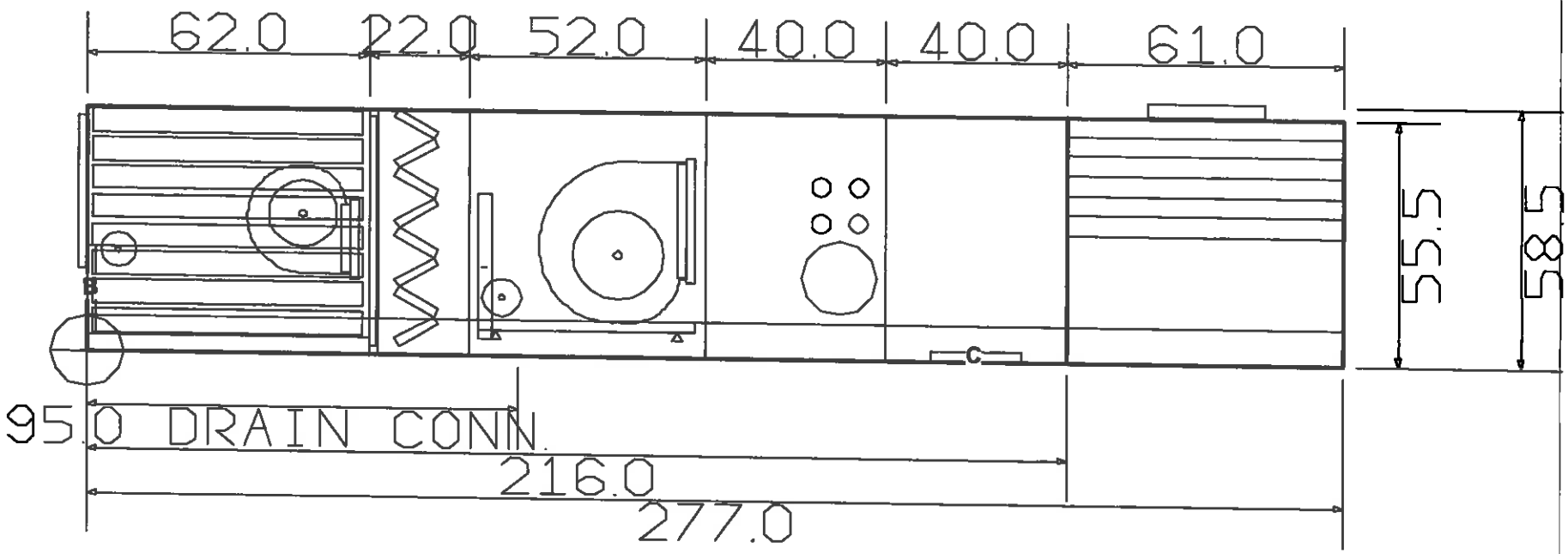
## Appendix C. Equipment Cuts

| | Opening | X | Y | Z | W(Width) | H(Height) |
|---|---|---|---|---|---|---|
| A | Condensate drain connection (1.5 MPT) | 95.00 | 95.50 | 2.70 | - | - |
| B | Return air inlet | 0.00 | 3.75 | 3.60 | 86.50 | 20.00 |
| C | Discharge air outlet | 186.00 | 12.00 | 0.00 | 76.00 | 20.00 |

Dimensions measured from ⊕

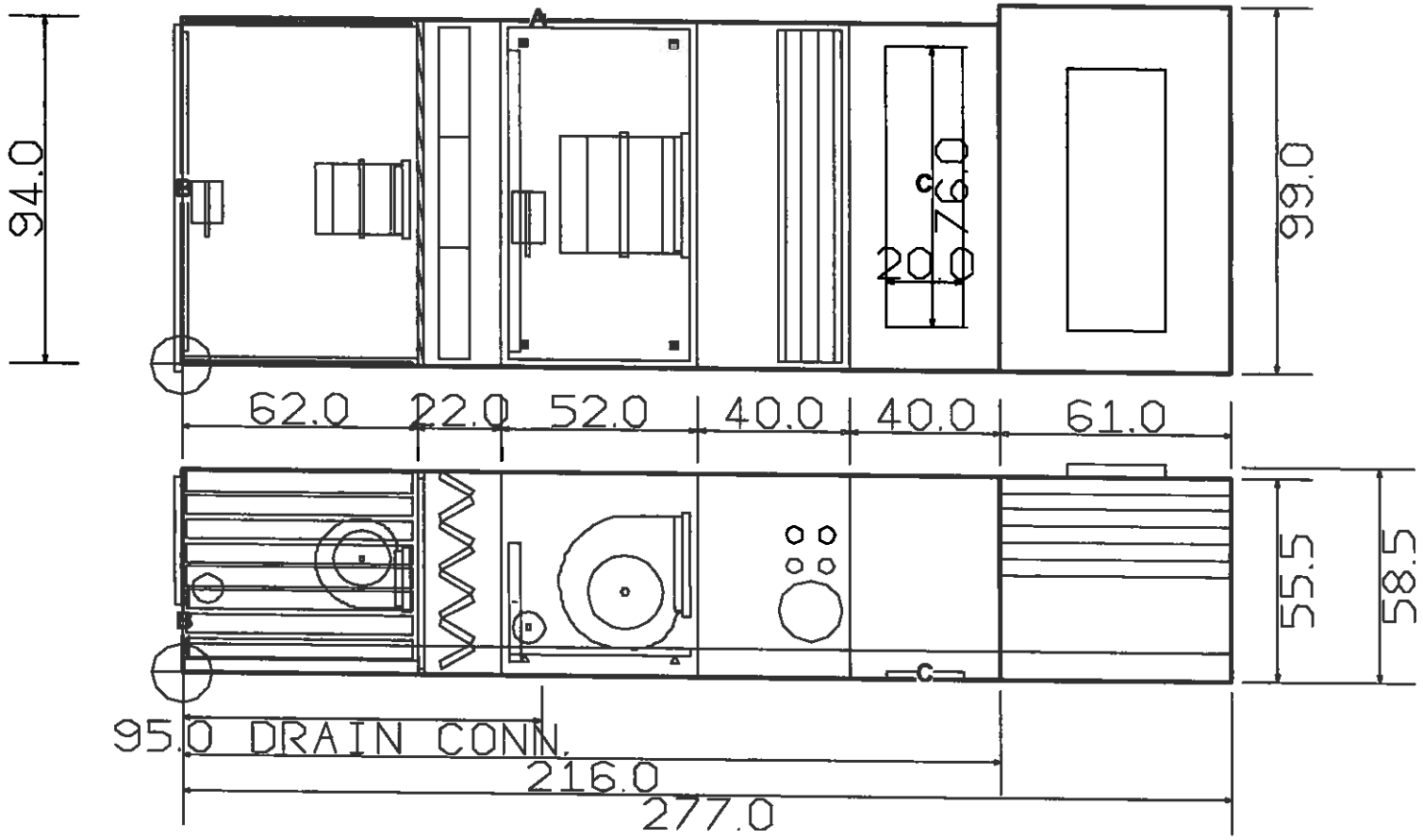



VIEW: Right Side
DRAWN: 28-June-2011 (15:46)
JOB NAME: Dover Shearborn 300ton chiller
UNIT TAGGING: RTU
MODEL: RPS020D

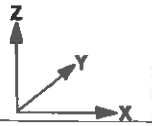
McQuay® Air Conditioning

| | Opening | X | Y | Z | W(Width) | H(Height) |
|---|---|---|---|---|---|---|
| A | Condensate drain connection (1.5 MPT) | 95.00 | 95.50 | 2.70 | - | - |
| B | Return air inlet | 0.00 | 3.75 | 3.60 | 86.50 | 20.00 |
| C | Discharge air outlet | 186.00 | 12.00 | 0.00 | 76.00 | 20.00 |

Dimensions measured from ⊕



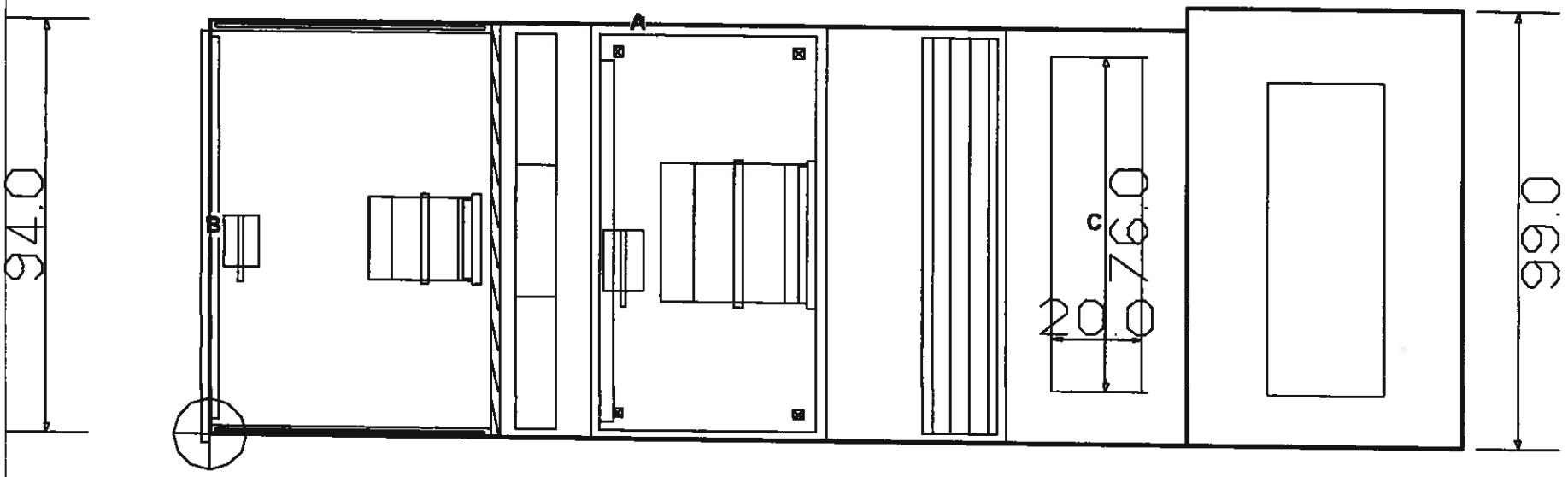

| | |
|---|---|
| VIEW: | General Arrangement No Ends |
| DRAWN: | 28-June-2011 (15:46) |
| JOB NAME: | Dover Shearborn 300ton chiller |
| UNIT TAGGING: | RTU |
| MODEL: | RPS020D |



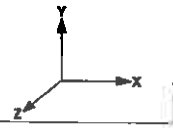

McQuay® Air Conditioning

| | Opening | X | Y | Z | W(Width) | H(Height) |
|---|---|---|---|---|---|---|
| A | Condensate drain connection (1.5 MPT) | 95.00 | 95.50 | 2.70 | - | - |
| B | Return air inlet | 0.00 | 3.75 | 3.60 | 86.50 | 20.00 |
| C | Discharge air outlet | 186.00 | 12.00 | 0.00 | 76.00 | 20.00 |

Dimensions measured from ○




VIEW: Top
DRAWN: 28-June-2011 (15:46)
JOB NAME: Dover Shearborn 300ton chiller
UNIT TAGGING: RTU
MODEL: RPS020D




McQuay Air Conditioning

# EnergyPro Building Energy Analysis

## Single-story School Building

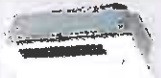
U.S. GREEN BUILDING COUNCIL MEMBER

MITSUBISHI ELECTRIC

HVAC Advanced Products Division

# Customize your CITY MULTI building comfort solution

**All models are quiet, easy to maintain and provide the ultimate in comfort. The chart below illustrates the capacity size for each model.**

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wall-mounted** |  | ● | ● | ● | ● | ● | ● | | ● | | | | | |
| **Ceiling-recessed Cassette** |  | | | ● | ● | ● | ● | | ● | ● | | | | |
| **Ceiling-recessed Cassette** |  | | ● | ● | ● | | | | | | | | | |
| **Ceiling-recessed Cassette** |  | ● | ● | ● | ● | | | | | | | | | |
| **Ceiling-suspended** |  | | | | ● | | ● | | ● | ● | | | | |
| **Ceiling-concealed (ducted)** |  | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| **Ceiling-concealed (ducted low-profile)** |  | ● | ● | ● | ● | ● | ● | | | | | | | |
| **Ceiling concealed (ducted alternative high-static option)** |  | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Floor-standing (exposed/concealed)** |  | ● | ● | ● | ● | ● | ● | | | | | | | |
| **Vertical Air Handler** |  | | | ● | | ● | ● | | ● | ● | ● | ● | | |

# CITY MULTI®
## VRFZ TECHNOLOGY

### *Advantages of CITY MULTI over Comparable Systems*

The EnergyPro model demonstrated that CITY MULTI systems offer reduced energy costs because of part-load efficiency and the ability to simultaneously cool and heat. CITY MULTI R2-Series heat recovery systems can simultaneously cool and heat different zones, which allows energy to be recovered from one zone and used in another, resulting in a huge increase in efficiency and energy savings over all of the compared systems.

There are some major areas in which the CITY MULTI system offers an advantage over other systems:

1. **Initial Cost:** CITY MULTI systems consist of an outdoor unit, an indoor unit in each zone, a BC controller (R2-Series only), refrigerant piping, and a very simple controls system. A four-pipe fan coil unit system includes a boiler, chiller, fan coil units, pumps, hot water piping, chilled water piping, a controls system, etc. A water-source heat pump system includes a cooling tower, supplemental boiler, condenser water piping, condenser water pumps, heat pumps, a controls system, etc. The reduced equipment required and ease of installation makes the CITY MULTI a superior first cost solution.

2. **Comfort:** One of the biggest advantages that CITY MULTI VRFZ solutions have over other systems is the increased comfort level for the occupants. VRFZ technology allows indoor units to operate at the precise level necessary to maintain room temperature which, when combined with the powerful controls system, allows the occupants to experience consistent comfort throughout the day.

3. **Quiet Operation:** CITY MULTI indoor and outdoor units operate at low sound levels; for example, a 20-ton outdoor unit operating at high speed has a sound level of 63 dB(A). Some indoor models have an operating sound level in the low 20 dB(A)s range, depending on fan speed and duct design. For contrast, the sound level for normal conversation is approximately 60 dB(A).

4. **Installation Space:** CITY MULTI systems do not require a mechanical room. Outdoor units can be installed outside either on grade or the roof and piped directly to indoor units, eliminating the need for pumps. Depending on the type of indoor unit, they can be installed in plenum spaces, on walls, or in the ceiling. Refrigerant piping is routed to the BC controller, also located in the plenum space, and then to the outdoor unit.

5. **Installation Time:** Because there are fewer components in a CITY MULTI system, the time it takes for installation is much shorter than for other systems. An indoor unit can be mounted and piped from the BC controller in hours.

6. **Flexibility:** The zoning capabilities of CITY MULTI systems allow for one indoor unit to be taken offline without affecting other indoor units. An outdoor unit can also be shut down and affect only a few zones. However with other systems if an air-handling unit should fail, or a component of the central mechanical system should fail (chiller, cooling tower or pumps) a large portion, if not all, building conditioning would be lost.

7. **Versatility:** CITY MULTI systems offer a choice of inside air handlers: ducted, wall-mounted, ceiling-mounted, and floor-mounted. Many other systems only offer limited indoor unit selections.

8. **Efficiency:** CITY MULTI R2-Series systems have the ability to recover energy when simultaneously cooling and heating, thereby reducing energy and increasing operating efficiency. Variable refrigerant flow zoning technology also allows CITY MULTI to automatically adjust to changing loads in each zone, maintaining the required temperature levels and operating at a lower cost.

9. **Maintenance:** CITY MULTI systems require significantly less maintenance; typically only requiring filter changes. CITY MULTI systems have a life expectancy of 15 to 20 years. Water-source heat pump systems require regular maintenance to maintain the compressor and keep the system functioning properly.

Mitsubishi Electric Advanced Products Division
3400 Lawrenceville Suwanee Road
Suwanee, GA 30024
Phone: 888-467-7546 Fax: 800-658-1458

Form No. EPBROSVM(GA)-7-09 V2
For more information visit www.mehvac.com

Please recycle.

**Mitsubishi Electric & Electronics - HVAC Advanced Products Div.**
3400 Lawrenceville Suwanee Road, Georgia 30024
**Toll Free:** 800-433-4822 • **Phone:** 678-376-2900
**E-Mail:** msmith@hvac.mea.com • **Web site:** www.mrslim.com

**Item # PCFY-P30NKMU-E, Ceiling-suspended Cooling and Heating Unit**

**Quiet, powerful airflow**

| Model Name | Airflow Rate | Sound Level at Low Airflow |
|---|---|---|
| PCFY-P15NGMU-E | 283-353-388-424 | 29 dB(A) |
| PCFY-P24NGMU-E | 424-494-565-636 | 32 dB(A) |
| PCFY-P30NGMU-E | 636-706-812-883 | 36 dB(A) |
| PCFY-P36NGMU-E | 918-989-1,130-1,236 | 37 dB(A) |

LENNOX

ENGINEERING DATA

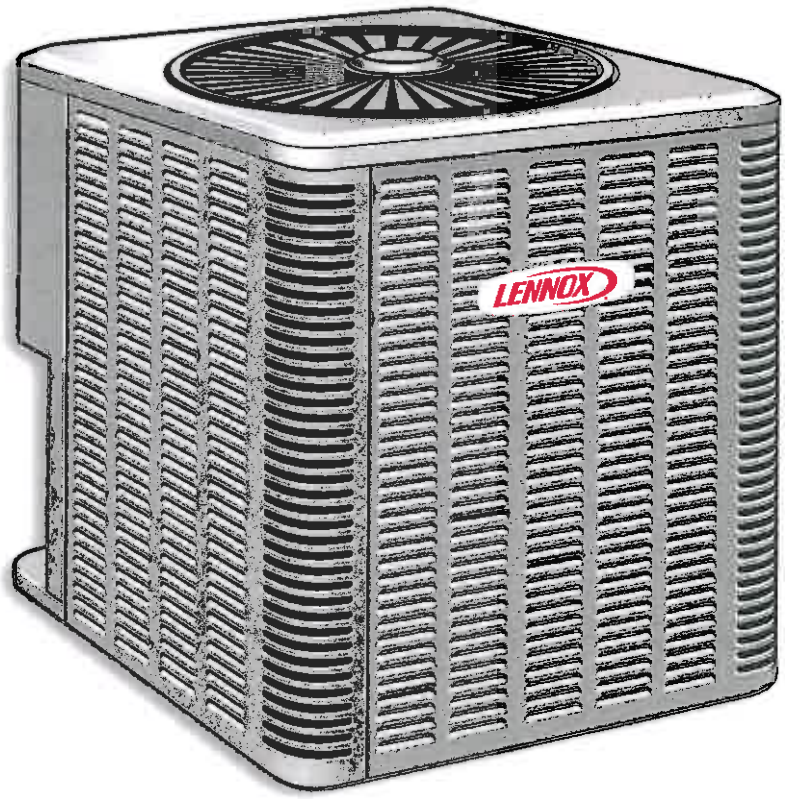
AIR CONDITIONERS

# 13ACX

## MERIT® Series

## R-410A

Bulletin No. 210563
June 2011
Supersedes May 2011




**SEER up to 15.50**
**1.5 to 5 Tons**
**Cooling Capacity - 18,000 to 61,500 Btuh**

## MODEL NUMBER IDENTIFICATION

**13 AC X - 024 - 230 - 2**

- **13** — Nominal SEER
- **AC** — Unit Type
  - AC= Air Conditioner
- **X** — Refrigerant
  - X = R-410A
- **024** — Nominal Cooling Capacity
  - 018 = 1.5 tons
  - 024 = 2 tons
  - 030 = 2.5 tons
  - 036 = 3 tons
  - 042 = 3.5 tons
  - 048 = 4 tons
  - 060 = 5 tons
- **230** — Voltage
  - 230 = 208/230V-1phase-60hz
- **2** — Minor Revision Number

# FEATURES

## CONTENTS



## EQUIPMENT WARRANTY

**Compressor** - limited warranty for **five years** in residential installations and five years in non-residential installations.

**All other covered components** - **five years** in residential installations and one year in non-residential installations.

Refer to Lennox Equipment Limited Warranty certificate included with unit for specific details.

## APPLICATIONS

SEER up to 15.50.

1.5 through 5 ton.

Single-phase power supply.

Sound levels as low as 76 dB.

Vertical air discharge allows concealment behind shrubs at grade level or out of sight on a roof.

Matching add-on furnace indoor coils or air handlers provide a wide range of cooling capacities and applications. See AHRI System Matches.

See Indoor Coils and Air Handlers sections for data.

Units shipped completely factory assembled, piped and wired. Each unit test operated at the factory ensuring proper operation.

Installer must set air conditioner, connect refrigerant lines and make electrical connections to complete job.

## APPROVALS

AHRI Certified to AHRI Standard 210/240-2008.

Sound rated in Lennox reverberant sound test room in Accordance with test conditions included in AHRI Standard 270-2008.

Tested in the Lennox Research Laboratory environmental test room.

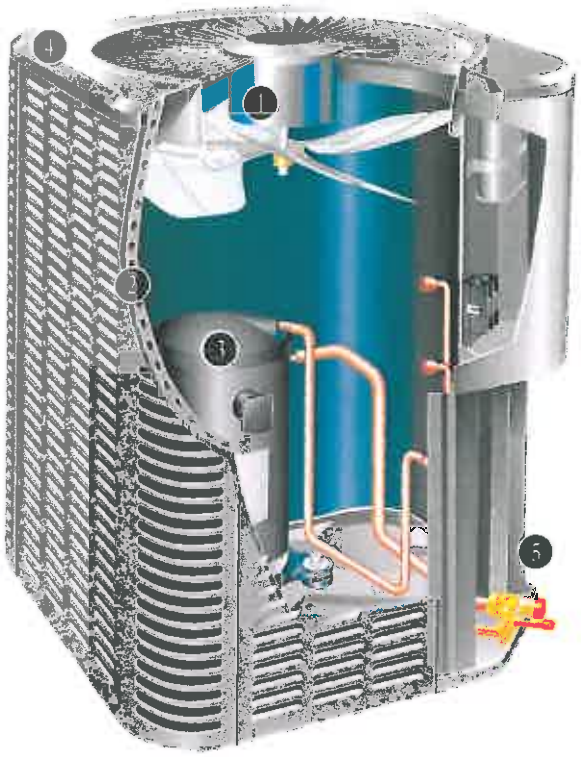
Rated According to U.S. Department of Energy (DOE) test procedures.

Units and components within bonded for grounding to meet safety standards for servicing required by UL, NEC and CEC.

Units are UL listed and CSA certified.

ISO 9001 Registered Manufacturing Quality System.

For expanded ratings, see **www.lennoxdavenet.com**.




## REFRIGERATION SYSTEM

**R-410A Refrigerant**

Non-chlorine, ozone friendly, R-410A.

Unit pre-charged with refrigerant.

See Specification table.

**1 Condenser Fan**

Direct drive fan moves large air volumes uniformly through entire condenser coil for high refrigerant cooling capacity.

Vertical air discharge minimizes operating sounds and eliminates damage to lawn and shrubs.

Fan motor has sleeve bearings and is inherently protected.

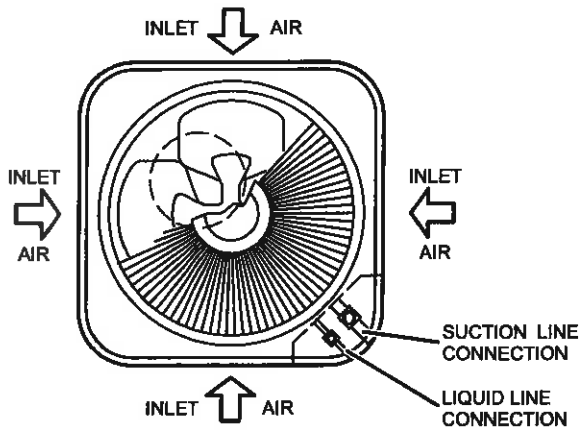
Motor totally enclosed for maximum protection from weather, dust and corrosion.

Rain shield on motor provides additional protection from moisture.

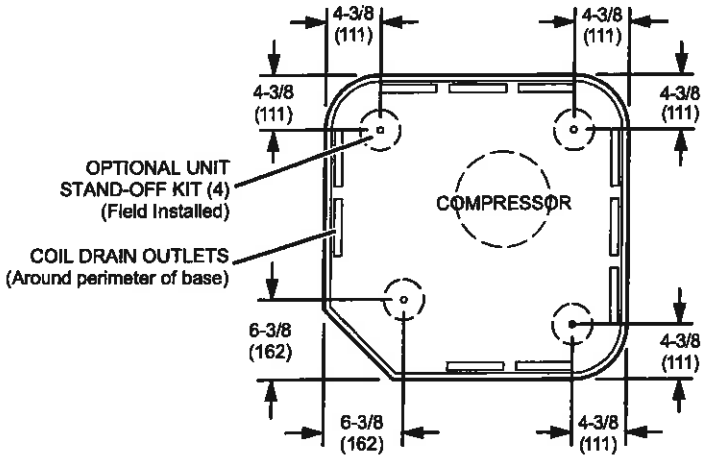
Louvered steel top fan guard furnished as standard.

Fan service access accomplished by removal of top panel.

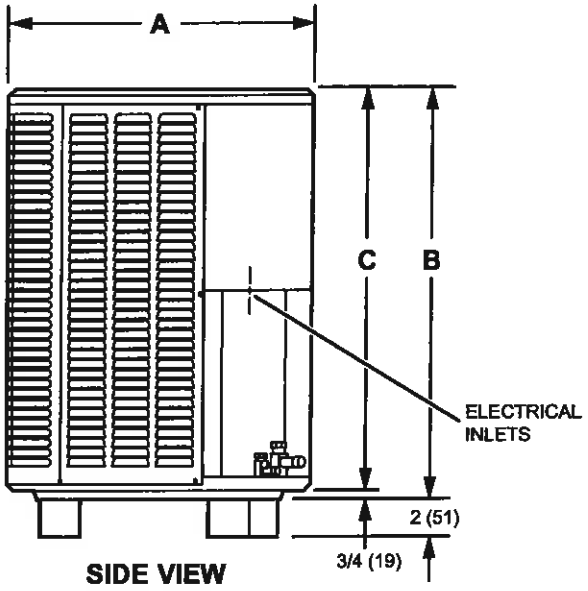
## DIMENSIONS - INCHES (MM)



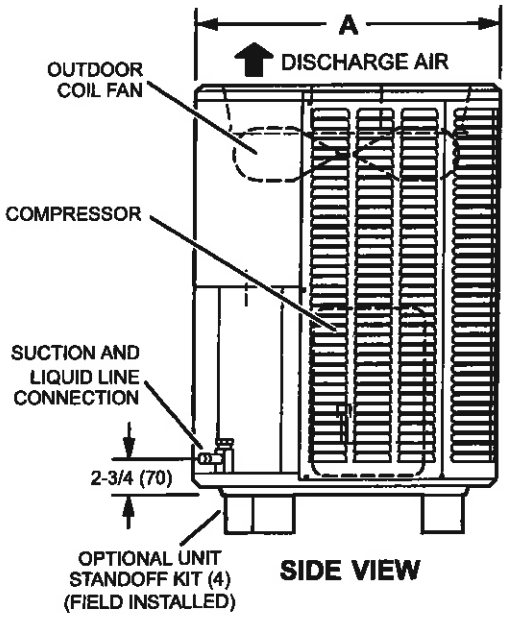

TOP VIEW




TOP VIEW BASE SECTION




SIDE VIEW




SIDE VIEW

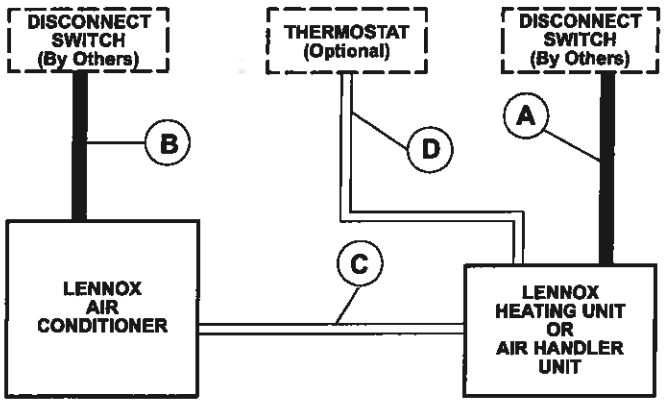
| Model No. | A | | B | | C | |
|---|---|---|---|---|---|---|
| | inches | mm | inches | mm | inches | mm |
| 13ACX-018 | 24-1/4 | 616 | 25-1/4 | 641 | 24-1/4 | 616 |
| 13ACX-024 | 24-1/4 | 616 | 25-1/4 | 641 | 24-1/4 | 616 |
| 13ACX-030 | 24-1/4 | 616 | 29-1/4 | 743 | 28-1/2 | 724 |
| 13ACX-036 | 24-1/4 | 616 | 29-1/4 | 743 | 28-1/2 | 724 |
| 13ACX-042 | 28-1/4 | 718 | 29-1/4 | 743 | 28-1/2 | 724 |
| 13ACX-048 | 28-1/4 | 718 | 37-1/4 | 946 | 36-1/4 | 921 |
| 13ACX-060 | 28-1/4 | 718 | 33-1/4 | 845 | 32-1/2 | 826 |

## SOUND DATA

| [1] Unit Model No. | Octave Band Sound Power Levels dBA, re $10^{-12}$ Watts Center Frequency - HZ | | | | | | | [1] Sound Rating Number (dB) |
|---|---|---|---|---|---|---|---|---|
| | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| 13ACX-018 | 53 | 60 | 64.5 | 68.5 | 67 | 61.5 | 54.5 | 76 |
| 13ACX-024 | 51.5 | 62 | 64.5 | 68.5 | 67 | 60.5 | 53.5 | 76 |
| 13ACX-030 | 52.5 | 62 | 67.5 | 69 | 67 | 61.5 | 54.5 | 76 |
| 13ACX-036 | 52.5 | 61 | 67 | 69 | 67 | 61.5 | 52.5 | 76 |
| 13ACX-042 | 58 | 68 | 73.5 | 75.5 | 74 | 69.5 | 62.5 | 79 |
| 13ACX-048 | 57.5 | 67 | 73 | 74.5 | 71 | 64 | 58.5 | 79 |
| 13ACX-060 | 57 | 63 | 69.5 | 71.5 | 71 | 65.5 | 60.5 | 79 |

NOTE - the octave sound power data does not include tonal correction.
[1] Tested according to AHRI Standard 270-2008 test conditions.

## FIELD WIRING

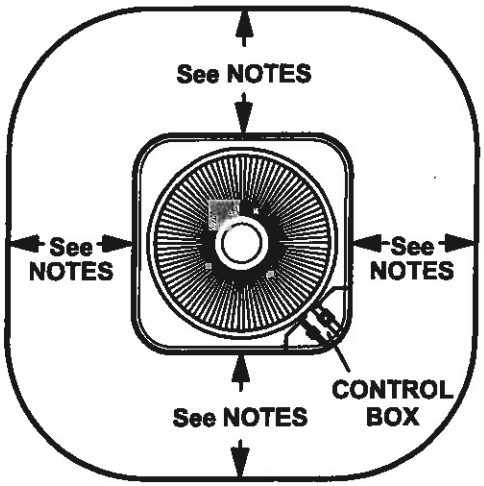



A - Two Wire Power
B - Two Wire Power (See Electrical Data)
C - Two Wire Low Voltage (18 ga. minimum)
D - Four Wire Low Voltage (Electro-Mechanical) 18 ga. minimum.
Five Wire Low Voltage (Electronic) 18 ga. minimum

*NOTE - Field Wiring Not Furnished*

All wiring must conform to NEC or CEC and local electrical codes.

## INSTALLATION CLEARANCES - IN. (MM)




**NOTES:**

Service clearance of 30 in. (762 mm) must be maintained on one of the sides adjacent to the control box.

Clearance to one of the other three sides must be 36 in. (914 mm)

Clearance to one of the remaining two sides may be 12 in. (305 mm) and the final side may be 6 in. (152 mm).

A clearance of 24 in. must be maintained between two units.

48 in. (1219 mm) clearance required on top of unit.

Fans & Blowers

Twin City

Defining Innovation.

# MODULAR PLENUM FANS

## TYPE MPQN | TYPE MPQS

BULLETIN 490
October 2010

# Modular Plenum Fans

The MPQN and MPQS offer many of the same advantages of the venerable EPQN plenum fan. The MPQN and MPQS can be used as a single fan or in parallel to construct a multiple fan system. By using multiple MPQN fans in parallel, sound power levels in low octave bands can be significantly reduced over alternative fan selections. In addition, considerable axial space savings is achieved over a single fan selection.

Twin City Fan & Blower, the world's largest supplier of plenum fans, offers the Modular Plenum Fan (MPQN), AMCA licensed for sound and air.

*Inlet View*

*Drive End View*

## Size & Performance

- Class II available in sizes 122 to 490
- Class III available in sizes 182 to 490
- Capacities to 76,000 CFM
- Static pressures to 12" w.g.

## Classes

Class II available in sizes 122 to 490. Class III available in sizes 182 to 490. See dimensional drawing on page 10.

# Fan Application

Plenum fans are unhoused fans designed to operate inside of field-fabricated or factory-built air handling units.

The fan wheel pressurizes the entire surrounding air plenum in which the fan is installed, allowing air ducts from any direction to be directly connected to the air handling unit enclosure. This design generally saves space by eliminating the fan housing, transitions, and diffusers within the air handling unit.

Plenum fans have found a ready acceptance in the air conditioning industry. In addition, the construction versatility, adaptability in the direction of the discharges, suitability for internal isolation and application of sound panels, and generally lower cost makes it a very popular fan arrangement.

The MPQN and MPQS fans, when used in parallel, can offer further advantages over a standard plenum fan. By using multiple fans in parallel, uniform flow can be achieved with less axial length in a given air handling unit. The use of multiple MPQN fans in parallel can also serve to reduce sound levels, possibly eliminating the need for additional sound attenuation within the unit.

Twin City Fan & Blower certifies that the Type MPQN Plenum Fans shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Refer to Bulletin 491 for sound power levels.

# MPQN Advantage

The MPQN plenum fans offer unique performance features that are beneficial for many sound sensitive and higher pressure applications. The fan system is advantageous by providing uniform air distribution downstream of the fan, allowing for better air distribution through AHU components. The use of multiple fans in parallel allows a shorter AHU (in axial direction of flow), and provides redundancy for critical fan applications.

The MPQN features a 12-bladed airfoil wheel versus the 8- to 10-bladed wheels with most other competition. The "Q" in the MPQN designates for Better Noise Quality. Noise quality is a subjective description for noise that is less objectionable.

The design provides lower sound power levels at the lower octave bands which are the most difficult to attenuate. Furthermore, the 12-bladed fan impeller offers a higher blade pass frequency. This in turn transfers sound power levels to the higher octave bands (Figure 1), which allows for easier attenuation of the noise. Sound levels are often influenced by the noise occurring at the blade pass frequency (Blade Pass Frequency = RPM x Number of blades/60). In many applications, the use of the MPQN design will move the blade pass frequency from the 2nd octave band to the 3rd octave band. Acoustic silencers will normally perform about 10 dB better in the 3rd band.

With the use of the 12-bladed impeller, sound quality is improved by reducing the change of abrupt sound levels between neighboring octave bands, providing a more balanced sound level across the octave bands. Although the overall A-weighted sound power levels of a nine-bladed fan may be slightly lower, the sound "quality" of the 12-bladed MPQN fan may be desirable for the application as it is more pleasing to the human ear.

The MPQN offers the benefit of reduced low-frequency casing radiated noise due to the small lattice structure opening and end reflection. The insulated housing absorbs some noise generated by the fan, and the decreased size of the discharge opening results in a degree of attenuation due to end reflection.

Figure 1 demonstrates the sound comparison between the single plenum fan and the multi-fan system with 12-bladed wheel and insulated enclosure. The multi-fan system generates less outlet sound power levels at the lower frequencies.

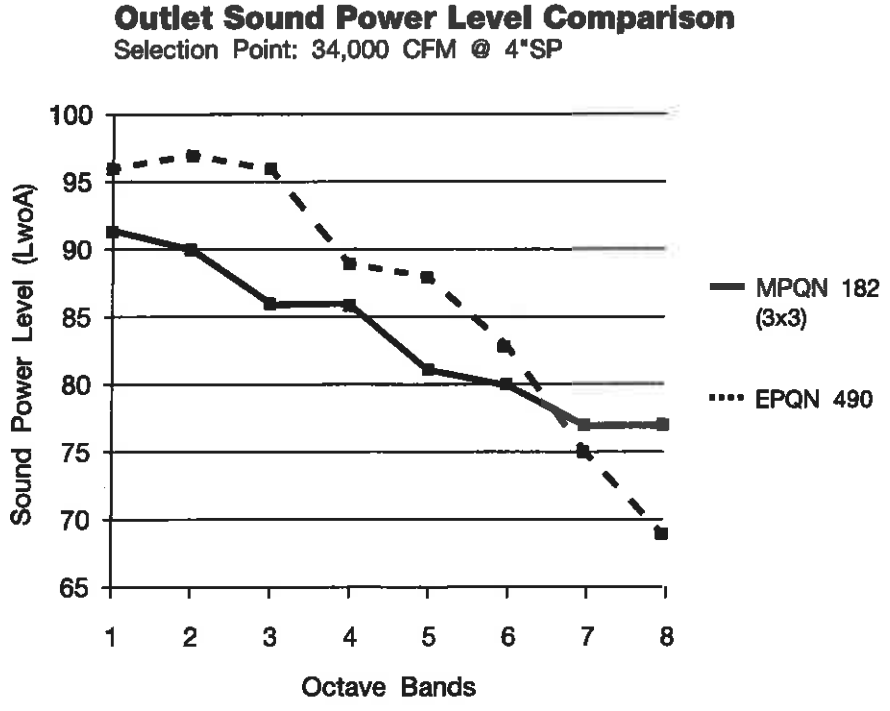
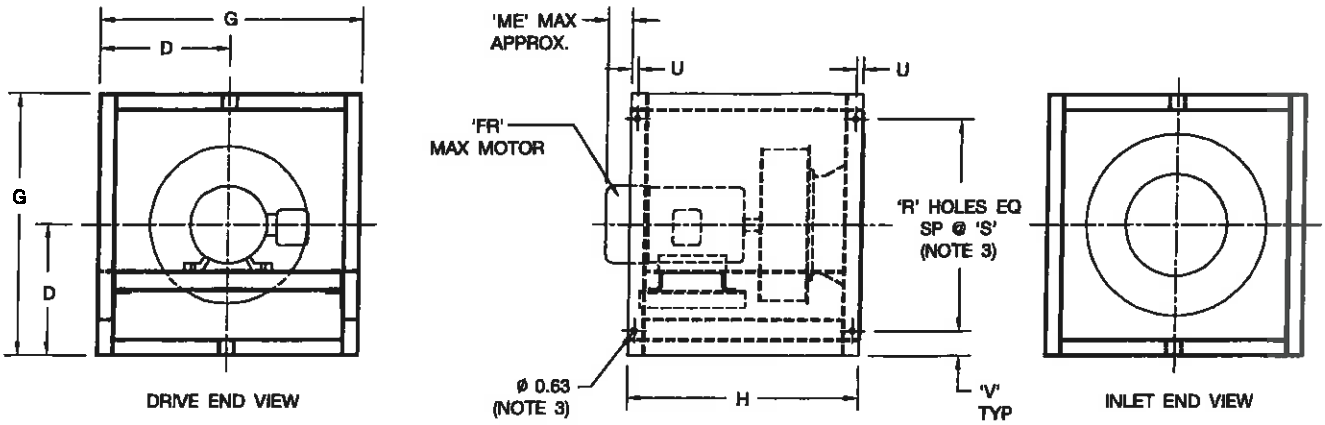



*Figure 1*

| Sound Power | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | LwoA |
|---|---|---|---|---|---|---|---|---|---|
| **MPQN 182 (3 x 3)** | 92 | 90 | 86 | 86 | 81 | 80 | 77 | 77 | 88 |
| **EPQN 490** | 96 | 97 | 96 | 89 | 88 | 83 | 75 | 69 | 93 |

# Dimensional Data – Horizontal, Arr. 4 - Class II




**NOTES:**

1. Horizontal application only.
2. CW rotation is standard, CCW rotation is optional. Rotation is determined by viewing the drive end.
3. Mounting hole pattern typical on inlet and drive end on all four sides. 3/8" diameter mounting hardware suggested. See IOM-110 for fan installation instructions.
4. Model MPQN provides acoustically insulated housing with perforated plate separating insulation from airstream. Model MPQS is identical to MPQN with the exception of the acoustical insulation and perforated plate.

This Model

| SIZE | G | D | H | 'R' PER SIDE | S | U | V | 'ME' MAX REF | MAX 'FR' |
|---|---|---|---|---|---|---|---|---|---|
| 122 | 23.00 | 11.50 | 20.00 | 2 | 16.81 | 1.13 | 3.13 | 2.25 | 184T |
| 150 | 25.38 | 12.69 | 21.00 | 2 | 19.19 | 1.13 | 3.13 | 6.25 | 213T |
| 165 | 28.06 | 14.06 | 23.63 | 3 | 10.94 | 1.13 | 3.13 | 4.81 | 215T |
| 182 | 31.81 | 15.94 | 27.38 | 3 | 12.75 | 1.13 | 3.13 | 8.56 | 254T |
| 200 | 34.50 | 17.25 | 30.00 | 3 | 14.13 | 1.13 | 3.13 | 7.19 | 254T |
| 222 | 39.81 | 19.94 | 33.38 | 3 | 17.81 | 1.75 | 2.13 | 5.44 | 256T |
| 245 | 43.25 | 21.63 | 36.75 | 3 | 18.50 | 1.75 | 2.13 | 6.84 | 284T |
| 270 | 46.94 | 23.50 | 40.50 | 4 | 14.25 | 1.75 | 2.13 | 5.00 | 286T |
| 300 | 51.50 | 25.75 | 45.00 | 4 | 15.75 | 1.75 | 2.13 | 5.50 | 324T |
| 330 | 55.94 | 28.00 | 49.50 | 4 | 17.25 | 1.75 | 2.13 | 3.25 | 326T |
| 365 | 61.25 | 30.63 | 54.75 | 5 | 14.25 | 2.25 | 2.13 | 5.69 | 405T |
| 402 | 68.81 | 34.44 | 60.38 | 5 | 15.63 | 2.25 | 3.13 | 3.13 | 405T |
| 445 | 75.25 | 37.63 | 66.75 | 5 | 17.25 | 2.25 | 3.13 | 0.13 | 405T |
| 490 | 81.94 | 41.00 | 73.50 | 5 | 18.94 | 2.25 | 3.13 | 1.38 | 444T |

BC1003160E

DIMENSIONS ARE SUBJECT TO CHANGE. CERTIFIED DRAWINGS AVAILABLE UPON REQUEST.