



Product Catalog

**VariTrane™**

**Round Inlet/Round Outlet**

Model VRRF





## Introduction

The installed base of ducted HVAC systems is very vast and highly variable. No matter the system, retrofit and upgrading is inevitable. The retrofit terminal units discussed in this catalog are utilized for upgrading existing ducted HVAC systems, most notably in the area of controls. Using Trane's vast knowledge of air volume control and unit controls, Round Inlet/Round Outlet Retrofit (VRRF) Terminal Units are used to improve energy efficiency and reduce overall operating cost in existing systems. Often VRRF units are used in the following applications:

- Bypass/replace existing mechanical regulator (air valve)
- Upgrade building and/or unit controls (e.g. Pneumatic to BACnet®) with or without replacing the mechanical regulator (air valve)
- Convert Constant Air Volume System to Variable Air Volume System
- Convert pressure dependent Variable Air Volume System to pressure independent Variable Air Volume System (e.g. Trane VariTrac™)
- Convert Multizone (Dual Duct) Systems to Variable Air Volume System

The VRRF terminal unit is also very beneficial for non-retrofit or new applications. This unit allows for great controllability, keeping occupied spaces comfortable in a very compact footprint. For those applications where space is at premium, but controls functionality is not, the VRRF terminal unit is ideal.

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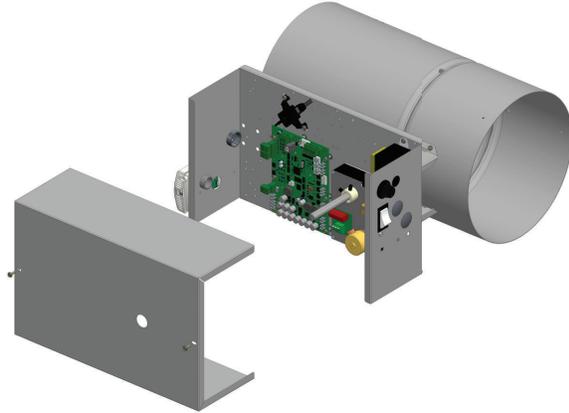
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## Features and Benefits



## Construction

The basic unit consists of a sheet metal casing with an air damper which is used to modulate the air being delivered into the occupied zone. The unit is designed to modulate either cooling or heating air between the temperatures of 40 and 140°F. Primary air enters the air valve through its round inlet and is sent into the air valve cylinder and exits from the round outlet. This air could be sent straight to the diffusers or in conjunction with a VAV unit that is being retrofitted.

### Standard Features

- Available in 8 sizes (0- 4,000 cfm) for simple easy install in round ductwork
- Available for installation in both vertical or horizontal airflow
- Optional adapter plate for easy integration with legacy Trane VAV units
- Optional LEED wrap for preventing contamination during the construction phase
- Optional Factory mounted, wired, tested and commissioned pressure independent controls
  - BACnet Communication
  - Trane Air-Fi Wireless Communication
- Additional Factory mounted, wired, tested options
  - Modulating Actuator
  - Power Fuse
  - Controls Transformer
  - Toggle Disconnect Switch
  - Relay Kits
  - Duct Temperature Sensor



## Agency Certifications

There are numerous regulations and standards in the industry that determine the construction and performance parameters for terminal units. Some of the more important of those standards and regulations are listed below.

### UL-Listed Products

All VariTrane™ Units are listed in accordance with UL as terminal units. This listing includes the terminal with electric heaters. Additionally, all insulation materials pass UL 25/50 smoke and flame safety standards.

### AHRI Certified Performance

All VariTrane™ units are AHRI certified. AHRI 880 guarantees the pressure drop, flow performance, and acoustical performance provided is reliable and has been tested in accordance with industry accepted standards. AHRI 885 uses AHRI 880 performance and applies accepted industry methods to estimate expected NC sound levels within the occupied space.

## American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE)

**ASHRAE - Standard 41.1**

**ASHRAE - Standard 41.2**

**ASHRAE - Standard 41.3**

These standards specify methods for temperature measurement (41.1), laboratory airflow measurement (41.2), and pressure measurement (41.3). While none of these standards specifically discusses air terminals, they discuss topics that are aspects of terminal box systems. Therefore, some engineers will include these standards in their specifications as a primer on accepted measurement techniques.

**ASHRAE - Standard 62.1**

**ASHRAE - Standard 111**

This standard calls out procedures to be followed for testing and balancing HVAC systems. It includes descriptions of the equipment used, procedures followed, and field changes that must be made when a system is balanced.

## Air Conditioning and Refrigeration Institute (AHRI)

**AHRI Standard 880**

This standard sets forth classifications, performance testing requirements, and test results reporting requirements for air terminal units. The standard contains very detailed procedures that are to be followed for the testing and certification program associated with this standard. The operating characteristics tested include discharge and radiated sound power, wide-open pressure drop, and fan motor amp draw.

**AHRI Standard 885-2008**

This document provides a procedure to estimate sound pressure levels in an occupied space. The standard accounts for the amount of sound pressure in the space due to the air terminal, diffusers and their connecting low pressure ductwork. While sound generated from the central system fan and ductwork may be a significant factor in determining the sound pressure level in the room, this standard does not address those factors. It focuses solely on the terminal and items downstream of it. This standard is related to AHRI-880 by using sound power determined using AHRI-880 methodology as a starting point for the AHRI-885 procedure.

## Underwriter's Laboratory (UL)

Underwriter's Laboratory is an independent testing agency that examines products and determines if those products meet safety requirements. Equipment manufacturers strive to meet UL guidelines and

obtain listing and classifications for their products because customers recognize UL approval as a measure of a safely designed product terminals are listed per UL, Heating and Cooling Equipment. The terminals are listed as an entire assembly.

## **National Fire Protection Association (NFPA)**

### **NFPA 70**

This standard is also known as the National Electrical Code (NEC). The Code gives standards for installation of wiring and electrical equipment for most types of commercial and residential buildings. It is often referred to in air terminal specifications when fan-powered boxes, electric heat or electric controls are included.

### **NFPA 90A**

This standard does not speak directly to air terminals but does discuss central system considerations pertaining to a fire and/or smoke condition. The standard discusses safety requirements in design and construction that should be followed to keep the air-handling system from spreading a fire or smoke. The standard specifies practices that are intended to stop fire and smoke from spreading through a duct system, keep the fire-resistive properties of certain building structures (fire walls, etc.) intact, and minimize fire ignition sources and combustible materials.

# Application Considerations

## Flow Measurement and Control



One of the most important characteristics of a VAV terminal unit is its ability to accurately sense and control airflow. The VariTrane™ terminal unit was developed with exactly that goal in mind. The patented, multiple-point, averaging flow ring measures the velocity of the air at the unit primary ventilation air inlet.

The differential pressure signal output of the flow ring provides the terminal unit controller a measurement of the primary ventilation airflow through the inlet. The terminal unit controller then opens or closes the inlet damper to maintain the controller airflow setpoint.

### Flow Measurement

Most of these terminal units contain a differential pressure airflow measurement device, mounted at the primary ventilation air inlet, to provide a signal to the terminal unit controller. Numerous names exist for the differential pressure measurement device—flow sensor, flow bar, flow ring. The differential pressure measured at the inlet varies according to the volumetric flow rate of primary ventilation air entering the inlet.

The total pressure and the static pressure are measurable quantities. The flow measurement device in a VAV terminal unit is designed to measure velocity pressure. Most flow sensors consist of a hollow piece of tubing with orifices in it. The VariTrane™ air valve contains a flow ring as its flow measuring device. The flow ring is two round coils of tubing. Evenly spaced orifices in the upstream coil are the high-pressure taps that average the total pressure of air flowing through the air valve. The orifices in the downstream ring are low-pressure taps that average the air pressure in the wake of flow around the tube. By definition, the measurement of static pressure is to occur at a point perpendicular to the airflow. The low-pressure taps on the VariTrane™ flow ring measure a pressure that is parallel to the direction of flow but in the opposite direction of the flow. This “wake pressure” that the downstream ring measures is lower than the actual duct static pressure. The difference between the wake pressure and the static pressure can be accounted for so that the above relationship between flow and differential pressure remain valid. The difference also helps create a larger pressure differential than the velocity pressure. Since the pressures being measured in VAV terminal unit applications are small, this larger differential allows transducers and controllers to measure and control at lower flow settings than would otherwise be possible.

The average velocity of air traveling through the inlet is expressed in the equation:

$$\text{FPM} = 1096.5 \sqrt{\frac{\text{VP}}{\text{DENS}}}$$

Where:

- FPM = Velocity of air in feet per minute
- 1096.5 = A constant
- VP = The velocity pressure of the air expressed in inches of water
- DENS = The density of the air expressed in pounds per cubic foot

Often, the density is assumed to be a constant for dry air at standard conditions [68°F (20°C)] and sea level pressure of 14.7 psi (101.4 kPa). These conditions have a density of 0.07496 lbs/cubic foot and yield the following commonly used equation:

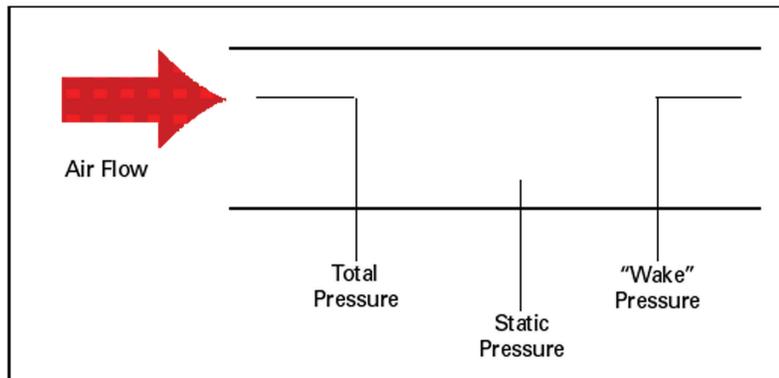
$$\text{FPM} = 4005 \sqrt{\text{VP}}$$

The amount of air traveling through the inlet is related to the area of the inlet and the velocity of the air:  
**AIRFLOW** (cubic feet per minute, cfm) = **AREA** (square feet) x **AVERAGE VELOCITY** (feet per minute)

## Accuracy

The multiple, evenly spaced orifices in the flow ring of the VariTrane™ terminal unit provide quality measurement accuracy even if ductwork turns or variations are present before the unit inlet. For the most accurate readings, a minimum of 1½ diameters, and preferably 3 diameters, of straight-run ductwork is recommended prior to the inlet connection. The straight-run ductwork should be of the same diameter as the air valve inlet connection. If these recommendations are followed, and the air density effects mentioned below are addressed, the flow ring will measure primary ventilation airflow within ±5% of unit nominal airflow.

**Figure 1. Air pressure measurement orientations**



## Air Density Effects

Changes in air density due to the conditions listed below sometimes create situations where the standard flow sensing calibration parameters must be modified. These factors must be accounted for to achieve accuracy with the flow sensing ring. Designers, installers, and air balancers should be aware of these factors and know of the necessary adjustments to correct for them.

### Elevation

At high elevations the air is less dense. Therefore, when measuring the same differential pressure at elevation versus sea level the actual flow will be greater at elevation than it would be at sea level. To calculate the density at an elevation other than standard conditions (most manufacturers choose sea level as the point for their standard conditions), you must setup a ratio between the density and differential pressure at standard conditions and the density and differential pressure at the new elevation.

$$\frac{\Delta P \text{ Standard Conditions}}{\text{DENS Standard Conditions}} = \frac{\Delta P \text{ New Conditions}}{\text{DENS New Conditions}}$$

Since the data from the manufacturer is published at standard conditions, this equation should be solved for the differential pressure at standard conditions and the other quantities substituted to determine the ratio for the differential pressure measured at the new conditions.

### Duct Pressure and Air Temperature Variations

While changes in these factors certainly affect the density of air, most operating parameters which systems need keep these effects very small. The impact on accuracy due to these changes is less than one half of one percent except in very extreme conditions. Extreme conditions are defined as those systems with inlet static pressures greater than 5 in. wg (1245 Pa) and primary inlet air temperatures greater than 100°F (37.8°C). Since those types of systems occur so infrequently, we assume the effects of duct pressure and air temperature variations to be negligible.

### Linearity

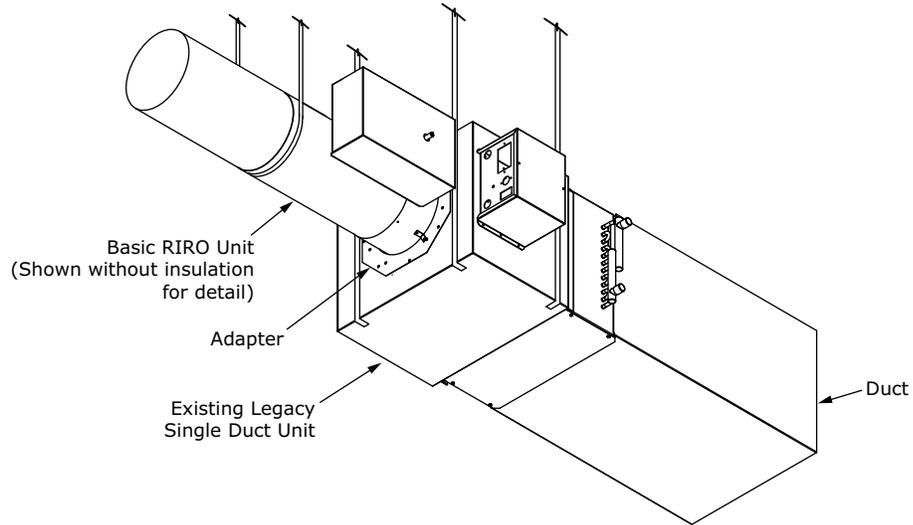
With the increased use of DDC controls instead of pneumatic controls, the issue of linearity is not as great as it once was. The important aspect of flow measurement versus valve position is the accuracy of the controller in determining and controlling the flow. Our units are tested for linearity and that position versus airflow curve is downloaded and commissioned in the factory to verify proper control of the unit.

## Retrofit Systems

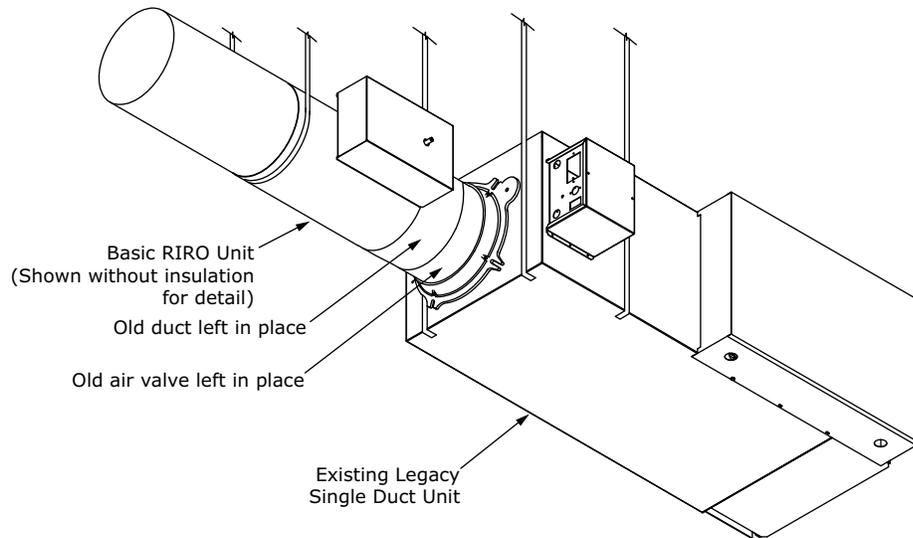
It is very important to understand how the VRRF terminal unit should be applied depending upon the retrofit application. This will ensure that the performance of the system is maintained. This section outlines the most common retrofit applications.

### Bypass/Replace Existing Mechanical Regulator (Air Valve)

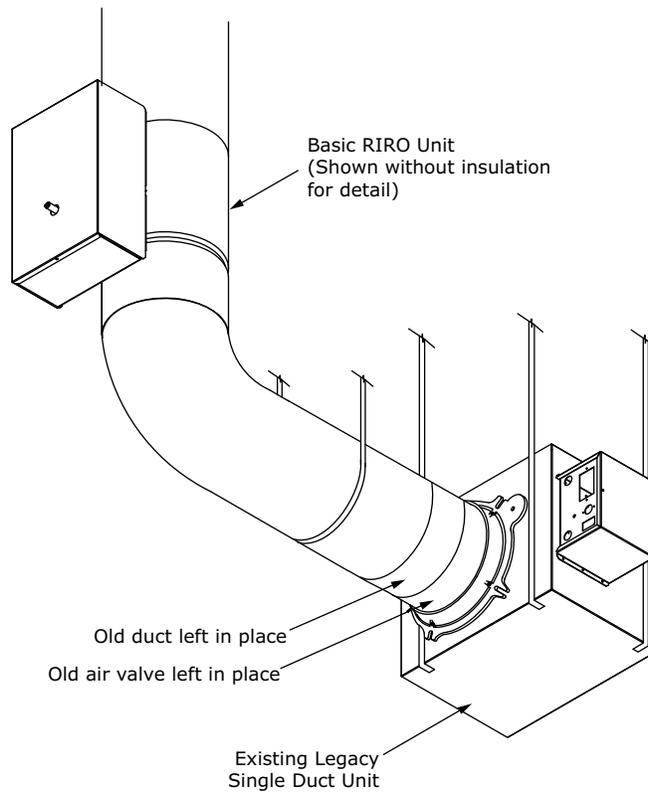
**Figure 2. Horizontal installation — Trane air valve removed**



**Figure 3. Horizontal installation — air valve remains**

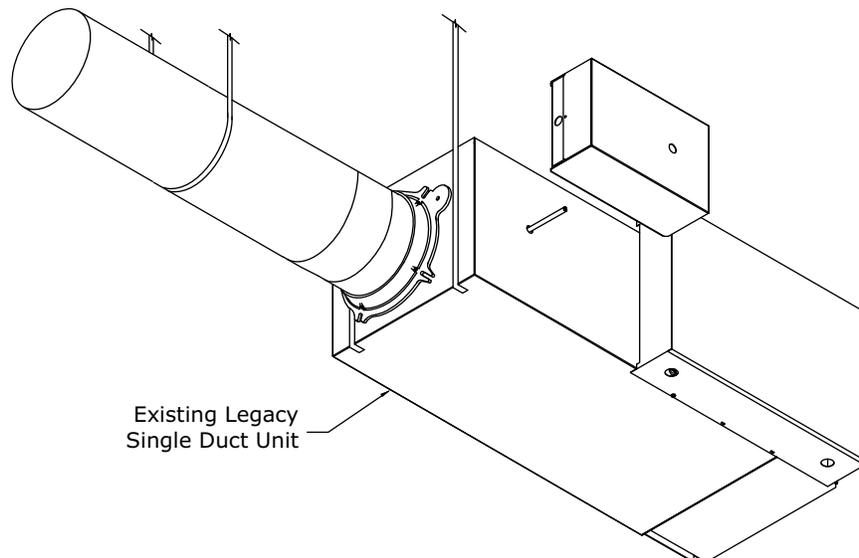


**Figure 4. Vertical installation**



## Upgrade Building and/or Unit Controls

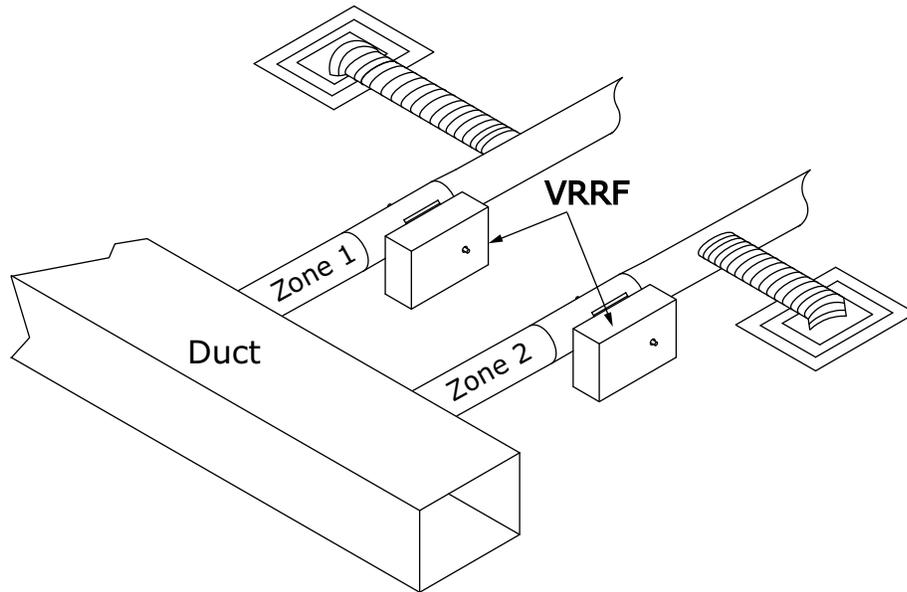
**Figure 5. Upgrade building and/or unit controls**



## Convert Constant Air Volume System to Variable Air Volume System

Conversion of the existing systems requires the VRRF product as well as retrofit of the existing air handler or rooftop to deliver variable air volume.

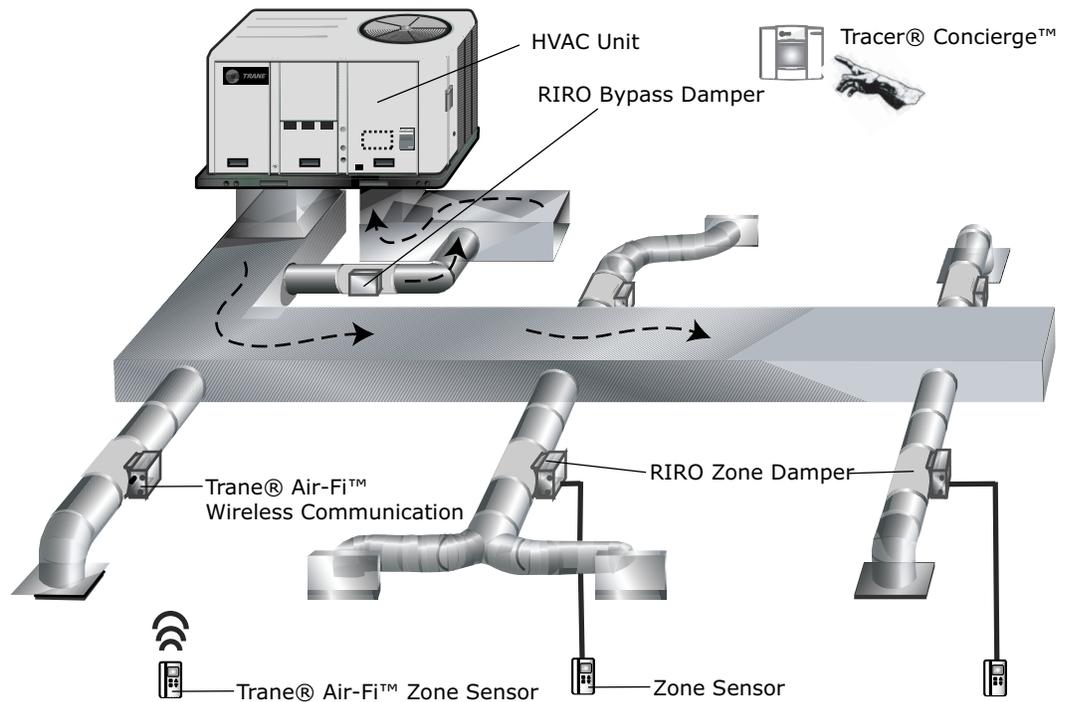
Figure 6. Constant air volume to variable air volume



### Convert Pressure Dependent Variable Air Volume System to Pressure Independent Variable Air Volume

Installation of new, or conversion of existing pressure dependent Variable Air Volume system to pressure independent Variable Air Volume System (e.g. Trane VariTrac™) utilizes VRRF to replace the existing VariTrac™ zone dampers and bypass damper.

Figure 7. Pressure dependent to pressure independent

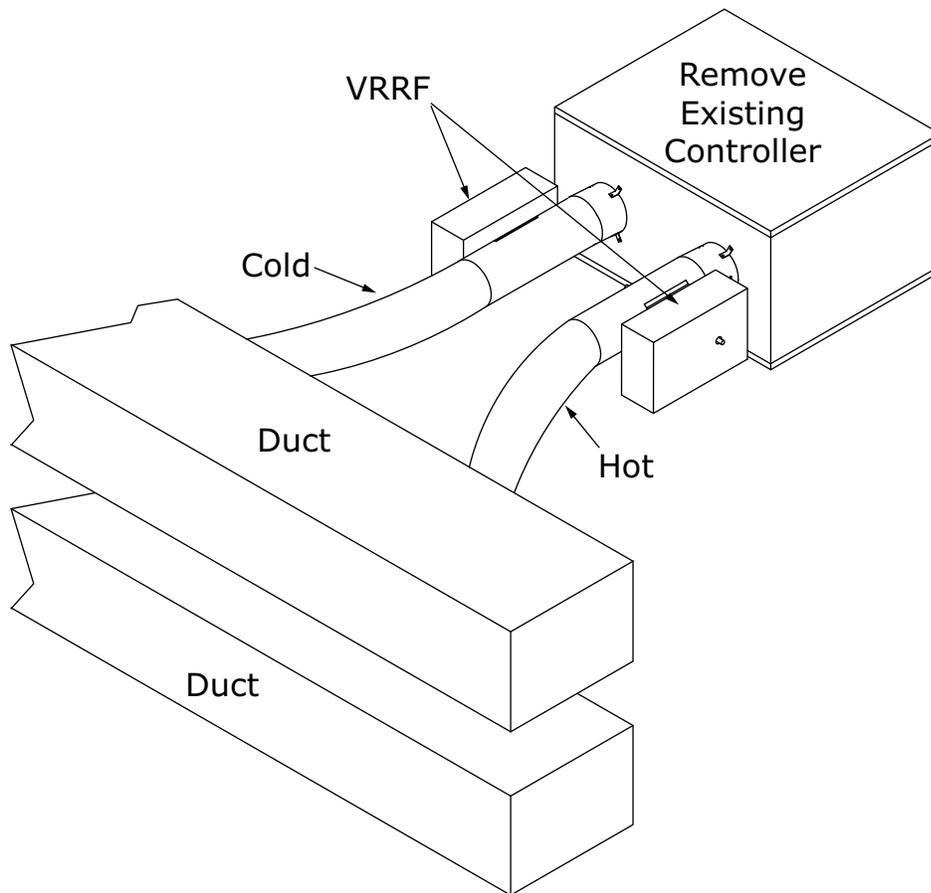


## Convert Legacy Trane Analog Controls to BACnet® Communication

- Trane Air-Fi® wireless is especially beneficial for this application. The legacy analog controls were non-communicating.
- For wiring diagrams and installation instructions see *VariTrane™ Round Inlet/Round Outlet Installation, Operation, and Maintenance (VAV-SVN09\*-EN)*.

## Convert Multizone (Dual Duct) Systems to Variable Air Volume System

Figure 8. Multizone (dual duct) to variable air volume





## Selection Procedure

This section describes the catalog selection of VRRF VAV terminal units with a specific example. A computer selection program, Trane Select Assist™ is also available to aid in selection of VAV terminal units. Selection of VRRF VAV terminal units can involve three elements:

- Air Valve Selection
- Acoustics
- Controls

### Trane Select Assist™

Trane Select Assist™ is an online tool used to determine properly sized VariTrane™ VAV terminal unit and resulting performance data for specific input specifications. In addition to selection of VAV terminal unit configuration selections, Trane Select Assist also includes most other Trane products, allowing user to select all required equipment within the one program.

Within the tool, required fields are denoted by red shading, and for VAV terminal units include maximum and minimum airflows, control type, and unit model. (Models with reheat have additional required fields.) The user has the option of viewing information for an individual selection on one screen, or as a schedule with all VAV units required for the specific application.

Trane Select Assist also calculates sound power data for the selected terminal unit. Input is either maximum individual sound level for each octave band, or maximum NC value. Trane Select Assist will calculate acoustical data subject to default or user-supplied sound attenuation data.

**Schedule View:** The program has many time saving features such as:

- Copy/paste from spreadsheets like Microsoft® Excel
- Easily arrange fields to match your schedule
- Time-saving templates to store default settings

The user can also export the schedule view to Excel for modification or inclusion in engineering drawings as a schedule. Details regarding the program, its operation, and instructions on obtaining a copy are available from your local Trane sales office.

### Air Valve Selection

The wide-open static pressure and airflows are found in the performance data section of the catalog. To select an air valve, locate the required design cooling airflow for your terminal unit type and find the smallest air valve size that has a pressure drop equal to or lower than the maximum wide-open static pressure requirement.

**Example: Cooling Only VCCF Terminal Unit**

- Design cooling airflow: 1700 cfm
- Maximum wide open Air pressure drop: 0.25-inch wg
- Minimum cooling airflow: 850 cfm

From the performance data charts, select a valve size 12, which has a wide-open static pressure drop of 0.01-inch wg

Check the minimum and maximum cfm desired with the minimum and maximum cfm allowed in the table in the general data section. The maximum setting of 1700 cfm is within the acceptable range. The desired minimum setting of 850 cfm is acceptable for the cooling only box desired. Note that if an electric reheat box was selected, the minimum cfm would be dependent upon the kW of the electric heater. (See Electric Heat Unit Selection.)

### Acoustics

The acoustical data found in the VAV catalog is used to determine sound the terminal unit will generate. Locate the table for the VAV terminal unit of interest. Sound power data and an equivalent NC level for an AHRI 885-2008 transfer function is listed.

**Example: VCCF, Cooling-Only Terminal Unit, Size 10** (See “Air Valve Selection,” p. 14)

**Example: VRRF, Size 12** (See “Air Valve Selection,” p. 14)

- Cooling Airflow: 11001700 cfm
- Maximum inlet static pressure: 1.5-inch wg

Interpolation gives sound power data of:

Octave Band	2	3	4	5	6	7	NC
Discharge Sound Power	68	68	65	65	60	57	28
Radiated Sound Power	63	58	54	47	39	32	29

Octave Band	2	3	4	5	6	7	NC
Discharge Sound Power	77	70	67	63	64	60	30
Radiated Sound Power	46	53	54	53	52	50	29

The NC level above is determined by using either the catalog’s AHRI 885-2008 (mineral fiber for radiated sound) transfer function for the conditions shown in the acoustics table. A different transfer function could be applied as conditions dictate.

The maximum NC level is NC-2930. If the maximum NC level was exceeded, it would have been necessary to reselect the next larger unit size.

## Controls

Proper control type selection is crucial to VRRF application. In most instances, the control type will need to match the existing building control system type. For example, VariTrac™ communicating via Comm3/Comm4 will require the UCM control type. See more detail in the Controls portion of the catalog.



# Model Number

## Digit 1, 2, 3, 4 — Unit Type

**VRRF** = VariTrane Round Inlet and Outlet (Retrofit)

## Digit 5, 6 — Primary Air Valve

- 04** = 4in Inlet (225 cfm)
- 05** = 5in Inlet (350 cfm)
- 06** = 6in Inlet (500 cfm)
- 08** = 8in Inlet (900 cfm)
- 10** = 10in Inlet (1400 cfm)
- 12** = 12in Inlet (2000 cfm)
- 14** = 14in Inlet (3000 cfm)
- 16** = 16in Inlet (4000 cfm)
- 0A** = 4in Inlet (225 cfm) — Control Box Only
- 0B** = 5in Inlet (350 cfm) — Control Box Only
- 0C** = 6in Inlet (500 cfm) — Control Box Only
- 0D** = 8in Inlet (900 cfm) — Control Box Only
- 0E** = 10in Inlet (1400 cfm) — Control Box Only
- 0F** = 12in Inlet (2000 cfm) — Control Box Only
- 0G** = 14in Inlet (3000 cfm) — Control Box Only
- 0H** = 16in Inlet (4000 cfm) — Control Box Only
- G0** = Control Box Only (200 cfm)
- G1** = Control Box Only (250 cfm)
- G2** = Control Box Only (300 cfm)
- G3** = Control Box Only (350 cfm)
- G4** = Control Box Only (400 cfm)
- G5** = Control Box Only (450 cfm)
- G6** = Control Box Only (500 cfm)
- G7** = Control Box Only (600 cfm)
- G8** = Control Box Only (650 cfm)
- G9** = Control Box Only (700 cfm)
- GA** = Control Box Only (800 cfm)
- GB** = Control Box Only (1000 cfm)
- GC** = Control Box Only (1050 cfm)
- GD** = Control Box Only (1200 cfm)
- GE** = Control Box Only (1300 cfm)
- GF** = Control Box Only (1400 cfm)
- GG** = Control Box Only (1500 cfm)
- GH** = Control Box Only (1600 cfm)
- GI** = Control Box Only (1700 cfm)
- GJ** = Control Box Only (1800 cfm)
- GK** = Control Box Only (2000 cfm)
- GL** = Control Box Only (2100 cfm)
- GM** = Control Box Only (2300 cfm)
- GN** = Control Box Only (2400 cfm)
- GP** = Control Box Only (2800 cfm)
- GQ** = Control Box Only (3000 cfm)
- GR** = Control Box Only (3100 cfm)
- GS** = Control Box Only (3200 cfm)
- GT** = Control Box Only (3400 cfm)
- GU** = Control Box Only (4000 cfm)
- GV** = Control Box Only (5200 cfm)

## Digit 7, 8 — Design Sequence

\*\* = Factory Assigned

## Digit 9, 10, 11, 12 — Unit Controls

- ENCL** = Shaft Only in Enclosure
- DD00** = Trane Actuator Only
- DD71** = UC210 DDC - Basic (No water or electric heat)
- DD72** = UC210 DDC - Basic (Water heat- N.C. - 2 position)
- DD73** = UC210 DDC - Basic (Water heat-Modulating)
- DD74** = UC210 DDC - Basic (Electric heat-staged)
- DD75** = UC210 DDC - Basic (Electric heat-PWM)
- DD76** = UC210 DDC - Ventilation flow- cooling only
- DD77** = UC210 DDC - Basic (Water heat- N.O. - 2 position)
- DD79** = UC210 DDC - Flow Tracking (Cooling only)
- DD80** = UC210 DDC - Ventilation Flow (Water heat - N. C. - 2 position)
- DD81** = UC210 DDC - Ventilation Flow (Electric heat-staged)
- DD82** = UC210 DDC - Ventilation Flow (Water heat-Modulating)
- DD93** = UC210 Ventilation Flow (Water heat- N.O. - 2 position)
- SE41** = Symbio™ 500 DDC - Basic (Cooling Only)
- SE42** = Symbio™ 500 DDC - Basic (Water heat - N.C. - 2 position)
- SE43** = Symbio™ 500 DDC - Basic (Water heat- Modulating)
- SE44** = Symbio™ 500 DDC - Basic (Electric heat-staged)
- SE45** = Symbio™ 500 DDC - Basic (Electric heat-PWM)
- SE46** = Symbio™ 500 DDC - Ventilation Flow (No Reheat)
- SE47** = Symbio™ 500 DDC - Basic (Water heat - N.O. - 2 position)
- SE49** = Symbio™ 500 DDC - Flow Track (Cooling only)
- SE50** = Symbio™ 500 DDC - Ventilation Flow (N.C. - 2 position)
- SE51** = Symbio™ 500 DDC - Ventilation Flow (Electric heat-staged)
- SE52** = Symbio™ 500 DDC - Ventilation Flow (Water heat-Modulating)
- SE63** = Symbio™ 500 DDC - Ventilation Flow (Water heat - N.O.- 2 position)
- SE71** = Symbio™ 210e DDC - Basic (Cooling only)
- SE72** = Symbio™ 210e DDC - Basic (Water heat - N.C. - 2 position)
- SE73** = Symbio™ 210e DDC - Basic (Water heat-Modulating)
- SE74** = Symbio™ 210e DDC - Basic (Electric heat-staged)
- SE75** = Symbio™ 210e DDC - Basic (Electric heat-PWM)
- SE76** = Symbio™ 210e DDC - Ventilation Flow (No Reheat)
- SE77** = Symbio™ 210e DDC -Basic (Water heat - N.O. - 2 position)
- SE79** = Symbio™ 210e DDC - Flow Track (Cooling only)
- SE80** = Symbio™ 210e DDC - Ventilation Flow (N.C. - 2 position)
- SE81** = Symbio™ 210e DDC - Ventilation Flow (Electric heat-staged)
- SE82** = Symbio™ 210e DDC - Ventilation Flow (Water heat-Modulating)
- SE93** = Symbio™ 210e DDC - Ventilation Flow (Water heat - N.O. - 2 position)

## Digit 9, 10, 11, 12 — Unit Controls (continued)

- SY71** = Symbio™ 210 DDC - Basic (Cooling only)
- SY72** = Symbio™ 210 DDC - Basic (Water heat - N.C. - 2 position)
- SY73** = Symbio™ 210 DDC - Basic (Water heat- Modulating)
- SY74** = Symbio™ 210 DDC - Basic (Electric heat-staged)
- SY75** = Symbio™ 210 DDC - Basic (Electric heat-PWM)
- SY76** = Symbio™ 210 DDC - Ventilation Flow (No Reheat)
- SY77** = Symbio™ 210 DDC - Basic (Water heat - N.O. - 2 position)
- SY79** = Symbio™ 210 DDC - Flow Track (Cooling only)
- SY80** = Symbio™ 210 DDC - Ventilation flow (N.C. - 2 position)
- SY81** = Symbio™ 210 DDC - Ventilation Flow (Electric heat-staged)
- SY82** = Symbio™ 210 DDC - Ventilation Flow (Water heat-Modulating)
- SY93** = Symbio™ 210 DDC - Ventilation Flow (Water heat - N.O. - 2 position)

## Digit 13 — Transformer

- 0** = No Transformer
- 1** = 120/24 Volt (50 VA)
- 2** = 208/24 Volt (50 VA)
- 3** = 240/24 Volt (50 VA)
- 4** = 277/24 Volt (50 VA)
- 5** = 480/24 Volt (50 VA)
- 6** = 347/24 Volt (50 VA)
- 7** = 575/24 Volt (50 VA)
- 8** = 380/24 Volt (50 VA)

## Digit 14 — Disconnect Switch

- 0** = No Power Disconnect
- W** = With Power Disconnect Switch

## Digit 15 — Power Fuse

- 0** = No Fusing
- W** = With Power Fuse

**Digit 16 — Unit Orientation**

**H** = Horizontal Airflow  
**V** = Vertical Airflow (up or down)

**Digit 17 — Wireless Sensor Options**

**0** = No Wireless Receiver (Wired Sensor Only)  
**3** = Air-Fi® Wireless Comm Interface (FM)

**Digit 18 — Outlet Adapters**

**0** = None  
**D** = Adapter (C, D, or E Style)

**Digit 19 — Relay Kit**

**0** = None  
**W** = With one or more relay kits

**Digit 20 — Water Valve**

**0** = None

**Digit 21 — Zone Sensor**

**0** = None  
**A** = DDC Sensor Only  
**B** = DDC Sensor, Ext Adj, Comm Jack  
**C** = DDC Sensor, NSB, Comm Jack  
**D** = DDC Sensor, Ext Adj, NSB, Comm Jack  
**E** = Digital Display Zone Sensor  
**M** = Air-Fi® WCS/SD (Display)  
**N** = Air-Fi® WCS/SB (Base)

**Digit 22— Factory Installed Solution**

**0** = None  
**W** = Factory-Mounted DTS  
**1** = Factory-Installed DTS  
**2** = HW Valve Harness  
**3** = Both DTS/HW Valve Harness

**Digit 23 — Actuator**

**0** = None  
**A** = Standard Actuator  
**B** = Belimo Actuator  
**G** = Trane Analog Actuator (UC210 only)

**Digit 24 — Special Options**

**0** = None  
**S** = Special Options



# General Data

**Table 1. Primary airflow control factory settings — I-P**

Control Type	Air Valve Size (in.)	Maximum Valve (cfm)	Maximum Controller (cfm)	Minimum Controller (cfm)	Constant Volume (cfm)
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, and UC210	4	225	25-225	0,25-225	25-225
	5	350	40-350	0,40-350	40-350
	6	500	60-500	0,60-500	60-500
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, and UC210	8	900	105-900	0,105-900	105-900
	10	1400	165-1400	0,165-1400	165-1400
	12	2000	240-2000	0,240-2000	240-2000
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, and UC210	14	3000	320-3000	0,320-3000	320-3000
	16	4000	420-4000	0,420-4000	420-4000
	24 x 16	8000	800-8000	0,800-8000	800-8000

**Table 2. Primary airflow control factory settings — SI**

Control Type	Air Valve Size (in.)	Maximum Valve L/s	Maximum Controller L/s	Minimum Controller L/s	Constant Volume L/s
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, and UC210	4	106	12-106	0,12-106	12-106
	5	165	19-165	0,19-165	19-165
	6	236	28-236	0,28-236	28-236
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, and UC210	8	425	50-425	0,50-425	50-425
	10	661	77-661	0,77-661	77-661
	12	944	111-944	0,111-944	111-944
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, and UC210	14	1416	151-1416	0,151-1416	151-1416
	16	1888	198-1888	0,198-1888	198-1888
	24 x 16	3776	378-3776	0,378-3776	378-3776

**Table 3. Primary airflow control factory settings — I-P**

Control Type	Air Valve Size (in.)	Maximum Valve (cfm)	Maximum Controller (cfm)	Minimum Controller (cfm)	Constant Volume (cfm)
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, UC210	4	225	25-225	0,25-225	25-225
	5	350	40-350	0,40-350	40-350
	6	500	60-500	0,60-500	60-500
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, UC210	8	900	105-900	0,105-900	105-900
	10	1400	165-1400	0,165-1400	165-1400
	12	2000	240-2000	0,240-2000	240-2000
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, UC210	14	3000	320-3000	0,320-3000	320-3000
	16	4000	420-4000	0,420-4000	420-4000
	24 x 16	8000	800-8000	0,800-8000	800-8000

**Table 4. Primary airflow control factory settings — SI**

Control Type	Air Valve Size (in.)	Maximum Valve L/s	Maximum Controller L/s	Minimum Controller L/s	Constant Volume L/s
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, UC210	4	106	12-106	0,12-106	12-106
	5	165	19-165	0,19-165	19-165
	6	236	28-236	0,28-236	28-236
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, UC210	8	425	50-425	0,50-425	50-425
	10	661	77-661	0,77-661	77-661
	12	944	111-944	0,111-944	111-944
Direct Digital Control/ Symbio™ 210, Symbio™ 210e, Symbio™ 500, UC210	14	1416	151-1416	0,151-1416	151-1416
	16	1888	198-1888	0,198-1888	198-1888
	24 x 16	3776	378-3776	0,378-3776	378-3776



# Performance Data

## Air Pressure Drop

Table 5. Air pressure drop (in. wg)

Inlet Size	I-P		SI	
	Airflow (cfm)	Cooling Only	Airflow (L/s)	Cooling Only
4	50	0.01	25	3
	100	0.01	50	3
	150	0.01	70	3
	225	0.01	105	3
5	100	0.01	45	3
	200	0.01	95	3
	300	0.01	140	3
	350	0.02	165	4
6	100	0.01	45	3
	250	0.05	120	13
	350	0.1	165	26
	500	0.22	235	55
8	200	0.01	95	3
	400	0.02	190	4
	600	0.04	280	9
	900	0.08	420	21
10	500	0.01	235	3
	800	0.01	375	3
	1100	0.01	520	3
	1400	0.01	660	3
12	800	0.01	375	3
	1200	0.01	565	3
	1600	0.01	755	3
	2000	0.01	940	3
14	1500	0.01	700	3
	2000	0.01	945	3
	2500	0.01	1180	3
	3000	0.01	1415	3
16	2000	0.01	940	3
	2500	0.01	1180	3
	3000	0.01	1415	3
	4000	0.01	1885	3

# Acoustics Data

**Table 6. Discharge sound power (dB) — 0.5, 1.0 and 1.5 in. inlet pressures**

Inlet Size (in.)	Cfm	L/s	0.5" Inlet Pressure $\Delta P_s$							1.0" Inlet Pressure $\Delta P_s$							1.5" Inlet Pressure $\Delta P_s$						
			2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7			
4	80	38	66	61	54	48	43	36	67	65	61	54	49	45	—	—	—	—	—	—			
	120	57	69	66	57	51	44	38	73	70	63	57	51	47	—	—	—	—	—	—			
	150	71	70	69	58	52	45	39	76	74	65	59	52	48	77	76	69	62	56	53			
	225	106	69	68	61	56	49	45	76	77	68	61	55	50	—	—	—	—	—	—			
5	130	61	64	58	52	47	43	39	66	64	58	54	50	47	—	—	—	—	—	—			
	200	94	66	58	52	48	44	41	71	66	60	55	50	50	—	—	—	—	—	—			
	250	118	65	58	52	49	44	41	73	67	61	55	50	50	76	70	66	59	55	55			
	350	165	65	58	53	48	44	41	74	66	61	56	51	51	—	—	—	—	—	—			
6	200	94	66	61	54	50	47	43	69	65	60	56	54	51	—	—	—	—	—	—			
	300	142	68	63	57	54	50	46	72	69	64	58	55	53	—	—	—	—	—	—			
	400	189	69	64	59	56	51	48	74	70	66	60	57	56	76	74	69	63	60	59			
	500	236	71	66	62	59	55	52	75	71	67	63	59	57	—	—	—	—	—	—			
8	350	165	66	58	52	49	47	41	70	62	56	54	52	49	—	—	—	—	—	—			
	520	245	67	62	55	53	50	45	73	68	60	57	55	52	—	—	—	—	—	—			
	700	330	71	64	58	56	53	49	75	70	65	60	58	57	78	74	68	63	61	59			
	900	425	73	64	61	60	56	52	78	70	68	63	60	60	—	—	—	—	—	—			
10	550	260	61	55	51	47	45	41	67	59	55	54	53	50	—	—	—	—	—	—			
	820	387	66	59	55	50	49	45	72	63	59	55	56	53	—	—	—	—	—	—			
	1100	519	71	62	59	53	53	48	76	67	63	57	58	56	79	70	65	60	61	60			
	1400	661	73	65	62	58	56	52	79	71	66	61	60	58	—	—	—	—	—	—			
12	800	378	60	53	52	50	49	43	64	58	56	55	55	52	—	—	—	—	—	—			
	1200	566	64	57	55	52	53	46	69	62	60	57	58	54	—	—	—	—	—	—			
	1600	755	68	60	59	55	56	50	74	65	63	59	61	56	76	69	66	62	63	60			
	2000	944	71	63	62	60	58	53	77	69	66	63	63	58	—	—	—	—	—	—			
14	1100	519	60	54	53	50	48	43	64	59	57	55	53	50	—	—	—	—	—	—			
	1600	755	64	58	58	53	51	46	68	62	62	57	56	53	—	—	—	—	—	—			
	2100	991	67	60	61	56	54	49	72	65	65	60	59	55	75	68	68	63	62	59			
	3000	1416	72	64	66	62	59	55	77	69	70	65	63	59	—	—	—	—	—	—			
16	1400	661	64	58	55	53	52	48	67	64	60	58	58	56	—	—	—	—	—	—			
	2100	991	66	61	58	55	55	51	70	67	64	60	60	59	—	—	—	—	—	—			
	2800	1321	69	63	61	58	57	54	73	69	66	63	62	61	76	71	70	66	65	64			
	4000	1888	73	68	67	64	62	58	78	72	70	66	65	62	—	—	—	—	—	—			

**Notes:**

1. All data are measured in accordance with Industry Standard ARI 880-2011.
2. Data at 1.5-inch inlet pressure constitutes AHRI 880–2011 standard rating conditions. Data at 0.5, 1.0, 2.0 and 3.0-inch are application ratings. These ratings are outside the scope of the certification program.
3. All sound power levels, dB re:  $10^{-12}$  Watts.
4. Where  $\Delta P_s$  is the inlet static pressure minus discharge static.



## Performance Data

**Table 7. Discharge sound power (dB) – 2.0 and 3.0 in. inlet pressures**

Inlet Size (in.)	Cfm	L/s	2.0" Inlet Pressure ΔPs							3.0" Inlet Pressure ΔPs						
			2	3	4	5	6	7	2	3	4	5	6	7		
4	80	38	68	67	66	60	56	54	68	69	68	63	60	58		
	120	57	73	73	70	64	58	56	73	74	73	67	63	61		
	150	71	77	77	72	65	60	57	76	78	75	69	64	62		
	225	106	81	83	76	68	62	59	83	86	79	72	67	64		
5	130	61	66	70	65	59	57	55	67	68	67	61	61	60		
	200	94	72	72	69	60	58	57	73	74	74	64	62	62		
	250	118	77	72	70	62	58	58	76	74	75	66	63	63		
	350	165	81	75	70	63	58	59	81	78	75	68	63	63		
6	200	94	70	68	66	61	60	58	71	70	68	64	65	63		
	300	142	76	73	69	63	62	60	76	74	72	67	66	64		
	400	189	79	76	72	66	63	62	80	77	75	69	67	66		
	500	236	80	77	74	68	64	64	82	79	77	71	68	67		
8	350	165	74	65	61	59	59	56	75	67	63	61	62	61		
	520	245	76	73	65	62	61	59	78	75	67	64	65	63		
	700	330	80	76	69	65	63	61	81	79	72	68	67	66		
	900	425	82	76	74	68	65	64	84	79	78	71	68	67		
10	550	260	70	65	59	58	59	58	73	68	62	61	64	63		
	820	387	76	68	64	61	62	61	78	71	67	64	65	65		
	1100	519	80	72	67	63	63	63	83	75	71	66	66	67		
	1400	661	84	76	70	64	64	64	86	78	73	68	68	68		
12	800	378	69	65	60	60	61	58	71	70	64	63	65	63		
	1200	566	74	67	66	63	64	61	76	72	69	66	67	65		
	1600	755	78	70	68	65	66	63	80	74	72	69	70	67		
	2000	944	82	73	71	67	68	64	83	76	74	71	71	68		
14	1100	519	69	66	62	59	60	58	71	70	64	62	64	63		
	1600	755	73	67	68	62	62	60	76	71	72	65	66	64		
	2100	991	77	70	70	65	64	62	80	73	76	68	67	66		
	3000	1416	83	75	75	69	67	65	86	77	78	72	71	69		
16	1400	661	72	70	67	63	64	63	74	73	71	67	68	67		
	2100	991	74	71	70	66	66	65	76	75	73	70	69	68		
	2800	1321	78	73	72	68	67	66	80	76	76	72	71	70		
	4000	1888	83	77	74	71	70	68	86	79	78	75	73	72		

**Notes:**

1. All data are measured in accordance with Industry Standard ARI 880-2011.
2. Data at 1.5-inch inlet pressure constitutes AHRI 880–2011 standard rating conditions. Data at 0.5, 1.0, 2.0 and 3.0-inch are application ratings. These ratings are outside the scope of the certification program.
3. All sound power levels, dB re: 10<sup>-12</sup> Watts.
4. Where ΔPs is the inlet static pressure minus discharge static.

**Table 8. Radiated sound power (dB) — 0.5, 1.0 and 1.5 in. inlet pressures**

Inlet Size (in.)	Cfm	L/s	0.5" Inlet Pressure ΔPs							1.0" Inlet Pressure ΔPs							1.5" Inlet Pressure ΔPs						
			2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7			
4	80	38	40	43	47	45	45	43	41	46	50	49	50	49	—	—	—	—	—	—			
	120	57	43	44	48	48	46	43	43	49	53	51	51	50	—	—	—	—	—	—			
	150	71	44	45	48	48	47	44	45	49	53	52	52	50	45	52	59	56	56	54			
	225	106	45	48	49	50	50	46	48	52	54	53	54	51	—	—	—	—	—	—			
5	130	61	39	41	45	43	41	37	39	43	49	50	49	46	—	—	—	—	—	—			
	200	94	40	41	43	42	39	36	41	45	49	50	49	47	—	—	—	—	—	—			
	250	118	40	41	43	42	39	36	43	45	49	49	48	46	44	48	51	52	53	52			
	350	165	39	43	47	47	44	40	43	47	49	49	47	46	—	—	—	—	—	—			
6	200	94	41	45	45	42	40	37	41	46	49	49	49	46	—	—	—	—	—	—			
	300	142	40	44	45	45	43	41	43	48	49	48	48	47	—	—	—	—	—	—			
	400	189	40	47	48	48	47	45	41	49	50	50	50	48	45	51	52	52	53	51			
	500	236	41	50	51	51	50	47	43	51	52	52	53	51	—	—	—	—	—	—			
8	350	165	39	43	48	46	44	39	40	45	50	50	50	46	—	—	—	—	—	—			
	520	245	40	45	47	46	44	39	43	48	52	51	50	48	—	—	—	—	—	—			
	700	330	41	46	48	47	45	41	47	51	53	51	50	48	47	53	55	54	54	52			
	900	425	44	49	50	50	48	46	45	51	54	52	51	49	—	—	—	—	—	—			
10	550	260	39	42	47	46	45	40	42	45	50	51	51	48	—	—	—	—	—	—			
	820	387	41	45	48	47	45	40	44	47	52	52	51	49	—	—	—	—	—	—			
	1100	519	43	47	49	48	45	41	47	50	53	52	51	48	49	52	56	55	55	53			
	1400	661	44	49	51	49	47	43	48	51	54	53	52	48	—	—	—	—	—	—			
12	800	378	40	46	47	47	45	40	40	48	50	50	50	48	—	—	—	—	—	—			
	1200	566	41	47	47	47	44	39	43	50	52	51	51	47	—	—	—	—	—	—			
	1600	755	42	49	48	48	46	41	44	51	51	51	50	46	45	53	54	53	52	50			
	2000	944	44	49	50	51	48	43	46	53	53	53	52	48	—	—	—	—	—	—			
14	1100	519	39	46	50	46	43	38	40	48	53	49	47	45	—	—	—	—	—	—			
	1600	755	40	47	51	47	44	40	42	51	55	51	49	47	—	—	—	—	—	—			
	2100	991	43	49	50	47	45	41	45	52	55	51	50	48	47	55	58	55	53	52			
	3000	1416	47	55	55	50	46	43	50	58	59	53	50	48	—	—	—	—	—	—			
16	1400	661	42	48	51	50	48	44	43	51	54	54	53	51	—	—	—	—	—	—			
	2100	991	43	49	51	50	49	45	45	52	55	55	55	53	—	—	—	—	—	—			
	2800	1321	46	51	53	52	49	46	48	55	56	56	55	54	50	57	59	59	59	58			
	4000	1888	49	56	55	55	54	51	51	56	58	57	57	54	—	—	—	—	—	—			

**Notes:**

1. All data are measured in accordance with Industry Standard ARI 880-2011.
2. Data at 1.5-inch inlet pressure constitutes AHRI 880-2011 standard rating conditions. Data at 0.5, 1.0, 2.0 and 3.0-inch are application ratings. These ratings are outside the scope of the certification program.
3. All sound power levels, dB re: 10<sup>-12</sup> Watts.
4. Where ΔPs is the inlet static pressure minus discharge static.



## Performance Data

**Table 9. Radiated sound power (dB) — 2.0 and 3.0 in. inlet pressures**

Inlet Size (in.)	Cfm	L/s	2.0" Inlet Pressure ΔPs							3.0" Inlet Pressure ΔPs						
			2	3	4	5	6	7	2	3	4	5	6	7		
4	80	38	42	52	57	51	54	55	42	55	61	55	57	58		
	120	57	43	52	57	54	57	56	43	55	61	56	58	60		
	150	71	45	53	58	57	58	57	45	56	61	57	59	61		
	225	106	49	56	59	58	59	59	49	58	63	61	62	63		
5	130	61	39	45	51	53	54	53	41	46	53	55	57	57		
	200	94	41	48	53	54	56	55	42	48	54	56	58	58		
	250	118	44	49	53	54	56	56	44	50	55	56	58	59		
	350	165	48	52	53	54	55	54	48	54	56	57	58	58		
6	200	94	41	49	52	52	55	55	42	51	55	55	57	58		
	300	142	43	51	54	54	56	55	43	53	56	56	58	59		
	400	189	48	53	54	53	54	54	48	55	57	55	57	58		
	500	236	46	53	54	54	56	55	51	57	58	56	57	58		
8	350	165	41	47	52	52	54	53	42	49	55	54	56	56		
	520	245	44	50	55	55	57	55	45	52	56	57	60	59		
	700	330	48	54	57	56	57	55	49	56	59	59	61	60		
	900	425	50	56	58	57	57	55	52	57	61	59	59	59		
10	550	260	45	49	53	54	56	55	45	50	53	55	58	59		
	820	387	47	51	56	57	58	57	48	52	57	58	60	61		
	1100	519	49	53	57	56	57	56	50	54	59	59	61	61		
	1400	661	51	54	57	57	57	56	53	56	60	59	60	60		
12	800	378	41	48	53	56	55	54	41	48	53	55	58	57		
	1200	566	44	52	57	56	57	56	45	52	57	58	59	58		
	1600	755	47	54	56	55	55	53	49	57	60	60	60	59		
	2000	944	50	55	56	56	56	54	51	58	60	59	59	58		
14	1100	519	41	48	54	52	51	50	43	51	56	53	52	53		
	1600	755	44	52	57	55	53	53	47	54	58	55	54	56		
	2100	991	47	56	60	56	55	54	50	57	62	58	56	57		
	3000	1416	54	60	61	56	55	54	54	61	65	61	60	60		
16	1400	661	43	52	56	59	58	57	44	52	58	60	61	60		
	2100	991	46	54	59	61	61	60	48	56	60	62	63	63		
	2800	1321	50	57	61	61	62	61	52	58	63	64	64	64		
	4000	1888	54	61	63	62	62	62	55	62	65	66	65	65		

**Notes:**

1. All data are measured in accordance with Industry Standard ARI 880-2011.
2. Data at 1.5-inch inlet pressure constitutes AHRI 880-2011 standard rating conditions. Data at 0.5, 1.0, 2.0 and 3.0-inch are application ratings. These ratings are outside the scope of the certification program.
3. All sound power levels, dB re: 10<sup>-12</sup> Watts.
4. Where ΔPs is the inlet static pressure minus discharge static.

**Table 10. Sound noise criteria (NC) - valve only**

Inlet Size (in.)	CFM	L/s	Discharge Inlet Pressure ( $\Delta$ Ps)					Radiated Inlet Pressure ( $\Delta$ Ps)				
			0.5"	1.0"	1.5"	2.0"	3.0"	0.5"	1.0"	1.5"	2.0"	3.0"
4	80	38	22	25	—	27	30	21	24	—	32	36
	120	57	26	31	—	34	36	22	27	—	32	36
	150	71	30	36	38	39	40	22	27	34	33	36
	225	106	28	39	—	46	50	23	28	—	34	38
5	130	61	20	24	—	31	29	19	23	—	25	27
	200	94	22	29	—	34	36	16	23	—	27	28
	250	118	21	31	35	36	36	16	23	25	27	30
	350	165	21	32	—	41	41	21	23	—	27	31
6	200	94	19	24	—	27	30	19	23	—	26	30
	300	142	21	28	—	33	34	19	23	—	28	31
	400	189	23	30	34	37	38	22	24	26	28	32
	500	236	25	31	—	38	40	25	26	—	28	33
8	350	165	19	24	—	29	30	22	24	—	26	30
	520	245	20	28	—	33	36	21	26	—	30	31
	700	330	25	30	35	37	40	22	27	30	32	34
	900	425	28	34	—	39	42	24	28	—	33	36
10	550	260	—	18	—	22	27	21	24	—	27	28
	820	387	16	24	—	29	32	22	26	—	31	32
	1100	519	23	29	33	34	38	23	27	31	32	34
	1400	661	25	33	—	39	42	25	28	—	32	35
12	800	378	—	16	—	23	28	21	24	—	28	28
	1200	566	—	20	—	26	31	21	26	—	32	32
	1600	755	19	26	29	31	34	22	25	28	31	35
	2000	944	22	30	—	37	38	24	27	—	31	35
14	1100	519	—	16	—	24	29	24	27	—	28	31
	1600	755	—	19	—	25	30	25	30	—	32	33
	2100	991	17	24	27	30	34	24	30	33	35	37
	3000	1416	24	30	—	38	42	30	34	—	36	40
16	1400	661	—	21	—	28	32	25	28	—	32	33
	2100	991	18	25	—	30	34	25	30	—	34	35
	2800	1321	20	27	30	32	36	27	31	34	36	38
	4000	1888	26	32	—	38	42	30	33	—	38	40

**Notes:**

1. "—" represents NC levels below NC15.
2. NC values are calculated using modeling assumptions based on AHRI 885-98-02 addendum.
3. Data at 1.5-inch inlet pressure constitutes AHRI 880-2011 standard rating conditions. Data at 0.5, 1.0, 2.0 and 3.0-inch are application ratings. These ratings are outside the scope of the certification program.
4. Where  $\Delta$ Ps is the inlet static pressure minus discharge static.



# Controls

## Tracer Building Automation System

Tracer® Building Automation Systems confirm comfort within your building.

Building controls have a bigger job description than they did a few years ago. It is no longer enough to control heating and cooling systems and equipment. Sophisticated buildings require smarter technology that will carry into the future. Tracer controls provide the technology platform – mobile, easy-to-use, cloud-based, scalable and open - for the next generation of data-driven, technology-enabled services that are creating high performance buildings.

With a Trane Tracer® Building Automation System, you will:

- Reduce operating costs through energy management strategies.
- Consistently provide occupant comfort.
- Enjoy reliable operation with standard, pre-engineered, and pretested applications.
- Easily troubleshoot and monitor either on site or from a remote location.
- Reduce installation time and simplify troubleshooting.

Whether factory-mounted or field-installed, Trane offers a wide range of controllers to suit virtually any application. These units are compatible with a variety of building types and can be used for new construction or renovation. Through extensive usability testing internally and with building operators, we've designed our controls for real world ease of use.

### Tracer BACnet Controllers

Trane offers a full line of programmable BACnet® controllers designed for simple integration into any system which can communicate via the BACnet® protocol. These controllers are factory-downloaded/factory-programmed, commissioned, and shipped ready for the VAV units to be installed.

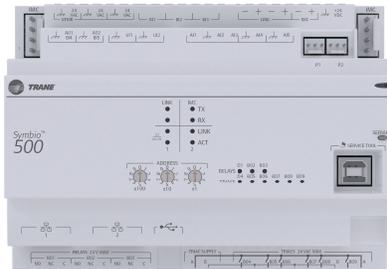
Symbio™ 210 BACnet® Controller



Symbio™ 210e BACnet® Controller



Symbio™ 500 Controller



UC210 BACnet® Controller



See DDC Controls chapter for additional control options and sequence-of-operations.

Trane DDC controllers provide Trane-designed solid-state electronics intended specifically for temperature and ventilation control in space comfort applications. DDC control capabilities include:

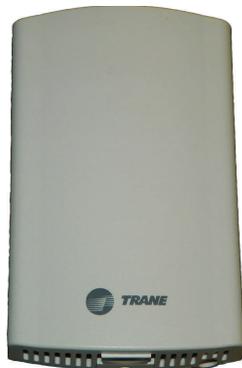
- Pressure-independent (PI) operation—Provides airflow required by the zone temperature sensor to maintain occupant comfort. The controller automatically adjusts valve position to maintain required airflow. Minimum and maximum airflow is factory-set and field-adjustable.
- Factory-set airflow and temperature setpoints.

## Air-Fi® Wireless System

For more detailed information on Air-Fi® Wireless systems and devices, see:

- *Air-Fi® Wireless Systems - Installation, Operation, and Maintenance* (BAS-SVX40\*-EN)
- *Air-Fi® Wireless Product Systems - Product Data Sheet* (BAS-PRD021\*-EN)
- *Air-Fi® Network Design - Installation, Operation, and Maintenance* (BAS-SVX55\*-EN)

### Air-Fi® Wireless Communications Interface (WCI)



A factory-installed Air-Fi® Wireless Communications Interface (WCI) provides wireless communication between the Tracer® SC, Tracer® UC210, Symbio™ 210/Symbio™ 210e/ Symbio™ 500 VAV unit controllers and optionally, Air-Fi® Wireless Communication sensors.

The Air-Fi® WCI's wireless mesh network is the perfect alternative to a wired communication link. Eliminating the low-voltage wire between the zone sensor and the terminal unit controller, and between the unit controllers and the system controller will:

- Reduced installation time and associated risks.
- Completion of projects with fewer disruptions.
- Easier and more cost-effective re-configurations, expansions, and upgrades.

### Air-Fi® Wireless Communication Sensor (WCS)



The Wireless Communications Sensor (WCS) communicates wirelessly to a Tracer® BACnet® unit controller that has an Air-Fi® WCI installed. A WCS is an alternative to a wired sensor when access and routing of communication cable are issues. It also allows flexible mounting and relocation. Also available are a non-display version of the WCS with a temperature setpoint knob, an occupancy / CO<sub>2</sub> sensor / zone temperature version of the WCS, and a relative humidity (RH) sensor add-on daughter board accessory.

## Factory-installed vs. Factory-commissioned

The terms factory-installed and factory-commissioned are often used interchangeably. Trane takes great pride in being the industry leader in factory-commissioned DDC controllers. The following table differentiates these concepts.

Factory-commissioned controllers provide the highest quality and most reliable units for your system. Additional testing verifies proper unit operation including occupied/unoccupied airflow and temperature setpoints, communication link functionality, and output device functionality. The benefits of factory-commissioning are standard on VariTrane™ terminal units with Trane DDC controls. This means that factory-commissioned quality on VariTrane™ units is now available on ANY manufacturer's control



## Controls

system that can communicate using the LonMark® Space Comfort Control (SCC) protocol or the BACnet® protocol. (See Controls section for complete listing of variables which are communicated.)

**Table 11. Factory-installed vs. factory-commissioned**

	Factory-installed	Factory-commissioned
Transformer installed (option)	X	X
Wires terminated in reliable/consistent setting	X	X
Controller mounted	X	X
Electric heat contactors and fan relay wired	X	X
Testing of electric heat contactors and fan relay	—	X
Controller addressing and associated testing	—	X
Minimum and Maximum airflows settings (occupied/unoccupied)	—	X
Minimum and Maximum temperature setpoints (occupied/unoccupied)	—	X
Minimum ventilation requirements	—	X
Heating offset	—	X
Trane Air-Fi® wireless communications modules (WCI)	X	X
Trane Air-Fi® Wireless Communications Sensor (WCS)	—	—
Duct temperature sensor	X	X
Pre-wired water valve harness	X	X



## Electrical Data

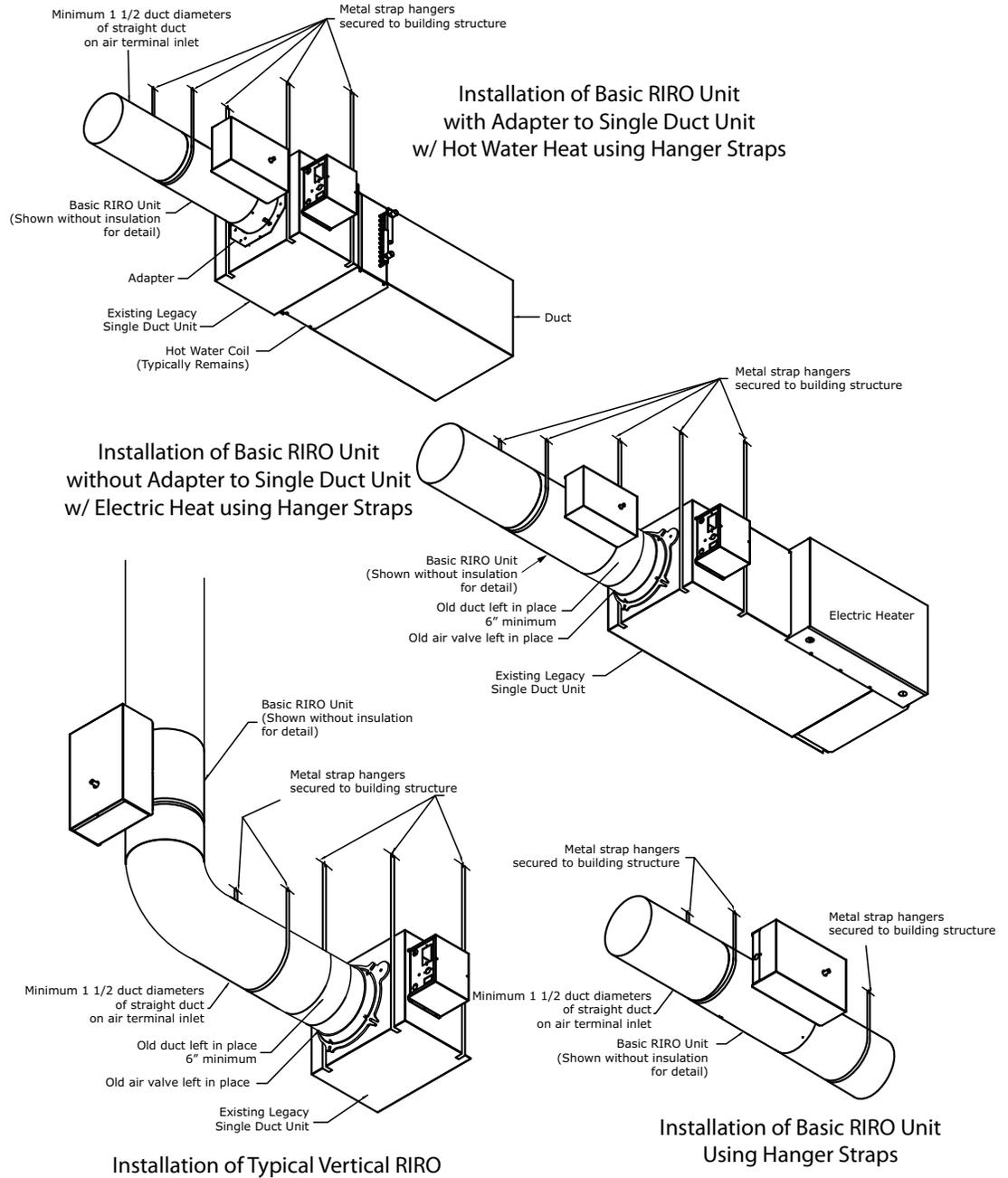
VRRF units are available with optional class 2, 50 VA, 50/60 Hz unit controls transformer available in the following line voltages:

- 120 Vac
- 208 Vac
- 240 Vac
- 277 Vac
- 347 Vac
- 380 Vac
- 480 Vac
- 575 Vac

# Jobsite Connections

Reference *VariTrane™ Round Inlet/Round Outlet (VRRF) Installation, Operation and Maintenance (VAV-SVN09\*-EN)* for detailed jobsite connections. See below for some common installations.

**Figure 9. Common VRRF installations**



# Dimensional Data

Figure 10. Unit dimensions

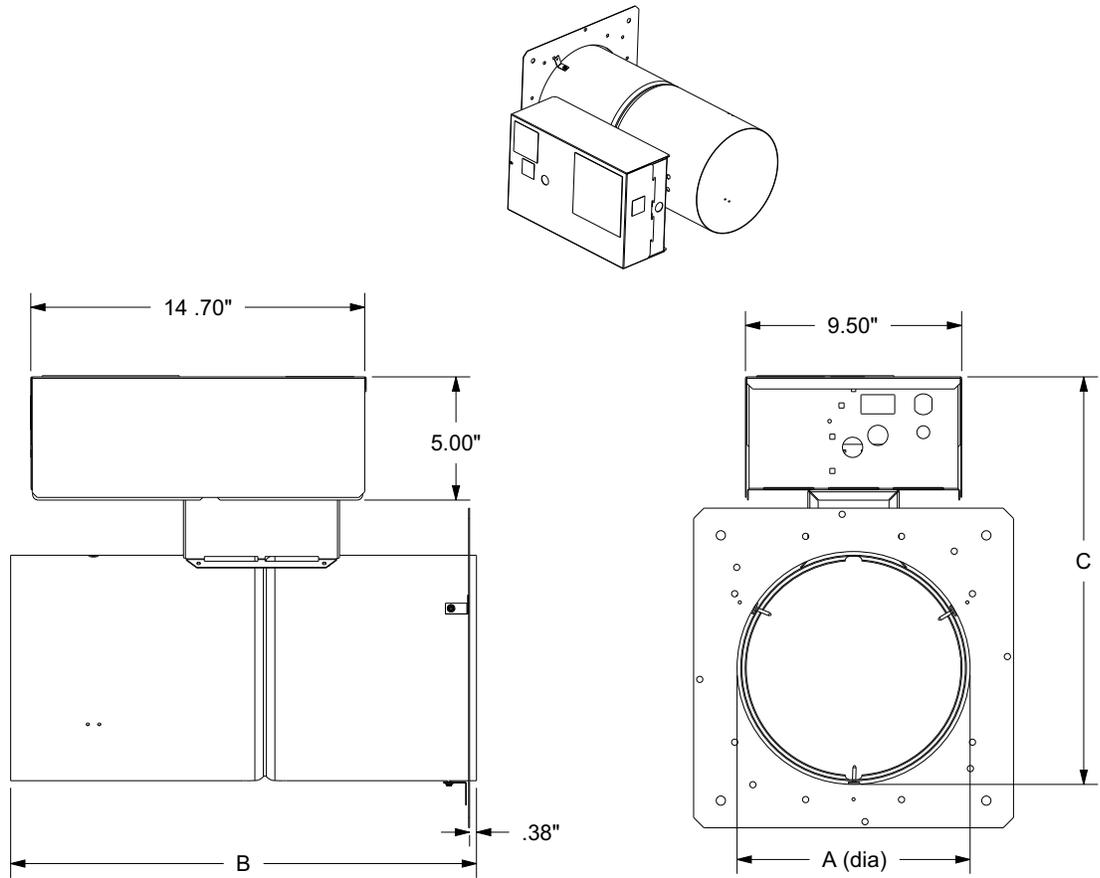


Table 12. Unit dimensions (in.)

Damper Size	A	B <sup>(a)</sup>	C	Nominal CFM	Unit Weight (lb)	Adapter Panel Weight (lb)
0 (Control Box Only) <sup>(b)</sup>	—	—	—	—	4.75	—
4 <sup>(c)</sup>	4.000	21	13	225	21	0.5
5 <sup>(c)</sup>	5.000	21	13	350	21	0.5
6	5.875	21	13	500	20	0.5
8	7.875	21	15	900	22	0.8
10	9.875	21	17	1400	24	1.4
12	11.875	21	19	2000	25	1.6
14	13.875	21	21	3000	27	1.6
16	15.875	21	23	4000	30	1.9

<sup>(a)</sup> Table values do not include adapter. The adapter increases B dimension by 2.50-inch.

<sup>(b)</sup> Control box dimensions on the Size 0 unit are the same as those shown in graphic above for all VRRF units that include damper.

<sup>(c)</sup> Size 4 and 5 require a reducer that will increase the B dimension. One or two reducers may be required depending on application. (Not shown in diagram.)



# Weights

**Table 13. Unit weights**

Damper Size (in.)	Unit Weight (lb)	Adapter Panel Weight (lb)
0 (Control Box Only)	4.75	—
4	21	1.6
5	21	1.6
6	20	1.6
8	22	2.1
10	24	2.6
12	25	3.3
14	27	3.7
16	30	4.3



# Mechanical Specifications

## Agency Listing

Unit is UL and Canadian UL Listed as a room air terminal unit. Control # 9N65. AHRI 880 Certified.

## Primary Air Valve

**Air Valve Round** — The primary (ventilation) air inlet connection is an 18-gauge galvanized steel cylinder sized to fit standard round duct. A multiple-point, averaging flow sensing ring is provided with balancing taps for measuring +/-5% of unit cataloged airflow. An airflow-versus-pressure differential calibration chart is provided. The damper blade is constructed of a closed-cell foam seal that is mechanically locked between two 22-gauge galvanized steel disks. The damper blade assembly is connected to a cast zinc shaft supported by self-lubricating bearings. The shaft is cast with a damper position indicator. The valve assembly includes a mechanical stop to prevent over-stroking. See for air leakage performance data.

## Direct Digital Controls

**DDC Actuator** — Trane 3-wire, 24-Vac, floating-point quarter turn control actuator with linkage release button. Actuator has a constant drive rate independent of load, a rated torque of 35 in-lb, a 90-second drive time, and is non-spring return. Travel is terminated by end stops at fully-opened and -closed positions. An integral magnetic clutch eliminates motor stall.

**DDC Actuator (Belimo)** — LMB24-3-T TN 3-wire, 24 Vac/Vdc, floating-point, quarter turn actuator with linkage release button. Actuator has constant drive rate independent of load, rated torque 45 in-lb, 95 sec drive time, and non-spring return. Travel is terminated by end stops at fully-opened and -closed positions. Internal electronic control prevents motor stall when motor reaches end stops.

**Direct Digital Controller** — Microprocessor-based terminal unit controllers provide accurate, pressure-independent control through the use of proportional integral control algorithm and direct digital control technology.

Controllers monitor zone temperature setpoints, zone temperature, zone temperature rate of change, and valve airflow. They can also monitor supply duct air temperature, CO<sub>2</sub> concentration and discharge air temperature via appropriate sensors. The controller monitors zone temperature setpoints, current zone temperature and its rate of change, and valve airflow using a differential pressure signal from the pressure transducer. Additionally, the controller can monitor either supply duct air temperature or CO<sub>2</sub> concentration via appropriate sensors. Controller is provided in an enclosure with 7/8-inch (22mm) knockouts for remote control wiring. Trane UCM zone sensor or Air-Fi® Receiver Interface Module paired with a Wireless Communications Sensor (WCS) is required.

Single duct units can use any of the following optional Trane unit controllers: Symbio™ 500, Symbio™ 210, Symbio™ 210e, Tracer® UC210.

Dual duct units use the following controller:

Symbio™ 500.

Additionally, VAV units may ship less controls or with factory mounted 3rd party unit controllers.

**DDC Zone Sensor** — The UCM controller senses zone temperature through a sensing element located in the zone sensor. In addition to the sensing element, zone sensor options may include an externally-adjustable setpoint, communications jack for use with a portable edit device, and an override button to change the individual controller from unoccupied to occupied mode. The override button has a cancel feature that will return the system to unoccupied. Wired zone sensors utilize a thermistor to vary the voltage output in response to changes in the zone temperature. Wiring to the UCM controller must be 18- to 22-awg. twisted pair wiring. The setpoint adjustment range is 50 to 88°F (10 to 31°C). Depending upon the features available in the model of sensor selected, the zone sensor may require from a 2-wire to a 5-wire connection. Wireless zone sensors report the same zone information as wired zone sensors, but do so using radio transmitter technology. Therefore with wireless, wiring from the zone sensor to the controller is unnecessary.

**Digital Display Zone Sensor with Liquid Crystal Display (LCD)** — Digital display zone sensor contains a sensing element, which signals the controller. A Liquid Crystal Display (LCD) displays setpoint or zone temperature. Sensor buttons allow user to adjust setpoints, and allow zone



## Mechanical Specifications

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temperature readings to be turned on or off. Digital display zone sensor also includes a communication jack for use with a portable edit device, and an override button to change from unoccupied to occupied. Override button cancel feature returns system to unoccupied mode.

**Digital Display Zone Sensor with Liquid Crystal Display (LCD)** — Digital display zone sensor contains a sensing element, which signals the UCM. A Liquid Crystal Display (LCD) displays setpoint or zone temperature. Sensor buttons allow user to adjust setpoints, and allow zone temperature readings to be turned on or off. Digital display zone sensor also includes a communication jack for use with a portable edit device, and an override button to change UCM from unoccupied to occupied. Override button cancel feature returns system to unoccupied mode.

**Digital Display Zone Sensor with Liquid Crystal Display (LCD)** — A Liquid Crystal Display (LCD) displays setpoint or zone temperature. Sensor buttons allow user to adjust setpoints, and allow zone temperature readings to be turned on or off. Digital display zone sensor also includes a communication jack for use with a portable edit device, and an override button to change UCM from unoccupied to occupied. Override button cancel feature returns system to unoccupied mode.

**System Communications** — The Controller is designed to send and receive data from a Tracer® SC or other Trane controllers. Current unit status conditions and setpoints may be monitored and/or edited via this data communication feature. The network type is a twisted wire pair shielded serial communication.

## Control Options

**Transformer (VCCF, VCWF)** — A 50-VA transformer is factory-installed in an enclosure with 7/8-inch (22 mm) knockouts to provide 24 VAC for controls.

**Disconnect Switch (VCCF, VCWF)** — A toggle disconnect disengages primary power to terminal.

**Fuse (VCCF, VCWF)** — Optional fuse is factory-installed in the primary voltage hot leg.

## Trane Hot Water Valves

**Two-Position Valve** — The valve is a field-adaptable, 2-way or 3-way configuration and ships with a cap to be field-installed when configured as a 2-way valve. All connections are National Pipe Thread (NPT). Valve body is forged brass with stainless steel stem and spring. Upon demand, the motor strokes the valve. When actuator drive stops, a spring returns valve to its fail-safe position.

Flow Capacity – 4.00 Cv  
Overall Diameter – ½" NPT  
Close-off Pressure – 25 psi (172 kPa)

Flow Capacity – 5.0 Cv  
Overall Diameter – ¾" NPT  
Close-off Pressure – 20 psi (138 kPa)

Flow Capacity – 8.0 Cv  
Overall Diameter – 1" NPT  
Close-off Pressure – 17 psi (117 kPa)

Maximum Operating Fluid Temperature – 200°F (93°C)  
Maximum system pressure – 300 psi (2067 kPa)  
Electrical Rating – 7 VA at 24 Vac, 6.5 Watts, 50/60 Hz

**Proportional Modulating Water Valve** — The valve is a field-adaptable, 2-way or 3-way configuration and ships with a cap over the bottom port. This configures the valve for 2-way operation. For 3-way operation, remove the cap. The valve is designed with an equal percentage plug. The intended fluid is water or water and glycol (50 percent maximum glycol). The actuator is a synchronous motor drive. The valve is driven to a predetermined position by the UCM controller using a proportional plus integral control algorithm. If power is removed, the valve stays in its last position. The actuator is rated for plenum applications under UL 94-5V and UL 873 standards.

*Pressure and Temperature Ratings* – The valve is designed and tested in full compliance with ANSI B16.15 Class 250 pressure/temperature ratings, ANSI B16.104 Class IV control shutoff leakage, and ISA S75.11 flow characteristic standards.

*Flow Capacity* – 0.7 Cv, 1.7 Cv, 2.7 Cv, 5.0 Cv, 6.6 Cv, 8.0 Cv  
*Overall Diameter* – ½-inch NPT

*Maximum Allowable Pressure* – 300 psi (2068 kPa)

*Maximum Operating Fluid Temperature* – 200°F (93°C)

*Maximum Close-off Pressure* – 60 psi (379 kPa)

*Electrical Rating* – 3VA at 24 Vac

8-inch plenum rated cable with AMP Mate-N-Lok connector. This connector is designed to mate with the optional factory mounted valve harness to make electrical connection quick and simple (120-inch plenum rated cable with quick connect tabs for control board interface).



The AHRI Certified mark indicates Trane U.S. Inc. participation in the AHRI Certification program. For verification of individual certified products, go to [ahridirectory.org](http://ahridirectory.org).

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