Honeywell VAV Balancing Tools

USER GUIDE

CENTRA LINE by Honeywell

EN2B0041-IE10-R0322

GLOBAL VAV BALANCING TOOL

Introduction

The purpose of this section is to detail the balancing procedures required for the pressure independent VAV controllers.

About Global VAV Balancing Tool

The Global VAV Balancing tool is an intuitive tool developed to perform calibration and balancing for the IRMNX controllers.

NOTE:
You must calibrate before performing the balancing operation.

You can perform setpoint balancing, max-min balancing, zero calibration, and move damper procedures. Additionally, the tool allows you to generate balancing reports.

This document describes each of these balancing techniques in detail so that a technician can efficiently balance a VAV controller.

Features of the Global VAV Balancing Tool

Features of the Global VAV Balancing tool.

- **Balancing VAV controllers:** The tool allows you to balance multiple IRMNX controllers at the same time, as well as calculate the flow calibration factors for the corresponding VAV boxes. This saves time spent initiating and performing balancing on each VAV box one at a time and waiting for them to reach the airflow setpoint. Setpoint balancing, max-min balancing, and damper movement on multiple controllers are all possible with a global balancing tool.
- **Dashboard view:** The dashboard categorizes and filters the controllers based on their status. The total number of controllers is displayed in each group. You can view only those controllers in the corresponding state by clicking the appropriate item on the dashboard.
- **Filtering option:** Filtering options allow you to filter the controllers based on their properties. You can create a filter and name it appropriately.
- **Column organizer:** The column organizer contains the controller's additional parameters. You can rearrange the balancing column table by selecting the required parameter from the column organizer.
- **Grouping:** Based on the project requirements, you can logically group a set of controllers and provide a suitable name. Controllers can be organized into groups based on where they are installed. Furthermore, by discovering the associated group, you can discover only the required set of controllers.
- **Pause or Resume communication:** This option indicates the tool's communication status. You can also use this option to either stop or resume communication. It also assists you in disconnecting the computer from the network and reconnecting it later to continue balancing.

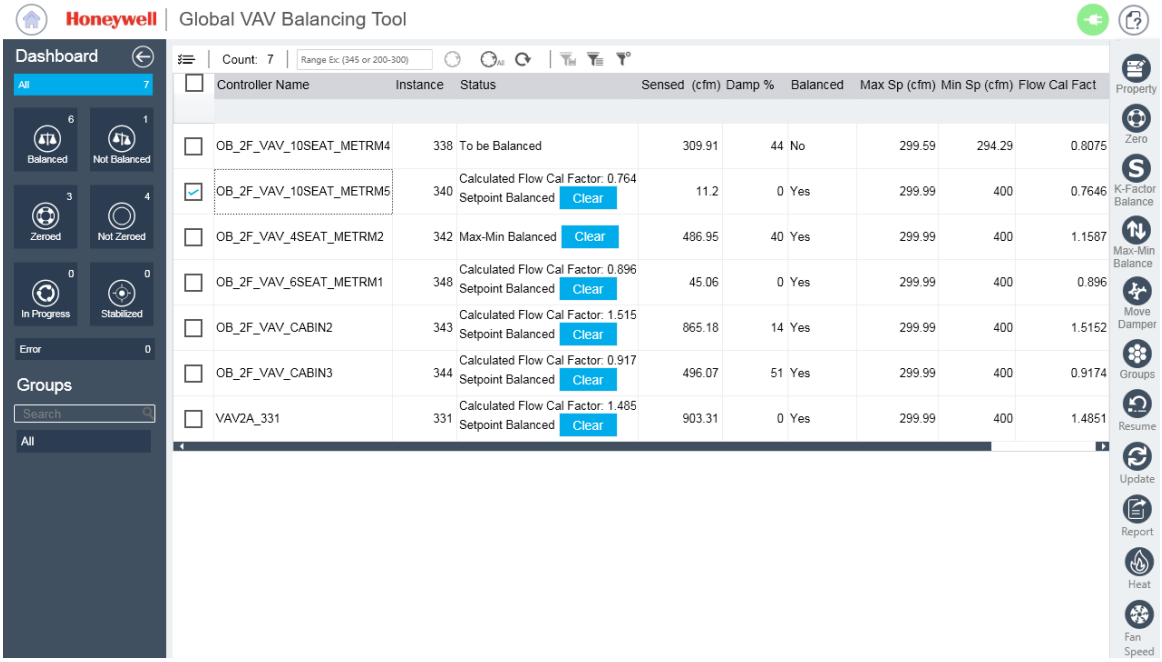


Fig. 1 Global VAV Balancing Tool dashboard

OVERVIEW OF VAV BALANCING DASHBOARD

Before working with the global balancing tool, you must familiarize yourself with the primary user interface (UI). When you open a VAV Balancing dashboard, you see a screen similar to the below image.

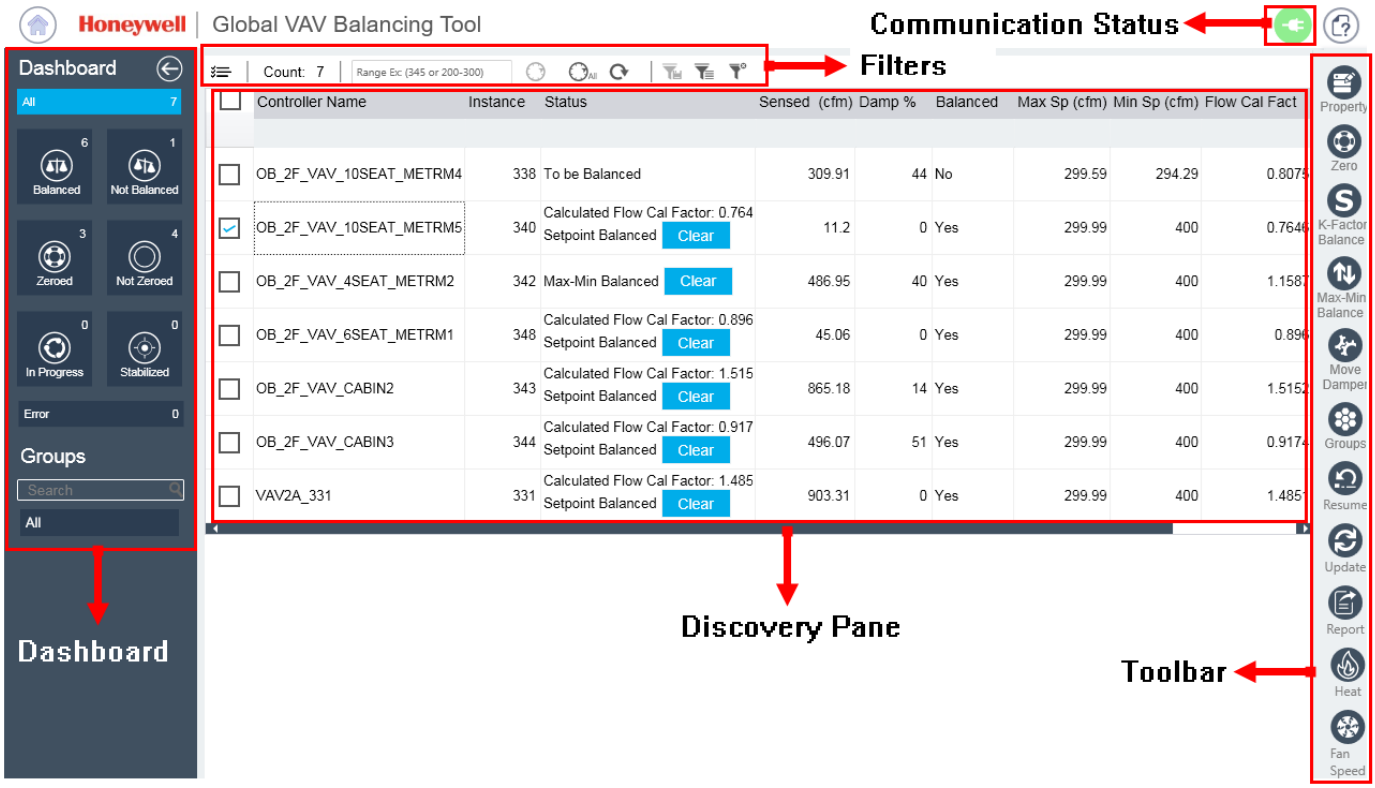


Fig. 2 Global VAV Balancing dashboard

The Global VAV Balancing dashboard is divided into the following sections:

Discovery Pane

The Discovery pane lists all of the discovered VAV controllers, along with their current status and parameters information.

Controller Name	Instance	Status	Sensed (cfm)	Damp %	Balanced	Max Sp (cfm)	Min Sp (cfm)	Flow Cal Fact
OB_2F_VAV_10SEAT_METRM4	338	To be Balanced	309.91	44	No	299.59	294.29	0.8075
OB_2F_VAV_10SEAT_METRM5	340	Calculated Flow Cal Factor: 0.764 Setpoint Balanced Clear	11.2	0	Yes	299.99	400	0.7646
OB_2F_VAV_4SEAT_METRM2	342	Max-Min Balanced Clear	486.95	40	Yes	299.99	400	1.1587
OB_2F_VAV_6SEAT_METRM1	348	Calculated Flow Cal Factor: 0.896 Setpoint Balanced Clear	45.06	0	Yes	299.99	400	0.896
OB_2F_VAV_CABIN2	343	Calculated Flow Cal Factor: 1.515 Setpoint Balanced Clear	865.18	14	Yes	299.99	400	1.5152
OB_2F_VAV_CABIN3	344	Calculated Flow Cal Factor: 0.917 Setpoint Balanced Clear	496.07	51	Yes	299.99	400	0.9174
VAV2A_331	331	Calculated Flow Cal Factor: 1.485 Setpoint Balanced Clear	903.31	0	Yes	299.99	400	1.4851

Fig. 3 Discovery pane

Toolbar

The toolbar displays the balancing functions used to perform setpoint or K Factor balancing, max-min balancing, zero calibration, move damper, and manual balancing. The toolbar menus change depending on the calibration option selected in the advanced settings.
In the below figure, each function in the toolbar is given a number for ease of reference in the following sections.

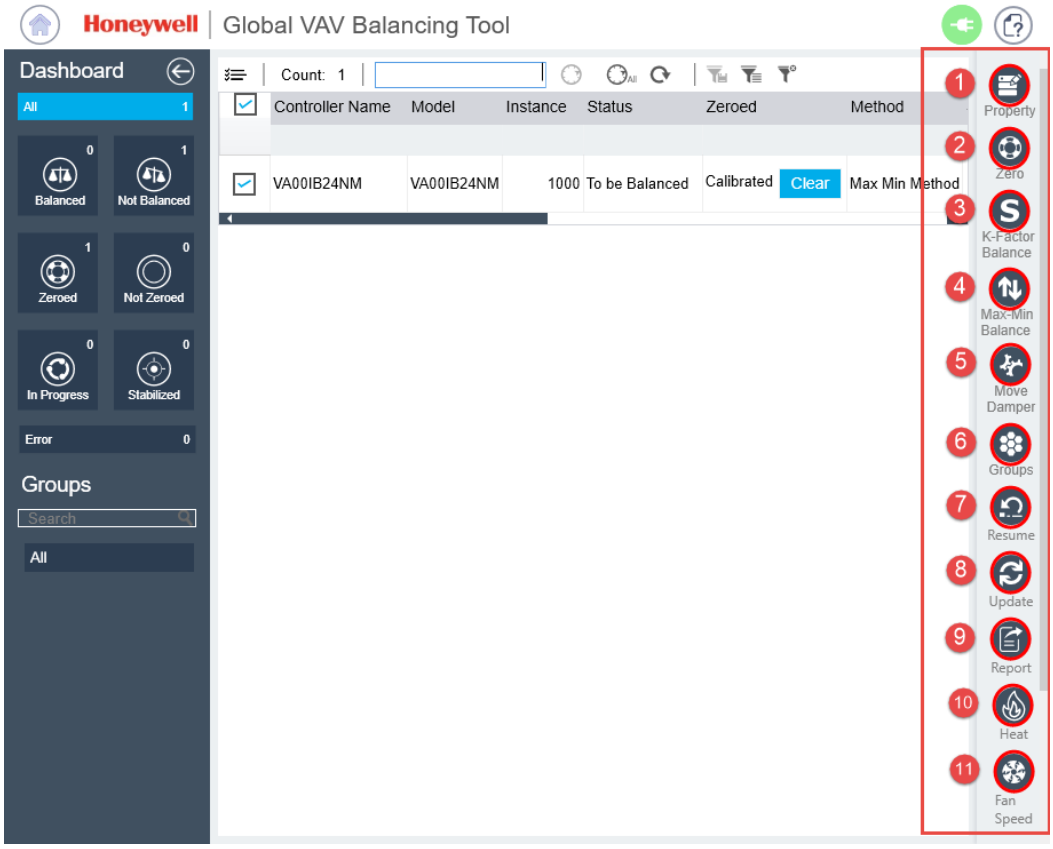


Fig. 4 Balancing functions in Toolbar section

Function 1: Edit Properties

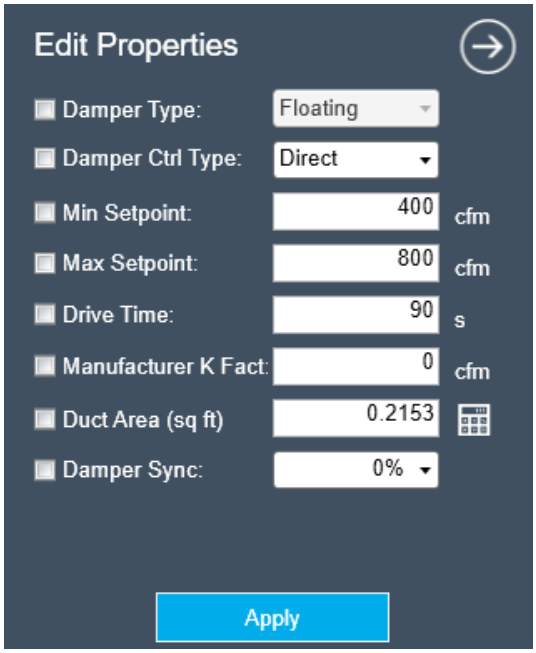


Fig. 5 Edit Properties

Fig. 6 Property icon

The property function allows you to edit controller properties.

- **Damper Type:** Select the type as floating, analog (0-10 V), or analog (2-10 V) based on the actuator connected to the VAV box.
- **Damper Control Type:** Select the direction in which the damper must rotate (direct or reverse).
- **Min Setpoint:** Enter the minimum airflow value. The min setpoint value must not be lower than the minimum airflow value of the VAV box.
- **Max Setpoint:** Enter the maximum airflow value. The max setpoint value must not exceed the maximum airflow value of the VAV box.

NOTE:
The minimum and maximum airflow setpoint is based on the design of the VAV box or specified by the engineer.

- **Drive Time:** Enter the maximum time (seconds) taken by the actuator to drive the damper from 0 % to 100 % open state or vice-versa.
- **Flow Calibration Factor:** Enter the flow calibration factor value provided by the VAV manufacturer.
  Or
  Manufacturer K Factor: Enter the K factor provided by the VAV manufacturer.
- **Duct Area:** Click the calculator and select the duct type. The dimensions are provided by the VAV manufacturer. You can also measure the dimensions manually.

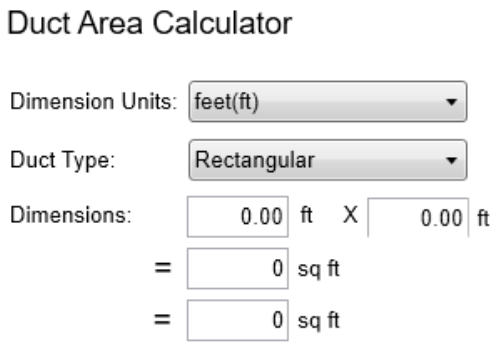


Fig. 7 Duct Area Calculator

- **Damper Sync:** Enter the sync direction 0 % or 100 %.

IMPORTANT:
Only select the properties of modified check boxes.

Function 2: Zero Calibration

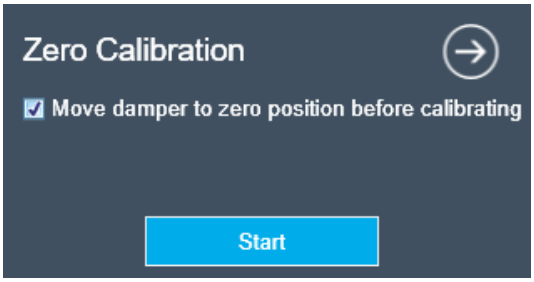


Fig. 8 Zero Calibration

Fig. 9 Zero Calibration icon

The Zero function allows moving the damper to a zero position. The VAV box can be zero calibrated when the damper is completely closed or when the damper is in its current position. This task is generally done before performing setpoint or max-min balancing. This task, however, is optional. For more details, refer to Perform a Zero Calibration on page 18.

Function 3: K-Factor or Flow Calibration Balance

The K-Factor Balance or Set Flow Calibration Factor options in toolbar section determined by the advanced settings selection. For more details, refer to Configure Advanced Settings on page 14.

- **K-Factor Balance**

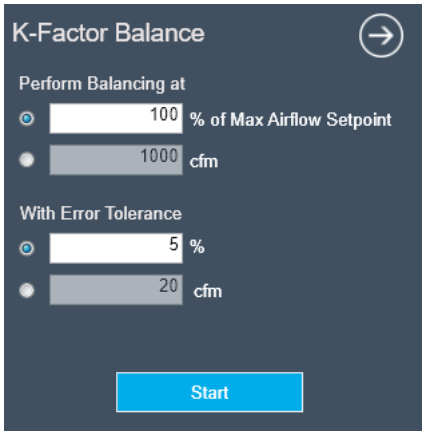


Fig. 10 K-Factor Balance

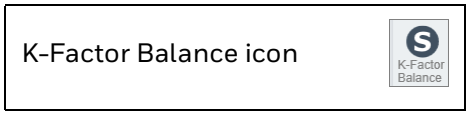


Fig. 11 K-Factor Balance icon

The K-Factor balancing option allows you to set the percentage of maximum airflow setpoint or airflow value that the VAV box should achieve and the error tolerance percentage for the target airflow or airflow value. For more details, refer to Perform an Airflow Setpoint or K Factor Balancing on page 18.

- **Set Flow Calibration Factor**

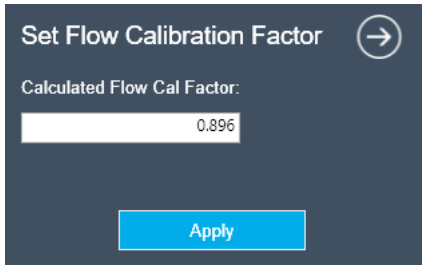


Fig. 12 Set Flow Calibration Factor

Fig. 13 Flow Calibration icon

The Flow Calibration function allows you to set the flow calibration factor value provided by the VAV manufacturer. For more details, refer to Perform an Airflow Setpoint or K Factor Balancing on page 18.

Function 4: Max-Min Balance

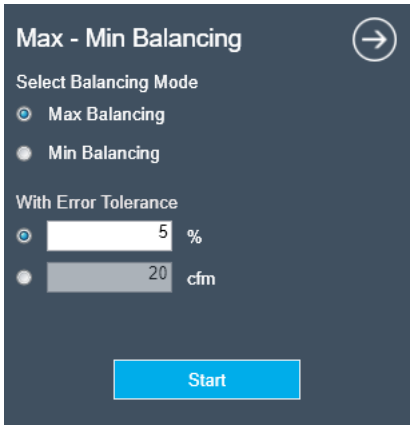


Fig. 14 Max-Min Balancing

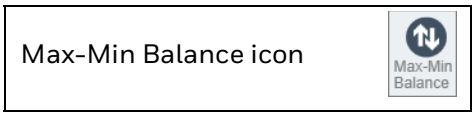


Fig. 15 Max-Min Balancing icon

The Max-Min balancing function allows you to set the Max Balancing or Min Balancing and the error tolerance percentage for the target airflow or airflow value (cfm). The max-min balancing is used to balance the VAV boxes for two different airflow setpoint values. For more details, refer to Perform Max-Min Balance on page 20.

Function 5: Move Damper

The Move Damper function allows you to balance the airflow across the duct system so that the balanced VAV boxes receive adequate airflow. You can move the damper by Position or Airflow method. For more details, refer to Move Damper on page 21.

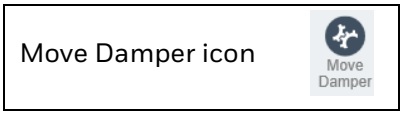


Fig. 16 Move Damper icon

Move Damper by Position

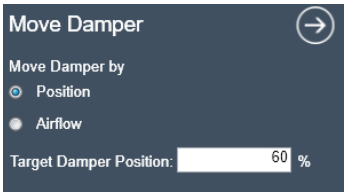


Fig. 17 Move Damper by position

- **By Position:** Move the damper to a defined position. Enter a value in the **Target Damper Position** field to move the damper to the required position. For example, if you type 10, the damper would move 10 % from the present position.

Move Damper by Airflow

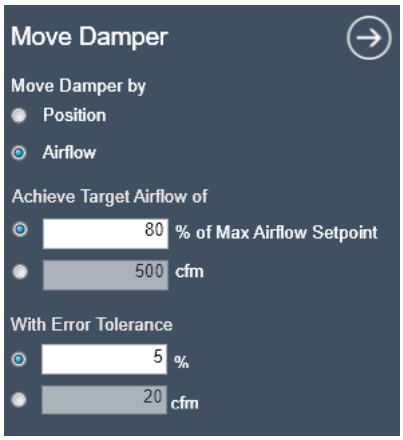


Fig. 18 Move Damper by airflow

- **By Airflow:** Move the damper to achieve the specified airflow. Provide a value that needs to be achieved by the VAV box in the **Achieved Target Airflow**. You have options to provide the airflow in the form of a percentage of the maximum airflow setpoint or an airflow value to be achieved.
- **With Error Tolerance:** Enter the error tolerance value; else the tool considers the default value. You can either set the tolerance in the form of a percentage of target airflow or the airflow value. For example, if the setpoint is set to 500 cfm and the error tolerance is set to 10 cfm, the tool considers the airflow in the stabilized state when it senses airflow between 490 - 510 cfm

NOTE:
The maximum airflow setpoint value is configured in the edit properties window.

Function 6: Groups

Based on the project requirements, you can logically group a set of controllers and provide a suitable name. Grouping of controllers can be based on the location where the controllers are installed. Additionally, this concept helps you to discover only the required set of controllers by discovering the associated group. For more details, refer to Manage Groups on page 16.

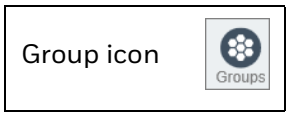


Fig. 19 Group icon

Using the Group option, you can perform the following operations:

- Create, modify, and delete a group.
- Import or export groups.
- Remove controllers from the group.

Function 7: Resume

The Resume function allows you to switch from the balancing mode to the operational mode.

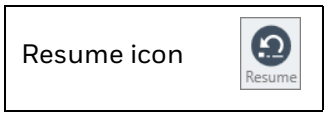


Fig. 20 Resume icon

The controller operates in two modes.

- **Operational mode**
- **Operational Read Only mode**

When you start balancing the controllers, the controller switches to “Operational Read Only” mode. During this mode, you cannot download applications or firmware to the controller.

After balancing, you must click the **Resume** option to switch to “Operational mode” (the controller restarts before switching). The controller status can be viewed in the system status column.

Function 8: Update

The Update function allows you to update the balancing values from the application to the controller or from the controller values to the application.

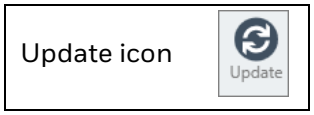


Fig. 21 Update icon

While verifying the balancing parameters (max setpoint, min setpoint, drive time, and damper type) in the global VAV balancing tool, if the balancing values are different from the application, you can update the application values by using the **FrmApp** function.

After balancing, if the max-min setpoint, drive time, and damper type values changes, update the modified values by using the **ToApp** function

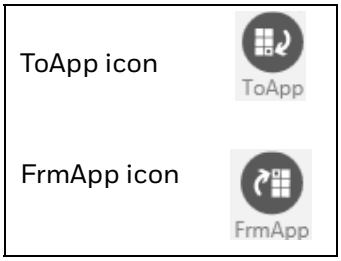


Fig. 22 ToApp and FrmApp icon

Function 9: Report

The Report function allows you to generate a report of all discovered controllers or a set of discovered controllers that are categorized based on the status provided in the dashboard view (Balanced, Not Balanced, or Zeroed, etc.). For more details, refer to Generate Report on page 23.

Fig. 23 Report icon

Function 10: Heat Calibration

The Heat function allows you to do water balancing. For more details, refer to Heat Valve Override on page 22.

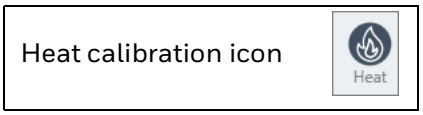


Fig. 24 Heat calibration icon

Based on the VAV controller's Application type, the Reheat function and the peripheral heat valve override function are shown or hidden. For more details, refer to Reheat Override on page 22 or Peripheral Heat Override on page 22.

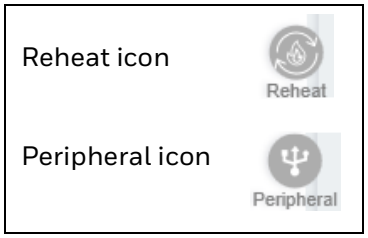


Fig. 25 Reheat and Peripheral icon

Function 11: Fan Speed Calibration

Fan Speed function allows you to adjust the fan speed.

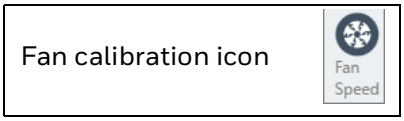


Fig. 26 Fan calibration icon

Based on the VAV controller's application type, the VAV Fan and the AHU Fan speed option are shown or hidden. For more details, refer to Fan Speed Override on page 22.

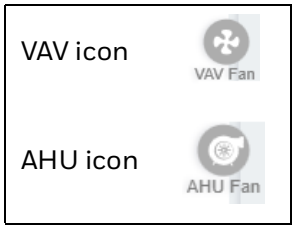


Fig. 27 VAV and AHU calibration icon

Dashboard

The dashboard categorizes and filters the controllers based on their status. The total number of controllers in each state is displayed in each group. When you click on the appropriate item on the dashboard, you can only see the corresponding controllers.

In addition, the dashboard displays all of the created groups. Select the required group to see the controllers associated with it.

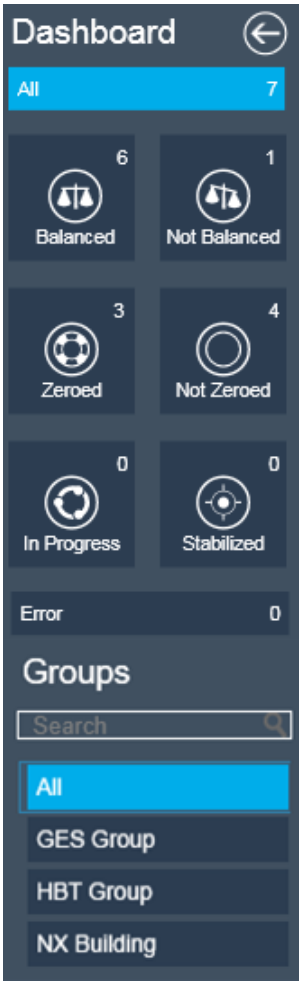


Fig. 28 Dashboard section

Filters

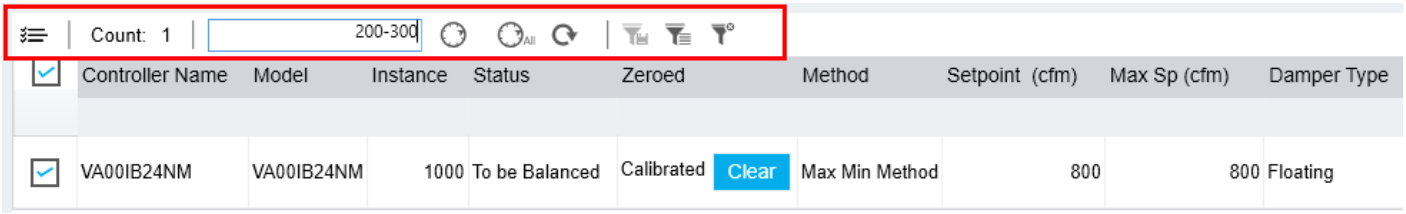


Fig. 29 Available filters

Table 1 Filters Description

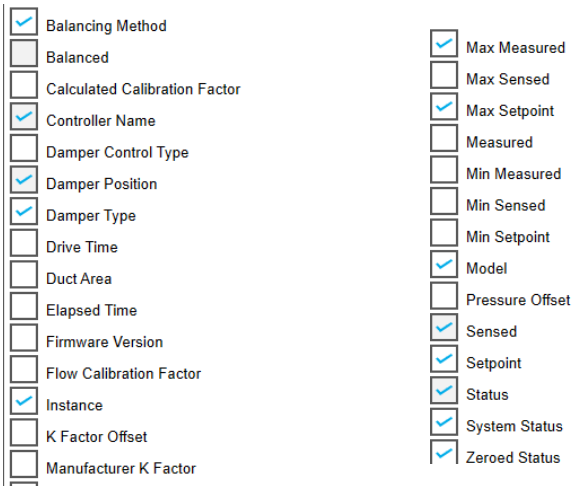
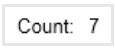
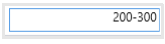
Filter	Icon	Description
Column Organizer		The column organizer contains various controller parameters that can be used to obtain additional information about the controller. You can select the desired parameter, which will be added to the balancing table column. The below figure shows available controller parameters in the column organizer.  **Fig. 30 Controller Parameters**
Count		Displays the number of controllers available in the discovery pane.
Range		Enter the instance range.
Discover Range		To discover the controller by providing its instance id.
Discover All		To discover all controllers.
Refresh		To update all of the balancing table's columns with the most recent values from the controller.
Clear Filter		To clear all the applied filters.

Table 1 Filters Description

Filter	Icon	Description
View Filter List		To view all the filters used in the tool. After discovering the controllers, click the “view filter list” icon. All the available filters will be displayed in the list. Select the desired filter from the list and click apply.
Save Filter		After applying a filter, click the “save filter” icon. The following dialog box appears.  **Fig. 31 Filter option** Enter the filter name and click **Save**.

Communication Status

Indicates the communication status between the VAV balancing tool and the controller.

Table 2 Communication Status Description

Icon	Status	Description
	Green	This indicates that the communication is in progress.
	Red	This indicates that the communication is lost or paused.

During balancing, the tool allows you to pause or resume the communication between the controller and the global VAV balancing tool.

During balancing, if you click the communication icon (pause communication), the controller and global VAV balancing tool communication is paused, and the green icon turns red. Similarly, if you select the same option (resume communication), the controller and the global VAV balancing tool re-establishes the communication, and the red icon turns green.

Additionally, it allows you to disconnect the computer from the network and reconnect it later to continue balancing. This is useful when you change the location in the room while balancing.

GETTING STARTED

This section describes the engineering process involved in balancing a VAV box.

Prerequisite Tasks

Before balancing a VAV controller, prerequisite tasks must be performed to ensure the proper installation of the controllers. After installing the controller correctly, you can program the VAV controller in the workbench.

You can download the Global VAV Balancing Tool from the Honeywell Buildings Forum.

- When you configure the VAV balancing tool for the first time, the VAV balancing tool asks you to change the admin password.
  It is recommended to create a strong password. Choose a password using unique symbols, numbers, lower-case letters, and upper-case letters for added strength. Keep the password written down and save it in a secure location.
- Check if the damper actuator is connected and operating correctly.
- Check if the pitot tubes are connected correctly.

Communication Protocol For Discovery

You can connect the Global VAV Balancing tool to a BACnet network using an IP or MSTP connection.

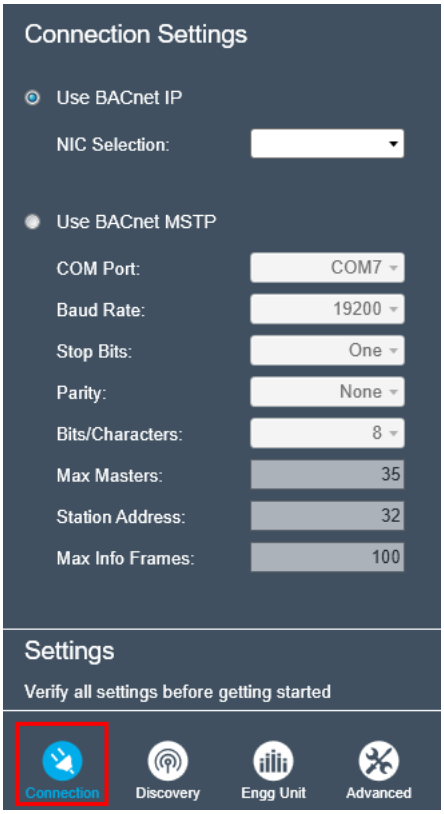


Fig. 32 Connection settings

- **BACnet IP:** Connects to a VAV controller via an IP network.
- **BACnet MSTP:** Connects to a VAV controller via an MSTP network.

Configure BACnet IP Settings

To configure the BACnet IP settings:

1. Click **Connection**.
2. Under **Connection Settings**, select the **Use BACnet IP** option.
3. In the **NIC Selection** list, select the appropriate network card to connect with the controller.

Fig. 33 Bacnet IP settings

Configure BACnet MSTP Settings

Before configuring the BACnet MSTP settings, make sure to perform the following change to the port settings.

Prerequisites

1. On your computer, choose **Start > Control Panel,** and click **Device Manager**.
   The Device Manager window appears.
2. Expand **Ports** and right-click on the **COM port** as shown below.

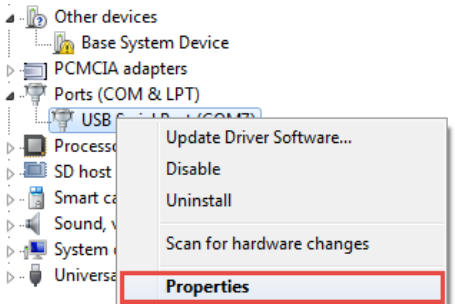


Fig. 34 Com Port configuration

3. Click **Properties.**
   The USB serial properties window appears.
4. Click the **Port Settings** tab and click **Advanced**.

The **Advanced Settings** window appears.

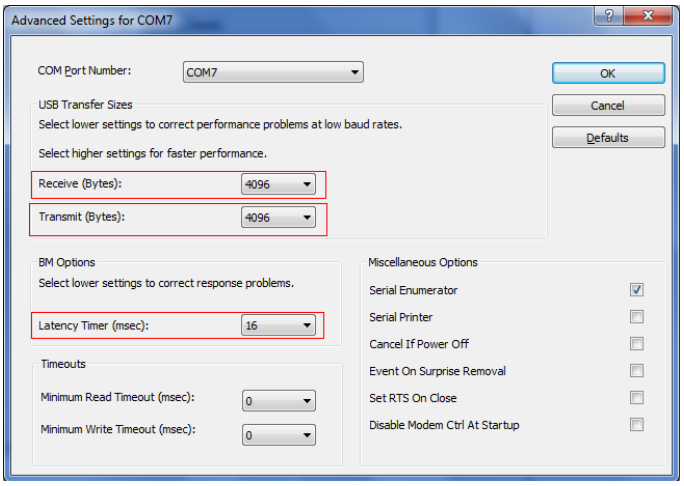


Fig. 35 Advance setting view

5. Modify the following parameters:
   - **Receive (Bytes):** 64
   - **Transmit (Bytes):** 64
   - **Latency Timer (msec):** 1

NOTE:
This setting is based on the type of converter used.

6. Click **OK**.
7. Launch the **Global VAV Balancing Tool** and click **Connection**.
8. Under **Connection Settings**, select the **Use BACnet MSTP** option and configure the following properties.
   - **COM Port**
   - **Baud Rate**
   - **Max Masters**
   - **Station Address**
   - **Max Info Frames**

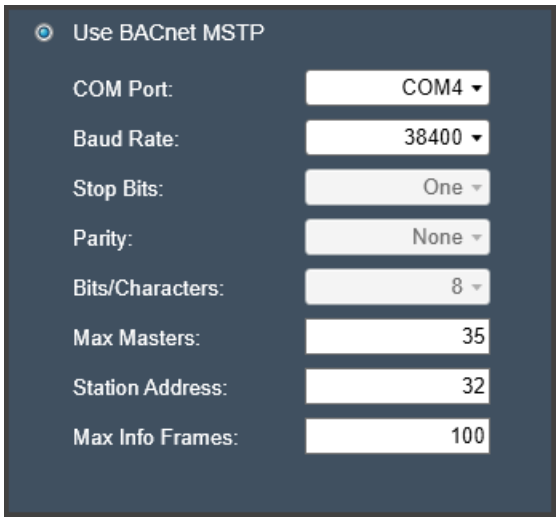


Fig. 36 BACnet MSTP property sheet

Table 3 BACnet MSTP properties

Property	Description
COM Port	Select the appropriate COM port. The COM port must be connected to a standard RS-485 or RS-232 converter and then to an MSTP network.
Baud Rate	The rate at which the computer must communicate with the communication port of the IRMNX controller. The default baud rate is 76,800.
Stop Bits	The number of stop bits used for transmission. This field is read-only.
Parity	The parity bit is used as an error detection code. It is a bit added to ensure that the number of bits with the value one in a set of bits is even or odd. This field is read-only.
Bits per Characters	The number of bits per character used for transmission. This field is read-only.
Max Masters	The maximum number of MSTP controllers that can be connected. The maximum allowable limit is 1-127.
Station Address	On the MSTP network, the maximum allowable limit is 0-127.
Max Info Frames	The maximum number of frames that can be sent through BACnet messages.

Configure Discovery Settings

The controllers can be discovered by providing the instance id or pre-configured groups.

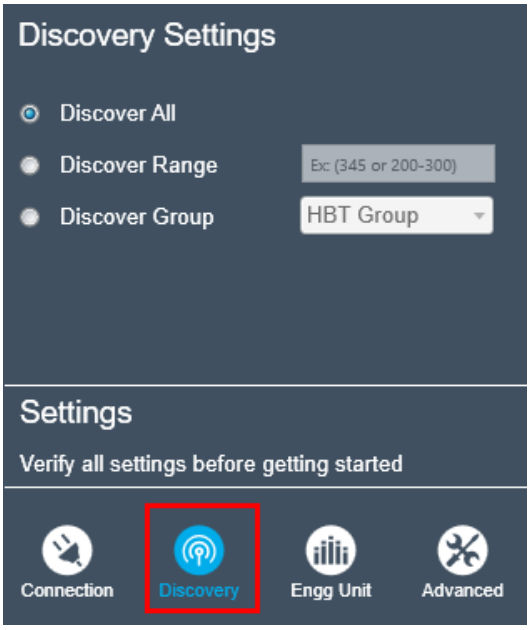


Fig. 37 Discovery settings

Follow the below steps to discover the controllers using the instance number.

1. Click **Discovery**.
2. Select one of the options:
   - **Discover All**: Discovers all the compatible controllers available in the network.
   - **Discover Range**: Discovers either a range of controllers by providing the range of device instance numbers or discovers a specific controller by providing the device instance number of that controller.
   - **Discover Group**: Discovers all the controllers created under a pre-configured group (Refer Manage Groups).

Configure Engineering Units Settings

Depending on your requirement, set the appropriate engineering units before balancing. This applies the selected engineering units to individual parameters. The tool supports three types of engineering units: Imperial (cfm), Metric (cmh), and Metric Pacific (l/s).

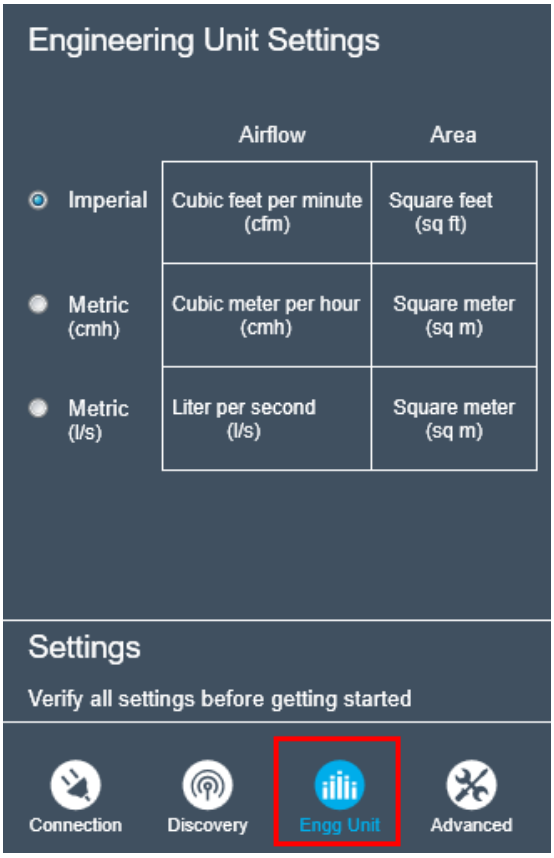


Fig. 38 Engineering units settings

Follow the below steps to discover the controllers using the instance number.

1. Click **Engg Unit**.
2. Select one of the options:
   - **Imperial**
   - **Metric (cmh)**
   - **Metric (l/s)**

Configure Advanced Settings

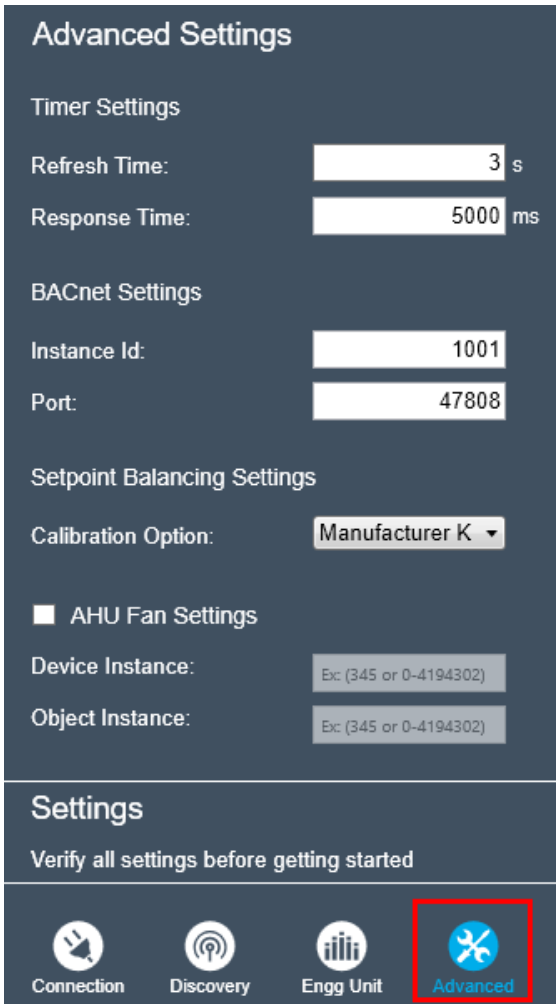


Fig. 39 Advanced settings

Table 4 Advance Setting properties

Property	Description
Timer Settings	
Refresh timer	Allows you to configure the rate (in seconds) at which the tool updates the live data from the controller. The sensed airflow, damper position, controller name and instance id, status, and so on are updated automatically.
Response time	Indicates the time that the tool waits for a response from a controller for each request before time out.
BACnet Settings	

Table 4 Advance Setting properties (Continued)

Instance Id	This is a unique id for the balancing tool. By default, 1001 is assigned as device instance id. Enter a different instance id if the controller with the same instance id is already connected to a BACnet network.
Port	The default port number is 47808 and can be configured. The same port number must be used as provided in the engineering tool while creating the project.
Setpoint Balancing Settings	
Calibration Option	• **Flow Calibration:** Flow Calibration is a calibration constant that is used to compensate for the difference between ideal velocity pressure and what is measured at a site. It is a value that has no unit. The flow calibration factor will typically be in the 0.7 to 1 range. • **Manufacturer K:** You can use the K factor if you have access to the manufacturer's datasheet. Depending on the engineering unit setting, the K factor must be in cfm per inch wg, cmh per 249 pa, or l/s per 249 pa.
AHU Fan Settings NOTE: Select the check box if AHU controller configuration is required.	
Device Instance	AHU controller BACnet device instance.
Device Object Instance	AHU controller BACnet object instance. Users can command this point from the balancing app to manually adjust the fan speed or set it to auto.

Steps To Perform VAV Balancing

This section provides the complete workflow for balancing a IRMNX controller. Before you begin, make sure you have read the Prerequisite Tasks section.

NOTE:

Perform clear operation before performing any balancing operation like setpoint, max-min balancing, or K-factor balancing on IRMNX controllers.

Perform the following steps:

1. Open the **Honeywell Global VAV Balancing Tool**.
2. Choose the desired **BACnet Connection Settings**.
3. Configure **Discovery settings.**
4. Configure **Engg Units**.
5. Configure the **Advanced Settings**.
6. Click **Get Started** to discover the controllers.

NOTE:

Based on the requirement you can group the controllers, refer to Manage Groups on page 16.

7. Select the required controllers to be balanced and verify the balancing parameters.
   - If the values of the application special points (max setpoint, min setpoint, drive time, and damper type) are different, you can copy the balancing values from the application special points by clicking **Update** > **FrmApp**.

   Special Points
   - AV1-Max setpoint
   - AV2-Min setpoint
   - AF1-Drive Time
   - BF1-Damper Type
8. Perform a **Zero calibration** (if required). For more details, refer to Perform a Zero Calibration on page 18.
9. Choose the required balancing method:
   - **Flow Calibration**
   - **Max-Min**
   - **K-factor**

This completes the balancing of the controller. If the max-min setpoint, drive time, and damper type values change, update the modified values to the special points.

10. Click **Update > ToApp**.
11. Click **Resume.** This switches the controller from the balancing mode to the operational mode.

NOTE:

In the Operational mode, the “Damp %” column displays as not available since the application controls the damper position. However, the damper position is available when switched back to the balancing mode.

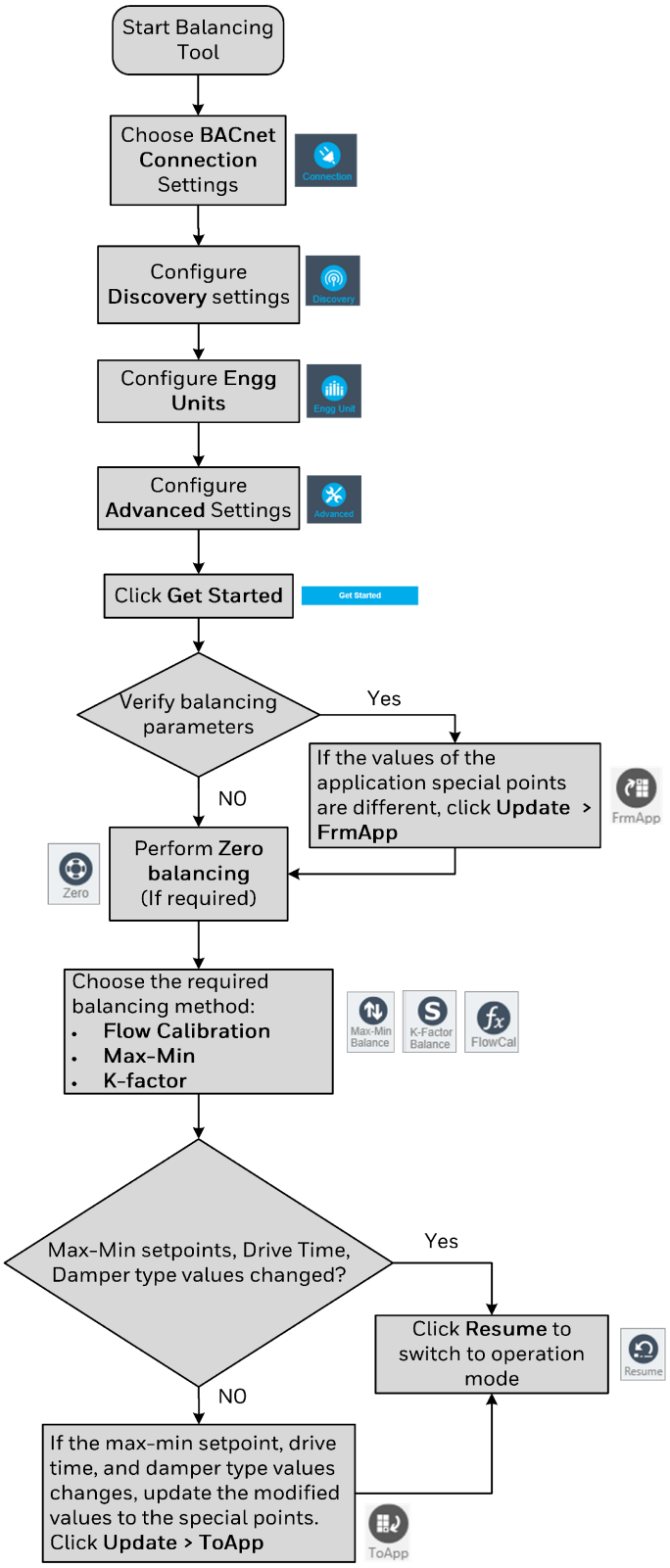


Fig. 40 VAV Balancing workflow

Manage Groups

Based on the project requirements, you can logically group a set of controllers and provide a suitable name. Grouping of controllers can be based on the location where the controllers are installed. Additionally, this concept helps you to discover only the required set of controllers by discovering the associated group.

For example, grouping can be based on a zone level. Consider a site with four floors, each floor consisting of two networks and multiple controllers connected to different VAV boxes. Here, you can create two new groups for each network by adding the appropriate VAV controllers under them.

This concept helps you to discover only the required group which has the selected controllers. You can also export the group and import them on another computer.

You can perform view or modify properties or balance the controllers. The tool allows you to perform the following tasks by using groups.

- Create, modify, and delete groups.
- Import or export the groups.
- Delete controllers from the group.

Table 5 Grouping options

Options	Description
	Create a group. For more details, refer to Create a Group on page 16. Or Add more controllers to an existing group. For more details, refer to Add Controllers to a Group on page 16.
	Import or export groups. For more details, refer to Import a Group on page 17.
	Delete the entire group or only the selected controllers in a group. For more details, refer to Delete a Group on page 17.

Create a Group

Follow the below steps to create a group:

1. Select the required controllers to be grouped.
2. Click the **Groups** options.
3. Click **Create/Modify** options.
   The group's window appears.
4. In the **Create Group** box, enter the name of the group. Make sure this name is unique.

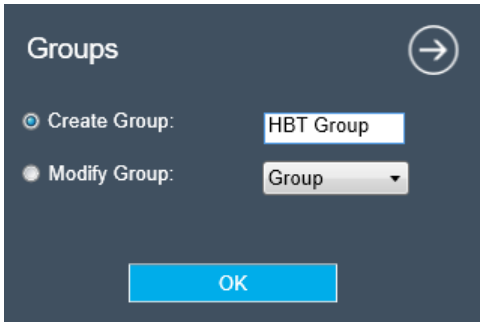


Fig. 41 Creating group

   The group is created.
5. Click **OK**. The controllers are arranged for the selected group.
   To view the controllers, under **Groups**, click the selected group name to see the controllers.
   To view all controllers, click **All**.

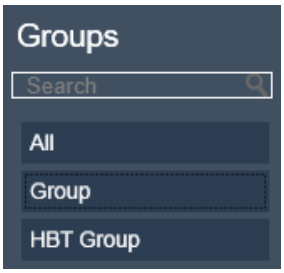


Fig. 42 List of groups

Add Controllers to a Group

Follow the below steps to add the controllers to a group:

1. Select the required controllers to be included.
2. Click the **Groups** option.
3. Click **Create/Modify**.
   The group's window appears.
4. In the **Modify Group** list, click the group you want to use.
5. Click **OK**. The selected controllers are added to the group.

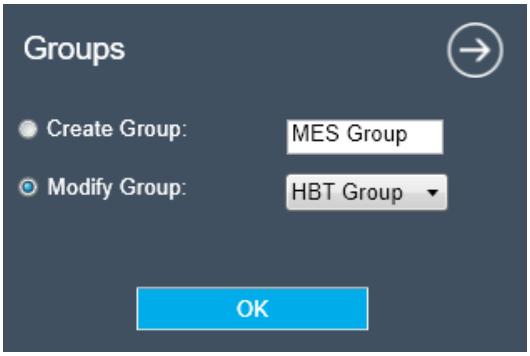


Fig. 43 Modifying group

Export a Group

Follow the below steps to export a group:

1. Click the **Groups** option.
2. Click the **Import/Export** option.
3. Select **Export** and choose a group from the list.
4. Click the browse option to select a location for saving the file.
5. Click **OK.**

   The selected group is exported.

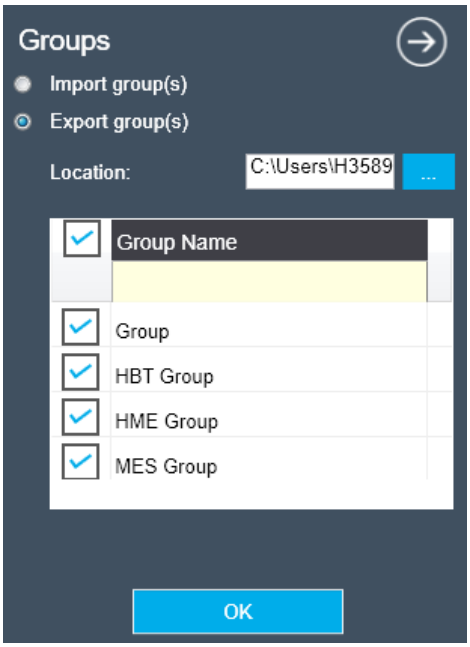


Fig. 44 Exporting groups

Import a Group

Follow the below steps to import a group:

1. Click the **Groups** option.
2. Click the **Import/Export** option.
3. Select **Import** and click the browse option to select a file.

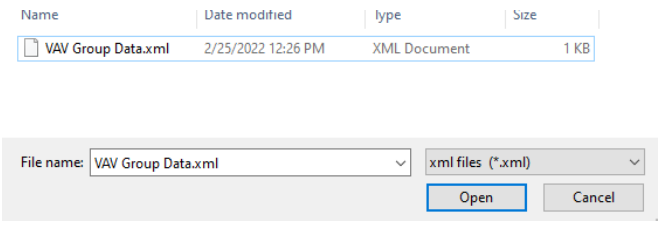


Fig. 45 File location for import

NOTE:
Only xml file type is supported.

4. Click **OK.**

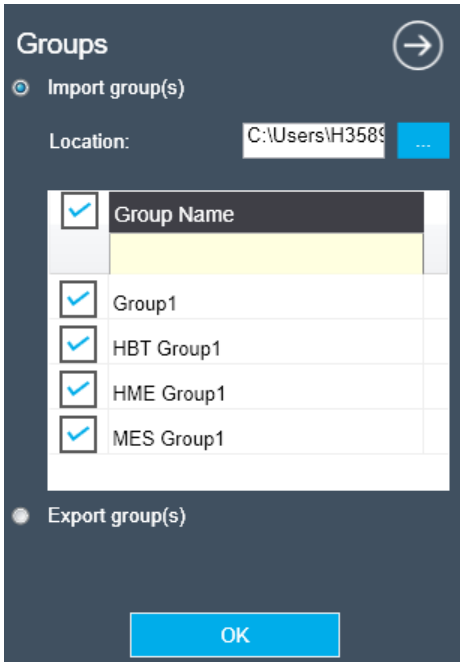


Fig. 46 Importing groups

The selected group is imported. The tool discovers the controllers present in the group and updates the tool with the latest values.

Delete a Group

Follow the below steps to delete a group:

1. Select a group to be deleted and click the **Groups** option.
2. Click the **Delete** option.
3. Select one of the following options:
   - **Delete Loaded Group:** Deletes the group and all the controllers under this group.
   - **Delete Selected Devices (s) from the Group:** Deletes only the selected controllers under the group.
4. Click **OK.**

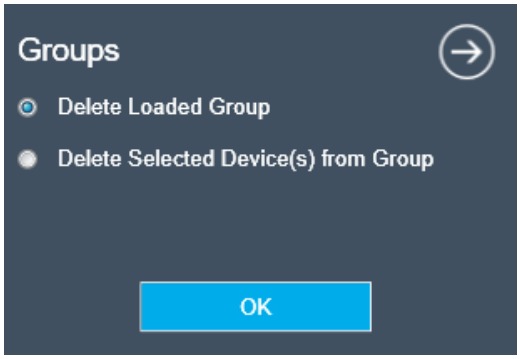


Fig. 47 Deleting group

Perform a Zero Calibration

The zero calibration can be performed on the VAV box either when the damper is completely closed or for the present position of the damper. Typically, this task is performed before performing setpoint or max-min balancing. However, this task is optional.

NOTE:
Add the **Zeroed Status** item from the column organizer, if not previously included.

Follow the below steps to perform zero calibration:

1. Select the check box of the required controller.
   Or
   Select multiple checkboxes to select multiple controllers.

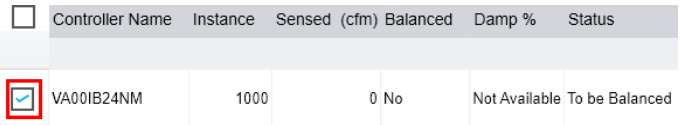


Fig. 48 Check box option

2. Click the **Property** option. The **Edit Properties** dialog box appears. For more details, refer to Function 1: Edit Properties on page 5.

NOTE:
The values of the properties may be empty if multiple controllers are selected. This occurs only when the properties of the selected controllers are different.

3. Click **Apply** to save the modified values to the controller.
4. Click **Zero**.
5. If you select the **Move damper to zero position before calibration** check box, the damper is closed completely, and the airflow is measured at this position.
   Or
   If you clear this check box, the airflow is measured for the present position of the damper.
6. Click **Start.**
7. The **Zeroed** column shows the progress of balancing.

A message appears that indicates the completion of the zero calibration.

Perform an Airflow Setpoint or K Factor Balancing

Under ideal conditions, the VAV box typically measures the flow calibration factor. The flow calibration factor or K factor, on the other hand, must be calculated again at the site under the site installation conditions. This method is used to balance and measure the flow calibration factor or K factor for the VAV box at the site for a fixed airflow value.

Follow the below steps to perform the setpoint balancing:

1. In the Global VAV Balancing tool, click **Advanced**, and set the **Calibration Option** to **Flow Calibration Factor** or **Manufacture K Factor.** For more details, refer to Configure Advanced Settings on page 14
2. Click **Get Started**.
   The controllers are discovered and displayed.
3. Select a controller by clicking the corresponding check box.
   Or
   Select multiple controllers by clicking multiple check-boxes of the required controllers.
4. Click the **Property** option. The Edit Properties dialog box appears. For more details, refer to Function 1: Edit Properties on page 5.

NOTE:
The values of the properties may be empty if multiple controllers are selected. This occurs only when the properties of the selected controllers are different.

5. Click **Apply** to save the modified values to the controller.
6. Click the **Setpoint** or **K-Factor Balancing**.

NOTE:
The calibration option configuration in the advanced setting determines whether the setpoint or K-Factor Balancing option is displayed in the toolbar.

7. In **Perform Balancing**, provide a setpoint value that needs to be achieved by the VAV box. You can specify the airflow as a percentage of the maximum airflow setpoint or as an airflow value to be achieved.

NOTE:
The maximum airflow setpoint value is configured in the edit properties window.

8. In **With Error Tolerance**, provide the error tolerance value, else the tool considers the default value. You can either set the tolerance in the percentage of target airflow or the airflow value. For example, if the setpoint is 500 cfm and the error tolerance is 10 cfm, the tool considers the airflow in a stabilized state when it senses airflow between 490 - 510 cfm. If the

error tolerance is set to 5 %, the tool considers the airflow in the stabilized state when it senses airflow between 475 - 525 cfm.

9. Click **Start.**

   The setpoint balancing is initiated simultaneously on the selected controllers. The controller switches to the balancing mode, and the damper position is initialized.

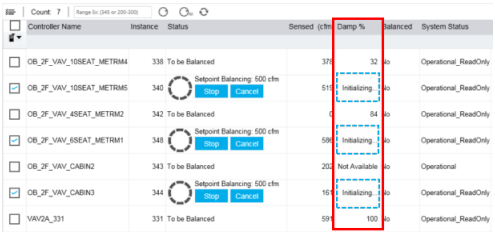


Fig. 49 Airflow setpoint balancing

The following message appears in the Damp % column based on the damper type:

- Damper Type: Analog - **Initializing**
- Damper Type: Floating - **Synchronizing**

The damper opens or closes until the current sensed airflow is within the configured airflow setpoint range. The tool displays the progress of balancing in the **Status** column. Add this item from the column organizer if not present.

After sensing the target airflow setpoint, the tool displays the **SetPoint Balancing or K factor balancing -Airflow Stabilized** message.

10. Measure the actual airflow by using a hood or a standard calibrated instrument.

IMPORTANT:

- If the Manufacturer K factor calibration option is selected, the controller will calculate the K Factor Offset. This is a read-only value.
- If the selected calibration option is Flow calibration factor then the controller will calculate a new flow calibration factor. This value is read-only.

11. In the **Measured Airflow** box, type the measured airflow value and click **Apply**.

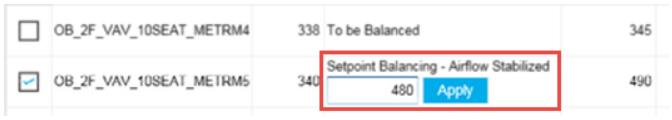


Fig. 50 Measured airflow box

12. This action calculates the factor value and applies the value to the VAV box.

Fig. 51 Calculate the factor value

Verify Setpoint Balance

After performing the setpoint balancing, the new flow calibration factor value is applied to the VAV box. You can perform the move damper operation to verify if the VAV box is calibrated correctly.

To verify setpoint balancing:

1. Click the **Move Damper** option.
2. Select one of the following methods to move the damper. For more details, refer to Function 5: Move Damper on page 6.

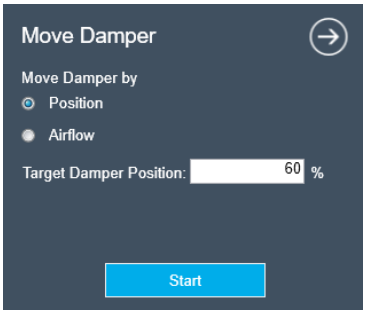


Fig. 52 Move damper options

3. Observe the **Sensed Airflow** value after the damper moves to the required position.
4. Measure the actual airflow by using a hood or a standard calibrated instrument.
5. Check if the sensed airflow value matches the measured airflow value. Repeat the setpoint balancing until the accurate value is achieved.

Flow Calibration On Multiple Controllers

After performing the setpoint balancing for a VAV box, the calculated flow calibration factor of that VAV box can be manually applied to other VAV boxes connected at the site. This is possible only if the VAV boxes have similarities with each other in terms of the duct area, maximum airflow capacity, damper type, and room size. You can select the controllers associated with these VAV boxes and apply the flow calibration factor.

NOTE:

This option is applicable only if the selected Calibration option is Flow Calibration Factor.

Follow the below steps to apply flow calibration factor to multiple controllers:

1. Select the required controllers which are associated with the VAV boxes of similar properties.
2. Click the **Flow Calibration Factor** option.
3. In the **Calculated Flow Calibration Factor** box, type the flow calibration factor of the calibrated VAV box.
4. Click **Set.** The **Status** column indicates that the controller is setpoint balanced.

Perform Max-Min Balance

This method is used to balance the VAV boxes for two different airflow setpoint values.

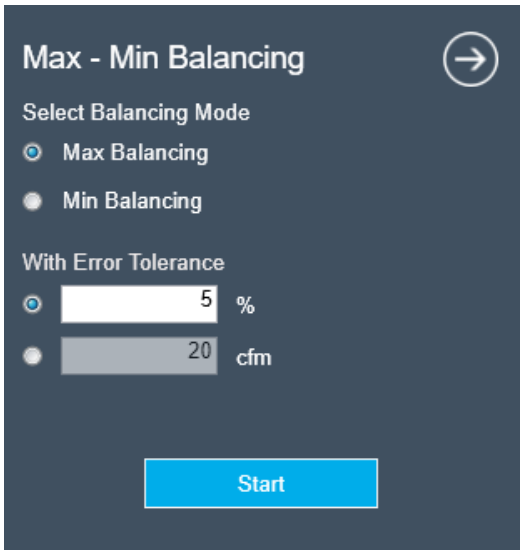


Fig. 53 Max-Min balancing

NOTE:
It is recommended to perform max balancing first, followed by min balancing.

Perform Max Balance

Follow the below steps to perform the max balancing:

1. Select a controller by clicking the corresponding check box.
   or
   Select multiple controllers by clicking multiple check-boxes of the required controllers.
2. Click the **Property** option. The **Edit Properties** dialog box appears. For more details, refer to Function 1: Edit Properties on page 5.

NOTE:
The values or status of the properties may be empty if multiple controllers are selected. This occurs only when the properties of the selected controllers are different.

3. Click **Apply** to save the modified values to the controller.
4. Click **Max-Min Balance** and select the **Max Balancing** option.
5. In **With Error Tolerance**, provide the error tolerance value, else the tool considers the default value. You can either set the tolerance in the form of a percentage of target airflow or the airflow value. For example, if the **Max Airflow** is set to 500 cfm and the error tolerance is set to 10 cfm, the tool considers the airflow in stabilized state when it senses airflow between 490 - 510 cfm.
6. Click **Start** to initiate the max balancing.
   The max balancing is initiated simultaneously on the selected controllers. The controller switches to the balancing mode, and the damper position is initialized.

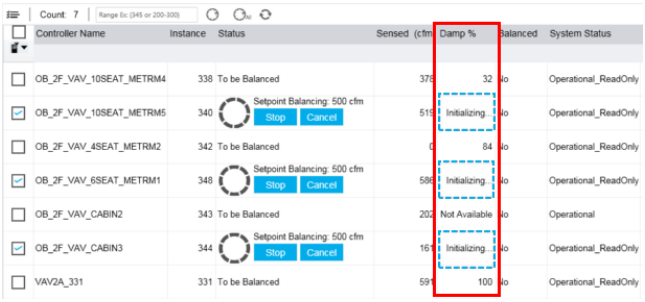


Fig. 54 Max-Min balancing

The following message appears in the Damp % column based on the damper type:

- Damper Type: Analog - **Initializing**
- Damper Type: Floating - **Synchronizing**

The damper opens or closes until the current sensed airflow is within the configured airflow setpoint range. The tool displays the progress of balancing in the **Status** column. Add this item from the column organizer if not present.

After sensing the target airflow, the tool displays the **Max Balancing-Airflow Stabilized** message.

7. Measure the actual airflow by using a hood or a standard calibrated instrument.

IMPORTANT:
- If the Manufacturer K factor calibration option is selected, the controller will calculate the K Factor Offset. This is a read-only value.
- If the selected calibration option is Flow calibration factor then the controller will calculate a new flow calibration factor. This value is read-only.

8. In the **Measured Airflow** box, type the measured airflow value and click **Apply**.
   This completes the Max balancing.

Perform Min Balance

Follow the below steps to perform the min balancing:

1. Select a controller by clicking the corresponding check box.
   or
   Select multiple controllers by clicking multiple check-boxes of the required controllers.
2. Click the **Property** option. The **Edit Properties** dialog box appears. For more details, refer to Function 1: Edit Properties on page 5.
3. Click **Apply** to save the modified values to the controller.

4. Click **Max-Min Balance** and select the **Min Balancing** option.
5. In **With Error Tolerance**, provide the error tolerance value, else the tool considers the default value. You can either set the tolerance in the form of a percentage of target airflow or the airflow value. For example, if the **Min Airflow** is set to 200 cfm and the error tolerance is set to 10 cfm, the tool considers the airflow in a stabilized state when it senses airflow between 190 - 210 cfm.
6. Click **Start** to initiate the Min balancing.

   The Min balancing is initiated simultaneously on the selected controllers.

   The damper moves in a direction to achieve the specified airflow. The tool displays the progress of balancing in the **Balanced Status** column. Add this item from the column organizer if not present.

   After sensing the target airflow, the tool displays the **Min Balancing-Airflow Stabilized** message.
7. Measure the actual airflow by using a hood or a standard calibrated instrument.
8. In the **Measured Airflow** box, type the measured airflow value and click **Apply**.
9. The **Status** column displays a message as Max-Min Balanced. This completes the Max-Min balancing.

Verify Max-Min Balance

After performing the Max-Min balancing, you can perform the move damper operation to verify if the VAV box is calibrated correctly.

1. Click the **Move Damper** option.
2. Select one of the following methods to move the damper. For more details, refer to Function 5: Move Damper on page 6.
3. After the damper moves to the required position, observe the **Sensed Airflow** value.
4. Measure the actual airflow by using a hood or a standard calibrated instrument.
5. Check if the sensed airflow value matches the measured airflow value. Repeat the Max-Min balancing until the accurate value is achieved.

Move Damper

You can move the damper either to its position or airflow. This feature is helpful while performing the manual balancing.

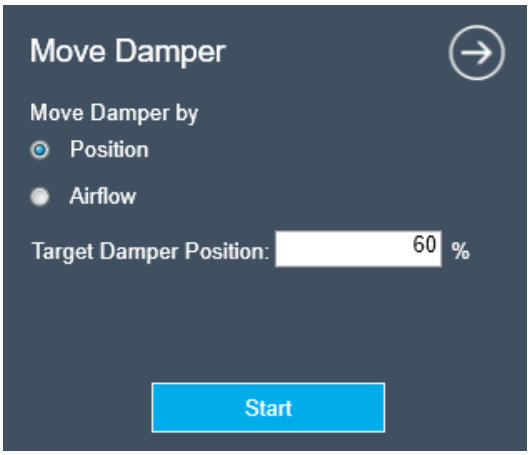


Fig. 55 Move damper options

To move the damper:

1. Select a controller by clicking the corresponding check box.

   Or

   Select multiple controllers by clicking multiple check-boxes of the required controllers.
2. Click the **Property** option. The **Edit Properties** dialog box appears. For more details, refer to Function 1: Edit Properties on page 5.

> **NOTE:**
> The values of the properties may be empty if multiple controllers are selected. This occurs only when the properties of the selected controllers are different.

3. Click **Apply** to save the modified values to the controller.
4. Click **Move Damper**.
5. Select one of the following methods to move the damper. For more details, refer to Function 5: Move Damper on page 6.
6. Click **Start.**

   The Status column shows the progress.

   The present position of the damper is displayed in the **Damper %** column.

   The **Sensed (cfm)** column displays the sensed aiflow.

Heat Valve Override

Based on the VAV controller's application type, the reheat and peripheral heat valve override options are shown or hidden. This feature will be typically used to do water balancing.

Reheat Override

To override Reheat coil:

1. On the toolbar, navigate to the **Heat**, and select the **Reheat**.
2. In **Mode,** select **Auto** to set the reheat coil to automatic or select Override to manually set the Override Value (0-100 %). The effective position is read-only. If effective position BACnet point is not available in the application, then this value will be blank.
3. Click **Apply**.

The selected value will be applied to the VAV controller.

Peripheral Heat Override

To override peripheral heat coil:

1. On the toolbar, navigate to the **Heat**, and select the **Peripheral**.
2. In **Mode**, select **Auto** to set the reheat coil to automatic or select override to manually set the override value (0 -100 %). If effective position BACnet point is not available in the application, then this value will be blank
3. Click **Apply**.

The selected value will be applied to the VAV controller.

Fan Speed Override

The fan speed option is shown or hidden based on the VAV controller's application type.

VAV Fan Speed Override

To override VAV Fan:

1. On the toolbar, navigate to the **Fan Speed**, and select the **VAV Fan Speed**.
2. In **Mode**, select **Auto** to set the reheat coil to automatic or select override to manually set the override value (0 -100 %). For staged fan or single speed fan, users can command to the appropriate value to turn on/off the fan stages.
3. Click **Apply.**

The selected value will be applied to the VAV controller.

AHU Fan Speed Override

The AHU fan speed can be adjusted from the balancing tool if the application in the AHU controller provides the ability to override the fan speed via a BACnet point. The user must know the device instance and object instance of the point.

> **NOTE:**
> The override BACnet point in the AHU controller must always be an analog value point.

To override AHU fan:

You must enter the details of the AHU controller to adjust the AHU fan speed setting via the VAV tool. Navigate to the advanced settings, under AHU fan settings, enter the device instance and object instance.

1. On the toolbar, navigate to the **Fan Speed**, and select the **AHU Fan Speed**.
2. In **Mode**, select **Auto** to set the reheat coil to automatic or select override to manually set the override value (0-100 %).
3. Click **Apply**.

The selected value will be applied to the AHU controller.

Generate Report

The tool provides a simple and easy way of generating reports of the controllers. You can either generate reports of all the controllers that are discovered or a set of controllers which are categorized based on the status as provided in the dashboard view (balanced, not balanced, zeroed, etc.). You can use the filter option to filter the controllers. This helps you to keep a record of the data and view it at any point in time.

To generate reports:

1. Click **Report**.
2. Select either **Custom Columns** or **Visible Columns** option.

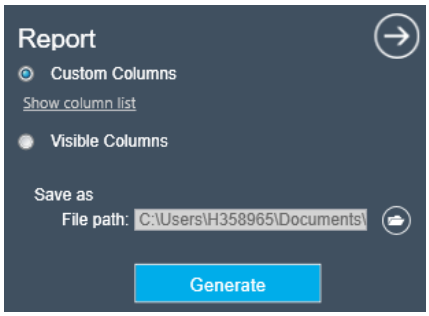


Fig. 56 Generating balancing report

- **Custom Columns:** You can customize the report template by adding balancing parameters as per the requirement. Use the **Show column list** option to customize the report.
  Choose one of the following options to create a template that includes the properties that you want in the report.

Fig. 57 Customize the balancing report

- **Select All:** Includes all parameters from the column list.
- **Unselect All:** Excludes all parameters from the column list.
- **Select visible columns:** Includes only those columns that are displayed in the discovery pane. However, you can add more properties from the column organizer view.

NOTE:

In the column, the parameters are displayed in the alphabetical order. You can rearrange the parameter by dragging them to the required position. The rearrangement of the parameter is automatically saved in the application. The generated report will show the parameters as per the updated order.

- **Visible Columns:** Includes only those columns that are displayed in the discovery pane.

3. Click the browse option.
   The **Export VAV Report** dialog box appears.
4. Select a location where you want the file to be saved.
5. In the **File name** box, type a unique name for the file and click **Save**.
6. Click **Generate**.

A progress bar appears, which indicates the percentage of completion.

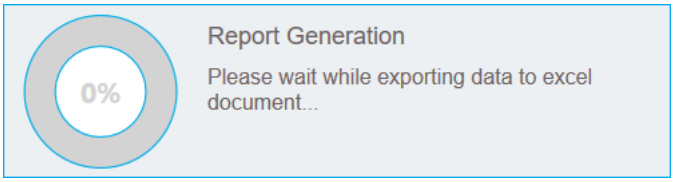


Fig. 58 Report generation status

RELATED TECHNICAL LITERATURE

Table 6 Related Technical Literature

Title	Reference
Merlin NX IP VAV Product Datasheet	EN0Z-1073GE51
Merlin NX MSTP VAV Product Datasheet	EN0Z-1072GE51
Merlin NX IP and MSTP VAV Installation Instructions	EN1Z-1076GE51
MERLIN NX IP and MSTP VAV Mounting Instructions	EN1Z-1074GE51
Honeywell Connect Mobile VAV Balancing User Guide	EN2Z-1086IE67

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