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401 W TOWN ST  
COLUMBUS, OH

NW MEP PLAN

KRAMER JOB #: 2014-017

MEP-1

**GENERAL NOTES - HVAC**

- CONTRACTOR SHALL INSTALL ALL EQUIPMENT, DUCTWORK, ETC. PER ALL LOCAL, STATE AND FEDERAL CODES, PER THE RECOMMENDATIONS OF THE MANUFACTURER AND PER ALL APPLICABLE GUIDELINES OF SMACNA AND ASHRAE.
- COORDINATE ALL EQUIPMENT LOCATIONS, DUCT ROUTINGS, ETC. IN THE FIELD WITH THE GENERAL CONTRACTOR AND ALL OTHER TRADES. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR RELOCATION OF EQUIPMENT AND MATERIALS THAT HAS NOT BEEN SO COORDINATED AND CAUSES CONFLICTS.
- DUCTWORK SHALL BE GALVANIZED STEEL, LOW PRESSURE TYPE AS OUTLINED BY SMACNA AND ASHRAE.
- INSTALL CONDENSATE DRAINS PER MANUFACTURER'S RECOMMENDATIONS. INSULATE SUCTION REFRIGERANT PIPING AND CONDENSATE DRAINS WITH 1/2" CLOSED CELL PLASTIC INSULATION WITH VAPOR BARRIER.
- BALANCE SUPPLY AND RETURN REGISTERS AND DIFFUSERS TO AIR FLOWS INDICATED ON THE DRAWINGS. PROVIDE AND INSTALL BALANCE DAMPERS WHERE SHOWN IN ALL SUPPLY DUCTS OFF MAIN TRUNK(S) TO SUPPLY REGISTERS AND DIFFUSERS.
- PROVIDE CONICAL TAKE-OFFS (OR "SPIN-INS") AT ALL BRANCHES FROM RECTANGULAR TO ROUND DUCTWORK.
- PROVIDE RADIUS TURNS OR TURNING VANES IN ALL 90 DEGREE ELBOWS IN RECTANGULAR DUCTWORK.
- PROVIDE COMPLETE START-UP AND TESTING OF EQUIPMENT AND INSTRUCT OWNER'S PERSONNEL IN OPERATION AND MAINTENANCE OF EQUIPMENT (FOUR HOURS MINIMUM SCHEDULED AT THE OWNER'S CONVENIENCE). PROVIDE THREE SETS OF OPERATION AND MAINTENANCE MANUALS FOR ALL EQUIPMENT INCLUDING A ONE-YEAR WARRANTY ON ALL PARTS AND WORKMANSHIP AND A FIVE-YEAR WARRANTY ON ALL AIR CONDITIONING COMPRESSORS.
- THIS CONTRACTOR SHALL PROVIDE AND PAY FOR ALL PERMITS, INSPECTIONS, TESTS, ETC. REQUIRED FOR THE PERFORMANCE OF THIS WORK.
- PROVIDE ALL TRANSITIONS, BOOTS, FITTINGS, ETC. AS REQUIRED TO ACHIEVE DUCT/DIFFUSER/REGISTER CONNECTIONS. FIELD VERIFY EXACT REQUIREMENTS.
- HVAC CONTRACTOR RESPONSIBLE FOR CUTTING AND PATCHING OF ALL PENETRATIONS, ROOF, CEILING, FLOORS, WALLS, ETC.
- DUCT DIMENSIONS ARE INSIDE FREE CLEAR.
- HVAC CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND INSTALLING COMPLETE SYSTEMS OF HVAC EQUIPMENT, PIPING, DUCTWORK, ETC. DRAWINGS ARE SCHEMATIC IN NATURE AND CONTRACTOR IS RESPONSIBLE FOR FIELD COORDINATING AND ROUTING OF ALL PIPING AND DUCTWORK WITH RESPECT TO EXISTING CONDITIONS, NEW CONSTRUCTION, OTHER TRADES, ETC. CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND INSTALLING ALL OFFSETS, JOGS, TRANSITIONS, CORE DRILLS, WALL CUTS, LINTELS AND OTHER NECESSARY APURTANCES TO INSTALL WORK. WORK WHICH HAS BEEN INSTALLED AND HAS NOT BEEN COORDINATED WITH OTHER TRADES AND HAS TO BE RELOCATED SHALL BE DONE SO AT THE EXPENSE OF THIS CONTRACTOR.
- CONTRACTOR SHALL OBTAIN A COMPLETE SET OF PLANS AND BE FAMILIAR WITH THE ENTIRE PROJECT IN ORDER TO UNDERSTAND THE COMPLETE SCOPE OF THE PROJECT.
- INSTALL SMOKE DETECTOR IN RA OF EQUIPMENT UPSTREAM OF ANY FILTERS, EXHAUST/OUTDOOR AIR, OR DECONTAMINATION EQUIPMENT CONNECTIONS, CAPABLE OF MONITORING ENTIRE RA AIR FLOW OR SYSTEM (INCLUDING ANY EXHAUST OR RELIEF AIR). UPON ACTIVATION, SMOKE DETECTOR WILL DISABLE AIR DISTRIBUTION SYSTEM AND ACTIVATE VISIBLE/AUDIBLE SUPERVISORY SIGNAL. EC TO PROVIDE SMOKE DETECTOR AND CONNECT TO BUILDING FIRE ALARM SYSTEM.
- INSTALL FIRE DAMPERS IN ALL FIRE RATED WALLS, FLOORS, AND CEILINGS PER CODE. CHECK ARCHITECTURAL DRAWINGS FOR FIRE RATINGS.

**HVAC CODED NOTES**

- NEW 7.5 TON RTU. PROVIDE ROOF CURB, STRUCTURAL BY OTHERS. COORDINATE EXACT LOCATION WITH STRUCTURAL. PROVIDE FULL SIZE SA & RA DROPS WITH LONG RADIUS TURN IF APPLICABLE.
- NEW 4 TON CONDENSER. PROVIDE RUBBER MOUNTING PAD. SET UNIT OVER COLUMN AS SHOWN.
- PROVIDE EXHAUST FAN. ROUTE 6" DUCT EITHER THROUGH EXTERIOR WALL OR THROUGH ROOF. PROVIDE WALL / ROOF CAP.

**ELECTRICAL CODED NOTES**

- EXISTING PANEL P1, 120/208, 3Ø, 4W, 200A, 42 POLE. PROVIDE (2) NEW 60A BREAKERS FOR NEW RTU AND (1) NEW 20A BREAKER FOR ROOFTOP RECEPTACLES. RESULTING PANEL LOAD = 68.74 KW = 190 AMPS. PROVIDE LABEL ON PANEL INDICATING LOAD.
- EC TO PROVIDE DUCT SMOKE DETECTOR IN RA DUCT OF RTU AND WIRE TO BUILD FAC. COORDINATE MOUNTING OF SMOKE DETECTOR WITH HVAC CONTRACTOR.
- WIRE EXHAUST FAN THROUGH RESTROOM LIGHTING CIRCUIT AND CONTROL THROUGH RESTROOM LIGHT SWITCH.

**PLUMBING CODED NOTES**

- FIELD ROUTE 1" GAS TO RTU FROM EXISTING MAIN IN ROOM. PROVIDE DIRT LEG, SHUT-OFF, AND UNION AT UNIT. SEE DETAIL ON SHEET MEP-2.

**DIFFUSER(D) REGISTER(R) GRILLE(G) SCHEDULE**

LABEL	TYPE	NECK	FACE	INSTALL	CONSTR	FINISH	PRICE MODEL NO.	ACCESSORIES REMARKS
D1	SUPPLY	6"Ø	-	-	STL	BWE	RDC	ØBD
D2	SUPPLY	6"Ø	-	-	STL	BWE	RDC	ØBD
R1	SUPPLY	-	7"x4"	-	STL	BWE	5200	-
R2	SUPPLY	-	10"x5"	-	STL	BWE	5200	-
R3	SUPPLY	-	12"x6"	-	STL	BWE	5200	-
G1	SUPPLY	-	10"x4"	-	STL	BWE	SDGE	-
G2	SUPPLY	-	10"x6"	-	STL	BWE	SDGE	-
G3	SUPPLY	-	14"x6"	-	STL	BWE	SDGE	-
G4	SUPPLY	-	12"x8"	-	STL	BWE	SDGE	-
G5	SUPPLY	-	14"x8"	-	STL	BWE	SDGE	-
G6	RETURN	-	16"x6"	-	STL	BWE	STG-BF	-
G7	RETURN	-	14"x12"	-	STL	BWE	STG-BF	-
G8	RETURN	-	22"x14"	-	STL	BWE	STG-BF	-
G9	RETURN	-	34"x14"	-	STL	BWE	80	-
G10	RETURN	-	32"x16"	-	STL	BWE	80	-

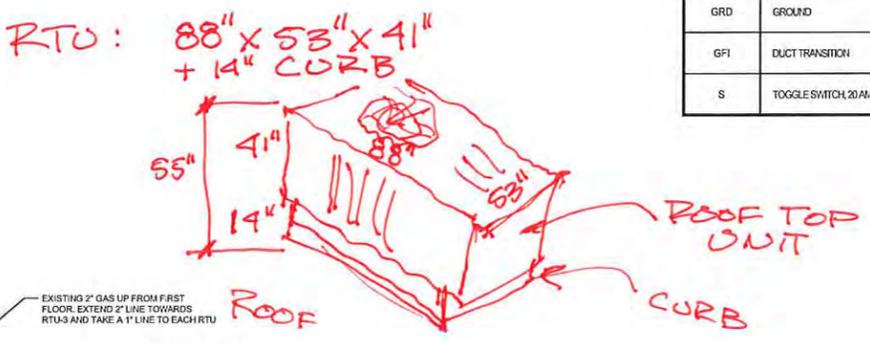
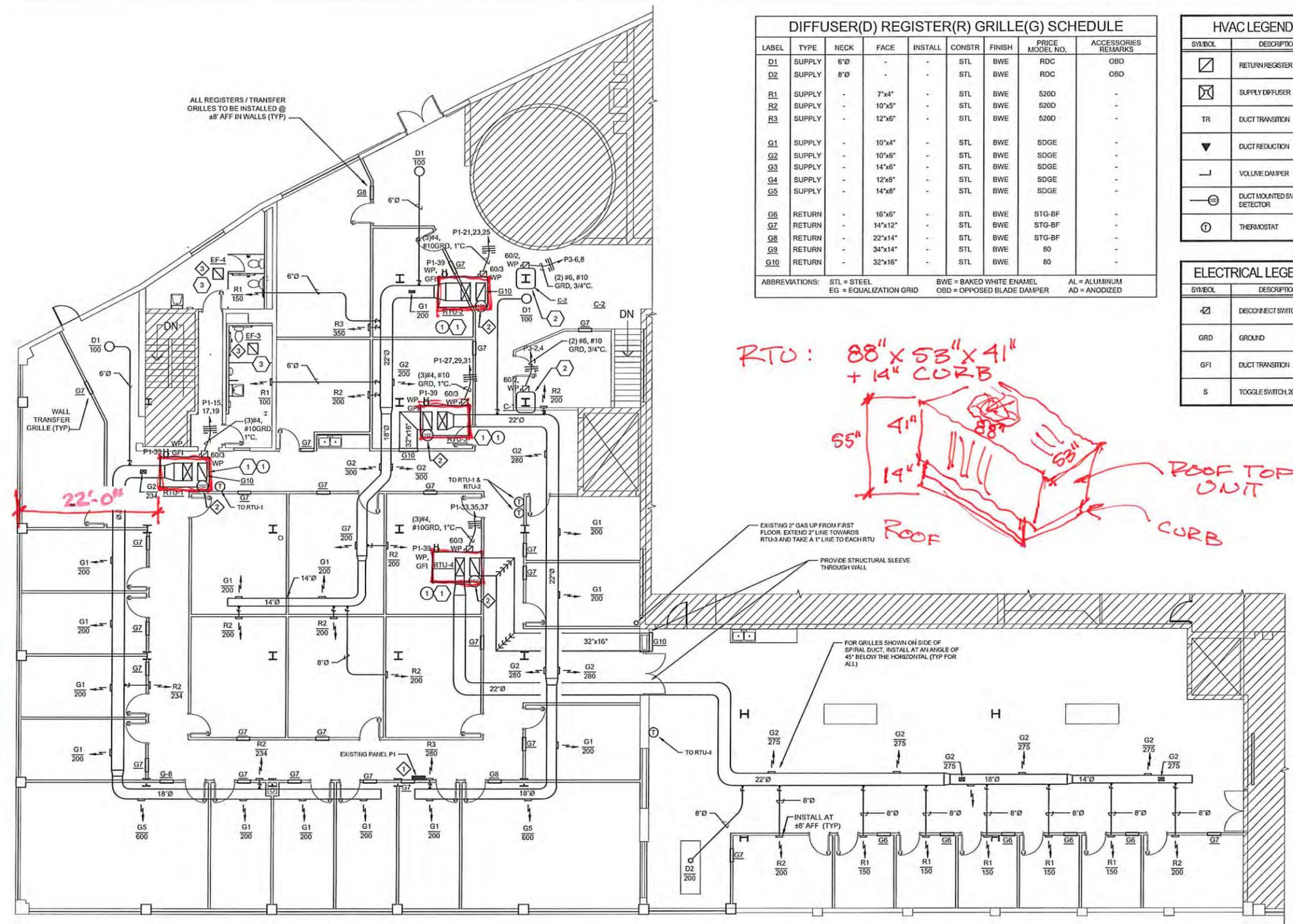
ABBREVIATIONS: STL = STEEL BWE = BAKED WHITE ENAMEL AL = ALUMINUM  
EG = EQUALIZATION GRID ØBD = OPPOSED BLADE DAMPER AD = ANODIZED

**HVAC LEGEND**

SYMBOL	DESCRIPTION
□	RETURN REGISTER
⊠	SUPPLY DIFFUSER
TR	DUCT TRANSITION
▼	DUCT REDUCTION
└	VOLUME DAMPER
⊙	DUCT MOUNTED SMOKE DETECTOR
Ⓢ	THERMOSTAT

**ELECTRICAL LEGEND**

SYMBOL	DESCRIPTION
⊠	DISCONNECT SWITCH
GRD	GROUND
GFI	DUCT TRANSITION
S	TOGGLE SWITCH 20 AMP



TOWN

LUCAS

**NORTHWEST PLAN**  
SCALE: 1/8" = 1'-0"

**VENTILATION TABLE**

UNIT	SPACE TYPE	Az	Ra	Pz	Rp	TOTAL CFM
RTU-1	STUDIO	2880	0.06	9	5	218
RTU-2	STUDIO	3874	0.06	10	5	283
RTU-3	STUDIO	2627	0.06	6	5	189
RTU-4	STUDIO	3677	0.06	7	5	256
F1/F2	STUDIO	3300	0.06	6	5	228

**ROOFTOP UNIT (RTU) SCHEDULE**

LABEL	MFR	MODEL	WEIGHT (LBS)	TONS	COOLING CAPACITY				GAS HEATING CAPACITY			SUPPLY FAN		COMPRESSOR(S)	FILTER	ELECTRICAL DATA				NOTES				
					TOTAL MBH	SENS MBH	EAT DB/WB	LAT DB/WB	(S)EER	STAGE	INPUT MBH	OUTPUT MBH	AFUE			CFM	OA CFM	MOTOR HP	TYPE		QUANTITY	TYPE	THICKNESS (IN)	VOLTS
RTU-1,2,3,4	TRANE	NH-0700BSAAA2	767	7.5	-	-	-	-	11.2	2	200	160	80	3000	-	-	1	MERV 6	-	208	3	60	38.2	1, 2

**NOTES**

- PROVIDE SINGLE DRY BULB ECONOMIZER AND BAROMETRIC RELIEF.
- PROVIDE WITH MERV 6 THROWAWAY FILTER.

# Rooftop Units

401 West Town Street

Approximate location of RTU based on plan from Kramer Engineers. Drawn in orange to draw attention, actual units are light grey.



# Rooftop Units

401 West Town Street

Units would not be seen from 424 W. Town St. | Land Grant Brewery



# Rooftop Units

401 West Town Street

Town @ McDowell  
Top of RTU may poke above parapet.



# Rooftop Units

401 West Town Street

Lucas @ Chapel  
RTU are slightly seen above parapet





Model Number YSC090F3RHA\*\*00000000000000000000000000000000

Customer : Trame  
 Project : 401 W Town  
 Name : 401 W Town

## Y4C

### General

Unit function	<b>DX cooling, gas heat</b>	Unit efficiency	<b>Standard efficiency</b>
Airflow	<b>Convertible configuration</b>	Airflow Application	<b>Downflow</b>
Tonnage	<b>7.5 Ton Single compressor</b>	Cooling Entering DB	<b>80.00</b>
Cooling Entering WB	<b>67.00</b>	Ambient Temp	<b>95.00</b>
Heating capacity	<b>High gas heat 3ph</b>	Heating EAT	<b>70.00</b>
Voltage	<b>208-230/60/3</b>	Major design sequence	<b>F - R-410A With Microchannel</b>

### Main Cooling

Tonnage	<b>7.5 Ton Single compressor</b>	Cooling Entering DB	<b>80.00</b>
Cooling Entering WB	<b>67.00</b>	Ambient Temp	<b>95.00</b>

### Main Heating

Heating capacity	<b>High gas heat 3ph</b>	Heating EAT	<b>70.00</b>
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### Motor/Electrical

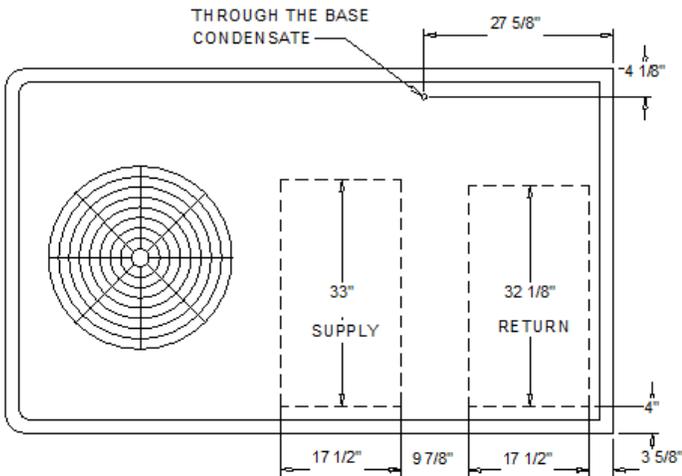
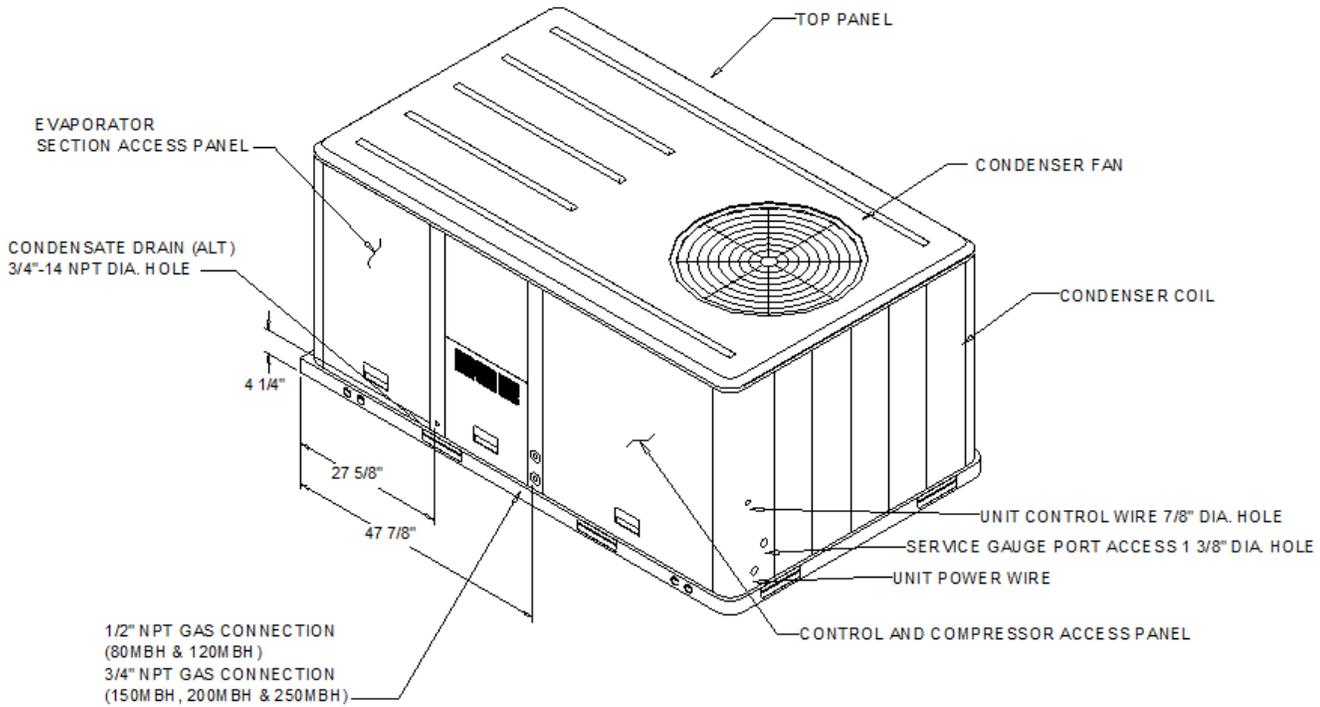
Voltage	<b>208-230/60/3</b>
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### DX Cooling, Gas Heat 3-10 Ton

Unit controls	<b>Microprocessor controls 3ph</b>
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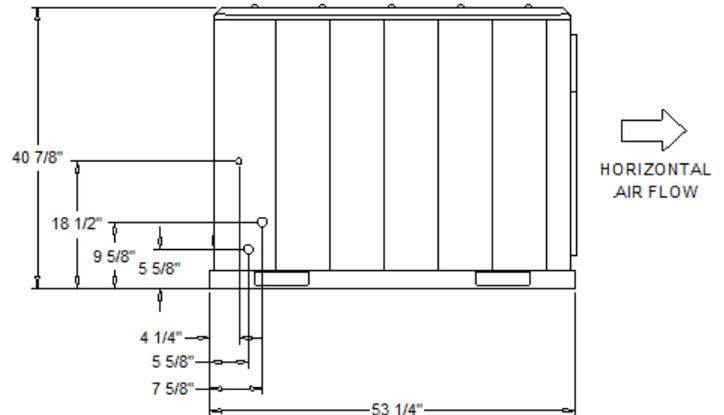
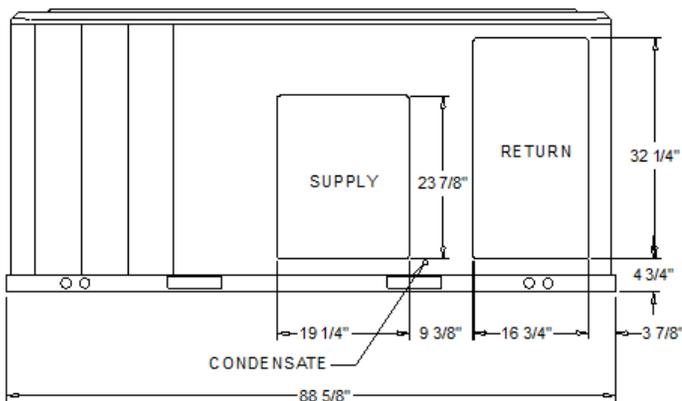
### Field installed accessories

Roof curb	<b>Roof curb</b>	Fresh air selection	<b>Dry bulb economizer 0-100% w/o bar rel</b>
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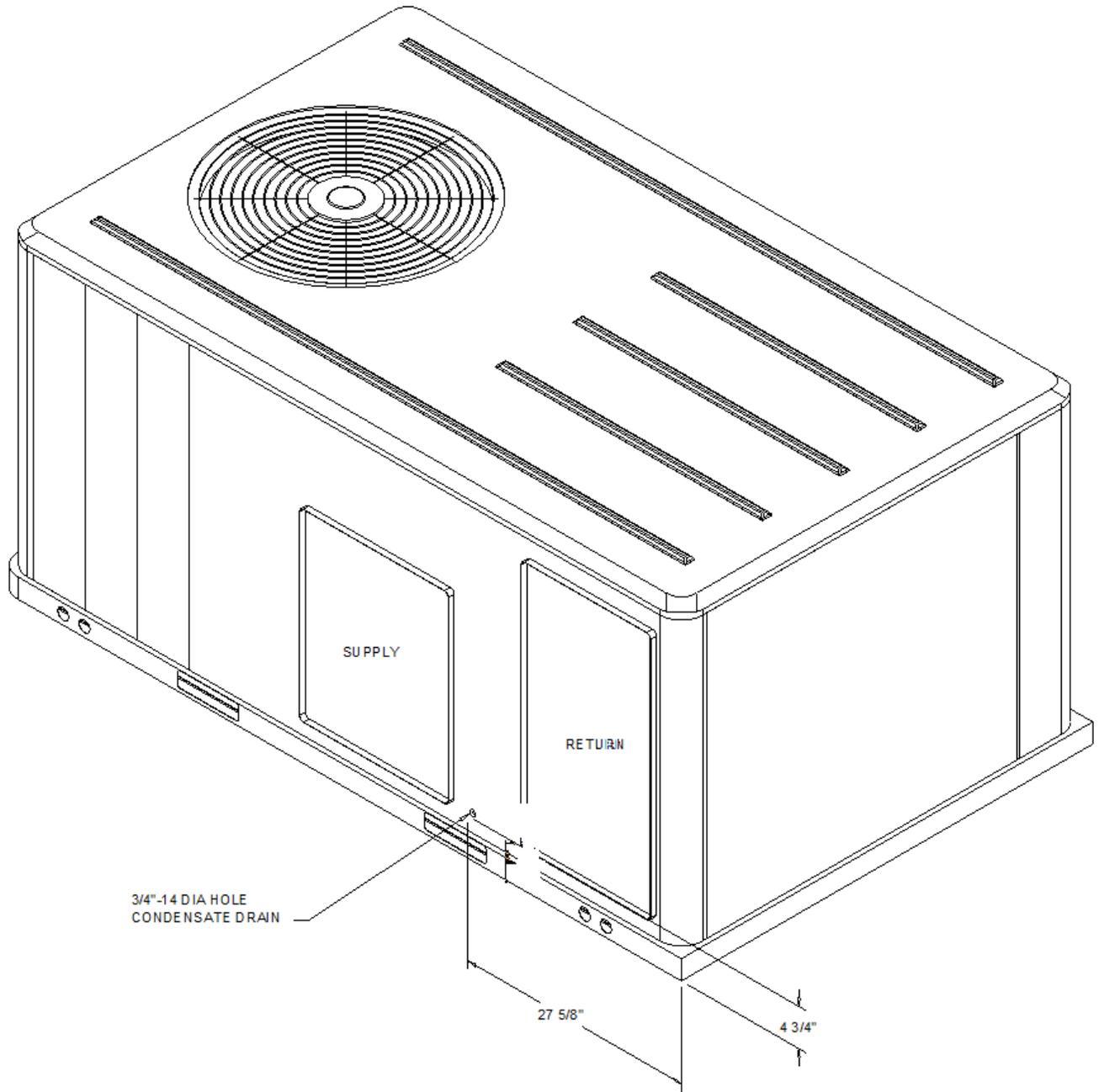


- NOTES:
1. THRU -THE -BASE ELECTRICAL AND GAS IS NOT STANDARD ON ALL UNITS.
  2. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

PLAN VIEW UNIT  
DIMENSION DRAWING



PACKAGED GAS / ELECTRICAL  
DIMENSION DRAWING



ISOMETRIC-PACKAGED COOLING



## ELECTRICAL / GENERAL DATA

<p><b>GENERAL</b> <sup>(2)(4)(6)</sup></p> <p>Model: YSC090F      Oversized Motor</p> <p>Unit Operating Voltage: 187-253      MCA: N/A</p> <p>Unit Primary Voltage: 208      MFS: N/A</p> <p>Unit Secondary Voltage: 230      MCB: N/A</p> <p>Unit Hertz: 60</p> <p>Unit Phase: 3</p> <p>EER: 11.2</p> <p>Standard Motor</p> <p>MCA: 38.2      MCA: N/A</p> <p>MFS: 60.0      MFS: N/A</p> <p>MCB: 60.0      MCB: N/A</p>	<p><b>HEATING PERFORMANCE</b></p> <p><b>HEATING - GENERAL DATA</b></p> <p>Heating Model: High</p> <p>Heating Input (BTU): 200,000/140,000</p> <p>Heating Output (BTU): 160,000/112,000</p> <p>No. Burners: 4</p> <p>No. Stages: 2</p> <p>Gas Inlet Pressure</p> <p>Natural Gas (Min/Max): 4.5/14.0</p> <p>LP (Min/Max): 11.0/14.0</p> <p>Gas Pipe Connection Size: 3/4"</p>																					
<p><b>INDOOR MOTOR</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Standard Motor</th> <th style="width: 33%;">Oversized Motor</th> <th style="width: 33%;">Field Installed Oversized Motor</th> </tr> </thead> <tbody> <tr> <td>Number: 1</td> <td>Number: N/A</td> <td>Number: N/A</td> </tr> <tr> <td>Horsepower: 1.0</td> <td>Horsepower: N/A</td> <td>Horsepower: N/A</td> </tr> <tr> <td>Motor Speed (RPM): --</td> <td>Motor Speed (RPM): N/A</td> <td>Motor Speed (RPM): N/A</td> </tr> <tr> <td>Phase: 3</td> <td>Phase: N/A</td> <td>Phase: N/A</td> </tr> <tr> <td>Full Load Amps: 3.6 - 3.5</td> <td>Full Load Amps: N/A</td> <td>Full Load Amps: N/A</td> </tr> <tr> <td>Locked Rotor Amps: 12.5</td> <td>Locked Rotor Amps: N/A</td> <td>Locked Rotor Amps: N/A</td> </tr> </tbody> </table>		Standard Motor	Oversized Motor	Field Installed Oversized Motor	Number: 1	Number: N/A	Number: N/A	Horsepower: 1.0	Horsepower: N/A	Horsepower: N/A	Motor Speed (RPM): --	Motor Speed (RPM): N/A	Motor Speed (RPM): N/A	Phase: 3	Phase: N/A	Phase: N/A	Full Load Amps: 3.6 - 3.5	Full Load Amps: N/A	Full Load Amps: N/A	Locked Rotor Amps: 12.5	Locked Rotor Amps: N/A	Locked Rotor Amps: N/A
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<p><b>COMPRESSOR</b>      Circuit 1/2</p> <p>Number: 1</p> <p>Horsepower: 6.7</p> <p>Phase: 3</p> <p>Rated Load Amps: 25.0</p> <p>Locked Rotor Amps: 164.0</p>	<p><b>OUTDOOR MOTOR</b></p> <p>Number: 1</p> <p>Horsepower: 0.7</p> <p>Motor Speed (RPM): 1100</p> <p>Phase: 1</p> <p>Full Load Amps: 3.3</p> <p>Locked Rotor Amps: 9.5</p>																					
<p><b>POWER EXHAUST ACCESSORY</b> <sup>(3)</sup></p> <p>(Field Installed Power Exhaust)</p> <p>Phase: N/A</p> <p>Horsepower: N/A</p> <p>Motor Speed (RPM): N/A</p> <p>Full Load Amps: N/A</p> <p>Locked Rotor Amps: N/A</p>	<p><b>FILTERS</b></p> <p>Type: Throwaway</p> <p>Furnished: Yes</p> <p>Number: 4</p> <p>Recommended: 16"x25"x2"</p>	<p><b>REFRIGERANT</b> <sup>(2)</sup></p> <p>Type</p> <p>Factory Charge</p> <p>Circuit #1: 5.5 lb</p> <p>Circuit #2: N/A</p>																				

**NOTES:**

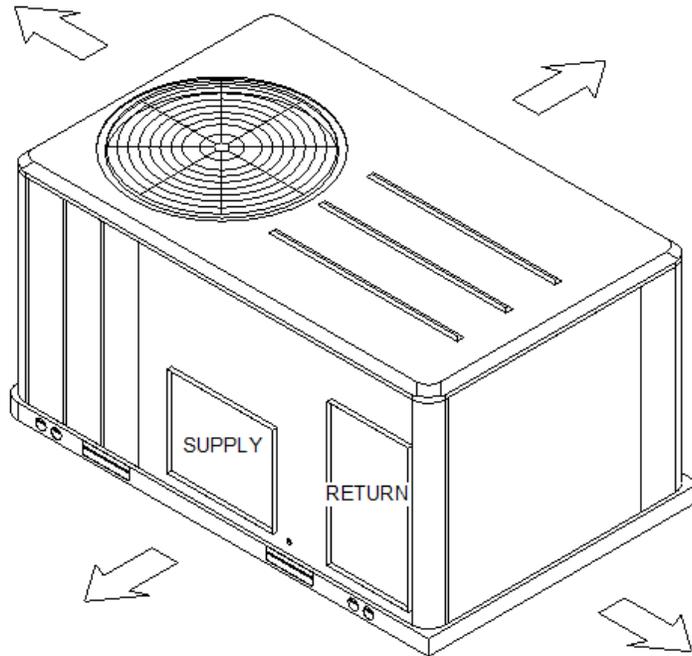
1. Maximum (HACR) Circuit Breaker sizing is for installations in the United States only.
2. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
3. Value does not include Power Exhaust Accessory.
4. Value includes oversized motor.
5. Value does not include Power Exhaust Accessory.
6. EER is rated at AHRI conditions and in accordance with DOE test procedures.



CLEARANCE 36"

CLEARANCE FROM TOP OF UNIT 72"

CLEARANCE 48"

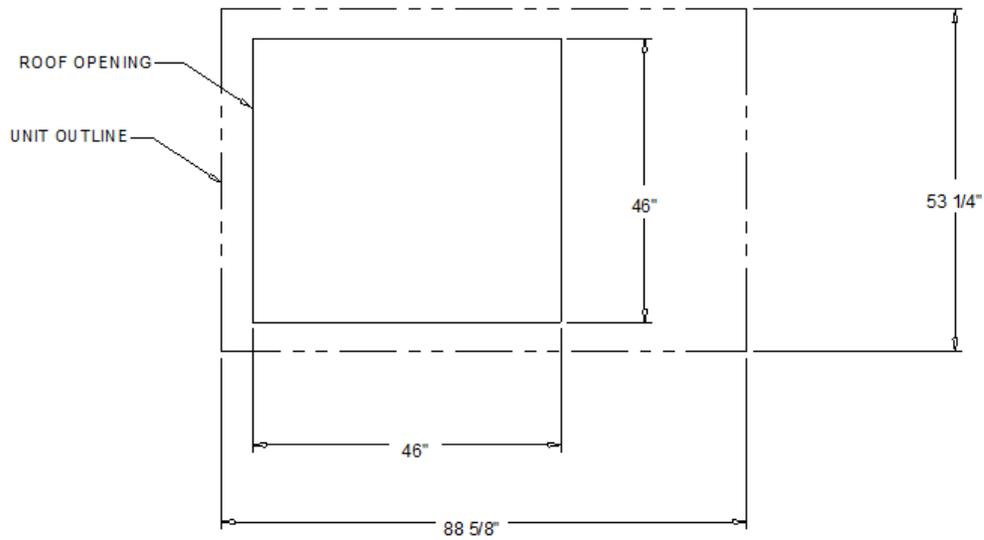


DOWNFLOW CLEARANCE 36"  
HORIZONTAL CLEARANCE 18"

CLEARANCE 36"

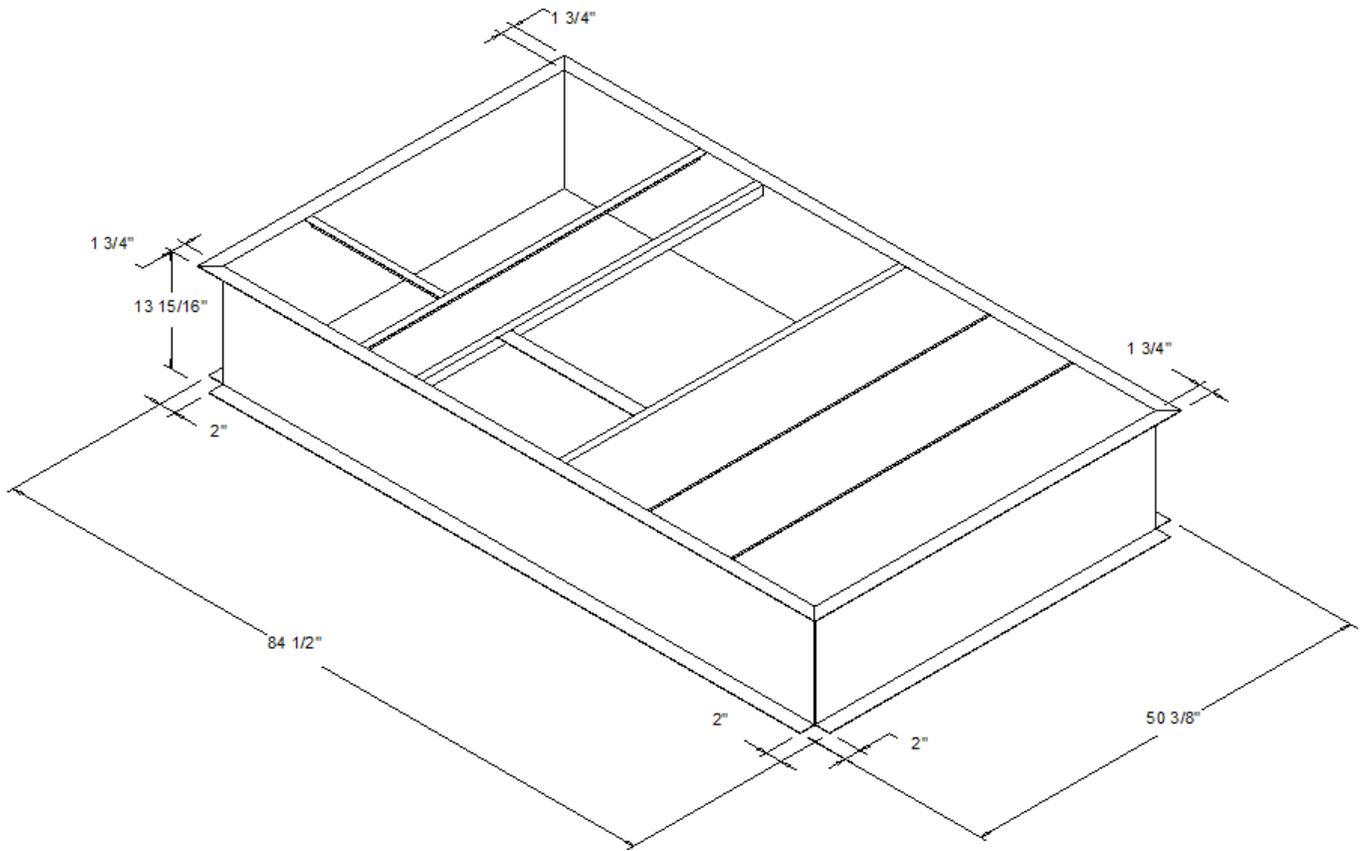
PACKAGED GAS / ELECTRIC

CLEARANCE

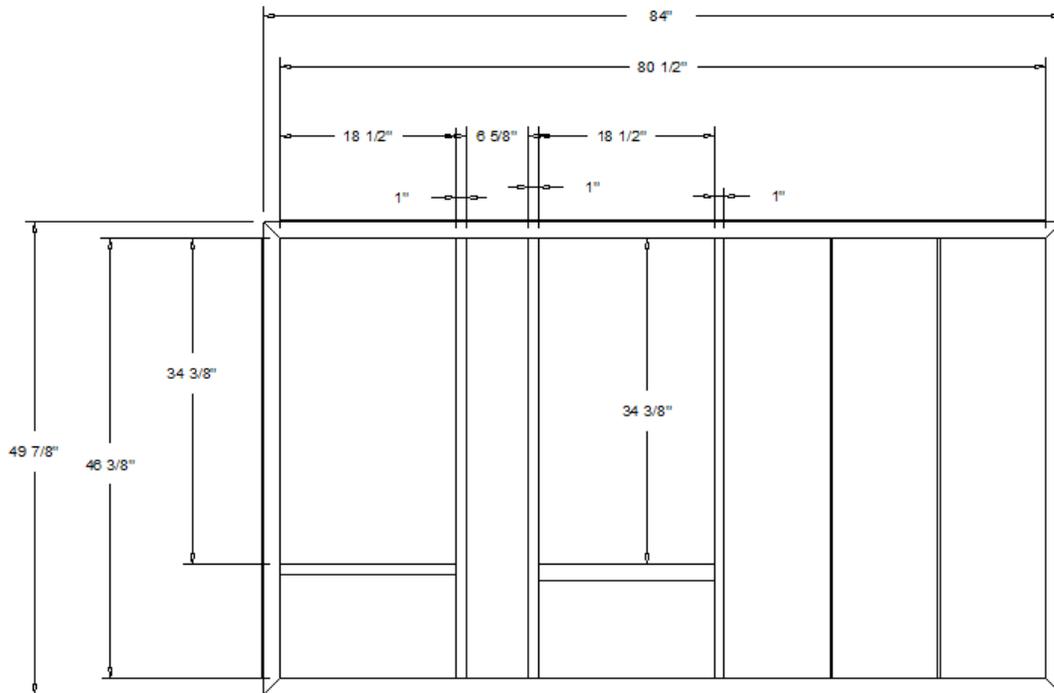


PACKAGED GAS / ELECTRIC

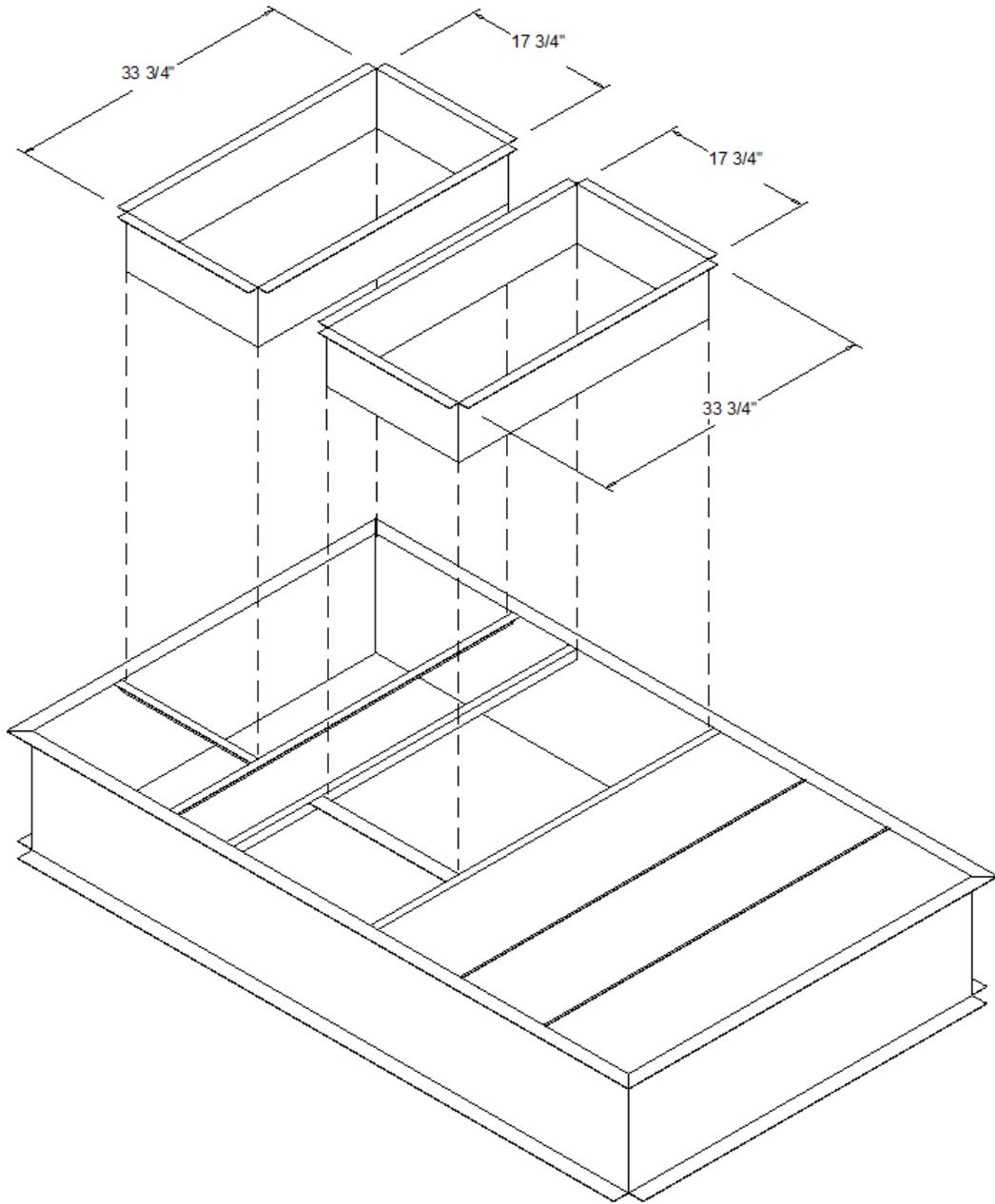
DOWNFLOW TYPICAL ROOF OPENING

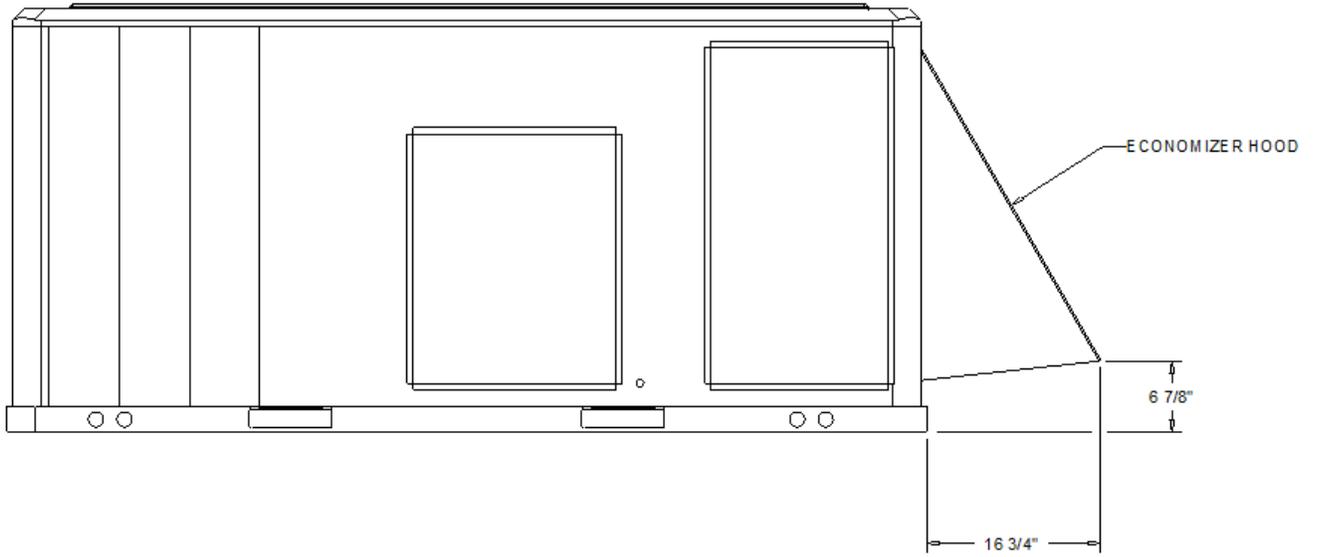
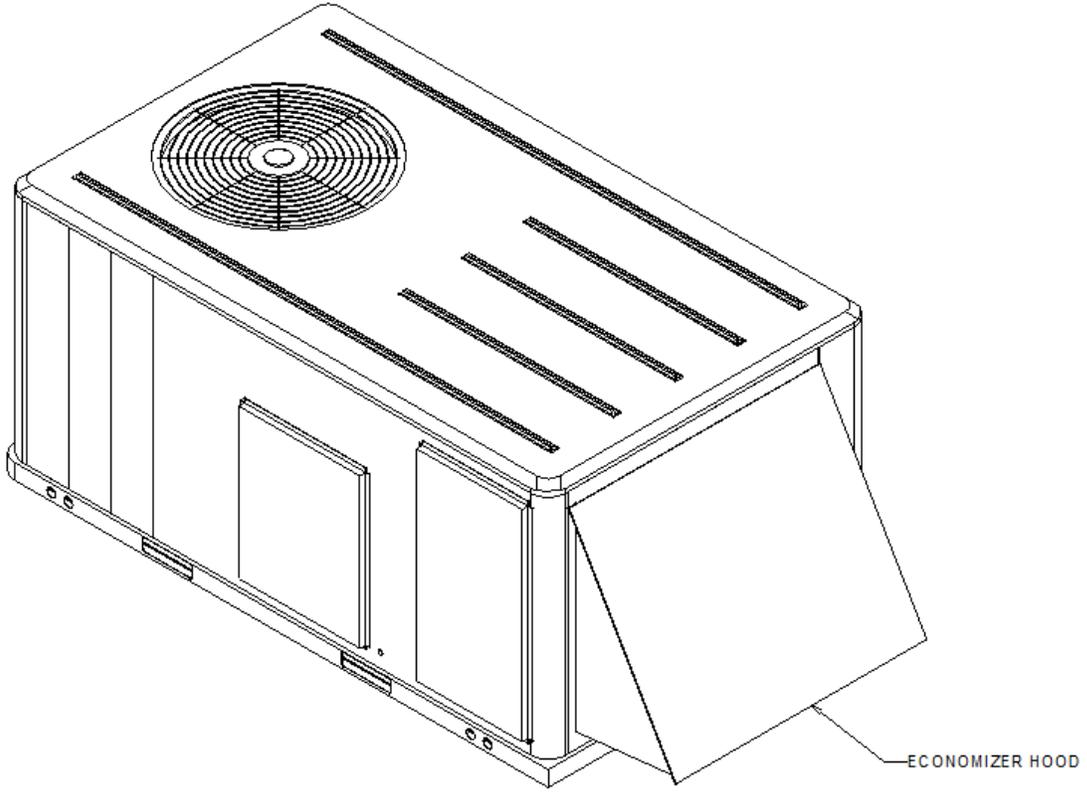


ACCESSORY - ROOF TOP CURB



ACCESSORY - ROOF TOP CURB





ACCESSORY - ECONOMIZER HOOD





## General

The units shall be convertible airflow. The operating range shall be between 115°F and 0°F in cooling as standard from the factory for units with microprocessor controls. Operating range for units with electromechanical controls shall be between 115°F and 40°F. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be cULus listed and labeled, classified in accordance for Central Cooling Air Conditioners.

## Casing

Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall have lifting handles and be removed and reinstalled by removing two fasteners while providing a water and air tight seal. All exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material. The base of the unit shall be insulated with 1/8 inch, foil-faced, closed-cell insulation. All insulation edges shall be either captured or sealed. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8 inch high downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up. The base of the unit shall have provisions for forklift and crane lifting, with forklift capabilities on three sides of the unit.

## Unit Top

The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top.

## Filters

Throwaway filters shall be standard on all units. Optional 2-inch MERV 8 and MERV 13 filters shall also be available.

## Compressors

All units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors.

Dual compressors are outstanding for humidity control, light load cooling conditions and system back-up applications. Dual compressors are available on 7½-10 ton models and allow for efficient cooling utilizing 3-stages of compressor operation for all high efficiency models.

## Notes:

Crankcase heaters are optional on YSC (036, 048, 060, 072, 090, 102, 120); standard on YHC (036, 048, 060, 072, 092, 102, 120).

## Indoor Fan

The following units shall be equipped with a direct drive plenum fan design (T/YSC120E, T/YHC092,102, 120E). Plenum fan design shall include a backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor. All plenum fan designs will have a variable speed adjustment potentiometer located in the control box. 3-5 ton units (standard efficiency 3-phase or high efficiency 3-phase with optional motor) are belt driven, FC centrifugal fans with adjustable motor sheaves. 3-5 ton units (1-phase or high efficiency 3-phase) have multispeed, direct drive motors. All 6-8½ ton units (standard efficiency) shall have belt drive motors with an adjustable idler-arm assembly for quick-adjustment to fan belts and motor sheaves. All motors shall be thermally protected. All 10 tons and 7½-8½ (high efficiency) have variable speed direct drive motors. All indoor fan motors meet the U.S. Energy Policy Act of 1992 (EPACT).

## Outdoor Fans

The outdoor fan shall be direct-drive, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motor shall be permanently lubricated and shall have built-in thermal overload protection.

## Evaporator and Condenser Coils

Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. The microchannel type condenser coil is standard for the T/YSC 10 ton models and 7½ ton high efficiency models. The microchannel type condenser coil is not offered on the 7½ ton dehumidification model. Due to flat streamlined tubes with small ports, and metallurgical tube-to-fin bond, microchannel coil has better heat transfer performance. Microchannel condenser coil can reduce system refrigerant charge by up to 50% because of smaller internal volume, which leads to better compressor reliability. Compact all-aluminum microchannel coils also help to reduce the unit weight. All-aluminum construction improves re-cyclability. Galvanic corrosion is also minimized due to all aluminum construction. Strong aluminum brazed structure provides better fin protection. In addition, flat streamlined tubes also make microchannel coils more dust resistant and easier to clean. Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 600 psig. The assembled unit shall be leak tested to 465 psig. The condenser coil shall have a patent pending 1+1+1 hybrid coil designed with slight gaps for ease of cleaning. A removable, reversible, double-sloped condensate drain pan with through the base condensate drain is standard.



### Controls

Unit shall be completely factory-wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Unit shall provide an external location for mounting a fused disconnect device. A choice of microprocessor or electromechanical controls shall be available. Microprocessor controls provide for all 24V control functions. The resident control algorithms shall make all heating, cooling, and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from set point, and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection. 24-volt electromechanical control circuit shall include control transformer and contactor

### High Pressure Control

All units include High Pressure Cutout as standard.

### Phase monitor

Phase monitor shall provide 100% protection for motors and compressors against problems caused by phase loss, phase imbalance, and phase reversal. Phase monitor is equipped with an LED that provides an ON or FAULT indicator. There are no field adjustments. The module will automatically reset from a fault condition.

### Refrigerant Circuits

Each refrigerant circuit offer thermal expansion valve as standard. Service pressure ports, and refrigerant line filter driers are factory-installed as standard. An area shall be provided for replacement suction line driers.

### Gas Heating Section

The heating section shall have a progressive tubular heat exchanger design using stainless steel burners and corrosion resistant steel throughout. An induced draft combustion blower shall be used to pull the combustion products through the firing tubes. The heater shall use a direct spark ignition (DSI) system. On initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat/zone sensor. Units shall be suitable for use with natural gas or propane (field-installed kit) and also comply with the California requirement for low NOx emissions (Gas/Electric Only).

### Accessory - Economizer

This accessory shall be available with or without barometric relief. The assembly includes fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness with plug, spring return actuator and fixed dry bulb control. The barometric relief shall provide a pressure operated damper that shall be gravity closing and shall prohibit entrance of outside air during the equipment off cycle. Optional solid state or differential enthalpy control shall be available for either factory or field installation. The economizer arrives in the shipping position and shall be moved to the operating position by the installing contractor.

### Accessory - Roof Curb

The roof curb shall be designed to mate with the unit's downflow supply and return and provide support and a water tight installation when installed properly. The roof curb design shall allow field fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb design shall comply with NRCA requirements. Curb shall be shipped knocked down for field assembly and shall include wood nailer strips.