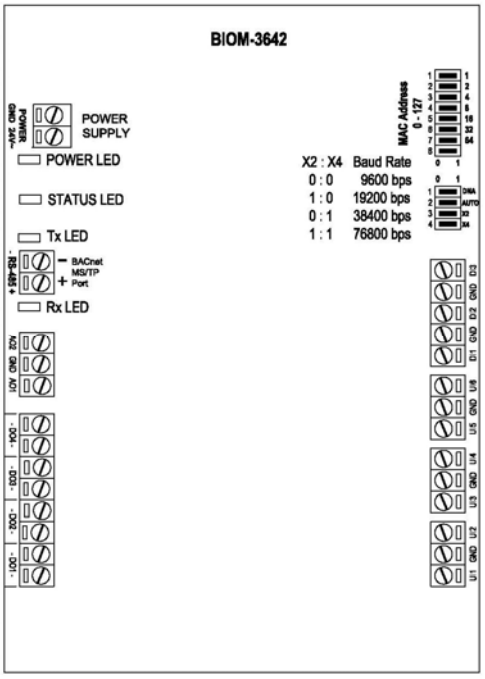
BIOM-3642 BACnet MS/TP Input/Output Field Modules
Installation and Parameter Setup Manual

Network & Cabling Requirements

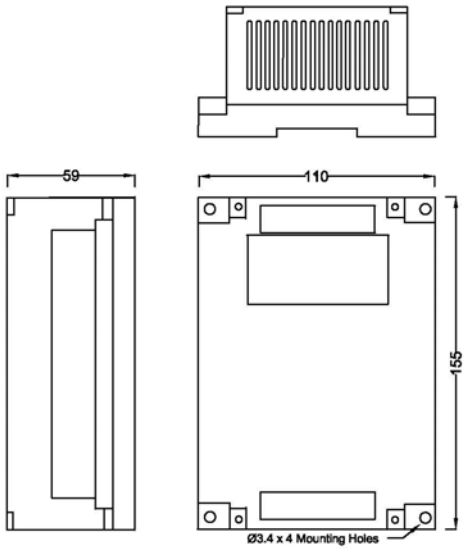
To ensure network stability and reliable communications, particularly at high speeds on a BACnet MS/TP network with a number of devices, it is imperative that the following network and cabling requirements are adhered to:

Item	Description
Cabling	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 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 BIOM. If and when the same transformer is shared with other devices, observe the polarities of the power supply of all devices including the BIOM.

Termination and Wiring Diagram



Dimensions in mm



Tables of Jumper Numbers and Jumper Settings of Universal Inputs

Jumper Number	J7	J8	J30	J24	J23	J25
Universal Input Number	UI1	UI2	UI3	UI4	UI5	UI6

Input Type	Pin Numbers of Universal Input Jumper Settings			
	1 & 2	2 & 3	3 & 4	4 & 5
Analog	4-20 mA	10 KΩ Thermistor	0-5 VDC	0-10 VDC
Others		Binary Input		

The BIOM-3642 input/output modules are plug and play devices which will go online automatically and be discovered by the BACnet system when connected to the BACnet MS/TP RS485 network trunk. Make sure that the baud rate of the BIOM-3642 modules is set to match the network baud rate.

Through the BACnet browser, the objects of the modules will be displayed as follows:

OBJECT	DEFAULT NAME	UNIT	INITIAL VALUE	OBJECT TYPE
yyyyyyy.DEV	BIOM_3642_yyyyyyy	Nil	Operational	Device
yyyyyy.BV1	Setting Device Instance ID	Nil	Off	Binary Value
yyyyyyy.BI1	BINARY INPUT_1	Nil	Off	Binary Input
yyyyyyy.BI2	BINARY NPUT_2	Nil	Off	Binary Input
yyyyyyy.BI3	BINARY NPUT_3	Nil	Off	Binary Input
yyyyyyy.UI1	UNIVERSAL INPUT_1	*	Blank	Analog Input
yyyyyyy.UI2	UNIVERSAL INPUT_2	*	Blank	Analog Input
yyyyyyy.UI3	UNIVERSAL NPUT_3	*	Blank	Analog Input
yyyyyyy.UI4	UNIVERSAL INPUT_4	*	Blank	Analog Input
yyyyyyy.UI5	UNIVERSAL INPUT_5	*	Blank	Analog Input
yyyyyyy.UI6	UNIVERSAL INPUT_6	*	Blank	Analog Input
yyyyyyy.BO1	BINARY OUTPUT_1	Nil	Off	Binary Output
yyyyyyy.BO2	BINARY OUTPUT_2	Nil	Off	Binary Output
yyyyyyy.BO3	BINARY OUTPUT_3	Nil	Off	Binary Output
yyyyyyy.BO4	BINARY OUTPUT_4	Nil	Off	Binary Output
yyyyyyy.AO1	ANALOG OUTPUT_1	*	Blank	Analog Output
yyyyyyy.AO2	ANALOG OUTPUT_2	*	Blank	Analog Output
Where yyyyyyy is the device's instance ID address; * Unit is to be defined and entered.				

Module MAC Addressing
The DIP switch is a binary switch. Each individual DIP switch represents a unique value, which forms the module MAC address when added together. To set the address, simply move the switches that add up to the module's desired address to the ON position.

Example: If the module is to be address 7 on the network, set the switches numbered 1, 2 and 4 (equals 7) to the ON position.

Note: Each module on the same MS/TP network segment must have a unique DIP switch address.

Derived Network Addressing (DNA)
The DNA DIP switch is set by factory default to ON position. This allows the module to automatically configure a BACnet instance ID number. This setting should not be changed unless an authorized agent is assigning a BACnet instance ID number through the system setup procedure. The BACnet instance ID number should not be confused with the module MAC address DIP switch setting, and each module must still have a unique DIP switch MAC address even when using software to define the module's instance ID number.

Example: If the MAC address of the upstream network router or controller is 8 and the module MAC address is set as 13, the module's DNA BACnet Instance ID is 80013 (8 x 10000 + 13).

Note:
When DNA function is turned on (DIP switch set as 1), function of setting device instance ID is disabled.
When DNA function is turned off (DIP switch set as 0), function of setting device instance ID is enabled.
Disconnect power supply before changing DNA switch position.

Device Object
The device's default object name can be changed by the workstation operator and the new name will be stored in the EEPROM chip in the module. Interruption of power supply will not lose the new name.

The BV1 object is used to set the unique device instance ID of the module in the BACnet network. The device instance ID address is a 7-digit decimal integer which is divided into 2 parts:

The first 5 digits are set in the BV1 object from 1 to 39999;
The last 2 digits are the module's MAC address set by the DIP switches on the module from 1 to 63.

To Change Device Object Name
The device's default object name is "BIOM_3642_yyyyyyy". If name change is required, double click the "DEV" object, go to the Description menu, enter the new object name and click "Apply" or "OK".

To Set Device Instance ID Address
This is a two-step operation:
1. Double click the "Setting Device Instance ID" object, go to the Setup menu, change the Setting Device Instance ID value from OFF to ON and click "Apply".
2 Go to the Description menu, change the description of the object in text command format as a string of characters to "/IDxxxxx" where xxxxx denotes the first 5 digits of the device instance ID address and its highest number is 39999. Then click "OK".

After the new setting is completed, the module will be re-initialized and its new device instance ID address will be automatically discovered by the BACnet system and displayed in the system browser. Interruption of power supply will not lose the new device ID. In the mean time, the original device ID address will go offline and can be deleted manually from the screen.

Input/Output Objects
The input or output object's name can be changed by the workstation operator and the new name will be stored in the EEPROM chip in the module. Interruption of power supply will not lose the new name.

To Change Input/Output Object Name
Double click the "Input or Output" object, go to the Setup menu, enter the new object name, maximum 20

characters, and click “Apply” or “OK”.

Enter Engineering Unit

Double click the “Analog input or Output Object”, go to the Sensor menu and select/enter the appropriate engineering unit for the object.

Binary Inputs

There are 3 binary input objects in each module with input numbers ranging from BI1 through BI3. The value of each binary input object has read only property.

When the volt-free input contact closes, the value changes to active (ON). When the contact opens, the value changes to inactive (OFF).

Universal Inputs

There are 6 analog input objects in each module with input numbers ranging from UI1 through UI6. The present value of each object has read only property and denotes the measuring result. Configure the device type property (or description property) of each object in text command format as a string of characters as:

For DC voltage input, the configuration format being “/V (a, b, c, d)” where a, b, c and d are range parameters. Parameters a and b, which are floating point values denoting the voltage input’s lower limit and upper limit respectively, with precision up to 2 decimal places, must meet the following conditions:

$0.00 \le a \le 10.00$
$0.00 \le b \le 10.00$
$a < b$

Parameters c and d, which are floating point values denoting the display span’s lower limit and upper limit respectively, with precision up to 2 decimal places, must meet the following conditions:

$-1{,}000{,}000.00 \le c \le 1{,}000{,}000.00$
$-1{,}000{,}000.00 \le d \le 1{,}000{,}000.00$
$c < d$

Example: “/V (0, 5, -80.92, 130)” = 0~5 VDC input, -80.92~130.00 span

For 4-20 mA input, a built-in resistor across the corresponding UI terminal and GND terminal will convert the signal input into voltage signal input and hence the parameters can be configured accordingly just like a voltage input.

For thermistor input, the configuration format is “/Tab (c)” where a, b and c are parameters.

Parameter a is a single character denoting the type of thermistor used:

a = 1 for 10kΩ@25ºC thermistor with following resistance-temperature table:		
Resistance Value @0ºC	Resistance Value @25ºC	Resistance Value @70ºC
27.3 kΩ	10 kΩ	2.22 kΩ
a = 2 for Type II 10kΩ@25ºC thermistor with following resistance-temperature table:		
Resistance Value @0ºC	Resistance Value @25ºC	Resistance Value @70ºC
32.7 kΩ	10 kΩ	1.75 kΩ
a = 3 for Type III 10kΩ@25ºC thermistor with following resistance-temperature table:		
Resistance Value @0ºC	Resistance Value @25ºC	Resistance Value @70ºC
29.5 kΩ	10 kΩ	1.99 kΩ

Parameter b is a single character denoting the temperature engineering unit:
b = C = Celsius
b = F = Fahrenheit.

Parameter c, which is a floating value denoting the offset adjustment value of the measured temperature, with precision up to 2 decimal places, must meet the following condition:

-10.00 ≤ c ≤ 10.00.
Examples:
"/T2C (0)" = Type II 10kΩ@25ºC thermistor, in ºC, no offset adjustment.

"/T3F (-0.33)" = Type III 10kΩ@25ºC thermistor, in ºF, with -0.33 R offset adjustment.

For the universal input used as a binary input, set as thermistor input and the configuration format is "/T0C (0)". The universal input will have the following values:

With input contact open, value = 0;
With input contact closed, value = 1.

Binary Outputs
There are 4 binary output objects in each module with output numbers ranging from BO1 through BO4.

The value of each binary output object has read/write property. When its value is active (ON), the output contact closes When its value is inactive (OFF), the output contact opens The value of the binary output can be changed by the BACnet system workstation operator or other controllers in the network. The BO object supports 16 priority arrays where write action of the higher priority array overrides that of the lower priority array until the write action of the higher priority array is relinquished.

Analog Outputs
There are 2 analog output objects in each module with output numbers ranging from AO1 through AO2.

The value of each analog output object has read/write property and is related to its voltage output. The AO object supports 16 priority arrays where write action of the higher priority array overrides that of the lower priority array until the write action of the higher priority array is relinquished. Configure the device type property (or description property) of each AO object in text command format as a string of characters as:

"/V (a, b, c, d)" where a, b, c and d are parameters.

Parameters a and b, which are floating point values denoting the voltage output's lower limit and upper limit respectively, with precision up to 2 decimal places, must meet the following conditions:

0.00 ≤ a ≤ 10.00
0.00 ≤ b ≤ 10.00
a < b

Parameters c and d, which are floating point values denoting the lower and upper values of the AO object corresponding to the voltage output's lower limit and upper limit respectively, with precision up to 2 decimal places, must meet the following conditions:

-1,000,000.00 ≤ c ≤ 1,000,000.00
-1,000,000.00 ≤ d ≤ 1,000,000.00
c < d

Example:
"/V (0, 10, 0, 100)" = 0-10 VDC output voltage, 0-100% output value if engineering unit "%" is specified.