

For all VariTrane units, the unit controller continuously monitors the zone temperature and varies the primary airflow as required to meet zone setpoints. Airflow is limited by adjustable minimum and maximum setpoints.

Additionally, for series fan-powered units, the controller will start and run the fan continuously during the occupied mode and intermittently during the unoccupied mode. Upon a further call for heat, any hot water or electric heat associated with the unit is enabled.

For parallel fan-powered units, the controller energizes the fan upon a call for heat. Upon a further call for heat, reheat is enabled.

FAN SPEED CONTROL

Variable Speed Control Switch (SCR)—The SCR speed control device is standard on all fan-powered units. The SCR adjusts the fanspeed and provides simplified system balancing.

DIRECT DIGITAL CONTROLS (DDC)

LonMark Direct Digital Controller—

Trane-designed LonMark certified controller uses the space comfort control (SCC) profile to exchange information over a LonTalk Network. LonMark networks provide the latest open protocol technology

Direct Digital Controller—The microprocessor-based terminal unit controller provides accurate, pressure-independent control through the use of a proportional integral control algorithm and direct digital control technology. The UCM, monitors zone temperature setpoints, zone temperature, the rate of temperature change, and valve airflow. With the addition of optional sensors, room occupancy or supply duct air temperature can be monitored. The controller is provided in an enclosure with 7/8" (22 mm) knockouts for remote control wiring. A Trane DDC zone sensor is required.

DDC Actuator—Trane 3-wire, 18-gage, 24-VAC, floating-point control actuator with linkage release button. Torque is 35 in.-lb minimum and is non-spring return with a 90-second drive time. Travel is terminated by end stops at fully opened and closed positions. An integral magnetic clutch eliminates motor stall.

DDC Zone Sensor—The UCM controller measures zone temperature through a sensing element located in the zone sensor. Other zone sensor

options may include an externally-adjustable setpoint, communications jack for use with a portable service tool, 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 50–88°F (10–31°C) Depending upon the features available in the model of sensor selected, the zone sensor may require from a 2-wire to a 7-wire connection. Wireless zone sensors report the same zone information as wired zone sensors, but do so using radio transmitter technology. No wiring from the zone sensor to the UCM controller is necessary.

Digital Display Zone Sensor with Liquid Crystal Display (LCD)—

The direct digital zone sensor contains a sensing element which sends a signal to the UCM. A Liquid Crystal Display (LCD) indicates setpoint, or space temperature. Sensor buttons allow setpoint adjust, and allow space temperature readings to be turned on or off. The digital display zone sensor also includes a communication jack, for use with a portable edit device, and an override button to change the UCM from unoccupied to occupied. The override button has a cancel feature, which returns the system to unoccupied mode.

The digital display zone sensor requires seven wires, one for 24-VAC power.

System Communications—The Controller UCM sends and receives data from a Tracer Summit or other Trane Controller. Current unit status and setpoints may be monitored and/or edited via this data communication feature. The network type is a twisted wire pair shielded serial communication.

The following direct digital control features are available with VariTrane terminal units:

- Controls Option – DD00: Trane actuator for field-installed DDC controllers
- Controls Option – DD01: Cooling Only (DDC/UCM)
- Controls Option – DD02: Cooling with Normally-Closed On/Off hot water valve (Normally-Open outputs) (DDC/UCM)

- Controls Option – DD03: Cooling with proportional hot water valve with optional spare On/Off Output) (DDC/UCM)
- Controls Option – DD04: Cooling with staged On/Off electric heat (DDC/UCM)
- Controls Option – DD05: Cooling with pulse-width modulation electric heat (DDC/UCM)
- Controls Option – DD07: Cooling with Normally-Open On/Off hot water valve (Normally-Closed outputs) (DDC/UCM)
- Controls Option – DD08: Cooling and Heating - Dual-Duct Constant Volume (DDC/UCM)
- Controls Option – FM00: Factory installation of customer supplied actuator and DDC controls. Controls supplier is responsible for providing factory-installation and wiring instructions.
- Controls Option – FM01: Trane actuator with factory installation of customer supplied DDC controls. Controls supplier is responsible for installing and wiring instructions.
- Controls Option – ENON: Shaft only for field-installation of customer-supplied actuator and controls.

The following override commands may be received by the Unit Control Module (UCM) from the Tracer Summit or other Trane Controllers.

- Control Mode – The UCM Control Mode may be edited from occupied to unoccupied to accommodate night setback/setup.
- Control Action – The Control Action may be edited from cooling to heating, changing the primary air damper to a heating source. This will accommodate a cooling/heating changeover system.
- Control Offset – Enabling Control Offset will increase the cooling temperature setpoint and decrease the heating temperature setpoint by a control-offset value (Stored at limiting in the occupied mode).
- Drive damper fully open
- Drive damper fully closed
- Drive damper to maximum airflow setpoint
- Drive damper to minimum airflow setpoint
- Disable unit heat
- Reset-Enabling the reset function forces the controller and the flow sensor to recalibrate
- Programmable hot water valve drive time
- Programmable air damper drive time

The following unit setpoints reside in the UCM in nonvolatile memory. These setpoints are editable from the Tracer via the communications link.

- Occupied cooling temperature setpoint (60–80°F (15–26°C))
- Occupied heating temperature setpoint (60–80°F (15–26°C))
- Unoccupied cooling temperature setpoint (60–100°F (15–37°C))
- Unoccupied heating temperature setpoint (30–100°F (15–37°C))
- Minimum cooling flow setpoint (0, 10–110% of unit equivalent nominal airflow)
- Minimum heating flow setpoint (0, 10–110% of unit equivalent nominal airflow)
- Maximum flow setpoint (0, 50–100% of unit equivalent nominal airflow)
- Fan Control Offset – This determines at what operating point the fan in a parallel fan-powered unit is energized. This can be specified as a function of temperature, degrees above heating setpoint, or primary airflow (0–10°F (-17–12°C) or 0,10–100% of unit equivalent nominal airflow).
- Heating Setpoint Offset – This determines at what point the first stage of reheat turns on. Expressed in degrees below cooling setpoint. (Only applicable when local thumbwheel is enabled.)
- Zone temperature, auxiliary temperature, and zone setpoint calibration corrections (adjustable from +/-10.0°F (+/- 12°C)).
- Flow measurement calibration correction (50–150%)
- Cooling Setpoint Low Limit – Applies low limit to programmed occupied cooling setpoint or zone sensor cooling setpoint (30–100°F (-1–37°C)).
- Heating Setpoint High Limit – Applies high limit to programmed occupied heating setpoint or zone sensor heating setpoint (30–100°F (-1–37°C)).
- RTD / Thermistor – Determines what type of zone temperature sensor will be used.
- Occupied and Unoccupied Outside Air Requirements – Determines the percent of outdoor air required in the zone for air quality requirements.
- Series Fan Configuration – allows option of series fan-powered box to shut off fan and close air valve when unit is unoccupied. Fan will operate in unoccupied mode if reheat is active.
- Heating setpoint low limit.

- Cooling setpoint high limit.
 - Local heating flow setpoint enable/disable and setpoint.
 - Auxiliary analog input mode select for either auxiliary temperature sensor or CO₂ detector.
 - Binary input mode select for either generic or occupancy detector.
- In addition to the above setpoints, the following status information can be transmitted to the Tracer Summit or other Trane Controllers.
- Active cooling temperature setpoint
 - Active heating temperature setpoint
 - Current unit primary airflow
 - Current zone temperature
 - Re-heat status (On/Off)
 - Auxiliary Air Temperature – Available only if the unit has an auxiliary temperature sensor.
 - Failure Indicators – The UCM will indicate the following:
 - Temperature Sensor Failure
 - Flow Sensor Failure
 - Local Zone Sensor Setpoint Failure

- Ventilation Ratio
- Fan Status (on/off)
- Calibration Status (calibration/not-calibrating)
- BIP state
- CO₂ Concentration – Available only if the unit has an auxiliary CO₂ sensor. This mode and auxiliary air temperature are mutually exclusive.

ANALOG (Non-Communicating)

Analog Controller—The controller consists of a circuit board that offers basic VAV unit operation and additional override functions and operates using 24-VAC power. The controller uses a capacitive type pressure transducer to maintain consistent air delivery regardless of system pressure changes in an enclosure with 7/8" (22 mm) knockouts for remote control wiring. A Trane electronic zone sensor is required.

Analog Actuator—A Trane 3-wire, 18-gage, 24-VAC, floating-point control actuator with linkage release button. Torque is 35 in.-lb minimum and is non-spring return with a 90-second drive time. Travel is terminated by end stops at fully-opened and -closed positions. An integral magnetic clutch eliminates motor stall.

Analog Thermostat—This single-temperature, wall-mounted electronic device utilizes a thermistor to vary the voltage output in response to changes in the zone temperature. Connections

to the VAV unit circuit board are made using standard three-conductor thermostat wire. The setpoint adjustment range is 63–85°F. (17–29°C) The sensor is available in two models. One model has a concealed, internally-adjustable setpoint. The other model has an externally-adjustable setpoint.

The following analog electronic control features are available with VariTrane terminal units:

- Controls Option—EI05: Cooling with remote or unit installed reheat
- Controls Option—EI28: Cooling with remote or unit-installed reheat—Auto Dual Minimum
- Controls Option—EI29: Cooling with remote or unit-installed reheat—Constant-Volume
- Controls Option—EI71: Cooling with remote or unit-installed reheat—Duct Pressure Switch
- Controls Option—ENON: Shaft only for field-installation of actuator and DDC controls

PNEUMATIC CONTROLS

Normally-Open Actuator—

Pneumatic 3 to 8 psig (20 to 55 kPa) spring-range pneumatic actuator.

Normally-Closed Actuator—

Pneumatic 8 to 13 psig (55 to 90 kPa) spring-range pneumatic actuator.

3011 Pneumatic Volume Regulator (PVR)—

The regulator is a thermostat reset velocity controller, which provides consistent air delivery within 5% of cataloged flow down to 15% of unit cataloged cfm, independent of changes in system static pressure. Factory-calibrated, field-adjustable setpoints for minimum and maximum flows. Average total unit bleed rate, excluding thermostat, is 28.8 scim at 20 psig (7.87 ml/min at 138 kPa) supply.

3501 Pneumatic Volume Regulator (PVR)—

The 3501 regulator is a linear-reset volume controller. This PVR is used to maintain a constant volume of airflow from the dual-duct unit when constant volume control is used. Average total unit bleed rate, excluding thermostat, is 43.2 scim at 20 psig (11.8 mL/min at 138 kPa) supply.

Considerations for Pneumatic Thermostat—

Field-supplied and -installed based on chosen control options, a direct-acting or a reverse-acting, one-pipe or two-pipe pneumatic room thermostat will control the available air valve, reheat and fan switch to maintain room temperature setpoint.

The following pneumatic control features are available with VariTrane terminal units:

- Controls Option – PN00: Cooling with Normally-Open damper and actuator only (Reverse-Acting Thermostat)
- Controls Option – PN04: Cooling with hot water reheat, Normally-Open damper, 3011 PVR (Direct-Acting Thermostat)
- Controls Option – PN05: Cooling with electric reheat, Normally-Open damper, 3011 PVR (Reverse-Acting Thermostat)
- Controls Option – PN08: Cooling and Heating, Normally-Open dampers, actuators only (Reverse-Acting Thermostat)
- Controls Option – PN09: Cooling and Heating, Normally-Open dampers, 3011 PVR's (Direct-Acting Thermostat)
- Controls Option – PN10: Cooling and Heating, Normally-Open dampers, 3501 PVR's, Dual-Duct Constant Volume (Direct-Acting Thermostat)
- Controls Option – PN11: Cooling with hot water reheat, Normally-Open damper, 3011 PVR - Auto Dual Minimum (Direct-Acting Thermostat) (N.O. Water Valve)
- Controls Option – PN32: Cooling with hot water reheat, Normally-Open damper, 3011 PVR - Constant Volume (Direct-Acting Thermostat)
- Controls Option – PN34: Cooling with electric reheat, Normally-Open damper, 3011 PVR - Constant Volume (Reverse-Acting Thermostat)
- Controls Option – PN51: Cooling with reheat, Normally-Open damper, 3011 PVR Duct Pressure Switch (Reverse-Acting Thermostat)
- Controls Option – PN52: Cooling with reheat, Normally-Open damper, 3011 PVR - Dual Pressure Minimum (Reverse-Acting Thermostat)
- Controls Option – PC00: Cooling Only with Normally-Closed damper - Direct-Acting Thermostat
- Controls Option – PC03: Cooling and Heating, Normally-Closed heating damper, Normally-Open cooling damper, actuators only - Direct-Acting Thermostat

- Controls Option – PC04: Cooling with hot water reheat, Normally-Closed damper, 3011 PVR - Direct-Acting Thermostat
- Controls Option – PC05: Cooling with electric reheat, Normally-Closed damper, 3011 PVR - Reverse-Acting Thermostat

OPTIONS

Power Fuse (cooling only and hot water units, and VDDF)—An optional fuse is factory-installed in the primary voltage hot leg.

Transformer (Standard on fan-powered, optional on VCCF, VCWF, VDDF)—The 50-VA transformer is factory-wired and installed in an enclosure with 7/8" (22 mm) knockouts to provide 24 VAC for controls.

Wireless Zone Sensor/Receiver—Factory mounted Receiver with field mounted Sensor accessory eliminates the need for the wiring between the zone sensor and unit level controller. See specifications on Page C67.

Disconnect Switch (Optional on VCCF, VCWF, VDDF)—Disengages power.

HOT WATER VALVES

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

Flow Capacity – 1.17 Cv,
Overall Diameter – 1/2" NPT
Close-Off Pressure – 30 psi (207kPa)

Flow Capacity – 3.0 Cv,
Overall Diameter – 3/4" NPT
Close-Off Pressure – 14.5 psi (100kPa)

Flow Capacity – 6.4 Cv
Overall Diameter – 1" NPT
Close Off Pressure – 9 psi (62kPa)

Maximum Operating Fluid Temperature – 203°F (95°C)

Maximum System Pressure – 300 psi (2067kPa)

Maximum Static Pressure – 300 psi (2067kPa)

Electrical Rating – 7VA at 24 VAC, 6.5 Watts, 50/60Hz

8 feet (2.44 m) of plenum rated wire lead is provided with each valve.

Proportional Water Valve—The valve is a field-adaptable for 2-way or 3-way piping arrangement. The valve is designed with an equal percentage plug. The intended fluid is water or water and glycol (50% 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 – 7.30 Cv, 4.60 Cv, 1.80 Cv, and 0.79 Cv

Overall Diameter – 1/2" NPT, 3/4" NPT (7.30 Cv)

Maximum Allowable Pressure – 345 psi (2415 kPa)

Maximum Operating Fluid Temperature – 281°F (138°C)

Maximum Close-Off Pressure – 55 psi (379 kPa)

Electrical Rating – 4VA at 24 VAC

10 feet (3.05 m) of plenum rated 22-gage wire for connection. Terminations are #6 stabs.

DDC RETROFIT KIT (VRTO)

The kit consists of a Trane DDC Unit Control Module (UCM) VAV terminal unit controller and a pressure transducer installed in a metal enclosure. The mechanical specifications of accessories such as DDC zone sensors, hot water valves, and transformers are found elsewhere in this section.

RETROFIT KIT OPTIONS

Flow Bar Sensor—The flow bar sensor is a multiple-point, averaging, pitot tube type flow sensor. It is intended for field installation on terminal units that have no flow measurement device. The total and static pressure outputs of the sensor are field-piped to the high and low inputs of the pressure transducer in the retrofit kit.

Retrofit Kit Actuator—The electric actuator is a direct-coupled type actuator that utilizes three-wire, floating-point control. The actuator is field-installed to the damper shaft and field-wired to the controller.

Trane Actuator—Actuator is rated at 4 VA at 24 VAC. Drive time is 90 seconds with 35 in.-lb (4 N-m).

Retrofit Actuator—Actuator is rated at 3 VA at 24 VAC. Drive time is 80 to 110 seconds for 0 to 35 in.-lb (0 to 4 N-m).

Other options available:

- DDC Zone Sensors
- 2-Position & Modulating Water Valves
- Control Transformer (Ships loose with mounting plate for 4x4 junction box)
- Auxiliary Temperature Sensor
- Zone Occupancy Sensors
- Co2 Sensors (Room- or duct-mounted)

Wireless Zone Sensor Specifications

Sensor Operating Temperature	32 to 122°F (0 to 50°C)
Receiver Operating Temperature	-40 to 158°F (-4 to 70°C)
Storage Temperature	-40 to 185°F (-4 to 85°C)
Storage and Operating Humidity Range	5% to 95%, non-condensing
Accuracy	0.5°F over a range of 55 to 85°F (12.8 to 29.4°C)
Resolution	±0.125°F over a range of 60 to 80°F (15.56 to 26.67°C) ±0.25°F when outside this range
Setpoint Functional Range	-45 to 95°F (7.22 to 35°C)
Setpoint Thumbwheel Markings	50 to 85°F (stamped every 5°F) and *, **, 11 to 29°C (stamped every 3°C) and *, **,
Receiver Voltage	24V Nominal AC/DC ±10%
Receiver Power Consumption	<1 VA
Housing	Polycarbonate/ABS blend, suitable for plenum mounting, UV protected, UL 94: 5VA flammability rating
Mounting	3.24 in. (82.55 mm) for 2 mounting screws (supplied)
Sensor Battery	(2) AA, 1.5V, 2800 mAh, Lithium, 5-year life
Range ¹	Open range—2,500 ft. (packet error rate = 2%) (762 m) Usable—200 ft (61 m) Typical—75 ft. (25 m)
Output Power	100 mW—North America 10mW—Outside North America
Radio Frequency	2.4 GHz (IEEE Std 802.15.4-2003 compliant)
Radio Channels	(2405-2480 MHz, 5 MHz spacing)
Address Range	16
Minimum Time Between Transmissions	000-999
Maximum Time Between Transmissions	30 Seconds
RoHS Compliance	15 Minutes
	Yes

¹ Range values are estimated transmission distances for satisfactory operation of the 100 mW version. Estimated transmission distance for the 10 mW version will be less. Actual distance is job specific and must be determined during site evaluation. Placement of the receiver and the sensor is critical to proper system operation. In most general office space installations, distance is not the limiting factor for proper radio signal quality. It is more greatly affected by walls, barriers and general clutter. In general, sheetrock walls and ceiling tiles offer little restriction to the propagation of the radio signal throughout the building as opposed to concrete or metal barriers.