Technical Manual

ClassMate®

Single Package Vertical Unit

Models CMD, CMP and CMS

AIREDALE

MODINE
Always Innovating. Always Improving.

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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 self-contained air conditioning unit in three possible configurations: Split Fan Coil Operation, DX Cooling Operation, Heat Pump Heating and Cooling Operation. The unit may employ options for electric, hot water, or steam (plenum mount only) heating. 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 engineered to provide one stage of free cooling and two stages of mechanical cooling. A third dehumidification stage of mechanical cooling may be used when using a humidity sensor. Heat pump units shall also offer two stages of mechanical heating with automatic defrost control.

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

ClassMate® - Model Nomenclature

1,2	3	4,5	6	7	8	9	10	11	12	13	14	15,16	17
PT	UC	MBH	SV	G	CC	VC	FL	CS	DS	DO	HP	HO	-

1,2 - Product Type (PT)
CM - Classmate®

3 - Unit Configuration (UC)
D - DX Cooling
P - HP Heating & Cooling
S - Split Fan Coil Unit

4,5 - Nominal Capacity (MBH)
24 - 24,000 Btu/Hr
36 - 36,000 Btu/Hr
48 - 48,000 Btu/Hr
60 - 60,000 Btu/Hr

6 - Supply Voltage (SV)
A - 115/60/1
B - 208/60/1
C - 230/60/1
D - 208/60/3
E - 230/60/3
F - 460/60/3
H - 277/60/1

7 - Generation (G)
A - First Generation
B - Second Generation

8 - Control Code (CC)
M - Modine Control System
F - Factory Installed Free Issue
B - By Others - Field Installed

9 - Ventilation Configuration (VC)
CMD & CMP
- A - Economizer
- B - Economizer with OA Damper
- C - ERV with OA Damper
- D - ERV with OA Damper & Economizer
- E - ERV with OA & RA Damper & Economizer
- Z - Return Air Only

CMS - No Exhaust
- A - Economizer
- B - Economizer with OA Damper
- Z - Return Air Only

CMS - Gravity Damper
- F - Economizer
- G - Economizer with OA Damper
- H - ERV with OA Damper
- J - ERV with OA Damper & Economizer
- K - ERV with OA & RA Damper & Economizer

CMS -Powered Exhaust
- L - Economizer
- M - Economizer with OA Damper
- H - ERV with OA Damper
- N - ERV with OA Damper & Economizer
- P - ERV with OA & RA Damper & Economizer

10 - Filters (FL)
A - MERV 8
B - MERV 11
C - MERV 13
D - MERV 16

11 - Case Construction (CS)
A - 20Ga (Standard)
B - 16Ga
S - STUDY Package 20Ga

12 - Door Mounted Stat (DS)
N - None
V - Vertical Stat
H - Horizontal Stat

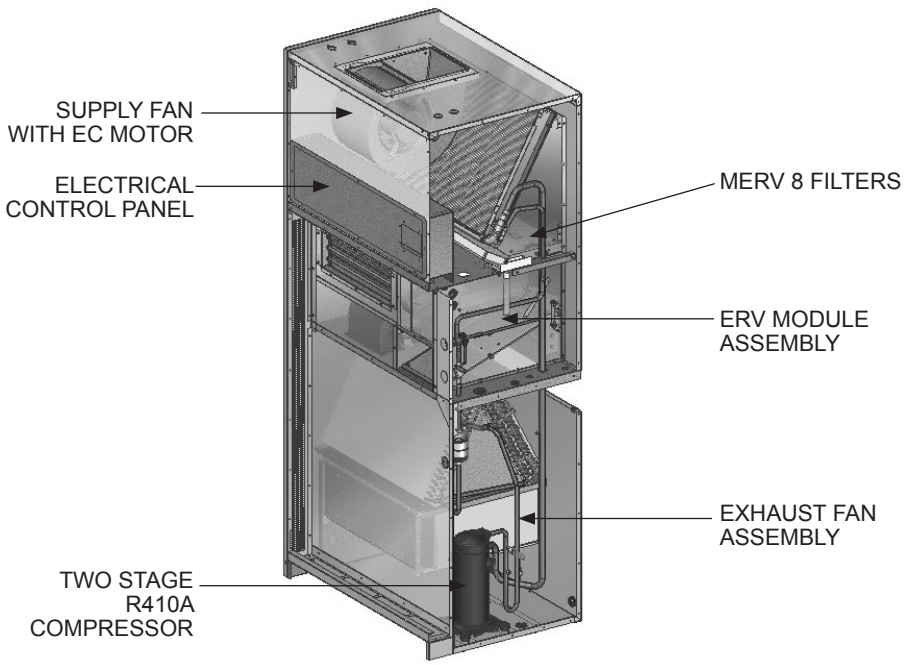
13 - Door Mounted Other (DO)
N - None
K - Key Over-ride
S - Occupancy Sensor
L - Indicator Light
T - Twist Timer

14 - HGRH & Pump Option (HP)
N - None
A - HGRH Coil
B - HGRH Coil & Condensate Pump
C - Condensate Pump

15,16 - Heating Option (HO)
00 - None
02 - 2 kW (1-stage)
03 - 3 kW (1-state)
04 - 4 kW (1-stage)
05 - 5 kW (1-stage)
06 - 6 kW (1-stage)
07 - 7.5 kW (1-stage)
08 - 8 kW (1-stage)
09 - 9 kW (1-stage)
10 - 10 kW (2-stage)
12 - 12 kW (2-stage)
15 - 15 kW (2-stage)
18 - 18 kW (2-stage)
20 - 20 kW (2-stage)
81 - 1R HW (1/2") - Bottom Conn.
82 - 1R HW (3/4") - Bottom Conn.
83 - 2R HW (1/2") - Bottom Conn.
84 - 2R HW (3/4") - Bottom Conn.
91 - 1R HW (1/2") - Top Conn.
92 - 1R HW (3/4") - Top Conn.
93 - 2R HW (1/2") - Top Conn.
94 - 2R HW (3/4") - Top Conn.

17 - N/A
Reserved for future use

General Description – ClassMate® Unit



View from front of unit. Parts of casing and sheet metal components removed for ease of viewing.

Cabinet
The cabinet shall be constructed from aluminized steel with 20 gauge panels (16 gauge optional), degreased and coated with electrostatically applied baked-on polyester powder paint. The standard color shall be beige with a hammertone textured finish. Additional colors are available from manufacturers color chart. The paint finish shall be easily cleanable and hard wearing to give maximum protection. The cabinet shall be double-wall insulated with acoustic foam insulation containing no fibrous materials.

The cabinet insulation is 1-inch thick, acoustic Hushcloth Polyester/Polyurethane foam with density of 2-pounds per cubic foot containing no fibrous materials. The foam insulation shall have a fire rating of UL94HF-1. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010. Unit shall employ 20 gauge aluminized steel full double wall construction on interior right and left hand sides.

Access to all components shall be through the front of the unit only.

Return air openings shall be integrated into the cabinet sides and front bottom base of unit with excess face area to allow installation of unit against one adjacent wall if required. A condensate connection stub shall also be provided internally at the rear of the unit for connection to the field installed building condensate drain.

Access Door
An access door is factory installed on the front of the unit. Door shall be fully insulated to provide for superior noise deadening at front of unit. Door shall employ heavy duty plunger hinges with a spring-loaded pin to allow for easy removal, if required. Door is secured with two (2) key locks. Door swing designed to turn into itself allowing side of the unit to be installed directly against a wall in the corner of a room.

Compressor
A two stage hermetic scroll compressor is mounted on four (4) vibration absorbers for quiet operation. Equipped with a crankcase heater to guard against liquid flood-back conditions and the elimination of oil foaming upon start-up. Two-stage compressor shall contain an internal unloading mechanism to provide capacity control and enable part load efficiencies to be increased. An internal overload protector shall protect the compressor against excessive motor temperatures and currents.

Indoor Coil
Patented micro-channel CF™ evaporator coil designed for maximum heat transfer with minimum footprint and pressure drop. Quick draining evaporator coil designed, tested and fabricated by unit ventilator manufacturer for optimal airflow and heat transfer specific to the unit. Coil is fitted to non-corrosive stainless steel drain trays.

Outdoor Coil
Enhanced, high-efficiency, cross rifled coil designed, tested and fabricated by unit ventilator manufacturer for optimal airflow and heat transfer specific to the unit. Coil is fitted to non-corrosive stainless steel drain trays.

Indoor Fan Assembly
The indoor fan assembly consists of one blower located inside a teardrop housing assembly engineered specifically for optimal airflow with low noise and minimal power consumption. Blower is powered by electronically commutated motor (ECM). The DC motor features brushless, permanently lubricated ball bearing construction for maintenance free operation. A wide range of programmable speeds and torque characteristics is possible for ultra-high-efficiency and superior acoustics. The ECM provides constant airflow by automatically adjusting the speed if the external static pressure changes.

Outdoor Fan Assembly (Powered Exhaust)
The outdoor fan assembly consists of one backward curved plug fan with centrifugal blower wheels powered by electronically commutated motor (ECM). The DC motor features brushless, permanently lubricated ball bearing construction for maintenance free operation. A wide range of programmable speeds and torque characteristics is possible for ultra-high-efficiency and low audible noise. Fan design capable of overcoming external static pressures from outdoor air rear extensions and supply air ductwork or plenums. Fans are sized such that powered exhaust shall be integral to the unit to prevent over pressurization of the space when the unit is introducing outside air. Capable of exhausting 100% equivalent of the fresh air intake of the unit.

Control Panel
The panel is located at top of the unit behind the front door for direct, centrally located access to controller, class II controls transformer (24V), and all necessary contactors, relays, and circuit breakers. Control panel shall swing away from unit case to facilitate easy access to posterior indoor blower, coil, and heating options.

All components located in the panel shall be clearly marked for easy identification. All terminal blocks and wires shall be individually numbered. Individually numbered terminal blocks and wires are to match job-specific wiring diagrams. All electrical wires in the control panel will run in an enclosed trough. Wiring outside the control panel to be contained in a protective sleeve. All controls and wiring is factory installed in a clean, organized arrangement.

Supply and exhaust fan decks, compressor, damper assembly, economizer, and energy wheel assembly (if applicable) wiring includes plugs local to the assembly allowing for quick wiring disconnection when the component requires removal for service.

Disconnect Switch
A power disconnect switch sized for the full load amperage of the unit is located on the control panel. Allows the unit to be disconnected from the power supply prior to any maintenance. In the off position the switch can be locked out.

BASE UNIT SELECTION

Digit 3: Unit Configuration (UC)

D = Direct Expansion Cooling
The refrigeration system utilizes HFC-R410A and contains a factory fitted thermal expansion device and a filter drier. Fitted with automatic reset high and low-pressure cut-out switches and a sight glass is included for system observation.

P = Heat Pump Heating and Cooling
The heat pump system utilizes HFC-R410A and is fitted with dual thermal expansion devices and a reversing valve to enable the unit to operate in either cooling or heat pump mode. Factory mounted outdoor coil stat allows defrosting of the outside coil when in heat pump mode. Fitted with automatic reset high-pressure and low-pressure cut-out switches and a sight glass for system observation.

S = Split Fan Coil
The refrigeration system utilizes HFC-R410A and contains a factory fitted thermal expansion device and a filter drier. Fitted with automatic reset high and low-pressure cut-out switches and a sight glass is included for system observation.

Digit 8: Control Code (CC)

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. The controller also modifies minimum damper position to compensate for specific modes of operation and appropriate fan speed.

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

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 controller and temperature sensors are provided by others and mounted in the field. 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.

Digit 9: Ventilation Configuration (VC)

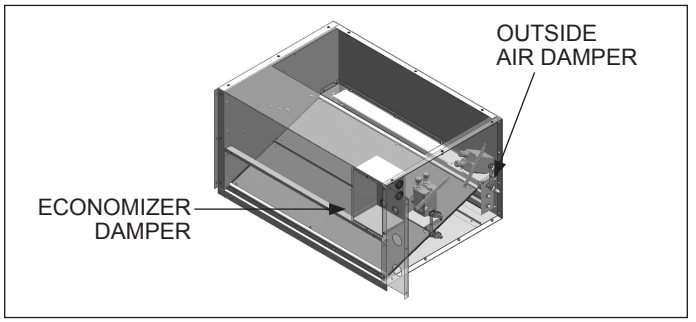
N = None

A, F, L = Economizer Ventilation
Single-blade damper 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 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. Electrical and control wiring to damper assembly includes quick disconnect plug local to assembly.

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, G, M = Economizer Ventilation with Outside Air Damper
Standard economizer operation except with additional outside air damper and actuator provided for protection from outdoor elements when unit is not in use (See Figure 6.1).

Figure 6.1 - Ventilation Configuration Digits: B, G, M



C, H = Exhaust Recover Ventilation (ERV) with OA Damper
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 500 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.

ERV section employs dual electronically commutated ventilation fans to ensure precise control of airflow through energy wheel and provide optimal wheel frost protection as required.

Separate outside air damper with actuator provided for protection from outdoor elements when unit is not in use.

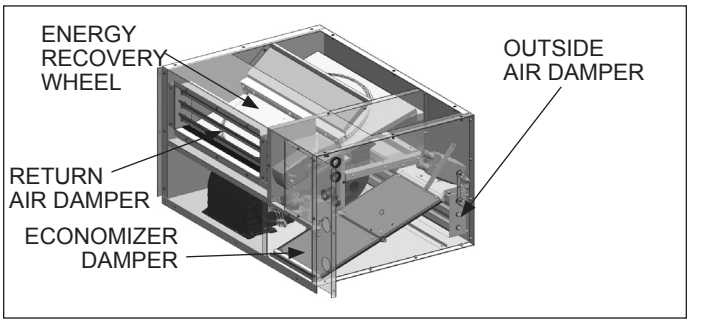
Complete energy recovery ventilator installed on rails to allow the entire assembly to be slid out of the unit for service. Electrical and control wiring to damper assembly includes quick disconnect plugs local to assembly.

The Heat Recovery Wheel can be disabled to provide 500 cfm of outside air in economizer mode.

D, J, N = Exhaust Recovery Ventilation (ERV) with Outside Air Damper and Economizer (Only available when Digit 8 = Modine Control Systems)
Standard ERV operation except with the addition of an economizer damper and actuator. This option enables enhanced economizer functionality allowing up to 75% volume of outside air during free cooling applications.

E, K, P = Exhaust Recovery Ventilation (ERV) with Outside air Damper, Economizer and Return Air Damper (Only available when Digit 8 = Modine Control Systems)
Standard ERV operation except with the addition of an economizer damper with actuator and return air damper with actuator. This option enables further enhanced economizer functionality by closing off return air allowing up to 100% volume of outside air during free cooling applications (See Figure 6.2).

Figure 6.2 - Ventilation Configuration Digits: E, K, P



Digit 10: Filters (FL)

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 and utilize 14.3 pleats per foot. Electrostatically enhanced pleated filter shall be constructed from 100% Synthetic media. 99% Arrestance and 35-40% Dust Spot Efficiency.

C = MERV 13
2" thick and utilize 17.5 pleats per foot. Filter shall be constructed from 100% Synthetic media and be LEED/Green compliant. 99% Arrestance and 70-80% Dust Spot Efficiency.

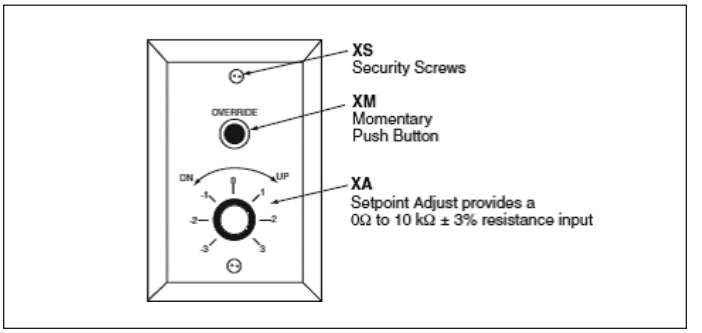
D = MERV 16
2" thick and incorporate a Mini-Pleat design. Filter shall incorporate a durable plastic frame and be constructed with no metal components. 95% evaporated Di-Octyl Phthalate (DOP) Tested Efficiency (Military Standard 282).

Digit 12: Door Mounted Stat (DS)

N = None

V = Vertical Stat
For units fitted with Modine Control Systems. A stainless steel flush-mount thermistor sensor with insulated back provides for +/- 3º 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 6.3).

Figure 6.3 - Temperature Sensor



H = Horizontal Stat (Digital Thermostat)
Digital thermostat with (or without) humidity sensing used in conjunction with Modine Control Systems. Displays current room temperature, cooling/heating setpoint, current room humidity level, humidity setpoint, 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. Thermostat allows for 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 7.1).

Figure 7.1 - 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 or standby 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: HGRH & Pump Option (HP)

N = None

A = Hot Gas Reheat (HGRH) Coil
Required when utilizing the dehumidification cycle on units without hot water heating. Unit is equipped with a reclaim valve and a second condenser coil (reheat coil). When the unit enters the dehumidification mode, the unit will reclaims the heat of rejection to maintain dry bulb temperature and reduce the need for an auxiliary heat source.

B = Hot Gas Reheat Coil & Condensate Pump
Unit is equipped with a Hot Gas Reheat Coil and Condensate Pump.

C = Condensate Pump
Unit is equipped with a Condensate Pump.

Digit 15,16: Heating Option (HO)

N = None

Electric Heating
Unit is equipped with electric resistance heating elements controlled in one or two stages, factory mounted downstream of the evaporator coil. A manual thermal protection and automatic thermal protection switch is included.

02 = 2 kW (1-stage)	***09 = 9 kW (1-stage)***
03 = 3 kW (1-stage)	***10 = 10 kW (2-stage)***
04 = 4 kW (1-stage)	***12 = 12 kW (2-stage)***
05 = 5 kW (1-stage)	***15 = 15 kW (2-stage)***
06 = 6 kW (1-stage)	***18 = 18 kW (2-stage)***
08 = 8 kW (1-stage)	***20 = 20 kW (2-stage)***

Hot Water Heating
Unit is equipped with a hot water heating coil integral to the unit mounted in the reheat position relative to the evaporator coil. The coil is manufactured from refrigeration quality copper tubing mechanically bonded onto aluminum fins. Coil is fitted with both an air bleed and a drain valve with hose bib.

81 = 1 Row Hot Water Coil (1/2") - Bottom Connection
82 = 1 Row Hot Water Coil (3/4") - Bottom Connection
83 = 2 Row Hot Water Coil (1/2") - Bottom Connection
84 = 2 Row Hot Water Coil (3/4") - Bottom connection
91 = 1 Row Hot Water Coil (1/2") - Top Connection
92 = 1 Row Hot Water Coil (3/4") - Top Connection
93 = 2 Row Hot Water Coil (1/2") - Top Connection
94 = 2 Row Hot Water Coil (3/4") - Top Connection

Steam Coil Heating (Plenum Mounted)
Field installed plenum including a factory mounted steam heating coil. The coil is manufactured from refrigeration quality copper tubing mechanically bonded onto aluminum fins. Capacity control shall be achieved by either a field installed solenoid or modulating valve.

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.

Coil Freeze Protection
An automatic 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_2 Sensor
The CO_2 sensor mounted in the interior return air passage of the unit to provide demand ventilation. When the level of CO_2 rises over a predetermined setpoint, the sensor shall proportionally adjust the minimum damper position to allow larger quantities of outside air into the room.

Condensate Pump
The unit is equipped with a condensate pump including 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.

Dirty Filter Switch
The unit is provided with an internally mounted pressure switch to detect pressure drop across the filters and indicate dirty or clogged filters.

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.

Head Pressure Transducer
Available on units with the Modine Control System, the transducer is installed on liquid line to maintain sufficient head pressure (setpoint is user adjustable), providing required Hot Gas Reheat capacity through condenser fan modulation.

Phase Failure Relay
The unit is be provided with an internally mounted phase measurement relay to monitor the 3-phase power supply for phase sequence, phase failure, asymmetry, under voltage and overvoltage.

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

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 conjuction 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.

Compressor Acousic Wrap
For improved sound attenuation, a compressor casing consisting of 18oz. PVC barrier laminated to 1/2 inch non-woven polyester. Casing includes integral 4 inch foil backed fiberglass heat shield for use with crankcase heater. Compressor base consists of 2lb EVA barrier with embedded 1/4 inch layered closed cell foam. Cover is easily removable for service.

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

Hot Water Control Valve, and Valve Package (Unit Mounted, Factory Installed)
Capacity control is achieved by either a two or three way modulating valve or a two position valve. The valve package can include factory piped circuit setter, manual shut off valves, strainer, and PT ports (when selected).

Field Installed Accessories

Hot Water Heating Coil, Control Valve, and Valve Package (Plenum Mounted)
Field installed plenum including a factory mounted hot water heating coil. Capacity control shall be achieved by either a two or three way modulating valve or a two position valve. The coil can include factory piped circuit setter, manual shut off valves, strainer, drain with hose bib and PT ports (when selected).

Steam Coil (Plenum Mounted)
Field installed plenum including a factory mounted steam heating coil. The coil is manufactured from refrigeration quality copper tubing mechanically bonded onto aluminum fins. Capacity control shall be achieved by either a field installed solenoid or modulating valve.

Remote Temperature Sensor
For units fitted with the Modine Control System. A stainless steel flush-mount thermistor sensor with insulated back provides for +/- 3º setpoint adjustment and momentary push button override. Sensor is wall mounted remote from the unit (See Figure 6.3).

Digital Thermostat (Temperature Only)
Digital thermostat used in conjunction with the Modine Control System displays current room temperature, cooling/heating setpoint, 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. 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 (See Figure 7.1).

Digital Thermostat with Humidity Sensor
Same functionality as digital thermostat, except with the addition of humidity sensing capability, and humidity setpoint adjustments (See Figure 7.1).

Floor Stand
Fully enclosed floor stand manufactured from heavy duty sheet metal, painted and finished to match the unit color. This accessory will be valuable in matching up the airflow openings in the back of the unit to the existing wall openings in lieu of using a Rear Extension.

Wall Sleeve
The wall sleeve is constructed from galvanized steel. The sleeve is provided by Airedale and insulated by the installing contractor with foil back insulation. Availabe 8"-14".

Louver
An outdoor louver shall be furnished by Airedale and be suitable for masonry, glass or panel wall ocnstruction. Two louver styles are available: AMCA rated and non-AMCA rated. Louvers shall be availabe 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 is 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 are supplied with the unit.

Duct Shroud
Three sided duct shroud 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 14" to 50" 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

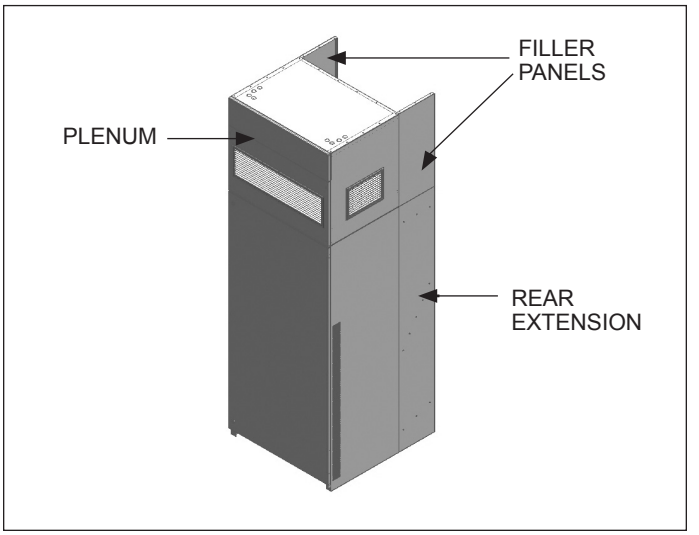
Acoustic Plenum
Discharge plenum mounted on top of the unit allowing for supply air to discharge through the top only. Fitted with acoustic shelf and lined with acoustic foam to minimize noise levels. Finished and painted to match the unit. Plenums can be supplied with aluminum grills with a clear anodized finish when discharging to the space.Plenums available in following configurations:

- 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 are 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 (See Figure 9.1)

Figure 9.1 - Rear Filler Panels



Side Trim Pieces

Trim pieces are available to aesthetically finish the installation where walls, floors or ceilings to not allow for a seamless and clean installation. Available in 90", 93" (size 60 units only), 120" and 150" heights. Flat 4' x 8' sheets also available. Painted and finished to match the unit (See Figures 10.1-10.4).

Figure 10.1 - 6" Flat with (1) Hanger Strip

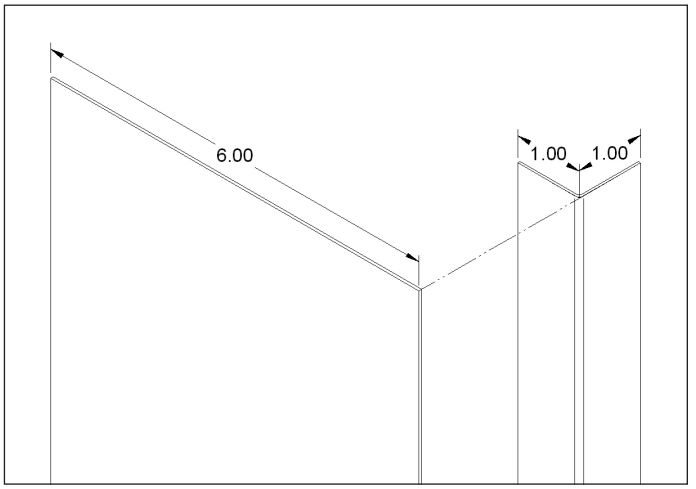


Figure 10.2 - 6" x 2" Angle

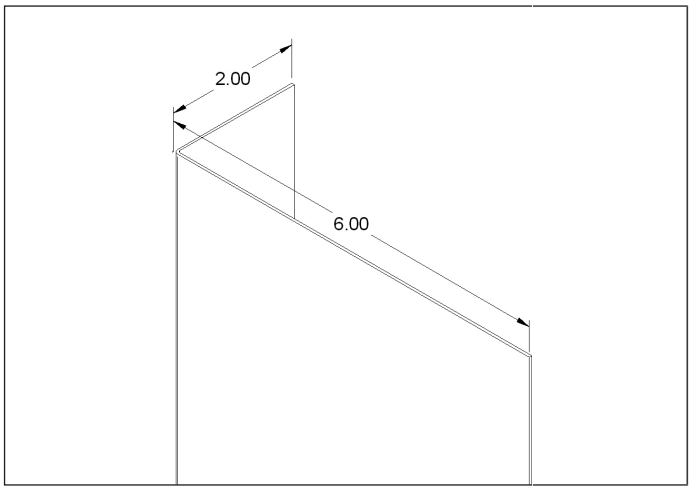


Figure 10.3 - 6" x 2" "C" with (2) Hanger Strips

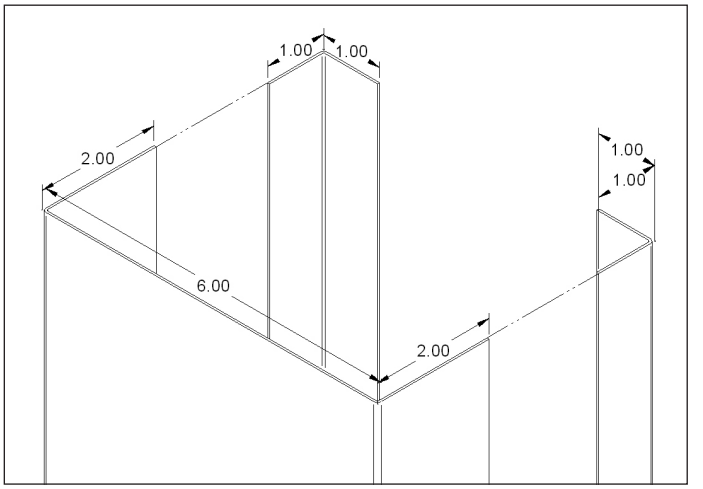
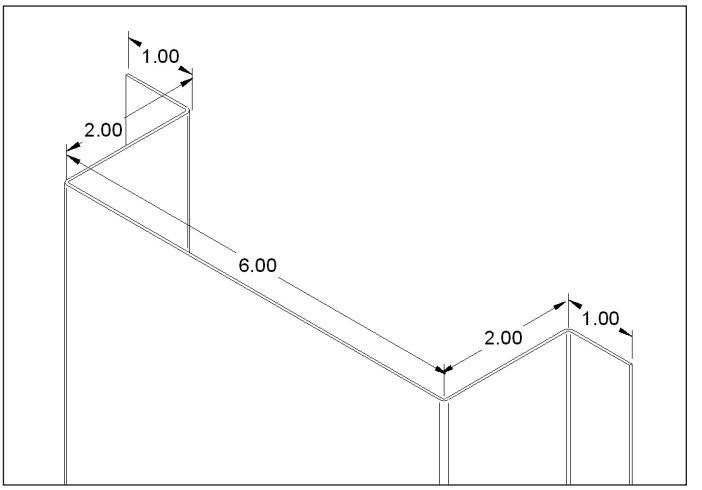


Figure 10.4 - 6" x 2" Hat with 1" Flanges



Economizer Damper
(Figures 11.1 - 11.5)

The economizer damper is controlled via a 0-10vDC control signal. A single-blade damper using a central single shaft is 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 air and return air to be possible (see Figures 11.1, 11.2, 11.4 & 11.5). Will allow for 100% of the units airflow to be taken from the outside during conditions allowing for free cooling operation (see Figure 11.3).

See **CONTROL STRATEGY** section for economizer damper operation details.

Figure 11.1 - 100% Recirculation, Cooling

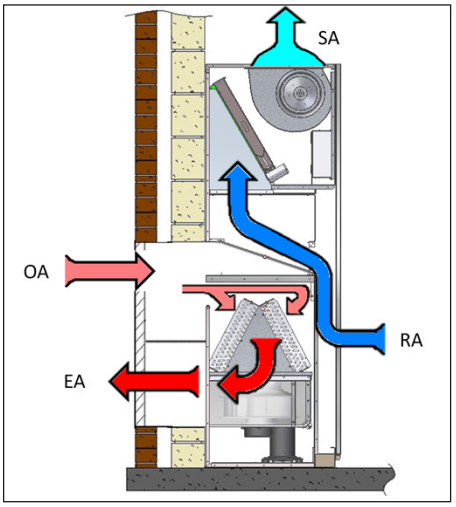


Figure 11.2 - 100% Recirculation, Heating

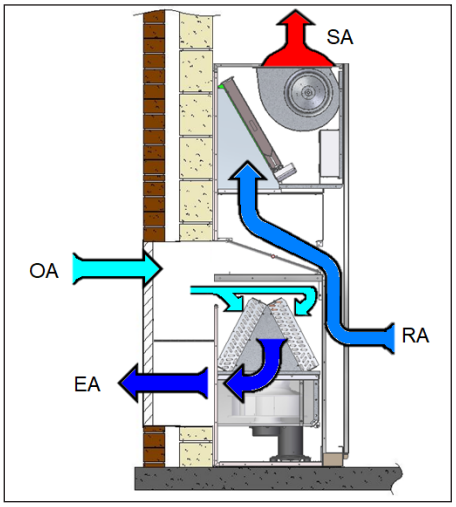


Figure 11.3 - Free Cooling

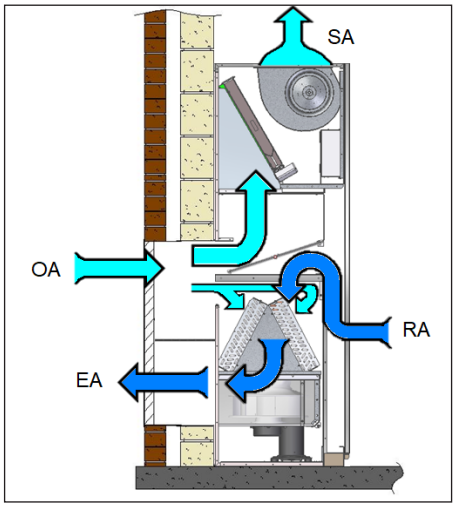


Figure 11.4 - Mixed Outside Air and Return Air, Cooling

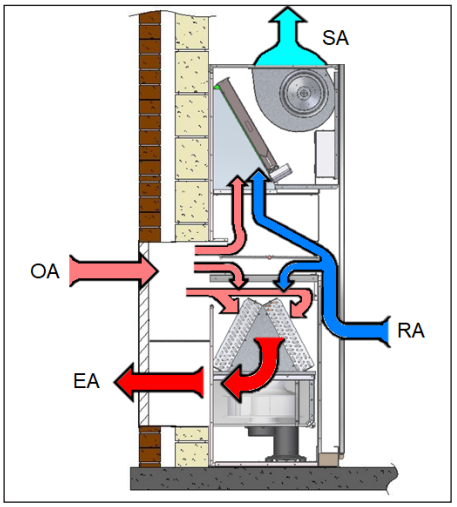
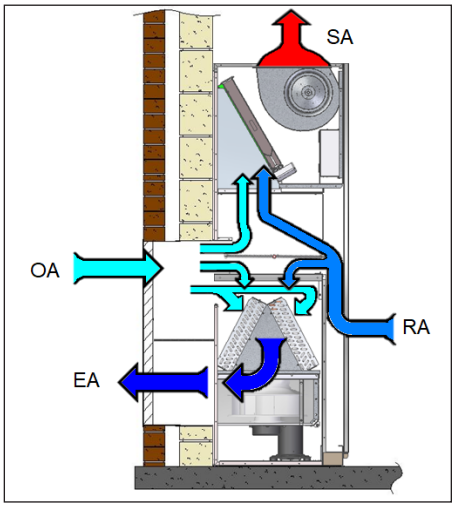


Figure 11.5 - Mixed Outside Air and Return Air, Heating



Energy Recovery Wheel
(Figures 11.6 & 11.7)

For units equipped with an Energy Recovery Wheel (ERW), the wheel rotates through the outside air and return air streams, transfering 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.

See **CONTROL STRATEGY** section for energy recovery wheel operation details.

Figure 11.6 - 100% Recirculation with Wheel, Cooling

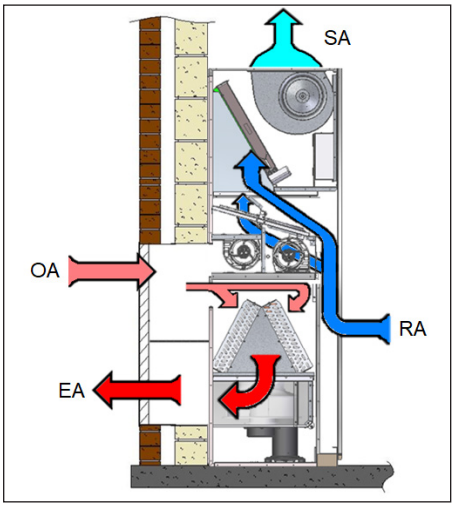
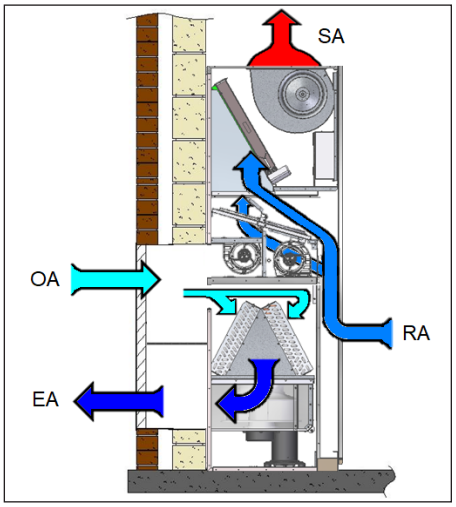


Figure 11.7 - 100% Recirculation with Wheel, Heating



Typical Supply Air Arrangements

Figure 12.1 - Three-way Discharge Plenum

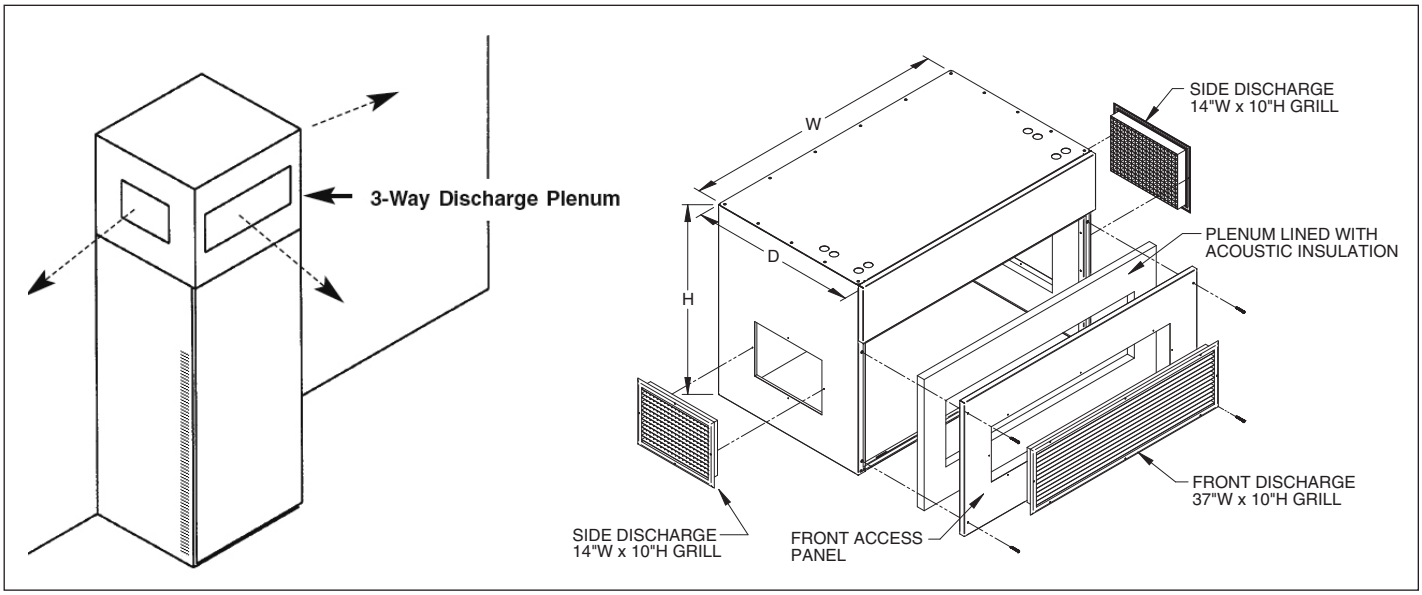


Figure 12.2 - Top Discharge Plenum

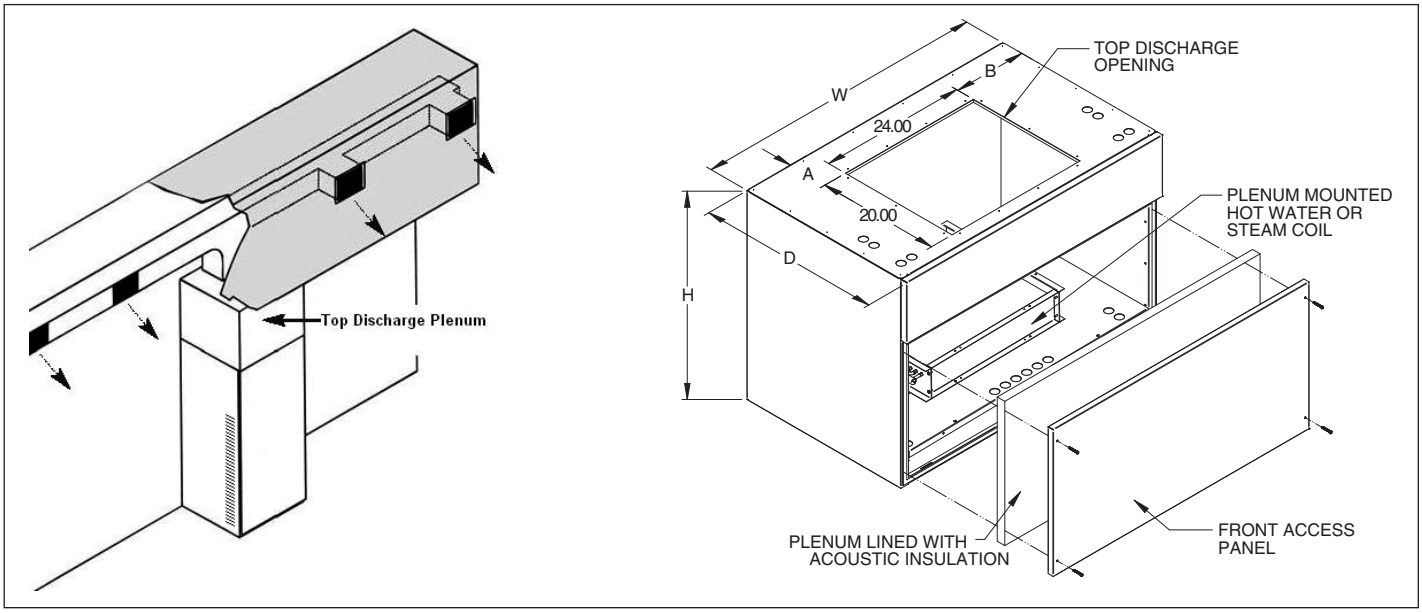


Table 12.1 - Discharge Plenum Dimensions

Model Size	Dimensions (inches)		
	W	D	H
24/36	42.00	30.00	12" to 48" (2" increments)
48/60	48.00	30.00	

Duct Shroud

Figure 12.1 - Duct Shroud

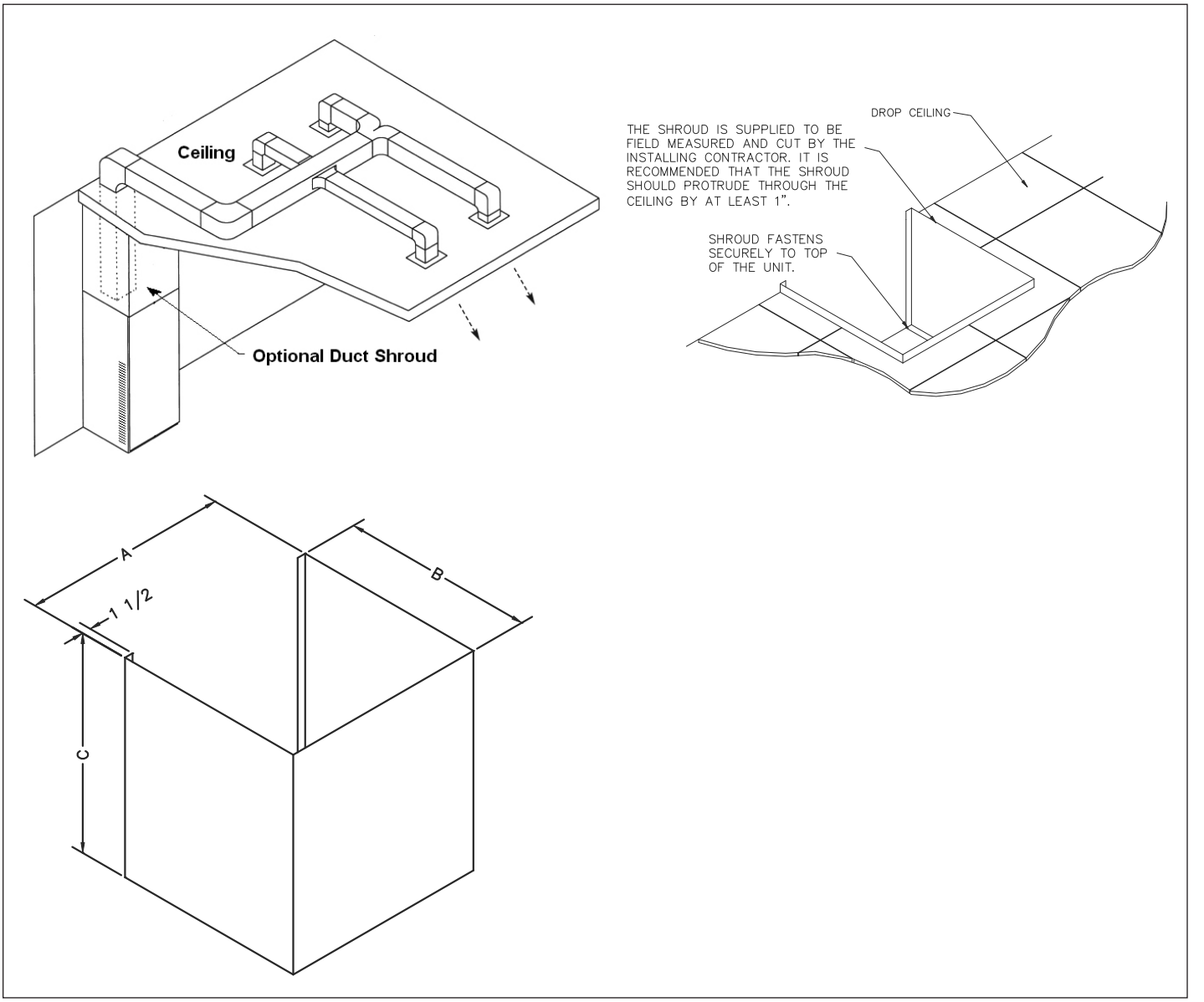


Table 12.1 - Duct Shroud Dimensions

Model Size	Dimensions (inches)		
	A	B	C
24/36	42.00	30.00	14" to 50" (6" increments)
48/60	48.00	30.00	

Table 13.1 - Performance Data - CMD

CMD (Rated in accordance with AHRI 390)	Units	24	36	48	60
Full Load Cooling (80/67˚F Air On, 95/75˚F Outdoor)					
Total Cooling	MBH	24.4	34.0	46.8	57.0
Sensible Cooling	MBH	17.5	24.3	31.5	41.1
EER	MBH/KW	12.1	11.0	11.6	11.0
Rated Airflow	CFM	800	1100	1500	1800
Part Load Cooling (80/67˚F Air On, 80/67˚F Outdoor)					
Total Cooling	MBH	17.1	27.3	37.1	45.5
Sensible Cooling	MBH	11.1	19.3	24.9	32.5
IPLV	MBH/KW	14.1	14.4	16.1	15.0
Rated Airflow	CFM	600	800	1100	1500

Table 13.2 - Performance Data - CMP

CMP (Rated in accordance with AHRI 390)	Units	24	36	48	60
Full Load Cooling (80/67˚F Air On, 95/75˚F Outdoor)					
Total Cooling	MBH	22.0	34.0	45.2	57.0
Sensible Cooling	MBH	17.0	24.3	32.2	41.0
EER	MBH/KW	11.2	11.0	11.0	11.0
Rated Airflow	CFM	800	1100	1500	1800
Full Load Heating (70/60˚F Air On, 47/43˚F Outdoor)					
Total Heating	MBH	20.9	32.8	47.2	54.0
COP	W/W	3.4	3.7	4.0	3.5
Rated Airflow	CFM	800	1100	1500	1800
Part Load Cooling (80/67˚F Air On, 80/67˚F Outdoor)					
Total Cooling	MBH	18.0	28.3	36.8	45.5
Sensible Cooling	MBH	14.6	19.3	26.0	32.5
IPLV	MBH/KW	15.6	14.4	15.4	15.0
Rated Airflow	CFM	600	800	1100	1500
Part Load Heating (70/60˚F Air On, 62/56.5˚F Outdoor)					
Total Heating	MBH	19.0	28.5	42.7	47.0
COP	W/W	4.6	4.2	4.4	4.4
Rated Airflow	CFM	600	800	1100	1500

Table 13.3 - Performance Data - ENERGY RECOVERY WHEEL (OPTIONAL)

ENERGY RECOVERY WHEEL (optional)		DATA SHOWN FOR ALL UNITS			
Outdoor Air Volume	CFM	200	300	400	500
Total Capacity Recovered (Cooling) ①	MBH	8.6	11.6	13.8	15.2
Measured Cooling Effectiveness	%	76.3	68.8	61.5	54.3
Total Capacity Recovered (Heating) ②	MBH	7.6	10.5	12.7	14.3
Measured Heating Effectiveness	%	78.8	72.3	65.9	59.4

① Cooling capacity based on: Room 75/63˚F Dry/Wet Bulb, Ambient 95/78˚F Dry/Wet Bulb.
② Heating capacity based on: Room 70/58.5˚F Dry/Wet Bulb, Ambient 35/33˚F Dry/Wet Bulb.

Table 14.1 - Technical Data - CMD & CMP

UNIT SIZE			24	36	48	60
DIMENSIONS – (H x W x D)		IN	90 X 42 X 30		90 X 48 X 30	93 X 48 X 30
INDOOR (Evaporator) COIL - Face Area		IN^2	720	720	863	863
OUTDOOR (Condenser) COIL - Face Area		IN^2	952	952	1156	1360
SUPPLY FAN			Direct Drive Centrifugal			
Fan Quantity			1	1	1	1
Motor Size (Qty 1)		HP	3/4	3/4	3/4	3/4
Motor Type			Electronically Commutated Motor (ECM)			
Indoor Coil Airflow		CFM	800	1,100	1,500	1,800
Rated/Max External Static Pressure		IN.Wg	0.10/0.50	0.15/0.50	0.20/0.50	0.20/0.50
EXHAUST FAN			Backward Curved Motorized Impellor			
Fan Quantity			1	1	1	1
OutdoorCoil Airflow		CFM	2,100	2,100	2,800	2,800
Motor Type			Electronically Commutated Motor (ECM)			
Max Room Exhaust Airflow		CFM	800	1,100	1,500	1,800
Rated/Max External Static Pressure		IN.Wg	0.10/0.50	0.15/0.50	0.20/0.50	0.20/0.50
COMPRESSOR			Copeland Scroll ULTRATECH			
Stages			0, 67%, 100%			
Refrigerant Type			HFC-R410A			
UNIT WEIGHT						
Operating Weight ①		LBS.	753	753	850	890
FILTER			MERV 8,11,13,16			
Quantity			2	2	2	2
Dimensions		IN	16 x 25	16 x 25	20 x 25	20 x 25
ELECTRIC HEATING (optional)						
Electric Heating Capacity		KW	20	20	20	20
Stages			2	2	2	2
HOT WATER HEATING (optional)						
Factory Installed - 1 row	Heating Capacity - 3/6 GPM ②	MBH	70/82	74/88	82/101	87/111
	Water Pressure Drop - 3/6 GPM	PSI	0.37/1.23	0.37/1.23	0.37/1.23	0.37/1.23
Factory Installed - 2 row	Heating Capacity - 3/6 GPM ②	MBH	94/106	101/118	113/139	122/158
	Water Pressure Drop - 3/6 GPM	PSI	0.75/2.50	0.75/2.5	0.88/2.94	0.88/2.94
Plenum Mounted - 1 row	Heating Capacity - 3/6 GPM ②	MBH	71/83	78/94	82/102	84/106
	Water Pressure Drop - 3/6 GPM	PSI	0.66/2.48	0.66/2.48	0.66/2.48	0.66/2.48
Plenum Mounted - 2 row	Heating Capacity - 3/6 GPM ②	MBH	93/107	104/126	109/139	111/146
	Water Pressure Drop - 3/6 GPM	PSI	0.33/1.26	0.33/1.26	0.33/1.26	0.33/1.26
STEAM HEATING (optional)						
Plenum Mount	1 Row Heating Capacity - 2/5 psig ②	MBH	93/97	103/108	116/122	124/131

① Operating Weight based on unit equipped with Standard Economizer, 20 Gauge casing, Hot Gas Reheat Coil, and 1-Row Hot Water Heating Coil.

② Hot water/steam heating capacity based on an Air On 33˚F (24MBH), 38˚F (36MBH), 47˚F (4Ton), and 51˚F (5 Ton). The Air On based on 450 CFM outside air at 0˚F and 70˚F room ambient for 24 MBH unit, and 500 CFM outside air at 0˚F and 70˚F room ambient for 36, 48, and 60 MBH unit. For Hot Water: Entering water temperature 180˚F, and water flow rate of 3 and 6 GPM. For Steam: Steam pressure of 2 and 5 psig.

Sequence of Operation - CMD

CMD – Cooling Only

The CMD cooling only unit is designed to maintain the desired setpoint temperature within a conditioned space by switching and modulating via the programmable microprocessor, controlling the unit in one of four occupied modes:

1. Free Cooling – using outside air
2. DX Cooling Stage 1 – mechanical cooling with 67% compressor, low speed supply fan, minimum fresh air
3. DX Cooling Stage 2 – mechanical cooling with 100% compressor, high speed supply fan, minimum fresh air
4. Heating (optional) – room return air and minimum fresh air

These modes are switched based on the following parameters: return air temperature, supply air temperature and the ambient air temperature.

Free Cooling

If the return air temperature is higher than the occupied setpoint and if the ambient air temperature is low enough to satisfy the cooling load in the occupied space, the microprocessor controller will signal the fresh air economizer damper. This will automatically modulate between 0-100% and the conditioned space temperature will be maintained by full fresh air or “free cooling”. During free cooling the outdoor fan will operate at reduced speed to match supply air volume.

On units equipped with energy recovery but no economizer, energy wheel is de-energized and outdoor air ventilation fan is 100% energized to allow up to 500cfm of outdoor air.

On units equipped with energy recovery and economizer but with no return air damper, energy wheel is de-energized and outdoor air ventilation fan is 100% energized. Economizer damper will automatically modulate between 0-100% allowing up to 75% free cooling to maintain conditioned space temperature.

On units equipped with energy recovery and economizer and return air damper, energy wheel is de-energized and outdoor air ventilation fan is 100% energized. Economizer damper and return air damper will automatically modulate between 0-100% allowing up to 100% free cooling to maintain conditioned space temperature.

The free cooling mode of operation leads to much reduced running time for the compressor leading to cost and equipment savings.

Mechanical Cooling (All Stages)

If the return air temperature is higher than the occupied setpoint and if the ambient air temperature is high enough the unit will call for mechanical DX cooling. The microprocessor controller will determine which stage of mechanical cooling is most efficient to handle the cooling load based on the return air, supply air, and ambient air temperatures, and pre-engineered control strategies. The microprocessor controller will then place the unit in one of the two stages of mechanical cooling.

1. Stage one utilizes 67% compressor capacity and a low speed supply fan
2. Stage two utilizes 100% compressor capacity and a high speed supply fan

Ventilation

During occupied cooling or heating modes, economizer damper or outdoor air ventilation fan can be set to achieve the necessary amount of outside air to be introduced prior to being conditioned, thus satisfying minimum ventilation code requirements.

Hot Gas Reheat (Optional)

During a call for dehumidification from return air humidity sensor, HGRH valve is opened and unit enters second stage of mechanical cooling. Outdoor air fan may modulate to maintain proper reheat capacity.

HGRH valve will close when return air humidity falls below setpoint or when other modes of cooling are required.

Heating (Optional)

As standard, this unit is not fitted with any heating capability; however, optional electric, hot water or steam heating may be provided and will be energized if the return air temperature falls below the occupied setpoint.

Sequence of Operation - CMP

CMP – Cooling & Heating

The CMP heat pump unit is designed to maintain the desired setpoint temperature within a conditioned space by switching and modulating via the programmable microprocessor, controlling the unit in one of seven occupied modes:

1. Free Cooling – using outside air
2. DX Cooling Stage 1 – mechanical cooling with 67% compressor, low speed fan, minimum fresh air
3. DX Cooling Stage 2 – mechanical cooling with 100% compressor, high speed fan, minimum fresh air
4. DX Heating Stage 1 – reverse cycle with 67% compressor, low speed supply fan, and minimum fresh air
5. DX Heating Stage 2 – reverse cycle with 67% compressor, high speed supply fan, and minimum fresh air
6. DX Heating Stage 3 – reverse cycle with 100% compressor, high speed supply fan, and minimum fresh air
7. Heating (optional) – room return air and minimum fresh air

These modes are switched based on the following parameters: return air temperature, supply air temperature and the ambient air temperature.

Free Cooling

If the return air temperature is higher than the occupied setpoint and if the ambient air temperature is low enough to satisfy the cooling load in the occupied space, the microprocessor controller will signal the fresh air economizer damper. This will automatically modulate between 0-100% and the conditioned space temperature will be maintained by full fresh air or “free cooling”. During free cooling the outdoor fan will operate at reduced speed to match supply air volume.

On units equipped with energy recovery but no economizer, energy wheel is de-energized and outdoor air ventilation fan is 100% energized to allow up to 500cfm of outdoor air.

On units equipped with energy recovery and economizer but with no return air damper, energy wheel is de-energized and outdoor air ventilation fan is 100% energized. Economizer damper will automatically modulate between 0-100% allowing up to 75% free cooling to maintain conditioned space temperature.

On units equipped with energy recovery and economizer and return air damper, energy wheel is de-energized and outdoor air ventilation fan is 100% energized. Economizer damper and return air damper will automatically modulate between 0-100% allowing up to 100% free cooling to maintain conditioned space temperature.

The free cooling mode of operation leads to much reduced running time for the compressor leading to cost and equipment savings.

Ventilation

During occupied cooling or heating modes, economizer damper or outdoor air ventilation fan can be set to achieve the necessary amount of outside air to be introduced prior to being conditioned, thus satisfying minimum ventilation code requirements.

Mechanical Cooling (All Stages)

If the return air temperature is higher than the occupied setpoint and if the ambient air temperature is high enough the unit will call for mechanical DX cooling. The microprocessor controller will determine which stage of mechanical cooling is most efficient to handle the cooling load based on the return air, supply air, and ambient air temperatures, and pre-engineered control strategies. The microprocessor controller will then place the unit in one of the three stages of mechanical cooling.

1. Stage one utilizes 67% compressor capacity and a low speed supply fan
2. Stage two utilizes 100% compressor capacity and a high speed supply fan.

Heating (All Stages)

If the return air temperature is below the setpoint and the ambient air temperature is high enough, the microprocessor controller will de-energize the reversing valve allowing the unit to operate in the reverse cycle DX heating mode. The microprocessor controller will also determine which stage of DX heating is most efficient to handle the heating load based on pre-engineered control strategies and the return air, supply air, and ambient air temperatures. The microprocessor controller will then place the unit in one of two DX heating stages of operation.

1. DX Heating Stage 1 – utilizes 67% compressor capacity and a low speed supply fan
2. DX Heating Stage 2 – utilizes 67% compressor capacity and a high speed supply fan
2. DX Heating Stage 3 – utilizes 100% compressor capacity and high speed supply fan.
3. Optional hot water, steam, or first stage of electric heat.

Note: if electric heat is capable of two stages, the second stage will be utilized for emergency backup only.

During periods of operation in low ambient temperature, the unit will periodically enter into a defrost mode to remove the frost build up on the coil acting as the evaporator. The microprocessor controller will de-energize the outdoor fan and energize the reversing valve allowing the unit to operate in the cooling mode using hot refrigerant to melt the frost build up. Defrost cycle will end when outdoor coil sensor is satisfied or when microprocessor defrost time limit expires, whichever comes first. An alternate heating source e.g. optional electric or hot water heating should be provided and will be energized to offset the cooling effect of the defrost cycle.

Hot Gas Reheat (Optional)

During a call for dehumidification from return air humidity sensor, HGRH valve is opened and unit enters second stage of mechanical cooling. Outdoor air fan may modulate to maintain proper reheat capacity.

HGRH valve will close when return air humidity falls below setpoint or when other modes of cooling are required.

Sequence of Operation - CMS

CMD – Cooling Only

The CMD cooling only unit is designed to maintain the desired setpoint temperature within a conditioned space by switching and modulating via the programmable microprocessor, controlling the unit in one of five occupied modes:

1. Free Cooling – using outside air
2. DX Cooling Stage 1 – mechanical cooling with compressor, low speed supply fan, minimum fresh air
3. DX Cooling Stage 2 – mechanical cooling with compressor, high speed supply fan, minimum fresh air
4. Heating (optional) – room return air and minimum fresh air

These modes are switched based on the following parameters: return air temperature, supply air temperature and the ambient air temperature.

Free Cooling

If the return air temperature is higher than the occupied setpoint and if the ambient air temperature is low enough to satisfy the cooling load in the occupied space, the microprocessor controller will signal the fresh air economizer damper. This will automatically modulate between 0-100% and the conditioned space temperature will be maintained by full fresh air or “free cooling”. During free cooling the outdoor fan will operate at reduced speed to match supply air volume.

On units equipped with energy recovery but no economizer, energy wheel is de-energized and outdoor air ventilation fan is 100% energized to allow up to 500cfm of outdoor air.

On units equipped with energy recovery and economizer but with no return air damper, energy wheel is de-energized and outdoor air ventilation fan is 100% energized. Economizer damper will automatically modulate between 0-100% allowing up to 75% free cooling to maintain conditioned space temperature.

On units equipped with energy recovery and economizer and return air damper, energy wheel is de-energized and outdoor air ventilation fan is 100% energized. Economizer damper and return air damper will automatically modulate between 0-100% allowing up to 100% free cooling to maintain conditioned space temperature.

The free cooling mode of operation leads to much reduced running time for the compressor leading to cost and equipment savings.

Mechanical Cooling (All Stages)

If the return air temperature is higher than the occupied setpoint and if the ambient air temperature is high enough the unit will call for mechanical DX cooling. The microprocessor controller will determine which stage of mechanical cooling is most efficient to handle the cooling load based on the return air, supply air, and ambient air temperatures, and pre-engineered control strategies. The microprocessor controller will then place the unit in one of the three stages of mechanical cooling.

1. Stage one utilizes compressor and a low speed supply fan
2. Stage two utilizes compressor and a high speed supply fan

Ventilation

During occupied cooling or heating modes, economizer damper or outdoor air ventilation fan can be set to achieve the necessary amount of outside air to be introduced prior to being conditioned, thus satisfying minimum ventilation code requirements.

Heating (Optional)

As standard, this unit is not fitted with any heating capability; however, optional electric, hot water or steam heating may be provided and will be energized if the return air temperature falls below the occupied setpoint.

The unit shall be either a heat pump or cooling only unit. When cooling only, the compressor will energize only for a call for cooling in both occupied and unoccupied mode. The defrost settings & outdoor coil sensor shall be disabled. First and second stage heat will either be electric, hot water or steam.

Occupied and Unoccupied Modes: The digital input shall accept a dry contact (volt free) signal from a central time clock or building management system. Closed equals occupied, open equals unoccupied. Standard time clock module will override the digital input (user selectable).

Fan

Occupied
The fan will run continuously during occupied mode. The supply fan will run at low speed during ventilation, economizer (free) cooling, stage one cooling/heating and dehumidification. The supply fan will run at high speed during stage two cooling/heating, stage three heating and when optional hot water, steam or electric heat is active.

Unoccupied
During unoccupied modes the fan will energize on a call for cooling or heating based on the return air temperature.

Compressor – CMD & CMP Only

Occupied
The compressor will energize on a call for cooling when the control temperature is higher than the cooling setpoint and if the outdoor air temperature is too high to allow free cooling. The control output, for units with a 2-stage compressor, shall have 2 stages:

Stage 1: Compressor 67%, Fan Low (Compressor Stage 1 on, Compressor Stage 2 off, Fan High off)

Stage 2: Compressor 100%, Fan High (Compressor Stage 1 off, Compressor Stage 2 on, Fan High on)

The compressor shall shut down if the HP-LP switch or float switch opens, or if the indoor freeze protection sensor falls below setpoint.

Unoccupied
The compressor will energize if there is a call for cooling or heating (CMP only) based on if the control temperature is above the cooling setpoint or below the heating setpoint (CMP only).

Compressor – CMS

Occupied
The compressor will energize on a call for cooling when the control temperature is higher than the cooling setpoint and if the outdoor air temperature is too high to allow free cooling. The control output, for units with a 2-stage compressor, shall have 2 stages:

Stage 1: Compressor on, Fan Low (Compressor Stage 1 on, Fan High off)

Stage 2: Compressor on, Fan High (Compressor Stage 1 on, Fan High on)

The compressor shall shut down if the HP-LP switch or float switch opens, or if the indoor freeze protection sensor falls below setpoint.

Unoccupied
The compressor will energize if there is a call for cooling based on if the control temperature is above the cooling setpoint.

Reversing Valve – CMP Only

Occupied
The reversing valve will energize when in cooling mode and will stay energized until the unit goes into heating mode. Reversing valve shall also be energized during a coil defrost cycle (see **Defrost Mode**).

Unoccupied
The reversing valve will energize and de-energize when there is a call for cooling or heating based on if the control temperature is above the cooling setpoint or below the heating setpoint. Reversing valve shall also be energized during a coil defrost cycle (see **Defrost Mode**).

Electric Heat

Occupied
The electric heat will energize on a call for heating when the control temperature is lower than the heating setpoint. For cooling only units both stage 1 and stage 2 of electric heat can be used when there is a call for heating. For heat pump units stage 2 of electric heat is energized only when the heat pump compressor is locked out.

Unoccupied
The electric heat will energize on a call for heating when the ctonrol temperature is lower than the heating setpoint.

Emergency Heat

Occupied
The emergency heat will energize only when there is a call for heating and the compressor cannot operate (f the HP-LP switch or float switch opens, or if the indoor coil freeze protection sensor falls below setpoint). Emergency heat will be based on the control temperature.

Unoccupied
The emergency heat will energize only when there is a call for heating and the compressor cannot operate (f the HP-LP switch or float switch opens, or if the indoor coil freeze protection sensor falls below setpoint). Emergency heat will be based on the control temperature.

Energy Recovery Wheel

Occupied
The energy recovery wheel will energize when the unit is in occupied mode. The wheel will de-energize if the outside temperature is warmer than the room and heat is needed, or if the outside air temperature is cooler than the room and cooling is needed.

If the outdoor air is cooler than the return air and an economizer cooling demand is present, the wheel will de-energize and free cooling will be energized.

Unoccupied
The energy recover wheel will be off.

Outdoor Fan – CMD & CMP Only

The outdoor fan shall be controlled via a 0-10vDC control signal. The fan will be off when the supply fan is off. The fan shall run in low speed when the supply fan is in low speed (Fan High off). The fan shall be in high speed when the indoor fan is in high speed (Fan High on) or when the compressor is at 100% (Compressor Stage 2 on). The outdoor fan will be off when the unit is in defrost mode (CMP only). The fan will run at a low speed when the unit is in free cooling mode.

Outdoor Fan (Exhaust Fan) – CMS

The outdoor fan shall be controlled via a 0-10vDC control signal. The fan will be off when the supply fan is off. The fan shall operate proportionally from an adjustable minimum speed to an adjustable maximum speed based on the position of the economizer damper. The fan will run at a low speed when the unit is in free cooling mode.

Economizer Damper

Occupied
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, DX cooling 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.

Unoccupied
The damper will be closed.

CO_2 Option

The CO_2 sensor will be mounted in the return air stream and used to measure space CO_2 levels. When the level of CO_2 rises over a predetermined setpoint, the sensor proportionally adjusts the minimum damper position to allow larger quantities of outside air into the room.

Hot Water / Steam Valve

Occupied
The hot water / steam valve shall be controlled via a 2-10vDC control signal. The valve will open if the control temperature is lower than the heating setpoint. The valve will modulate based on demand. If the supply air temperature exceeds the user defined maximum supply air temperature, the valve shall modulate closed to maintain maximum supply air temperature. If the supply air temperature falls below the user defined minimum supply air temperature, the valve shall modulate open to maintain minimum supply air temperature.

Unoccupied
During unoccupied mode the call for hot water / steam heat will be based upon the return air temperature. If heating is not required, the valve will remain closed unless the outside air temperature is below the unoccupied heat override setpoint which would cause the valve to open. If the indoor coil freeze protection trips, the valve shall spring open.

Return Air Sensor

This sensor is used to control the unit during occupied and unoccupied modes. Sensor is mounted in the return air stream. Should the sensor fail, the unit will go to full heating mode. If hot water or steam is installed, the valve will open. If the unit is equipped with an economizer damper, the damper will close.

Supply Air Sensor

This sensor is used to monitor supply air temperature to maintain the supply air setpoint in cooling and heating modes. Sensor is mounted in supply fan. If the unit is equipped with plenum mounted heat the sensor will be mounted in the plenum after the heating coil. Should the sensor fail, the unit will continue to run but the economizer will close.

Outside Air Sensor

This sensor is used to enable economizer control, determine if free cooling is acceptable, and ensure supply air is tempered correctly. Sensor is mounted in incoming outdoor air stream. Should the sensor fail, the unit will continue to run but economizer functions and electric heat will be disabled.

Indoor Coil Freeze Protection

This sensor is used to monitor the temperature of the indoor coil. If the coil temperature falls below the indoor coil temperature setpoint, the compressor, electric heat, economizer damper, and energy wheel will be disabled. The supply fan will remain energized to raise the indoor coil temperature. If the unit is equipped with hot water / steam heat, the valve shall spring open.

Outdoor Coil Sensor – CMP Only

This sensor is used to monitor the temperature of the outdoor coil. If the coil temperature falls below the coil defrost temperature setpoint, the unit shall run a coil defrost cycle. Should the sensor fail, the compressor will be locked out and alarm generated.

Defrost Mode – CMP Only

Defrost mode is enabled when the compressor runs in heat pump mode for a predetermined amount of time and the outdoor coil temperature sensor is below the coil defrost temperature setpoint. When enabled, the reversing valve and first stage of electric heat are energized and the condenser fan de-energizes. Unit will remain in defrost mode until outdoor coil temperature has risen to a predetermined setpoint, or a user specified time has elapsed.

Condensate Float Switch Option

The condensate float switch is used to monitor condensate levels in the evaporator coil drain pan. Should the float switch trip, the unit will continue to run but cooling will be disabled.

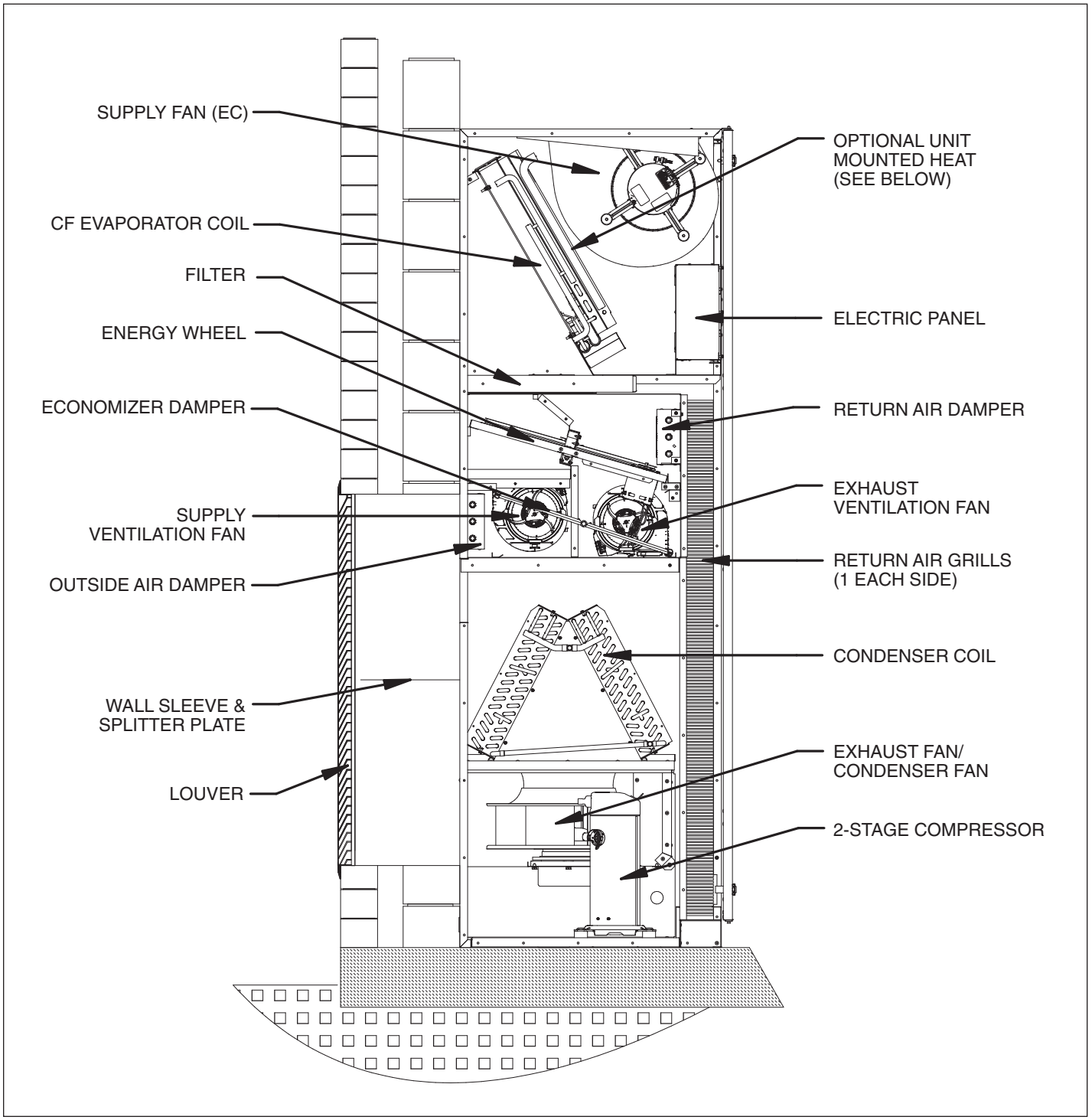
Fan Status Option

The unit shall be provided with an internally mounted sensor to monitor the status of the supply fan and outdoor fan. The digitial input is normally closed during operation. If the contact goes open during a call for fan, the compressor, electric heat, economizer damper, and energy wheel will be disabled.

Dehumidification (Hot Gas Reheat) – CMD & CMP Only

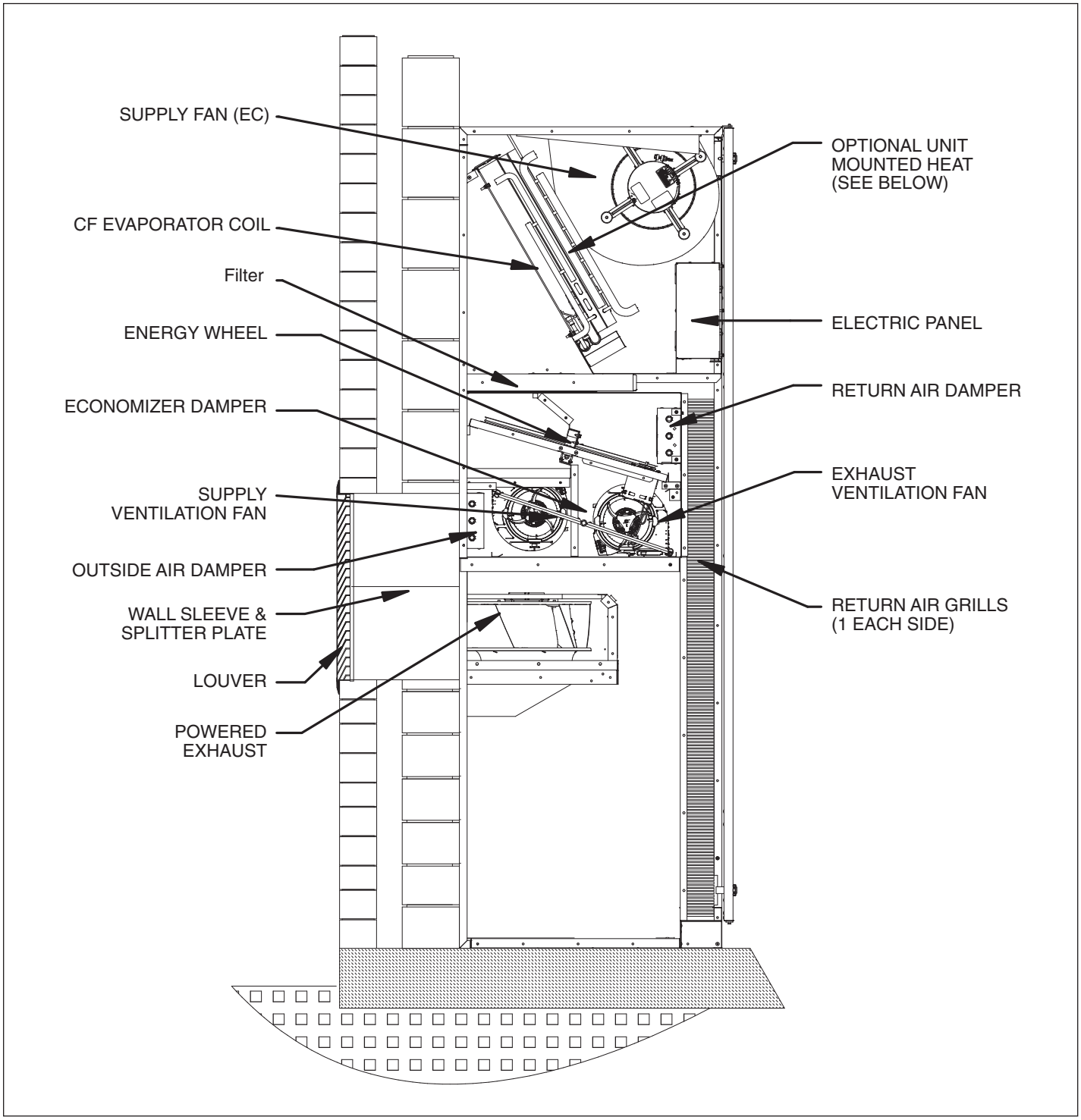
The unit shall go into dehumidification mode when the room is occupied and the humidity goes above the humidity setpoint (user adjustable). This will energize the compressor and the hot gas reheat solenoid (if supplied). If the dry bulb temperature falls below the cooling setpoint by a predetermined temperature range, dehumidification mode shall stop. If cooling is required during dehumidification, the hot gas reheat solenoid shall be de-energized. If the unit has a two-stage compressor, it runs at full capacity during dehumidification mode.

Figure 22.1 - General Arrangement - CMD and CMP



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 23.1 - General Arrangement - CMS



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.

Figure 24.1 - Dimensional Data - Base Unit CMD and CMP 24-48 MBH

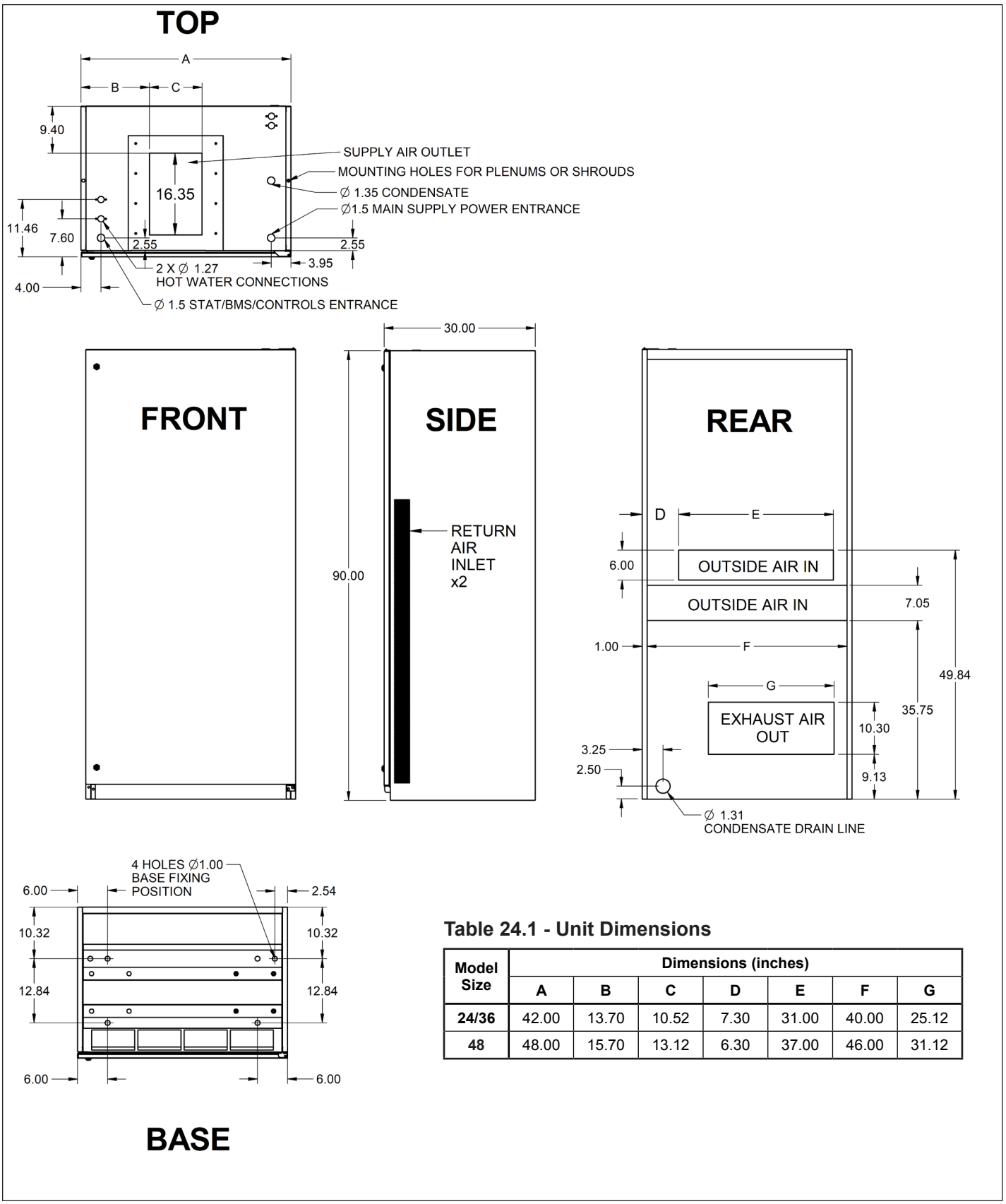


Table 24.1 - Unit Dimensions

Model Size	Dimensions (inches)						
	A	B	C	D	E	F	G
24/36	42.00	13.70	10.52	7.30	31.00	40.00	25.12
48	48.00	15.70	13.12	6.30	37.00	46.00	31.12

Figure 25.1 - Dimensional Data - Base Unit CMD and CMP 60 MBH

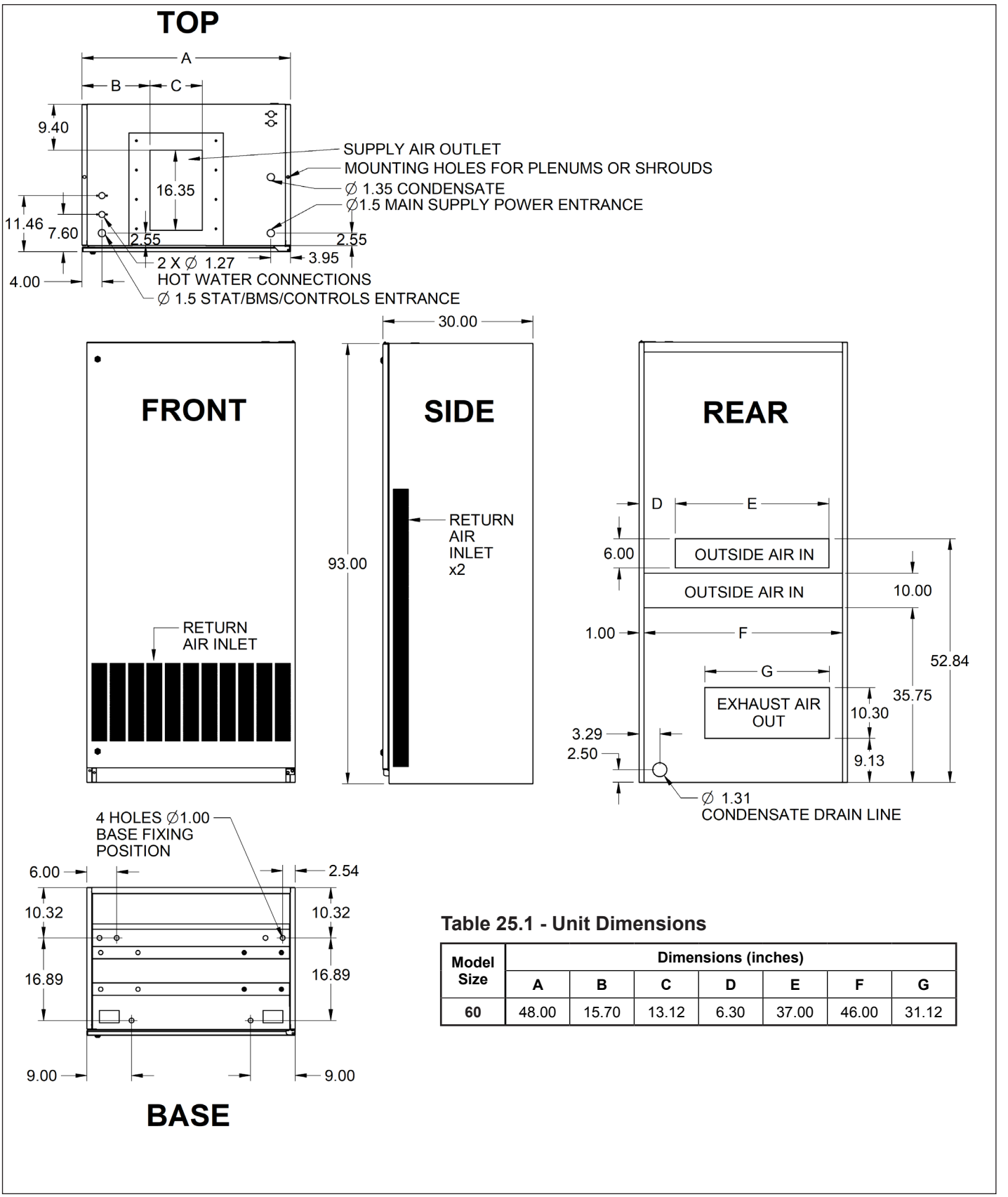


Table 25.1 - Unit Dimensions

Model Size	Dimensions (inches)						
	A	B	C	D	E	F	G
60	48.00	15.70	13.12	6.30	37.00	46.00	31.12

Figure 26.1 - Dimensional Data - Base Unit CMS

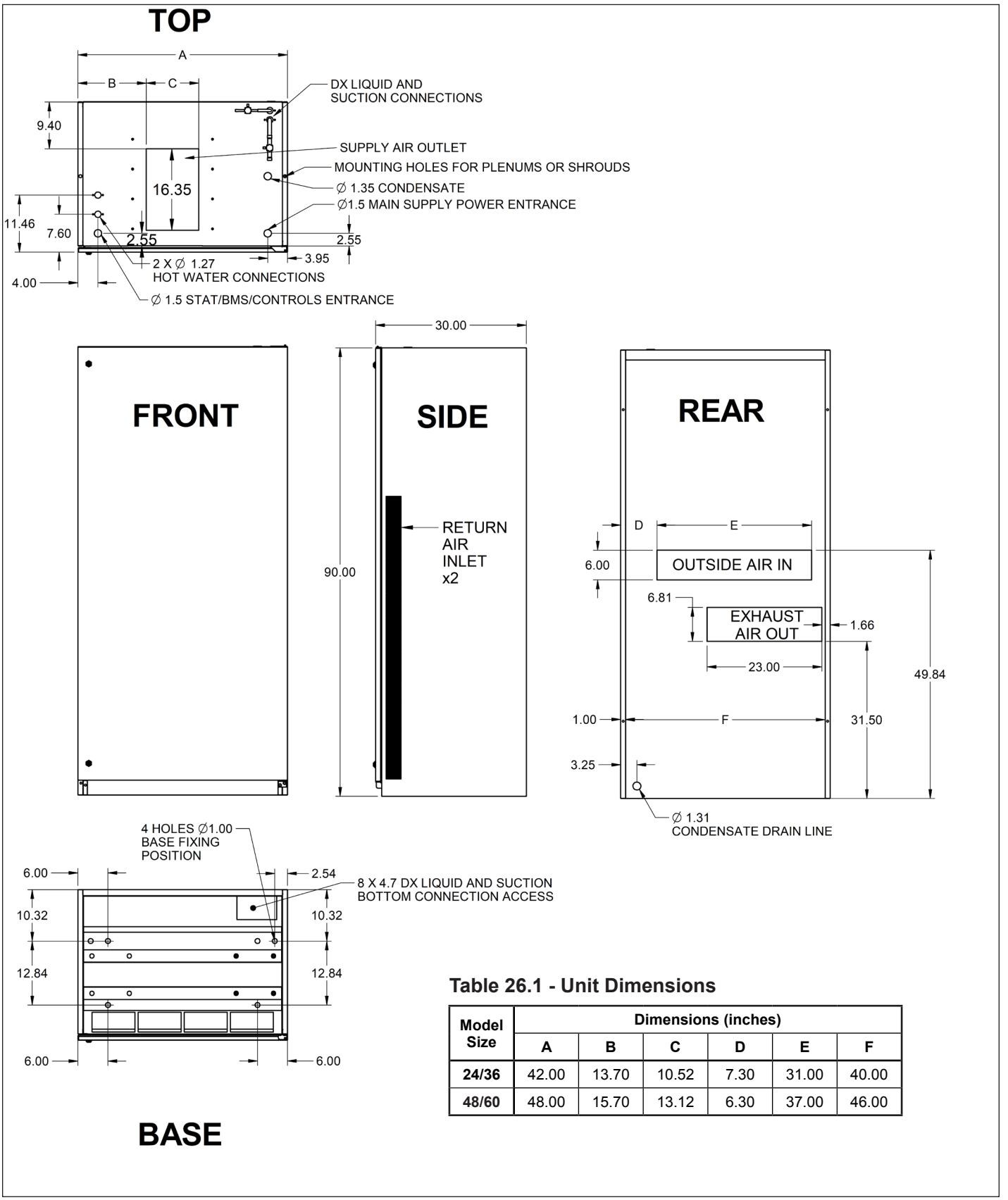
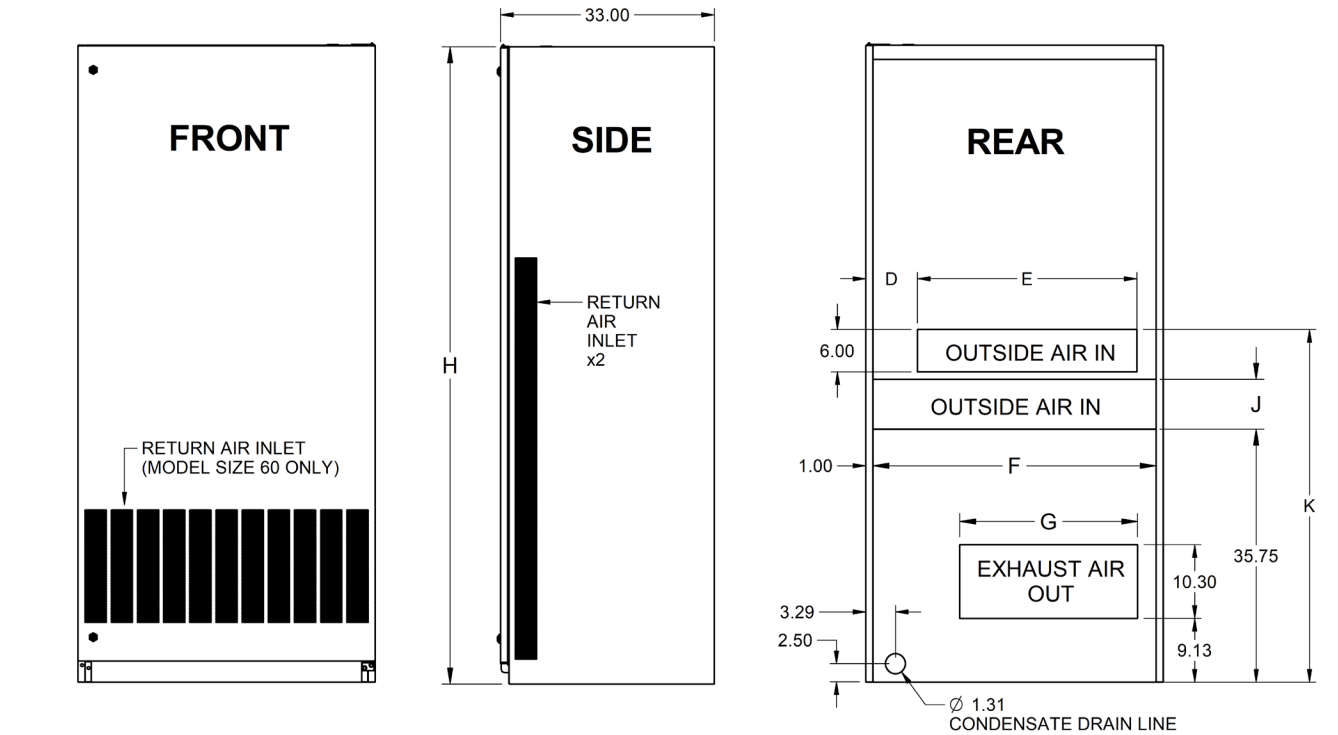
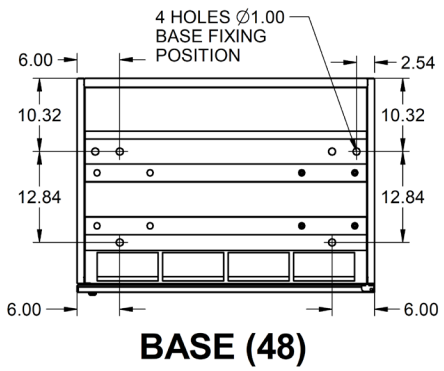


Table 26.1 - Unit Dimensions

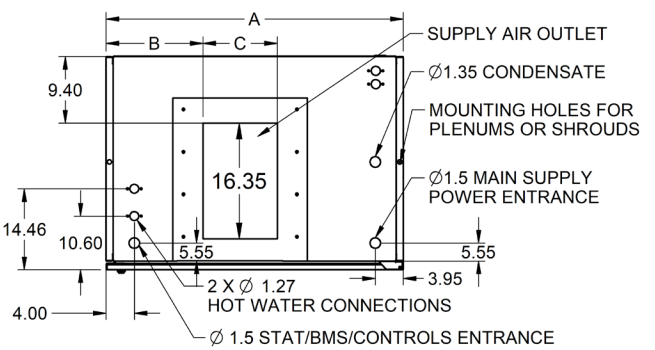
Model Size	Dimensions (inches)					
	A	B	C	D	E	F
24/36	42.00	13.70	10.52	7.30	31.00	40.00
48/60	48.00	15.70	13.12	6.30	37.00	46.00

Figure 27.1 - Dimensional Data - Base Unit CMD and CMP 48-60 MBH with STUDY Package

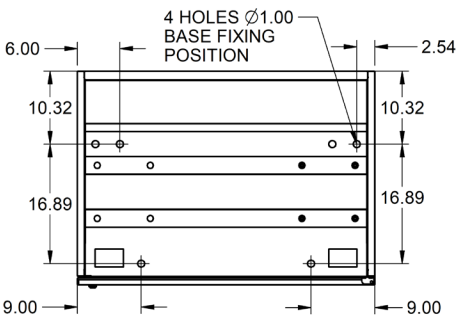




BASE (48)



TOP



BASE (60)

Table 27.1 - Unit Dimensions

Model Size	Dimensions (inches)									
	A	B	C	D	E	F	G	H	J	K
48	48.00	15.70	13.12	6.30	37.00	46.00	31.12	90.00	7.05	49.84
60	48.00	15.70	13.12	6.30	37.00	46.00	31.12	93.00	10.00	52.84

Standard Wall Sleeve and Louver Dimensions and Mounting - CMD and CMP

Figure 28.1 - Standard Arrangement

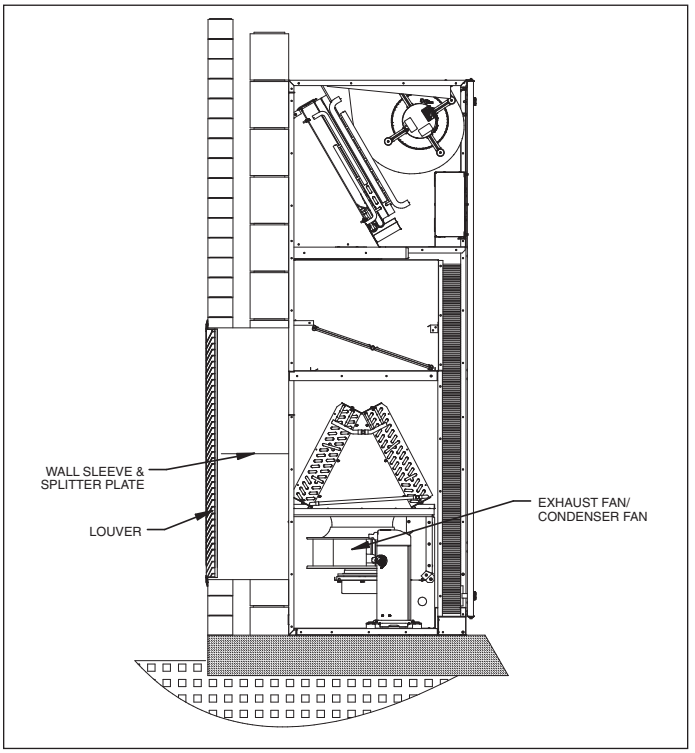


Figure 28.2 - Standard Single Louver

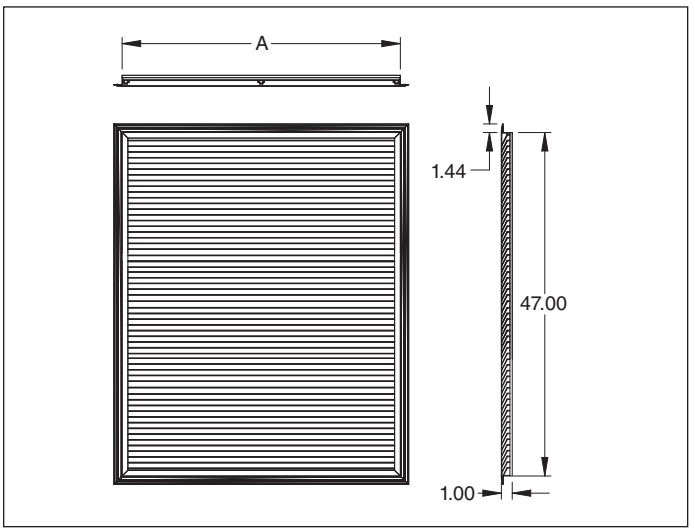


Table 28.1 - Standard Single Louver Dimensions

Model Size	Dimensions (inches)		
	A	B	C
24/36	39.00	39.75	40.00
48/60	45.00	45.75	46.00

Figure 28.3 - Standard Single Wall Sleeve

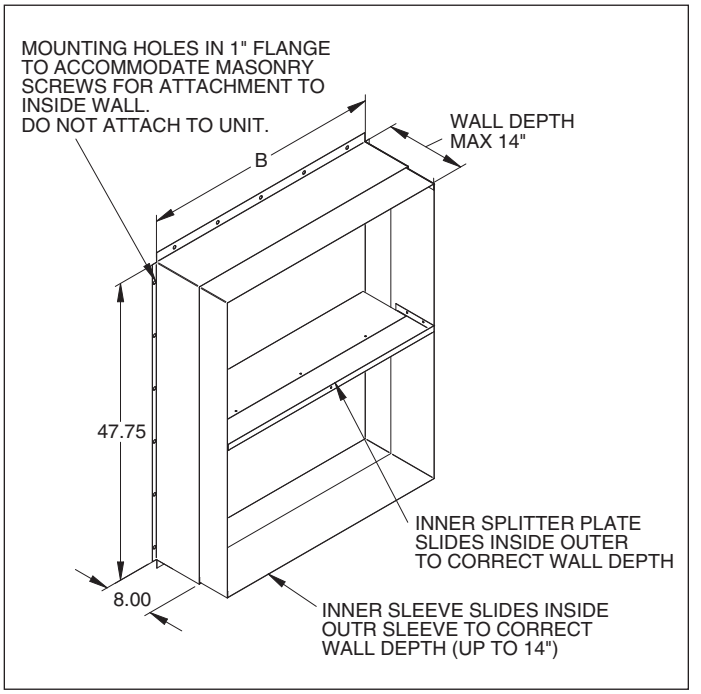
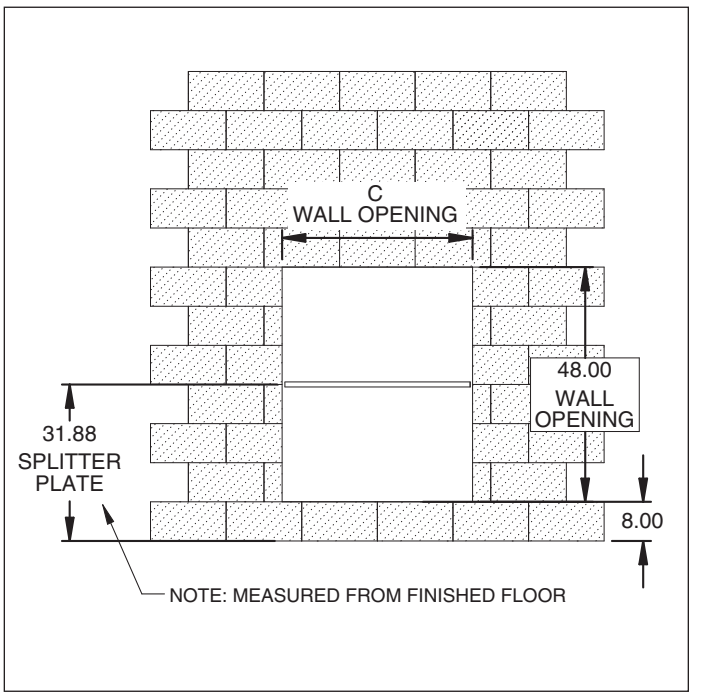


Figure 28.4 - Standard Single Wall Opening



Split No Exhaust Wall Sleeve and Louver Dimensions and Mounting - CMS

Figure 29.1 - Standard Arrangement

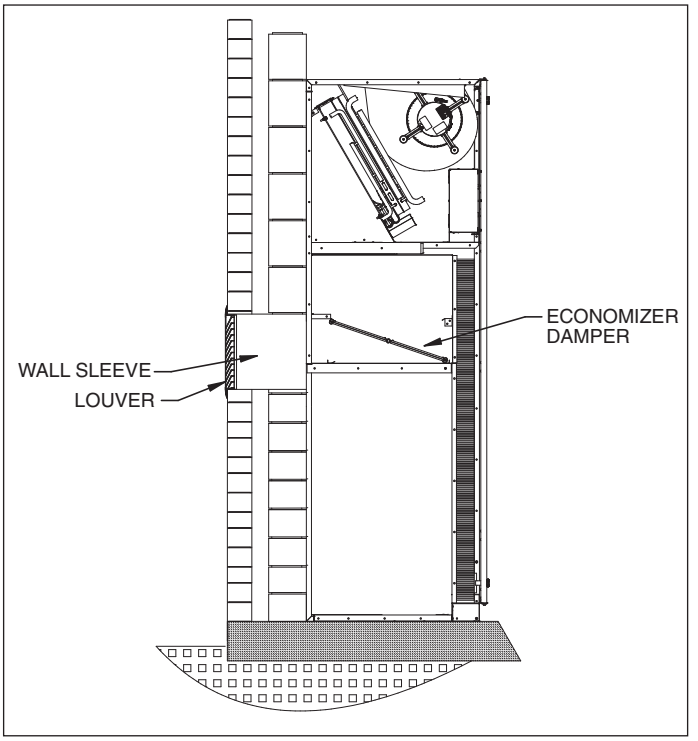


Figure 29.2 - Standard Louver

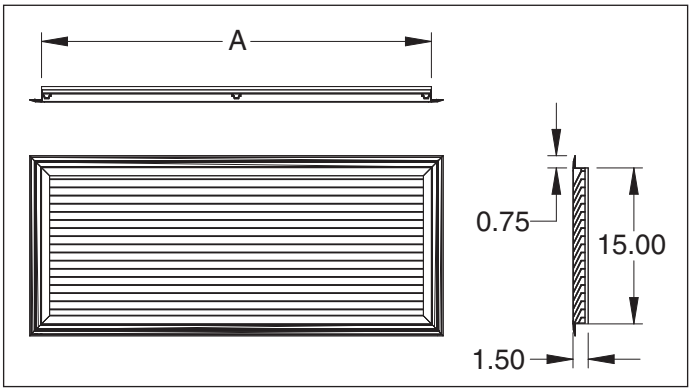


Table 29.1 - Standard Louver Dimensions

Model Size	Dimensions (inches)		
	A	B	C
24/36	39.00	39.75	40.00
48/60	45.00	45.75	46.00

Figure 29.3 - Standard Wall Sleeve

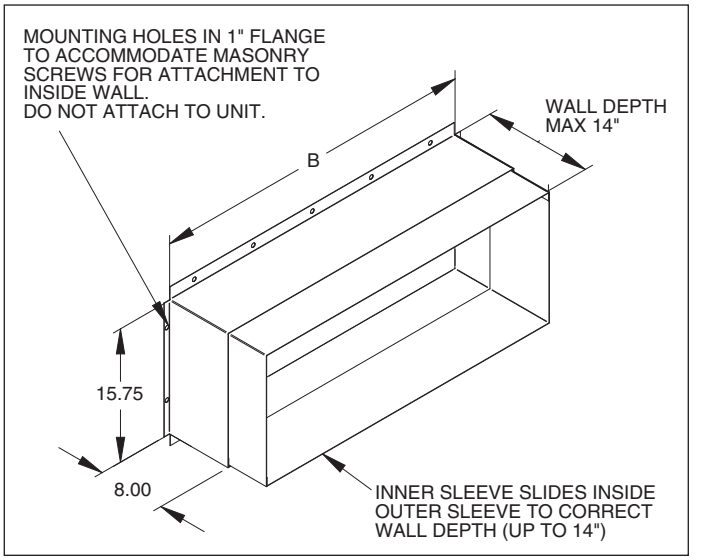
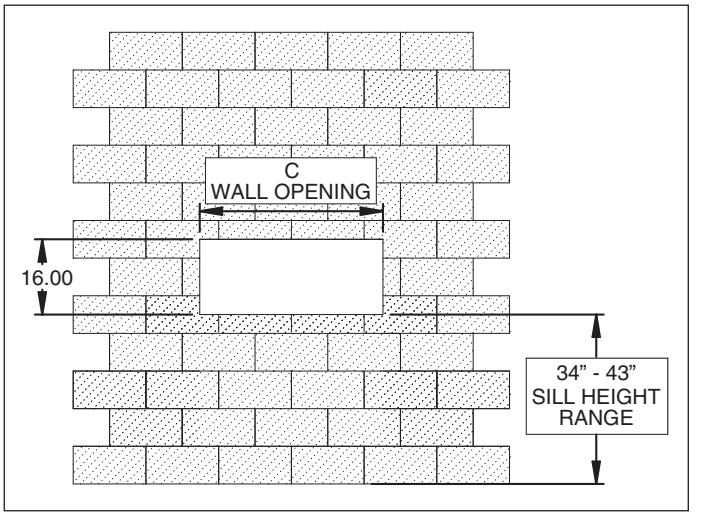


Figure 29.4 - Standard Wall Opening



6" Deep, Fixed Rear Extension / Wall Sleeve / Louver Dimensions and Mounting

Figure 30.1 - 6" Rear Extension Arrangement

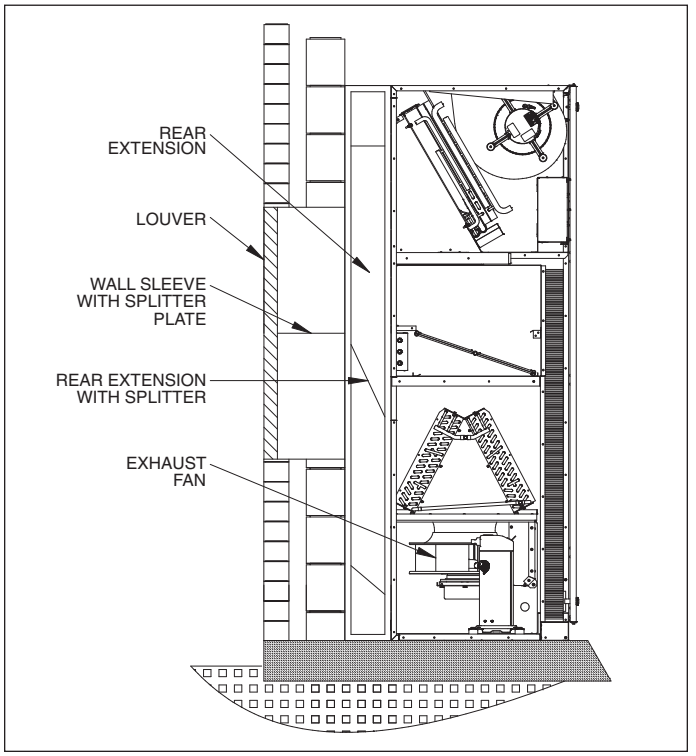


Figure 30.2 - 6" Rear Extension Louver

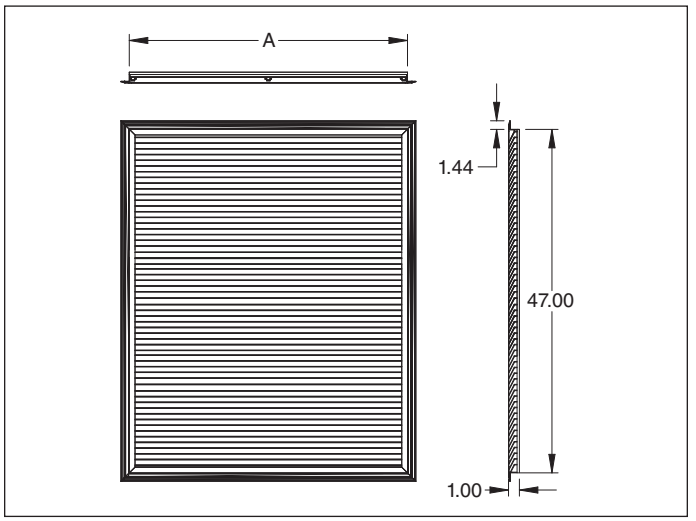


Table 30.1 - 6" Rear Extension Dimensions

Model Size	Sill Height	Dimensions (inches)				
		A	B	C	D	E
24/36	22-28"	39.00	39.75	40.00	42.00	42.00
	28-34"					50.00
	35-38"					60.50
48/60	22-28"	45.00	45.75	46.00	48.00	42.00
	28-34"					50.00
	35-38"					60.50

Figure 30.3 - 6" Rear Extension Wall Sleeve

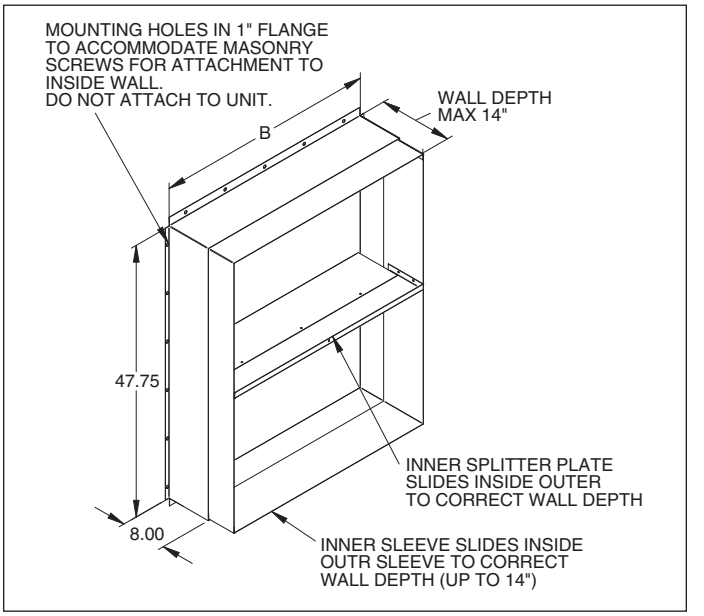


Figure 30.4 - 6" Rear Extension Wall Opening

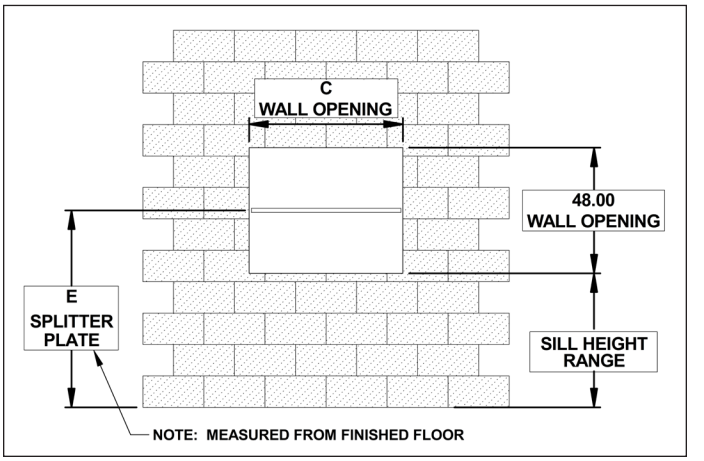
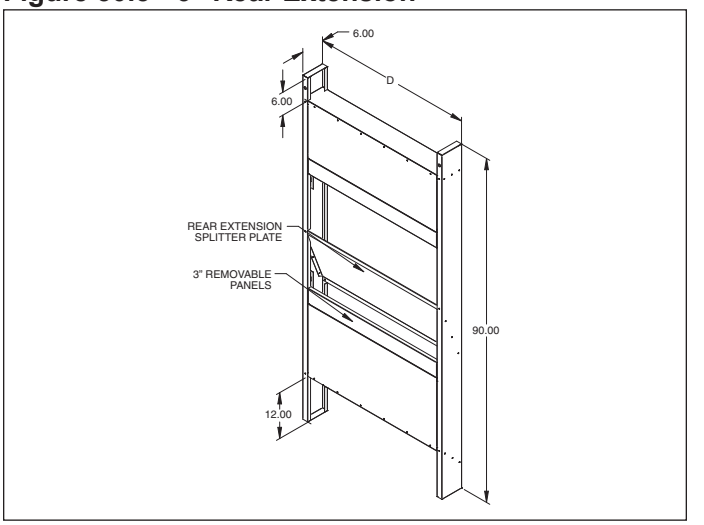


Figure 30.5 - 6" Rear Extension



15" Deep, Fixed Rear Extension / Wall Sleeve / Louver Dimensions and Mounting

Figure 31.1 - 15" Rear Extension Arrangement

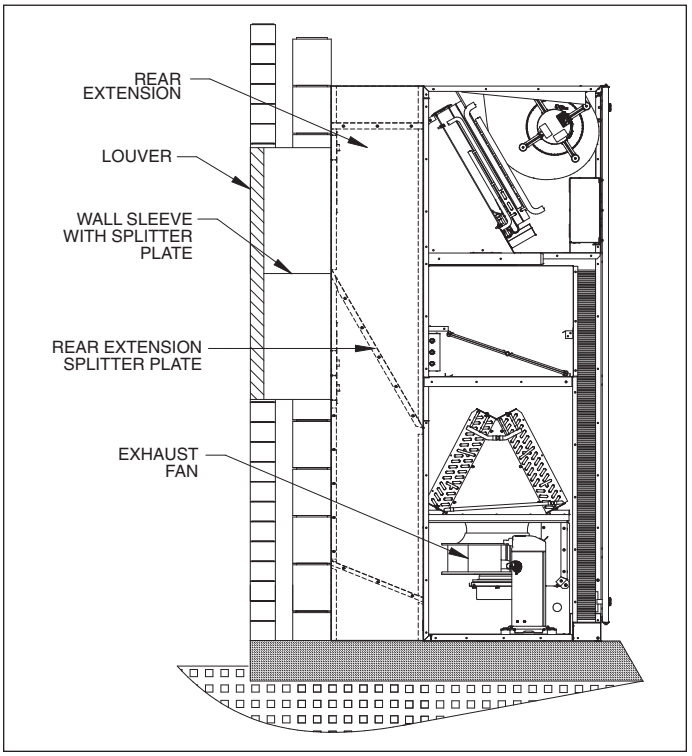


Figure 31.2 - 15" Rear Extension Louver

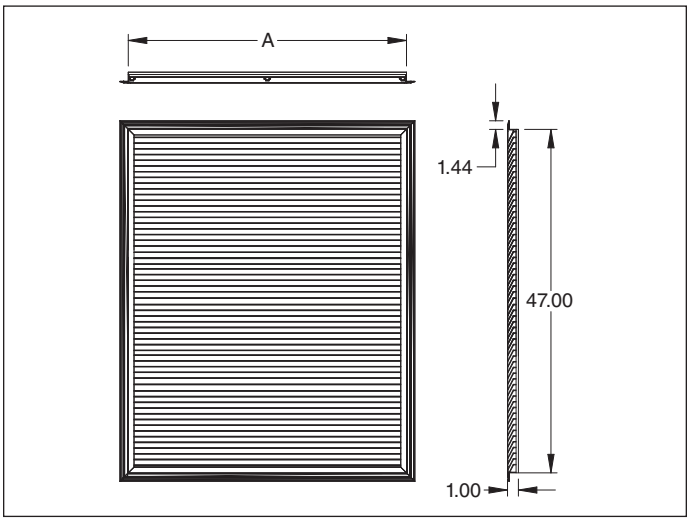


Table 31.1 - 15" Rear Extension Dimensions

Model Size	Sill Height	Dimensions (inches)				
		A	B	C	D	E
24/36	34-42"	39.00	39.75	40.00	42.00	60.00
48/60	34-42"	45.00	45.75	46.00	48.00	60.00

Figure 31.3 - 15" Rear Extension Wall Sleeve

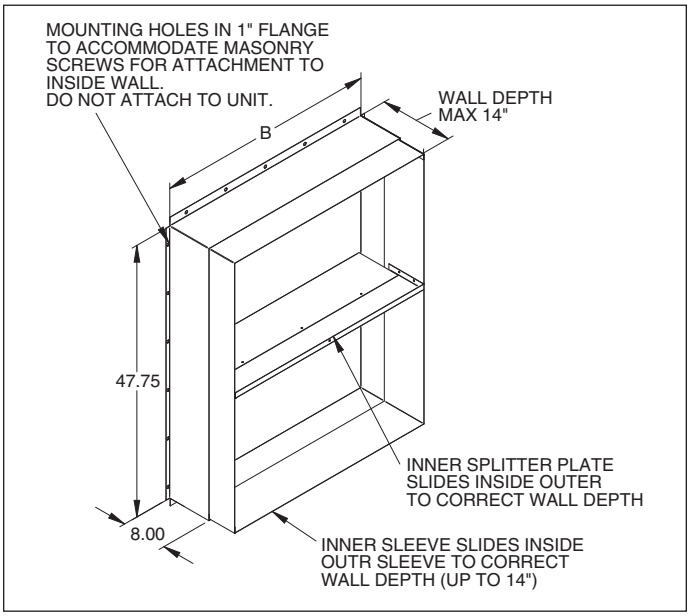


Figure 31.4 - 15" Rear Extension Wall Opening

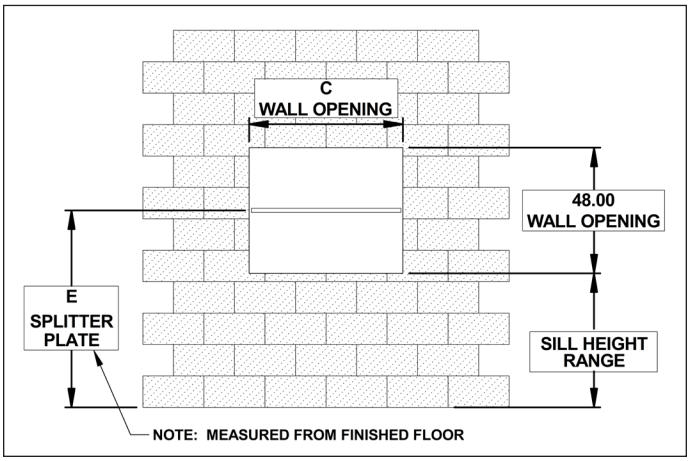
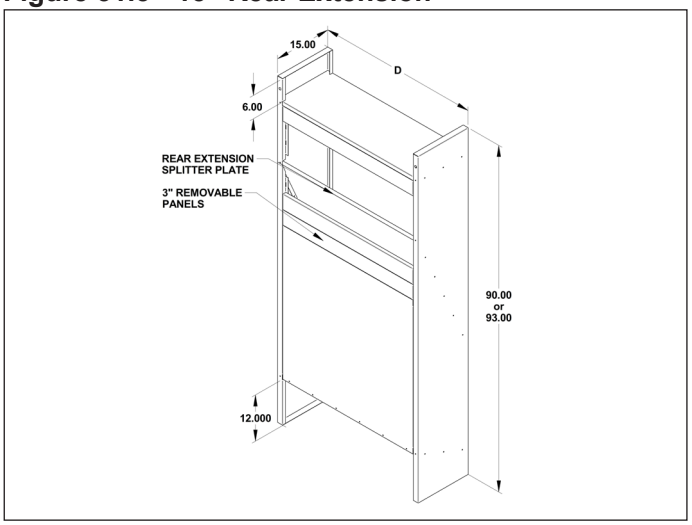


Figure 31.5 - 15" Rear Extension



Modine Manufacturing Company
1500 DeKoven Avenue
Racine, Wisconsin 53403-2552
Phone: 1.800.828.4328 (HEAT)
www.modinehvac.com

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