Installation, Operation, and Maintenance

Split System

Air-Cooled Condensers — 20 to 120 Tons

CAUJ-C20
CAUJ-C25
CAUJ-C30
CAUJ-C40
CAUJ-C50
CAUJ-C60
CAUJ-C80
CAUJ-D10
CAUJ-D12

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

June 2020

CAUJ-SVX01G-EN

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs and HCFCs such as saturated or unsaturated HFCs and HCFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠ WARNING

Follow EHS Policies!

Failure to follow instructions below could result in death or serious injury.

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

⚠ WARNING

R-410A Refrigerant under Higher Pressure than R-22!

Failure to use proper equipment or components as described below, could result in equipment failing and possibly exploding, which could result in death, serious injury, or equipment damage.

The units described in this manual use R-410A refrigerant which operates at higher pressures than R-22. Use ONLY R-410A rated service equipment or components with these units. For specific handling concerns with R-410A, please contact your local Trane representative.

Copyright

Trademarks

Revision History

Miscellaneous edits in Unit Dimensions section.

Table of Contents

Model Number Description

Digit 1 — Unit Type

C = Condenser

Digit 2 — Condenser

A = Air-Cooled

Digit 3 — System Type

U = Upflow

Digit 4 — Development Sequence

J = Third

Digit 5, 6, 7 — Nominal Capacity

C20 = 20 Tons
C25 = 25 Tons
C30 = 30 Tons
C40 = 40 Tons
C50 = 50 Tons
C60 = 60 Tons
C80 = 80 Tons
D10 = 100 Tons
D12 = 120 Tons

Digit 8 — Voltage and Start Characteristics
E = 200/60/3 XL (80 to 120 tons only)
F = 230/60/3 (80 to 120 tons only)
G = 200–230/60/3 (20 to 60 tons only
4 = 460/60/3 XL
5 = 575/60/3 XL

Digit 9 — Condenser Circuit

1 = Single (20 to 30 tons)
2 = Dual (40 to 120 tons)

Digit 10 — Design Sequence

Factory Assigned

Digit 11 — Ambient Control

0 = Standard
1 = 0°F

Digit 12 — Agency Approval

0 = None
3 = cULus (60 Hz only)

Digit 13 — Corrosion Protected Condenser Coil
0 = None
J = Corrosion Protected Condenser Coil

Digit 14 — Unit Isolation

1 = Spring Isolator
2 = Neoprene Isolators (20 to 60 tons only)

Note: *The service digit for each model number contains 14 digits. All 14 digits must be referenced.*

General Information

Unit Inspection

To protect against loss due to damage incurred in transit, perform inspection immediately upon receipt of the unit.

Exterior Inspection

If the job site inspection reveals damage or material shortages, file a claim with the carrier immediately. Specify the type and extent of the damage on the bill of lading before signing. Notify the appropriate sales representative.

Important: *Do not proceed with installation of a damaged unit without sales representative's approval.*

- Visually inspect the complete exterior for signs of shipping damages to unit or packing material.
- Verify that the nameplate data matches the sales order and bill of lading.
- Verify that the unit is properly equipped and there are no material shortages.
- Verify that the power supply complies with the unit nameplate and electric heater specifications.

Inspection for Concealed Damage

Visually inspect the components for concealed damage as soon as possible after delivery and before it is stored.

Do NOT walk on the sheet metal base pans. Bridging between the unit's main supports may consist of multiple 2 by 12 boards or sheet metal grating.

⚠ WARNING

No Step Surface!

Failure to follow instruction below could result in death or serious injury.

Do not walk on the sheet metal drain pan. Walking on the drain pan could cause the supporting metal to collapse and result in the operator/technician falling.

If concealed damage is discovered:

- Notify the carrier's terminal of the damage immediately by phone and by mail.
- Concealed damage must be reported within 15 days.
- Request an immediate, joint inspection of the damage with the carrier and consignee.
- Stop unpacking the unit.
- Do not remove damaged material from receiving location.
- Take photos of the damage, if possible.
- The owner must provide reasonable evidence that the damage did not occur after delivery.

Repair

Notify the appropriate sales representative before arranging unit installation or repair.

Important: *Do not repair unit until the damage has been inspected by the carrier's representative.*

Nameplates

Unit Nameplate

One Mylar unit nameplate is located on the outside upper right corner of the control panel door. It includes the unit model number, serial number, electrical characteristics, weight, refrigerant charge, as well as other pertinent unit data. A small metal nameplate with model number, serial number, and unit weight is located just above the Mylar nameplate, and a third nameplate is located on the inside of the control panel door.

When ordering replacement parts or requesting service, be sure to refer to the specific model number, serial number, and DL number (if applicable) stamped on the unit nameplate.

Unit Description

All air cooled condensing units are designed for outdoor installations with vertical air discharge. These units may be installed on a flat roof or placed on a concrete slab at ground level.

Before shipment, each unit is leak-tested, evacuated, a nitrogen holding charge is added, and the controls are tested for proper operation.

The condenser coils are all-aluminum microchannel design. Corrosion protected condenser coils are a standard option. Louvered condenser grilles for coil protection are standard. Direct-drive, vertical discharge condenser fans are provided with built-in current and overload protection.

For "Ship with" items, see the following figures.

If low ambient operation is required, low ambient dampers are available as a field or factory installed option.

The unit control panel contains all required fan cycling controls, compressor interlocks, and a 115 volt control power transformer. Field wiring, electrical schematics and panel connection diagrams are located inside the control panel access door.

Figure 1. Unit component layout and 'ship-with' locations – 20 to 60 ton units

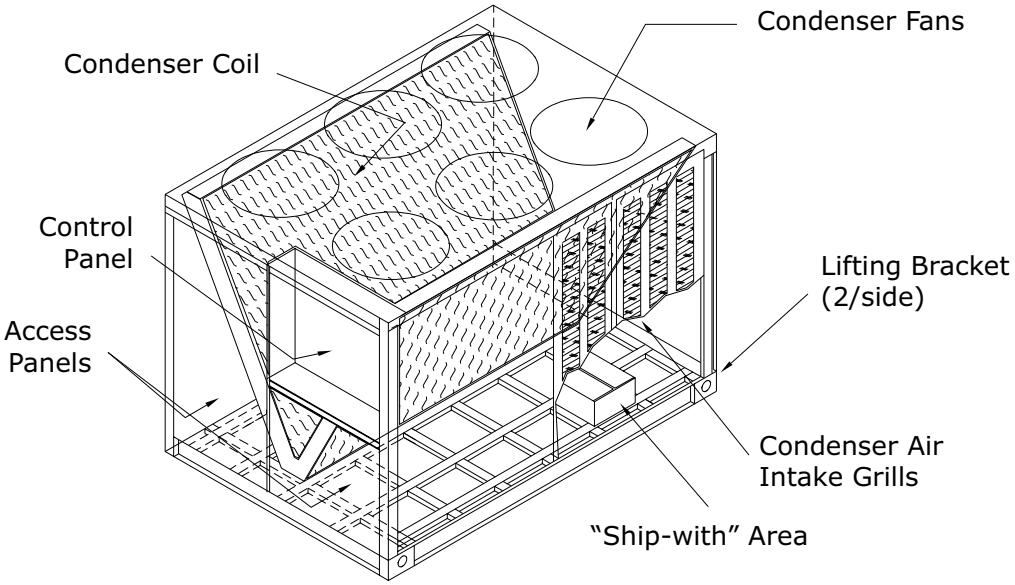
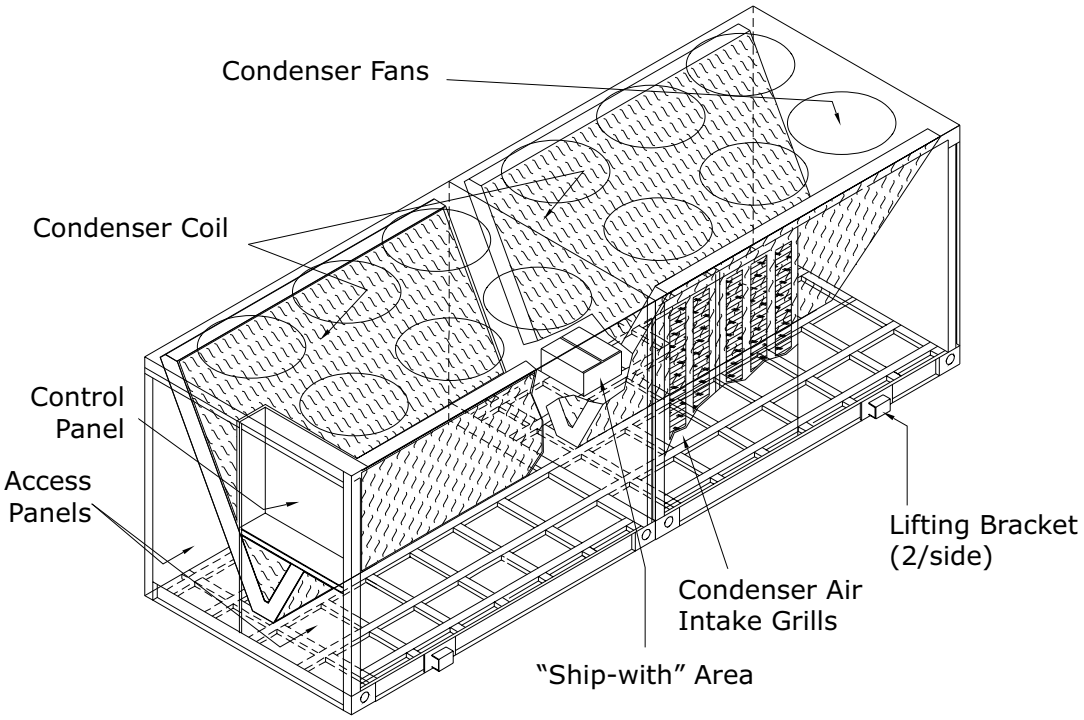


Figure 2. Unit component layout and 'ship-with' locations – 80 to 120 ton units



General Data

Table 1. General data — CAUJ condensers

Unit Size (tons)		20	25	30	40	50	60	80	100	120
Condenser Fan Data										
Type/Drive Type		Prop/Direct								
Qty		2	3	3	4	6	6	8	12	12
Diameter	in	26	26	26	26	26	26	26	26	26
Power/motor	hp	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nominal Total Airflow	cfm	14600	20700	20700	26790	36890	40490	56490	73890	76280
Condenser Coil Data										
Type		Microchannel								
Number of Coils		2	2	2	2	2	2	4	4	4
Size	in	42x71	42x71	42x71	59x71	51x96	51x96	59x71	51x96	64x96
Face Area	ft^2	41.4	41.4	41.4	58.2	68.0	68.0	116.4	136.0	170.7
Rows/Fin Per Ft.		1/240	1/240	1/240	1/240	1/240	1/240	1/240	1/240	1/240
Storage Capacity[a]	lbs	18.7	18.7	18.7	23.5	25.0	25.0	47.1	50.0	62.9
Refrigerant Data[b]										
Type		R-410A								
Operating Charge[c]	lbs	11.9	11.8	11.8	22.7	23.4	23.8	57.1	59.1	65.3
Outdoor Air Temperature for Mechanical Cooling										
Standard Ambient Operating Range	°F	40-125	40-125	40-125	40-125	40-125	40-125	40-125	40-125	40-125
Low Ambient Option	°F	0-125	0-125	0-125	0-125	0-125	0-125	0-125	0-125	0-125

(a) Condenser storage capacity is given at conditions of 95°F outdoor temperature, and 95% full.
(b) Condensing units are shipped with nitrogen holding charge only.
(c) Operating charge is approximate for condensing unit only, and does not include charge for low side or interconnecting lines. Condensing units are shipped with a nitrogen holding charge only.

Dimensions and Weights

Unit Clearances

The figure below illustrates the minimum operating and service clearances for either a single, multiple, or pit application. These clearances are the minimum distances necessary to assure adequate serviceability, cataloged unit capacity, and peak operating efficiency.

Important: *Providing less than the recommended clearances could result in condenser coil starvation or recirculation of hot condenser air.*

Locate the unit as close to the applicable system support equipment as possible to minimize refrigerant piping lengths.

Allow adequate clearance for water and refrigerant piping connections, space to perform service procedures, i.e. read gauges, thermometers, and operate water system valves.

Figure 3. Unit clearances

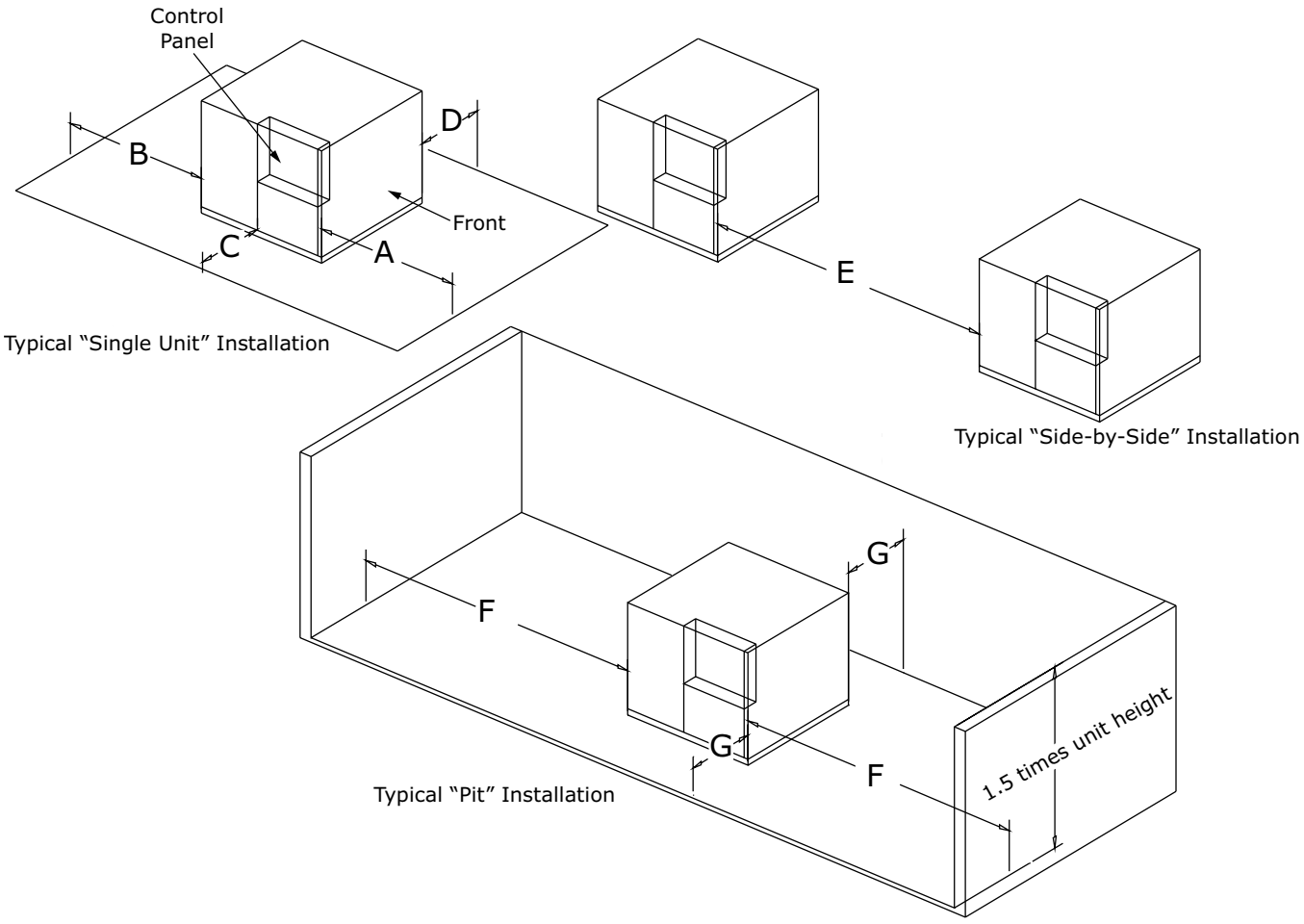


Table 2. Unit clearances

Dimension	Location	Clearance (in)	
		20 to 60 tons	80 to 120 tons
A	Front	72	96
B	Back	72	96
C	Left (control panel side)	42	48
D	Back	42	48
E	Distance between units (side-by-side)	192	192
F	Pit installation - front and back	192	192
G	Pit installation - sides	48	48

Unit Dimensions

Figure 4. Air-cooled condenser — 20 ton

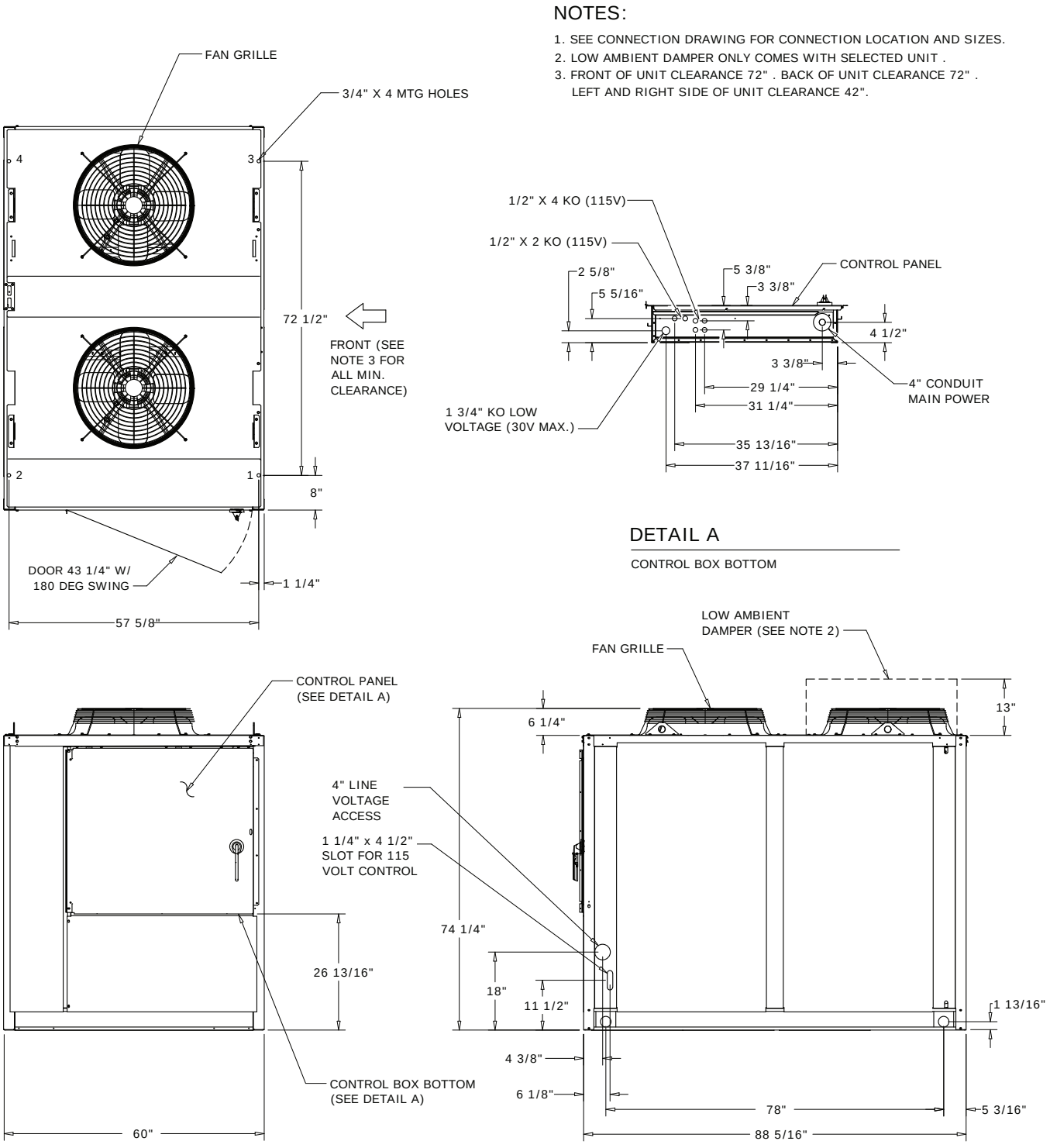
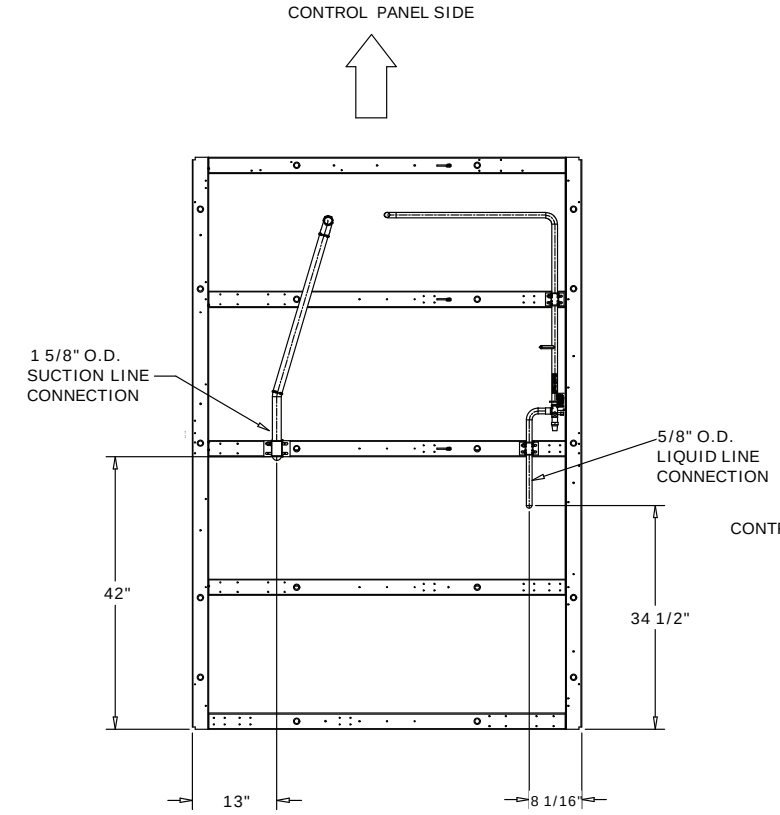


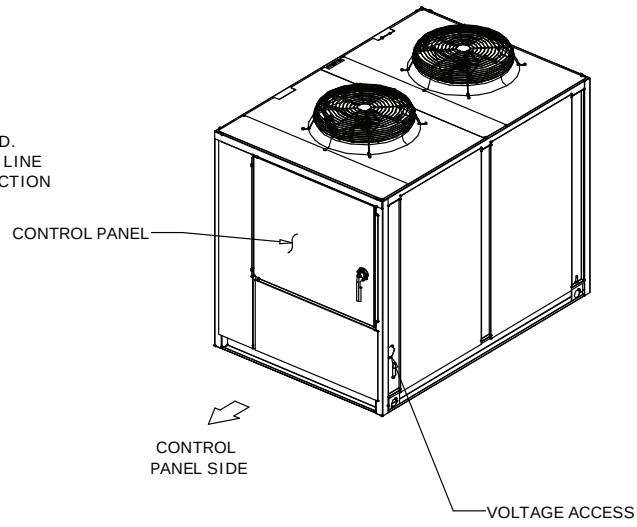
Figure 5. Air-cooled condenser connections — 20 ton



PLAN VIEW OF UNIT

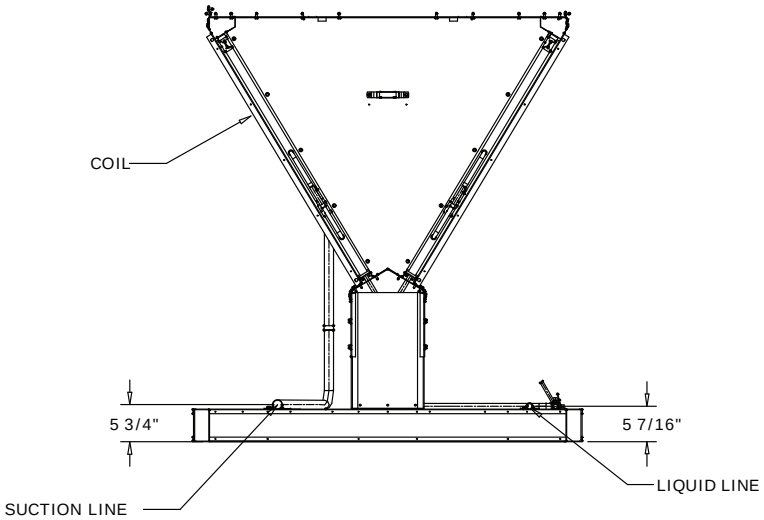
CONNECTION DRAWING

NOTES:
1. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION



ORIENTATION VIEW OF UNIT

ISOMETRIC DRAWING



CONTROL PANEL SIDE VIEW OF UNIT

CONNECTION DRAWING

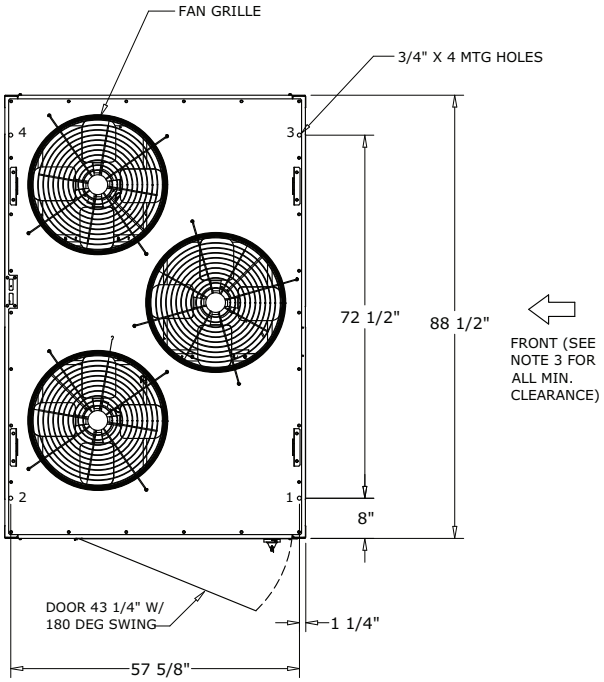
20 TON UNIT

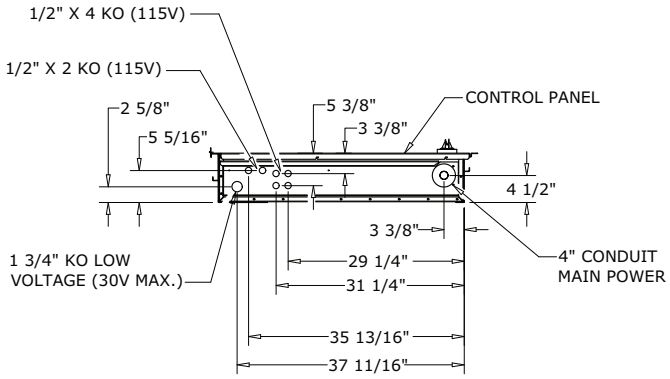
DIMENSIONAL CONNECTION DRAWING

Figure 6. Air-cooled condenser — 25 and 30 ton

NOTES:

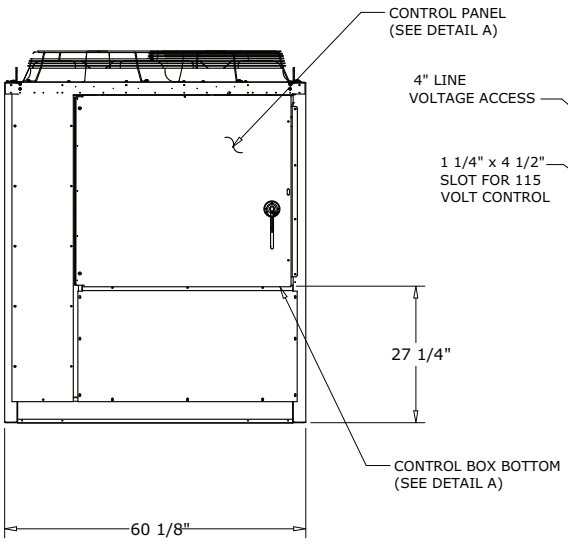
1. SEE CONNECTION DRAWING FOR CONNECTION LOCATION AND SIZES.
2. LOW AMBIENT DAMPER ONLY COMES WITH SELECTED UNIT .
3. FRONT OF 20 AND 30 UNIT CLEARANCE 72" . BACK OF UNIT CLEARANCE 72".
   LEFT AND RIGHT SIDE OF 20 AND 30 UNIT CLEARANCE 42".





DETAIL A

CONTROL BOX BOTTOM



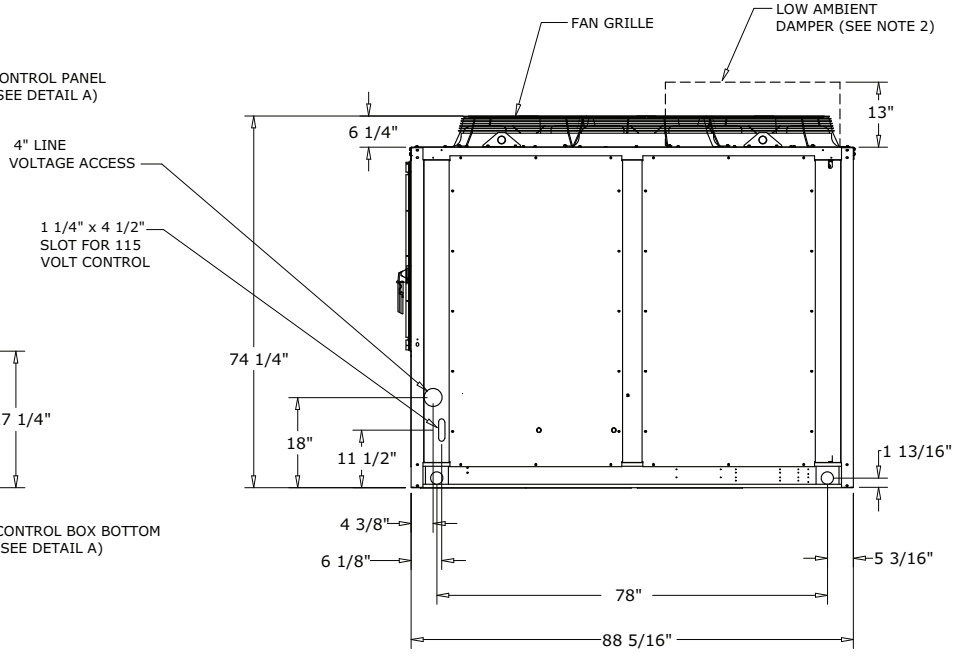
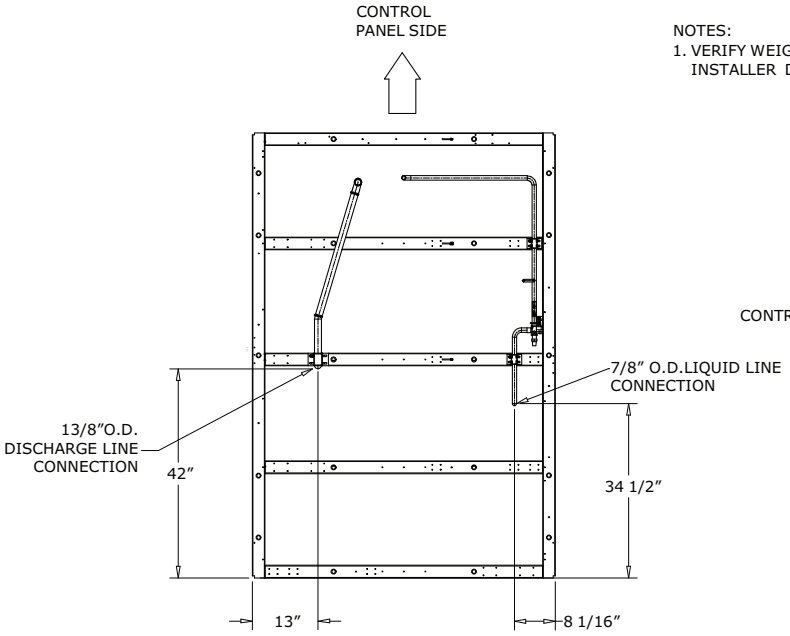


Figure 7. Air-cooled condenser connections — 25 and 30 tons



PLAN VIEW OF UNIT

CONNECTION DRAWING

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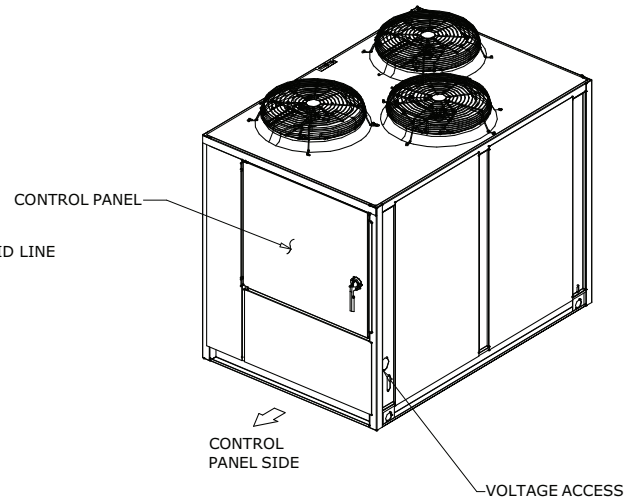
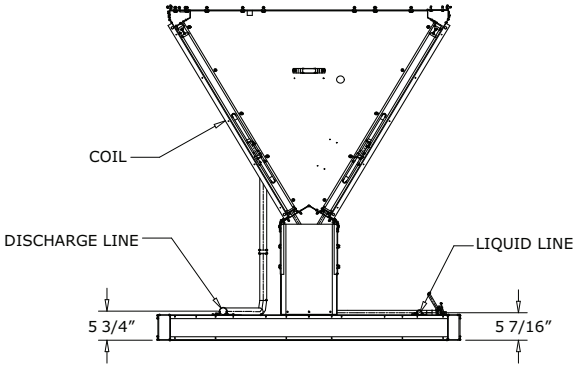


ORIENTATION VIEW OF UNIT

ISOMETRIC DRAWING



CONTROL PANEL SIDE VIEW OF UNIT

CONNECTION DRAWING

25 - 30 TON UNIT

DIMENSIONAL CONNECTION DRAWING

Figure 8. Air-cooled condenser — 40 ton

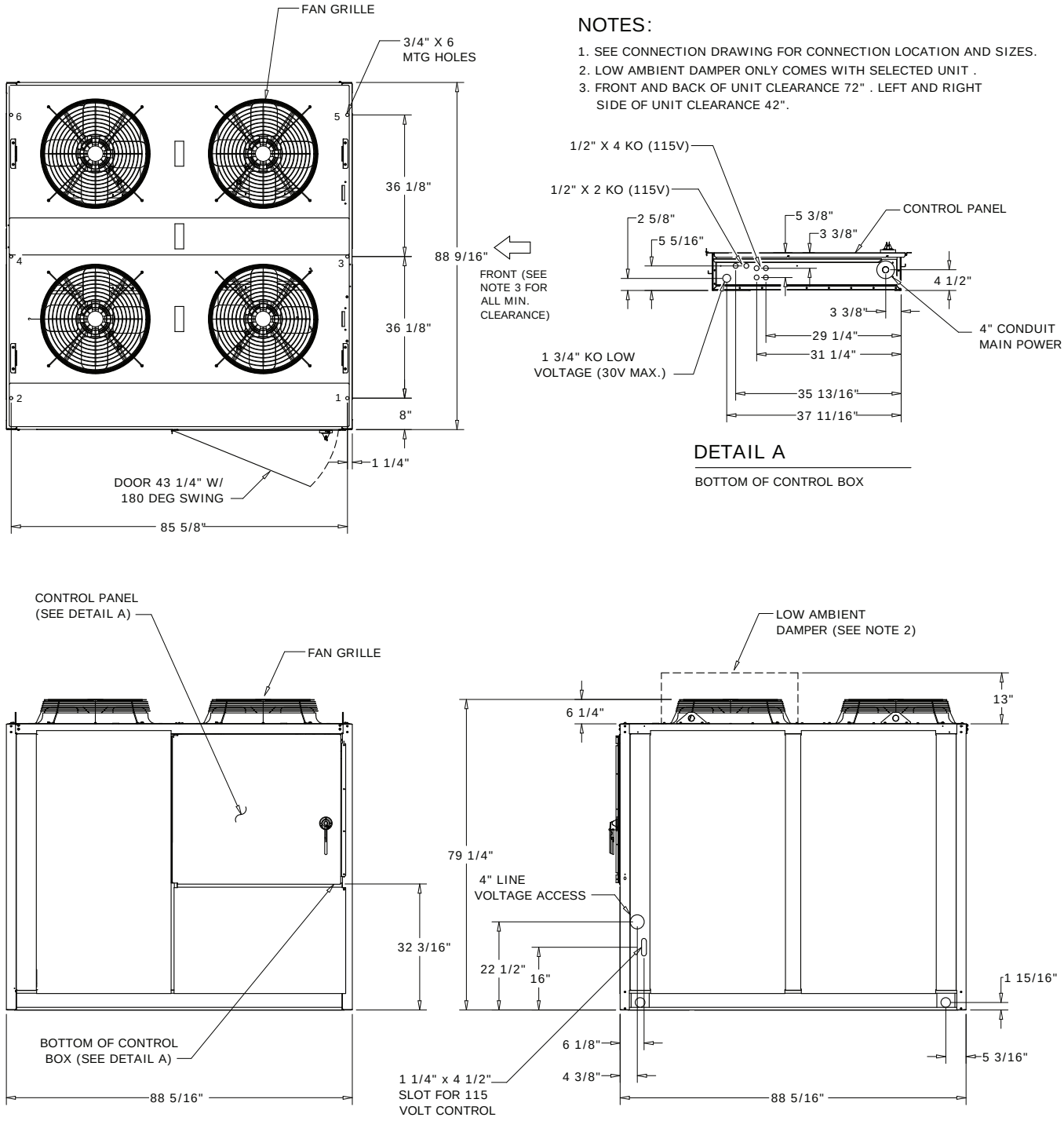
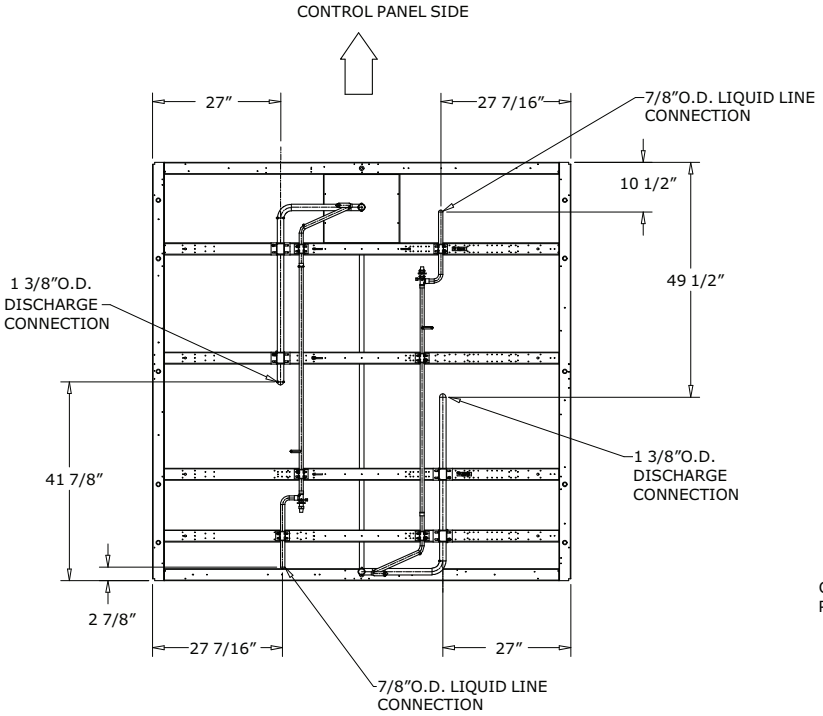


Figure 9. Air-cooled condenser connections — 40 ton



PLAN VIEW OF UNIT

CONNECTION DRAWING

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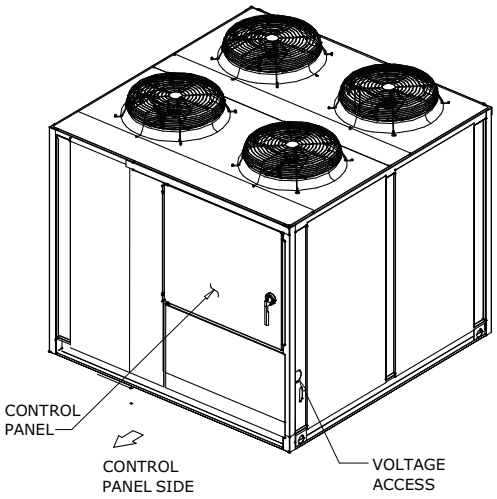
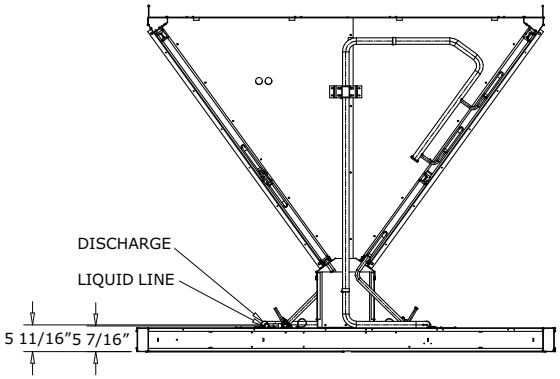


ORIENTATION VIEW OF UNIT

ISOMETRIC DRAWING



CONTROL PANEL SIDE VIEW OF UNIT

CONNECTION DRAWING

40 TON UNIT

DIMENSIONAL CONNECTION DRAWING

Figure 10. Air-cooled condenser — 50 ton

NOTES:

1. SEE CONNECTION DRAWING FOR CONNECTION LOCATION AND SIZES.
2. LOW AMBIENT DAMPER ONLY COMES WITH SELECTED UNIT .
3. FRONT AND BACK OF UNIT CLEARANCE 72" . LEFT AND RIGHT SIDE OF UNIT CLEARANCE 42".

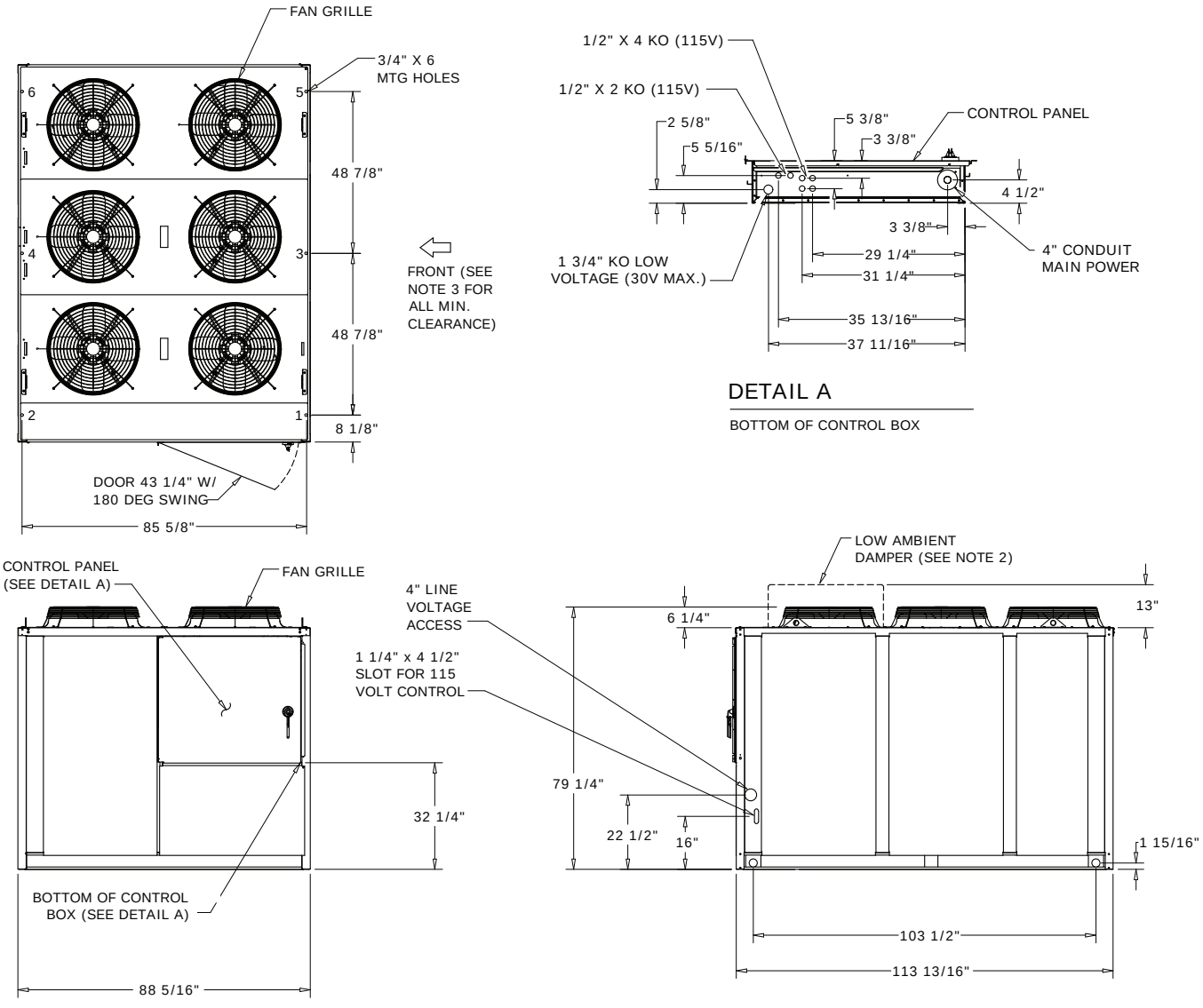
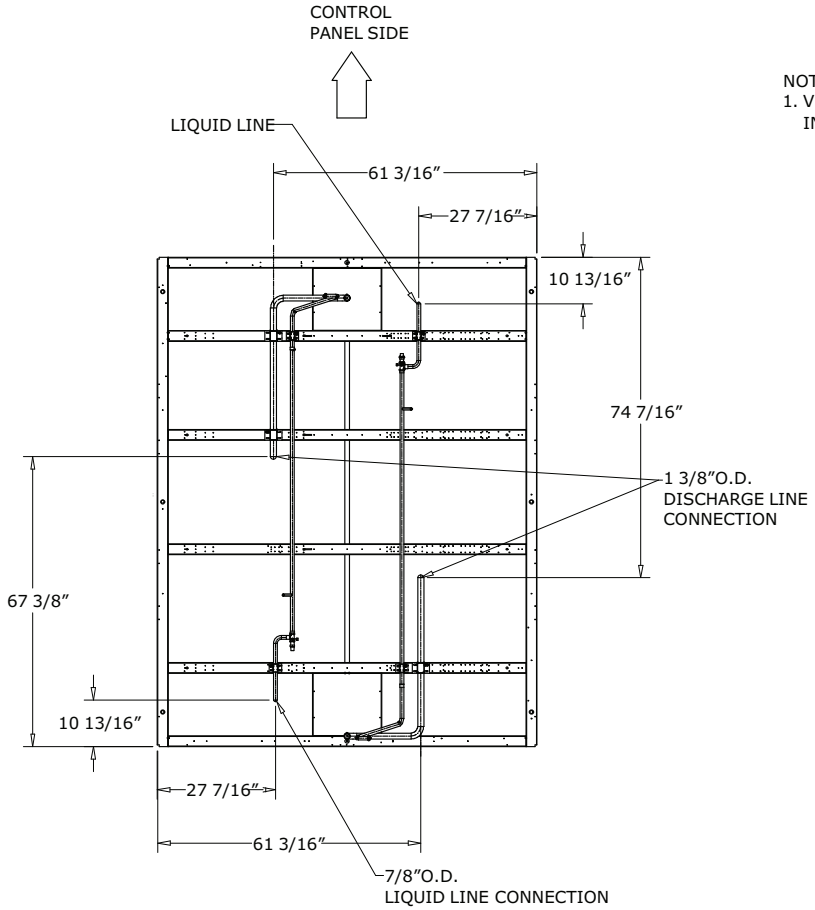


Figure 11. Air-cooled condenser connections — 50 ton



PLAN VIEW OF UNIT

CONNECTION DRAWING

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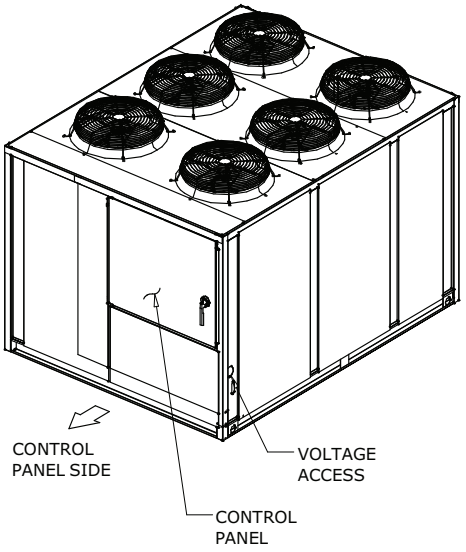
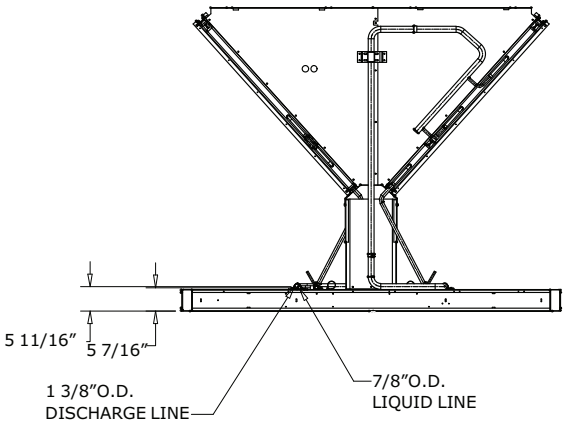


ORIENTATION VIEW OF UNIT

ISOMETRIC DRAWING



CONTROL PANEL SIDE VIEW OF UNIT

CONNECTION DRAWING

50 TON UNIT

DIMENSIONAL CONNECTION DRAWING

Figure 12. Air-cooled condenser — 60 ton

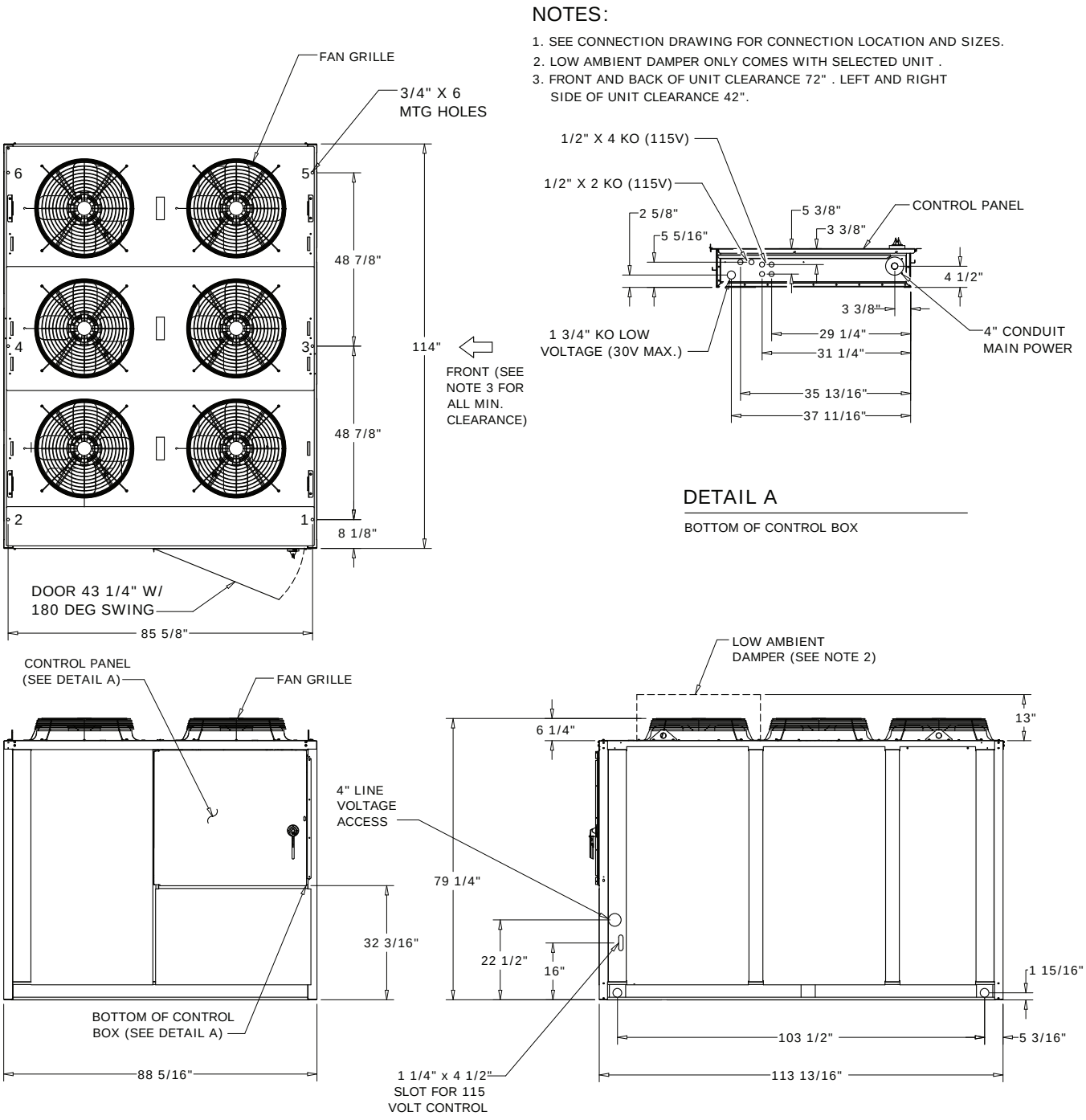
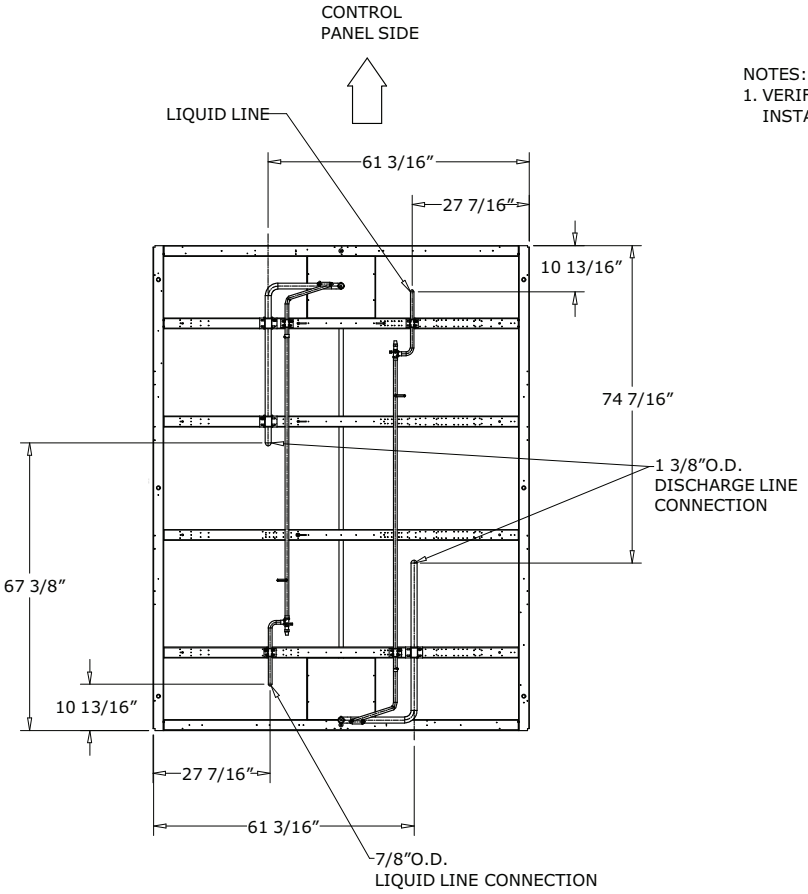


Figure 13. Air-cooled condenser connections — 60 ton



PLAN VIEW OF UNIT

CONNECTION DRAWING

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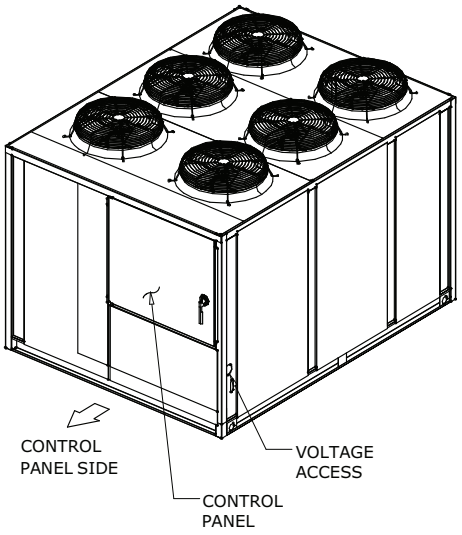
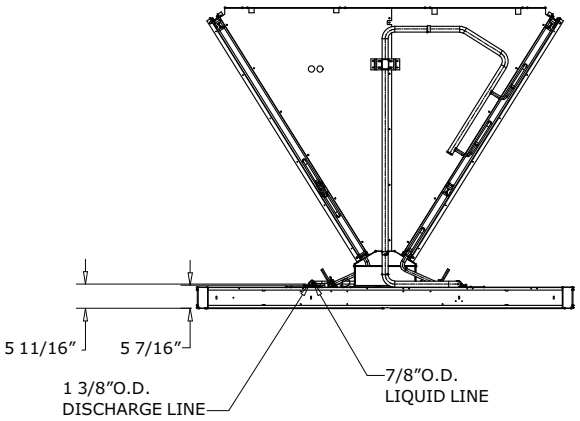


ORIENTATION VIEW OF UNIT

ISOMETRIC DRAWING



CONTROL PANEL SIDE VIEW OF UNIT

CONNECTION DRAWING

60 TON UNIT

DIMENSIONAL CONNECTION DRAWING

Figure 14. Air-cooled condenser — 80 ton

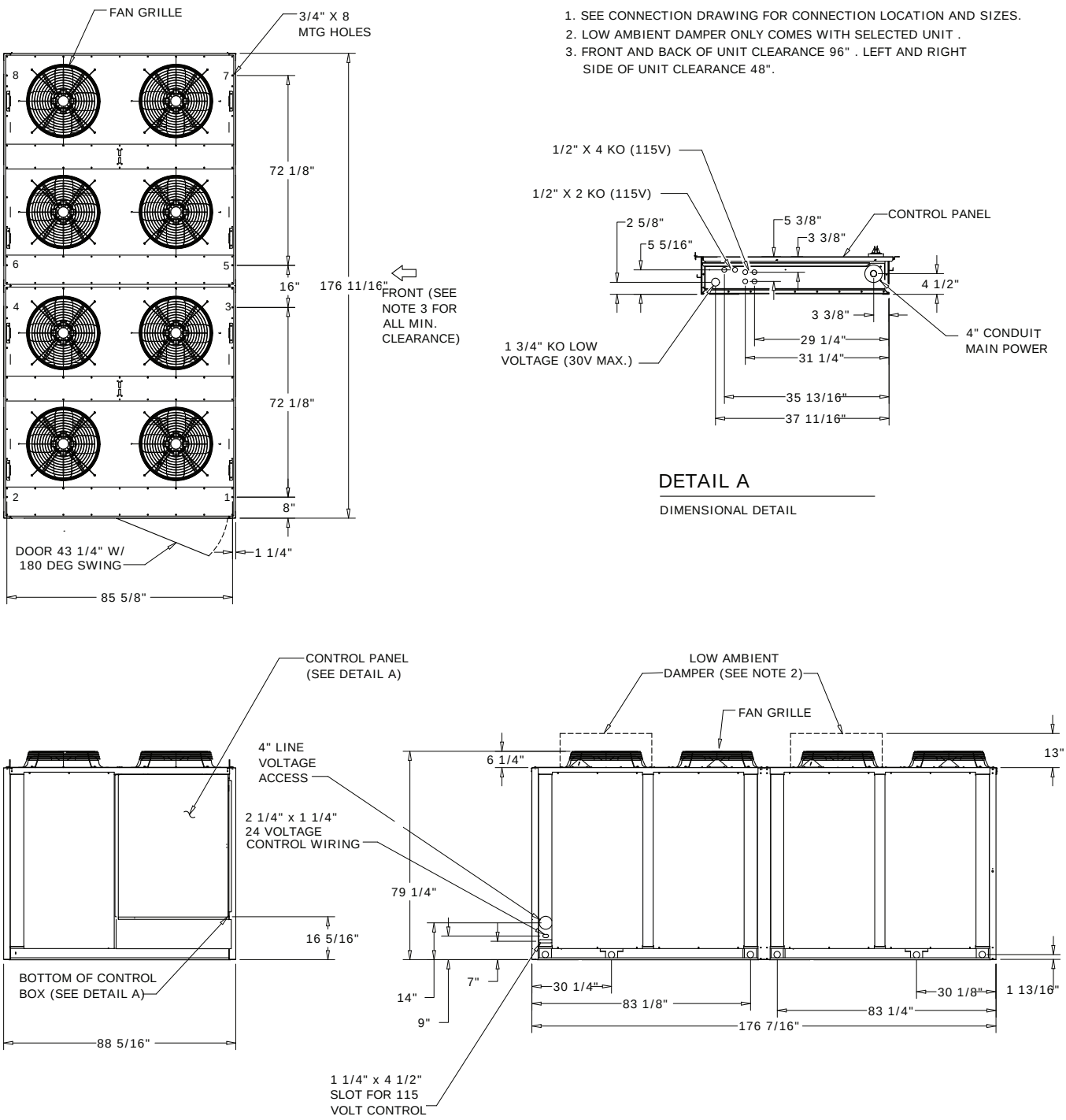


Figure 15. Air-cooled condenser connections — 80 ton

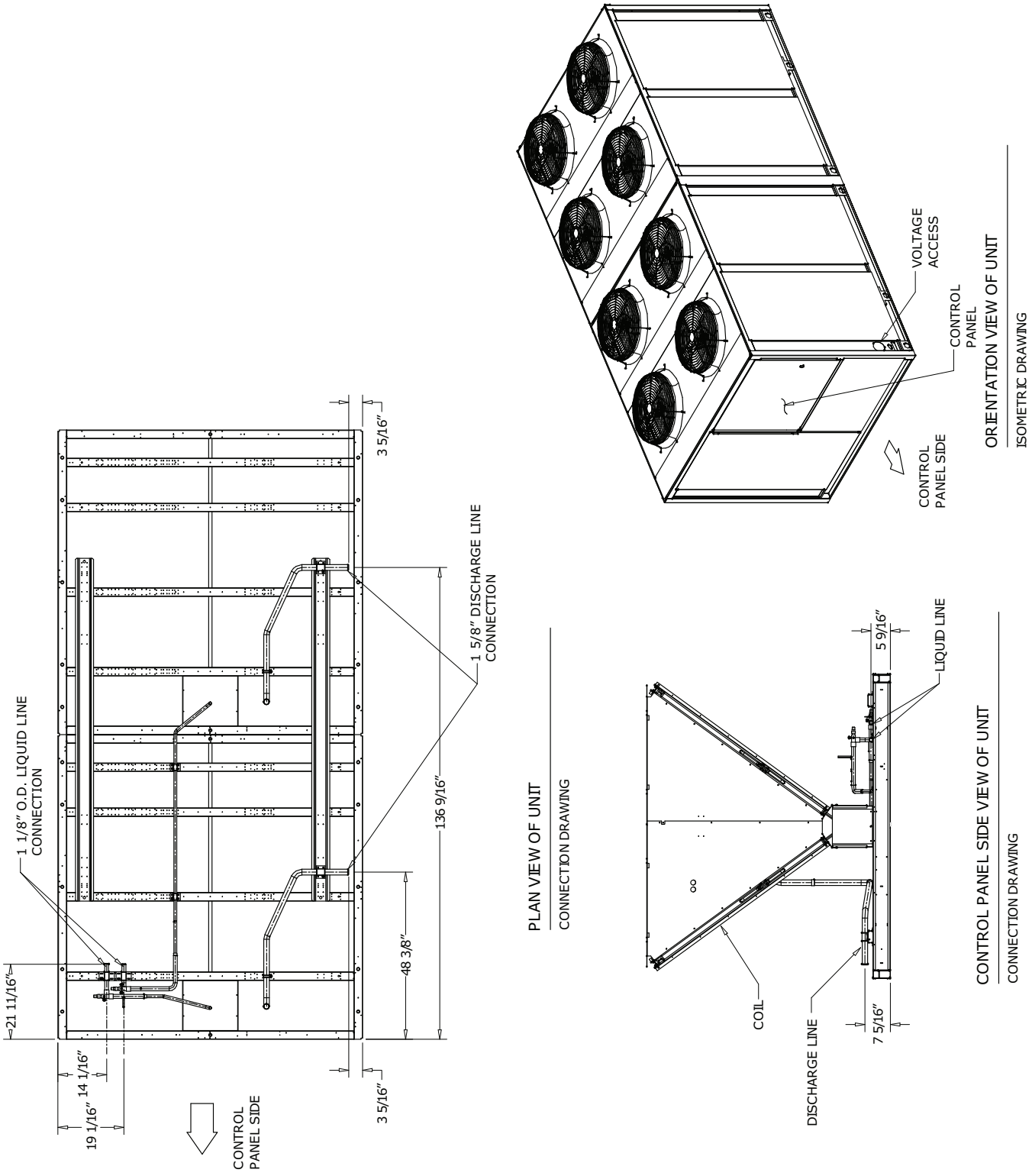


Figure 16. Air-cooled condenser — 100 and 120 tons

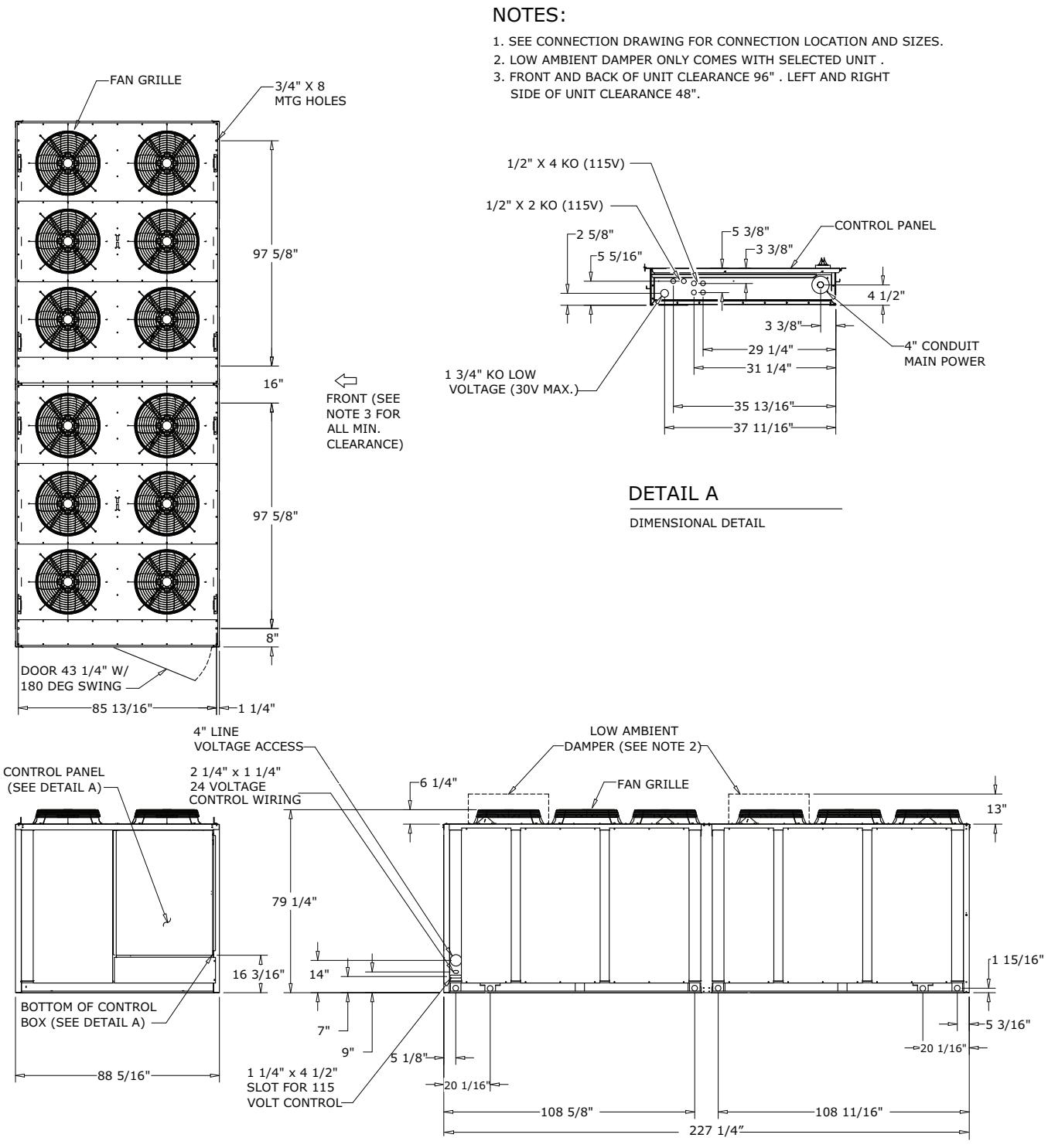
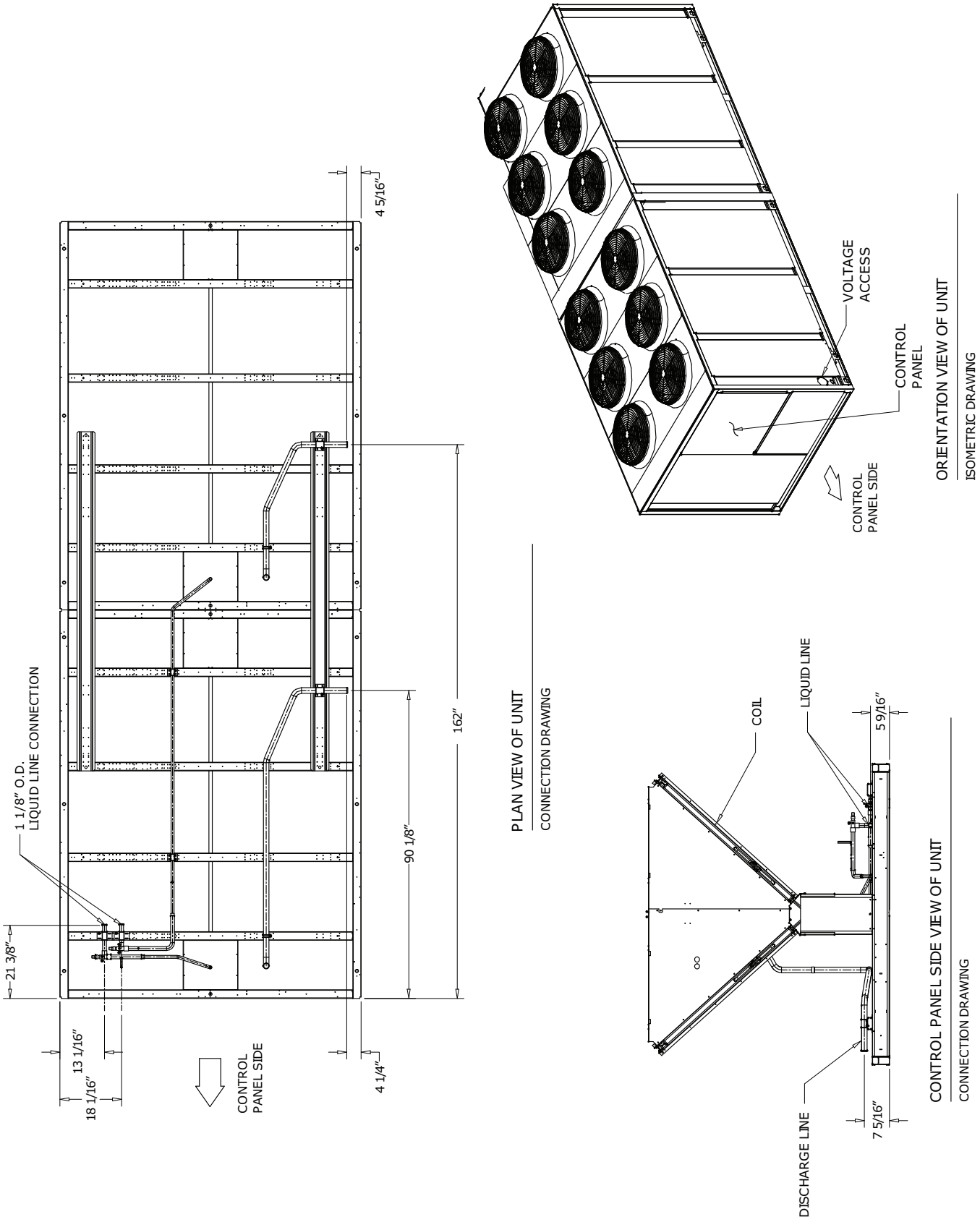


Figure 17. Air-cooled condenser connections — 100 and 120 tons



Unit Weights

Table 3. CAUJ air-cooled condenser weights

Unit Size (tons)	Weights (lbs)	
	Shipping	Operating
20	1163	1188
25	1213	1238
30	1211	1236
40	1758	1808

Table 3. CAUJ air-cooled condenser weights (continued)

Unit Size (tons)	Weights (lbs)	
	Shipping	Operating
50	2078	2120
60	2086	2136
80	3142	3212
100	3877	3960
120	4325	4451

Installation Mechanical

Location Requirements

Isolation

To minimize unit sound and vibration transmission, one of the following installation methods should be used:

- Install the unit directly on an isolated (detached) concrete pad or on isolated concrete footings located at each unit load point. OR
- Install the optional neoprene or spring isolators at each mounting location. See Unit Isolation section.

Foundation

Ground Level Installation

- If the unit is installed at ground level, elevate it above the snow line.
- Provide concrete footings at each support location or a slab foundation for support.
- See Weights table in Dimensions and Weights chapter for the unit operating weights.
- See Unit Mounting section for mounting locations and point loading weights when constructing the footing foundation.
- Anchor the unit to the footings or slab using hold down bolts or isolators.
- Isolators should be installed to minimize the transmission of vibrations into the building. See Unit Isolation section.

Rooftop Applications

For rooftop applications, ensure the roof is strong enough to support the unit. See Weights table in Dimensions and Weights chapter for the unit operating weights.

Anchor the unit to the roof with hold-down bolts or isolators. Follow the instructions in Unit Isolation section for proper isolator placement and installation.

Check with a roofing contractor for proper waterproofing procedures.

Leveling the Unit

Before tightening the mounting bolts, level the unit carefully. Use the unit base rail as a reference. Level the unit to within 1/4 inch over its entire length. Use shims if non-adjustable isolators (neoprene) are used.

If adjustable isolators (spring) are used, ensure that the proper isolator housing clearance is maintained while leveling the unit. Isolators are identified by color and/or an isolator part number. Shims under the isolators may be required if the unit cannot be leveled using the isolator leveling bolt.

Rigging and Lifting

⚠ WARNING

Heavy Object!

Failure to follow instructions below could result in unit dropping which could result in death or serious injury, and equipment or property-only damage.

Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

⚠ WARNING

Improper Unit Lift!

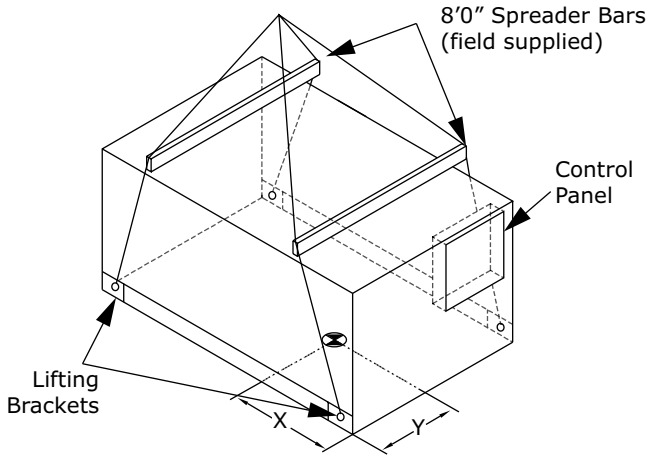
Failure to properly lift unit in a LEVEL position could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage.

Test lift unit approximately 24 inches (61 cm) to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

See Weights table in Dimensions and Weights chapter for unit weights. See Table 4, p. 28 for center-of-gravity information.

1. Rig condensing unit as shown in Figure 18, p. 27 and Figure 19, p. 27. Attach adequate strength lifting slings to all four lifting brackets. Do not use cables, chains, or slings except as shown.
2. Install spreader bars as shown in Figure 18, p. 27 to protect the unit and to facilitate a uniform lift. Minimum distance between lifting hook and top of unit is 7 feet.
3. Test-lift the unit to ensure it is properly rigged and balanced. Make any necessary rigging adjustments.
4. Lift the unit and position into place.

Figure 18. Rigging and center-of-gravity data



Note: *See lifting bracket location figure for more detail.*

Figure 19. Lifting bracket locations

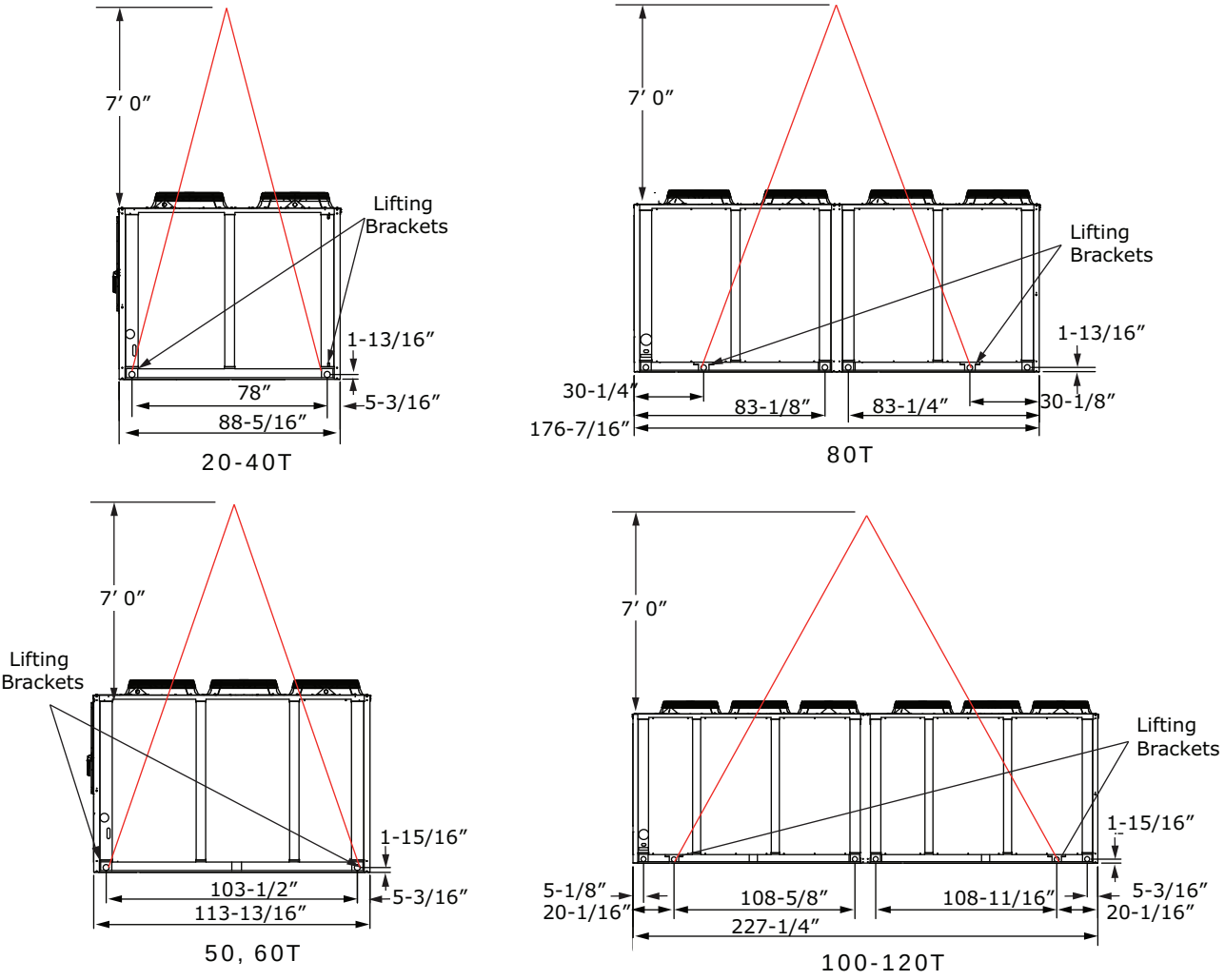


Table 4. CAUJ center-of-gravity

Tons	CG Locations	
	X	Y
20	41.5	32.5
25	41.9	32.2
30	41.5	32.3
40	43.9	46.1
50	52.8	45.8

Table 4. CAUJ center-of-gravity (continued)

Tons	CG Locations	
	X	Y
60	53.0	45.8
80	85.3	54.3
100	111.4	53.9
120	112.2	52.6

Unit Mounting

Figure 20. Mounting location

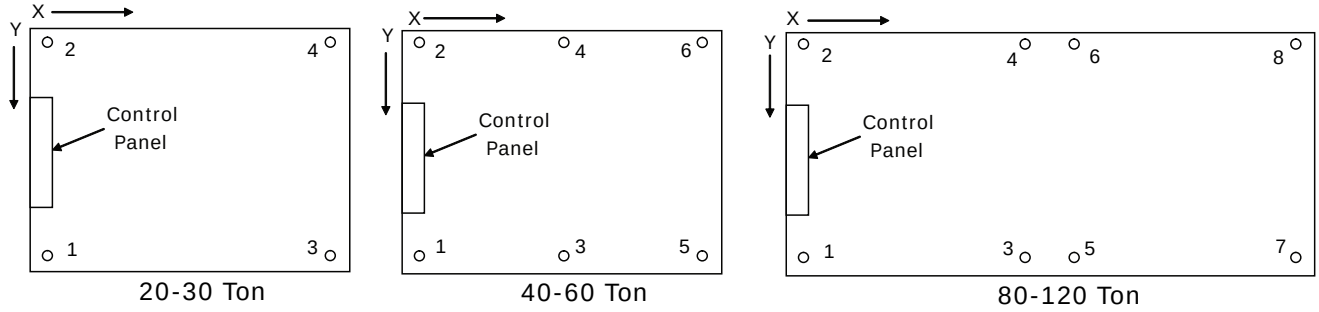


Table 5. Isolator mounting locations (in)

Unit Size (tons)		Mounting Location							
		1	2	3	4	5	6	7	8
20/25/30	X	8.00	8.00	80.125	80.125	-	-	-	-
	Y	58.75	1.25	58.75	1.25	-	-	-	-
40	X	8.00	8.00	44.125	44.125	80.25	80.25	-	-
	Y	87.125	1.25	87.125	1.25	87.125	1.25	-	-
50/60	X	8.00	8.00	56.875	56.875	105.75	105.75	-	-
	Y	87.125	1.25	87.125	1.25	87.125	1.25	-	-
80	X	8.00	8.00	80.125	80.125	108.125	108.125	168.25	168.25
	Y	87.125	1.25	87.125	1.25	87.125	1.25	87.125	1.25
100/120	X	8.00	8.00	105.625	105.625	121.625	121.625	219.25	219.25
	Y	87.125	1.25	87.125	1.25	87.125	1.25	87.125	1.25

Table 6. CAUJ point loading weights (lbs)

Unit Size (tons)		Mounting Location						
1	2	3	4	5	6	7	8	
20	296.3	340.8	358.8	192.1	—	—	—	—
25	357.1	300.2	318.8	261.9	—	—	—	—
30	360.9	302.0	316.0	257.1	—	—	—	—
40	385.9	212.5	181.7	441.8	377.2	208.3	—	—
50	239.4	211.3	367.5	339.4	495.5	466.6	—	—
60	238.8	210.9	370.2	342.2	501.6	472.8	—	—
80	513.5	474.4	459.6	200.2	452.1	196.7	561.6	354.0
100	636.7	402.1	610.1	383.6	605.8	380.5	579.2	361.9
120	687.8	461.8	667.7	447.8	664.4	445.5	644.4	431.5

Unit Isolation

Neoprene Isolators (20 to 60 Ton units)

Figure 21. Neoprene isolators (20 to 60 ton units only)

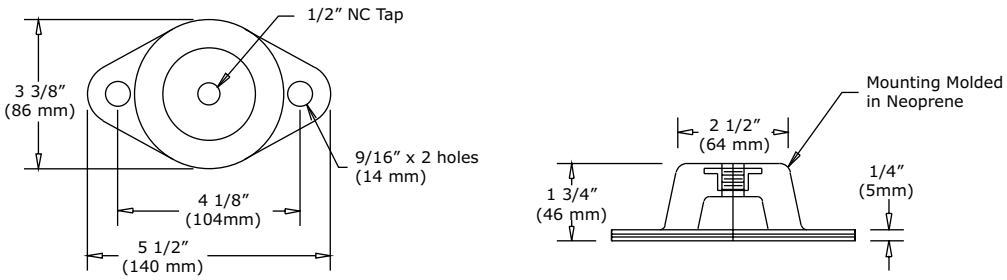


Table 7. CAUJ neoprene isolator selection (20 to 60 ton units only)

Unit Size (tons)	Mounting Location					
	1	2	3	4	5	6
20	R-3-RED	R-3-RED	R-3-RED	R-3-BLACK	-	-
25	R-3-RED	R-3-RED	R-3-RED	R-3-RED	-	-
30	R-3-RED	R-3-RED	R-3-RED	R-3-RED	-	-
40	R-3-RED	R-3-BLACK	R-3-BLACK	R-3-RED	R-3-RED	R-3-BLACK
50	R-3-BLACK	R-3-BLACK	R-3-RED	R-3-RED	R-3-RED	R-3-RED
60	R-3-BLACK	R-3-BLACK	R-3-RED	R-3-RED	R-3-RED	R-3-RED

⚠ WARNING

Heavy Object!

Failure to follow instructions could result in death or serious injury.

Use solid type blocks, i.e. 4" X 4" wood blocks or similar material, to prevent collapsing. Keep hands and other body limbs clear of elevated base rail while installing isolators.

Install the neoprene isolators at each unit mounting (load) point, using the following procedure:

1. Elevate the unit (one side at a time) to allow access to the base rail mounting holes.
2. Align the mounting holes in the base rail of the unit with the holes in the top of the appropriate isolator.
3. Install a 1/2" NC bolt (field supplied) through the base rail of the unit into the threaded bolt hole of the isolator. Position the isolator to allow access to the mounting holes in the base of the isolator, then tighten securely.
4. Lower the unit and isolator onto the mounting surface. The maximum isolator deflection should be approximately 1/4 inch.
5. Secure the isolator to the mounting surface using the base holes in the isolator.
6. Level the unit carefully. See the Leveling the Unit section earlier in this chapter.
7. After the unit is level, tighten the isolator base mounting bolts to secure them to the mounting surface.

Spring Isolators (20 to 120 Ton units)

Figure 22. Spring isolators

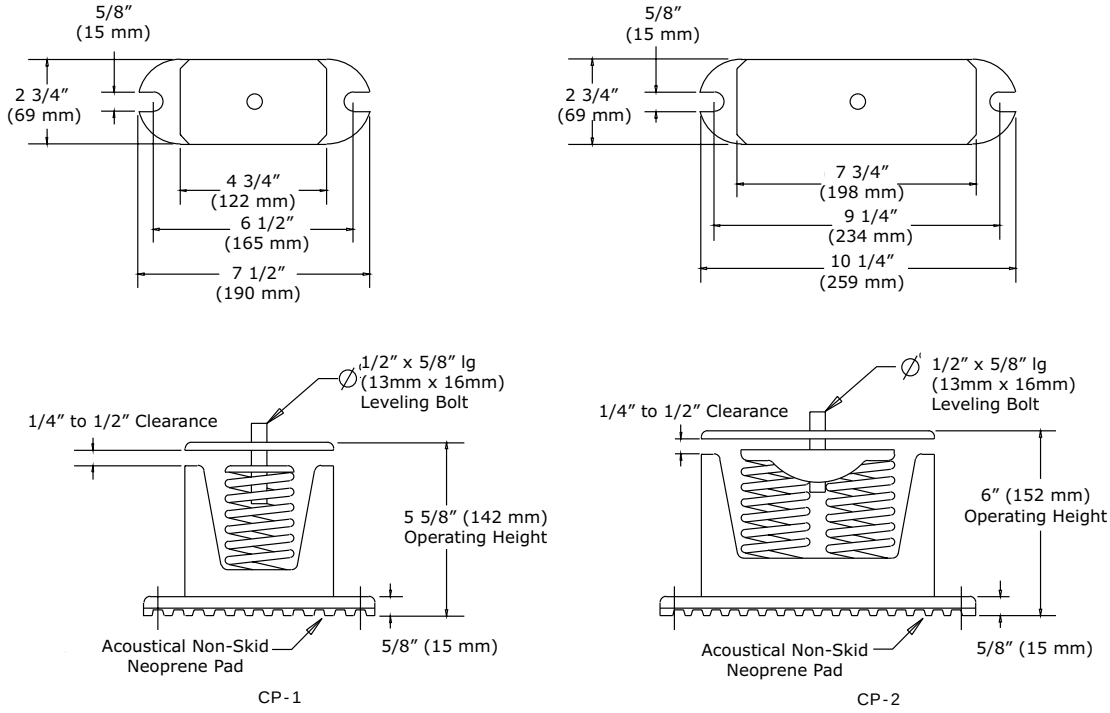


Table 8. CAUJ spring isolator selection

Unit Size (tons)		Mounting Location						
	1	2	3	4	5	6	7	8
20	CP-1D-340	CP-1D-510	CP-1D-510	CP-1D-340	-	-	-	-
25	CP-1D-510	CP-1D-340	CP-1D-340	CP-1D-340	-	-	-	-
30	CP-1D-510	CP-1D-340	CP-1D-340	CP-1D-340	-	-	-	-
40	CP-1D-510	CP-1D-340	CP-1D-340	CP-1D-510	CP-1D-510	CP-1D-340	-	-
50	CP-1D-340	CP-1D-340	CP-1D-510	CP-1D-340	CP-1D-510	CP-1D-510	-	-
60	CP-1D-340	CP-1D-340	CP-1D-510	CP-1D-510	CP-1D-510	CP-1D-510	-	-
80	CP-1D-675	CP-1D-510	CP-1D-510	CP-1D-340	CP-1D-510	CP-1D-340	CP-1D-675	CP-1D-510
100	CP-1D-675	CP-1D-510	CP-1D-675	CP-1D-510	CP-1D-675	CP-1D-510	CP-1D-675	CP-1D-510
120	CP-1D-900	CP-1D-510	CP-1D-675	CP-1D-510	CP-1D-675	CP-1D-510	CP-1D-675	CP-1D-510

⚠ WARNING

Heavy Object!

Failure to follow instructions could result in death or serious injury.

Use solid type blocks, i.e. 4" X 4" wood blocks or similar material, to prevent collapsing. Keep hands and other body limbs clear of elevated base rail while installing isolators.

Install the spring isolators at each unit mounting (load) point, using the following procedure:

1. Elevate the unit (one side at a time) to allow access to the base rail mounting holes.
2. Align the mounting holes in the base rail of the unit with the positioning pin in the top of the appropriate isolator.
3. Position the isolator to allow access to the mounting holes in the base of the isolator.
4. Lower the unit onto the isolator. The positioning pin on the isolator must engage into the hole of the base rail. The clearance between the upper and lower isolator housings should be approximately 1/4 to 1/2 inch. A clearance greater than 1/2 inch

indicates that shims are required to level the unit. See Leveling the Unit section earlier in this chapter.

5. Make minor clearance adjustments by turning the isolator leveling bolt clockwise to increase the clearance and counterclockwise to decrease the clearance. If proper isolator clearance cannot be obtained by turning the leveling bolt, level the isolators themselves. A 1/4 inch variance in elevation is acceptable.
6. Secure the isolator to the mounting surface using the base holes in the isolator.
7. After unit is level, tighten isolator base mounting bolts to secure them to the mounting surface.

Installation

General Unit Requirements

The checklist listed below is a summary of the steps required to successfully install a commercial air cooled condenser. This checklist is intended to acquaint the installing personnel with what is required in the installation process. It does not replace the detailed instruction called out in the applicable sections of this manual.

- Verify that the power supply complies with the unit nameplate specifications.
- Check the unit for shipping damage and material shortage. If damage or shortage is found, file a freight claim and notify Trane office.
- Verify installation location of the unit will provide the required clearance for proper operation.
- Install appropriate isolators, if required.

Refrigerant Piping Requirements

Note: *See Refrigerant Piping Component and Refrigerant Piping sections and for recommended line components and guidelines.*

- Install properly sized liquid line(s) between the liquid line connections on the unit and the evaporator.
- Install refrigerant rated shutoff valves in the liquid line(s) to isolate the filter drier(s) for service.
- Install a properly sized filter drier in each liquid line.
- Install properly sized discharge (hot gas) line(s) between the discharge line connections on the unit and the compressor unit.
- Leak test the system per Leak Testing Procedure section.

Refrigerant Piping Components

For recommended components, see the latest edition of the Applications Guide SS-APG012-EN.

Liquid Line Components

Filter driers and valves (expansion valves, charging valves, etc.) should be provided in the liquid lines just before the evaporator. Minimize the use of valves, reducers and tube bends as much as possible to avoid excessive pressure drop before the expansion valve.

Liquid Line Filter/Filter Drier (Field Supplied)

Install the filter drier in the liquid line as close as possible to the expansion valve. Locate them upstream of the moisture indicator and solenoid valve (if applicable).

Liquid Line Moisture Indicator

To aid in troubleshooting, charging and servicing the system, install moisture indicators in the liquid lines near the evaporator, down stream of the liquid line drier between the solenoid valve (if applicable) and the expansion valve.

Liquid Line Solenoid Valves

NOTICE

Equipment Damage!

Do not use solenoid valve as a pumpdown device as it could result in equipment damage.

Liquid line solenoid valves are not recommended on units when they are connected to DX coils. Liquid line solenoid valves are recommended for refrigerant migration control when they are connected to an EVP chiller and should be connected as described in the Installation Electrical chapter.

Thermostatic Expansion Valve (TXV)

Trane recommends a balance-ported externally equalized valve in order to maintain satisfactory superheat control down to lower valve loading conditions and to compensate for pressure drops between the expansion valve and superheat control point (evaporator refrigerant outlet). For fin and tube evaporator applications, a 30% bleed port TXV is required for 20 to 60 ton units and a 15% bleed port is required for 80 to 120 ton units.

In order to get proper refrigerant distribution into the coil, an expansion valve is required for each coil distributor. See tables below for valve selection.

Table 9. Expansion valve selection, any BPHE all Fin and Tube OD coils (0% bleed)

Min Tonnage	Max Tonnage	Selection[a]	Alternate[a]
1.5	2	BBIZE-1-1/2-GA	ERZE-1-1/2-GA
2	3	BBIZE-2-GA	ERZE-2-GA
2.5	4	BBIZE-3-GA	ERZE-3-GA
3.5	5.5	BBIZE-4-GA	ERZE-4-GA
4.5	6.5	BBIZE-5-GA	ERZE-5-GA
5.5	7.5	BBIZE-6-GA	ERZE-6-GA
6.5	10.5	BBIZE-8-GA	ERZE-8-GA
8.5	13.5	BBIZE-12-1/2-GA	ERZE-12-1/2-GA
11	16.5	BBIZE-15-GA	ERZE-15-GA
13	22	OZE-20-GA	n/a
17	26	OZE-25-GA	n/a
20.5	39	OZE-35-GA	n/a
30.5	59	OZE-50-GA	n/a
45.5	70	OZE-60-GA	n/a

[a] Valve part numbers with "-ZGA" in place of "-GA", may be used interchangeably.

Table 10. Expansion valve selection, 20 to 60 ton MCHE (30% bleed)

Min Tonnage	Max Tonnage	Manufacturer	Selection[a]	Trane Part
2	3	Sporlan	ERZE-1-1/2-ZGA (BP/15)	VAL10487
2.5	3.5	Sporlan	ERZE-2-ZGA (BP/30)	VAL10488
3.5	5	Sporlan	ERZE-3-ZGA (BP/30)	VAL10489
4.5	7	Sporlan	ERZE-4-ZGA (BP/30)	VAL10490
6	8.5	Sporlan	ERZE-5-ZGA (BP/30)	VAL10491
7	10	Sporlan	ERZE-6-ZGA (BP/30)	VAL10492
8	13.5	Sporlan	ERZE-8-ZGA (BP/30)	VAL10493
11	17.5	Sporlan	ERZE-12-1/2-ZGA (BP/30)	VAL10494
14	21.5	Sporlan	ERZE-15-ZGA (BP/30)	VAL10495
17	28.5	Sporlan	OZE-20-ZGA (BP/30)	VAL10496
22	30	Sporlan	OZE-25-ZGA (BP/30)	VAL10497

[a] Valve part numbers with "-ZGA" in place of "-GA", may be used interchangeably.

Table 11. Expansion valve selection, 80 to 120 ton MCHE (15% bleed)

Min Tonnage	Max Tonnage	Manufacturer	Selection[a]	Trane Part
2	2.5	Sporlan	ERZE-1-1/2-ZGA (BP/15)	n/a
2.5	3	Sporlan	ERZE-2-ZGA (BP/15)	n/a
3	4.5	Sporlan	ERZE-3-ZGA (BP/15)	n/a
4	6	Sporlan	ERZE-4-ZGA (BP/15)	n/a
5	7.5	Sporlan	ERZE-5-ZGA (BP/15)	VAL10579
6	9	Sporlan	ERZE-6-ZGA (BP/15)	VAL10580

Table 11. Expansion valve selection, 80 to 120 ton MCHE (15% bleed) (continued)

Min Tonnage	Max Tonnage	Manufacturer	Selection[a]	Trane Part
7	12	Sporlan	ERZE-8-ZGA (BP/15)	VAL10581
9.5	15.5	Sporlan	ERZE-12-1/2-ZGA (BP/15)	VAL10582
12.5	19	Sporlan	ERZE-15-ZGA (BP/15)	VAL10583
15	25	Sporlan	OZE-20-ZGA (BP/15)	VAL10584
19.5	30	Sporlan	OZE-25-ZGA (BP/15)	VAL10585
23.5	45	Sporlan	OZE-35-ZGA (BP/15)	VAL10586
35	68	Sporlan	OZE-50-ZGA (BP/15)	VAL10587
52.5	70	Sporlan	OZE-60-ZGA (BP/15)	VAL10588

[a] Valve part numbers with "-ZGA" in place of "-GA", may be used interchangeably.

Ball Shutoff Valves

The ball shutoff valve allows for isolation of the filter/ filter drier for easier core replacement.

Two ball shutoff valves equal to the OD tubing size for liquid line are required.

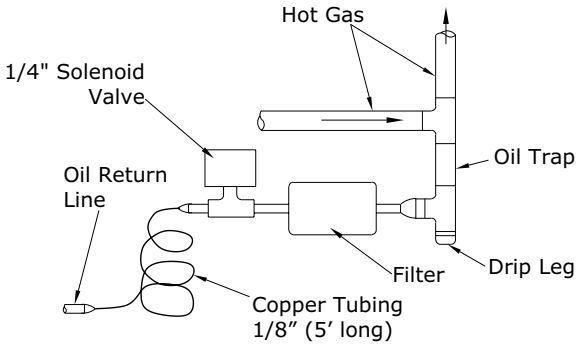
Discharge Line Components

Field supplied hot gas mufflers, pipe anchors, single or double risers, oil traps, etc. as applicable, should be provide to prevent excessive line vibration and assure proper oil return to the compressor for proper system operation.

A field supplied discharge "shutoff" valve in each hot gas line near the condenser is recommended to facilitate refrigerant storage in the condenser during service procedures.

A "constant drain" oil trap is illustrated below and can be used as an alternative to a double riser application. The constant drain oil trap assures adequate oil return to the suction line even at part load conditions.

Figure 23. Hot gas line components



Refrigerant Piping

NOTICE

Compressor Damage!

POE oil is hygroscopic – it absorbs water directly from the air. This water is nearly impossible to remove from the compressor oil and can result in compressor failures.

To prevent POE oil from absorbing water, the system should not remain open for longer than necessary. When open, dry nitrogen should flow through the piping. Only new oil containers should be used for service and maintenance. Always use the smallest container size required for the job requirements. Always leave the oil container tightly sealed until time of use. Do not reuse oil that has been opened.

Refrigerant piping must be properly sized and applied. These two factors have a very significant effect on both system performance and reliability.

Note: *Use Type "L" refrigerant grade copper tubing only.*

Refrigerant Piping should be sized and laid out according to the job plans and specifications. This should be done when the system components are selected.

The primary objective when sizing refrigerant piping for this unit is to make refrigerant line sizes as small as possible while avoiding excessive refrigerant pressure drops.

Sizing refrigerant lines as small as possible minimizes the required refrigerant charge and maximizes compressor life.

See SS-APG012-EN for line sizing information.

Liquid Line Piping

Basic sizing parameters with the system operating at full load for liquid lines are:

- Maximum Liquid velocity: 600 fpm

- Maximum allowable pressure drop: 7 psig (1°F)

As the pressure drop in the liquid line increases, the potential for liquid flashing, due to reduced refrigerant pressure corresponding to a reduced liquid temperature (subcooling), increases. Under these conditions, liquid lines exposed to high surrounding ambient temperatures must be insulated.

Note: *Adding refrigerant to a system with improperly sized refrigerant lines will only decrease system performance and reliability and accentuate poor operating condition.*

Isolate all refrigerant lines from the building. This prevents transferring line vibration to the structure. Do not secure the lines rigidly to the building at any point since this will defeat the isolation system of the unit.

See connection drawings in Dimension and Weights chapter for refrigerant line size connections and locations. Connect the liquid line piping to the stubs provided at the liquid line shutoff valves.

Note: *The installer must cut an appropriately-sized opening in the unit sheet metal for the refrigerant piping entrance into the unit.*

Discharge (Hot Gas) Lines

Discharge lines should be pitched downward 1/2 inch for each 10 feet of horizontal run in the direction of hot gas flow and away from the compressor. Insulate any portion of the discharge piping that is exposed to outdoor ambient temperature.

Discharge line sizing is based on minimum velocity required for good oil movement in system.

Basic discharge line parameters are:

- Maximum allowable pressure drop: 6 psig
- Maximum velocity: 3500 fpm

Minimum velocities at Minimum Load:

- Horizontal Lines: 500 fpm
- Vertical Lines: See table below.

A double riser system may be necessary to meet the discharge line velocity requirements.

When either a single or double discharge riser is used, the line should drop well below the discharge outlet of the compressor before starting the vertical rise to prevent the possibility of refrigerant draining back to the compressor during the "Off" cycle.

Table 12. Minimum vertical line velocities

Line Dia.	Minimum Velocity (fpm)	Line Dia.	Minimum Velocity (fpm)
7/8"	470	2-1/8"	750
1-1/8"	540	2-5/8"	825

Table 12. Minimum vertical line velocities (continued)

Line Dia.	Minimum Velocity (fpm)	Line Dia.	Minimum Velocity (fpm)
1-3/8"	600	3-1/8"	915
1-5/8"	650	3-5/8"	975

Final Refrigerant Pipe Connections

To access the refrigerant pipe connections, remove the louvered side grills. See connection drawings in Dimensions and Weights chapter..

These condensing units are shipped with a Nitrogen holding charge. Install pressure gauges to the appropriate access valve(s) and take a reading.

- If no pressure is present, see Leak Testing Procedure section.
- If pressure is present, relieve the pressure before attempting to unsweat the "seal" caps.
- If refrigerant connections are not capped, but are "spun-end" tubes, use a tubing cutter to remove the end from the pipe.

NOTICE

Equipment Damage!

Drilling or sawing pipe stubs could introduce copper chips into the system and cause equipment damage.
Do not drill a hole in the seal caps or saw the ends of pipe stubs.

Brazing Procedures

⚠ WARNING

Explosion Hazard and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury.
Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

⚠ WARNING

Explosion Hazard!

Failure to follow these instructions could result in death or serious injury or equipment or property-only damage.

Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use mixtures of a hydrogen containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units.

Proper brazing techniques are essential when installing refrigerant piping. The following factors should be kept in mind when forming sweat connections.

- When copper is heated in the presence of air, copper oxide forms. To prevent copper oxide from forming inside the tubing during brazing, sweep an inert gas, such as dry nitrogen, through the tubing. Nitrogen displaces air in the tubing and prevents oxidation of the interior surfaces. A nitrogen flow of one to three cubic feet per minute is sufficient to displace the air. Use a pressure regulating valve or flow meter to control the flow.
- Ensure that the tubing surfaces to be brazed are clean, and that the ends of the tubes have been carefully reamed to remove any burrs.
- Make sure the inner and outer tubes of the joint are symmetrical and have a close clearance, providing an easy slip fit. If the joint is too loose, the tensile strength of the connection will be significantly reduced. The overlap distance should be equal to the diameter of the inner tube.
- Wrap the body of each refrigerant line component with a wet cloth to keep it cool during brazing. Move any tube entrance grommets away for the brazing area.

  Note: *Use 40 to 45% silver brazing alloy (BAg-7 or BAg-28) on dissimilar metals. Use BCup-6 brazing alloy on copper to copper joints.*
- If flux is used, apply it sparingly to the joint. Excessive flux can enter the system which will contaminate the refrigerant system.
- Apply heat evenly over the length and circumference of the joint to draw the brazing material into the joint by capillary action. Remove the brazing rod and flame from the joint as soon as a complete fillet is formed to avoid possible restriction in the line.
- Visually inspect the connection after brazing to locate any pin holes or crevices in the joint. The use of a mirror may be required, depending on the joint location.

Leak Testing Procedure

⚠ WARNING

Explosion Hazard!

Failure to follow these instructions could result in death or serious injury or equipment or property-only damage.

Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use mixtures of a hydrogen containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units.

⚠ WARNING

Explosion Hazard!

Failure to follow safe leak test procedures below could result in death or serious injury or equipment or property-only-damage.

Never use an open flame to detect gas leaks. Use a leak test solution for leak testing.

When leak testing a refrigerant system, observe all safety precautions.

Trane condensing units are shipped with a nitrogen holding charge. If there is no pressure, the unit must be leak tested to determine the location of leak.

Note: *These service procedures require working with refrigerant, Do NOT release refrigerant to the atmosphere! The service technician must comply with all federal, state, and local laws.*

Use refrigerant gas as a tracer for leak detection and use oil-pumped dry nitrogen to develop the required test pressure. Test the high and low side of the system at pressures dictated by local codes.

1. Close the field supplied liquid line service valve(s) installed near the evaporator and the compressor discharge service valve to isolate the system's high side from the low side. Pressure test the liquid line, discharge line, and condenser coils at pressures dictated by local codes. Do not exceed 10# above the pressure control settings.
2. Connect a refrigerant cylinder to the charging port of the liquid line service valve. Use the refrigerant to raise the high side pressure to 12 to 15 psig.
3. Disconnect the refrigerant cylinder. Connect a dry nitrogen cylinder to the charging port and increase the high side pressure. Do not exceed the condenser maximum working pressure listed on

the unit nameplate.

4. Use a leak detector or soap bubbles to check for leaks. Check all piping joints, valves, etc.
5. If a leak is located, use proper procedures to remove the refrigerant/nitrogen mixture, break the connection and remake as a new joint. Retest for leaks after making repairs.
6. Repeat the test procedure for the low side of the system, charging through the suction pressure gauge port or through an access provided on the suction line by the installer. Increase the system pressure to 100 psig.
7. If a leak is located, use proper procedures to remove the refrigerant/nitrogen mixture, break the connection and remake as a new joint. Retest for leaks after making repairs.
8. Open the liquid line service valve and the compressor discharge service valve.

Installation Electrical

Electrical

Note: *Local codes may take precedence.*

Table 13. CAUJ electrical data

Unit Size (ton)	Rated Voltage[a]	Unit Characteristics		Condenser Fan Motor[b]				
		MCA[c]	Max Fuse[d]	kW[e]	Qty	FLA	HP	LRA
20	200-230/60/3	9.2	15	0.9	2	4.1	1	20.7
	460/60/3	4.1	15	0.9	2	1.8	1	9.0
	575/60/3	3.2	15	0.9	2	1.4	1	7.2
25	200-230/60/3	13.3	20	0.9	3	4.1	1	20.7
	460/60/3	5.9	15	0.9	3	1.8	1	9.0
	575/60/3	4.6	15	0.9	3	1.4	1	7.2
30	200-230/60/3	13.3	20	0.9	3	4.1	1	20.7
	460/60/3	5.9	15	0.9	3	1.8	1	9.0
	575/60/3	4.6	15	0.9	3	1.4	1	7.2
40	200-230/60/3	17.4	20	0.9	4	4.1	1	20.7
	460/60/3	7.7	15	0.9	4	1.8	1	9.0
	575/60/3	6.0	15	0.9	4	1.4	1	7.2
50	200-230/60/3	25.6	30	0.9	6	4.1	1	20.7
	460/60/3	11.3	15	0.9	6	1.8	1	9.0
	575/60/3	8.8	15	0.9	6	1.4	1	7.2
60	200-230/60/3	25.6	30	0.9	6	4.1	1	20.7
	460/60/3	11.3	15	0.9	6	1.8	1	9.0
	575/60/3	8.8	15	0.9	6	1.4	1	7.2
80	200/60/3	34	40	0.9	8	4.1	1	20.7
	230/60/3	34	40	0.9	8	4.1	1	20.7
	460/60/3	15	20	0.9	8	1.8	1	9
	575/60/3	12	15	0.9	8	1.4	1	7.2
100	200/60/3	50	60	0.9	12	4.1	1	20.7
	230/60/3	50	60	0.9	12	4.1	1	20.7
	460/60/3	22	25	0.9	12	1.8	1	9
	575/60/3	17	20	0.9	12	1.4	1	7.2
120	200/60/3	50	60	0.9	12	4.1	1	20.7
	230/60/3	50	60	0.9	12	4.1	1	20.7
	460/60/3	22	25	0.9	12	1.8	1	9
	575/60/3	17	20	0.9	12	1.4	1	7.2

[a] Voltage Utilization Range is +/- 10% of Rated voltage (use range): 200/60/3 (180-220), 230/60/3 (208-254), 460/60/3 (414-506), 575/60/3 (516-633)
[b] Electrical information is for each individual motor.
[c] Minimum circuit ampacity (MCA) is 125 percent of the RLA of one compressor motor plus the total RLA of the remaining motors.
[d] Maximum fuse size is permitted by NEC 440-22 is 300 percent of one motor RLA plus the RLA of the remaining motors
[e] All kW values taken at conditions of 45°F saturated suction temperature at the compressor and 95°F ambient.

Wiring Requirements

Main Electrical Power Requirements

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state/national electrical codes.

- Verify the power supply meets the required power requirements of the system.
- Install power wiring in accordance with all applicable codes.
- Install and connect properly sized power supply wiring, with over current protection, to the main power terminal block (1TB1) in the control panel.
- Install proper grounding wires to an earth ground.

Field Installed Control Wiring Requirements

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state/national electrical codes.

115 Volt Control Wiring (All Units)

- Verify that the Control transformer (1T1) is wired for the proper operating voltage.
- Install the interlock circuitry wiring between the unit and the appropriate compressor unit to permit condenser fan operation when the compressor starter auxiliary contacts closes. Refer to the Field Connection Diagram that shipped with the unit for interlocking information.
- Verify the appropriate jumpers have been installed on the unit to allow proper condenser fan operation (If applicable). Refer to the control wiring diagram that shipped with the unit for jumper details.

Field Installed Power Wiring

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state/national electrical codes.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as the equipment was not designed or qualified to accept other types of conductors.

See Dimensions and Weights chapter for overall dimensional layouts for the field installed wiring locations. To insure that the unit's supply power wiring is properly sized and installed, follow the guidelines outlined below.

Note: *All field installed wiring must conform to NEC guidelines as well as state and local codes.*

Verify that the power supply available is compatible with the unit's nameplate ratings. The available supply power must be within 10% of the rated voltage stamped on the nameplate.

Main Unit Power Wiring

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.
All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state/national electrical codes.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as the equipment was not designed or qualified to accept other types of conductors.

See "Power Wire Sizing and Protection Devices," p. 40 for field connection wire ranges for main power terminal block 1TB1.

See Electrical Data tables for unit electrical data. The electrical service must be protected from over current and short circuit conditions in accordance with NEC requirements. Protection devices must be sized according to the electrical data on the nameplate.

- See Calculation — MCA, MOP, and RDE in "Wiring Requirements," p. 39 section to determine the following:
  - Electrical service wire size based on Minimum Circuit Ampacity (MCA),
  - Maximum Overcurrent Protection (MOP) device.
  - Recommended Dual Element fuse size (RDE).
- A field supplied disconnect switch must be installed at or near the unit in accordance with the National Electrical Code (latest edition). See Calculation — Disconnect Switch Sizing (DSS) in "Wiring Requirements," p. 39 section to determine the correct size.
- Complete the unit's power wiring connections onto either the main terminal block 1TB1, or the factory mounted non-fused disconnect switch 1S1, inside the unit control panel. Refer to the customer connection diagram that shipped with the unit for specific termination points.
- Provide proper supply power (with over current protection) to the Compressor unit and Air Handling unit ("No Control", "VAV", and "Constant Volume") applications. For chilled water systems, provide a properly sized power supply to the circulating pump motor (EVP control applications). Be certain that these components are properly grounded.
- Provide proper grounding for the unit in accordance with local and national codes.

Power Wire Sizing and Protection Devices

Table 14. CAUJ power wire selections

Units Sizes (tons)	Voltage	To Main Terminal Block 1T1	
		Terminal Block Size (amps)	Connector Wire Range
20 to 60	All	175	(1) #14-2/0
80 to 120	All	175	(1) #12-2/0

Table 15. Control wire selections

Units Sizes (tons)	Wire Gauge	Ohms per 1000 feet	Max Wire Length (ft)
All	18	8	500
All	16	5	1000
All	14	3	2000
All	12	2	3000

Table 16. Control terminal blocks

Unit Size	Control Terminal Blocks
20 to 60	1TB2
80 to 120	1TB4

Equations

To correctly size main power wiring for the unit, use appropriate calculation(s) listed below.

Load Definitions for Calculations

- LOAD 1: Current of largest motor (compr or fan motor)
- LOAD 2: Sum of the currents of all remaining motors
- LOAD 4: Control panel transformer and any other load rated at 1A or more

Calculation — MCA, MOP, and RDE

- **MCA** = (1.25 x LOAD 1) + LOAD 2 + LOAD 4
- **MOP** = (2.25 x LOAD 1) + LOAD 2 + LOAD 4

Select a fuse rating equal to the MOP value. If the MOP value does not equal a standard fuse size as listed in NEC 240 - 6, select the next lower standard fuse rating.

Note: *If selected MOP is less than the MCA, then select the lowest standard maximum fuse size which is equal to or larger than the MCA, provided the selected fuse size does not exceed 800 amps.*

- **RDE** = (1.5 x LOAD 1) + LOAD 2 + LOAD 4

Select a fuse rating equal to the RDE value. If the RDE value does not equal a standard fuse size as listed in NEC 240 - 6 select the next higher standard fuse rating.

Note: *If the selected RDE is greater than selected MOP value, select RDE value to equal MOP value.*

Calculation — Disconnect Switch Sizing (DSS)

- DSS = 1.15 X (LOAD 1 + LOAD 2 + LOAD 4)

Field Installed Control Wiring

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

Before installing any connecting wiring, see drawings Dimensions and Weights chapter for the electrical access locations provided on the unit. Install appropriately sized control wiring for the 115 volt electrical components as required by the application.

Since the unit-mounted 115V control power transformer (1T1) is provided on all units, it is not necessary to run a separate 115 volt control power source to the unit.

Note: *All 200/230V units are shipped with transformer 1T1 wired for 200 volt operation. If the unit is to be operated on a 230V power supply, rewire the transformer as shown on the unit schematic.*

When the 115 volt control circuit is properly connected to the field provided interlock contacts 5K1 for circuit #1 and 5K2 for circuit #2 (if applicable), proper condenser fan cycling and ambient control for the remaining fans is achieved with corresponding compressor operation.

Note: *All field wiring must conform to NEC guidelines as well as state and local codes.*

Night Setback

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

If night setback operation is desired, connect a set of normally open contacts (field provided) to the appropriate terminals on the terminal board (7TB7), in the unit's control panel. Remove the factory installed jumper at the terminal board when making the final wiring termination. Refer to the field connection diagram, numbers 2307-9122 (for 20 to 60 ton units) and 2307-9144 (for 80 to 120 ton units) for details.

Operating Principles

Component Locations

Condenser Fans

Figure 24. Condenser fan locations: 20 to 60 ton units

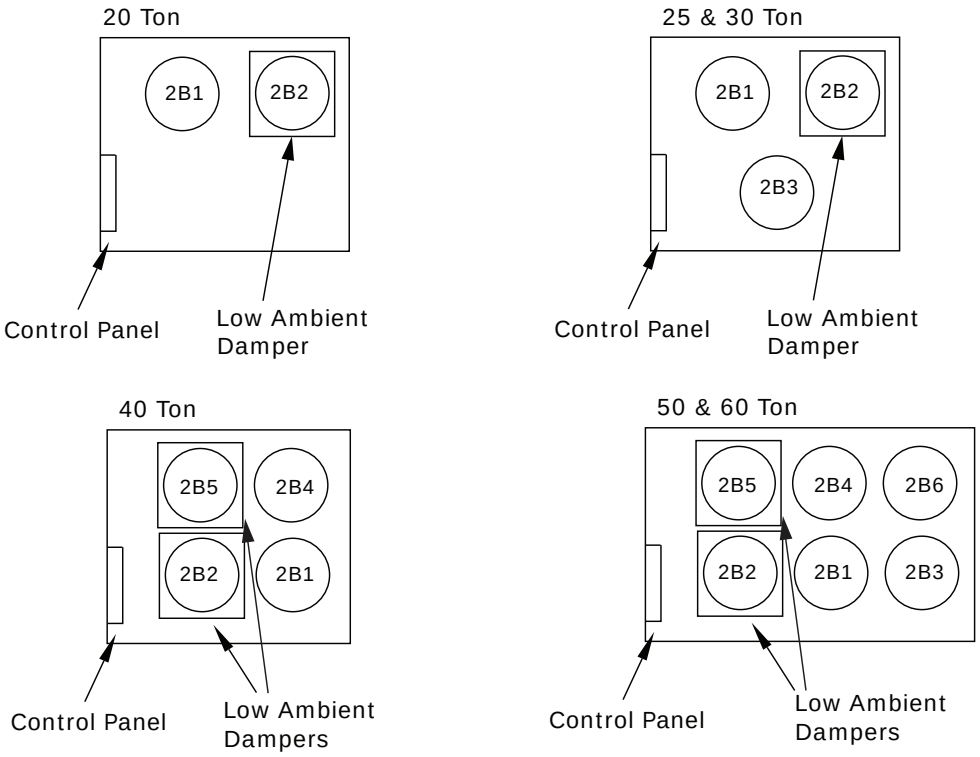
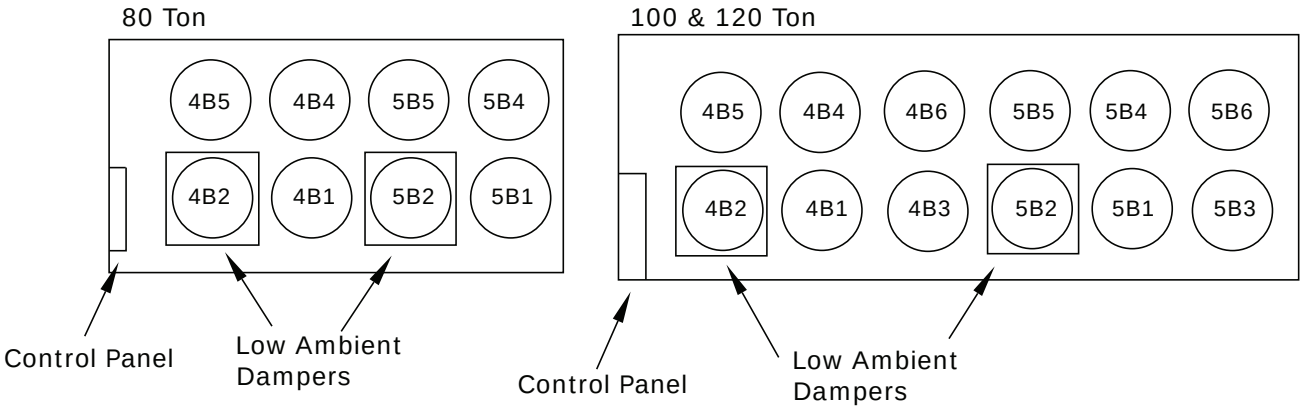


Figure 25. Condenser fan locations: 80 to 120 ton units



Unit Operation

Standard air cooled condensers function as the outdoor condensing units for appropriately sized split refrigeration systems. These units, operating in conjunction with a matched indoor compressor/evaporator configuration, provide refrigerant condensing for these systems down to a normal ambient temperature of 40° F. Operation to 0° F ambient is possible with the addition of externally mounted low ambient dampers.

All condenser fans are direct drive, 26 inch propeller type. They are driven by 1 HP thermally protected motors.

When wired properly, the unit will start and operate satisfactorily as long as the operating temperature is

above the minimum operating temperature shown in Table 21, p. 50.

The condensing unit operation starts and stops automatically when the cooling demand is initiated and terminated by the cooling circuit interlock relays.

The control components are mounted in the various areas of the unit. See diagrams 2307-9123, 2307-9124, 2307-9125, and 2307-9126 for additional information.

Condenser Fans

20 to 60 Ton Specs

Condenser fan cycling is accomplished through interlocking the fan operation with remote compressor operation (5K1 & 5K2), liquid line pressure switches (4S11 & 4S12). When the low ambient option is applied, ambient temperature thermostats (1S36 & 1S37) are used to provide additional fan cycling control. Table 17, p. 43 lists the condenser fan sequencing data. See "Condenser Fans," p. 42 for condenser fan locations and designators.

Table 17. CAUJ condenser fan sequencing data: 20 to 60 ton units

Controlling Device	Fan "ON"	Fan "OFF"	Fan Identification
Customer Interlock Circuit 1	5K1 Closed	5K1 Open	2B2, 2B3[a]
Customer Interlock Circuit 2	5K2 Closed	5K2 Open	2B5[b], 2B6[c]
Fan Temperature Switch[d]	1S36		
	67.5°F	65°F	2B3[a]
	1S37		
	67.5°F	65°F	2B6[c]
Fan Pressure Switch	4S11		
	444 psig	255 psig	2B1
	4S12		
	444 psig	255 psig	2B4[b]

[a] Fan used on 25, 30, 50 and 60 ton units only.
[b] Fan used on 40, 50 and 60 ton units only.
[c] Fan used on 50 and 60 ton units only.
[d] 1S36 and 1S37 normally-closed contacts open on ambient temperature drop to 65°F. Contacts reclose on ambient temperature rise to 65°F and 67.5°.

80 to 120 Ton Specs

Condenser fan cycling is accomplished through interlocking the fan operation with remote compressor operation (6K1 & 6K2), and ambient temperature thermostats (1S42 & 1S43) are used to provide additional fan cycling control. Table 18, p. 43 lists the condenser fan sequencing data. See "Condenser Fans," p. 42 for condenser fan locations and designators.

Table 18. CAUJ condenser fan sequencing data: 80 to 120 ton units

Controlling Device	Stage	Fan ON	Fan OFF	Fan Identification
Customer Interlock Circuit 1		6K1 Closed	6K1 Open	4B2, 4B5, 4B6[a]
Customer Interlock Circuit 2		6K2 Closed	6K2 Open	5B2, 5B5, 5B6[a]
Fan Temperature Switch 1S42 [b]	Stage 1	53°F	45°F	4B3[a]
	Stage 2	73°F	65°F	4B1, 4B4
Fan Temperature Switch 1S43[b]	Stage 1	53°F	45°F	5B3[a]
	Stage 2	73°F	65°F	5B1, 5B4

[a] Fan used on 100 and 120 ton units only.
[b] 1S42 and 1S43 normally-closed contacts open on ambient temperature drop to "OFF" setpoints. Contacts reclose on ambient temperature rise on "ON" setpoints.

Low Ambient Dampers

Low Ambient Dampers are available as a factory installed option or can be field-installed. Dampers are used to extend the operation of these units from the standard operational temperatures to a minimum of 0°F without hot gas bypass or 10°F with hot gas bypass. (These values apply when wind speed across the condenser coil is less than 5 m.p.h.). If typical wind speeds are higher than 5 m.p.h., a wind screen around the unit may be required. By restricting the airflow across the condenser coils, saturated condensing temperatures can be maintained as the ambient temperatures change.

The low ambient damper actuator controls damper modulation for each refrigerant circuit in response to saturated condensing temperature.

Low Ambient Thermostats

20 to 60 Ton Units

In addition to the low ambient dampers on 25, 30, 50 & 60 Ton units, a low ambient thermostat is installed to further restrict the airflow across the condenser by cycling the 2B3 condenser fan on 25 & 30 Ton units plus 2B6 on 50 & 60 Ton units. The thermostat opens when the ambient temperature reaches 65°F and closes at approximately 67.5°F.

80 to 120 Ton Units

In addition to the low ambient dampers a two stage low ambient thermostat is installed to further restrict the airflow across the condenser by cycling the 4B1 + 4B6, 5B1 + 5B6 on 100 & 120 Ton units. The final stage thermostats opens when the ambient temperature approaches 65°F and closes at approximately 73°F. The second stage opens when the ambient temperature approaches 45°F and closes at approximately 53°F.

Pre-Start

Use the checklist provided below in conjunction with the "General Unit Requirement" checklist" to ensure that the unit is properly installed and ready for operation. Be sure to complete all of the procedures described in this section before starting the unit for the first time.

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

- Turn the field supplied disconnect switch, located upstream of the unit, to the "Off" position.
- Turn the "System" selection switch (at the Remote Panel) to the "Off" position and the "Fan" selection switch (if applicable) to the "Auto" or "Off" position.
- Check all electrical connections for tightness and "point of termination" accuracy.
- Verify that the condenser airflow will be unobstructed.
- Check the condenser fan blades. Ensure they rotate freely within the fan orifices and are securely fastened to the fan motor shaft.

NOTICE

Compressor Damage!

Excessive liquid accumulation in the suction lines could result in compressor damage.

Do not allow liquid refrigerant to enter the suction line.

- Verify that all compressor service valves, discharge service valves, and liquid line service valves are back seated on each circuit.

  Important: *After liquid line service valves are fully opened (back seated), close just 1/4 turn to allow for fan pressure control (4S7, 4S8) operation.*

- Check the condenser coils. They should be clean and the fins should be straight. Straighten any bent coil fins with an appropriate sized fin comb.
- Inspect the interior of the unit for tools and debris.

System Evacuation Procedures

NOTICE

Operating Under Vacuum!

Failure to follow these instructions will result in compressor failure.

Do not operate or apply power to the compressor while under a vacuum.

Each refrigeration circuit for split system applications must be evacuated before the unit can be started. Use a rotary type vacuum pump capable of pulling a vacuum of 100 microns or less. Verify that the unit disconnect switch and the system control circuit switches are "OFF".

The oil in the vacuum pump should be changed each time the pump is used with a high quality vacuum pump oil. Before using any oil, check the oil container for discoloration which usually indicates moisture in the oil and/or water droplets. Moisture in the oil adds to what the pump has to remove from the system, making the pump inefficient.

When connecting the vacuum pump to a refrigeration system, it is important to manifold the vacuum pump to both the high and low side of the system (liquid line access valve and suction line access valve). Follow pump manufacturer's directions for proper methods of using vacuum pump.

The lines used to connect pump to the system should be copper and the largest diameter that can practically be used. Using larger line sizes with minimum flow resistance can significantly reduce evacuation time. Rubber or synthetic hoses are not recommended for system evacuation. They have moisture absorbing characteristics which result in excessive rates of evaporation, causing pressure rise during standing vacuum test. This makes it impossible to determine if system has a leak, excessive residual moisture, or a continual or high rate of pressure increase due to hoses.

An electronic micron vacuum gauge should be installed in the common line ahead of the vacuum pump shutoff valve, as shown in [Either the href or the keyref attribute should be set on xref elements] Figure 32, p. 51. Close Valves B and C, and open Valve A.

Start vacuum pump. After several minutes, the gauge reading will indicate the maximum vacuum the pump is capable of pulling. Rotary pumps should produce vacuums of 100 microns or less.

Open Valves B and C. Evacuate the system to a pressure of 300 microns or less. As vacuum is being pulled on the system, it may appear that no further vacuum is being obtained, yet the pressure is high. To

facilitate the evacuation process, it is recommended that the vacuum be “Broken”.

To break the vacuum, close valves A, B, & C and connect a refrigerant cylinder to the charging port on the manifold. Purge the air from the hose. Raise the standing vacuum pressure in the system to “zero” (0 psig) gauge pressure. Repeat this process two or three times during evacuation.

Note: *It is unlawful to release refrigerant into the atmosphere. When service procedures require working with refrigerants, the service technician must comply with all Federal, State, and local laws. See the General Service Bulletin MSCU-SB-1 (latest edition).*

Standing Vacuum Test

Once 300 microns or less is obtained, close Valve A and leave valves B and C open. This will allow the vacuum gauge to read the actual system pressure. Let the system equalize for approximately 15 minutes. This is referred to as a “standing vacuum test” where, time versus pressure rise. The maximum allowable rise over a 15 minute period is 200 microns. If the pressure rise is greater than 200 microns but levels off to a constant value, excessive moisture is present. If the pressure steadily continues to rise, a leak is indicated. Figure 27, p. 46 illustrates three possible results of the “standing vacuum test”.

If a leak is encounter, repair the system and repeat the evacuation process until the recommended vacuum is obtained. Once the system has been evacuated, break the vacuum with refrigerant, and complete the remaining “Pre-Start Procedures” before starting the unit.

Figure 26. Typical vacuum pump hookup

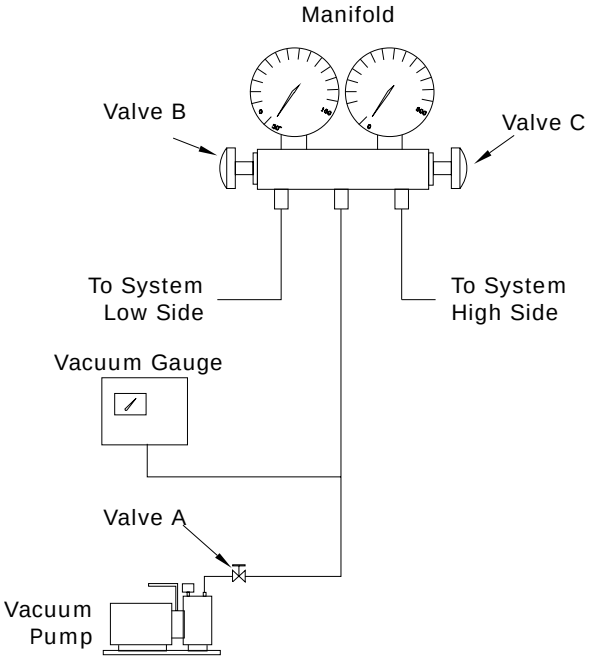
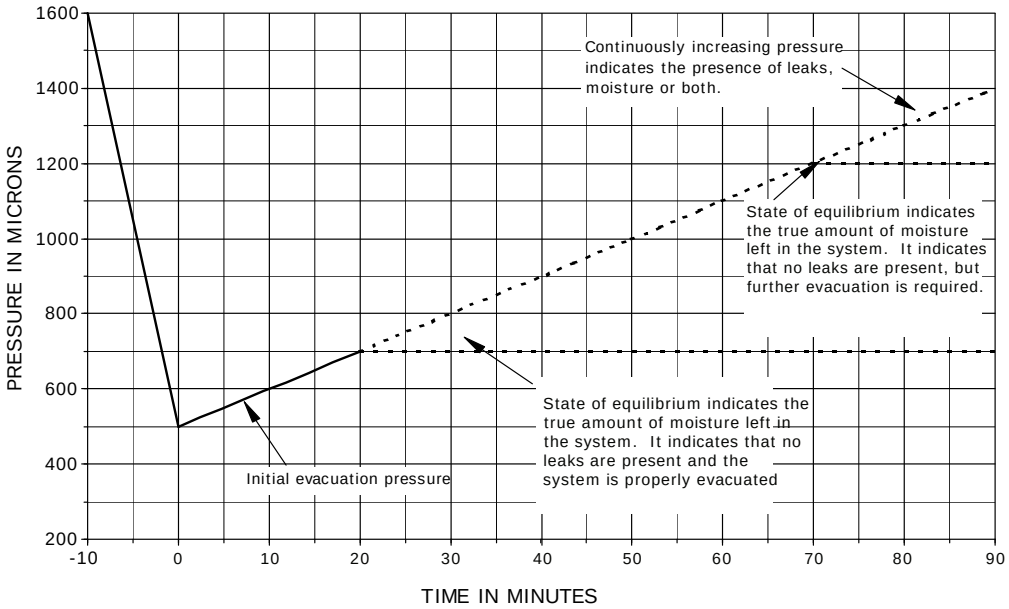


Figure 27. Evacuation time vs. pressure rise



Voltage Imbalance

Excessive three phase voltage imbalance between phases will cause motors to overheat and eventually fail. The maximum allowable voltage imbalance is 2%. Measure and record the voltage between phases 1, 2, and 3 and calculate the amount of imbalance as follows:

% Voltage Imbalance = 100 x [(AV - VD)/(AV)] where:

- AV (Average Voltage) = (Volt 1 + Volt 2 + Volt 3)/3
- V1, V2, V3 = Line Voltage Readings
- VD = Line Voltage reading that deviates the farthest from the average voltage.

Example:
If voltage readings of supply power measured 221, 230, and 227, average volts would be:

- AV = (221 + 230 + 227)/3 = 226 Avg.
- VD = 221

The percentage of imbalance is calculated as follows:

- 100 x[(226 - 221)/226)] = 2.2%

The 2.2% imbalance in this example exceeds the maximum allowable imbalance of 2.0%. This much imbalance between phases can equal as much as a 20% current imbalance with a resulting increase in motor winding temperatures that will decrease motor life. If the voltage imbalance is over 2%, notify the proper agencies to correct the voltage problem before operating this equipment.

Electrical Phasing

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Proper electrical phasing can be quickly determined and corrected before starting unit by using an instrument such as Associated Research Model 45 Phase Sequence Indicator, following steps below

- Turn field supplied disconnect switch that provides power to terminal block 1TB1 to “Off” position
- Connect the phase sequence indicator leads to the terminal block or to the “Line” side of the optional factory mounted disconnect switch as follows:
- Black (phase A) to L1
- Red (phase B) to L2
- Yellow (phase C) to L3
- Close the main power disconnect switch or circuit protector switch that provides the supply power to the condensing unit.
- Observe the ABC and CBA phase indicator lights on the face of the sequencer. The ABC indicator light will glow if the phase is ABC. If the CBA indicator light glows, open the disconnect switch or circuit protection switch and reverse any two power wires.
- Restore the main electrical power and recheck the phasing.
- If the phasing is correct, open the main power disconnect switch or circuit protection switch and remove the phase sequence indicator.

Start-Up

Verifying Proper Condenser Fan Rotation

⚠ WARNING

Rotating Components!

Failure to disconnect power before servicing could result in rotating components cutting and slashing technician which could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

1. "Open" the field supplied disconnect switch or circuit protector switch that provides power to the compressor unit and lock it in the "Off" position.
2. Open the disconnect switch or circuit protector switch that provides power to the condensing unit.
3. To install temporary jumpers:
   a. For 20-60 ton units: install temporary jumpers across terminals 1TB2-1 to 1TB2-3, 1TB2-1 to 1TB2-8, and the applicable cycling controls, i.e., pressure switches and ambient thermostats, to start the condenser fans, as illustrated in component location drawings.
   b. For 80-120 ton units: Install temporary jumpers across terminals 1TB4-7 to 1TB4-9, 1TB4-7 to 1TB4-11, and the applicable cycling controls, i. e., pressure switches and ambient thermostats, to start the condenser fans, as illustrated in component location drawings.
4. "Close" the disconnect switch or circuit protector switch that provides power to the condensing unit. Turn the control circuit switch 1S5 to the "On" position. The fans will start when the power is applied.
5. Check the condenser fans for proper rotation. The direction of rotation is clockwise when viewed from the top of the unit.
6. Turn the field supplied disconnect switch or circuit protector switch that provides power to the condensing unit to the "Off" position. Lock the disconnect switch in the open position while working at the unit.
7. Interchange any two of the field connected main power wires at the unit terminal block 1TB1 in the unit control panel.
8. Remove all temporary jumpers previously installed in step 3 of "Verifying Proper Condenser Fan Rotation".

   Note: *Interchanging "Load" side power wires at the fan contactors will only affect the individual fan rotation. Ensure that the voltage phase sequence at the main terminal block 1TB1 is ABC as outlined in the "Electrical Phasing" section.*
9. "Open" the field supplied disconnect switch upstream of the unit. Lock the disconnect switch in the "Open" position while working at the unit.
10. Interchange any two of the fan motor leads at the fan contactor for each fan that is rotating backwards.
11. Remove all temporary jumpers previously installed in step 3 of "Verifying Proper Condenser Fan Rotation".

All Fans are Rotating Backwards

1. Turn the field supplied disconnect switch or circuit protector switch that provides power to the condensing unit to the "Off" position. Lock the disconnect switch in the open position while working at the unit.
2. Interchange any two of the field connected main power wires at the unit terminal block 1TB1 in the unit control panel.
3. Remove all temporary jumpers previously installed in step 3 of Verifying Proper Condenser Fan Rotation section.

Note: *Interchanging "Load" side power wires at the fan contactors will only affect the individual fan rotation. Ensure that the voltage phase sequence at the main terminal block 1TB1 is ABC as outlined in the "Electrical Phasing" section.*

Some Fans are Rotating Backwards

1. "Open" the field supplied disconnect switch upstream of the unit. Lock the disconnect switch in the "Open" position while working at the unit.
2. Interchange any two of the fan motor leads at the fan contactor for each fan that is rotating backwards.
3. Remove all temporary jumpers previously installed in step 3 of Verifying Proper Condenser Fan Rotation section.

Low Ambient Damper Adjustment (Factory or Field Installed)

When a unit is ordered with the low ambient option (model number digit 11 =1), a damper is factory installed over the lead condenser fan for each

refrigeration circuit. See Component Location drawings in the Operating Principals chapter for damper location illustrations for the appropriate unit.

For field installation, mount the dampers over the condenser fans at the locations shown in Component Location drawings and connect the actuator, controller, and sensor for each circuit. (Refer to the Installation Instructions provided with each low ambient damper kit.)

The controller has a factory default setpoint of 80° F. This setpoint can be adjusted by installing a field supplied resistor on 2TB34 in the low ambient control panel located in the back of the main control panel. (See the low ambient wiring diagram that shipped with the unit or with the field kit, for resistance values and installation location.)

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Inspect the damper blades for proper alignment and operation. Dampers should be in the closed position during the "Off" cycle.

NOTICE

Actuator Damage!

Do not depress actuator clutch while actuator is energized as it could result in actuator damage.

If adjustment is required:

1. Remove the sensor leads from the input terminals 6 and 7 for circuit #1 and/or 11 and 12 for circuit #2. (Controller output signal will go to 0.0 VDC and the damper will drive to the closed position.)
2. Loosen the actuator clamp.
3. Firmly hold the damper blades in the closed position
4. Retighten the actuator clamp.

To check damper operation, jumper between the sensor input terminals 6 and 7 and/or 11 and 12 (if applicable). Controller output signal will go to 10 VDC and damper will drive to full open position.

Charging the System

1. Verify that all discharge service valves and liquid line service valves for each circuit is back seated.
2. Attach a set of service gauges onto the liquid line and discharge line gauge ports for each circuit.
3. Charge liquid refrigerant into the liquid line of each refrigerant circuit with the required amount of R-410A. Refrigerant should be charged into the system by weight.

   Use an accurate scale or a charging cylinder to monitor the amount of refrigerant entering the system. See Table 19, p. 50 for the recommended refrigerant capacities for the condensing unit. The weight of refrigerant required for the liquid line and liquid line driers are listed in Table 20, p. 50.

   If the pressure within the system equalizes with the pressure in the charging cylinder before charging is completed, complete the process by vapor charging into the suction (low) side of the system after the system has been started.

   Table 21, p. 50 gives the minimum starting temperatures for both "Standard" & "Low" Ambient units.

   Do not attempt to charge the system with the low ambient dampers and/or hot gas bypass operating (if applicable). Disable the low ambient dampers in the "Open" position (refer to the "Low Ambient Damper Adjustment" section) and de-energize the hot gas bypass solenoid valves before proceeding.
4. On units with dual circuits, start only one circuit at a time. To disable the second circuit compressors, refer to the compressor sequencing information that shipped with the compressor unit.
5. With the compressors operating, slowly open the "Low Side" valve on the manifold gauge set. The remainder of the refrigerant will be drawn into the system.
6. Once the charging for the operating circuit has been completed, check and record the:
   - ambient temperature;
   - compressor oil level (each circuit); compressor suction and discharge pressures (each circuit);
   - superheat and subcooling (each circuit);

   Record this data on an "operator's maintenance log" like the one shown in Table 22, p. 51. If the operating pressures indicate a refrigerant shortage, measure the system superheat and system subcooling. Repeat steps 1 through 6 for the second refrigeration circuit, if applicable.

Table 19. Recommended refrigerant capacities

Unit Size	Operating Charge per Circuit[a]	Condenser Storage Capacity[b]
C20	12	19
C25	12	19
C30	12	19
C40	11	24
C50	12	25
C60	13	32
C80	29	47
D10	30	50
D12	33	63

[a] CAUJ-C20 through C30 are single circuit units. CAUJ C40 through D12 are dual circuit units.
[b] Pounds R-410A per circuit at 95°F ambient, 95% full.

Table 20. Liquid line & drier refrigerant requirements

Liquid Line O.D.	Liquid Line Charge	Sporlan Part No	Drier Refrigerant Charge
5/8"	1.827	C-305-S	1 lb. - 1 oz.
3/4"	2.728	C-307-S	1 lb. - 1 oz.
		C-417-S	1 lb. - 8 oz.
7/8"	3.790	C-307-S	1 lb. - 1 oz.
		C-417-S	1 lb. - 8 oz.
1-1/8"	6.461	C-419-S	1 lb. - 8 oz.

Note: Refrigerant charge given in ounces per foot.

Table 21. Minimum starting ambient temperatures

Unit Size (tons)	Standard Units		Low Ambient Units	
	With HGBP	No HGBP	With HGBP	No HGBP
20-60	40	30	10	0
80-120		40	10	0

Note: Minimum starting ambients in degrees F, based on unit at minimum step of unloading and 5 mph wind across condenser.

Table 22. Sample maintenance log

Date	Current Ambient Temp. (°F)	Refrigerant Circuit #1						Refrigerant Circuit #2					
		Compr. Oil level	Suct. Press. (Psig)	Disch. Press. (Psig)	Liquid Press. (Psig)	Super-heat (°F)	Subcool (°F)	Compr. Oil level	Suct. Press. (Psig)	Disch. Press. (Psig)	Liquid Press. (Psig)	Super-heat (°F)	Subcool (°F)
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					
		- ok- Low						- ok- Low					

Note: Check and record the data requested above each month during the cooling season with the unit running

Maintenance

Monthly Maintenance

Air Handling Equipment

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

Before completing the following checks, turn the system control circuit switch 1S2 and 5S1 to the "Off" position. Open the main power disconnect switch for the Condensing Unit and Air Handling Unit and "lock it" in the "Off" position before removing any access panels.

- Inspect the return air filters. Clean or replace them if necessary.
- Check the evaporator drain pan and condensate piping to ensure that there are no blockages.
- Inspect the evaporator coils for dirt. If the coils appear dirty, clean them according to the instructions described in ""Coil Cleaning," p. 56," p. 53.
- Inspect the economizer damper hinges and pins (if applicable) to ensure that all moving parts are securely mounted. Clean the blades as necessary.
- Verify that all damper linkages move freely. Lubricate with white grease, if necessary.
- Check Supply Fan motor bearings. Repair or replace the motor as necessary.
- Check the fan shaft bearings for wear. Replace the bearings as necessary.
- Lubricate supply fan bearings. Contact equipment manufacturer for recommended greases.

NOTICE

Bearing Damage!

Over lubrication could result in as much damage to fan bearings as not enough grease.

To prevent damage to fan bearings, do not over lubricate.

Important: *Use a hand grease gun to lubricate bearings. Add grease until a light bead appears all around the seal.*

After greasing the bearings, check the setscrews to ensure that the shaft is held securely to the bearings and fan wheels. Make sure that all bearing supports are tight.

- Check the supply fan belt(s). If the belts are frayed or worn, replace them.
- Verify that all wire terminal connections are tight.
- Inspect unit for unusual conditions (e.g., loose access panels, leaking piping connections, etc.)
- When checks are complete, verify all retaining screws are reinstalled in unit access panels.

Condensing Unit

⚠ WARNING

Rotating Components!

Failure to disconnect power before servicing could result in rotating components cutting and slashing technician which could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

- Manually rotate the condenser fans to ensure free movement and check motor bearings for wear. Verify that all of the fan mounting hardware is tight.
- Verify that all wire terminal connections are tight.
- Inspect the condenser coils for dirt and foreign debris. If the coils appear dirty, clean them according to the instructions described in Coil Cleaning section.
- Inspect the compressor and condenser fan motor contactors. If the contacts appear severely burned or pitted, replace the contactor. Do not clean the contacts.
- Check the compressor oil level. (Compressors "Off")

Coil Cleaning

NOTICE

Damaging Coil Cleaners!

Coil cleaners can damage roofs, surrounding buildings, vehicles, etc.
Cleaning substances should be checked to ensure that they will not cause damage to surroundings. Coils and roof (if applicable) should be rinsed thoroughly. Do not spray coil cleaners in windy conditions.

Regular coil maintenance, including annual cleaning, enhances unit's operating efficiency by minimizing:

- compressor head pressure and amperage draw;
- water carryover;
- fan brake horsepower; and,
- static pressure losses.

At least once each year—or more often if the unit is located in a "dirty" environment—clean the microchannel condenser using the instructions outlined below. Be sure to follow these instructions as closely as possible to avoid damaging the coils.

To clean refrigerant coils, use a soft brush and a sprayer.

Note: *DO NOT use any detergents with microchannel condenser coils. Pressurized water or air ONLY.*

1. Remove enough panels from the unit to gain safe access to coils..

⚠ WARNING

No Step Surface!

Failure to follow instruction below could result in death or serious injury.
Do not walk on the sheet metal drain pan. Walking on the drain pan could cause the supporting metal to collapse and result in the operator/technician falling.

Important: *Bridging between the main supports required before attempting to enter into the unit. Bridging may consist of multiple 2 by 12 boards or sheet metal grating.*

2. Straighten any bent coil fins with a fin comb.
3. For accessible areas, remove loose dirt and debris from both sides of the coil. For dual row microchannel condenser coil applications, seek pressure coil wand extension through the local Trane Parts Center.

   Note: *DO NOT use any detergents with microchannel coils. Pressurized water or air ONLY.*

4. Pour the cleaning solution into the sprayer. If a high-pressure sprayer is used:
   a. The minimum nozzle spray angle is 15 degrees.
   b. Do not allow sprayer pressure to exceed 600 psi.
   c. Spray the solution perpendicular (at 90 degrees) to the coil face.
5. Spray the leaving-airflow side of the coil first; then spray the opposite side of the coil. For evaporator and reheat coils, allow the cleaning solution to stand on the coil for five minutes.
6. Rinse both sides of the coil with cool, clean water.
7. Inspect both sides of the coil; if it still appears to be dirty, repeat Steps 6 and 7.
8. Reinstall all of the components and panels removed in Step 1; then restore power to the unit.

Microchannel Condenser Coil Repair and Replacement

If microchannel condenser coil repair or replacement is required, see Service Guide document RT-SVB83*-EN for further details.

Fall Restraint — Condenser Roof

⚠ WARNING

Falling Off Equipment!

Failure to follow instructions below could result in death or serious injury.
This unit is built with fall restraint slots located on unit top that MUST be used during servicing. These slots are to be used with fall restraint equipment that will not allow an individual to reach the unit edge. However such equipment will NOT prevent falling to the ground, for they are NOT designed to withstand the force of a falling individual.

This unit is built with fall restraint slots located on unit top that must be used during servicing. See figures below.

Figure 28. Fall restraint slot

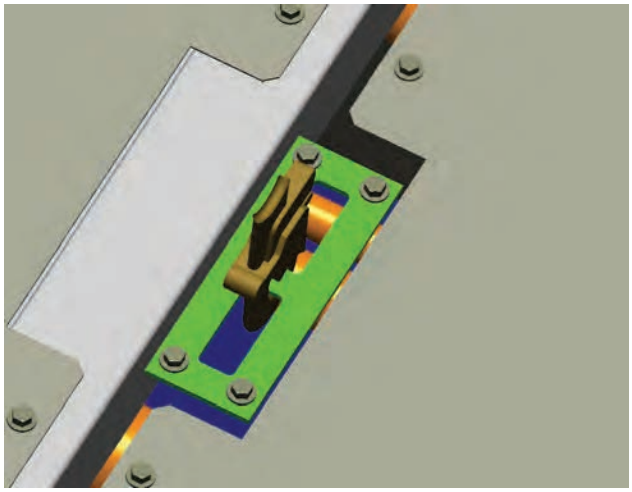
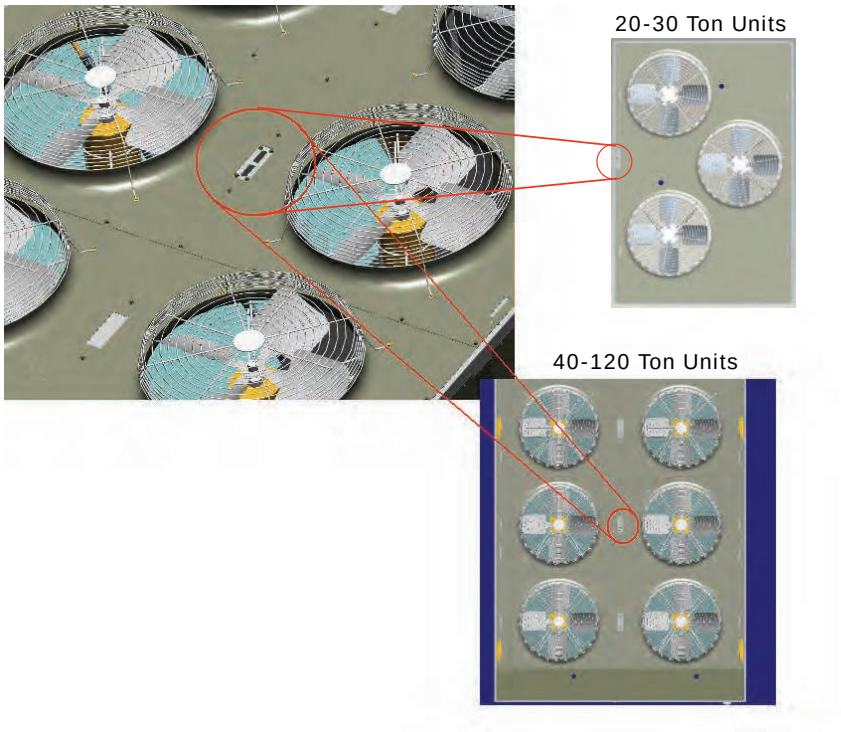


Figure 29. Fall restraint slot location



Warranty and Liability Clause

Commercial Equipment Rated 20 Tons and Larger and Related Accessories

Products Covered

This warranty* is extended by Trane Inc. and applies only to commercial equipment rated 20 Tons and larger and related accessories.

The Company warrants for a period of 12 months from initial start-up or 18 months from date of shipment, whichever is less, that the Company products covered by this order (1) are free from defects in material and workmanship and (2) have the capacities and ratings set forth in the Company's catalogs and bulletins, provided that no warranty is made against corrosion, erosion or deterioration. The Company's obligations and liabilities under this warranty are limited to furnishing f.o.b. factory or warehouse at Company designated shipping point, freight allowed to Buyer's city (or port of export for shipment outside the conterminous United States) replacement equipment (or at the option of the Company parts therefore) for all Company products not conforming to this warranty and which have been returned to the manufacturer. The Company shall not be obligated to pay for the cost of lost refrigerant. No liability whatever shall attach to the Company until said products have been paid for and then said liability shall be limited to the purchase price of the equipment shown to be defective.

The Company makes certain further warranty protection available on an optional extra-cost basis. Any further warranty must be in writing, signed by an officer of the Company.

The warranty and liability set forth herein are in lieu of all other warranties and liabilities, whether in contract or in negligence, express or implied, in law or in fact, including implied warranties of merchantability and fitness for particular use. In no event shall the Company be liable for any incidental or consequential damages.

THE WARRANTY AND LIABILITY SET FORTH HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, WHETHER IN CONTRACT OR IN NEGLIGENCE, EXPRESS OR IMPLIED, IN LAW OR IN FACT, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE, IN NO EVENT SHALL WARRANTOR BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Manager - Product Service

Trane Inc.

Clarksville, Tn 37040-1008

PW-215-2688

*Optional Extended Warranties are available for compressors and heat exchangers of Combination Gas-Electric Air Conditioning Units.

Wiring Diagrams

Note: *Published unit wiring diagrams (individual, separate diagrams for unitary product lines) are available via e-Library.*

Drawing Number	Description
2307-9123	Power Schematic Diagram - Air-Cooled Condensing Unit - Line Voltage 200-230-460-575V/60HZ/3PH - CA 20-60 Ton
2307-9124	Unit & Field Connection Wiring Diagram - Air-Cooled Condensing Unit - Line Voltage 200, 230, 460, 575V/60HZ/3PH - CA 20-60 Ton
2307-9125	Power Schematic Diagram - Split System Condensing Unit - Duplex Condenser Units - CA 80-120 ton
2307-9126	Unit & Field Connection Wiring Diagram - Air-Cooled Condenser Unit - Duplex Condenser Unit - CA 80-120 ton

Notes

Trane - by Trane Technologies (NYSE: TT), a global innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

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