



Product Catalog

Commercial Self-Contained Units SWUD

R-454B – 20 to 110 Tons





Introduction

Commercial Self-Contained Units



- Single cabinet construction with 1-inch aluminum sheets foam panel, double wall construction, and sturdy gage aluminum framework.
- Horizontal or vertical airflow discharge configuration.
- Left hand/Right hand water connections.
- Left hand electrical connections.
- Two independent circuits with two tandem fixed speed compressors in each.
- Fan wall with plenum fans with integrated motor, electronics, and VFD for efficient operation.
- Unit-mounted microprocessor control with human interface panel and touch screen.
- Waterside valve package option to enhance system efficiency.
- Sight glasses with ports for viewing unit while running.
- 2-inch flat filter box inside unit casing.
- Waterside economizer option.
- Water flow switches included as standard.

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Features and Benefits

Features

Standard Features

- 20 to 110 tons commercial water cooled, self-contained units.
- Single cabinet construction with 1-inch aluminum sheets foam panel, double wall construction and sturdy gage aluminum framework.
- Fully integrated, factory-installed, and commissioned microelectronic controls.
- Variable air volume (VAV) operation.
- Fan wall with ECM direct drive plenum fans.
- Emergency stop input.
- Units are shipped with R-454B refrigerant.
- Factory piped and tested, mechanically cleanable shell and tube water-cooled condenser.
- Sloped drain pans to provide complete condensate removal for IAQ.
- Standard left hand electrical connections.
- Expansion valves and filter driers are easily accessible.
- Access panels and clearance provided to clean both evaporator and waterside economizer coil fins.
- Panels meet UL1995, ASTM E84/UL 723 for flame spread and smoke develop rating.

Standard Control Features

- Durable unit-mounted touch screen display. The 7-inch WVGA 800 x 480 resolution touch-sensitive color screen is backlit, which enables viewing in poor light conditions including outdoor usage.
- Phase reversal protection provided in each compressor.
- Compressor lead/lag on fixed speed compressors.
- Fan failure detection.
- Occupied/unoccupied switching.
- Programmable water purge during unoccupied mode.
- High leaving air temperature limit.
- BACnet® communication by MSTP.

Optional Features

- Variable speed technology on lead compressor for highest efficiencies (coming soon).
- Constant volume (CV) airflow operation.
- Waterside modulating with spring return temperature control valves include factory installed piping and control wiring.
- Protective coatings for the evaporator coils.
- Stainless steel sloped drain pan.
- Standard height plenum (or custom height, if requested).
- Non-fused external disconnect switch.
- Left hand/right hand water connections.
- Medium efficiency throwaway filters. 2- and 4-inch filter racks for all sizes.

Note: A water flow switch (factory supplied) is required for installation.

Factory-Installed or Ship-Separate Options

- Waterside economizer with factory-installed piping and controls.
- Field-installed accessories.

Benefits

Servicing Advantages

Strategically placed service doors with easy access to critical components.

Tenant Satisfaction

- Complete HVAC system on each floor minimizes tenant inconvenience during routine maintenance.
- Tenants can control system after hours to increase productivity and minimize expense.

Lower Installed Cost

- Single point power connection. Left hand electrical connections.
- Single point water connection. Left hand or right hand water connections for easier design and flexibility during installation.
- Factory-commissioned and tested controls.
- Factory-installed options.

Economical Operation

- Free cooling with optional waterside economizer.
- Energy savings with floor-by-floor system since only units on floors requiring cooling need to operate.
- Variable speed ECM direct drive plenum fans for increased efficiency and lower sound levels.
- Energy savings from the integrated water valve control using pump unloading.

Acoustical Performance

- Double wall insulated panels for quiet operation.
- Multiple compressor design reduces acoustical levels. Scroll compressor design smooths gas flow for quieter operation.

Indoor Air Quality (IAQ) Features

- Sloped drain pan in galvanized steel. Optional stainless steel sloped drain pan.
- Double wall insulated panel modular frame construction.
- High-efficiency throwaway filter option.
- Easily cleanable evaporator, condensers, and waterside economizers.
- Filter access door allows easy removal to encourage frequent filter changing.

Enhanced Serviceability

- Access doors for ease of service.
- Hinged and removable panels.
- Easy to adjust setpoints and operating parameters using the human interface panel on units.
- Refrigerant line sight glasses in view during operation.

Competitive Advantage

- Single cabinet construction with optimized footprints; compact cabinet to minimize mechanical room space requirements.
- Left hand electrical connections.
- Optional left hand/right hand water connections meets the needs of the mechanical room.
- Up to 30 percent more efficient (full-load avg) than legacy Trane units.
- Low leaving air temp capability to reduce fan motor energy, improve acoustical performance, and minimize duct sizes.
- Latest generation of factory-installed and programmed Symbio™ 500 unit controller.

Application Considerations

Self-Contained Acoustical Recommendations

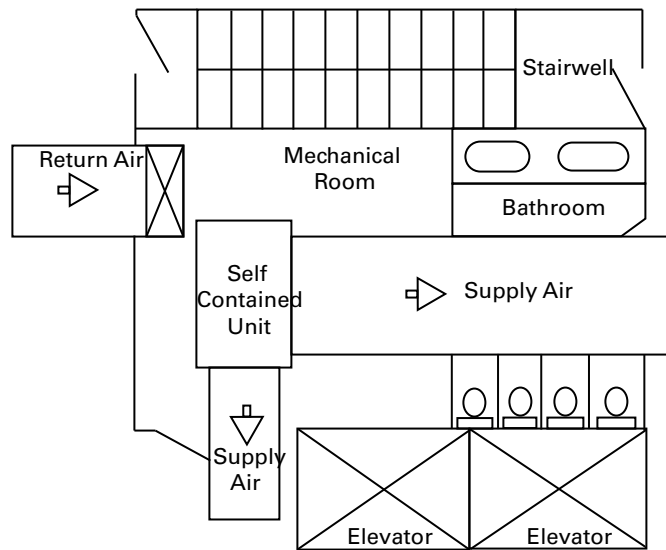
Successful acoustical results are dependent on many system design factors.

The following are general acoustical recommendations. For more information, or if there is concern about a particular installation, contact a professional acoustical consultant.

Location and Orientation of the Mechanical Equipment Room

- Locate the equipment room adjacent to stairwells, utility rooms, electrical closets, and rest rooms if possible, to minimize the acoustic effects and risk of workmanship or installation errors (see figure below).
- Place the discharge and return air ductwork over these less acoustically sensitive areas, using vertical or horizontal fresh air shafts.
- Consult code requirements for fresh air and smoke purge constraints.

Figure 1. Equipment room and location and orientation



Return Air Ductwork

Duct the return air into the mechanical equipment room. Connect ductwork to the unit if local code dictates. The return air ductwork must have an elbow inside the equipment room. This elbow will reduce sound transmissions through the return duct. Extend the ductwork from the elbow far enough to block the line of sight to the exterior of the equipment room. Use a minimum ductwork length of 15 feet to the equipment room exterior. Line the duct with two-inch, three-pound density insulation. Use multiple, small return ducts for better acoustical performance to the occupied space.

Supply Air Ductwork

Insulate the supply air duct with two-inch, three-pound density insulation. Extend this lining at least 15 feet out from the equipment room wall, keeping the duct aspect ratio as small as possible. Minimize large flat panels since they transmit sound. In addition, small aspect ratios will minimize potential oil canning of the duct due to flow turbulence.

The flexible horizontal discharge plenum option helps avoid complicated ductwork transitions. Ductwork turning vanes typically improve pressure drop but degrade acoustical performance.

Recommended Maximum Air Velocities

The maximum recommended velocity for the discharge air duct is 2,000 fpm. The maximum recommended velocity for the return air duct is 1,000 fpm. Limit air velocities below these operating

points to minimize the risk of flow turbulence that causes regenerated noise. Using round supply duct and static regain allows maximum discharge air velocities up to 3,000 fpm. Lining round supply duct also substantially lowers frequency noise attenuation. Flow regenerated noise potential increases dramatically at air velocities over 3,000 fpm.

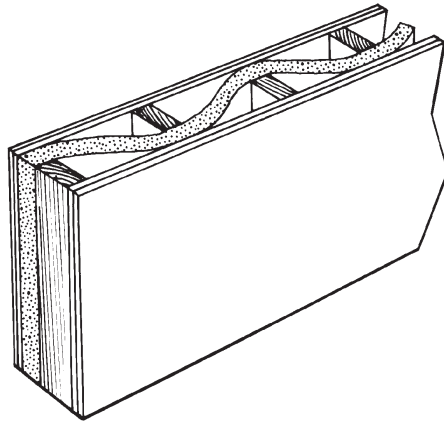
Equipment Room Construction Options

The preferred equipment room wall construction is concrete block. If this is not feasible then a double stud offset wall is suggested (see figure below). This removes physical contact that would transmit sound through the equipment room wall to the occupied space. Interweave fiberglass insulation between the wall studs. Use two layers of drywall on each side of the wall.

Workmanship details are critical to acoustical performance. Seal all wall and floor penetrations by the ductwork, water piping, and equipment room access doors with a flexible material such as caulk and/or gasketing to stop noise and air leaks.

Locate the equipment room door away from acoustically sensitive areas like conference rooms. If possible, the door should swing out of the equipment room so that the low pressure in the equipment room pulls the door in to help maintain a tight seal.

Figure 2. Double stud offset wall with interwoven insulation



Static Pressure Versus Acoustics

Design the system to minimize the total static pressure required from the self-contained unit fan. Typically a change in static pressure of only 0.5 inches can reduce NC level by approximately 2 or 3 in the occupied space.

Isolation Recommendations

Unit

The compressors are internally isolated. All fans are factory balanced. The unit fan and compressors are internally isolated. Therefore, external isolation is not required. Consult a vibration specialist before considering external or double vibration isolation.

Ductwork

Design duct connections to the unit using a flexible material. Consult local codes for approved flexible duct material to prevent fire hazard potential.

Piping Connections

Rubber isolator connectors are recommended for condenser piping to prevent vibration transmission to or from the building plumbing. The self-contained unit is internally isolated and does not require additional isolation. Confirm that proper system vibration isolation design prevents vibration transmission from the building plumbing to the unit. Properly isolate the drain line.



Application Considerations

Condenser Water Piping

Piping Location and Arrangement

Provide at least 24 inches of clearance between the piping and the unit for service. Place the risers away from the side of the unit if possible. Allow for sufficient space for valves and unions between the piping and the self-contained unit.

Lay out condenser piping in reverse returns to help balance the system. This is accomplished by equalizing the supply and return pipe length. Multi-story buildings can use a direct return system with balancing valves at each floor. Install all heat exchangers and most cooling tower piping below the sump operating water level to prevent overflow during unit and/or system shut down.

Recommended Pump Location

Locate pump downstream of the cooling tower and upstream of the commercial self-contained unit. This provides smoother and more stable unit operation.

When the tower and pump are both roof mounted, provide the necessary net positive suction head pressure to prevent cavitation. Raise the tower or submerge the pump in a sump to provide positive suction. To prevent an on-line pump failure, use a standby pump to avoid a complete system shutdown.

Several partial capacity pumps or variable speed pumps can be used. Review the economics of these alternate pumping options.

Strainers and Water Treatment

Water strainers are required at the unit inlet to eliminate potential unit damage from dirty water. Each unit will be supplied with a field installed 20 mesh strainer. The unit also comes standard with differential pressure monitoring that can be used to alert owner when 20 mesh screen requires cleaning. Untreated or poorly treated water may result in equipment damage. Consult a water treatment specialist for treatment recommendations.

Isolation Valves

Install isolation valves at each unit before the strainer and after the condenser. This allows periodic servicing of the unit or strainer while allowing other units in the system to remain in operation.

Pressure Gauges

Install pressure gauges on the inlet and outlet of the self-contained unit. Select the gauge scale so the unit design operating point is approximately mid-scale.

Thermometers

Install thermometers on the condenser water inlet and outlet lines to each unit for system analysis. Trane® recommends using a thermometer temperature range of 40°F to 140°F, using a 2°F temperature increment.

Drains

Install a trapped drain in the low point of the mechanical equipment room floor to collect water from cleaning operations.

Note: Units are not internally trapped. Externally trapped drain must be added in the field.

Condensing Pressure Control (Water-Cooled Condensers)

Often cold condensing water applications between 35°F and 54°F require a condensing pressure control valve. To utilize this feature, the building water system must be capable of operating at reduced water flow rates through the SWUD units. It is imperative to install variable volume pumps or an external bypass in the water distribution system.

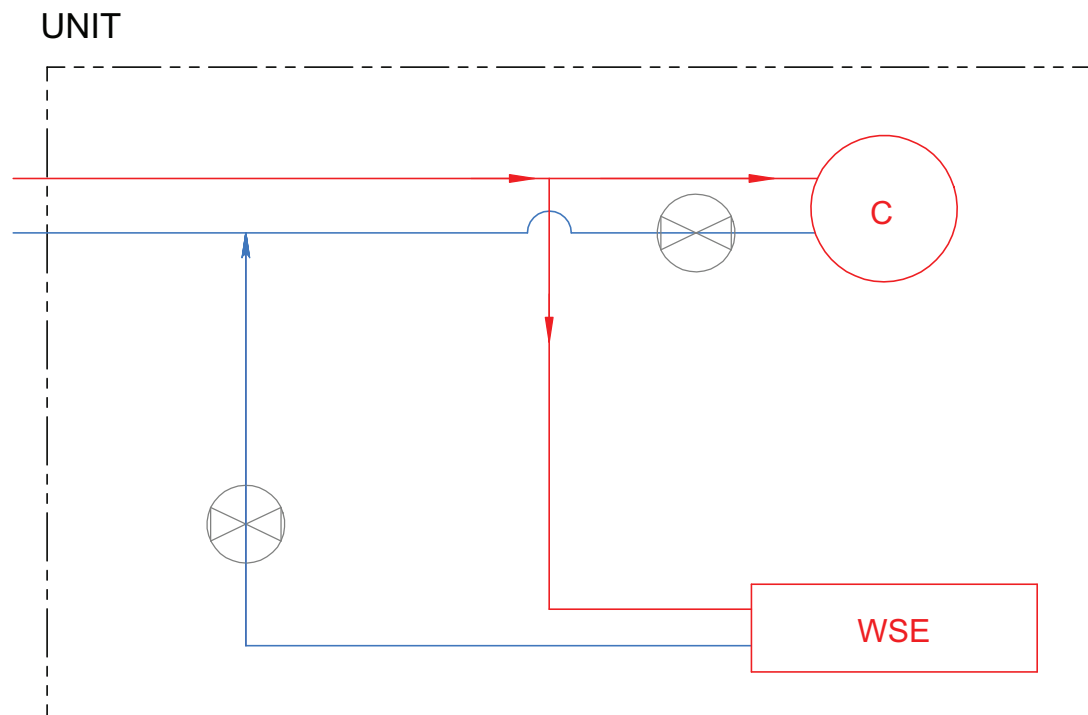
Waterside Economizer Flow Control

Units equipped with waterside economizer and intermediate piping package can be set up for variable or constant water flow.

Use constant water flow setup on water systems that are not capable of unloading water supply to the unit. The economizer and condenser valves will operate in complement to one another to provide continuous water flow.

Use variable water flow setup with water flow systems that can take advantage of pump unloading for energy savings. Since non-cooling operation restricts water flow during part load economizing or condensing temperature control, it is imperative to install variable volume pumps or an external bypass in the water distribution system.

Figure 3. Waterside economizer flow control



Free Cooling Opportunities and Alternatives

Free cooling is available with waterside economizer options. The advantages are listed as follows:

Waterside Economizer

The waterside economizer substantially reduces the compressor energy requirements because it uses the cooling water before it enters the condensers. Additional equipment room space is not required since the coils are contained within the overall unit dimensions.

Disadvantages include higher airside pressure drop and a higher head on condenser water pumps.

Unit Operating Limits

Airflow

The minimum recommended airflow for proper VAV system staging and temperature control is 35 percent of nominal design airflow. Adjusting VAV boxes with the appropriate minimum settings prevents the self-contained unit from operating in a surge condition at airflows below this point. Continuous operation in a surge condition can cause fan failure.

Note: Contact your local Trane sales office for minimum airflow conditions.

Water Flow

Use 3 gpm/ton for optimum unit capacity and efficiency. Use 2.5 gpm/ton to reduce pump energy, cooling tower, and piping costs. These reduced water flows may impact unit capacity and efficiency by one or two percent. Consult factory for unit specific water flow ranges.



Model Number Description

Digit 1, 2, 3, 4 — Unit Model

SWUD = Self-Contained Water-Cooled Unitary Device

Digit 5 — Refrigerant

5 = R-454B

Digit 6, 7, 8 — Capacity

020 = 20 Tons
025 = 25 Tons
030 = 30 Tons
035 = 35 Tons
040 = 40 Tons
045 = 45 Tons
050 = 50 Tons
055 = 55 Tons
060 = 60 Tons
065 = 65 Tons
070 = 70 Tons
075 = 75 Tons
085 = 85 Tons
090 = 90 Tons
100 = 100 Tons
110 = 110 Tons

Digit 9 — Unit Voltage

F = 208–230/60/3
4 = 460/60/3
5 = 575/60/3

Digit 10, 11 — Design Sequence

**

Digit 12 — Fan Type

1 = 1 Fan
2 = 2 Fans
3 = 3 Fans
4 = 4 Fans
5 = 5 Fans
6 = 6 Fans
7 = 7 Fans

Digit 13 — Compressor Technology

F = Fixed Speed

Digit 14 — Control Valves

0 = None
H = Head Pressure Control Valves

Digit 15 — Future Use

0 = None

Digit 16 — Economizer

0 = No Economizer
W = With Water Side Economizer

Digit 17 — Water Connections

L = Left Hand Connections with Flow Switch
R = Right Hand Connections with Flow Switch

Digit 18 — Unit Water Connections

1 = Victaulic

Digit 19 — Air Discharge

H = Horizontal Discharge
V = Vertical Discharge

Digit 20 — Electrical Connections

L = Left Hand Connections

Digit 21 — Unit Electrical Connections

1 = Disconnect Switch
2 = Terminal Block

Digit 22 — Drain Pan

G = Galvanized Drain Pan
S = Stainless Steel Drain Pan

Digit 23 — Future Use

0 = None

Digit 24 — Filter Type

A = 2 inch - MERV 8
B = 4 inch - MERV 8
C = 2 inch - Pre-MERV 8, 4 inch, Post-MERV 13
D = 2 inch - MERV 13
E = 4 inch - MERV 13
F = 6 inch - MERV 15

Digit 25 — Heater

0 = None
4 = Hydronic Remote
5 = Electric Remote (3 stages max, on/off)

Digit 26 — Shipping Method

S = Single Piece

Digit 27 — Unit Isolators

0 = None
A = Isopads

Digit 28 — Air Volume/Temp Control

A = VAV Control Scheme (Fixed DA Temp)
B = VAV Control Scheme (Return Air Reset)
C = VAV Control Scheme (Space Temp Reset)
D = CV Control Scheme (Fixed DA Temp)

Digit 29 — Agency Listing

0 = None
E = ETL listing

Digit 30 — Options

0 = None
2 = Compressor Service Valves

Digit 31 — Space Sensor Options

0 = None
1 = Space Sensor Only

Digit 32 — Future Use

0 = None

Digit 33 — Industrial Options

0 = None
A = Protective Coating Evaporator Coil
B = Protective Coating Evaporator Coil + WSE

Digit 34 — Discharge Plenum

0 = None
S = Standard Plenum with Field-Cut Holes

Digit 35 — Future Use

0 = None

Digit 36 — Future Use

0 = None

Digit 37 — Controller

3 = Symbio™ 500

Digit 38 — Future Use

0 = None

Digit 39 — Major Design Version

A = 1.0

Digit 40 — Design Special

0 = None
S = Design Special



General Data

Table 1. SWUD water-cooled self-contained

Tonnage	20	25	30	35	40	45	50	55	60	65	70	75	85	90	100	110
Compressor Data																
Quantity	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Nominal Ton/Comp	5	6.25	7.5	8.75	10	11.25	12.5	13.75	15	16.25	17.5	18.75	21.25	22.5	25	27.5
Circuits	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Evaporator Coil Data																
Rows	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Sq. Ft.	28.65	28.65	28.65	28.65	35.42	37.5	39.58	40.63	40.63	50	51.11	52.78	52.78	68.33	68.33	68.33
Fins/in	12.0	12.0	12.0	12.0	12	12	12	12	12	12	12	12	12	12	12	12
Number of Coils	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Condenser Data																
Minimum GPM w/o Econ (a)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimum GPM w/ Econ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum GPM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Evaporator Fan Data																
Quantity	1	1	2	2	2	2	3	3	4	4	4	4	5	5	6	7
Diameter	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Power consumption kW	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Minimum Design cfm ^(b)	4000	5000	6000	7000	7400	8600	10000	10800	12000	13000	13600	15200	16600	18000	20400	22600
Maximum Design cfm	7600	9500	11400	13300	14060	16340	19000	20520	22800	24700	25840	28880	31540	34200	38760	42940
Refrigerant Charge, lbs. R-454B^(c)																
Circuit A	10.0	12.5	15.0	17.5	20.0	22.5	25.0	27.5	30.0	32.5	35.0	37.5	42.5	45.0	50.0	55.0
Circuit B	10.0	12.5	15.0	17.5	20.0	22.5	25.0	27.5	30.0	32.5	35.0	37.5	42.5	45.0	50.0	55.0
Total	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0	75.0	85.0	90.0	100.0	110.0
Filter Data, Water-Cooled Units																
Number - Size (in.)	9-20"x24"				12-20"x24"				15-20"x24"				21-20"x24"			
Number of Compressor Tandems																
8T Fixed Speed Tandem	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10T Fixed Speed Tandem	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13T Fixed Speed Tandem	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
15T Fixed Speed Tandem	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0
20T Fixed Speed Tandem	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0
23T Fixed Speed Tandem	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
26T Fixed Speed Tandem	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0
30T Fixed Speed Tandem	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
37T Fixed Speed Tandem	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	0
45T Fixed Speed Tandem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Number of Fans/Unit																
No. of fans	1		2			3			4			5		6		7

Note: All performance data is provided in the Performance Selection Program. Contact Trane Sales at 770-988-8338 for more information.

(a) All performance data is provided in the Performance Selection Program. Contact MJC Sales at 770-988-8338 for more information.

(b) Minimum air flow at part load is 35% of full load design CFM.

(c) Refrigerant charge shown is a general guideline, charge to sub-cooling as described in IOM. Note that occasionally a TXV adjustment may need to be made but only after adequate sub-cooling has been reached.



General Data

Table 2. EER/IEER ratings

Tonnage	Model Number	EER	IEER	AHRI Net Cooling Capacity (MBH)
20	SWUD5020	18.7	21.3	252
25	SWUD5025	16.7	19.9	292
30	SWUD5030	17.9	22.6	387
35	SWUD5035	18.2	22.0	411
40	SWUD5040	18.2	21.9	458
45	SWUD5045	17.9	22.1	536
50	SWUD5050	18.8	22.8	625
55	SWUD5055	18.3	22.1	665
60	SWUD5060	18.2	21.7	743
65	SWUD5065	17.7	21.2	775
70	SWUD5070	17.3	21.7	839
75	SWUD5075	16.5	20.4	920
85	SWUD5085	16.6	20.6	987
90	SWUD590F	16.4	20.1	1096
100	SWUD5100	16.5	20.3	1234
110	SWUD5110	16.2	19.6	1371

Notes:

1. Cooling only.
2. Cooling performance is rated at 80F EDB/67F EWB with 85 EWT for water-cooled performance and 95F Ambient for air-cooled performance.
3. EER, IEER, and AHRI Net Cooling Capacity are tested in accordance with the AHRI 340/360 (I-P) and certified to 10 CFR Part 431 from the US Department of Energy.



Available Inputs and Outputs for the Unit Module (on all units with controls)

Binary Inputs

- Emergency stop
- External auto/stop
- Unoccupied/occupied
- Dirty filter

Binary Outputs

- VAV box drive max (VAV units only)
- Alarm
- Fan run request
- Water pump request (water-cooled only)

BACnet/Building Automation System

The Symbio 500 controller utilizes the BACnet defined MS/TP protocol as defined in ASHRAE standard 135-2004. This controller works in standalone mode, with Tracer® SC+ or when connected to a third party building automation system that supports BACnet.

Controls – Symbio™

Enhanced BAS Integration and Connectivity

- Open standard communications
 - BACnet® MS/TP
- Securely access, troubleshoot, and monitor equipment from anywhere via Trane Connect™
- Open Optional communications (accessory required)
 - BACnet IP
 - BACnet over Zigbee (Air-Fi Wireless)

Air-Fi® Wireless Communications

The optional Air-Fi communications module allows the unit to communicate directly with a Tracer or non-Trane Building Automation System via open protocol BACnet over Zigbee wireless.

Standard Unit Control Features

Note: All set-up parameters are preset from the factory, requiring less start-up time during installation.

Unit Features

- Durable unit-mounted touch screen display. The 7-inch WVGA 800 x 480 resolution touch-sensitive color screen is backlit, which enables viewing in poor light conditions including outdoor usage.
- Compressor lead/lag
- Fan failure detection
- Occupied/unoccupied switching
- Programmable water purge during unoccupied mode

Control Sequences of Operation

Occupied/Unoccupied Switching

There are three ways to switch occupied/unoccupied:

- Field-supplied contact closure [hardwired binary input to field wiring terminal block (2TB3)] — This input accepts a field supplied switch or contacts closure such as a time clock.
- BACnet BAS system can control the occupied/unoccupied request of the self-contained unit.
- Through the TD-7 display via the on-board schedule.

Compressor Lead/Lag

Compressor lead/lag is present in the controls for all units. Balanced run hours is achieved by changing the fixed speed compressors sequence number when commanded to rotate.

Emergency Stop Input

A binary input is provided on the unit field wiring terminal block (2TB3) for installation of a field-provided switch or contacts to immediately shutdown all unit functions.

External Stop Input

A binary input is provided on the unit's field wiring terminal block (2TB3) for installation of a field-provided switch or contacts to safely shutdown all unit functions.

Local Auto Stop

A binary value is located on the TD-7 which allows the user to start and stop the unit in a safe manner for maintenance. On the TD-7 home screen in the upper right hand corner the unit can be put into Auto to perform normally or Stop to perform a controlled shutdown and keep the unit off.

Water Flow Control

The standard configuration of a unit is with constant water flow. With compatible piping configurations, the unit can be configured to provide orderable option variable water flow, which maximizes energy saving by unloading the water pumping system.

Head Pressure Control

Water-cooled condensers — Units that are ordered with the optional flow control valves and configured for variable water flow will modulate a water valve to maintain both the user-defined refrigerant condenser pressure and refrigerant pressure differential setpoints. Refrigerant pressures will be referenced utilizing factory installed suction and discharge pressure sensors located at each circuit.

Water Purge

This user-definable feature allows the user to select a purge schedule to automatically circulate water through the economizer and condensers periodically during non-operational times. This allows fresh chemicals to circulate in waterside heat exchangers.

Supply Air Static Pressure High Limit

During normal operation, the supply air static is monitored. If at any time the static pressure exceeds the software high static limit (defaulted at 2.0 inches from the factory) the unit will immediately shut down and generate a diagnostic.

In order for the unit to resume operation, the Alarm Reset must be toggled from the TD-7. The software high static limit can be user adjusted at the TD-7.



Supply Air Temperature Control Unit Sequence of Operation

Occupied Supply Air Temperature Control

Cooling/Waterside Economizer

During occupied cooling mode, the waterside economizer option and mechanical cooling are used to control the supply air temperature. The supply air temperature setpoint is user defined at the human interface panel.

After the fans run for 5 minutes, and a call for cooling is calculated, the Cooling Tower/Pump Command is turned on. After the Condenser Water flow switch closes proving flow, the compressors and/or economizer will be allowed to start.

Waterside economizing enables when the unit entering water temperature is less than the entering return air temperature. This is set at Waterside Economizer Enable Offset setpoint. The factory default is 7°F, but can be adjusted by the user in the TD-7 or BACnet.

The economizer acts as the first stage of cooling. If the economizer is unable to maintain the supply air setpoint, the unit controller will bring on the compressors as required to meet the setpoint. If the unit does not include an economizer, only mechanical cooling will satisfy cooling requirements.

Fixed Discharge Air Setpoint VAV (Ordered Option of Digit 28 Set to A)

The Discharge Air Cooling Setpoint BAS default valve of 55 degrees and the unit will control to this value when in the cooling mode. This option also includes the ability to change in the field the option to the Reset Based on Return Air functionality (Digit 28 = B).

Reset Based on Return Air Temperature VAV (Ordered Option of Digit 28 Set to B)

The Discharge Air Temperature is reset based off the return air temperature which will work to keep this temperature between its heating and cooling setpoints. This option also includes the ability to disable in the field the reset functionality and revert to the Fixed Discharge Air Setpoint functionality (Digit 28 = A).

Reset Based on Zone Temperature VAV (Ordered Option of Digit 28 Set to C)

The Discharge Air Temperature is reset based off the space temperature which will work to keep this temperature between its heating and cooling setpoints. This option also includes the ability to disable in the field the reset functionality and revert to the Fixed Discharge Air Setpoint functionality (Digit 28 = A).

Fixed Discharge Air Setpoint CV (Ordered Option of Digit 28 Set to D)

The Discharge Air Cooling Setpoint BAS default valve of 55 degrees and the unit will control to this value when in the cooling mode. This option also includes the ability to change in the field the option to the Reset Based on Zone Temperature functionality (Digit 28 = C).

Building Automation Control of setpoint

When a BAS system controls the Discharge Air Cooling Setpoint BAS at a priority level it will take precedence over locally calculated values in the Cooling Mode.

Heat/Cool Mode

The unit is in Cooling mode by default. The front end Building Automation System will switch the Heat Cool Mode Request Multistate Value between the Heating and Cooling modes to get the desired control.

Heating Operation

During occupied heating mode, the hot water valve modulates to maintain the discharge air setpoint.

Discharge Air Heating Setpoint

The Discharge Air Heating Setpoint BAS default valve of 95 degrees and the unit will control to this value when in the heating mode.

Zone Sensor Options

Zone Temperature Sensor, BAYSENS077



This zone sensor includes an internal thermistor and should be mounted in the zone, Model Number Digit 31=1. This sensor is available for use with all zone sensor options to provide remote sensing capabilities.

Additional sensors are also available for order using the Model Number Digit 31.



Electrical Data

Selection Procedures

- RLA = Rated Load Amps
- Compressor LRA = Locked Rotor Amps
- Compressor Input = VFD drive Input
- Compressor Output = VFD drive output
- Voltage utilization range is $\pm 10\%$

Determine Minimum Circuit Ampacity (MCA)

MCA = 1.25 x Largest motor amps/VFD Input + the sum of the remaining motor amps.

Determine Max Fuse (MFS) and Max Circuit Breaker (MCB) Sizes

MFS and MCB = 2.25 x Largest motor amps (RLA)/VFD input) + the sum of the remaining motor amps.

If the rating value calculation does not equal a standard over current protective device rating, use the next lower standard rating as the maximum.

Table 3. Electrical service sizing data — motors

Digit 9 - Unit Voltage	Digit 9	Tonnage	Comp 1	Comp 2	Comp 3	Comp 4	Fan FLA	Qty Fans	Misc	MCA	MOP
460/60/3	4	20	7.1	7.1	7.1	7.1	7.1	1.00	1.00	38	45
460/60/3	4	25	9.1	9.1	9.1	9.1	7.1	1.00	1.00	47	56
460/60/3	4	30	11.9	11.9	11.9	11.9	7.1	2.00	1.00	66	77
460/60/3	4	35	12.4	12.4	11.9	11.9	7.1	2.00	1.00	67	79
460/60/3	4	40	12.4	12.4	12.4	12.4	7.1	2.00	1.00	68	80
460/60/3	4	45	15.4	15.4	12.4	12.4	7.1	2.00	1.00	75	90
460/60/3	4	50	15.4	15.4	15.4	15.4	7.1	3.00	1.00	88	103
460/60/3	4	55	19.4	19.4	15.4	15.4	7.1	3.00	1.00	97	116
460/60/3	4	60	20.6	20.6	19.4	19.4	7.1	4.00	1.00	115	135
460/60/3	4	65	20.6	20.6	20.6	20.6	7.1	4.00	1.00	117	137
460/60/3	4	70	24.0	24.0	20.6	20.6	7.1	4.00	1.00	124	148
460/60/3	4	75	32.8	32.8	20.6	20.6	7.1	4.00	1.00	144	177
460/60/3	4	85	32.8	32.8	24.0	24.0	7.1	5.00	1.00	158	191
460/60/3	4	90	32.8	32.8	32.8	32.8	7.1	5.00	1.00	176	208
460/60/3	4	100	38.5	38.5	32.8	32.8	7.1	6.00	1.00	196	234
460/60/3	4	110	38.5	38.5	38.5	38.5	7.1	7.00	1.00	214	253
208-230/60/3	F	20	16.0	16.0	16.0	16.0	13.5	1.00	2.00	84	100
208-230/60/3	F	25	21.2	21.2	21.2	21.2	13.5	1.00	2.00	105	127
208-230/60/3	F	30	24.4	24.4	24.4	24.4	13.5	2.00	2.00	133	157
208-230/60/3	F	35	28.7	28.7	24.4	24.4	13.5	2.00	2.00	142	171
208-230/60/3	F	40	28.7	28.7	28.7	28.7	13.5	2.00	2.00	151	179
208-230/60/3	F	45	33.3	33.3	28.7	28.7	13.5	2.00	2.00	161	195
208-230/60/3	F	50	33.3	33.3	33.3	33.3	13.5	3.00	2.00	184	218
208-230/60/3	F	55	40.8	40.8	33.3	33.3	13.5	3.00	2.00	201	242
208-230/60/3	F	60	45.9	45.9	40.8	40.8	13.5	4.00	2.00	241	287
208-230/60/3	F	65	45.9	45.9	45.9	45.9	13.5	4.00	2.00	251	297

Table 3. Electrical service sizing data — motors (continued)

Digit 9 - Unit Voltage	Digit 9	Tonnage	Comp 1	Comp 2	Comp 3	Comp 4	Fan FLA	Qty Fans	Misc	MCA	MOP
208-230/60/3	F	70	49.0	49.0	45.9	45.9	13.5	4.00	2.00	258	307
208-230/60/3	F	75	62.1	62.1	45.9	45.9	13.5	4.00	2.00	287	349
208-230/60/3	F	85	62.1	62.1	49.0	49.0	13.5	5.00	2.00	307	369
208-230/60/3	F	90	62.1	62.1	62.1	62.1	13.5	5.00	2.00	333	395
208-230/60/3	F	100	83.1	83.1	62.1	62.1	13.5	6.00	2.00	394	477
208-230/60/3	F	110	83.1	83.1	83.1	83.1	13.5	7.00	2.00	450	533
575/60/3	5	20	6.4	6.4	6.4	6.4	5.7	1.00	0.75	34	40
575/60/3	5	25	7.7	7.7	7.7	7.7	5.7	1.00	0.75	39	47
575/60/3	5	30	9.4	9.4	9.4	9.4	5.7	2.00	0.75	52	61
575/60/3	5	35	9.0	9.0	9.4	9.4	5.7	2.00	0.75	51	60
575/60/3	5	40	9.0	9.0	9.0	9.0	5.7	2.00	0.75	50	59
575/60/3	5	45	12.9	12.9	9.0	9.0	5.7	2.00	0.75	59	72
575/60/3	5	50	12.9	12.9	12.9	12.9	5.7	3.00	0.75	73	86
575/60/3	5	55	13.7	13.7	12.9	12.9	5.7	3.00	0.75	75	88
575/60/3	5	60	14.5	14.5	13.7	13.7	5.7	4.00	0.75	84	98
575/60/3	5	65	14.5	14.5	14.5	14.5	5.7	4.00	0.75	85	100
575/60/3	5	70	19.2	19.2	14.5	14.5	5.7	4.00	0.75	96	115
575/60/3	5	75	24.0	24.0	14.5	14.5	5.7	4.00	0.75	107	131
575/60/3	5	85	24.0	24.0	19.2	19.2	5.7	5.00	0.75	122	146
575/60/3	5	90	24.0	24.0	24.0	24.0	5.7	5.00	0.75	131	155
575/60/3	5	100	27.1	27.1	24.0	24.0	5.7	6.00	0.75	144	171
575/60/3	5	110	27.1	27.1	27.1	27.1	5.7	7.00	0.75	156	183

Notes:

1. MCA: Minimum Circuit Ampacity is 125 percent of the largest compressor RLA or Drive input current, plus 100 percent of the other compressor (s) RLA, plus the sum of the condenser fan RLA, plus any other load rated at 1 AMP or more.
2. Maximum Breaker Overcurrent Protection (MOP): 225 percent of the largest compressor RLA or VSD drive Input, plus 100% of the other compressor(s) RLA, plus the sum of the condenser fan Motor/Drive FLA, plus any other load rated at 1 AMP or more.
3. Recommended disconnect switch: 110 percent to 115 percent of the sum of the RLA of the compressors, VSD drive input, fan motor/drive, and controls FLA.
4. RLA: Rated in accordance with UL standard 1995.
5. Local codes may take precedence.
6. Fix speed compressor are across the line starting, the VSD compressors are controlled by VSD drive. Compressors will never start simultaneously.
7. Voltage utilization range is ±10 percent.

Dimensional Data

Figure 6. Unit dimensions (in inches)

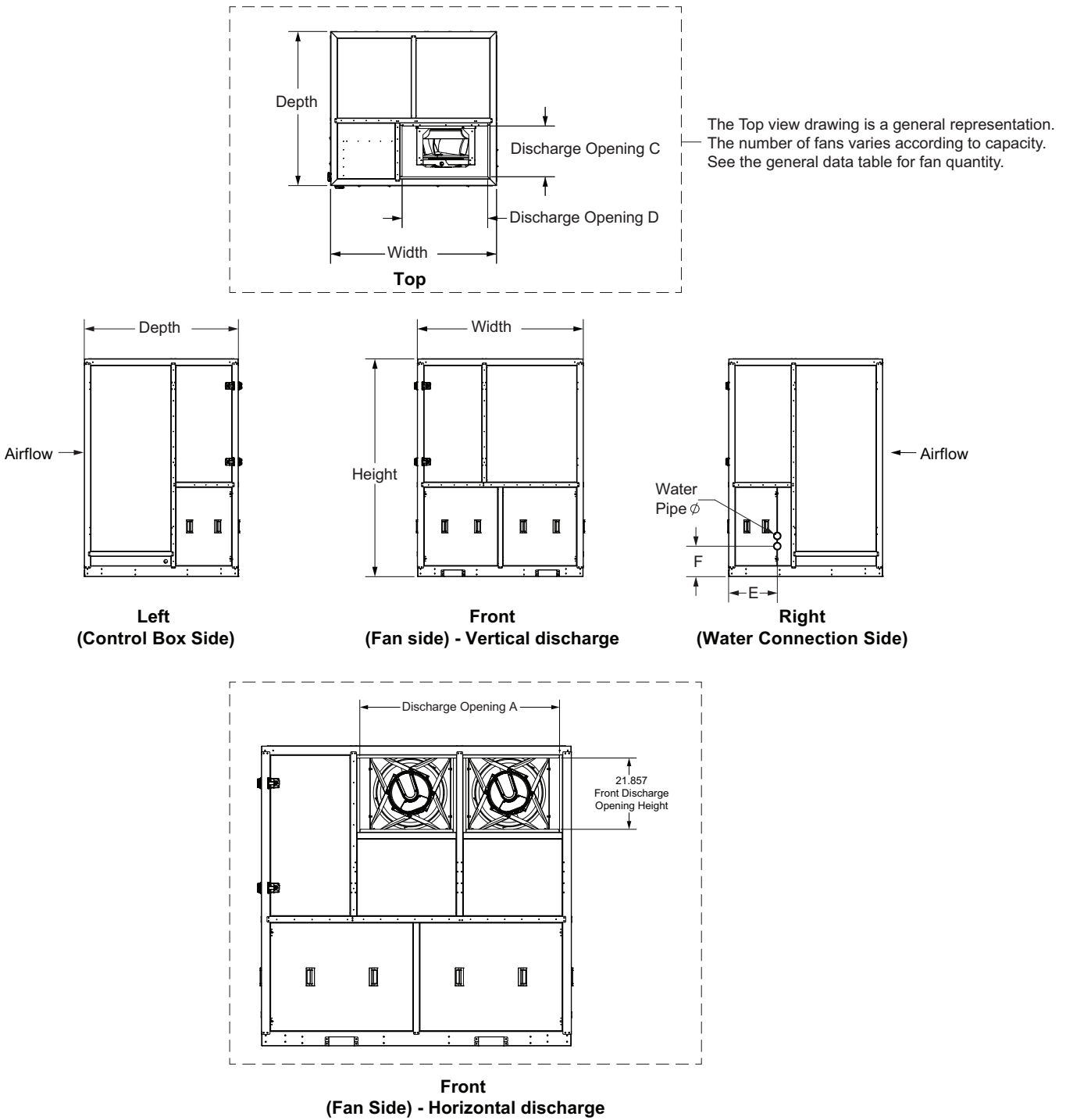
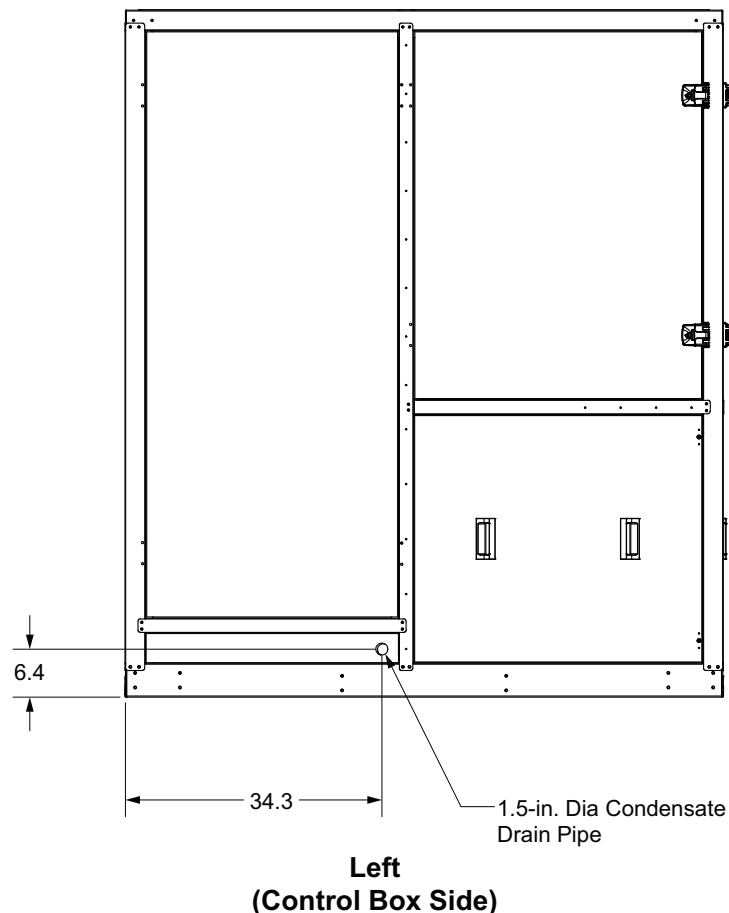


Table 4. Unit dimensions (in inches)

Dimension	Unit Size			
	20, 25, 30, and 35T	40, 45, 50, 55, and 60T	65, 70, 75, and 85T	90, 100, and 110T
Width (in.)	70.00	95.00	111.00	140.00
Depth (in.)	65.00	80.00	80.00	80.00
Height (in.)	92.00	92.00	92.00	92.00
Discharge Opening - Vertical discharge				
Discharge Opening C (in.)	21.42	36.50	36.50	36.50
Discharge Opening D (in.)	36.17	61.22	77.16	106.00
Discharge Opening - Horizontal discharge				
Discharge Opening A (in.)	36.24	61.24	79.09	107.96

Dimension	Unit Size				
	20, 25, 30, and 35T	40T	45, 50, 55, 60, and 65T	70T	75, 85, 90, 100, and 110T
Water Pipe Ø	2.50 NPT	2.50 NPT	3.00 NPT	3.00 NPT	4.00 NPT
E	20.60	30.00	30.00	30.00	30.00
F	12.83	12.87	11.76	13.73	14.82

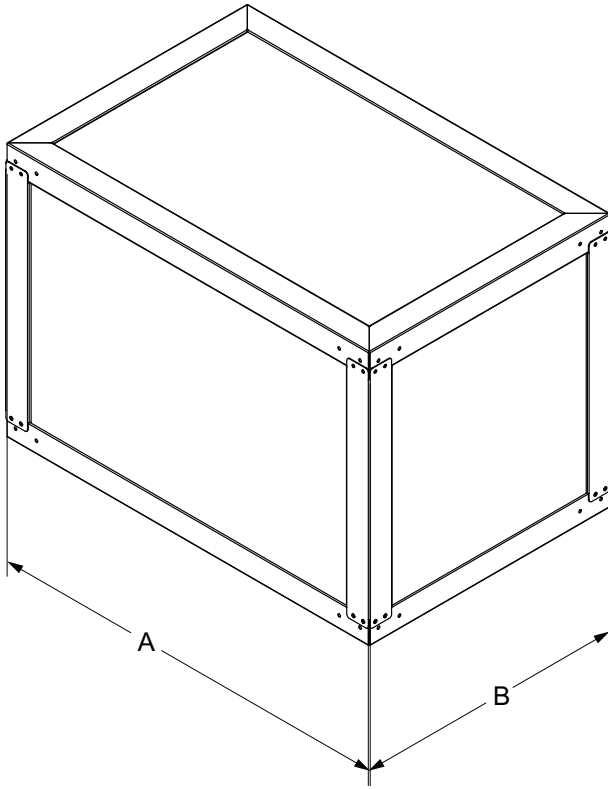
Figure 7. Condensate drain pipe location


Note: Condensate drain connection always on the LEFT (Control Box) side.



Dimensional Data

Figure 8. Standard plenum (option)



Note: Custom height plenums available upon request.

Table 5. Standard plenum (option)

Unit Size	Dim A (in.)	Dim B (in.)	Height (in.)
20, 25, 30, and 35T	42.92	28.55	30.00
40, 45, 50, 55, and 60T	67.77	43.40	30.00
65, 70, 75, and 85T	83.77	43.40	30.00
90, 100, and 110T	112.63	43.40	30.00

Service Clearances

Figure 9. Service clearance

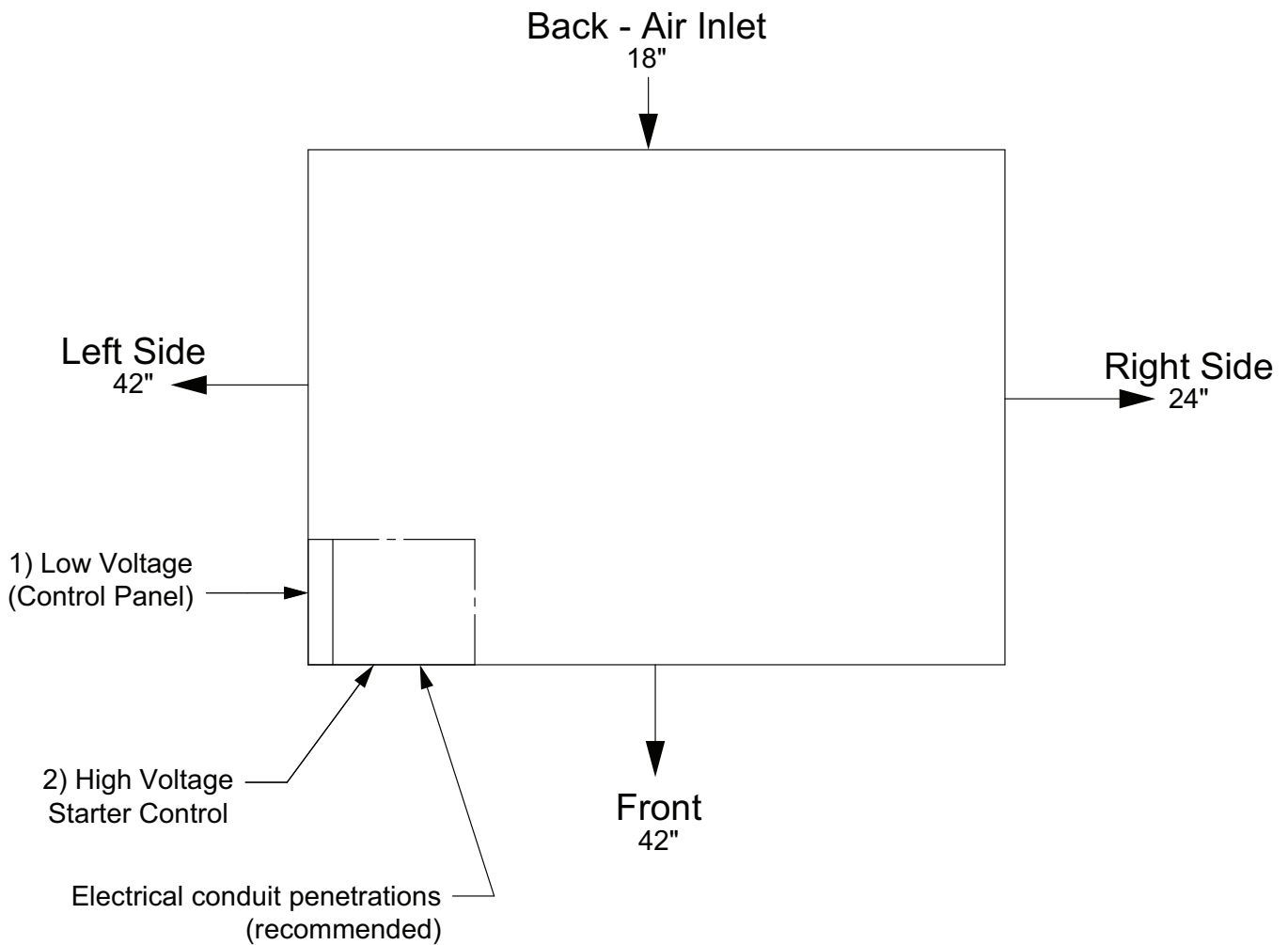


Table 6. Service/code clearance requirements

Side	Distance - in. (mm)	Purpose
Front	42	NEC Code Requirements; Fan, Compressor, Condenser, Service/Removal
Left	42	NEC Code Requirements
Right	24	Door Clearance
Back	18	Provides Uniform Airflow



Weights

Table 7. Unit weights

Unit Size	Base Weight	Waterside Economizer
	(lbs)	(lbs)
20	2763	459
25	2813	459
30	2915	459
35	2965	468
40	3423	578
45	3489	602
50	3654	626
55	3734	638
60	3904	649
65	4231	679
70	4240	777
75	4367	796
85	4466	796
90	5137	1055
100	5237	1055
110	5336	1055



Mechanical Specifications

Standard Features

Agency Listing

Units have the Intertek UL agency listing.

BACnet Communication Protocol

- The BACnet® communication protocol is standard in the Symbio controller.
- Expands communication from the unit to a Tracer SC system controller or a third-party building automation system utilizing BACnet, allowing for external setpoint and configuration adjustment and monitoring of status and diagnostics.

Cabinet

- Framework is constructed of sturdy-gauge steel. Exterior panels are fabricated from 1-inch thick insulating foam core between two layers of aluminum panels.
- Removable panels allow service access to compressors, condensers, fans, coils, and valves. Panels are secured with quick-acting hinges that allow panel to act as door, or completely remove panel when necessary. The refrigerant sight glasses are accessible during operation.
- Unit ships as a single piece.

Compressors

- Units contain two circuits with a set of tandem compressors per circuit.
- Scroll compressors are heavy duty suction cooled type with suction screen, centrifugal oil pump with dirt separator, oil charging valve, and oil sight glass.
- Protective devices for low pressure, high pressure, and motor temperature are provided.
- The compressors are mounted on isolators for vibration isolation.
- Compressors are manufactured by an independent manufacturer.

Condenser

- One condenser is provided for the entire unit.
- Shell and tube water-cooled design with removable heads and mechanically cleanable tubes. Tubes are 0.75-inch (19 mm) OD and constructed of copper.
- Condenser waterside working pressure is 150 psig.
- Shell and tube condenser is mechanically cleanable.

Dirty Filter Switch

- Factory-installed pressure sensor detects the pressure differential across the filters. When the differential pressure exceeds 0.9-inches (23 mm) WG, contact closure occurs.
- Field-installed indicator device may be wired to relay terminals to indicate when filter service is required. Contacts are rated at 115 Vac and powered by a field-supplied transformer.

Evaporator

- Evaporator coils are UL recognized as refrigerant containing component. Coils to be used with refrigerant R-454B have undergone cycle testing and safety listed with 420 psig rating.
- Tubes and return bends are constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed, with a maximum grain size of 0.040 mm. Tubes are to be mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 0.50-inch diameter x (0.016R) wall thickness, copper rifled tubes.



Mechanical Specifications

- Secondary surface (fins) are plate-fin design consisting of aluminum, with die- formed collars. Fin designs are flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements. Collars hold fin spacing at specified density and cover the entire tube surface.
- Aluminum properties are Alloy 1100 per ASTM B209, with O (soft) temper. Copper is Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
- Headers are constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size.
- Evaporator coils are designed with brass liquid distributors (as required), and copper sweat suction connections. Distributors are capped using soft-solder for ease of cap removal; suction connections are capped.
- Coil casing material consists of G90 galvanized steel (16 gauge). Intermediate tube supports are provided on all coils 48 inches and longer fin length. Coil casings on top and bottom of coils have double-flange construction, allowing for vertical stacking of coils.
- All coils are brazed with minimum 5 percent silver content (BCup-3) filler material for joint integrity.

Filters

- Standard filters are 2-inch MERV 8 (24-inch x 20-inch).
- Optional filters: 2-inch MERV 13, 4-inch MERV 8, 4-inch MERV 13 and 6-inch MERV 15 are available.

Phase and Voltage Monitor

- Protects 3-phase equipment from phase loss, phase reversal, and low voltage.
- Fault conditions display a failure message on the TD-7 display and send the unit into an auto-stop condition.
- cULus approved.

Refrigerant Circuit

- Refrigerant circuits have tandem compressors and include sight glasses, distributors, thermal expansion valves with adjustable superheat and external equalizer, and-high pressure relief valves with 0.50-inch (13 mm) flare connection.
- The unit is provided with adequate means of frost control.
- Circuits are shipped with a full R-454B refrigerant charge.
- Compressors are mounted on rubber-in-shear isolators for vibration isolation.

Refrigerant Leak Detection Sensors

- Factory-installed leak detection system with one or more refrigerant detection sensors.
- When the system detects a leak, the unit controller will initiate mitigation actions.

Supply Fan

Fan wall arrangement with direct drive ECM plenum fans for increased efficiency.

Unit Controls

- Microprocessor controls control all unit functions. Trane Symbio™ 500 is the provided unit controller.
- Controls are factory-installed and mounted in the main control panel. All factory-installed controls are fully commissioned (run-tested) at the factory.
- Unit-mounted Tracer® TD-7 user-interface with a 7-inch WVGA 800 x 480 resolution, touch-sensitive color screen is provided. The screen is backlit, to enable viewing in poor light conditions. The TD-7 display is standard to provide the operator with full adjustment and display of control data functions.
- The unit control can be used as a standalone controller or as part of a building management system involving multiple units.

Water Connections

- The unit can be configured with left or right-hand water connections.
- Water connections are designed for victaulic pipe couplings.

Water Flow Switch

- A water flow switch is provided for field-installation in the condenser water pipe to the unit.
- When the flow switch detects a water flow loss prior to or during mechanical cooling, compressor operation locks out and a diagnostic code displays.
- If water flow is restored, the compressor operation automatically restores.

Optional Features

Air Volume/Temperature Control

Air Volume: Variable Air Volume Control Scheme

This option controls the VAV self-contained unit using factory- mounted, direct drive plenum fans with electronically commutated motors (ECM).The ECM safely varies the fan motor speed to allow the motor to meet the dynamic requirements at the motor shaft and meet the system static. The ECM receives 0 to 10 Vdc signal from the unit microprocessor based upon supply static pressure and causes the drive to accelerate or decelerate as required to maintain the supply static pressure setpoint. There are three types of temperature control available.

Temperature Control: Fixed Discharge Air Temperature

- This option includes a discharge air microprocessor controller and discharge air sensor. The microprocessor controller coordinates the optional waterside economizer control and the stages of cooling to maintain the fixed discharge air setpoint. From the factory the discharge air setpoint is fixed.
- There is an option on the unit to calculate the discharge air setpoint by comparing the return air temperature against the return air temperature setpoint. Based upon this calculation the setpoint is then reset between the discharge air reset setpoint max bas and discharge air reset setpoint min bas.

Temperature Control: Return Air Reset

- This option includes a discharge air microprocessor controller and discharge air sensor. The microprocessor controller coordinates the optional waterside economizer control and the stages of cooling to maintain the discharge air temperature setpoint. It is calculated by comparing the return air temperature against the return air temperature setpoint. Based upon this calculation the setpoint is then reset between the discharge air reset setpoint max bas and discharge air reset setpoint min bas.
- There is an option on the unit to use a fixed discharge air setpoint if desired.

Temperature Control: Space Temperature Reset

- This option includes a discharge air microprocessor controller and discharge air sensor. The microprocessor controller coordinates the optional waterside economizer control and the stages of cooling to maintain the discharge air temperature setpoint. It is calculated by comparing the space temperature against the space temperature setpoint. Based upon this calculation the setpoint is then reset between the discharge air reset setpoint max bas and discharge air reset setpoint min bas.
- There is an option on the unit to use a fixed discharge air setpoint if desired.

Air Volume: Constant Volume Control Scheme

This option controls the VAV self-contained unit using factory- mounted, direct drive plenum fans with electronically commutated motors (ECM).The ECM safely varies the fan motor speed to allow the motor to meet the dynamic requirements at the motor shaft and meet the needed speed. The ECM receives 0-10 Vdc signal from the unit microprocessor to maintain the fixed speed setpoint. There is one type of temperature control available.



Mechanical Specifications

Temperature Control: Fixed DA Temp

- This option includes a discharge air microprocessor controller and discharge air sensor. The microprocessor controller coordinates the optional waterside economizer control and the stages of cooling to maintain the discharge air setpoint. From the factory the discharge air setpoint is fixed.
- There is an option on the unit to calculate the discharge air setpoint by comparing the space temperature against the space temperature setpoint. Based on this calculation, the setpoint will reset between the discharge air reset setpoint max bas and discharge air reset setpoint min bas.

Isopads

Isopads are furnished with the unit for vibration isolation.

Non-fused External Disconnect Switch

- The unit is supplied with an external disconnect switch that will be field-mounted.
- If this option is not selected, the unit is supplied with a terminal block.

Plenum

Units include a ship-separate discharge plenum for field-cut holes with a standard height of 30 inches. Plenum is fabricated from 1-inch thick insulating foam core between two layers of aluminum panels.

Protective Coating Coils

- Evaporator coil – A 3 to 5 mL of protective coating is applied to the coil using a multiple dip-and-bake process.
- Evaporator coil and water side economizer – A 3 to 5 mL of protective coating is applied to the coils using a multiple dip-and-bake process.

Service Valves

Service valves are factory-installed on each circuit before and after the compressor to allow compressor isolation for servicing.

Stainless Steel Drain Pan

The drain pan is positively sloped, fabricated from 304L stainless steel, and insulated with 0.25-inch (6.35 mm) of 1-pound (0.5 kg) density fiberglass.

Unit Flow Control

Units equipped with optional water regulating valves can be configured at the TD-7 for variable or constant water flow.

Constant Water Flow

- Two-way modulating control shutoff valves are wired, controlled, and installed in the unit on each circuit. These valves are driven to their maximum value anytime the unit is powered up. The valves will spring-return closed in the event of a power failure.
- If the unit has the waterside economizer option, the water side economizer valves will modulate to maintain the discharge air setpoint when active and be fully closed when inactive. These valves always remain variable-flow due to the waterside economizer design.

Variable Water Flow

- Two-way modulating control shutoff valves are wired, controlled, and installed in the unit on each circuit. When the compressor is in operation, the valves modulate to maintain the differential pressure across the compressor and to maintain the head pressure below the design setpoint. The valve will be limited to stay between the factory-set minimum and maximum valve position.
- When the compressors in a circuit are not operational the valve will be fully closed. The valves will spring-return closed in the event of a power failure.
- If the unit has the waterside economizer option, the waterside economizer valves will modulate to maintain the discharge air setpoint when active and be fully closed when inactive.

Waterside Economizer

- Utilizes the cooling tower water to either pre-cool the entering air to aid the mechanical cooling process or provides total system cooling if the water temperature is low enough.
- Will enable when the entering water temperature of the unit is below the entering mixed air temperature of the unit by a minimum of 4°F plus the economizer's approach temperature. The approach temperature default is 4°F and is adjustable from 0 to 9°F.
- Will disable when the entering water temperature of the unit is not below the entering mixed air temperature of the unit by at least the water economizer approach temperature. The economizer acts as the first stage of cooling. If the economizer is unable to maintain the supply air setpoint, the unit control module brings on compressors as required to meet the setpoint.
- Includes a coil, modulating valves, controls, and piping with cleanouts. Coil construction is 0.50-inch (13 mm) OD seamless copper tubes expanded into aluminum fins. The evaporator and economizer coils share a common sloped (IAQ) drain pan. Drain pan options are either galvanized or stainless steel and insulated.



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.

Trane has a policy of continuous product and product data improvements and reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.