RS-485 Networking Room Thermostats with LCD for Fan Coil Units
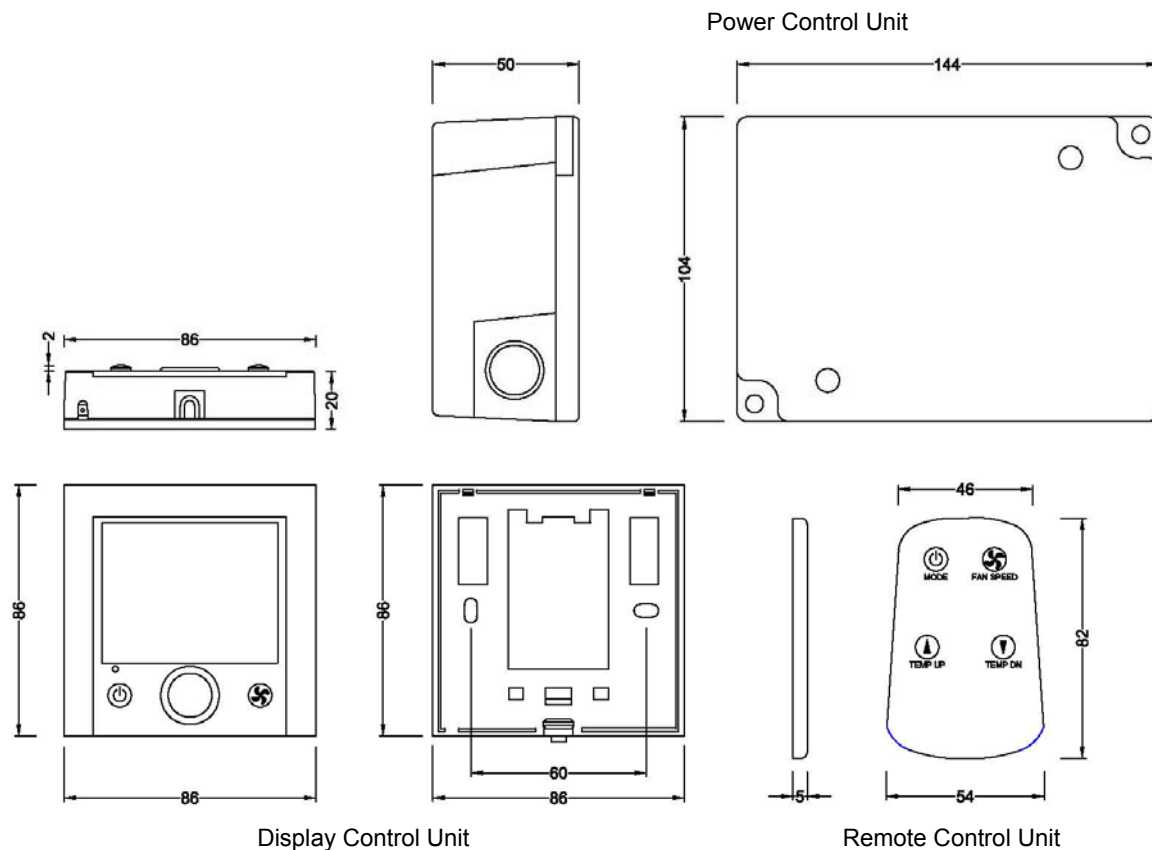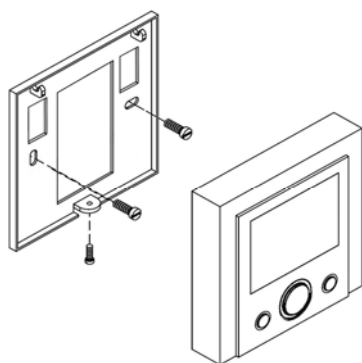# Installation and Operation Instructions

Dimensions in mm

Power Control Unit

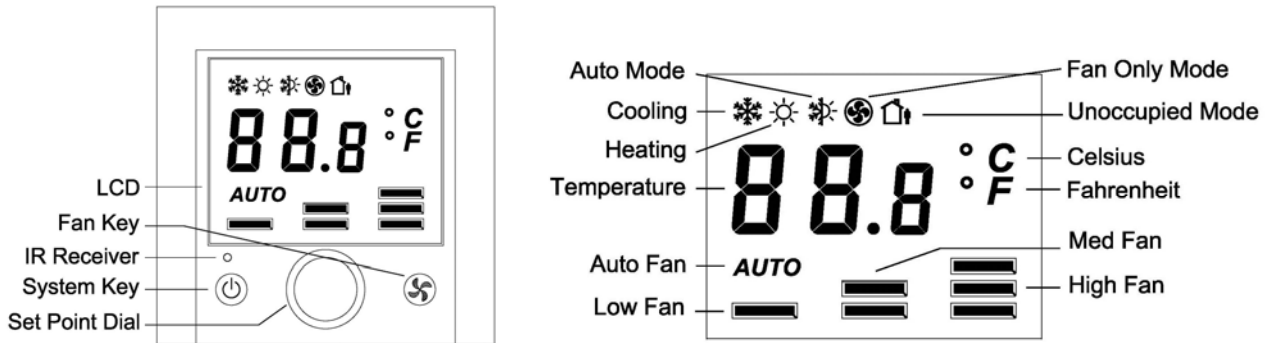Display Control Unit   Remote Control Unit

NCU Mounting Details

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.

Network Control Unit and LCD Layout

Thermostat Errors Reporting

When the following errors are reported on the LCD display unit, these errors will prevent the thermostat from normal operation and all thermostat functions will be locked out:

E-1   EEPROM read/write error
E-2*   Temperature sensor open-circuited
E-3   Temperature sensor short-circuited

* If jumper JP1 is cut open and external sensor is used, E-2 means the external sensor may have been disconnected from Terminals SR1 and GND. Check the external sensor's connectivity and resistive value. If E-2 error is still reported, return the thermostat to the manufacturer for repair.

When the error E-1 or E-3 is reported or when the error E-2 is reported without jumper JP1 being cut and external sensor being installed, return the thermostat to the manufacturer for repair.

Trouble-Shooting

Before trouble-shooting starts, ensure that the voltage output from Terminals 1 (GND) and 2 (+5 Vdc) on the power supply unit is between 5 Vdc and 5.25 Vdc and not higher. Higher voltage may damage the internal circuitry and components of the network control unit.

When abnormal power voltages are found, return the thermostat to the manufacturer for repair.

When there is no 5 Vdc power output, check the line voltage power and its 5 A fuse.

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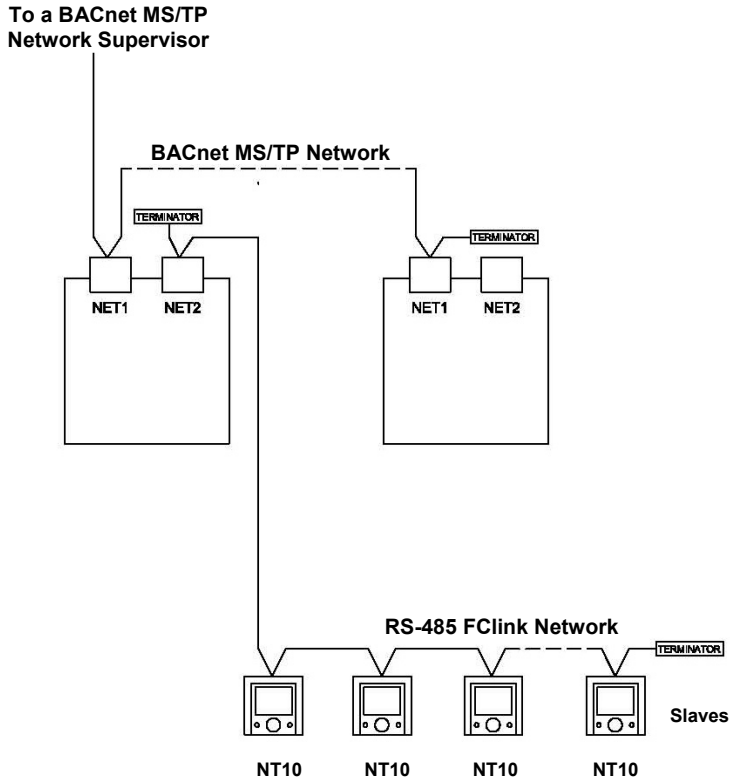
Parameter Setup Mode
- The thermostat allows authorized service agent to change a number of operating parameters in the field. For details, refer to the parameters setup manual.

Error Reporting
- All valve and fan outputs will be shut down when error is reported. Details of error reporting are described above.

Parameter Setup Menu

MCU firmware revision level	*0*	Appears after entering the setup mode
Choice of temperature engineering unit	*1*	*1-C* = °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 (Tr) => set point value (Ts). Low speed when - 2.0 K <= Tr - Ts <= -0.5 K Med speed when - 4.0 K <= Tr - Ts <= -2.5 K High speed when Tr - Ts <= -4.5 K *P-2* = (factory setting) Low fan output when -2.0 K <=Tr - Ts Med speed when - 4.0 K <= Tr - Ts <= -2.5 K High speed when Tr - Ts <= -4.5 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	*rS*	*rS1* = Retain current settings (factory setting) *rS2* = Restore default factory settings

Network Configuration

To a BACnet MS/TP Network Supervisor

BACnet MS/TP Network

TERMINATOR

TERMINATOR

| NET1 | NET2 |
| NET1 | NET2 |

RS-485 FClink Network

TERMINATOR

Slaves

NT10   NT10   NT10   NT10

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.

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3. Ensure a terminator is installed on each end of each FClink network.
4. The maximum nodes per FClink 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 FClink and BACnet MSTP networks	It is recommended to use networking cabling that matches the following specifications: • 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 FClink 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.

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 ºC, 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	Piping Notes:
Incorrect wiring connection may cause permanent equipment damages to the thermostat.	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.