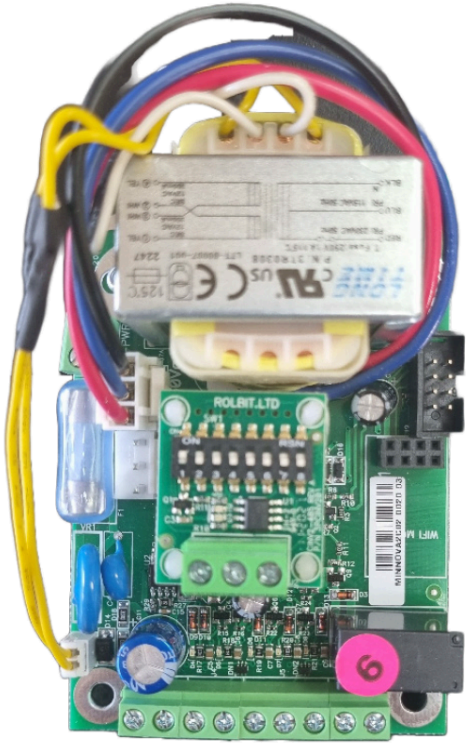
AIO® BACnet MS/TP and Modbus Gateway BACH20

Product Data Sheet



innova

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1. READING THIS DOCUMENTATION

Some symbols and language in this guide have specific meanings.

Note: Any reference to "the unit" is meant to refer to the AIO® Wall Mounted / Wall Mounted Pro unit.

1.1 Icons and symbols

Warnings and Attentions are included throughout this guide. It is essential to read each carefully and follow the instructions stated.

⚠WARNING

Used to advise of a situation or potential situation which, if not avoided, may result in death, serious injury, and/or property damage.

2. AIO® BACNET & MODBUS MS/TP GATEWAY BACH20

- Wired connection

The BACnet Gateway provides the ability for a building management system (BMS) to control all the functionality of the HPAC 2.0, as well as view error codes.

⚠WARNING

Only qualified professionals should install and service this equipment. Improper installation or modifications by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the installation manual and labels attached to the equipment.

The BACH20 extends your BACnet or Modbus network when your application requires monitoring and controlling the Heat Pump unit with your Building Automation System, reducing the cost of additional components.

The Networkable BACH20 Controller is mounted inside the heat-pump cabinet.

The controller provides a BACnet network interface between BACnet client devices and the INNOVA BACH20 Controller.

It uses the BACnet Master Slave/Token Passing (MS/TP) protocol at the BACnet MAC layer.

2.1 Prerequisites

This guide to BACnet and Modbus communication usage protocol assumes that you are familiar with the concepts of BACnet, Modbus, and related terminology.

The Wifi module must be removed to work with BACNET or Modbus.

2.2 Specifications

- Connection
  MSTP gateway
- BACnet and Modbus Protocol Revision
- Material
  Electronics Board
- Dimensions
  - Width: 3.12" (79.2 mm)
  - Height: 4.76" (120.9 mm)
  - Total Depth: 1.25" (31.8 mm)
  - Weight: 0.8 lb (0.4 kg)
- Temperature Units
  Fahrenheit or Celsius
- Comfort Setpoint Range
  60°F (15.6°C) - 90°F (32.2°C)
- Mounting
  Mounts inside the AIO® unit
- Connection Type
  Wired RS485
- Communication Protocol
  - BACnet MS/TP
  - Modbus RTU
- Warranty
  2-year limited
- Power Consumption
  Less than 1 kWh/month

2.3 Features

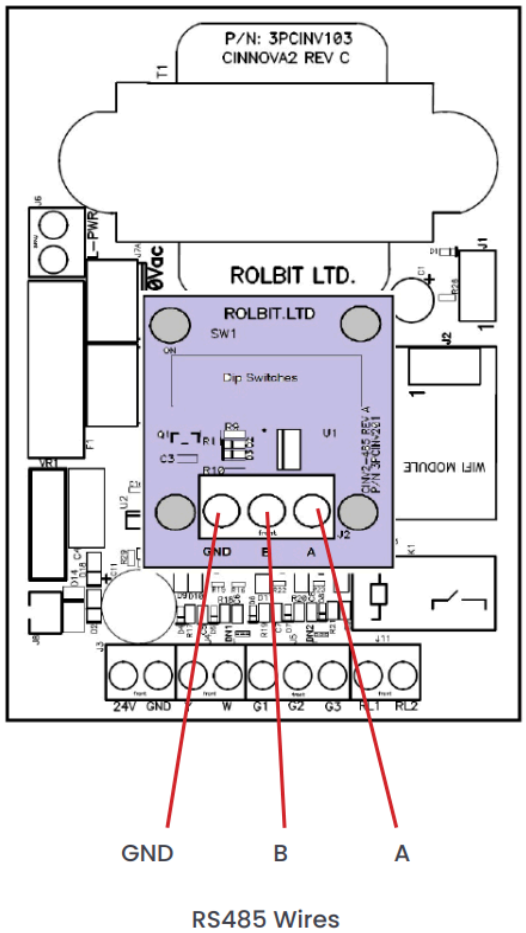
- On/off controls
- Controls set-point in one-degree increments
- Controls Modes Include: Cool, Heat, Dehumidify, and Fan Only.
- Controls Fan Speed Including: Low, Medium, High, and Auto
- View Error Messages

2.4 Included

- BACnet and Modbus Gateway

2.5 Wiring Diagram

Figure 1. Wiring diagram showing RS485 wires



3. PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT (PICS)

The following provides information about the protocol conformance of the BACnet gateway.

3.1 BACnet Properties Configuration

The WiFi module must be removed to work with BACNET or Modbus.

To establish communication on the network, configure the following properties for the unique ID of devices in the BACnet system.

- MAC address
  - Default value: 000
  - Valid values:
    - For BACnet: 000 - 063
    - For Modbus 001 - 064
- Device Instance:
  - Default value: 369
  - Configure to: 369,000 + MAC address
- Baud rate:
  - Fixed: 38,400 8N1

3.2 DIP Switch Setting

The BACnet gateway includes a bank of eight DIP switches. For information on configuring the gateway using the DIP switches, see DIP Switch Configuration.

4. BACNET OBJECT LIST

The following provides a list of BACnet objects, including their IDs, names, descriptions, whether or not they are writable, and notes:

4.1. Analog Inputs

Object	Name	Description	Writable	Notes
AI.0	Ambient temperature	Room air temperature	Read Only	60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution
AI.1	ALARMS2	ALARMS2		E8 discharge temp. probe fault
AI.2	ALARMS1	ALARMS1		E1–E7 alarm bit definitions (see alarm table)
AI.3	MISC_IN	Miscellaneous input		1. [1-0] OF Condensate pan overflow probe fault overflow=11 normal=xx 2. CP Unit activation external contact unit_off=1 unit_on=0

4.2 Analog Values

Object	Name	Description	Writable	Notes
AV.0	Mode of system operation	Operating mode	Read/Write	0=Heat, 1=Cool, 2=Off, 3=Dry, 4=Fan Only, 5=Auto
AV.1	Temperature setpoint	Value of the required user temperature in the room		60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution
AV.2	Fan Mode	Fan speed demand		0=Auto, 1=Low, 2=Med, 3=High, 4=Fan_Only
AV.3	Louver/Swing Mode	Louver/Swing (flap) operation mode		0=Swing, 7=Stop

Object	Name	Description	Writable	Notes
AV.4	Night Mode	Sleep mode status	Read/Write	1=Enabled, 0=Disabled
AV.5	Minimum cooling setpoint	Minimum temperature setting in COOL mode		60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution
AV.6	Maximum cooling setpoint	Maximum temperature setting in COOL mode		60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution
AV.7	Minimum heating setpoint	Minimum temperature setting in HEAT mode		60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution
AV.8	Maximum heating setpoint	Maximum temperature setting in HEAT mode		60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution
AV.9	Set Back adjustment in COOL mode	Temperature value to reduce setpoint by in COOL mode		60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution
AV.10	Set Up adjustment in HEAT mode	Temperature value to reduce setpoint by in HEAT mode		60°F (15.6°C) –88°F (31.1°C), 1.8°F (-16.8°C) resolution

Binary Outputs (Not Implemented)

Object	Name	Description	Writable	Notes
BO.0	AC_OFF Display ON	Not implemented	N/A	Not implemented
BO.1	FAN ON Compressor OFF	Not implemented	N/A	Not implemented
BO.2	BO-2	Not implemented	N/A	Not implemented

5. DIP SWITCH CONFIGURATIONS

The BACH20 gateway supports both BACnet MS/TP and Modbus RTU protocols. The gateway uses a 7-bit binary DIP switch arrangement (DIP 1–7) to set the device address, and DIP 7 also determines the protocol.

5.1 DIP Switch 1–6 — Address Selection

DIP switches 1-6 determine the device address.

- For BACnet, valid addresses are 1–64 (0–63 in DIP value).
- For Modbus, valid addresses are 1–64 (but Modbus uses “all off” = address 1).

5.2 DIP Switch 7 — Protocol Selection

DIP 7	Protocol	Baud Rate
OFF	Modbus RTU	9600 baud
ON	BACnet MS/TP	38,400 baud

5.3 DIP Switch 8 — End-of-Line (EOL) Termination

DIP 8	Function
OFF	Termination disabled
ON	Termination enabled (use **only on the last device** in the RS-485 chain)

- The BACH20 gateway supports up to 64 device addresses.
- BACnet Device Instance = 369000 + MAC address.
- BACnet baud rate is fixed 38,400 8N1.
- Modbus baud rate is fixed 9,600.

6. BACNET ADDRESS TABLE

6.1. BACnet DIP Switch Settings (DIP 1-7)

- Default = all OFF = 0
- BACnet = DIP 7 ON

Address	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6	DIP7
1	ON	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	ON	OFF	OFF	OFF	OFF	ON
3	ON	ON	OFF	OFF	OFF	OFF	ON
4	OFF	OFF	ON	OFF	OFF	OFF	ON
5	ON	OFF	ON	OFF	OFF	OFF	ON
6	OFF	ON	ON	OFF	OFF	OFF	ON
7	ON	ON	ON	OFF	OFF	OFF	ON
8	OFF	OFF	OFF	ON	OFF	OFF	ON
9	ON	OFF	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF	OFF	ON
11	ON	ON	OFF	ON	OFF	OFF	ON
12	OFF	OFF	ON	ON	OFF	OFF	ON
13	ON	OFF	ON	ON	OFF	OFF	ON
14	OFF	ON	ON	ON	OFF	OFF	ON
15	ON	ON	ON	ON	OFF	OFF	ON
16	OFF	OFF	OFF	OFF	ON	OFF	ON
17	ON	OFF	OFF	OFF	ON	OFF	ON
18	OFF	ON	OFF	OFF	ON	OFF	ON
19	ON	ON	OFF	OFF	ON	OFF	ON
20	OFF	OFF	ON	OFF	ON	OFF	ON
21	ON	OFF	ON	OFF	ON	OFF	ON
22	OFF	ON	ON	OFF	ON	OFF	ON
23	ON	ON	ON	OFF	ON	OFF	ON
24	OFF	OFF	OFF	ON	ON	OFF	ON
25	ON	OFF	OFF	ON	ON	OFF	ON
26	OFF	ON	OFF	ON	ON	OFF	ON
27	ON	ON	OFF	ON	ON	OFF	ON
28	OFF	OFF	ON	ON	ON	OFF	ON
29	ON	OFF	ON	ON	ON	OFF	ON
30	OFF	ON	ON	ON	ON	OFF	ON
31	ON	ON	ON	ON	ON	OFF	ON
32	OFF	OFF	OFF	OFF	OFF	ON	ON

Address	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6	DIP7
33	ON	OFF	OFF	OFF	OFF	ON	ON
34	OFF	ON	OFF	OFF	OFF	ON	ON
35	ON	ON	OFF	OFF	OFF	ON	ON
36	OFF	OFF	ON	OFF	OFF	ON	ON
37	ON	OFF	ON	OFF	OFF	ON	ON
38	OFF	ON	ON	OFF	OFF	ON	ON
39	ON	ON	ON	OFF	OFF	ON	ON
40	OFF	OFF	OFF	ON	OFF	ON	ON
41	ON	OFF	OFF	ON	OFF	ON	ON
42	OFF	ON	OFF	ON	OFF	ON	ON
43	ON	ON	OFF	ON	OFF	ON	ON
44	OFF	OFF	ON	ON	OFF	ON	ON
45	ON	OFF	ON	ON	OFF	ON	ON
46	OFF	ON	ON	ON	OFF	ON	ON
47	ON	ON	ON	ON	OFF	ON	ON
48	OFF	OFF	OFF	OFF	ON	ON	ON
49	ON	OFF	OFF	OFF	ON	ON	ON
50	OFF	ON	OFF	OFF	ON	ON	ON
51	ON	ON	OFF	OFF	ON	ON	ON
52	OFF	OFF	ON	OFF	ON	ON	ON
53	ON	OFF	ON	OFF	ON	ON	ON
54	OFF	ON	ON	OFF	ON	ON	ON
55	ON	ON	ON	OFF	ON	ON	ON
56	OFF	OFF	OFF	ON	ON	ON	ON
57	ON	OFF	OFF	ON	ON	ON	ON
58	OFF	ON	OFF	ON	ON	ON	ON
59	ON	ON	OFF	ON	ON	ON	ON
60	OFF	OFF	ON	ON	ON	ON	ON
61	ON	OFF	ON	ON	ON	ON	ON
62	OFF	ON	ON	ON	ON	ON	ON
63	ON	ON	ON	ON	ON	ON	ON
64	OFF	OFF	OFF	OFF	OFF	OFF	ON

7. MODBUS ADDRESS TABLE

7.1. Modbus DIP Switch Settings (DIP 1–7)

- Default = all OFF = Address 1
- Modbus = DIP 7 OFF

Address	D1	D2	D3	D4	D5	D6	D7
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	OFF	ON	OFF	OFF	OFF	OFF	OFF
4	ON	ON	OFF	OFF	OFF	OFF	OFF
5	OFF	OFF	ON	OFF	OFF	OFF	OFF
6	ON	OFF	ON	OFF	OFF	OFF	OFF
7	OFF	ON	ON	OFF	OFF	OFF	OFF
8	ON	ON	ON	OFF	OFF	OFF	OFF
9	OFF	OFF	OFF	ON	OFF	OFF	OFF
10	ON	OFF	OFF	ON	OFF	OFF	OFF
11	OFF	ON	OFF	ON	OFF	OFF	OFF
12	ON	ON	OFF	ON	OFF	OFF	OFF
13	OFF	OFF	ON	ON	OFF	OFF	OFF
14	ON	OFF	ON	ON	OFF	OFF	OFF
15	OFF	ON	ON	ON	OFF	OFF	OFF
16	ON	ON	ON	ON	OFF	OFF	OFF
17	OFF	OFF	OFF	OFF	ON	OFF	OFF
18	ON	OFF	OFF	OFF	ON	OFF	OFF
19	OFF	ON	OFF	OFF	ON	OFF	OFF
20	ON	ON	OFF	OFF	ON	OFF	OFF
21	OFF	OFF	ON	OFF	ON	OFF	OFF
22	ON	OFF	ON	OFF	ON	OFF	OFF
23	OFF	ON	ON	OFF	ON	OFF	OFF
24	ON	ON	ON	OFF	ON	OFF	OFF
25	OFF	OFF	OFF	ON	ON	OFF	OFF
26	ON	OFF	OFF	ON	ON	OFF	OFF
27	OFF	ON	OFF	ON	ON	OFF	OFF
28	ON	ON	OFF	ON	ON	OFF	OFF
29	OFF	OFF	ON	ON	ON	OFF	OFF
30	ON	OFF	ON	ON	ON	OFF	OFF
31	OFF	ON	ON	ON	ON	OFF	OFF
32	ON	ON	ON	ON	ON	OFF	OFF

Address	D1	D2	D3	D4	D5	D6	D7
33	OFF	OFF	OFF	OFF	OFF	ON	OFF
34	ON	OFF	OFF	OFF	OFF	ON	OFF
35	OFF	ON	OFF	OFF	OFF	ON	OFF
36	ON	ON	OFF	OFF	OFF	ON	OFF
37	OFF	OFF	ON	OFF	OFF	ON	OFF
38	ON	OFF	ON	OFF	OFF	ON	OFF
39	OFF	ON	ON	OFF	OFF	ON	OFF
40	ON	ON	ON	OFF	OFF	ON	OFF
41	OFF	OFF	OFF	ON	OFF	ON	OFF
42	ON	OFF	OFF	ON	OFF	ON	OFF
43	OFF	ON	OFF	ON	OFF	ON	OFF
44	ON	ON	OFF	ON	OFF	ON	OFF
45	OFF	OFF	ON	ON	OFF	ON	OFF
46	ON	OFF	ON	ON	OFF	ON	OFF
47	OFF	ON	ON	ON	OFF	ON	OFF
48	ON	ON	ON	ON	OFF	ON	OFF
49	OFF	OFF	OFF	OFF	ON	ON	OFF
50	ON	OFF	OFF	OFF	ON	ON	OFF
51	OFF	ON	OFF	OFF	ON	ON	OFF
52	ON	ON	OFF	OFF	ON	ON	OFF
53	OFF	OFF	ON	OFF	ON	ON	OFF
54	ON	OFF	ON	OFF	ON	ON	OFF
55	OFF	ON	ON	OFF	ON	ON	OFF
56	ON	ON	ON	OFF	ON	ON	OFF
57	OFF	OFF	OFF	ON	ON	ON	OFF
58	ON	OFF	OFF	ON	ON	ON	OFF
59	OFF	ON	OFF	ON	ON	ON	OFF
60	ON	ON	OFF	ON	ON	ON	OFF
61	OFF	OFF	ON	ON	ON	ON	OFF
62	ON	OFF	ON	ON	ON	ON	OFF
63	OFF	ON	ON	ON	ON	ON	OFF
64	ON	ON	ON	ON	ON	ON	OFF

8. MODBUS REGISTERS LIST

8.1 Primary Registers

Register #	Short Name	Description	R/W	Units / Values	Min	Max
1	MODE	Operating mode	R/W	0=Heat, 1=Cool, 2=Standby, 3=Dehum, 4=Fan, 5=Auto	—	—
5	Set Point	Temperature setpoint	R/W	°F/°C	50°F (10°C)	104°F (40°C)
6	LVL	Fan speed	R/W	0=Auto, 1=Low, 2=Med, 3=High	—	—
7	Flap	Louver mode	R/W	0=Swing, 7=Stop	—	—
8	Night	Night mode	R/W	0=Disabled, 1=Enabled	—	—
98	Set Point Status	Actual SP	R/W	°F/°C	50°F (10°C)	104°F (40°C)
99	Mode + Level	Running mode + fan level	R	Bit-coded values (auto, cool, heat, etc.)	—	—
129	Ambient	Room temperature	R	Temperature	—	—

9. ERROR CODES

9.1 ALARMS1 — Register #121

Fault Code	Bit	Decimal	Description
E1	0	1	Room temperature probe fault
E2	1	2	Indoor exchanger temp probe fault
E3	2	4	Outdoor exchanger temp probe fault
E4	3	8	Outdoor temperature probe fault
E5	4	16	Indoor fan failure
E6	5	32	Outdoor fan failure
E7-disp	6	64	Display communication failure
E7-drv	7	128	Driver communication failure

9.2 ALARMS2 — Register #121 (additional)

Fault Code	Bit	Decimal	Description
E8	5	16	Discharge temperature probe fault

9.3 Additional ALARMS — Register #142

Fault Code	Bit	Decimal	Description
OF	0.1	3	Condensate pan overflow (overflow=11, normal=xx)
CP	2	4	Unit activation external contact (unit_off=1, unit_on=0)

10. WARRANTY INFORMATION

For terms and conditions, click on the link below (and navigate to Section 4) :

AIO Warranty Terms and Conditions - 2026 - INN...

11. BACNET GATEWAY BACH20 SUBMITTAL

Job	Reference	Construction
Location	Approval	Quote Number
Engineer	Date	Drawing Number
Submitted To	Submitted By:	P.O. Number:

Features

- Controls on/off
- Controls Set-point in one degree increments
- Controls Modes Including: Cool, Heat, Dehumidify and Fan Only.
- Controls Fan Speed Including: Low, Medium, High and Auto
- View Error Messages

Specs

- **Connection:** MSTP gateway
- **BACnet and Modbus Protocol:** Revision
- **Material:** Electronics Board
- **Dimensions:**
  - **Width:** 3.12" (79.2 mm)
  - **Height:** 4.76" (120.9 mm)
  - **Total Depth:** 1.25" (31.8 mm)
  - **Weight:** 0.8 lb (0.4 kg)
- **Temperature Units:** Fahrenheit or Celsius
- **Comfort Setpoint Range:** 60°F - 90°F (15.6°C - 32.2°C)
- **Mounting:** Mounts inside the AIO®
- **Connection Type:** Wired RS485:
- **Communication Protocol:**
  - BACnet MS/TP
  - Modbus RTU:
- **Warranty:** 2-year limited
- **Power Consumption:** Less than 1 kWh/month

With over 20 years of experience in the climate comfort sector, we have a clear goal: growth through innovation. Our team is laser-focused on the conception, development, and production of innovative heating, ventilation, and air conditioning solutions. This mission has developed through bringing together technical skills, creativity, technology, design, Italian passion, and a global vision to achieve the best energy efficiency and performance.

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MADE IN ITALY

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AIO® BACnet MS/TP and Modbus Gateway BACH20
Product Data Sheet