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1 Building Operator Engineering Guide

1.1 Overview
This document is intended for Administrators and Engineers in the Building Operator application.
The instructions in this document will cover how to connect building automation controls, that reside within a corporate IT network on site, to Building Operator application, using the Connect device gateway.

1.1.1 Before You Start
Before you begin the commissioning process, clarify the corporate IT network configuration on site. For example:

- How is the building automation network zone built on the IT network? Is it a physical isolated Building Automation network zone, or part of the corporate network zone (Building Automation and Internet on the same network)?
- What are the guidelines for the IP address scheme of building automation network devices (fixed IP address or DHCP)?
- How will the Connect device access the Internet from the corporate IT network on site (e.g. proxy server)?

After clarifying the IT network configuration of the site, see the Connect Device Quick Install guide in the Help tab of Building Operator.

Connect Device (e.g. Connect X300)
The Connect family of devices are physical devices that serve as the connecting point between the cloud and controlled or monitored devices. This can include controllers, sensors, and actuators in the building. These devices integrate BACnet/IP or Modbus/TCP devices and systems as well as FS20 fire panels.

For more information on the Connect device hardware, please see the Connect X300 Data Sheet (A6V11473182) in the Building Operator Help section.

For information on network set-up and accessories, please see the CXG3.X300 Quick Install Guide (A6V110508811).

User Interface
The Connect device has a web user interface that is intended for commissioning and maintenance of the device. The web interface has three tabs.

Operation
In the Operation tab, you can check the cloud connectivity and application status. You can also edit and rename the gateway device or edit the device location.
Network

In the Network tab, you can configure IP settings, firewall, route and proxy settings. There are four sub-tabs to individually complete these tasks:

- **IP Settings**: You can configure local area network (LAN) settings here or add new IP setting in the fields provided.

- **Firewall**: Here you can add or remove different inbound and outbound rules for Connect devices.

- **Route**: Don’t change anything in the Route tab. If you do, you risk losing cloud connectivity.
Proxy: Here you can enable or disable a proxy server and define its IPv4 address and port numbers. This feature is typically used for enterprise-level networks. The proxy server must have DNS functionality built in to properly work.

Maintenance

In the Maintenance tab, you can update the Connect device operating system, the Building Operator Discovery application version, restart the gateway device, reset the device to factory settings, and download logs.

See the Cybersecurity Guidelines (A6V11852371) for more details on SSH and why it is disabled by default.
1.2 Setting Up Connect Device and Building Operator

The instructions in this document will cover how to properly commission the Connect device, as well as establish remote web access. We recommend you first read the Connect device Quick Install Guide, found in the Building Operator Help tab.

The first time you set up Connect device and Building Operator, you must update the software Connect device. Once the device registration and software updates are completed, you can connect to Building Operator Discovery remotely.

Preconditions:

- You have unboxed a Connect device and turned it on.
- You have plugged this device into a private network that has Internet access.
- You have read the Connect device Quick Install Guide found in the Help tab of the Building Operator Settings.

For additional security, always close remote web access connections and log out from Building Operator. Closing your browser does not guarantee your account safety.

1.2.1 Engineering Workflow

Use the workflow diagram to commission the Connect device and activate Building Operator. We recommend that you open two browser tabs during the commissioning process: one for Connect device, and the other for Building Operator.

The recommended browsers are:

- Google Chrome
- Mozilla Firefox
1.2.2 Setting up Connect Device

This section will cover the installation, network choice, and log-in credentials for the Connect device.

To install the Connect device, complete the instructions below.

- Connect to the LAN port X1P1 and open a new browser window. In the browser address bar, type the following IP address: 169.254.169.254.
- The network patching configuration should look as follows:
  - Single network mode (combined): WAN in port X2P1.
  - Separate network mode (isolated): WAN in port X2P1, LAN in port X1P1.
Only LAN X1P1 supports the local connection to Connect device. LAN and WAN in different networks must have different subnets.

<table>
<thead>
<tr>
<th>①</th>
<th>Protective earth</th>
</tr>
</thead>
<tbody>
<tr>
<td>The protective earth connection must be connected on the installation side with the building grounding system (PE). Min. diameter: 2.5 mm² / 14 AWG</td>
<td></td>
</tr>
</tbody>
</table>

| ② | Pluggable Terminal Block for operating voltage DC 24 V = |
| ③ | ON/OFF Switch, OFF when pressing |
| ④ | USB 2.0, 3.0 interfaces (unused) |
| ⑤ | Serial interface, 9-pin for RS 232, EIA-422, EIA-485 (unused) |
| ⑥ | Display Port Interface (unused) |
| ⑦ | Serial interface, 9-pin for RS 232, EIA-422, EIA-485 (unused) |
| ⑧ | X1P1 = LAN (customer network) Ethernet 10/100/1000 Mbps (with 2 LEDs per port for indicators) |
| ⑨ | X2P1 = LAN (internet access) Ethernet 10/100/1000 Mbps (with 2 LEDs per port for indicators) |

There are multiple LED lights on the Connect device. The table below outlines each light’s function:

<table>
<thead>
<tr>
<th>LED</th>
<th>Activity</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC On/WD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>Device off</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>Device power on</td>
<td></td>
</tr>
<tr>
<td>Green/red flashing</td>
<td>Power on Self-Test (POST)</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>Idle</td>
<td></td>
</tr>
<tr>
<td>Red flashing</td>
<td>Watchdog state error (turn off device, wait 1 minute, then switch on)</td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Green</td>
<td>Application(s) running and operational</td>
</tr>
<tr>
<td>Green flashing</td>
<td>Application(s) starting up</td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>Yellow</td>
<td>Network connection stable; no cloud connectivity</td>
</tr>
<tr>
<td>Yellow flashing</td>
<td>Cloud connectivity</td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>Orange</td>
<td>WAN link stable (internet connection)</td>
</tr>
<tr>
<td>Orange flashing</td>
<td>Connect device activated</td>
<td></td>
</tr>
</tbody>
</table>
1. In the Connect device landing page, select **Accept** to verify you’ve acknowledged the end user license agreement.

2. Next, enter the following credentials in the fields provided:
   - **Username:** admin (case-sensitive)
   - **Password:** admin (case-sensitive)

3. Next, complete the prompt to change the default password. This password is specific to the Connect device you are logged in to. Select a password that complies with the following guidelines:
   - At least 8 characters
   - Uppercase and lowercase letters
   - Numbers
   - Special characters

4. Select **Change Password** when finished.

5. Sign in again with the newly created password.

### 1.2.3 Registering Connect Device

After you sign in to the Connect device, complete the following instructions:

- Select a network connection mode. The two options are as follows:
  - **Separate network mode:** Select this option if your building automation network and Internet use two different physical network connections. In this...
case, connect the LAN cable to your building automation network, and your WAN to the Internet.

- **Single network mode**: Select this option if your building automation network, and the Internet, use the same physical network connection. In this case, the use the WAN for both the Internet and building automation.

  ![Select the network connection mode](image)

  **CAUTION**

  This selection is not reversible. A factory reset is required to change this selection, which will result in loss of existing network configuration and project data.

  1. The following warning message will display if you select Single network mode. See the *Cybersecurity Guidelines (A6V11852371)* document for further details.

  ![Warning - Network mode](image)

  2. To configure alternative IP and proxy settings, click the **IP settings** tab under the **Network** tab.
3. *(Optional)* If you need to configure a proxy setting for an alternative WAN IP address, do so by clicking the **Network** tab, then **Proxy**.

4. *(Optional)* Toggle on the proxy server button. Then type to enter the appropriate values in the spaces provided.

5. In the **Registration** tab, complete the registration prompt:
   - **Email**: The recipient – who is setting up Building Operator – will receive the Connect device Activation key.
   - **Device name**: Identifies the Connect device in Building Operator. Used to differentiate devices, if more than one is used. Special and language specific characters for the Gateway name are not supported (e.g. é, â).
   - **Device location**: Helps to identify Connect device in Building Operator. Special and language specific characters for the Gateway name are not supported (e.g. é, â).
1. Select **Register** when finished. A confirmation message will display. The email recipient will also receive an email after successfully registering the device.

2. Copy the Activation key from the email or from the message that is displayed. You can select directly on the Activation key to copy the address to your clipboard.

**Troubleshooting**

If your Connect device does not properly register or the Cloud Connectivity state shows disconnected, follow these steps:

1. Power off the gateway device.
2. Check if your WAN port Internet connectivity is ON.
3. Power on the gateway device.
4. Directly connect your PC to the LAN port via 169.254.169.254
5. Check with the IT administrator if there is a proxy in the network – enable the proxy settings and set a fixed IP address on the WAN port.
1.2.4 Adding a Site and Activating a Gateway Device

To create a site, activate, and update your gateway device, follow the steps below.

▷ In Building Operator

◊ Use the App switcher to navigate to Asset Manager.

Creating a site

▷ In Asset Manager:

1. You can add a site in two ways:

   – To add a site through the Overview tab, select Sites.

   ![Image of overview tab](image1)

   - Fill in the fields on the ensuing form appropriately. Select Add.

   – To add a site through the Sites tab, select Add.

   ![Image of sites tab](image2)

2. Fill in the fields on the ensuing form appropriately. Select Add.
The **Address** field will automatically suggest addresses. Selecting a suggested address will automatically populate the **Time Zone** field. If Google API is unavailable, you will need to enter in an address and time zone manually.

### Adding and activating device

1. In the **Sites** tab, select the site where you want to add your device.

2. Select **Add**.
3. Enter the device activation key and select Validate.

![Add device](image)

4. Confirm the details of your device and select Add.

![Add device](image)

When defining or changing the custom name of the device, it will only affect the display name in the cloud.

**Update Operating System**

To update the operating system of the Connect device, follow the steps below.

- In Asset Manager:
1. In the sites tab, select the site with the Connect device you want to update.
2. In the list of devices, select the device.

   The device list will indicate if an update is available for your device.

3. Select the updates tab and click **Update** to update the device to the latest version.

4. Select **update** to confirm.

5. After the update is executed, an update success message will appear on the screen.
The operating system update could take approximately 20 minutes depending on your network bandwidth. Ensure that the download rate of your network bandwidth is at least 8Mbit/second, or else the update will likely time out. Wait before proceeding to the next step.

If you update the operating system, you’ll be logged out of the Connect Device Interface.

- (Optional) In Connect device:
  - Navigate to the Maintenance tab in Connect device to follow the software update in real-time.

1.2.5 Verifying the Registration State and Software Updates
- (Optional) In Connect device:
  1. To check the status of all applications on the Connect device, select the Operation tab in the top navigation bar.
  2. Select the caret icon to expand the Applications menu. Ensure all applications have green dots next to their names. You will also note that Cloud Connectivity is “Connected” and Registration State is “Operational”, respectively.

If you update Building Operator Discovery operating systems, you’ll be logged out of the Connect Device interface.
### 1.2.6 Configuring the Connect Device Firewall

Once you’ve ensured cloud connectivity and updated the latest gateway application software to the Connect device, you must next configure the firewall rules. By default, there is no inbound traffic allowed on the device. You must open the ports so the Connect device can communicate with the building automation network.

The Building Operator Discovery operating system **must** finish updating before you configure the firewall rules in Connect device (as outlined in the section above). To manually configure the Connect device:

1. Select the **Network** tab. Then, select the **Firewall** header.

2. Create the following **inbound** rules for:

#### Separate Network Mode

<table>
<thead>
<tr>
<th>Description</th>
<th>Protocol</th>
<th>Source Port</th>
<th>Destination</th>
<th>Interface</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus devices</td>
<td>tcp</td>
<td>502</td>
<td>lan0</td>
<td>accept</td>
<td></td>
</tr>
<tr>
<td>BACnet IP devices</td>
<td>udp</td>
<td>47808</td>
<td>lan0</td>
<td>accept</td>
<td></td>
</tr>
<tr>
<td>Building Operator Discovery Web-client</td>
<td>tcp</td>
<td>8085</td>
<td>lan0</td>
<td>accept</td>
<td></td>
</tr>
<tr>
<td>Default</td>
<td>all</td>
<td></td>
<td></td>
<td>RETURN</td>
<td></td>
</tr>
</tbody>
</table>

#### Single Network Mode

<table>
<thead>
<tr>
<th>Description</th>
<th>Protocol</th>
<th>Source Port</th>
<th>Destination</th>
<th>Interface</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus devices</td>
<td>tcp</td>
<td>502</td>
<td>wan0</td>
<td>accept</td>
<td></td>
</tr>
<tr>
<td>BACnet IP devices</td>
<td>udp</td>
<td>47808</td>
<td>wan0</td>
<td>accept</td>
<td></td>
</tr>
<tr>
<td>Building Operator Discovery Web-client</td>
<td>tcp</td>
<td>8085</td>
<td>wan0</td>
<td>accept</td>
<td></td>
</tr>
<tr>
<td>Default</td>
<td>all</td>
<td></td>
<td></td>
<td>RETURN</td>
<td></td>
</tr>
</tbody>
</table>

Protocol entries only accept lowercase letters. Depending on building automation network configuration on site, the source ports may differ.

Select **Accept** from the **Target** drop-down for each rule. Select **Add** to confirm.
You can create outbound rules by clicking the Outbound Rule tab. However, outbound rules do not need to be configured.

### 1.2.7 Enabling Remote Web Access

> In Building Operator:

1. Enable both Connect device and Building Operator Discovery web server endpoints (if the boxes are not already checked). This allows you to remotely access the Connect device and Building Operator Discovery.

2. Click **Save** to confirm.

![Building Operator Discovery Tool](image)

The Building Operator Discovery Tool and Connect device are pre-configured to work. You do not need to edit these fields.

Gateway software must be version 4.0.5 or higher to use the Remote Access Web Feature for Building Operator Discovery.

### 1.2.8 Selecting Data Point Settings

> In Building Operator:

◊ The Display Settings select whether you see the BACnet object name or BACnet object description as the primary identifier for the device’s data points.

![Building Operator](image)

See below for how devices are displayed by name and description in Building Operator. Display by Name on the left, and display by Description on the right.
1.3 Adding Data Points Using Building Operator Discovery

Building Operator Discovery is an engineering tool embedded on Connect device to configure and provision data points for Building Operator.

1.3.1 Logging in to Building Operator Discovery Remotely

You can log in to Building Operator Discovery remotely, or locally. The instructions below outline how to log in remotely. To log in locally, use a local port or network cable. The tunnel will close the session after one hour, even if you are actively working.

Gateway software must be version 4.0.5 or higher to use the Remote Access Web Feature for Building Operator Discovery.

In Building Operator

1. Select the Site name to access the Site page. In the site page, find and select the Remote Web Access icon, listed beneath the Site name and Site location.

2. Next, find and select Building Operator Discovery in the drop-down. Select Start to proceed.
1. Wait for the connection to verify. Select **Continue**.

2. A new tab will open in the browser. Log in using the following credentials (case-sensitive):
   - **Username**: admin
   - **Password**: admin

3. (Recommended) After you first log in to Building Operator Discovery, you may want to create a more secure password. Find and select the username dropdown in the top-right corner, then select **Change Password**. Complete the fields from the pop-up and select **Apply**.

4. Once you’ve created a more secure password, find and select **Open Project**.
5. A new tab will appear. Select the menu icon in the top left of the screen.

6. Select **DB Builder**.

If your remote connection is interrupted during this session, select **Disconnect** in Building Operator. Re-start the Remote Web Access process again.

### 1.3.2 Organizing Your Device View

This section will cover how to create a device hierarchy in Building Operator Discovery, and the recommended way to organize your equipment. Prior to organizing your equipment, you will have to add a site in the Equip Tree.
Before you organize the device view, first change the time zone in My Site to the time zone your device resides in. To do so:

1. **IMPORTANT!** Add or change the country and time zone. This is the time zone you set for points – and their associated historical data – in Building Operator. The field is called “tz.”

Once you’ve set the site to the right time zone, you can create a new floor object. However, before you create a new floor object, you must set the right context in the navigation pane. To do so:
2. Select the Site name.

3. Find and select the (+) icon at the bottom of the navigation tree. Select Add Floor.

4. In the pop-up, type to in the Floor Name field and give your site a unique name.

5. Select Create when finished.

6. Close the property editor to proceed.

The floor structure will not appear in Building Operator. The hierarchy you create is used to organize and engineer items in Building Operator Discovery.
1.3.3 Discovering a BACnet Device

After you've added a floor object, you can now discover a device. In doing so, you can add that device to the Building Operator Discovery project and sync it with Building Operator. Complete the instructions below to discover a BACnet device.

**Discover a BACnet Device**

1. Find and expand **Connectors** in the Navigation tree. Here you will see the following device connection options:
   - BACnet
   - Haystack (not currently used)
   - Modbus

2. Select to expand the appropriate device type. For example, select **BACnet** to discover a BACnet device.

3. *(Optional)* If your BACnet device is not located in the same IP range as the Connect device, you will need to add the BACnet device manually. First, select **BACnet**, then select **+ Add**.

4. *(Optional)* In the pop-up, add values in the following fields:
   - Display Name
   - Host
   - Device Instance
5. *(Optional)* Select **Add**.

6. Select **Discover** beneath the device type. At the bottom of Added Devices (there will be no list results if you haven’t added anything yet), select **Discover**.

7. Find and select the appropriate device(s) in the list results.

8. Select **+ Add**, and then **OK** in the confirmation pop-up.

9. *(Optional)* Before you add a device, select **Discovery Settings**. In the Device Discovery Settings, you can enter custom local addresses as needed (for specific devices).

---

Building Operator only allows for BACnet networks on ports 47808 – 47823.
10. If you can’t discover all BACnet devices, increase the timeout setting using the up and down arrows in the field provided. We recommend a 30-second timeout value.

Network Number:

65535

Timeout (seconds):

8

11. *(Optional)* Select **Apply** to save changes.

12. Locate the appropriate device, select its name to highlight and select **Add**. You can also add multiple devices at once. To select a range of devices, click on the first device and then while holding **Shift**, click on the last device. Click **Ctrl** to select individual devices not in a specific range.

13. Select **OK** to close the pop-up menu.

14. Select **Discover** again after you saved these changes. The new settings will reflect in the new search.

15. When you’re finished, you’ll see list results for both Discovered and Added Devices.

1.3.4 **Adding a Modbus TCP Device**

*If you don’t intend on adding a Modbus TCP device, skip to the next section.*

The instructions below detail how to integrate multiple Modbus devices in bulk. You’ll need to create a .CSV file with the Modbus data point data and import it to Building Operator Discovery. Then, a Modbus device must be created in Building Operator Discovery and the CSV file assigned.

**Creating .CSV file**

To create a .CSV file, see the information below.

Download Template: [Template .CSV File](#)

Please note that in this file, you must:
• Begin column "A' data with lowercase letters.
• Add a ping register so that Building Operator Discovery can monitor the controller to make sure it’s active.
• Manually upload this file to Building Operator Discovery.

Configuration Information
The following information is required to help configure your .CSV file.
• name (required): Name of the register. It must be unique and must start with a lowercase letter (a-z). A-Z, a-z, 0-9, and underscores are allowed. No spaces or other special characters.
• addr (required): The address of the register that follows the modbus convention.
  Types of data:
  – bit: Bool
  – u1: Unsigned 8-bit Int
  – u2: Unsigned 16-bit Int
  – u4: Unsigned 32-bit Int
  – s1: Signed 8-bit Int
  – s2: Signed 16-bit Int
  – s4: Signed 32-bit Int
  – s8: Signed 64-bit Int
  – f4: 32-bit Float
  – f8: 64-bit Float
• Bit Mask Types: Supports a position notation for cases where bits are packed into input or holding registers. Format: name, addr, data, rw.
  Examples:
  – do0, 40101, bit:0, rw
  – do1, 40101, bit:1, rw
  – do2, 40101, bit:2, rw
• Word and Byte Order: If register data not stored in network byte order, you can specify the order using suffix
  – u2e: Unsigned 16-bit Int - Little endian byte and word order
  – u2eb: Unsigned 16-bit Int - Little endian byte order only
  – u2ew: Unsigned 16-bit Int - Little endian word order only
• rw (required): Determines read and write permissions.
  – rw: Register may be read and written.
  – r: Register is read-only.
  – w: Register is write-only.
• scale (optional): Allows user to apply a scale factor to the registers. Format: (operator)(number) where the number is a numeric constant.
  Examples:
  – Add: +1.5
  – Minus: -0.25
  – Multiply: *10
  – Division: /1000
• dis (optional): An optional tag that allows the user to specify a display name for the register.
• unit (optional): Defines the unit to use for the register.
• tags (optional): Tags to apply to the point when learned into the database.
• folderPath (optional): User can organize points by applying a folderPath.
Uploading a .CSV File to Building Operator Discovery

Once you’ve configured the file, it’s time to upload it to Building Operator Discovery.

1. Select and expand the Modbus drop-down in the Navigation tree.
2. Select Register Maps.
3. Select Upload, below the Modbus Register Maps list. You won’t see any results if you haven’t uploaded a Modbus file yet.

4. Select Choose File. Select the appropriate file from your device.

5. Select Upload to proceed. Your file will now appear in the Modbus Register Maps list results.

Adding a Modbus Connector

Once you’ve uploaded the file, you must then create a Modbus connector. This connector will help you add points to your Modbus devices later.

Modbus Properties

- Dis: Name of connector
- ModbusSlave: The slave of the Modbus device being connected (default is 1).
• Existing Register Map: If you've already configured a modbus connector, this property will let you choose from a list of available registers or to create a new one with ModbusRegMapUri.

• ModbusRegMapUri: Specify the name of the register map to link with this connector. Replace “xxx” with whatever the name of the register map is.

• Uri: To specify the Uri, enter the host, protocol, and port (default 502).

### Supported Protocols

<table>
<thead>
<tr>
<th>Protocol Type</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP/IP</td>
<td>modbus-tcp://host/</td>
</tr>
<tr>
<td>RTU over TCP/IP</td>
<td>modbus-rtutcp://host/</td>
</tr>
<tr>
<td>RTU over RS-485</td>
<td>modbus-rtu://ttyUSB0</td>
</tr>
</tbody>
</table>

To add a Modbus connector:

1. Navigate to and expand Connectors > Modbus in the Navigation tree.
2. Select + Add.
3. In the pop-up, select the Existing Register Map drop-down and select the file you just uploaded.
4. (Optional) If you have not yet uploaded the register map file, you can supply a ModbusRegMapURI.
5. The Uri field gives information on the Modbus address. You can leave “modbus-tcp://” as the protocol address and replace “host” with the device’s IP address.
6. Select Add when finished.

### 1.3.5 Adding Equipment and Data Points

Once you’ve added a floor object, you can then add equipment objects to the hierarchy. These objects are discoverable through object discovery in Building Operator Discovery.

The Equipment hierarchy level, although optional, provides flexibility to structure the device level in Building Operator. Typically, the equipment corresponds to a BACnet device; however, two or more building equipment of a BACnet device can be mapped to two or more equipment in Building Operator Discovery.

**Adding Equipment**

To add an equipment object to a floor object, complete the instructions below:

1. Expand the Equip Tree in the Navigation pane.
2. Expand the site object, then select the right floor object.
3. Select the plus icon (+) below the available objects pane, then select Add Equip.

4. In the pop-up, type to enter the equipment name. This name will appear in Building Operator as the Device Name. We strongly recommend you label the equipment as the same name as it is on the BACnet network.

5. Select Create.

Immediately after an equipment has been added in the Building Operator Discovery, it is also populated in Building Operator.

To see this reflected in Building Operator:

1. Open a new tab in the browser and log in to Building Operator.
2. Select the site name to access the site page.
3. Here you’ll see the new device in Building Operator that you added in Building Operator Discovery.
Adding Data Points

Similar to discovering equipment, you can discover points to add to the equipment you just discovered. To discover points for specific equipment in Building Operator Discovery, complete the following instructions:

1. In the floor object, find and select the right device. Three icons appear once you hover over the device name. Select the arrow icon, closest to the device name, to set that device as your current context in Building Operator Discovery.

2. After setting the context, you will see a breadcrumb trail that reflects this action in the menu bar above.

3. Once you’ve set the proper context, find and select the appropriate device controller in the Connectors node. Select to expand Connectors, then BACnet (or whichever type of connector you’re using).

4. Find and select the connector you want to add points to. Then, select Discover Points, below the Added Points list results (there will be none, if you haven’t added any yet).
5. Once loaded, find and select (or multiselect) points you want to add to the device. Drag and drop the point(s) on the equipment name in the Equip Tree on your site to add the points or select + Add.

6. Select Apply in the confirmation dialog to add the point.

7. Select Cancel in the Batch Record editor: [Your Panel Name]. This functionality is not fully supported yet.

8. Navigate to the appropriate device in the Equip Tree, and you'll see the points you just added.

**Building Operator Point Icons**
Once you have added points in Building Operator Discovery, you can view them in Building Operator. See the table below for Building Operator point icon definitions.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="physical_output.png" alt="Icon" /></td>
<td>physical-output</td>
</tr>
<tr>
<td><img src="physical_input.png" alt="Icon" /></td>
<td>physical-input</td>
</tr>
<tr>
<td><img src="generic_point.png" alt="Icon" /></td>
<td>generic point</td>
</tr>
</tbody>
</table>

### 1.3.6 Deleting Data Points and Equipment

**Deleting Data Points:** To correctly delete a data point in Building Operator, you must first delete the point in Building Operator Discovery. If you delete a point in Building Operator, that action won't reflect in Building Operator Discovery.

**Deleting Equipment:** To correctly delete equipment, you must delete the equipment in both Building Operator and Building Operator Discovery. If you delete equipment in Building Operator Discovery, you must also manually delete the same device in Building Operator. Similarly, deleting a device in Building Operator won't automatically delete the equipment in Building Operator Discovery.

To delete a data point or equipment in Building Operator Discovery:

1. Select the appropriate point or equipment from the Available Equip Tree.

2. Select the (-) icon below the Available Equip Tree.
3. Select **Delete [Point or Equipment Name]**.

4. Select **Delete** in the ensuing pop-up to confirm.

5. Navigate to Building Operator and see that the point was successfully deleted from that device.

6. If you’re deleting equipment, navigate to the device in Building Operator. Find and select the delete icon (see below). This is not applicable for data points.

### 1.3.7 Adding Tags to Data Points

Now that you have added points to the device, you can configure and tag these points to meet specific criteria. There are two types of tags in Building Operator Discovery, both of which we’ll detail below.

Building Operator Discovery will automatically apply some tags for you based on the point data type.
Marker Tags
Marker tags are used to indicate a type. They are a one-word string value that describes the point. To add marker tags:

1. In the Marker Tags section, select the plus icon (⁺) to expand the tags menu.

2. Enter or scroll to search for the tag(s) you want to attach to this point.

3. Select the check mark icon to save these changes. Select Save to confirm the changes.

See the Appendix for a list of applicable Haystack tags.

Property Tags
Currently, Building Operator will not display these tags.

Tags added in Building Operator Discovery won’t appear in Building Operator until there’s a change of value on that specific point. As an Administrator, you can manually override the point data value to push the changes to Building Operator, or you can restart the Connect device. For more information on how to complete these steps, please see the subsections in Updating Data Point Information.

To add a property tag in Building Operator Discovery:

1. Select the <+ icon in the Property Tags section.

2. The default tag editor is a string type. To change the tag type, select the dot icon next to tag-name.
3. Select the appropriate property type to execute the type change.

4. Once you've selected the right property tag type, type to enter the tag-name or manually select the tag-name field to find the right tag name.

5. Then, set the appropriate value for the tag using the field provided.

6. Select the check mark to confirm the change, then select Save to save the changes.

**Adding Marker Tags in Bulk**

In Building Operator Discovery, you also have the ability to batch edit tags assigned to points. This saves you from having to manually update point tags one-by-one. To batch edit tags, complete the following instructions:

1. In the Available Equip Tree, navigate to the appropriate device and set it as the current context.

2. Navigate to a specific point and change the value of a specific tag to the appropriate value. In the workflow below, we'll outline how to batch change the property tag `bacnetWriteLevel` to 9.
3. To clone this value across all points in a device, select the settings icon, below the Available Equip Tree.

4. Select Batch Edit and Clone, then Clone Tags in the ensuing pop-up.

5. (Required) Select to select the appropriate tag in the list results. This populated list based on the object you selected in the Available Equip Tree.

6. (Required) Type to enter a filter query in the space provided. The tags you selected above are impacted by the search criteria in the filter field. For example, in the image below, the bacnetWriteLevel tag would be applied to any object that has a point tag, and the equipRef points to a navName that matches “Desigo Classic.”

   Example: point and equipRef->navName=="[EquipName]"

7. (Optional) Select Filter to open the Filter Editor. Enter a custom filter.
8. (Optional) To create a custom tag, select Custom in the Filter Editor pop-up.

9. (Optional) Navigate to the appropriate device in the filter editor by expanding the drop-down fields. Find and select the right point and select OK.

10. (Optional) Edit the filter conditions, including Boolean search criteria (and vs. or), conditions, and tags. Select OK to proceed, and then Confirm in the ensuing window. Here you'll see how the search filter will display. You can also test its validity by clicking Test.
11. When the two required fields have been filled out, select **Apply**.

**Meter Tags**

Meter tags will allow you to view energy consumption values as bar charts in Building Operator. The meter tag should be applied to points that are connected to accumulator style points.

If a Siemens Intelligent Valve is being integrated into Building Operator via Connect X300 instead of directly to the cloud, then the meter tag should be applied to the following four points:

- Total cooling energy
- Total cooling volume flow
- Total heating energy
- Total heating volume flow

To add a meter tag in Building Operator Discovery:

1. In the Meter Tags section, select the **plus icon (⁺)** to expand the tags menu.

2. Enter or scroll to search for the tag(s) you want to attach to this point. Select the **check mark icon** to save these changes.
3. Select **Save** to confirm the changes.

See the Appendix for a list of applicable Haystack tags.

**Using the Bar Chart Option**

To view energy consumption values in the bar chart option:

1. In **Building Operator**, select the site you want to view from the site list.
2. Select the **View Data Points** icon.

3. Select a data point with a meter tag. You can use the search bar by typing in **meter** to filter out points with the meter tag.
4. After selecting the data point, use the icons at the top of the chart to toggle between the line and bar chart options.

1.3.8 Determining BACnet Write Priority for Points

BACnet priorities are vary for different vendors. Siemens devices abide by the following BACnet priority array:

- 1-6: Safety and protection
- 7: Delay time on/off
- 8: Manual operation
- 9-18: Program mode

If you want Building Operator to write to any value or output with a BACnet priority array, you must determine a write level. Building Operator Discovery has its own priority array, but it’s important to set the BACnet write level appropriately for the end device.

Complete the following instructions to configure the write priority for BACnet points:

**Changing Point Priority Individually**

1. Find and select the appropriate value or output point beneath the device, in the Available Equip tree.
2. In the point editor, find the Write Level field.
3. Use the up or down arrows, or type to enter 8 for the field value. Any command you send to the Building Operator Discovery priority array will be sent out to the end BACnet device at slot 8, or manual override.
4. Select **Save** at the bottom of the editor to save your changes.

### 1.3.9 Restarting Connect Device to Update Data Point Information

If you want to update data point information or change it for any reason, you’re able to do so in Building Operator Discovery. However, any data point information you update in Building Operator Discovery won’t appear in Building Operator until there’s a change of value (COV) on that specific data point. To force a COV, as an Administrator, you must restart the Connect device. The example below outlines how to restart the gateway to force a COV.

To restart the Connect device to update data points:

1. Navigate to the point you want to change in the Available Equip Tree (Site > Floor > Equipment > Data point) and type to enter the revisions in the appropriate field(s). In this example, we’re adding "(SieSte20)" to the end of the AOV2 data point name.

2. Select **Apply** when finished.

3. In a separate browser tab, log in to Connect device. Use the same username and password you created earlier when you first activated the device.

4. Select the **Maintenance** tab in the navigation ribbon.

5. Select the blue **Restart** button in the **Gateway operation** section.
6. Select **Restart** in the confirmation pop-up.  
**NOTE:** You will likely lose and re-gain cloud connectivity during this process.

7. Log back into Building Operator Discovery to confirm the changes reflected after the Connect device restart.

8. Refresh the Site page in Building Operator if the revisions don’t automatically populate.

### 1.3.10 Creating and Restoring a Record Library

This section will cover the process for creating and restoring custom point and equipment templates to reduce the configuration time of standardized building applications.

1. Commission one device with the points named/tagged as desired.

2. Select the device in the equip tree and select the device tab on the main window.

3. Select the points you would like to add to your record library and click **Save to Record Library**.
4. Fill in a descriptive name for the record library and click **Save**.

![Save Point Template](image)

**Points to be saved**
- My Site Room 7301.0300 - iValve EV B0600'R'F1r003'R7101X0100'Viv
- My Site Room 7301.0300 - iValve EV B0600'R'F1r003'R7101X0100'Hw

**Create New File**

```
IntelligentValveHeatingTemplate
```

5. Select an equip in the Equip Tree and then select **Gear Icon → Create Batch Records → Download Saved Records**.

![Download Saved Records](image)

6. Select your record library from the drop-down box and click **OK**.
7. Click **Download**.

8. The file should now be placed in your browser’s download location.

9. After commissioning a new site, you can then upload a record library. Create an empty equip, select it, and then select **Gear Icon → Create Batch Records → Upload Saved Records**.

10. Click **Choose File** and browse to your saved record library, then click **Upload**.
11. Create your equip in the equip tree and make it the current context. Discover the appropriate connector's points and select the points that were saved in your library. Add them to your new equip record.

12. When the Batch Record Editor window pops up, select your record library from the dropdown box in upper left corner.

13. The points have been matched against your record library. Leave the three toggle switches to Replace Existing Names, Marker Tags, His Tags, and click Apply.

14. The points will be brought it with the correct name and tags. You can now clone your equip to other devices of the same type. Before cloning, the equip with the points you had setup should be the current context. Select BACnet under Connectors in the Equip Tree.

15. Select the connectors you want to clone the equip to and click **Clone**.

16. If the equip was set to the current context, the Clone Options will be prepopulated with the correct settings. Click **Create**.
17. To see the new equip refresh the Floor View.

1.4 Configuring Alarms in Building Operator Discovery

**CAUTION**

Only use Alarm Config to add, modify or remove alarms. COVs may be needed to ensure alarms are operating.

To configure alarms in Building Operator Discovery, please complete the following instructions:

1. Log in to Building Operator Discovery.
2. Select the menu icon in the top-left corner.
3. Find and select Alarm Config.
4. In Alarm Config, you can set alarm configurations for the points on your device. To do so, first select the appropriate **Point Filter** above the list results. Choose from **Number, Boolean, Enum** or **String** value.

5. Then, select the box next to the appropriate point name(s). A blue check mark will appear to the left of the point name. You can multi-select points and write different values to them at once. Furthermore, the **Select All** box only selects all the fields on the current list results page. If you have more than one page of list results, you must manually scroll and Select All for each page.

6. Next, find and select the appropriate configuration type from the **Alarm Configuration** drop-down menu.

7. Select **Add / Edit** to edit the point alarm values.

8. In the pop-up, change the value(s) in the fields provided to meet the parameters for your point alarm. Select **OK** when finished.
The values you apply in this window will be written to the points selected in the Alarm Config list.

### 1.4.1 Configuring Number Alarm

When configuring a Number alarm with a Delta From Setpoint value, follow the instructions below:

1. Open and launch **Alarm Config** from the Building Operator Discovery applications menu.
2. Select the Number point filter, select Number Alarm in the Alarm Configuration drop-down, then select Add/Edit.
3. In the pop-up, change the value(s) in the fields provided to meet the parameters for your point alarm. In the **Compare Point Name** field, copy and paste the **NavName** of the point you want to compare to. The point you want to compare to, must exist within the same equip as the point the alarm is being configured for.

   The **Compare Point Name** field is case sensitive.

4. Select **OK** when finished.
1.4.2 Configuring Boolean Alarm State Text

When configuring alarms in Building Operator Discovery, there are a few nuances you should be aware of. First, if you’re configuring a Boolean alarm that has different values than “True” or “False,” you need to know how to determine which of these binary values are true, and which is false.

To determine this, please complete the instructions below:

1. Open and launch DB Builder from the Building Operator Discovery applications menu.
2. Navigate to and select the Boolean point on the appropriate device, within the device hierarchy.
3. Find and select the information icon (i), above the Point Name field.
4. Scroll down to find the enum property. To the right, you’ll find the Boolean point values, listed in False, True order. In the screenshot below, the False value is Day, and the True value is Night.
5. Once you’ve determined the correct value, navigate back to the Alarm Config application (we recommend opening two separate browser tabs).
6. Select the check box next to the appropriate point.
7. Select the Boolean point filter, select Boolean Alarm in the Alarm Configuration drop-down, then select Add/Edit.
8. Select either True or False, depending on the alarm value you want to set.
9. Select **OK** to proceed.

### 1.4.3 Configuring Multistate Alarm State Text

If you’re configuring a Multistate alarm that has multiple values, you need to know which of these values to manually add to trigger an alarm.

To determine this, please complete the instructions below:

1. Open and launch DB Builder from the Building Operator Discovery applications menu.

2. Navigate to and select the multistate point on the appropriate device.

3. Find and select the *information icon* (i), above the Point Name field. Scroll down to find the *enum* property. To the right, you’ll find the Multistate point values, listed in ascending order (0, 1, 2, 3, 4, etc.).

4. Once you’ve determined which value(s) you’d like to manually add, navigate to the Alarm Config application.
5. Enter the multistate value in the **Alarm State Text** field. Note that spacing is critical in this field. If you enter a multistate field value with incorrect spacing, the alarm will not work. Use a semicolon to separate state text.

6. Select **OK**.

### 1.4.4 Verifying Alarms in Building Operator Discovery

Once you’ve configured point alarms, you can verify that these changes executed in Building Operator Discovery. You can do so one of two ways:

First, after you select **OK** in the Edit/Add pop-up, you’ll see a blue check box below a new [Alarm Type] Alarm column in the Alarm Config list results.

However, if you’re interested in seeing which value was configured to set the alarm, follow the instructions below:

1. Navigate to and launch DB Builder from the Applications menu.
2. Find and select the appropriate point on the device within the site hierarchy.
3. Beneath Property Tags, you’ll note new tags were created. These tags outline various Alarm Config parameters, or the values that you just manually set.
1.4.5 Viewing Alarms in Building Operator Discovery

Once you've set parameters for your alarm, you can then view the alarm status and associated tags in Building Operator Discovery (pending the alarm has gone off). To do so:

1. Select the menu icon in the top-left corner, and then select Alarms.
2. In the right-hand – Alarms – pane, you'll see each point that's listed in an alarm state.
3. To view the point alarm details, select the (i) information icon directly above the point name.

4. Here you'll find the point alarm details and associated tags. For example, you can see the timestamp of when that specific point went into alarm (as outlined below).

5. Select Close.

1.4.6 Viewing Alarms in Building Operator

Once a point goes into alarm in Building Operator Discovery, that state will also reflect in Building Operator. For the time being, Building Operator only shows when a point is in and out of an alarm state.

To view whether a point is in an alarm state, complete the following instructions:

1. Find and select the appropriate site name in the Building Operator home page.

2. In the site page, select the device name. You will see the same event icon to the right of the device name.

3. Select the point name that has the alarm event icon listed next to its name.
1.5 Backing Up and Restoring a Building Operator Discovery Database

In Building Operator Discovery, you can back up or restore a database that you have already created. This is particularly useful if you want to save engineering configurations and data to apply on a replacement Connect device (for example: due to device damage).

1.5.1 Creating a Backup

To back up a database in Building Operator Discovery:

1. Find and select Folio in the Building Operator Discovery menu. Select Menu. For more information on Folio in Building Operator Discovery, please see the Building Operator Discovery documentation.

2. In the Folio pane, select Snapshots.
3. From the menu, select **Make Snapshot**.
4. Once the loading bar reaches 100 percent, your database snapshot will display directly below the menu in the Folio pane.
5. Select the Folio snapshot name you want to pack up to your computer. Three options will appear:
   - **Restore**: This will upload the same version of the database you created when you made a snapshot. See below for instructions on how to properly restore.
   - **Backup**: This will save the database locally to your device in a Zip file.
   - **Delete**: This will remove the folio snapshot of the database.

   ◇ Select **Backup**. Save the zip file to a safe location on your computer for later restore.

### 1.5.2 Restoring a Backup

To properly restore a snapshot from your computer:

▷ In Building Operator:

1. Select Folio. Select **Menu**, then **Snapshots**.
2. Select **Upload Snapshot**.
3. Choose the zip file that you previously backed up. The snapshot displays under **Folio snapshots**.
4. In the restored snapshot, select **Restore**.
After you've executed this procedure, restart the Connect device. To do so:

- In Connect device:
  1. Select the **Maintenance** tab.
  2. Select **Restart** and wait approximately ten minutes to execute a proper restore in Building Operator Discovery.

### 1.6 System Limits

For ideal performance, ensure that your system is configured with the following limitations in mind:

- Maximum number of data points per Connect device: 500
- Maximum number of COVs per Connect device: 200/minute
- Maximum number of alarms per Connect device: 200/minute

For devices that do not support COVs, Building Operator Discovery will poll the network according to its default tuning policy. On slow networks, such as MSTP, this tuning policy may not be ideal. Refer to the Building Operator Discovery documentation for instructions to configure a custom tuning policy.

#### BACnet Objects

The current Building Operator Discovery is not BTL listed, however, you can represent nine basic object types within Building Operator. More object types will be available once certification is obtained.

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>Analog Output</th>
<th>Analog Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary Input</td>
<td>Binary Output</td>
<td>Binary Value</td>
</tr>
<tr>
<td>Multi-State Input</td>
<td>Multi-State Output</td>
<td>Multi-State Value</td>
</tr>
</tbody>
</table>
# 2 Haystack tags

Here is a white list of Haystack tags accessible in Building Operator.

<table>
<thead>
<tr>
<th>absorption</th>
<th>elecReheat</th>
<th>kvarhSensor</th>
<th>series</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac</td>
<td>enum</td>
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<td>singleDuct</td>
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<tr>
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<td>equip</td>
<td>kvaSensor</td>
<td>site</td>
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<td>export</td>
<td>kwhSensor</td>
<td>siteMeter</td>
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<td>faceBypass</td>
<td>kwSensor</td>
<td>sitePanel</td>
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<td>flue</td>
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<td>gasHeat</td>
<td>mag</td>
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<td>reactive</td>
<td>wetBulb</td>
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You can find a complete list of Haystack tags on their [website](http://example.com).