

# INSTALLATION AND MAINTENANCE



Smart Heating Solutions

**MakeUp Air Unit  
MAU Series**



DANGER

ELECTRIC SHOCK OR FIRE HAZARD

READ ALL WIRE SIZING, VOLTAGE REQUIREMENTS AND SAFETY DATA TO AVOID PROPERTY DAMAGE AND PERSONAL INJURY

WARNING

**READ CAREFULLY** - Use the heater only as described in this manual. Any other use is not recommended and could result in fire, electric shock, and personal injury. Following these instructions will prevent difficulties that might occur during the installation and use of the heater. Please study the instructions first, as they may save considerable time and trouble during use, in addition to providing important safety information. Save these instructions for future use.

## NEVER LEAVE HEATER UNATTENDED WHILE CONNECTED TO A POWER SOURCE

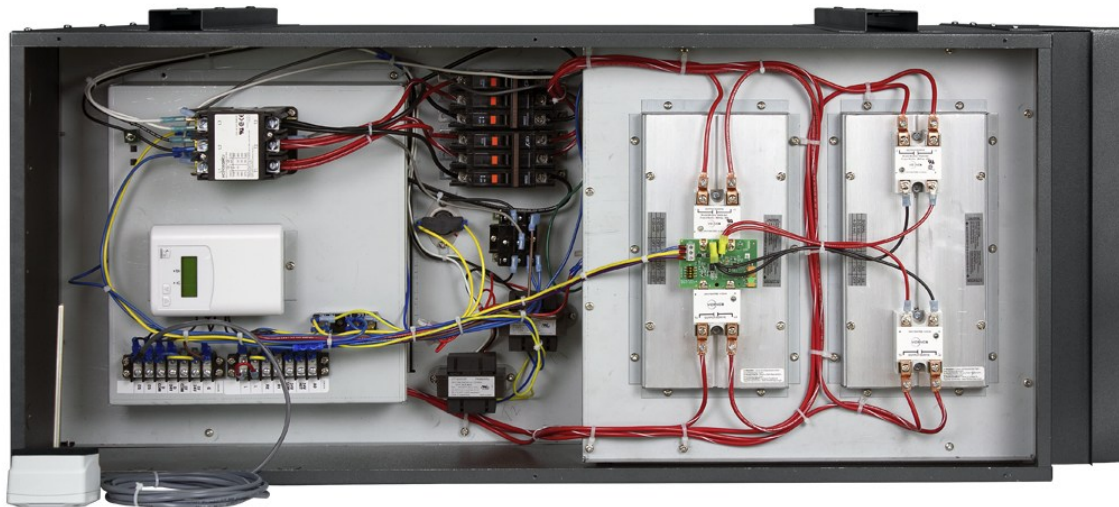
- WARNING** To prevent a possible electrical shock, disconnect all power coming to heater at main service panel before wiring or servicing.
- WARNING** All wiring must be in accordance with the National Electrical Code (Canadian Electrical Code in Canada) and all applicable local codes. The heater must be grounded as a precaution against electrical shock. Supply wiring must be copper and suitable for at least 75° C.
- WARNING** Verify power supply and control voltages coming to the heater match the ratings printed on the heater nameplate before energizing.
- WARNING** Heater must be installed so the minimum clearances shown in Specifications table are maintained.
- WARNING** This heater is NOT suitable for use in hazardous locations as described by the National Fire Protection Association (NFPA). this heater has hot and arcing or sparking parts inside. DO NOT use in areas where gasoline, paint or other flammable liquids are used or stored.
- WARNING** The mounting structure and anchoring hardware MUST BE capable of reliably supporting the weight of the heater plus mounting bracket if used. Refer to specifications table for heater weight.
- WARNING** Heater air flow MUST be directed parallel to or away from adjacent walls.
- WARNING** To prevent a possible fire, DO NOT block air intakes or exhaust openings in any manner. DO NOT allow foreign objects to enter grille openings as this may cause electric shock, fire or damage to heater.



**CAUTION—RISK OF ELECTRIC SHOCK  
DO NOT OPEN HEATER SHELL  
NO USER—SERVICEABLE PARTS INSIDE**



# MAU Series INSTALLATION INSTRUCTIONS



## PRODUCT DESCRIPTION

The King make up air unit (MAU) is a packaged unit comprised of a fan driven fully modulating electric heating unit with a fresh air relay logic control circuit providing an extremely versatile all-in-one packaged unit. It is designed to supplement other HVAC equipment by providing quality indoor air into the return side or supply side of the ductwork system or alternatively directly into the building space.

## WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 24 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the installation instructions shipped with the product.
2. The equipment is not installed in accordance with federal, state, and local codes and regulations.
3. The equipment is used in the manner not intended by the manufacturer. Any internal wiring changes, modifications or bypass of any controls, or installation practices not according to the details of the instruction manual will void the product warranty.
4. The equipment is misused or neglected, or not maintained per industry standards.
5. The equipment is not operated within its published requirements and standards.
6. The installer is not authorized to make any modifications to the MAU the unit without factory consent. The installer will be held responsible for any damage resulting from this modification, and the UL certification could be void.

King shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in materials or workmanship within the 24-month warranty period, upon examination by King, such part will be repaired or replaced at no charge. The customer shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without prior written authorization and all returned equipment shall be shipped freight prepaid to King.

**WARNING****EQUIPMENT AND PERSONAL HAZARD WARNINGS**

Before installing and operating this product, the user and/or installer must read, understand, and follow these instructions. This product must be installed by a qualified HVAC technician and the power connection by a certified electrician, in accordance with the NEC and local building codes. The following instructions must be followed to avoid personal injury, death, or property damage:

1. When performing installation, servicing, or cleaning of the system, it is recommended to wear safety glasses and gloves.
2. Make sure that all screws and electrical terminal connections are tightly secured before operating the unit in case they may have loosened during transportation.
3. Protect the equipment with the appropriately sized circuit breaker or fuse.
4. Make sure the line voltage matches with that indicated on the unit's nameplate.
5. The MAU must be grounded.
6. Switch off the power at the circuit breaker/fuse before installing, repairing, or cleaning the unit.
7. Make sure the unit is sized appropriately for the intended use. If the unit's capacity is undersized for the application, it could prematurely fail.
8. When notching or drilling into framing, rim joists, and wall studs, comply with code and manufacturer limitations on allowable modifications to these structural members.
9. Maintain the minimum clearance distances indicated on Page 7 of this manual.
10. When cutting or drilling into wall or ceiling, do not damage electrical wiring or other hidden utilities.
11. This unit must not come in contact with water and must be protected from splashes. Do not use if any part of the unit has been immersed. Moreover, do not turn it on or off when standing in water or if your hands are wet.
12. The unit can be hot when in use, it may pose a burn risk even under normal operation. To avoid burns, do not let bare skin touch any hot surfaces. Let the unit cool down before handling or servicing it.
13. Do not block the intake air or discharge air ducts. This obstruction could lead to overheating, which could result in a fire. Do not insert or allow foreign objects to enter any air duct as this may cause electric shocks, fires, or damage to the unit.
14. It is not designed to be used or stored in wet areas or areas containing flammable liquids, combustible materials, or corrosive chemicals.
15. It is the user's responsibility to evaluate the frequency that the filter must be changed based on the cleanliness of the environment it is operating in. An excessively dirty filter may lead to the MAU malfunctioning which could cause a fire hazard.
16. A tripped high temperature limit control indicates that the unit has been subjected to abnormal operating conditions. If the limit control continues to cycle on and off, then a qualified contractor must examine the MAU to find out the source of the problem and repair it. If the unit is damaged or defective, cut off power supply at the circuit breaker/fuse immediately and do not use the unit until it is repaired.

**SYSTEM INSTALLATION WARNINGS**

1. This system is not designed to provide combustion air for fuel-burning appliances.
2. Do not connect the system directly to a combustion appliance of any type.
3. Do not locate outside air inlet near hazardous materials or explosives.

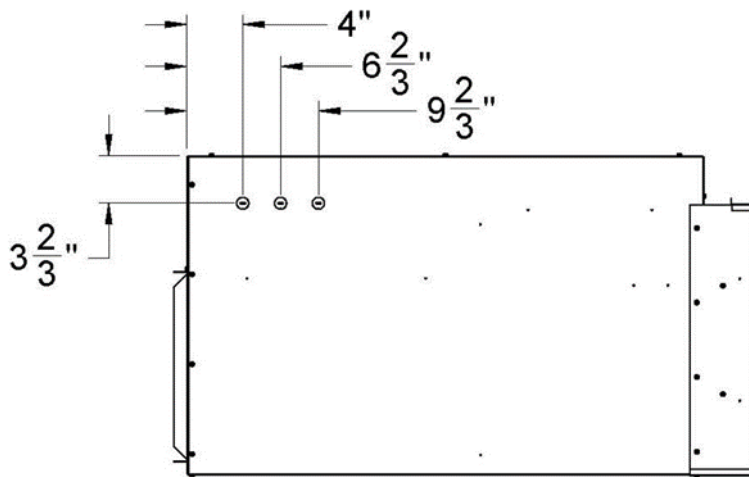


**WARNING**

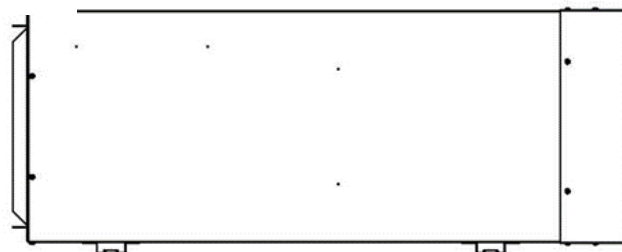


4. System shall not be installed to introduce air from crawl spaces, garages, attics, adjacent dwelling units, or other locations within the building shell. System shall be installed to bring in fresh air directly from outdoors.
5. Do not install the MAU and supply ductwork directly above or closer than 36 inches to any furnace or its supply plenum, boiler, or other heat producing appliance.
6. Any ductwork used in conjunction with the system must be installed in compliance with applicable local/national codes.
7. Do not operate the MAU until the filters have been installed.
8. The MAU must be installed in an accessible location which allows for regular inspection and maintenance.
9. The HVAC designer/contractor must take into consideration the effects that the supply of outdoor air by the MAU will have on the building's comfort and mechanical systems. The HVAC designer should know the makeup air system's frequency and duration of use as well as the cfm of outdoor air coming into the building.
10. Do not supply outdoor air to a space or duct where water pipes or water coils could possibly freeze.
11. Locate the outside air inlet hood above any anticipated snow drift level and away from any architectural and landscape features to ensure that the intake area for the outside air duct is never blocked and provides a clear pathway for the incoming air.
12. When federal, or state legislation comprises more restrictive installation and/or certification requirements, these requirements prevail over those in this document and the installer must conform to these at his own expense.

**DIMENSIONAL DIAGRAMS**

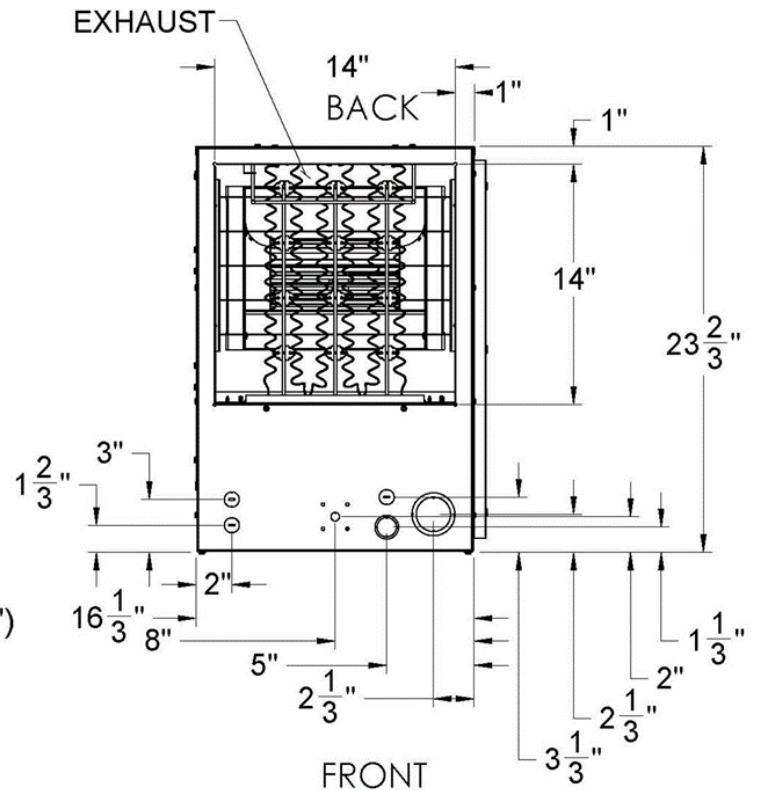
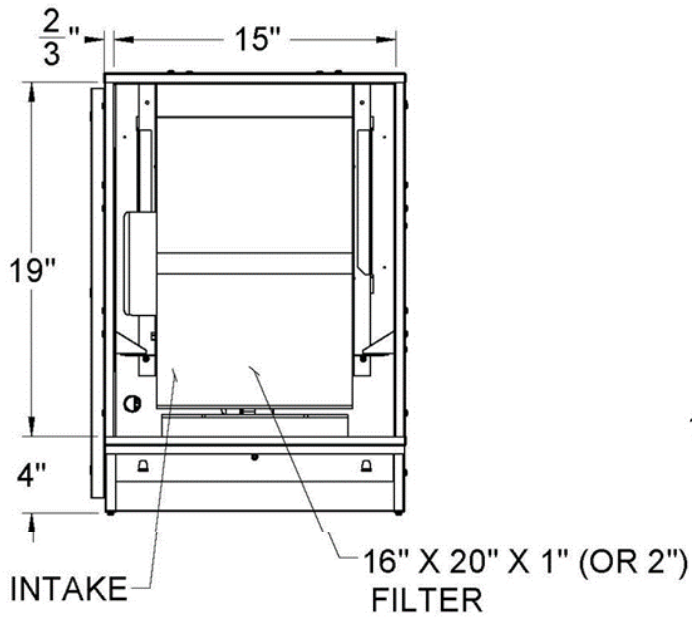
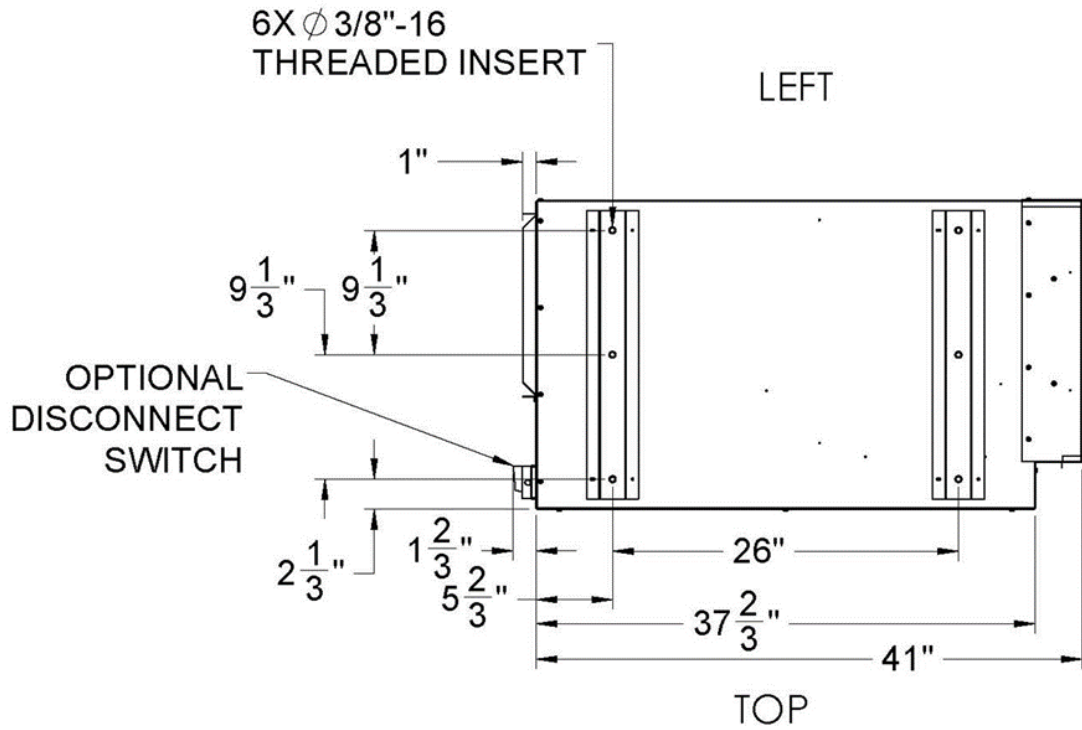


BOTTOM



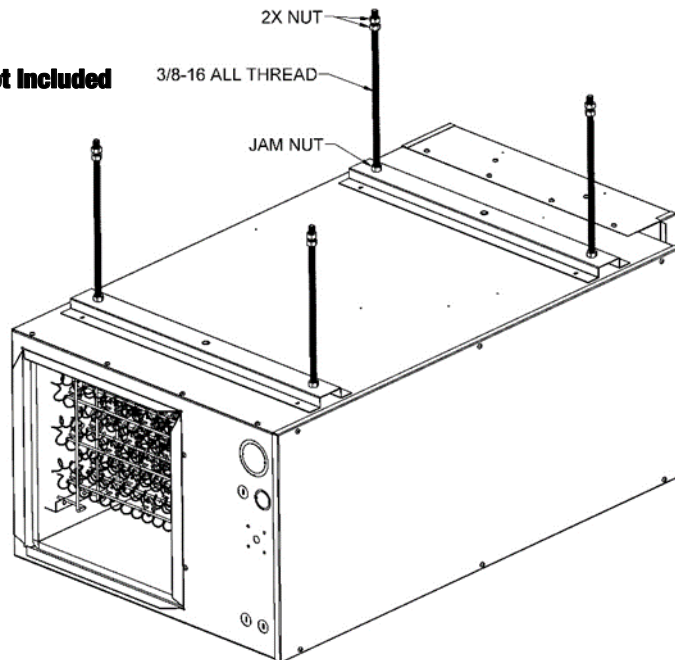
LEFT

# DIMENSIONAL DIAGRAMS



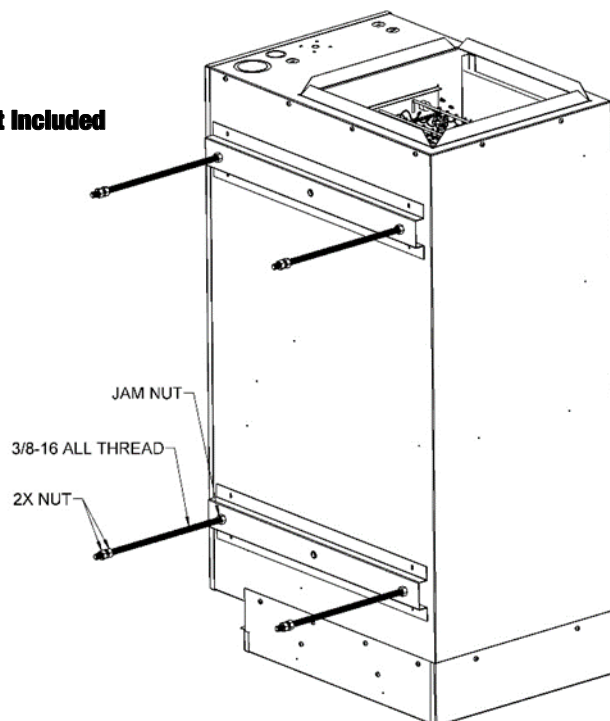
## HORIZONTAL MOUNTING ILLUSTRATION

**Mounting Hardware Not Included**



## VERTICAL MOUNTING ILLUSTRATION

**Mounting Hardware Not Included**





## MOUNTING OF UNIT

1. Select a location that will minimize the noise from vibration and blower air noise to the building occupants. Ideally in a service room intended for this purpose, where the temperature is maintained between 40°F and 100°F and preferably, close to an exterior wall, to limit the length of the insulated inlet air ducts.
2. Unit can be installed vertically or horizontally. When vertical, inlet must face down.
3. Make sure you can easily access the MAU to perform maintenance (24" minimum clearance required from the electrical entrance cover).
4. The unit can be mounted within the ceiling (between joists if it will fit) or ceiling hung, at any convenient location between the outside inlet hood and the fresh air discharge connection.
5. The discharge connection is where the conditioned fresh air is to be distributed within the building, such as a HVAC return air duct or directly into a room or hallway register.
6. Leave a minimum space of 2" above the MAU.

## DUCT SYSTEM

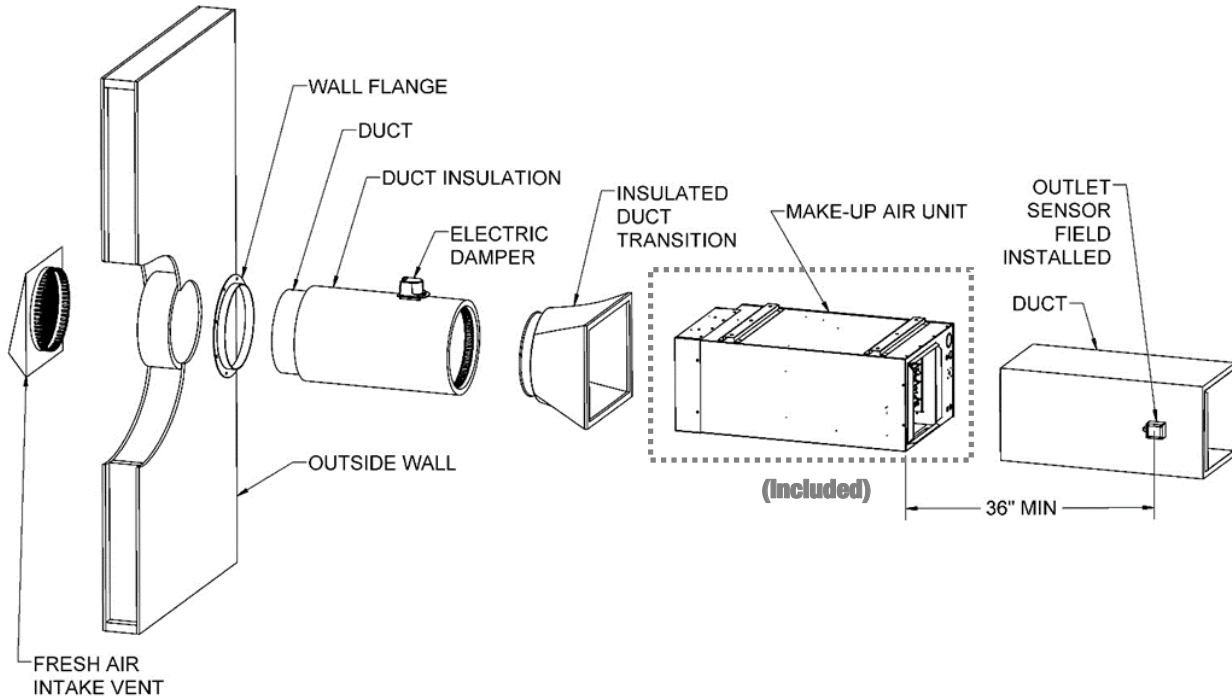
1. The outside hood, damper and ducting material are not included with this unit. It is the installer's responsibility to provide these materials and the necessary weather protection for the inlet.
2. Select the inlet and outlet ducting size in accordance to the system design requirements.
3. Plan the simplest system, using the least number of elbows and joints. Keep the length of insulated ducts to a minimum to prevent a choke point and improve ventilation.
4. Use only rigid metal ducts.
5. Do not install elbows less than twice the diameter of the MAU duct.
6. In cold climates, frost and or condensation may collect on metal parts of this product. Insulated ducting must be used between the outside inlet air hood and the inlet of this unit. Insulate the inlet ducts only, it is not necessary to insulate the outlet ducts as they are heated by the MAU. The inlet damper and insulated inlet piping will prevent cold air migration and a slight incline will keep moisture collection at the inlet end.

## OUTDOOR INLET HOOD

Choose the appropriate location to install the fresh air inlet hood:

1. The fresh air intake hood must be installed at least 18 in. above the ground.
2. Make sure the fresh air intake hood is at least 6 ft. away from the following elements: garbage can or any other contaminating source, gas meter outlet, dryer outlet, any other combustion source outlet.
3. Install the fresh air intake hood at least 3 in. from the edge of the building to avoid turbulence, which could cause dust to enter the hood.
4. See the illustration below on how to connect the fresh air intake hood to the exterior hood.

## ILLUSTRATION OF DUCT SYSTEM COMPONENTS:



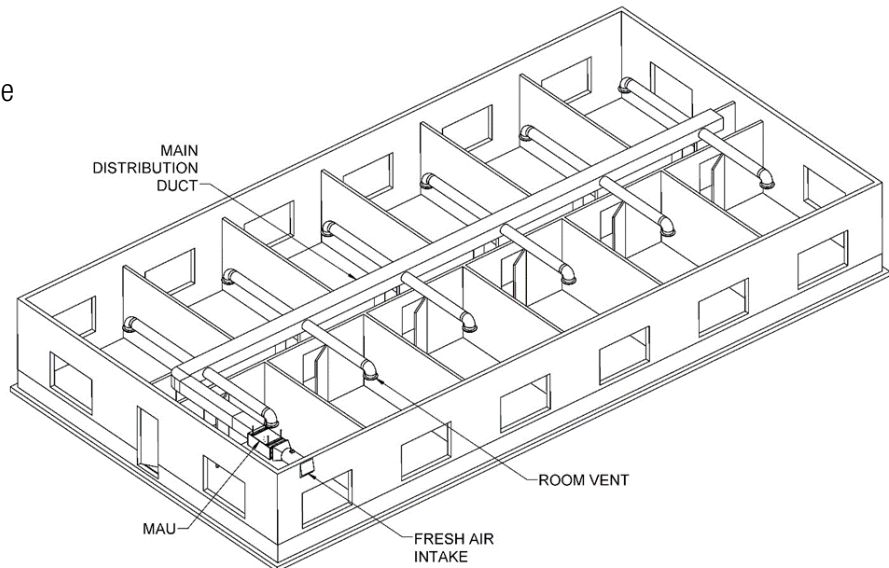
## TYPICAL DUCTING INSTALLATION METHODS

The two most frequently used installation methods are independent installation and installation connected to a forced air system.

### **DIRECT DUCTING INSTALLATION**

The MAU can be installed to have its own dedicated outdoor fresh air duct system that is filtered, pre-heated and then is distributed DIRECTLY to each room and hallway through register grills. In this way, it acts independently to the primary heating system that could be hydronic, electric zonal heat or a centralized HVAC system. When installed as a direct system, make sure the Temperature rise is sufficient to bring adequate warm tempered air into the building.

For example, in a cold climate when the outside air is at 0°F the Temperature rise would need to be at least 70°F to warm the air adequately before delivering it directly to the occupied space.



### **DIRECT DUCTING ILLUSTRATION**



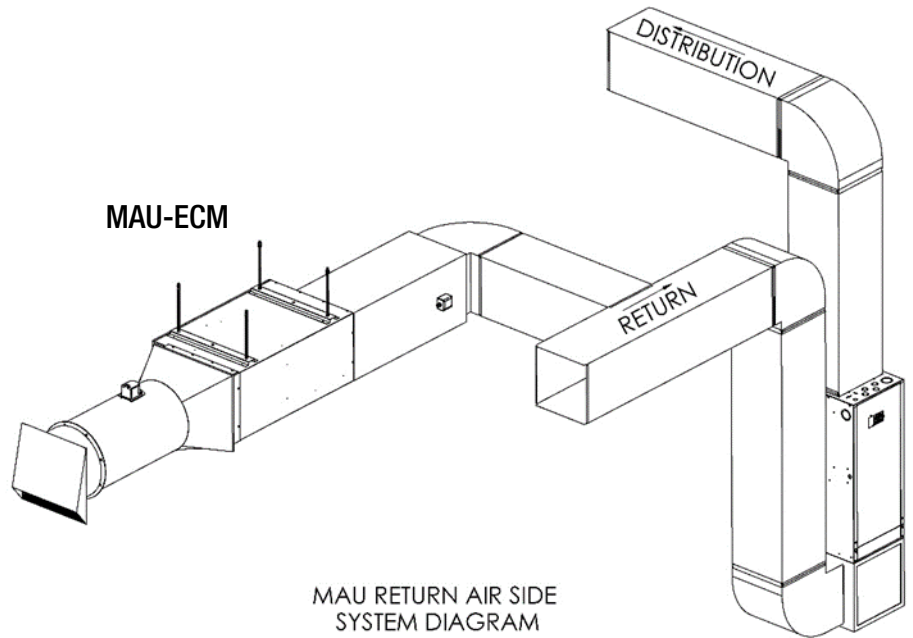
## TYPICAL DUCTING INSTALLATION METHODS

### HVAC RETURN and SUPPLY AIR DUCTING CONNECTION

The second method consists of using the furnace distribution system to distribute fresh air. There are two methods of connecting the device to the furnace: Supply air side connection or Return air side connection.

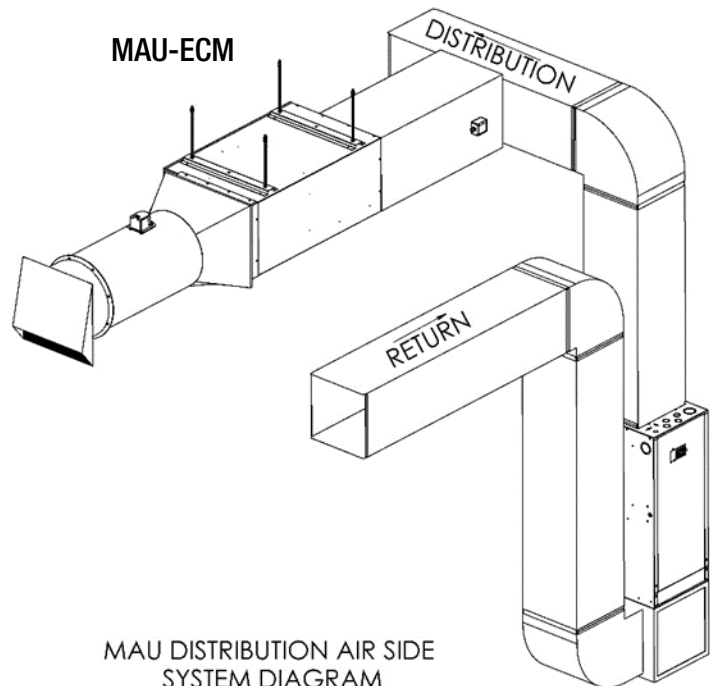
#### **RETURN CONNECTION:**

Cut an opening in the return air duct at least 3 feet from the furnace. Connect this opening to the MAU.



#### **SUPPLY CONNECTION:**

Cut an opening in the supply air duct, at least 2 ft. from the furnace. Connect this opening to the MAU.



# AIRFLOW DESIGN PARAMETERS

The King MAU has a wide range of airflow options that can be field adjusted to match the needs of a specific installation. Providing fresh air into a building has several design parameters that must be taken into consideration:

1. The amount of fresh air required is normally calculated as Cubic Feet per Minute (CFM) per person or CFM per square feet of the building or a room. The required CFM can also be designed to meet a specific exhaust air condition such as in a commercial kitchen where the MAU is set to match the exhaust air of the cooking hoods.
2. Static pressure is one of the most important factors in HVAC design. Simply put, static pressure refers to the resistance to air-flow in a heating and cooling system's components and duct work. To determine operating total external static pressure, measure pressures where air enters and leaves the MAU equipment. Add the two readings together to find total external static pressure. Make sure not to exceed the external static pressures listed in the design tables, doing so will cause harm the equipment.
3. Temperature rise or Delta T is the difference between the incoming air temperature and the discharge temperature of the MAU. In make-up air applications the required temperature rise is influenced by the geographic territory where colder climates require much more heat capacity to temper cold incoming air into the building. Another factor to consider is whether the fresh air is delivered directly such as to a room, hallway or delivered to the supply side of an HVAC system where the conditioned air might need to be 70°F versus the fresh air being delivered to the return air intake where the design temperature could be 55°F. Under sizing the MAU could lead to insufficient delivery temperatures causing colder than desired air to enter the building.

**Air Flow Chart (For 4 to 17.25kW Units with 1/3HP ECM Motor)**

MODEL	KW	TORQUE	0.1"WC		0.2"WC		0.3"WC		0.4"WC		0.5"WC		0.6"WC		0.7"WC		0.8"WC		0.9"WC		1.0"WC		
			CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	
MAU**04	4			(F)		(F)		(F)		(F)													
		6.8	832	15	708	18	593	21	510	25	442	29	374	34	320	39	278	46					
		9.4	1,030	12	919	14	826	15	739	17	658	19	594	21	546	23	494	26					
		12.0	1,168	11	1,085	12	992	13	902	14	835	15	783	16	736	17	700	18					
		17.0	1,376	9	1,320	10	1,259	10	1,189	11	1,116	11	1,060	12	1,016	12	987	13					
MAU**05	5	6.8	832	19	708	22	593	27	510	31	442	36	374	42	320	49	278	57					
		9.4	1,030	15	919	17	826	19	739	21	658	24	594	27	546	29	494	32					
		12.0	1,168	14	1,085	15	992	16	902	18	835	19	783	20	736	21	700	23					
		17.0	1,376	11	1,320	12	1,259	13	1,189	13	1,116	14	1,060	15	1,016	16	987	16					
		20.0	1,582	10	1,536	10	1,462	11	1,380	11	1,275	12	1,192	13	1,107	14	1,043	15					
MAU**08	8	6.8	832	30	708	36	593	43	510	50	442	57	374	68	320	79	278	91					
		9.4	1,030	25	919	27	826	31	739	34	658	38	594	43	546	46	494	51					
		12.0	1,168	22	1,085	23	992	25	902	28	835	30	783	32	736	34	700	36					
		17.0	1,376	18	1,320	19	1,259	20	1,189	21	1,116	23	1,060	24	1,016	25	987	26					
		20.0	1,582	16	1,536	16	1,462	17	1,380	18	1,275	20	1,192	21	1,107	23	1,043	24					
MAU**10	10	6.8	832	38	708	45	593	53	510	62	442	71	374	84	320	99	278	NR					
		9.4	1,030	31	919	34	826	38	739	43	658	48	594	53	546	58	494	64					
		12.0	1,168	27	1,085	29	992	32	902	35	835	38	783	40	736	43	700	45					
		17.0	1,376	23	1,320	24	1,259	25	1,189	27	1,116	28	1,060	30	1,016	31	987	32					
		20.0	1,582	20	1,536	21	1,462	22	1,380	23	1,275	25	1,192	27	1,107	29	1,043	30					
MAU**12	12	6.8	832	46	708	54	593	64	510	74	442	86	374	101	320	NR	278	NR					
		9.4	1,030	37	919	41	826	46	739	51	658	58	594	64	546	69	494	77					
		12.0	1,168	32	1,085	35	992	38	902	42	835	45	783	48	736	52	700	54					
		17.0	1,376	28	1,320	29	1,259	30	1,189	32	1,116	34	1,060	36	1,016	37	987	38					
		20.0	1,582	24	1,536	25	1,462	26	1,380	27	1,275	30	1,192	32	1,107	34	1,043	36					
MAU**15	15	6.8	832	57	708	67	593	80	510	93	442	107	374	NR	320	NR	278	NR					
		9.4	1,030	46	919	52	826	57	739	64	658	72	594	80	546	87	494	96					
		12.0	1,168	41	1,085	44	992	48	902	53	835	57	783	61	736	64	700	68					
		17.0	1,376	34	1,320	36	1,259	38	1,189	40	1,116	42	1,060	45	1,016	47	987	48					
		20.0	1,582	30	1,536	31	1,462	32	1,380	34	1,275	37	1,192	40	1,107	43	1,043	45					
MAU**18	17.25	6.8	832	66	708	77	593	92	510	107	442	NR	374	NR	320	NR	278	NR					
		9.4	1,030	53	919	59	826	66	739	74	658	83	594	92	546	100	494	110					
		12.0	1,168	47	1,085	50	992	55	902	60	835	65	783	70	736	74	700	78					
		17.0	1,376	40	1,320	41	1,259	43	1,189	46	1,116	49	1,060	51	1,016	54	987	55					
		20.0	1,582	34	1,536	35	1,462	37	1,380	40	1,275	43	1,192	46	1,107	49	1,043	52					

A \*\* Represents the voltage, 20=208V, 24=240V, 48=480V. Voltage of the MAU unit does not affect the data in this table.

B NR= Not Recommended, Temperature Rise is above maximum design parameter.

C The highlighted cells are the factory default torque setting for each model. The ECM motor has 5 field adjustable torque settings, allowing for a wide range of design choices.

E Blower: 10" diameter, 8" wide

# AIRFLOW DESIGN PARAMETERS

**Air Flow Chart (For 20 to 25kW Units with 1/2HP ECM Motor)**

MODEL	KW	0.1"WC		0.2"WC		0.3"WC		0.4"WC		0.5"WC		0.6"WC		0.7"WC		0.8"WC		0.9"WC		1.0"WC			
		TORQUE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	
MAU**20	20			(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)	
		15.0			1,258	50	1,262	50	1,193	53	1,132	56	1,054	60	910	69	834	76	821	77	705	90	
		19.0			1,466	43	1,419	45	1,300	49	1,285	49	1,218	52	1,180	54	1,015	62	979	65	934	68	
		22.5			1,575	40	1,570	40	1,564	40	1,363	46	1,347	47	1,284	49	1,256	50	1,200	53	1,152	55	
		26.0			1,690	37	1,679	38	1,640	39	1,546	41	1,472	43	1,430	44	1,378	46	1,358	47	1,315	48	
MAU**25	25	15.5			1,258	63	1,262	63	1,193	66	1,132	70	1,054	75	910	87	834	95	821	96	705	NR	
		19.0			1,466	54	1,419	56	1,300	61	1,285	61	1,218	65	1,180	67	1,015	78	979	81	934	85	
		22.5			1,575	50	1,570	50	1,564	51	1,363	58	1,347	59	1,284	62	1,256	63	1,200	66	1,152	69	
		26.0			1,690	47	1,679	47	1,640	48	1,546	51	1,472	54	1,430	55	1,378	57	1,358	58	1,315	60	
		30.0			1,771	45	1,766	45	1,723	46	1,728	46	1,569	50	1,542	51	1,522	52	1,487	53	1,415	56	

A \*\* Represents the voltage, 20=208V, 24=240V, 48=480V. Voltage of the MAU unit does not affect the data in this table.  
 B NR= Not Recommended, Temperature Rise is above maximum design parameter.  
 C The highlighted cells are the factory default torque setting for each model. The ECM motor has 5 field adjustable torque settings, allowing for a wide range of design choices.  
 E Blower: 10" diameter, 8" wide

**Air Flow Chart (For 20 to 25kW Units with OPTIONAL 3/4HP ECM Motor)**

MODEL	KW	0.1"WC		0.2"WC		0.3"WC		0.4"WC		0.5"WC		0.6"WC		0.7"WC		0.8"WC		0.9"WC		1.0"WC			
		TORQUE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	
MAU**20	20			(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)	
		26.0			1,592	40	1,592	40	1,581	40	1,551	41	1,529	41	1,496	42	1,432	44	1,353	47	1,231	51	
		30.0			1,789	35	1,758	36	1,716	37	1,650	38	1,598	40	1,552	41	1,451	41	1,451	44	1,282	49	
		35.0			1,814	35	1,819	35	1,828	35	1,866	34	1,849	34	1,794	35	1,688	37	1,561	40	1,316	48	
		40.5			2,080	30	2,122	30	2,082	30	2,054	31	1,916	33	1,814	35	1,700	37	1,482	43	1,230	51	
MAU**25	25	26.0			1,592	50	1,592	50	1,581	50	1,551	51	1,529	52	1,496	53	1,432	55	1,353	58	1,231	NR	
		30.0			1,789	44	1,758	45	1,716	46	1,692	47	1,650	48	1,598	49	1,552	51	1,451	54	1,282	62	
		35.0			1,814	44	1,819	43	1,828	43	1,866	42	1,849	43	1,794	44	1,688	47	1,561	51	1,316	60	
		40.5			2,080	38	2,122	37	2,082	38	2,054	38	1,916	41	1,814	44	1,700	46	1,482	53	1,230	64	
		45.0			2,174	36	2,154	37	2,139	37	2,138	37	2,094	38	1,928	41	1,671	47	1,471	54	1,232	64	

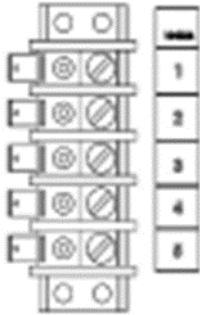
**Air Flow Chart (For 30 to 35kW Units with 3/4HP ECM Motor)**

MODEL	KW	0.1"WC		0.2"WC		0.3"WC		0.4"WC		0.5"WC		0.6"WC		0.7"WC		0.8"WC		0.9"WC		1.0"WC		
		TORQUE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE
MAU**30	30			(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)		(F)
		26.0			1,592	60	1,592	60	1,581	60	1,551	61	1,529	62	1,496	63	1,432	NR	1,353	NR	1,231	NR
		30.0			1,789	53	1,758	54	1,716	55	1,692	56	1,650	57	1,598	59	1,552	61	1,451	65	1,282	74
		35.0			1,814	52	1,819	52	1,828	52	1,866	51	1,849	51	1,794	53	1,688	56	1,561	61	1,316	72
		40.5			2,080	46	2,122	45	2,082	46	2,054	46	1,916	49	1,814	52	1,700	56	1,482	64	1,230	77
MAU**35	35	26.0			1,592	69	1,592	69	1,581	60	1,551	71	1,529	72	1,496	NR	1,432	NR	1,353	NR	1,231	NR
		30.0			1,789	62	1,758	63	1,716	64	1,692	65	1,650	67	1,598	69	1,552	71	1,451	NR	1,282	NR
		35.0			1,814	61	1,819	61	1,828	60	1,866	59	1,849	60	1,794	62	1,688	66	1,561	71	1,316	84
		40.5			2,080	53	2,122	52	2,082	53	2,054	54	1,916	58	1,814	61	1,700	65	1,482	75	1,230	90
		45.0			2,174	51	2,154	51	2,148	52	2,138	52	2,094	53	1,928	57	1,671	66	1,471	75	1,232	90

A \*\* Represents the voltage, 20=208V, 24=240V, 48=480V. Voltage of the MAU unit does not affect the data in this table.  
 B NR= Not Recommended, Temperature Rise is above maximum design parameter.  
 C The highlighted cells are the factory default torque setting for each model. The ECM motor has 5 field adjustable torque settings, allowing for a wide range of design choices.  
 E Blower: 10" diameter, 8" wide

## MOTOR TORQUE FIELD ADJUSTMENT

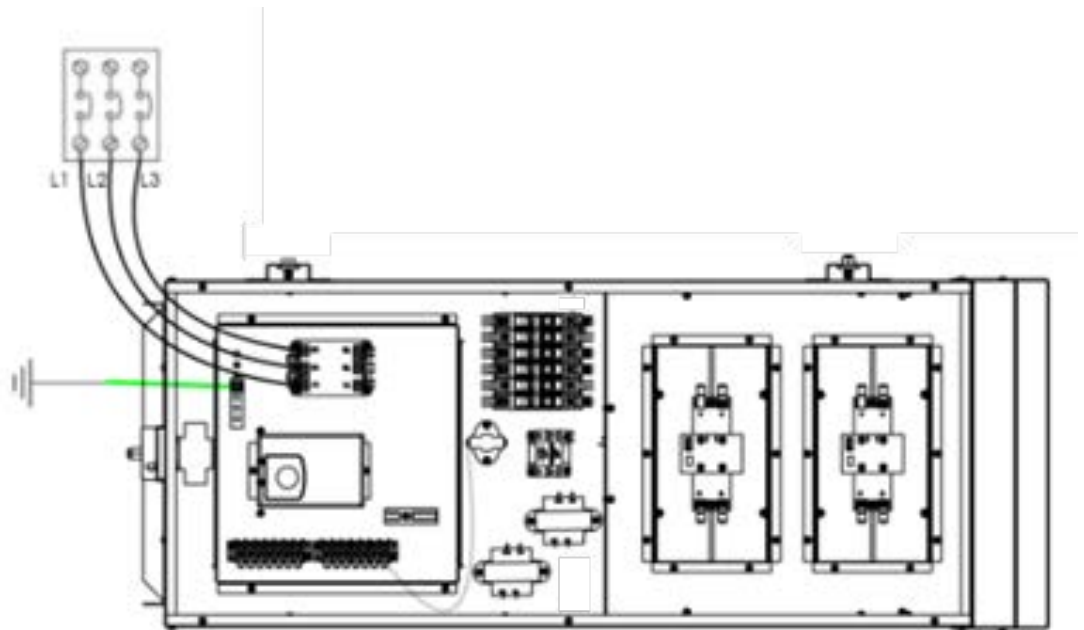
The versatility of the King MAU allows for the ECM motor torque to be adjusted in the field. Pressure test the system to find the actual external static pressure, then fine tune the system by adjusting the motor torque. The goal is to meet the CFM/Temperature rise combination for the intended design criteria. Refer to the diagram below showing the terminal strip. The ECM motor is pre-programmed with 5 torque values and terminated at the 5-point terminal strip. Only one speed can be selected for the modulating heat mode and one speed for fan only mode. Note: the heat mode and fan mode cannot be wired to the same speed, otherwise a back feed will energize the heat circuit in fan mode.



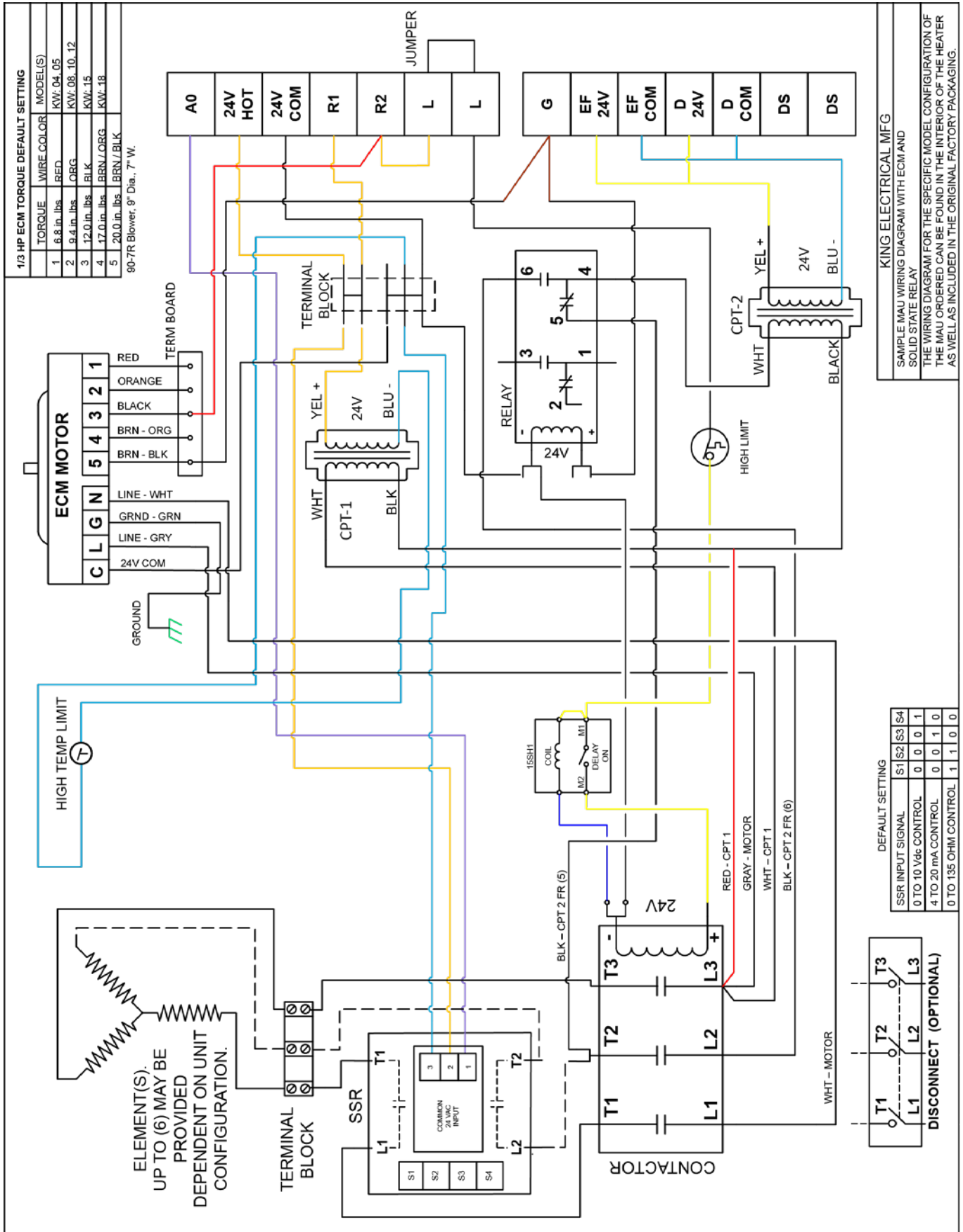
Motor Tap#	1/3 HP Torque	1/2 HP Torque	3/4 HP Torque	Wire Color
1	6.8 in-lb.	15.5 in-lb.	26.0 in-lb	RED
2	9.4 in-lb.	19.0 in-lb.	30.0 in-lb	ORANGE
3	12.0 in-lb.	22.5 in-lb.	35.0 in-lb	BLACK
4	17.0 in-lb.	26.0 in-lb.	40.5 in-lb	ORANGE/BLACK
5	20.0 in-lb.	30.0 in-lb.	45.0 in-lb	BROWN/BLACK

## LINE VOLTAGE ELECTRICAL CONNECTIONS

Refer to the wiring diagram provided with the MAU for the supply line connection points, typically a two or three pole contactor marked L1, L2, L3 and Ground. Size the wire gage supplying the unit per the NEC building wire ampacity standards and protect the supply circuit with the appropriately sized circuit breaker or fuse. Install a disconnect switch when called for, an optional field installed disconnect is available, refer to the data table to select the correct model number.



# SAMPLE MAU WIRING SCHEMATIC





## LOW VOLTAGE CONTROL WIRING

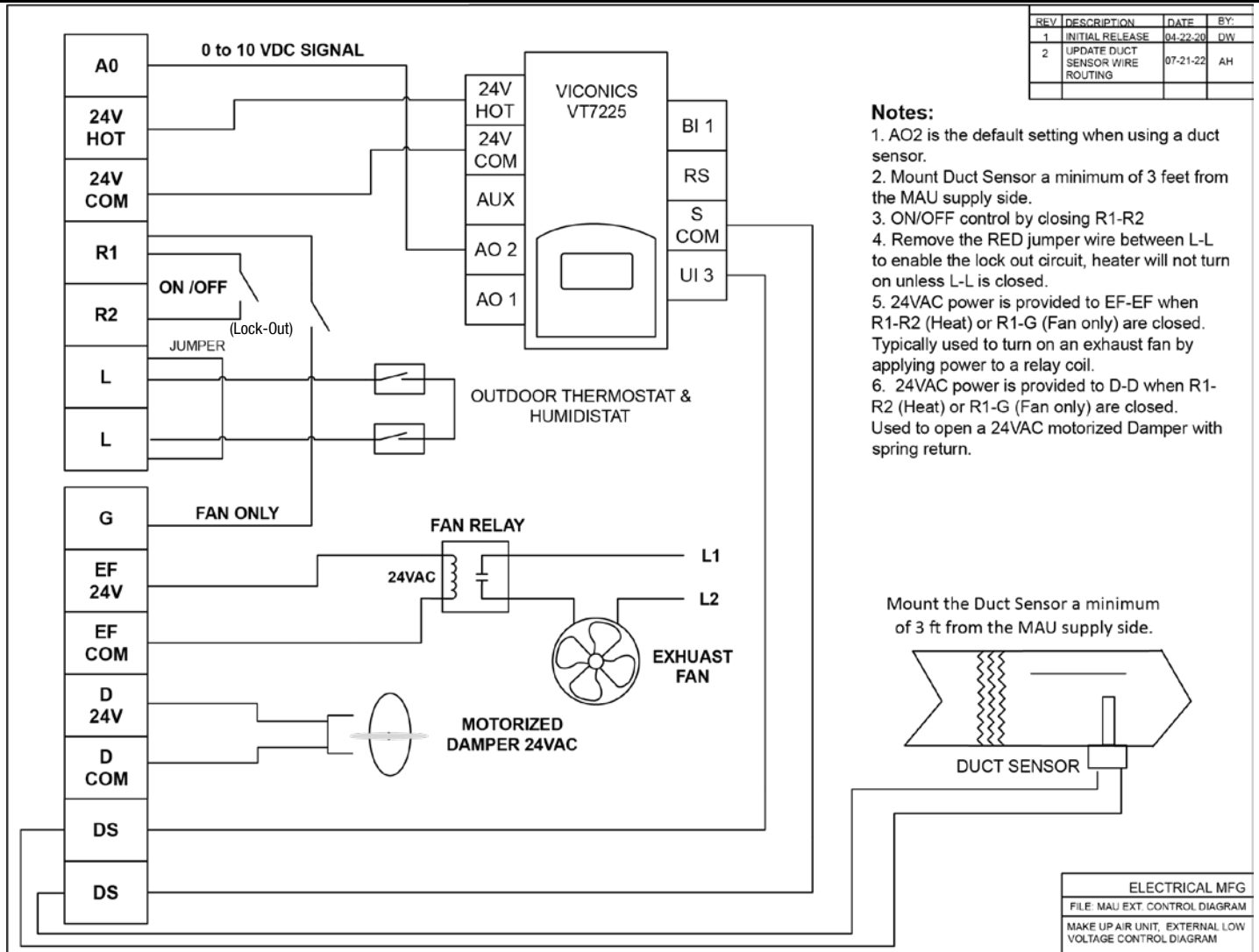
The King MAU has a built-in relay logic control circuit enabling other make up air components to be controlled directly by the MAU. Review all the system components such as the damper, exhaust fans, outside thermostat and humidistat. All the control options are prewired to a 14-point terminal strip making them easy to integrate by the installer. The control circuit does not require any programming, simply enabled the control features by wiring the external components directly to the MAU low voltage terminal strip. List of control features:

1. R1-R2, ON/OFF control of the MAU. Closing this circuit via a dry contact will turn on the fan and the modulating heating circuit. This is often done by a building management system, but other common methods are to be activated by a current transformer (CT) on an exhaust fan, a timer, or a manual switch. Once on, the Solid-State Relay (SSR) regulates the wattage to the heating elements to accurately control the discharge air temperature from the MAU regardless of the incoming outdoor air temperature.
2. AO, proportional signal from the built-in thermostat (0-10VDC) that drives the SSR to modulate the heat output.
3. DS-DS, DUCT SENSOR, the field installed duct sensor is connected to thermostat for controlling and maintaining the output temperature, type 2 NTC thermistor, 10K ohms.
4. 24V HOT - 24V COM, these are the 24VAC connections to the modulating thermostat.
5. L-L, LOCKOUT CIRCUIT, the controller can be wired to an optional outdoor thermostat and/or a humidistat by using the 'L-L' terminals to prevent the MUA from turning on. Remove the factory set jumper to activate this feature. This feature can also be used to monitor indoor activity such as an occupancy sensor and CO2 sensor.
6. G, FAN ONLY, closing G-R1 will turn on the fan and bypass the modulating heating circuit. No heat in this mode.
7. EF-EF, EXHAUST FAN, provides a switched 24VAC circuit to connect a fan relay that will turn on an exhaust fan relay or other auxiliary device.
8. D-D, DAMPER, provides a switched 24VAC circuit to connect to a motorized damper with spring return.  
Note: 40VA maximum for the sum of EF-EF and D-D.

Note: If the design calls for a room thermostat, the inbuilt thermostat and duct sensor can be removed. Place the thermostat in the new room location and extend the wiring connections from the MAU low voltage terminal strip, connect AO on the terminal strip to AO 2 on the thermostat when used as a room thermostat without a duct sensor.



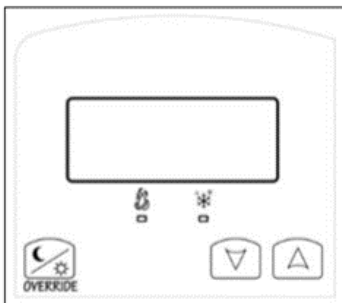
# LOW VOLTAGE CONTROL SCHEMATIC



# MODULATING THERMOSTAT CONTROL

The VT7225 series controllers are microcomputer-based, proportional and integral (PI) devices with one analog 0 to 10 Vdc output, one 8 Vdc and one 24 Vac proportioning pulsed output.

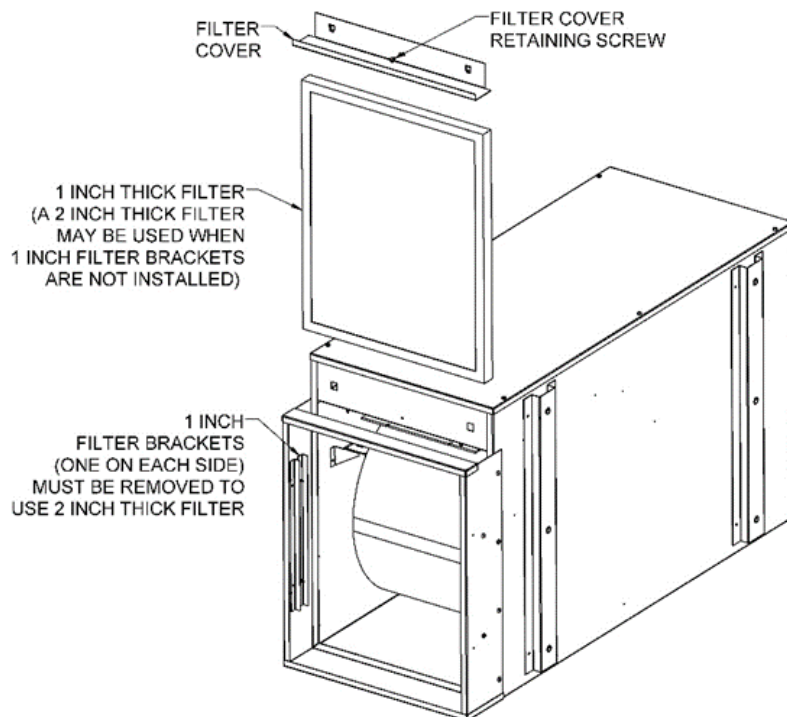
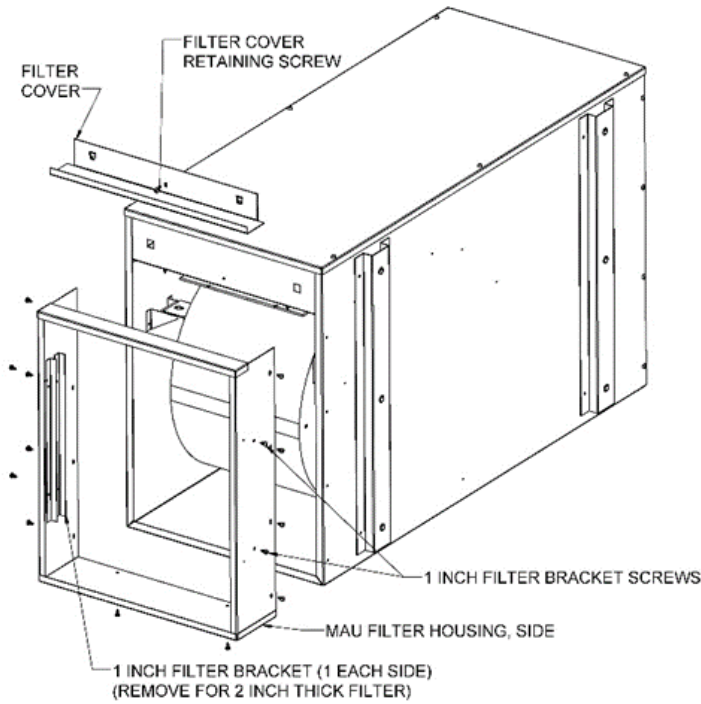
The King MAU uses the analog 0 to 10 Vdc modulating output to control the room or supply air temperature by modulating directly a 0 to 10 Vdc SCR power controller.



Adjust the temperature set point by pushing the up and down arrows. An Override can be made during an unoccupied period. If the Override option is enabled in the lockout configuration pressing the override key will resume occupied setpoints for a time specified by parameter ToccTime. Refer to the Viconics VT7225 Series User Guide for additional information.

# INSTALLATION OF THE FILTER HOUSING

The filter housing is shipped separately to be field installed. The filter housing is mounted to the intake side the MAU, which is the same side as where the blower is mounted. The filter can accept a 1" or 2" thick 16" by 20" filter. Install the 1" filter brackets when using a 1" thick filter. Please refer to the assembly drawings below.



**START UP PROCEDURE & TROUBLE SHOOTING**

1. Apply power to the MAU.
  - a. Verify with a voltmeter on the line side of the contactor lugs that the proper voltage is present and phases correctly.
2. If the lockout circuit is being used close the auxiliary devices or jumper across L-L to test the unit.
3. Close R1 and R2 with the activation switch being used or jumper across R1 & R2 to test the unit.
4. Increase the thermostat set point above the ambient air temperature and make sure the duct sensor is connected, otherwise no heat will be produced.
5. The Fan and heating circuit should engage.
6. Check that the Fan is operating, and the green LED lights are blinking on the SSR controller, this will indicate the SSR relays are modulating the heating elements. Tempered air should be discharging out of the MAU.
  - a. If not check the load side of the contactor to verify voltage is present.
  - b. Check the terminal strip points marked 24V HOT/24V COM for 24VAC, this is the control power for the internal control circuit, the contactor coil, the relay coil, and the ECM motor. They require 24VAC coming from CPT-1 and will not operate if no voltage is present.
  - c. If 24VAC is not present in the control circuit, check to see if the high temp limit is tripped. It is an electrically held limit and is reset by opening the R1-R2 switch or turning off power to unit for a few minutes and then turning the power back on. The limit can also be tested by jumping around the switch to see if it is defective. Do not operate unit without a working limit switch, it can create a dangerous overheating situation.
  - d. If the High limit is working, check the element high temperature limits that are wired in series, one per element, check for continuity across the string and then individually, these are normally closed devices, if an open limit is found, replace it.
7. Check that the 24VAC power is present across D 24V - D com, this is the damper circuit. The control relay energizes a separate control power transformer to run the damper motor. It requires a spring return damper. This circuit is activated in both the modulating heating mode (R1-R2) and the Fan only mode (G-R1)
8. Check that the 24VAC power is present across EF 24V - EF com, this is the exhaust fan circuit. The control relay energizes a separate control power transformer (CPT-2) to close an exhaust fan relay or other auxiliary 24VAC devices.
9. Note: Maximum limit of 40VA for the sum of these two circuits, D-D and EF-EF.
10. Remove the R1-R2 switch or jumper to test the Fan only circuit by closing G-R1. The fan should operate without the heating circuit activated. The power contactor will not close, only the control relay will close to supply 24VAC to the damper and exhaust fan circuit.
  - a. If the fan does not operate check L1, L2 and L3 to verify line voltage is present. The motor takes the operating power from the line side of the contactor. The motor is switched on and off using the 24VAC control power from CPT-1.
  - b. Make sure the brown fan only wire is connected from the motor terminal block (1-5) to the G terminal as noted in the wiring schematic.
  - c. Check that there is 24VAC at the motor terminal block.
11. In fan only mode, check that there is 24VAC at the damper (D-D) terminals and 24VAC at the exhaust fan (EF-EF) terminals.

## START UP PROCEDURE & TROUBLE SHOOTING (Cont'd)

- a. Check that the control relay is functioning properly. Make sure there is 24VAC across the control relay and that you can hear it snap close when the Fan Only is switched on.
- b. If no voltage is present, trouble shoot CPT-2
- c. Refer the wiring schematic and check for continuity through the control relay.

This completes the startup and troubleshooting section of the King MAU.

## MAINTENANCE

Very little maintenance is required for the MAU to keep it functioning properly throughout the year.

1. It is recommended to clean the exterior hood of the fresh air intake once a year.
2. Replace the air filter every 6 months. Shut off the unit before removing the filter.
3. Dust the device regularly to prevent dust from accumulating, which could cause the device to overheat.
4. Disconnect the power supply to the circuit breaker/fuse before cleaning the unit.
5. If the MAU is located in a dusty area, use a vacuum cleaner to thoroughly clean the unit.

**WARNING:** All other servicing should be performed by authorized service personnel.

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