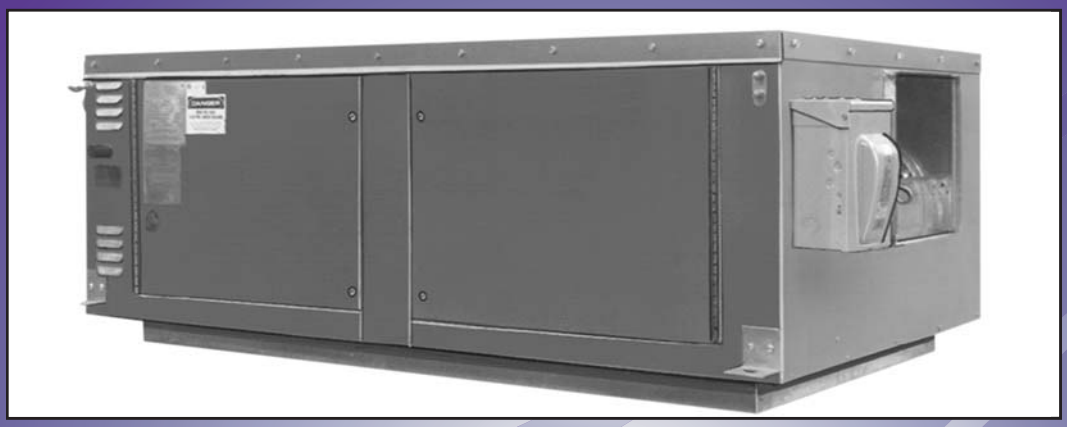
CATALOG
5-160.7
December, 2002

DIRECT-FIRED MAKE-UP AIR UNITS
SERIES MDA/MD, MDM, & MRA/MR

Make-Up Air • Ventilating • Evaporative Cooling



MODINE
INDOOR AIR SOLUTIONS

DIRECT-FIRED MAKE-UP AIR

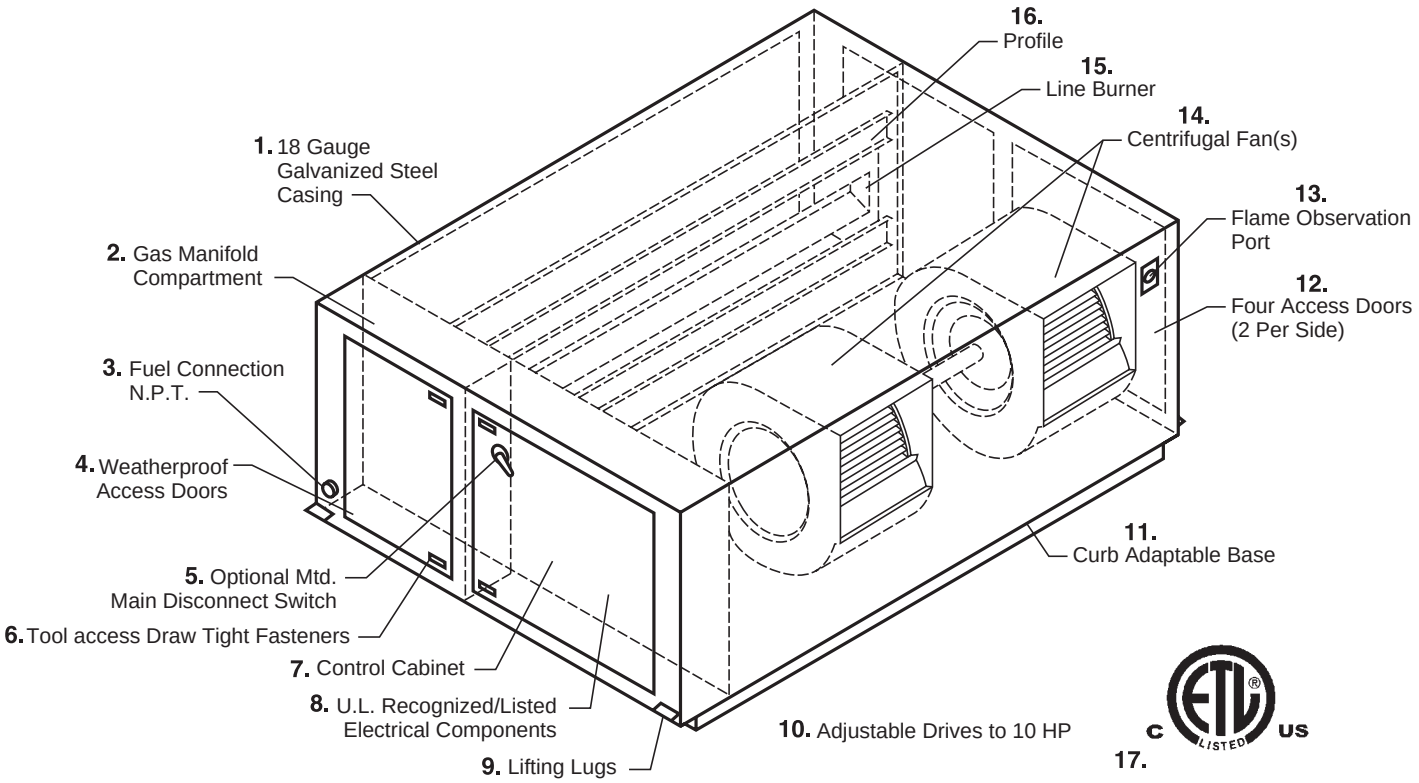
Modine has developed the best in direct-fired make-up air units, the “M” Series. Direct-fired make-up air units are designed to provide an economical and efficient means of supplying tempered make-up air to a space or building. Any process which exhausts air from a building is a candidate for the application of a direct-fired make-up air unit to replace the exhausted air. Modine units are superior because:

- High heat transfer efficiency results in lower fuel bills.
- Units are designed for indoor or outdoor mounting, affording flexibility in application and design, and simplifies installation.
- Natural or propane gas manifolds are factory-assembled to provide flexible fuel options.
- Factory-wired electrical panel with numbered terminal-strip and wires ease installation.
- 100% factory flame-testing assures safe and reliable product is delivered every time.
- Weatherproof design, including a roof with drip ledge provides protection from the elements.

Table of Contents **Page**

The information presented in this literature is correct at the time of printing.
Modine reserves the right to change design, dimensions and/or material specifications without notice.

FEATURES AND BENEFITS



Direct-fired make-up air units from Modine include the following:

Features	Benefits
1. 18-gauge galvanized steel casing.	High corrosion resistance for long life.
2. Gas manifold compartment	Protects gas-manifold components and isolates them from electrical service.
3. Exterior fuel connection N.P.T. pipe stub.	Provides contractor/installer with easy connection point.
4. Weatherproof access doors	Protects the unit's interior and all electrical and gas-manifold, and mechanical components from the elements.
5. Main disconnect switch (Optional)	Insures power will be deactivated when control cabinet is open. Also provides ease of installation and single-point electrical connection.
6. Tooled-access, draw-tight door fasteners	Discourages access by non-authorized personnel and assures positive sealing.
7. Control cabinet	Provides easy and unobstructed access to electrical controls.
8. U.L. recognized/listed electrical components	Assures reliable and safe electrical components.
9. Lifting lugs	Facilitates easy rigging and installation.
10. Adjustable drives to 10 HP	Simplifies onsite air balancing and eliminates need to change drives.
11. Curb-adaptable base	Simplifies installation as duct openings can be made inside curb opening.
12. Four access doors (2/side)	Provides maximum access for easy adjustments and service.
13. Flame observation port	Allows external observation of burner performance.
14. Centrifugal fan(s)	AMCA-rated fans assure quality and performance.
15. Line burner	Direct-fired burner is clean, low NO_X and operates at nearly 100% efficiency.
16. Profile plates	Factory set for maximum combustion efficiency.
17. ETL approved and certified.	Third-party testing agency certifies equipment conformity to national safety standards.

GENERAL UNIT APPLICATIONS

100% Make-Up Air - Single Speed

For processes which require 100% make-up air, direct-fired units provide the best fuel efficiency. The make-up air is heated directly by the gas flame, eliminating the need for a heat exchanger, and the general efficiency losses associated with indirect-fired heating equipment. In 100% make-up air applications, the amount of make-up air introduced into the building is equal, or just slightly more than the amount of exhaust air being liberated. For the best performance, the building should be kept under a slightly positive pressure.

Direct-fired units used for 100% make-up air are usually interlocked with an exhaust fan by means of an interlock relay (by others), which allows the make-up air unit to run only when an exhaust fan is operating. The heating load of the building is handled separately using indirect-fired unit heaters, or indirect-fired heating or heating/ventilating units.

100% Make-Up Air - Two Speed

Two speed 100% make-up air units are used to serve the same function as single speed units, but they have the added advantage of providing flexibility of operation depending on load requirements.

There are two common ways of applying two-speed 100% make-up air units. The first application is for buildings which have two fixed exhaust loads. The two exhaust loads should have a cfm ratio of approximately 50/50. Under these conditions, the first speed (low speed) is interlocked (interlock by others) with the first exhaust fan. The second speed (high speed) is interlocked (interlock by others) to operate when both exhaust fans are running. In this manner, one unit can accommodate two different exhaust loads.

The second common application of a two speed unit is to accommodate winter exhaust and summer ventilation requirements. In this application, low speed is interlocked with the exhaust fan (interlock by others) and the unit runs on low speed whenever the exhaust fan is running. High speed is controlled by a manual switch (by others) and the unit can be manually set to high speed whenever summer ventilation is desired.

The heating load of the building is handled separately using indirect-fired unit heaters, or indirect-fired heating or heating/ventilating units.

Recirculating Units

Direct-fired units can also be used as a combination make-up air, and heating and ventilating unit. This application requires units with the capability of operating with recirculated air as well as make-up air. There are two styles of units which can be used to achieve the heating and ventilating function. They are, fixed two-position return air units, and 80/20 floating damper recirculating units.

Two Position: Fixed Return Air Units - 80/20, 70/30, 60/40 and 50/50

Two position, fixed return air units can be used when there is a fixed exhaust load and it is desired to utilize the make-up air unit for heating when possible. These units are provided with a damper set consisting of a two-position burner by-pass damper and a return air damper. With this system, a fixed percentage of outside air is introduced into the building to offset the exhaust load, and the remainder of the air is recirculated through the unit to provide for heating. This system can also be used to handle two different exhaust loads, going to full outside air when both exhaust systems are running, and moving to a fixed amount of recirculated air when only one exhaust system is operating. The position of the two position fresh and return air damper can be controlled manually, with a time clock, or with exhaust fan interlocks.

80/20 Floating Damper Units

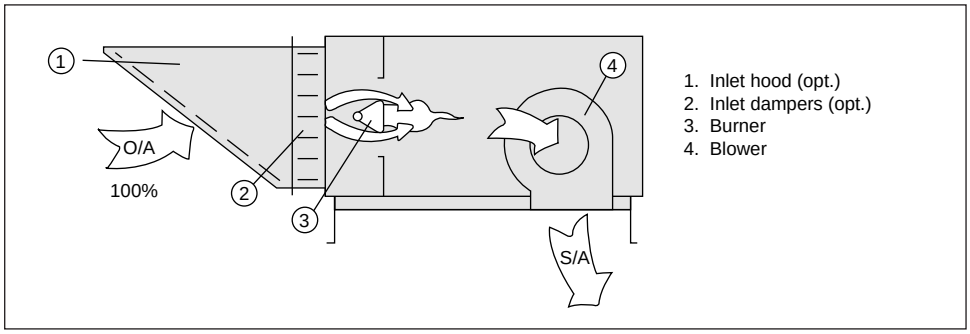
This system is usually used when multiple exhaust loads must be handled by one make-up air unit. Properly sized, this system can accomplish both make-up air, and heating and ventilating requirements. An 80/20 make-up air system is most effective, and most economical when a building has a required minimum exhaust load of at least 20% of the air capacity of the unit, and also has varying exhaust loads throughout the day, depending on the number of processes being run. If the building does not have a minimum exhaust requirement (e.g., warehouses or other storage facilities), indirect-fired heating and ventilating equipment may provide a more economical heating system than a system designed with direct-fired equipment. With direct-fired 80/20 systems a minimum amount of outside air (20% min.) is always supplied to the building, and is mixed with recirculated room air (80% max.). A set of modulating burner by-pass and return air dampers are controlled by means of a building air pressure switch, which allows the introduction of more outside air if the exhaust load of the building changes. The amount of make-up air is automatically and continually modified to meet the demands of the varying exhaust air loads.

STANDARD MODEL DESCRIPTIONS

Single Speed 100% Make-Up Air Model Series MDA/MD

- Standard 18 gauge uninsulated galvanized steel cabinet and enclosure for blower, burner, and gas and electrical controls. (Insulation and cabinet paint options are available.) Cabinet is designed for roof curb mounting, slab or rail mounting, and indoor suspended mounting.
- All cabinets are supplied with four (4) full access service doors, and permanent lifting/mounting lugs.
- Horizontal right hand straight discharge arrangement is standard. (Optional arrangements are available.)
- Model sizes 110 through 118 have a single DWDI blower wheel with spider bearings. (Optional pillow block bearings are available.) Model sizes 120 through 130 have a single DWDI blower wheel with pillow block bearings. Model sizes 215 through 230 have twin DWDI blowers with pillow block bearings.
- Flame supervision on standard models is accomplished with the use of a flame rod. (Ultraviolet flame supervision is available as an option.)
- Standard optional remote control panel includes a three position Summer/Off/Winter switch, main valve light and flame failure alarm light. (Other panels are available.)
- Units with motor horsepowers up to and including 10 h.p. are supplied as standard with adjustable motor sheaves. Units with motor horsepowers greater than 10 h.p. are supplied as standard with fixed drives. (Optional adjustable drives are available for motors over 10 h.p.)
- The standard control system is a Maxitrol System 14 control system with discharge air temperature control. (Optional control systems are available.)

FIGURE 5.1 – 100% Make-Up Air Units – Single Speed

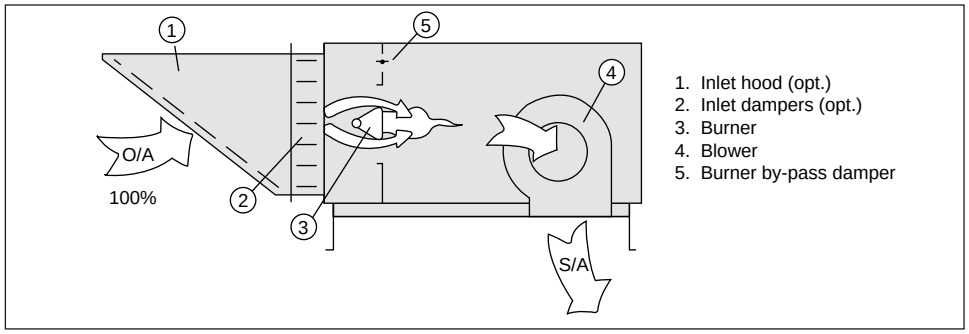


Two Speed 100% Make-Up Air, Model Series MDM

- Standard 18 gauge uninsulated galvanized steel cabinet and enclosure for blower, burner, and gas and electrical controls. (Insulation and cabinet paint options are available.) Cabinet is designed for roof curb mounting, slab or rail mounting, and indoor suspended mounting.
- All cabinets are supplied with four (4) full access service doors, and permanent lifting/mounting lugs.
- Horizontal, right hand straight discharge arrangement is standard. (Optional arrangements are available.)
- Model sizes 110 through 118 have a single DWDI blower wheel with spider bearings. (Optional pillow block bearings are available.) Model sizes 120 through 130 have a single DWDI blower wheel with pillow block bearings. Model sizes 215 through 230 have twin DWDI blowers with pillow block bearings.
- Flame supervision on standard models is accomplished with the use of a flame rod. (Ultraviolet flame supervision is available as an option.)
- Standard optional remote control panel includes a three position Summer/Off/Winter switch, main valve light, a flame failure alarm light. A motor speed selector switch or relay may be added (switch or relay must be specified). (Optional panels are available.)
- Units with motor horsepowers up to and including 10 h.p. are supplied as standard with adjustable motor sheaves. Units with motor horsepowers greater than 10 h.p. are supplied as standard with fixed drives. (Optional adjustable drives are available for motors over 10 h.p.). Two speed motors are not available below 1½ h.p. as a standard option.
- The standard control system is a Maxitrol System 14 control system with discharge air temperature control. (Optional control systems are available.)

A two speed motor and a two position fresh air burner by-pass damper must be added separately to the basic unit. (See two speed motor options on page 12.)

FIGURE 5.2 – 100% Make-Up Air Units – Two Speed



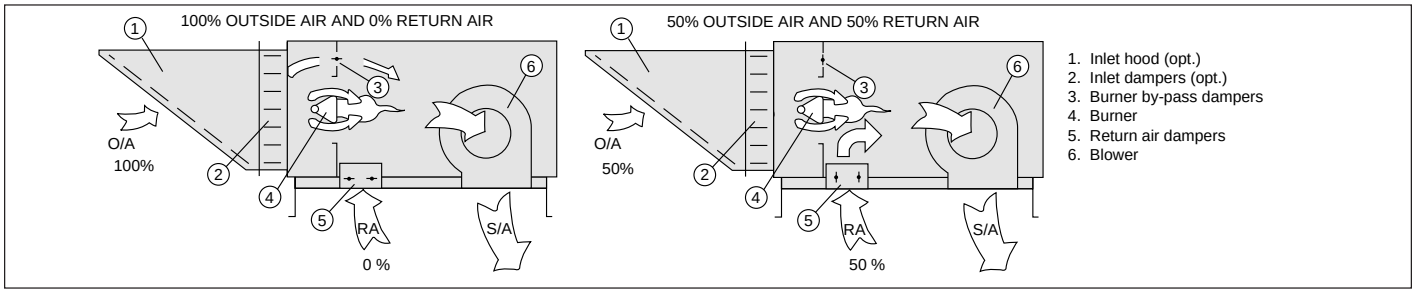
STANDARD MODEL DESCRIPTIONS

Two Position 80/20, 70/30, 60/40, 50/50 Recirculating Units, Model Series MRA/MR

- Standard 18 gauge uninsulated galvanized steel cabinet and enclosure for blower, burner, and gas and electrical controls. (Insulation and cabinet paint options are available.) Cabinet is designed for roof curb mounting, slab or rail mounting, and indoor suspended mounting.
- All cabinets are supplied with four (4) full access service doors, and permanent lifting/mounting lugs.
- Horizontal, right hand straight discharge, with bottom return air opening is the standard arrangement. (Optional arrangements are available.)
- Standard remote control panel includes a three position Summer/Off/Winter switch, main valve light, flame failure alarm light. A damper position switch may be added (Switch must be specified). (Optional panels are available.)
- Flame supervision on standard models is accomplished with the use of a flame rod. (Ultraviolet flame supervision is available as an option.)
- Model sizes 110 through 130 have a single DWDI blower wheel with pillow block bearings. Model sizes 215 through 230 have twin DWDI blowers with pillow block bearings.
- Units with motor horsepowers up to and including 10 h.p. are supplied as standard with adjustable motor sheaves. Units with motor horsepowers greater than 10 h.p. are supplied as standard with fixed drives. (Optional adjustable drives are available for motors over 10 h.p.)
- The standard control system is a Maxitrol System 14 control system with discharge air temperature control. (Optional control systems are available.)

A set of two-position fresh air burner by-pass and return air dampers must be added to the basic unit. (See two position 80/20, 70/30, 60/40 and 50/50 air flow options on page 12.)

FIGURE 6.1 – Two-Position Recirculating Units

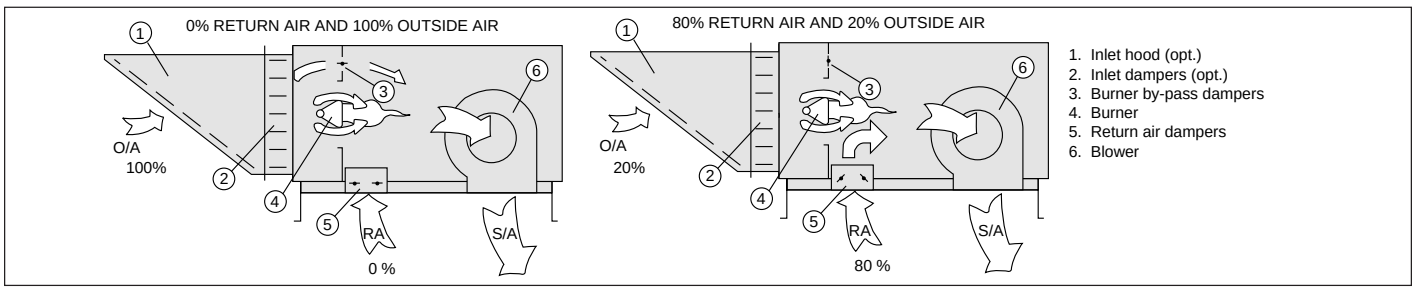


80/20 Floating Damper Recirculating Units, Model Series MRA/MR

- Standard 18 gauge uninsulated galvanized steel cabinet and enclosure for blower, burner, and gas and electrical controls. (Insulation and cabinet paint options are available.) Cabinet is designed for roof curb mounting, slab or rail mounting and indoor suspended mounting.
- All cabinets are supplied with four (4) full access service doors and permanent lifting/mounting lugs.
- Horizontal, right hand straight discharge with bottom return air opening is the standard arrangement. (Optional arrangements are available.)
- Model sizes 110 through 130 have a single DWDI blower wheel with pillow block bearings. Model sizes 215 through 230 have twin DWDI blowers with pillow block bearings.
- Flame supervision on standard models is accomplished with the use of a flame rod. (Ultraviolet flame supervision is available as an option.)
- Standard remote control panel includes a three position Summer/Off/Winter switch, main valve light, flame failure alarm light, and a space temperature thermostat. (Optional panels are available.)
- Units with motor horsepowers up to and including 10 h.p. are supplied as standard with adjustable motor sheaves. Units with motor horsepowers greater than 10 h.p. are supplied as standard with fixed drives. (Optional adjustable drives are available for motors over 10 h.p.)
- The standard control system for all 80/20 units is a Maxitrol Series 44 control system with a space temperature thermostat, and a discharge air temperature high/low limit sensor.

A set of floating (modulating) fresh air burner by-pass and return air dampers, modulating damper motor, and a building pressure damper position control switch must be added to the basic unit. (See variable air flow options on page 13.)

FIGURE 6.2 – 80/20 Recirculating Units



MODEL NOMENCLATURE

MDA 110 A

UNIT TYPE
MDA = 100% Make-Up Air (110-118)
MD = 100% Make-Up Air (120-230)
MDM = 100% Make-Up Air - 2 Speed
MRA = Fresh & Return Air (110-118)
MR = Fresh & Return Air (120-230)

BLOWER SIZE AND QUANTITY
110 = (1) 10" Blower
230 = (2) 30" Blowers
etc.

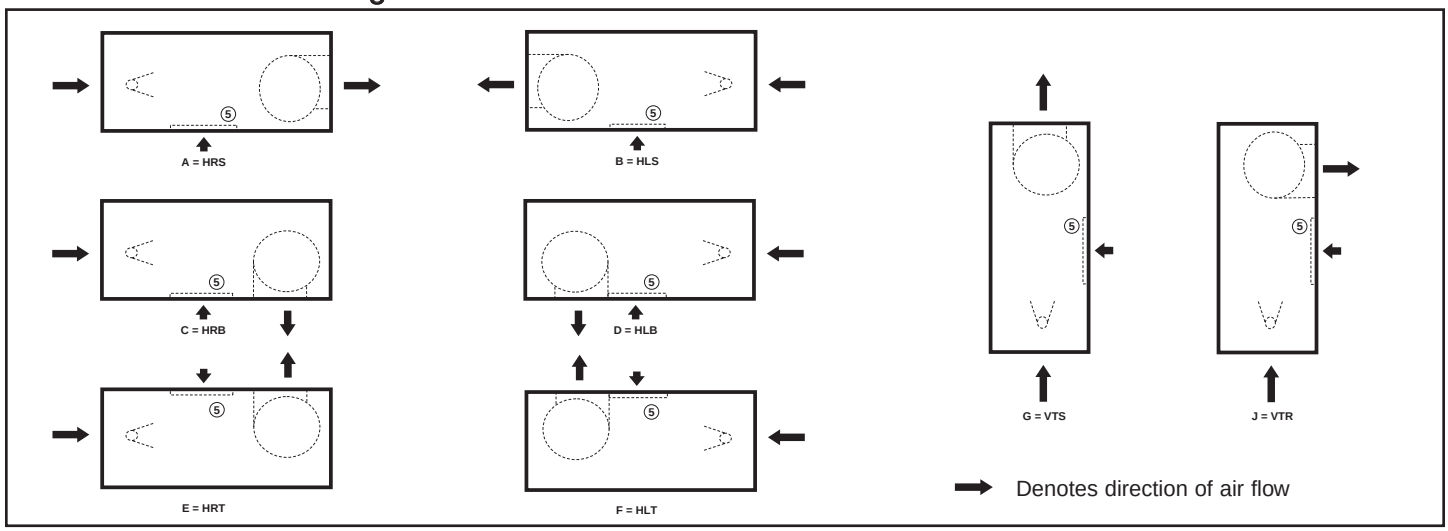
UNIT CONFIGURATION
A = Horz. Right Hand, Straight Disch. (HRS)
B = Horz. Left Hand, Straight Disch. (HLS)
C = Horz. Right Hand, Bottom Disch. (HRB)
etc. (See configurations below)

TABLE 7.1 – General Performance Data

Model Size ④	CFM Min	CFM MDA/MD Max	CFM MRA/MR Max	CFM MDM High Speed	Max Allowable Btu/Hr①	Max Allowable Temp Rise Natural Gas	Max Allowable Temp Rise Propane Gas	Total Static Press Range Inches W.C. ②③
MDA/MDM/MRA 110	1,600	3,300	3,000	2,800 - 3,300	409,860	115°F	85°F	0-2.8
MDA/MDM/MRA 112	2,000	4,700	4,500	3,600 - 4,700	583,740			0-3.0
MDA/MDM/MRA 115	3,000	6,500	6,000	5,600 - 6,500	807,300			0-2.6
MDA/MDM/MRA 118	3,500	10,000	9,000	7,000 - 10,000	1,242,000			0-3.0
MD/MDM/MR 120	6,000	13,500	12,000	11,000 - 13,500	1,647,540			0-3.0
MD/MDM/MR 122	8,000	16,500	16,000	12,000 - 16,500	2,049,300			0-3.0
MD/MDM/MR 125	10,000	21,500	20,000	18,000 - 21,500	2,670,300			0-3.0
MD/MDM/MR 127	12,000	26,000	24,000	24,000 - 26,000	3,004,560			0-2.5
MD/MDM/MR 130	14,000	30,000	28,000	26,000 - 30,000	3,564,000			0-2.7
MD/MDM/MR 215	9,000	13,000	12,000	12,000 - 13,000	1,614,600			0-2.3
MD/MDM/MR 218	12,500	18,500	17,000	15,000 - 18,500	2,197,800			0-3.0
MD/MDM/MR 220	18,000	27,000	26,000	22,000 - 27,000	3,295,080			0-3.0
MD/MDM/MR 222	25,000	33,000	31,000	26,000 - 33,000	3,849,120			0-3.0
MD/MDM/MR 225	30,000	46,000	46,000	37,000 - 46,000	5,713,200			0-3.0
MD/MDM/MR 230	44,000	60,000	56,000	50,000 - 60,000	7,128,000			0-2.7

① Maximum Btu/Hr based on maximum unit CFM @ max air temp rise and -10°F entering air. Actual max Btu/Hr may be lower depending on job conditions
② Total Static Pressure Range = Internal Static Pressure for accessory items + External Static Pressure for ductwork.
③ Maximum Static Pressure not available at all CFM's. See Breeze Selection Software for available static.
④ ETL Certified Max Allowable Discharge Air = 105°F.

FIGURE 7.1 – Unit Configurations ⑤



⑤ Configurations are shown facing the side of the unit with the gas and electrical controls.
⑥ For models with return air (Series MRA/MR).

MODEL & HP SELECTION GUIDE

TABLE 8.1 – Median Accessory Static Pressures (Inches W.C.)

Accessory static pressure losses are approximate values only. Please consult the Modine Breeze Selection Software for static pressure losses at other than median CFM.

Size	Median CFM	Inlet Damper	Discharge Damper	V-Bank Filter w/ Cleanable Filters	Inlet Hood w/ Cleanable Filters	Inlet Hood w/o Filters	Discharge Louver 3-way	Discharge Louver 4-way
110/112	3000	0.01	0.06	0.20	0.08	0.02	0.07	0.06
115/118	6000	0.01	0.07	0.17	0.09	0.02	0.08	0.07
120/122	11000	0.01	0.06	0.13	0.08	0.02	0.07	0.06

TABLE 8.2 – Model & HP Selection Guide

Size	CFM	TOTAL EXTERNAL STATIC PRESSURE (Inches W.C.) ①							
		0.25	0.5	0.75	1	1.25	1.5	2	2.5
		MOTOR HORSEPOWER							
110	1600	3/4	3/4						
	1800	3/4	3/4	1					
	2000	3/4	1	1 1/2	1 1/2				
	2250	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2		
	2500	1 1/2	1 1/2	1 1/2	2	2	2	3	3 (2.3")
	2750	1 1/2	1 1/2	2	2	2	3	3	3
	3000	2	2	2	2	3	3	3	3 (2.3")
	3300②	2	3	3	3	3	3		
112	2000	3/4							
	2500	1	1 1/2	1 1/2	1 1/2				
	3000	1 1/2	1 1/2	1 1/2	2	2	3		
	3500	2	2	2	3	3	3	3	5
	4000	2	3	3	3	3	5	5	5
	4500	3	3	5	5	5	5	5	
	4700②	3	5	5	5	5	5	5	
115	3000	1							
	3500	1 1/2	1 1/2	1 1/2					
	4000	1 1/2	2	2	2	3			
	4500	2	2	3	3	3	3		
	5000	2	3	3	3	5	5	5	
	5500	3	3	3	5	5	5	5	5 (2.3")
	6000	3	5	5	5	5	5		
	6500②	5	5	5	5	5			
118	3500	1 1/2							
	4000	1 1/2	1 1/2						
	5000	2	2	3	3				
	6000	3	3	3	5	5	5		
	7000	3	5	5	5	5	7 1/2	7 1/2	7 1/2
	8000	5	5	5	7 1/2	7 1/2	7 1/2	7 1/2	10
	9000	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	10	10	10
	10000②	7 1/2	7 1/2	10	10	10	10		
120	6000	2							
	7000	3	3	3					
	8000	3	5	5	5	5			
	9000	5	5	5	5	7 1/2	7 1/2		
	10000	5	5	7 1/2	7 1/2	7 1/2	7 1/2	10	
	11000	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	10	10	15
	12000	7 1/2	7 1/2	7 1/2	10	10	10	15	15
	13000	7 1/2	10	10	10	10	15	15	15
	13500②	10	10	10	15	15	15	15	15
122	8000	3	3	5					
	9000	3	5	5	5				
	10000	5	5	5	7 1/2	7 1/2	7 1/2		
	11000	5	5	7 1/2	7 1/2	7 1/2	7 1/2		
	12000	7 1/2	7 1/2	7 1/2	7 1/2	10	10	10	
	13000	7 1/2	7 1/2	7 1/2	10	10	10	15	15
	14000	7 1/2	10	10	10	15	15	15	15
	15000	10	10	15	15	15	15	15	20
	16000	10	15	15	15	15	15	20	20
	16500②	15	15	15	15	15	15	20	20

① The horsepowers shown are calculated using ESP only. Any accessories included must be added to this static pressure. Unit internal resistance has been included in the horsepower tables above. All data subject to change.

② This CFM is not available for MRA/MR Units.

MODEL & HP SELECTION GUIDE

TABLE 9.1 – Median Accessory Static Pressures (Inches W.C.)

Accessory static pressure losses are approximate values only. Please consult the Modine Breeze Selection Software for static pressure losses at other than median CFM.

Size	Median CFM	Inlet Damper	Discharge Damper	V-Bank Filter w/ Cleanable Filters	Inlet Hood w/ Cleanable Filters	Inlet Hood w/o Filters ①	Discharge Louver 3-way	Discharge Louver 4-way
125/127	18000	0.02	0.06	0.20	0.13	0.02	0.06	0.06
130	22000	0.03	0.08	0.29	0.14	0.03	0.09	0.08

① Maximum allowable CFM for a 125/127/130 with an Inlet Hood w/Filters is 21,800 CFM.

TABLE 9.2 – Model & HP Selection Guide

Size	CFM	TOTAL EXTERNAL STATIC PRESSURE (Inches W.C.) ②							
		0.25	0.5	0.75	1	1.25	1.5	2	2.5
		MOTOR HORSEPOWER							
125	10000	3							
	11000	5	5						
	12000	5	5	5					
	13000	5	5	7 1/2	7 1/2				
	14000	5	7 1/2	7 1/2	7 1/2	10			
	15000	7 1/2	7 1/2	7 1/2	10	10	10		
	16000	7 1/2	7 1/2	10	10	10	15	15	
	17000	7 1/2	10	10	10	15	15	15	
	18000	10	10	10	15	15	15	15	20
	19000	10	10	15	15	15	15	20	20
	20000	10	15	15	15	15	20	20	20
	21000③	15	15	15	15	20	20	20	
	21500③	15	15	15	15	20	20	20	
127	12000	3							
	13000	5							
	14000	5	5						
	15000	5	5	7 1/2					
	16000	5	7 1/2	7 1/2					
	17000	7 1/2	7 1/2	7 1/2	10				
	18000	7 1/2	7 1/2	10	10	10			
	19000	7 1/2	10	10	10	15	15		
	20000	10	10	10	15	15	15		
	21000	10	10	15	15	15	15	20	
	22000	10	15	15	15	15	15	20	
	23000	15	15	15	15	15	20	20	20
	24000	15	15	15	15	20	20	20	
	25000③	15	15	15	20	20	20		
	26000③	15	15	20	20	20	20		
130	14000	5							
	15000	5	5						
	16000	5	7 1/2						
	17000	5	7 1/2	7 1/2					
	18000	7 1/2	7 1/2	7 1/2					
	19000	7 1/2	7 1/2	10	10				
	20000	7 1/2	7 1/2	10	10	15			
	21000	7 1/2	10	10	15	15	15		
	22000	10	10	10	15	15	15		
	23000	10	10	15	15	15	15		
	24000	10	15	15	15	15	20	20	
	25000	15	15	15	15	20	20	20	
	26000	15	15	15	15	20	20	25	25
	27000	15	15	15	20	20	20	25	25
	28000	15	15	20	20	20	20	25	
	29000③	15	20	20	20	20	25	25	
	30000③	20	20	20	20	25	25		

② The horsepowers shown are calculated using ESP only. Any accessories included must be added to this static pressure. Unit internal resistance has been included in the horsepower tables above. All data subject to change.

③ This CFM is not available for MR Units.

MODEL & HP SELECTION GUIDE

TABLE 10.1 – Median Accessory Static Pressures (Inches W.C.)

Accessory static pressure losses are approximate values only. Please consult the Modine Breeze Selection Software for static pressure losses at other than median CFM.

Size	Median CFM	Inlet Damper	Discharge Damper	V-Bank Filter w/ Cleanable Filters	Inlet Hood w/ Cleanable Filters	Inlet Hood w/o Filters	Discharge Louver 3-way	Discharge Louver 4-way
215/218	13000	0.02	0.08	0.22	0.12	0.03	0.09	0.08
220/222	26000	0.02	0.10	0.23	①	0.03	0.11	0.10
225/230	46000	0.03	0.09	0.31	②	0.04	0.10	0.09

① Maximum allowable CFM for a 220/222 with an Inlet Hood w/ Filters is 23,700 CFM

② Maximum allowable CFM for a 225/230 with an Inlet Hood w/ Filters is 36,100 CFM

TABLE 10.2 – Model & HP Selection Guide

Size	CFM	TOTAL EXTERNAL STATIC PRESSURE (Inches W.C.) ③							
		0.25	0.5	0.75	1	1.25	1.5	2	2.5
		MOTOR HORSEPOWER							
215	9000	5	5	5	5	7 1/2			
	10000	5	5	5	7 1/2	7 1/2	7 1/2		
	11000	5	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	10	
	12000	7 1/2	7 1/2	7 1/2	7 1/2	10	10	10	
	13000④	7 1/2	10	10	10	10	10		
218	12500	5	7 1/2	7 1/2	7 1/2	10			
	13000	7 1/2	7 1/2	7 1/2	7 1/2	10	10		
	14000	7 1/2	7 1/2	7 1/2	10	10	10		
	15000	7 1/2	10	10	10	15	15	15	
	16000	10	10	10	15	15	15	15	20
	17000	10	10	15	15	15	15	20	20
	18000④	15	15	15	15	15	20	20	20
	18500④	15	15	15	15	15	20	20	
220	18000	7 1/2	7 1/2	10	10	15	15		
	20000	10	10	15	15	15	15	20	
	21000	10	15	15	15	15	15	20	20
	22000	15	15	15	15	15	20	20	25
	23000	15	15	15	15	20	20	20	25
	24000	15	15	15	20	20	20	25	25
	26000	15	20	20	20	20	25	25	
	27000④	20	20	20	25	25	25		
222	25000	15	15	15	20	20	20	25	25
	26000	15	15	15	20	20	20	25	30
	27000	15	15	20	20	20	25	25	30
	28000	15	20	20	20	25	25	25	30
	29000	20	20	20	25	25	25	30	30
	30000	20	20	20	25	25	25	30	
	31000	20	20	25	25	25	30	30	
	32000④	20	25	25	25	30	30		
	33000④	25	25	25	30	30	30		
225	30000	15	15	15	20	20	20		
	32000	15	15	20	20	20	25		
	34000	15	20	20	20	25	25	30	
	36000	20	20	20	25	25	30	30	40
	38000	20	20	25	25	30	30	40	40
	40000	20	25	25	30	30	40	40	40
	42000	25	25	30	30	40	40	40	
	44000	25	30	30	40	40	40		
	46000	30	30	40	40	40	40		
230	44000	20	20	20	25	25	30		
	46000	20	20	25	25	30	30		
	48000	20	25	25	30	30	40	40	
	50000	25	25	30	30	40	40	40	
	52000	25	25	30	30	40	40	50	50
	54000	25	30	30	40	40	40	50	50
	56000	30	30	40	40	40	40	50	
	58000④	30	40	40	40	40	50	50	
	60000④	40	40	40	40	50	50		

③ The horsepowers shown are calculated using ESP only. Any accessories included must be added to this static pressure. Unit internal resistance has been included in the horsepower tables above. All data subject to change.

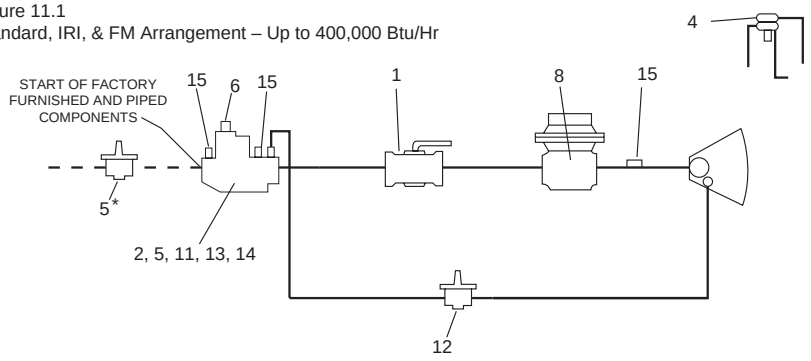
④ This CFM is not available for MR units.

MANIFOLD ARRANGEMENTS

Component Listing

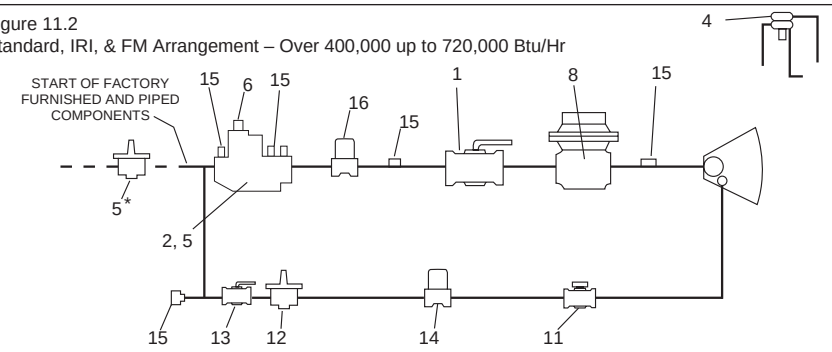
1 Auxiliary Gas Shut-Off Valve
2 Combination Main Gas Valve
3 High and Low Gas Pressure Switch
4 Main Air Flow Proving Switch
5 Main Gas Pressure Regulator
6 Main Gas Shut-Off Valve
7 Main Gas Valve
8 Modulating Valve
9 Motorized Main Gas Valve
10 N/A
11 Orificed Pilot Needle Valve
12 Pilot Gas Pressure Regulator
13 Pilot Gas Shut-Off Valve
14 Pilot Gas Valve
15 Plugged Test Port
16 Redundant Main Gas Valve

Figure 11.1
Standard, IRI, & FM Arrangement – Up to 400,000 Btu/Hr



* Required and field installed when gas pressure exceeds 14" wc (1/2 psi)

Figure 11.2
Standard, IRI, & FM Arrangement – Over 400,000 up to 720,000 Btu/Hr



* Required and field installed when gas pressure exceeds 14" wc (1/2 psi)

Figure11.3
Standard & IRI Arrangement – Over 720,000 Btu/Hr
FM (Less & With Restriction) – Up to 2,500,000 Btu/Hr

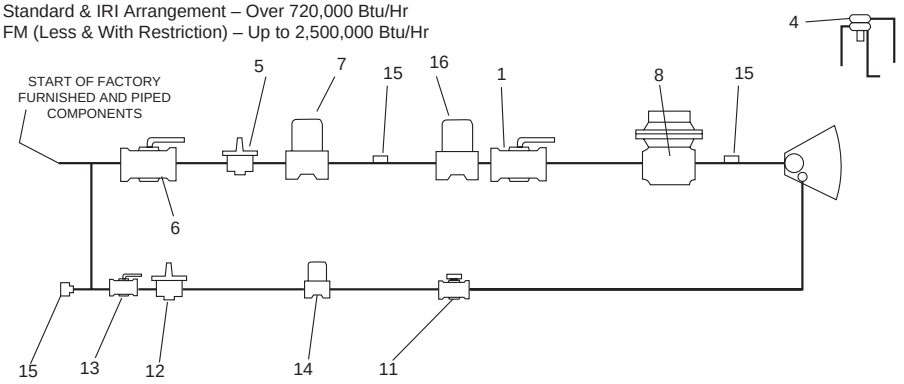


Figure 11.4
FM (Less & With Restriction) – Over 2,500,000 Btu/Hr

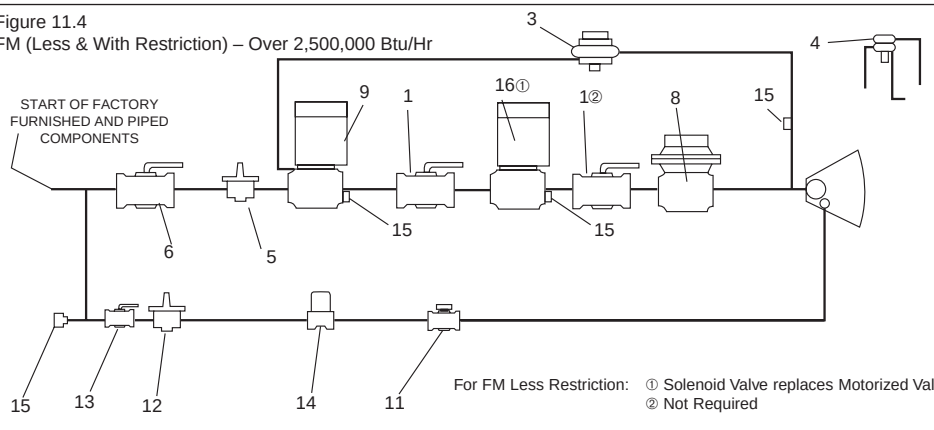


TABLE 11.1
Field Gas Supply Connections (For Natural Gas)

8"-14" W.C. Supply Pressure	
Firing Rate - MBH	Connection Size
275	3/4"
550	1"
1100	1 1/4"
1375	1 1/2"
2200	2"
3575	2 1/2"
4950	3"

1-5 PSIG Supply Pressure	
Firing Rate - MBH	Connection Size
550	3/4"
1000	1"
1650	1 1/4"
2475	1 1/2"
4950	2"
7150	2 1/2"

VARIABLE AIR FLOW OPTIONS ① ②

Two Speed Motor Option – 1800/1200 RPM
Model MDM 100% Make-Up Air Units Only
(Requires two-speed motor option)

This option is used in conjunction with two-speed motors. Includes: a two-position outside air burner bypass damper and damper motor, a manual Hi/Lo speed selector switch mounted on any optional remote control panel. (A remote control panel must be selected separately.) A **separate inlet or outlet damper must be selected if 100% positive outside air shut off is required.** When ordering, specify Control Type.

Control Type "A"

Standard Sequence of Operation: When power is supplied to the make-up air unit, the fan runs on Hi or Lo speed depending where the manual Hi/Lo speed selector switch is set. The firing rate of the burner is dependent on the type of gas control system selected.

Control Type "B"

Sequence of Operation With Hi/Lo Speed Exhaust Fan Interlocks: Includes the addition of three optional interlock relays in lieu of the manual Hi/Lo speed selector switch. The operation of the unit is dependent on exhaust load demands. If no exhaust fans are running, the unit is off. If one exhaust fan is energized, power is supplied to the unit and the fan runs on low speed. If a second exhaust fan is energized, the interlocking relay runs the fan at high speed.

Two Position Mixed Air Control
Return Air/Fresh Air Percentages: 80/20, 70/30, 60/40, or 50/50
Model MRA/MR Fresh & Return Air Units Only

Includes: A two-position fresh air burner bypass damper and return air damper, a two-position damper motor, and an occupied/unoccupied manual control switch mounted on any optional remote control panel. (A remote control panel must be selected separately.) When ordering, specify Control Type.

Control Type "A"

Standard Sequence of Operation: The fan runs continuously and the burner firing rate is dependent on the type of gas control system selected. The position of the outside air burner bypass damper and return air damper is determined by the setting on the manual occupied/unoccupied switch. In the occupied mode, 100% outside air is delivered to the unit. In the unoccupied mode, the outside air burner bypass damper is closed and the remainder of the air is supplied to the unit via the return air dampers.

Control Type "B"

Sequence of Operation with Occupied/Continuous Fan, Unoccupied/Intermittent Fan Controlled by a Manual Switch and Night Set Back Thermostat: Includes the addition of a fan relay and night set back thermostat. In the occupied mode, the fan runs continuously and the two-position damper is set to supply 100% outside air to the unit, and the burner firing rate is controlled by the occupied thermostat setting, or discharge air temperature setting depending on which gas control system has been selected. In the unoccupied mode, the fan runs intermittently and the outside air burner bypass damper is closed, providing maximum return air during unoccupied hours. At the same time, the burner firing rate is switched over for control by the night set back thermostat.

Control Type "C"

Sequence of Operation with Occupied/Continuous Fan, Unoccupied/Intermittent Fan Controlled by a Time Clock and Night Set Back Thermostat: Includes the addition of a time clock (in lieu of occupied/unoccupied manual control switch), fan relay, and night set back thermostat. In the occupied mode, the fan runs continuously and the two-position damper is set to supply 100% outside air to the unit, and the burner firing rate is controlled by the occupied thermostat setting, or discharge air temperature setting depending on which gas control system has been selected. In the unoccupied mode, the fan runs intermittently and the outside air burner bypass damper is closed, providing maximum return air during unoccupied hours. At the same time, the burner firing rate is switched over for control by the night set back thermostat.

① A separate inlet or discharge air damper is required if 100% shut-off of outside air is required when the unit is not operating.
② Unit height of models 110 and 112 and their inlet accessories increases from 24" to 36" when this option is selected.

VARIABLE AIR FLOW OPTIONS ① ②

Series 60 Floating Mixed Air Control
Return Air/Fresh Air percentage: 80/20
Model MRA/MR Fresh & Return Air Units Only

Includes: A Series 60 floating damper operator, an outside air burner bypass damper, a return air damper and a remote panel with room to outside air pressure control. (A separate system remote control panel must be selected separately.) When ordering, specify Control Type.

Control Type "A"

Standard Sequence of Operation: The fan runs continuously and the burner firing rate is dependent on the type of gas control system selected. The building pressure control monitors the negative pressure in the building and adjusts the ratio of fresh to return air to maintain a constant building pressure. In this manner, this system can introduce more outside air when high exhaust demands are present and reduce the outside air to a minimum of 20% of the total air flow when exhaust loads are at a minimum. The damper operation is independent of the gas controls and will provide mixed air on demand even during summer ventilation.

Control Type "B"

Sequence of Operation with Occupied/Continuous Fan, Unoccupied/Intermittent Fan Controlled by a Manual Switch and Night Set Back Thermostat: Includes the addition of an occupied/unoccupied manual control switch, two control relays and a night set back thermostat. In the occupied mode, the fan runs continuously, the burner firing rate is dependent on which gas control system has been selected, and the building pressure control monitors the negative pressure in the building and adjusts the ratio of fresh to return air to maintain a constant building pressure. In the unoccupied mode, the fan runs intermittently and the outside air burner bypass dampers are closed, providing maximum return air during the unoccupied hours. At the same time, the burner firing rate is switched over for control by the night set back thermostat.

Control Type "C"

Sequence of Operation with Occupied/Continuous Fan, Unoccupied/Intermittent Fan Controlled by a Time Clock and Night Set Back Thermostat: Includes the addition of a time clock, two control relays and a night set back thermostat. In the occupied mode, the fan runs continuously, the burner firing rate is dependent on which gas control system has been selected, and the building pressure control monitors the negative pressure in the building and adjusts the ratio of fresh to return air to maintain a constant building pressure. In the unoccupied mode, the fan runs intermittently and the outside air burner bypass dampers are closed, providing maximum return air during unoccupied hours. At the same time, the burner firing rate is switched over for control by the night set back thermostat.

① A separate inlet or discharge air damper is required if 100% shut-off of outside air is required when the unit is not operating.
② Unit height of models 110 and 112 and their inlet accessories increases from 24" to 36" when this option is selected.

GAS CONTROLS

System 14 (MAXITROL)

Discharge Air Temperature Control

System 14 is an electronic modulating discharge air temperature control system which utilizes a remote temperature dial for adjusting the discharge air temperature set point. A discharge air sensor monitors the discharge air temperature and controls an electronic modulating gas valve which modulates the main burner gas flow to maintain the desired discharge air temperature. The temperature set point range for this system is 55-90 degrees F.

Note: Requires field mounting and wiring of discharge air sensor.

When specifying this control system, the optional System 14 Remote Control Station must be used. The System 14 Remote Control Station includes a remote Temperature Set Point Dial, a Summer/Off/Winter Selector switch, a Main Valve On light and a Flame Failure Alarm light. (Optional remote stations are available.) This system can also be used with a room-temperature override.

System 44 (MAXITROL)

Space Temperature Control

System 44 is an electronic modulating room temperature control system which utilizes a modulating room thermostat to control the main burner firing rate based on the room air temperature set point. The room thermostat monitors the room air temperature and controls an electronic modulating gas valve which modulates the main burner gas flow to maintain the desired thermostat set point. The temperature set point range for this system is 55-90 degrees F.

This control system also includes a discharge air sensor which is used as a high and low temperature limit control. The discharge air sensor will prevent make-up air from being delivered to the space at temperatures which are below its set point, even if the room thermostat is satisfied and will prevent the room thermostat from over firing the burner when mild outdoor temperatures exist, and the maximum firing capacity of the burner is not required to achieve the desired winter design discharge air temperature.

When specifying this control system, the optional System 44 Remote Control Station must be used. The System 44 Remote Control Station includes an electronic Modulating Room Thermostat, a Summer/Off/Winter selector switch, a Main Valve On light and a Flame Failure Alarm light. (Optional remote stations are available.)

Standard Control Panel For Maxitrol Series 14 System

Dimensions: 8"H x 6"W x 4"D

Standard Control Panel For Maxitrol Series 44 System

Dimensions: 10"H x 8"W x 4"D

DDC Compatible Controls (Maxitrol A200)

Building Management Control

The DDC compatible control system is an electronic modulating control system which utilizes a 0 - 10 Vdc or 4 - 20 mA input signal (by others) to control the discharge air temperature. The input signal to the electronic modulating gas valve is controlled by a discharge air sensor (by others) that is compatible with the building management system. An increase or decrease in the input signal modulates the main burner gas flow to maintain the desired discharge air temperature.

Provided with this system is a discharge air sensor which is used as a high temperature limit control. The discharge air sensor will prevent make-up air being delivered to the space that is above the recommended operating limits.

Note: This system requires a field supplied discharge air sensor that is compatible with the building management system.

UNIT AND ACCESSORY WEIGHTS

FIGURE 15.1 – Unit and Accessory Weights

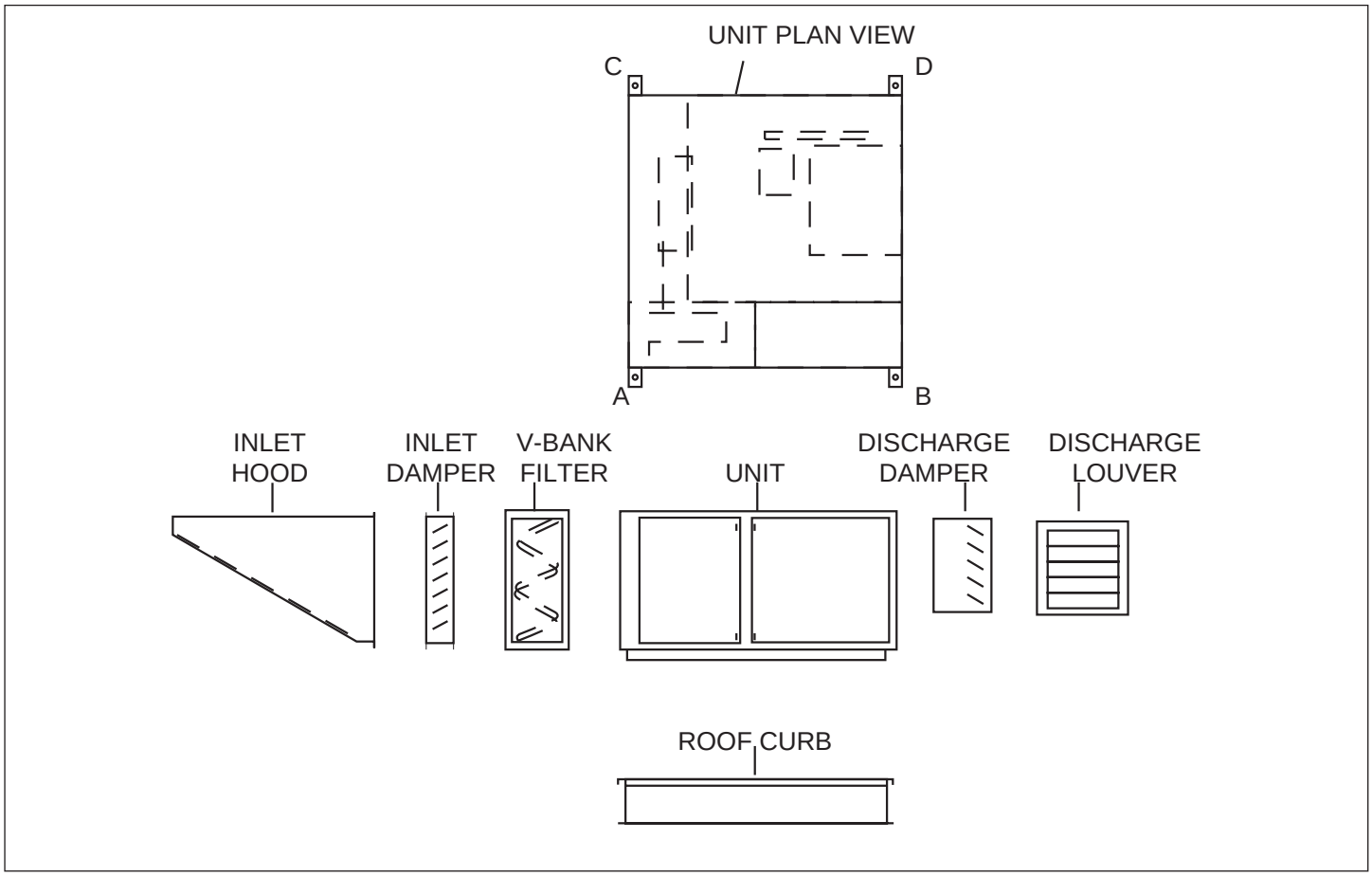


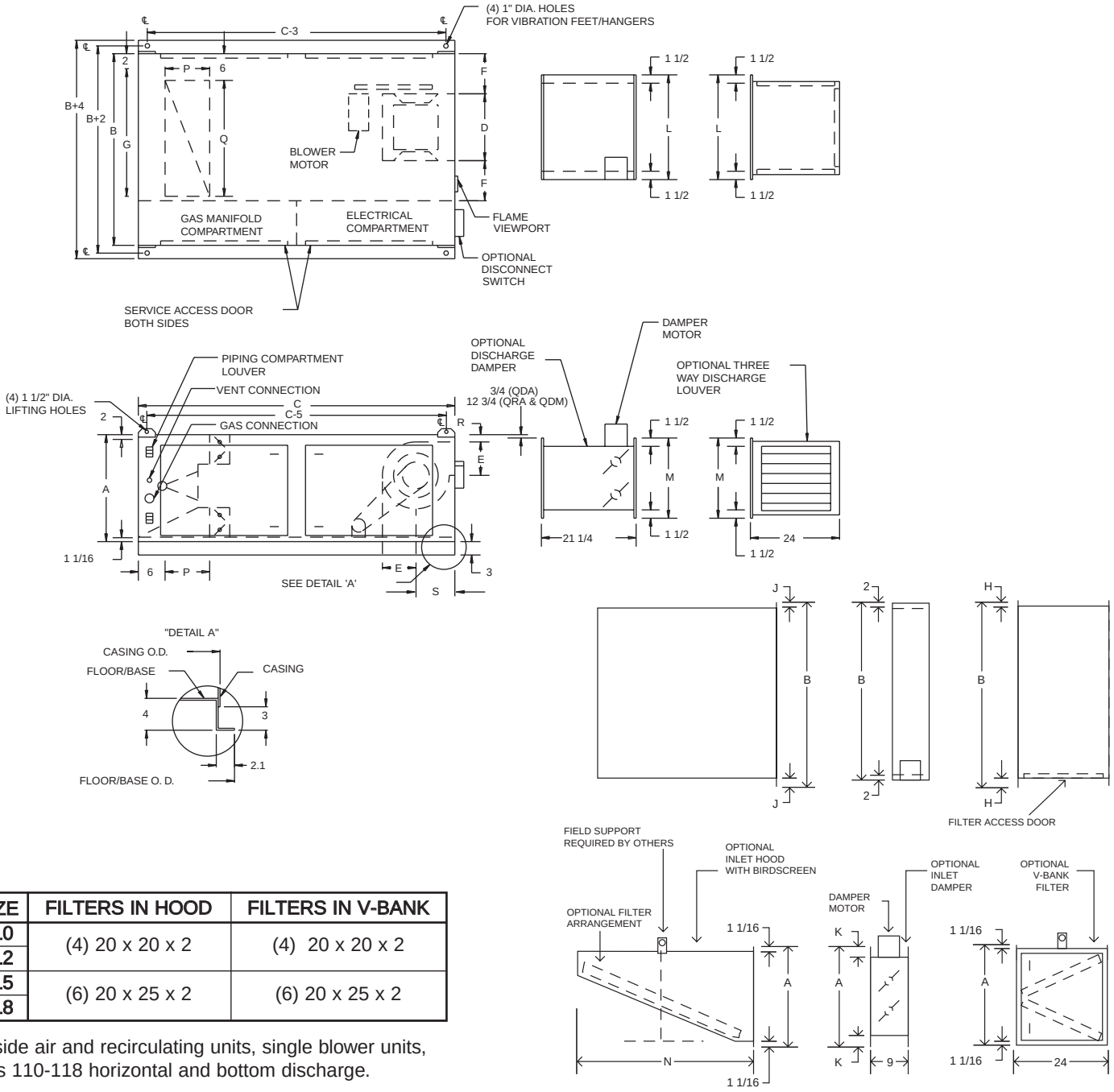
TABLE 15.1 – Unit and Accessory Weights

	MODEL		110	112	115	118	120	122	125	127	130	215	218	220	222	225	230
	UNIT ONLY		440	500	800	850	1200	1275	1655	1725	1805	1210	1320	1850	2050	2620	2795
	INLET HOOD		80		125		165		220			195		235		385	
	INLET DAMPER		70		95		170		230			160		260		380	
	V-BANK FILTER		100		135		210		280			200		300		430	
	DISCHARGE DAMPER		60		80		95		135			160		210		285	
	DISCHARGE LOUVER		80		95		115		150			185		225		310	
	14" ROOF CURB		115		140		220		240			180		285		315	
	24" ROOF CURB		180		215		375		410			280		485		540	
	WEIGHT DISTRIBUTION	A	125	140	220	235	325	345	445	465	490	340	375	510	570	725	780
		B	100	120	200	210	300	315	400	415	430	300	320	395	435	610	645
		C	90	100	160	170	250	265	365	380	395	230	250	435	475	560	590
		D	125	140	220	235	325	345	445	465	490	340	375	510	570	725	780
	VARIABLE AIR FLOW WEIGHT ADDS																
	RETURN AIR O/A - R/A BY-PASS DAMPER		115		85		145		225			155		220		305	
	TWO SPEED O/A BY-PASS DAMPER		75		45		70		105			55		115		170	
	ADDITIONAL OPTIONAL UNIT WEIGHT ADDS																
	INTRNL MTR/BLWR SPRNG VBRTN ISOLTN		35		50		60		75			150		250		275	
	VERTICAL UNIT WEIGHT ADDS																
	VERTICAL UNIT STRUCTURAL REENFORCEMENT		40		50		150		250			-		-		-	
	VERTICAL UNIT INLET STAND 24		55		70		180		225			-		-		-	
	VERTICAL UNIT INLET STAND 48		75		90		220		265			-		-		-	
	VERTICAL UNIT INLET STAND 72		95		110		260		305			-		-		-	

WEIGHTS

All data subject to change.

MDA/MDM/MRA 110-118 DIMENSIONS



SIZE	FILTERS IN HOOD	FILTERS IN V-BANK
110	(4) 20 x 20 x 2	(4) 20 x 20 x 2
112		
115	(6) 20 x 25 x 2	(6) 20 x 25 x 2
118		

Outside air and recirculating units, single blower units, sizes 110-118 horizontal and bottom discharge.

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
110	24/36①	43	71	13 1/4	11 1/2	9 7/8	30	1 1/8	1 1/2	3/4/1 1/4③	21	20	38 1/2	10	26	2 1/4②	6 1/4
112	24/36①	43	71	15 3/4	13 9/16	8 5/8	30	1 1/8	1 1/2	3/4/1 1/4③	21	20	38 1/2	10	26	14 1/4②	7 3/16
115	36	52	82	18 3/4	16	11 5/8	39	7/8	1	1 1/4	26 1/2	25 1/2	54 3/8	12	35	2 1/4	8 5/8
118	36	52	82	22	19	10	39	7/8	1	1 1/4	26 1/2	25 1/2	54 3/8	12	35	2 1/4	10 9/16

Note: All accessories shipped completely assembled for easy installation. Some accessories shipped separately. All data subject to change. All dimensions subject to manufacturing tolerances.

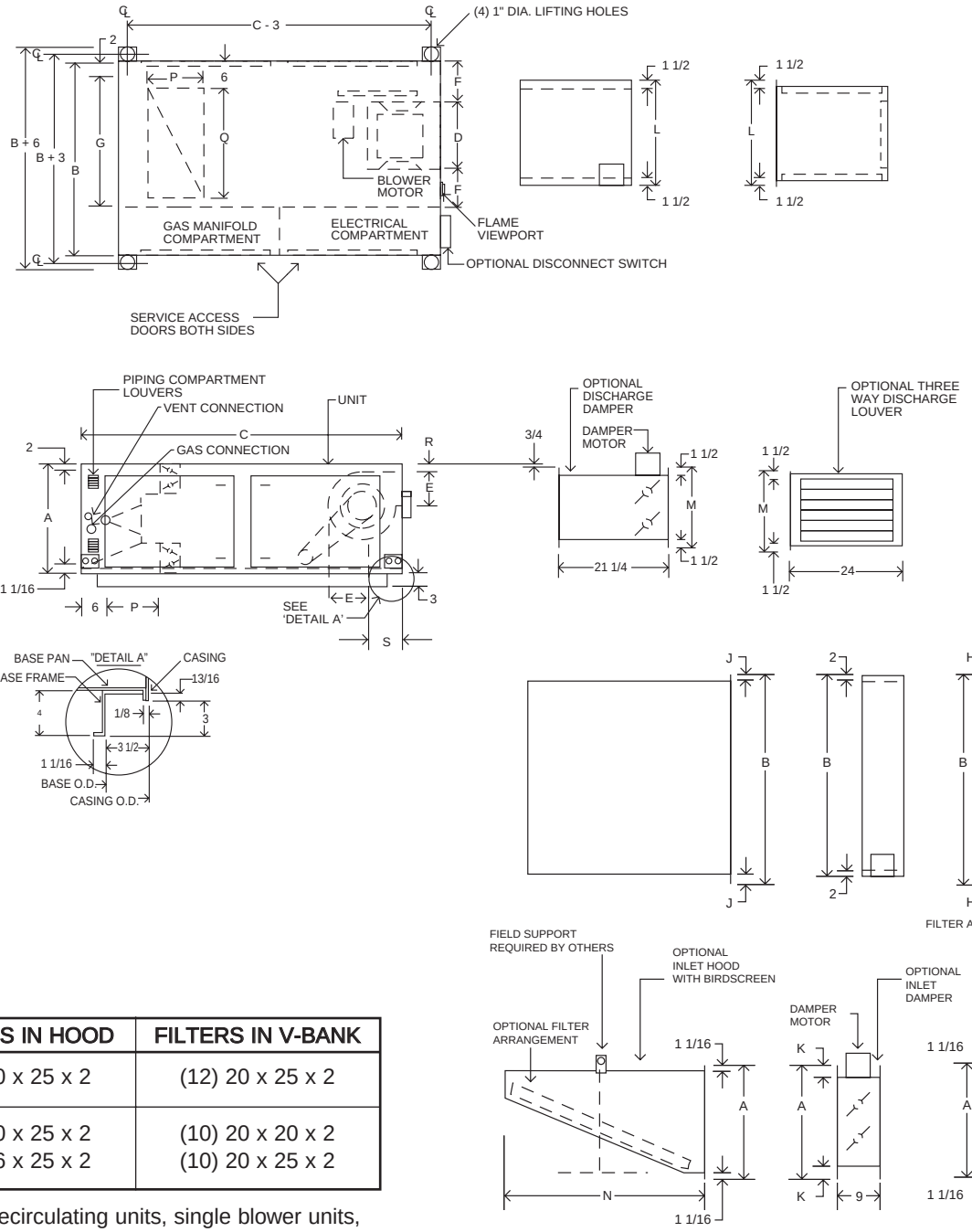
MATERIAL GAUGES: Unit Casing: 18 gauge galvanized. • Unit Base: (110-118) 12 gauge galvanized. Rain Hood: 18 gauge galvanized. • V-Bank: 14 and 18 gauge galvanized. • Damper Blades: 18 gauge galvanized. Damper Frame: 14 gauge galvanized. • Discharge Louvers: 14 and 18 gauge galvanized.

① 24" for MDA models, 36" for MRA models and MDM models.

② 2 1/4" for MDA models, 14 1/4" for MRA models and MDM models.

③ 3/4" for MDA models, 1 1/4" for MRA models and MDM models.

MD/MDM/MR 120-130 DIMENSIONS



SIZE	FILTERS IN HOOD	FILTERS IN V-BANK
120	(9) 20 x 25 x 2	(12) 20 x 25 x 2
122		
125	(6) 20 x 25 x 2 (9) 16 x 25 x 2	(10) 20 x 20 x 2 (10) 20 x 25 x 2
127		
130		

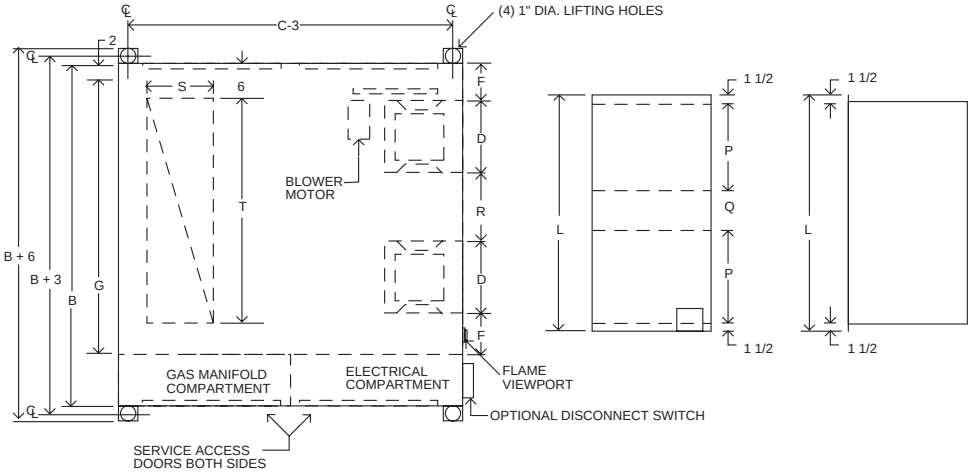
Outside air and recirculating units, single blower units, sizes 120-130 horizontal and bottom discharge.

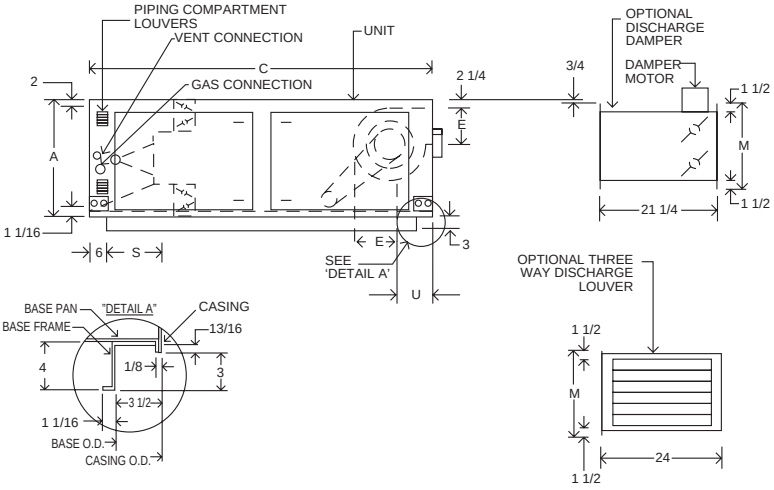
SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
120	48	78	96	24 7/8	24 7/8	18 9/16	59	1 5/16	1 1/2	1 3/4	31 1/2	31	45 3/8	14	55	2 1/4	11 1/4
122	48	78	96	27 3/8	27 3/8	17 5/16	59	1 5/16	1 1/2	1 3/4	31 1/2	31	45 3/8	14	55	2 1/4	12 1/4
125	60	92	110	31 3/8	31 3/8	22 5/16	73	1 1/16	1	2 1/4	41 1/2	42	56	20	69	2 1/4	13 1/4
127	60	92	110	34 3/8	34 3/8	20 13/16	73	1 1/16	1	2 1/4	41 1/2	42	56	20	69	2 1/4	15 1/4
130	60	92	110	36 7/8	36 7/8	19 9/16	73	1 1/16	1	2 1/4	41 1/2	42	56	20	69	2 1/4	16 1/4

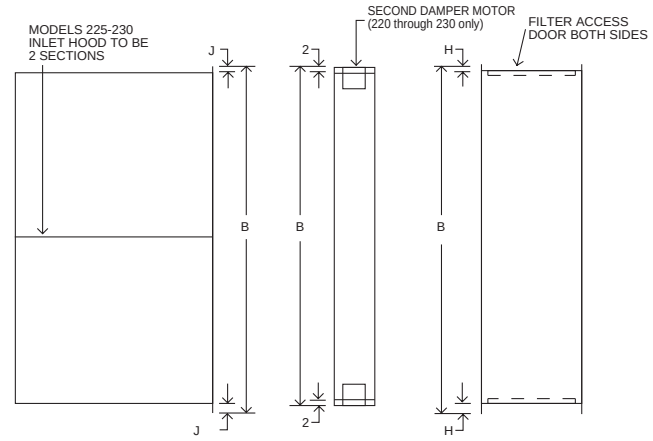
Note: All accessories shipped completely assembled for easy installation. Some accessories shipped separately. All data subject to change. All dimensions subject to manufacturing tolerances.

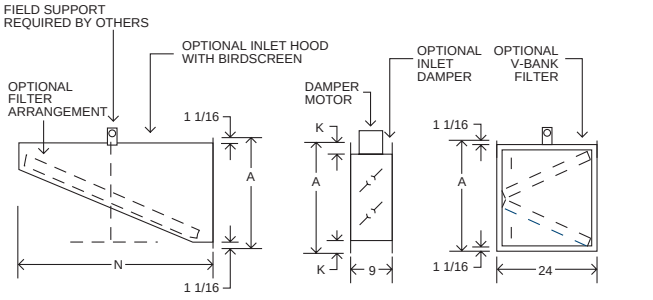
MATERIAL GAUGES: Unit Casing: 18 gauge galvanized. • Unit Channel Base: (120-130) 12 gauge galvanized. Rain Hood: 18 gauge galvanized. • V-Bank: 14 and 18 gauge galvanized. • Damper Blades: 18 gauge galvanized. Damper Frame: 14 gauge galvanized. • Discharge Louvers: 14 and 18 gauge galvanized.

MD/MDM/MR 215-230 DIMENSIONS









SIZE	FILTERS IN HOOD	FILTERS IN V-BANK
215	(6) 20 x 20 x 2	(6) 20 x 20 x 2
218	(6) 20 x 25 x 2	(6) 20 x 25 x 2
220	(15) 20 x 25 x 2	(20) 20 x 25 x 2
222		
225	(6) 16 x 25 x 2	(36) 20 x 25 x 2
230	(18) 20 x 25 x 2	

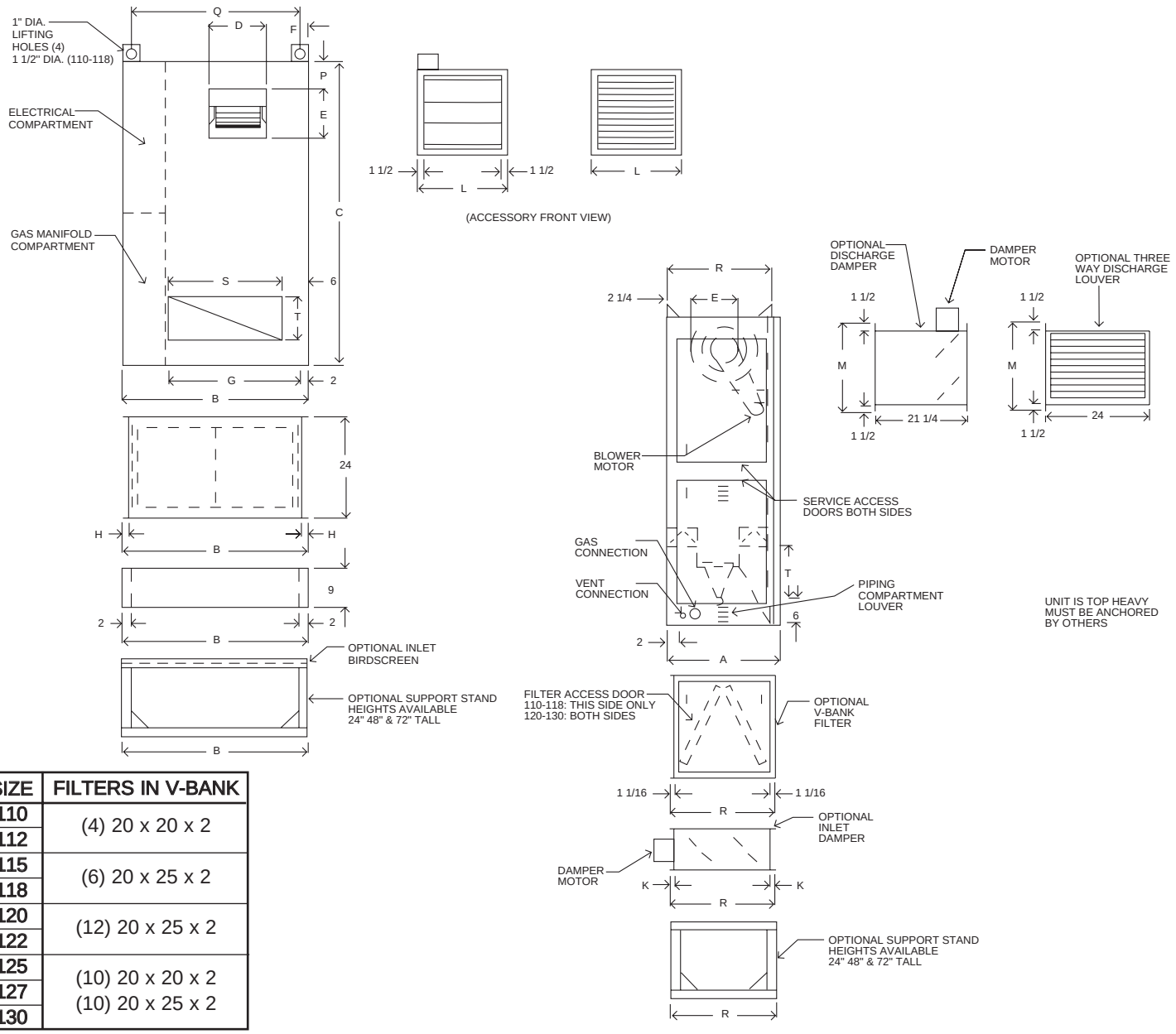
Outside air and recirculating units, twin blower units, sizes 215-230 horizontal and bottom discharge

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
215	36	94	82	18 3/4	16	11 5/8	81	2	2	1 1/4	68	25 1/2	54 3/8	23 1/2	18	23 1/4	12	77	8 5/8
218	36	94	82	22	19	10	81	2	2	1 1/4	68	25 1/2	54 3/8	23 1/2	18	20	12	77	10 9/16
220	48	130	96	24 7/8	24 7/8	16 1/16	111	2 11/16	2 1/2	1 3/4	88	31	45 3/8	28 1/2	28	32 1/8	14	107	11 1/4
222	48	130	96	27 3/8	27 3/8	14 13/16	111	2 11/16	2 1/2	1 3/4	88	31	45 3/8	28 1/2	28	29 5/8	14	107	12 1/4
225	60	154	110	31 3/8	31 3/8	18 13/16	135	2 3/8	2	2 1/4	110	42	56	38 1/2	30	37 5/8	20	131	13 1/2
230	60	154	110	36 7/8	36 7/8	16 1/16	135	2 3/8	2	2 1/4	110	42	56	38 1/2	30	32 1/8	20	131	16 3/4

Note: All accessories shipped completely assembled for easy installation. Some accessories shipped separately. All data subject to change. All dimensions subject to manufacturing tolerances.

MATERIAL GAUGES: Unit Casing: 18 gauge galvanized. • Unit Channel Base: (215-218) 14 gauge galvanized. (220-230) 12 gauge galvanized. Rain Hood: 18 gauge galvanized. • V-Bank: 14 and 18 gauge galvanized. • Damper Blades: 18 gauge galvanized. Damper Frame: 14 gauge galvanized. • Discharge Louvers: 14 and 18 gauge galvanized.

MDA/MD/MDM/MRA/MR DIMENSIONS VERTICAL UNITS



SIZE	FILTERS IN V-BANK
110	(4) 20 x 20 x 2
112	
115	(6) 20 x 25 x 2
118	
120	(12) 20 x 25 x 2
122	
125	(10) 20 x 20 x 2 (10) 20 x 25 x 2
127	
130	

SIZE	A	B	C	D	E	F	G	H	K	L	M	P	Q	R	S	T
110	24/36①	43	71	13 1/4	11 1/2	9 7/8	30	1 1/8	3/4 / 1 1/4②	21	20	6 1/4	38	24/36①	26	10
112	24/36①	43	71	15 3/4	13 9/16	8 5/8	30	1 1/8	3/4 / 1 1/4②	21	20	7 3/16	47	24/36①	26	10
115	36	52	82	18 3/4	16	11 5/8	39	7/8	1 1/4	26 1/2	25 1/2	8 5/8	47	36	35	12
118	36	52	82	22	19	10	39	7/8	1 1/4	26 1/2	25 1/2	10 9/16	47	36	35	12
120	51	78	96	24 7/8	24 7/8	18 9/16	59	1 5/16	1 3/4	31 1/2	31	11 1/4	75	48	55	14
122	51	78	96	27 3/8	27 3/8	17 5/16	59	1 5/16	1 3/4	31 1/2	31	12 1/4	75	48	55	14
125	63	92	110	31 3/8	31 3/8	22 5/16	73	1 1/16	2 1/4	41 1/2	42	13 1/4	89	60	69	20
127	63	92	110	34 3/8	34 3/8	20 13/16	73	1 1/16	2 1/4	41 1/2	42	15 1/4	89	60	69	20
130	63	92	110	36 7/8	36 7/8	19 9/16	73	1 1/16	2 1/4	41 1/2	42	16 1/4	89	60	69	20

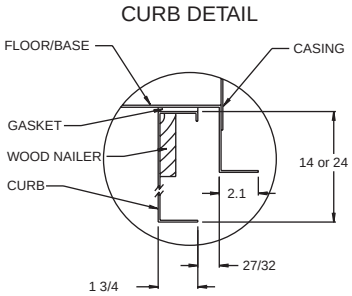
Note: All accessories shipped completely assembled for easy installation. Some accessories shipped separately. All data subject to change. All dimensions subject to manufacturing tolerances.

MATERIAL GAUGES: Unit Casing: 18 gauge galvanized. • Unit Channel Base: (120-130) 12 gauge galvanized. V-Bank: 14 and 18 gauge galvanized. • Damper Blades: 18 gauge galvanized. • Damper Frame: 14 gauge galvanized. Discharge Louvers: 14 and 18 gauge galvanized.

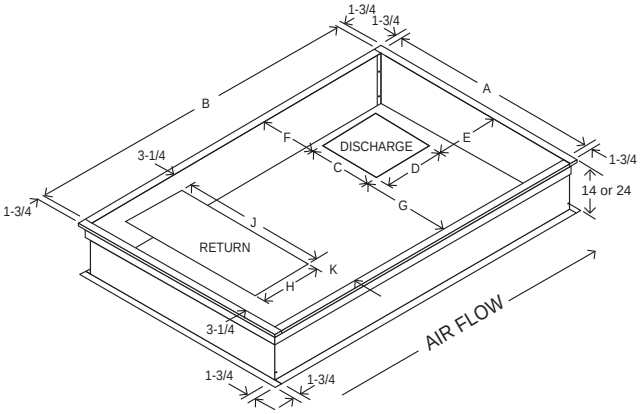
① 24" for MDA models, 36" for MRA models and MDM models.

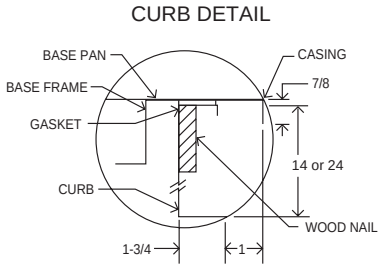
② 3/4" for MDA models, 1 1/4" for MRA models and MDM models.

ROOF-CURB DIMENSIONS - SIZE 110-130



TYPICAL FOR SIZE 110-118

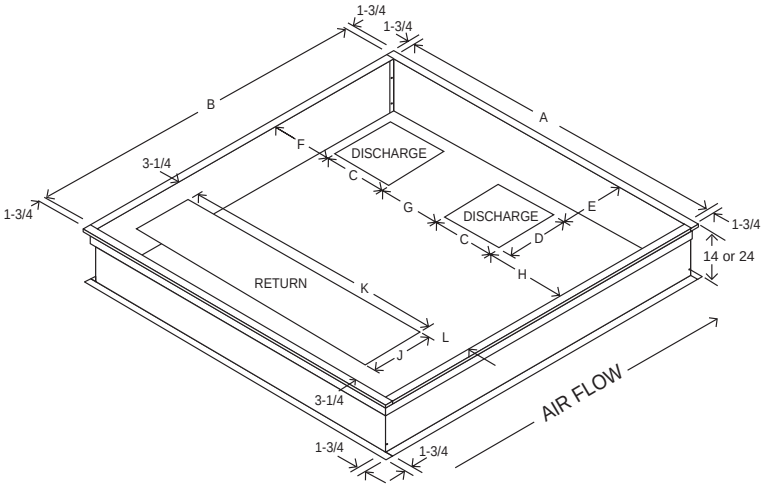


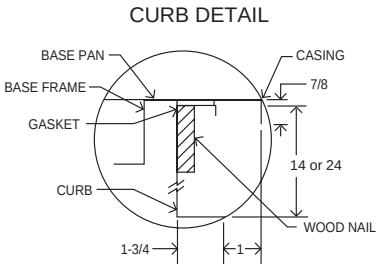


TYPICAL FOR SIZE 120-130

SIZE	CURB ID A	CURB ID B	OPTIONAL DISCHARGE C	OPTIONAL DISCHARGE D	E	F	G	OPTIONAL RETURN H	OPTIONAL RETURN J	K	Gasket Length (Feet)	Weight 14" / 24"
110	37 1/2	65 1/2	13 1/4	11 1/2	3 1/2	7 1/8	17 1/8	10	26	8 1/4	19	115# / 180#
112	37 1/2	65 1/2	15 3/4	13 9/16	4 7/16	5 7/8	15 7/8	10	26	8 1/4	19	115# / 180#
115	46 1/2	76 1/2	18 3/4	16	5 7/8	8 7/8	18 7/8	12	35	8 1/4	23	140# / 215#
118	46 1/2	76 1/2	22	19	7 13/16	7 1/4	17 1/4	12	35	8 1/4	23	140# / 215#
120	72 1/2	90 1/2	24 7/8	24 7/8	8 1/2	16 13/16	30 13/16	14	55	14 1/4	29	220# / 375#
122	72 1/2	90 1/2	27 3/8	27 3/8	9 1/2	14 9/16	30 9/16	14	55	14 1/4	29	220# / 375#
125	86 1/2	104 1/2	31 3/8	31 3/8	10 1/2	19 9/16	35 9/16	20	69	14 1/4	34	240# / 410#
127	86 1/2	104 1/2	34 3/8	34 3/8	12 1/2	18 1/16	34 1/16	20	69	14 1/4	34	240# / 410#
130	86 1/2	104 1/2	36 7/8	36 7/8	13 1/2	16 13/16	32 13/16	20	69	14 1/4	34	240# / 410#

ROOF-CURB DIMENSIONS - SIZE 215-230

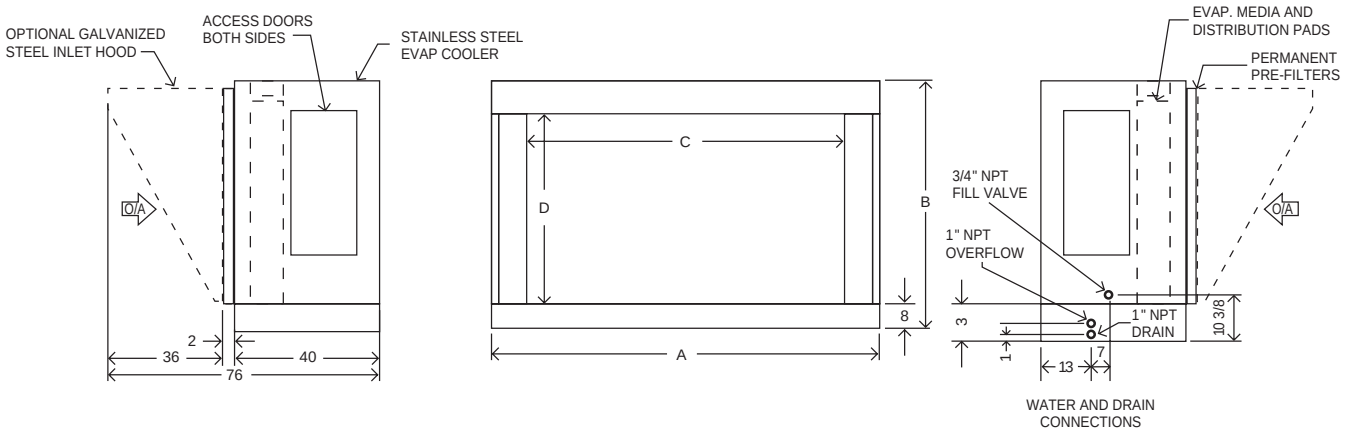




TYPICAL FOR SIZE 215-230

SIZE	CURB ID A	CURB ID B	OPTIONAL DISCHARGE C	OPTIONAL DISCHARGE D	E	F	G	H	OPTIONAL RETURN J	K	L	Gasket Length (Feet)	Weight 14" / 24"
215	88 1/2	76 1/2	18 3/4	16	5 7/8	8 7/8	23 1/4	18 5/8	12	77	8 1/4	30	180# / 280#
218	88 1/2	76 1/2	22	19	7 13/16	7 1/4	20	17 1/4	12	77	8 1/4	30	180# / 280#
220	124 1/2	90 1/2	24 7/8	24 7/8	8 1/2	13 5/16	32 1/8	29 5/16	14	107	14 1/4	38	285# / 485#
222	124 1/2	90 1/2	27 3/8	27 3/8	9 1/2	12 1/16	29 5/8	28 1/16	14	107	14 1/4	38	285# / 485#
225	148 1/2	104 1/2	31 3/8	31 3/8	10 1/2	16 1/16	37 5/8	32 1/16	20	131	14 1/4	44	315# / 540#
230	148 1/2	104 1/2	36 7/8	36 7/8	14	13 5/16	32 1/8	29 5/16	20	131	14 1/4	44	315# / 540#

EVAPORATIVE COOLING



SIDE VIEW

FRONT VIEW
(DISCHARGE END)

SIDE VIEW

Model Size Used With	Evaporative Cooler							2" Pre-Filters				12" Evaporative Media				2" Dist. Pad		Weight (Lbs.)		
	A	B	C	D	Qty	CFM Range Min.	CFM Range Max.	Qty	Size (L x H)	Max. Vel. (FPM)	Face Sq. Ft.	Qty	Size (W x H)	Max. Vel. (FPM)	Face Sq. Ft.	Qty	Size (W x H)	Evap. Ship.	Cooler Oper.	Hood Add.
110	48	47	39	17	1	1,600	3,300	6	16 x 20	248	13.33	4	12 x 36	275	12	1	12 x 48	265	525	62
112	48	47	39	17	1	2,000	4,700	6	16 x 20	353	13.33	4	12 x 36	392	12	1	12 x 48	265	525	62
115	60	59	48	29	1	3,000	6,500	6	20 x 25	312	20.83	5	12 x 48	325	20	1	12 x 60	395	720	75
118	60	59	48	29	1	3,500	10,000	6	20 x 25	480	20.83	5	12 x 48	500	20	1	12 x 60	395	720	75
120	84	71	74	41	1	6,000	13,500	3 12	20 x 20 16 x 20	386	35.00	7	12 x 60	386	35	1 1	12 x 60 12 x 24	610	1065	105
122	84	71	74	41	1	8,000	16,500	3 12	20 x 20 16 x 20	471	35.00	7	12 x 60	471	35	1 1	12 x 60 12 x 24	610	1065	105
125	108	71	88	53	1	10,000	21,500	9 9	20 x 20 16 x 20	478	45.00	9	12 x 60	478	45	1 1	12 x 48 12 x 60	755	1340	110
127	108	83	88	53	1	12,000	26,000	9 9	20 x 25 16 x 25	462	56.25	9	12 x 72	481	54	1 1	12 x 48 12 x 60	835	1420	125
130	108	83	88	53	1	14,000	30,000	9 9	20 x 25 16 x 25	533	56.25	9	12 x 72	556	54	1 1	12 x 48 12 x 60	835	1420	125
215	96	59	90	29	1	9,000	13,000	2 8	16 x 25 20 x 25	390	33.33	8	12 x 48	406	32	2	12 x 48	590	1110	105
218	96	59	90	29	1	12,500	18,500	2 8	16 x 25 20 x 25	555	33.33	8	12 x 48	578	32	2	12 x 48	590	1110	105
220	144	71	126	41	1	18,000	27,000	12 12	16 x 20 20 x 20	450	60.00	12	12 x 60	450	60	2	12 x 72	1065	1845	140
222	144	71	126	41	1	25,000	33,000	12 12	16 x 20 20 x 20	550	60.00	12	12 x 60	550	60	2	12 x 72	1065	1845	140
225	180	95	150	53	1	30,000	46,000	9 27	20 x 25 20 x 20	433	106.25	15 15	12 x 72 12 x 12	438	105	3	12 x 60	1735	2710	175
230	180	95	150	53	1	44,000	60,000	9 27	20 x 25 20 x 20	565	106.25	15 15	12 x 72 12 x 12	571	105	3	12 x 60	1735	2710	175

TYPICAL SPECIFICATIONS - MODELS MDA/MD, MDM, AND MRA/MR DIRECT-FIRED UNITS

General

Contractor shall furnish and install Modine Airsystems model(s) ____ MDA/MD 100% outside air direct-fired unit(s), ____ MDM 100% outside air two speed direct-fired unit(s) ____ MRA/MR Outside & Return Air direct-fired unit(s) with the performance as indicated on the equipment schedule shown in the plans. All units shall be ETL certified to ANSI Z83.18

Unit Casing & Configuration

The unit casing shall be constructed from minimum 18 gauge galvanized steel and designed for _____ indoor, _____ outdoor installation. The unit base shall be constructed of minimum 14 gauge galvanized steel and shall be designed for rail, slab, or roof curb mounting. The casing roof shall be designed with a rain drip edge to prevent water from entering the unit. The unit(s) shall include four service access doors (two on each side). Each door shall have a minimum of two tooled access draw tight fasteners. Gas piping and electrical controls shall be mounted in separate enclosures and these enclosures shall have independent service access doors. The blower motor and drives shall be accessible through an access service door. Each unit shall include a minimum of four factory installed lifting lugs for handling and installation.

In addition to the basic unit cabinet, the following factory assembled unit accessories and options shall be included when checked.

_____ Inlet Rain Hood with Bird Screen (horizontal units only) _____ with, _____ without filters — Inlet hood to be constructed of minimum 18 gauge galvanized steel and shall be shipped from the factory fully assembled. The maximum air inlet velocity shall not exceed 720 fpm for hoods without filters, and 520 fpm for hoods with filters. When the inlet hood is supplied with filters, the filters shall be 2" permanent washable aluminum filters.

_____ Motorized Fresh Air Inlet Damper — Constructed of minimum 14 gauge galvanized steel damper frames and minimum 18 gauge galvanized steel damper blades.

_____ V-Bank filter section with 2" _____ permanent aluminum, _____ 30/30 FARR, _____ Throw-A-Way filters — The maximum air velocity through the filters shall not exceed 520 fpm. The V-Bank filter section shall be constructed from minimum 18 gauge galvanized steel and shall be completely factory assembled.

_____ Motorized Discharge Air Damper — Damper shall be constructed from minimum 14 gauge galvanized steel for the damper frames and minimum 18 gauge galvanized steel for the damper blades.

_____ Discharge Air Louver — Discharge louver shall be constructed from minimum 18 gauge galvanized steel. Eachlouver shall have horizontally adjustable air deflection blades for maximum field adjustment. The discharge air louvers shall be:

_____Three-Way End Discharge_____Four-Way Bottom Discharge_____ Support stand for vertical unit(s) — Support stand height shall be _____ 24 inch, _____ 48 inch, _____ 72 inch. The support stand shall be completely factory assembled prior to shipment. The stand _____ requires, _____ does not require an inlet screen.

Air-dried gray industrial enamel paint for added corrosion protection on:

_____Blower & Burner Cabinet _____Inlet Rain Hood
_____Inlet Air Damper _____V-Bank Filter Section
_____Discharge Air Damper

The following items shall be supplied with 1", 1-1/2 pound-density insulation:

_____ Blower Cabinet _____ Burner Cabinet _____ V-Bank Filter Section

A factory supplied prefabricated _____ 14", _____ 24" roof curb shall be provided — The roof curb shall be constructed of corrosion resistant galvanized steel with the following minimum gauges based on the unit size.

Model Sizes 110-118, 215-218 Minimum 14 Gauge
Model Sizes 120-130, 220-230 Minimum 12 Gauge

Blower(s) and Motor

The basic unit shall include _____ one, _____ two forward curbed DWDI blower(s) properly sized to supply _____ cfm against a total static pressure of _____" wc using a _____ hp motor. The total static pressure shall include allowances for a minimum pressure drop of _____" wc for field connected ductwork, excluding the pressure drop for factory supplied accessories.

The blower motor shall have the following characteristics.

_____ Open Drip Proof, _____ Totally Enclosed
_____ Standard Efficiency, _____ High Efficiency
_____ Single Speed
_____ 1800/1200 Two Speed
_____ 115V/60Hz/1ø
_____ 208V/60Hz/1ø, _____ 230V/60Hz/1ø
_____ 208V/60Hz/3ø, _____ 230V/60Hz/3ø
_____ 460V/60Hz/3ø
_____ 575V/60Hz/3ø

Units having motor horsepower of 10 hp or below shall be provided with adjustable motor drive sheaves. Units with motor horsepower greater than 10 hp shall have _____ fixed, _____ adjustable motor drive sheaves. All units with three phase motors shall be provided with a factory installed and wired motor starter _____ with, _____ without an auxiliary starter contact.

Units with a single blower shall have minimum internal side wall clearances (including insulation) of not less than one half of the blower wheel diameter. Units with twin blowers shall have minimum internal side wall clearances (including insulation) of not less than one half of the blower wheel diameter, and a distance between the blowers of not less than one blower diameter. Extend blower bearing grease line _____ are, _____ are not required.

Gas Controls

All gas controls shall be designed for use with _____ natural, _____ propane gas using an inlet supply pressure of _____" wc, _____ psig. For units with 24Volt controls, with inlet gas pressures between 1-5 PSIG a separate factory supplied regulator shall be included. For inlet gas pressures greater than 5 PSIG a separate factory supplied gas regulator shall be included. When checked, the gas controls shall comply with the following insurance requirements.

_____ FM Less Restriction
_____ FM With Restriction
_____ IRI

The standard gas controls and manifold system shall include, at a minimum, a main gas hand shut-off valve, hand shut-off valve, pilot gas hand shut-off valve, main gas regulator, pilot gas regulator, main gas solenoid valve, redundant main gas solenoid valve, pilot gas solenoid valve, modulating gas valve, and three gas pressure test ports.

TYPICAL SPECIFICATIONS - MODELS MDA/MD, MDM AND MRA/MR DIRECT-FIRED UNITS

Ignition and Safety Controls

The unit(s) shall be supplied with intermittent pilot ignition with 100% lockout on flame failure with a manual reset. These controls shall include, at a minimum, a flame safeguard control, spark pilot ignitor generator, high temperature limit control, primary and secondary electrical circuit fuses, air flow proving switch, and a safety prepurge timed delay relay.

Temperature Controls

Each unit shall be supplied with a remote control panel having a _____ general purpose, _____ NEMA 12 enclosure and compatible with the temperature control system specified.

The unit(s) shall be supplied with the control system as checked below.

_____ System 14 (Maxitrol) Electronic Modulating Discharge Air Temperature controls shall be provided. This system shall include a remote temperature dial for adjusting the set point of the discharge air temperature sensor. The discharge air sensor shall monitor the discharge air temperature and modulate the firing rate of the main burner to maintain the desired discharge air temperature. The temperature range of the remote temperature dial shall be 55-90°F.

A room temperature override thermostat which acts as a room temperature low limit stat _____ is, _____ is not to be provided.

_____ System 44 (Maxitrol) Electronic Modulating Room Temperature controls shall be provided. This system shall include a modulating room thermostat to regulate the firing rate of the main burner based on space temperature thermostat demand. The temperature set point range of the room thermostat is to be 55-90°F.

This system is also to include a discharge air sensor which serves as a high and low temperature limit. The discharge air sensor will prevent make-up air from being delivered to the space at temperatures which are below its set point, even if the room thermostat is satisfied, and willprevent the room thermostat from over-firing the burner when mild outdoor temperatures exist, and the maximum firing capacity of the burner is not required to achieve the desired winter design discharge air temperature.

_____ DCC compatible controls (Maxitrol A200) Electronic Modulating controls shall be provided. The system shall include and electronic modulating control system which utilizes a 0-10 Vdc or 4-20 mA input signal (by others) to control the discharge air temperature. The input signal to the electronic modulating gas valve is controlled by a discharged air sensor (by others) that is compatible with the building management systems. An increase or decrease in input signal modulates the main burner gas flow to maintain the desired discharged air temperature.

Provided with this system is a discharged air sensor which is used as a high temperature limit control. The discharged air sensor will prevent make-up air being delivered to the space that is above the recommended operating limits.

Electrical

The unit(s) shall be completely factory wired to provide for single point wiring for the main power supply to the unit. Supply voltage to the unit shall be:

_____ 115V/60Hz/1ø,
_____ 208V/60Hz/1ø,
_____ 230V/60Hz/1ø,
_____ 208V/60Hz/3ø
_____ 230V/60Hz/3ø
_____ 460V/60Hz/3ø
_____ 575V/60Hz/3ø

The main control panel shall include a number terminal strip for all factory wiring and field wiring connections. The unit(s) shall also include a factory mounted and wired control transformer as required to provide a completely prewired unit with the exception of accessory temperature control devices and remote control station and damper operates when these accessories are shipped separately. Units which must be split shipped because of their physical size shall have electrical wire connections tagged and numbered for ease of reconnection during installation.

The unit(s) shall be provided with the following main power disconnect switch when checked.

_____ Indoor Field Mounted General Purpose Disconnect
_____ Outdoor Field Mounted NEMA 3R Disconnect
_____ Indoor/Outdoor Factory Mounted Dead Front Disconnect

The following additional controls or electrical devices shall be supplied when checked.

_____ High Gas Pressure Switch
_____ Low Gas Pressure Switch
_____ Dirty Filter Light & Pressure Switch
_____ Freeze Protection with Automatic Timed Delay
_____ Fire Stat
_____ Exhaust Fan Interlock
_____ Interlocking Relay
_____ Mild Temperature Inlet On/Off Duct Stat
_____ Additional Switch on Remote Control Panel
_____ Additional Light on Remote Control Panel
_____ Additional Burner High Limit
_____ Substitute Motorized Main Gas Valve
_____ Proof of Closure Switch for Motorized Valve
_____ 10 Point Circuit Analyzer
_____ 12 Point Circuit Analyzer
_____ 14 Point Circuit Analyzer
_____ 7 Day Time Clock
_____ 7 Day Time Clock with Set Back Thermostat
_____ Digital 7 Day Time Clock with Battery Carryover
_____ Digital 7 Day Time Clock with Battery Carryover and Night Set Back Thermostat
_____ Night Set Back Thermostat
_____ Room Override Thermostat
_____ Building Door Switch
_____ Alarm Horn with Silencing Switch
_____ Unit Service Door Electrical Interlocks
_____ Service Receptacle
_____ Service Receptacle with Light & Light Switch
_____ Hood/V-Bank Support

Installation

Contractor is to install units according to manufacturers published installation instructions, ANSI Z223.1 (also known as NFPA 54 National Fuel Gas Code), and in accordance with all local codes.

After installation, installer is to perform a complete start-up check as recommended by the manufacturer. A copy of the start-up report shall be left with the owner, and one copy sent to the manufacturer.

INDOOR AIR SOLUTIONS

Products from Modine are designed to provide indoor air-comfort solutions for commercial, institutional and industrial applications. Whatever your heating and ventilating requirements, Modine has the product to satisfy your needs, including:

- Gas-fired unit heaters
- Gas-fired duct furnaces
- Gas-fired high-intensity infrared heaters
- Gas-fired low-intensity infrared heaters
- Steam/hot water unit heaters
- Steam/hot water cabinet unit heaters
- Steam/hot water commercial fin tube radiation
- Oil-fired unit heaters
- Electric unit heaters
- Indoor gravity vented duct furnace make-up air units
- Indoor gravity vented multiple duct furnace make-up air units
- Indoor separated combustion duct furnace make-up air units
- Indoor separated combustion multiple duct furnace make-up air units
- Outdoor duct furnace make-up air units
- Outdoor multiple duct furnace make-up air units
- Direct-fired make-up air units

With burner capacities up to 7,128,000 Btu/hr and air-handling capacities as high as 60,000 CFM, Modine products are compatible with every fuel type, including:

• Natural or Propane Gas • Steam/Hot Water • Oil • Electric

Specific catalogs and computer-generated heat-loss calculations are available for each product. Catalogs 75-136 and 75-137 provide details on all Modine HVAC equipment.

The Modine brand has been the industry standard since Arthur B. Modine invented and patented the first lightweight, suspended hydronic unit heater in 1923. No other manufacturer can provide the combined application flexibility, technical expertise and fast delivery found at Modine. Consult your local Modine distributor for help in solving your indoor air problems.

Distributed By:

MODINE

Commercial HVAC&R Division
Modine Manufacturing Company
1500 DeKoven Avenue
Racine, Wisconsin 53403-2552
Phone: 1.800.828.4328 (HEAT)
Fax: 1.262.636.1665
www.modine.com

© Modine Manufacturing Company, 2002, C12/02 - M Litho in USA