

SmartStruxure™ Lite Solution

MPM series

installation instructions

Smart  truxure

Site and zone managers providing wired and wireless integrated control solutions for HVAC, lighting and metering, as well as remote management via StruxureWare™ Building Expert.



MPM-UN multi-purpose manager




MPM-VA VAV manager



MPM-GW wireless manager

Get Control. Get Efficient. Get Value™

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Who Should Read This Guide

Who Should Read This Guide

This guide is intended for integrators of SmartStruxure Lite™ solutions. It provides important information for getting you started with the setup and configuration of your building efficiency management system.

Plan and Prepare

In order to ensure a successful and trouble-free deployment at the client's site, we make the following recommendations, which we strongly suggest that you follow:

- **Read and follow the instructions in this guide.**
The information contained here is provided to help you work effectively and minimize the likelihood of any critical issues coming up during deployment. Have this document on hand, if possible, when doing your on-site installation.
- **Prepare your equipment before going on site.**
To the extent possible, commission and configure your equipment before venturing on site for deployment.
Successful deployment of your SmartStruxure Lite™ system requires preparation and planning. Without proper planning and preparation, the risk of frustration—or even failure — is greatly increased. Proper planning saves resources, prevents wasted effort, and saves time and money.

Finally, by following these recommendations, you will minimize the risk of inconvenience, hampered productivity, and/or revenue loss for your customer.

About this Document

This document provides instructions for the physical installation of the following hardware components of your SmartStruxure Lite system:

- MPM-UN multi-purpose manager
- MPM-VA VAV manager
- MPM-GW wireless manager

It also provides brief overviews of creating a network of MPM devices.

for more information and documentation, visit:

documentation.smartstruxurelite.com

Overview

Overview

Multi-Purpose Management Devices are a flexible line of site and zone managers. They allow facility managers and contractors to deploy and manage integrated solutions for HVAC, lighting and metering. They are also a quick and efficient link between multiple devices based on many standard protocols. The Building Expert web building energy management system is embedded in the Multi-Purpose Management Devices. The devices are also BACnet and oBIX compliant for integration into larger StruxureWare systems.

MPM-UN Multi-purpose Manager

The MPM-UN multi-purpose manager is an electronic device designed to monitor and control various end-devices for building automation applications.

The manager consists of a printed circuit board housed in a plastic shell casing. External connectors are available for the following:

- 6 universal inputs
- 4 analog outputs
- 2 binary outputs (dry contact)
- LAN (Ethernet cable)
- RS-485 device (Modbus)
- CANbus
- Power supply

The manager is compatible with BACnet (IP/Ethernet) and oBix. It has optional embedded enOcean and ZigBee wireless modules that enable bidirectional communication with enOcean and ZigBee devices. The managers may also communicate with each other wirelessly using their ZigBee modules.

Uses

Multi-purpose managers are fully programmable and have been designed with wireless lighting and HVAC applications in mind.

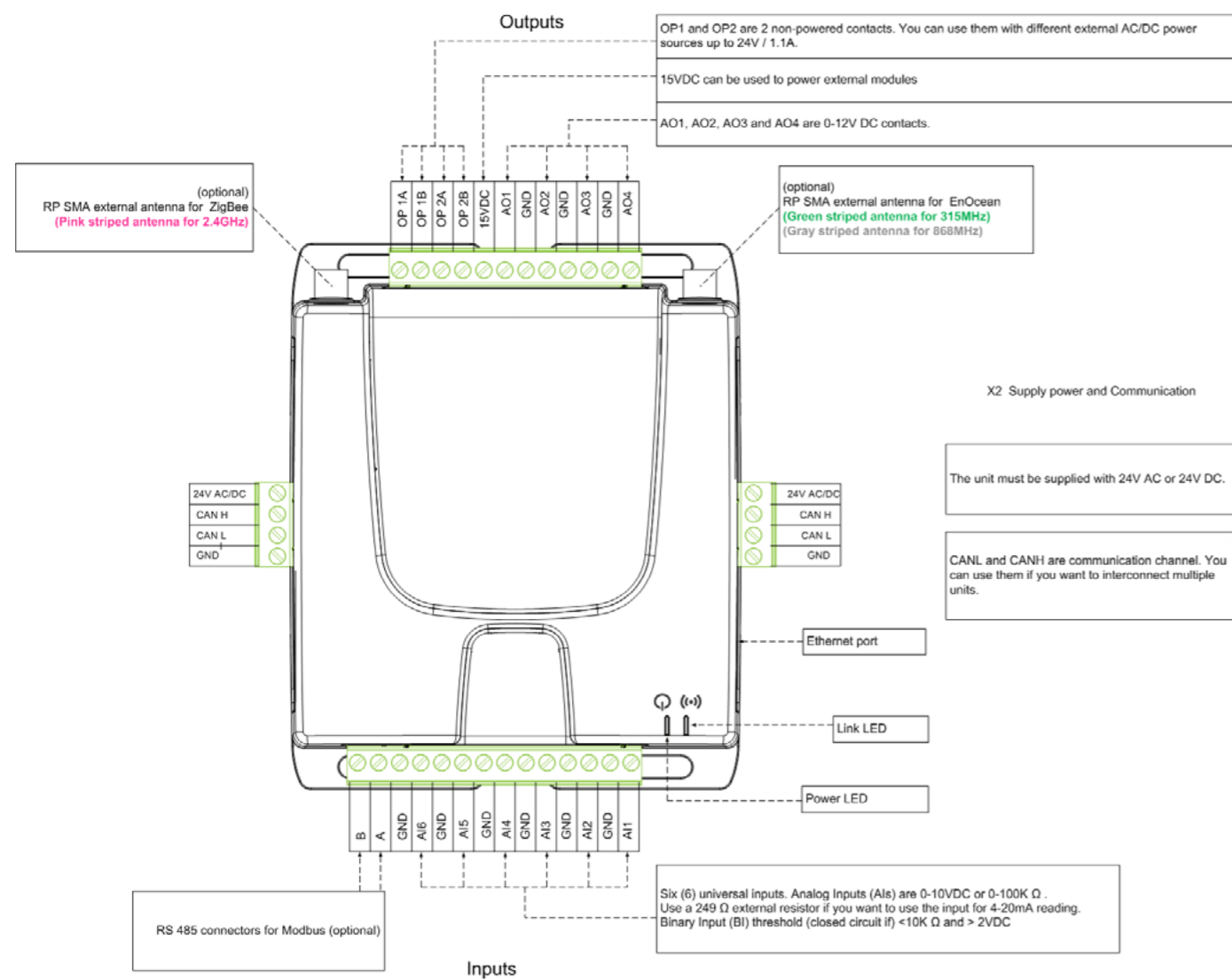
Multi-purpose managers can be used to control a wide range of wired and wireless (enOcean and ZigBee-compatible) end-devices, including light sensors, light switches, relays, thermostats, card readers, magnetic door contacts, and similar systems.

Multi-purpose managers are intended for installation in commercial, industrial or institutional buildings.



Overview

Pinout Information



MPM-VA VAV Manager

The MPM-VA VAV Manager is an electronic device designed to monitor and control various end-devices for building automation purposes, including VAV boxes.

The MPM-VA VAV Manager is an electronic device designed to monitor and control various end-devices for building automation applications.

The VAV manager consists of a printed circuit board housed in a plastic shell casing. External connectors are available for the following:

- 6 universal inputs
- 4 analog outputs
- 2 binary outputs (dry contact)
- 1 damper actuator
- 1 pressure sensor
- LAN (Ethernet cable)
- RS-485 device (Modbus)
- CANbus
- Power supply

The VAV Manager has a pressure sensor and is equipped with a damper actuator (optional).

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Overview

The VAV Manager has optional embedded enOcean and ZigBee wireless modules that enable bidirectional communication with enOcean and ZigBee devices. The managers may also communicate with each other wirelessly using their ZigBee modules.

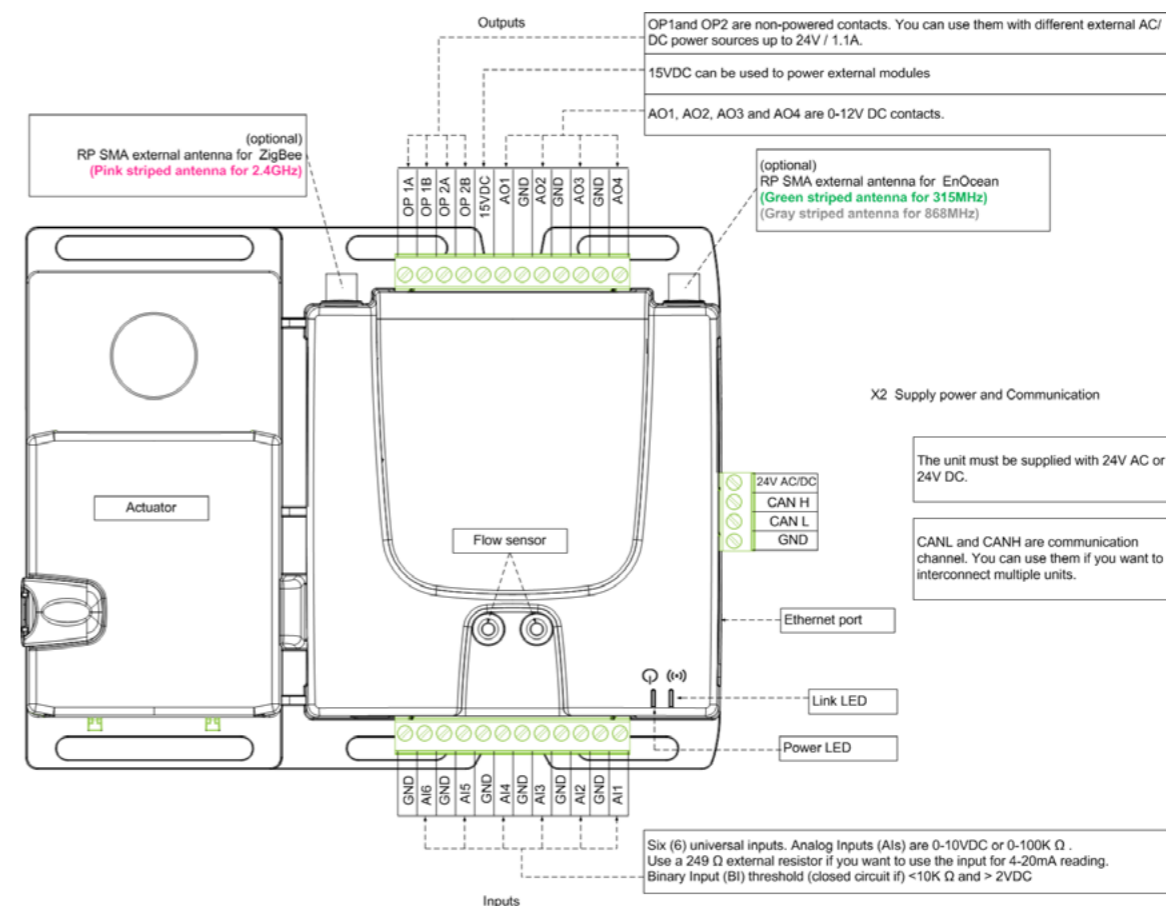
Uses

VAV managers are fully programmable and have been designed with VAV control in mind. In addition to all the features of the MPM, The VAV Manager has a pressure sensor and a damper actuator for direct control of VAV boxes.

VAV Managers can be used to control a wide range of wired and wireless (enOcean and ZigBee-compatible) end-devices, including light sensors, light switches, relays, thermostats, card readers, magnetic door contacts, and similar systems.

VAV Managers are intended for installation in commercial, industrial or institutional buildings.

Pinout Information



MPM-GW Wireless Manager

The MPM-GW wireless manager is an electronic device designed to integrate wireless solutions to wired building automation systems. Small Buildings System gateways can integrate wireless end-devices, based on the enOcean and ZigBee protocols and standards, into BACnet building automation systems.

They are all interoperable with any BACnet compliant building management system.

The MPM-GW is a printed circuit board housed in a plastic shell casing. Unlike the MPN-UN and MPM-VA, there are no physical (wired) I/Os on this manager. The following connectors are concealed by the casing, giving a neutral look to the device, for installation in institutional or commercial environments:

- LAN
- CANbus
- Power supply

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Installation

The MPM-GWs have optional embedded enOcean and ZigBee wireless modules that enable bidirectional communication with enOcean and ZigBee devices. The managers may also communicate with each other wirelessly using their ZigBee modules.

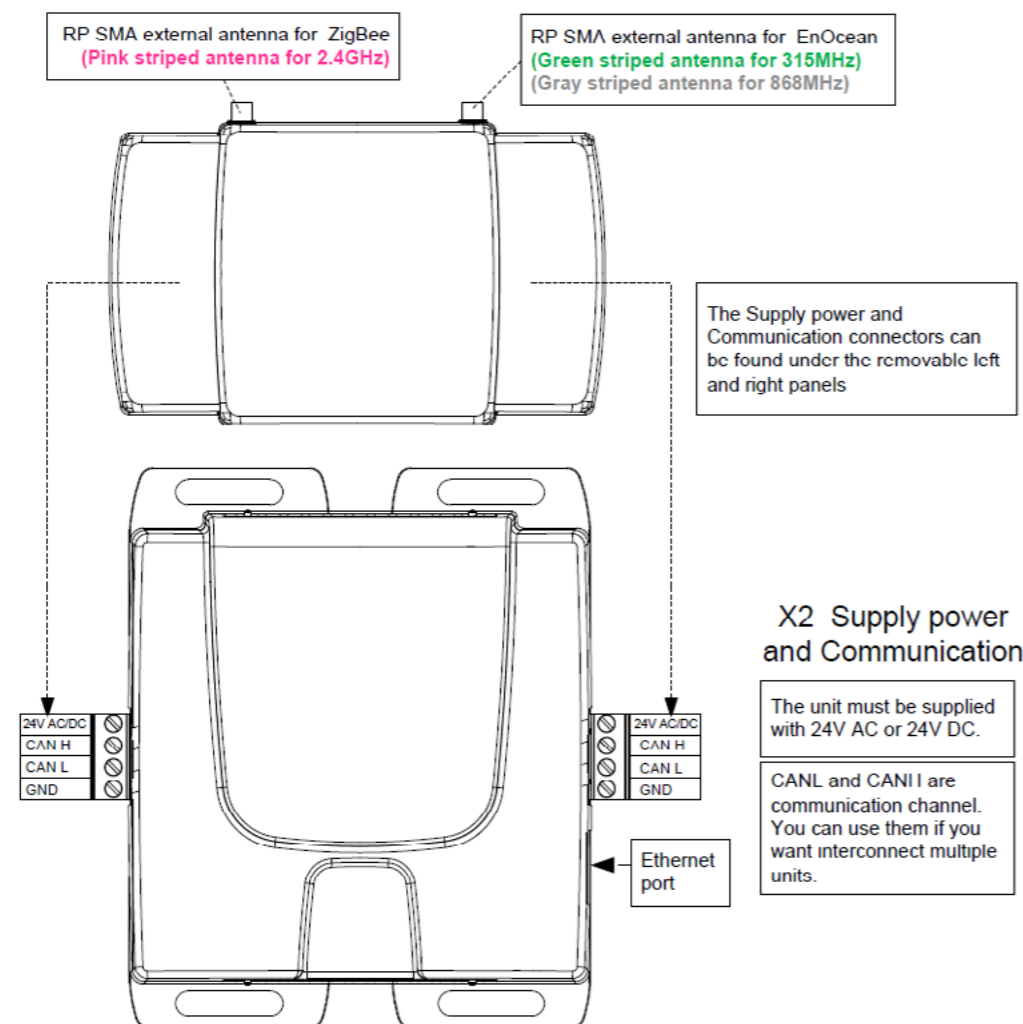
Uses

MPM-GWs are fully programmable and have been designed with wireless lighting and HVAC applications in mind. They can control wired end-devices, as well as compatible wireless enOcean and ZigBee end-devices.

MPM-GWs can be used to control a wide range of wireless end-devices including light sensors, light switches, relays, thermostats, card readers, magnetic door contacts, and similar systems.

MPM-GWs are intended for installation in commercial, industrial or institutional buildings.

Pinout Information



Installation

This sections explains how to install and power up your manager(s).

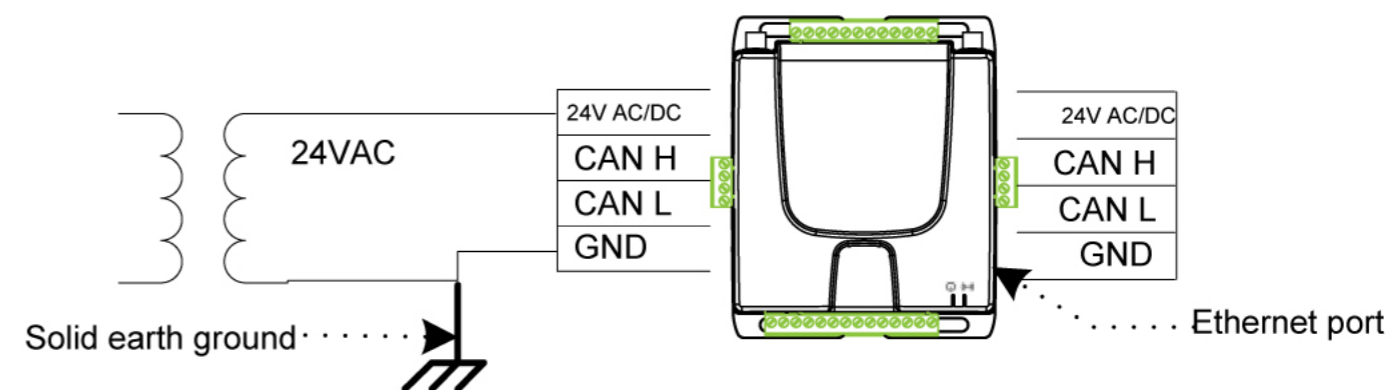
Required Tools and Equipment

- One flat-blade screwdriver (3mm/1/8" wide or smaller)
- One straight-through Ethernet cable (RJ-45)
- A computer (PC, Mac, or Linux) with the Firefox browser (version 17 or later)
- Optional: an Ethernet switch or hub, if you want to connect your manager to your local network.

Networking

Powering Up Your Manager

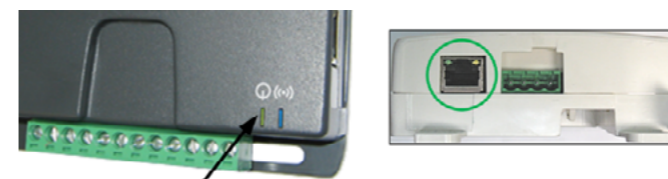
The following figure show the power connectors for your MPM-UN, MPM-VA, and MPM-GW managers.



1. Connect the power supply to your manager: using a flat-head screw driver, connect the positive wire to the 24V AC/DC pin. Connect the second wire to GND.

NOTE: If you are using the power supply provided with your manager, the positive wire is the one identified with a red marker. If you are using a third-party power supply, verify correct polarity before connecting.

2. After fastening the wires, plug the power supply into the outlet. The green LED on the MPM-UN/MPM-VA or the RJ-45 connector's LED on the MPM-GW's should now be lit.



Networking

You can connect your manager(s) directly to your computer or to your local area network (LAN).

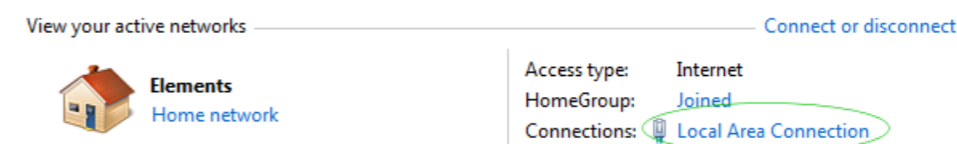
IMPORTANT: Regardless of the type of connection you intend to use for your network, you must connect your MPM directly to your computer for its initial setup.

Configuring Your PC to Communicate Directly with the Manager

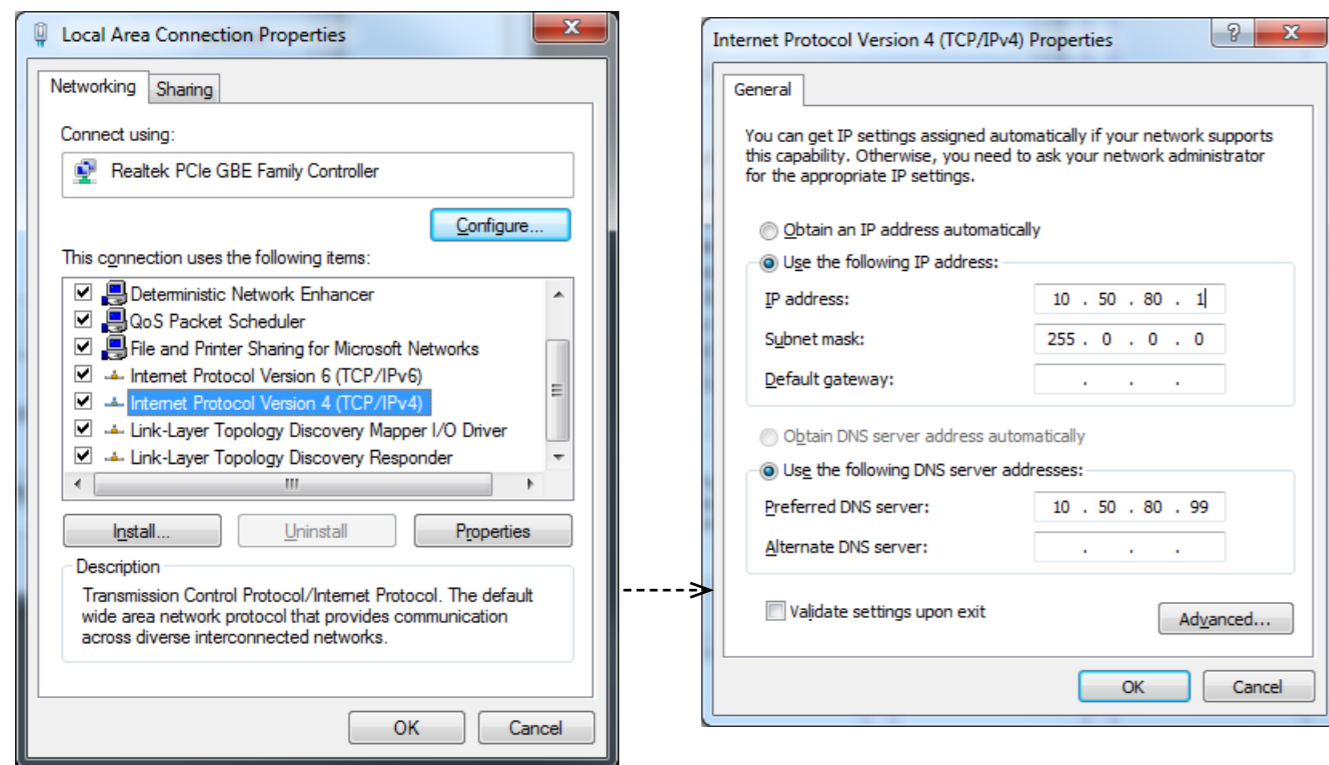
If you connect your manager directly to your computer then you will need to configure your network card.

Note: The following example describes the procedure for Windows operating systems; for Mac or Linux, use the platform-specific commands or applications.

1. Open Network Connections (Windows XP) or Network and Sharing Center (Windows 7) inside your Control Panel.
2. Click on your Local Area Connection and then choose **Properties**.



3. Select Internet Protocol (TCP/IP) and click on **Properties**.



4. Type the following parameters:
 IP address: 10.50.80.1
 Subnet mask: 255.0.0.0

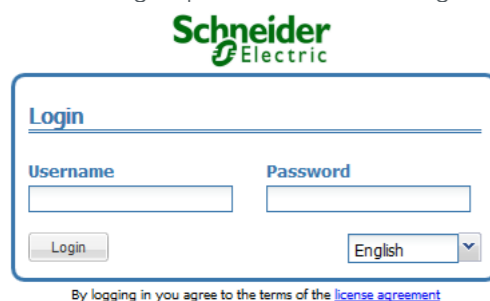
Connecting to Your Local Area Network

IMPORTANT! If want to connect your manager to your local network, you might have to ask your administrator to grant you access and confirm your site's network parameters.

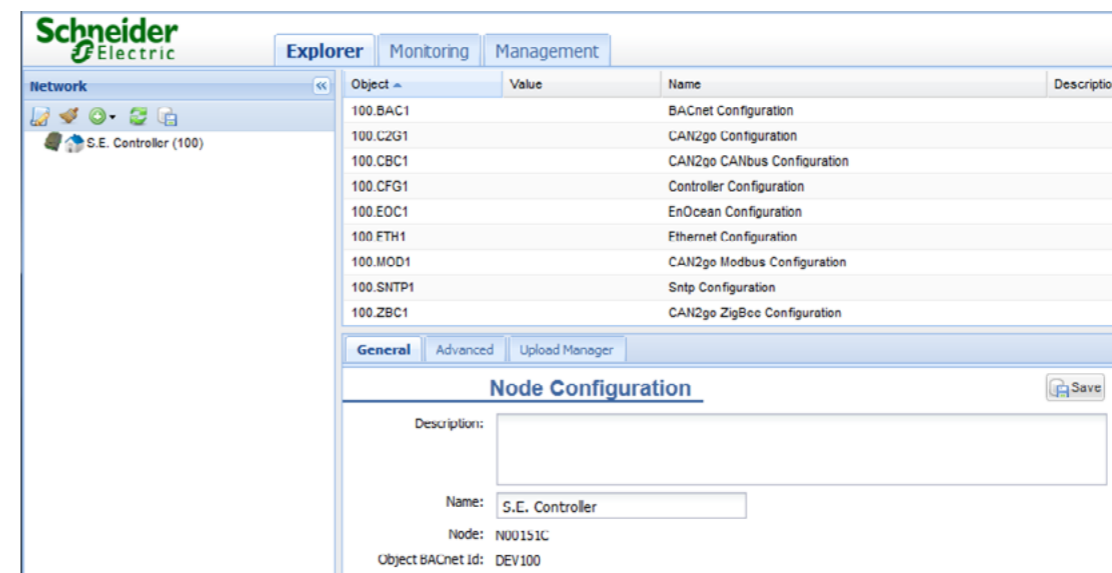
By default, all managers are configured with the same default IP address: 10.50.80.3 (or 10.50.80.4 for the MPM-VA). Since the same IP address cannot be used twice on a single subnet without creating a conflict, it is absolutely necessary to configure the manager's Ethernet settings before connecting them together. The chosen IP addresses must be unique, and it is strongly recommended to note them down to avoid any confusion between managers.

To change the Ethernet configuration:

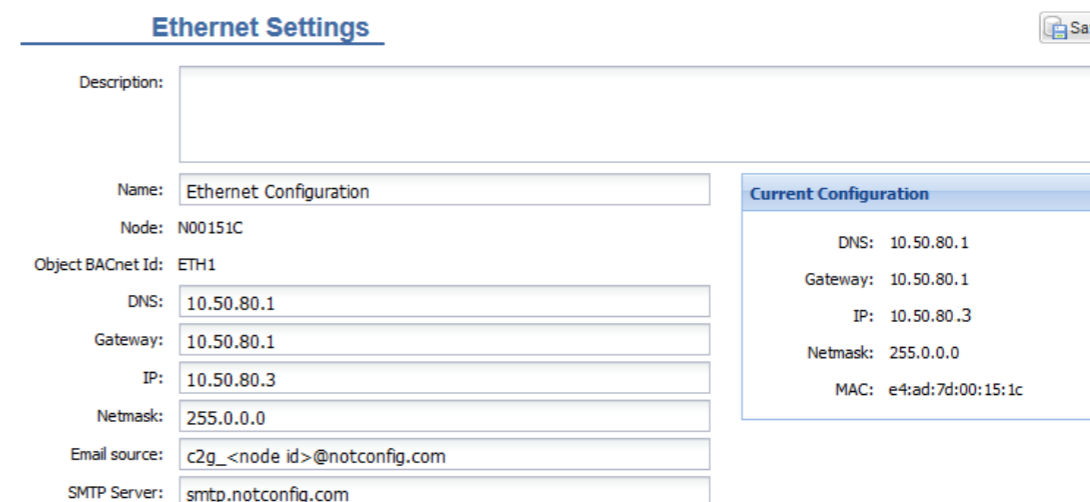
1. Log in by opening Firefox and navigating to the manager's IP address (<http://10.50.80.3/> or <http://10.50.80.4/>). The Building Expert web interface login screen displays.



2. Enter the default username (admin) and password (admin), and then press the **Login** button. Upon successful login, the Building Expert web BMS displays with the Explorer tab selected.



3. In the Display panel, select **Ethernet Configuration (ETH1)**. The Ethernet Settings parameters display in the Detail Panel.



4. Configure your settings as follows:

- **DNS:** (Optional) This is the Domain Name Server address, which is only required when accessing devices by hostname rather than by numerical IP addresses. This field shall be completed, for example, if you want to use the email feature or access SNTP servers using hostname.
- **Gateway:** (Optional) This is the local network default gateway, which is only required if another network, such as internet, needs to be connected to this device. This is typically your local router IP address. This field shall be completed, for example, if you want to use the email feature or access SNTP servers.
- **IP:** (Mandatory) This is the IP address of the manager. It must be unique on the local network. If a gateway is specified, both should be part of the same subnet.
- **Netmask:** (Mandatory) This is the local network mask defining the subnet. When accessing IP addresses outside of this mask, the requests will be routed through the local gateway.
- **Email source:** (Optional) This is the email account used to send emails using your manager.

Creating a Network of MPM Devices

- **SMTP server:** (Optional) This is the SMTP server used to send emails using your manager.

Once the Ethernet settings have been modified, press the **Save** button to apply them. Once **Save** is pressed, the IP address is modified and the connection with the manager will be lost. You will need to enter the new IP address in the Firefox address bar and press **Enter** to access the controller at its new address. Once you have logged back on to your controller, save the database to ensure your changes remain after a controller reboot.

Creating a Network of MPM Devices

You can create a network of MPM devices using 3 different inter-manager communication protocols:

- ZigBee
- CANbus
- UDP

What is ZigBee?

ZigBee is a high-level wireless communication protocol operating in the worldwide 2.4GHz radio band. Its digital radio uses the IEEE 802.15.4 standard for low-rate wireless Personal Area Networks (PANs).

The main advantage of ZigBee is its ability to provide mesh networking. ZigBee mesh networks are multipoint to multipoint and self-healing: the network can still operate when one node breaks down or a connection goes bad. As a result, the network is typically very reliable, because there is often more than one path between a source and a destination in the network.

What is CANbus?

Controller–area network (CAN or CAN-bus) is a wired bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer. CAN was designed specifically for the automotive industry, but has now spread out to industrial and building automation and medical equipment.

CANbus provides the following advantages:

- A multi-master hierarchy that allows building intelligent and redundant systems. If one node is defective, the network is still able to operate.
- Broadcast communication: A sender of information transmits to all devices on the bus. All receiving devices read the message and then decide if it is relevant to them. This guarantees data integrity, as all devices in the system use the same information.
- Sophisticated error detecting mechanisms and re-transmission of faulty messages. This also guarantees data integrity.

SmartStruxure Lite™ managers use CANbus as one of multiple ways to communicate with each other. Using the CANbus ports, SmartStruxure Lite™ managers can be chained-linked together, effectively creating a network.

CANbus can be used to chain link two or more managers using Shielded Twisted Pair (STP) cable.

What is UDP?

UDP (User Datagram Protocol) is a communications protocol used for communication between managers on a n IP/Ethernet network

Creating a Network of MPM Devices

You enable/disable and configure these protocols via the manager's Network Configuration (C2G1) object on the Building Expert web interface.

MPM Network Roles

Each manager can be separately configured as a **Monitor** or a **Passive Node**.

- A **Monitor** stores the information from all the managers active on its network. Ideally, only one manager should be monitor over a given network type, since each monitor uses a lot of bandwidth. The Monitor node should be the manager that is connected to your LAN via its Ethernet port in order to give you access to all information.
- A **Passive Node** will cast its changed values to its monitor once every **Property Cast Period**. See "Property Cast Period" on page 11.
NOTE: In UDP, the passive Manager does not require a LAN connection.

Specifying Network Roles

You configure network roles for your MPM devices using the Network Configuration (C2G1) object.

To access the C2G1 object:

- Click on your manager in the Network panel, then click C2G1 (**Communication Configuration**) in the Object panel.

The following figure shows the C2G1 object.

The C2G1 object specifies the way the manager communicates with its peers, whenever using the inter-manager communication protocols (UDP, CANbus and ZigBee).

For each of the 3 protocols, you can enable or disable functionality, and specify its operating mode and property cast period.

Note: All 3 protocols are enabled by default. Disable or enable the protocols as required for your network.

Property Cast Period

The Property Cast Period defines the interval (or frequency) with which a passive node casts information to a monitor. The cast comprises all changed values detected by the passive node since the last request from the monitor.


Notes: By default, a passive node will cast its values to a monitor once every minutes. It is recommended that you do not set this interval to a value of less than 30 seconds.

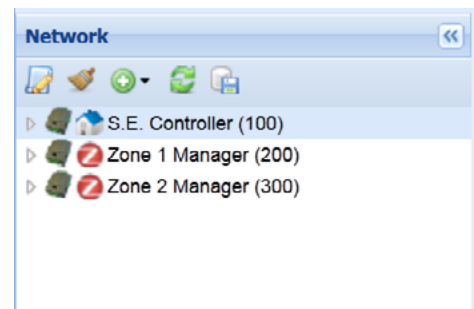
Creating a Network on the Monitor


Once all the managers have been configured and connected properly, it is time to create the image of the network on the Monitor. When looking at a MPM network through the Monitor,


Creating a Network of MPM Devices


you are looking at an image that is being refreshed periodically by the casting of changed values from the passive devices to the monitor.

The monitor is presented on the network tree next to the “house” icon.  The passive devices on the network are presented next to an icon representing the protocol used for communication. Clicking on any manager will bring the list of objects in Building Expert.



To initiate the discovery of all information from all passive managers on the network, click on the **Scan for new nodes added to the network** button at the top of the Network panel. 

During the discovery, the icon will activate and take this shape before returning to its original state when the discovery is complete. 

Clicking the clean button (broom) will erase the local copy of the network information and reboot the monitor manager. It will not affect the information residing on passive managers. 

Identifying Devices on the Network


Managers on the network are identified by 2 distinct numbers:

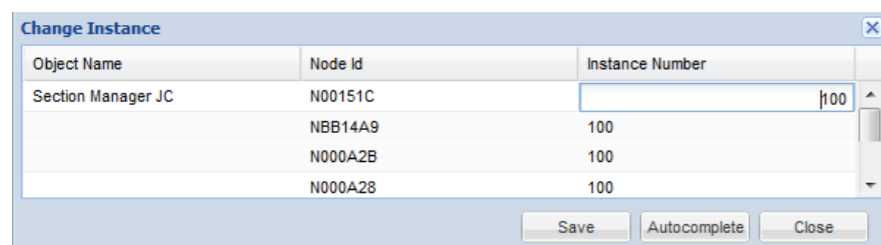
- **Node number:** This is a fixed (uneditable) and unique number assigned to each manager by the SmartStruxure Lite™ internal protocol.
- **Device number:** This is an editable identifier that must be unique within the context of the extended network. The device number is used for integration with BACnet and SmartStruxure. See “Changing a Device Number”.

Changing a Device Number

IMPORTANT: In order to change the device number of a Manager, you must be connected directly to the Manager—you cannot change a device number over the network.

To change a device number:

1. In the Network panel of the Building Expert web interface, click on the Manager.
2. From the toolbar, select the **Change any node instance number** icon.  The Change Instance dialog displays in a pop-up window.



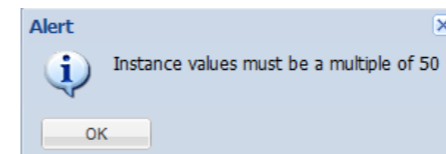
3. Click in the **Instance Number** field, and type in a new instance number for the Manager.

The new instance number must conform to the following rules:

- It must be greater than or equal to 100.
- It must be a multiple of 50 (e.g., 50, 100, 150...), otherwise the following error dialog

Creating a Network of MPM Devices

will display:



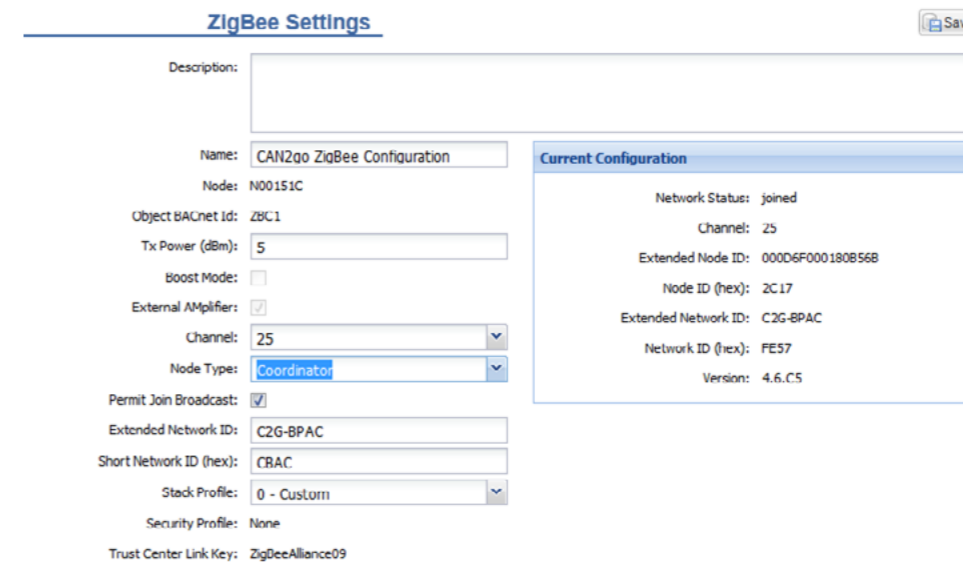
- It must be less than or equal to 3999950.
4. Click the **Save** button to save your changes.

NOTE: The new instance number(s) may take some time to propagate across the network. You may have to restart the Building Expert web interface before seeing the changes.

Setting up Managers in a ZigBee Network

Each MPM can be configured independently through the ZigBee Settings (ZBC1) configuration object on the Building Expert BEMS.

All settings should be configured when you are connected directly to the Manager.



IMPORTANT: Do not change ZBC1 parameters on a remote manager, as you will lose communication with the Manager.

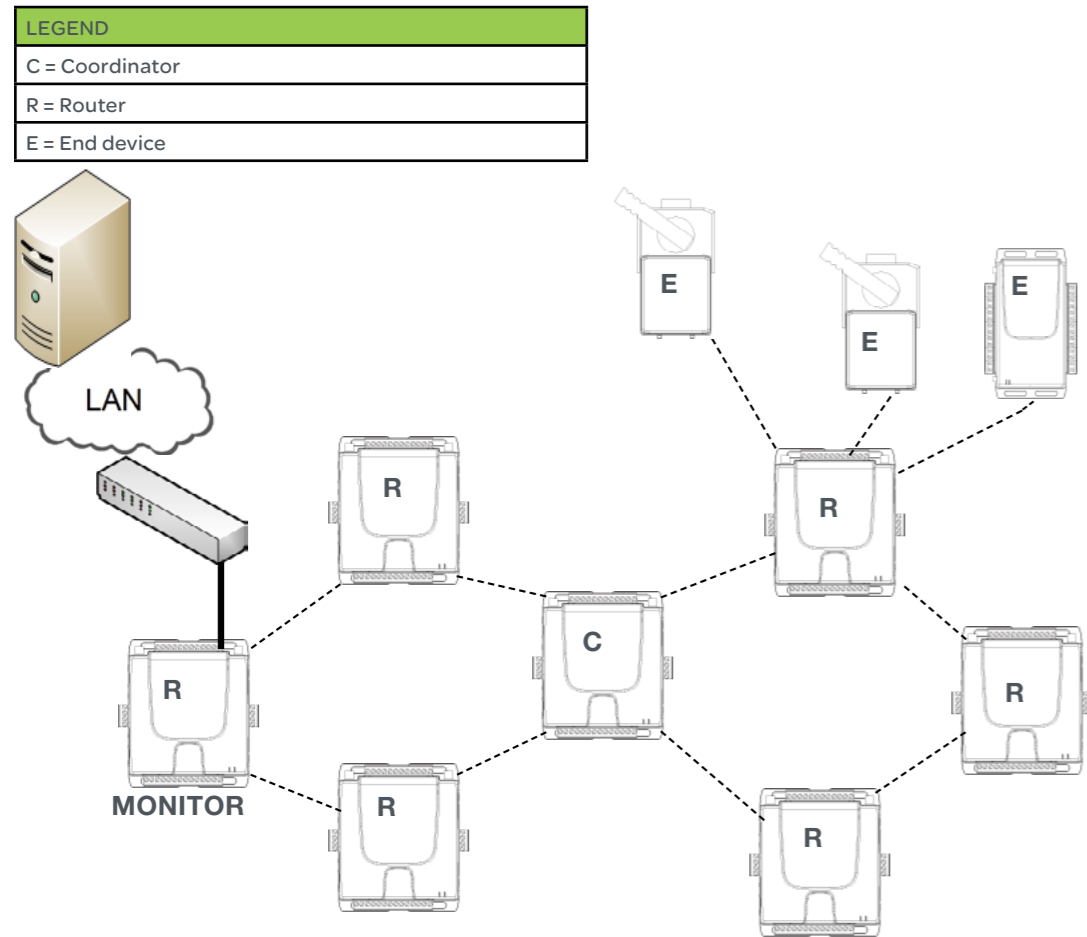
ZigBee Roles

In a ZigBee network, three types of devices are available:

1. **The ZigBee Coordinator** is the heart of the network. There must be at least one and only one coordinator per network. Its role is to act as a trust center, to allow and approve all routers and end devices that attempt to join its network.
2. **The ZigBee Router** is a link in the network. It can route packets between other nodes, providing extended network range through a maximum of 30 hops. A router device is always on to provide routes for other devices, acting as a parent for end devices.
3. **The ZigBee End Device** only has the functionality to achieve a specific task and communicate with a parent node (either the coordinator or a router). Examples of end devices are SEC-TE smart terminal controller and SED-0 smart wireless actuator.

Creating a Network of MPM Devices

The following figure provides an example of network architecture for MPMs communicating over ZigBee.



Network Guidelines

The following table provides the theoretical range between two controllers with a Zigbee radio:

ENVIRONMENT	RANGE
Open air/Line of sight	Up to 300m (1000 feet)
In Building/Line of sight	Up to 100m (300 feet)
In Building/Non line of sight (gypsum wall)	Up to 50m (150 feet)

As a rule of thumb, you can estimate that a dedicated ZigBee manager can monitor up to 15 passive managers performing typical control tasks (Air Handler/Fan Coil/VAV controls, Lighting controls).

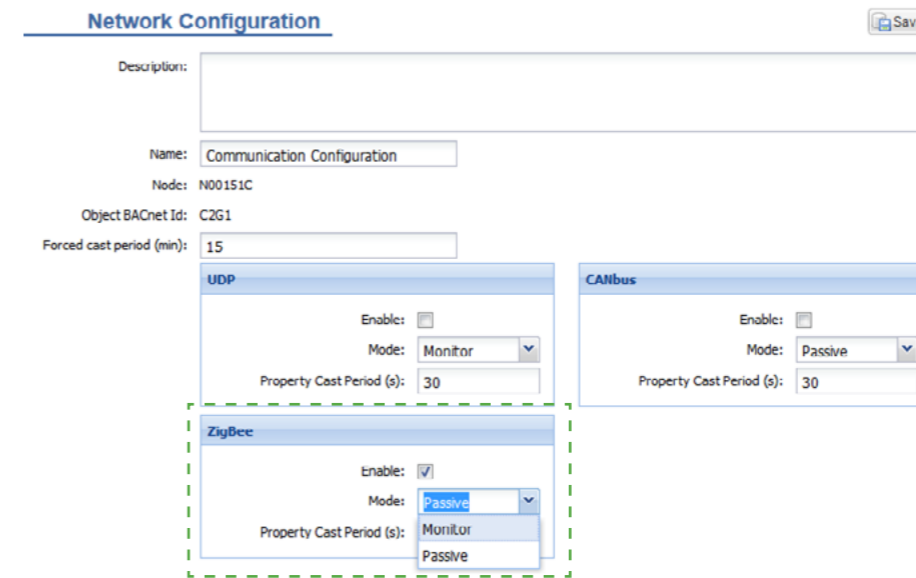
Depending on your specific application, the monitor-to-router ratio may vary. Refer to <https://documentation.smartstruxurelite.com> for detailed deployment guidelines, or contact Small Business Systems customer support for a review of your application.

Configuring ZigBee Settings

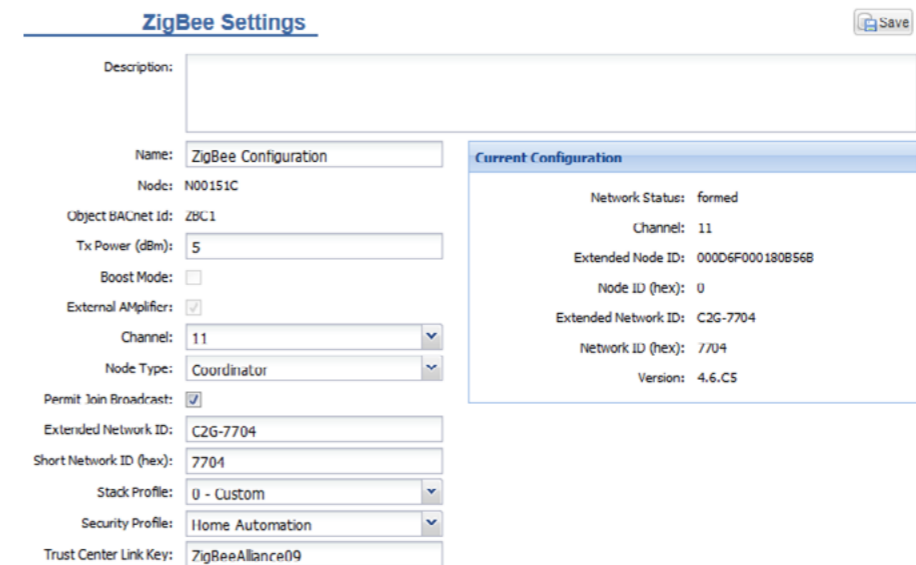
To form a ZigBee network among multiple Managers, do the following:

- For each Manager on the network, enable the ZigBee driver:
 - Click on your Manager in the Network panel of the Building Expert web interface.
 - From the Object panel, select the **Communication Configuration (C2G1)** object.

Creating a Network of MPM Devices



- Ensure that the ZigBee **Enable** check box is selected.
 - Configure your **Mode** parameters as follows:
 - For the Manager connected to your LAN, set **Mode** to *Monitor*.
 - For all other Managers, set **Mode** to *Passive*.
- For each Manager on the network, set the ZigBee Configuration parameters to common values, as follows:
 - Click on your Manager in the Network panel of the Building Expert web interface.
 - From the Object panel, select the **ZigBee Configuration (ZBC1)** object.



- Configure parameters as follows:

PARAMETER	VALUE
Channel	Recommended values: <ul style="list-style-type: none"> North America: 25, 26 Europe : 15, 16, 21, 22 Asia: 25, 26

Creating a Network of MPM Devices

PARAMETER	VALUE
Extended Network ID	An 8-character string. Default value is ZBC-CBAC
Short Network ID	A 4-digit Hexadecimal value. Default value is CBAC. Note: In firmware version 2.6.x and subsequent, you can enter Short network ID in decimal or Hexadecimal and conversion will be applied automatically.
Stack Profile	Select Custom or ZigBee Pro . See <i>Security Profile</i> .
Security Profile	Select None or Home Automation . ZigBee Pro Stack Profile must be selected to use Home Automation Security Profile. Custom Stack Profile is used when no Security Profile is selected.

- Set the **Node Type** of only one Manager to be a network coordinator. For ease of operation, it is recommended to use the network Monitor as Coordinator.
- During commissioning of your Manager, leave the **Permit Join** check box selected. See *Permit Join*.

Permit Join

The Permit Join feature of the ZBC1 parameter allows control of the Managers or devices to join any ZigBee network.

Node Type: ▼

Permit Join Broadcast:

The Permit Join feature is set only on the ZigBee Coordinator, hence the **Permit Join Broadcast** check box will appear only if the Node Type selected is Coordinator.

When **Permit Join Broadcast** is activated (checked), a broadcast is sent periodically to all routers on the network, letting them know that it is possible to join the network.

Conversely, if **Permit Join Broadcast** is deactivated (unchecked), a broadcast will be sent periodically to prevent routers to let any device join the network.

This feature is useful for joining End Devices to a specific network when more than one ZigBee network is formed in a specific environment.

In normal operation, **Permit Join Broadcast** should be left unchecked on all coordinators and checked only during commissioning or when adding a new Manager, Gateway or End Device to the network.

Setting up Managers in a CANbus Network

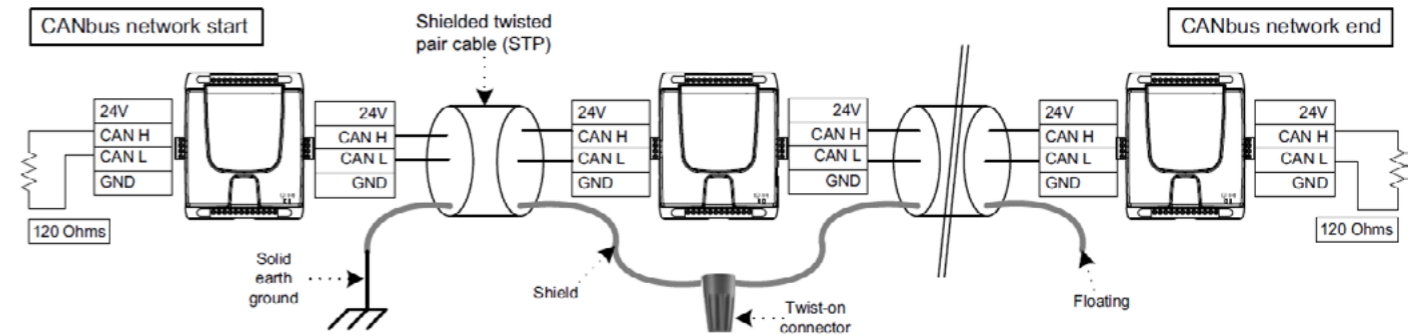
CANbus Roles

All Managers in a CANbus network have the same status.

Network Guidelines

The following figure describes how to chain-link three managers.

Creating a Network of MPM Devices



IMPORTANT: You must use shielded twisted pair cables. It is considered good practice to use a three-wire shielded cable. Always solid earth ground each Manager in the CANbus network!

You use the STP cabling to connect the + and – pins of the CANBUS port of the managers and ground the shield of the STP cabling of the first manager to the solid earth ground. Only the first manager should have the shield grounded, and the shield must be left floating at the other end. Never ground the shield of a network in more than one place along the network, because if the shield is connected to two different ground potentials, the resulting current will induce noise into the CANbus network.

IMPORTANT: Star networks are not acceptable; CANbus networks must be linear.

The CANbus ports of managers operate by default at 250kbps and may be configured at 125 and 500 kbps.

CANbus transfer rate is proportional to total chain-link length:

- 125Kbps: Up to 500m (1500 feet)
- 250kbps: Up to 250m (750 feet)
- 500kbps: Up to 100m (300 feet)

Changing the CANbus speed will not be applied immediately. When changing the CANbus bitrate, save the manager DB and then reset the manager.

As a rule of thumb, you can estimate that a dedicated CANbus manager can monitor up to 15 passive managers performing typical control tasks (Air Handler/Fan Coil/VAV controls, Lighting controls).

Depending on your specific application, the monitor to router ratio may vary. Refer to <https://documentation.smartstruxurelite.com> for detailed deployment guidelines, or contact Small Business Systems customer support for a review of your application.

CANbus Settings

CANbus settings are accessible via the CANbus Configuration (CBC1) object.

Description:

Name:

Node: N00151C

Object BACnet Id: CBC1

Speed: ▼

NOTE: The CANbus speed of all Managers on a network must be the same in order to enable network communication.

Creating a Network of MPM Devices

Setting up Managers in a UDP Network

UDP Roles

There are no roles specific to a UDP network.

Network Guidelines

In a UDP network, all Managers must be connected to the same LAN, and their individual IP addresses must share the same subnet.

As a rule of thumb, you can estimate that a dedicated UDP manager can monitor up to 15 passive managers performing typical control tasks (Air Handler/Fan Coil/VAV controls, Lighting controls).

Depending on your specific application, the monitor to router ratio may vary. Refer to <https://documentation.smartstruxurelite.com> for detailed deployment guidelines, or contact Small Business Systems customer support for a review of your application.

UDP Settings

- To set up your Managers in a UDP network, do the following:
- From the Network panel, select your Manager.
- From the Object panel, select the **Communication Configuration (C2G1)** object.
- Ensure that the UDP **Enable** check box is selected.

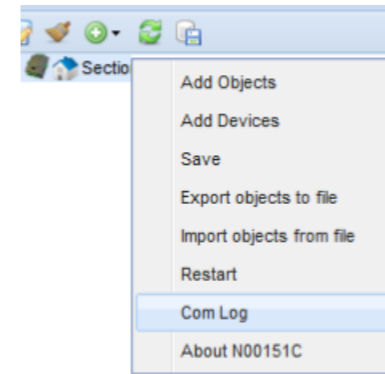
- Click the **Save** button to save your changes.
- From the Object panel, select the **Ethernet Communication (ETH1)** object.
- Assign an IP address to your Manager by typing it into the **IP** text field.

- Click the **Save** button to save your changes.
- Repeat this procedure for all Managers on your UDP network, ensuring that they are part of the same subnet and are assigned unique IP addresses.

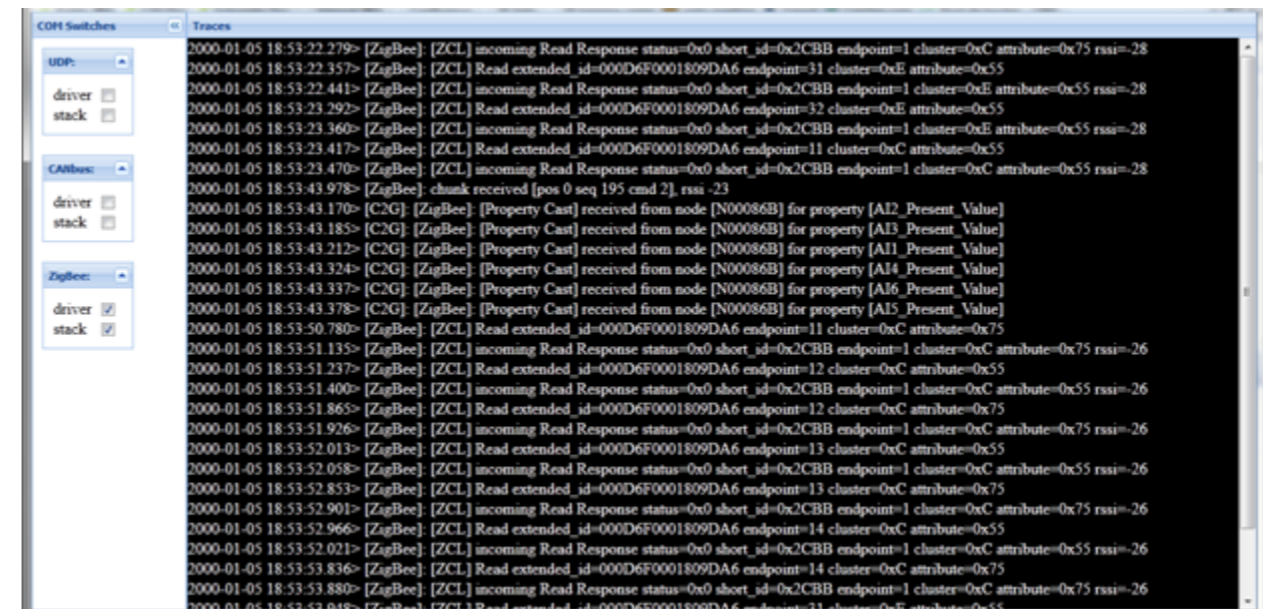
Visualizing inter-manager network communication

From the monitor of a network, you can visualize the communication on a network. This may be useful to confirm that a passive node is communicating properly or that a new passive node has joined the network. To do so:

- Right-click on the Manager in the Network panel and choose Com Log from the pop-up menu. The Com Log displays in a separate window.



- Check the “driver” and “stack” boxes for the protocol of your network. The figure below shows typical communication between managers.



- Should you not see communication on the network, press the **Scan for new nodes added to the network** button to initiate communication.
- After visualization is completed, uncheck the “driver” and “stack” boxes as this feature uses manager resources.



for more information and documentation, visit:

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