

Technical Manual

# Sentinel<sup>®</sup> Vertical Unit Ventilator

Models UVV and UVD



Modine is located in Racine, Wisconsin, and is one of the world's leading manufacturers of heat pump and air conditioning systems for schools. Our reputation for product excellence has been earned through innovative design, our use of the highest quality controls, engineering selections of component parts, and the highest quality manufacturing and assembly of all products.

State-of-the-art test facilities reflect Modine's commitment to the latest design and manufacturing technology to maintain leadership in the production of systems of unsurpassed quality and reliability.

In addition to creating a healthier and safer learning environment for our children, many of the features in Modine products are unique, and the range of systems available offer schools a variety of options.

### Overview

The supplied product shall be a vertical unit ventilator able to be configured for chilled water, hot water, steam, or a combination of both chilled and hot water (two pipe and four pipe configurations). The unit shall be floor-mounted and vertically sized to allow the supply air to be ducted or supplied through a high level plenum. All access and maintenance shall be through the front of the unit.

The unit shall be constructed in accordance with UL & CSA standards with a label affixed to the unit listing the product code under which it is registered. Unit performance shall be tested in accordance with AHRI 390.

### Table of Contents

Model Identification . . . . .	3
Base Unit Selection . . . . .	4-6
General Arrangement . . . . .	7-8
Airflow Paths . . . . .	9
Standard Features / Options / Accessories . . . . .	10-11
Supply Air Arrangement . . . . .	12
Performance Data . . . . .	13
Controls Sequence . . . . .	14-15
Unit Arrangement	
Base Unit Dimensional Data . . . . .	16-19
Standard Wall Sleeve and Louver Dimensions and Mounting . . . . .	20-22
Piping Components . . . . .	23

MODINE HAS A CONTINUOUS PRODUCT IMPROVEMENT PROGRAM AND THEREFORE RESERVES THE RIGHT TO CHANGE DESIGN AND SPECIFICATIONS WITHOUT NOTICE.

## Model Nomenclature

1,2	3	4,5	6	7	8	9	10	11	12	13	14	15	16	17	18,19	20
PT	CC	MBH	SV	G	C	VC	FL	CS	DS	DO	PA	CO	HO	HP	--	PC

### 1,2 - Product Type (PT)

UV - Sentinel®

### 3 - Cooling Control (CC)

V - Valve Control  
D - Face & Bypass, Draw Thru

### 4,5 - Nominal Capacity (MBH)

30 - 30,000 Btu/Hr  
40 - 40,000 Btu/Hr  
50 - 50,000 Btu/Hr  
60 - 60,000 Btu/Hr  
80 - 80,000 Btu/Hr

### 6 - Supply Voltage (SV)

A - 115/60/1  
B - 208/60/1  
C - 230/60/1  
H - 277/60/1

### 7 - Generation (G)

A - Current Design

### 8 - Control (C)

M - Modine Control System  
F - Factory Installed Free Issue  
B - By Others - Field Installed

### 9 - Ventilation Configuration (VC)

A - Economizer with no exhaust  
B - Economizer with gravity exhaust  
C - Economizer with powered exhaust  
D - ERV with OA Damper (Digit 3 = V only)  
E - ERV with OA Damper & Economizer (Digit 3 = V only)

### 10 - Filters (FL)

A - MERV 8 (Standard)  
B - MERV11  
C - MERV 13

### 11 - Case Construction (CS)

A - 20Ga (Standard)  
B - 16Ga

### 12 - Door Mounted Stat (DS)

N - None  
V - Vertical Stat  
H - Horizontal Stat

### 13 - Door Mounted Other (DO)

N - None  
K - Key Over-ride  
S - Occupancy Sensor  
L - Indicator Light  
T - Twist Timer

### 14 - Piping Arrangement (PA)

2 - 2-Pipe  
4 - 4-Pipe

### 15 - Cooling Option (CO)

0 - None  
6 - 6-row coil

### 16 - Heating Option (HO)

0 - None  
1 - 1-row coil  
2 - 2-row coil  
6 - 6-row coil  
9 - 1-row steam coil

### 17 - Heating Position (HP)

N - Not Applicable  
R - Reheat

### 18,19

Reserved for future use

### 20 - Piping Connections (PC)

T - Top Connections  
B - Bottom Connections

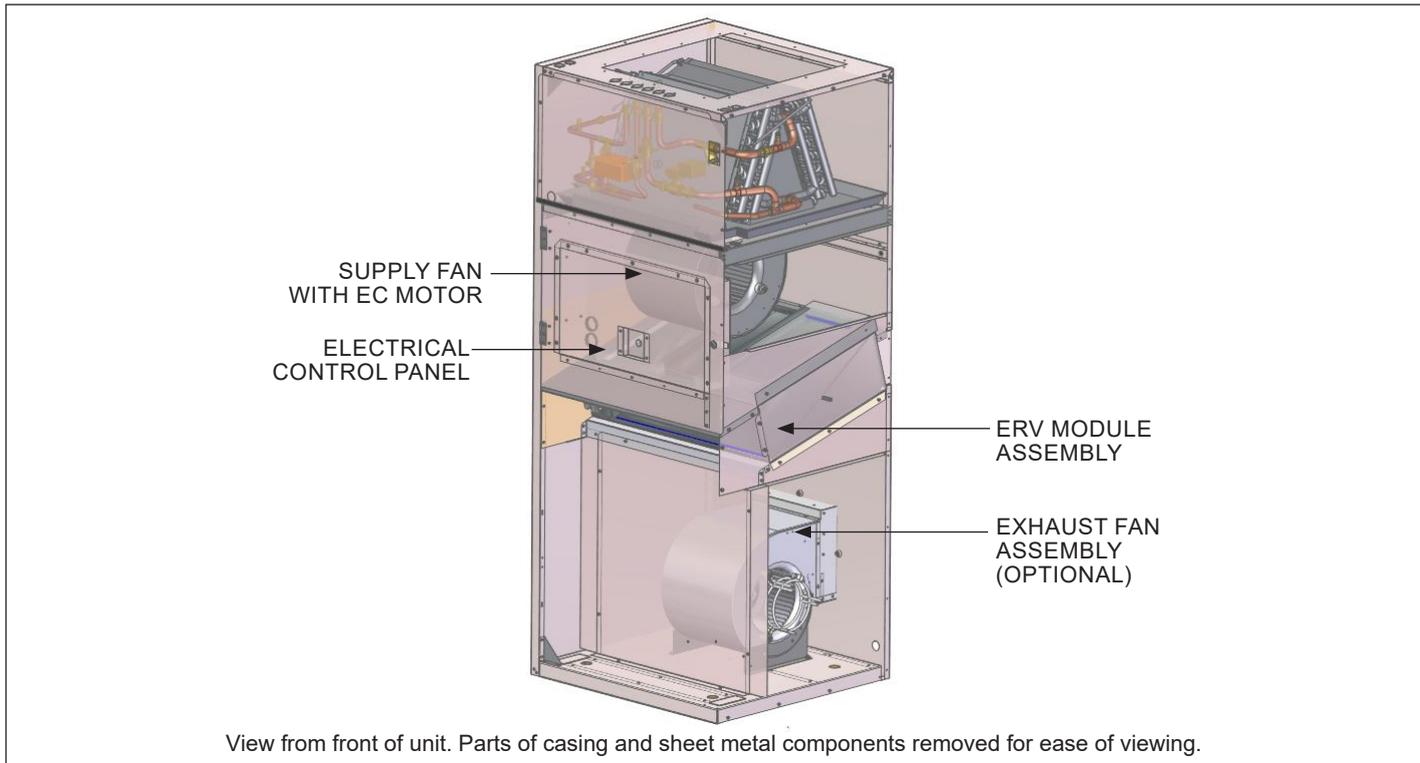
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General Description – Sentinel® Unit



**Digit 3: Cooling Control (CC)**

**V = Valve Control - Blow Thru**

The unit shall be furnished with a fixed plate directing 100% of the airflow across the coil(s). Full modulation allowing any mixture of outside air and return air shall be possible. Discharge air temperature is controlled by modulating the cooling and/or heating valve(s). Unit height shall be 84" tall.

**D= Face & Bypass - Draw Thru**

The unit shall be furnished with a face and bypass section that shall include an aluminum opposed blade face and bypass dampers with overlapping neoprene blade tips and jamb seals, and a spring return Belimo modulating actuator. The fan will be located above the coil, requiring the unit to be 90" tall.

**Digit 8: Control (C)**

**M = Modine Control System**

The unit is fitted with a programmable microprocessor controller provided by the unit manufacturer mounted outside the air stream in the control panel. The controller is designed specifically for operating the unit in its most energy efficient manner using pre-engineered control strategies. The microprocessor determines mode of operation based on the factory installed return air, supply air, and outdoor air temperature sensors.

**F = Factory Installed Free Issue**

The unit is fitted in the factory with a controller and temperature sensors provided by others. The controller provided by others will be required to operate in a similar fashion to Modine Control Systems (same inputs and outputs will be required). Modine will provide coordination with the controls contractor. The controls contractor will be responsible for appropriate sequence of operations. A wiring diagram agreed upon by Modine and the Controls Contractor will be required before the units can be released to production.

**B = By Others – Field Installed**

The unit will not have any controller or temperature sensors mounted in the factory. The controller provided by others will be required to operate in a similar fashion to Modine Control Systems (same inputs and outputs will be required). The controls contractor will be responsible for appropriate sequence of operations. A wiring diagram reflecting a generic controller will be installed in the unit.

**Digit 9: Ventilation Configuration (VC)**

**A = Economizer with No Exhaust**

Single-blade damper that pivots using a central single shaft attached to a single actuator allowing for complete balance of the return and outside air streams. Capable of full modulation allowing any mixture of outside air and return air to be possible. Will allow for 100% of the units airflow to be taken from the outside during conditions allowing for full economizer savings. Damper blade edges lined with rubber gasket to prevent air infiltration in full recirculation or full economizer operation. Complete damper assembly slides out of unit on rails allowing for the damper assembly to be removed through the front of the unit if it requires service.

Low voltage modulating damper actuator operates damper and is spring-return, fail safe. When power is cut to actuator, damper actuator will force damper blade closed to outside air.

**B = Economizer with Gravity Exhaust**

Standard economizer operation except with additional exhaust air gravity damper.

**C = Economizer with powered exhaust**

Standard economizer operation except with additional powered exhaust fan.

**D = ERV with OA Damper (Digit 3 = V only)**

Energy recovery ventilation (ERV) provided within the unit through an enthalpy transfer wheel mounted in an insulated cassette frame complete with seals, drive motor, and belt. The rotary wheel is coated with silica gel desiccant and is sized to handle a maximum of 450 cfm of outside air. The entire assembly shall be a UL tested component. Performance shall be certified in accordance with the ASHRAE Standard 84 method of test and AHRI Rating Standard of 1060. A manually adjustable return air damper integral to the Energy Recovery Ventilator assembly allows for balancing of the outside air and return air flow across the enthalpy wheel.

Separate outside air damper with actuator provided for protection from outdoor elements when unit is not in use. Complete energy recovery ventilator installed on rails to allow the entire assembly to be slid out of the unit for service. Electrical and control wiring to damper assembly includes quick disconnect plug local to assembly.

The Heat Recovery Wheel can be disabled to provide 450 cfm of outside air in economizer mode.

**E = ERV with OA Damper & Economizer (Digit 3 = V only)**

Standard energy recovery ventilation (ERV) operation except with ability to bypass energy recovery wheel to maximize free cooling operation. Each unit shall be fitted with spring return modulating outside air and relief air dampers that act to bypass the energy recovery wheel and mix the outdoor air with the return air. The dampers shall have the capability of permitting up to 80% of the unit's total supply air to be outside air for free cooling. Full modulation allowing any mixture of outside air and return air shall be possible. A minimum damper position setting shall also be possible to continuously maintain outside air ventilation requirements dependent on control via the unit's microprocessor controller. The damper blades shall pivot on self-lubricating nylon bearings and modulate using electronically controlled damper actuators.

**Digit 10: Filtration (F)**

Minimum Efficiency Reporting Value (MERV) corresponding to the MERV value shown below when evaluated per ASHRAE standard 52.2. Arrestance and Dust Spot Efficiency ratings are based on the ASHRAE 52.1 - 1992 test method.

**A = MERV 8**

2" thick radial pleated disposable cotton and synthetic blend filters.

**B = MERV 11**

2" thick electrostatically enhanced pleated filter shall be constructed from 100% Synthetic media. Specification details: 14.3 pleats per foot, 99% Arrestance and 35-40% Dust Spot Efficiency.

**C = MERV 13**

2" thick 100% Synthetic LEED/Green compliant filters. Specification details: 17.5 pleats per foot, 99% Arrestance and 70-80% Dust Spot Efficiency.

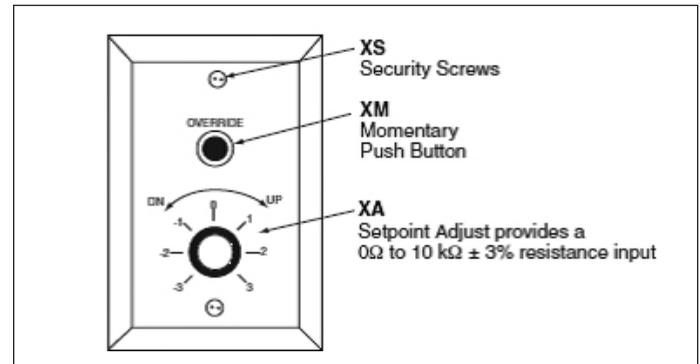
**Digit 12: Door Mounted Stat (DS)**

**N = None**

**V = Vertical Stat**

For units fitted with Modine Control System. A stainless steel flush-mount thermistor sensor with insulated back provides for +/- 3° setpoint adjustment and momentary push button override. Sensor is wall mounted remote from the unit or mounted on the front door of the unit, 48" above the finished floor (48" AFF only if no floor stand selected) (See Figure 5.1).

**Figure 5.1 - Temperature Sensor**



**H = Horizontal Stat (Digital Thermostat)**

The digital thermostat with (or without) humidity sensing is used in conjunction with Modine Control System. It displays the current room temperature, cooling/heating setpoint, current room humidity level, humidity setpoint (if applicable), current time and day, current occupied mode, and the unit's compressor and fan speeds. The display will also display a remote alarm from the Microprocessor Control. The thermostat allows for an occupied temperature and humidity setpoint adjustment (when selected). The allowable setpoint adjustment range can be limited by the Microprocessor Control. Thermostat allows for occupied override activation allowing user to select the amount of time the unit is to remain in the override state. Thermostat is mounted on the front door of the unit, 48" above the finished floor (48" AFF only if no floor stand selected) (See Figure 5.2).

**Figure 5.2 - Digital Thermostat**



**Digit 13: Door Mounted Other (DO)**

**N = None**

**K = Key Override Switch**

Key operated override switch mounted on the front of the unit sends a timed override signal to the Factory Microprocessor Control system. The time the unit will remain in occupied mode when the override key has been operated can be adjusted using the User Interface Display Module.

**S = Occupancy Sensor**

A passive infrared sensor mounted on the exterior of the unit controls the unit's occupancy mode based on changes in infrared energy (moving body heat) within the coverage area. The occupancy sensor shall utilize a dense wide angle lens, covering up to 2000 sq. ft. of walking motion and 1000 sq. ft. of desktop motion. If the sensor detects movement in the coverage area when the unit is in unoccupied mode, the unit shall switch to occupied mode. If the sensor detects no movement in the coverage area for a predetermined amount of time (adjustable) while the unit is in occupied mode, the unit shall switch to unoccupied mode.

**L = Indicator Light**

A factory mounted amber signal light shall illuminate upon alarm or fault signal from factory microprocessor control.

**T = Twist Timer**

The unit shall be provided with a manually adjustable 6 hour timer located on the exterior door of the unit which enables the unit for the specified time period.

**Digit 14: Piping Arrangement (PA)**

**2 = 2 Pipe**

Two pipe coil connections (one coil), one for supply and one for return, used in conjunction with cooling and heating options.

**4 = 4 Pipe**

Four pipe coil connections (two coils), one for supply and one for return for each chilled and hot water coil, used in conjunction with cooling and heating options.

**Digit 15: Cooling Option (CO)**

**0 = None**

**6 = 6 Row 'A' Coil**

Twin six row coils assembled in an A frame.

**Digit 16: Heating Option (HO)**

**1 = 1 Row 'A' Coil (Digit 15 = 6)**

Twin one row coils assembled in an A frame and installed in the reheat position on top of the chilled water coil.

**1 = 1 Row Slab Coil (Digit 15 = 0)**

Hot water heating only coil assembly consisting of a one row horizontal slab coil.

**2 = 2 Row Slab Coil (Digit 15 = 0)**

Hot water heating only coil assembly consisting of a two row horizontal slab coil.

**6 = 6 Row 'A' Coil (Digit 15 = 6)**

Twin six row coils assembled in an A frame.

**9 = 1 Row Steam Slab Coil (Digit 15 = 0)**

Steam heating only coil assembly consisting of a one row horizontal slab coil.

**Digit 17: Heating Position (HP)**

**N = Not Applicable**

Heating position is not applicable when two pipe piping arrangement is configured.

**R = Reheat**

Heating position will be reheat when four pipe piping arrangement is configured.

**Digit 18-19**

Digits 18 and 19 are reserved for future use.

**Digit 20: Piping Connections (PC)**

**T = Top Connections**

Field connection to the unit's water piping terminations located at the top of the unit.

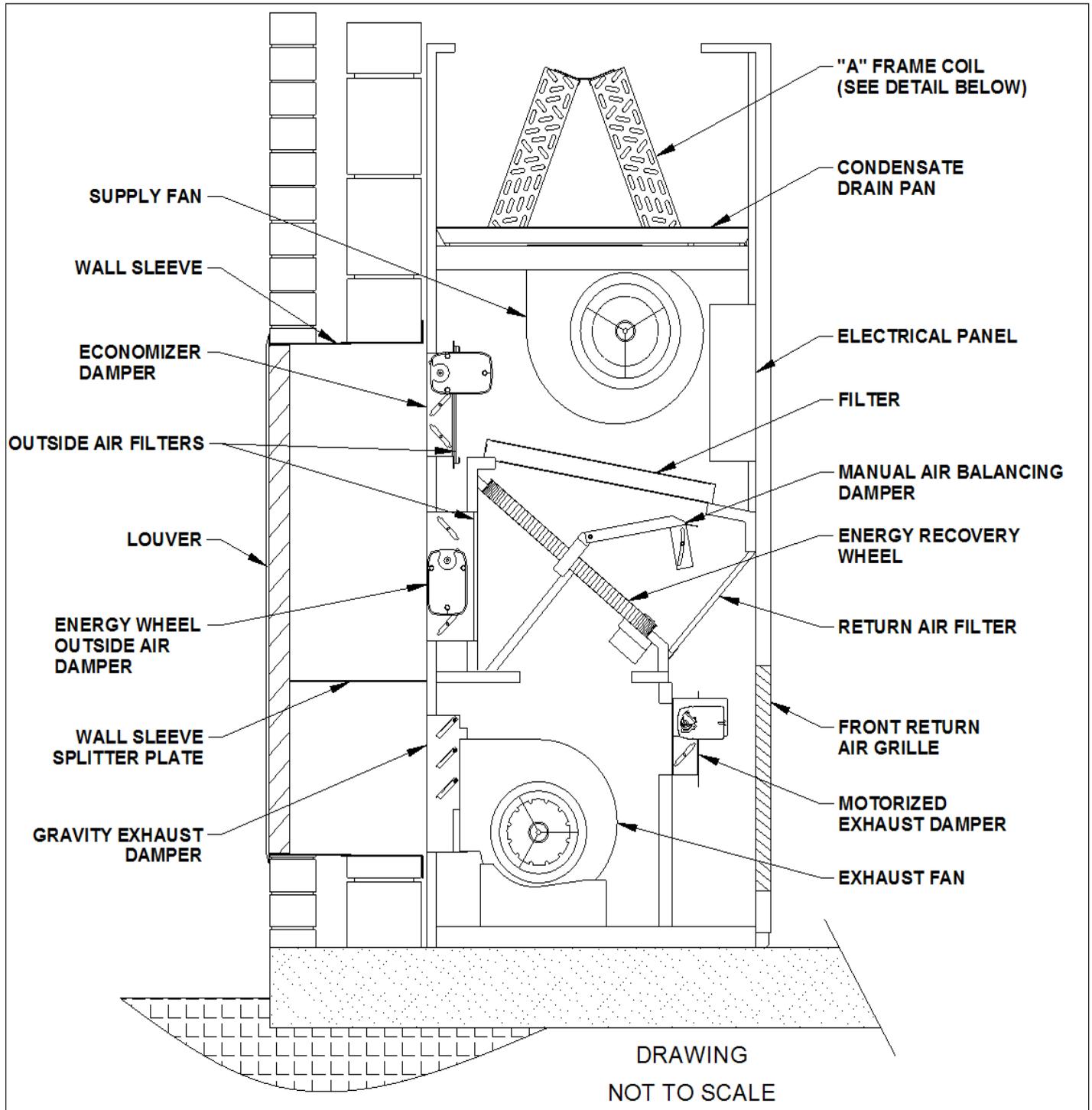
**B = Bottom Connection**

Field connection to the unit's water piping terminations located at the bottom of the unit.

**Table 6.1 - Available Coil Options**

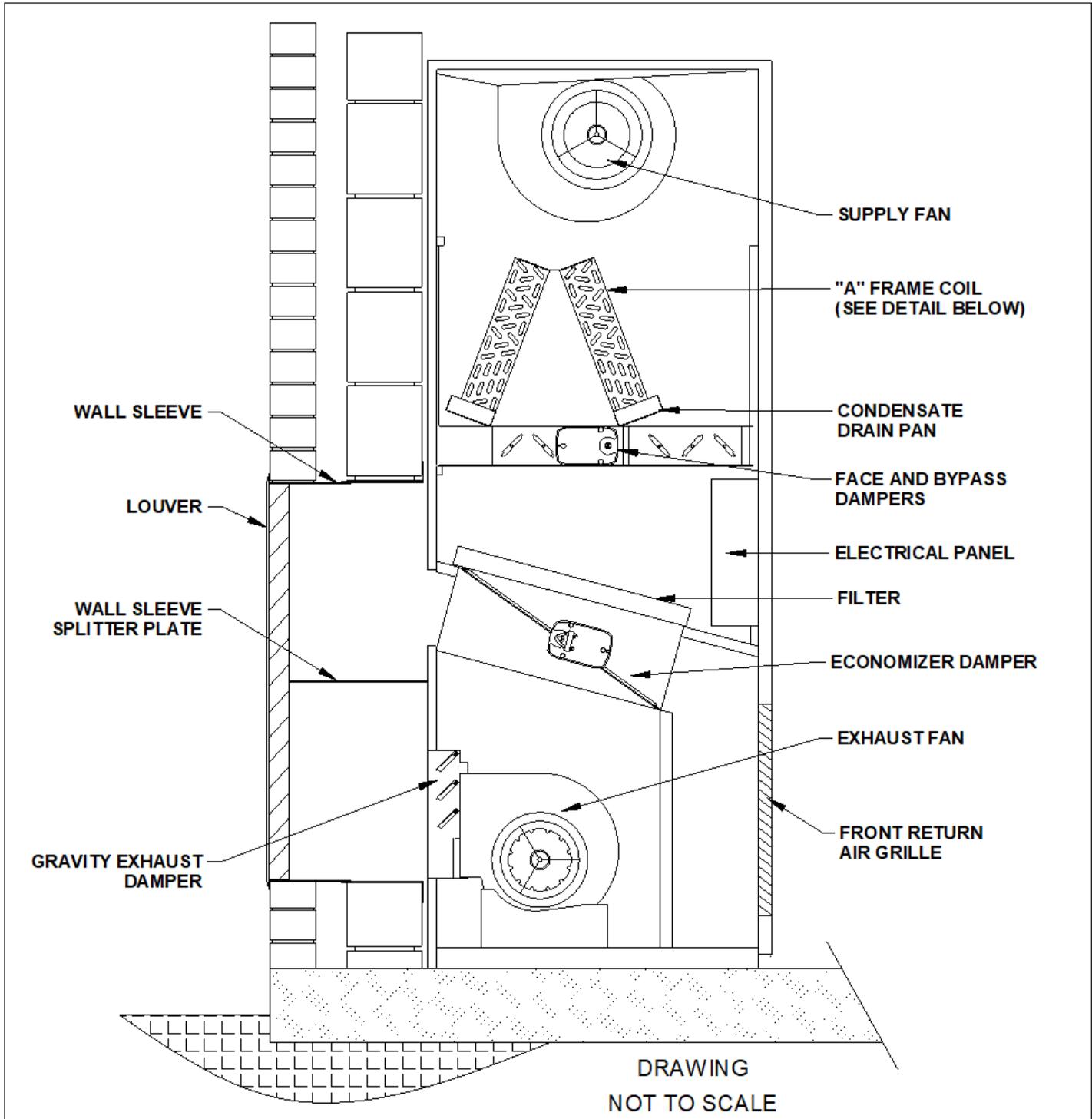
14	15	16	17
Piping Arrangement	Cooling Option	Heating Option	Heating Position
4	6	1	R
2	6	6	N
2	6	0	N
2	0	1	N
2	0	2	N
2	0	9	N

Figure 7.1 - General Arrangement - UVV Vent Configuration E



Unit shown with optional unit mounted heat, energy recovery wheel ventilation configuration with economizer damper, wall sleeve and louver. For project-specific general arrangement, contact your local sales representative for submittal data.

Figure 8.1 - General Arrangement - UVD Vent Configuration C



Unit shown with optional unit mounted heat, energy recovery wheel ventilation configuration with economizer damper, powered exhaust, wall sleeve and louver. For project-specific general arrangement, contact your local sales representative for submittal data.

## Valve Control Units

In a Valve Control unit all of the air passes through the coil. The flow of water through the coil is modulated to maintain the setpoint temperature in the room. Air is drawn in through the unit by the blower (blow-through design), conditioned and supplied to the room.

Return air enters through the lower front return air louvers on the door and outside air enters through the back panel of the unit. The percentage of outside air and return air is controlled by the position of the economizer damper.

Air passes through the filters and then through the coil. The air is conditioned as it passes through the coil. Cooling or heating is controlled by adjusting the flow of water through the coil with a modulating valve.

For units equipped with Energy Recovery Ventilation (ERV), the wheel rotates through the outside air and return air streams, transferring hot or cool return air to the unconditioned outside air. This allows the outside air to be preconditioned, which reduces the cooling or heating demand of the unit to maintain the setpoint temperature in the room.

Figure 9.1 - UVV (Digit 9 = A)

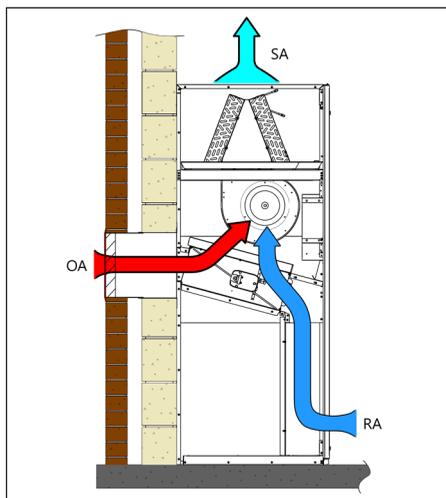


Figure 9.2 - UVV (Digit 9 = B or C)

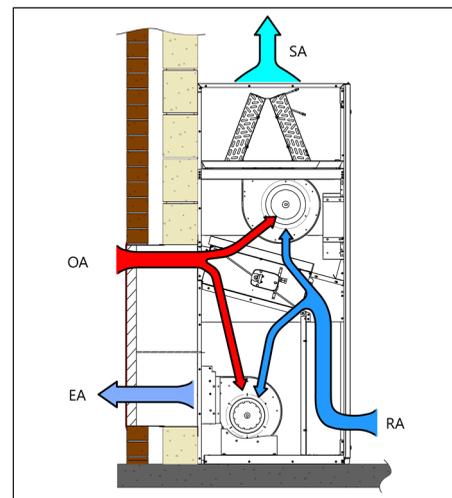


Figure 9.3 - UVV (Digit 9 = D)

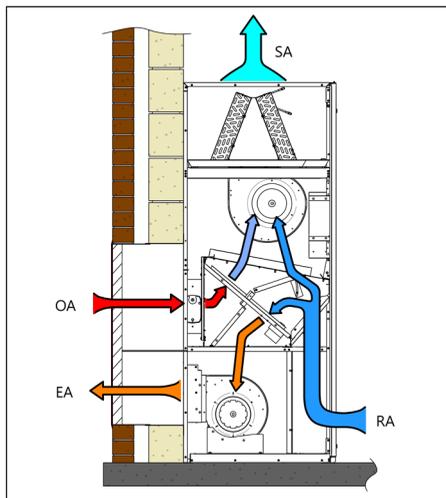
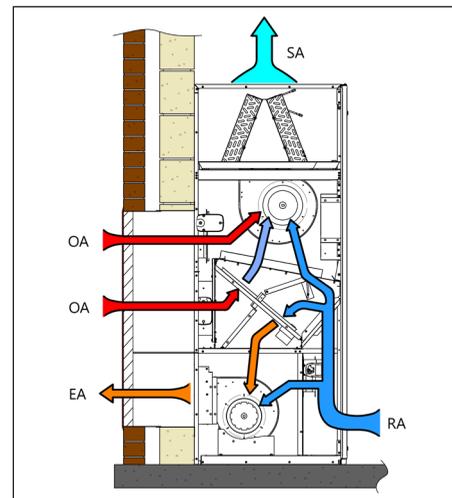


Figure 9.4 - UVV (Digit 9 = E)



## Face & Bypass Units

In a Face & Bypass unit the percentage of conditioned air and bypass air is controlled by the position of the face & bypass damper.

Return air enters through the lower front return air louvers on the door and outside air enters through the back panel of the unit. The percentage of outside air and return air is controlled by the position of the economizer damper.

Water flow and coil temperature remain constant to provide maximum dehumidification and low risk of coil freezing. The face & bypass damper is modulated to maintain the setpoint temperature in the room.

Figure 9.5 - UVD (Digit 9 = A)

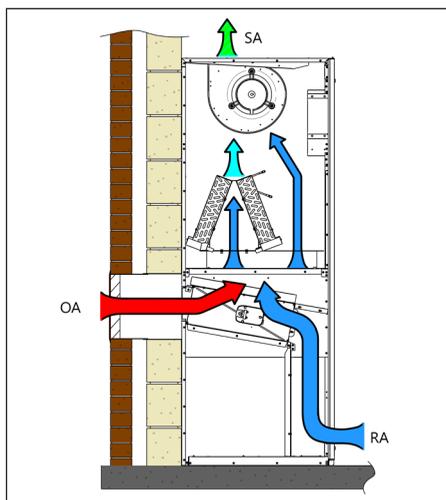
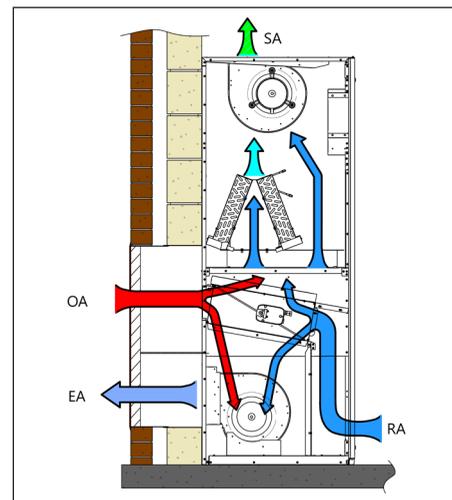


Figure 9.6 - UVD (Digit 9 = B or C)



## Standard Features

### Cabinet

Prior to assembly, the cabinet parts shall be degreased and coated with an electrostatically applied baked-on polyester powder paint and is insulated with acoustic foam containing no fibrous materials. The foam insulation shall have a fire rating of UL94 HF1.

The exterior panels of the cabinet shall be constructed of 20 or 16 gauge aluminized steel. All service and maintenance access shall be possible through the front of the unit only. An access door is factory installed on the front of the unit with integral low-level return air grilles. The back of the cabinet shall have an opening / have openings for connection to a wall sleeve and louver.

### Control Panel

The control panel is located behind the front door. All components located in the panel shall be clearly marked for easy identification. All terminal blocks and wire shall be individually numbered. All electrical wires in the control panel shall be run in an enclosed trough. Wiring outside of the control panel shall be run in protective sleeves.

### Water / Steam Coils

Large surface area slab coils shall be utilized to optimize heat transfer and airflow.

### Drain Pan

Each unit subject to chilled water flow shall be mounted in an ABB vacuum formed condensate tray.

### Supply Fan & Fan Motor

Supply airflow shall be provided by double inlet, forward curved, centrifugal type fan with offset aerodynamic blades. The assembly shall be statically and dynamically balanced to ensure smooth running and minimum noise levels. The fan is mounted to an electronically commutated motor (ECM). The fan and motor assembly shall be direct drive type with motor and bearings positioned outside of the airstream.

The fan assembly shall be positioned for a "blow through" configuration for Valve Control units. The fan assembly shall be positioned for a "draw through" configuration for Face & Bypass units.

### Damper Assembly

Single-blade damper that pivots using a central single shaft attached to a single actuator allowing for complete balance of the return, outside, and exhaust air streams. Capable of full modulation allowing any mixture of outside and return air to be possible.

## Factory Mounted Options

### BACnet Network Card

The factory Microprocessor Control includes a plug-in card allowing for complete compatibility with an MS/TP BACnet control system.

### LonWorks Network Card

The factory Microprocessor Control includes a plug-in card allowing for complete compatibility with FT-10 LonWorks control system.

### Time / Clock Card

A time clock (card) shall be provided for "stand-alone" units where time functions, night and weekend setback, etc. are not transmitted from a building management system or remote central time clock. The time clock shall have a full 7 day schedule and calendar function with two adjustable occupied/unoccupied periods per day. The calendar function shall allow 20 calendar periods (start date / stop date = 1 period).

### Display Module

The user interface for Modine Control System displays status of controllers inputs and outputs, allows for occupied/unoccupied setpoint changes, displays service settings, allows adjustment of control parameters, and is used for troubleshooting the unit. (This is required to change any factory setpoints if it is not receiving a signal from a BMS system).

### Coil Freeze Protection

A manual reset freeze protection bulb and capillary tube mounted on the discharge side of the coil to prevent any freezing of the coil assembly. When the sensor detects a freeze up condition it will force the damper to close off the outside air, force the heating control valve open and prevent the unit supply fan from running.

### CO<sub>2</sub> Sensor

The CO<sub>2</sub> sensor shall be mounted in the interior return air passage of the unit to provide demand ventilation. When the level of CO<sub>2</sub> rises over a predetermined setpoint, the sensor shall proportionally adjust the minimum damper position to allow larger quantities of outside air into the room.

### Aquastat

An aquastat shall be fitted to two pipe systems to prevent changeover into a heating mode when cooling is required and vice-versa.

### Condensate Pump

The unit shall be fitted with a condensate pump. The pump shall be equipped with an ABS plastic tank with built-in flow check valve and safety switch.

### Condensate Pan Float Switch

The unit shall be fitted with a float switch mounted on the condensate pan to stop the cooling function should the condensate rise to a predetermined level.

### Fire Detection

A liquid element fire detection device mounted in the return air stream prevents the unit from operating if the return air temperature should rise above the adjustable high limit setting.

### Smoke Detector

Mounted in the return air stream, if smoke is present the unit will be shut down automatically.

## Field Installed Accessories

### Room Sensor with Offset and Override

For units fitted with the Modine Control System, a stainless steel flush-mount thermistor sensor with insulated back provides for +/- 3° setpoint adjustment and momentary push button override. Sensor is wall mounted remote from the unit.

### Digital Wallstat

Digital thermostat used in conjunction with the Modine Control System displays current room temperature, cooling/heating setpoint, and current occupied mode. The display will also display a remote alarm from the Microprocessor Control. Thermostat allows for occupied temperature setpoint adjustment. The allowable setpoint adjustment range can be limited by the Microprocessor Control. Thermostat allows for occupied override activation allowing user to select the amount of time the unit is to remain in the override state. Thermostat is wall mounted remote from the unit.

### Modulating Control Valve

Two-way or three-way modulating valve(s) shall be provided for precise capacity control of hot water and/or chilled water coil(s). The capacity control valve(s) shall be controlled by a 2-10VDC signal from the unit mounted controller.

### 2-Position Spring Return Control Valve

Two-way or three-way 2-position spring return control valve(s) shall be provided for control of hot water and/or chilled water coil(s). The control valve(s) shall be controlled by a 24V signal from the units control panel and shipped loose for field installation.

### Balancing Valve

A heavy duty ball-valve construction balancing valve shall be factory installed on Valve Control units and supplied loose for field installation on Face & Bypass units.

### Circuit Setter

A manually adjustable ball-valve construction balancing valve with Schrader style pressure ports and drain port shall be factory installed on Valve Control units and supplied loose for field installation on Face & Bypass units.

### Shut-Off Valves

A set of two heavy duty ball valves, one for the supply and one for the return, shall be factory installed on Valve Control units and supplied loose for field installation on Face & Bypass units.

### Strainer

A heavy duty cast iron strainer with screen, gasketed and tapped retainer cap and blow-off outlet shall be factory installed on Valve Control units and supplied loose for field installation on Face & Bypass units.

### Wall Sleeve

The wall sleeve shall be constructed from galvanized steel. The sleeve shall be provided by Airedale and insulated by the installing contractor with foil back insulation.

### Louver

An outdoor louver shall be furnished by Airedale and be suitable for masonry, glass or panel wall construction. Two louver styles are available: AMCA rated and non-AMCA rated. Louvers shall be available in the following materials:

- Aluminum with clear anodized finish
- Aluminum with baked enamel finish, customer selected from manufacturer's standard louver color chart

### Duct Flange

A 3" duct flange shall be factory installed installed to allow for easy installation of a supply air duct to the unit or plenum.

### Spare Filters

Up to three spare sets of filters shall be supplied with the unit.

### Duct Shroud

Three sided duct shroud shall be field mounted on top of the unit for extending the cabinet through the ceiling/soffit. Field trimmed by the installing contractor to suit the ceiling height. Finished and painted to match the unit. Available sizes from 20" to 48" in 6" increments.

### Plenum

Acoustic foam lined discharge plenum mounted on top of the unit allowing for supply air to discharge from the unit. Finished and painted to match the unit. Plenums can be supplied with aluminum grills with a clear anodized finish when discharging to the space. Plenums available in the following configurations:

- No Discharge (field cut openings)
- Top Discharge
- Front Discharge
- Front and 1 Side Discharge
- Front and 2 Sides Discharge

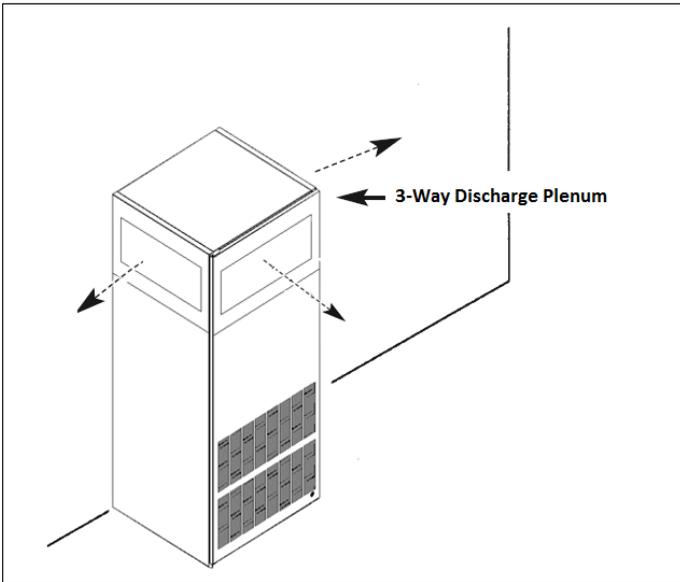
### Rear Extension

Where site conditions do not permit the use of the standard locations for outside air intake and exhaust air discharge, an insulated outside air rear extension can be supplied for site installation between the back of the unit and the outside wall by the installing contractor. Painted and finished to match the unit.

### Filler Panels

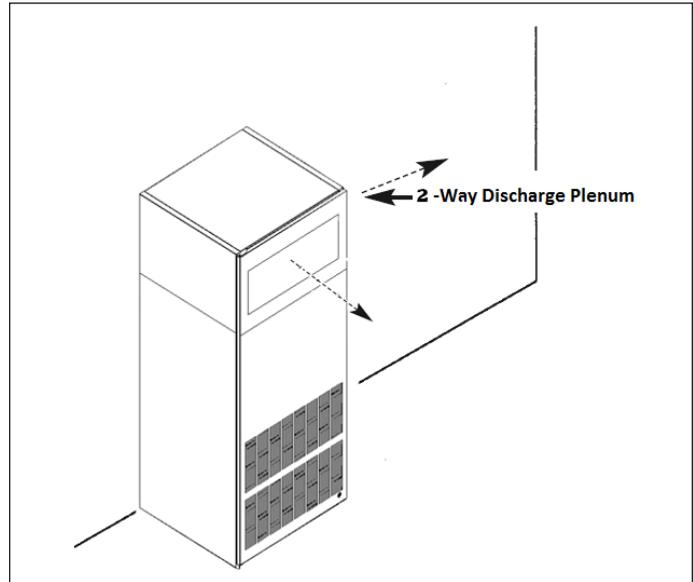
Rear filler panels supplied for rear extensions used in conjunction with a plenum or duct shroud to fill the gap between the rear of the plenum/shroud and above the rear extension. Painted and finished to match the unit.

Figure 12.1 - Front + 2 Side Discharge Plenum ①



① Front + 2 Side Discharge plenums include two (2) 14"W x 10"H Side Discharge Grilles.

Figure 12.3 - Front + 1 Side Discharge Plenum ①



① Front + 1 Side Discharge plenums include one (1) 14"W x 10"H Side Discharge Grille and one (1) Side Blank-Off Panel. Grille and Panel can be installed on either side of plenum for left or right side discharge.

Figure 12.2 - Front + 2 Side Discharge Plenum

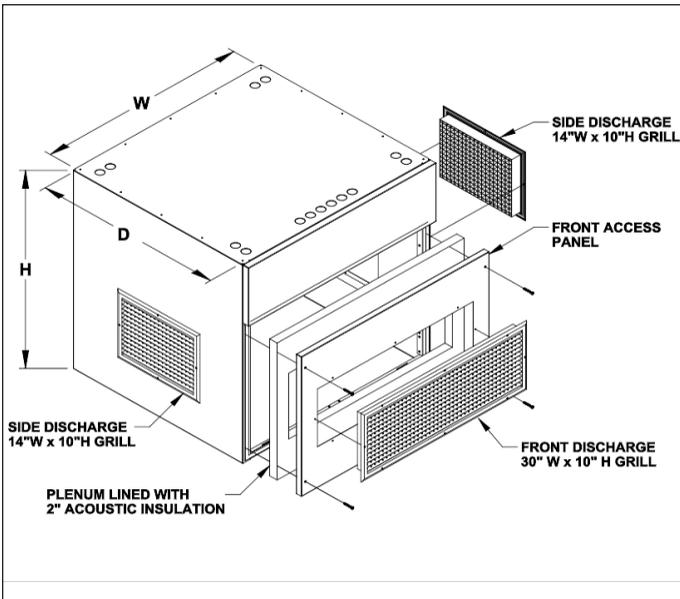


Figure 12.4 - Top Discharge Plenum

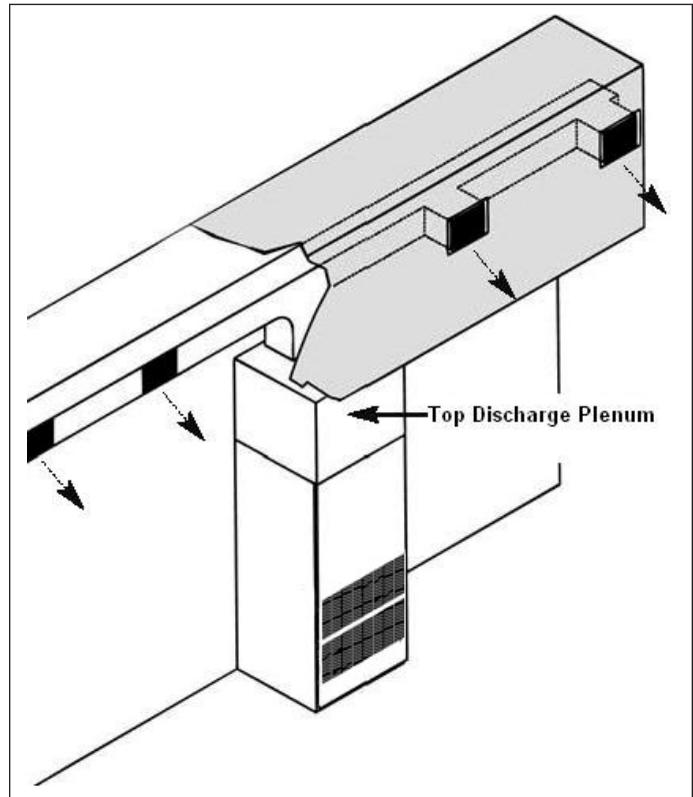


Table 13.1 - Performance Data - UV

	30		40		50		60		80	
<b>Nominal Cooling Capacity</b>	MBH	GPM	MBH	GPM	MBH	GPM	MBH	GPM	MBH	GPM
6 Row 'A' Coil (Digit15 = 6) ①	32.0	6.4	40.0	8.0	46.6	9.3	57.7	11.5	78.5	15.0
<b>Nominal Heating Capacity</b>	MBH	GPM	MBH	GPM	MBH	GPM	MBH	GPM	MBH	GPM
1 Row 'A' Coil (Digit 15 = 6, Digit 16 = 1) ②	38.3	2.0	48.0	2.5	57.1	3.0	64.6	3.4	73.7	3.8
1 Row Slab Coil (Digit 15 = 0, Digit 16 = 1) ②	33.4	1.7	40.8	2.1	48.6	2.5	55.2	2.9	64.8	3.4
2 Row Slab Coil (Digit 15 = 0, Digit 16 = 2) ②	44.1	2.3	56.3	2.9	70.1	3.6	77.8	4.0	90.1	4.6
6 Row 'A' Coil (Digit 16 = 6) ③	49.4	6.4	65.4	8.0	79.7	9.3	94.4	11.5	123.4	15.0
1 Row Steam Slab Coil (Digit 16 = 9) ②	73.7	N/A	88.2	N/A	100.6	N/A	111.4	N/A	130.7	N/A
<b>Coils - Qty and Size</b>	Qty	ft²	Qty	ft²	Qty	ft²	Qty	ft²	Qty	ft²
Chilled Water and Hot Water - 'A' Frame	2	4.36	2	4.36	2	4.36	2	4.36	2	4.36
Hot Water and Steam - Slab	1	3.33	1	3.33	1	3.33	1	3.33	1	3.33
<b>Supply Fan &amp; Motor</b>	Direct Drive Centrifugal with ECM Motor									
Fan Quantity	1		1		1		1		1	
Motor Size (Qty 1)	1/2		1/2		1/2		3/4		1	
Nominal Airflow (CFM, High/Med/Low)	750 / 600 / 500		1000 / 750 / 600		1250 / 1000 / 750		1500 / 1250 / 1000		2000 / 1750 / 1500	
Rated/Max External Static Pressure	0.5		0.5		0.5		0.5		0.5	
<b>Powered Exhaust Fan &amp; Motor (Optional)</b>	Direct Drive Centrifugal with ECM Motor									
Fan Quantity	1		1		1		1		1	
Motor Size (HP)	1/2		1/2		1/2		1/2		3/4	
Max Exh. Airflow (CFM, High/Med/Low)	600 / 480 / 400		800 / 600 / 480		1000 / 800 / 600		1200 / 1000 / 800		1600 / 1400 / 1200	
Rated/Max External Static Pressure	0.5		0.5		0.5		0.5		0.5	
<b>Base Unit Weight</b>										
Operating Weight (lbs) ④	550		550		550		550		550	
<b>Filter - MERV 8, 11, 13</b>	Qty	Size	Qty	Size	Qty	Size	Qty	Size	Qty	Size
Quantity	2	12 x 24	2	12 x 24	2	12 x 24	2	12 x 24	2	16 X 24
<b>Energy Recovery Wheel (Optional)</b>	Data shown for all units									
Outdoor Air Volume	225		300		375		450		ERW NOT AVAILABLE FOR SIZE 80 UNITS	
Total Capacity Recovered (Cooling) ⑤	9.9		12.4		14.5		16.3			
Measured Cooling Effectiveness	77.8		73.3		68.8		64.4			
Total Capacity Recovered (Heating) ⑥	8.7		11.0		13.1		14.8			
Measured Heating Effectiveness	80.1		76.2		72.3		68.4			

① Cooling Capacity based on Air On 80/67°F Dry/Wet Bulb, 45°F Entering Water, 55°F Leaving Water, High Fan Speed.

② Hot water heating capacity based on Air On 70/58.5°F Dry/Wet Bulb, 180°F Entering Water, 140°F Leaving Water, High Fan Speed. Steam Capacity based on Air On 70/58.5°F Dry/Wet Bulb, Steam at 5 PSIG, High Fan Speed.

③ Hot water heating capacity based on Air On 70/58.5°F Dry/Wet Bulb, 140°F Entering Water, flow equal to cooling flow, High Fan Speed.

④ Weight is base unit only. Additional options and accessories not included.

⑤ Cooling capacity based on: Room 75/63°F Dry/Wet Bulb, Ambient 95/78°F Dry/Wet Bulb.

⑥ Heating capacity based on: Room 70/58.5°F Dry/Wet Bulb, Ambient 35/33°F Dry/Wet Bulb.

## Factory Installed Carel Controls

The unit is fitted with a programmable microprocessor controller provided by the unit manufacturer mounted outside of the air stream in the control panel. The controller is designed specifically for operating the unit in its most energy efficient manner using pre-engineered control strategies. The microprocessor determined mode of operation based on the factory installed return air, supply air, and outdoor air temperature sensors.

## Factory Installed Controls by Others

Automatic Temperature Controls are furnished by the ATC Contractor. The controls are shipped to the unit manufacturer for factory mounting and Wiring. ATC contractor coordinates with the unit manufacturer regarding control strategy, wiring diagrams, and component specifications.

## Field Installed Controls by Others

The unit will not have any controller or temperature sensors mounted in the factory. The controller provided by others will be required to operate in a similar fashion to Modine Control Systems (same inputs and outputs will be required). The controls contractor will be responsible for appropriate sequence of operations. A wiring diagram will be installed within the unit, but will reflect a generic controller.

## Supply / Exhaust Fan

The supply and exhaust fans shall run at all times when unit is in occupied mode. When in unoccupied mode, the supply fan shall run only on a call for heating or cooling, and the exhaust fan will not run. The supply fan speed can be adjusted with an optional manual 3-speed switch. If equipped with a Carel controller, the supply fan is programmed to run for 2 minutes (adjustable) after the heating or cooling cycle ends.

## Economizer Damper

All UVV and UVD units with A, B or C ventilation are equipped with a standard economizer damper. The economizer damper controls the mixture of return air and outside air drawn through the unit. The economizer damper shall be controlled via a 0-10VDC control signal. The damper will open to the adjustable minimum position when the unit is in occupied mode. The minimum position is determined by the required ventilation required for the occupied space. If there is a call for cooling and the outside temperature is below the cooling setpoint the economizer damper will modulate open towards free cooling operation. If free cooling cannot maintain the space cooling demand, the chilled water valve will be energized and the damper will return to its minimum position. If the supply air temperature cannot be maintained at minimum position, the damper shall fully closed (unless supplied with hot water heating). When the outdoor temperature is below the adjustable outdoor temperature setpoint, economizer cooling will be disabled.

On UVV units with E ventilation, the economizer damper is replaced with an economizer supply damper and an economizer exhaust damper. These dampers are modulated by separate actuators, but are controlled in parallel by the same 2-10VDC control signal. The operation is identical to that of the single economizer damper described above.

UVV units with D ventilation are not equipped with an economizer damper. Thus, the amount of outside air cannot be controlled.

## Energy Recovery Wheel

Energy recovery wheels are standard on UVV models with D or E ventilation. The energy recovery wheel shall be engaged when the exhaust fan is powered and the unit is not in free cooling mode.

## Chilled Water with Valve Control

Units with a chilled water coil and non-Carel controls desiring valve control shall use a non-spring return modulating valve operated by either a proportional (2-10VDC) or a floating (24VAC) signal. Units with a chilled water coil and Carel controls desiring valve control shall use a modulating valve requiring a floating signal. When the room temperature is above the cooling setpoint, the valve shall open proportionally according to the adjustable proportional band. The adjustable proportional band on the Carel controller is set to a default 1°F (i.e. damper is 50% open when room temperature is 0.5°F from setpoint). The Carel controller will not allow the chilled water valve to open when the outside air temperature is below 53°F.

## Hot Water or Steam with Valve Control

Units with a hot water or steam coil and non-Carel controls desiring valve control shall use a spring-return, normally open modulating valve operated by a proportional signal (2-10VDC). Units with a hot water or steam coil and Carel controls desiring valve control shall use a modulating control valve with a proportional signal. When the room temperature is below the heating setpoint, the valve shall open proportionally according to the adjustable proportional band. The adjustable proportional band on the Carel controller is set to a default 1°F. If the supply air temperature drops below 55°F, the hot water or steam valve shall modulate open to maintain 55°F.

## Chilled Water and Hot Water (2-Pipe) with Valve Control

Units desiring valve control to provide heating and cooling on a single water coil (two-pipe system) and not using Carel controls shall use a spring-return, normally open modulating valve operated by a proportional signal (2-10VDC) or a floating signal (24VAC). Units with Carel controls shall use a modulating control valve with a proportional signal. On a call for heating or cooling, the valve shall open proportionally based on how many degrees the room temperature is from the setpoint. The adjustable proportional band on the Carel controller is set to a default 1°F. If the supply air temperature drops below 55°F, the water valve shall modulate open to maintain 55°F. On two-pipe units not having Carel controls or not connected to a network, an optional aquastat is recommended to prevent inadvertent changeover of heating/cooling modes.

## Chilled Water with Face & Bypass Control

Face and bypass units equipped with a chilled water coil shall modulate the face and bypass damper via a spring return actuator, controlled by a proportional signal (2-10V). The face and bypass damper regulates the mixed air (return and outside air) passing through the chilled water coil. On a call for cooling, the damper shall open to the face of the coil proportionally based on how many degrees the room temperature is from the setpoint. The adjustable proportional band on the Carel controller is set to a default 1°F. When the damper is in full bypass position, all return and outside air bypasses the chilled water coil. When the damper is in full face position, all return and outside air passes through the chilled water coil.

## Hot Water or Steam with Face & Bypass Control

Face and bypass units equipped with a hot water or steam coil and face and bypass control shall modulate the face and bypass damper via a spring return actuator, controlled by a proportional signal (2-10V). The face and bypass damper regulates the amount of return air and outside air passing through the hot water coil. On a call for heating, the damper shall open proportionally based on how many degrees the room temperature is from the setpoint.

## Hot Water and Chilled Water (2-Pipe) with Face & Bypass Control

Face and bypass units desiring to provide heating and cooling on a single water coil (two-pipe system) shall modulate the face and bypass damper via a spring return actuator, controlled by a proportional signal (2-10V). The face and bypass damper regulates the amount of return air and outside air passes through the water coil. On a call for heating or cooling (depending on the season), the damper shall open proportionally based on how many degrees the room temperature is from the setpoint. The adjustable proportional band on the Carel controller is set to a default 1°F. When the damper is in full bypass position, all return and outside air bypasses the water coil. When the damper is in full face position, all return and outside air passes through the water coil. If the supply air temperature drops below 55°F, the water valve shall open (if equipped) and the face and bypass damper shall modulate to maintain 55°F. On two-pipe units not having Carel controls or not connected to a network, an optional aquastat is recommended to prevent inadvertent changeover of heating/cooling modes.

## 2-Position Control Valves

Optional spring-return, two-position control valves can be used to control the end of cycle flow on both chilled and hot water coils. On a chilled water coil, a normally closed valve is used. On a hot water coil or two-pipe changeover system, a normally open valve is used.

The two-position valve used on a chilled water coil shall open on a call for cooling when the outside air temperature is greater than 55°F. When the outside air temperature is less than 55°F, the valve should remain closed and free cooling shall be utilized. The two-position chilled water valve shall be closed when the two-position hot water valve is open (when equipped). The valve is controlled by a 24VAC digital output.

The two-position valve used on a hot water coil shall open on a call for heating. The valve shall always open when the outside air temperature drops below 40°F. This is to prevent the coil from freezing or nuisance tripping of the freeze stat. The two-position hot water valve shall be closed when the two-position chilled water valve is open (if equipped). The valve is controlled by a 24VAC digital output.

The two-position valve used on a two-pipe changeover system shall operate like the two-position chilled water valve in cooling mode, and like the two-position hot water valve in heating mode.

## Condensate Pump

On units equipped with a condensate pump, the pump shall begin to run once the condensate reaches a set level. The pump comes with an internal safety switch that can be wired either normally open or normally closed. The safety switch shall be wired such that the chilled water valve closes when it trips. On Carel units, the switch shall be wired normally closed into a digital input of the controller. If the unit is also equipped with a condensate pan float switch, both switches shall be wired in series.

## Condensate Pan Float Switch

On units equipped with a condensate pan float switch, the normally closed switch shall be wired such that the chilled water valve closes upon tripping. On Carel units, the switch shall be wired normally closed into a digital input of the controller. If the unit is also equipped with a condensate pump, both the condensate pump limit switch and condensate pan float switch shall be wired in series.

## CO<sub>2</sub> Sensor

An optional CO<sub>2</sub> sensor with a range of 0-2000 ppm producing an output signal of 0-20mA is available to modulate the outside air damper. If equipped, the outside air damper shall modulate open proportionally to compensate for the CO<sub>2</sub> levels in the room. On Carel units, if the CO<sub>2</sub> level is 800 ppm or less, the damper shall remain at its normal minimum position. If the CO<sub>2</sub> level increases above 800 ppm, the damper begins to open according to the proportional band. The proportional band is set to a default of 200 ppm and is adjustable. Using the default, once the CO<sub>2</sub> level reaches 1000 ppm, the damper shall be at its maximum ventilation position.

## Freeze Stat

On chilled water and hot water units, an adjustable manual-resetting freeze stat monitors the temperature of the coil. The freeze stat shall be wired so that upon tripping, power is removed from the supply fan, the outside air damper closes, and either the HW valve opens or the face & bypass damper goes to full bypass (depending on how unit is equipped).

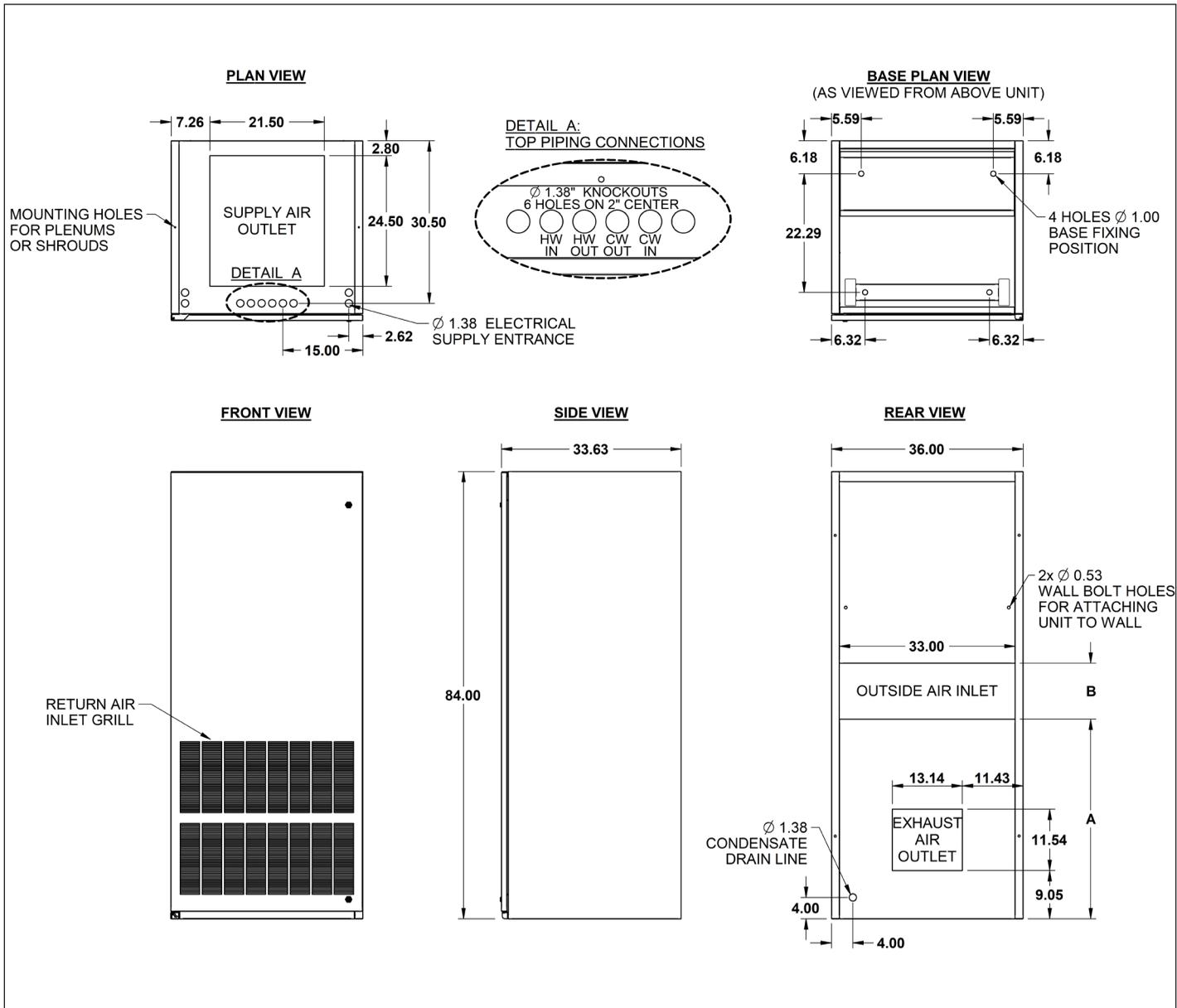
## Fire Detector

Units equipped with an optional fire detector shall shut down power to the supply fan and close all dampers upon the detection of a fire.

## Smoke Detector

Units equipped with an optional smoke detector shall shut down power to the supply fan and close all dampers upon the detection of smoke.

Figure 16.1 - Dimensional Data - Base Unit UVV (Digit 9: Ventilation Configuration = A, B or C)



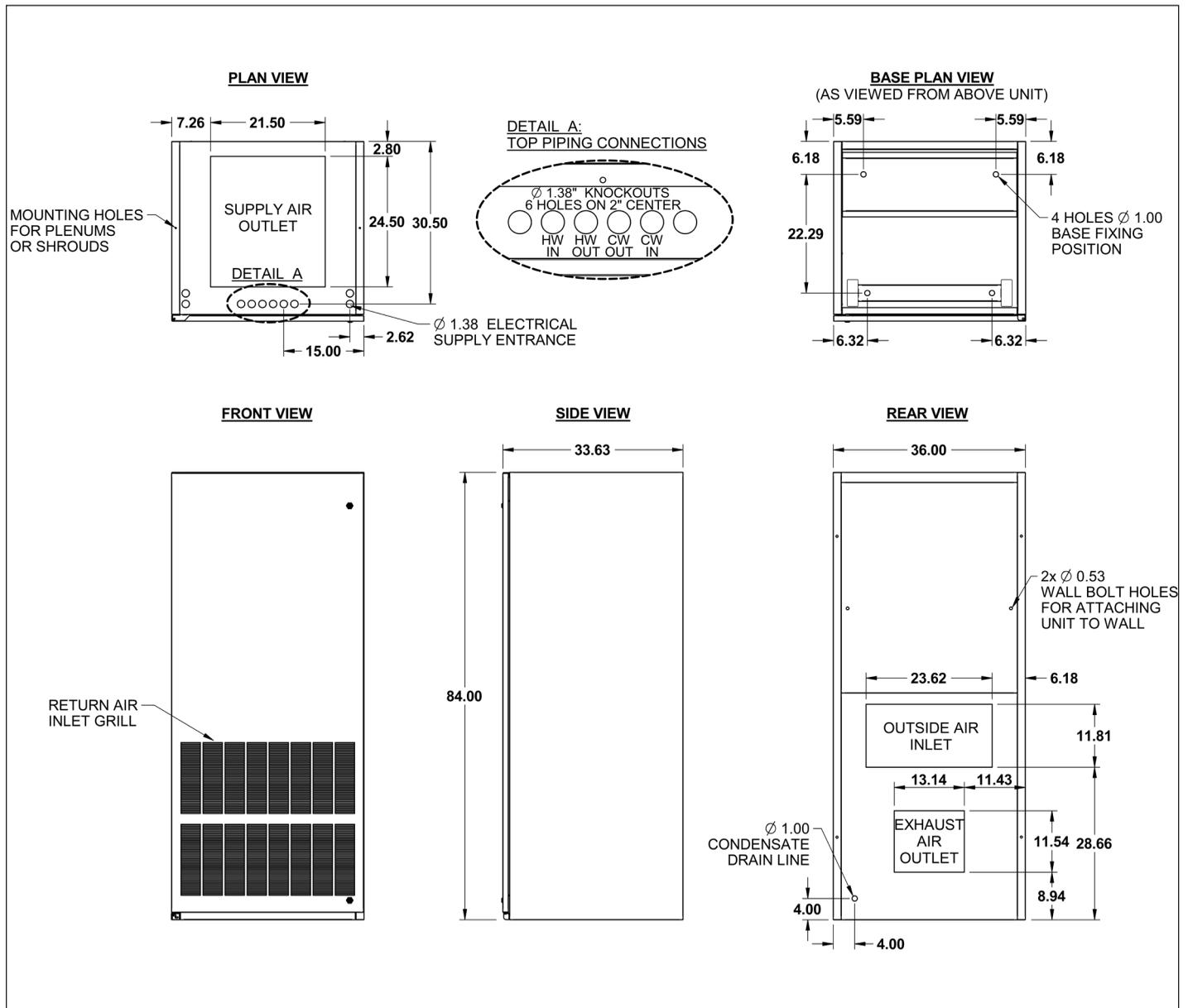
**NOTE:**

1. Base Unit UVV (Digit 9: Ventilation Configuration = A) will be provided with no Exhaust Air Outlet.
2. Unit will be provided with top and bottom piping knockouts. Reference Digit 20 in unit nomenclature to understand where terminations are located.

**Table 16.1 - Dimensions**

Unit Size	A	B
30 / 40 / 50 / 60	40.50	7.50
80	37.50	10.50

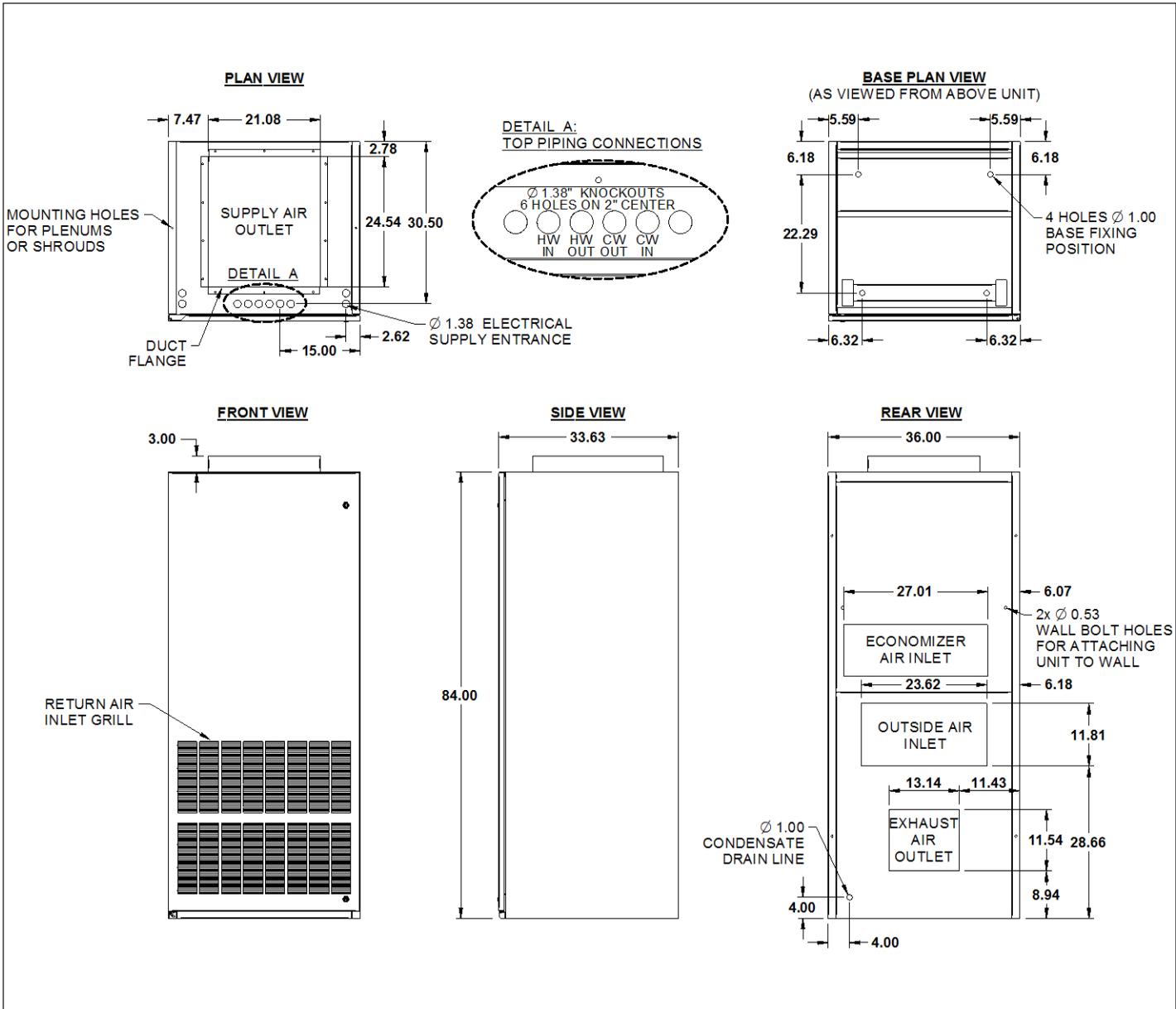
Figure 17.1 - Dimensional Data - Base Unit UVV (Digit 9: Ventilation Configuration = D)



**NOTE:**

Unit will be provided with top and bottom piping knockouts. Reference Digit 20 in unit nomenclature to understand where terminations are located.

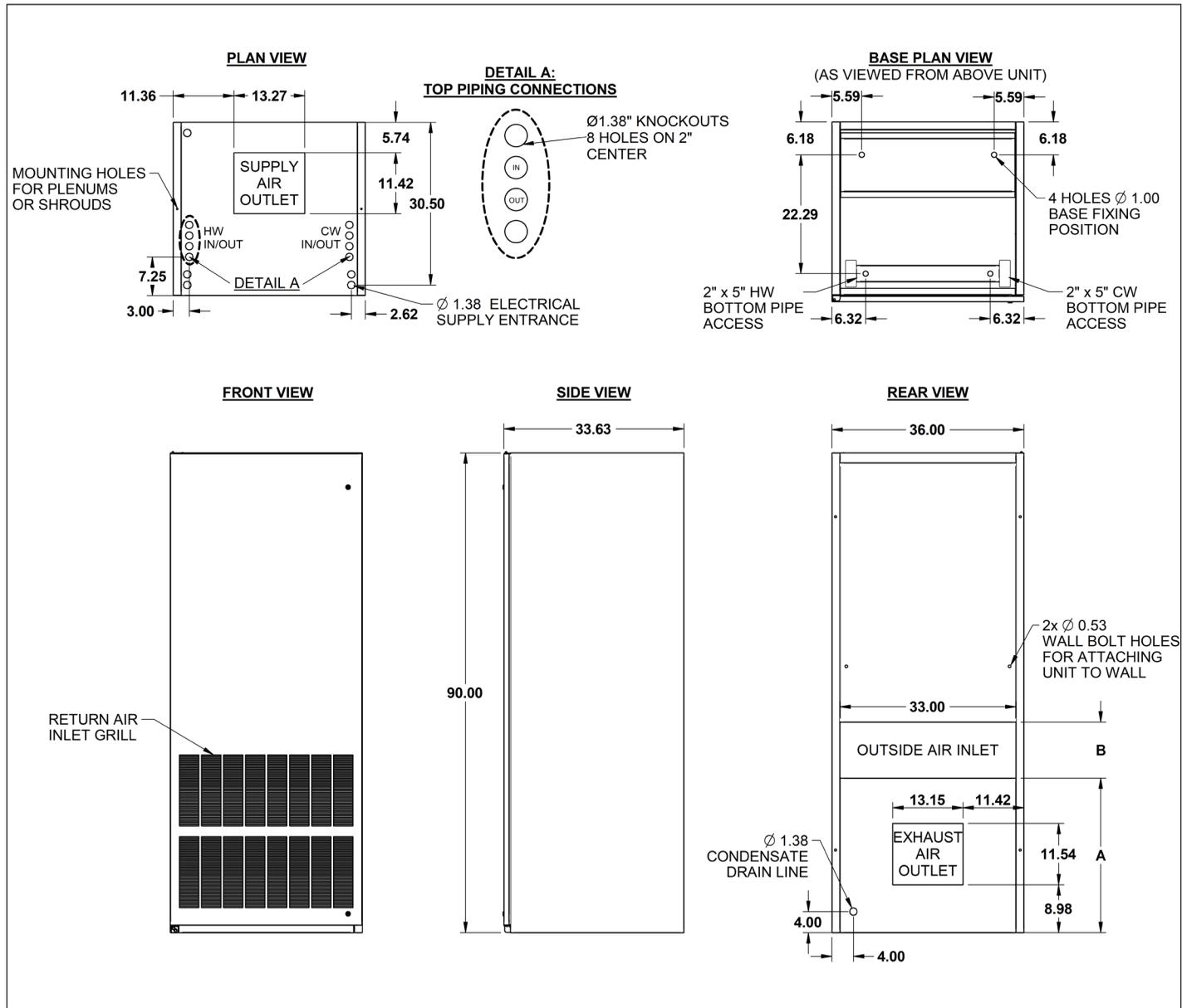
Figure 18.1 - Dimensional Data - Base Unit UVV (Digit 9: Ventilation Configuration = E)



**NOTE:**

Unit will be provided with top and bottom piping knockouts. Reference Digit 20 in unit nomenclature to understand where terminations are located.

Figure 19.1 - Dimensional Data - Base Unit UVD (Digit 9: Ventilation Configuration = A, B or C)



**NOTE:**

1. Base Unit UVD (Digit 9: Ventilation Configuration = A) will be provided with no Exhaust Air Outlet.
2. Unit will be provided with top and bottom piping knockouts. Reference Digit 20 in unit nomenclature to understand where terminations are located.

**Table 19.1 - Dimensions**

Unit Size	A	B
30 / 40 / 50 / 60	32.00	7.50
80	29.00	10.50

Standard UVV / UVD with Economizer - Single Wall Sleeve, Louver and Mounting Dimensions

Figure 20.1 - General Arrangement

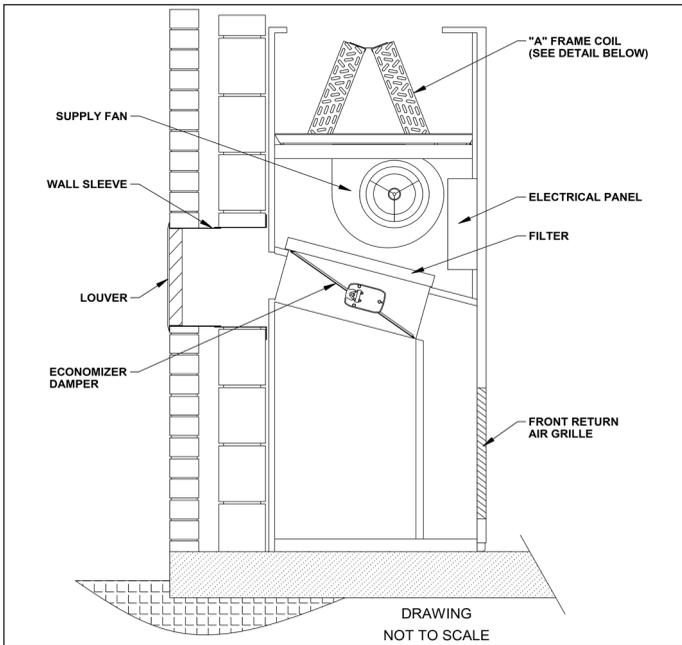


Figure 20.3 - Louver

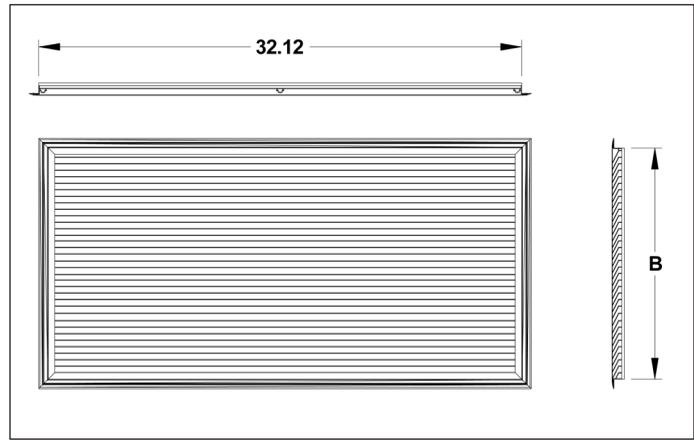


Figure 20.2 - Wall Sleeve

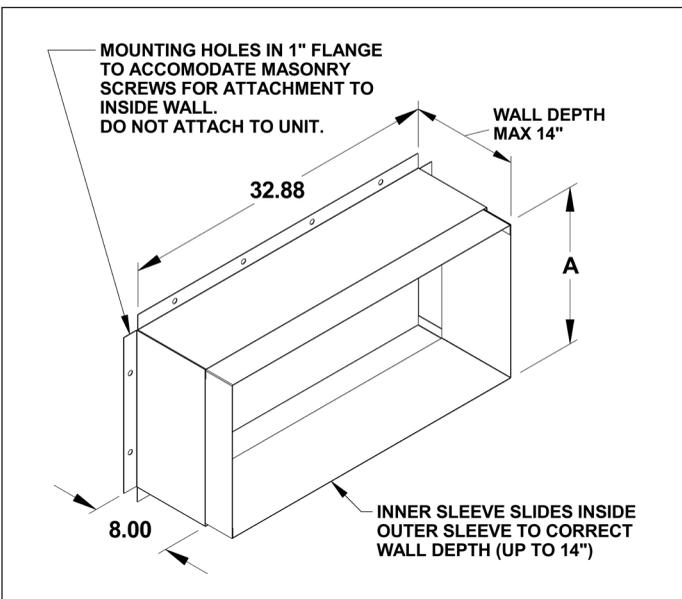


Figure 20.4 - Wall Opening

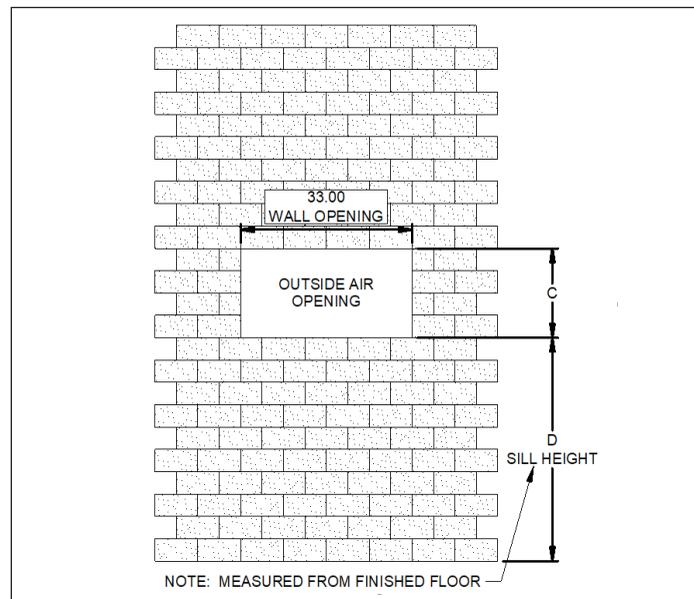


Table 20.1 - Dimensions

Unit Size	30 / 40 / 50 / 60	80
A	19.88	21.88
B	19.00	21.00
C	20.00	22.00
D	29.00 to 40.00	27.00 to 37.00

Standard UVV ERV with OA Damper & Economizer - Single Wall Sleeve, Louver and Mounting Dimensions

Figure 21.1 - General Arrangement

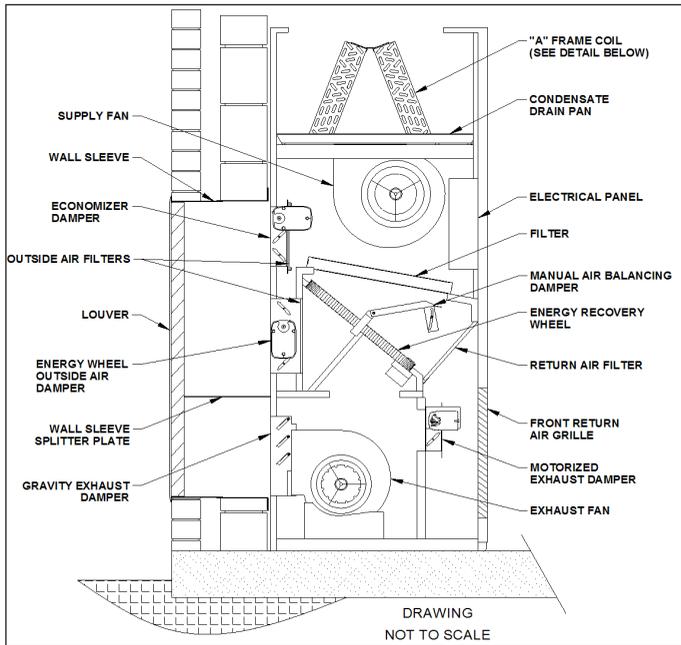


Figure 21.3 - Louver

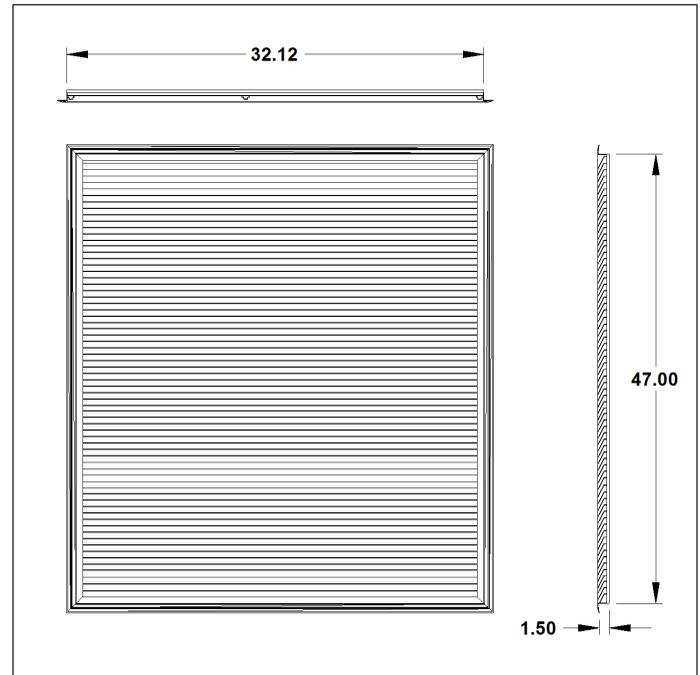


Figure 21.2 - Wall Sleeve

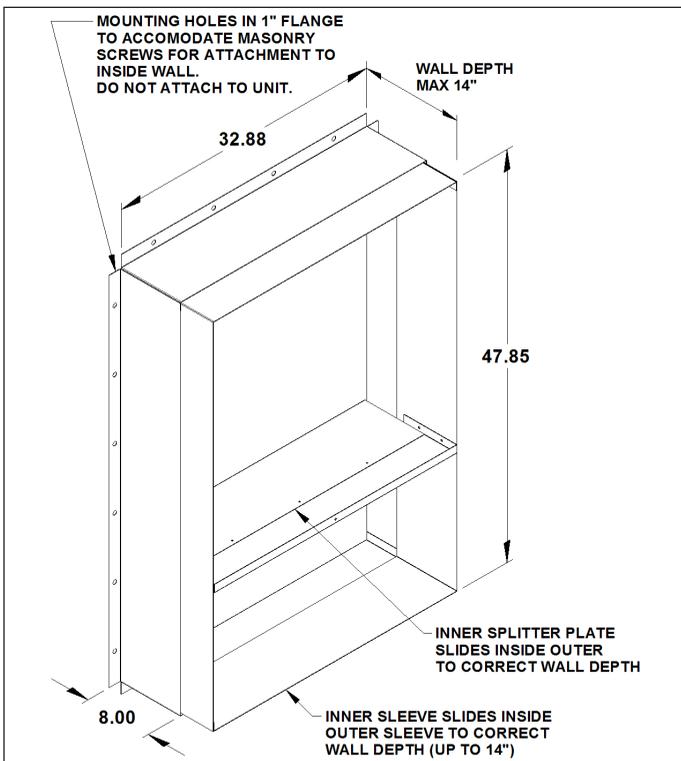
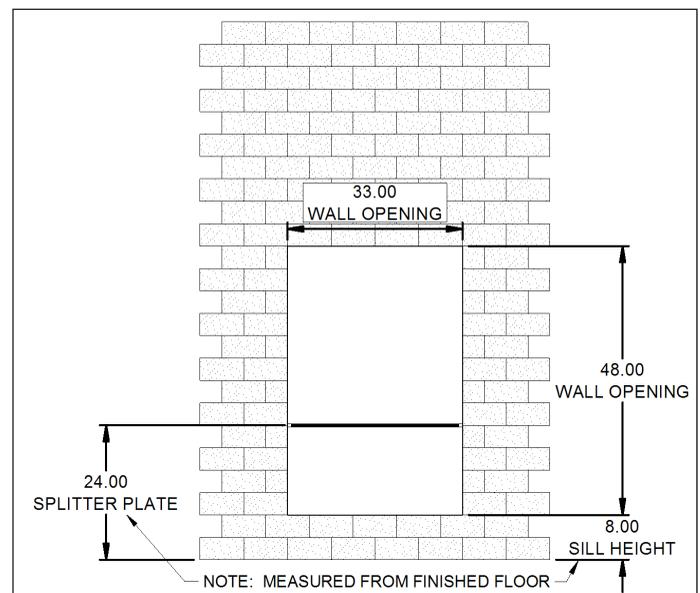


Figure 21.4 - Wall Opening



Standard UVD Economizer with Exhaust - Single Wall Sleeve, Louver and Mounting Dimensions

Figure 22.1 - General Arrangement

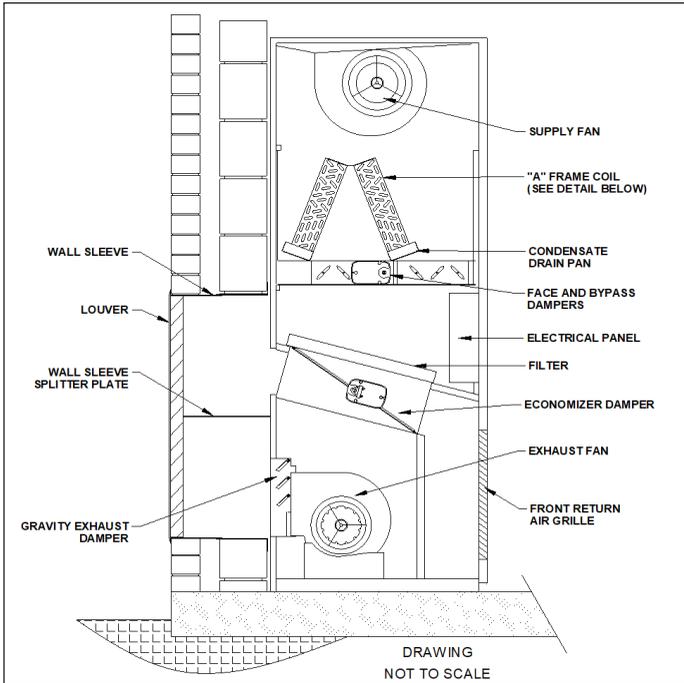


Figure 22.3 - Louver

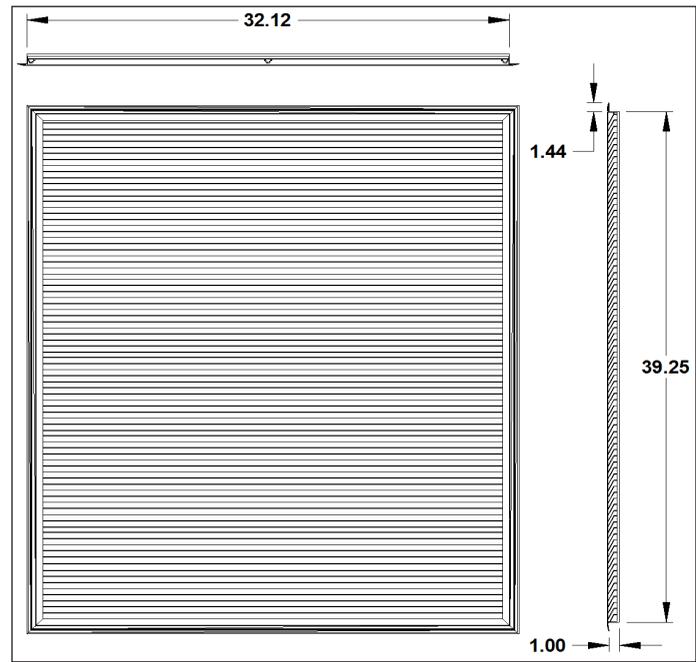


Figure 22.2 - Wall Sleeve

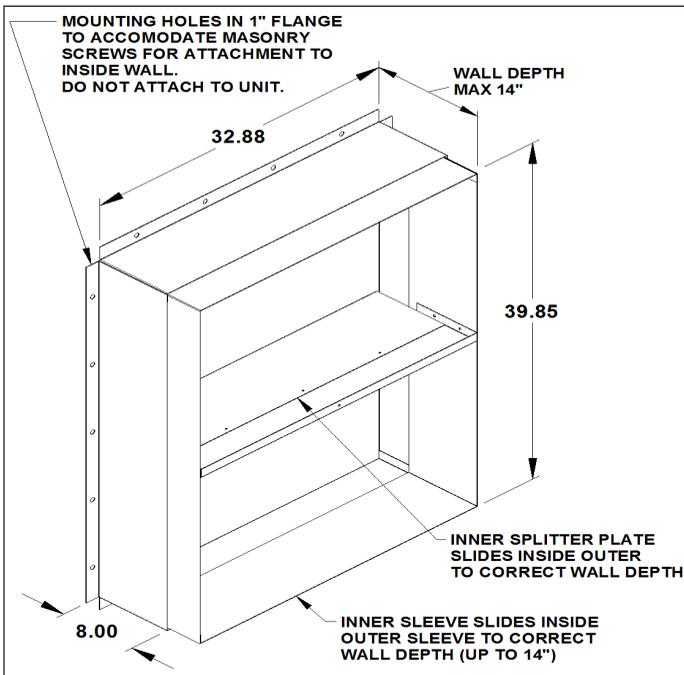
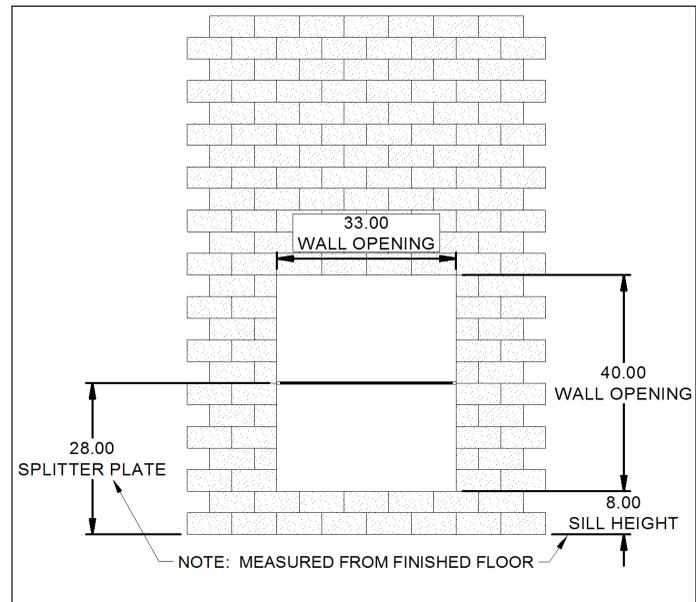


Figure 22.4 - Wall Opening

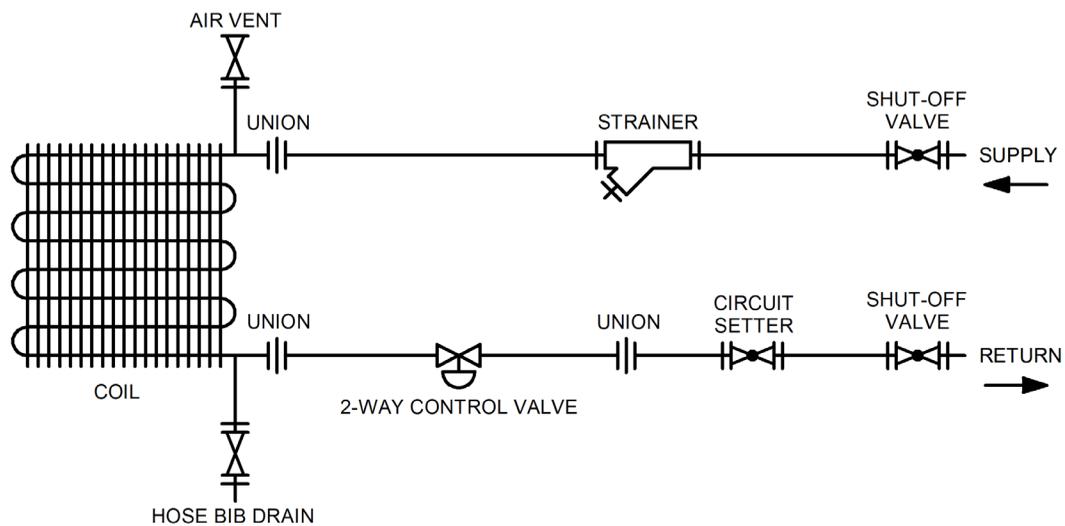


**Airedale offers the following piping components:**

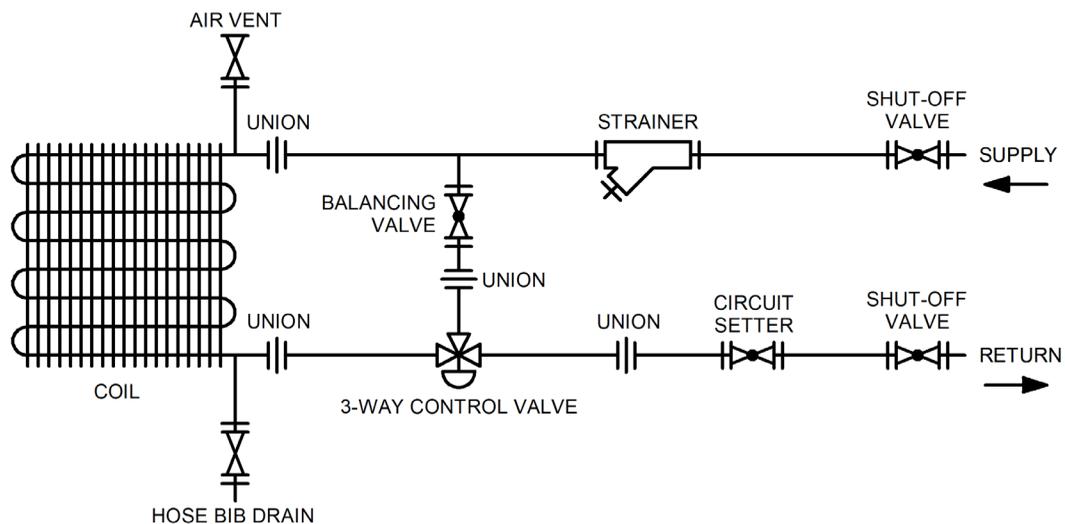
- Modulating Control Valve, 2-way or 3-way - for Valve Control units (Digit 3 = V)
- 2-Position Control Valve, 2-way or 3-way - for Face & Bypass units (Digit 3 = D)
- Balancing Valve
- Circuit Setter
- Shut Off Valves
- Strainer

Piping components can be shipped loose for field installation and are available in 1/2" and 3/4" sizes for chilled water units and 1/2" and 3/4" for hot water units. Selected piping components are factory assembled and installed on Valve Control units (Digit 3 = V). Piping components are shipped loose for field installation on Face & Bypass units (Digit 3 = D).

**Figure 23.1 - Typical 2-Way Piping Diagram**



**Figure 23.2 - Typical 3-Way Piping Diagram**





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