TRUEWAY®
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FULLY TOUCH SCREEN BACnet THERMOSTAT

MODEL B212 -WITH NATIVE BACnet COMMUNICATION

PRODUCT FEATURES

- Distributed nature with separate Display and Control units
- BACnet over MS/TP communication.
- Configuration of parameters over BACnet communication.
- Applicable for Dx single stage compressor Units.
- Easily Configurable through software configuration tool.
- Powerful 32-Bit ARM processor.
- Operates from 24V AC or DC power supply.
  Operates from 230V AC
- Status LEDs for communication and power.
- Wide variety of built-in applications.
- Applications include occupancy and window-contact.
- Inputs/Output: 4 BI, 2 UI, 2 AO and 5 BO.
- 3 Binary outputs dedicated for the FCU speed control.
- Real-Time-Clock with power backup.
- Scheduling services.

PRODUCT OVERVIEW

B212 is a communicating room thermostat that can be used to various segments in the automation field. This automation field can include, but not limited to, building management system (BMS), guest room management system (GRMS), and home automation. B212 basically follows a distributed control in its hardware nature; it has a Display Unit (DU) and a Control Unit (CU), which normally are physically installed at two different locations. The DU interacts with the users allowing them to monitor and command the control operations whereas the CU performs the control algorithms, and interacts with the field units.

The DU comes with an attractive LCD with a capacitive touch interface that provides an easier view and control. The LCD offers colorful symbols on select items for a faster attraction. It has built-in temperature sensor and a humidity sensor that can be configured to work with different room-temperature-control-units such as Fan-Coil-Units (FCU), Variable Air Volume (VAV) unit, Package Units, Air-Handling-Units (AHUs), etc.

The CU comes with two universal inputs, four binary inputs, two analog outputs and five binary outputs. These inputs and outputs can suitably be selected to work for different applications. A wide variety of built-in applications are available within the CU so that the field configuration becomes quick and effortless. The appropriate selection of input and output can be made based on the field application.

A wide variety of field units can be connected and controlled by this unit; these field units can include:

- Valve controls with On/Off or modulating type.
- Fan controls with 1, 2 or 3-speed type as well as electronically commutated type (EC).
- Variable Frequency Drive controls (VFD).
- Compressor controls with multiple stages.
- Heater control with stage heating and thyristor type.
- Additional controls by External temperature sensor, Occupancy, Door-Contact or Window Contact as widely used in GRMS or FAHU controls.

B212 is a high-performance BACnet device that communicates with other field/global devices or controllers through BACnet communication over MS/TP network at a communication speed ranging from 9600bps up to 115.2kbps. The powerful 32-bit ARM® processor executes the operations without any execution delays, and optionally allows for faster Change-Of-Value updates. Native BACnet communication behavior of **B212** can help configure the input and outputs points to be freely monitored or overridden by a supervisory control system if the application demands. In order to meet such application demands, **B212** has an optional field programmability in addition to its built-in applications. A dedicated configuration software communicates with **B212** over BACnet for its configuration of parameters. It reads and alters parameters such as BACnet LAN speed, BACnet device-instance, inputs and output, applications etc.

B212 can be configured to communicate with 9600, 19200, 38400, 57600, 76800 or 115200 bits per second (bps). The default baud-rate is 38400. Although B212 supports auto baud-rate feature, it is disabled by default to ensure that other products (with or without a similar feature) connected over the same MS/TP LAN do not induce any conflicts of baud-rate. BACnet communication status is indicated by the 'MS/TP' LED, which lights red in the absence of valid BACnet frames and lights blue when a healthy communication is detected.

The Display Unit and the Control Unit are connected with each other via a 3-core cable. The CU not only provides the power for the operation of the DU, but also establishes a communication with the DU for the exchange of monitor and control parameters.

B212 has a built-in real-time-clock (RTC) with sufficient power backup so that the clock retains the date and time even in the absence of mains power. B212 also has attractive and easy-to-configure scheduling services.
The inputs and outputs provide high flexibility while selecting the field units associated with the applications. However, the first three binary outputs are dedicated for a 3-speed fan, which have a hardware interlock mechanism whereby it produces an output exclusively to one of these three outputs.

Power Supply	**230V AC / 24V AC or DC**
Max current consumption	**200mA**
Input types supported	**Binary inputs, Universal Inputs**
Output types supported	**Analog and Binary outputs**
Binary Inputs (BI)	**4**
Universal Inputs (UI)	**2 with 12-bit ADC**
Analog Outputs (AO)	**2 with 12-bit DAC**

Binary Outputs (BO)	5
Universal Input Types	BI, Thermistor, 4~20mA, 0~5VDC, 0~10VDC
Analog Output Types	0~5VDC, 0~10VDC
Binary Output Types	Volt-Free-Contacts
Binary Output Current Rating	10A resistive or ¼ HP motor load
LED indications (Only on CU)	ELynk, BOs, BACnet link & fault
Built-In temperature sensing	0°C ~ 100°C, Tolerance: ±0.5°C
Built-In humidity sensing	Relative, 0%~100%, Tolerance: ±0.5%
Communications	BACnet over MS/TP, Inter-Module-Communication
Communication speed	Selectable, 9.6kbps ~ 115.2kbps
Additional Features	Change-of-value
Ambient Temp	0°C ~ 70°C
Dimensions (DU)	85mm x 85mm x 11mm
Dimensions (CU)	155mm x 110mm x 60mm
Physical installation (DU)	Wall mounted
Physical installation (CU)	Din-Rail or Direct mounting on-to the panel

Physical Inputs and Outputs

B212 has sufficient input and outputs to fulfill majority of the HVAC applications for the AC control. The following inputs and outputs are available on the controller unit of B212:

a. **Binary Input (BI):** There are 4 BIs available on the controller unit, B212-CU. All BIs are identical in their operation and designated as BI0, BI1, BI2 and BI3. Based on the application, any BI can be assigned to be Door Contact Input, Occupancy Sensor Input, Keycard Switch Input or Window Contact Input. The input mapping is highly flexible, and it can easily be configured using the TrueWay Configuration Tool, TConfigurator.

b. **Binary Output (BO): B212-CU** has 5 binary outputs. All BOs are volt free contacts produced by relays each having a current rating of 10A (resistive). Binary outputs are designated as BO0, BO1, BO2, BO3 and BO4. BO0, BO1 and BO2 are dedicated for LOW, MEDIUM and HIGH speeds of the Fan Coil Unit (FCU) alternatively when the CU is used for FCU. BO0 through BO2 are hardware interlocked so that exactly one speed will be activated at any point in time regardless of the operation status. BO3 and BO4 can be used for the operation of cooling or heating valve. BO3 and BO4 together supports the operation of floating valve. When the application demands a floating valve (only 1 floating valve can be used), if BO3 is configured as OPEN, BO4 shall be configured as CLOSE and vice-versa. Either BO3 or BO4 can be configured from TConfigurator for the operation of cooling valve in cooling mode and for the operation of the heating valve of heating valve in heating mode.

c. **Universal Inputs (UI):** UIs can be configured to be binary input, thermistor input, 0~10VDC or 4~20mA as required by the application. BI212-CU has 2 UIs each having identical hardware characteristics. When configured as a thermistor input, the UI supports 3K NTC,

10K-TYPE2 thermistor, 10K-TYPE3 thermistor, 10K-B3435 thermistor and 20K thermistor. In this case, the resistance measured at the UI node is internally converted to its equivalent temperature and is used by the application when it is configured as the external temperature sensor input. In addition to the built-in thermistor type, it can also be configured to support a custom defined thermistor where the temperature versus the resistance values can be downloaded to the CU from TConfigurator. UI can also be configured as 0~10 VDC either for the external temperature sensor or for the valve feedback. When selected as the 0~10VDC external temperature sensor, it can be scaled within a field programmable range of voltage-into-temperature. When selected as the valve feedback, the valve position can optionally be displayed on the Display Unit (DU) while it also made available on the AI object of BACnet. Like 0~10VDC, it can also be configured as 4~20mA if the application demands. BI212-CU has a built-in shunt resistor, which internally converts to voltage. B212-CU is designed with an accurate ADC having a resolution of 12-bits.

d. **Analog Output (AO):** The 2 Analog Outputs are built up on a 12-bit DAC delivering a high accuracy of ± 0.1% making it suitable for precise control of the modulating valve or similar units. Depending on the nature of the application, both AOs can be configured for the operation of the modulating valve or one AO can be configured as modulating valve control signal and the other can be configured as the Electronically Commutated (EC) motor control signal. AOs are designated as AO0 and AO1, any of which can be configured as the modulating valve's control signal and the other can be configured as EC motor control signal. It can also be used for modulating damper control when used in a VAV application.

Applications

B212 can be used for many applications comprising a wide variety of input/ output combinations. All those applications have been classified into four major application categories and are commonly represented as the "Unit Type" in all references of B212 and it associated products. The four unit types are as given below :

a. Fan Coil Unit (FCU) in 2-pipe and 4-pipe configurations.
b. Variable Air Volume (Unit) in bypass configuration.
c. Air Handling Unit (AHU) with 1 fan.
d. Package Unit with 1 fan & 1 or 2 compressors.

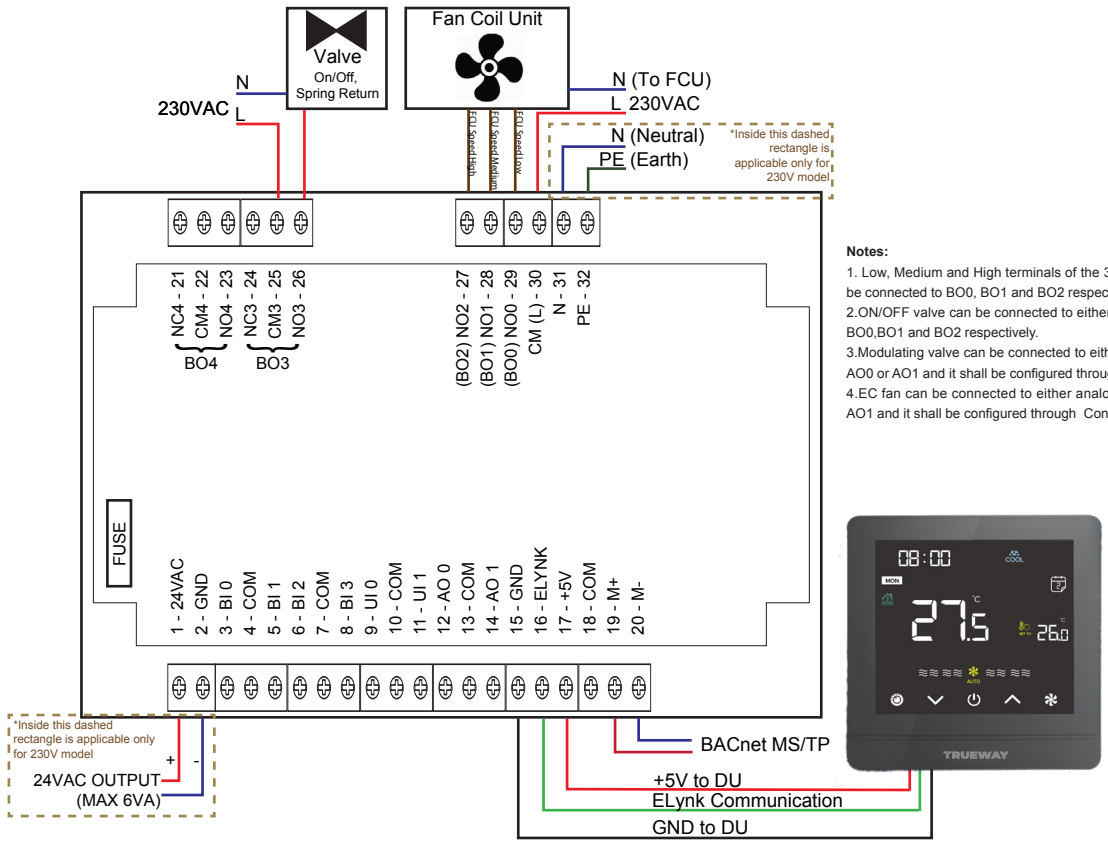
a. **Fan Coil Unit (FCU)**

B212, when configured for the operation of 2-pipe FCU, can be used to control both AC and EC fans with 3-speeds. Although an EC motors is typically powered from an AC source, terminologies "AC" motor (or fan) and "EC" motor (or fan) are used to conveniently indicate a "conventional AC" motor (or fan) and an "Electronically Commutated" motor (or fan) respectively in all references of B212. In any, both "Cooling" and "Heating" control mode can be selected for any unit. In 2-pipe configuration, the valve (cooling or heating) can be chosen to be On/Off type with spring-return, On/Off type (non-spring return), floating type or modulating type. Regardless of the valve type, the fan type can be either AC or EC. Typical wiring diagrams of FCU in 2-pipe configuration are given through figure 3.1 to figure 3.5.

In 4-pipe configuration, the fan type can be AC motor or EC motor when the valve type is On/Off, spring return. However, when the valve type is modulating, only AC motor is supported. Floating operation is not supported in 4-pipe configuration.

When a modulating valve is used, it is controlled using a 0~10VDC, and the position is calculated by Proportional-Integral (PI) control algorithm. The output is always limited to be within a range of 0 to 100 (in percentage). When a floating valve is used, although the same PI control algorithm is used, the valve position is adjusted by an impulsive open/close control of the valve. This means that, if the valve needs to position to an additional 10% to its previous position, then the valve will be opened (or closed) for a duration equal to the 10% valve open time (or close time). When this control philosophy is followed for a long time, it can induce significant errors in the actual position of the valve. B212 has an "Auto Start-Over" feature to overcome this limitation so that when a total runtime has completed, the valve will be completely closed to 0% and then reopen to the desired open position starting from 0%. The auto start-over feature can be totally customized from TConfigurator. The proportional and integral constants as well as other constants can also be customized from TConfigurator.

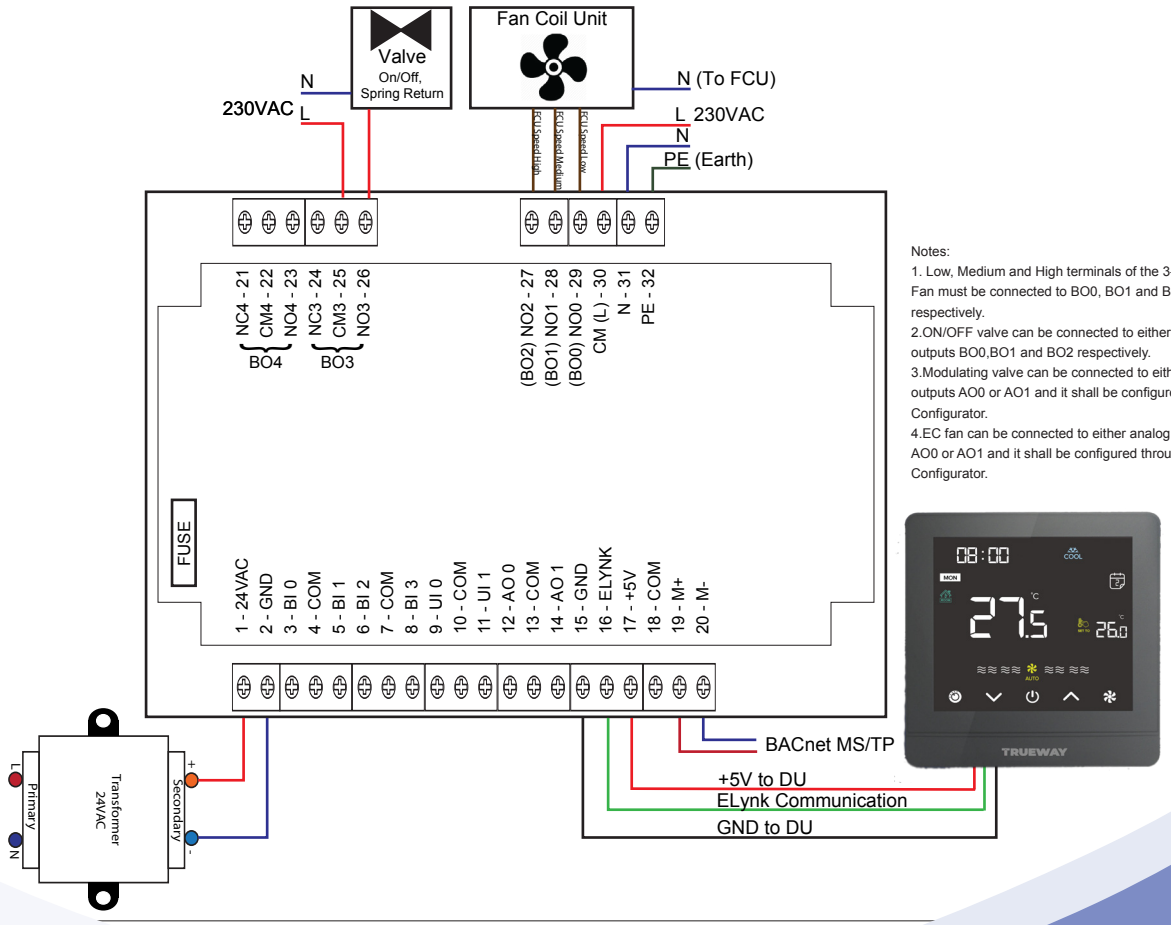
General Connection Diagram B212-CU230



Notes:

1. Low, Medium and High terminals of the 3-Speed Fan must be connected to BO0, BO1 and BO2 respectively.
2. ON/OFF valve can be connected to either of binary outputs BO0,BO1 and BO2 respectively.
3. Modulating valve can be connected to either analog outputs AO0 or AO1 and it shall be configured through Configurator.
4. EC fan can be connected to either analog outputs AO0 or AO1 and it shall be configured through Configurator.

General Connection Diagram B212-CU024



Notes:

1. Low, Medium and High terminals of the 3-Speed Fan must be connected to BO0, BO1 and BO2 respectively.
2. ON/OFF valve can be connected to either of binary outputs BO0,BO1 and BO2 respectively.
3. Modulating valve can be connected to either analog outputs AO0 or AO1 and it shall be configured through Configurator.
4. EC fan can be connected to either analog outputs AO0 or AO1 and it shall be configured through Configurator.

b. **VAV Control.**

In VAV control system, only the bypass type can be controlled. It has a modulating damper, which is controlled by the PI control algorithm.

c. **AHU Control.**

In AHU control system, a single speed fan can be controlled from the DU. B212 only supports modulating valve when configured as a AHU controller.

d. **Package Unit (PU) Control.**

In PU control system, it can be configured with either single speed or dual speed fan. The number of compressors can also be configured to be single or double.

Advanced Controls

B212 offers several advanced features that can easily be configured from TConfigurator. It can be configured to monitor “Occupied/ Unoccupied” status based on either a KeyCard (KC) holder or a combination of a Door Contact (DC) and an Occupancy Sensor (OS). When it operates on a keycard holder, the unit status will be changed “Occupied” mode when a card is inserted. which eventually produces dry contact which is captured by the CU. The status is changed to “Unoccupied” when the card is removed from the keycard holder.

But the operation with the DC and OS is slightly different from that of the keycard switch. The unit is changed to Occupied status only when a “presence” is detected by the OS, but only if the DC status is changed from open-to-close. The presence detection algorithm will be active for a defined period following the open-to-close status of the DC. This period can be modified from TConfigurator. The input channel selection of DC (or keycard) and OS can also be selected from the TConfigurator. When the unit status is changed to “Unoccupied”, the set point is automatically changed to a pre-defined value (which can be modified in TConfigurator). When the status is changed to “Occupied”, the set point and fan speed will be recalled to the values which were active when the unit was changed its status to “Unoccupied”.

In addition to the occupancy detection algorithm, B212 can also perform a “Window Contact” (WC) control of the unit, where a physical window contact is monitored by B212. When the window status is “Open”, the unit is immediately switched OFF and when the status changes back to “Close”, the unit retains its previous state.

CAUTION

B212 module might be used to switch loads with 230VAC line voltages and therefore it is dangerous to work on the module when it is energized. Make sure that the power is isolated from the module before starting to work on it.

ORDERING INFORMATION

B212-DU	: BACnet room thermostat Display Unit
B212-CU	: BACnet room thermostat Control Unit

MADE IN INDIA