



# Application Guide

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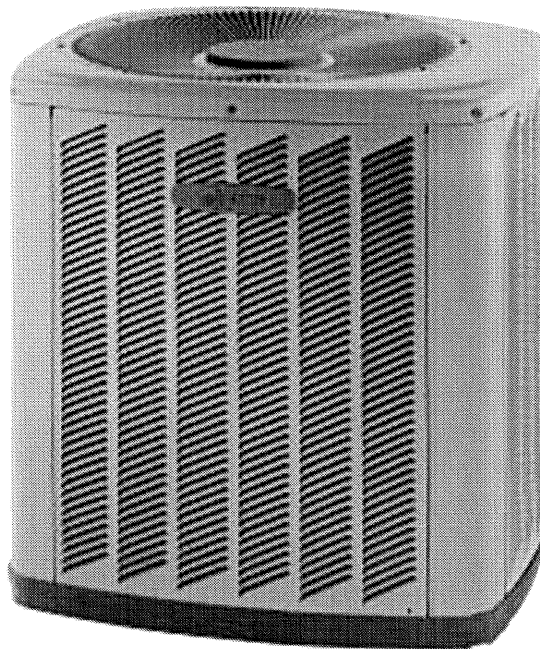
## **XB-APG04-EN**

Low OD Ambient Operation

Unit Mounting

Minimum Clearances

System Charging



For Trane XB13 and 13 SEER 3 Phase Outdoor Models

## **Purpose:**

The purpose of this bulletin is to provide cumulative application criteria as related to the Trane XB style cooling units and heat pumps.

This bulletin discusses:

- I. Definitions and terms
- II. Off Season Cooling Operation
- III. Unit Mounting
- IV. Minimum Operating Clearances
- IV. System Charging

### **POSITION STATEMENT:**

The Trane Company has always recommended installing Trane approved, matched indoor and outdoor systems. All Trane split systems with a nominal rating of 13 SEER and above are listed in the ARI Certified Directory with thermostatic expansion valves (TXV) only.

### **ISSUED BY:**

Product Application Engineering Department  
Trane  
Tyler, Texas

### Three phase products:

All 2.5 to 5 ton three phase split system cooling units and heat pumps are shipped from the factory with compressor crankcase heat. Three phase compressor do not require start capacitors or start relays.

### Definitions and information:

**CCHT** - Compressor Crankcase Heater, sometimes called a compressor sump heater. This device is designed to warm the compressor crankcase (or sump) in order to prevent or deter refrigerant migration during the compressor off cycle. Compressor crankcase heaters are required for low ambient cooling operation.

**TXV** - Thermostatic Expansion Valve. This is a type of refrigerant flow control device designed to maintain constant superheat throughout the operating envelope. For low ambient cooling applications, a non-bleed TXV is required.

**Bleed TXV:** This type of TXV will allow the refrigerant pressures between the high side and low side to equalize through the valve during the off cycle.

**Non Bleed TXV:** This type of TXV will not allow the refrigerant pressures between the high side and low side to equalize through the valve during the off cycle. When using this type of valve on single phase units with reciprocating style compressors, compressor start components are required. Check product data specifications for most current information.

**Head pressure controller** - A device that is field installed on a condensing unit or heat pump designed to maintain system head pressure that will allow safe system operation without indoor coil icing in colder outdoor ambients. The BAYLOAM103 will cycle the condenser fan motor in order to achieve adequate operating head pressure. The control is adjustable.

**Evaporator Defrost Control** - A device that is field installed on the system's indoor coil in order to prevent the system from running during the cooling cycle when the indoor coil approaches or reaches a temperature in which frost will form on the coil surface. When the indoor coil approaches a safe temperature for cooling operation, the control will close and allow the outdoor unit to restart. This controller makes and breaks the control voltage to the condensing unit.

**Quick Start Component** - This component may be factory installed or offered as a field installed accessory ( BAYKSKT\*\*\*). A quick start kit consist of a capacitor with a high microfarad rating and a potential relay. It is installed so that the start capacitor is wired in parallel with the compressor's run capacitor. Prior to start-up the potential relay contacts are closed, therefore placing the start capacitor in the compressor circuit, as the compressor motor reaches operating speed, electrical current flows through the potential relay's coil and the the relay contacts are opened, thus taking the start capacitor out of the system until the next compressor start up.

**Unit Base Size** - Unit base size may be determined by looking at the cabinet size. If cabinet size appears as **2.1**, the base size is **2**. The number following the decimal point is used by Trane as an internal denoter to determine cabinet size.

## Section I - Off Season Cooling Operation:

The Trane XB models, as well as the 3 phase models may be operated in the cooling mode to 45°F as shipped from the factory when applied with an indoor TXV. Where required, these units, with appropriate accessories, may be applied to operate at outdoor temperatures below 45°F

Please refer to the accessory table below when determining if the desired model unit will operate at the specified conditions and required accessories

Model Family	Ambient Temperature in Cooling Mode Operation							
	45 F	30 F		0 F				
2TTB3	As Shipped	AY28X079	CCHT*	BAYLOAM103	AY28X079	Quick Start Accessory*	CCHT*	Solenoid Valve**
2TWB3	As Shipped	AY28X084	CCHT*	BAYLOAM103	AY28X084	Quick Start Accessory*	CCHT*	
2TTA3	As Shipped	AY28X079		BAYLOAM103	AY28X079			Solenoid Valve**
2TWA3	As Shipped	AY28X084		BAYLOAM103	AY28X084			

\* Unit requires a compressor crankcase heater and start accessory only if it is not factory installed. Check general specifications located in product data to determine if unit is equipped with factory installed quick start components.

\* \*\*Solenoid valve required if:

1. Liquid line is one size larger than factory connection. (example: factory connection is 3/8" and the existing liquid line is 1/2") Please refer to publication 32-3009-03 or latest edition for approved line sizes.
2. Off cycle time will be longer than 30 minutes during low ambient cooling operation.

### Compressor Crankcase Heaters:

Reciprocating Compressor: BAYCCHT300

Scroll Compressor: BAYCCHT301

### Evaporator Defrost Control Kits:

AY28X079: Cooling only

AY28X084: Heat pumps

### Head Pressure Controller:

BAYLOAM103: Approved for heat pumps and cooling units

### Wind Shields:

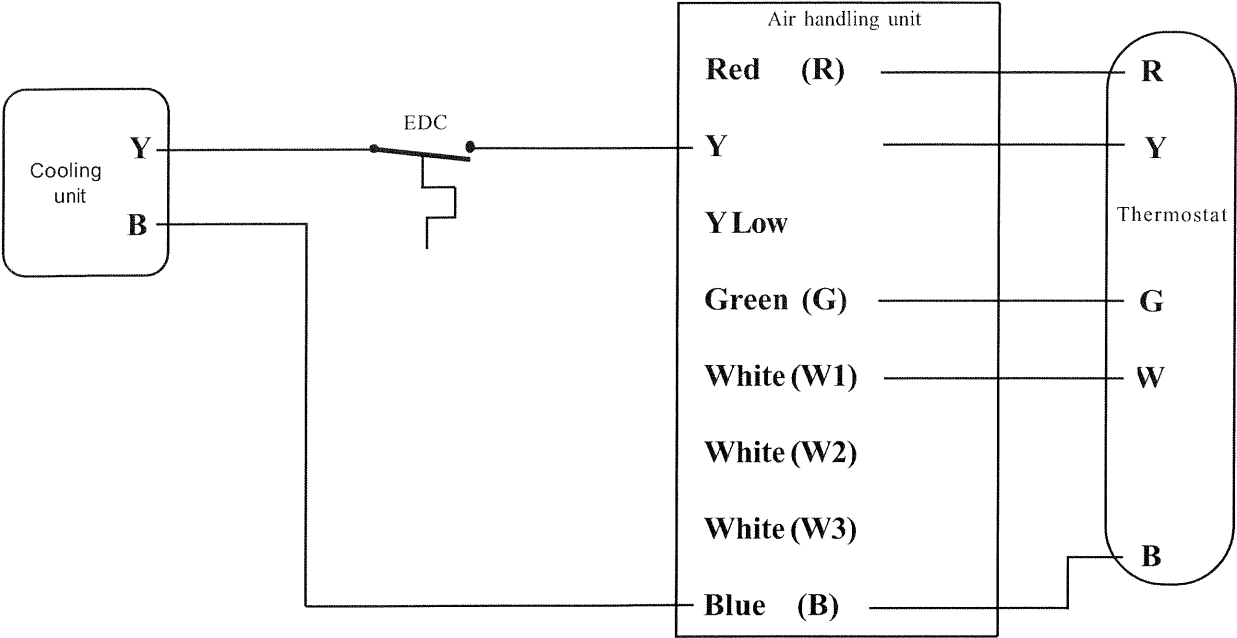
Please refer to page 14 of this document for information regarding wind shields when low ambient cooling operation is required.

### More Information:

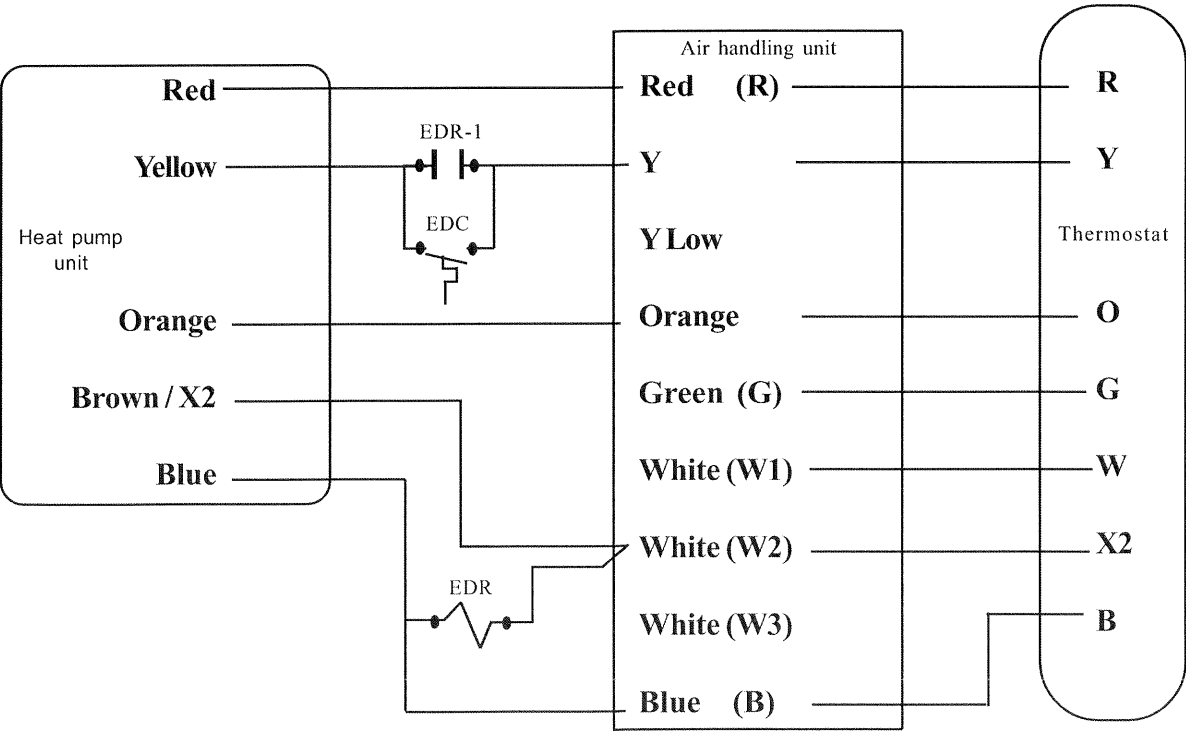
As noted in the above table, the XB13 and 3 phase outdoor units may be operated to 0°F if necessary, by applying the BAYLOAM103 head pressure controller and other required accessories. The BAYLOAM103 is a newly developed head pressure controller that cycles the OD fan as needed to maintain liquid line temperature as set by the DIP switches located on the control. There is no need to change the outdoor fan motor on approved products since the controller does not vary the frequency to the motor. For more information publication number 18-HE46D1-1 or latest version, should be consulted.

**Typical wiring when using the evaporator defrost control (EDC):**

**Cooling Split System and AY28X079 Evaporator Defrost Control**



**Heat Pump Split System and AY28X084 Evaporator Defrost Control**

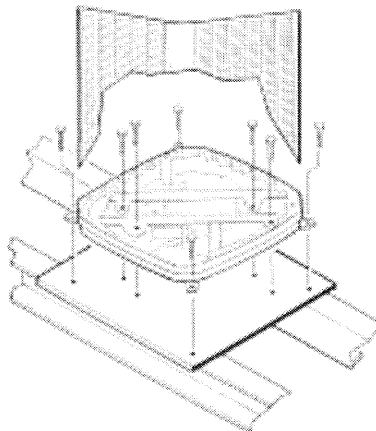
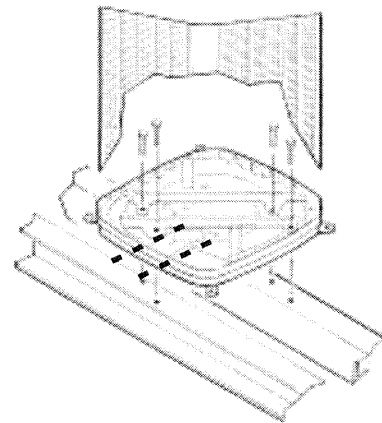
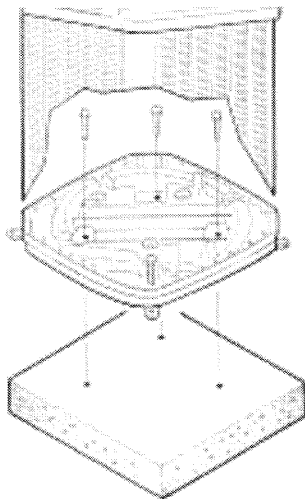


## SECTION II - Unit Mounting:

This section describes appropriate methods for mounting and securing the XB13 1.5 through 5 ton units and Trane 2.5 to 5 ton three phase split systems. However, if these units are to be mounted in a region where high winds are an issue, please refer to the Trane BAYECMT001 extreme conditions mounting kit. In seismic zones the unit shall be secured according to local code; this may require a local P.E.'s stamp.

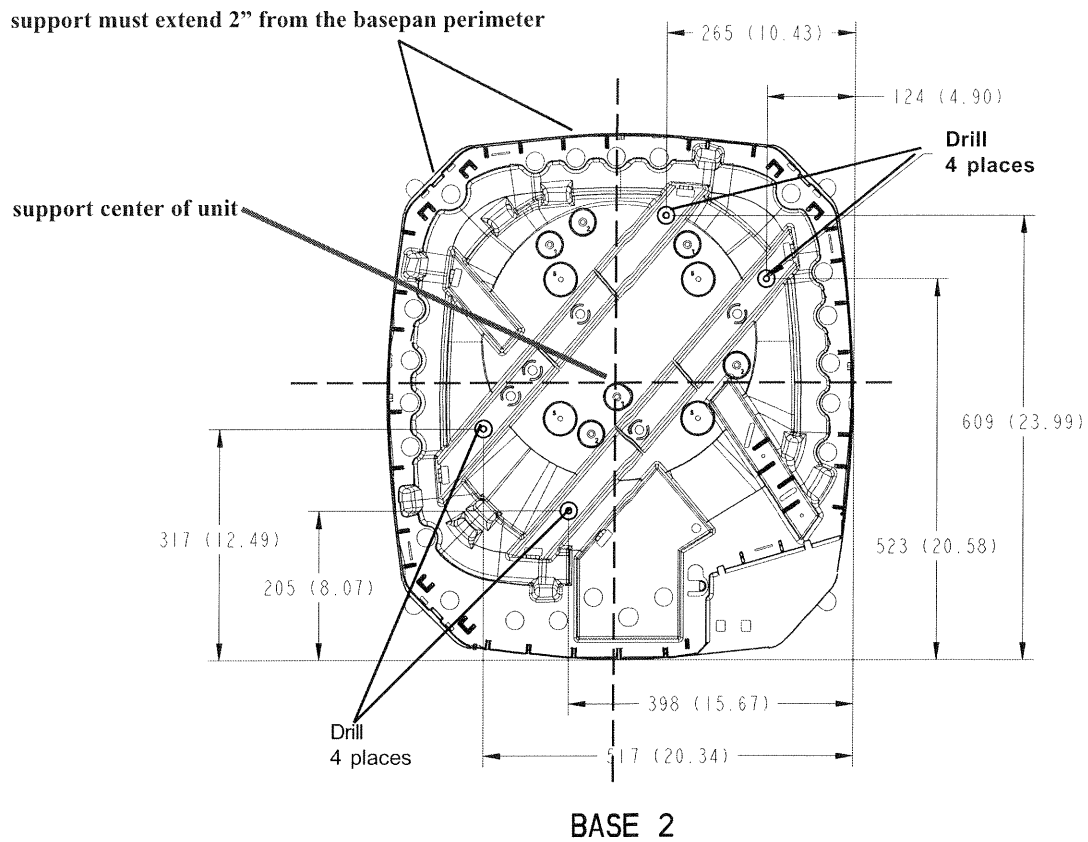
When mounting or securing Trane residential style condensing units and heat pumps please observe the following.

1. Anytime the unit is to be supported from the edge, the supporting material must extend minimum two inches beyond the perimeter of the unit's base.
2. The mounting hole locations are molded in the basepan, however, must be drilled through.
  - a) Hole locations are identified on page 7 and 8 of this document as well as the unit installation guide.
3. Washers should be placed in between the fastener head and the basepan.
4. Trane recommends supporting the center of the unit with a cross member if unit is not mounted on plate.
5. Base 2, 3, and 4 pans have four mounting hole locations.
6. Drill size / bolt diameter shall be 5/16".



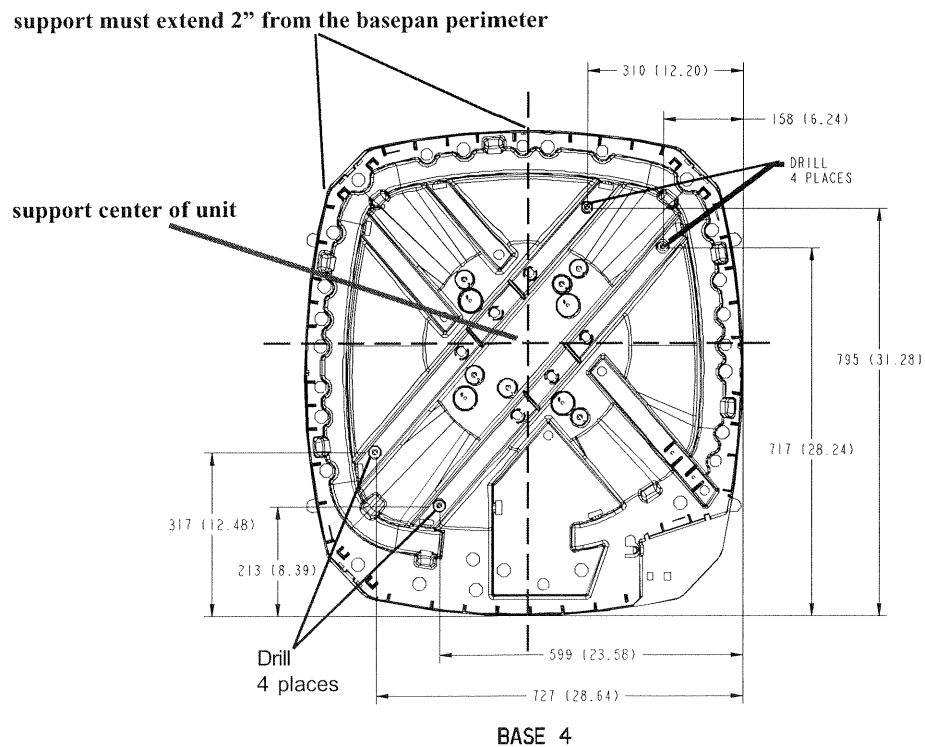
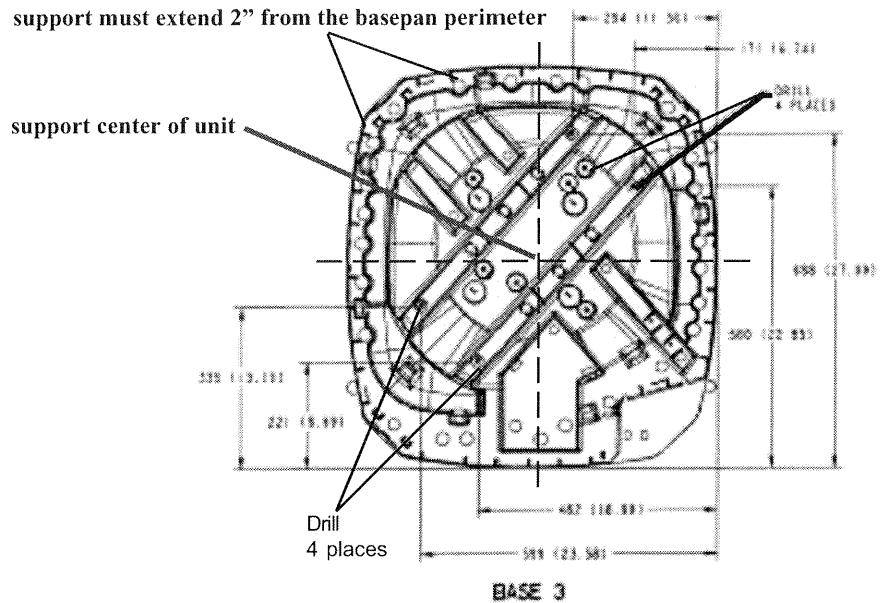
Drawings for illustration purposes only.

## BASE PAN MOUNTING HOLE LOCATIONS ( location only, holes must be drilled )



If supporting the base pan from the perimeter, the support must extend under the base pan at least 2". Trane recommends supporting the middle of the base pan with a cross member.

## BASE PAN MOUNTING HOLE LOCATIONS (location only, holes must be drilled)



If supporting the base pan from the perimeter, the support must extend under the base pan at least 2". Trane recommends supporting the middle of the base pan with a cross member.



## Section III - Minimum Operating Clearances

This section discusses installing the XB13 and 3 phase condensing unit / heat pump where spacing is limited. When installing Trane outdoor units in a location where clearance to other units, walls, fences, etc. is limited, the concerns listed below must be addressed:

1. System Operation - Adequate airflow must be provided to and away from the condensing unit / heat pump in order to enable appropriate heat transfer. If this is accomplished, head pressure will remain within an effective operating range.
2. System Servicability - Sufficient working space must be allowed for the HVAC service technician to properly maintain the condensing unit / heat pump. Furthermore, space must be allowed for major component change out in the event of a failure. Working space is determined by the Local, State and National Codes. (See National Electric Code Table 110.26 for explanation.)
3. Space Maintenance - Appropriate area must be allowed in order to maintain the ground area where the units are positioned to prohibit debris from collecting on the panels, thus further providing unobstructed airflow to the condensing unit.
3. State, Local Codes, and National Codes shall prevail. Check with the local jurisdiction before installation to assure compliance.

Numerous projects require minimum clearances between outdoor units and adjacent walls, fences and other units. The obstruction in question is usually one of the following:

1. One or more walls of an adjacent building.
2. Fences or barriers provided to reduce sound transmission or visually screen the equipment.
3. Other outdoor units in a multi-unit installation.
4. A combination of the above.
5. Overhangs

The prime considerations involved in establishing minimum clearances are:

1. Adequate airflow to the outdoor coil with minimum recirculation.
2. Service access to the equipment.
3. Compliance with the National Electric Code and other applicable codes.
4. Design temperature - Design temperatures greater than 105F require additional consideration.

I. In order to assure that adequate airflow reaches the XR condensing unit, size free air passages at 300 Feet Per Minute maximum velocity. See condensing unit airflow performance on page 23 of this document.

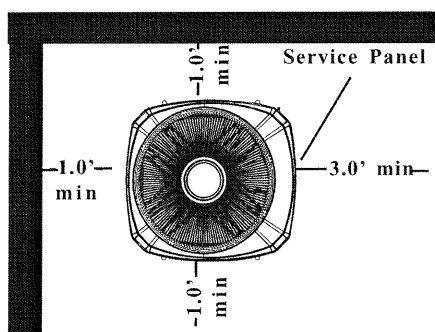
II. The importance of providing proper service access to equipment cannot be overemphasized. The HVAC service technician's job may be performed with greater ease and lower cost if adequate service space is allowed.

III. Knowledge of the National Electric Code and other applicable codes for the job sight location is a necessity in order to satisfy local inspectors. These codes are in place for service as well as safety.

IV. Be sure to read all provisions and footnotes contained in this document. When ambient temperatures exceed 105F, more space may be required for minimum operating clearances.

**1. Installation of a single condensing unit / heat pump in a corner with free air space on top.**

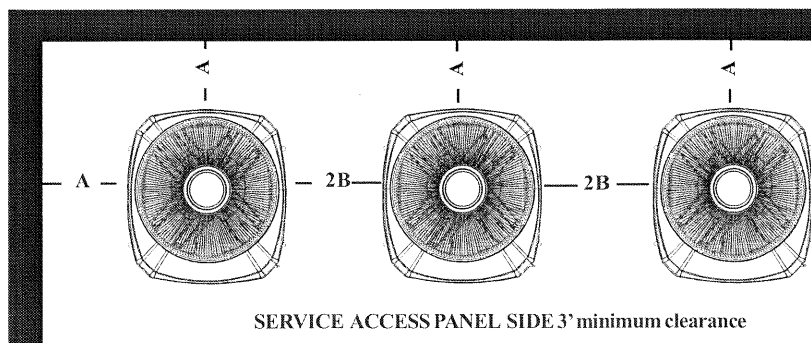
- A) For locations where the design ambient temperature is below 105F:
- 1) 1.0 feet clearance on 2 sides - If shrubbery is to be placed by the unit other side, then allow 1.0 Feet minimum clearance from the unit
  - 2) Service access side minimum 3 feet minimum clearance. Consult Local, State, and National Electric Codes for minimum service clearance.
- B) For locations where the design ambient temperature exceeds 105F:
- 1) 1.5 feet clearance on 2 walls. - If shrubbery is to be placed by the unit other side, then allow 1.0 Feet minimum clearance from the unit.
  - 2) Service access side minimum 3 feet minimum clearance.
- C) If unit is located in such a way that service panel is facing the wall
- 1) NEC requires minimum 3 feet between the unit and the wall
    - a) This space may be increased to 3 1/2 feet. Consult the National Electric Code for more information regarding minimum clearances for working spaces.



5 feet minimum unrestricted top clearance shall be provided.

**2. Installation of two or more units where two adjacent walls form a corner.**

- A) For locations where the design ambient temperature is below 105F:
- 1) Note the unit base size and obtain the minimum clearance values from the table below.
- B) **For locations where the design ambient temperature exceeds 105F:**
- 1) 2.0 feet clearance from both walls.
  - 2) 3.0 feet clearance in between units, unless service panels face each other. ( if service panels face each other, this clearance may be increased to 4 feet per NEC)
- C) If unit's are located in such a way that the service panels are facing the wall
- 1) NEC requires minimum 3 feet between the unit and the wall
    - a) This space may be increased to 3 1/2 feet. Consult the most current edition of the National Electric Code for more information regarding minimum clearances for working spaces.



5 feet minimum unrestricted top clearance shall be provided.

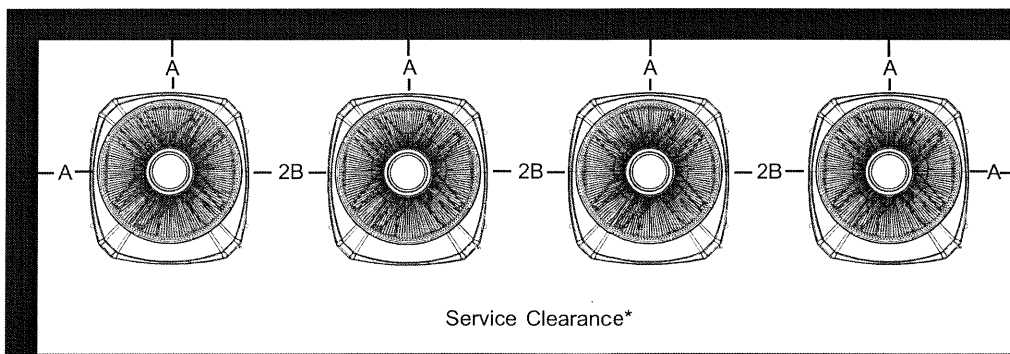
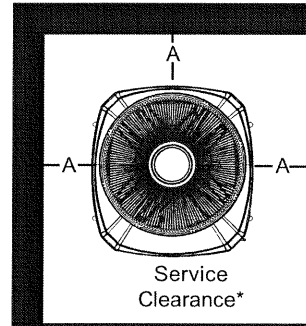
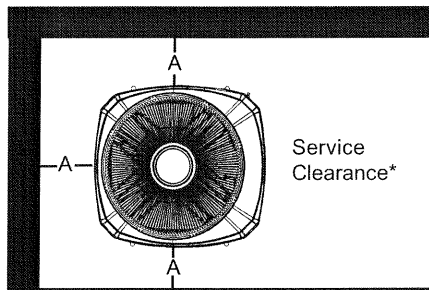
**minimum clearance table**

Base Size	A	B	Service Clearance
2	1.0'	1.0'	36"
3	1.2'	1.2'	36"
4	1.5'	1.4'	36"

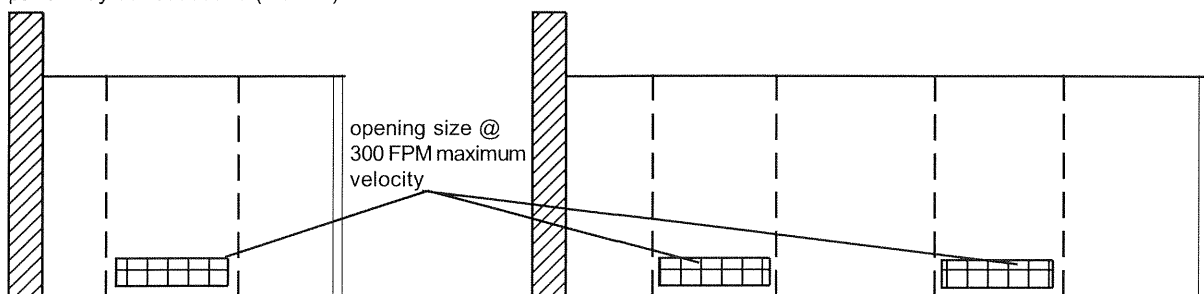
### 3. Units surrounded on all four sides:

A. If installed unit(s) is / are surrounded by 2 walls and a solid fence, fence height on two sides shall be no higher than the height of the unit. In this application knockouts or louvers shall be provided on two sides minimum with free area to provide maximum 300 FPM velocity. Cutting a portion of the lower fence on two sides to accomplish 300 FPM maximum velocity is acceptable provided debris, dirt, and grass is prohibited from accumulating or growing to obstruct the opening. Refer to page 18 of this document for outdoor unit airflow. Please refer to table below for minimum clearances.

5 feet minimum top clearance shall be provided.



\* If removable panels are used and acceptable to local inspection agency, the clearance to the removable panel may be reduced to (1.5 X A)



Single Unit - Solid Fence

Multiple Units Solid Fence

Solid Fence: If fence height is taller than unit(s), provide openings in fence that will provide maximum 300 FPM air velocity. These openings shall be located at the lower portion of the fence. If acceptable, the fence may be raised to provide open bottom clearance of fence height above the unit.

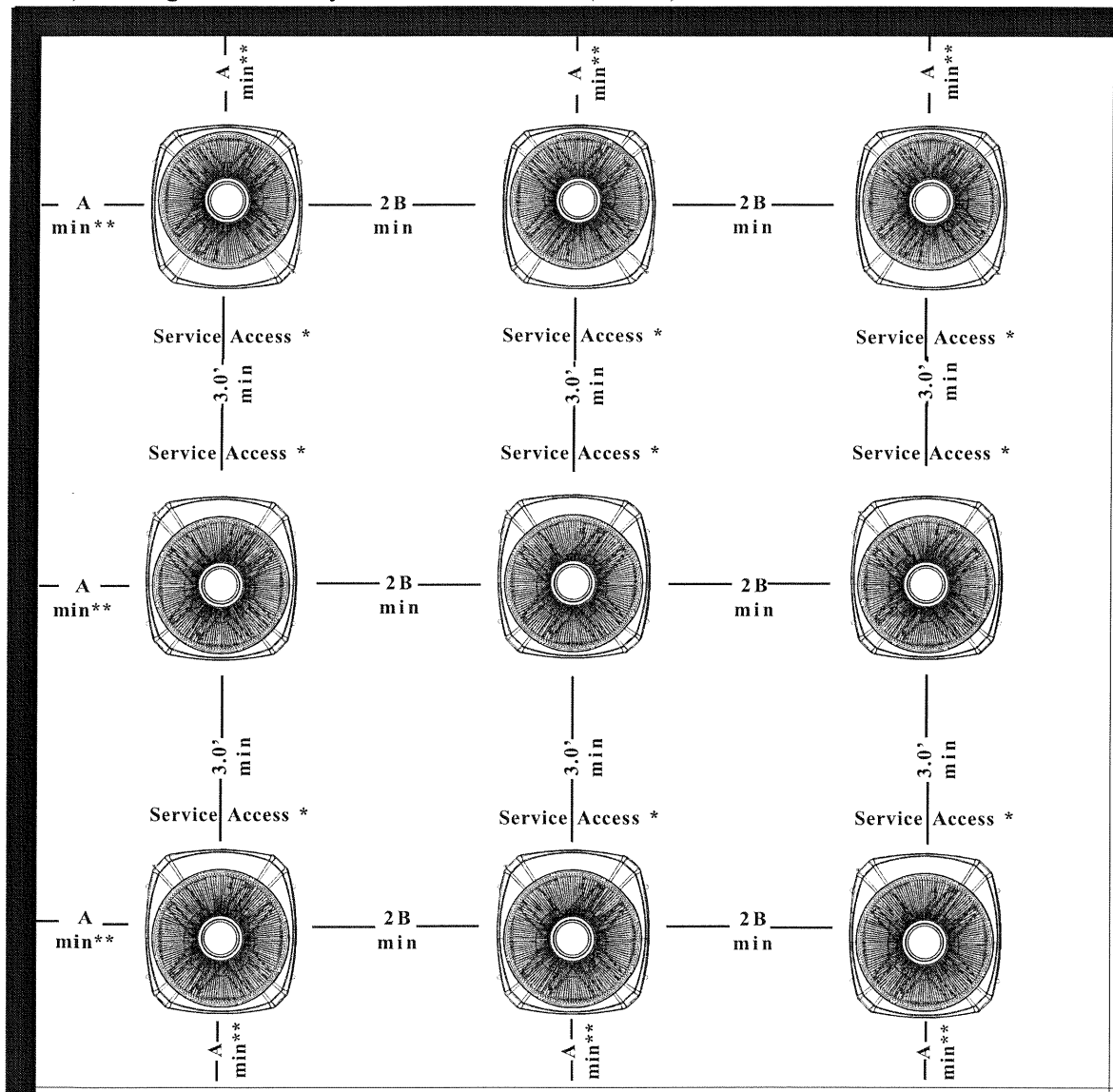
minimum clearance table

Base Size	A	B	Service Clearance
2	1.0'	1.0'	36"
3	1.2'	1.2'	36"
4	1.5'	1.4'	36"

These clearances apply in geographical locations in which the maximum design outdoor dry bulb = 105F or less.

**4. Installation of multiple units on a pad or rooftop where the top clearance is open.**

- A) Refer to minimum clearance table in the lower corner of this page for clearances
- B) National Electric Code requires 3 feet minimum (4 feet if certain conditions are present) clearance between service access panel and adjacent unit. If service access panel faces the wall, the required space between the the wall and the unit shall be minimum 3 feet. (May require as much as 3 1/2 feet)
- C) Walls shall not be higher than top of units.
- D) National, State, and Local Codes must be observed.
- E) If design outdoor dry bulb exceeds 105F (40.6C) add 1.0 Ft. to all dimensions.



\* Units may be rotated in order that service access sides face each other provided that 3 feet minimum clearance be maintained between the units. In order to comply with NEC, this may increase to 4 feet minimum clearance.

\*\* If wall or fence is to be constructed around the entire perimeter of the mechanical yard, Maintain minimum 1.5 feet clearance from the units. The fence height shall not exceed that of the unit. It is recommended to install louvers in the fence to allow no greater than 300 feet per minute velocity. Consult the table on page 18 for unit airflow. Place louvers in the lower section of the fence by each unit in order to provide air access to each unit located by the fence. The lower portion of the fence may also be cut in order to equal the calculated free area.

**minimum clearance table**

Base Size	A	B	Service Clearance
2	1.0'	1.0'	36"
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4	1.5'	1.4'	36"

**4. Installation of multiple units on a pad or rooftop where the top clearance is open.**

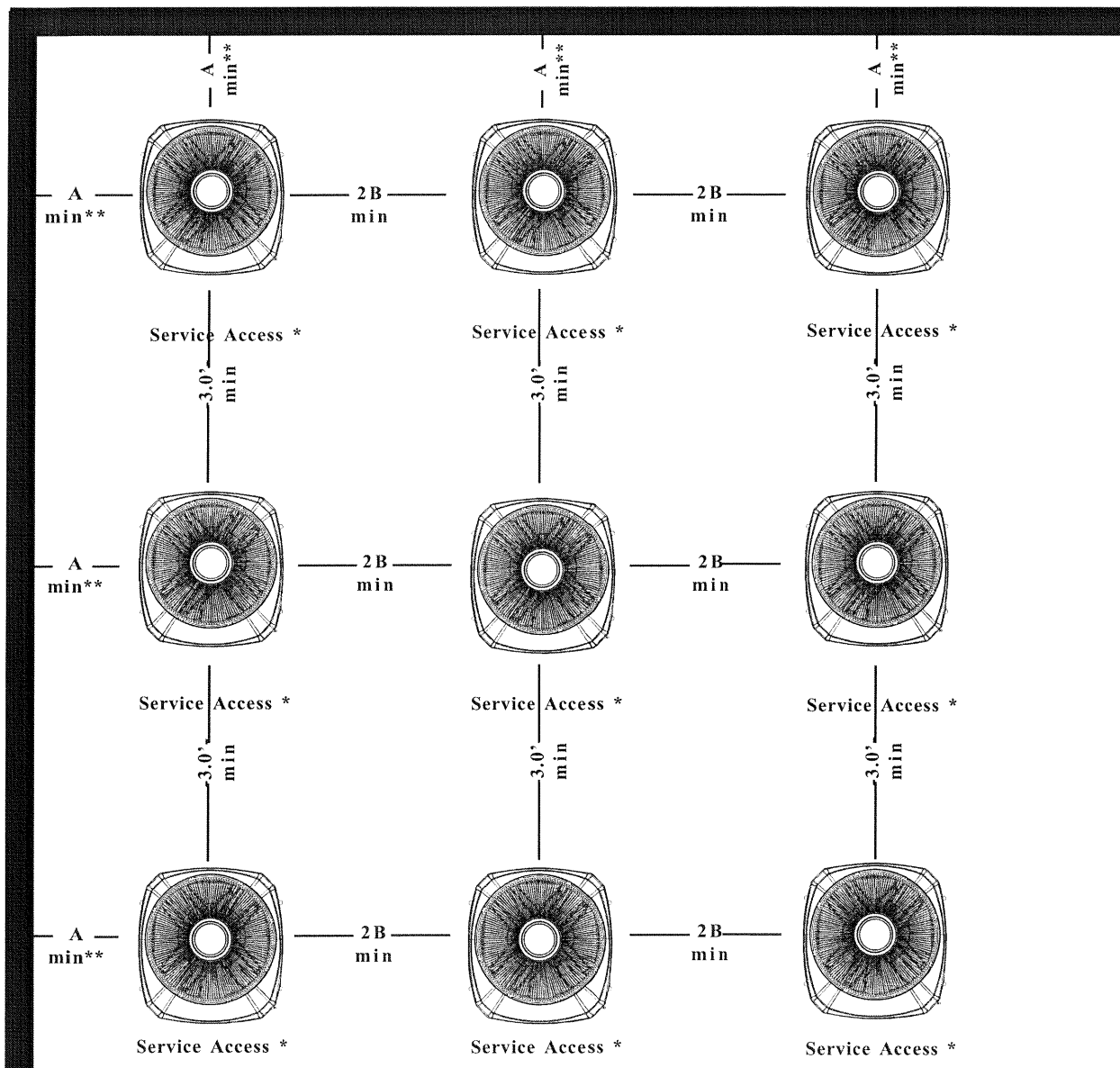
A) Refer to minimum clearance table in the lower corner of this page for required clearances

B) National Electric Code requires 3 feet minimum (4 feet if certain conditions are present) clearance between service access panel and adjacent unit. If service access panel faces the wall, the required space between the wall and the unit shall be minimum 3 feet. (May require as much as 3 1/2 feet)

C) Walls / Fence height shall not be higher than top of units.

D) National, State, and Local Codes must be observed.

E) If design outdoor dry bulb exceeds 105F (40.6C) add 1.0 Ft. to all dimensions.



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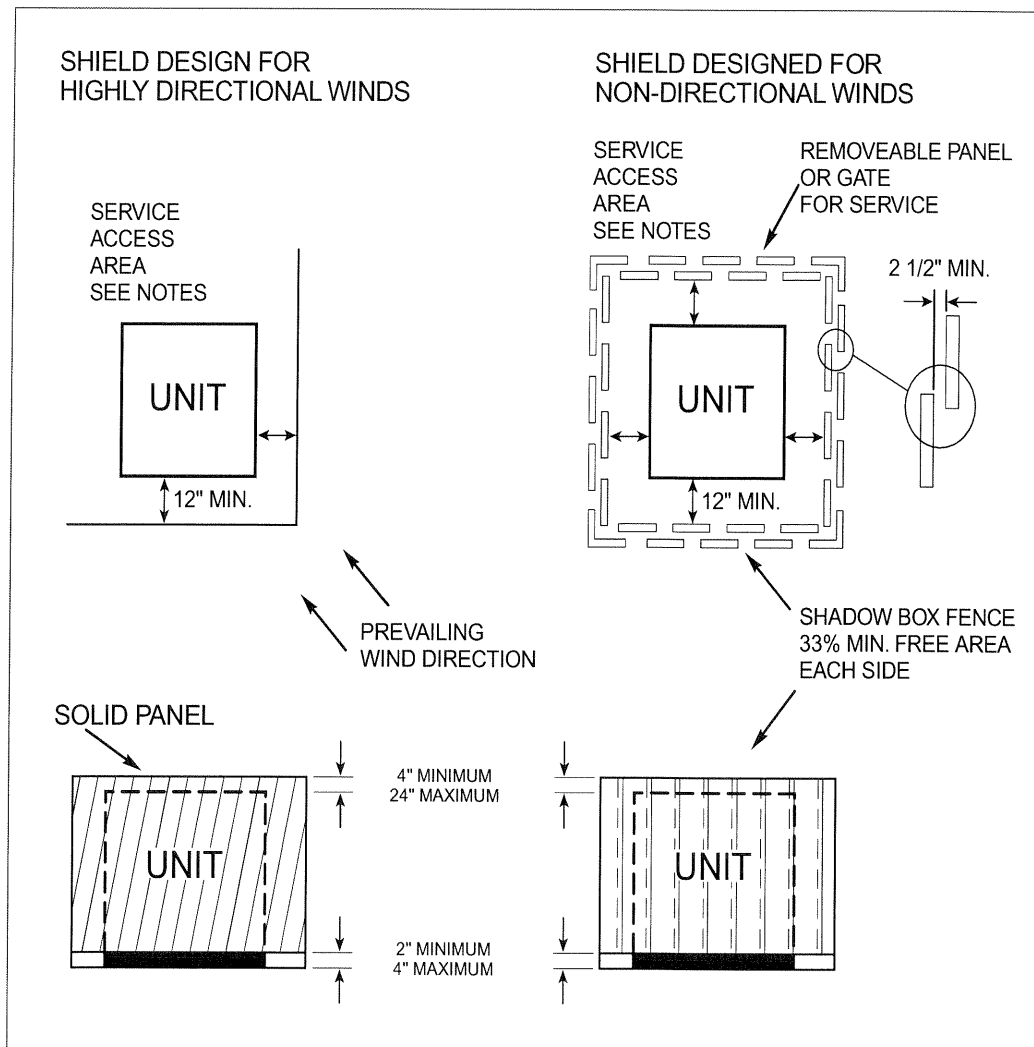
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**minimum clearance table**

Base Size	A	B	Service Clearance
2	1.0'	1.0'	36"
3	1.2'	1.2'	36"
4	1.5'	1.4'	36"

### Windshields:

If low ambient operation to 0F is required, windshields are a must in order to block prevailing winds from impacting system performance at low outdoor temperatures.



### Note:

Minimum working clearance must be in compliance with the National Electric Code. Currently, the minimum clearance between a wood or suitable grounding material type fence requires minimum 3 feet. If other material is used to form the windshield, the minimum space may be increased to 3.5 feet. Please consult the 2002 or current Edition of the National Electric Code, Article 110 for the most up to date information

## Electrical Code Information

Compliance with Local, State, and National Codes is a must on every HVAC Installation. This page discusses the criteria regarding minimum working spaces as defined in the 2002 National Electric Code. The main concern is the safety of the HVAC service / maintenance person. Minimum working clearances are specified in the National Electric Code (NEC) Article 110.26

For electrical equipment that from ground to power the voltage is 600 volts or less:

The National Electric Code specifically states that service area around electrical equipment shall provide sufficient access, and shall be properly maintained in order to permit safe operation and maintenance of the equipment. Table 110.26 as well as the figures beside the table describe the minimum clearance for proper service and access to electrical equipment.

Trane residential and light commercial condensing units ranging from 1 to 6 ton require access to the side service panel as indicated on the previous pages to gain access to the electrical controls.

The table and figure below are excerpts from the National Electric Code 2002:

**Table 110.26(A)(1) Working Clearances**

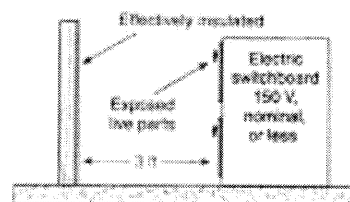
Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0-150	900 mm (3 FT)	900 mm (3 FT)	900 mm (3FT)
151-600	900 mm (3FT)	1 M (3.5FT)	1.2 mm (4FT)

Note: Where the conditions are as follows

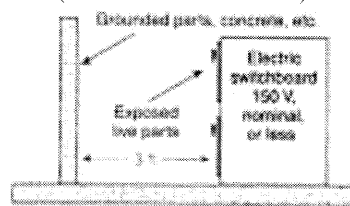
**Condition 1** - Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated busbars operating at not over 300 volts to ground shall not be considered live parts

**Condition 2** - Exposed live parts on one side and grounded parts on the other side. Concrete, brick, or tile walls shall be considered as grounded.

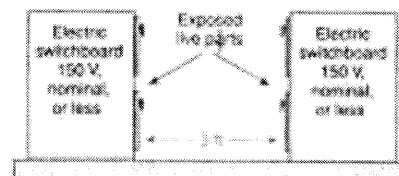
**Condition 3** - Exposed live parts on both sides of the work space (not guarded as provided in Condition 1) with the operator between.



**Condition 1**  
(3 ft min. for 151 - 600 V)



**Condition 2**  
(Space would increase to 3 1/2 ft for 151 - 600 V)

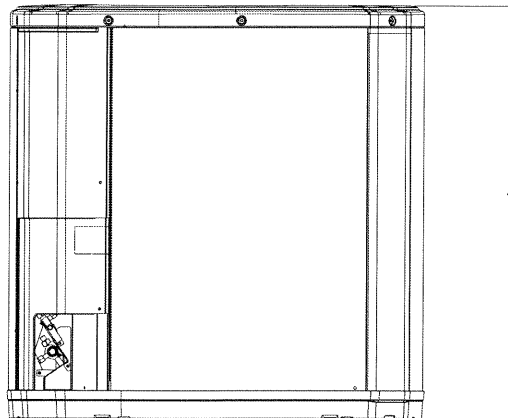
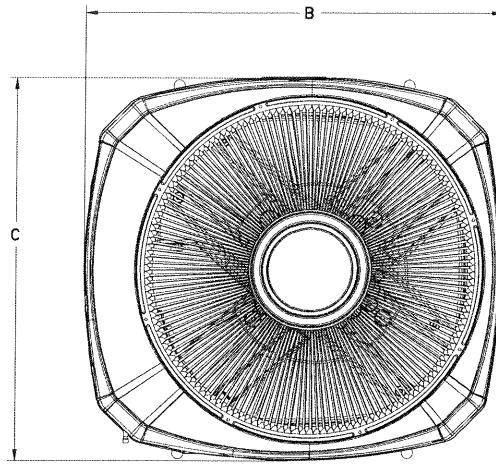


**Condition 3**  
(Space would increase to 4 ft for 151 - 600 V)

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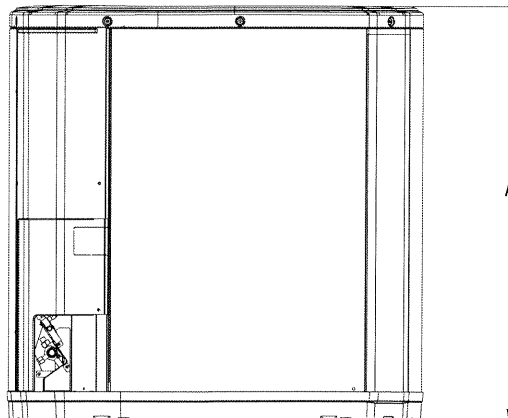
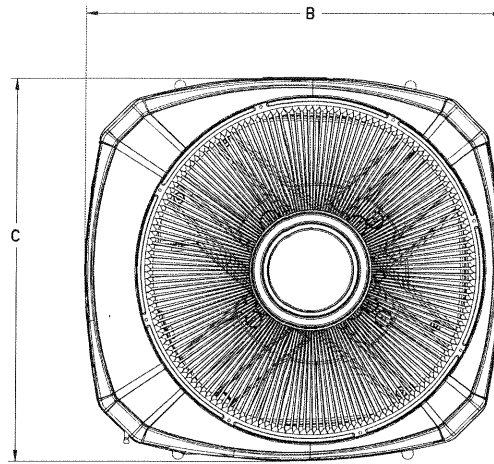
## Unit Dimensions 2TTB3 and 2TWB3



Unit Model	Cabinet Size	A	B	C	Unit Model	Cabinet Size	A	B	C
2TTB3018A1000AA	2.1	25 5/8	28 1/2	25 5/8	2TWB3018A1000AA	2.3	32 3/4	28 1/2	25 5/8
2TTB3024A1000AA	2.3	33	28 1/2	25 5/8	2TWB3024A1000AA	2.3	32 3/4	28 1/2	25 5/8
2TTB3030A1000AA	3.3	33	32 5/8	39 3/4	2TWB3030A1000AA	3.4	36 3/4	32 5/8	29 3/4
2TTB3036A1000AA	3.3	33	32 5/8	39 3/4	2TWB3036A1000AA	4.4	37 1/8	37 1/4	34 1/4
2TTB3042A1000AA	4.3	33	37 1/4	34 1/4	2TWB3042A1000AA	4.5	41 1/8	37 1/4	34 1/4
2TTB3048A1000AA	4.5	41	37 1/4	34 1/4	2TWB3048A1000AA	4.5	41 1/8	37 1/4	34 1/4
2TTB3060A1000AA	4.5	41	37 1/4	34 1/4	2TWB3060A1000AA	4.5	41 1/8	37 1/4	34 1/4



## Unit dimensions 2TTA3 and 2TWA3



Unit Model	Cabinet Size	A	B	C	Unit Model	Cabinet Size	A	B	C
2TTA3030A3 / A4	3.3	33	32 5/8	39 3/4	2TWA3030A3 / A4	3.4	36 3/4	32 5/8	29 3/4
2TTA3036A3 / A4	3.3	33	32 5/8	39 3/4	2TWA3036A3 / A4	4.4	37 1/8	37 1/4	34 1/4
2TTA3042A3 / A4	4.3	33	37 1/4	34 1/4	2TWA3042A3 / A4	4.5	41 1/8	37 1/4	34 1/4
2TTA3048A3 / A4	4.5	41	37 1/4	34 1/4	2TWA3048A3 / A4	4.5	41 1/8	37 1/4	34 1/4
2TTA3060A3 / A4	4.5	41	37 1/4	34 1/4	2TWA3060A3 / A4	4.5	41 1/8	37 1/4	34 1/4

\*Table produced Aug. 2005. For the most current information, please refer to specific equipment Product Data.

XB13, 2TTA3, and 2TWA3 Outdoor Unit Airflow Table							
XB13		XB13		2TTA3		2TWA3	
Unit Model Number	CFM	Unit Model Number	CFM	Unit Model Number	CFM	Unit Model Number	CFM
2TTB3018A1000A	1565	2TWB3018A1000A	1565				
2TTB3024A1000A	2500	2TWB3024A1000A	2485				
2TTB3030A1000A	3320	2TWB3030A1000A	2800	2TTA3030A3 / A4	3320	2TWA3030A3 / A4	2800
2TTB3036A1000A	4400	2TWB3036A1000A	4400	2TTA3036A3 / A4	4400	2TWA3036A3 / A4	4400
2TTB3042A1000A	4400	2TWB3042A1000A	4400	2TTA3042A3 / A4	4400	2TWA3042A3 / A4	4400
2TTB3048A1000A	4800	2TWB3048A1000A	4400	2TTA3048A3 / A4	4800	2TWA3048A3 / A4	4400
2TTB3060A1000A	4800	2TWB3060A1000A	4960	2TTA3060A3 / A4	4800	2TWA3060A3 / A4	4960

$$\text{Required Opening} = \text{CFM} / 300 \text{ FPM}$$

*Example:*

**Given:**

Qty of 4 units in a mechanical yard, surrounded by a fence. Units are 2TWA3048A3000A's -

**Required:**

Determine free air opening space required in fence -

**Solution:**

4400 CFM X Qty of 4 = 17,600 CFM

17600 CFM / 300 FPM = 58.67 square feet

Round 58.67 to 59 square feet of free air opening in the 4 fence sections surrounding the mechanical yard.

## IV. SYSTEM CHARGING

The XB13, 2TTA3 and 2TWA3 split system outdoor units are factory supplied with enough refrigerant for 15 feet of the rated lineset and the smallest rated coil. Furthermore, the appropriate subcooling value is printed on the unit nameplate. This value may be used when the outdoor ambient temperature is above 55F (12.8C). **Charging the system by subcooling is the only approved charging method since these products are to be installed with indoor TXV's only.**

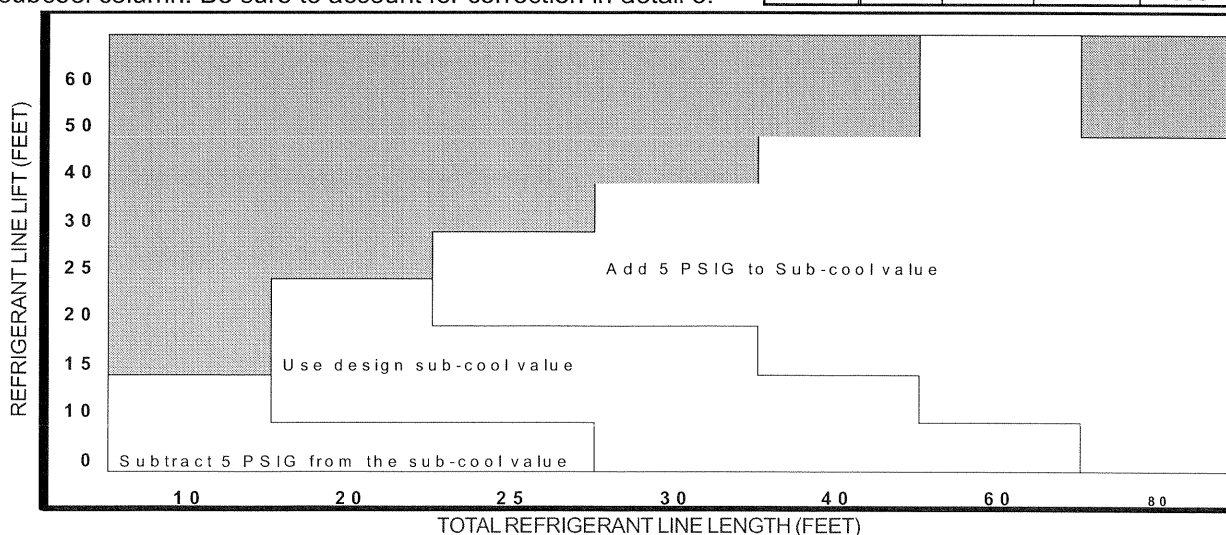
***Please note:*** At startup, or whenever refrigerant is removed or added, the system must be on line for at least 20 minutes before reading temperature and pressures.

***Use the procedure below when charging the XB13 unit.***

1. When charging systems below 65F (18.3C) outdoor ambient, the indoor temperature should be maintained between 70F to 80F (21.1C to 26.7C). Heat may be added to the indoor if needed.
2. If the line lengths are longer than 40 feet, weigh in enough refrigerant to compensate for the additional line length. *Refer to tubing allowance chart.* The additional refrigerant should be added to the system's liquid line prior to opening the service valves and after leak check and evacuation. *(if line length exceeds 80 feet, please refer to Trane Refrigerant Piping Guideline publication 32-3009-03 or latest version.)*
3. Open the service valves and start system. Run system at least 20 minutes before reading pressures and temperatures.
4. Read and record subcooling value from unit nameplate and locate the correct design value on the subcooling charging chart. This chart is located on the unit's control box cover as well as in the installation manual. *(example is on this page)*
5. Determine total line length and height if the indoor unit is above the outdoor unit. *Refer to subcool correction chart for line length and rise.* Add or subtract this value from the liquid gauge pressure corresponding to the liquid temperature.
6. Measure liquid pressure and temperature at the outdoor liquid service valve. Add or remove refrigerant to line up the liquid temperature with the liquid gauge pressure in the appropriate subcool column. Be sure to account for correction in detail 5.

Tubing Allowance (Lbs. R-22)			
tube size (inches)	Length		
	40	60	80
1/4 - 5/8	0.4	0.7	1.1
5/16 - 3/4	0.7	1.3	1.8
5/16 - 7/8	0.7	1.3	1.9
3/8 - 3/4	1.1	1.9	2.8
3/8 - 7/8	1.1	2.0	2.9
3/8 - 1 1/8	1.2	2.2	3.1

R-22 Sub-cooling Charging Chart				
Liquid Temp (°F)	Design SC (°F)			
	8	10	12	14
Liquid Gauge Pressure (PSIG)				
45	89	93	96	100
50	98	102	105	109
55	107	111	115	119
60	117	121	126	130
65	128	132	137	141
70	139	144	148	153
75	151	156	161	166
80	163	168	174	179
85	176	182	187	193
90	190	196	202	208
95	205	211	217	223
100	220	226	233	239
105	236	243	249	256
110	253	260	267	274
115	271	278	285	293
120	289	297	305	313
125	309	317	325	333



For more details regarding system charging, please refer to the Systems Charging Manual - Publication 34-4100-08 or latest version.



*It's Hard To Stop A Trane.®*

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Stocking Location		

Since Trane has a policy of continuous product improvement, it reserves the right to change design and specifications without notice