

Product Description

The DNT-T221 is an intelligent room thermostat with a custom 3-value, 96 segment, LCD display. The DNT-T221 can communicate on a BACnet MS/TP network or on Delta’s proprietary LINKnet network.

The DNT-T221 can display a wide-range of digital or analog values, including setpoints, temperature, air flow, heating and cooling status, fan speed, valve and damper position, and more.

When connected on a BACnet MS/TP network the DNT-T221 functions as an independent BACnet thermostat. When connected to a controller, on a LINKnet network, it provides a programmable remote sensor and expanded I/O capabilities. This version’s firmware can be flash loaded over the network, and has a termination resistor that is jumper selectable.



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Model Numbers

Features	DNT-T221	DNT-H121B
Internal Thermistor Input	✓	✓
Internal Humidity Input		✓
Additional I/O	2IP, 2AO, 1 BO	1 IP, 2 AO, 1 BO
Backlighting	Option B	✓
External Input Terminator	Option X	✓
Button Icons	INT	INT

An appended button icon code must be included to specify the desired icons embossed on the buttons as follows:

[*default*] Bottom 2 buttons are ▼ and ▲ (Setpoint Adjust), top 2 are OFF and ON

INT Bottom 2 buttons are ▼ and ▲ (Setpoint Adjust), top 2 are O and I – *International*

You need not specify button icons if you want the default, but must specify INT if you want the international button icons. (i.e., DNT-T221-INT).

Package Contents

- Delta Network Thermostat: BACstat II Product, **DNT-T221 (Rev 4.1)**
 - **DNT-T221 (Rev 4.1)** Installation Guide
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Other Relevant Documents

- Delta Controls Wiring and Installation Guidelines
 - BACstat II Application Guide (for Configuration & Programming)
 - ORCAview Operator Guide
 - ORCAview Technical Reference Manual
 - BACstat II, DAC and DCU Release Notes
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Product Specifications

Power Requirements

- 24V AC, 50/60 Hz (Class 2)
- 15 VA maximum (with internally powered triac at full load)
(3VA without triac loading)

Ambient Ratings

- 32° to 131° F (0° to 55° C)
- 10 to 90% RH (non-condensing)

Communication Port

LINKnet Connection

- Communications Speed @ 76,800 bps
- Up to 12 Devices per segment (depending on the controller), only two of which can be DNT or DFM devices

BACnet MS/TP Connection

- Communications Speed @ 9,600 or 19,200 or 38,400 or 76,800 bps (the default)
- Maximum of 99 nodes per MS/TP segment (50 without a repeater)
- Firmware can be flash loaded over the network

Temperature Sensor (IP1)

- Thermistor Input – 10,000 ohm @ 77 °F (25 °C)
- Accuracy of +/- 0.36 °F from 32 - 158 °F (+/- 0.2 °C from 0 - 70 °C)
- Display Resolution of 0.1 °F or °C
- Stability of 0.24 °F over 5 years (0.13 °C)
- Optional Termination point for an External Thermistor on Input 1
 - Jumper Selectable for Internal or External Thermistor
 - Use a standard 10 KΩ Thermistor (10,000 ohm @ 77 °F / 25 °C)

Humidity Sensor (DNT-H121B Model Only)

- Accuracy of +/-2% RH from 0-100% RH (25°C, V_{SUPPLY} = 2.6Vdc)
- Display Resolution of 0.1 %
- Stability of +/- 1% RH typical @ 50% RH over 5 years

*Note: Extended exposure to >90% RH causes a reversible shift of 3% RH

Inputs (Additional)

- 2 Universal Inputs (10 bit), jumper configurable for the following input types:
 - 0-5 VDC
 - 0-10 VDC
 - 10 KΩ Thermistor
 - Dry Contact (using 10 KΩ Thermistor jumper setting)

Outputs

- 2 Analog Outputs
 - 0-10 vdc @ 20 mA maximum per output
- 1 Binary Triac Output
 - Switching 24 VAC @ 0.5 Amp maximum per output
 - Leakage Current per Triac is 100 μA
 - Internally Powered with 24 VAC (so an external power source should not be used)
 - Software Configurable for Binary, PWM, Time Proportioned

Technology

- 32-bit Processor with internal A/D, Flash and RAM
- 3-value LCD with icons (96 total segments) and optional backlighting
- 4 stylized momentary push buttons with tactile feedback

Device Addressing

LINKnet Connection

- Set via Keypad Configuration Setup
- Address Range: 1 to 12

BACnet MS/TP Connection

- Set via Keypad Configuration Setup, or Software Setup
- Keypad MAC Address Range: 1 to 99 per network segment
- Software Address Range: As per the BACnet standard
- Supports DNA – Delta’s intuitive addressing scheme

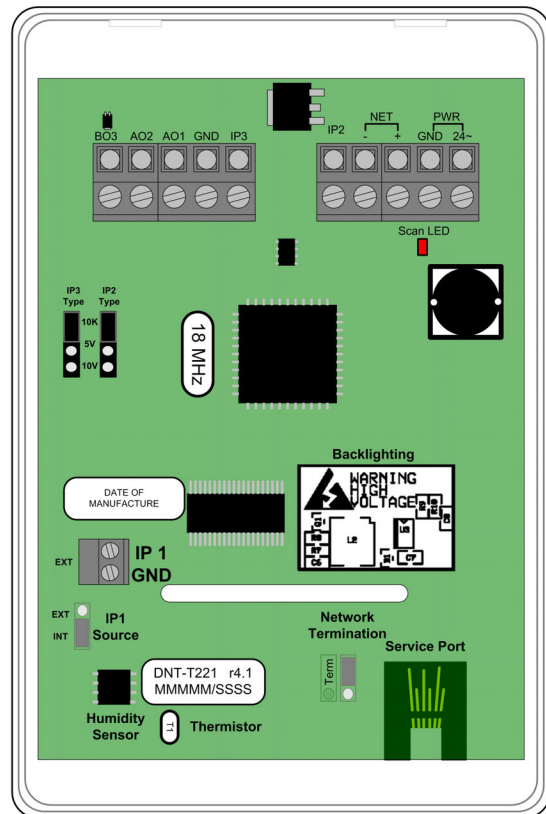
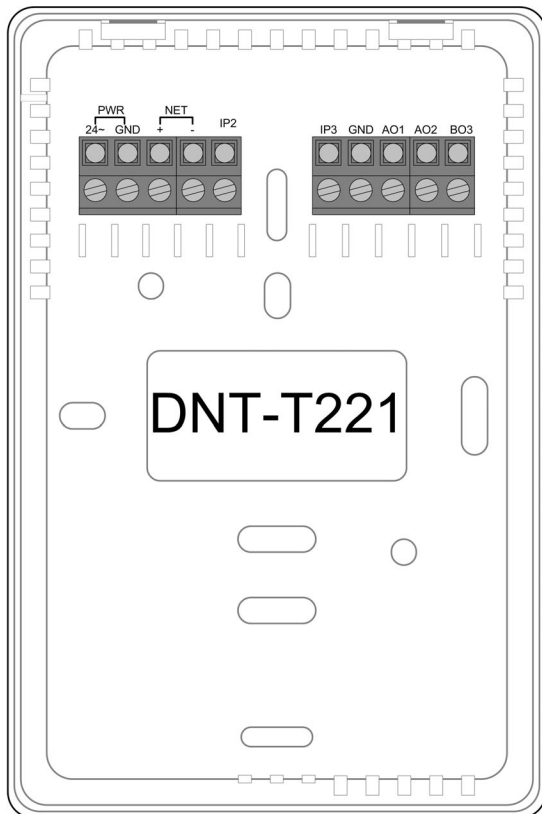
Size

- 5” x 3.25”x 1” (12.7 cm x 8.3 cm x 2.5 cm)

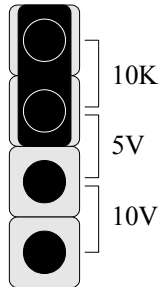
Weight

- 0.3 lb. (136 g.)

PCB Board Layout



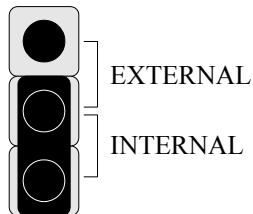
Jumpers



INPUT SIGNAL TYPE

The input type is selected by placing the jumper in the correct location on the Input Type Selector Block. The diagram to the left shows the factory default selection of 10 K Ω .

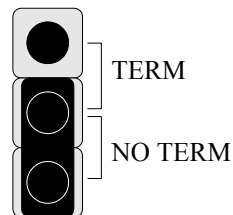
- 10K ▪ For 10 K Ω Thermistor temperature sensors, as well as Binary or Dry Contact inputs.
- 5V ▪ For sensors and other field devices that use a 5 VDC signal.
- 10V ▪ For sensors and other field devices that use a 10 VDC signal.



INPUT CONNECTION SELECTOR – DNT-T221X MODELS ONLY

This jumper is used to select whether the internal Thermistor sensor or a remotely located Thermistor is connected to IP1. The diagram to the left shows the factory default selection of the Internal 10 K Ω Thermistor.

- External ▪ For connecting a remotely located 10 K Ω Thermistor temperature sensor to IP1, which is wired to the connection terminals provided.
- Internal ▪ For connecting the internal 10 K Ω Thermistor temperature sensor to IP1.



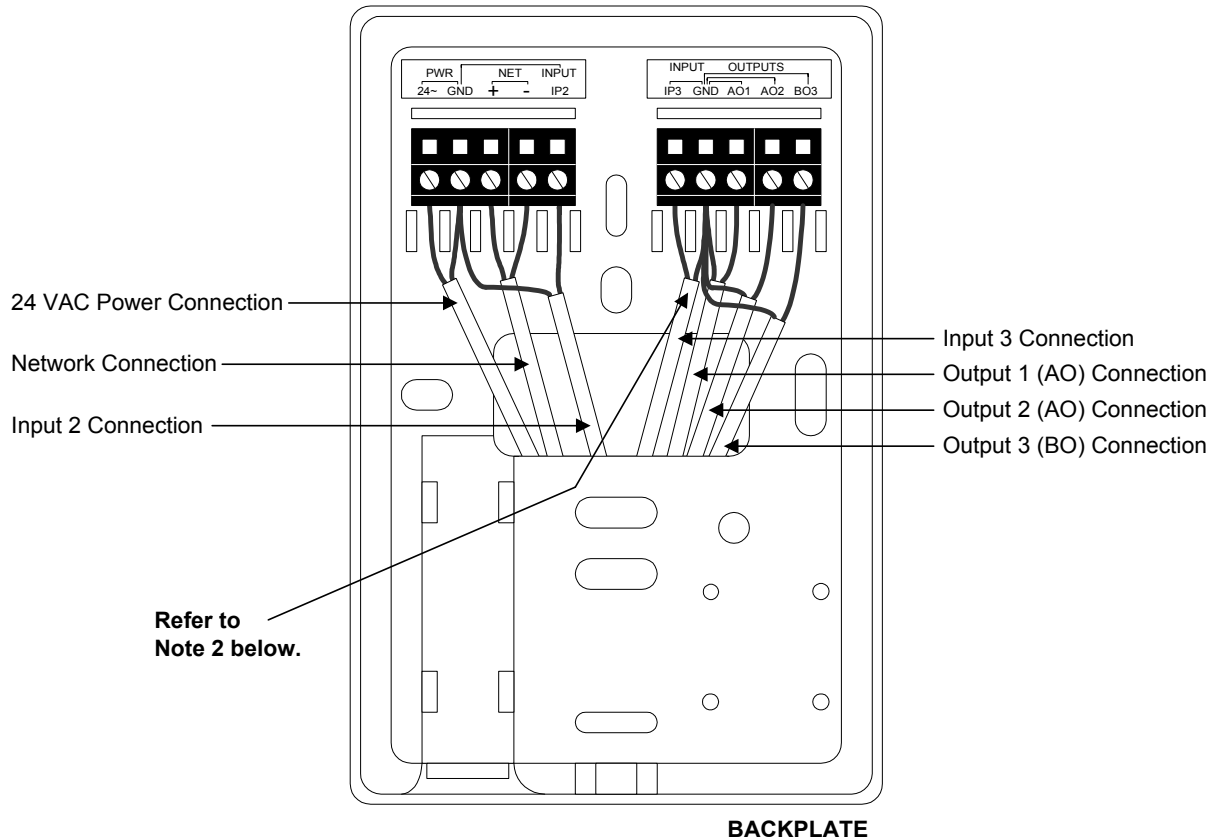
NETWORK TERMINATION RESISTOR

This jumper is used to select the termination resistor at each end of each MS/TP network segment. The diagram to the left shows the factory default selection of No Term.

Mounting

The BACstat II backplate is designed for mounting directly on standard North American, European or Australian electrical boxes.

Wiring Diagram



Warning:

The network shield and any other bare wires should be bent back and taped to ensure that they do not come into contact with the board electronics and cause a short. Otherwise you run the risk of damaging the BACstat.

Notes:

1. Note that the DNT-T221 has different wiring connections from the DNS-24 and DNT-T103.
2. If wiring 2 or more outputs use a wire nut to terminate all the outputs to GND.
3. Ensure you use the recommended balanced cable for the network and follow the documented procedures within *Delta Controls Wiring and Installation Guidelines* for MS/TP or LINKnet networks.
4. Do *not* use 4-wire multi-conductor cable for network and power, as it will not meet the balanced cable requirements for the MS/TP or LINKnet networks. Use two separate cables: one for the network and the other for power.
5. Do not terminate the network shield on the BACstats, but ensure shield conductivity is maintained along the network from end-to-end with wire nuts as necessary.
6. If the same power source is used for more than one device, ensure that the transformer is properly sized for the rated VA and that the same polarity is observed from device to device.

Power

The DNT-T221 requires a 24V AC Class 2 power supply rated for at least 15 VA. This includes output loading of the internally powered triac (0.5A max @ 24 VAC) and the two analog outputs (20mA max each).

More than one device – not including DCUs or V2 products – may be connected to the same transformer, if the transformer is properly sized (including line losses), and the polarity is observed between controllers (in regards to 24~ and GND). The transformer must **ONLY** be used to provide power to other MS/TP or LINKnet devices and field devices powered through its outputs. Auxiliary field devices (i.e., 4-20 mA devices) that don't use ½ wave rectification must be powered separately.

For more information refer to the *Delta Controls Wiring and Installation Guidelines*.

Network & Cabling Requirements

Adhere to the following network and cabling requirements to ensure network stability and reliable communications, particularly at high speeds on the RS-485 MS/TP or LINKnet networks.

Item	Description
Cabling	For MS/TP and LINKnet networks it is recommended that you use network cabling that matches the following specifications: <ul style="list-style-type: none"> Balanced 100 to 120 Ω nominal impedance Twisted Shielded Pair (TSP) Cable Nominal capacitance of 16 PF/FT or lower Nominal velocity of propagation of 66% or higher
Topology	For MS/TP and LINKnet networks, ensure the cable is installed as a daisy-chain from one device to the next.
Max. Nodes	<ul style="list-style-type: none"> MS/TP: The maximum number of devices per MS/TP network without any repeaters is 50. LINKnet: Up to a maximum of 12 Devices (depending on the controller), only two of which can be DNT or DFM devices. (Refer to the Appendix on <i>Working with MS/TP and LINKnet</i> in the <i>Technical Reference Manual</i> for more information.)
Termination Boards	<ul style="list-style-type: none"> MS/TP: A termination resistor must be jumper selected at each end of each MS/TP network segment. Ensure you do not overlook this in laying out your network architecture. LINKnet: Jumper select a termination resistor on each end of the network when there are more than 2 nodes. Termination resistors do not need to be installed for one or two nodes.
Repeater	<ul style="list-style-type: none"> MS/TP: A repeater (RPT-768) is not necessary unless more than 50 nodes will be installed on a network <i>or</i> you need to extend the network beyond 4000 ft (1220 m). LINKnet: Repeaters should not be necessary. Ensure the maximum distance is no more than 1000 ft (300 m).

For more information refer to the *Delta Controls Wiring and Installation Guidelines*.

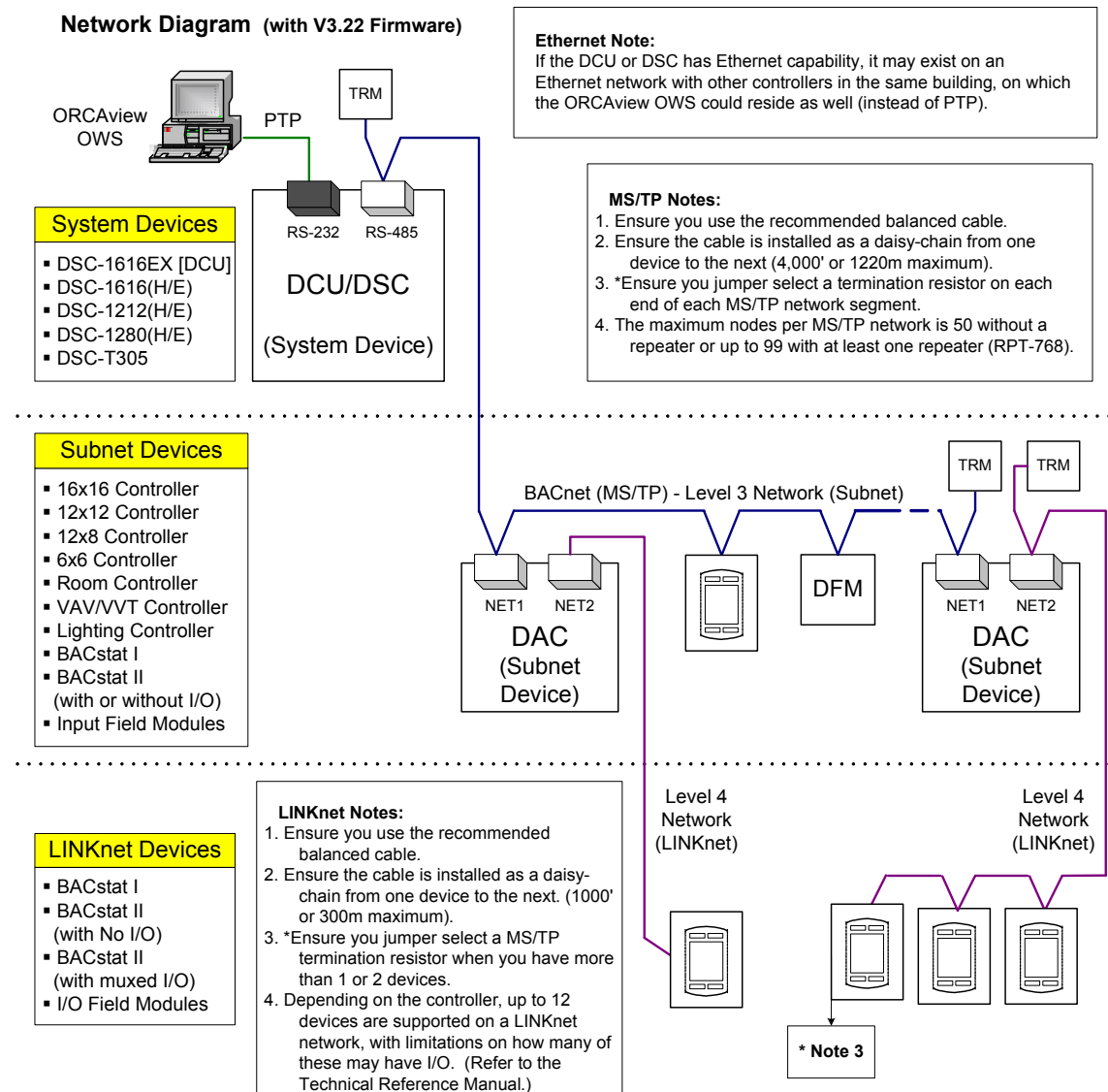
Network Topology

1. BACstats Configured as MS/TP Subnet Devices

With V3.21 firmware or higher, one possible MS/TP network architecture has the MS/TP devices configured as Subnet devices, which allows BACstats to reside on the MS/TP network with other Subnet devices. Note that V3.21 requires a DCU, while V3.22 or higher may use any System Controller instead.

2. BACstats Configured as LINKnet Devices

The BACstat may reside on LINKnet instead of MS/TP. However, this requires a controller that supports a LINKnet network for I/O expansion. The maximum LINKnet devices with or without I/O depends on the controller. All built-in applications must be disabled, but the I/O may be muxed (with V3.22 or higher firmware).



Cautions and Warnings



The DNT-T221 BACstat II is an electrostatically sensitive device. An ESD protection (ground strap) should be unnecessary if sufficient care is taken in handling because the electronics are contained within the product housing.

Compliance Declarations

FCC Compliance Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Industry Canada Compliance Statement

ICES-003 This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe B Respecte toutes les exigences du Règlement sur le matériel brouiller du Canada.

UL Compliance Information



This product conforms to the following UL requirements:

- UL916: Energy Management Equipment
- CAUTION – Risk of Electric Shock – More than one disconnect switch may be required to de-energize the equipment before servicing
- All terminals are acceptable for Class 2 circuit connection only
- CAUTION – Input Class 2 Power Supplies are interconnected. To Reduce the Risk of Fire or Electric Shock, Use only Class 2 sources Suitable for Interconnection
- Use Copper Conductor Only
- Select an external power supply that is certified for safety for the correct destination country and that has an output rating, which is considered an NEC Class 2 or Limited Power Source with the rating not to exceed 30 V rms, 42.4 V peak, 100 VA.
- Apply minimum 6.0 lb-in torque for tightening field wires into the terminal blocks.

