

smartIAQ Hub-4 Pro— Installation and Commissioning Guide

Product: Hub-4 Pro

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Applies to: Firmware 1.1.0 and later

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1. Scope

This guide is the full reference for installers, commissioning agents, and BMS integrators. It covers the Hub-4 Pro after first power-up. For mounting, wiring, and first discovery, start with the the Quick Start Guide. For every BACnet object and its rules, see the BACnet Points List. When something does not work, see the Troubleshooting Guide.

Configure the Hub-4 Pro with BACnet WriteProperty from any BACnet client, or with the local Bus Manager console. There is no web interface. The Hub-4 Pro stores changes in flash, and they survive power cycles.

2. Settings Reference

2.1 Board jumpers

The BN and MB service jumpers select the Bus Manager console. The 120R jumper enables the onboard MS/TP termination. Normal installation and commissioning do not use any other jumper.

Do not install or remove a jumper while the Hub-4 Pro is powered on. A jumper change on a powered Hub-4 Pro can cause permanent damage. The Hub-4 Pro reads the jumpers only at power-up.

2.2 Device object parameters

Write these properties on the Device object. They take effect immediately.

Property	ID	Type	Default	Valid range
Object_Identifier	75	ObjectID	Device:1000	0 to 4194303
Object_Name	77	CharString	"GridSet Gateway"	1 to 31 chars
Description	28	CharString	"server"	0 to 64 chars
Location	58	CharString	"USA"	0 to 64 chars

These Device properties are read-only. A write returns `write-access-denied`.

Property	ID	Value	How to change
Max_Master	64	127	AV:3 Gateway Max_Master
Max_Info_Frames	63	1	Fixed in firmware
APDU_Timeout	11	3000 ms	Fixed in firmware
Number_Of_APDU_Retries	73	3	Fixed in firmware

2.3 MS/TP link settings

There are two ways to set the MS/TP address, and the one you use depends on the firmware version. This section explains why, how to check the version, and which way to take.

Why there are two ways. Every BACnet device keeps its MS/TP address in a property called `MAC_Address` on the Network Port object. The BACnet standard stores that address as an octet string. An octet string is a raw byte value, not a plain number, so a tool needs a special editor to change one. Most commissioning tools do not have one. YABE shows the field grayed out. Niagara Workbench and BQT do not recognize the property and treat it as read-only. A tool that cannot write an octet string cannot set the address this way.

Firmware 1.2.0 solved this. It added three ordinary points that hold the same three settings as plain numbers. Any tool that can write a setpoint can write them, so the octet string never comes up. Firmware before 1.2.0 does not have those points.

How to check the firmware version. Use whichever of these you can:

- From a BACnet tool, read `Firmware_Revision` (property 44) on the Device object. This needs the Hub-4 Pro to be reachable on the bus already.
- From the Bus Manager console, choose menu item **9**, Show full config and device info. The first line reads `Firmware`. See section 4.
- From the object list, look for AV:1, named `Gateway MS/TP MAC`. If that point exists, the firmware is 1.2.0 or later. If it does not, the firmware is older.

Which way to take.

Your situation	Use
Firmware 1.2.0 or later	The three points below
Firmware before 1.2.0, and your tool can write an octet string	Network Port object, section 6

Your situation	Use
Firmware before 1.2.0, or no BACnet client on the bus, or a lost password	Bus Manager console, section 4

Firmware 1.2.0 and later: the gateway settings points

The MS/TP settings are three Analog Value points on the gateway. Write the `Present_Value` from any BACnet tool. The Hub-4 Pro saves the value to flash at once and applies it at the next restart. The write needs no `ReinitializeDevice` and no password.

Point	Object	Valid values	Default
Gateway MS/TP MAC	AV:1	Whole number 1 to 127, unique on the segment, $\leq$ Max_Master	1
Gateway MS/TP Baud	AV:2	9600, 19200, 38400, 57600, 76800, or 115200	38400
Gateway Max_Master	AV:3	Whole number 1 to 127, at least the MAC of the Hub-4 Pro	127

Rules:

- Write the value as a REAL. An Unsigned or Integer write returns `invalid-data-type`.
- The Hub-4 Pro rejects a fraction, a value outside the range, a baud that is not one of the six rates, and a MAC above Max_Master. A rejected write returns `value-out-of-range`, and the saved value does not change.
- To lower both the MAC and Max_Master, write the MAC first.
- A read returns the saved value. The bus keeps the old settings until the restart.
- Any restart applies the change. Use a power cycle, or send `ReinitializeDevice WARMSTART` with the management password if one is set.
- Max_Master is the highest station address that the Hub-4 Pro polls for the token. Your commissioning tool is a master too. If Max_Master is below the address of the tool, the tool loses the bus and cannot send a Who-Is. Keep Max_Master at 127 unless the site needs a lower value.
- While `Out_Of_Service` is `TRUE`, a write changes only the displayed value. Nothing is saved. Set it back to `FALSE` to show the saved value.

The same settings are also on the standard Network Port object. See section 6.

Firmware before 1.2.0

These units have no gateway settings points. Set the MS/TP address with the Bus Manager console in section 4. It needs a jumper change and a terminal program, and it works whatever your BACnet tool can do. If your tool can write an octet string, the Network Port object in section 6 also works.

Everything else in this guide applies to these units unchanged. That includes the password, the device identity, the BMS integration notes, and the handoff record.

2.4 Management password

The password is proprietary property **512** on the Device object, a `CharacterString`. The Hub-4 Pro ships with a blank password and runs without one. A password is recommended, not required. After a password is set, the gateway authenticates `ReinitializeDevice` and

`DeviceCommunicationControl` (DCC) requests against it. Ordinary reads and point writes are never gated.

BACnet action	Password required after one is set?
<code>ReinitializeDevice</code> (<code>WARMSTART</code> , <code>COLDSTART</code>)	Yes
<code>DeviceCommunicationControl</code>	Yes
Ordinary <code>ReadProperty</code> / <code>WriteProperty</code> traffic	No

Constraints:

- A password has 1 to 20 printable ASCII characters (0x20 through 0x7E). The Hub-4 Pro stores up to 31 characters, but BACnet limits the `ReinitializeDevice` password to 20. A longer password blocks `ReinitializeDevice`.
- A password **must not contain** `:`. The colon separates `old:new` in a rotation. The gateway rejects a colon, a control character, a tab, and a high-bit byte with `value-out-of-range`.
- A read of property 512 always returns an empty string. The gateway never sends the password on the wire.
- The Hub-4 Pro stores the password in flash. It survives reboots and power cycles.

2.5 Factory reset

There are two ways to return all parameters to their defaults:

- Use the Bus Manager console, item **13** Factory reset. This works without the management password. See section 4.
- Ask engineering to erase the configuration flash pages through the debug port.

After a factory reset, the Hub-4 Pro boots with instance 1000, name `GridSet Gateway`, MAC 1, baud 38400, Max_Master 127, and no password.

2.6 Polling defaults

These values control the polling of the device ports. The firmware sets them at build time. There is no field path to change them.

Parameter	Default	Effect
Poll interval	1000 ms	How often the gateway polls an active device.
Probe interval	5000 ms	How often an empty or failed port probes for a device.
Response timeout	500 ms	How long the gateway waits for a response before it counts a timeout.
Max consecutive timeouts	5	Missed responses before an active port enters FAILED.
Stale-data window	3 s	Poll interval times the staleness multiplier of 3.

During the stale-data window a sensor point keeps its last reliability if the device omits the field or sends null. After the window the point reports `UNRELIABLE_OTHER`.

If sensor points drop out while Device Online stays Active, a larger staleness multiplier is the usual fix. If a port LED shows three short flashes every 2 seconds, a longer response timeout or a higher timeout count is the usual fix. Contact engineering to request either change.

3. Commissioning Procedure

Before you start:

- Confirm that the gateway is visible on the BACnet MS/TP segment.
- Record the device instance, MS/TP MAC, and baud rate of the gateway before you change security settings.
- Use a BACnet client that can write proprietary Device properties.

3.1 Set the MS/TP link settings

Skip this step if MAC 1, 38400 baud, and Max_Master 127 suit the segment.

On firmware before 1.2.0, use the Bus Manager console in section 4 instead of the steps below. Section 2.3 explains how to check the version.

1. Find the points `Gateway MS/TP MAC`, `Gateway MS/TP Baud`, and `Gateway Max_Master`, or use their instances AV:1, AV:2, and AV:3.
2. Write the new `Present_Value` as a REAL.
3. Read it back to confirm the saved value.
4. Restart the Hub-4 Pro. A power cycle is fine. The new settings apply at start-up.

See section 2.3 for the validation rules and the Max_Master rule for your own tool.

In Niagara Workbench, discover the three points into the station like any other AV and write them as a `NumericWritable`. In YABE, edit `Present_Value` in the property grid of the point.

3.2 Set the device identity

1. Write the device instance to `Object_Identifier` if the site needs a value other than 1000.
2. Write `Object_Name`, `Location`, and `Description` to identify the gateway in the BMS. Each takes a normal WriteProperty to the Device object. An empty string clears Location or Description.

These take effect immediately and survive power cycles.

3.3 Set the management password (recommended)

The Hub-4 Pro ships with no password and runs without one. A password is not required. Without a password, any BACnet participant on the segment can reboot the gateway or silence its traffic. Set one before handoff at a production site, and at any site where the MS/TP segment is not physically secure, such as a hospital, a school, a multi-tenant space, or a data center.

1. Select the Device object.
2. Send WriteProperty to property ID `512` with tag `CharacterString`.

3. For a **first-time write**, when no password is set, write the new password directly, for example `mysecret`.
4. For a **rotation**, when a password is already set, write `old:new`, for example `mysecret:bettersecret`.
5. To **clear** the password and return to no authentication, write `old:` with an empty new half, for example `mysecret:`.

On a rotation, the gateway compares `old` with the stored password. On a mismatch, it returns `password-failure` (Error Class 2, Code 26).

If the password is lost, recover with a factory reset from the Bus Manager console. Engineering can also erase the configuration through the debug port.

3.4 Record the handoff

Record the device instance, MAC, baud, Max_Master, and the password in the commissioning record of the customer. Use the table in section 7.

4. Bus Manager Console

Use the Bus Manager to set the BACnet identity of the Hub-4 Pro from a local terminal. Use it when you have no BACnet client on the bus, or the management password is lost. If you have a BACnet client, write the MS/TP MAC, baud, and Max_Master as points AV:1, AV:2, and AV:3 instead.

4.1 Enter

1. Power off the Hub-4 Pro.
2. Disconnect the Hub-4 Pro from the BACnet bus. At power-up the Hub-4 Pro listens for 1.5 seconds. If it detects bus traffic, it prints a warning and ignores the console until the next power cycle.
3. Fit **both** the **BN** and **MB** jumpers.
4. Power on the Hub-4 Pro.
5. Confirm that LED1 blinks **3 times**. This shows that the Bus Manager is active.

Warning: Change jumpers only while the Hub-4 Pro is powered off. A jumper change on a powered Hub-4 Pro can cause permanent damage. The Hub-4 Pro reads the jumpers only at power-up.

4.2 Connect

1. Connect the RS-485 port (green terminal block) to an RS-485-to-USB adapter, and connect the adapter to the PC.
2. Open a terminal program such as PuTTY, Tera Term, or `screen` at **115200 8N1**.

4.3 Set and save

1. Enter a number from the on-screen menu.
2. Enter the value.
3. Repeat for each setting that you want to change.

4. Enter **11** to save.

The menu covers the device instance, MS/TP MAC, baud rate, Max_Master, name, location, description, and password. For **8** Password, enter **1** to set a new password or **2** then **CLEAR** to remove it. A password has 1 to 20 printable characters and no colon.

The menu also has **9** to show the current settings, **10** to probe the device ports, **12** to discard changes, and **13** to factory reset.

4.4 Exit

1. Save your changes.
2. Power off the Hub-4 Pro.
3. Remove the **MB** jumper. Leave **BN** fitted.
4. Reconnect the Hub-4 Pro to the BACnet bus.
5. Power on the Hub-4 Pro. The Hub-4 Pro returns to normal operation.

4.5 Lost password

1. Enter the Bus Manager.
2. Enter **13** for Factory reset, then type **RESET** to confirm.

The factory reset clears the password and restores the defaults. Enter your settings again and save them.

5. BMS Integration

5.1 Adding the gateway to the BMS

1. **Discover the gateway.** The gateway responds to Who-Is with I-Am. The default instance is **1000**, the default MAC is **1**, and the default baud is **38400**.
2. **Browse the object list.** The gateway creates objects as it discovers devices on its four ports. The point set can change if a port later discovers a different hardware capability set.
Database_Revision increments on each such change.
3. **Map points.** Instance numbers follow the pattern **Port × 1000 + Offset**. Port 1 uses 1001 to 1061, Port 2 uses 2001 to 2061, and so on. See the BACnet Points List.

5.2 Object types

Type	Count per port	Use
Analog Input (AI)	Up to 17	Sensor readings (temperature, humidity, CO2, PM, and others) and fan and filter metrics
Analog Value (AV)	Up to 7	Writable setpoints (fan CFM, CO2 threshold, CO2 demand low and high, light occupancy low and high, HPS sensitivity)

Type	Count per port	Use
Binary Input (BI)	5	Status flags (filter warning and critical, fan inhibited, zone occupied, device online)
Binary Value (BV)	Up to 4	CO2 demand enable, light occupancy enable, HPS enable, and ionizer enable
Multi-State Value (MSV)	Up to 6	Modes and states (fan mode, filter limiter and confidence, motor run and fault, fan mode command)
Network Port	1 (static)	MS/TP datalink configuration
Gateway settings (AV)	3 (static)	AV:1 MS/TP MAC, AV:2 MS/TP baud, AV:3 Max_Master. Saved on write, applied at the next restart

The "Up to" counts depend on the sensors and actuators that the connected device reports in its capabilities.

5.3 Point lifecycle

- If a port has never discovered a device, there are no BACnet objects for that port yet.
- After discovery, the point set is based on the capabilities that the device reports. A point that is missing usually means that the device does not have that sensor or actuator.
- If the device stops responding, the objects first stay present with Device Online Inactive and `COMMUNICATION_FAILURE` on the other points. If the device stays silent for about 10 more seconds, the gateway deletes all objects for that port and increments `Database_Revision`. The gateway creates them again when it discovers a device.
- If a different hardware variant is connected later, the gateway recreates the point set of the port to match the new capabilities.

5.4 Reliability

Check the `Reliability` property on any object to understand the data quality:

Reliability Value	What it means	Action
<code>NO_FAULT_DETECTED</code>	Normal. The data is fresh and valid.	None.
<code>COMMUNICATION_FAILURE</code>	The gateway cannot reach the device, or the data is stale.	Check the wiring and Device Online (BI:x060).
<code>NO_SENSOR</code>	The device does not have that sensor or capability.	Confirm that the expected hardware is present on that model.
<code>UNRELIABLE_OTHER</code>	An installed sensor returns missing data, or a subsystem behind the point is degraded. While the human-presence radar stream is interrupted, HPS Enable (BV:x048) and Zone Occupied (BI:x040) report this value.	Check the sensor health on the device and Motor Fault (MSV:x038). If Device Online shows <code>UNRELIABLE_OTHER</code> , contact support.

When a device goes offline, all points on that port, except Device Online itself, show `COMMUNICATION_FAILURE`. The full mapping is in the Reliability Mapping in the BACnet Points List.

5.5 Writing overrides

Twelve port objects accept WriteProperty on `Present_Value`. They are listed with their rules in the Writable Objects in the BACnet Points List. A write that breaks a rule returns `value-out-of-range`.

For fan control, write the desired airflow to **Fan CFM Setpoint** (AV:x034). The device switches to manual mode when it accepts the command. To return control to the device, write **1** (Auto) to **Fan Mode Command** (MSV:x036). Read **Fan Applied Duty** (AI:x039) or **Fan CFM** (AI:x031) to confirm the result.

These writable objects are direct writes. They do not use BACnet command prioritization or relinquish behavior. A NULL write returns `invalid-data-type`.

Writes must use the correct BACnet datatype: **REAL** for the AV setpoints, **Enumerated** (active/inactive) for the BV switches, and **Unsigned** for the Fan Mode Command MSV. A value sent with any other datatype returns `invalid-data-type`. One example is a bare integer written to an AV. If the gateway refuses writes with that error, check your BMS point configuration.

5.6 Setpoint persistence across power loss

The device commits written setpoints to its non-volatile storage. They survive a power loss of any scope: the device, the Hub-4 Pro, or the whole building. After power returns, each device comes back with the values that the BMS last wrote. No supervisory rewrite is required.

This applies to the configuration-style points:

Point	Device parameter
CO2 Occ Threshold (AV x041)	<code>occ.co2_threshold</code>
CO2 Demand Enable (BV x042)	<code>fan.co2_demand_enabled</code>
CO2 Demand Low Setpoint (AV x043)	<code>fan.co2_demand_low</code>
CO2 Demand High Setpoint (AV x044)	<code>fan.co2_demand_high</code>
Light Occupancy Enable (BV x045)	<code>occ.light_enabled</code>
Light Occupancy Low Setpoint (AV x046)	<code>occ.light_exit</code>
Light Occupancy High Setpoint (AV x047)	<code>occ.light_enter</code>
HPS Enable (BV x048)	<code>occ.hps_enabled</code>
HPS Sensitivity (AV x049)	<code>occ.hps_sensitivity</code>

These are commissioning values. Set them once to match the space, then leave them alone. The device stores them for that reason.

Fan and ionizer commands are different. Fan CFM Setpoint (AV x034), Fan Mode Command (MSV x036), and Ionizer Enable (BV x050) are live control commands, not configuration. The device applies them immediately but does **not** persist them. After a power loss, the device returns to its own control defaults and the BMS resumes control.

When a device reboots or recovers from a communication outage while the Hub-4 Pro stays powered, the gateway sends every value that the BMS last wrote to the device again.

The gateway does not send a persisted setpoint to the device if the value does not change. Repeated writes of the same setpoint do not wear the storage of the device. Fan and ionizer commands are always sent.

5.7 COV subscriptions

The gateway supports **SubscribeCOV** on all object types.

Object type	Notification trigger
AI / AV	The value changes by more than the COV increment. See the Points table in the BACnet Points List for the per-object increments.
BI / BV / MSV	Any state change.
All types	Any change in <code>Status_Flags</code> , for example a Reliability transition.

The subscription table holds 128 entries from up to 16 subscriber addresses. Available memory limits the practical count to about 50 subscriptions when all four ports are populated. The HUB-4 rejects a further SubscribeCOV with the error `no-space-to-add-list-element`.

Best practices:

- **Subscribe to Device Online (BI:x060)** on each port. This is the fastest way to detect a device disconnect. If the outage lasts longer than about 10 seconds, the gateway deletes the port objects and the subscription ends. Treat a missing Device Online object as offline and subscribe again after the object returns.
- **Subscribe to Fan Applied Duty (AI:x039)** instead of polling after a write. The COV notification confirms that the device accepted the override.
- **Use an infinite lifetime** (lifetime = 0) for persistent monitoring. The gateway does not expire infinite subscriptions. If the BMS reboots, subscribe again at startup.

5.8 Alarm mapping suggestions

The gateway does not have intrinsic reporting. It has no Notification Class and no Event Enrollment objects. Configure alarms in the BMS with COV subscriptions or polled reads.

Alarm	Object to monitor	Condition
Device offline	BI:x060 Device Online	Inactive
Filter replacement needed	BI:x025 Filter Critical	Active
Filter life low	BI:x024 Filter Warning	Active
Motor fault	MSV:x038 Motor Fault	State = 2 (Fault)
CO2 high	AI:x003 CO2	Value > site threshold

Alarm	Object to monitor	Condition
Fan stopped unexpectedly	MSV:x037 Motor Run State	State = 2 (Stopped) while Fan Mode = Auto
Filter confidence low	MSV:x023 Filter Confidence	State = 1 (Low)

5.9 Supported BACnet services

- Discovery with `Who-Is` / `I-Am`
- Point reads with `ReadProperty` and `ReadPropertyMultiple`
- Point writes with `WriteProperty` on writable objects
- COV subscriptions with `SubscribeCOV`
- Password-gated `DeviceCommunicationControl` and `ReinitializeDevice`

6. Standard Network Port Path

The MS/TP settings are also on the standard **Network Port** object (`MS/TP Port 1` , instance 1) as `MAC_Address` , `Max_Master` , and `Link_Speed` . Use this path when your tool supports octet-string writes and `ReinitializeDevice` . Otherwise use AV:1 to AV:3. Most field tools cannot write the octet-string `MAC_Address` .

A `WriteProperty` to these properties stages the value and sets `Changes_Pending` to `TRUE` . The link keeps the previous settings until you activate the change.

To activate staged changes, send `ReinitializeDevice` with state `ACTIVATE_CHANGES` or `WARMSTART` . The gateway saves the changes to flash and restarts. After the restart, read the Network Port to confirm that `Changes_Pending` is `FALSE` .

In YABE, right-click the device and select **Device control**. Set Action to **Reinitialize** and set Reinitialize State to **WARMSTART**. Most BMS commissioning software exposes `ReinitializeDevice` directly.

Rules:

- If a management password is set, the `ReinitializeDevice` request must carry it. The gateway rejects a `ReinitializeDevice` with a wrong password **and discards the staged change**, so a later, unrelated `ReinitializeDevice` cannot apply it.
- Staged settings live in RAM. A power cycle before the `ReinitializeDevice` discards them. If a MAC or baud write "did not take", this is the usual reason. Use AV:1 to AV:3 instead.
- `Changes_Pending` is read-only. A restart clears it.
- A write to AV:1, AV:2, or AV:3 that changes a value replaces any staged Network Port changes. The Network Port then shows the saved values, with `Changes_Pending` `TRUE` until the restart.
- `Max_Master` and MAC must be 1 to 127. The gateway rejects an out-of-range write with `value-out-of-range` at write time.
- `Max_Master` must be at least the MAC of the gateway. Other masters never poll a node whose MAC exceeds its `Max_Master`, so that node drops off the token ring. The gateway checks this rule at activation, because both values are staged together. You can lower both values in one change.

- A refused activation still returns a SimpleACK. The gateway discards the staged values, sets the Network Port Reliability to unreliable-other, does not restart, and keeps its previous configuration. Read the Network Port Reliability to detect the refusal.

7. Commissioning Handoff Record

Capture at least the following in the site record before release:

Item	Record
Site, panel, and date	
Installer or technician	
Firmware version (Firmware_Revision)	
BACnet device instance	
MS/TP MAC address (AV:1)	
MS/TP baud rate (AV:2)	
Max_Master (AV:3)	
Device Location and Description set	
Management password set and stored	
Ports with a device, and each tested	
Open items and owner	
Customer contact or system owner	