification			X	X
Acoustic Mode				X
Efficiency Mode				X
Single Zone VAV Mode				X
Staged Capacity (2-Stage Electric Supplementary)			X	X
Other Functions				
Manual Test	X	X	X	in TU
Maintenance Timer	X	X	X	X
Setpoint Limits	X	X	X	X

** 'Generic' i/o - if there is unused i/o the user may create a new point to reference the i/o. But there is no dedicated 'generic' i/o like on ZN
Binary inputs -- there is also a defrost and fan status (for 1,2,3 speed fans) for UC400 and ZN520.
The ECM fan does not use the Binary input for fan status but gets the info over IMC from the ECM.
ZN520 also had a binary input for fan status. ZN520 also had defrost but it was wired directly to the compressor (IOP explains this).

Zone Sensor Options

Zone sensors are available as either unit, wall, or split-mounted options for design flexibility. Force-Flo units with the unit-mounted zone sensor option include a thermistor in the unit's return air path. Wall-mounted zone sensor options have an internal thermistor. Zone sensors operate on 24 Vac.

Tracer ZN010 Options

Figure 8. Unit-mounted zone sensor: Digit 30 = E and Digit 31 = V

X13790843-01

Figure 10. Wall-mounted zone sensor: Digit 30 = E and Digit 31 = W

X13790841-01

Figure 12. Split-mounted zone sensor, unit-mounted fan mode and wall-mounted setpoint dial: Digit 30 = E and Digit 31 = X

X13511529-01 (wall)
X13790849-01 (unit)

Tracer UC400, ZN510, and ZN520 Options

Figure 9. Wall-mounted zone sensor: Digit 30 = F or G and Digit 31 = 1

X13511530-01 (wall)
X13651467-02 (comm)

Figure 11. Wall-mounted zone sensor: Digit 30 = F or G and Digit 31 = 2

X13790842-01 (wall)
X13651467-02 (comm)

Figure 13. Split-mounted zone sensor, unit-mounted fan mode and wall-mounted setpoint dial: Digit 30 = F or G and Digit 31 = Y

X13511527-01 (wall)
X13790849-01 (unit)
X13651467-02 (comm)

Figure 14. Unit-mounted zone sensor: Digit 30 = F or G and Digit 31 = Z

X13790844-01

Tracer UC400, ZN510, and ZN520 Options (continued)

Figure 15. Wall-mounted digital zone sensor with setpoint adjustment: Digit 30 = F or G and Digit 31 = 4

X13790886-04 (wall)

Figure 16. Wireless zone sensor (setpoint adjustment, no fan speed adjustment): Digit 30 = F or G and Digit 31 = 6

X13790821-01 (wall)
X13790860-02 (unit)

Figure 17. Wireless zone sensor: Digit 30 = F or G and Digit 31 = 7

X13790822-04 (wall)
X13790860-02 (unit)

Control Features

The following control functions are standard features on units with Tracer UC400, ZN010, ZN510, ZN520, or UC400.

Occupied/Unoccupied Operation

The occupancy input utilizes a binary switch (i.e. motion sensor, timeclock, etc.) that allows the zone sensor to utilize its unoccupied internal setpoints.

Random Start

This feature randomly staggers multiple unit startup to reduce electrical demand spikes.

Warmup

The two-position fresh air damper option closes during the occupied mode when the space temperature is three degrees or more below the heating setpoint temperature. The damper remains closed during warmup until the space temperature is within two degrees of the heating setpoint temperature.

Manual Output Test Function

This feature is an invaluable tool for troubleshooting a unit. By simply pressing the controller's test button, service personnel can manually exercise outputs in a pre-defined sequence.

Peer to Peer Communication (Tracer ZN510, ZN520, and UC400)

Peer to peer communication allows multiple units in one space to share the same zone sensor and provide simultaneous heating. The Tracer ZN510 or ZN520 controller can share information between units on the same communication link using a twisted pair wire in the field. Unit configuration must be modified with Rover service tool. On the UC400, zone sensor data sharing can be accomplished by use of the BAS system controller.

Tracer ZN520 and UC400 Additional Features

Filter Maintenance Status

Tracer controller has an adjustable timer that indicates through the building automation system or the service software tool when filter maintenance is necessary. Filter maintenance status is based on cumulative fan run hours.

Water Valve Override

Using the building automation system or the service software tool, the water valve override function drives all water valves in every unit fully open simultaneously. This helps reduce the time required for waterside balancing.

Cascade Control

Tracer controller maintains discharge air temperature using a cascade control algorithm. The discharge air temperature is based on the difference between the space temperature and setpoint. Unit capacity modulates to achieve the discharge air temperature.

Interoperability

Tracer ZN520 can be used with a Tracer Summit system or on other control systems that support LonTalk® and the SCC profile. For more information on specific inputs and outputs, see UNT-IOM-6 (*Installation, Operation, and Maintenance: UniTrane® Fan-Coil Room Conditioners - Force Flo™ Cabinet Heaters*), or the most recent version.

The Tracer UC400 can be used with the Tracer SC or another BACnet MS/TP building automation system. For more information see the Installation Operation and Programming Guide BAS-SVX48 for more information.

End Device Options

All end device options are factory-installed and -tested.

Two-Position Control Valves; Model Number Digits 27 & 28 = A–H

Two-position valve options are available with either Tracer ZN010, ZN510, ZN520, or UC400. Valves are spring-return type, sweat connections, and available as normally open or closed. The valves respond to a 24 V signal and have 1/2-inch sweat connections. The two-way valve option will either fully open or close. The three-way valve option allows either full water flow through the coil or diverts waterflow through the bypass. If the control valve loses power, the valve returns to its de-energized position. All control valve options are factory installed in the leaving water piping downstream of the hydronic coil. The valve actuator is easily removable for service without removing the valve body from piping.

Modulating Control Valves (Tracer ZN520 and UC400); Model Number Digits 27 & 28 = J–R

These 1/2-inch sweat connect valves are three-wire floating point valves, equal percentage type. Modulating valves are available in four Cv sizes: 0.7, 1.5, 2.5, and 4.0. The valve responds to a 24 V

triac signal from the controller, which determines the valve position by a control algorithm. If the valve loses power, it remains in the position that it was in when the power loss occurred. All control valves are factory installed in the leaving water piping downstream of the hydronic coil.

Field-Supplied Valves; Model Number Digits 27 and 28 = X, Y, Z or 1.

When using field-supplied valves, this option allows the controller to be factory-configured for the normal position of the field-supplied valve.

Note: *Trane does not recommend wild coil applications.*

Two-Position Fresh Air Damper Actuator; Model Number Digit 13 = D, E, or F (Available with all control options except Tracer ZN520)

This damper actuator uses a 24 V signal and is factory-wired and mounted to the damper assembly. It allows zero to 50 percent fresh air. The damper will drive open to an adjustable mechanical stop-position whenever the fan is running during occupied mode and will spring-return closed when the fan turns off.

Electrical Data

Table 23. Two-stage electric heat (digit 18 = U)

Unit Size	Voltage	Wires	1st Stage kW	Total kW	Total amps/ph
02	208/60/1	2	0.75	2.25	10.9
	240/60/1	2	1.0	3.0	12.5
	277/60/1	2	1.0	3.0	10.9
	208/60/3	3	0.75	2.25	6.3
	240/60/3	3	1.0	3.0	7.3
	480/60/3	4	1.0	3.0	3.7
03	208/60/1	2	1.5	4.5	21.7
	240/60/1	2	2.0	6.0	25.0
	277/60/1	2	2.0	6.0	21.7
	208/60/3	3	1.5	4.5	12.6
	240/60/3	3	2.0	6.0	14.5
	480/60/3	4	2.0	6.0	7.3
04	208/60/1	2	1.9	5.7	27.5
	240/60/1	2	2.5	7.5	31.3
	277/60/1	2	2.5	7.5	27.1
	208/60/3	3	1.9	5.7	15.9
	240/60/3	3	2.5	7.5	18.1
	480/60/3	4	2.5	7.5	9.1
06	208/60/1	2	3.4	7.9	38.0
	240/60/1	2	4.5	10.5	43.8
	277/60/1	2	4.5	10.5	38.0
	208/60/3	3	3.4	7.9	21.9
	240/60/3	3	4.5	10.5	25.3
	480/60/3	4	4.5	10.5	12.7
08	208/60/1	2	4.5	10.1	48.8
	240/60/1	2	6.0	13.5	56.3
	277/60/1	2	6.0	13.5	48.8
	208/60/3	3	4.5	10.1	28.2
	240/60/3	3	6.0	13.5	32.5
	480/60/3	4	6.0	13.5	16.3
10	208/60/1	2	6.0	13.5	65.0
	240/60/1	2	8.0	18.0	75.0
	277/60/1	2	8.0	18.0	65.0
	208/60/3	3	6.0	13.5	37.6
	240/60/3	3	8.0	18.0	43.3
	480/60/3	4	8.0	18.0	21.7
12	208/60/1	2	6.8	15.0	72.3
	240/60/1	2	9.0	20.0	83.4
	277/60/1	2	9.0	20.0	72.3
	208/60/3	3	6.8	15.0	41.7
	240/60/3	3	9.0	20.0	48.2
	480/60/3	4	9.0	20.0	24.1

Note: When both stages are on, the electric heat will operate only when fan is in high speed. All data based on individual units.

Table 24. Single-stage, max kW electric heat (digit 18 = N)

Unit Size	Voltage	Wires	Heater kW	Heater amps/ph
02	208/60/1	2	2.25	10.9
	240/60/1	2	3.0	12.5
	277/60/1	2	3.0	10.9
	208/60/3	3	2.25	6.3
	240/60/3	3	3.0	7.3
	480/60/3	4	3.0	3.7
03	208/60/1	2	4.5	21.7
	240/60/1	2	6.0	25.0
	277/60/1	2	6.0	21.7
	208/60/3	3	4.5	12.6
	240/60/3	3	6.0	14.5
	480/60/3	4	6.0	7.3
04	208/60/1	2	5.7	27.5
	240/60/1	2	7.5	31.3
	277/60/1	2	7.5	27.1
	208/60/3	3	5.7	15.9
	240/60/3	3	7.5	18.1
	480/60/3	4	7.5	9.1
06	208/60/1	2	7.9	38.0
	240/60/1	2	10.5	43.8
	277/60/1	2	10.5	38.0
	208/60/3	3	7.9	21.9
	240/60/3	3	10.5	25.3
	480/60/3	4	10.5	12.7

Note: All data based on individual units. Electric heat will operate only with fan at high speed.

Table 25. Single stage, low kW electric heat (digit 18 = V)

Unit Size	Voltage	# Wires	kW	amps/ph	kW	amps/ph	kW	amps/ph
02	208/60/1	2	0.75	3.7	1.5	7.3		
	240/60/1	2	1.0	4.2	2.0	8.4		
	277/60/1	2	1.0	3.7	2.0	7.3		
03	208/60/1	2	2.25	10.9				
	240/60/1	2	3.0	12.5				
	277/60/1	2	3.0	10.9				
	208/60/3	3	2.25	6.3				
	240/60/3	3	3.0	7.3				
	480/60/3	4	3.0	3.7				
04	208/60/1	2	2.25	10.9				
	240/60/1	2	3.0	12.5				
	277/60/1	2	3.0	10.9				
	208/60/3	3	2.25	6.3				
	240/60/3	3	3.0	7.3				
	480/60/3	4	3.0	3.7				
06	208/60/1	2	2.25	10.9	3.3	15.9		
	240/60/1	2	3.0	12.5	4.5	18.8		
	277/60/1	2	3.0	10.9	4.5	16.3		
	208/60/3	3	2.25	6.3	3.3	9.2		
	240/60/3	3	3.0	7.3	4.5	10.9		
	480/60/3	4	3.0	3.7	4.5	5.5		
08	208/60/1	2	2.25	10.9	3.3	15.9	4.5	21.7
	240/60/1	2	3.0	12.5	4.5	18.8	6.0	25.0
	277/60/1	2	3.0	10.9	4.5	16.3	6.0	21.7
	208/60/3	3	2.25	6.3	3.3	9.2	4.5	12.5
	240/60/3	3	3.0	7.3	4.5	10.9	6.0	14.5
	480/60/3	4	3.0	3.7	4.5	5.5	6.0	7.3
10	208/60/1	2	2.25	10.9	3.3	15.9	5.7	27.5
	240/60/1	2	3.0	12.5	4.5	18.8	7.5	31.3
	277/60/1	2	3.0	10.9	4.5	16.3	7.5	27.1
	208/60/3	3	2.25	6.3	3.3	9.2	5.7	15.9
	240/60/3	3	3.0	7.3	4.5	10.9	7.5	18.1
	480/60/3	4	3.0	3.7	4.5	5.5	7.5	9.1
12	208/60/1	2	2.25	10.9	3.3	15.9	6.6	31.8
	240/60/1	2	3.0	12.5	4.5	18.8	9.0	37.5
	277/60/1	2	3.0	10.9	4.5	16.3	9.0	32.5
	208/60/3	3	2.25	6.3	3.3	9.2	6.6	18.4
	240/60/3	3	3.0	7.3	4.5	10.9	9.0	21.7
	480/60/3	4	3.0	3.7	4.5	5.5	9.0	10.9

Note: All data based on individual units. Electric heat will operate only with fan at high speed.

Minimum Circuit Ampacity (MCA) and Maximum Fuse Size (MFS) Calculations

Units with Electric Heat. HACR (heating, air conditioning, and refrigeration) type circuit breakers are required in the branch circuit wiring for all units with electric heat. To compute MCA and MFS, see Table 26, p. 44 through Table 29, p. 44 for motor FLAs and Table 23, p. 41 through Table 25, p. 42 for electric heat amps.

Calculating electric heat amps:

Single stage, three phase = heat kW * 1000/1.732/volts

Two stage, three phase = total heat kW * 1000/1.732/volts

Note: *Use 240 V heat voltage for 230 V units.*

Calculating MCA (units with electric heat):

MCA = 1.25 * (heat amps + sum of all motor FLAs)

Calculating MFS (units with electric heat):

MFS = (2.25 * largest motor FLA) + second motor FLA, size 10-12 units only + heat amps

Use the closest larger fuse or HACR circuit breaker above the MCA. Standard fuse sizes are: 15, 20, 25, 30, 35, 40, 45, 50, 60 amps.

Electric heat MBh = heater kW * 3.413

Units without Electric Heat. To compute MCA and MFS, see Table 26, p. 44 through Table 29, p. 44 for motor FLAs and Table 23, p. 41 through Table 25, p. 42 for electric heat amps.

Calculating MCA (units without electric heat):

MCA = (1.25) x largest motor FLA + second motor FLA, unit sizes 10 and 12 only

Calculating MFS (units without electric heat):

MFS or HACR[1] type circuit breaker = 15 amps for all units without electric heat.

[1] HACR (heating, air-conditioning and refrigeration) type circuit breakers are required in the branch circuit wiring for all size 10 and 12 units.

Table 26. Free discharge electrically commutated motors (ECMs) programmed to standard ECM mode

	115 Volt				208–230 Volt				277 Volt			
	FLA		HP		FLA		HP		FLA		HP	
Unit Size	1	2	1	2	1	2	1	2	1	2	1	2
2	3.1		0.22		1.8		0.22		1.6		0.24	
3	3.1		0.22		1.8		0.22		1.6		0.24	
4	3.1		0.22		1.8		0.22		1.6		0.24	
6	3.1		0.22		1.8		0.22		1.6		0.24	
8	3.1		0.22		1.8		0.22		1.6		0.24	
10	3.1	3.1	0.22	0.22	1.8	1.8	0.22	0.22	1.6	1.6	0.24	0.24
12	3.1	3.1	0.22	0.22	1.8	1.8	0.22	0.22	1.6	1.6	0.24	0.24

Table 27. High static electrically commutated motors (ECMs) on units programmed to standard ECM mode

	115 Volt				208–230 Volt				277 Volt			
	FLA		HP		FLA		HP		FLA		HP	
Unit Size	1	2	1	2	1	2	1	2	1	2	1	2
2	3.1		0.22		1.8		0.22		1.6		0.24	
3	3.1		0.22		1.8		0.22		1.6		0.24	
4	3.1		0.22		1.8		0.22		1.6		0.24	
6	3.1		0.22		1.8		0.22		1.6		0.24	
8	3.1		0.22		1.8		0.22		1.6		0.24	
10	3.1	3.1	0.22	0.22	1.8	1.8	0.22	0.22	1.6	1.6	0.24	0.24
12	3.1	3.1	0.22	0.22	1.8	1.8	0.22	0.22	1.6	1.6	0.24	0.24

Table 28. Free discharge electrically commutated motors (ECMs) programmed to reduced FLA mode

	115 Volt				208–230 Volt				277 Volt			
	FLA		HP		FLA		HP		FLA		HP	
Unit Size	1	2	1	2	1	2	1	2	1	2	1	2
2	0.6		0.22		0.4		0.22		0.3		0.24	
3	0.6		0.22		0.4		0.22		0.3		0.24	
4	0.8		0.22		0.6		0.22		0.4		0.24	
6	1.1		0.22		0.8		0.22		0.6		0.24	
8	1.6		0.22		1.1		0.22		0.8		0.24	
10	0.7	1.2	0.22	0.22	0.5	0.8	0.22	0.22	0.4	0.6	0.24	0.24
12	0.7	1.3	0.22	0.22	0.5	0.9	0.22	0.22	0.4	0.7	0.24	0.24

Table 29. High static electrically commutated motors (ECMs) programmed to reduced FLA mode

	115 Volt				208–230 Volt				277 Volt			
	FLA		HP (kW)		FLA		HP (kW)		FLA		HP (kW)	
Unit Size	1	2	1	2	1	2	1	2	1	2	1	2
2	1.3		0.22		0.9		0.22		0.7		0.24	
3	1.3		0.22		0.9		0.22		0.7		0.24	
4	1.7		0.22		1.2		0.22		0.9		0.24	
6	2.3		0.22		1.6		0.22		1.2		0.24	
8	3.1		0.22		1.8		0.22		1.5		0.24	
10	1.4	2	0.22	0.22	1	1.4	0.22	0.22	0.7	1.1	0.24	0.24
12	1.5	2.8	0.22	0.22	1.1	1.8	0.22	0.22	0.8	1.4	0.24	0.24

Table 30. Unit RPM

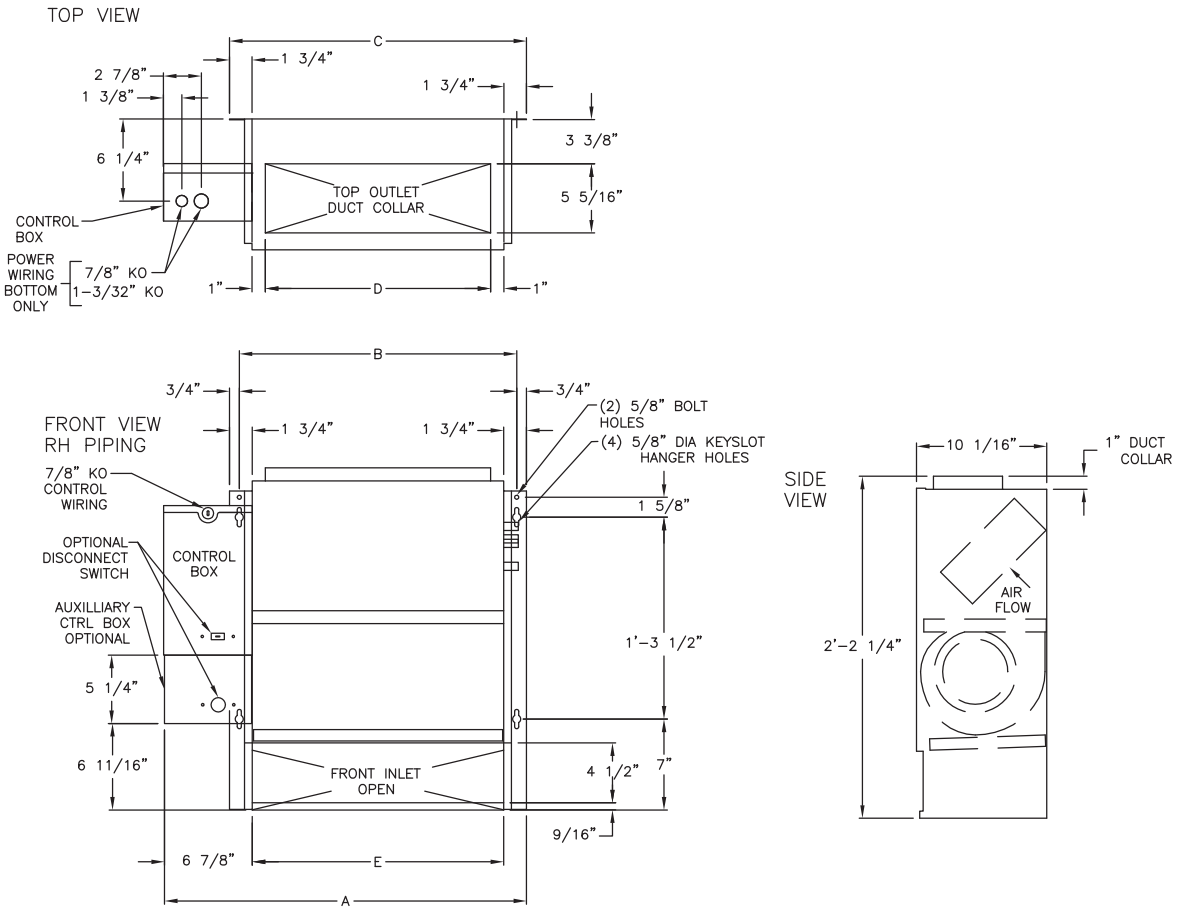
Unit Size	Free Discharge-Units with 2-Row Coils			Free Discharge-Units with 3- and 4-Row Coils		
	H	M	L	H	M	L
2	980	840	655	980	840	655
3	980	780	580	1080	800	600
4	1050	780	580	1080	800	600
6	1030	780	580	1080	800	600
8	1080	800	600	1080	800	600
10	1050	780	580	1080	800	600
	1030	780	580	1080	800	600
12	1050	780	580	1080	800	600
	1080	800	600	1080	800	600

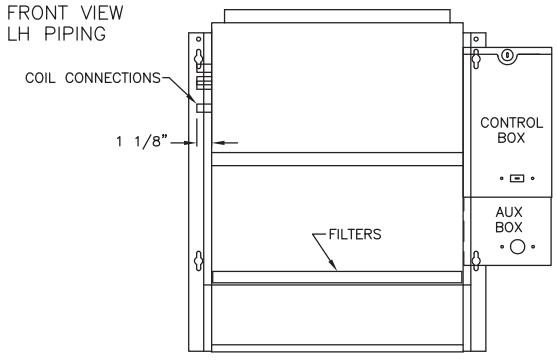
Unit Size	High Static-Units with 2-Row Coils			High Static-Units with 3- and 4-Row Coils		
	H	M	L	H	M	L
2	1480	1110	865	1480	1110	865
3	1400	1175	860	1500	1355	1110
4	1475	1315	1070	1580	1375	1240
6	1400	1070	855	1475	1285	975
8	1475	1285	975	1475	1285	975
10	1475	1315	1070	1580	1375	1240
	1400	1070	855	1475	1285	975
12	1475	1315	1070	1580	1375	1240
	1475	1285	975	1475	1285	975

Note: Actual rpm will vary with application and configuration.

Dimensions and Weights

Vertical Concealed, Model A



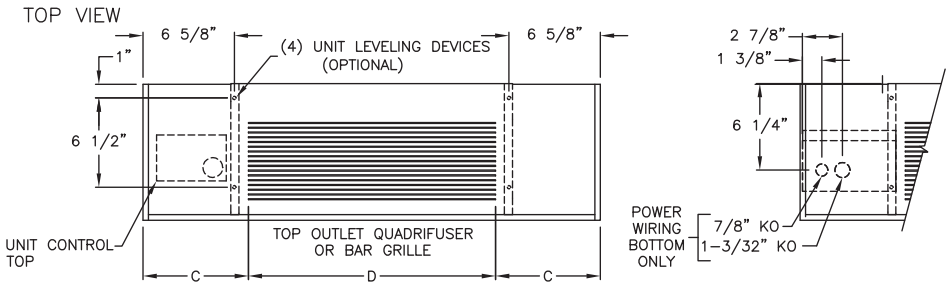


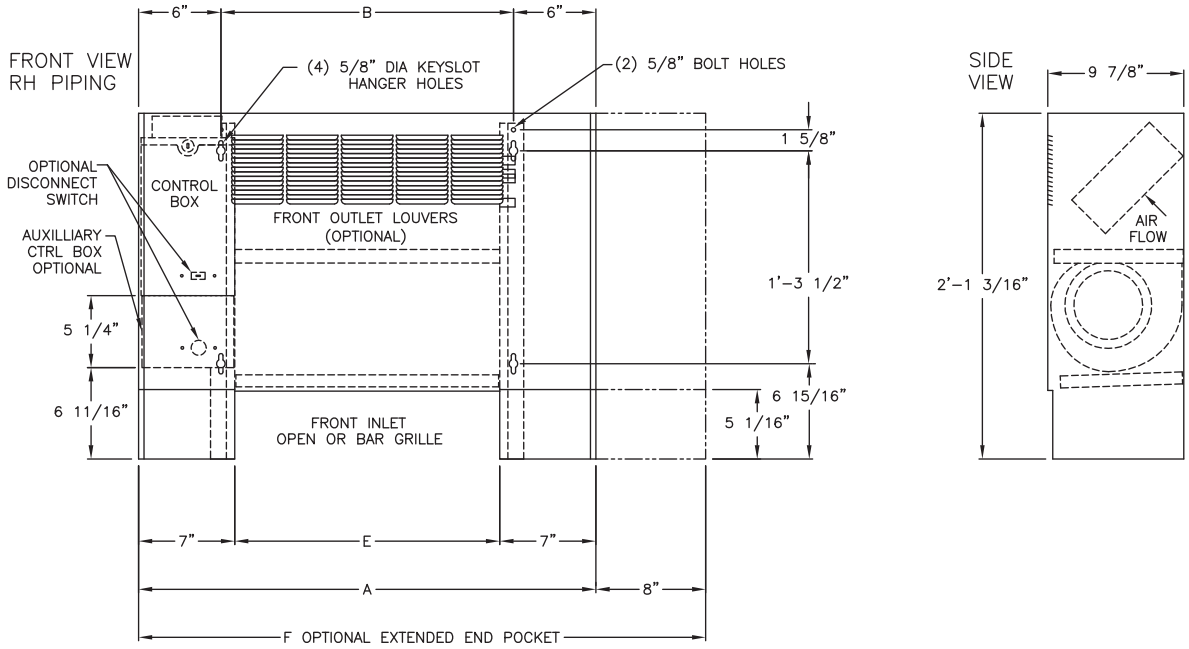
Vertical Concealed Unit

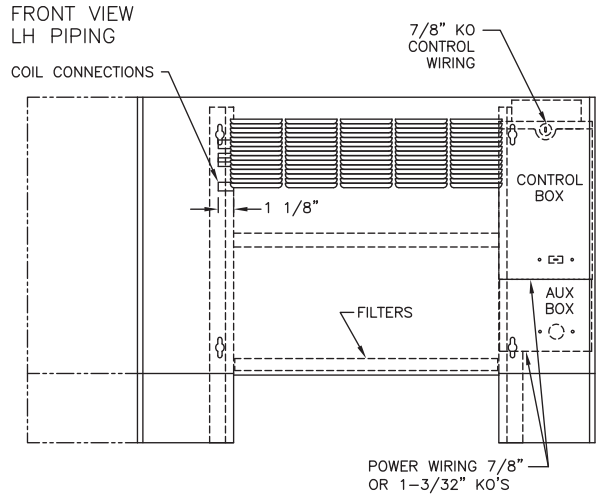
Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-3 7/8"	2'-8 7/8"	3'-6 3/8"	4'-2 7/8"	5'-9 7/8"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	1'-5 5/16"	1'-10 5/16"	2'-7 13/16"	3'-4 5/16"	4'-11 5/16"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-4 5/16"	5'-1 5/16"

Notes:
1. Coil connections are always opposite the control box.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. All duct collar dimensions are to the outside of the collar.
4. See p. 58 for dimensions for air openings.

Vertical Cabinet, Model B





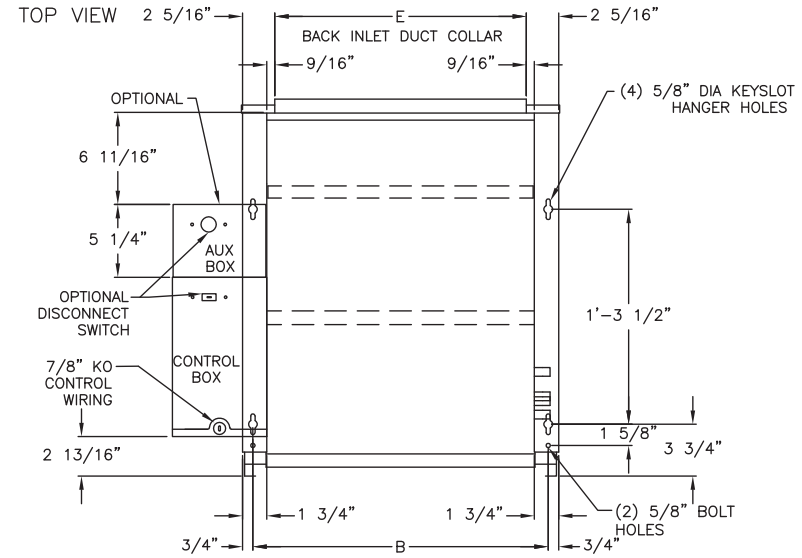


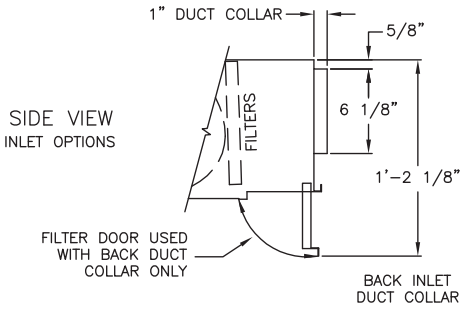
Vertical Cabinet Unit

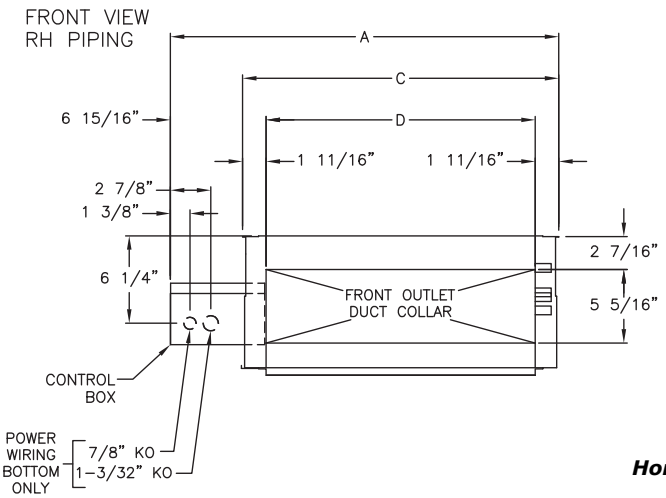
Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-9 7/8"	3'-2 5/16"	3'-11 13/16"	4'-8 5/16"	6'-3 5/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	7 5/8"	7 1/8"	8' 7/8"	7 1/8"	7 5/8"
D	1'-6"	2'-0"	2'-6"	3'-6"	5'-0"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"
F	3'-5 5/16"	3'-10 5/16"	4'-7 13/16"	5'-4 5/16"	6'-11 5/16"

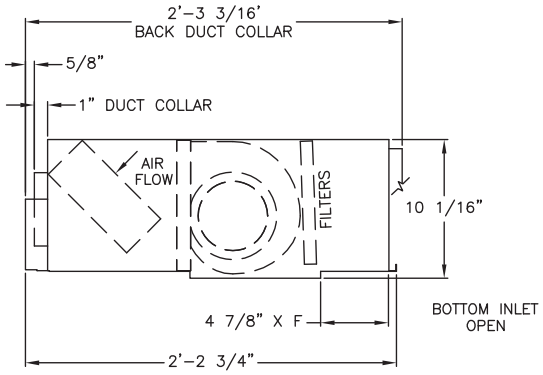
Notes:
1. Coil connections are always opposite the control box.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. See p. 58 for dimensions for air openings.

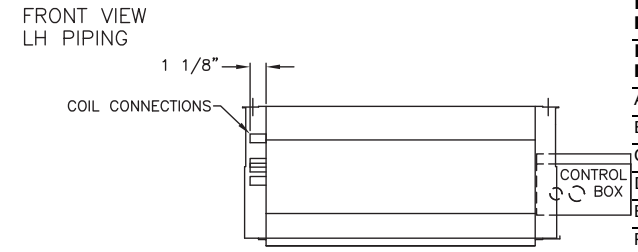
Horizontal Concealed, Model C









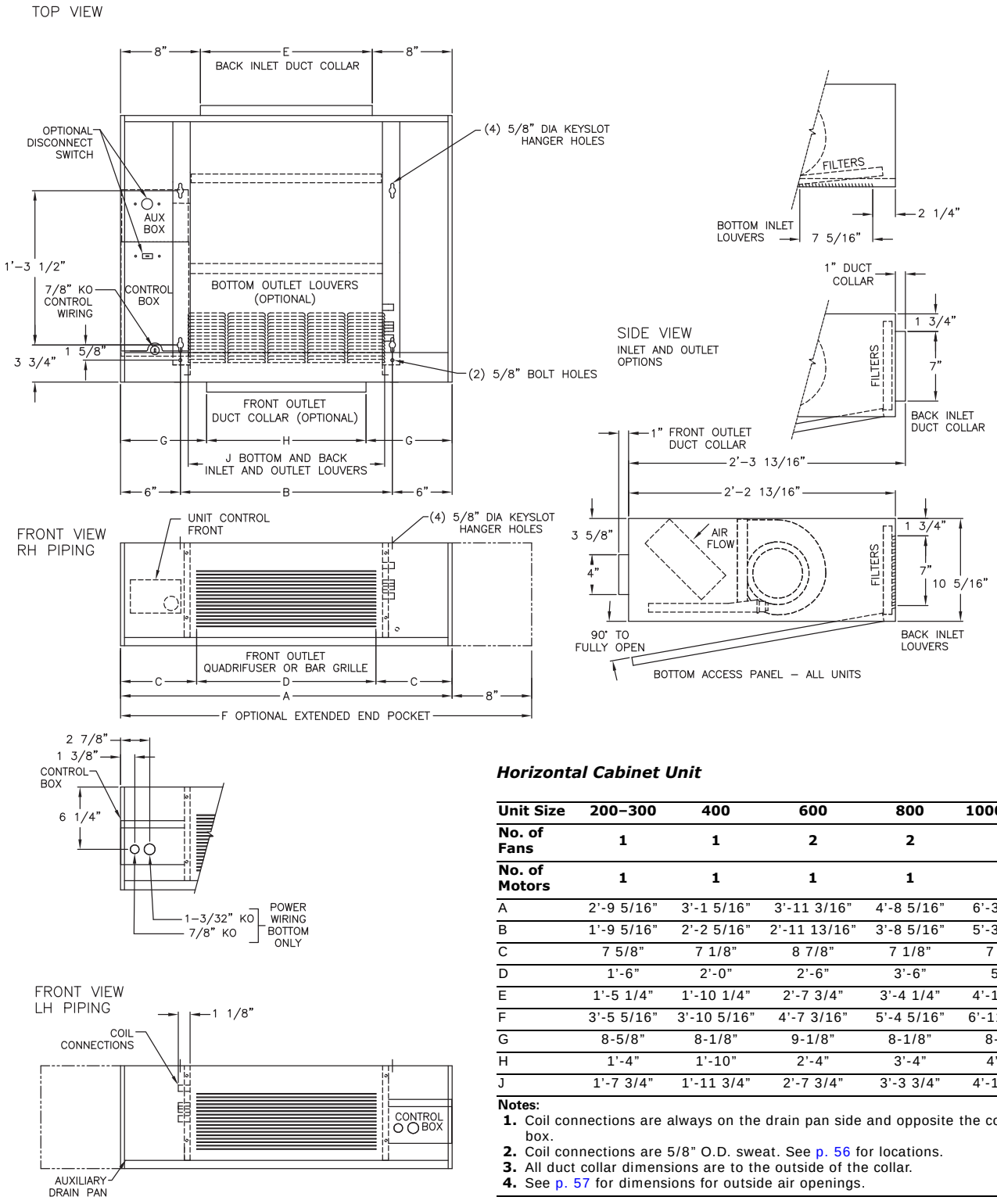


Horizontal Concealed Unit

Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-4 1/16"	2'-9 1/16"	3'-6 9/16"	4'-3 1/16"	1'-10 1/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	1'-7 3/8"	2'-0 3/8"	2'-9 7/8"	3'-6 3/8"	5'-1 3/8"
E	1'-6 1/8"	1'-11 1/8"	2'-8 5/8"	3'-5 1/8"	5'-0 1/8"
F	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"

Notes:
1. Coil connections are always opposite the control box.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. All duct collar dimensions are to the outside of the collar.
4. See p. 58 for dimensions for air openings.

Horizontal Cabinet, Model D

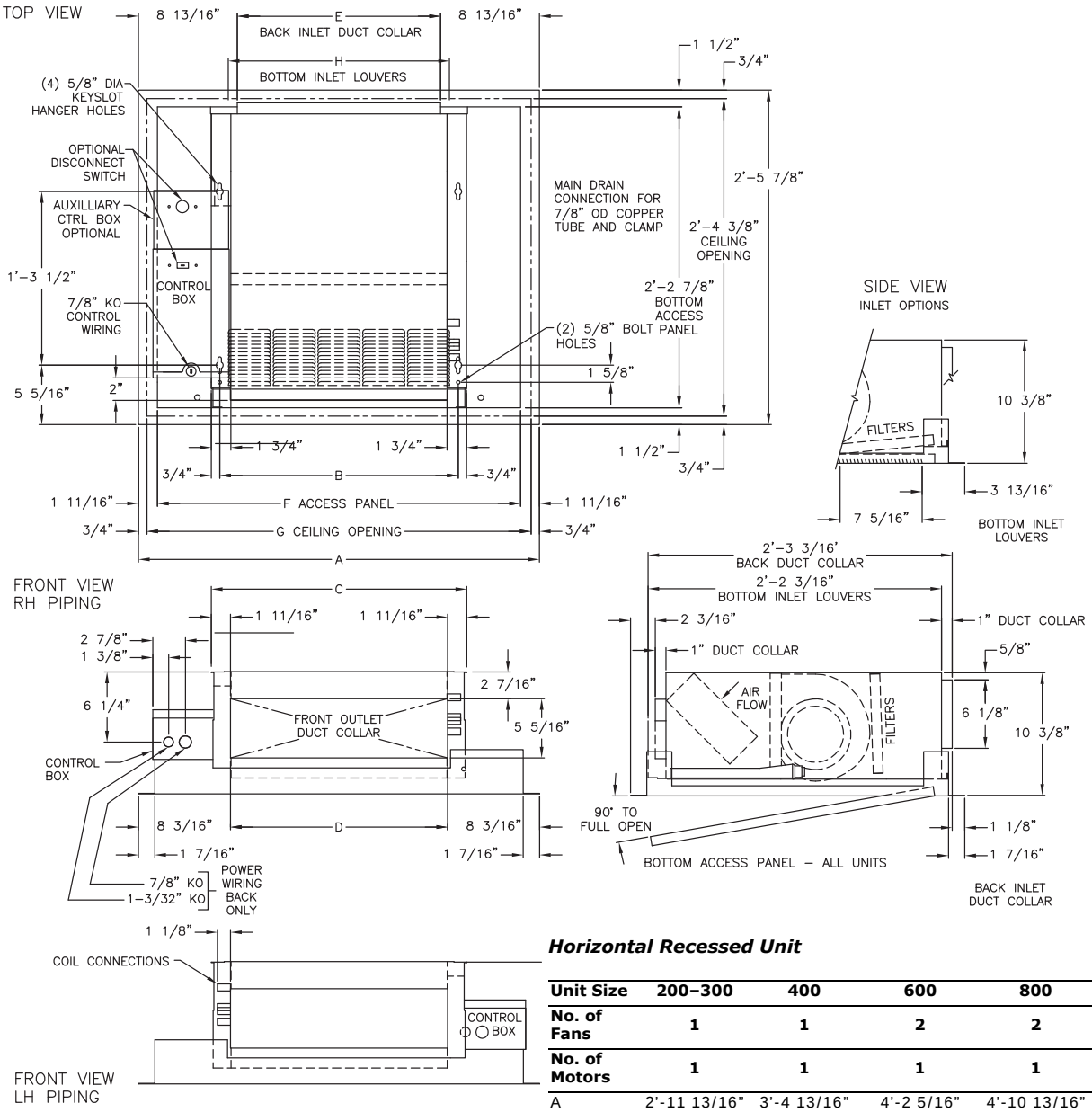


Horizontal Cabinet Unit

Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-9 5/16"	3'-1 5/16"	3'-11 3/16"	4'-8 5/16"	6'-3 5/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	7 5/8"	7 1/8"	8 7/8"	7 1/8"	7 5/8"
D	1'-6"	2'-0"	2'-6"	3'-6"	5'-0"
E	1'-5 1/4"	1'-10 1/4"	2'-7 3/4"	3'-4 1/4"	4'-11 1/4"
F	3'-5 5/16"	3'-10 5/16"	4'-7 3/16"	5'-4 5/16"	6'-11 5/16"
G	8-5/8"	8-1/8"	9-1/8"	8-1/8"	8-5/8"
H	1'-4"	1'-10"	2'-4"	3'-4"	4'-10"
J	1'-7 3/4"	1'-11 3/4"	2'-7 3/4"	3'-3 3/4"	4'-11 3/4"

Notes:
1. Coil connections are always on the drain pan side and opposite the control box.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. All duct collar dimensions are to the outside of the collar.
4. See p. 57 for dimensions for outside air openings.

Horizontal Recessed, Model E

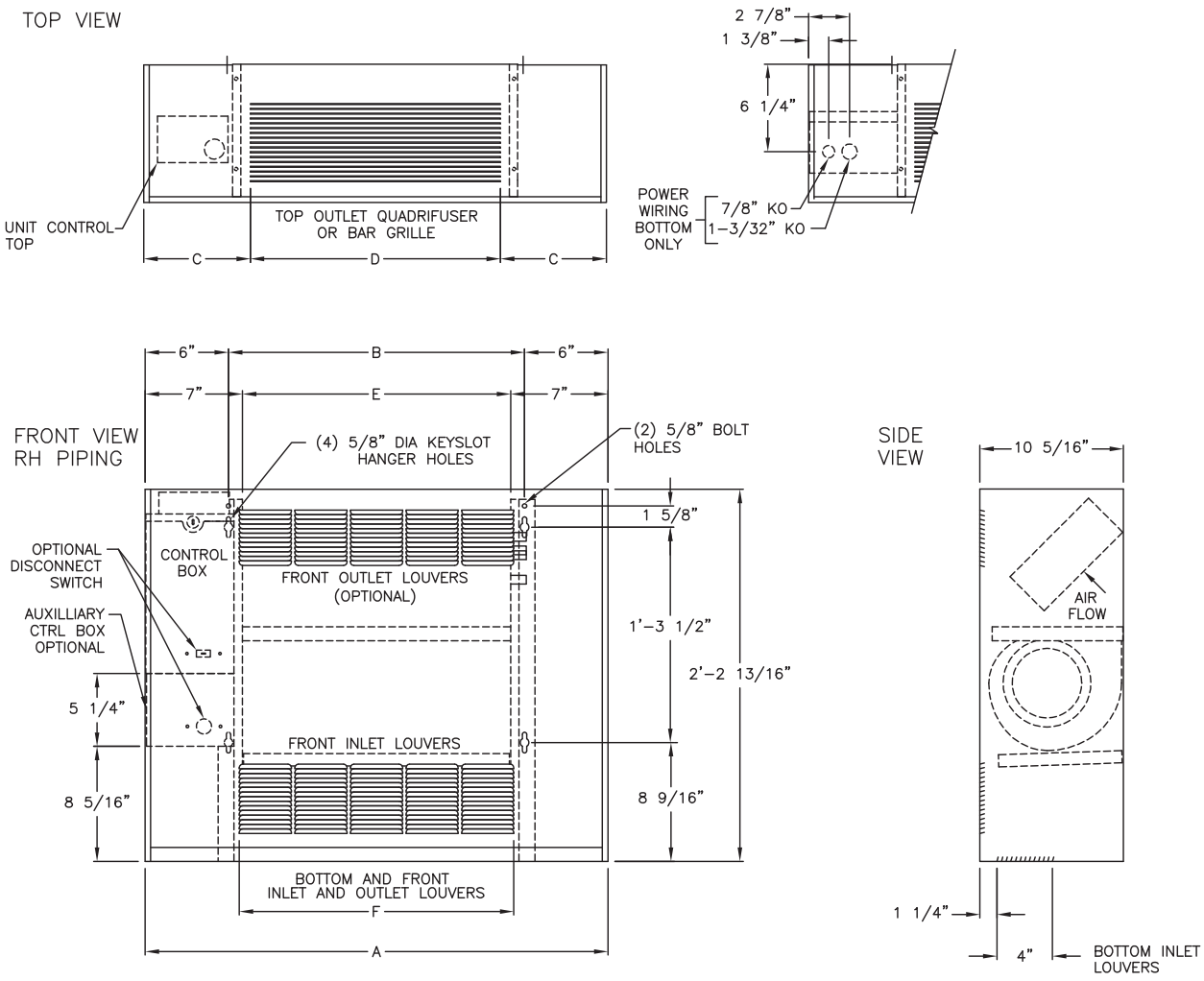


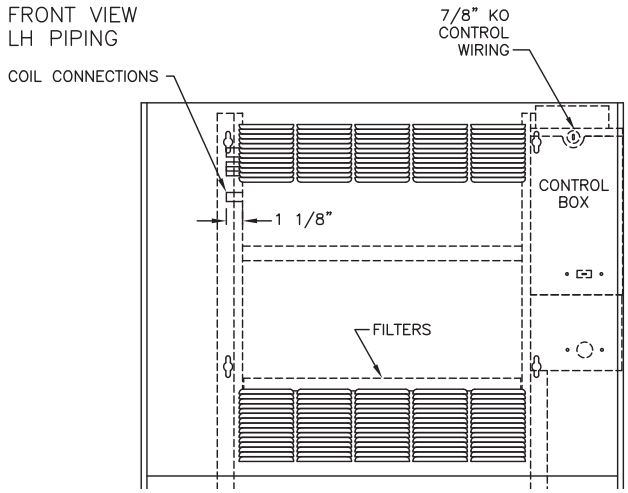
Horizontal Recessed Unit

Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-11 13/16"	3'-4 13/16"	4'-2 5/16"	4'-10 13/16"	6'-5 13/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	1'-7 3/8"	2'-0 3/8"	2'-9 7/8"	3'-6 3/8"	5'-1 3/8"
E	1'-6 1/8"	1'-11 1/8"	2'-8 5/8"	3'-5 1/8"	5'-0 1/8"
F	2'-8 7/16"	3'-1 7/16"	3'-10 15/16"	4'-7 7/16"	6'-2 7/16"
G	2'-10 5/16"	3'-3 5/16"	4'-0 13/16"	4'-9 5/16"	6'-4 5/16"
H	1'-7 3/4"	1'-11 3/4"	2'-7 3/4"	3'-3 3/4"	4'-11 3/4"

Notes:
1. Coil connections are always opposite the drain pan side.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. All duct collar dimensions are to the outside of the collar.
4. See p. 57 for dimensions for outside air openings.

Vertical Wall Hung Cabinet, Model F



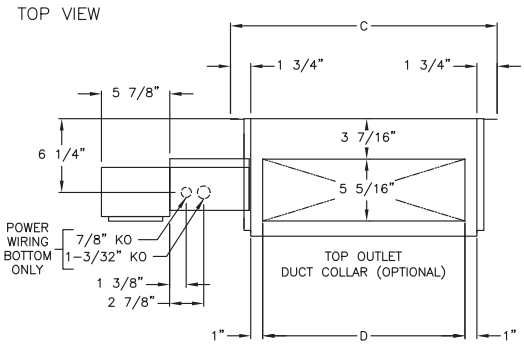


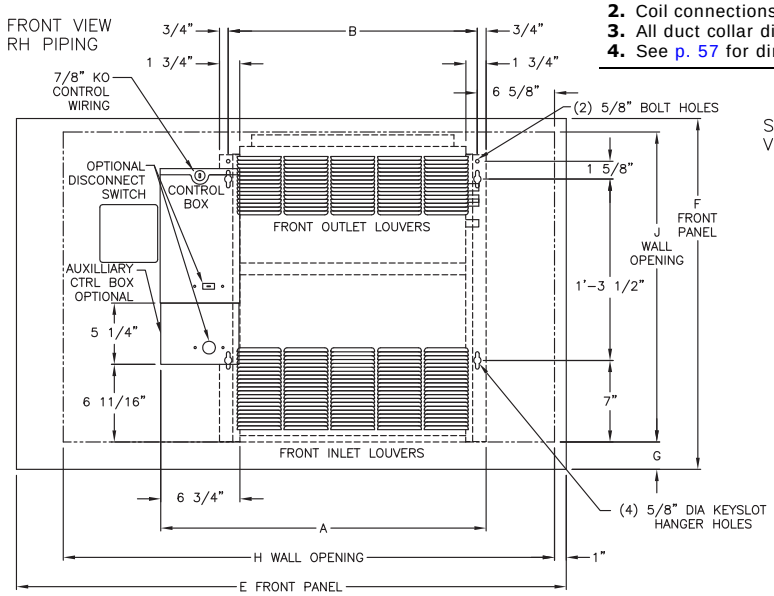
Vertical Wall Hung Cabinet Unit

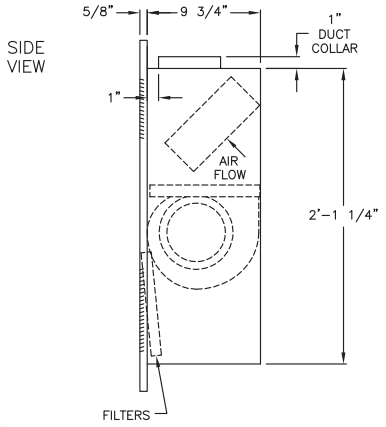
Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-9 5/16"	3'-2 5/16"	3'-11 13/16"	4'-8 5/16"	6'-3 5/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	7 5/8"	7 1/8"	8 7/8"	7 1/8"	7 5/8"
D	1'-6"	2'-0"	2'-6"	3'-6"	5'-0"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"
F	1'-7 3/4"	1'-11 3/4"	2'-7 3/4"	3'-3 3/4"	4'-11 3/4"

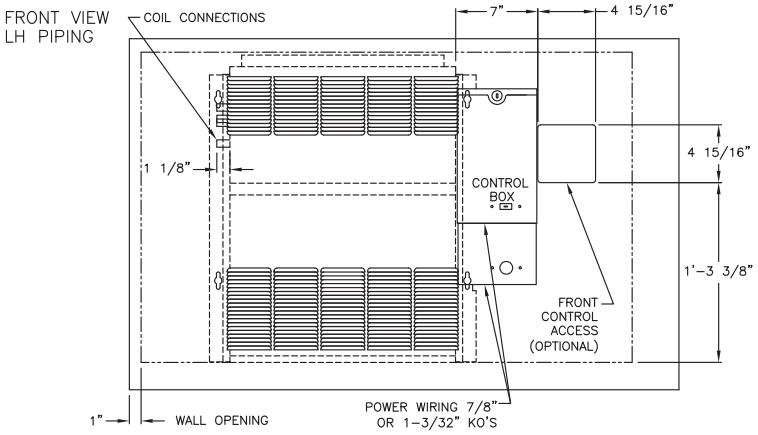
Notes:
1. Coil connections are always opposite the control box side.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. All duct collar dimensions are to the outside of the collar.
4. See p. 58 for dimensions for outside air openings.

Vertical Recessed, Model H







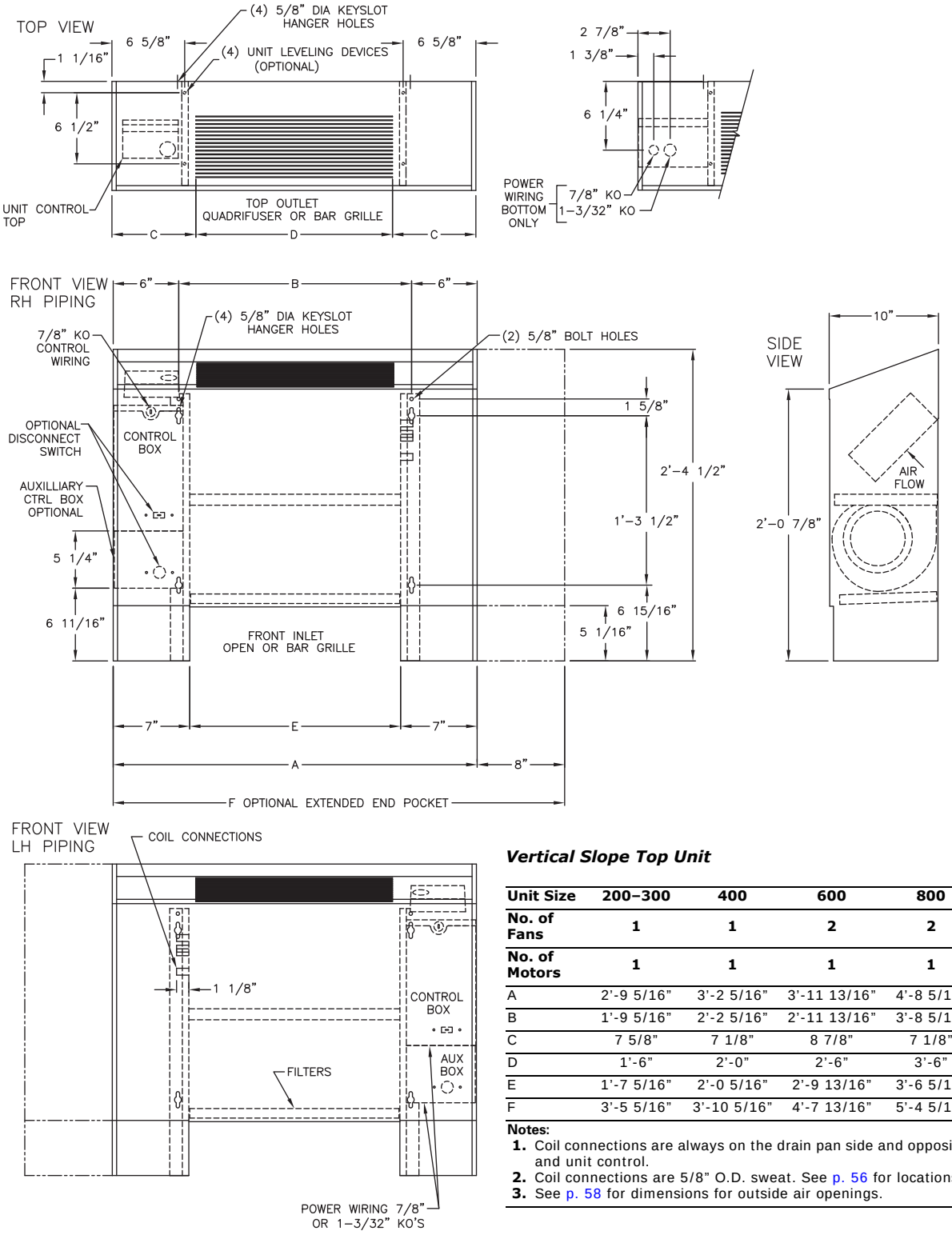


Vertical Recessed Unit

Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-3 7/8"	2'-8 7/8"	3'-6 3/8"	4'-2 7/8"	5'-9 7/8"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	1'-5 5/16"	1'-10 5/16"	2'-7 13/16"	3'-4 5/16"	3'-11 5/16"
E	3'-11"	4'-3"	5'-3"	5'-5 1/2"	7'-5 1/2"
F	2'-6"	2'-6"	2'-6"	2'-9 1/2"	2'-9 1/2"
G	2-3/8"	2-3/8"	2-3/8"	4-1/8"	4-1/8"
H	3'-6"	4'-0"	4'-9"	5'-3"	7'-3"
J	2'-2 1/2"	2'-2 1/2"	2'-2 1/2"	2'-3 1/2"	2'-3 1/2"

Notes:
1. Coil connections are always on the drain pan side and opposite the control box.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. All duct collar dimensions are to the outside of the collar.
4. See p. 57 for dimensions for outside air openings.

Vertical Slope Top, Model J

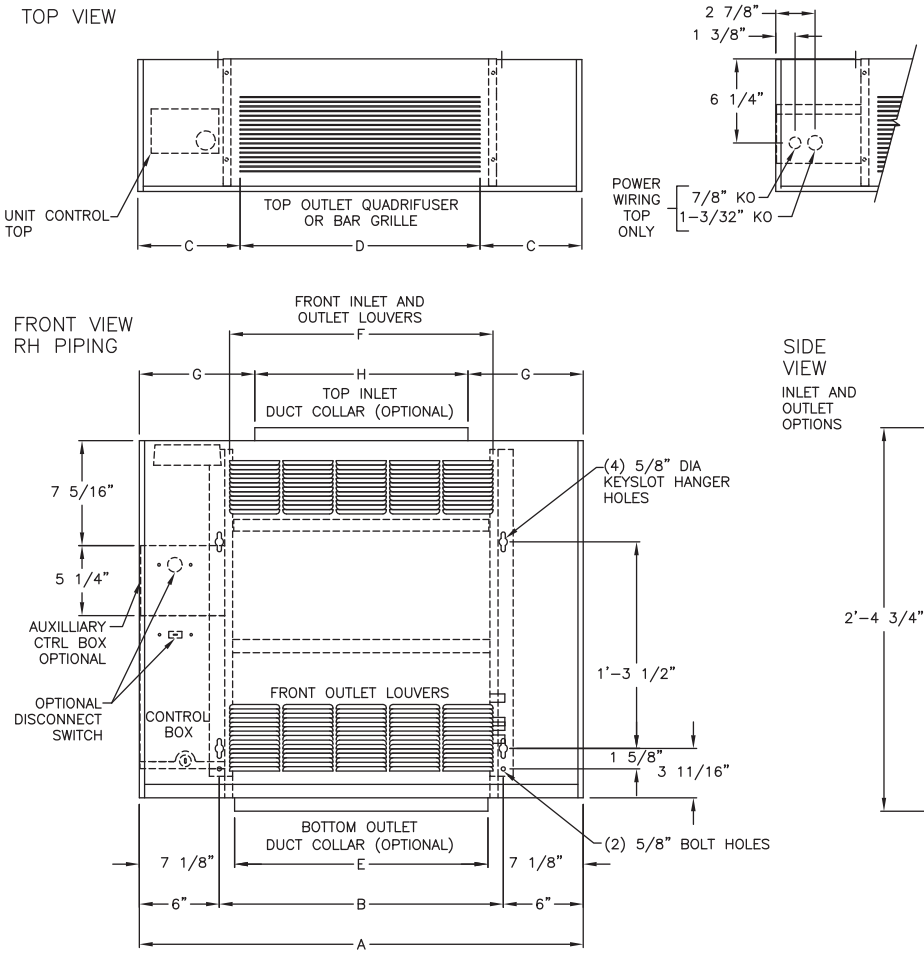


Vertical Slope Top Unit

Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-9 5/16"	3'-2 5/16"	3'-11 13/16"	4'-8 5/16"	6'-3 5/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	7 5/8"	7 1/8"	8 7/8"	7 1/8"	7 5/8"
D	1'-6"	2'-0"	2'-6"	3'-6"	5'-0"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"
F	3'-5 5/16"	3'-10 5/16"	4'-7 13/16"	5'-4 5/16"	6'-11 5/16"

Notes:
1. Coil connections are always on the drain pan side and opposite the control box and unit control.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. See p. 58 for dimensions for outside air openings.

Inverted Vertical Cabinet, Model M



Inverted Vertical Cabinet Unit

Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2'-9 5/16"	3'-2 5/16"	3'-11 13/16"	4'-8 5/16"	6'-3 5/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	7 5/8"	7 1/8"	8 7/8"	7 1/8"	7 5/8"
D	1'-6"	2'-0"	2'-6"	3'-6"	5'-0"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"
F	1'-7 3/4"	1'-11 3/4"	2'-7 3/4"	3'-3 3/4"	4'-11 3/4"

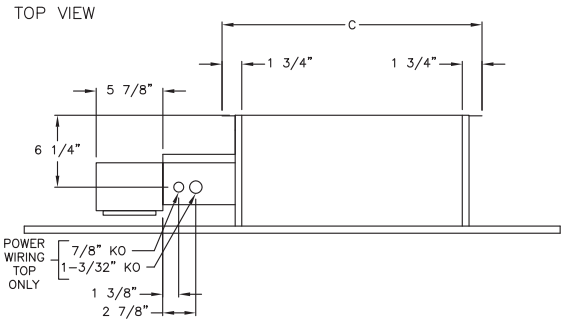
Notes:
1. Coil connections are always opposite the control box side.
2. Coil connections are 5/8" O.D. sweat. See p. 56 for locations.
3. All duct collar dimensions are to the outside of the collar.
4. See p. 58 for dimensions for outside air openings.

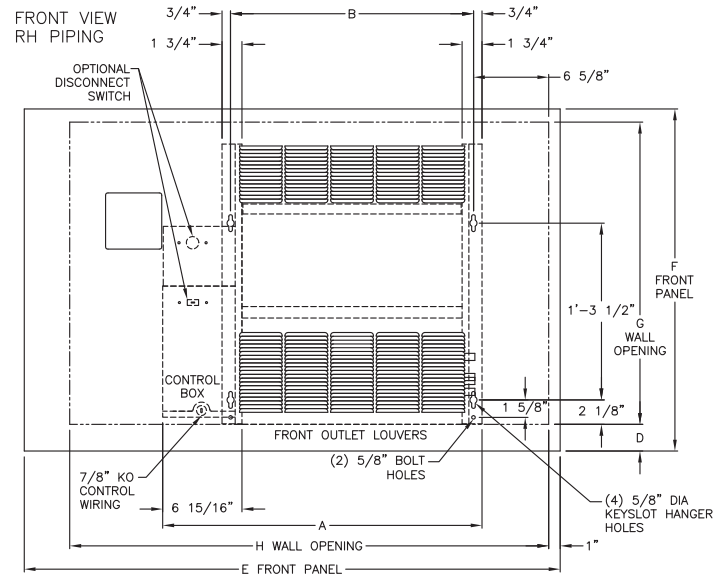
Inverted Vertical Recessed, Model N

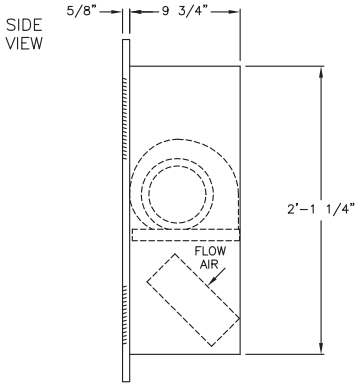
Inverted Vertical Recessed Unit

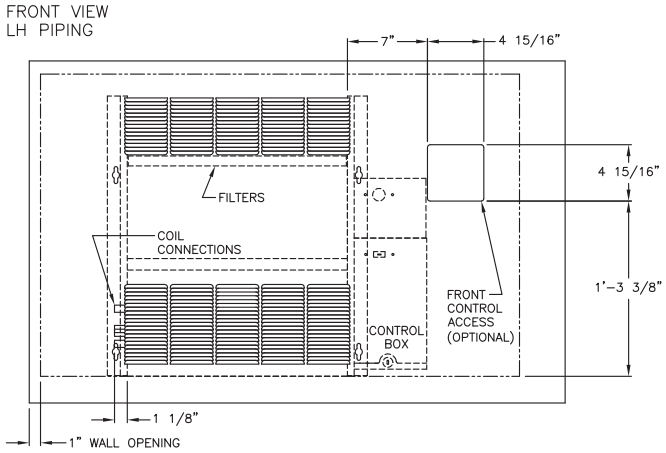
Unit Size	200–300	400	600	800	1000-1200
No. of Fans	**1**	**1**	**2**	**2**	**3**
No. of Motors	**1**	**1**	**1**	**1**	**2**
A	2’-3 7/8”	2’-8 7/8”	3’-6 3/8”	4’-2 7/8”	5’-9 7/8”
B	1’-9 5/16”	2’-2 5/16”	2’-11 13/16”	3’-8 5/16”	5’-3 5/16”
C	1’-10 13/16”	2’-3 13/16”	3’-1 5/16”	3’-9 13/16”	5’-4 13/16”
D	2’ 3/8”	2’ 3/8”	2’ 3/8”	4’ 1/8”	4’ 1/8”
E	3’-11”	4’-3”	5’-3”	5’-5 1/2”	7’-5 1/2”
F	2’-6”	2’-6”	2’-6”	2’-9 1/2”	2’-9 1/2”
E	2’-2 1/2”	2’-2 1/2”	2’-2 1/2”	2’-3 1/2”	2’-3 1/2”
F	3’-6”	4’-0”	4’-9”	5’-3”	7’-3”

Notes:
1. Coil connections are always opposite the control box side.
2. Coil connections are 5/8” O.D. sweat. See p. 56 for locations.
3. See p. 58 for dimensions for outside air openings.



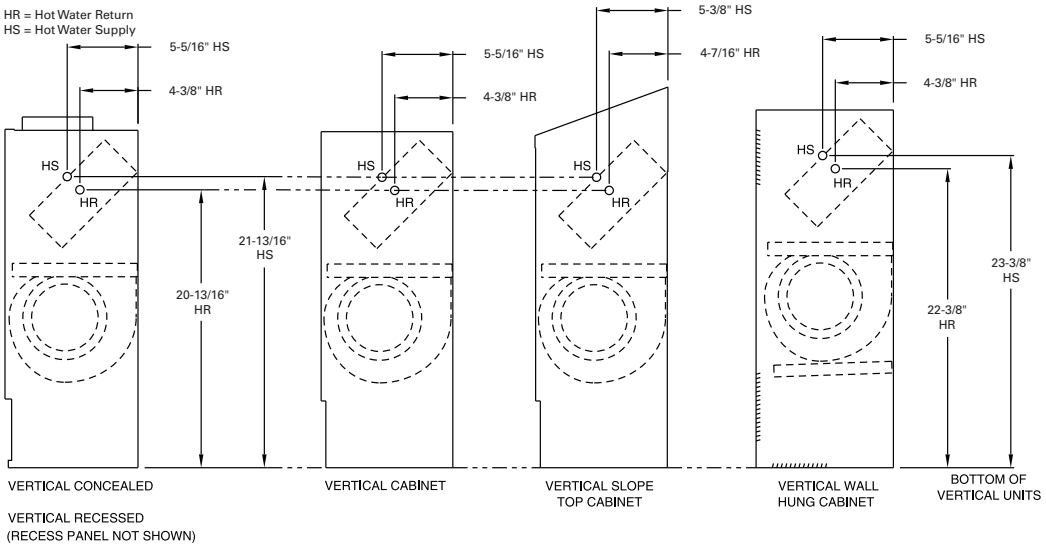




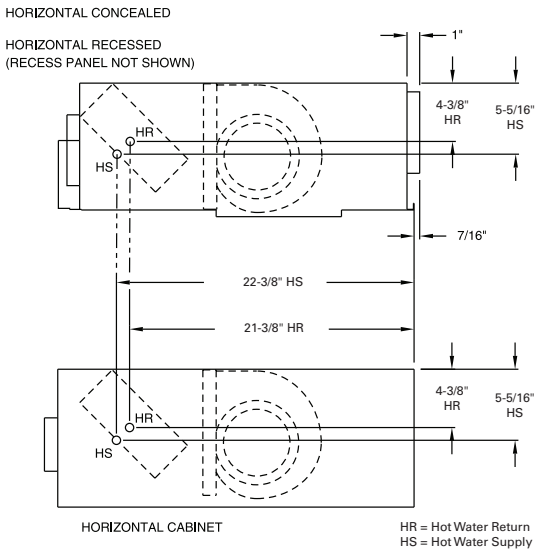


Coil Connections

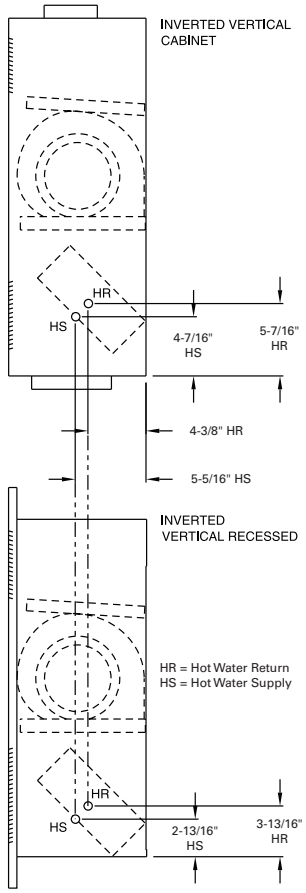
Vertical Units



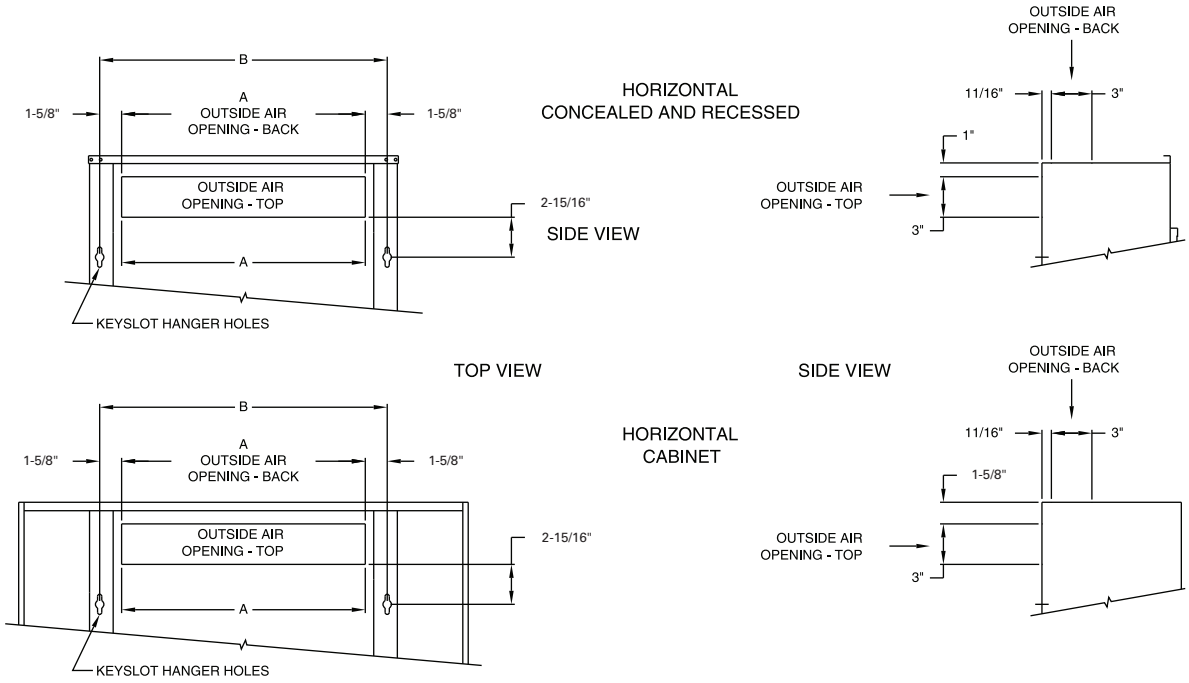
Horizontal Units



Inverted Units



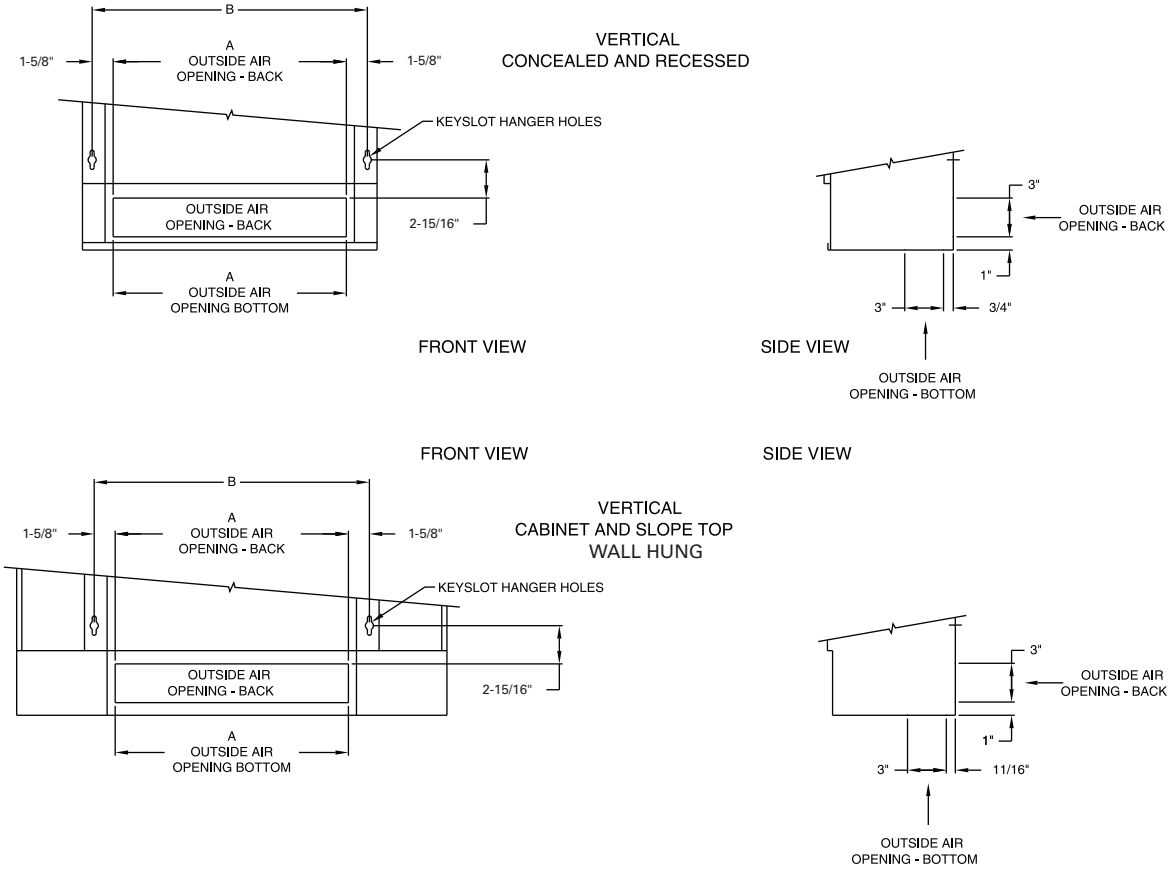
Fresh Air Opening Locations-Horizontal Units Models C, D, and E



Fresh Air Opening Dimensions, Horizontal Units

Unit Size	02–03	04	06	08	10–12
A	18”	23”	32-1/2”	41”	60”
B	21-5/16”	26-5/16”	35-13/16”	44-5/16”	63-5/16”

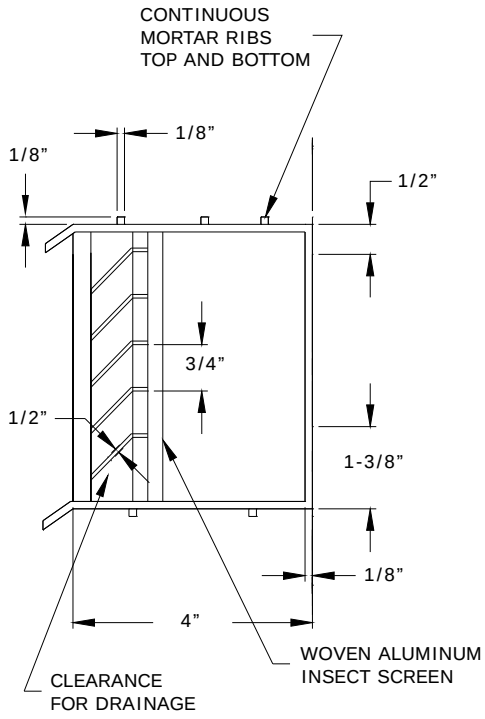
Fresh Air Opening Locations-Vertical Units Models A, B, F, and J



Fresh Air Opening Dimensions, Vertical Units

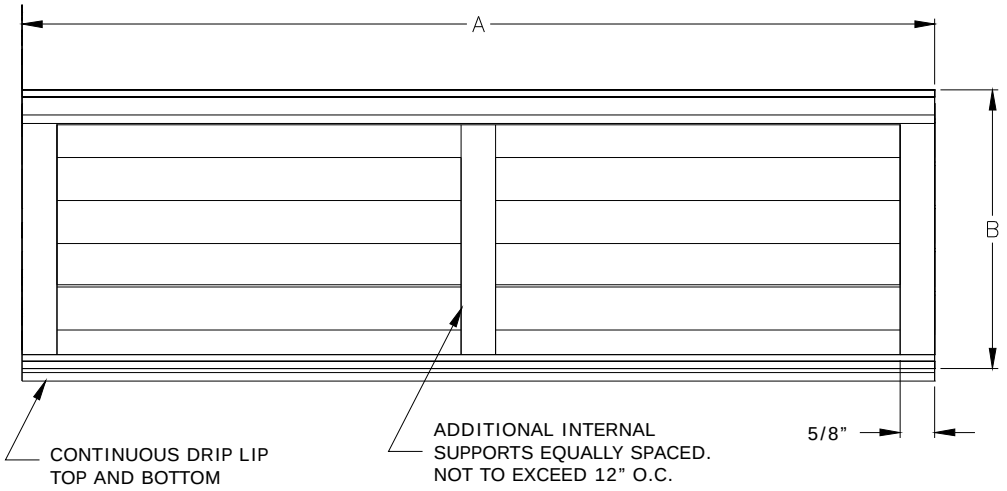
Unit Size	02–03	04	06	08	10–12
A	18”	23”	32-1/2”	41”	60”
B	21-5/16”	26-5/16”	35-13/16”	44-5/16”	63-5/16”

Wall Box



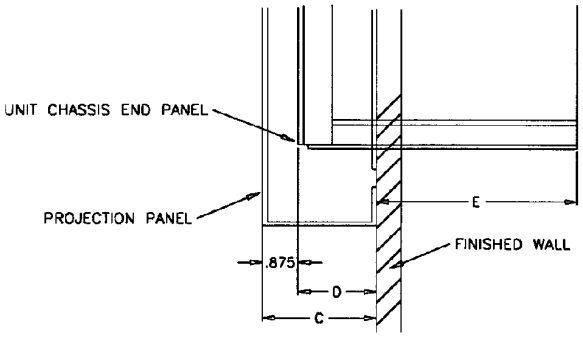
Wall Box Dimension

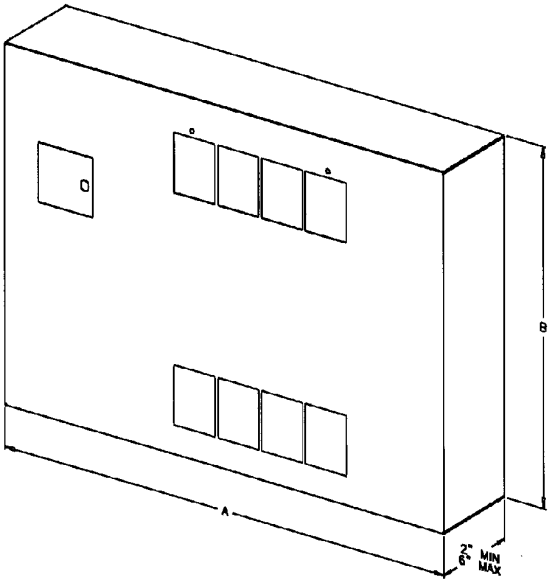
Unit Size Ref. Only	Dimensions A x B	Internal Supports
02–03	24-3/8" x 4-3/4"	1
04	24-3/8" x 7-1/2"	1
06	33-1/8" x 7-1/2"	2
08	37-1/2" x 7-1/2"	3
10–12	58-1/4" x 7-1/2"	4



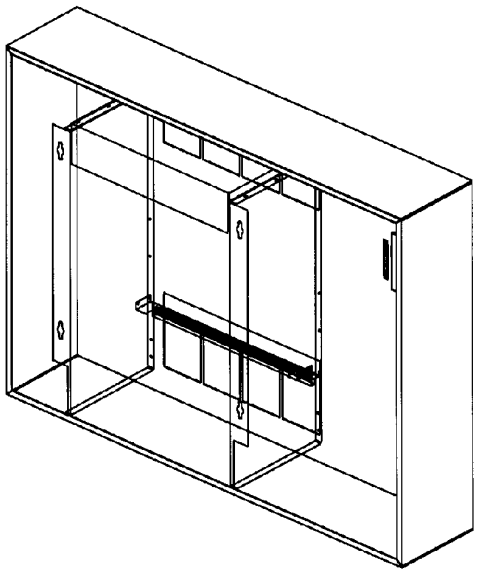
Projection Panel

UNIT TO WALL-TOP VIEW





FRONT VIEW ISO



REAR VIEW ISO

Projection Panel Dimensions

Unit Size	02–03	04	06	08	10–12
A	47”	51”	63”	65-1/2”	89-1/2”
B	30”	30”	30”	339-1/2”	33-1/2”

Projection Panel Dimensions

C	2”	2-1/2”	3”	3-1/2”	4”	4-1/2”	5”	5-1/2”	6”
D	1-1/8”	1-5/8”	2-1/8”	2-5/8”	3-1/8”	3-5/8”	4-1/8”	4-5/8”	5-1/8”
E	8-5/8”	8-1/8”	7-5/8”	7-1/8”	6-5/8”	6-1/8”	5-5/8”	5-1/8”	4-5/8”

Mechanical Specifications

Force-Flo Cabinet Heater Mechanical Specifications

Performance Data

Capacity: Unit capacities are in accordance with Industry Room Fan-Coil Air Conditioner Certification Program under ARI Standard 440-97. Safety: All standard units are UL listed in the United States and Canada. Units comply with NFPA90A requirements.

Construction-All Units

The unit includes a chassis, coil, fan wheel(s), fan casing(s), fan board, and motor(s). The fan board assembly is easily removable. The fan board assembly includes a quick-disconnect motor plug. The chassis construction is 18-gage galvanized steel, and continuous throughout the unit. The unit is acoustically and thermally insulated with closed-cell insulation. All panels are made rigid by channel forming.

Vertical Cabinet and Slope Top Units

Front panel fabrication is 16-gage galvanized steel. All other panels are 18-gage galvanized steel. Hinged access door construction is 20-gage steel and is flush with top panel.

Vertical Wall Hung Unit

Front panel fabrication is 16-gage galvanized steel. All other panels are 18-gage galvanized steel. Side panels are removable for piping access.

Horizontal Cabinet Units

All panels are 18-gage galvanized steel, including the bottom panel. The hinged access door is flush with front panel. Bottom panels ship with tamperproof screw fasteners and safety chain.

Concealed/Recessed Units

Exposed panels on recessed units are 18-gage steel construction and ship separate from the unit. Bottom panels on horizontal recessed models ship with tamperproof screw fasteners and safety chain. Horizontal recessed units feature a telescoping panel to allow the panel to be adjusted to line up flush with the ceiling. The telescoping panel extends 1.25″ to 2″ depending on the configuration of airflow.

Unit Finish

All cabinet parts and exposed recessed panels are cleaned, bonderized, phosphatized, and painted with a baked powder finish available in six decorator colors. Standard finish meets ASTM B117 specifications (salt spray test).

Fans

The galvanized metal fan wheels are centrifugal forward-curved and double-width. Fan wheels and housings are corrosion resistant. Fan housing construction is formed sheet metal.

Motors

All motors are brushless DC (BLDC)/electronically commutated motors (ECM) factory-programmed and run-tested in assembled units. The motor controller is mounted in a touch-safe control box with a built-in integrated user interface and LED tachometer. If adjustments are needed, motor parameters can be adjusted through momentary contact switches accessible without factory service personnel on the motor control board.

Motors will soft-ramp between speeds to lessen the acoustics due to sudden speed changes. Motors can be operated at three speeds or with a field-supplied variable speed controller. The motor will choose the highest speed if there are simultaneous/conflicting speed requests.

All motors have integral thermal overload protection with a maximum ambient operating temperature of 104°F and are permanently lubricated. Motors are capable of starting at 50 percent

of rated voltage and operating at 90 percent of rated voltage on all speed settings. Motors can operate up to 10 percent over voltage.

Controls

Controls options are: fan speed switch, control interface, and Tracer UC400, ZN010, ZN510, and ZN520. A variety of inputs and outputs are available for the control interface and Tracer controller options. A disconnect switch (for non-electric heat units), fused transformer, contactor(s), and terminal strip are provided with the control interface and Tracer controller options. For specifics on the Tracer UC400, ZN010, ZN510, and ZN520, please refer to "Controls," p. 29.

Control Interface

The control interface is intended to be used with a field-supplied, low-voltage thermostat or controller. The control box contains a relay board which includes a line voltage to 24-volt transformer, quiet contactors (for electric heat units), and an optional disconnect switch. All end devices are wired to a low-voltage terminal block and are run-tested, so the only a power connection and thermostat connection is needed to commission the unit. Changeover sensors and controls are provided whenever a change-over coil is selected. When NO valves are selected, inverting relays are provided for use with standard thermostats.

Fan Speed Switch

The fan speed switch is available with or without the control interface option and is available as wall-mount or unit-mount. Both the wall-mount and unit-mount FSS will employ low-voltage fan switches. However, the low-voltage fan speed option will provide an interface to factory wiring, including variable-speed/high-medium-low (HML) control. The control box contains a line voltage to 24-volt transformer, ECM motor controller, and an optional disconnect switch.

Hot Water Coils

Hot water coils are proof tested at 350 psig (air under water) and leak tested at 125 psig (air under water). Additionally a pressure decay test is conducted at 120 psig.

Maximum main coil working pressure is 300 psig. Maximum entering water temperature is 200°F. Tubes and u-bends are 3/8"OD copper. Fins are aluminum and are mechanically bonded to the copper tubes. Coil stubouts are 5/8"OD copper tubing.

Steam Coils

The steam heating coil is a one-row, tube-in-tube distributing type coil. Coil construction is aluminum fins mechanically bonded with 1"OD copper tubing. Steam coils are (air) burst tested at 250 psig. Maximum steam coil working pressure is 100 psig. Maximum entering steam temperature is 325°F. Tubes and u-bends are 5/8" OD copper. Fins are aluminum, 9 fpi, and are mechanically bonded to the copper tubes. Coil stubouts are 1" OD copper tubing. Piping is field-supplied.

Piping Packages (Hot Water Coils Only)

All piping packages are proof-tested at 350 psig (air under water) and leak-tested at 125 psig (air under water). The maximum working pressure of the interconnecting piping is 300 psig.

Piping packages are available in either basic or deluxe configurations. The deluxe package includes unions at the coil connections and a 20 mesh strainer on the supply side with a pressure rating on the strainer of up to 400 psig. The basic package does not include either unions or the strainer.

End valve options available on both the basic and deluxe piping packages include ball valves, manual circuit setters, and auto circuit setters.

Ball Valve Supply and Return

A ball-type stop valve is on the piping supply and return. The ball valve is a shutoff valve only with a maximum working pressure of 400 psig.

Ball Valve Supply, Manual Circuit Setter Return

A ball valve is provided on the supply with a manual circuit setter on the return. The manual circuit setter is a combination flow-setting device and shutoff valve that includes two Schrader ports. The maximum working pressure of the valve is 300 psig.

Ball Valve S & R, Auto Circuit Setter Return

Ball type end valves are mounted on the supply and return, with an additional auto circuit setter mounted on the return. The auto circuit setter is an automatic flow control valve that is sized to allow a specific flow rate through the coil. Auto circuit setters also include two P/T plugs and have a maximum working pressure of 400 psig.

Control Valve Options

All control valves have a maximum working pressure of 300 psig. The maximum entering water temperature of the valve is 200°F.

Two-Way, Two-Position Control Valves

When using two-way valves, use some means such as a pump and chiller bypass to ensure the maximum closed off DP rating of the valve is not exceeded. Two-way, two-position valves are rated for a maximum pressure differential across the valves of 30 psig. The valves are also available with a close-off pressure of 50 psig. The valve actuator is easily removable for service without removing the valve body from piping.

Three-Way, Two-Position Control Valves

Normally open three-way, two-position valves are rated for a maximum 28 psig pressure differential across the valve. Normally closed three-way two-position valves are rated for a maximum 20 psig pressure differential across the valve. All 3-way valve piping packages include a bypass line with a balance fitting to set flow through the bypass line. The balance fitting has a maximum working pressure of 150 psig. The valves are also available with a maximum close-off pressure of 50 psig. The valve actuator is easily removable for service without removing the valve body from piping.

Modulating Control Valves

Two-way and three-way modulating valves are rated for a maximum 50 psig pressure differential across the valve. Modulating valves are available in Cv values of 0.7, 1.5, 2.5, and 4.0.

Electric Heat Coil

A single- or dual-stage electric heating coil is provided as the total source of heat. Electric heat coils are open-wire type. The coils are a nickel-chromium element design. The electric heat operates at the same voltage as the unit, and only a single power connection is necessary.

All units with factory-mounted electric heat are UL-listed and interlocked with the fan motor switch. A call for electric heat operation will turn the fan on. Motors controls are synchronized with fan/valve operation to ensure safe operation and to ensure that two modes of heat are not operating simultaneously. A transformer is supplied on any voltage unit, eliminating the need for field installation of a step-down transformer. Unit-mounted quiet magnetic relays are supplied on all voltages. A line-break high temperature cutout with automatic reset is provided as an integral part of the elements to de-energize the electric heat in the event of a malfunction.

Filters

Filters are concealed from sight and easily removable. Filters are located behind an integral access door on horizontal type units. Filters are either 1″ throwaway, MERV 8, or MERV 13.

Units equipped with 1″ MERV 8 filters have a rating based on ASHRAE Standard 52.2. The average dust spot efficiency is no less than 35 to 40 percent when tested in accordance with ASHRAE 52.1 atmospheric dust spot method.

Units equipped with 1" MERV 13 filters have a rating based on ASHRAE Standard 52.2. The average dust spot efficiency is no less than 90 percent efficiency on 1–3 micron particles and greater than 90 percent efficiency on 3–10 micron particles when tested in accordance with ASHRAE Test Standard 52.2.

Fresh Air Damper

A fresh air opening with damper is a factory-installed option. Dampers are constructed of 18-gage steel. Fresh air is sealed off with gasket material when the damper is set in the closed position. Return and fresh air mixes when the damper is open.

Manual Damper

The manual damper is field-adjustable to allow zero to 100 percent fresh air. The automatic two-position damper is accompanied by a factory-installed and wired two-position (spring-return) actuator.

Auto Two-Position Damper

The auto two-position damper is factory set at 25 percent when open. The damper can be set in the field to allow from zero to 50 percent fresh air.

Disconnect Switch

A unit mounted disconnect switch is available as a standard option on all units (except electric heat units).

Colors

Six decorator colors are available in a baked powder finish. For a color chart, contact your local Trane office for a copy of UNT-SLB017-EN (*Color Selector: Cabinet Heaters, Fan-Coils, Unit Ventilators, & Water-Source Heat Pump Consoles*).

Extended End Pockets

On vertical or horizontal cabinet units, an 8" extended end pocket is available on the piping end.

Tamperproof Locks

Key-operated locking access doors and/or panels will help prevent nuisance tampering with unit and/or controls. Tamperproof locks are available on vertical cabinet, horizontal cabinet, vertical wall-hung cabinet, vertical recessed, and vertical slope-top units.

Leveling Feet

Refrigerator type screw-in bolts to level the unit are available on vertical units.

Quad Grille Outlet

Quad grilles are square multi-directional grilles that allow four different discharge directions by rotating the grilles 90°. The quad grille is constructed of a black plastic material (NORYL-SE 1-731) with a 15° angle on the discharge louvers. Quad grilles are available on all cabinet style units.

Bar Grille Inlet/Outlet

Bar grilles are formed steel grille options available on the discharge of all units and the return of vertical cabinet and vertical slope tops. The grilles have a black paint finish with 18-gage steel construction. The louvers are formed at a 15° angle. The bar grilles are fixed in one discharge direction.

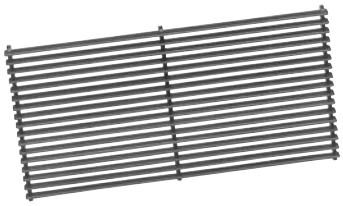
Sub-bases

Sub-bases elevate vertical cabinet or slope top cabinet units to a specified height; for example, to reach the bottom of a window sill. The sub-base also provides a cavity through which to run piping underneath the unit. Sub-bases are 16-gage steel construction and have the same black paint finish

as the unit's base. The sub-base is available in heights between 2″–7″ (5 cm–18 cm) in 1/2″ (1 cm) increments. The sub-base depth and width is identical to the unit's dimensions.

Quad grille outlet

Bar grille inlet and outlet



Sub-base (shown turned on its side)

False Backs

False backs increase the depth of a vertical cabinet unit and provide a cavity through which to run piping behind the unit. False backs are also an excellent application when installing a unit beneath a window sill that extends out past the front of the unit.

False backs are 18-gage steel construction and have the same paint finish as the unit. The false back is available in depths between 2″–8″ in 1″ increments, with height and width identical to the unit's dimensions.

Recessing Flanges

Recessing flanges have 18-gage steel construction and are painted the same finish as the unit. Recessing flanges provide an aesthetic architectural border or frame around vertical and horizontal cabinet units.

Aluminum Wall Boxes

Wall boxes have a clear anodized finish and include a single core wire mesh insect screen. The frame is 10-gage extruded aluminum alloy 6063-T5 construction. Horizontal louvers have 16-gage extruded aluminum alloy 6063-T5 construction.

Wall boxes ship separate for field installation. A field supplied duct or sleeve from the wall box to the unit fresh air opening is required to provide fresh air. Wall boxes are sized to handle up to 100 percent of nominal airflow.

Projection Panels

Projection panels allow semi-recessing of vertical recessed units.

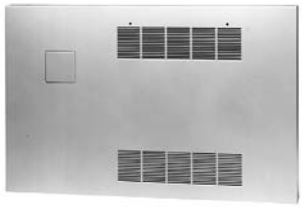
Panels are 16-gage steel construction, painted with a baked powder finish. They are available in projection depths ranging from 2″–6″ in 1/2″ increments. There is a distance of 7/8″ between the projection panel and the front of the unit.

False back

Recessing flange

Wall box

Project panel



Piping Components

Ball Valve

Part	Material	Spec ASTM
lever	steel, zinc plated	
seat	Teflon	VTFE
packing	Teflon	RTFE
stem	rod brass	B16
g-nut	hex brass	B16
ball	brass, chrome plated	B16
retainer	brass	B16
body	cast brass	B584-C84400

Working Pressure

400 psi

Manual Circuit Setter

Material

body-forged brass alloy

trim-forged brass alloy

all wetted parts brass

Temperature

250°F max

Working Pressure

300 psi

Auto Circuit Setter

Material

Body-Forged Brass

Flow Cartridge-Electroless Nickel and Stainless Steel

Temperature

250°F max

Working Pressure

400 psi

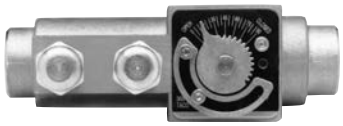
Pressure Drop

0.5–9.0 gpm = 2 psi ΔP

10.0–12.0 gpm = 5 psi ΔP

Ball valve

Manual circuit setter



Control Valve

Material

body-forged brass

drive shaft stem-chrome-plated brass (modulating) brass (2-position)

seat-stainless steel (modulating)

ball plug-Buna N rubber (2-postion)

plug-high temperature thermoplastic (modulating)

o-ring seals-EPDM rubber (2-position)

actuator-stainless steel base plate, aluminum cover

Temperature

200°F max

Working Pressure

300 psi

Pressure Drop (close-off ΔP)*

2-way, two-position, N.O. = 30 psig & 50 psig

2-way, two-position, N.C. = 30 psig & 50 psig

3-way, two-position, N.O. = 28 psig

3-way, two-position, N.C. = 20 psig

2-way modulating = 50 psig

3-way modulating = 50 psig

Balance Fitting

Material

packing washer-11 ga. brass

o-ring-EPDM rubber

stem-rod brass

gland screw-hex brass

valve body-cast brass

Union

Material

nut-forged brass

body-copper

tail-copper

Strainer

Material

body-cast bronze (85-5-5-5)

cover-cast bronze (85-5-5-5)

screen-stainless steel (20 mesh)

gasket-Teflon

Pressure and Temperature

400 psi (2,758 kPa) at 150°F (66°C)

Trane optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, Trane offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts.
For more information, visit www.Trane.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

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We are committed to using environmentally conscious print practices that reduce waste.