



# Force-Flo™ Cabinet Heater

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**Air Terminal Devices  
Horizontal and Vertical  
Sizes 02-12**



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December 2000

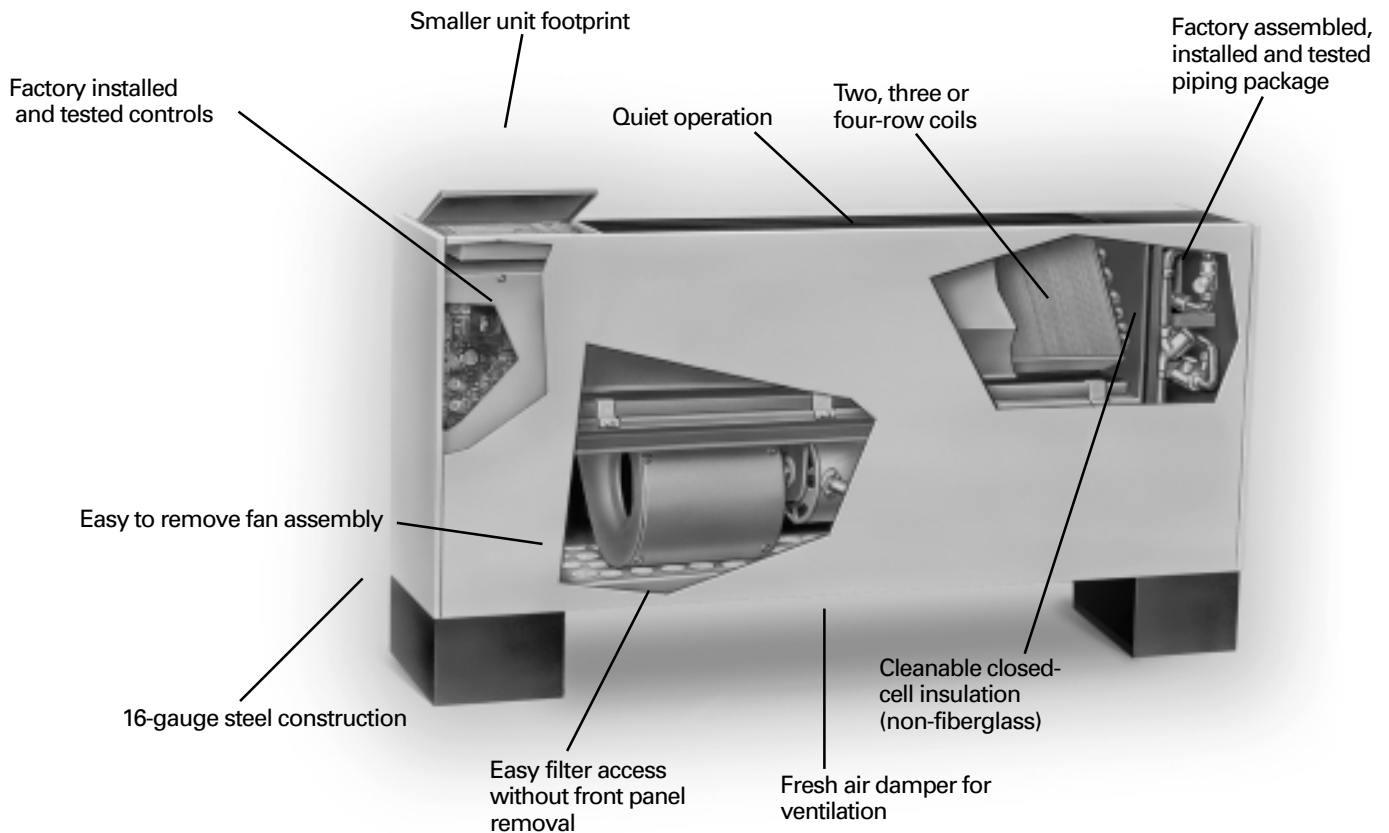
**CAB-PRC001-EN**



## It isn't just a fan and a coil...

The Trane Company 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



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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:

- 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 fully comply with ASHRAE 62.

## 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

- All controls are factory-mounted and tested to minimize field setup.
- 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 Tracer® controls family introduces the latest in control technology with the ZN.010, ZN.510, and ZN.520 controllers.
- The random start-up feature helps reduce electrical demand peaks by randomly staggering multiple units at start-up.
- 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 ZN.010 or ZN.510.
- Monitor unit operation using Tracer® Summit building management system with ZN.510 or ZN.520.
- To customize unit control, Tracer Summit or Rover™ software will allow field modification of ZN.510 and ZN.520 default settings. For ZN.010, use Rover to field modify default settings.
- Maximize cabinet heater system efficiency with modulating valves on units with ZN.520.

## 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 intercon-

necting 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 Summit® 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

- 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® ZN.510, ZN.520, or ZN.010; service personnel can manually exercise outputs in a pre-defined sequence.



# Selection Procedure

# Model Number Description

## 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.

**FF B B 020 1 C M0 A 0 G 1 0 A A 2 M 000 0 0 1 0 0 0 A A 000 000 0 0 0 0 0 0**  
**1 5 10 15 20 25 30 35 40 44**

**Digits 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  
H = Vertical Recessed  
J = Vertical Cabinet Slope Top  
M = Inverted Vertical Cabinet  
N = Inverted Vertical Recessed

**Digit 4 — Development Sequence “B”**

**Digits 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

**Digits 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  
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 with Leveling Feet  
G = Keylock Panel and Access Door with Leveling Feet

**Digit 17 — Motor**  
A = Free Discharge  
B = High Static

**Digit 18 — Coil**  
A = 2 Row Hot Water  
B = 3 Row Hot Water  
C = 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

**Digits 21, 22, 23 — Electric Heat kW (208V 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**

**Digit 25 — Disconnect Switch**  
0 = None  
D = Disconnect Switch

**Digit 26 — Filter**  
0 = None  
1 = 1” Throwaway Filter  
2 = 1” Throwaway Pleated Media Filter  
3 = 1” Throwaway + (1) Extra  
4 = 1” Throwaway Pleated Media + (1) Extra  
5 = 1” Throwaway + (2) Extras  
6 = 1” Throwaway Pleated Media + (2) Extras  
7 = 1” Throwaway + (3) Extras  
8 = 1” Throwaway Pleated Media + (3) Extras



# Selection Procedure

# Model Number Description

## Digit 27 — Main Control Valve

0 = None  
A = 2-Way, 2-Position, NO (25 psig)  
B = 3-Way, 2-Position, NO (30 psig)  
C = 2-Way, 2-Position, NC (25 psig)  
D = 3-Way, 2-Position, NC (15 psig)  
E = 2-Way, 2-Position, NO (50 psig)  
F = 3-Way, 2-Position, NO (50 psig)  
G = 2-Way, 2-Position, NC (50 psig)  
H = 3-Way, 2-Position, NC (50 psig)  
J = 2-Way, Modulating, 0.7 Cv (50 psig)\*  
K = 3-Way, Modulating, 0.7 Cv (50 psig)\*  
L = 2-Way, Modulating, 1.5 Cv (50 psig)\*  
M = 3-Way, Modulating, 1.5 Cv (50 psig)\*  
N = 2-Way, Modulating, 2.5 Cv (50 psig)\*  
P = 3-Way, Modulating, 2.5 Cv (50 psig)\*  
Q = 2-Way, Modulating, 4.0 Cv (50 psig)\*  
R = 3-Way, Modulating, 4.0 Cv (50 psig)\*  
X = Field-supplied, NO  
Y = Field-supplied, NC  
Z = Field-Supplied 3-Wire Modulating

## Digit 28 — Not Used

0 = None

## 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 with 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 with Auto Circuit Setter

## Digit 30 — Control Type

A = Fan Speed Switch  
E = Tracer ZN.010  
F = Tracer ZN.510  
G = Tracer ZN.520

## Digit 31 — Control Option

D = Unit Mounted Fan Speed Switch  
K = Wall Mounted Fan Speed Switch  
V = Unit Mounted Fan Speed Switch w/ Setpoint Dial  
W = Wall Mounted Fan Speed Switch w/ Setpoint Dial  
X = Unit Mounted Fan Speed Switch w/ Wall Mounted Setpoint Dial  
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.

## Digit 32 — Not Used

0 = None

## Digits 33, 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  
2 = Fan Status Sensor

## Digit 38 — Control Function 6

0 = None  
2 = Filter Status Sensor

## 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 L = 2" Falseback  
E = 3.5" Projection Panel M = 3" Falseback  
F = 4" Projection Panel N = 4" Falseback  
G = 4.5" Projection Panel  
H = 5" Projection Panel P = 5" Falseback  
J = 5.5" Projection Panel Q = 6" Falseback  
K = 6" Projection Panel R = 7" Falseback  
T = 8" Falseback

## Digit 40 — Main Autoflow GPM

A = 0.5	G = 3.0	N = 7.0
B = 0.75	H = 3.5	P = 8.0
C = 1.0	J = 4.0	Q = 9.0
D = 1.5	K = 4.5	R = 10.0
E = 2.0	L = 5.0	T = 11.0
F = 2.5	M = 6.0	U = 12.0

## Digit 41 — Not Used

## Digit 42 — Subbases

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

## Digit 43 — Recessed Flange

0 = None  
A = Recessed Flange

## Digit 44 — Wall Boxes

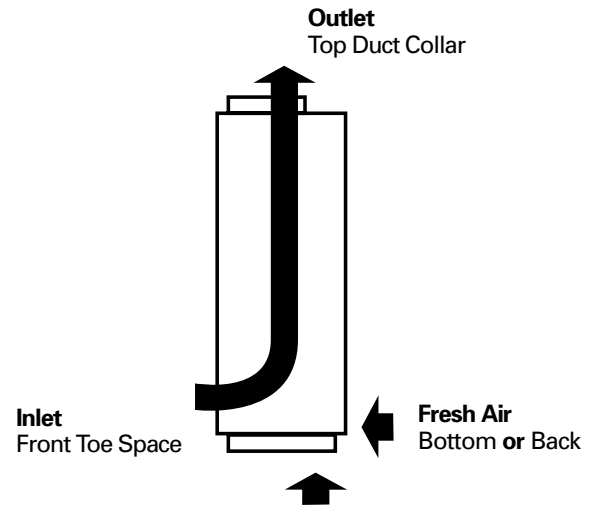
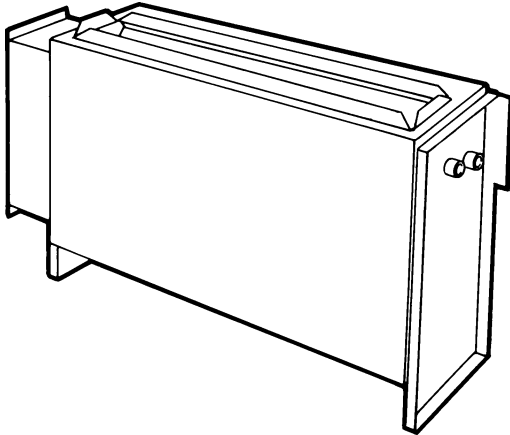
0 = None  
A = Anodized Wall Box

Note: Please contact your local Trane sales representative for buildable digit combinations.

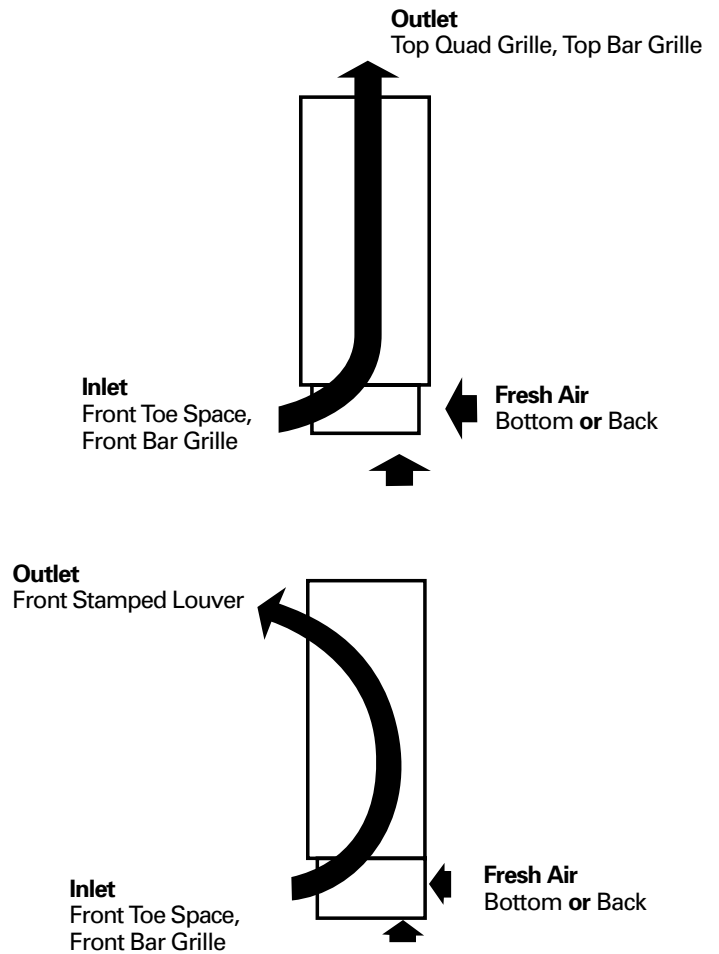
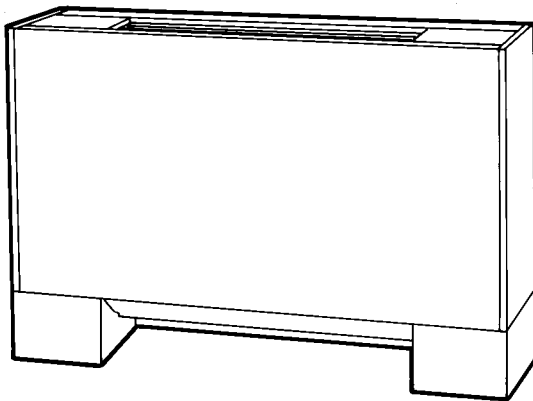
# General Data

# Unit Configurations

## Model A Vertical Concealed



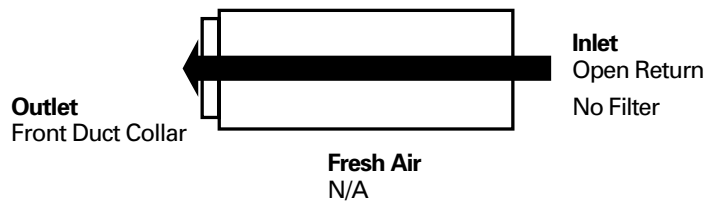
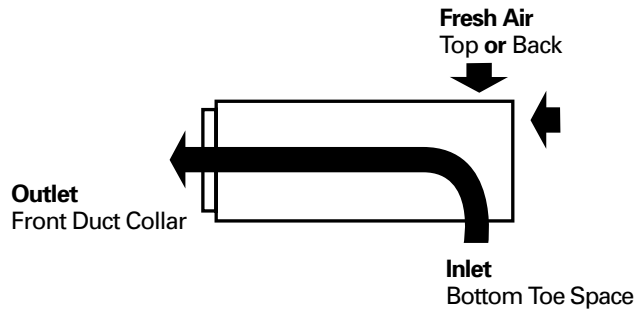
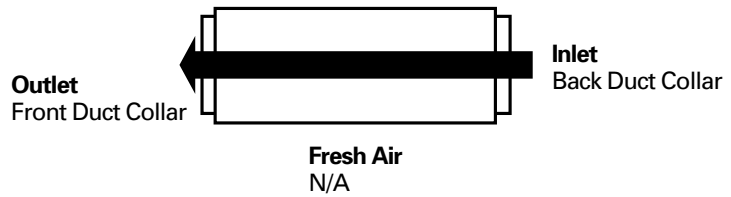
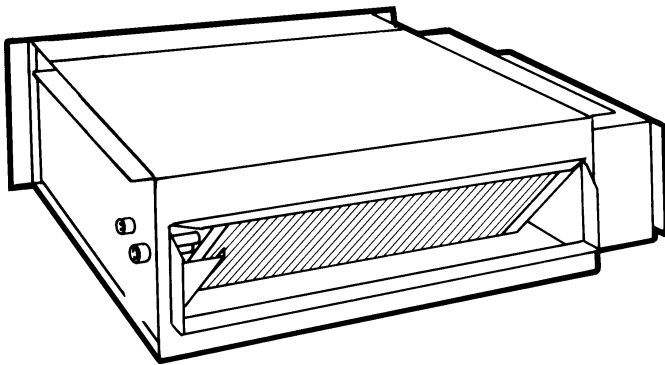
## Model B Vertical Cabinet



# General Data

# Unit Configurations

## Model C Horizontal Concealed

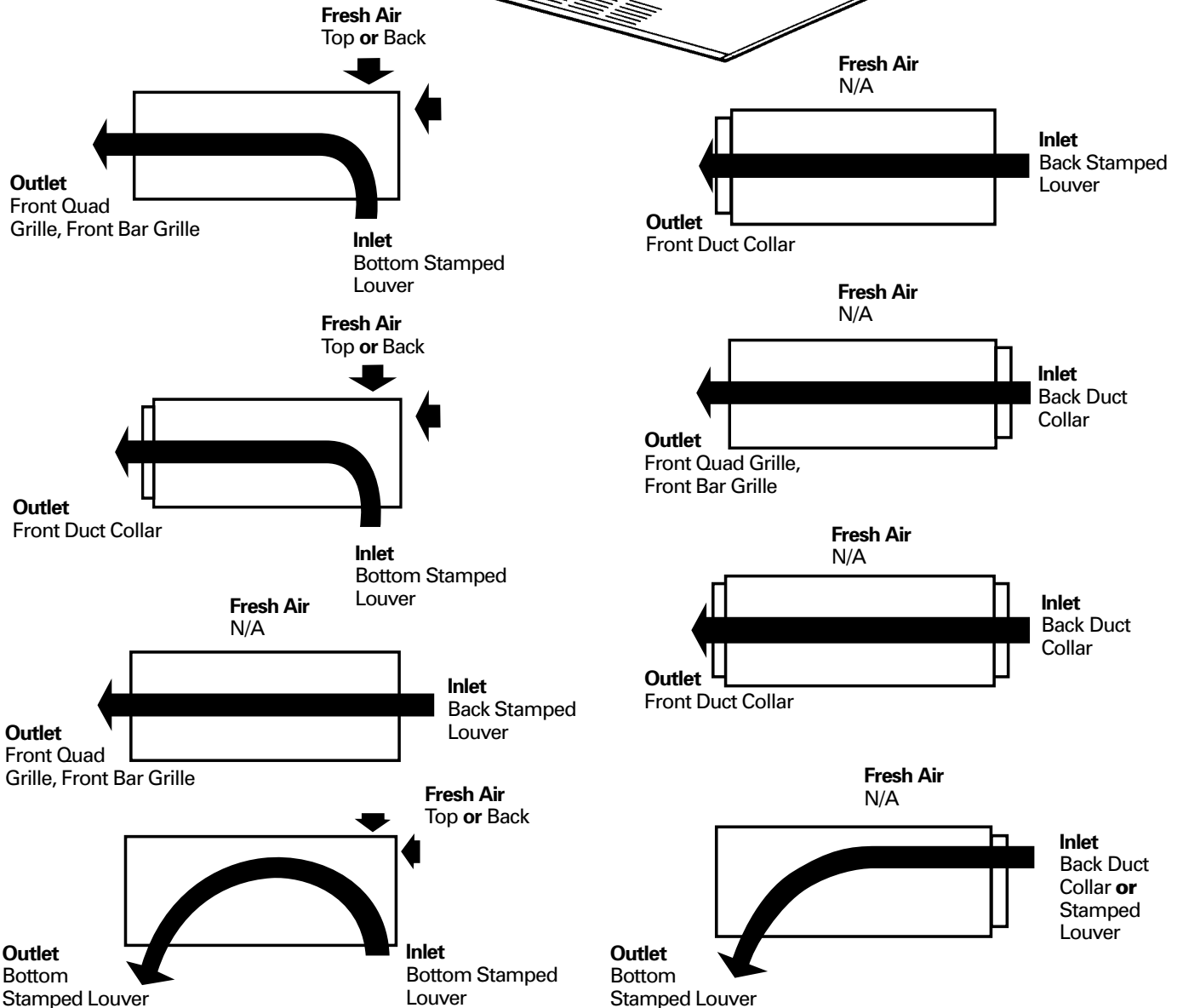
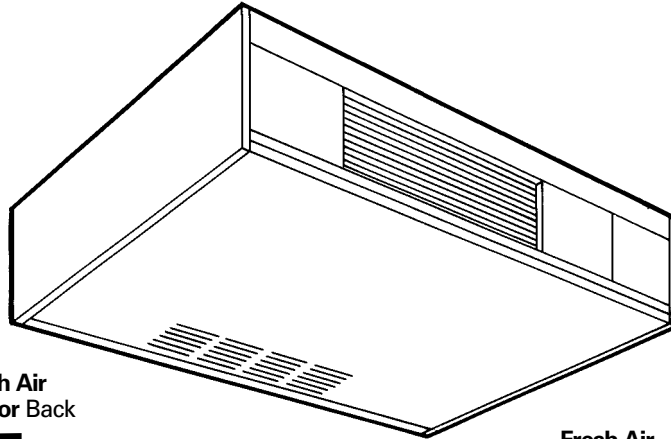




# General Data

# Unit Configurations

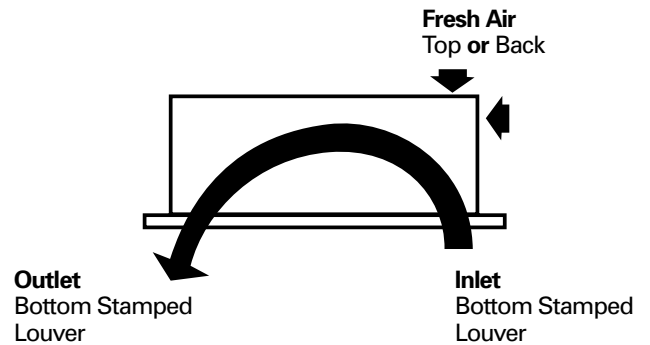
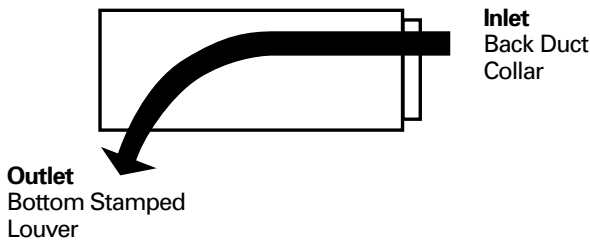
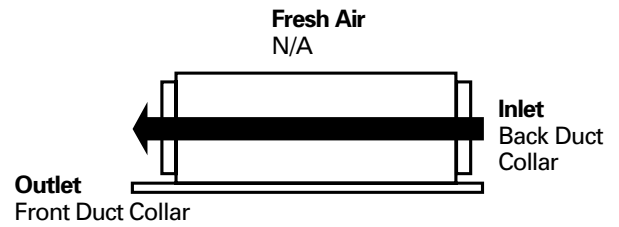
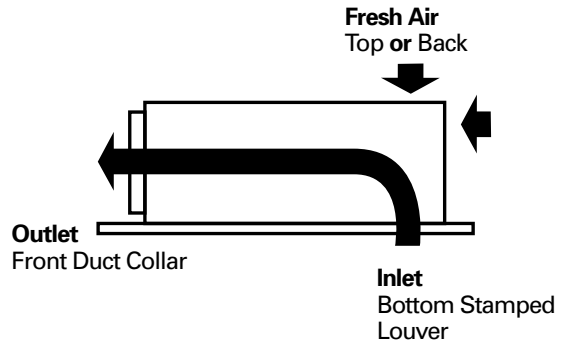
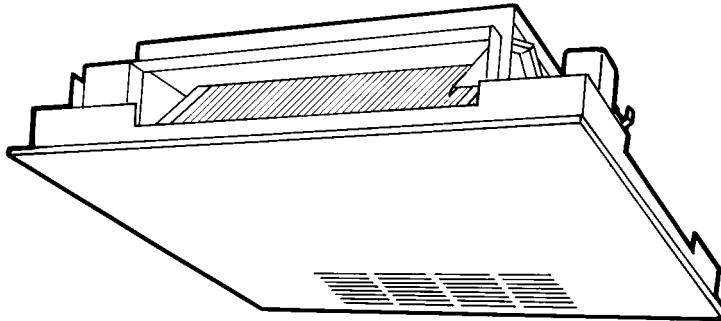
## Model D Horizontal Cabinet



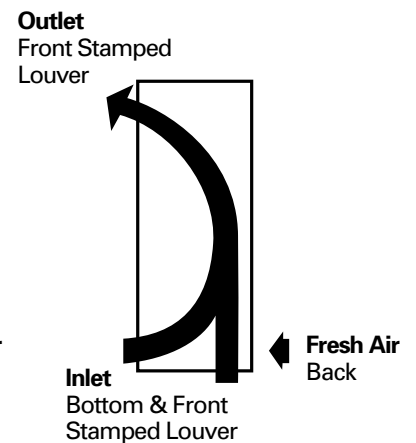
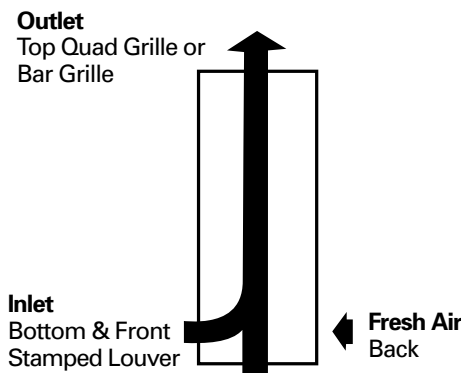
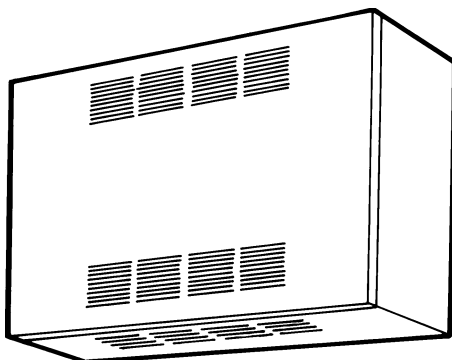
# General Data

# Unit Configurations

## Model E Horizontal Recessed



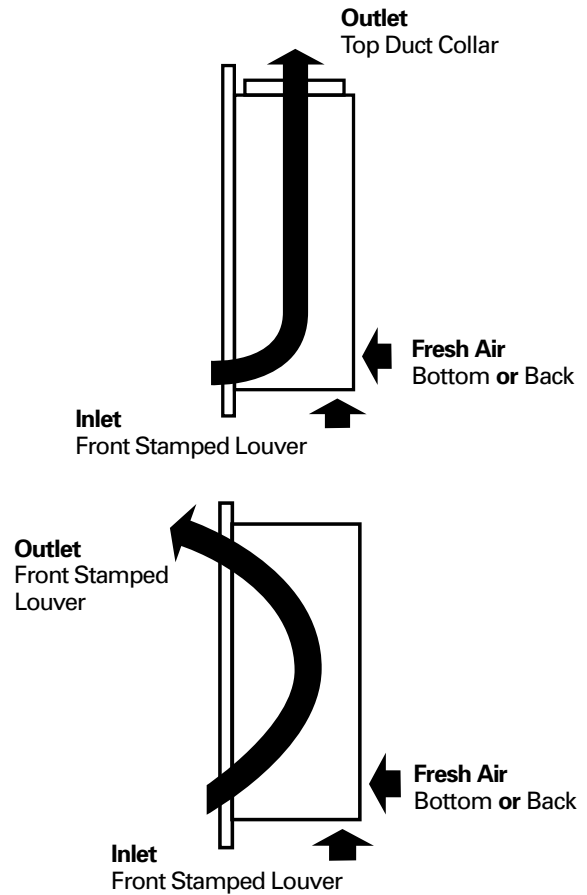
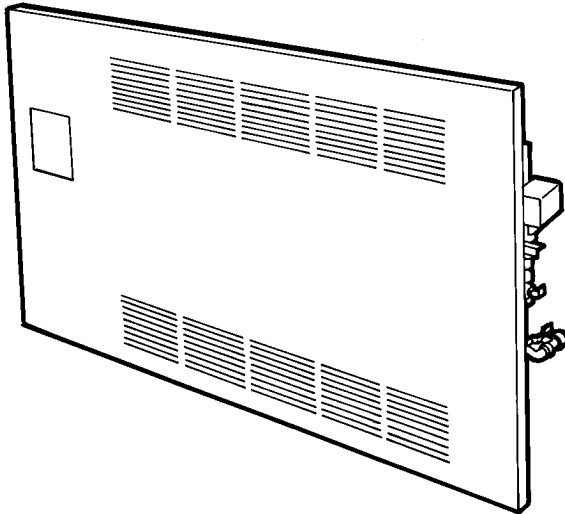
## Model F Vertical Wall Hung Cabinet



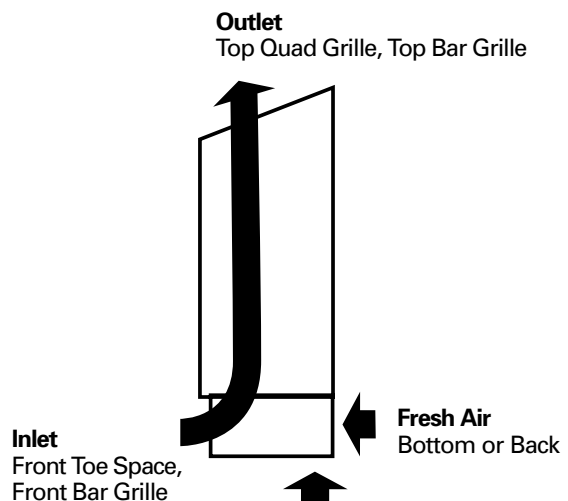
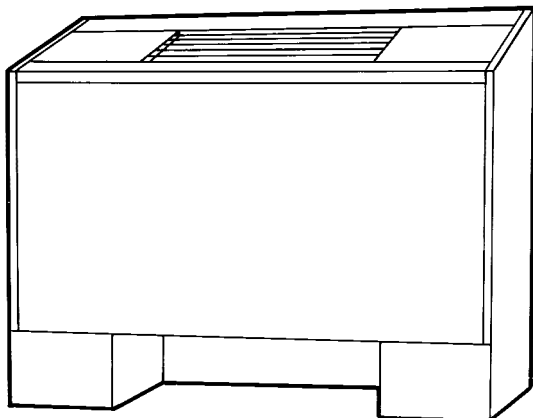
# General Data

# Unit Configurations

## Model H Vertical Recessed



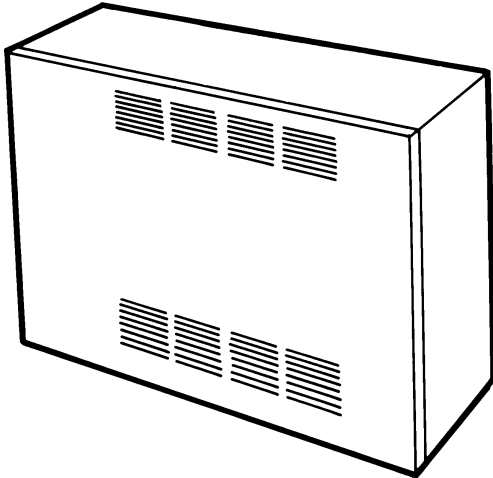
## Model J Vertical Cabinet Slope Top



## General Data

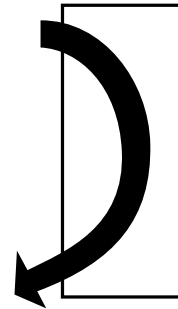
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### Model M Inverted Vertical Cabinet



**Inlet**  
Front Stamped  
Louver

**Outlet**  
Front Stamped  
Louver

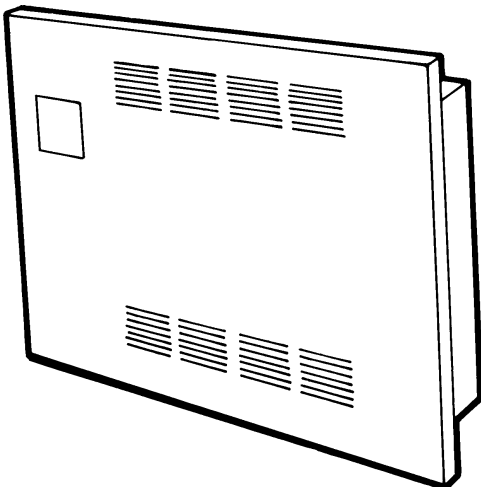


**Inlet**  
Top Duct  
Collar

**Outlet**  
Top Duct  
Collar

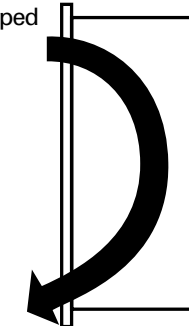


### Model N Inverted Vertical Recessed



**Inlet**  
Front Stamped  
Louver

**Outlet**  
Front Stamped  
Louver





# General Data

**Table GD-1. Force-Flo Cabinet Heater General Data**

Unit Size	02	03	04	06	08	10	12
<b>Coil Data</b>							
Face Area — Ft <sup>2</sup> (cm <sup>2</sup> )	0.8 (743)	0.8 (743)	1.1 (1020)	1.6 (1490)	2.1 (1950)	3.2 (2970)	3.2 (2970)
LxDxH — In. (cm)							
2-Row	15x1.7x8 (38x4x20)	15x1.7x8 (38x4x20)	20x1.7x8 (51x4x20)	29.5x1.7x8 (75x4x20)	38x1.7x8 (97x4x20)	57x1.7x8 (145x4x20)	57x1.7x8 (145x4x20)
3-Row	15x2.6x8 (38x7x20)	15x2.6x8 (38x7x20)	20x2.6x8 (51x7x20)	29.5x2.6x8 (75x7x20)	38x2.6x8 (97x7x20)	57x2.6x8 (145x7x20)	57x2.6x8 (145x7x20)
4-Row	15x3.5x8 (38x9x20)	15x3.5x8 (38x9x20)	20x3.5x8 (51x9x20)	29.5x3.5x8 (75x9x20)	38x3.5x8 (97x9x20)	57x3.5x8 (145x9x20)	57x3.5x8 (145x9x20)
Volume — Gal. (Liters)							
1-Row (Heat)	.06 (.23)	.06 (.23)	.08 (.30)	.11 (.42)	.14 (.53)	.21 (.79)	.21 (.79)
2-Row	.12 (.45)	.12 (.45)	.15 (.57)	.22 (.83)	.28 (1.06)	.42 (1.59)	.42 (1.59)
3-Row	.18 (.68)	.18 (.68)	.23 (.87)	.33 (1.25)	.42 (1.59)	.62 (2.35)	.62 (2.35)
4-Row	.24 (.91)	.24 (.91)	.30 (1.14)	.44 (1.67)	.56 (2.12)	.83 (3.14)	.83 (3.14)
Fins/Ft (cm)							
2-Row	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)
3-Row	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)
4-Row	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)	144 (4.7)
<b>Fan/Motor Data</b>							
Fan Quantity	1	1	1	2	2	3	3
Size — Dia" x Width" (cm)	6.31x4 (16x10)	6.31x6.5 (16x17)	6.31x7.5 (16x19)	6.31x6.5 (16x17)	6.31x7.5 (16x19)	(1) 6.31x7.5 (16x19) (2) 6.31x6.5 (16x6.5)	6.31x7.5 (16x19)
Motor Quantity	1	1	1	1	1	2	2
<b>Filter Data</b>							
<b>1" (cm) TA and PI. Media</b>							
Quantity	1	1	1	1	1	1	1
Size — In. (cm)	8 <sup>7</sup> / <sub>8</sub> x 19 <sup>1</sup> / <sub>8</sub> (23x49)	8 <sup>7</sup> / <sub>8</sub> x 19 <sup>1</sup> / <sub>8</sub> (23x49)	8 <sup>7</sup> / <sub>8</sub> x 24 <sup>1</sup> / <sub>8</sub> (23x61)	8 <sup>7</sup> / <sub>8</sub> x 33 <sup>5</sup> / <sub>8</sub> (23x85)	8 <sup>7</sup> / <sub>8</sub> x 42 <sup>1</sup> / <sub>8</sub> (23x107)	8 <sup>7</sup> / <sub>8</sub> x 61 <sup>1</sup> / <sub>8</sub> (23x155)	8 <sup>7</sup> / <sub>8</sub> x 61 <sup>1</sup> / <sub>8</sub> (23x155)
<b>1" Fresh Air Filter (only on cabinet styles D, E, and H with bottom return and fresh air opening)</b>							
Quantity	1	1	1	1	1	1	1
Size — In. (cm)	5 <sup>1</sup> / <sub>2</sub> x 19 <sup>1</sup> / <sub>8</sub> (14 x 49)	5 <sup>1</sup> / <sub>2</sub> x 19 <sup>1</sup> / <sub>8</sub> (14 x 61)	5 <sup>1</sup> / <sub>2</sub> x 24 <sup>1</sup> / <sub>8</sub> (14 x 85)	5 <sup>1</sup> / <sub>2</sub> x 33 <sup>5</sup> / <sub>8</sub> (14 x 107)	5 <sup>1</sup> / <sub>2</sub> x 42 <sup>1</sup> / <sub>8</sub> (14 x 156)	5 <sup>1</sup> / <sub>2</sub> x 61 <sup>1</sup> / <sub>8</sub> (14 x 156)	5 <sup>1</sup> / <sub>2</sub> x 61 <sup>1</sup> / <sub>8</sub>

**Table GD-2. Cabinet Heater Air Flow**

Unit Size	Coil	FD Motor	ESP			
			0.05	High Static Motor		
				0.1	0.2	0.3
02	2R144	240	330	300	280	250
	3R144	230	330	300	270	240
	4R144	200	300	270	250	220
03	2R144	320	410	390	350	320
	3R144	310	400	360	330	290
	4R144	280	370	340	300	270
04	2R144	390	450	410	380	340
	3R144	370	550	510	470	430
	4R144	340	510	480	440	400
06	2R144	610	760	700	650	590
	3R144	610	890	830	770	710
	4R144	560	820	760	710	660
08	2R144	800	1020	960	890	820
	3R144	730	1000	930	870	800
	4R144	680	940	870	810	750
10	2R144	980	1260	1180	1090	1010
	3R144	1000	1400	1310	1210	1120
	4R144	930	1300	1220	1130	1040
12	2R144	1110	1430	1330	1240	1140
	3R144	1080	1520	1420	1330	1220
	4R144	1000	1430	1340	1240	1150

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.



## General Data

## Electric Heat

### 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 any of the Tracer® ZN control options. Two-stage electric heat is controlled by the Tracer ZN.520 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%, the controller controls the electric heat output on for approximately four minutes each period.

### Safety Features

- 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 step-down transformer.
- A unit mounted magnetic contactor(s) is (are) supplied on all unit voltages.
- A high temperature cutout with automatic reset de-energizes the electric heat in the event of an overheat condition.

## General Data

## Piping Packages

### 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 which is attached to 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. 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 degrees 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 so the correct setting can be found 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 24VAC signal from the Trane controller. Control valves are direct-acting valves. The control valve is factory mounted in the leaving water pipe downstream of the coil. Some means of relieving pump head pressure should be accounted for when two-way valves are selected. 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 24VAC signal from the Trane 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 Trane 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 Trane controller. Three-way valves allow water that is directed through the coil to mix with water that is 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.

# General Data

# Piping Packages

## Piping Package Options

Digits 27,28 Main/Aux. Control Valve BASIC	Digit 29		
	Basic (A)	Manual Circuit Setter (B)	Automatic Circuit Setter (C)
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			



# General Data

## Selecting the Correct Modulating Valve Size

Modulating valves are available in any of four port sizes. These four port sizes relate to a Cv of 0.7, 1.5, 2.5 or 4.0, which is the coefficient of flow. 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 (6.895 kPa) differential across the valve. It is calculated using the following formula:  
 $Cv = Q / \text{Square root } \Delta P$  where:  
 Cv = flow coefficient  
 Q = flow rate (GPM)  
 $\Delta P$  = 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 cabinet heater is selected to operate at the following conditions:  
 Vertical cabinet cabinet heater  
 Entering water temperature = 180 F (82 C)  
 Leaving water temperature = 150 F (C)  
 EAT = 70 F (21 C)  
 The coil is selected as a four-row coil.  
 Select the best modulating valve size for this unit.

1  
 Find the  $\Delta P$  across the water coil. Refer to the ARI performance table to determine the  $\Delta P$  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' (17.0 kPa) 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.  
 $Cv = \text{GPM} / \text{Square root } \Delta P$   
 $Cv = 3.59 / \text{Square root } 2.47$   
 $Cv = 2.29$   
 Therefore, select the valve with the Cv of 2.5 since it is closest to the Cv of the water coil. The following tables 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 the flowrate and make calculations using the formulas above.

**Table GD-3. Modulating Valve Selections for Horizontal Concealed Units, High Static Motor, 70 F (21 C) EAT, 180 F (82 C) EWT, 30 F (-1 C)  $\Delta T$**

Unit Size	Coil	GPM (L/s)	Coil		Valve Cv
			WPD (kPa)	Cv	
02	2-Row	1.19 (0.08)	6.0 (17.8)	0.74	0.7
	3-Row	1.52 (.10)	13.8 (41.2)	0.62	0.7
	4-Row	1.59 (.10)	3.8 (11.5)	1.24	1.5
03	2-Row	1.53 (.10)	10.3 (30.8)	0.72	0.7
	3-Row	1.82 (.11)	4.3 (12.8)	1.33	1.5
	4-Row	1.98 (.12)	6.2 (18.6)	1.21	1.5
04	2-Row	1.73 (.11)	3.3 (9.8)	1.45	1.5
	3-Row	2.57 (.16)	9.1 (27.0)	1.29	1.5
	4-Row	2.81 (.18)	13.4 (39.9)	1.17	1.5
06	2-Row	2.87 (.18)	9.9 (29.5)	1.39	1.5
	3-Row	3.96 (.25)	5.9 (17.7)	2.48	2.5
	4-Row	4.37 (.28)	8.2 (24.6)	2.32	2.5
08	2-Row	3.71 (.23)	4.7 (14.2)	2.60	2.5
	3-Row	4.74 (.30)	9.1 (27.1)	2.39	2.5
	4-Row	5.22 (.33)	12.7 (37.8)	2.23	2.5
10	2-Row	4.71 (.30)	8.1 (24.1)	2.52	2.5
	3-Row	6.50 (.41)	18.1 (54.0)	2.32	2.5
	4-Row	7.13 (.45)	25.3 (75.6)	2.15	2.5
12	2-Row	5.48 (.35)	11.4 (34.0)	2.47	2.5
	3-Row	7.19 (.45)	14.5 (43.2)	2.87	2.5
	4-Row	7.83 (.51)	10.5 (31.4)	3.67	4.0

**Table GD-4. Modulating Valve Selections for Vertical Cabinet Units, Free Discharge Motor, 70 F (21 C) EAT, 180 F (82 C) EWT, 30 F (-1 C)  $\Delta T$**

Unit Size	Coil	GPM (L/s)	Coil		Valve Cv
			WPD (kPa)	Cv	
02	2-Row	1.06 (.07)	4.8 (14.4)	0.74	0.7
	3-Row	1.31 (.08)	10.5 (31.4)	0.61	0.7
	4-Row	1.34 (.08)	2.8 (8.4)	1.22	1.5
03	2-Row	1.40 (.09)	8.8 (26.3)	0.72	0.7
	3-Row	1.70 (.11)	3.8 (11.3)	1.33	1.5
	4-Row	1.81 (.11)	5.3 (15.7)	1.20	1.5
04	2-Row	1.71 (.11)	3.2 (9.5)	1.45	1.5
	3-Row	2.12 (.13)	6.4 (19.0)	1.27	1.5
	4-Row	2.28 (.14)	9.1 (27.3)	1.15	1.5
06	2-Row	2.70 (.17)	8.9 (26.5)	1.38	1.5
	3-Row	3.31 (.21)	4.2 (12.6)	2.46	2.5
	4-Row	3.59 (.23)	5.7 (17.0)	2.29	2.5
08	2-Row	3.39 (.21)	4.0 (11.9)	2.58	2.5
	3-Row	4.11 (.26)	6.9 (20.7)	2.38	2.5
	4-Row	4.45 (.28)	9.4 (28.1)	2.21	2.5
10	2-Row	4.32 (.27)	6.8 (20.4)	2.52	2.5
	3-Row	5.55 (.35)	13.4 (40.2)	2.30	2.5
	4-Row	6.00 (.38)	18.3 (54.8)	2.13	2.5
12	2-Row	4.99 (.32)	9.6 (28.6)	2.45	2.5
	3-Row	6.10 (.38)	10.5 (31.4)	2.86	2.5
	4-Row	6.48 (.42)	7.3 (21.8)	3.65	4.0



# Performance Data

# Hot Water Coils

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. Below is a table that summarizes the performance groups.

**Table PD-1. Force Flo™ Performance Groupings**

Group Description	Unit Model	Inlet Style	Outlet Style
Group 1	Horizontal Concealed (C)	Back Duct Collar Open Return	Front Duct Collar Front Duct Collar
	Horizontal Cabinet (D)	Back Duct Collar	Front Duct Collar Front Bar Grille Front Quad Grille
	Horizontal Recessed (E)	Back Duct Collar	Front Duct Collar
Group 2	Vertical Concealed (A)	Front Toe Space	Top Duct Collar
	Vertical Cabinet (B)	Front Toe Space	Top Quad Grille Top Bar Grille Front Stamped Louver
		Front Bar Grille	Top Quad Grille Top Bar Grille Front Stamped Louver
	Horizontal Concealed (C) Horizontal Cabinet (D)	Bottom Toe Space Back Duct Collar Bottom Stamped Louver	Front Duct Collar Bottom Stamped Louver Front Quad Grille Front Bar Grille Front Duct Collar Bottom Stamped Louver
		Back Stamped Louver	Front Quad Grille Front Bar Grille Front Duct Collar Bottom Stamped Louver
	Horizontal Recessed (E)	Bottom Stamped Louver	Front Duct Collar Bottom Stamped Louver
		Back Duct Collar	Bottom Stamped Louver
	Wall Hung Cabinet (F)	Front Stamped Louver	Top Quad Grille Top Bar Grille Front Stamped Louver
	Vertical Recessed (H)	Front Stamped Louver	Front Stamped Louver Top Duct Collar
	Inverted Vertical Cabinet (M)	Front Stamped Louver	Front Stamped Louver Bottom Duct Collar
Top Duct Collar		Bottom Duct Collar Front Stamped Louver	
Inverted Vertical Recessed (N)	Front Stamped Louver	Front Stamped Louver	
Group 3	Vertical Slope Top (J)	Front Toe Space	Top Quad Grille Top Bar Grille
		Front Bar Grille	Top Quad Grille Top Bar Grille

Note:  
For performance conditions other than ARI, use TOPSS™ (Trane Official Product Selection System) for Force Flo cabinet heaters.



# Performance Data

# Hot Water Coils

Heating performance is based on 70 F (21 C) entering air temperature, 180 F (82 C) entering hot water temperature with a 30 F (-1 C) ΔT. All performance measured on high speed tap, zero ESP, and a throwaway filter.

**Table PD-2. Free Discharge Motor, Group 1**

Unit Size	Coil	CFM (L/s)	Heating				115V Watt	230V Watt	277V Watt
			TMBH (TkW)	Q/ITD	GPM (L/s)	WPD (kPa)			
2	2H	240 (113)	15.9 (4.7)	0.14	1.06 (0.07)	4.8 (14.4)	60	95	65
	3H	230 (108)	19.6 (5.7)	0.18	1.31(0.08)	10.5 (31.4)	60	95	65
	4H	210 (99)	20.1 (6.0)	0.18	1.34 (0.08)	2.8 (8.4)	60	95	65
3	2H	318 (150)	21.0 (6.2)	0.19	1.40 (0.09)	8.8 (26.3)	70	80	83
	3H	314 (148)	25.6 (7.5)	0.23	1.70 (0.11)	3.8 (11.3)	85	89	101
	4H	284 (134)	27.1 (7.9)	0.25	1.81 (0.11)	5.3 (15.7)	85	89	101
4	2H	388 (183)	25.6 (7.5)	0.23	1.71 (0.11)	3.2 (9.5)	95	96	104
	3H	374 (177)	31.8 (9.3)	0.29	2.12 (0.13)	6.4 (19.0)	100	107	106
	4H	350 (165)	34.2 (10.0)	0.31	2.28 (0.14)	9.1 (27.3)	100	107	106
6	2H	611 (289)	40.6 (11.9)	0.37	2.70 (0.17)	8.9 (26.5)	110	154	165
	3H	608 (287)	49.7 (14.6)	0.45	3.31 (0.21)	4.2 (12.6)	125	130	124
	4H	565 (267)	53.8 (15.8)	0.49	3.59 (0.23)	5.7 (17.0)	125	130	124
8	2H	790 (373)	50.9 (14.9)	0.46	3.39 (0.21)	4.0 (11.9)	135	150	159
	3H	731 (345)	61.6 (18.1)	0.56	4.11 (0.26)	6.9 (20.7)	120	123	133
	4H	688 (325)	66.8 (19.6)	0.61	4.45 (0.28)	9.4 (28.1)	120	123	133
10	2H	980 (463)	64.8 (19.0)	0.59	4.32 (0.27)	6.8 (20.4)	205	250	269
	3H	992 (468)	83.3 (24.4)	0.76	5.55 (0.35)	13.4 (40.2)	225	237	230
	4H	930 (439)	90.1 (26.4)	0.82	6.00 (0.38)	18.3 (54.8)	225	237	230
12	2H	1110 (524)	75.0 (22.0)	0.68	4.99 (0.32)	9.6 (28.6)	230	246	263
	3H	1082 (511)	91.5 (26.8)	0.83	6.10 (0.38)	10.5 (31.4)	220	230	239
	4H	1010 (477)	99.3 (28.5)	0.90	6.48 (0.42)	7.3 (21.8)	220	230	239

**Table PD-3. Free Discharge Motor, Group 2**

Unit Size	Coil	CFM (L/s)	Heating				115V Watt	230V Watt	277V Watt
			TMBH (TkW)	Q/ITD	GPM (L/s)	WPD (kPa)			
2	2H	211 (100)	14.5 (4.3)	0.13	0.97 (0.06)	4.1 (12.3)	60	95	65
	3H	201 (95)	17.7 (5.2)	0.16	1.18 (0.07)	8.8 (26.2)	60	95	65
	4H	188 (89)	18.3 (5.4)	0.17	1.22 (0.08)	2.4 (7.1)	60	95	65
3	2H	280 (132)	19.2 (5.6)	0.17	1.28 (0.08)	7.5 (22.4)	70	80	83
	3H	277 (131)	23.3 (6.8)	0.21	1.55 (0.10)	3.2 (9.5)	85	89	101
	4H	256 (121)	24.8 (7.3)	0.23	1.65 (0.10)	4.5 (13.4)	85	89	101
4	2H	349 (165)	23.8 (7.0)	0.22	1.58 (0.10)	2.8 (8.3)	95	96	104
	3H	338 (159)	29.4 (8.6)	0.27	1.96 (0.12)	5.5 (16.5)	100	107	106
	4H	320 (151)	31.7 (9.3)	0.29	2.11 (0.13)	7.9 (23.7)	100	107	106
6	2H	544 (257)	37.4 (11.0)	0.34	2.49 (0.16)	7.6 (22.8)	110	154	165
	3H	541 (255)	45.4 (13.3)	0.41	3.03 (0.19)	3.6 (10.6)	125	130	124
	4H	510 (241)	49.4 (14.5)	0.45	3.29 (0.21)	4.8 (14.5)	125	130	124
8	2H	706 (331)	47.0 (13.8)	0.43	3.13 (0.20)	3.4 (10.2)	135	150	159
	3H	659 (311)	56.8 (16.7)	0.52	3.79 (0.24)	5.9 (17.8)	120	123	133
	4H	627 (296)	61.8 (18.1)	0.56	4.12 (0.26)	8.1 (24.3)	120	123	133
10	2H	879 (415)	60.0 (17.6)	0.55	4.00 (0.25)	5.9 (17.7)	205	250	269
	3H	886 (420)	76.4 (22.4)	0.69	5.09 (0.32)	11.4 (34.1)	225	237	230
	4H	840 (397)	82.8 (24.3)	0.75	5.52 (0.35)	15.7 (46.8)	225	237	230
12	2H	996 (470)	69.4 (20.3)	0.63	4.62 (0.29)	8.3 (24.7)	230	246	263
	3H	976 (461)	84.3 (24.8)	0.77	5.62 (0.35)	9.0 (26.8)	220	230	239
	4H	921 (435)	91.8 (26.4)	0.83	6.12 (0.39)	10.2 (30.5)	220	230	239

Note:

1. CFM = Cubic feet per minute
2. TMBH = Total capacity (MBH)
3. GPM = Gallons per minute
4. WPD = Water pressure drop (feet of water)
5. Q/ITD = MBH (kW)/(Entering water temperature - Entering air temperature) when DT and GPM (L/s) remain constant. To determine heating capacities at a different entering water temperature or entering air temp, compute the new ITD and multiply it by the Q/ITD shown.
6. Medium and low speed capacities are approximately 80 percent and 60 percent respectively of the high speed capacity.



# Performance Data

# Hot Water Coils

Heating performance is based on 70 F (21 C) entering air temperature, 180 F (82 C) entering hot water temperature with a 30 F (-1 C) ΔT. All performance measured on high speed tap, zero ESP, and a throwaway filter.

**Table PD-4. Free Discharge Motor, Group 3**

Unit Size	Coil	CFM (L/s)	Heating						
			TMBH (Tkw)	Q/ITD	GPM (L/s)	WPD (kPa)	115V Watt	230V Watt	277V Watt
2	2H	198 (93)	13.8 (4.1)	0.13	0.92 (0.06)	3.8 (11.3)	60	95	65
	3H	188 (90)	16.7 (4.9)	0.15	1.11 (0.07)	8.0 (23.8)	60	95	65
	4H	177 (84)	17.3 (5.1)	0.16	1.16 (0.07)	2.2 (6.4)	60	95	65
3	2H	262 (124)	18.3 (5.4)	0.17	1.22 (0.08)	6.9 (20.6)	70	80	83
	3H	260 (123)	22.1 (6.5)	0.20	1.47 (0.09)	2.9 (8.7)	85	89	101
	4H	242 (114)	23.7 (6.9)	0.22	1.58 (0.10)	4.1 (12.3)	85	89	101
4	2H	330 (156)	22.8 (6.7)	0.21	1.52 (0.10)	2.6 (7.7)	95	96	104
	3H	320 (151)	28.1 (8.2)	0.26	1.87 (0.12)	5.1 (15.2)	100	107	106
	4H	304 (144)	30.3 (8.9)	0.28	2.02 (0.13)	7.3 (21.9)	100	107	106
6	2H	512 (242)	35.8 (10.5)	0.33	2.38 (0.15)	7.0 (21.0)	110	154	165
	3H	508 (240)	43.3 (12.7)	0.39	2.88 (0.18)	3.3 (9.7)	125	130	124
	4H	483 (228)	47.2 (13.8)	0.43	3.14 (0.20)	4.4 (13.3)	125	130	124
8	2H	665 (314)	45.0 (13.2)	0.41	3.00 (0.19)	3.2 (9.4)	135	150	159
	3H	623 (294)	54.3 (15.9)	0.49	3.62 (0.23)	5.5 (16.3)	120	123	133
	4H	596 (282)	59.2 (17.3)	0.54	3.94 (0.25)	7.5 (22.4)	120	123	133
10	2H	829 (391)	57.5 (16.9)	0.52	3.83 (0.24)	5.5 (16.3)	205	250	269
	3H	835 (394)	72.9 (21.3)	0.66	4.86 (0.31)	10.5 (31.2)	225	237	230
	4H	796 (376)	79.0 (23.1)	0.72	5.26 (0.33)	14.4 (42.9)	225	237	230
12	2H	940 (444)	66.5 (19.5)	0.60	4.43 (0.28)	7.6 (22.8)	230	246	263
	3H	923 (436)	80.6 (23.6)	0.73	5.37 (0.34)	8.2 (24.6)	220	230	239
	4H	876 (413)	87.9 (25.8)	0.80	5.86 (0.37)	9.4 (28.2)	220	230	239

**Note:**

1. CFM = Cubic feet per minute
2. TMBH = Total capacity (MBH)
3. GPM = Gallons per minute
4. WPD = Water pressure drop (feet of water)
5. Q/ITD = MBH (kW)/(Entering water temperature - Entering air temperature) when DT and GPM (L/s) remain constant. To determine heating capacities at a different entering water temperature or entering air temp, compute the new ITD and multiply it by the Q/ITD shown.
6. Medium and low speed capacities are approximately 80 percent and 60 percent respectively of the high speed capacity.



# Performance Data

# Hot Water Coils

Heating performance is based on 70 F (21 C) entering air temperature, 180 F (82 C) entering hot water temperature with a 30 F (-1 C) ΔT. All performance measured on high speed tap, zero ESP, and a throwaway filter.

**Table PD-5. High Static Motor, Group 1**

Unit Size	Coil	CFM (L/s)	Heating						
			TMBH (TkW)	Q/ITD	GPM (L/s)	WPD (kPa)	115V Watt	230V Watt	277V Watt
2	2H	287 (135)	17.9 (5.3)	0.16	1.19 (0.08)	6.0 (17.8)	145	145	145
	3H	282 (133)	22.9 (6.7)	0.21	1.52 (0.10)	13.8 (41.2)	145	145	145
	4H	260 (123)	23.9 (7.0)	0.22	1.59 (0.10)	3.8 (11.5)	145	145	145
3	2H	365 (172)	23.0 (6.7)	0.21	1.53 (0.10)	10.3 (30.8)	140	140	140
	3H	343 (162)	27.3 (8.0)	0.25	1.82 (0.11)	4.3 (12.8)	145	140	135
	4H	318 (150)	29.7 (8.7)	0.27	1.98 (0.12)	6.2 (18.6)	145	140	135
4	2H	396 (187)	26.0 (7.6)	0.24	1.73 (0.11)	3.3 (9.8)	170	180	170
	3H	484 (228)	38.6 (11.3)	0.35	2.57 (0.16)	9.1 (27.0)	210	210	210
	4H	453 (214)	42.2 (12.4)	0.38	2.81 (0.18)	13.4 (39.9)	210	210	210
6	2H	668 (315)	43.1 (12.6)	0.39	2.87 (0.18)	9.9 (29.5)	245	240	240
	3H	780 (368)	59.5 (17.4)	0.54	3.96 (0.25)	5.9 (17.7)	320	320	320
	4H	725 (342)	65.6 (19.2)	0.60	4.37 (0.28)	8.2 (24.6)	320	320	320
8	2H	907 (428)	55.7 (16.3)	0.51	3.71 (0.23)	4.7 (14.2)	320	320	320
	3H	886 (418)	71.2 (20.9)	0.65	4.74 (0.30)	9.1 (27.1)	320	320	320
	4H	835 (394)	78.3 (22.9)	0.71	5.22 (0.33)	12.7 (37.8)	320	320	320
10	2H	1117 (527)	70.8 (20.7)	0.65	4.71 (0.30)	8.1 (24.1)	415	420	410
	3H	1230 (580)	97.6 (28.6)	0.89	6.50 (0.41)	18.1 (54.0)	530	530	530
	4H	1152 (544)	107.1 (31.4)	0.97	7.13 (0.45)	25.3 (75.6)	530	530	530
12	2H	1270 (600)	82.2 (24.1)	0.75	5.48 (0.35)	11.4 (34.0)	490	500	490
	3H	1350 (637)	108.0 (31.6)	0.98	7.19 (0.45)	14.5 (43.2)	530	530	530
	4H	1274 (601)	120.0 (35.2)	1.09	7.83 (0.51)	10.5 (31.4)	530	530	530

**Table PD-6. High Static Motor, Group 2**

Unit Size	Coil	CFM (L/s)	Heating						
			TMBH (TkW)	Q/ITD	GPM (L/s)	WPD (kPa)	115V Watt	230V Watt	277V Watt
2	2H	256 (121)	16.6 (4.9)	0.15	1.11 (0.07)	5.2 (15.5)	145	145	145
	3H	250 (118)	20.9 (6.1)	0.19	1.39 (0.09)	11.8 (35.3)	145	145	145
	4H	234 (111)	22.0 (6.5)	0.20	1.47 (0.09)	3.3 (9.9)	145	145	145
3	2H	330 (156)	21.5 (6.3)	0.20	1.43 (0.09)	9.2 (27.4)	140	140	140
	3H	309 (146)	25.3 (7.4)	0.23	1.68 (0.11)	3.7 (11.1)	145	140	135
	4H	290 (137)	27.6 (8.1)	0.25	1.84 (0.12)	5.4 (16.3)	145	140	135
4	2H	367 (173)	24.6 (7.2)	0.22	1.64 (0.10)	3.0 (8.9)	170	180	170
	3H	440 (208)	36.0 (10.5)	0.33	2.40 (0.15)	8.0 (23.8)	210	210	210
	4H	416 (196)	39.5 (11.6)	0.36	2.63 (0.17)	11.8 (35.3)	210	210	210
6	2H	610 (288)	40.5 (11.9)	0.37	2.70 (0.17)	8.8 (26.4)	245	240	240
	3H	704 (332)	55.3 (16.2)	0.50	3.68 (0.23)	5.2 (15.4)	320	320	320
	4H	662 (312)	61.1 (17.9)	0.56	4.07 (0.26)	7.2 (21.5)	320	320	320
8	2H	834 (394)	52.7 (15.5)	0.48	3.51 (0.22)	4.3 (12.7)	320	320	320
	3H	815 (385)	66.9 (19.6)	0.61	4.46 (0.28)	8.1 (24.1)	320	320	320
	4H	775 (366)	73.7 (21.6)	0.67	4.91 (0.31)	11.3 (33.8)	320	320	320
10	2H	1029 (486)	67.0 (19.6)	0.61	4.46 (0.28)	7.3 (21.8)	415	420	410
	3H	1117 (527)	91.0 (26.7)	0.83	6.06 (0.38)	15.9 (47.4)	530	530	530
	4H	1057 (499)	100.0 (29.3)	0.91	6.66 (0.42)	22.3 (66.6)	530	530	530
12	2H	1175 (554)	78.0 (22.8)	0.71	5.19 (0.33)	10.3 (30.8)	490	500	490
	3H	1242 (586)	101.5 (29.8)	0.92	6.77 (0.43)	12.8 (38.4)	530	530	530
	4H	1181 (557)	113.0 (33.1)	1.03	7.53 (0.47)	14.9 (44.6)	530	530	530

Note:

1. CFM = Cubic feet per minute
2. TMBH = Total capacity (MBH)
3. GPM = Gallons per minute
4. WPD = Water pressure drop (feet of water)
5. Q/ITD = MBH (kW)/(Entering water temperature - Entering air temperature) when DT and GPM (L/s) remain constant. To determine heating capacities at a different entering water temperature or entering air temp, compute the new ITD and multiply it by the Q/ITD shown.
6. Medium and low speed capacities are approximately 80 percent and 60 percent respectively of the high speed capacity.
7. High static motors need the appropriate length of duct to prevent poor acoustical applications.



# Performance Data

# Steam Coils

Heating performance is based on 70 F (21 C) entering air temperature, 2 psig (14 kPa) and 5 psig (103 kPa) entering steam pressure. All performance measured on high speed tap, zero ESP, with a throwaway filter.

**Table PD-7. Free Discharge Motor, Group 1**

Unit Size	Coil	CFM (L/s)	2 psig		5 psig		115V Watt	230V Watt	277V Watt
			TMBH (TKW)	Q/ITD	TMBH (TKW)	Q/ITD			
2	Steam	234 (110)	10.1 (2.9)	0.07	10.7 (3.1)	0.07	60	95	65
3	Steam	311 (147)	13.2 (3.9)	0.09	13.9 (4.1)	0.09	70	80	83
4	Steam	383 (181)	17.3 (5.1)	0.12	18.3 (5.4)	0.12	95	96	104
6	Steam	601 (284)	26.3 (7.7)	0.18	27.9 (8.2)	0.18	110	154	165
8	Steam	783 (370)	34.7 (10.2)	0.23	36.7 (10.8)	0.23	135	150	159
10	Steam	974 (460)	44.0 (12.9)	0.30	46.6 (13.7)	0.30	205	250	269
12	Steam	1104 (521)	51.1 (15.0)	0.34	54.2 (15.9)	0.35	230	246	263

**Table PD-8. Free Discharge Motor, Group 2**

Unit Size	Coil	CFM (L/s)	2 psig		5 psig		115V Watt	230V Watt	277V Watt
			TMBH (TKW)	Q/ITD	TMBH (TKW)	Q/ITD			
2	Steam	207 (98)	9.6 (2.8)	0.07	10.1 (3.0)	0.07	60	95	65
3	Steam	277 (130)	12.5 (3.7)	0.08	13.3 (3.9)	0.08	70	80	83
4	Steam	346 (163)	16.6 (4.9)	0.11	17.6 (5.1)	0.11	95	96	104
6	Steam	538 (254)	25.1 (7.4)	0.17	26.6 (7.8)	0.17	110	154	165
8	Steam	702 (331)	33.1 (9.7)	0.22	35.1 (10.3)	0.22	135	150	159
10	Steam	875 (413)	42.1 (12.3)	0.28	44.6 (13.1)	0.28	205	250	269
12	Steam	993 (469)	48.9 (14.3)	0.33	51.8 (15.2)	0.33	230	246	263

**Table PD-9. Free Discharge Motor, Group 3**

Unit size	Coil	CFM (L/s)	2 psig		5 psig		115V Watt	230V Watt	277V Watt
			TMBH (TKW)	Q/ITD	TMBH (TKW)	Q/ITD			
2	Steam	195 (92)	9.3 (2.7)	0.06	9.9 (2.9)	0.06	60	95	65
3	Steam	259 (122)	12.2 (3.6)	0.08	12.9 (3.8)	0.08	70	80	83
4	Steam	328 (155)	16.2 (4.7)	0.11	17.1 (5.0)	0.11	95	96	104
6	Steam	507 (239)	24.5 (7.2)	0.16	26.0 (7.6)	0.17	110	154	165
8	Steam	662 (312)	32.3 (9.5)	0.22	34.3 (10.0)	0.22	135	150	159
10	Steam	827 (390)	41.1 (12.0)	0.28	43.6 (12.8)	0.28	205	250	269
12	Steam	938 (443)	47.7 (14.0)	0.32	50.6 (14.8)	0.32	230	246	263

Note:  
 $Q/ITD = MBH (kW) / (\text{Saturated Steam temperature} - \text{Entering air temperature})$  when DT 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 Q/ITD shown.



# Performance Data

# Steam Coils

Heating performance is based on 70 F (21 C) entering air temperature, 2 psig (14 kPa) and 5 psig (103 kPa) entering steam pressure. All performance measured on high speed tap, zero ESP, no filter.

**Table PD-10. High Static Motor, Group 1**

Unit Size	Coil	CFM (L/s)	2 psig		5 psig		115V Watt	230V Watt	277V Watt
			TMBH (TkW)	Q/ITD	TMBH (TkW)	Q/ITD			
2	Steam	208 (132)	10.8 (3.2)	0.07	11.5 (3.4)	0.07	145	145	145
3	Steam	358 (169)	13.9 (4.1)	0.09	14.7 (4.3)	0.09	140	140	140
4	Steam	393 (185)	17.5 (5.1)	0.12	18.5 (5.4)	0.12	170	180	170
6	Steam	658 (311)	27.3 (8.0)	0.18	28.9 (8.5)	0.18	245	240	240
8	Steam	901 (425)	36.7 (10.7)	0.25	38.9 (11.4)	0.25	320	320	320
10	Steam	1110 (524)	46.4 (13.6)	0.31	49.2 (14.4)	0.31	415	420	410
12	Steam	1264 (597)	54.0 (15.8)	0.36	57.2 (16.8)	0.36	490	500	490

**Table PD-11. High Static Motor, Group 2**

Unit Size	Coil	CFM (L/s)	2 psig		5 psig		115V Watt	230V Watt	277V Watt
			TMBH (TkW)	Q/ITD	TMBH (TkW)	Q/ITD			
2	Steam	251 (119)	10.4 (3.0)	0.07	11.0 (3.2)	0.07	145	145	145
3	Steam	326 (154)	13.4 (3.9)	0.09	14.2 (4.2)	0.09	140	140	140
4	Steam	364 (172)	16.9 (5.0)	0.11	17.9 (5.3)	0.11	170	180	170
6	Steam	603 (285)	26.3 (7.7)	0.18	27.9 (8.2)	0.18	245	240	240
8	Steam	829 (392)	35.5 (10.4)	0.24	37.6 (11.0)	0.24	320	320	320
10	Steam	1024 (483)	44.9 (13.2)	0.30	47.6 (14.0)	0.30	415	420	410
12	Steam	1171 (553)	52.3 (15.3)	0.35	55.5 (16.3)	0.35	490	500	490

**Table PD-12. Steam Properties**

Steam Pressure PSIG (kPa)	2 (14)	5 (34)	10 (69)	15 (103)
Sat. Steam Temp. F (C)	219 (104)	227 (108)	239 (115)	250 (121)
Latent Heat — BTU/LB. (kJ/kg)	965 (2240)	960 (2230)	952 (2210)	945 (2200)

Note:

Q/ITD = MBH (kW)/(Saturated Steam temperature - Entering air temperature) when DT 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 Q/ITD shown. All performance measured on high speed tap, zero ESP, with a throwaway filter.

# Controls

## Control Options

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

- Manual three-speed fan switch
- Tracer ZN.010
- Tracer ZN.510
- Tracer ZN.520

## Manual Fan Mode Switch

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

The manual fan mode switch is a four-position switch (off, high, medium, low) that allows manual fan mode selection. 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.



*Fan Speed Switch*

## Tracer® Controls

The Tracer family of controllers (ZN.010, ZN.510, and ZN.520) 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 Rover™ service software. For more detailed information, refer to the Trane publication, *CNT-IOP-1* or *CNT-IOP-2*.

### Tracer ZN.010

#### Model Number Digit 30 = E

Tracer ZN.010 is a stand-alone microprocessor controller.

### Tracer ZN.510

#### Model Number Digit 30 = F

ZN.510 can be used as either a stand-alone or communicating microprocessor controller.

### Tracer ZN.520

#### Model Number Digit 30 = G

The ZN.520 controller can be used in a stand-alone application or as part of a Trane Integrated Comfort™ System (ICS).

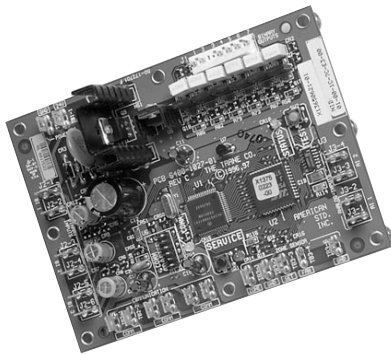
In the stand-alone configuration, ZN.520 receives operation commands from the zone sensor. The zone sensor module is capable of transmitting the following information to the controller:

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

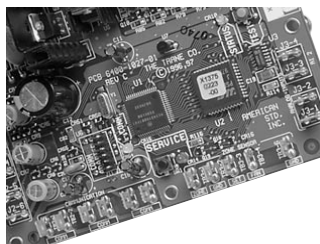
For optimal system performance, Force-Flo units can be linked to an Integrated Comfort™ System (ICS) building automation system controlled by Tracer Summit®. The controller is connected directly to the Summit control panel via a twisted pair communication wire, requiring no additional interface device (i.e., a command unit). The Trane ICS system can monitor or override ZN.520 control points. This includes such points as temperature and output positions.

### Rover™ Service Software

This windows-based software package option allows field service personnel to easily monitor, save, download, and configure Tracer controllers through a communication link from a portable computer. When connected to the communication link, Rover can view any Tracer controller that is on the same communication link.



*ZN.010 Control Board*



*ZN.510 Control Board*



# Controls

# Sequence of Operation

## 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.

### ZN.010 and ZN.510

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 cooling mode, the fan cycles from off to medium and 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.

### ZN.520

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.



# General Information

## Controls

**Table C-1. Controller Input/Output Summary**

	ZN.010	ZN.510	ZN.520
<b>Binary Outputs</b>			
3-Speed Fan	✓	✓	✓
2-Position Hydronic Valve	✓	✓	✓
2-Position Fresh Air Damper	✓	✓	✓
1-Stage Electric Heat	✓	✓	✓
3-Wire Hydronic Valve			✓
2-Stage Electric Heat			✓
Generic	✓	✓	✓
<b>Binary Inputs</b>			
Occupancy	✓	✓	✓
Generic Input	✓	✓	✓
<b>Analog Inputs</b>			
Zone Temperature	✓	✓	✓
Setpoint	✓	✓	✓
Fan Mode: Auto, High, Medium, Low	✓	✓	✓
Entering Water	✓	✓	✓
Discharge Air	✓	✓	✓
Outside Air			✓
Generic			✓

Note: The generic input and output are for use with a Tracer Summit system only.

**Table C-2. Controller Function Summary**

	ZN.010	ZN.510	ZN.520
<b>Control Functions</b>			
Timed Override	✓	✓	✓
Fan Cycling	✓	✓	✓
Warm-Up	✓	✓	✓
Data Sharing (Master/Slave)		✓	✓
Random Start	✓	✓	✓
Staged Capacity (2-Stage Electric Supplementary)			✓
<b>Other Functions</b>			
Manual Test	✓	✓	✓
Maintenance Timer	✓	✓	✓
Setpoint Limits	✓	✓	✓

# Controls

## Zone Sensor Options

### Zone Sensor Options

Zone sensors are available as either unit, wall, or split-mounted options for design flexibility. Cabinet heaters 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.

#### ZN.010



**Unit-mounted zone sensor: Digit 30 = E and Digit 31 = V**



**Wall-mounted zone sensor: Digit 30 = E and Digit 31 = W**



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

#### ZN.510 and ZN.520



**Unit-mounted zone sensor: Digit 30 = E and Digit 31 = Z**



**Wall-mounted zone sensor: Digit 30 = E and Digit 31 = 2**



**Split-mounted zone sensor, unit-mounted fan mode and wall-mounted setpoint dial: Digit 30 = E and Digit 31 = Y**

## Controls

## Features

### Control Features

The following control functions are standard features on units with Tracer ZN.010, ZN.510, or ZN.520.

#### 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 start-up to reduce electrical demand spikes.

#### Warm-up

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 warm-up 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 (ZN.510 and ZN.520)

Peer to peer communication allows multiple units in one space to share the same zone sensor and provide simultaneous heating. The ZN.510 or ZN.520 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.

### ZN.520 Additional Features

#### Fan Status

The ZN.520 controller monitors the fan output status to determine if the fan is operating.

#### Filter Maintenance Status

The controller has an adjustable timer that indicates through Summit or Rover when filter maintenance is necessary. Filter maintenance status is based on cumulative fan run hours.

#### Water Valve Override

Using Summit or Rover, 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

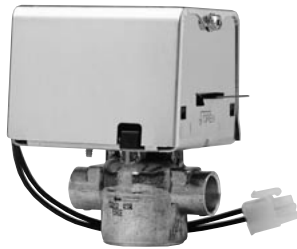
The controller maintains discharge air temperature using a cascade control algorithm. The discharge air temperature is based on the difference between the space temperature and setpoint. Unit capacity modulates to achieve the discharge air temperature.

#### Interoperability

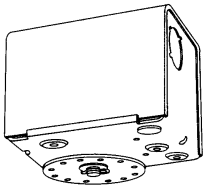
The ZN.520 controller can be used with a Tracer Summit system or on other control systems that support LonTalk and the SCC profile. For more information on specific inputs and outputs, see the *Installation, Owner, and Maintenance Manual, UNT-IOM-6*.

## End Device Options

# Controls



*Control Valve*



*Two-Position Fresh Air Damper Actuator*

### End Device Options

All end device options are factory-installed and tested.

#### Two-Position Control Valves

##### Model Number Digits 27 and 28 = A - H

Two-position valve options are available with either Tracer ZN.010, ZN.510, or ZN.520. Valves are spring-return type, sweat connections, and available as normally open or closed. The valves respond to a 24V 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 (ZN.520)

##### Model Number Digits 27 and 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 24V 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 or Y

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

Note: The Trane Company 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 ZN.520)

This damper actuator uses a 24V signal and is factory-wired and mounted to the damper assembly. It allows zero to 50% 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

## 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 Tables ED-2 through ED-5 on page 31 for motor FLAs and Tables ED-6 through ED-8 on pages 32-33 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 240V heat voltage for 230V units.

### Calculating MCA:

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

### Calculating MFS:

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 Tables ED-2 through ED-5 on page 31 for motor FLAs and Tables ED-6 through ED-8 on pages 32-33 for electric heat amps.

### Calculating MCA:

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

### Calculating MFS:

MFS or HACR<sup>1</sup> type circuit breaker = 15 amps for all units without electric heat.

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

**Table ED-1. Decimal to Fractional HP (kW) Conversion**

Unit Size	Decimal	Fraction
02	.03	<sup>1</sup> / <sub>30</sub>
	.07	<sup>1</sup> / <sub>15</sub>
03	.04	<sup>1</sup> / <sub>25</sub>
	.05	<sup>1</sup> / <sub>20</sub>
	.08	<sup>1</sup> / <sub>12</sub>
04	.05	<sup>1</sup> / <sub>20</sub>
	.06	<sup>1</sup> / <sub>16</sub>
	.10	<sup>1</sup> / <sub>10</sub>
	.13	<sup>1</sup> / <sub>8</sub>
06	.07	<sup>1</sup> / <sub>15</sub>
	.12	<sup>1</sup> / <sub>8</sub>
	.16	<sup>1</sup> / <sub>6</sub>
	.24	<sup>1</sup> / <sub>4</sub>
08	.12	<sup>1</sup> / <sub>8</sub>
	.13	<sup>1</sup> / <sub>8</sub>
	.24	<sup>1</sup> / <sub>4</sub>
10	.05	<sup>1</sup> / <sub>20</sub>
	.06	<sup>1</sup> / <sub>16</sub>
	.10	<sup>1</sup> / <sub>10</sub>
	.13	<sup>1</sup> / <sub>8</sub>
12	.05	<sup>1</sup> / <sub>20</sub>
	.06	<sup>1</sup> / <sub>16</sub>
	.10	<sup>1</sup> / <sub>10</sub>
	.13	<sup>1</sup> / <sub>8</sub>

Note:  
Values for fractional HPs (kW) are approximate values and not necessarily the actual HP (kW).

# Electrical Data

**Table ED-2. Free Discharge Motors on Units with Two-Row, Electric, or Steam Coils**

FC	115 Volt			208-230 Volt			277-480 Volt			RPM		
	FLA	HP (kW)		FLA	HP (kW)		FLA	HP (kW)		H	M	L
02	0.6	.03 (.02)		0.3	.03 (.02)		0.2	.03 (.02)		980	840	655
03	0.7	.04 (.02)		0.4	.04 (.02)		0.3	.04 (.02)		980	780	580
04	0.9	.05 (.04)		0.5	.05 (.04)		0.4	.05 (.04)		1050	780	580
06	1.2	.07 (.05)		0.6	.07 (.05)		0.5	.07 (.05)		1030	780	580
08	1.4	.12 (.09)		0.9	.12 (.09)		0.6	.12 (.09)		1080	800	600
10	0.9	1.2	.05 (.04) .07 (.05)	0.5	0.6	.05 (.04) .07 (.05)	0.4	0.5	.05 (.04) .07 (.05)	1050 1030	780 780	580 580
12	0.9	1.4	.05 (.04) .12 (.09)	0.5	0.9	.05 (.04) .12 (.09)	0.4	0.6	.05 (.04) .12 (.09)	1050 108	780 800	580 600

**Table ED-3. High Static Motors on Units with Two-Row, Electric, or Steam Coils**

FC	115 Volt			208-230 Volt			277-480 Volt			RPM		
	FLA	HP (kW)		FLA	HP (kW)		FLA	HP (kW)		H	M	L
02	1.1	.07 (.05)		0.6	.07 (.05)		0.5	.07 (.05)		1480	1110	865
03	1.4	.08 (.06)		0.7	.08 (.06)		0.6	.08 (.06)		1400	1175	860
04	1.6	.10 (.07)		0.8	.10 (.07)		0.7	.10 (.07)		1475	1315	1070
06	2.6	.16 (.12)		1.2	.16 (.12)		1.0	.16 (.12)		1400	1070	855
08	3.4	.24 (.18)		1.4	.24 (.18)		1.1	.24 (.18)		1475	1285	975
10	1.6	2.6	.10 (.07) .16 (.12)	0.8	1.2	.10 (.07) .16 (.12)	0.7	1.0	.10 (.07) .16 (.12)	1475 1400	1315 1070	1070 855
12	1.6	3.4	.10 (.07) .24 (.18)	0.5	0.9	.10 (.07) .24 (.18)	0.7	1.1	.10 (.12) .24 (.18)	1475 1475	1315 1285	1240 975

**Table ED-4. Free Discharge Motors on Units with Three and Four-Row Coils**

FC	115 Volt			208-230 Volt			277-480 Volt			RPM		
	FLA	HP (kW)		FLA	HP (kW)		FLA	HP (kW)		H	M	L
02	0.6	.03 (.02)		0.3	.03 (.02)		0.2	.03 (.02)		980	840	655
03	0.8	.05 (.04)		0.5	.05 (.04)		0.4	.05 (.04)		1080	800	600
04	1.0	.06 (.04)		0.6	.06 (.04)		0.5	.06 (.04)		1080	800	600
06	1.4	.12 (.09)		0.9	.12 (.09)		0.6	.12 (.09)		1080	800	600
08	1.7	.13 (.10)		1.0	.13 (.10)		0.8	.13 (.10)		1080	800	600
10	1.0	1.4	.06 (.04) .12 (.09)	0.6	0.9	.06 (.04) .12 (.09)	0.5	0.6	.06 (.04) .12 (.09)	1080 1080	800 800	600 600
12	1.0	1.7	.06 (.04) .13 (.10)	0.6	1.0	.06 (.04) .13 (.10)	0.5	0.8	.06 (.04) .13 (.10)	1080 1080	800 800	600 600

**Table ED-5. High Static Motors on Units with Three and Four-Row Coils**

FC	115 Volt			208-230 Volt			277-480 Volt			RPM		
	FLA	HP (kW)		FLA	HP (kW)		FLA	HP (kW)		H	M	L
02	1.1	.07 (.05)		0.6	.07 (.05)		0.5	.07 (.05)		1480	1110	865
03	1.3	.08 (.06)		0.7	.08 (.06)		0.5	.08 (.06)		1500	1355	1110
04	2.1	.13 (.10)		0.9	.13 (.10)		0.7	.13 (.10)		1580	1375	1240
06	3.4	.24 (.18)		1.4	.24 (.18)		1.1	.24 (.18)		1475	1285	975
08	3.4	.24 (.18)		1.4	.24 (.18)		1.1	.24 (.18)		1475	1285	975
10	2.1	3.4	.13 (.10) .24 (.18)	0.9	1.4	.13 (.10) .24 (.18)	0.7	1.1	.13 (.10) .24 (.18)	1580 1475	1375 1285	1240 975
12	2.1	3.4	.13 (.10) .24 (.18)	0.9	1.4	.13 (.10) .24 (.18)	0.7	1.1	.13 (.10) .24 (.18)	1580 1475	1375 1285	1240 975

Note:  
Actual rpm will vary with application and configuration.



# Electrical Data

**Table ED-6. Two-Stage Electric Heat (Digit 18 = U)**

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



# Electrical Data

**Table ED-7. Single-Stage, Max kW Electric Heat (Digit 18 = N)**

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

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

**Table ED-8. 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.



# Dimensions and Weights

**Table DW-1. Operating Weights — lbs. (kg)**

Unit Size	Cabinet Models	Concealed Models	Recessed Models
02	97 (44)	81 (37)	78 (35)
03	97 (44)	81 (37)	78 (35)
04	125 (57)	109 (49)	88 (40)
06	155 (70)	139 (63)	128 (58)
08	164 (74)	147 (67)	139 (63)
10	218 (99)	200 (91)	253 (115)
12	218 (99)	200 (91)	253 (115)

**Table DW-2. Shipping Weights — lbs. (kg)**

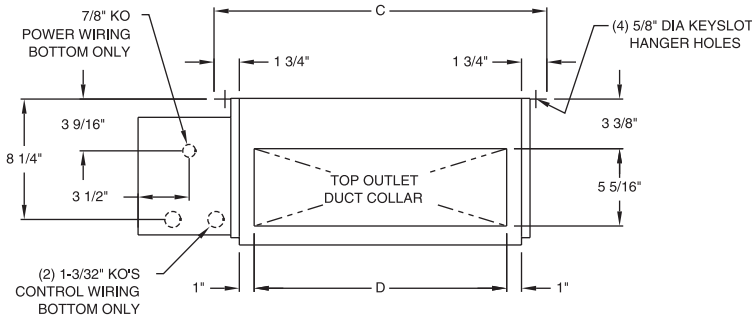
Unit Size	Cabinet Models	Concealed Models	Recessed Models
02	84 (38)	68 (31)	68 (31)
03	84 (38)	68 (31)	68 (31)
04	112 (51)	96 (44)	78 (35)
06	139 (63)	123 (56)	118 (54)
08	148 (67)	131 (59)	129 (59)
10	200 (91)	182 (83)	243 (110)
12	200 (91)	182 (83)	243 (110)

# Dimensions and Weights

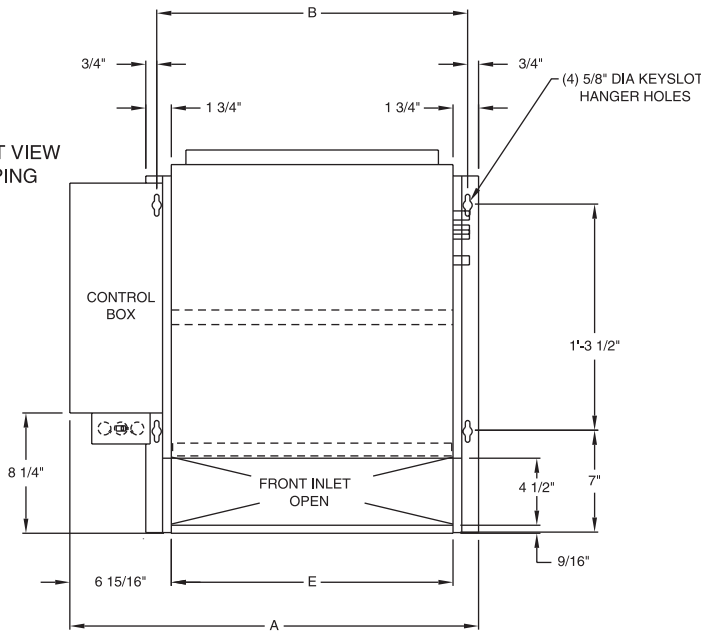
# Vertical Concealed

## Vertical Concealed, Model A

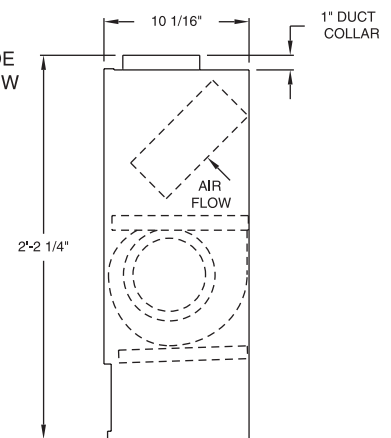
TOP VIEW



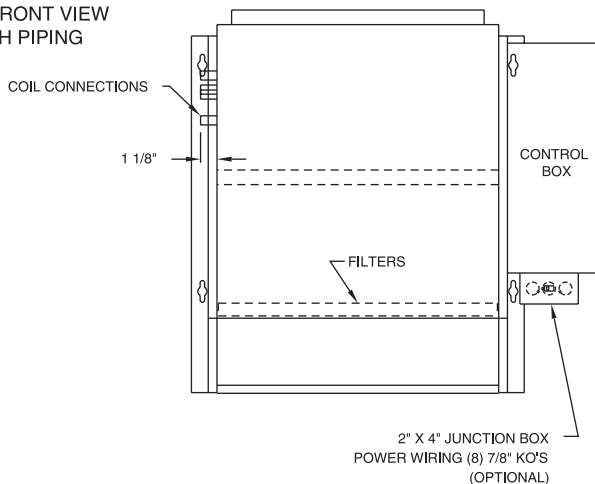
FRONT VIEW  
RH PIPING



SIDE VIEW



FRONT VIEW  
LH PIPING



### Vertical Concealed Unit Dimensions

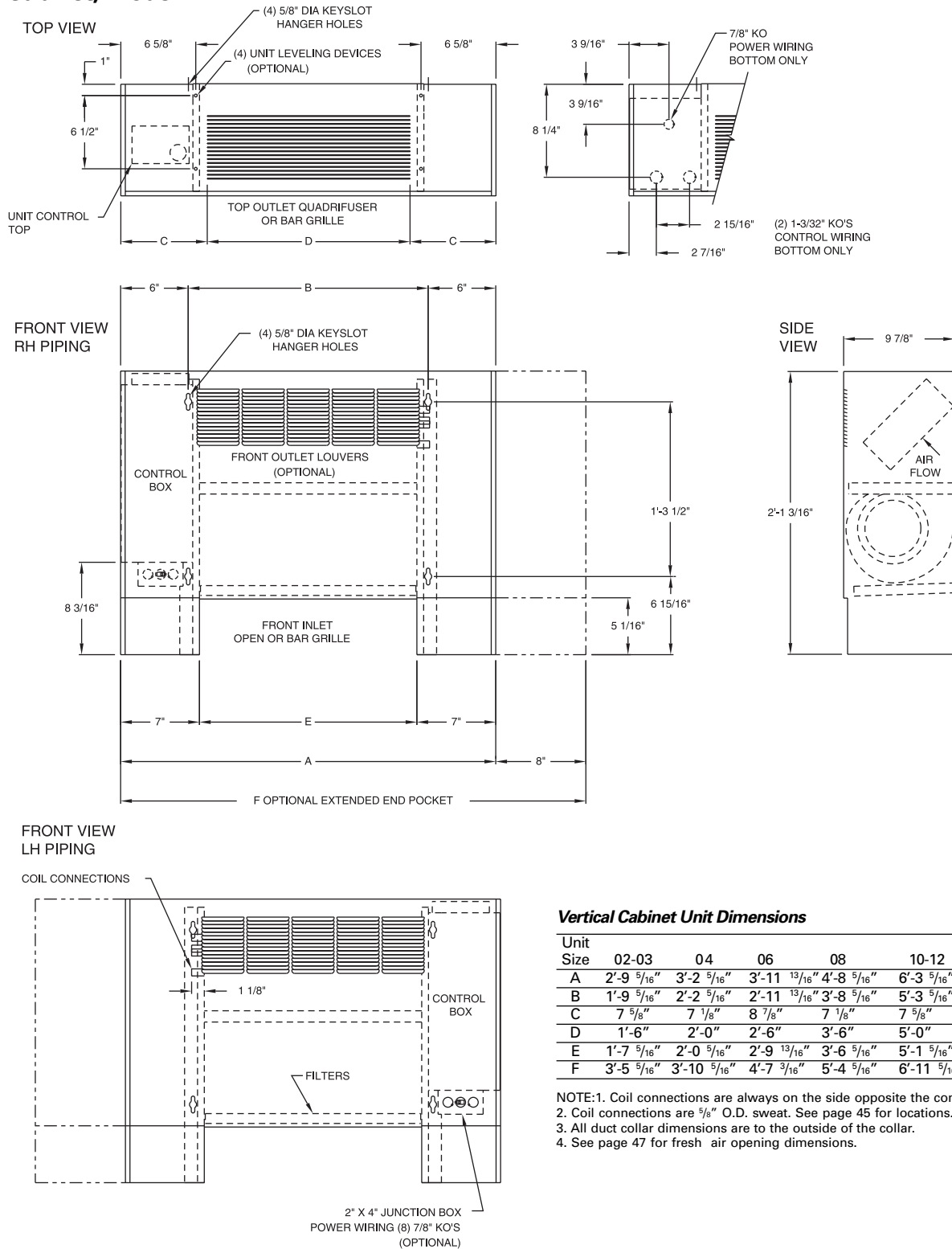
Unit Size	02-03	04	06	08	10-12
A	2'-3 7/8"	2'-8 7/8"	3'-6 3/8"	4'-2 7/8"	5'-9 7/8"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	1'-5 5/16"	1'-10 5/16"	2'-7 13/16"	3'-4 5/16"	4'-11 5/16"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"

- NOTE: 1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 47 for fresh air opening dimensions.

# Dimensions and Weights

# Vertical Cabinet

## Vertical Cabinet, Model B



### Vertical Cabinet Unit Dimensions

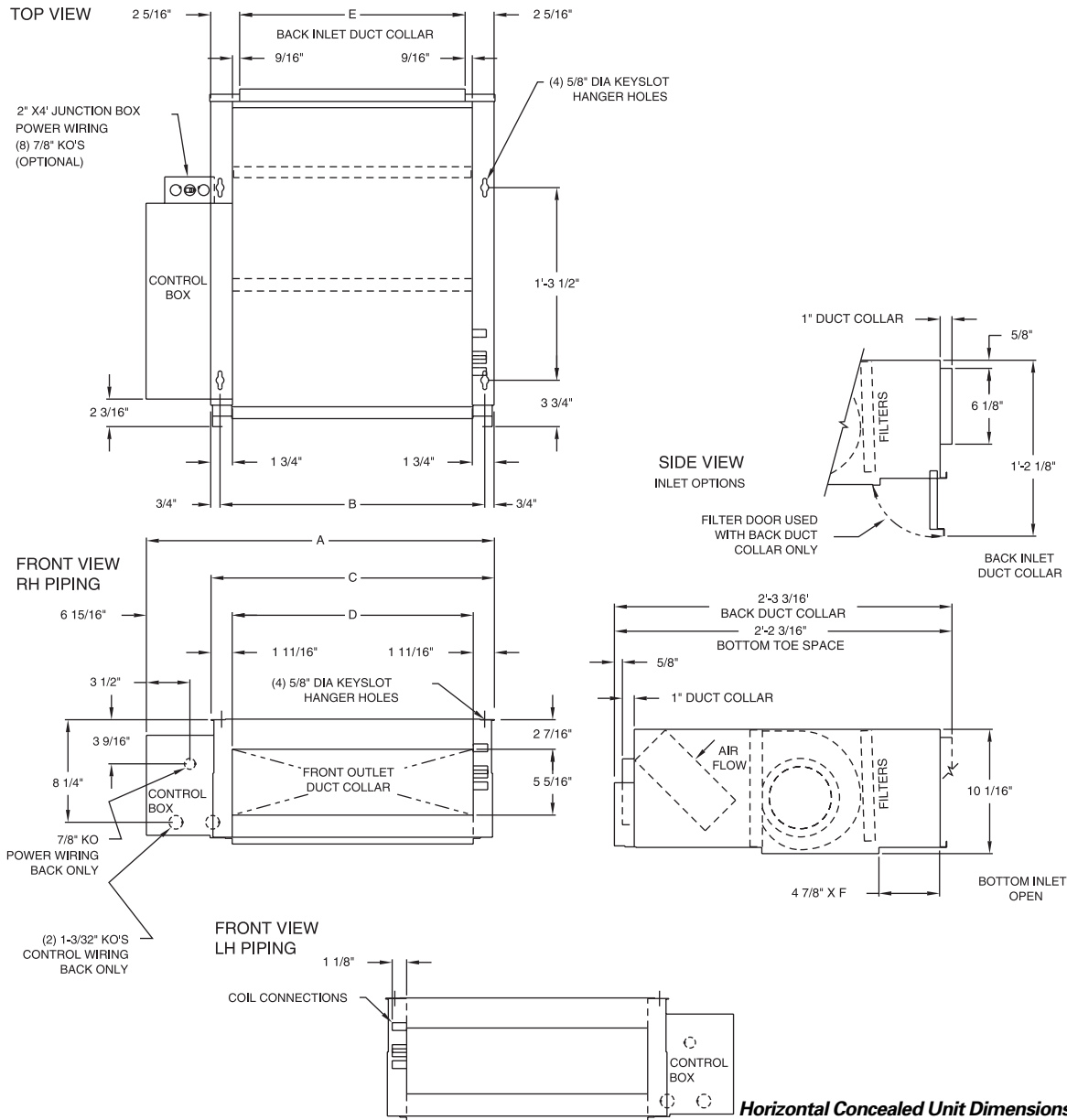
Unit Size	02-03	04	06	08	10-12
A	2'-9 5/16"	3'-2 5/16"	3'-11 13/16"	4'-8 5/16"	6'-3 5/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	7 5/8"	7 1/8"	8 7/8"	7 1/8"	7 5/8"
D	1'-6"	2'-0"	2'-6"	3'-6"	5'-0"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"
F	3'-5 5/16"	3'-10 5/16"	4'-7 3/16"	5'-4 5/16"	6'-11 5/16"

- NOTE: 1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 47 for fresh air opening dimensions.

# Dimensions and Weights

# Horizontal Concealed

## Horizontal Concealed, Model C



**Horizontal Concealed Unit Dimensions**

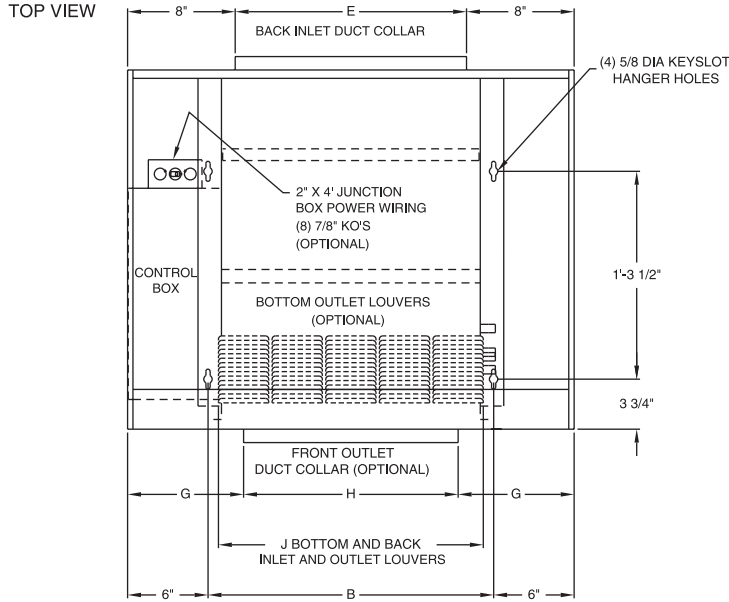
Unit Size	02-03	04	06	08	10-12
A	2'-4 1/16"	2'-9 1/16"	3'-6 3/16"	4'-3 1/16"	5'-10 1/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	1'-7 3/8"	2'-0 3/8"	2'-9 7/8"	3'-6 3/8"	5'-1 3/8"
E	1'-6 1/8"	1'-11 1/8"	2'-8 5/8"	3'-5 1/8"	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"

NOTE:1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 46 for fresh air opening dimensions.

# Dimensions and Weights

# Horizontal Cabinet

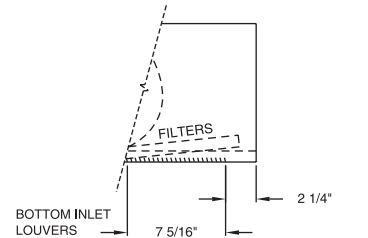
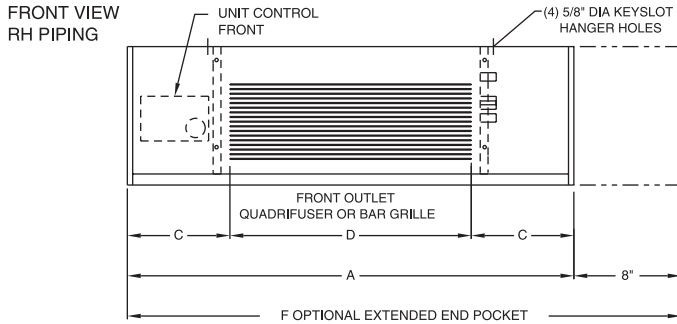
## Horizontal Cabinet, Model D



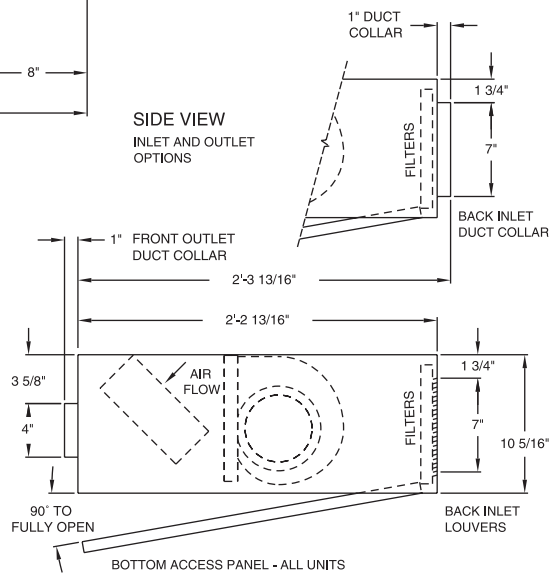
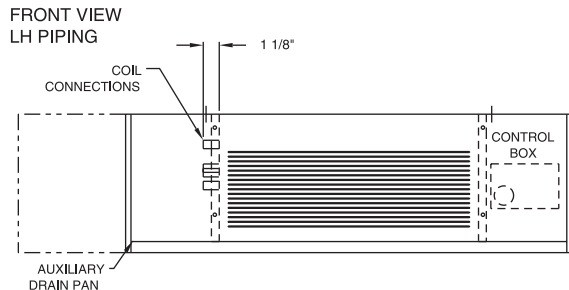
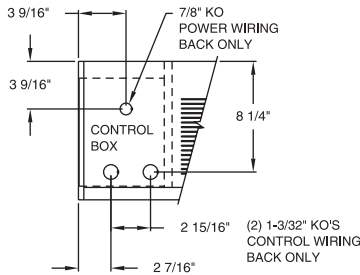
**Horizontal Cabinet Unit Dimensions**

Unit Size	02-03	04	06	08	10-12
A	2'-9 5/16"	3'-2 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"

NOTE:1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 3/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 46 for fresh air opening dimensions.



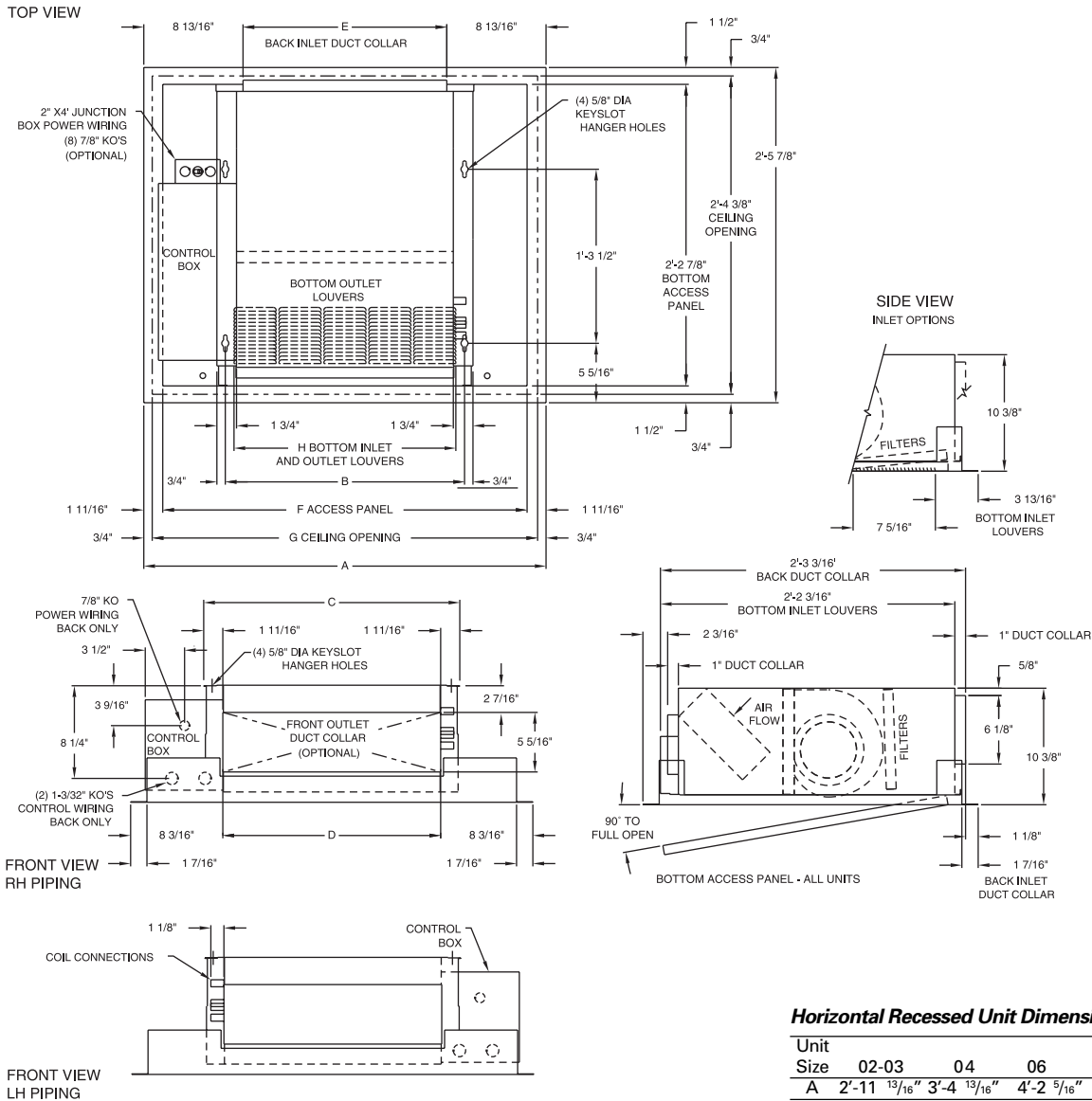
**SIDE VIEW  
INLET AND OUTLET  
OPTIONS**



# Dimensions and Weights

# Horizontal Recessed

## Horizontal Recessed, Model E



### Horizontal Recessed Unit Dimensions

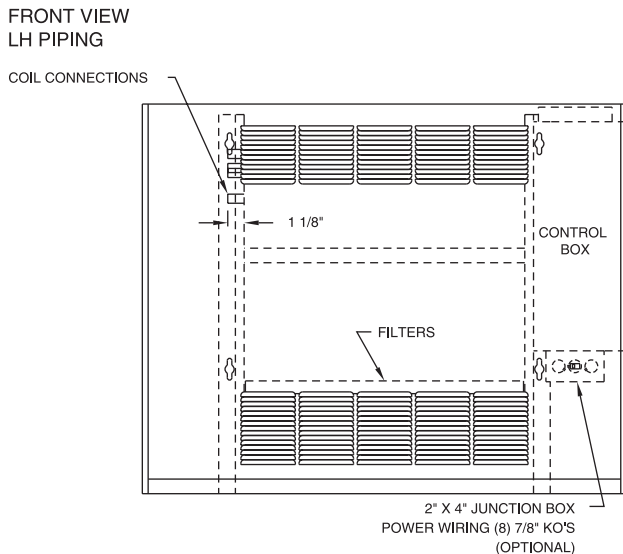
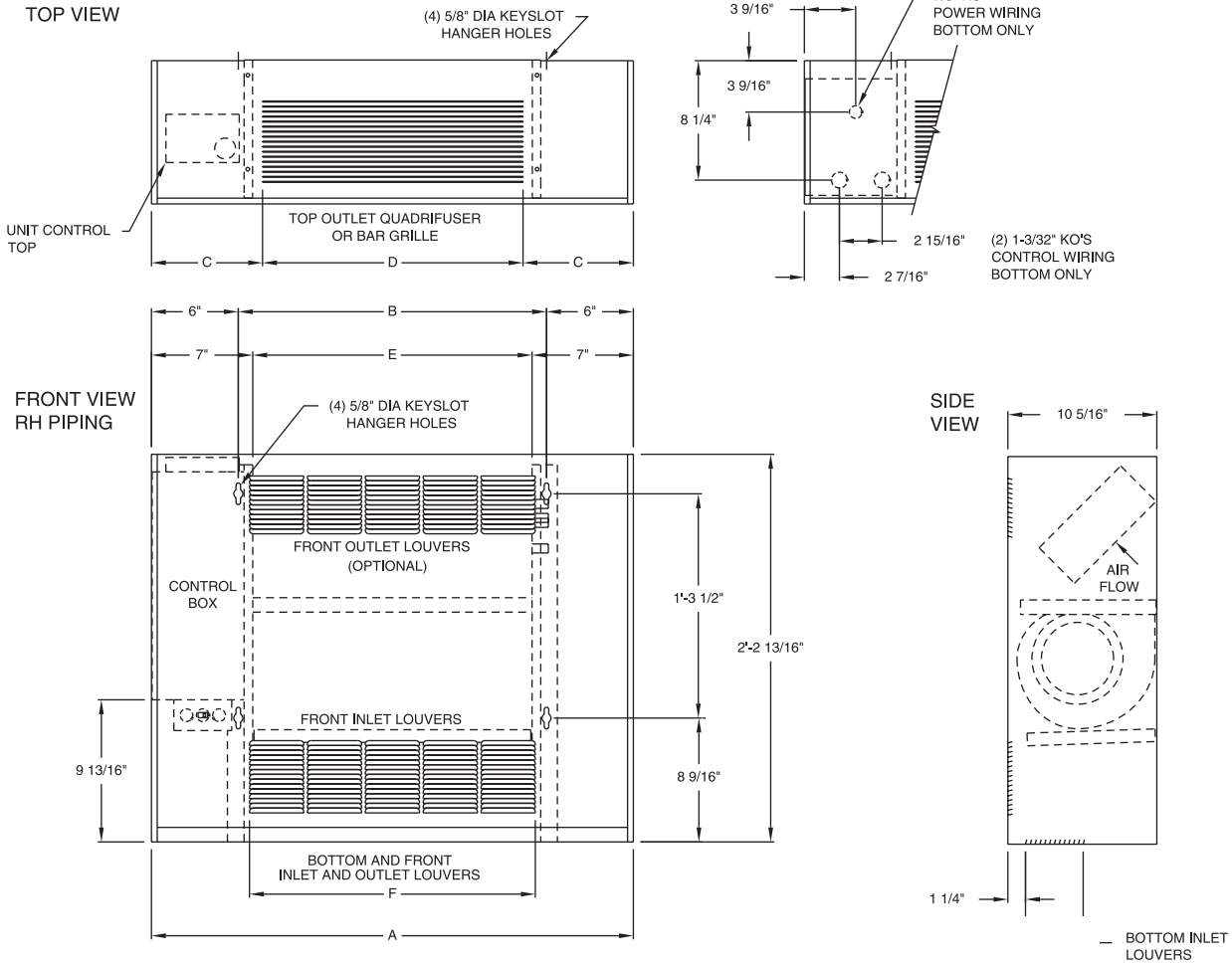
Unit Size	02-03	04	06	08	10-12
A	2'-11 13/16"	3'-4 13/16"	4'-2 5/16"	4'-10 13/16"	6'-5 13/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	1'-7 3/8"	2'-0 3/8"	2'-9 7/8"	3'-6 3/8"	5'-1 3/8"
E	1'-6 1/8"	1'-11 1/8"	2'-8 5/8"	3'-5 1/8"	5'-0 1/8"
F	2'-8 7/16"	3'-1 7/16"	3'-10 13/16"	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"

NOTE: 1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 46 for fresh air opening dimensions.

# Dimensions and Weights

# Vertical Wall Hung

## Vertical Wall Hung Cabinet, Model F



### Vertical Wall Hung Cabinet Unit Dimensions

Unit Size	02-03	04	06	08	10-12
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"

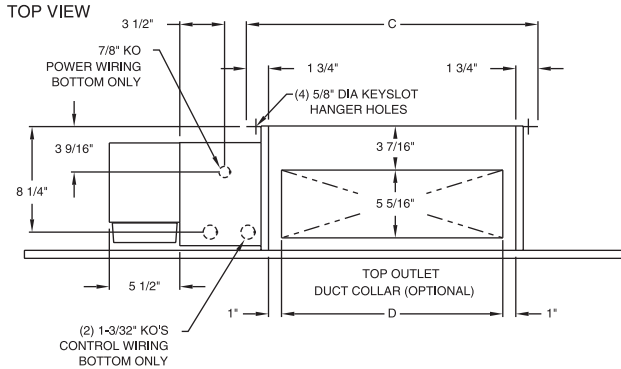
NOTE: 1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 47 for fresh air opening dimensions.



# Dimensions and Weights

## Vertical Recessed

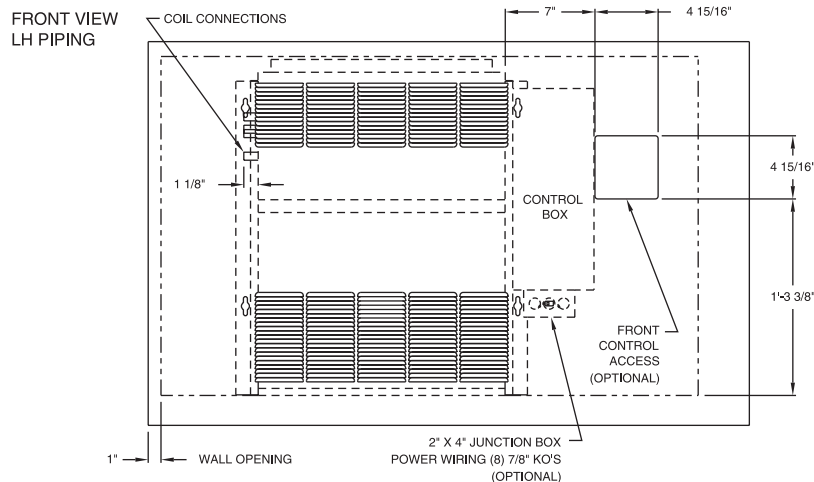
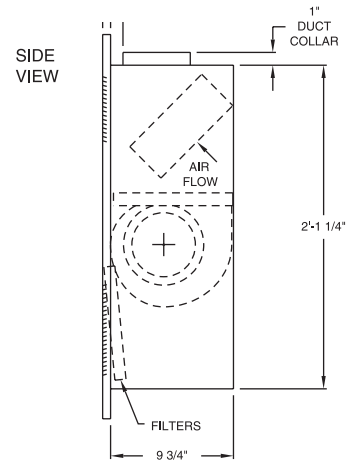
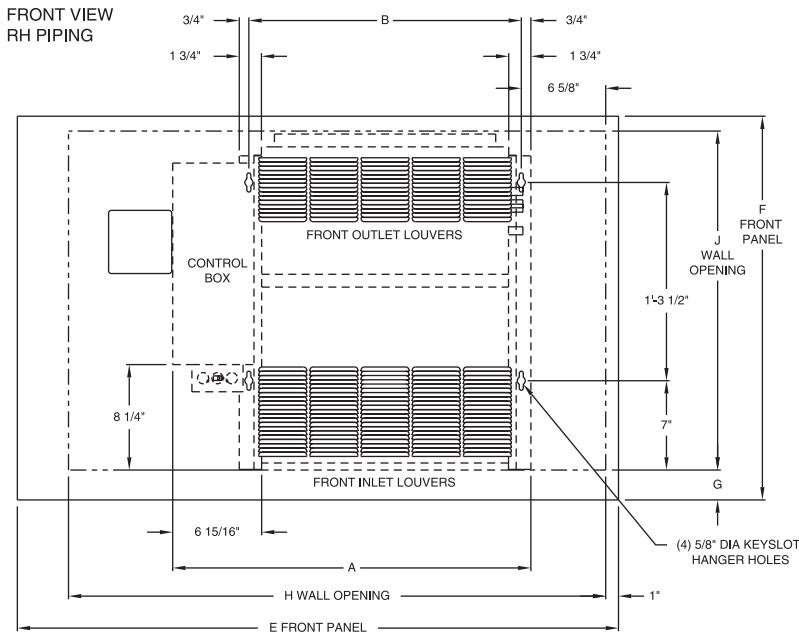
### Vertical Recessed, Model H



#### Vertical Recessed Unit Dimensions

Unit Size	02-03	04	06	08	10-12
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	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"

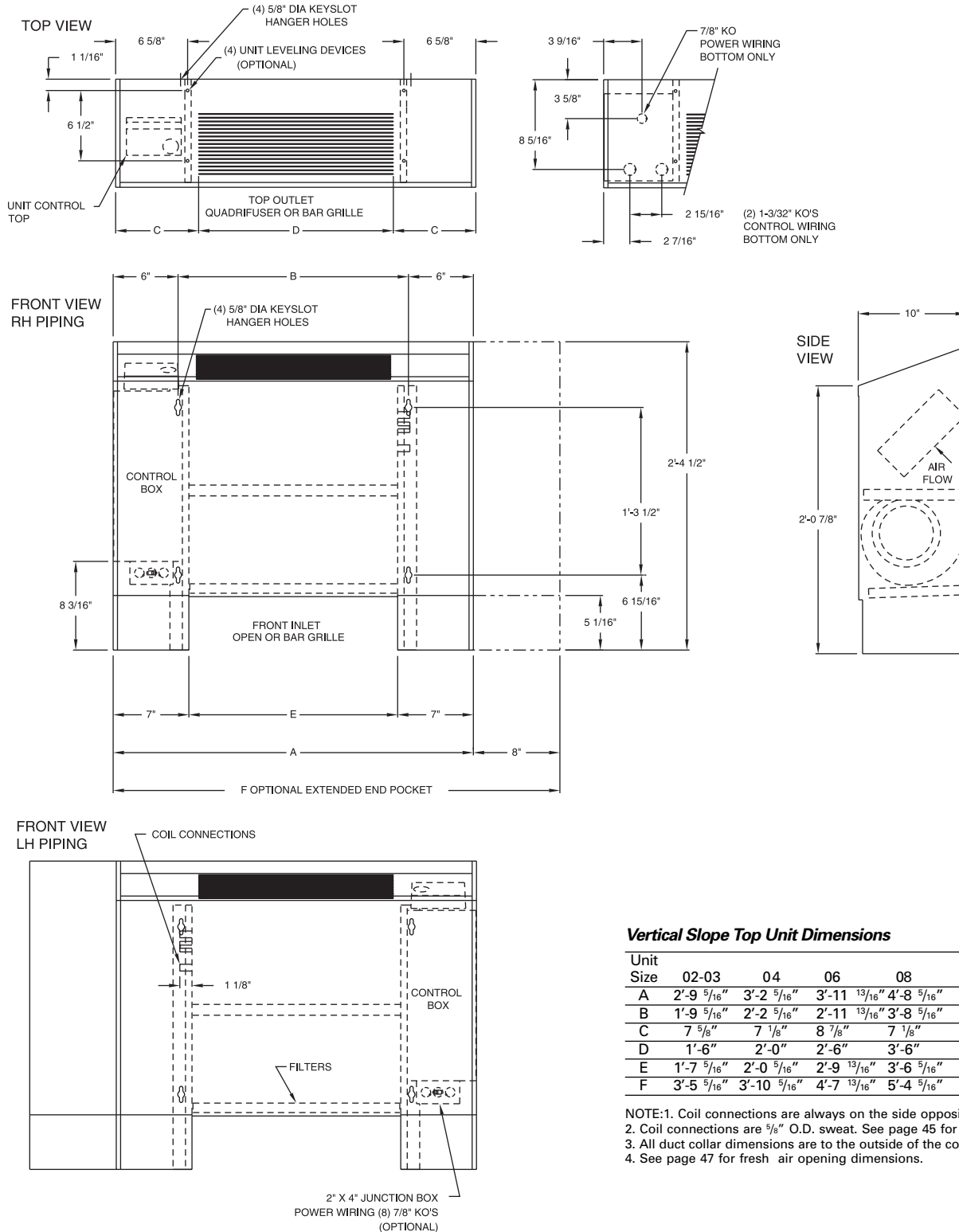
- NOTE:1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 47 for fresh air opening dimensions.



# Dimensions and Weights

# Vertical Slope Top

## Vertical Slope Top, Model J



### Vertical Slope Top Unit Dimensions

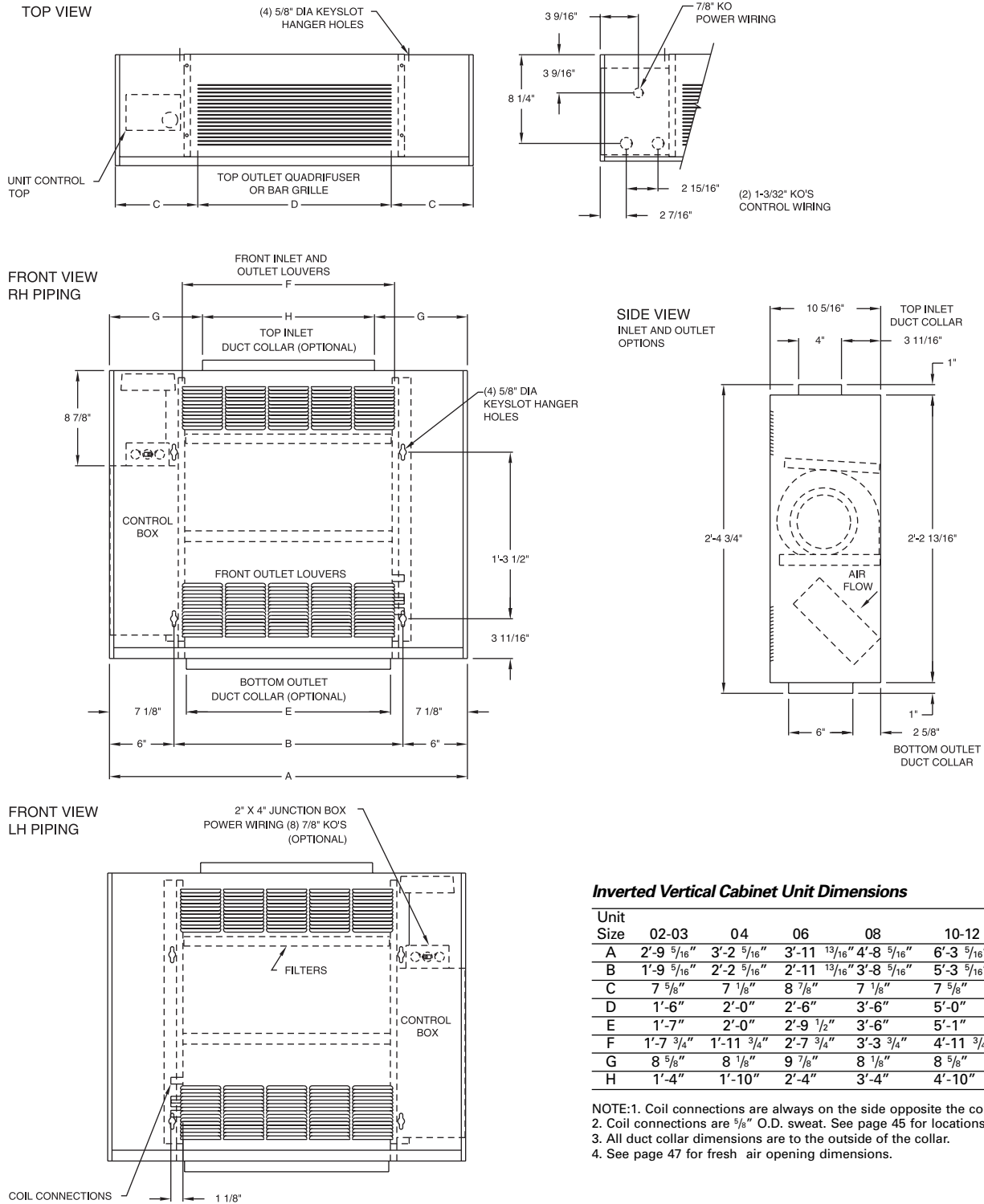
Unit Size	02-03	04	06	08	10-12
A	2'-9 5/16"	3'-2 5/16"	3'-11 13/16"	4'-8 5/16"	6'-3 5/16"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	7 5/8"	7 1/8"	8 7/8"	7 1/8"	7 5/8"
D	1'-6"	2'-0"	2'-6"	3'-6"	5'-0"
E	1'-7 5/16"	2'-0 5/16"	2'-9 13/16"	3'-6 5/16"	5'-1 5/16"
F	3'-5 5/16"	3'-10 5/16"	4'-7 13/16"	5'-4 5/16"	6'-11 5/16"

NOTE: 1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 47 for fresh air opening dimensions.

# Dimensions and Weights

# Inverted Vertical Cabinet

## Inverted Vertical Cabinet, Model M

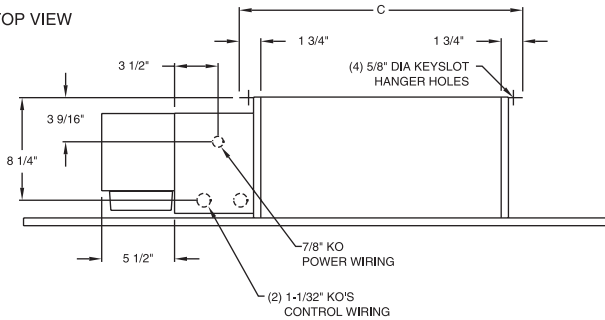


# Dimensions and Weights

# Inverted Vertical Recessed

## Inverted Vertical Recessed, Model N

TOP VIEW

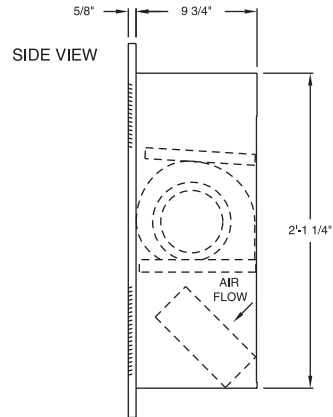
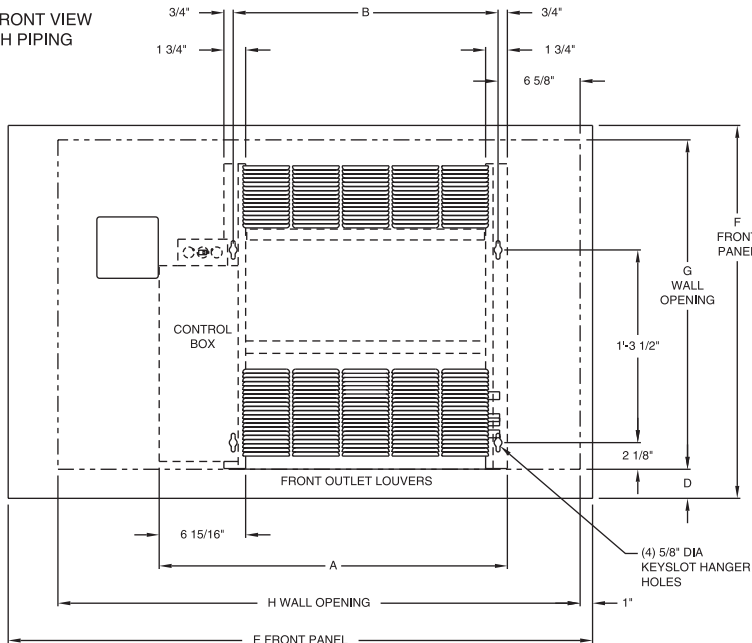


**Inverted Vertical Recessed Unit Dimensions**

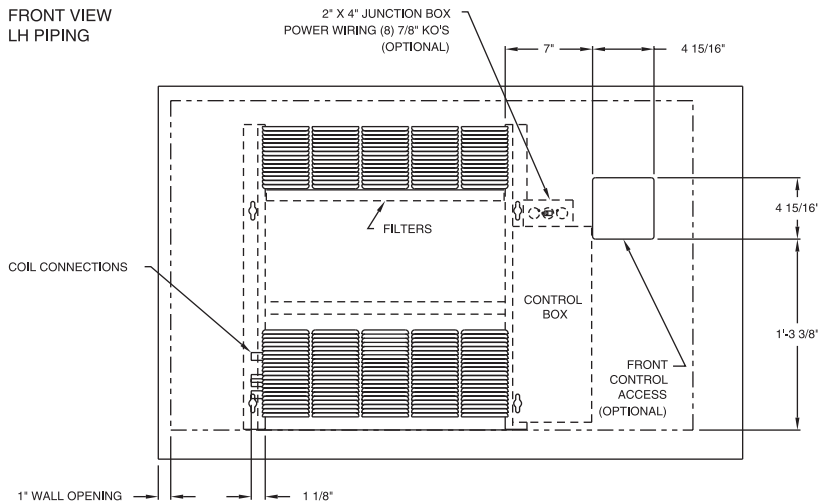
Unit Size	02-03	04	06	08	10-12
A	2'-3 7/8"	2'-8 7/8"	3'-6 3/8"	4'-2 7/8"	5'-9 7/8"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"
C	1'-10 13/16"	2'-3 13/16"	3'-1 5/16"	3'-9 13/16"	5'-4 13/16"
D	2 3/8"	2 3/8"	2 3/8"	4 1/8"	4 1/8"
E	3'-11"	4'-3"	5'-3"	5'-5 1/2"	7'-5 1/2"
F	2'-6"	2'-6"	2'-6"	2'-9 1/2"	2'-9 1/2"
G	2'-2 1/2"	2'-2 1/2"	2'-2 1/2"	2'-3 1/2"	2'-3 1/2"
H	3'-6"	4'-0"	4'-9"	5'-3"	7'-3"

- NOTE: 1. Coil connections are always on the side opposite the control box.  
 2. Coil connections are 5/8" O.D. sweat. See page 45 for locations.  
 3. All duct collar dimensions are to the outside of the collar.  
 4. See page 47 for fresh air opening dimensions.

FRONT VIEW  
RH PIPING



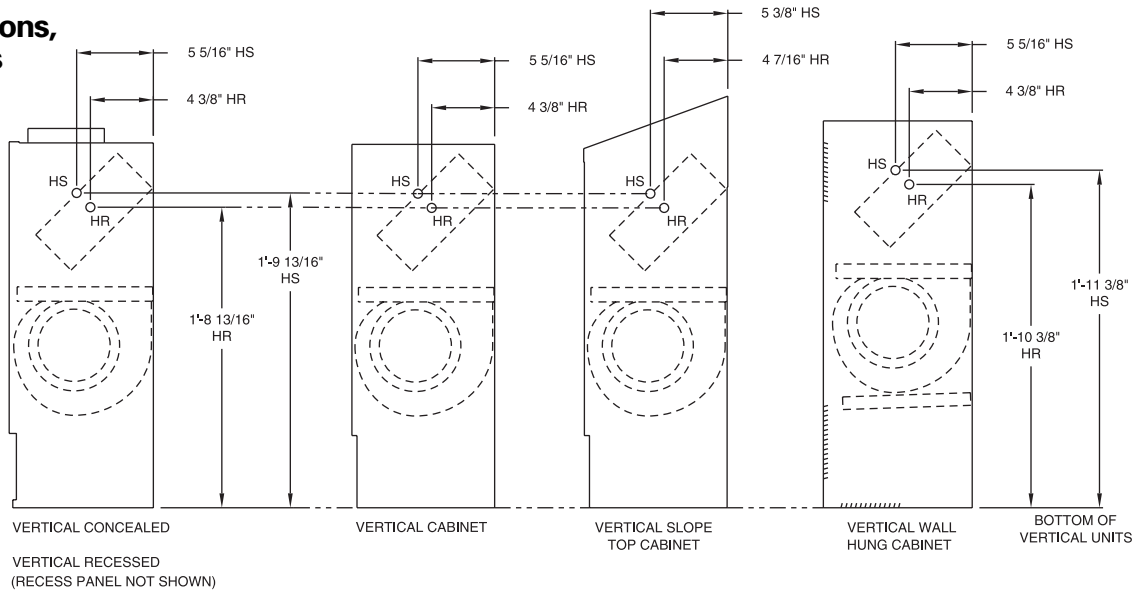
FRONT VIEW  
LH PIPING



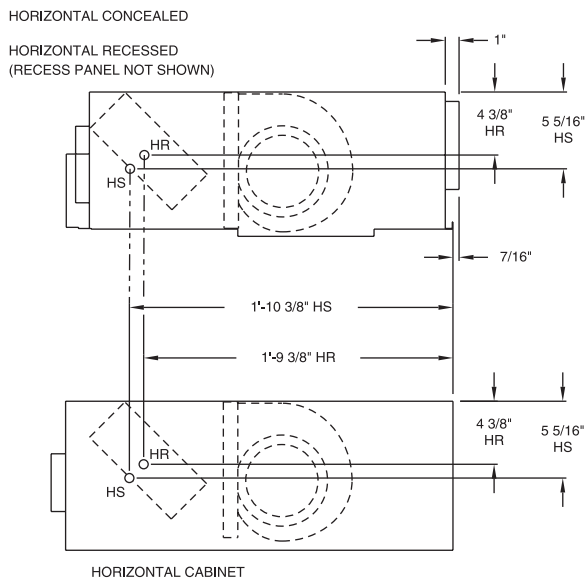
# Dimensions and Weights

# Coil Connections

## Coil Connections, Vertical Units

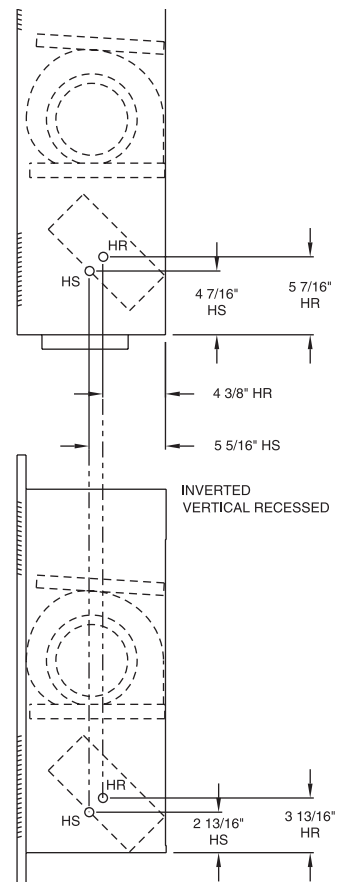


## Coil Connections, Horizontal Units



HR - Hot Water Return  
 HS - Hot Water Supply

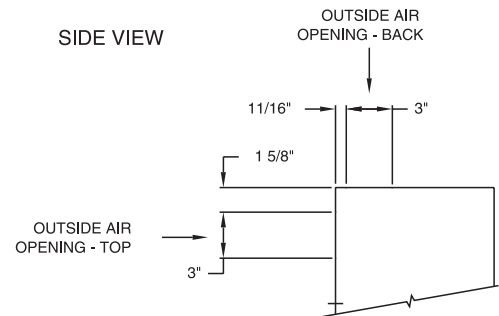
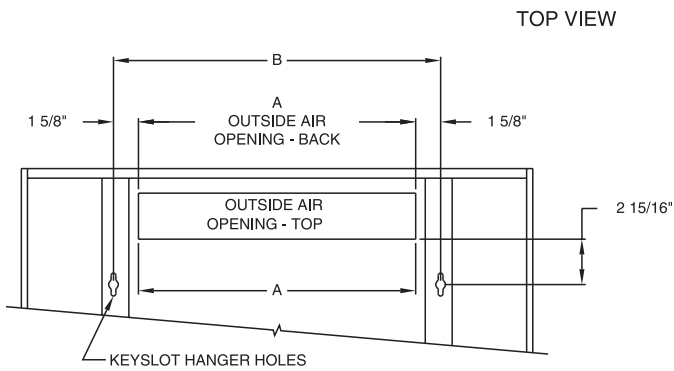
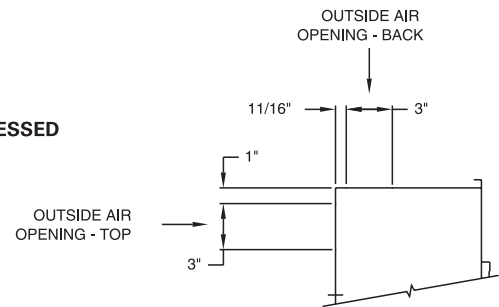
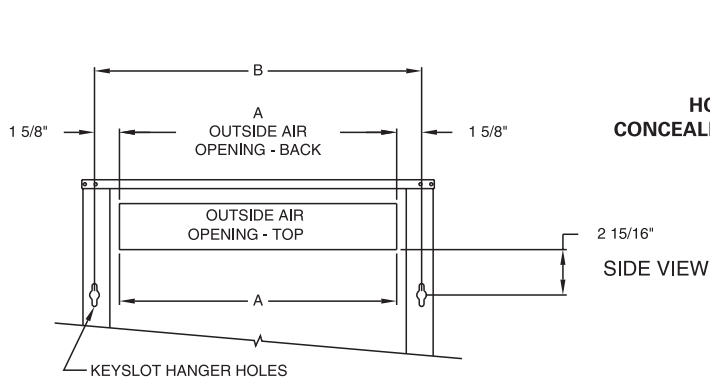
## Coil Connections, Inverted Units



# Dimensions and Weights

# Fresh Air Opening

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



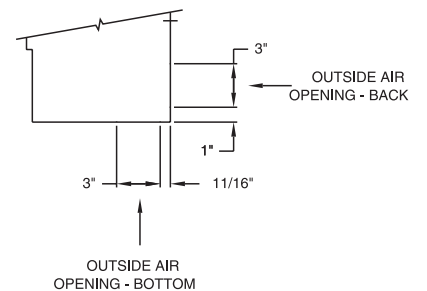
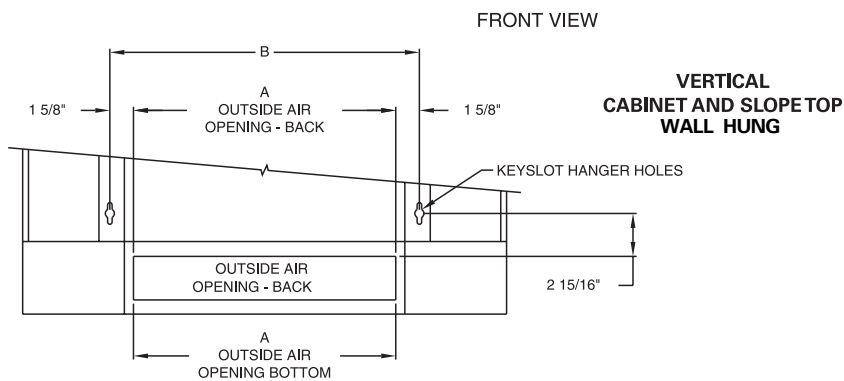
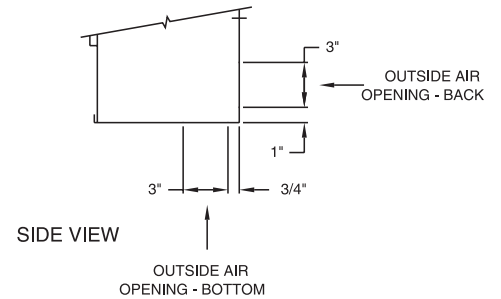
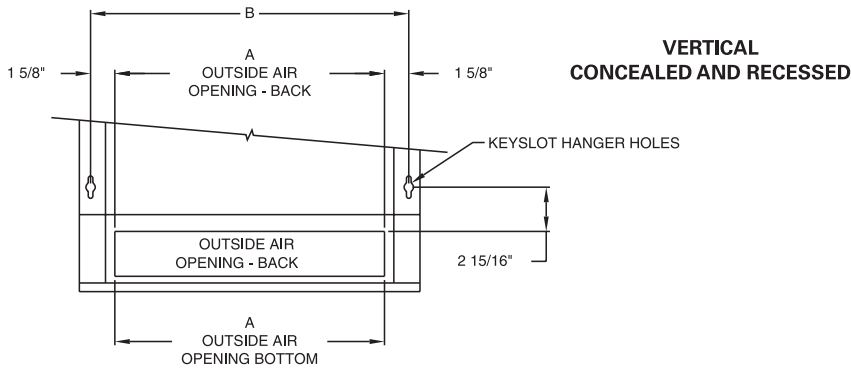
**Fresh Air Opening Dimensions, Horizontal Units**

Unit Size	02-03	04	06	08	10-12
A	1'-6"	1'-11"	2'-8 1/2"	3'-5"	5'-0"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"

# Dimensions and Weights

# Fresh Air Opening

## 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	1'-6"	1'-11"	2'-8 1/2"	3'-5"	5'-0"
B	1'-9 5/16"	2'-2 5/16"	2'-11 13/16"	3'-8 5/16"	5'-3 5/16"

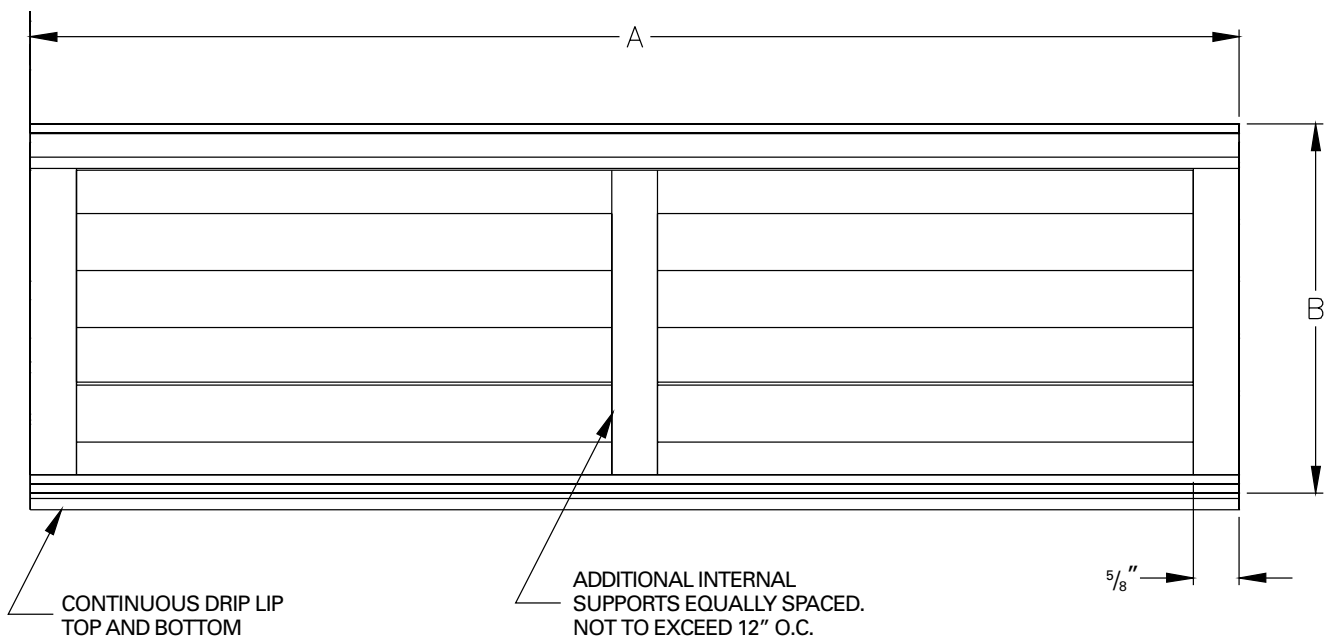
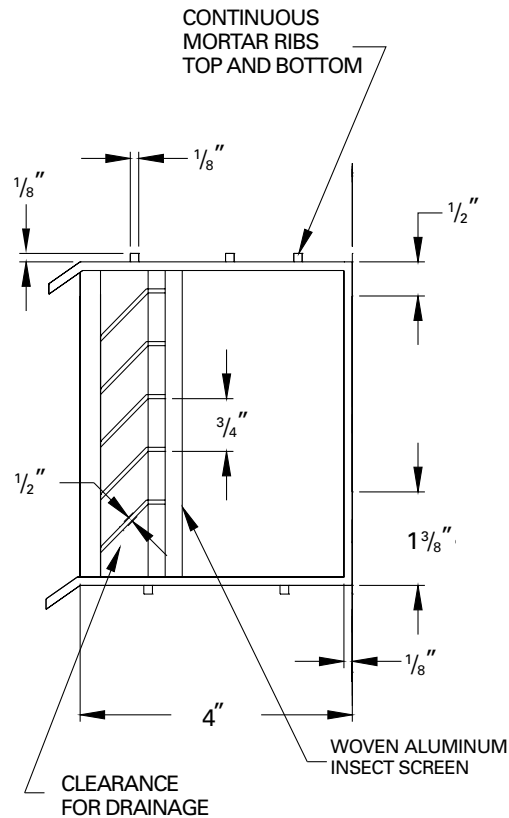
# Dimensions and Weights

## Wall Box

### Wall Box

#### Wall Box Dimensions

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





# Dimensions and Weights

## Projection Panel

### Projection Panel

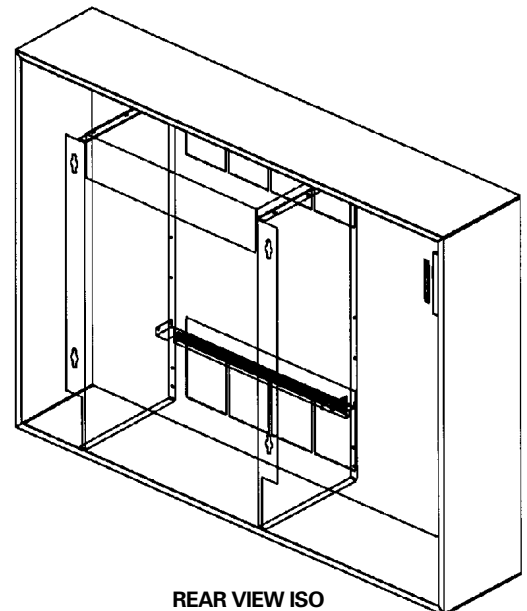
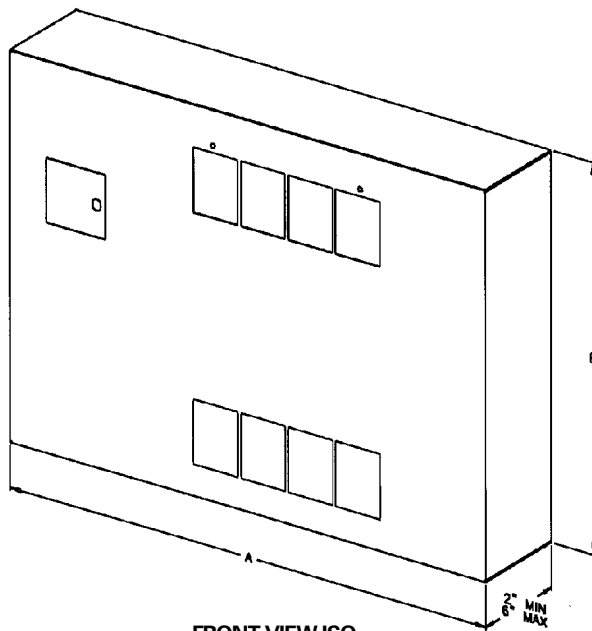
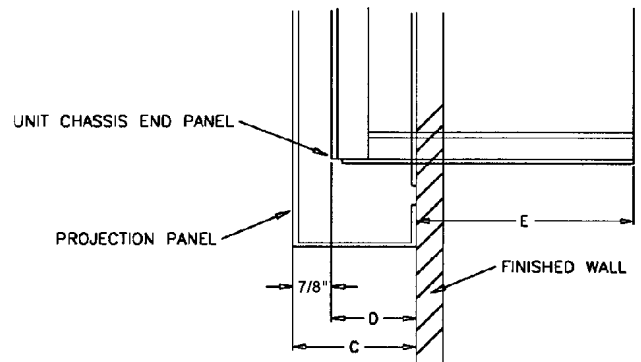
#### Projection Panel Dimensions

Unit Size	02 - 03	04	06	08	10 - 12
A	3'-11"	4'-3"	5'-3"	5'-5 1/2"	7'-5 1/2"
B	2'-6"	2'-6"	2'-6"	2'-9 1/2"	2'-9 1/2"

#### Projection Panel, All Unit Sizes

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"

#### UNIT TO WALL — TOP VIEW





# 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-gauge 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-gauge galvanized steel. All other panels are 18-gauge galvanized steel. Hinged access door construction is 20-gauge steel and is flush with top panel.

#### Vertical Wall Hung Unit

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

#### Horizontal Cabinet Units

All panels are 18-gauge 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-gauge steel construction and ship separate from the unit. Bottom panels on horizontal recessed models ship with tamperproof screw fasteners and safety chain.

#### Unit Finish

All cabinet parts and exposed recessed panels are cleaned, bonderized, phos-

phatized, and painted with a baked powder finish available in six decorator colors. Standard finish meets ASTM B117 specifications (salt spray test).

#### Fans

The aluminum 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 permanent split capacitor motors are run tested in assembled units. 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 78 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.

#### Hot Water Coils

Hot water coils are burst tested at 450 psig (3,103 kPa) (air) and leak tested at 100 psig (690 kPa) (air under water). Maximum main coil working pressure is 300 psig (2,069 kPa). Maximum entering water temperature is 200 F (93 C). Tubes and u-bends are  $\frac{3}{8}$ " (10 mm) OD copper. Fins are aluminum and are mechanically bonded to the copper tubes. Coil stubouts are  $\frac{5}{8}$ " (16 mm) 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" (25 mm) OD copper tubing. Steam coils are (air) burst tested at 250 psig (1,724 kPa). Maximum steam coil working pressure is 100 psig (689 kPa). Maximum entering steam temperature is 325 F (163 C). Tubes and u-bends are  $\frac{5}{8}$ " (16 mm) OD copper. Fins are aluminum, 9 fpi, and are mechanically bonded to the copper tubes. Coil stubouts are 1" (25 mm) OD copper tubing. Piping is field-supplied.

#### Piping Packages (Hot Water Coils Only)

All piping packages are burst tested at 450 psig (3,103 kPa) (air) and leak tested at 100 psig (690 kPa) (air under water). The maximum working pressure of the interconnecting piping is 300 psig (2,069 kPa).

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 (2,758 kPa). 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 (2,758 kPa).

#### 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 (2,069 kPa).

#### 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 GPM through the coil. Auto circuit setters also include two P/T plugs and have a maximum working pressure of 400 psig (2,758 kPa).

#### 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 25 psig (172 kPa). The valves are also available with a close-off pressure of 50 psig (345 kPa). The valve actuator is easily removable for service without removing the valve body from piping.

# Mechanical Specifications

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## **Three-Way, Two-Position Control Valves**

Normally open three-way, two-position valves are rated for a maximum 25 psig (207 kPa) pressure differential across the valve. Normally closed three-way two-position valves are rated for a maximum 15 psig (103 kPa) 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 (1,034 kPa). The valves are also available with a maximum close-off pressure of 50 psig (345 kPa). 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 (345 kPa) pressure differential across the valve. Modulating valves are available in Cv values of 0.7, 1.5, 2.5 and 4.0.

All two-position and modulating control valves have a maximum working pressure of 300 psig (2,069 kPa). The maximum entering water temperature of the valve is 200 F (93 C).

## **Electric Heat Coil**

Electric heating coils are available as the total source of heating on all Force-Flo™ cabinet heaters except inverted models. The electric heat coils are Nichrome elements with an open-wire design. Single stage coils are available on all units and two-stage coils are available on units with a Tracer ZN.520 controller. The electric heat operates at the same voltage as the unit. Therefore, only a single-point power connection is necessary.

All standard electric heat coils are UL listed and interlocked with the fan motor

switch. Therefore, electric heat operation is possible only when the fan is running. A transformer is supplied to eliminate the need for field installation of a step-down transformer. A unit-mounted magnetic contactor is supplied on all voltages. A 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.

## **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" (25 mm) throwaway or 1" (25 mm) pleated media throwaway. Pleated media filters are Farr 30/30.

## **Fresh Air Damper**

A fresh air opening with damper is a factory-installed option. Dampers are constructed of 18-gauge 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**

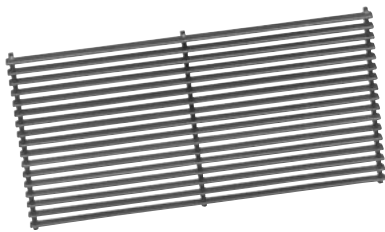
The auto two-position damper is factory set at 25 percent when open. The damper can be set in the field to allow from zero to 50 percent fresh air.

# Mechanical Specifications

# Options



**Quad Grille Outlet**



**Bar Grille Inlet and Outlet**



**Sub-base (shown turned on its side)**

### Disconnect Switch

A unit mounted disconnect switch is available as a standard option on all 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-S-10.

### Extended End Pockets

On vertical or horizontal cabinet units, an 8" (20 cm) 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 degrees. The quad grille is constructed of a black plastic material (NORYL-SE 1-731) with a 15 degree 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 cabinet units, the return of vertical cabinet and vertical slope tops. The grilles have a black paint finish with 18-gauge steel construction. The louvers are formed at a 15 degree 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-gauge 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 - 18 cm) in 1/2" (1 cm) increments. The sub-base depth and width is identical to the unit's dimensions.

# Mechanical Specifications

## Options



**False Back**

### 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-gauge steel construction and have the same paint finish as the unit. The false back is available in depths between 2" - 8" (5 - 20 cm) in 1" (2.54 cm) increments, with height and width identical to the unit's dimensions.



**Recessing Flange**

### Recessing Flanges

Recessing flanges have 18-gauge 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-gauge extruded aluminum alloy 6063-T5 construction. Horizontal louvers have 16-gauge extruded aluminum alloy 6063-T5 construction.



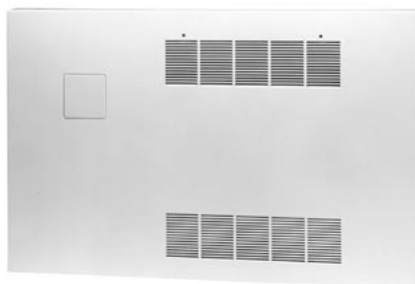
**Wall Box**

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% of nominal airflow.

### Projection Panels

Projection panels allow semi-recessing of vertical recessed units.

Panels are 16-gauge steel construction, painted with a baked powder finish. They are available in projection depths ranging from 2" - 6" (5 - 15 cm) in 1/2" (1 cm) increments. There is a distance of 7/8" (2.2 cm) between the projection panel and the front of the unit.



**Projection Panel**

# Mechanical Specifications

# Options



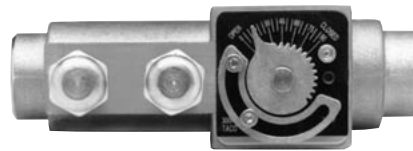
*Ball Valve*

## 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 (2,758 kPa)



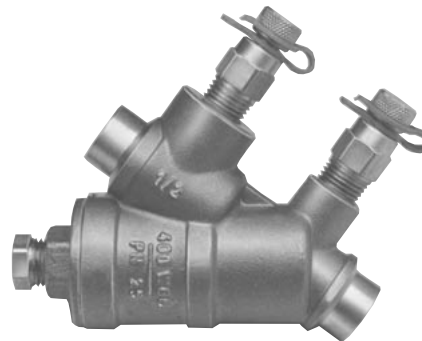
*Manual Circuit Setter*

## Manual Circuit Setter

**Material**  
Body — Forged Brass Alloy  
Trim — Forged Brass Alloy  
All Wetted Parts Brass

**Temperature**  
250 F MAX (121 C)

**Working Pressure**  
300 psi (2,069 kPa)



*Auto Circuit Setter*

## Auto Circuit Setter

**Material**  
Body — Forged Brass  
Flow Cartridge — Electroless Nickel and Stainless Steel

**Temperature**  
250 F MAX (121 C)

**Working Pressure**  
400 psi (2,758 kPa)

**Pressure Drop**  
0.5 - 9.0 GPM = 2 psi ΔP (14 kPa)  
10.0 - 12.0 GPM = 5 psi ΔP (34 kPa)

# Mechanical Specifications

## Options



**Control Valve**

### Control Valve

#### Material

Body — Forged Brass  
 Stem — Chrome-Plated Brass (Modulating) Nickel Plated (2-Position)  
 Seat — Brass (2-Position) Stainless Steel (Modulating)  
 Paddle — Buna N (2-Position)  
 Plug — High Temperature Thermoplastic (Modulating)  
 Actuator — Stainless Steel Base Plate, Aluminum Cover

#### Temperature

200 F MAX (93 C)

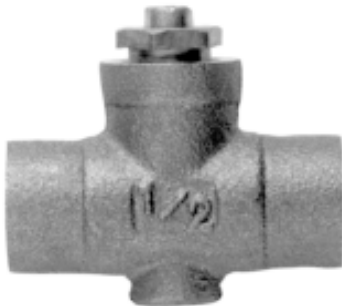
#### Working Pressure

300 psi (2,069 kPa)

#### Pressure Drop (Close-Off $\Delta P$ )\*

2-Way, Two-Position, N.O. = 25 psig (172 kPa)  
 2-Way, Two-Position, N.C. = 25 psig (172 kPa)  
 3-Way, Two-Position, N.O. = 25 psig (207 kPa)  
 3-Way, Two-Position, N.C. = 15 psig (103 kPa)  
 2-Way Modulating = 50 psig (345 kPa)  
 3-Way Modulating = 50 psig (345 kPa)

\*All valves are available with optional 50 psig (345 kPa).



**Balance Fitting**

### 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

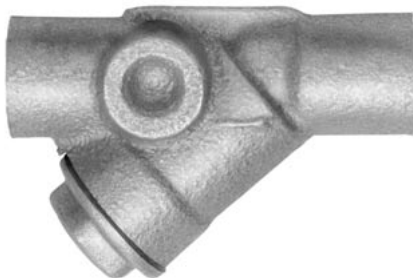
### Strainer

#### 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)



**Strainer**



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