

NT10 Series

RS-485 FLink Networking Room Thermostats with LCD for Fan Coil Units

Features

- Ultra slim wall-mount unit to match any decor
- Supports standalone operation on RS-485 communication failure. A power reset must be carried out on thermostat before this can take place.
- Fan coil application database pre-loaded
- Large easy-to-read Liquid Crystal Display (LCD), with LED backlight
- A stylish bi-directional rotating dial and two compact touch keys to provide ease of operation
- Choice of constant display of ambient temperature or temperature set point value
- Output relays employed for direct connection of valve actuators and 3-speed fan
- Configurable operating parameters
- Choice of °C or °F temperature display via parameter setup menu
- 2-wire on-off output models available
- Field adjustable high and low occupied set point limit settings
- Field adjustable cooling and heating unoccupied set point values (applicable to some models only)
- Choice to retain last entered settings on power resumption
- Dual-output on-off models with auto cooling/heating changeover (deadband operation) and manual override
- Adjustable 1 to 5 K deadband for dual-output models
- Unoccupied mode capability with field adjustable cooling and heating set points, not available to "1M" models.
- Choice of unoccupied mode activation in operating mode only or in both standby and operating modes
- Provides one additional digital input for function such as remote night

setback, service/filter alarm or motion detection

- Field recalibration capability of measured temperature
- Continuous or auto fan operation
- External and seasonal changeover temperature sensor capability
- Optional infra-red remote control unit
- Optional special faceplate color available on request

General

The NT10 Series RS-485 networking room thermostats use the communication technologies of Mega Controls FLink communication protocol to monitor and supervise fan coil units in the heating, ventilating and air-conditioning industry, and employ a simple master/slave protocol. All NT10 Series thermostats are slaves in this protocol, and can be under the control of a Mega Controls BACnet MS/TP gateway (BMG) called the master. The BMGs are native BACnet MS/TP devices and communicate using the BACnet MS/TP protocol.

The master and all slaves are daisy-chained through a RS-485 FLink network. The maximum number of NT10 slaves in a FLink network is 32.

The BMG has 2 addresses. Net 2 address is always 0 which is the address of the FLink network. Net 1 address is the MAC address of the BACnet MS/TP network which is also set up for a maximum of 32 devices in a trunk cable length not exceeding 1000 m.

If more than 32 BMGs are needed in the system, an additional BACnet system device is required for the second BACnet MS/TP network.



The NT10 Series thermostats cover a wide range of fan coil applications, including 2 and 4-pipe fan coils and direct connection to 3-speed fans. Temperature sensing can be from a built-in room sensor or a remote sensor.

A fan-speed control touch key allows control of a 3-speed fan. The speed control key has 4 positions: "Hi-Med-Low-Auto". In the "Hi", "Med" or "low" position, the fan runs continuously at the selected speed. In the "Auto" mode, the fan speed is temperature dependent and controlled automatically at 2 K differential increments from low to high speed.

Ordering

To order, specify complete model numbers.

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Specifications

Product Model Numbers	See Fig.1: NT10 Series Model Number Selection Guide
Power Requirements	110-230 V, +10% and -15%, 50/60 Hz
Operating temperature differential	Fixed at 1 K for both cooling and heating modes
Temperature Display Range	5-35°C in 0.5 K increments: accuracy ± 1 K (41-95°F in 0.5 R increments, accuracy ± 1 R)
Temperature Set Point Range	5-35°C in 0.5 K increments, initial factory setting at 22°C (41-95°F in 0.5 R increments)
Offset adjustment of temperature indication (field recalibration)	+2, +1, 0, -1 and -2 K (+2, +1, 0, -1 and -2 R) throughout the range, factory setting 0
Deadband of dual-output models	Adjustable 1 to 5 K(2 to 10 R) between cooling Mode and heating Mode, factory set at 3 K(6 R)
Auto fan temperature differential	At 2 K (2 R) increments. At ≥ 0 K, fan is on low speed in cooling mode and fan status in heating mode depends on choice of auto fan action.
Sensing Element	NTC thermistor, 10 k Ω @25°C; accuracy ± 0.5 K@25°C
Unoccupied Mode	Input signal from external voltage-free contact Always runs at "Low" fan when in operation
Unoccupied temperature set point range (not applicable to "1M" models)	Field adjustable 5-35°C (41-95°F) in 1 K (1 R) increments separately for cooling and heating; Factory settings: 16°C (61°F) for heating and 26°C (79°F) for cooling
Binary input	1 binary input for external voltage-free contacts
Digital Outputs	For Direct Connection of Valve Actuators (110-230 VAC) 1 Relay Output for 2-Pipe Models 2 Relay Outputs for 4-Pipe Models For Direct Connection to 3-speed Fans (110-230 VAC) 3 Relay Outputs
RS-485 Communication Speed	Baud rate fixed at 19200 bps
Device MAC Addressing	01-32 via parameter setup menu, factory set address "01"
Proprietary FCLink Network Guideline	Maximum 32 devices and maximum 1,000 m cable length
Enclosure	Material: Self-extinguishing, molded ABS Finish: Off white housing and dark grey faceplate
Electrical ratings	Valve output relays 110-230 V, 5 A resistive, 2 A inductive, 50/60 Hz Fan output relays For on-off and floating models 110-230 V, 5 A resistive, 2 A inductive, 50/60 Hz For 0-10 VDC models 110-230 V, 5 A resistive, 2 A inductive, 50/60 Hz Total rating 110 -230 V, 5 A maximum, 50/60 Hz
Ambient/Storage Temperature Limits	0 to 55°C/-30 to 50°C, 10 to 90% RH Non-condensing
Connectors	Non-removable line-voltage terminal blocks and removable low-voltage wire plugs
Power wires	Wire size 1 mm ² or 18 AWG solid copper recommended
RS-485 Communication Wires	22 or 24 AWG twisted shielded pair double-insulated cable
Sensor wires	22 AWG twisted shielded pair double-insulated cable
Accessories and options	See Figure 8: Optional Accessories
Agency approval	CE Mark compliant to EMC and Low Voltage Directives
Shipping weight	0.78 kg (1.7 lb)
Dimensions	See Figure 4: Dimensions in mm

*The performance specifications above are nominal and subject to tolerances and application variables of generally acceptable industry standards.
The manufacturer shall not be liable for damages resulting from misapplication or misuse of its products.*

Figure 1: NT10 Series Model Number Selection Guide

NT10 Series RS-485 Networking Room Thermostats Model Number Selection Guide (Complete Sets)					
NT1	0	–	1M	R	
Product Type	Power Supply	Separator	Control Type	Options	
NT1 = NT10 Series RS-485 Networking Room Thermostats	0 = 110-230 VAC		1 = Single 2-wire on-off output, cool only or heat only 1M = Single 2-wire on-off output, manual cool/heat changeover 2 = Dual 2-wire on-off outputs, manual or Auto cool/heat changeover	R = with infra-red receiver for RCU-1 W = with all-white NCU enclosure	

Power Supply Unit Model Number Selection Guide				
PSU1	0	–	1	M
Product Type	Power Supply	Separator	Number of Outputs	Seasonal Changeover
PSU1 = Power Supply Units for NT10 Series	0 = 100-230 VAC		1 = Single output 2 = Dual outputs	Nil = Auto by external sensor M = Manual

Networking Control Unit Model Number Selection Guide					
NCU	–	1	M	–	R
Product Type	Separator	Number of Outputs	Seasonal Changeover	Separator	Options
NCU = Network Control Units for NT10 Series		1 = Single output 2 = Dual outputs	Nil = Auto on 4-pipe system or by external sensor On 2-pipe system M = Manual		Nil = No option R = with IR receiver for RCU-1 W = with all-white NCU enclosure

Figure 2: NT10 Series Application Guide

Model Numbers	Outputs	Applications	Cooling/Heating Mode	External Seasonal Changeover	System Modes	Fan Control	Unoccupied Mode
NT10-1	Single 2-Wire On-Off	Cooling Only or Heating Only (2-Pipe System)	Auto Only	Yes	Cool or Heat-Fan Only-Off	Hi-Med-Low-Auto	Yes
NT10-1M	Single 2-Wire On-Off	Cooling/Heating (2-Pipe System)	Manual Only	No	Cool or Heat-Fan Only-Off	Hi-Med-Low-Auto	Yes
NT10-2	Dual 2-Wire On-Off	Cooling and Heating (4-Pipe System)	Manual or Auto	No	Cool-Heat-Auto-Fan Only-Off Or Auto-Off	Hi-Med-Low-Auto	Yes

Figure 3: Dimensions in mm

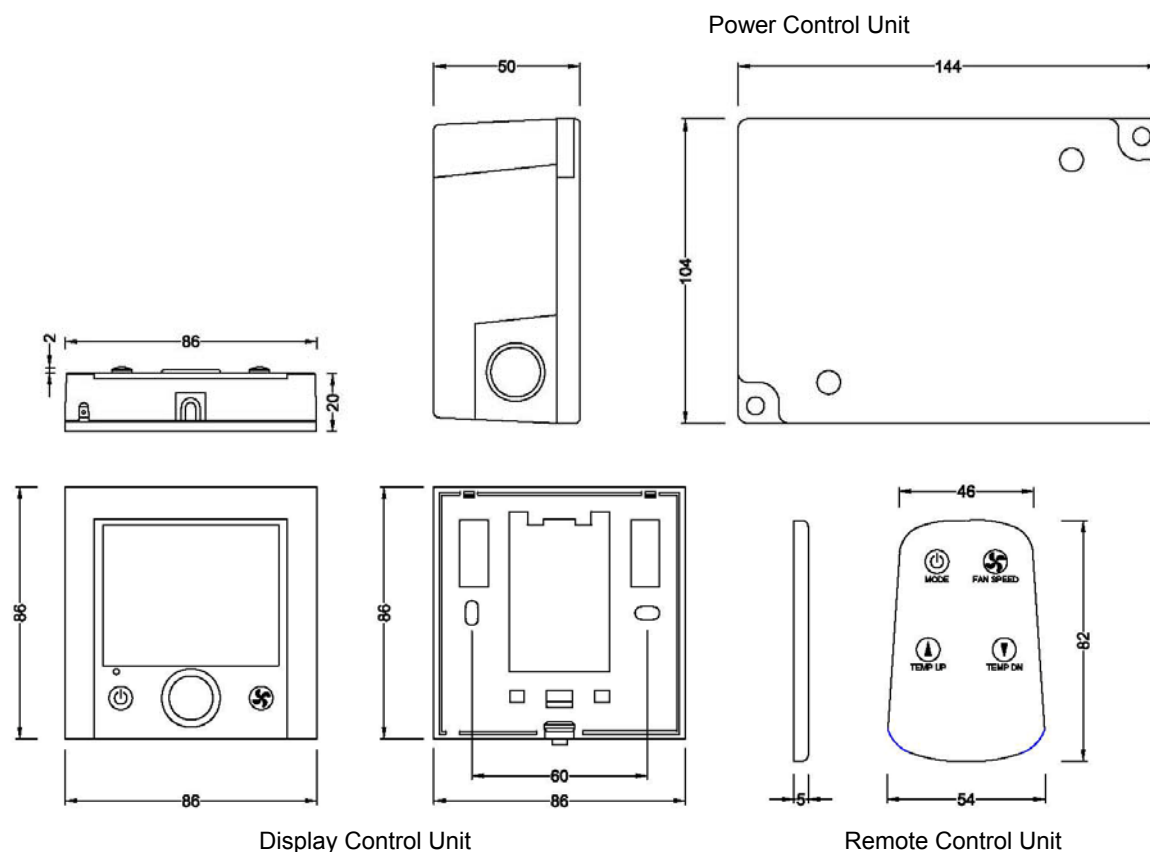


Figure 4: NCU Mounting Details

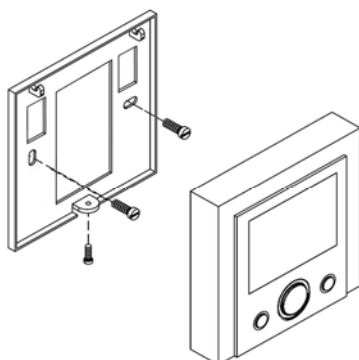


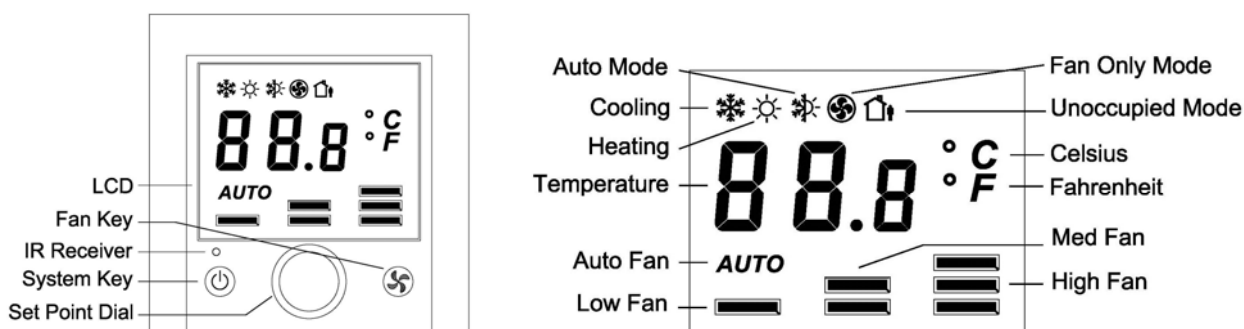
Figure 5: Optional Accessories

Description	Part Number
Remote control unit	RCU-1
Probe temperature sensor	TE10-1
Duct temperature sensor	TE10-2
With infra-red receiver capability	NT10-xxR
With all-white NCU enclosure	NT10-xxW

Mounting of Network Control Unit

The NT10 network control unit can be surface mounted or secured to a standard European 75 x 75 x 35 mm electrical box. See Fig. 2: Mounting Details. Two M3.5 mounting screws for Network Control Units only are included.

Figure 6: Network Control Unit and LCD Layout



Operation Notes

OPERATION

- LCD shows ambient temperature constantly except when set point adjustment is being made.
- Press the switch key Φ to enter into the desired operating mode: Cool-Heat-Auto-Fan Only-Off, etc.
- Press the fan key \star to change the fan speed mode: High-Med-Low-Auto.
- Increase or decrease temperature set point in 0.5 K increments by rotating the adjustment dial clockwise or counter-clockwise. When the dial is rotated, the LCD shows the existing set point setting.

UNOCCUPIED MODE

- When the unoccupied contact closes, it will override the operating mode and operate the thermostat in energy saving mode despite the thermostat being in operating or standby mode.
- In unoccupied mode, the factory-set temperature cut-in points are 26°C for cooling and 16°C for heating. Meanwhile, the operation of all operating keys is locked out until the unoccupied contact opens.
- During unoccupied mode, the default fan speed is set at "low" when pre-set cut-in temperature is reached, or otherwise the fan output is always "off".
- Unoccupied mode can be activated in the following manner when the unoccupied contact closes:
 - For 2-pipe models with auto seasonal changeover, the unoccupied cooling or heating mode is determined by the status of the SR2 seasonal changeover sensor and the valve output is activated according to the measured temperature.
 - For 2-pipe models with manual seasonal changeover, while in unoccupied mode, the valve output is never activated and the fan always runs at low speed.
 - For 4-pipe models, the unoccupied cooling or heating mode is always determined by the measured temperature and valve output is also activated according to the measured temperature.
- Unoccupied mode activation in operating mode only or in both standby and operating mode will be determined by activation setting in setup menu. Low fan will run according to fan action setting in setup menu.
- When unoccupied mode is activated, all keys are locked out and no settings can be entered.

PARAMETER SETUP MODE

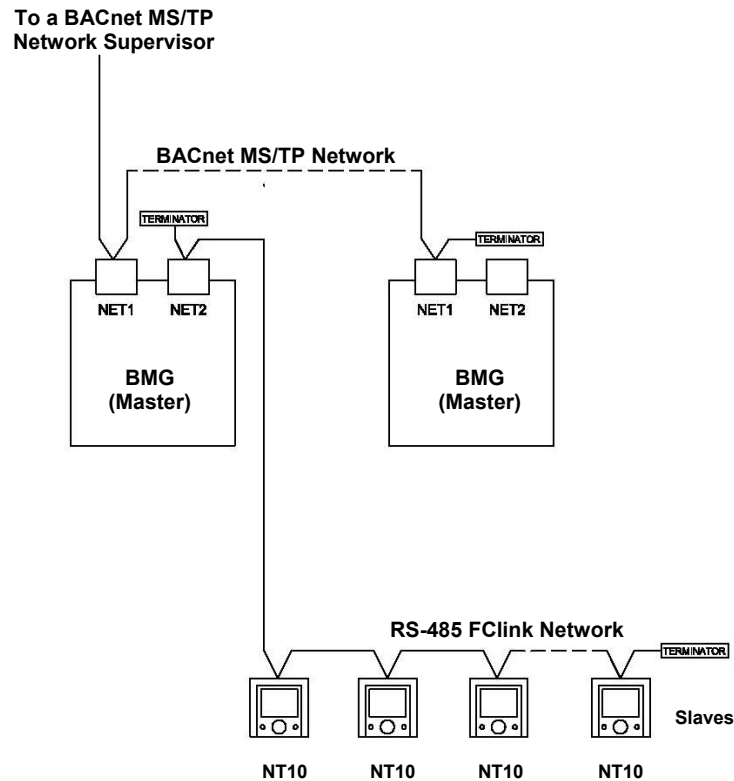
- The thermostat allows authorized service agent to change a number of operating parameters in the field. For details, refer to the parameters setup manual.

ERROR REPORTING

- All valve and fan outputs will be shut down when error is reported.

MCU firmware revision level	0	Appears after entering the setup mode
Choice of temperature engineering unit	1	1-1 = °C (factory setting) 1-F = °F
Choice to retain last entered settings on power resumption	2	2On = program on (factory setting) 2Of = program off
Offset adjustment of temperature indication (field recalibration of measured temperature)	3	3-2 = temperature indication plus 2 degrees 3-1 = temperature indication plus 1 degree 3-0 = no offset (factory setting) 3-1 = temperature indication minus 1 degree 3-2 = temperature indication minus 2 degrees
Thermostat address setting	5	To set the slave device address from 1 to 32
Deadband adjustment for dual-output models	d	To set deadband value from 1 to 5 K, factory setting 3 K
Upper occupied set point limit setting	E	To set upper occupied set point limit, adjustable between current lower set point limit value and 35°C (factory setting 35°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the upper occupied set point limit value and the lower set point limit value.
Lower occupied set point limit setting	F	To set lower occupied set point limit, adjustable between current upper set point limit value and 5°C (factory setting 5°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the upper occupied set point limit value and the lower set point limit value.
Unoccupied cooling set point setting	G	To set unoccupied cooling set point, adjustable between current unoccupied heating set point value and 35°C (factory setting 26°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the unoccupied cooling set point value and the unoccupied heating set point value.
Unoccupied heating set point setting	h	To set unoccupied heating set point, adjustable between current unoccupied cooling set point value and 5°C (factory setting 16°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the unoccupied cooling set point value and the unoccupied heating set point value.
Choice of fan action in unoccupied mode (always in auto fan mode)	J	J-1 = Low fan will run only when unoccupied set point calls for cooling or heating in unoccupied mode (factory setting) J-2 = Low fan always runs whenever unoccupied contact is closed while opening and closing of control valve are temperature-dependent.
Choice of activation of unoccupied mode	L	L-1 = Unoccupied mode can only be activated when thermostat is in operating mode (factory setting) L-2 = Unoccupied mode can be activated when thermostat is in either standby mode or operating mode
Choice of auto fan action in heating mode (operation of both control valve and fan is temperature-dependent)	P	P-1 = No fan output when room temperature (T_r) => set point value (T_s). Low speed when $-2.0\text{ K} \leq T_r - T_s \leq -0.5\text{ K}$ Med speed when $-4.0\text{ K} \leq T_r - T_s \leq -2.5\text{ K}$ High speed when $T_r - T_s \leq -4.5\text{ K}$ P-2 = (factory setting) Low fan output when $-2.0\text{ K} \leq T_r - T_s$ Med speed when $-4.0\text{ K} \leq T_r - T_s \leq -2.5\text{ K}$ High speed when $T_r - T_s \leq -4.5\text{ K}$
Choice of operating sequence for dual-output models only	r	r-1 = to set operating mode in sequence of Cool-Heat-Auto-Fan Only-Off (factory setting) r-2 = to set operating mode in sequence of Auto-Off
Choice of "1" or "1M" model	t	t-1 = to set operating mode in sequence of Off-Cool or Heat-Fan Only (factory setting for "1" model) t-2 = to set operating mode in sequence of Off-Cool-Heat-Fan Only (factory setting for "1M" model)
Choice of constant display of ambient temperature or temperature set point value	u	u-1 = constant display of ambient temperature (factory setting) u-2 = constant display of set point value
Restoration of default factory settings	5	51 = Retain current settings (factory setting) 52 = Restore default factory settings

Figure 7: Network Configuration



BACnet MS/TP Network Notes:

1. Ensure the recommended balanced cable is used.
2. Ensure the cable is installed as a daisy chain from one device to the next (1,000 m maximum) and the shield is grounded at one single point of the network only.
3. Ensure a MS/TP terminator is installed on each end of each MS/TP network.
4. The maximum nodes per MS/TP network is 32 without a repeater.

FLink Network Notes:

1. Ensure the recommended balanced cable is used.
2. Ensure the cable is installed as a daisy chain from one device to the next (1,000 m maximum) and the shield is grounded at one single point of the network only.
3. Ensure a terminator is installed on each end of each FLink network.
4. The maximum nodes per FLink network is 32

Network & Cabling Requirements

To ensure network stability and reliable communications, particularly at high speeds on a BACnet MS/TP network for a number of devices, it is imperative that the following network and cabling requirements are adhered to:

Item	Description
Cabling for FLink and BACnet MSTP networks	It is recommended to use networking cabling that matches the following specifications: <ul style="list-style-type: none"> • Balanced 100 to 120 ohms nominal impedance, 22 or 24 AWG Twisted Shielded Pair (TSP) Cable • Nominal capacitance of 52 pF/m or lower • Nominal velocity of propagation of 66% or higher • Terminating the shield to ground at one end only for each isolated segment will prevent ground loops in the shield and drain RF energy to ground. Grounding at the BACnet router or controller is preferred.
Topology	Ensure the MS/TP and FLink network cable is installed as a daisy chain from one device to the next.
Maximum Nodes	The maximum number of devices is 32 per MS/TP network segment and 64 per network trunk with one repeater.
Terminator	A terminator of 120-ohm impedance must be installed at each end of each MS/TP network segment, or two per MS/TP network. Ensure that this requirement is not overlooked in laying out the network architecture and ordering product.
Cable Shielding	Use a shielded, twisted pair cable for communications. Never directly ground wire in more than one point on the shield. Doing so can induce large currents and result in communication problem.
Repeater	A repeater is not necessary unless more than 32 nodes will be installed on a network or the MS/TP network is extended beyond 1,000 m.
Step-down Transformer	A separate isolated double-wound transformer is recommended for supplying 24 VAC power to each BMG. If and when the same transformer is shared with other devices, observe the polarities of the power supply of all devices including the BMG.

Figure 8: Wiring Diagrams and Application Notes

The networking thermostats consist of two basic units: the Network Control Unit and the Power Supply Unit. While all line-voltage wiring is terminated at the Power Supply Unit, all connections between Network Control Unit and Power Supply Unit are of low-voltage signaling wires.

Wiring and Application Notes

- Cut jumper JP1 if external sensor is wired to SR1 and GND. Run the wiring away from any electrical motors or power wiring. Failure to do so may result in poor thermostat performance due to electrical noise.
- 22 AWG twisted shielded pair double-insulated cable is recommended as remote sensor wiring and its length must not exceed 25 m.
- Do not bundle and run power wiring and remote sensor wiring in the same conduit.

- Connecting wires between Network Control Unit and Power Supply Unit must not exceed 15 m.
- Seasonal changeover sensor or switch is only applicable to heat only or cool only 2-pipe model only.
- The seasonal changeover sensor should be wrapped around the supply water pipe when associated with a water system. When the changeover sensor temperature exceeds 30 °C, the thermostat enters into heating mode.
- Unoccupied contact closure activates energy saving mode.
- The thermostat outputs are designed for controlling zone valves. If used for controlling electric heaters, external contactors must be used.

Wiring Diagram for Line-Voltage Fan and Line-Voltage 2-Wire On-Off Valve Outputs

WARNING

Incorrect wiring connection may cause permanent equipment damages to the thermostat.

Piping Notes:

1. On a single-output unit, V1 can be a 2-wire cooling or heating valve.
2. On a dual-output unit, V1 must be a 2-wire cooling valve and V2 a 2-wire heating valve.
3. Hidden-line wiring for Terminals V2 and 6 are applicable to dual-output models only.

