Honeywell

Environmental & Energy Solutions

# BACnet FF Configuration Wizard Guide

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# INTRODUCTION

The BACnet FF (TB3026B) is a fixed function communicating thermostat with the 19 fixed application and built-in temperature and humidity sensor. The TB3026B-W is the wireless version with an onboard wireless receiver for wireless occupancy control.

It supports the following equipment types:

1. AHU
2. Air Source Heat Pump
3. Water Source Heat Pump
4. Two Pipe Fan Coil Unit
5. Four Pipe Fan Coil Unit

Each equipment type has other various configurable settings, which provide multiple options and flexibility to the user. Configuration of the BACnet FF controllers involves selection of the appropriate settings from available options as per the application requirement.

It can be configured using the 'BACnet FF Configuration Wizard'. This configuration wizard is developed under WEBStation-AX™ software tool which uses the Niagara$^{AX}$ Framework® software. It utilizes BACnet® network communication technology (MS/TP).

# WEBStation-AX™

The WEBStation-AX™, powered by the Niagara AX Framework® is a flexible network server for all connected WEBs-AX controllers.

WEBStation-AX™ creates a powerful network environment with comprehensive database management, alarm management and messaging services.

WEBStation-AX™ hosts an application called 'BACnet FF Configuration Wizard', which provides an engineering environment for configuration of TB3026B and TB3026B-W controllers.

## Features

- Provisioning of multi-controller systems (tools for updating and installation of software modules).
- Central database storage for attached controllers.
- Archive destination/repository for log and alarm data.
- Central server of graphics and aggregated data (single point of access to the system – one IP address).
- Platform for optional enterprise applications.

WEBStation-AX™ acts as a network server or a 'Supervisor' for all connected WEBs-AX™ Controllers. It creates a network environment for the management of these controllers, alarms and messaging services.

# BACnet FF Configuration Wizard

It is a special application developed in the WEBStation-AX to configure the TB3026B and TB3026B-W controllers. All configurable network variables of theTB3026B and TB3026B-W controllers are accessible through this application for configuration.

BACnet FF Configuration Wizard provides a means to select settings for all equipment types, control strategy and parameters as per the application requirement.

The following operations can be performed using this wizard:

1. Add a BACnet FF controller on the BACnet network.
2. Configure and set the parameters as per the application requirements.
3. Download and upload the configuration into the selected BACnet FF controller (Online Operation).
4. Set the time and date.

# BACnet FF Configuration Requirement

BACnet FF controller can be configured using any of the following methods:

## 1. With WEBStation-AX Software Tool

In the WEBStation-AX™ software tool, the BACnet FF Configuration Wizard application is integrated for TB3026B and TB3026B-W controllers' configuration.

- **Configuration through PC**

BACnet FF controllers can be accessed with a personnel computer with WEBStation-AX™ software tool installed. Via BACnet converter, which connects a PC, BACnet FF controller can be accessed for configuring, uploading, downloading operations.

- **Configuration through WEBs Controller**

If the BACnet FF controller is on the BACnet network of WEBs controller, it can be accessed through WEBs controller using a PC with WEBStation-AX™ tool installed.

When WEBs controller is already commissioned, then it can be accessed through an IP address via Browser. All required operations on the BACnet FF controller can be performed by accessing WEBs controller.

## 2. Through BACnet FF touch screen

Configurable network parameters are also accessible through the BACnet FF touch screen. Access to the configurable parameters is password protected with a default password of 0000. For details refer to, 'BACnet Fixed Function System Engineering Guide, 31-00098.'

# Organization of the Manual

This manual is divided into two basic parts: Introduction and Configuration.

The Introduction provides information for the BACnet FF configurable controllers, WEBStation-AX™ Software tool, " BACnet FF Configuration Wizard", control application, and abbreviations.

Configuration provides information for the engineering about configurable TB3026B and TB3026B-W controllers' different application types through " BACnet FF Configuration Wizard" using its various settings options.

# CONFIGURATION OF BACNET FF CONTROLLERS

## Installation

Before proceeding to the " BACnet FF Configuration Wizard", WEBStation-AX™ should be installed as it hosts the configuration wizard.

### Installation of WEBStation-AX™ Tool

WEBStation-AX™ software is distributed via the web or a DVD, and has the following minimum hardware requirements:

**Processor:** Intel Pentium® IV, 2 GHz or higher

**Operating System:**

32-bit: Windows 7 and Windows 8.1

64-bit: Windows 7 and Windows 8.1

**Browser:** Microsoft IE versions 7, 8, 9, and Mozilla Firefox version 8, 10, 12

**Memory:** 1 GB minimum, 2 GB or more recommended for large systems, 8 GB or more recommended for the windows 64-bit version

**Hard Drive:** 1 GB minimum, 5 GB for applications that need more archiving capacity

**Display:** Video card and monitor capable of displaying 1024 x 768 pixel resolution or greater

**Network Support:** Ethernet adapter (10/100 Mb with RJ-45 connector)

**Modem:** 56 KB minimum, full time high speed ISP connection1111 recommended for remote site access (i.e. T1, ADSL, cable modem).

These requirements can vary for the different versions of WEBStation-AX™ as support for newer operating systems is added. For the latest product data, visit http://customer.honeywell.com

After selecting the setup for installation, proceed by clicking 'Next' to accept the license agreement.

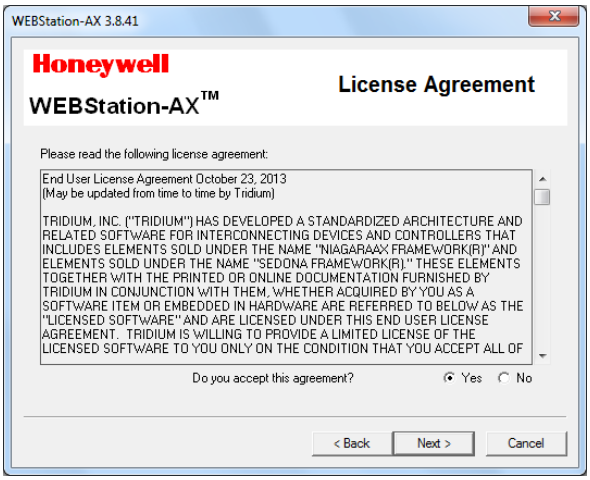



**Figure 1: Installing WEBStation-AX™**

Select the installation location, (It will create a path in 'C' drive under 'Honeywell' folder by default)

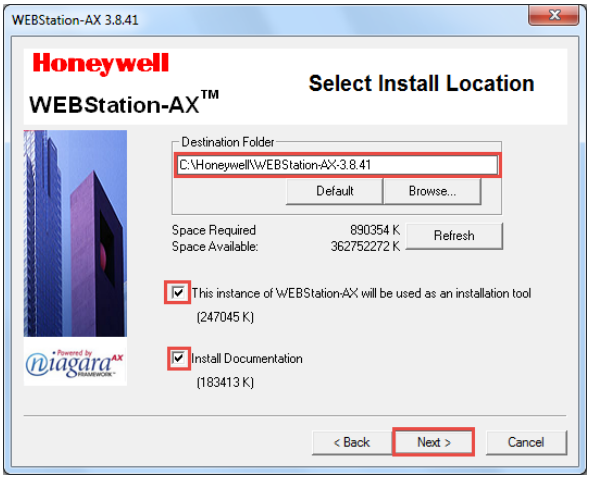



**Figure 2: Installing WEBStation-AX™ (selecting installation location)**

Click 'Next' button to proceed after selecting appropriate options. Wait until the installation gets finished.

| | |
|---|---|
| | ***Note:*** |
| *It is recommended to secure the WEBStation-AX system in order to make it resistant to the attacks.*<br>Refer to ***"AX Hardening Security Guide"*** *(Document no.* ***31-00014-01)*** *to make a WEBs-AX system secure.* | |

# Getting Started

BACnet FF Configuration Wizard is a user interface where a user can set and adjust various types of parameters.

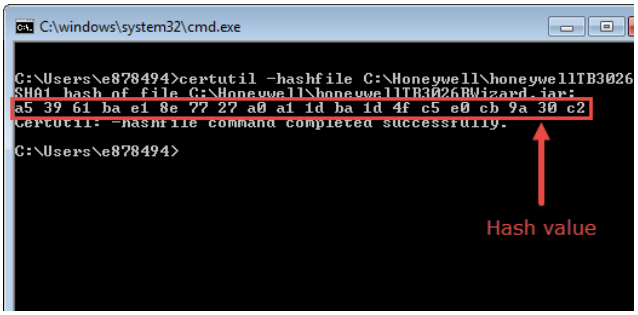
***Important***

***Hash Value:*** *Honeywell publishes the SHA1 algorithm based Hash Value with the TB3026B Configuration Wizard module. It is available on the TB3026B Configuration Wizard's download page.*

*The Hash Value generated at the user's end should match the Hash Value published with the TB3026B Configuration Wizard module. It is recommended to perform this check in order to ensure the authenticity of the TB3026B Configuration Wizard module.*

*In order to generate the Hash Value, go to Command > Type "**certutil -hashfile (location of the saved .jar file in the PC)"** and hit enter.*

*For example; "**certutil -hashfile C:\Honeywell\honeywellTB3026BWizard.jar"**. When this command is executed, a Hash value gets generated as shown below;*




*A user should ensure that the generated hash value should always match the hash value published with the released TB3026B Configuration Wizard module. If the module is tampered by any means, the hash value will change and won't match with the published hash value.*

*For more reference on generating certutil, refer to https://technet.microsoft.com/en-us/library/cc732443.aspx#BKMK_hashfile*

To start working with the configuration wizard, go to 'Start' menu, select 'All Programs', navigate to 'WEBStation-AX 3.8.41' folder and click on it. Click 'Install Platform Daemon' as shown in Figure 3.

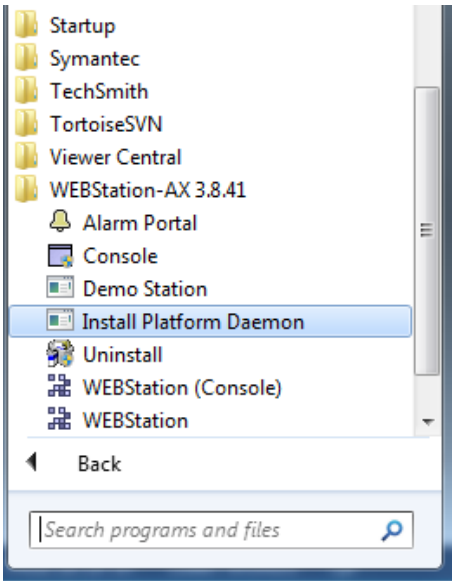



**Figure 3: Installing Platform Daemon**

***Note:***

- *If more than one version of WEBStation-AX is installed on the same PC, It is mandatory to install Platform Daemon when switching from one version of WEBStation-AX to other.*
  *It is not required to install Platform Daemon if the same version of WEBStation-AX needs to open consecutively.*
- *If only single version of WEBStation-AX is installed, then it may not be required to install Platform Daemon every time while opening WEBStation-AX.*

After installing Platform Daemon completely, go to 'Start' menu again and select 'All Programs, navigate to 'WEBStation-AX 3.8.41' folder and click on it. Click 'WEBStation.' It will open 'WEBStation-AX' window. Refer to Figure 4.

***Note:***

*'WEBStation-AX' can also be open by clicking an icon named 'WEBStation' on the desktop*

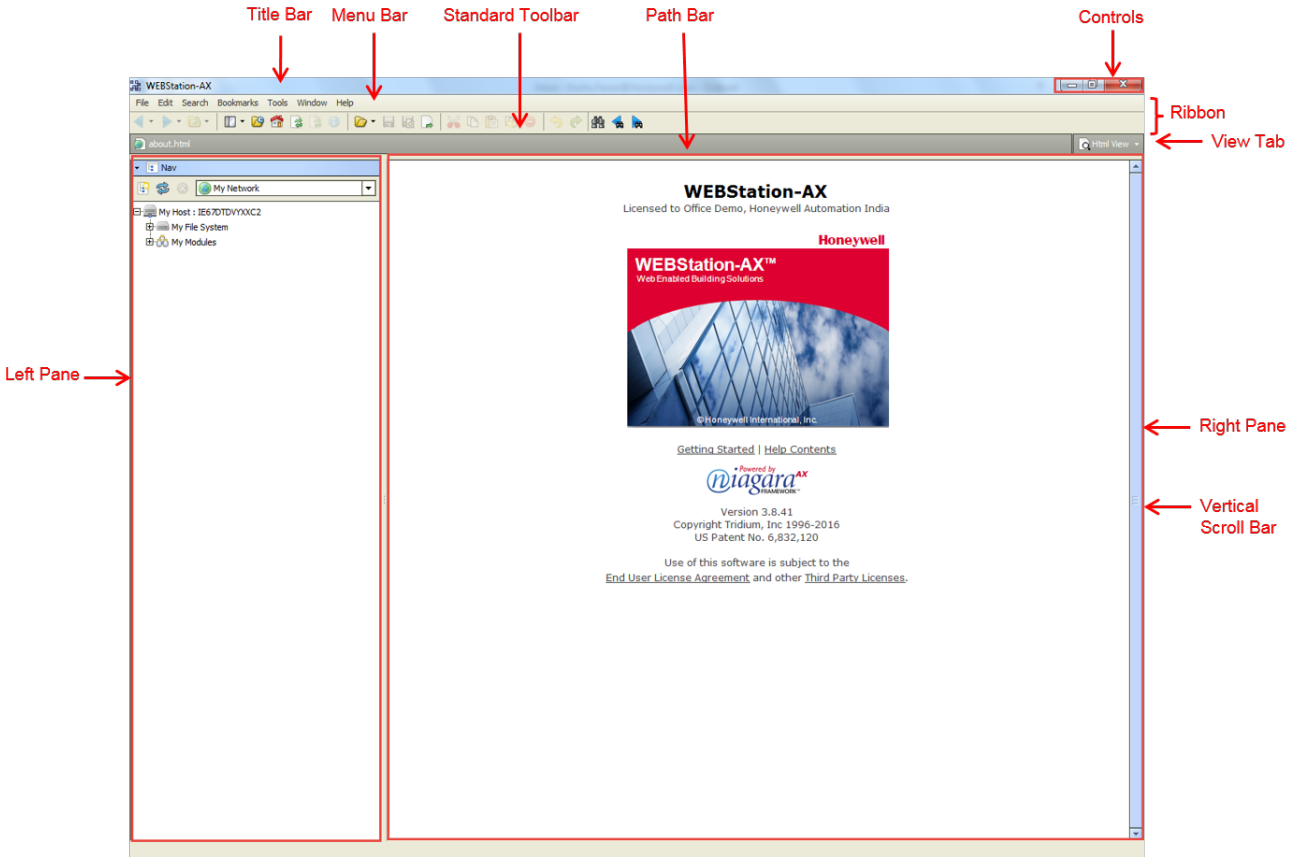



**Figure 4: WEBStation-AX™ – Getting Started**

The field description for Figure 4is as follows:

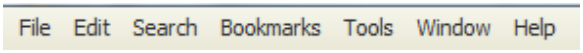
### 1. Title Bar:

Top of the WEBStation interface is the Title bar. It displays the title of the screen.

### 2. Controls

An application can be minimized, maximized and closed with these controls.

### 3. Menu Bar




It displays heading for drop-down menus.

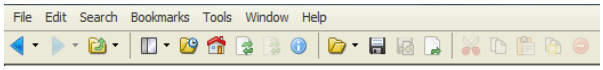
According to function, commands are group in to the menu tabs. These are File, Edit, Search, Bookmarks, Tools, Window, and Help.

I. **File:** A user can open, close and save the file, directory, query, new tab, new window using File tab.
II. **Edit:** Cut, copy, paste, duplicate delete options are available.
III. **Search:** A file can be searched and navigate from one file to other file.
IV. **Bookmarks:** A user can add or manage bookmarks.
V. **Tools:** A user can maintain certificates, license, migration and credential details.
VI. **Window:** A user can add/ hide Side Bar, Console window, check Active Plug-in.
VII. **Help:** A user can get assist by clicking F1 or help tab.

### 4. Standard Tool Bar

Various functions can be accessed using this tool bar. It provides a quick shortcut to frequently used functions.

### 5. Ribbon

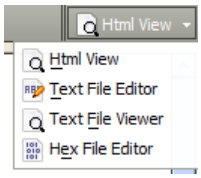



It includes menu bar and standard toolbar.

### 6. Path Bar

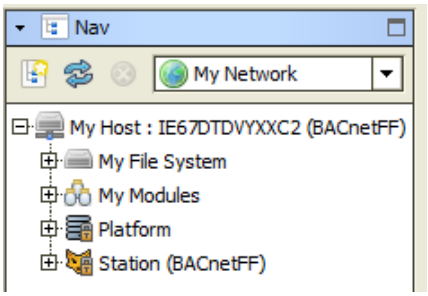
A path of a particular function can be tracked using this.

### 7. View Tab



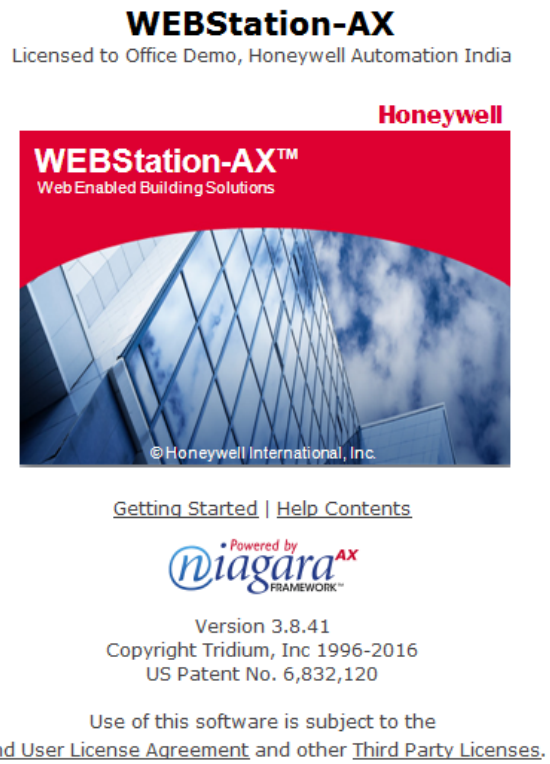

It is used to switch between various views, such as, Html View, Text File Editor, Text File Viewer, and Hex File Editor.

### 8. Left pane




Nav tree details can be viewed over here.

### 9. Right Pane




Details about Version, License and Certificate are found over here.

# BACnet FF Configuration Wizard Initial Setup

The BACnet FF Configuration Wizard's user interface window is obtained by following these steps:

1. Connecting to platform
2. Adding new station
3. Starting/Running new station
4. Adding a BACnet network
5. Adding BACnet FF device to the BACnet network

## Connecting to Platform

To perform various operations, it is necessary to connect to the Platform initially.

To connect Platform, follow the process:

Navigate to 'My Host: …' in the Left pane, by right clicking on it, select 'Open Platform'. Refer to Figure 5.

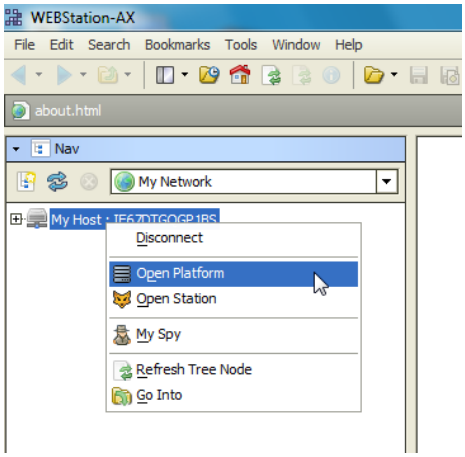



**Figure 5: Open Platform**

A window will pop up to connect to the Host's secure platform daemon. Click 'OK' to proceed.

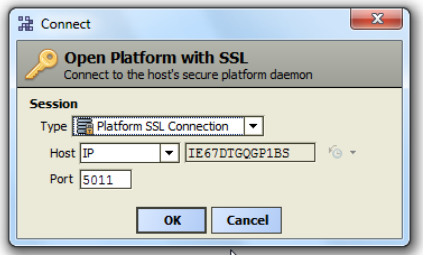



**Figure 6: Connect Platform**

An Identity Verification window may pop up during the first time configuration. Click 'Accept' to verify. (Refer to Figure 8)

Enter Username and Password and click 'OK'

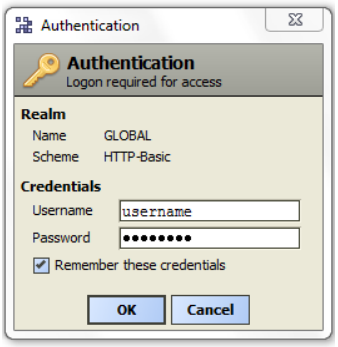



**Figure 7: Authentication during connecting Platform**

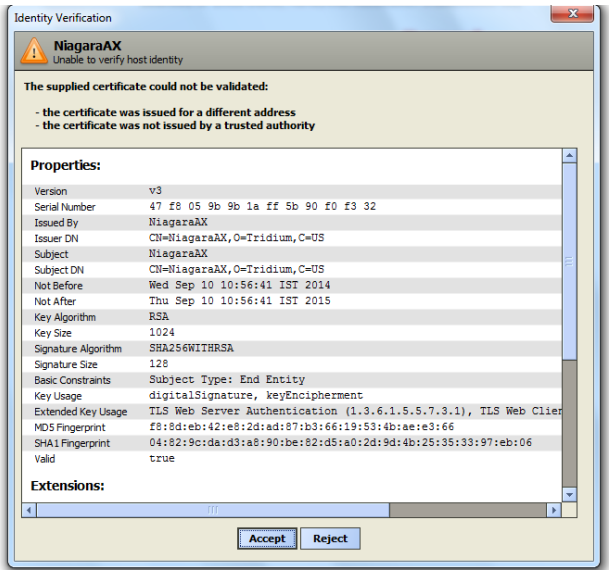



**Figure 8: Identity Verification during Connecting to Platform**

## Adding New Station

The next stage is to add a new station under platform. Different controllers can be added to the respective network assigned to the station.

To add a new station:

- Navigate to the Platform by clicking ⊞ sign of Host in the left pane.
- Click 'Tools' tab on menu bar.
- Navigate to 'New station' and click on it.

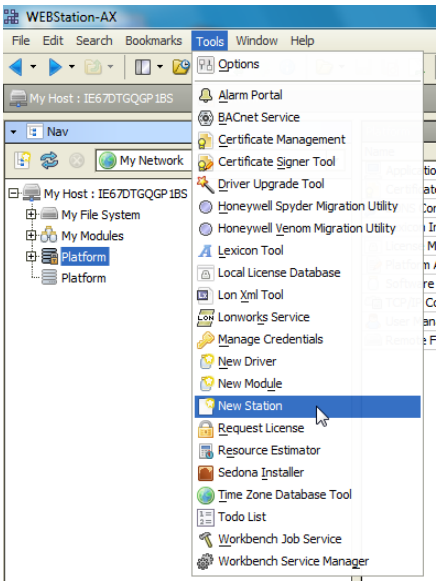



**Figure 9: Adding New Station**

- After clicking ‘New Station’, it opens ‘New Station Wizard, window. (Refer to Figure 10)
- Enter name in Station Name field. For example, ‘BACnetFF’ is added here. Station Directory displays a path by default.
- Click ‘Next’

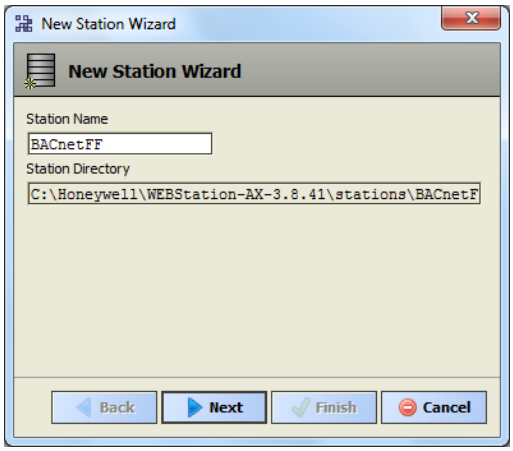



**Figure 10: New Station Wizard Window**

- Enter a password in the ‘Admin Password’ field. Enter the same password in ‘Confirm Admin Password’ field.

| | |
|---|---|
| | ***Important:*** |
| ***Password must contain:***<br>– at least 10 character(s)<br>– at least 1 digit(s)<br>– at least 1 lower case character(s)<br>– at least 1 upper case character(s) | |

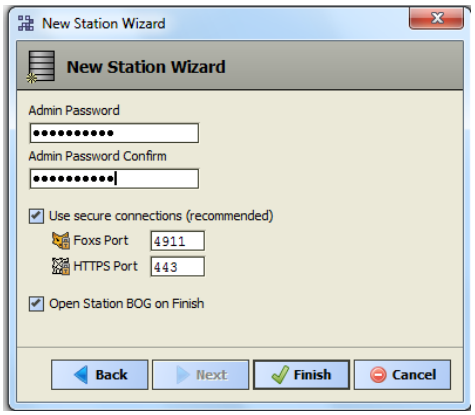



**Figure 11: Entering Admin Password for New Station**

- Click ‘Finish’ to complete action.

It creates a station at ‘My Host > My File System> Sys Home > Stations > (created station)’. Refer to Figure 12.

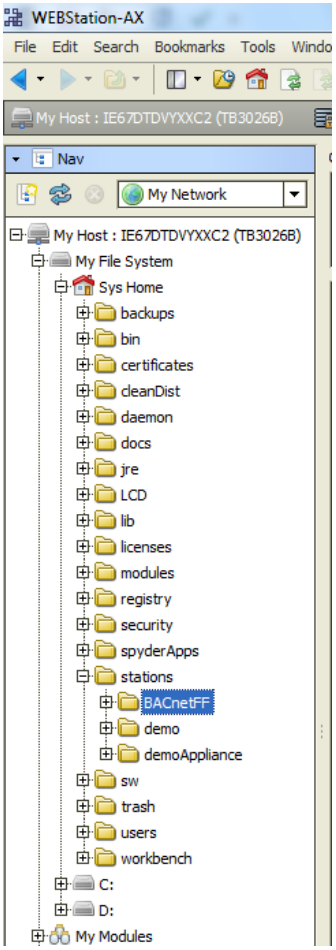



**Figure 12: Location of New Station (BACnetFF)**

## Starting New Station

To start configuration of controller, it is necessary to start the station. The following is the process to start a newly added station:

Double click on ‘Platform’, it opens a screen as shown in Figure 13.

Double click on ‘Application Director’ at the right pane. (Refer to Figure 13).

Select the newly created station (‘BACnetFF’ in this case) by just clicking on it. Status for this station will be Idle at this stage.

Click ‘Start’ button as shown in Figure 14. After clicking ‘Start’, the ‘Status’ of this station will change to ‘Starting’ as shown in Figure 15.

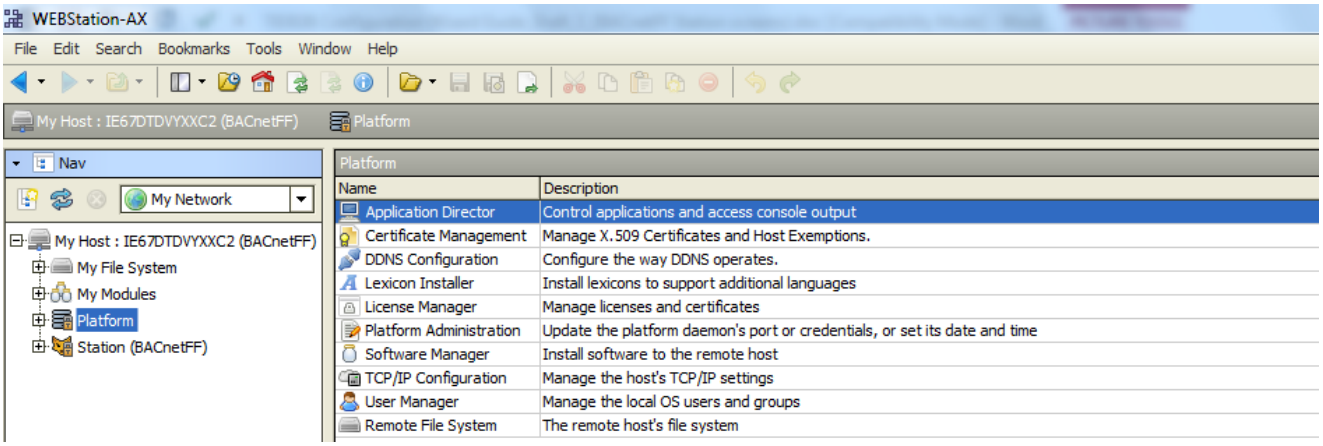



**Figure 13: Application Director**

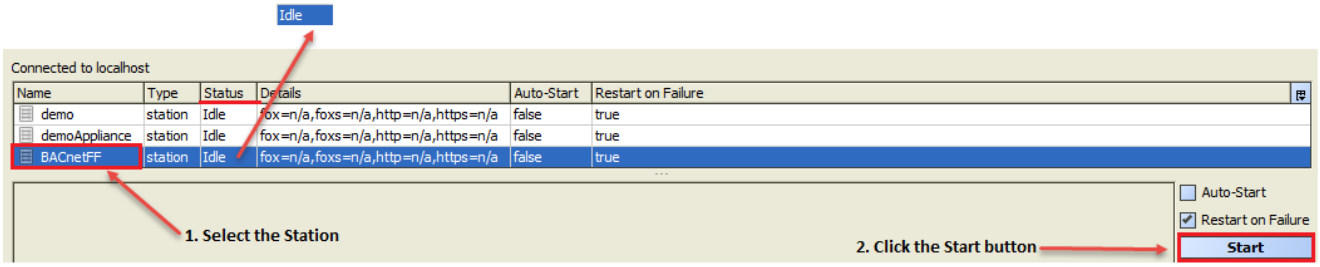



**Figure 14: Selecting the Station to Start**

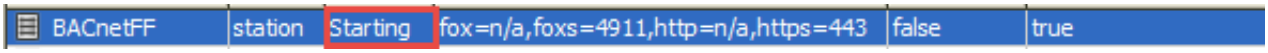



**Figure 15: Starting the Station**

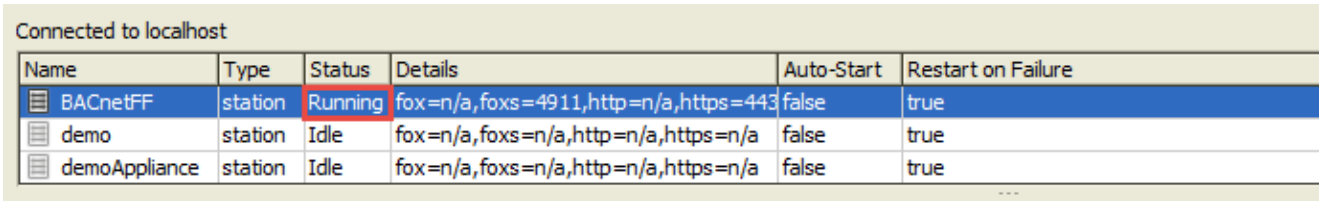



**Figure 16: Started Station**

Once the station is started, its status will change to ‘Running’ (Refer to Figure 16).

Double click on the started station, a ‘verification window will pop up as shown in Figure 8. Click ‘Accept’ to proceed.

It opens an authentication window. Enter username and password. Click ‘OK’ to proceed.

| | |
|---|---|
| | ***Note:*** |
| *Check ‘Remember these credentials’ box to remember the username and passwords so that it will not be required to enter it every time during opening the station.* | |

Check newly added station as shown in Figure 17.

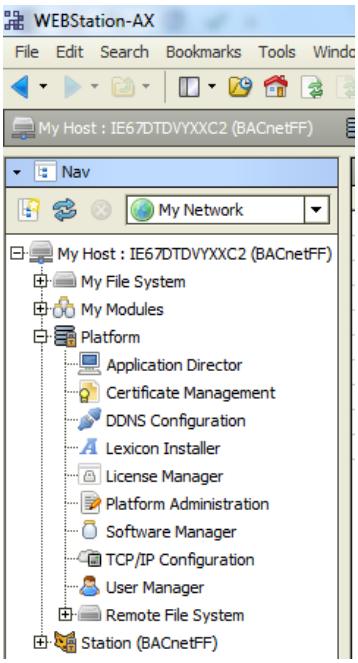



**Figure 17: Newly added Station**

## Adding BACnet Network to Niagara Network

BACnet FF controller works with BACnet network.

To add a BACnet network (Refer to Figure 18):

- Navigate to Drivers and double click on it.
- Click on ‘New’ tab

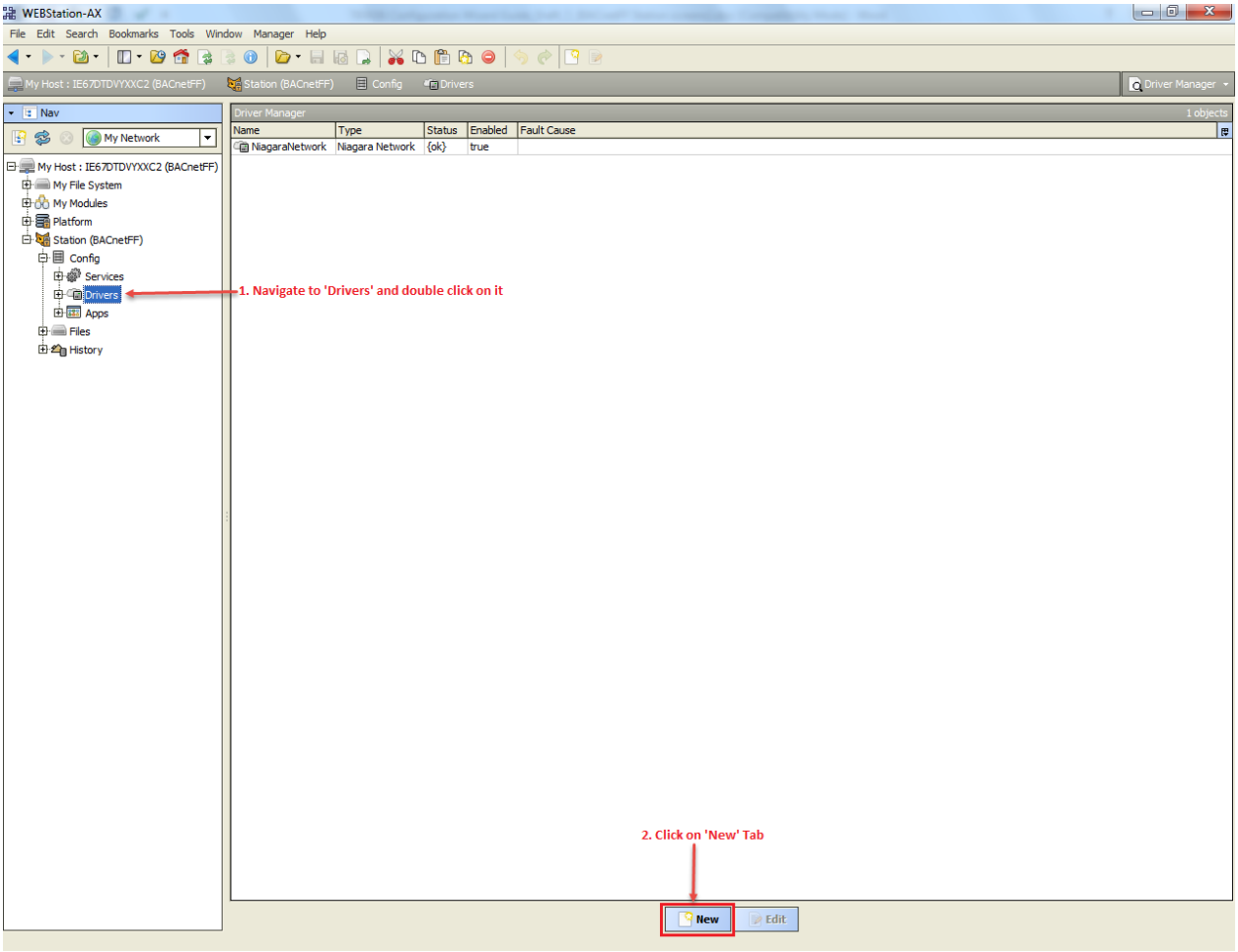



**Figure 18: Adding BACnet Network**

- A window will pop out as shown in Figure 19, asking ‘Type to Add’.
- Select ‘Bacnet Network’ from the drop down list.

Required number of networks can be added in ‘Number to Add’ field. (In this guide since only one network is shown, Number is added as ‘1’ )

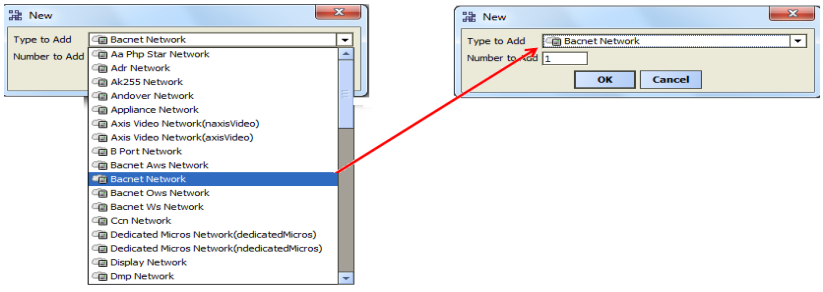



**Figure 19: Selecting BACnet Network to add**

- Click ‘OK’ to proceed.
- Next, a new window will appear, showing ‘Name’, ‘Type’ and ‘Enabled’(keep its value to ‘True’). Refer to Figure 20.
- Click ‘OK’.

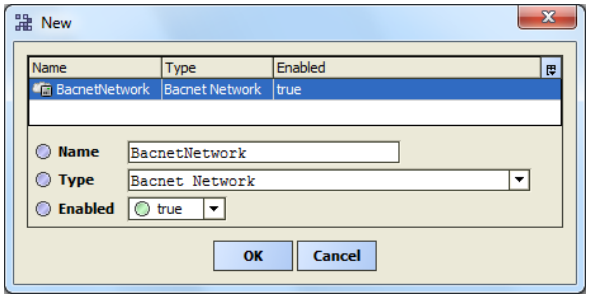



**Figure 20: Adding Specification to add BACnet Network**

- A newly added ‘BacnetNetwork’ can be seen under ‘Device manager’ on the right pane highlighted in Amber color as shown in Figure 21

(An amber colored background highlight appears, as BacnetNetwork is offline. Background will turn white when it is online.)

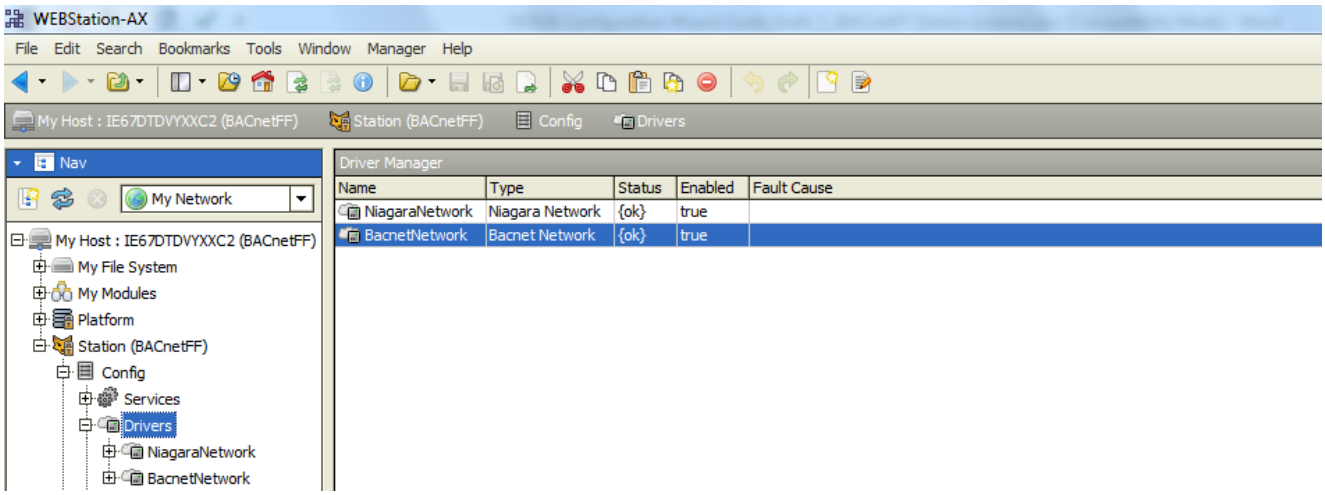



**Figure 21: Newly added BACnet Network**

## Adding BACnet FF Controller to the BACnet Network

- After adding a Bacnet Network to the Drivers, the next step is to add a BACnet FF controller to the Bacnet Network.
- Click on the 'Window' option in Menu bar; navigate to 'Palette' through sub menu of 'Side Bars'. (Refer to Figure 22).

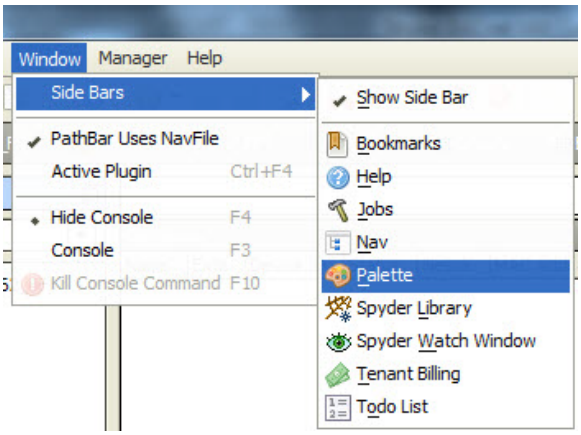



**Figure 22: Adding Palette**

- This will add a 'Palette' tab in the left pane. (Refer to Figure 23). Click 'Open Palette' option.

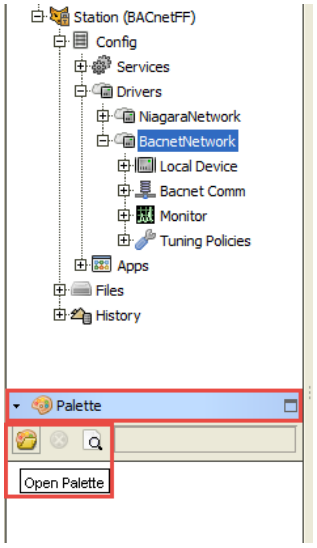



**Figure 23: Opening Palette**

- An 'Open Palette' window will open. Find a module named 'honeywellTB3026BWizard' as shown in Figure 24, Select it and click 'OK' button to add into the Palette.

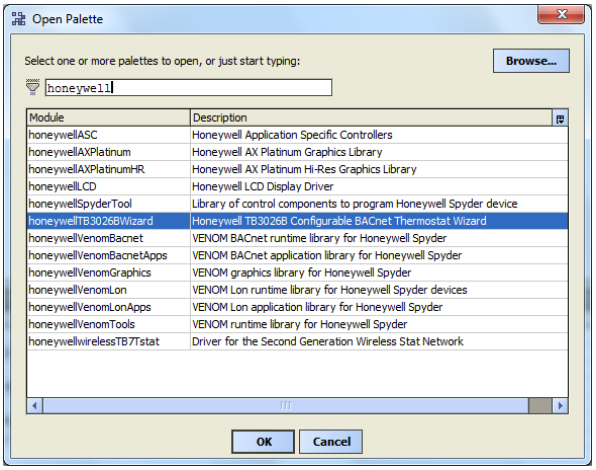



**Figure 24: Adding 'honeywellTB3026BWizard' to BACnet Network**

- After adding 'honeywellTB3026BWizard', it reflects in the 'Palette' tab as 'BACnetFF' as seen in Figure 25.

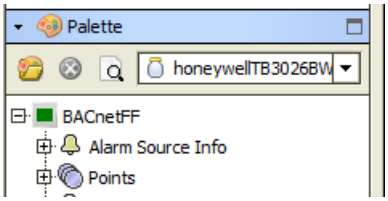



**Figure 25: BACnetFF in Palette TAB**

- Drag 'BACnetFF' and Drop it on 'BacnetNetwork' added under created station. Refer to Figure 26.

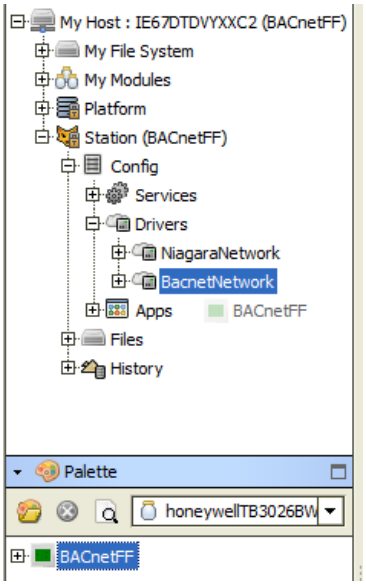



**Figure 26: Drag and drop BACnetFF on BacnetNetwork**

A window will pop up as 'BACnetFF' is dropped on BacnetNetwork to name the controller. Enter the name accordingly. In this guide, it is named as 'BACnetFF' as shown in Figure 27.

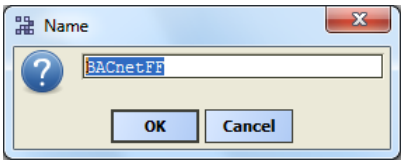



**Figure 27: Naming Controller**

A newly added BACnet FF controller can be seen by clicking ⊞ sign as shown in Figure 28.

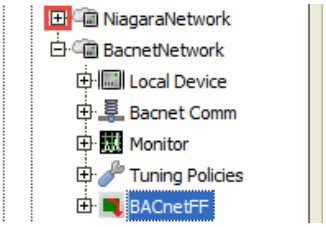



**Figure 28: Location of Controller**

## BACnet FF Configuration Wizard

To start working with the BACnet FF wizard, navigate to Bacnet Network (Refer to Figure 28). Double click on added controller. It will open the BACnet FF Configuration Wizard window.

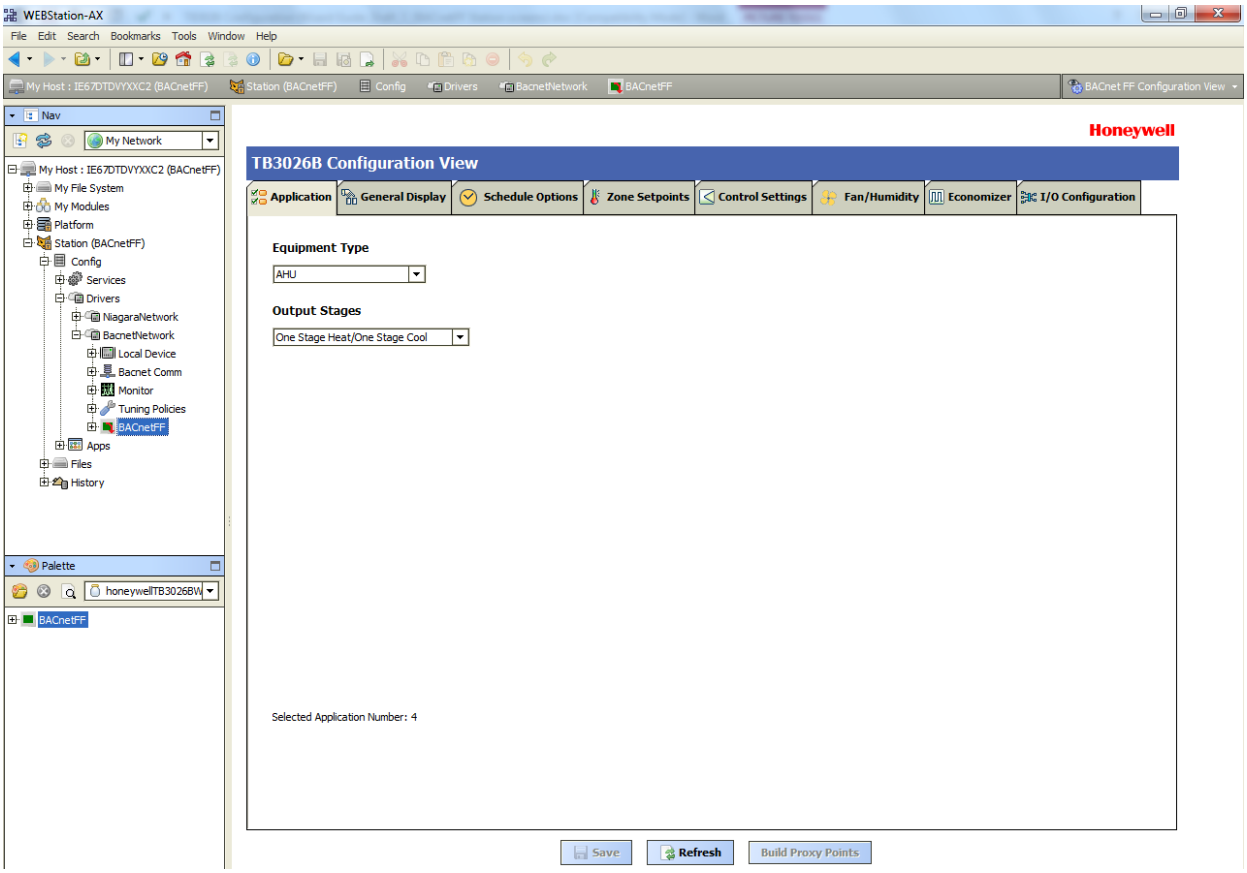


**Figure 29: Opening BACnet FF Configuration Wizard Screen**

# Field Description for BACnet FF Configuration Wizard

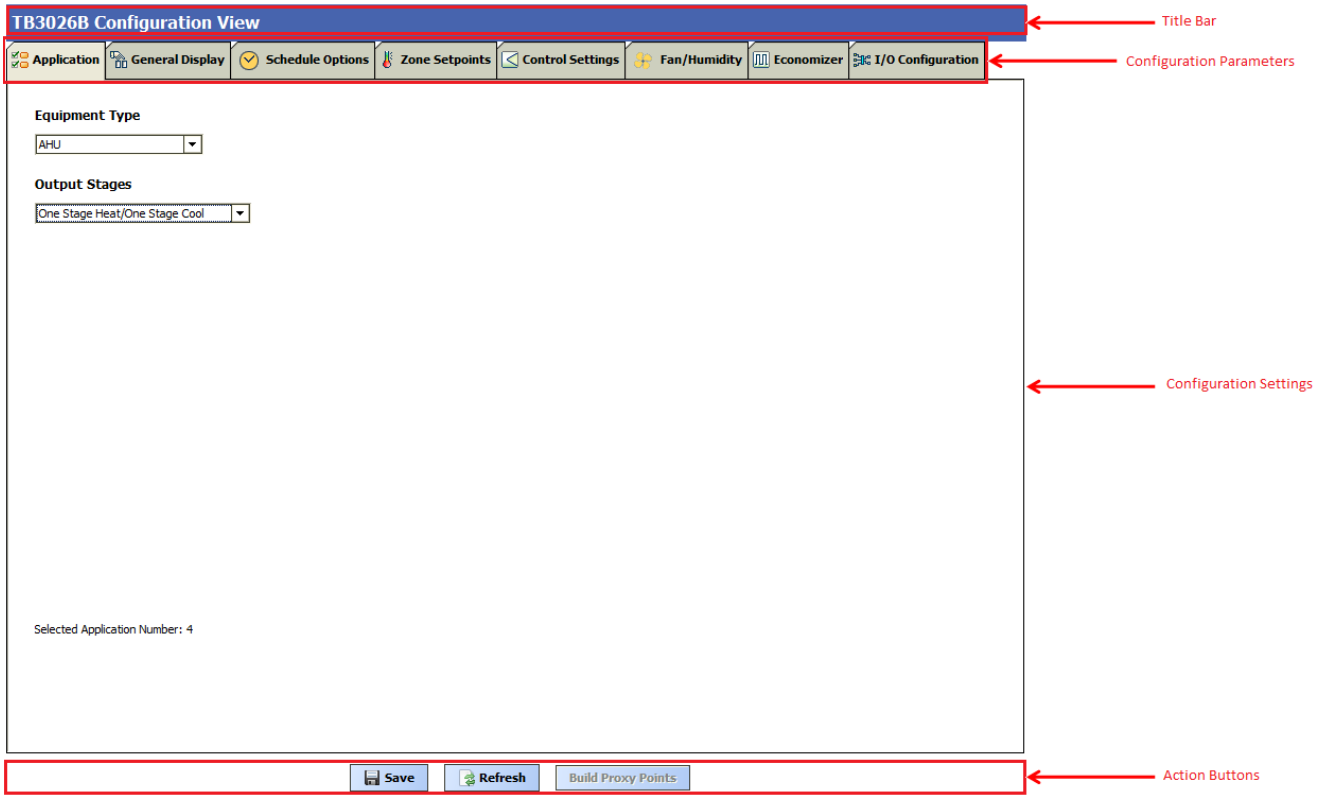



**Figure 30: Field description for BACnet FF Configuration Wizard Screen**

1. **Title Bar**
   It displays the name 'TB3026B Configuration View'.

2. **Configuration Parameters**
   It displays the list of setting buttons for various groups of configuration parameters.

3. **Configuration Settings**
   It displays Configuration settings as per the selected group of parameters.

4. **Action Buttons**
   It displays following buttons:

   Save It is used to save the configuration settings.

   Refresh It is used to reset actions to its default value.

   Build Proxy Points It is used to generate proxy points under BACnet FF controller's "points" folder for the selected configuration.

# APPLICATIONS

Application is the first tab of the Configuration Wizard. The Application screen allows a user to select the required Equipment Type.

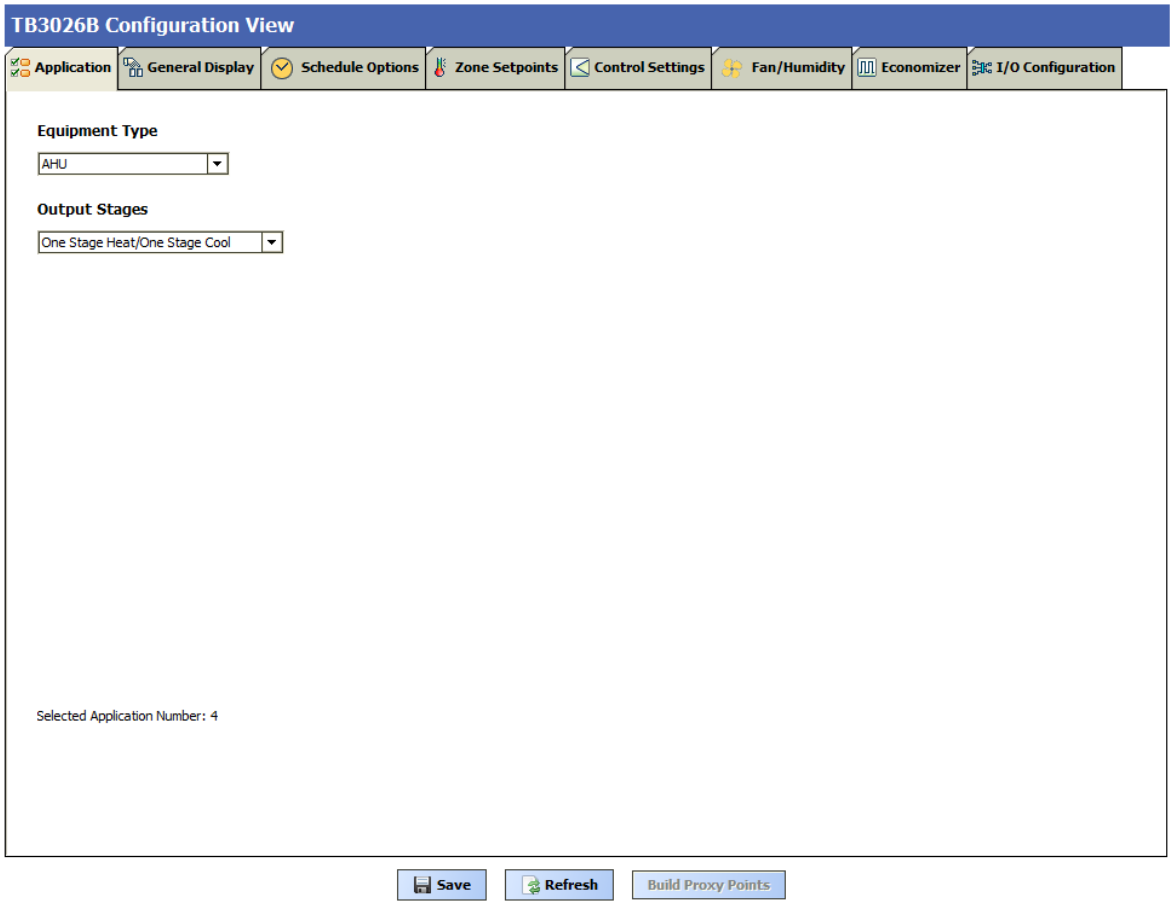



**Figure 31: Application Screen**

## Equipment Type

A user can select the required equipment type through this option. This is a fundamental setting in a configuration as selection of various other parameters from the different settings depend on the Equipment Type.

A required Equipment Type can be selected from the following:

1. AHU
2. Air Source Heat Pump
3. Water Source Heat Pump
4. Two Pipe Fan Coil Unit
5. Four Pipe Fan Coil Unit

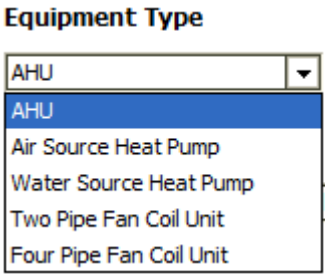



**Figure 32: Equipment Type**

# AHU

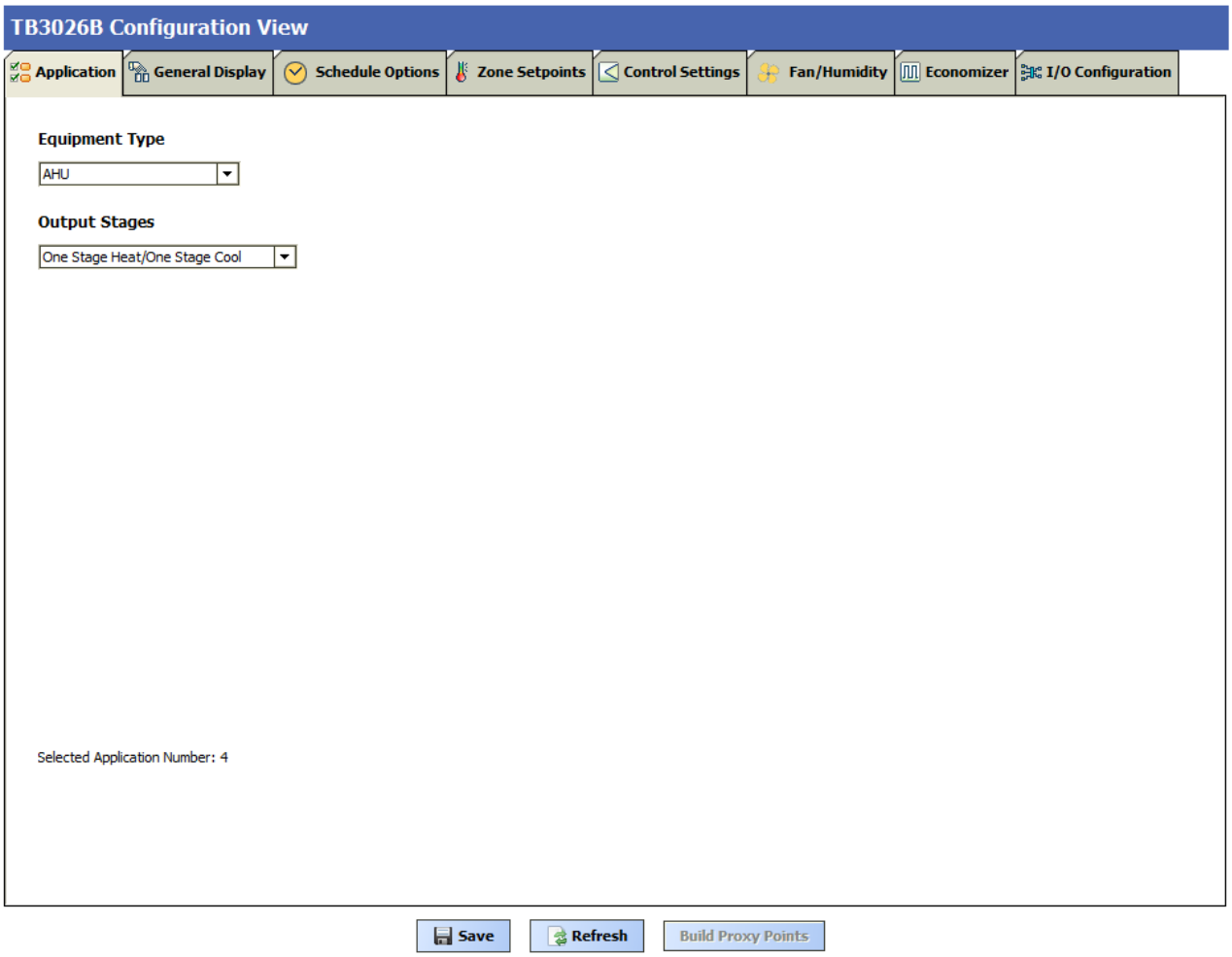
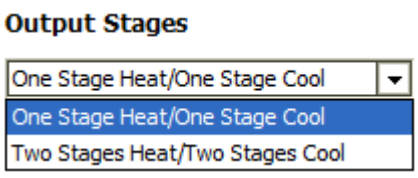



**Figure 33: AHU window**

## Output Stages

Equipment Type 'AHU' consists of two types of 'Output Stages'

1. One Stage Heat/One Stage Cool
2. Two Stage Heat/Two Stage Cool




**One Stage Heat/One Stage Cool:** Select this option if One stage of cooling and one stage of Heating is required in the application.

**Two Stage Heat/Two Stage Cool:** Select this option if Two stages of cooling and two stages of Heating are required in the application.

## General Display

Click 'General Display' to view the general display settings. The following parameters are used to configure the controller's display settings.

1. Engineering Units
2. Time Functions
3. Display
4. Contractor Access Codes

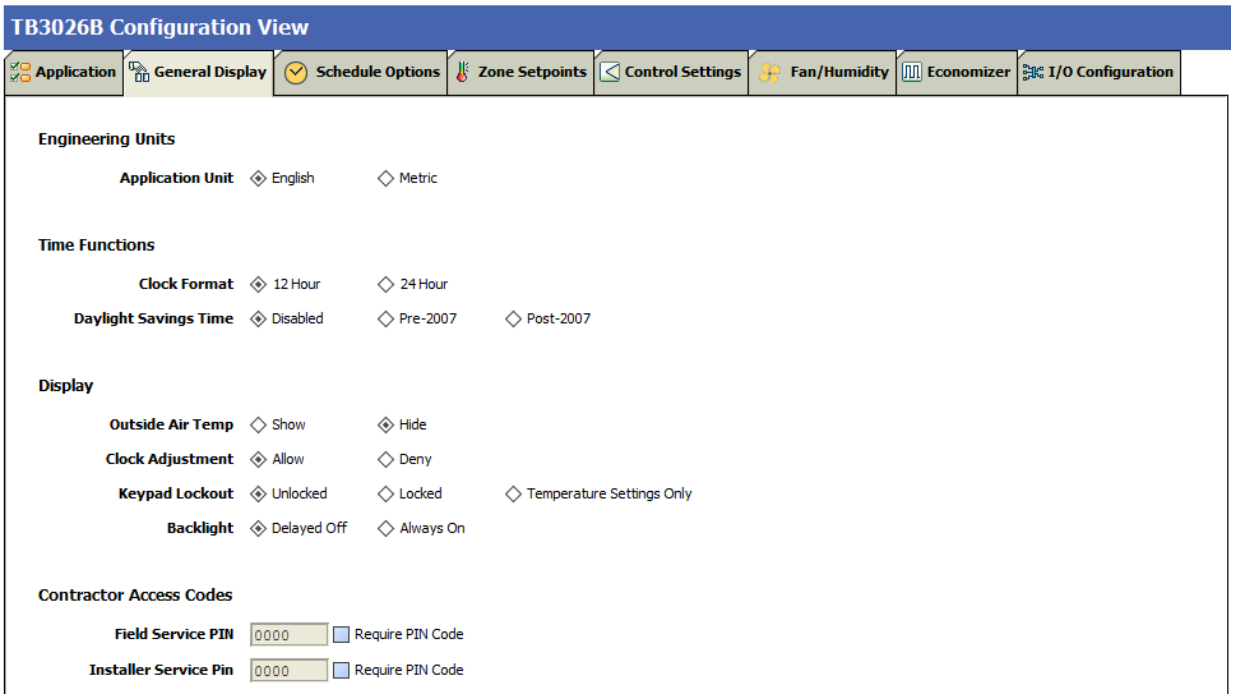
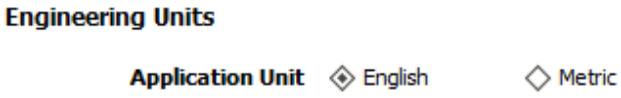


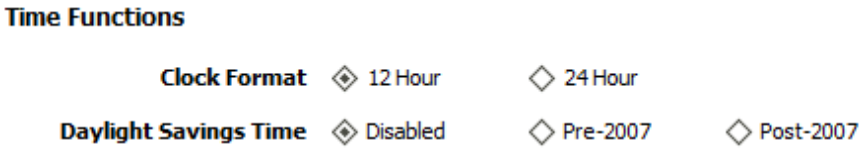

**Figure 34: General Display Screen (AHU)**

### Engineering Units




**Application Unit:** The application units contain two options to change the controller's units. By default, the controller's application units are set to 'English'. Application Units can be changed to 'English' or 'Metric'.

## Time Function

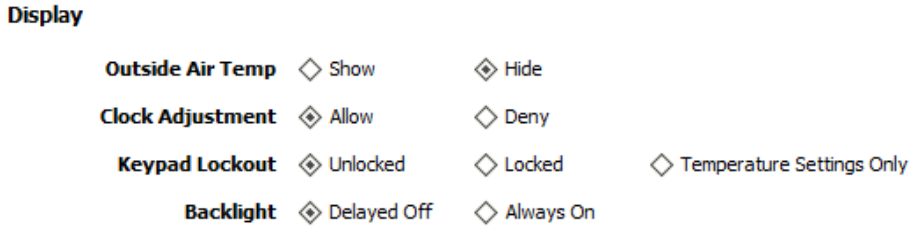



**Clock Format:** A user can select a clock format as 12-hour format or 24-hour format.

**Daylight Savings Time:** This feature enables to select the Daylight Savings Time settings. By default, Daylight Savings Time is set to 'Disabled'. Daylight Savings Time can be changed to 'Pre-2007' or 'Post-2007'.

## Display

This feature allows a user to select the Display settings.




**Outside Air Temp:** A user has an option to hide/show an outside air temperature.

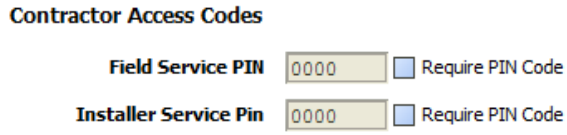
**Clock Adjustment:** This option allows a user to enable/disable the clock adjustment on the controller display.

**Keypad Lockout:** This option allows a user to lock/unlock the clock adjustment.

When an option, 'Temperature Settings Only' is selected, a user can only set the temperature through keypad.

**Backlight:** A user can keep the backlight always on or set to delayed off through this option.

## Contractor Access Codes

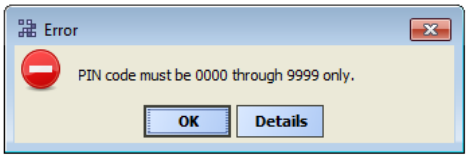



An access to the controller can be restricted with the help of Access Codes.

Field Service Pin and Installer Service Pin can be set. These codes should be enabled to restrict an access to the controller.

***Note:***

*A user can set only numerical PIN code for 'Field Service Pin' and 'Installer Service Pin'. PIN codes should be set within 0000 – 9999. The following Error Window pops up if this field is left blank after selecting.*



## Schedule Options

'Schedule' tab displays Schedule options.
The following parameters are used to configure the schedule options (i.e. Occupancy Configuration and Bypass and Standby).

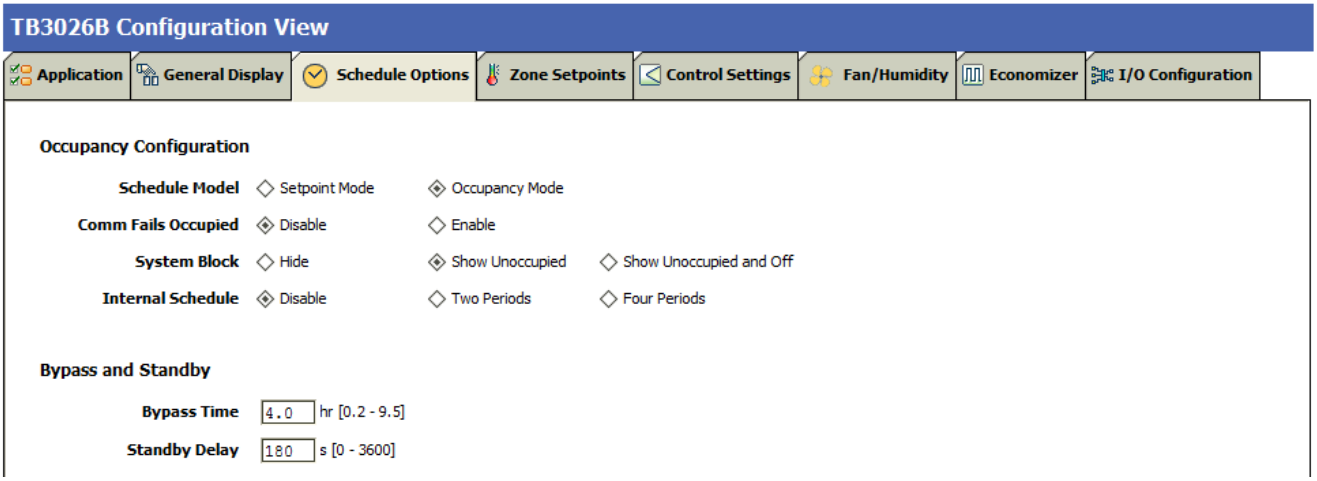



**Figure 35: Schedule Options Screen (AHU)**

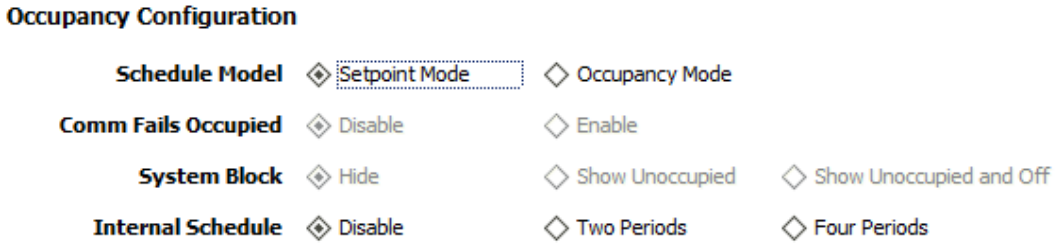
### Occupancy Configuration

**Schedule Model:** A user can set the device's schedule model as;

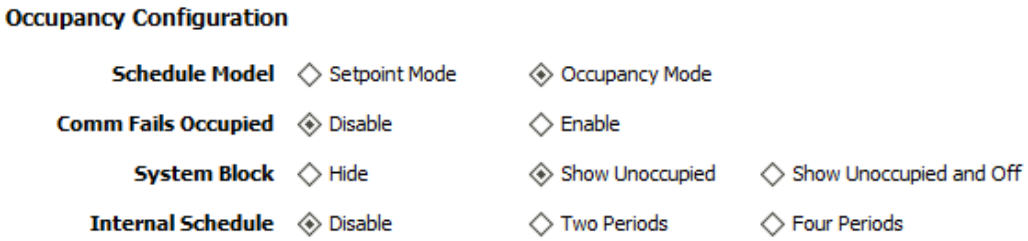
1. Setpoint Mode or
2. Occupancy Mode

**Setpoint Mode:** In setpoint mode, the controller logically emulates residential thermostats. The space temperature is controlled to "SP Mode Cooling SP" and "SP Mode Heating SP". Each schedule period consists of a start time, a heating setpoint, and a cooling setpoint.

**If a user selects 'Setpoint Mode' from the available 'Schedule Model', the fields for 'Comm Fails Occupied' and 'System Block' settings become disabled.**




**Occupancy Mode:** By default, 'Schedule Model' is in 'Occupancy Mode'. The system will be switched to 'Occupied Mode' when the occupancy sensor detects occupancy. Occupied Mode allows a user to configure 'Comm Fails Occupied', 'System Block' & 'Internal Schedule' settings.




**Comm Fails Occupied:** It allows a user to switch the system in Occupied Mode in case of MS/TP communication failure. If the MS/TP communication fails, the system enters into Occupied Mode when this option is selected as 'Enable', otherwise the system remains in its current state when this option is selected as 'Disable'.

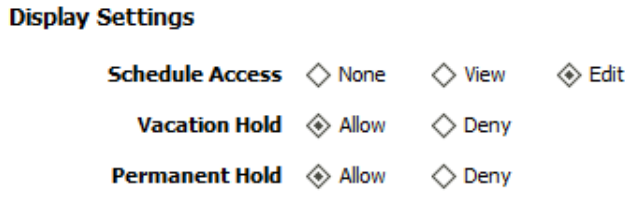
**System Block:** The System Block is hidden when the schedule model is in 'Setpoint Mode'. When the schedule model is in 'Occupancy Mode', it allows a user to switch between the available options. Selecting "Show Unoccupied/Off" places the controller in unoccupied state.

**Internal schedule:** It can be configured in both Occupancy Mode & Setpoint Mode. By default, 'Internal Schedule' is 'Disable'.

If the internal schedule is 'Disable', a user can adjust the setpoint (within setpoint limits).

## Display Settings

When a user selects, 'Two Periods' or 'Four Periods' options an additional 'Display Settings' appears as follows:

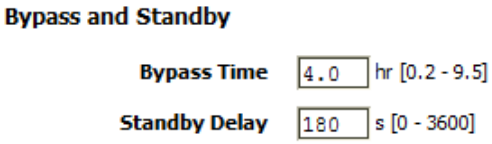



**Schedule Access:** When a user selects 'Edit', it allows a user to view and edit the schedule and when a user selects 'View', it allows a user to view the schedule. When a user selects 'None', it will not allow a user to view or edit the schedule.

**Vacation Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Vacation Hold".

**Permanent Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Permanent Hold".

## Bypass and Standby




**Bypass Time:** In the Unoccupied state, it forces the controller into the occupied state for up to 4 hours (default value). The override time limit is adjustable from a minimum of 0.2 hours to a maximum of 9.5 hours.

**Standby Delay:** In Occupied Mode, if any window or door is opened and closed with no motion detected after the time mentioned for the Standby Delay, the room status switches to Standby state. The default value is 180 seconds.

## Zone Setpoints

Zone Setpoints , allows a user to set the following parameters as per the requirement:

1. Temperature Setpoints
2. Setpoint Limits
3. Standby Settings
4. Display Options

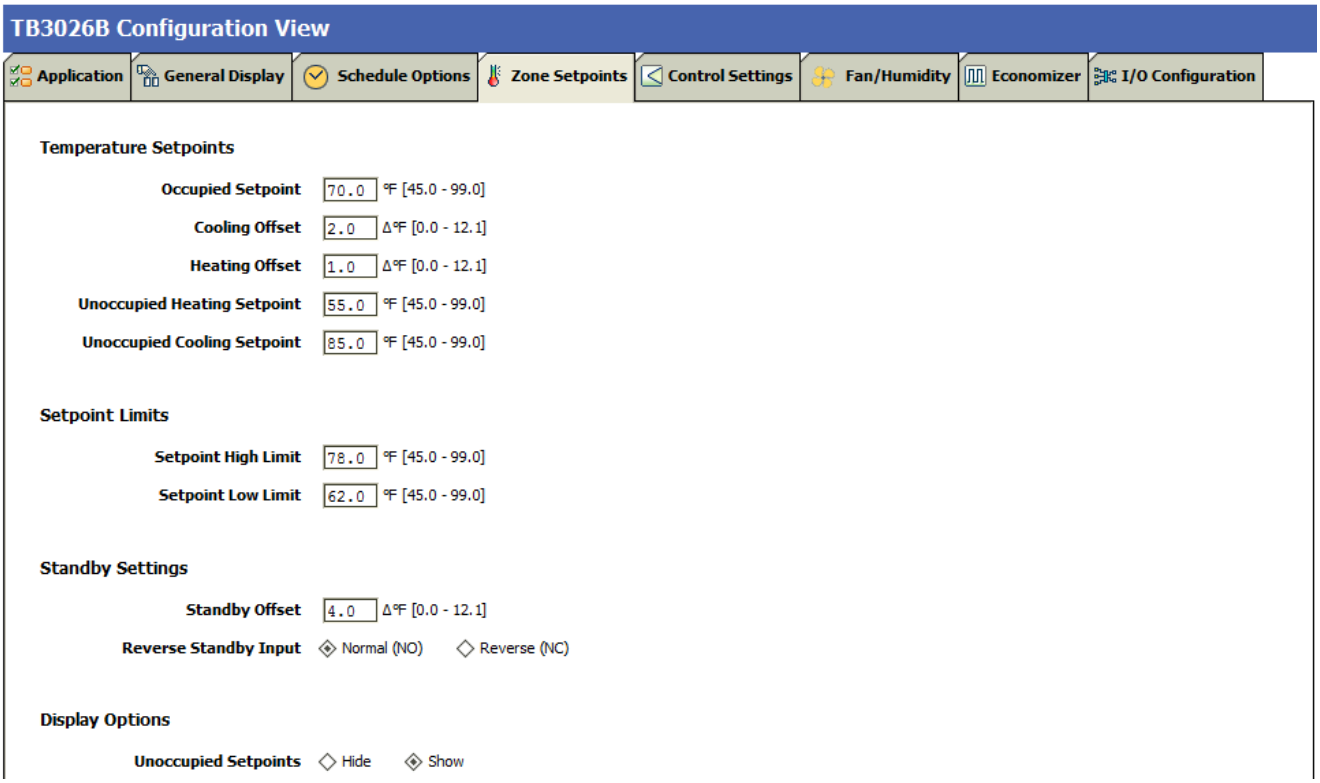
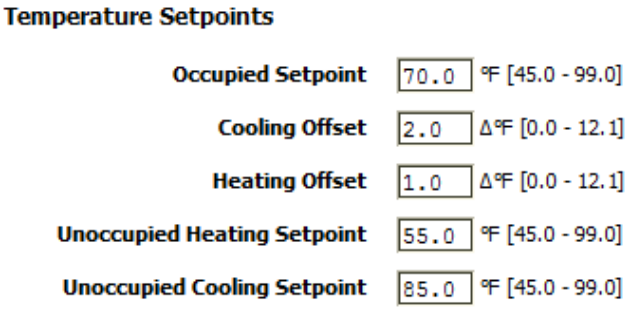



**Figure 36: Zone Setpoints Screen (Occupancy Mode)**

### Temperature Setpoints




**Occupied Setpoint:** It is a setpoint in Occupied Mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 70ºF.

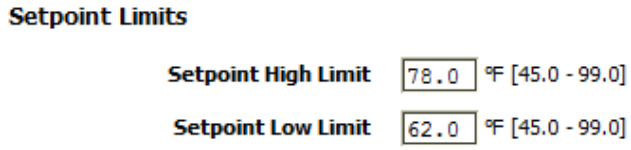
**Cooling Offset:** In the Occupied state, the cooling setpoint is calculated as cooling offset plus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 2 ΔºF.

**Heating Offset:** In the Occupied state, the heating setpoint is calculated as heating offset minus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 1 ΔºF.

**Unoccupied Heating Setpoint:** It is a setpoint for Heating in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 55 ºF.

**Unoccupied Cooling Setpoint:** It is a setpoint for Cooling in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 85 ºF.

## Setpoint Limits



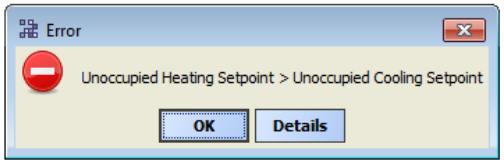

**Setpoint High Limit:** A user can enter a Setpoint High Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 78 ºF.

**Setpoint Low Limit:** A user can enter a Setpoint Low Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 62 ºF.

***Note:***

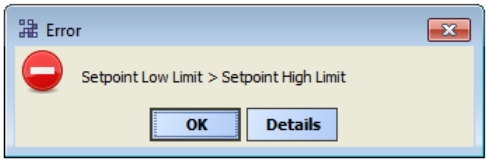
1. *Unoccupied Cooling Setpoint should always be set GREATER than Unoccupied Heating Setpoint.*

   *Following Error window appears if Unoccupied Cooling Setpoint is set lower than Unoccupied Heating Setpoint.*

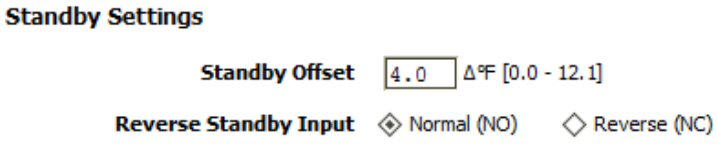



2. *Setpoint High Limit should always be set GREATER than Setpoint Low Limit.*

   *Following Error window appears if Setpoint High Limit is set lower than Setpoint low Limit.*




## Standby Settings

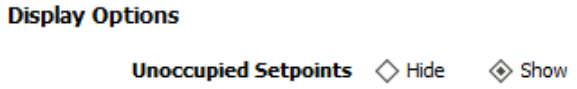



Standby state is a power-saving function of Occupancy mode. It occurs when the space is scheduled as Occupied, but sensors detect (When the Standby input is active) there are no humans in the space.

**Standby Offset:** In this case, the Standby Offset relaxes the occupied setpoints. The value of the Standby Offset [SO] can be set between a minimum of 0ΔºF and a maximum of 12.1ΔºF degrees. The default value is 4 ΔºF.

**Reverse Standby Input:** It allows a user to configure two types of inputs, 'Normally Open (NO)' and 'Normally Close (NC)'.

**Display Options**




**Unoccupied Setpoints:** It allows a user to either 'Hide' or 'Show' the unoccupied setpoint.

**When a user selects Schedule Mode under the 'Schedule Options' tab to 'Setpoint Mode', the 'Zone Setpoints' configuration window appears as follows:**

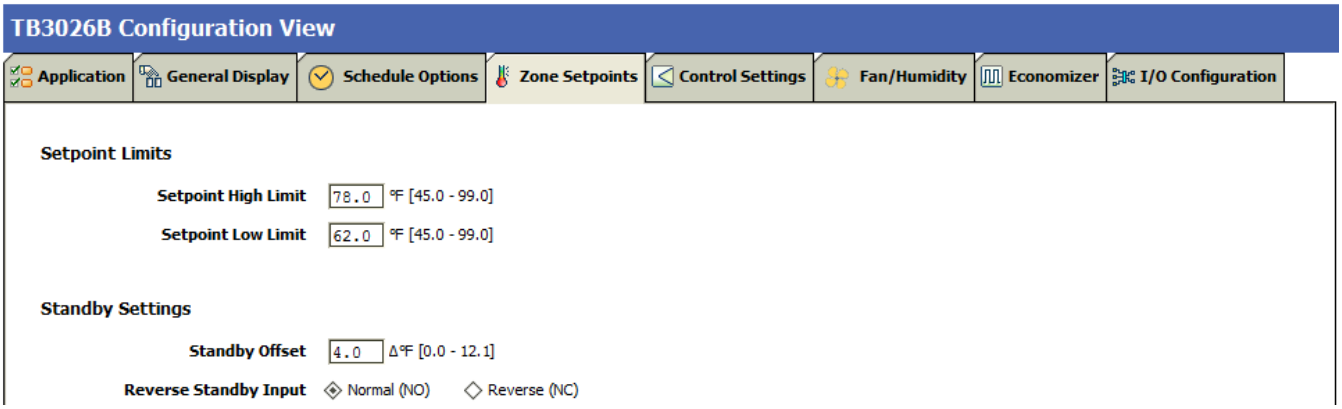



**Figure 37: Zone Setpoint Screen (Setpoint Mode)**

## Control Settings

'Control Settings' allows a user to configure following settings:

1. Cooling PI Control
2. Heating PI Control
3. Compressor Settings

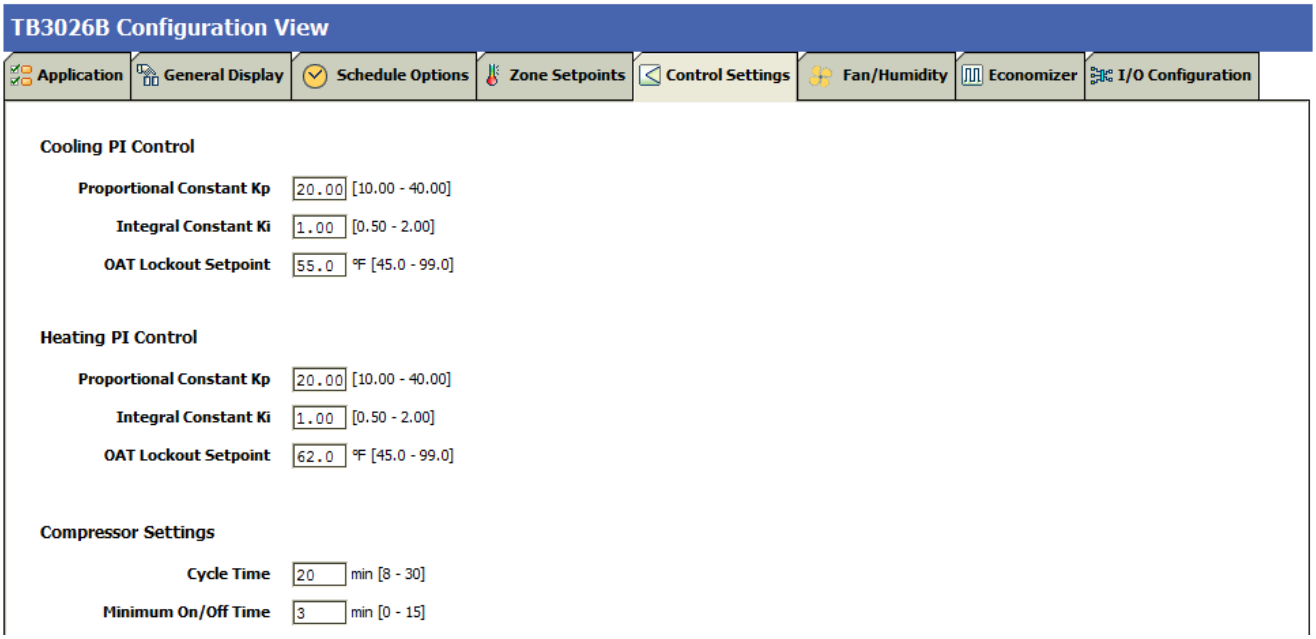



**Figure 38: Control Settings Screen (AHU)**

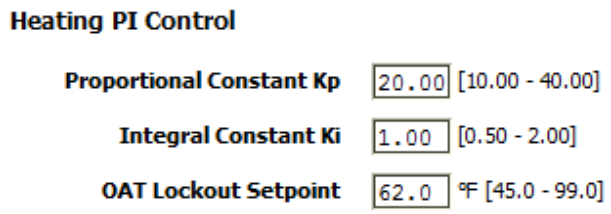
## Cooling PI Control

**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Cooling PI control will lockout when outside Temperature decreases below OAT (Cooling) Lockout Setpoint. The default value is 55 ºF.

## Heating PI Control

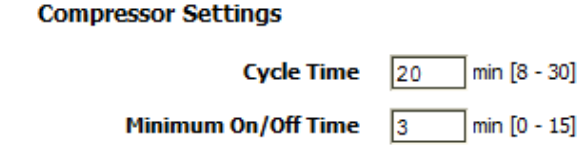



**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Heating PI control will lockout when outside Temperature increases above OAT (Heating) Lockout Setpoint. The default value is 62 ºF.

## Compressor Settings




**Cycle Time:** The Compressor Cycle Time is adjustable, it ranges from minimum of 8 minutes, and a maximum of 30 minutes. The default value is 20 minutes.

**Minimum On/Off Time**: It is a minimum time for the compressor to stay On/Off. The default value is 3 minutes.

## Fan / Humidity

'Fan / Humidity' allows a user to configure the following settings:

1. Fan Operation
2. Humidity Control
3. Filter Alarm

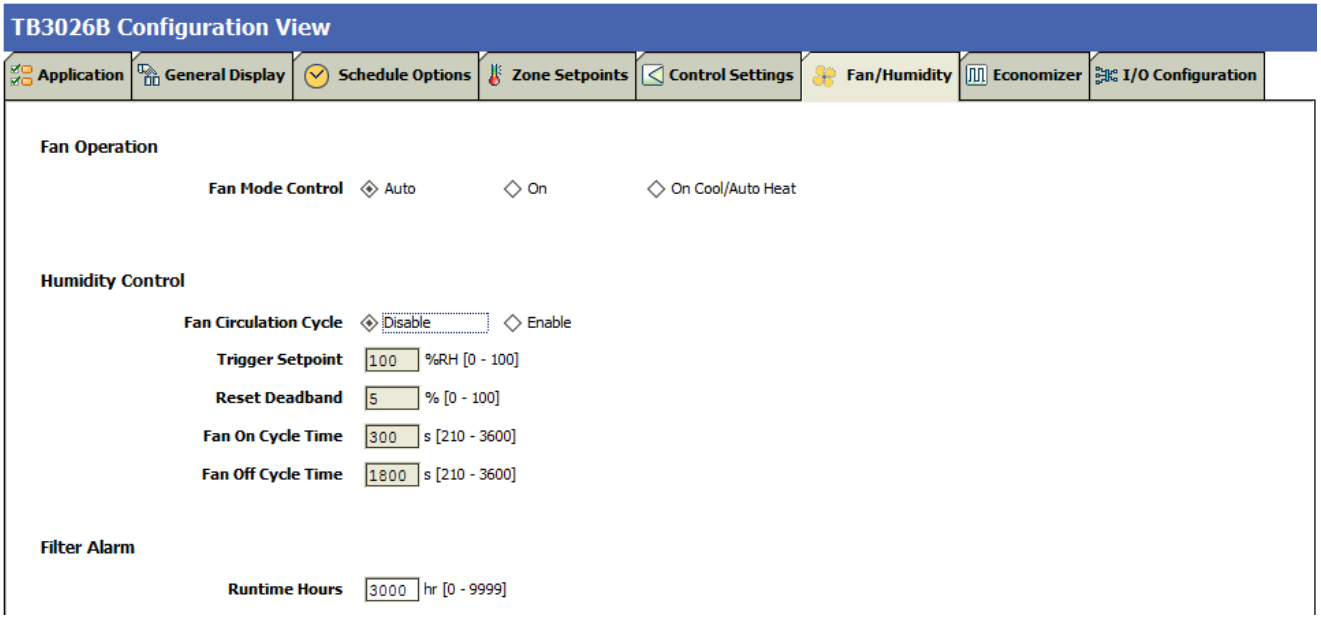
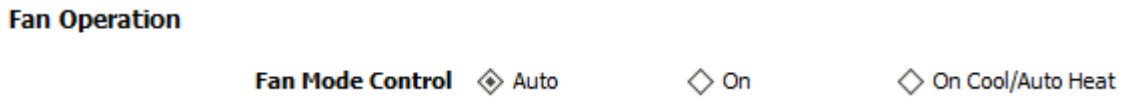



**Figure 39: Fan/Humidity Screen (AHU)**

### Fan Operation

**Fan Mode Control:** During Setpoint Mode and Occupancy Mode, the fan can be configured to operate based on the selected Fan Mode Control as describe below:



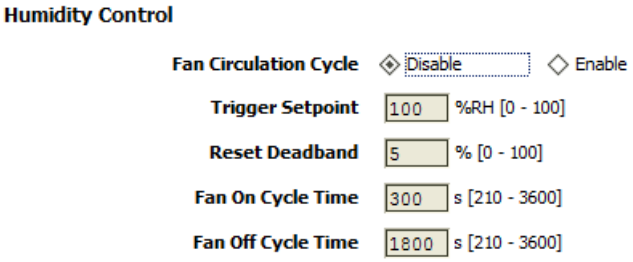

**Auto:** When this option is selected, Fan cycles ON when:

1. Cooling or heating is selected or
2. During Unoccupied mode only when called to run by cooling or heating demand.

**On:** When this option is selected the fan runs continuously for ventilation.

**On Cool/Auto Heat**: When this option is selected the fan runs continuously in cooling mode. In heating mode the fan cycles on only when the heating signal calls for the fan to run.

## Humidity Control



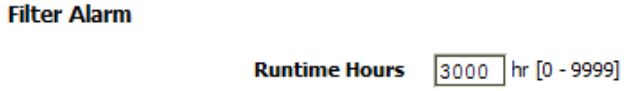

**Fan Circulation Cycle:** When a user selects the 'Enable' option from Fan Circulation Cycle, it allows a user to edit the Trigger Setpoint, Reset Deadband, and Fan On/Off Cycle Time.

**Trigger Setpoint & Reset Deadband:** When sensed humidity equals or exceeds humidity trigger setpoint, the fan cycles ON/OFF at low speed until sensed humidity drops below the trigger setpoint minus the reset deadband.

**Fan On Cycle Time:** This field allows a user to enter a time for fan ON cycle when stratification and humidity control is active. The default value is 300 seconds.

**Fan Off Cycle Time:** This field allows a user to enter a time for fan OFF cycle when stratification and humidity control is active. The default value is 1800 seconds.

## Filter Alarm




**Runtime Hours:** A filter alarm activates after the Runtime Hours mentioned in this field. The default value is 3000 hours.

## Economizer

Select Economizer from Configuration parameters. It is used to configure the economizer settings in BACnet FF controller.

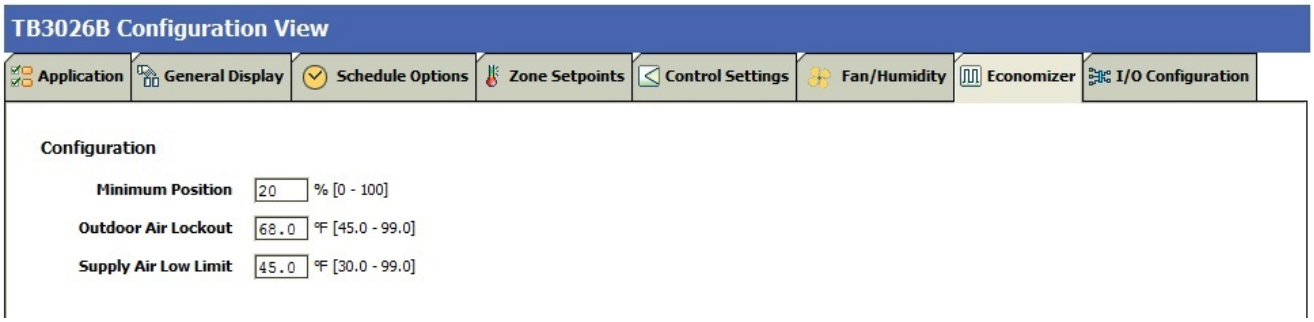



**Figure 40: Economizer Screen (AHU)**

### Configuration

**Minimum Position:** When either the occupied command or the After-hours Timer is ON, the current minimum position is set to the specified Economizer Minimum Position; otherwise, it is zero. The default minimum position is 20%.

**Outside Air Lockout:** The economizer is forced to Minimum position when Outside Air Temperature goes above the Outside Air Lockout setpoint and when 'Schedule Model' is configured as 'Setpoint Mode'. The default value is 68º F.

**Supply Air Low Limit:** The economizer is forced to Minimum position when Supply Temperature goes below the Supply Air Low Limit and when Schedule Model is configured as "Setpoint Mode'. The default value is 45º F.

## I/O Configurations

Select I/O Configurations from Configuration parameters. This configuration is mainly used for Terminal Assignment & Output Configuration.

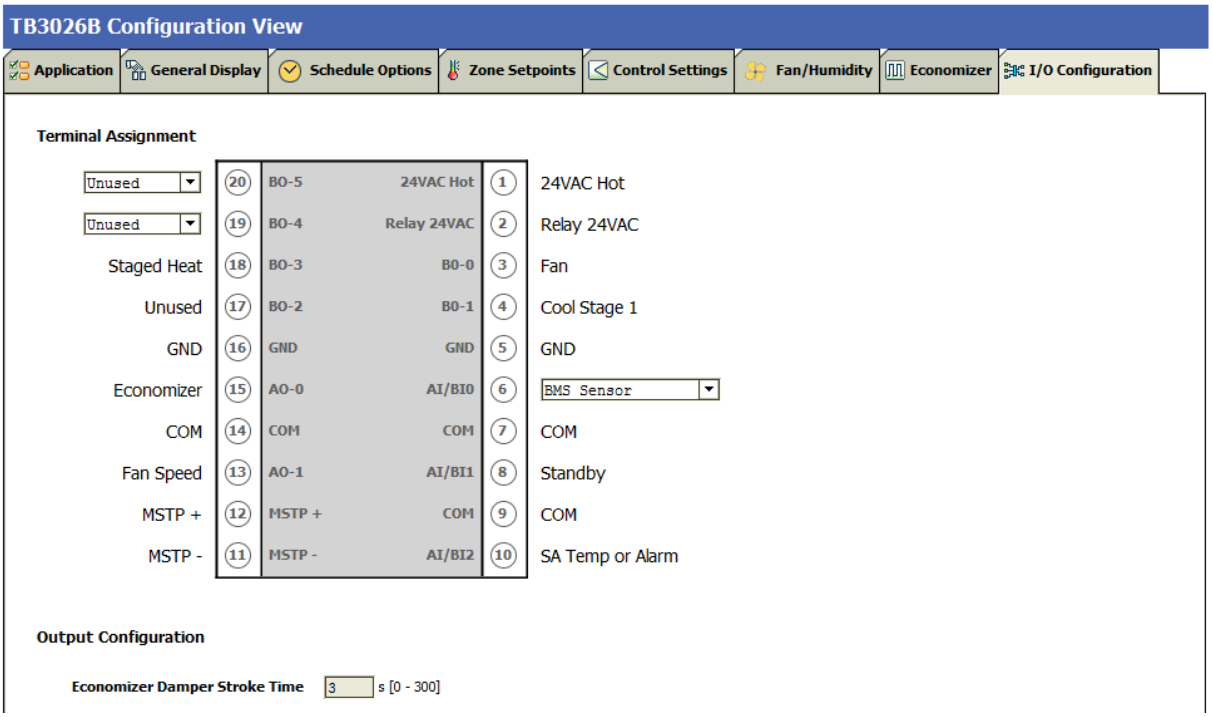



**Figure 41:I/O Configurations Screen (AHU)**

### Terminal Assignment

After completing the AHU configuration, selected inputs and outputs get automatically assigned to the BACnet FF controller's input and output terminals. However, a user can assign the outputs as 'Economizer Open' & 'Economizer Close 'to BO-4 & BO-5 and inputs as 'BMS Sensor' or 'Remote Space Temp' or 'Outdoor Air Temp' to AI/BI0 respectively.

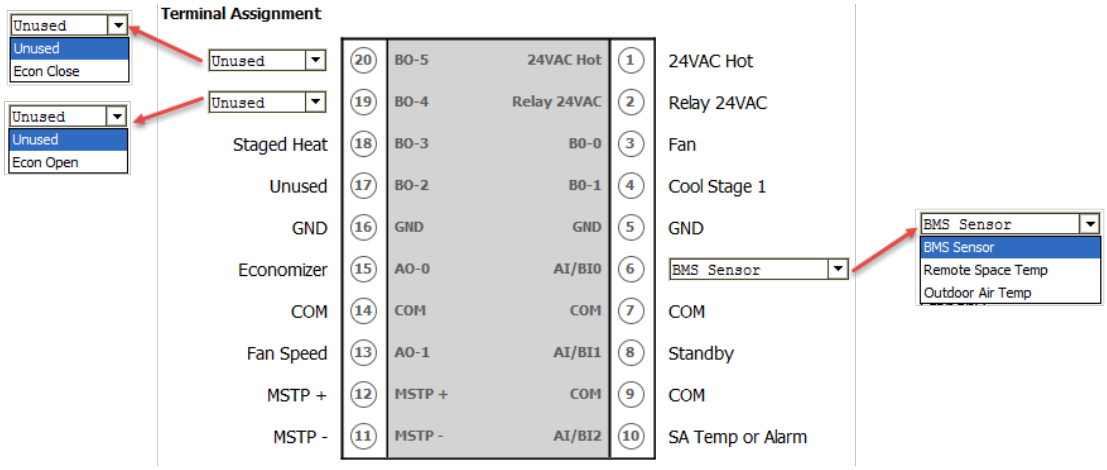


**Figure 42: Terminal Assignment View (AHU)**

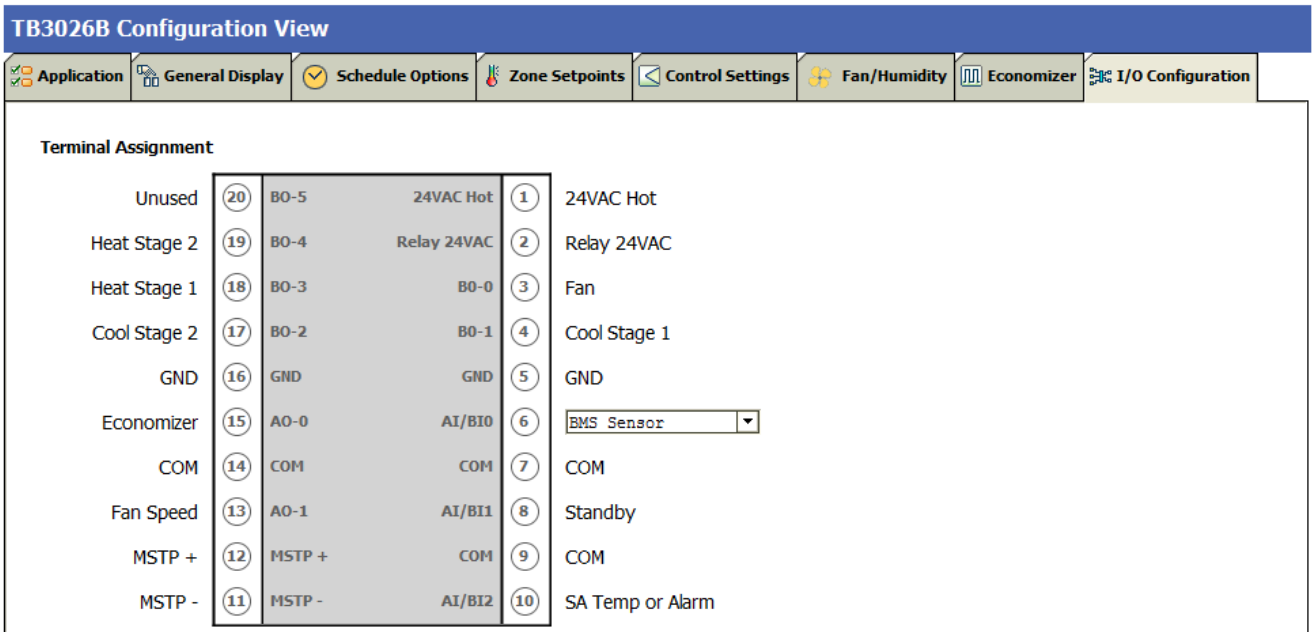
## Output Configuration

### Output Configuration

**Economizer Damper Stroke Time** 90 s [6 - 300]

When a user assigns the outputs, 'Economizer Open' and 'Economizer Close' to BO-4 and BO-5 respectively, 'Economizer Damper Stroke Time' can be mentioned in the field 'Output Configuration'. The default value is 90 seconds.

**When 'Output Stage' is selected as 'Two Stages Heat/Two Stages Cool', the 'Terminal Assignment' view changes as follows:**



# Air Source Heat Pump

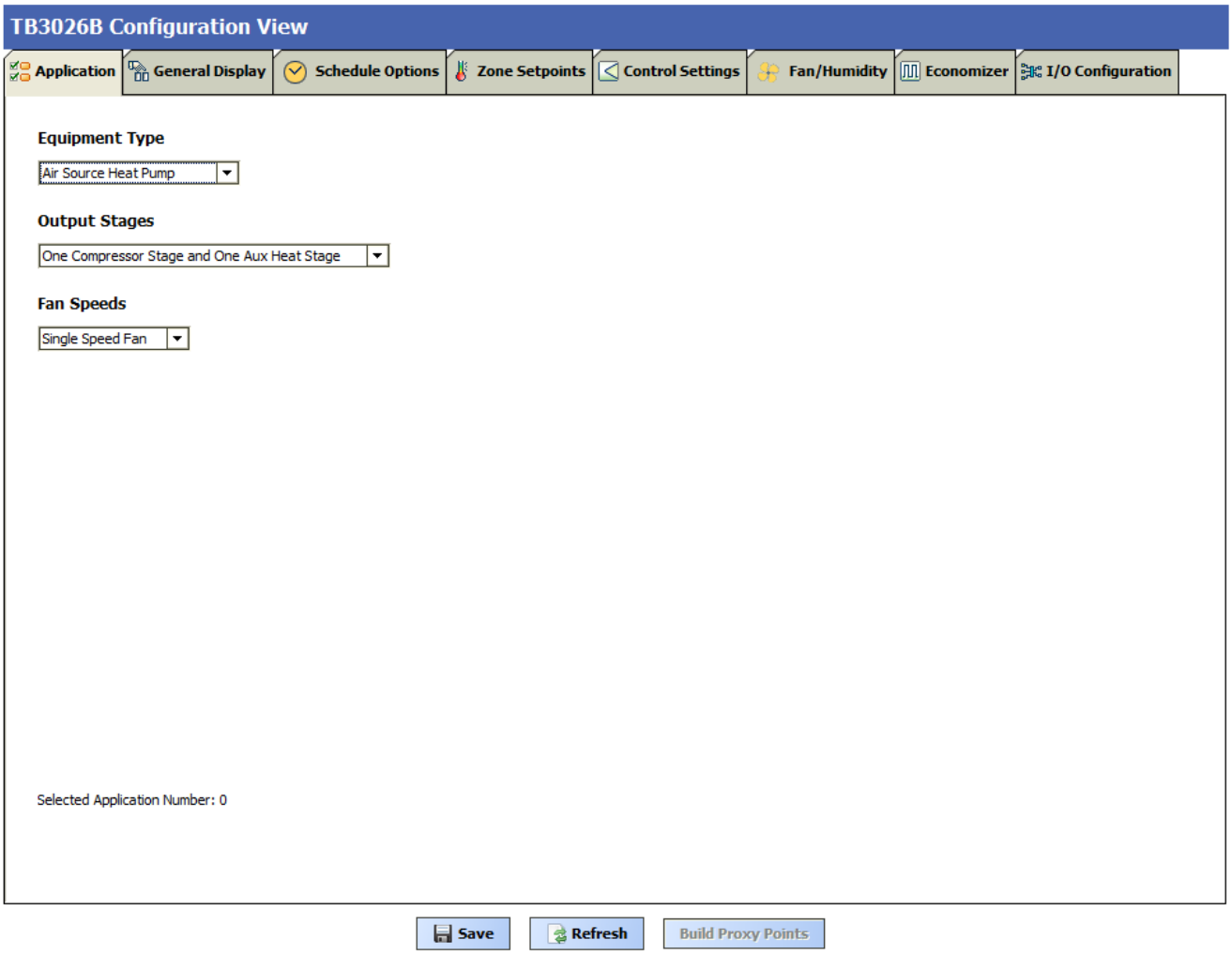
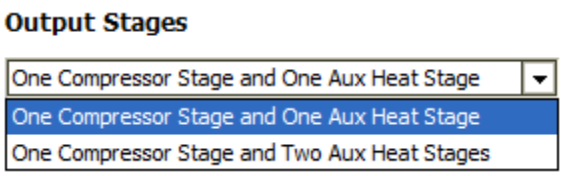



**Figure 43: Air Source Heat Pump Window**

## Output Stages

Equipment Type 'Air Source Heat Pump' consists of two types of 'Output Stages'. Required type of output stages can be selected from the following available options:



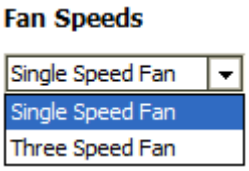

**One Compressor Stage and One Aux Heat Stage:** Select this option if One stage of compressor and one stage of Auxiliary Heating is required in the application

**One Compressor Stage and Two Aux Heat Stage:** Select this option if Two stages of Compressors and Two stages of Auxiliary Heating are required in the application

## Fan Speeds

A user can select Two types of 'Fan Speeds' when the output stage is configured as 'One Compressor Stage and One Aux Heat Stage'.

1. Single Speed Fan
2. Three Speed Fan



## General Display

Click ‘General Display’ to view the general display settings. The following parameters are used to configure the controller’s display settings.

1. Engineering Units
2. Time Functions
3. Display
4. Contractor Access Codes

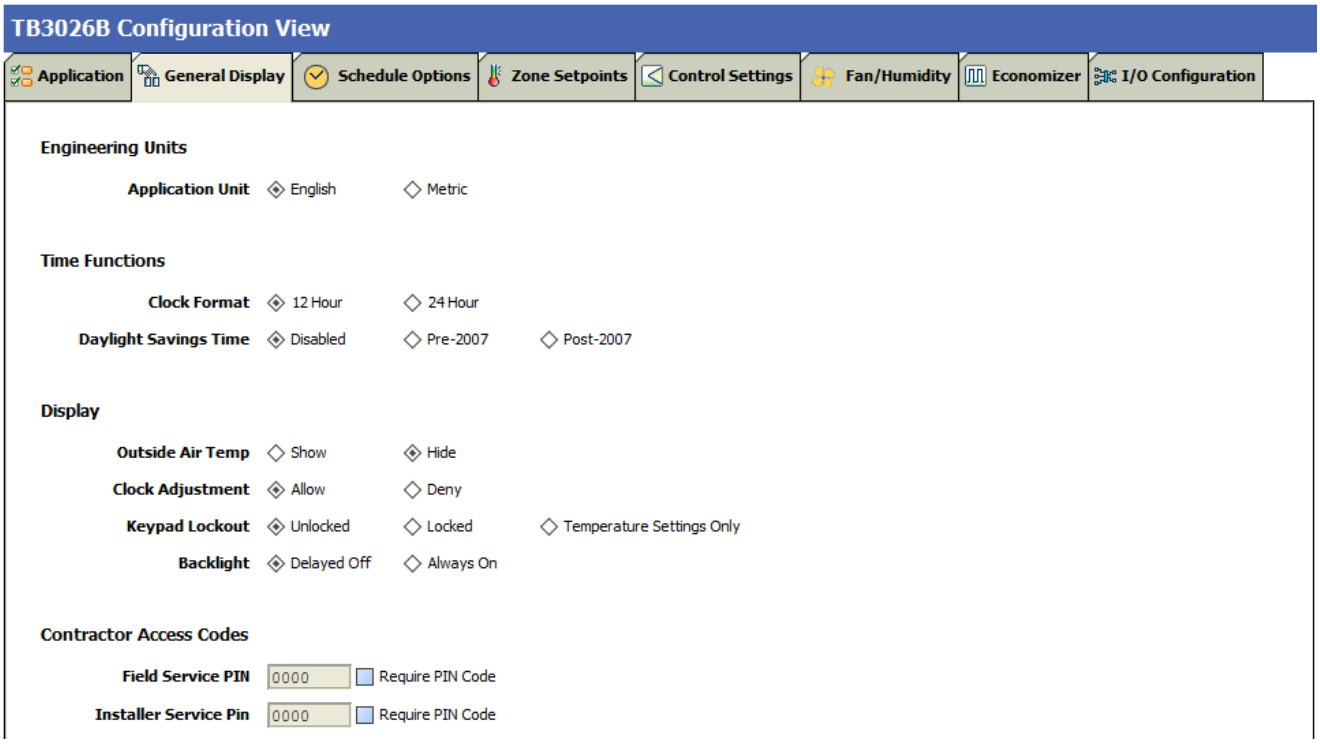
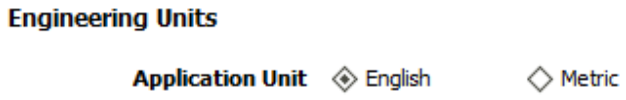


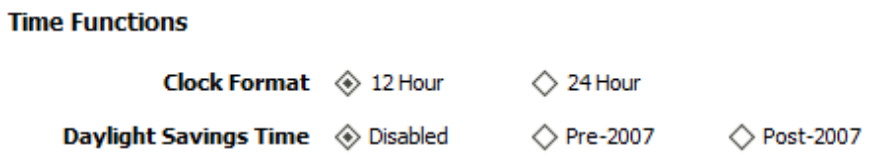

**Figure 44: General Display Screen (Air Source Heat Pump)**

### Engineering Units




**Application Unit:** The application units contain two options to change the controller’s units. By default, the controller’s application units are set to ‘English’. Application units can be changed to ‘English’ or ‘Metric’.

## Time Function

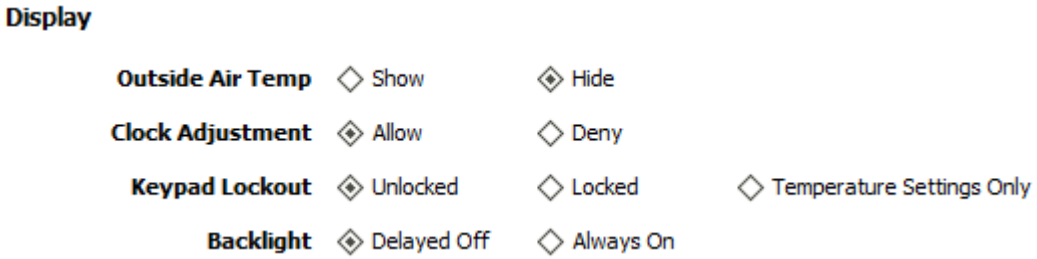



**Clock Format:** A user can select a clock format as 12-hour format or 24-hour format.

**Daylight Savings Time:** This feature enables to select the Daylight Savings Time settings. By default, Daylight Savings Time is set to 'Disabled'. Daylight Savings Time can be changed to 'Pre-2007' or 'Post-2007'.

## Display

This feature allows a user to select the Display settings.




**Outside Air Temp:** A user has an option to hide/show an outside air temperature.

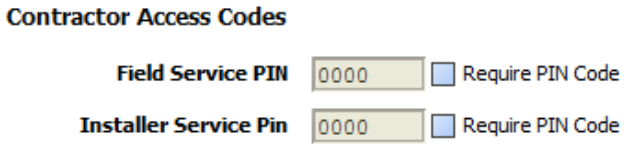
**Clock Adjustment:** This option allows a user to enable/disable the clock adjustment on the controller display.

**Keypad Lockout:** This option allows a user to lock/unlock the clock adjustment.

When an option, 'Temperature Settings Only' is selected, a user can only set the temperature through keypad.

**Backlight:** A user can keep the backlight always on or set to delayed off through this option.

## Contractor Access Codes

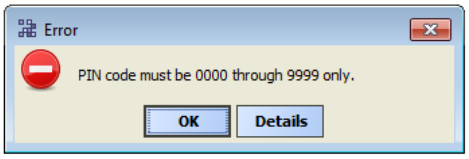



An access to the controller can be restricted with the help of Access Codes.

Field Service Pin and Installer Service Pin can be set. These codes should be enabled to restrict an access to the controller.

***Note:***

*A user can set only numerical PIN code for 'Field Service Pin' and 'Installer Service Pin'. PIN codes should be set within 0000 – 9999. The following Error Window pops up if this field is left blank after selecting.*



## Schedule Options

'Schedule' tab displays Schedule options.
The following parameters are used to configure the schedule options (i.e. Occupancy Configuration and Bypass and Standby)

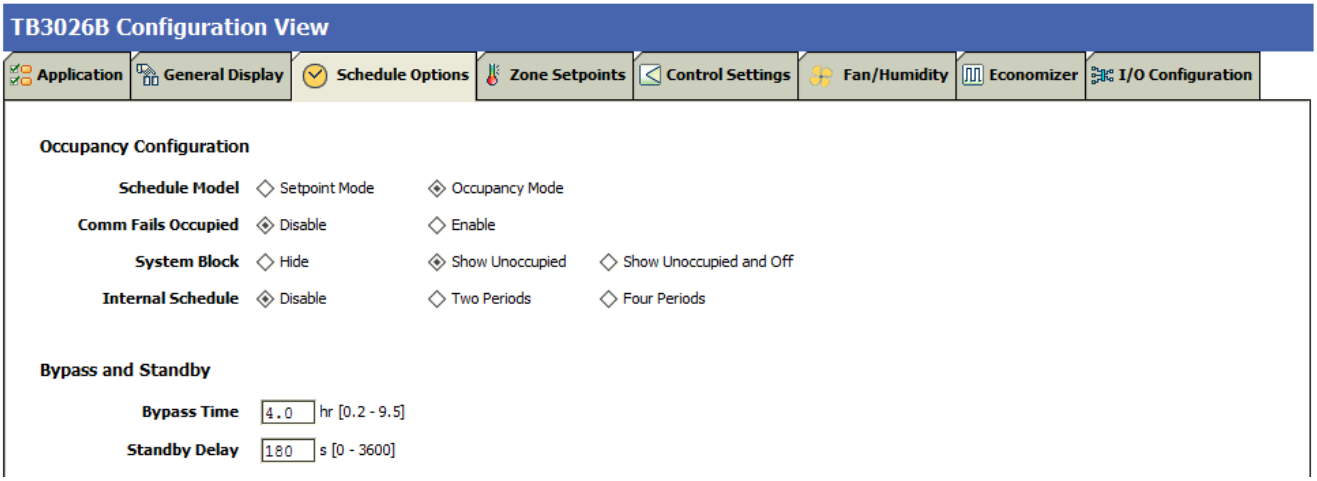



**Figure 45: Schedule Options Screen (Air Source Heat Pump)**

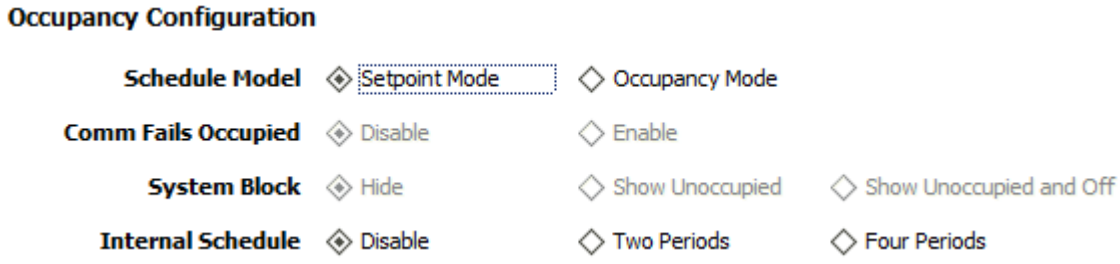
### Occupancy Configuration

**Schedule Model:** A user can set the device's schedule model as;

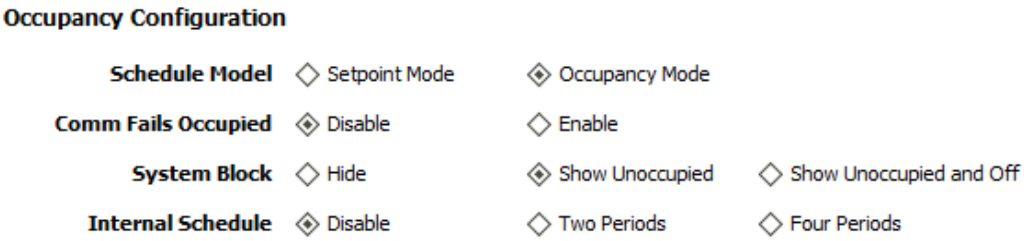
1. Setpoint Mode or
2. Occupancy Mode

**Setpoint Mode:** In setpoint mode, the controller logically emulates residential thermostats. The space temperature is controlled to "SP Mode Cooling SP" and "SP Mode Heating SP". Each schedule period consists of a start time, a heating setpoint, and a cooling setpoint.

**If a user selects 'Setpoint Mode' from the available 'Schedule Model', the fields for 'Comm Fails Occupied' and 'System Block' settings become disabled.**




**Occupancy Mode:** By default, 'Schedule Model' is in 'Occupancy Mode'. The system will be switched to 'Occupied Mode' when the occupancy sensor detects occupancy. Occupied Mode allows a user to configure 'Comm Fails Occupied', 'System Block' & 'Internal Schedule' settings.




**Comm Fails Occupied:** It allows a user to switch the system in Occupied Mode in case of MS/TP communication failure. If the MS/TP communication fails, the system enters into Occupied Mode when this option is selected as 'Enable', otherwise the system remains in its current state when this option is selected as 'Disable'.

'Enable', and remains in its current state when this option is selected as 'Disable'.

**System Block:** The System Block is hidden when the schedule model is in 'Setpoint Mode'. When the schedule model is in 'Occupancy Mode', it allows a user to switch between the available options. Selecting "Show Unoccupied/Off" places the controller in unoccupied state.

**Internal schedule:** It can be configured in both Occupancy Mode & Setpoint Mode. By default, 'Internal Schedule' is 'Disable'.

If the internal schedule is 'Disable', a user can adjust the setpoint (within setpoint limits).

## Display Settings

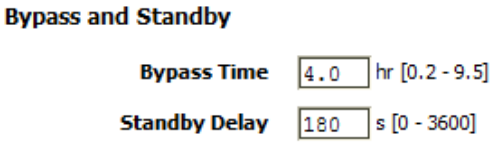
When a user selects, 'Two Periods' or 'Four Periods' options an additional 'Display Settings' appears as follows:

**Schedule Access:** When a user selects 'Edit', it allows a user to view and edit the schedule and when a user selects 'View', it allows a user to view the schedule. When a user selects 'None', it will not allow a user to view or edit the schedule.

**Vacation Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Vacation Hold".

**Permanent Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Permanent Hold".

## Bypass and Standby




**Bypass Time:** In the Unoccupied state, it forces the controller into the occupied state for up to 4 hours (default value). The override time limit is adjustable from a minimum of 0.2 hours to a maximum of 9.5 hours.

**Standby Delay:** In Occupied Mode, if any window or door is opened and closed with no motion detected after the time mentioned for the Standby Delay, the room status switches to Standby state. The default value is 180 seconds.

## Zone Setpoints

Zone Setpoints , allows a user to set the following parameters as per the requirement:

1. Temperature Setpoints
2. Setpoint Limits
3. Standby Settings
4. Display Options

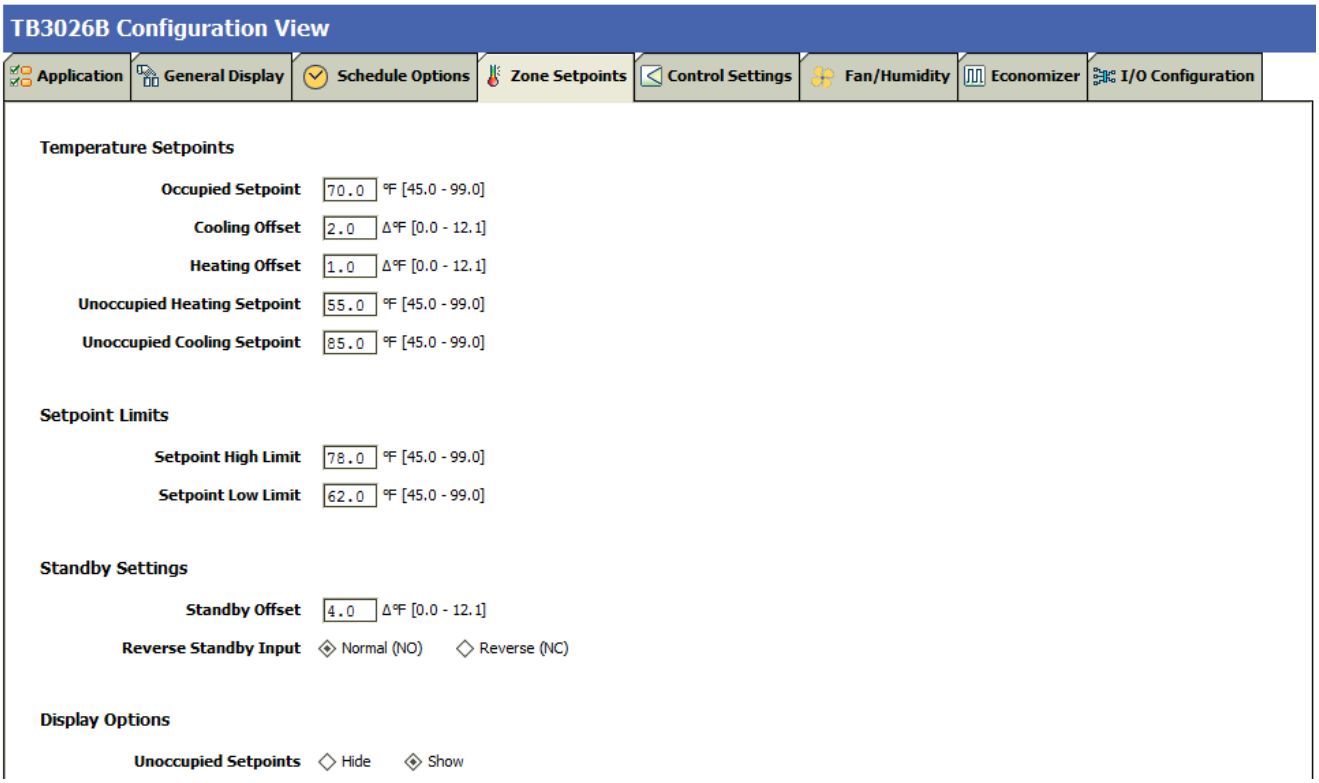
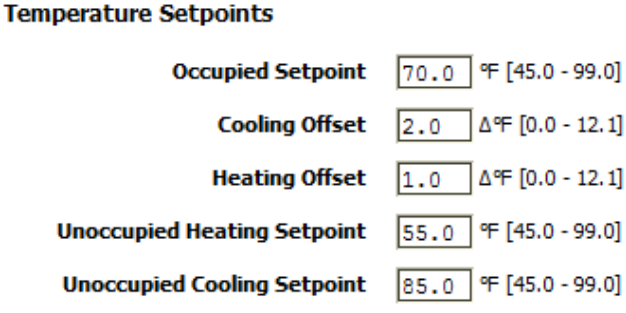



**Figure 46: Zone Setpoints Screen (Occupancy Mode)**

### Temperature Setpoints




**Occupied Setpoint:** It is a setpoint in Occupied Mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 70ºF.

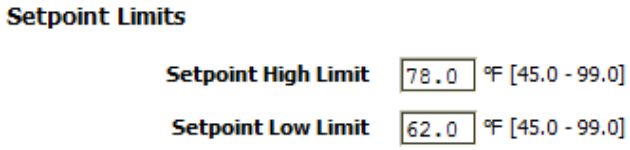
**Cooling Offset:** In the Occupied state, the cooling setpoint is calculated as cooling offset plus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF.The default value is 2 ΔºF.

**Heating Offset:** In the Occupied state, the heating setpoint is calculated as heating offset minus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 1 ΔºF.

**Unoccupied Heating Setpoint:** It is a setpoint for Heating in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 55 ºF.

**Unoccupied Cooling Setpoint:** It is a setpoint for Cooling in Unoccupied mode. Enter the value within the range of 45ºF to 99ºF.The default value is 85 ºF.

## Setpoint Limits



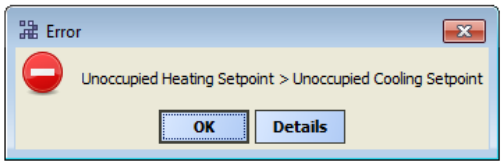

**Setpoint High Limit:** A user can enter a Setpoint High Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 78ºF.

**Setpoint Low Limit:** A user can enter a Setpoint Low Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 62ºF.

***Note:***

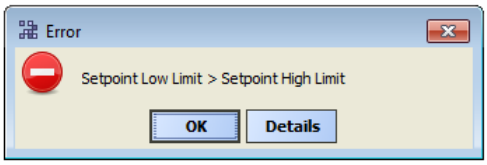
1. *Unoccupied Cooling Setpoint should always be set GREATER than Unoccupied Heating Setpoint.*

   *Following Error window appears if Unoccupied Cooling Setpoint is set lower than Unoccupied Heating Setpoint.*




2. *Setpoint High Limit should always be set GREATER than Setpoint Low Limit.*

   *Following Error window appears if Setpoint High Limit is set lower than Setpoint low Limit.*



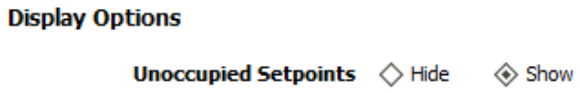

## Standby Settings

Standby state is a power-saving function of Occupancy mode. It occurs when the space is scheduled as Occupied, but sensors detect (When the Standby input is active) there are no humans in the space.

**Standby Offset:** In this case, the Standby Offset relaxes the occupied setpoints. The value of the Standby Offset [SO] can be set between a minimum of 0ΔºF and a maximum of 12.1ΔºF degrees. The default value is 4 ΔºF.

**Reverse Standby Input:** It allows a user to configure two types of inputs, 'Normally Open (NO)' and 'Normally Close (NC)'.

**Display Options**




**Unoccupied Setpoints:** It allows a user to either 'Hide' or 'Show' the unoccupied setpoint.

**When a user selects Schedule Model under the 'Schedule Options' tab to 'Setpoint Mode', the 'Zone Setpoints' configuration window appears as follows:**

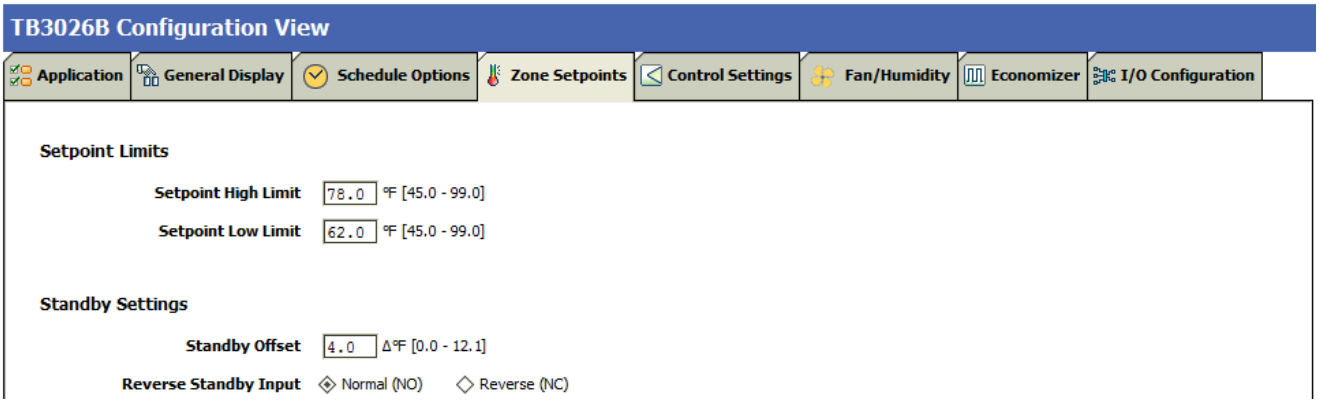



**Figure 47: Zone Setpoint Screen (Setpoint Mode)**

## Control Settings

'Control Settings' allows a user to configure following settings:

1. Cooling PI Control.
2. Heating PI Control.
3. Aux Staged Heating
4. Compressor Settings.

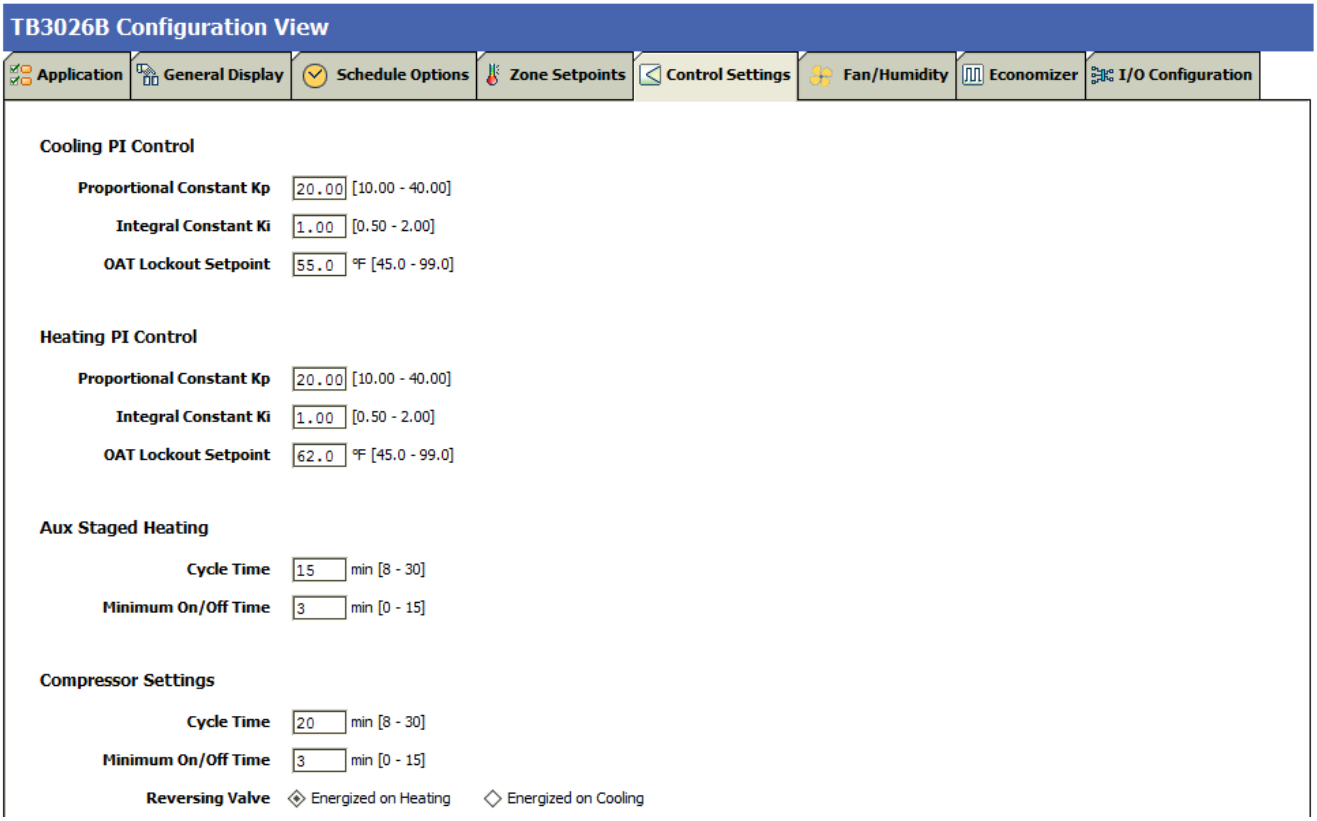
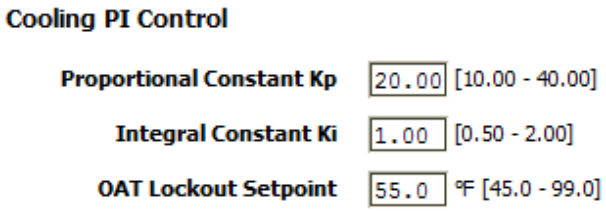



**Figure 48: Control Settings Screen (Air Source Heat Pump)**

## Cooling PI Control

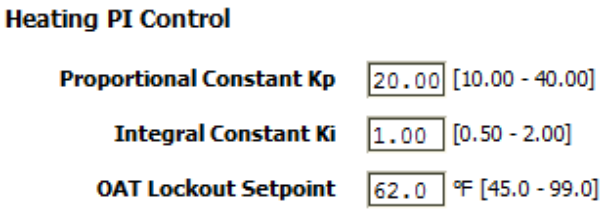



**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Cooling PI control will lockout when outside Temperature increases above OAT (Cooling) Lockout Setpoint. The default value is 55 ºF.

## Heating PI Control

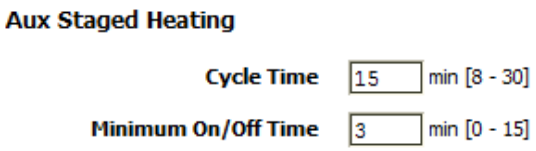



**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Heating PI control will lockout when outside Temperature decreases below OAT (Heating) Lockout Setpoint. The default value is 62 ºF.

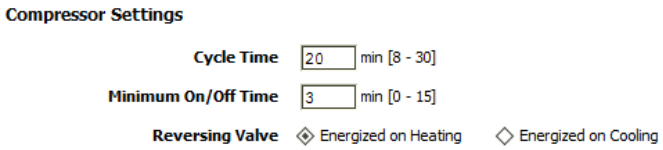
## Aux Staged Heating




**Cycle Time:** The Cycle Time ranges from minimum of 8 minutes, and a maximum of 30 minutes. The default value is 15 minutes.

**Minimum On/Off Time:** It is a minimum On/Off time for the Auxiliary Heating. The default value is 3 minutes.

## Compressor Settings




**Cycle Time:** The Compressor Cycle Time is adjustable; it ranges from minimum of 8 minutes, and a maximum of 30 minutes. The default value is 20 minutes.

**Minimum On/Off Time:** It is a minimum time for the compressor to stay On/Off. The default value is 3 minutes.

**Reversing Valve:** Depending upon heating/cooling demand, a user can Energize the Reversing Valve on Heating or Cooling.

## Fan / Humidity

'Fan / Humidity' allows a user to configure the following settings:

1. Fan Operation
2. Humidity Control
3. Filter Alarm

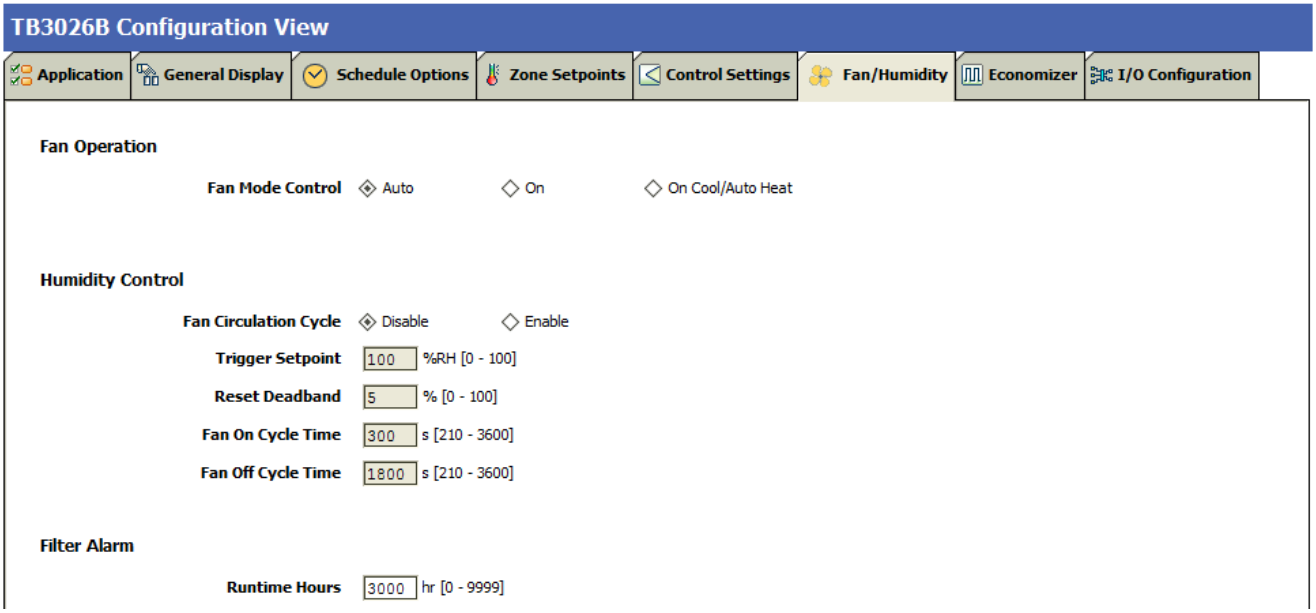
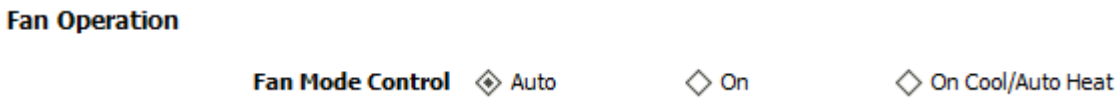



**Figure 49: Fan/Humidity Screen (Air Source Heat Pump)**

### Fan Operation

**Fan Mode Control:** During Setpoint Mode and Occupancy Mode, the fan can be configured to operate based on the selected Fan Mode Control as describe below:



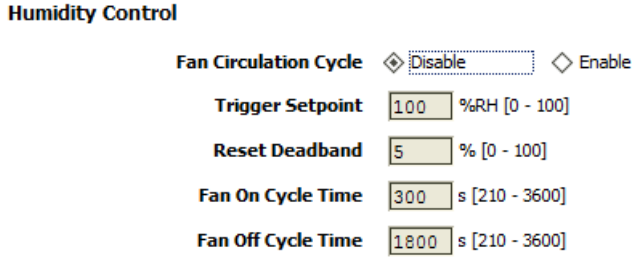

**Auto:** When this option is selected, Fan cycles ON when:

1. Cooling or heating is selected or
2. During Unoccupied mode only when called to run by cooling or heating demand.

**On:** When this option is selected the fan runs continuously for ventilation.

**On Cool/Auto Heat**: When this option is selected the fan runs continuously in cooling mode. In heating mode the fan cycles on only when the heating signal calls for the fan to run.

## Humidity Control



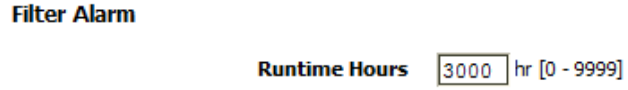

**Fan Circulation Cycle:** When a user selects the 'Enable' option from Fan Circulation Cycle, it allows a user to edit the Trigger Setpoint, Reset Deadband, and Fan On/Off Cycle Time.

**Trigger Setpoint & Reset Deadband:** When sensed humidity equals or exceeds humidity trigger setpoint, the fan cycles ON/OFF at low speed until sensed humidity drops below the trigger setpoint minus the reset deadband.

**Fan On Cycle Time:** This field allows a user to enter a time for fan ON cycle when stratification and humidity control is active. The default value is 300 seconds.

**Fan Off Cycle Time:** This field allows a user to enter a time for fan OFF cycle when stratification and humidity control is active. The default value is 1800 seconds.

## Filter Alarm




**Runtime Hours:** A filter alarm activates after the Runtime Hours mentioned in this field. The default value is 3000 hours.

## Economizer

Select Economizer from Configuration parameters. It is used to configure the economizer settings in BACnet FF controller

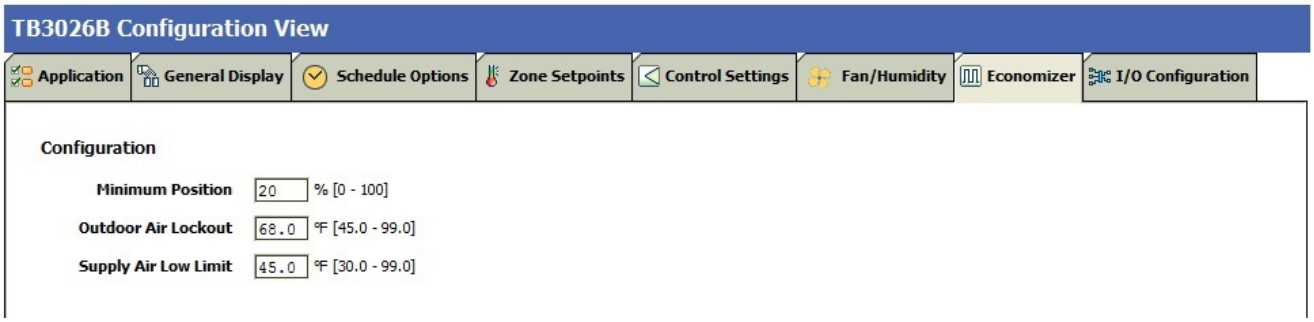



**Figure 50: Economizer Screen (Air Source Heat Pump)**

### Configuration

**Minimum Position:** When either the occupied command or the After-hours Timer is ON, the current minimum position is set to the specified Economizer Minimum Position; otherwise, it is zero. The default minimum position is 20%.

**Outside Air Lockout:** The economizer is forced to Minimum position when Outside Air Temperature goes above the Outside Air Lockout setpoint and when 'Schedule Model' is configured as 'Setpoint Mode'. The default value is 68º F.

**Supply Air Low Limit:** The economizer is forced to Minimum position when Supply Temperature goes below the Supply Air Low Limit and when Schedule Model is configured as "Setpoint Mode'. The default value is 45º F.

## I/O Configurations

Select I/O Configurations from Configuration parameters. This configuration is used for Terminal Assignment & Output Configuration.

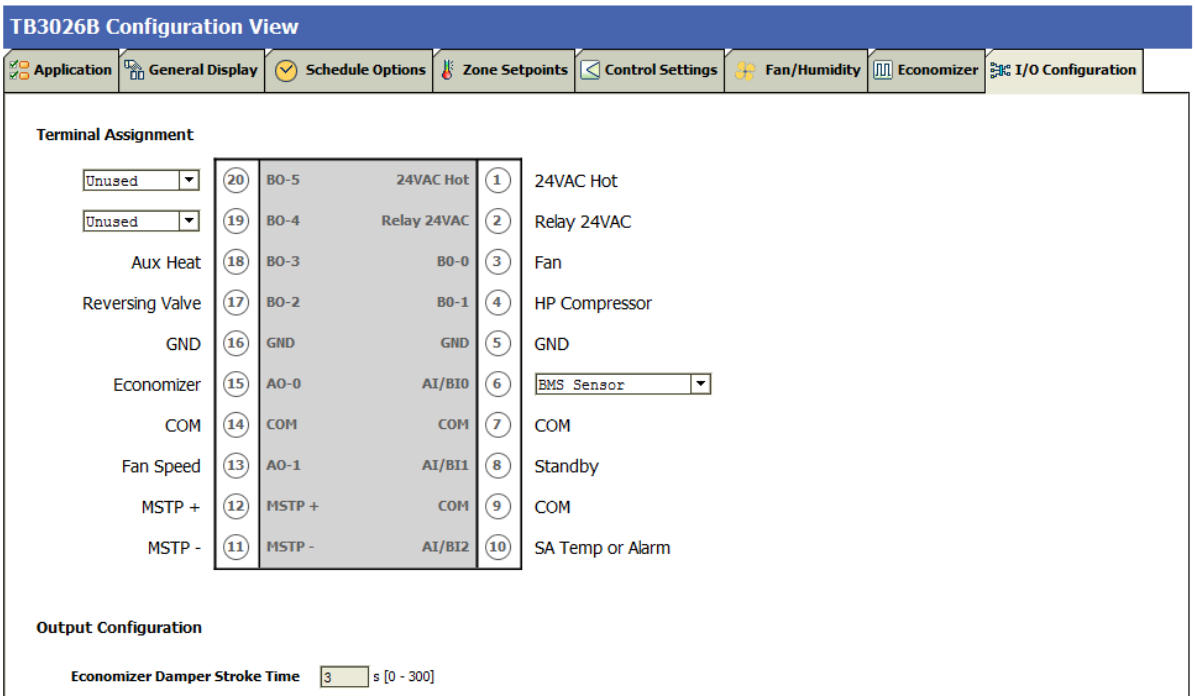



**Figure 51: I/O Configurations Screen (Air Source Heat Pump)**

### Terminal Assignment

After completing the 'Air Source Heat Pump' configuration, selected inputs and outputs get automatically assigned to the BACnet FF controller's input and output terminals. However, a user can assign the outputs as 'Economizer Open' & 'Economizer Close' to BO-4 & BO-5 and inputs as 'BMS Sensor' or 'Remote Space Temp' or 'Outdoor Air Temp' to AI/BI0 respectively.

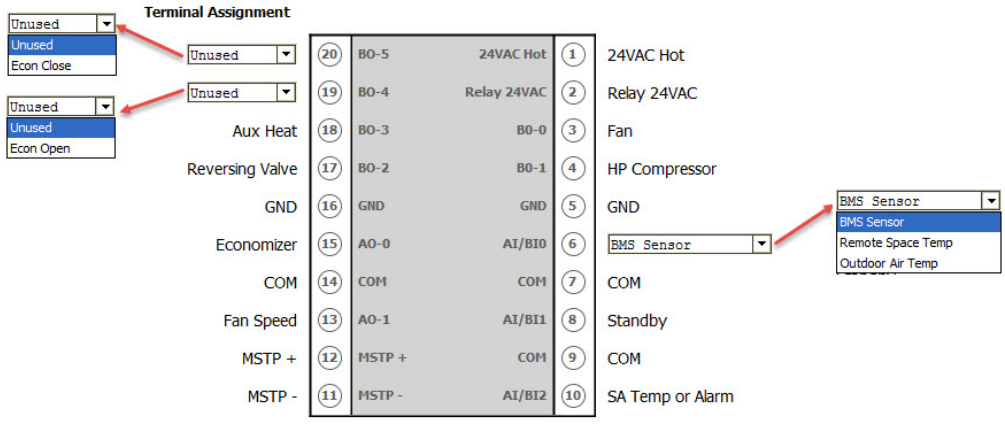



**Figure 52: Terminal Assignment View (Air Source Heat Pump)**

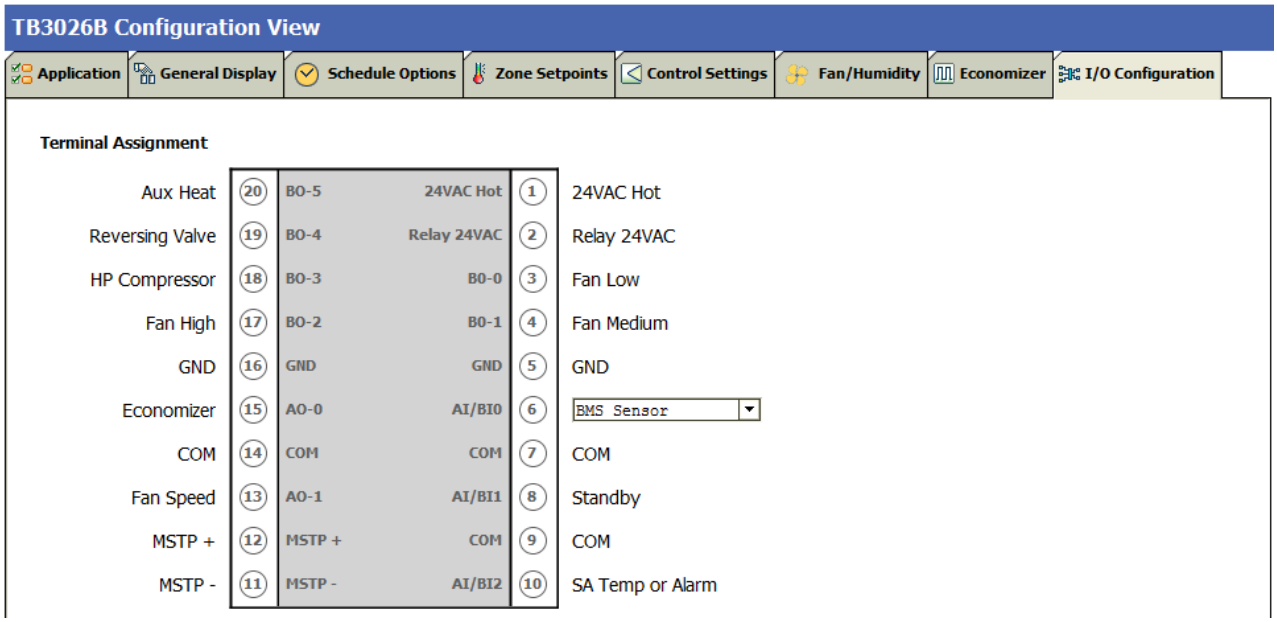
## Output Configuration

### Output Configuration

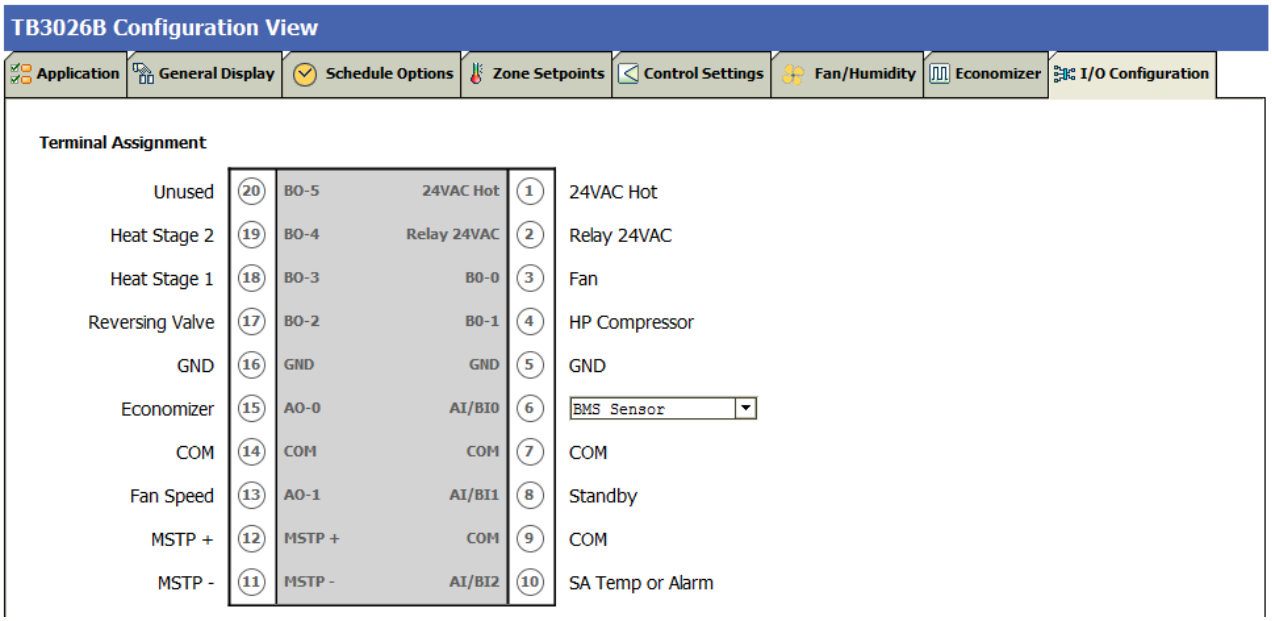
**Economizer Damper Stroke Time** 90 s [6 - 300]

When a user assigns the outputs, ‘Economizer Open’ and ‘Economizer Close’ to BO-4 and BO-5 respectively, ‘Economizer Damper Stroke Time’ can be mentioned in the field ‘Output Configuration’. The default value is 90 seconds.

**When ‘Fan Speed’ is selected as ‘Three Speed Fan’, the ‘Terminal Assignment’ view changes as follows:**




**When ‘Output Stage’ is selected as ‘One Compressor Stage/Two Aux Stages’, the ‘Terminal Assignment’ view changes as follows:**



# Water Source Heat Pump

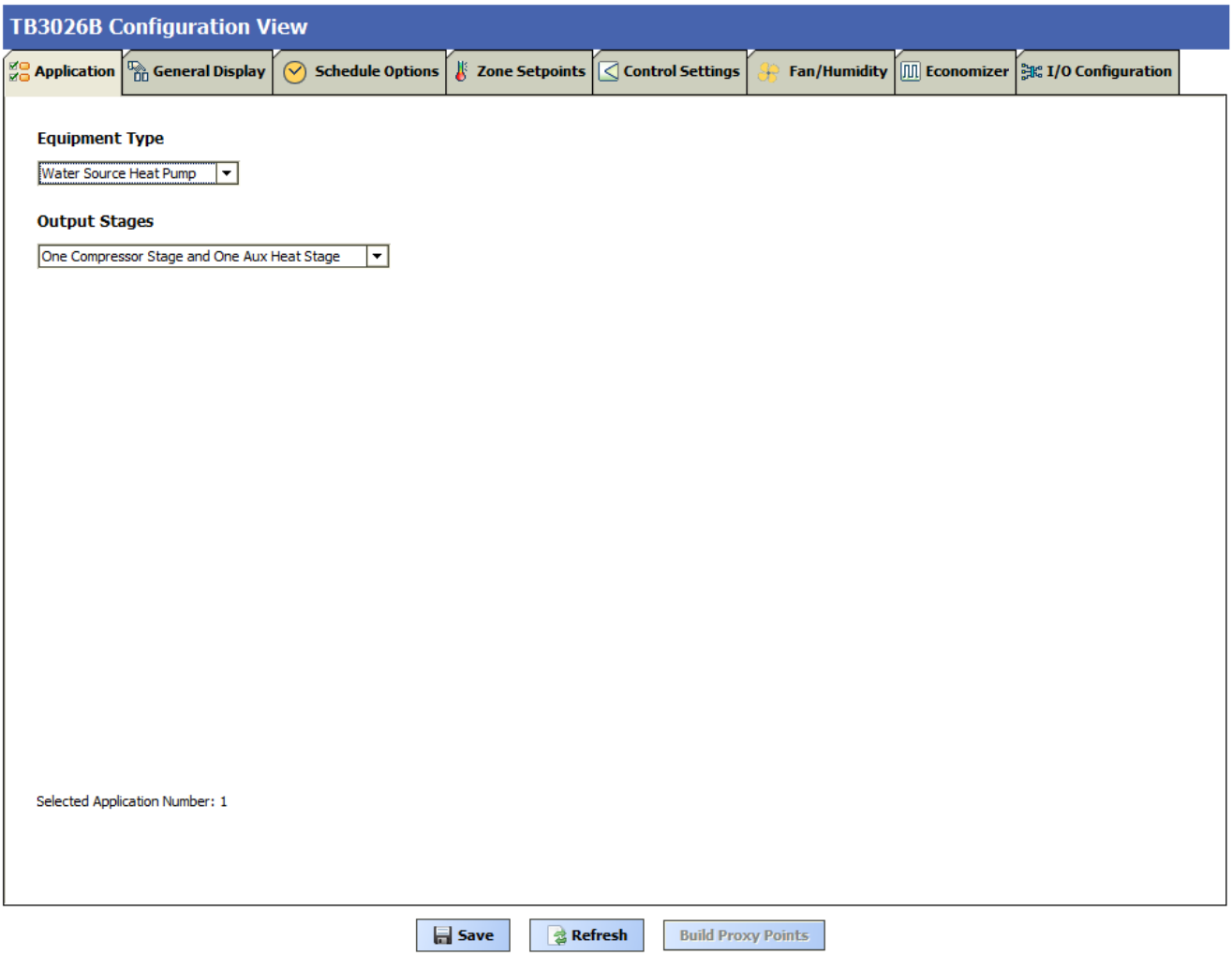
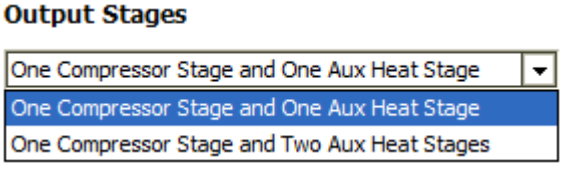



**Figure 53: Water Source Heat Pump Window**

## Output Stages

Equipment Type 'Water Source Heat Pump' consists of two types of 'Output Stages'

1. One Compressor Stage/One Aux Heat Stage
2. One Compressor Stage/Two Aux Heat Stages




**One Compressor Stage and One Aux Heat Stage:** Select this option if One stage of compressor and one stage of Auxiliary Heating is required in the application

**One Compressor Stage and Two Aux Heat Stage:** Select this option if Two stages of Compressors and Two stages of Auxiliary Heating are required in the application

## General Display

Click 'General Display' to view the general display settings. The following parameters are used to configure the controller's display settings.

1. Engineering Units
2. Time Functions
3. Display
4. Contractor Access Codes

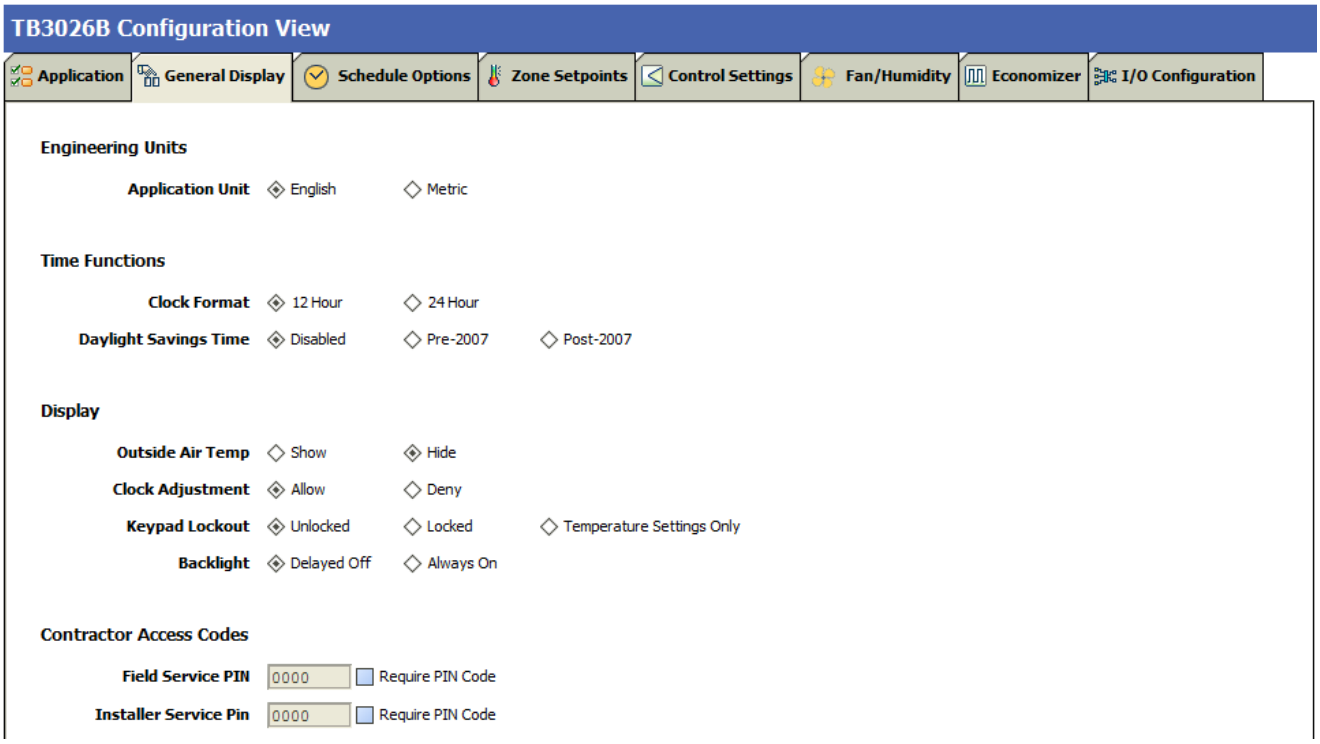
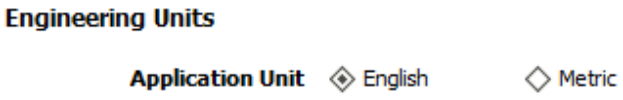


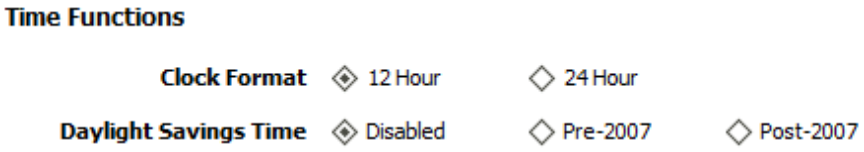

**Figure 54: General Display Screen (Water Source Heat Pump)**

### Engineering Units




**Application Unit:** The application units contain two options to change the controller's units. By default, the controller's application units are set to 'English'. Application Unit can be changed to 'English' or 'Metric'.

## Time Function

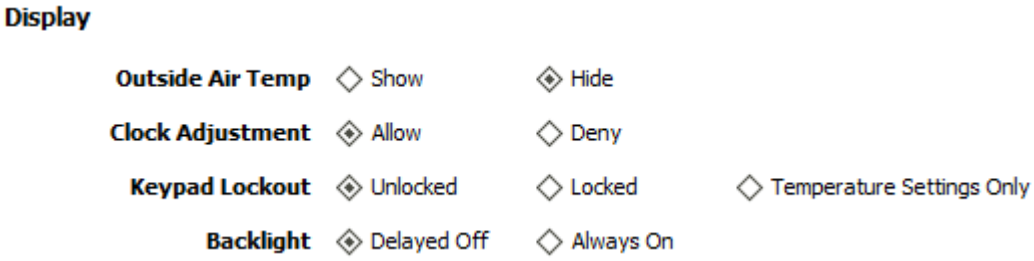



**Clock Format:** A user can select a clock format as 12-hour format or 24-hour format.

**Daylight Savings Time:** This feature enables to select the Daylight Savings Time settings. By default, Daylight Savings Time is set to 'Disabled'. Daylight Savings Time can be changed to 'Pre-2007' or 'Post-2007'.

## Display

This feature allows a user to select the Display settings.




**Outside Air Temp:** A user has an option to hide/show an outside air temperature.

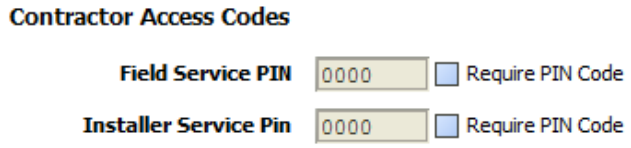
**Clock Adjustment:** This option allows a user to enable/disable the clock adjustment on the controller display.

**Keypad Lockout:** This option allows a user to lock/unlock the clock adjustment.

When an option, 'Temperature Settings Only' is selected, a user can only set the temperature through keypad.

**Backlight:** A user can keep the backlight always on or set to delayed off through this option.

## Contractor Access Codes

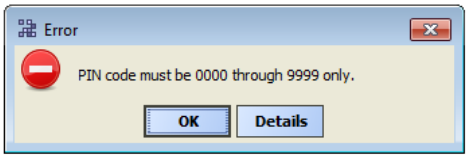



An access to the controller can be restricted with the help of Access Codes.

Field Service Pin and Installer Service Pin can be set. These codes should be enabled to restrict an access to the controller.

***Note:***

*A user can set only numerical PIN code for 'Field Service Pin' and 'Installer Service Pin'. PIN codes should be set within 0000 – 9999. The following Error Window pops up if this field is left blank after selecting.*



## Schedule Options

'Schedule Options' tab displays Schedule options. The following parameters are used to configure the schedule options (i.e. Occupancy Configuration and Bypass and Standby).

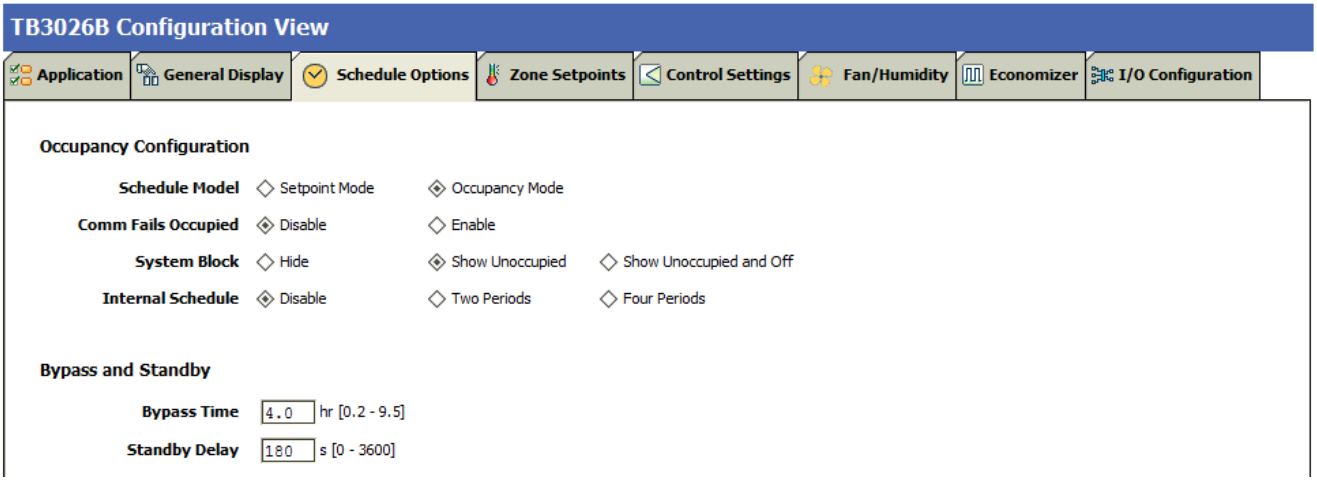



**Figure 55: Schedule Options Screen (Water Source Heat Pump)**

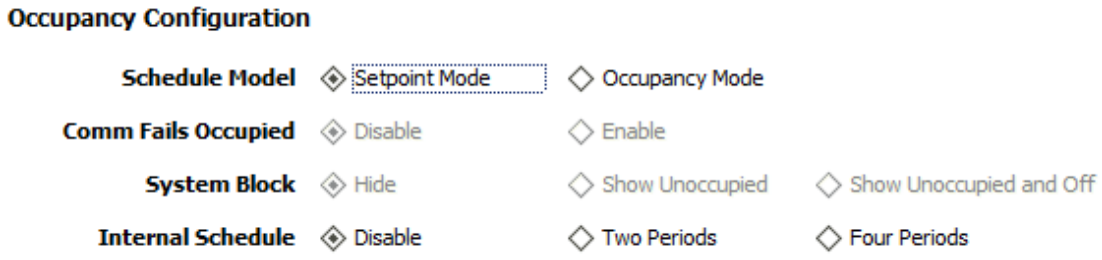
### Occupancy Configuration

**Schedule Model:** A user can set the device's schedule model as;

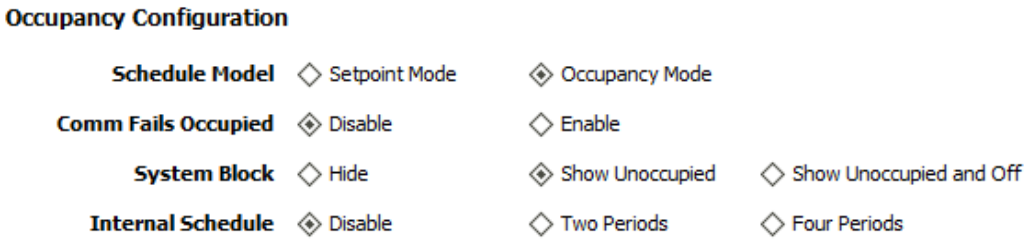
1. Setpoint Mode or
2. Occupancy Mode

**Setpoint Mode:** In setpoint mode, the controller logically emulates residential thermostats. The space temperature is controlled to "SP Mode Cooling SP" and "SP Mode Heating SP". Each schedule period consists of a start time, a heating setpoint, and a cooling setpoint.

**If a user selects 'Setpoint Mode' from the available 'Schedule Model', the fields for 'Comm Fails Occupied' and 'System Block' settings become disabled.**




**Occupancy Mode:** By default, 'Schedule Model' is in 'Occupancy Mode'. The system will be switched to 'Occupied Mode' when the occupancy sensor detects occupancy. Occupied Mode allows a user to configure 'Comm Fails Occupied', 'System Block' & 'Internal Schedule' settings.




**Comm Fails Occupied:** It allows a user to switch the system in Occupied Mode in case of MS/TP communication failure. If the MS/TP communication fails, the system enters into Occupied Mode when this option is selected as 'Enable', otherwise the system remains in its current state when this option is selected as 'Disable'.

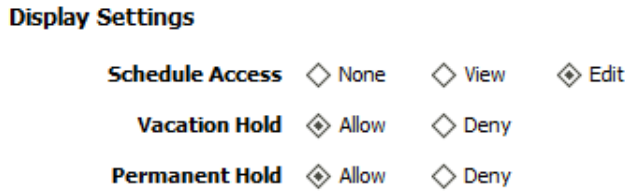
**System Block:** The System Block is hidden when the schedule model is in 'Setpoint Mode'. When the schedule model is in 'Occupancy Mode', it allows a user to switch between the available options. Selecting "Show Unoccupied/Off" places the controller in unoccupied state.

**Internal schedule:** It can be configured in both Occupancy Mode & Setpoint Mode. By default, 'Internal Schedule' is 'Disable'.

If the internal schedule is 'Disable', a user can adjust the setpoint (within setpoint limits).

## Display Settings

When a user selects, 'Two Periods' or 'Four Periods' options an additional 'Display Settings' appears as follows:

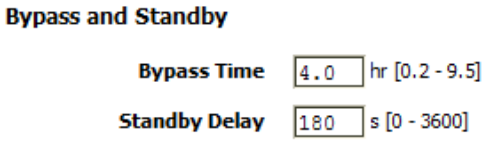



**Schedule Access:** When a user selects 'Edit', it allows a user to view and edit the schedule and when a user selects 'View', it allows a user to view the schedule. When a user selects 'None', it will not allow a user to view or edit the schedule.

**Vacation Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Vacation Hold".

**Permanent Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Permanent Hold".

## Bypass and Standby




**Bypass Time:** In the Unoccupied state, it forces the controller into the occupied state for up to 4 hours (default value). The override time limit is adjustable from a minimum of 0.2hours to a maximum of 9.5 hours.

**Standby Delay:** In Occupied Mode, if any window or door is opened and closed with no motion detected after the time mentioned for the Standby Delay, the room status switches to Standby state. The default value is 180 seconds.

## Zone Setpoints

Zone Setpoints , allows a user to set the following parameters as per the requirement:

1. Temperature Setpoints
2. Setpoint Limits
3. Standby Settings
4. Display Options

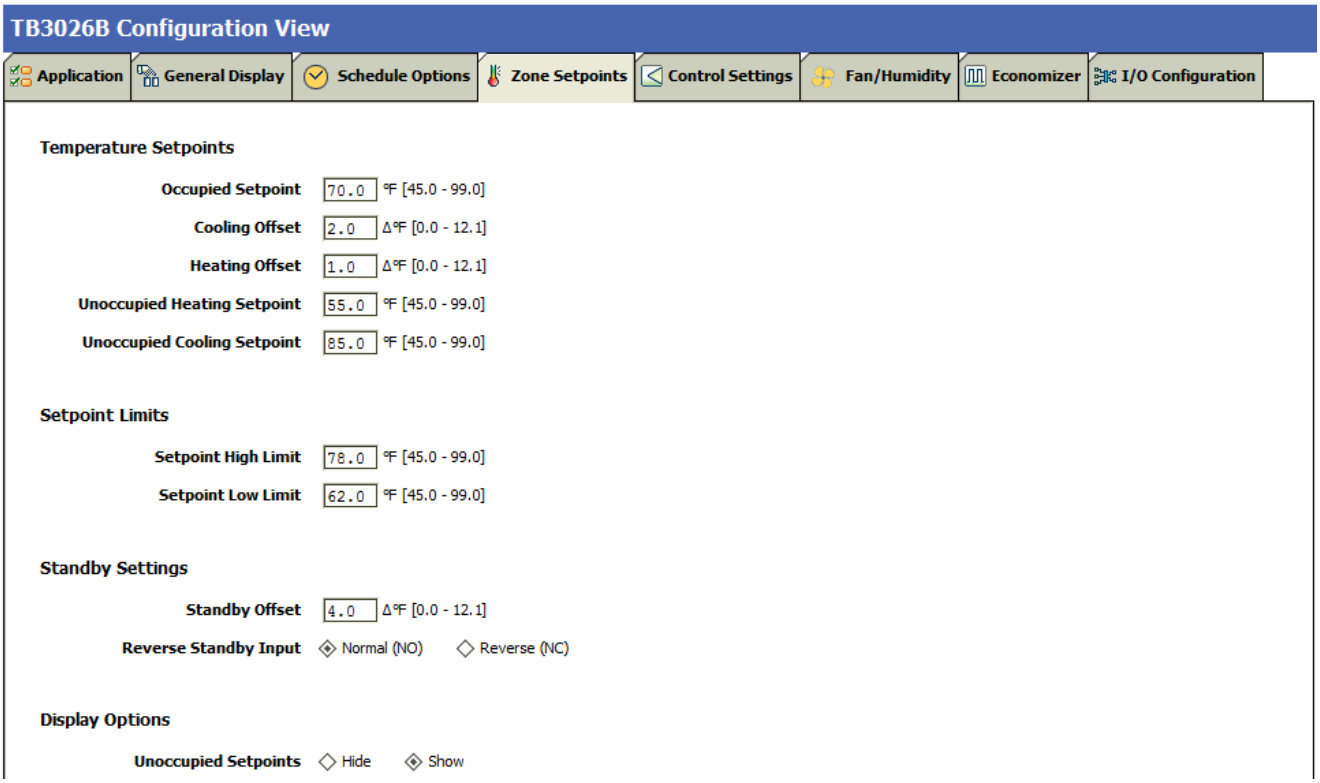
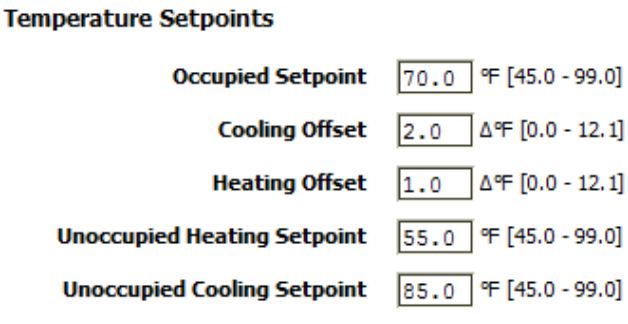



**Figure 56: Zone Setpoints Screen (Occupancy Mode)**

### Temperature Setpoints




**Occupied Setpoint:** It is a setpoint in Occupied Mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 70 ºF.

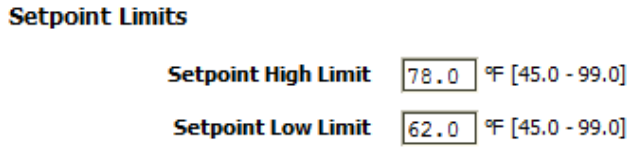
**Cooling Offset:** In the Occupied state, the cooling setpoint is calculated as cooling offset plus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 2 ΔºF.

**Heating Offset:** In the Occupied state, the heating setpoint is calculated as heating offset minus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 1 ΔºF.

**Unoccupied Heating Setpoint:** It is a setpoint for Heating in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 55 ºF.

**Unoccupied Cooling Setpoint:** It is a setpoint for Cooling in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 85 ºF.

## Setpoint Limits



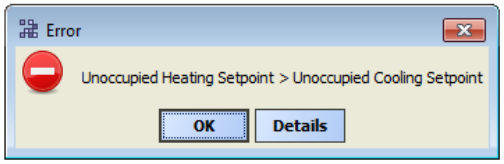

**Setpoint High Limit:** A user can enter a Setpoint High Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 78 ºF.

**Setpoint Low Limit:** A user can enter a Setpoint Low Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 62 ºF.

***Note:***

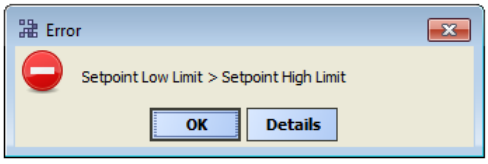
1. *Unoccupied Cooling Setpoint should always be set GREATER than Unoccupied Heating Setpoint.*

   *Following Error window appears if Unoccupied Cooling Setpoint is set lower than Unoccupied Heating Setpoint.*

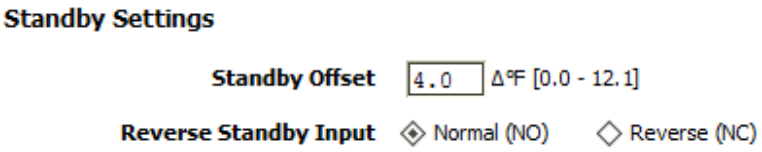



2. *Setpoint High Limit should always be set GREATER than Setpoint Low Limit.*

   *Following Error window appears if Setpoint High Limit is set lower than Setpoint low Limit.*




## Standby Settings

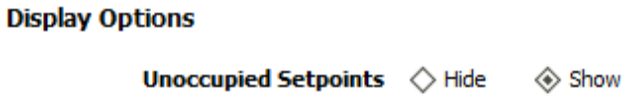



Standby state is a power-saving function of Occupancy mode. It occurs when the space is scheduled as Occupied, but sensors detect (When the Standby input is active) there are no humans in the space.

**Standby Offset:** In this case, the Standby Offset relaxes the occupied setpoints. The value of the Standby Offset [SO] can be set between a minimum of0ΔºF and a maximum of 12.1ΔºF degrees. The default value is 4 ΔºF.

**Reverse Standby Input:** It allows a user to configure two types of inputs, ‘Normally Open (NO)’ and ‘Normally Close (NC)’.

## Display Options




**Unoccupied Setpoints:** It allows a user to either 'Hide' or 'Show' the unoccupied setpoint.

**When a user selects Schedule Model under the 'Schedule Options' tab to 'Setpoint Mode', the 'Zone Setpoints' configuration window appears as follows:**

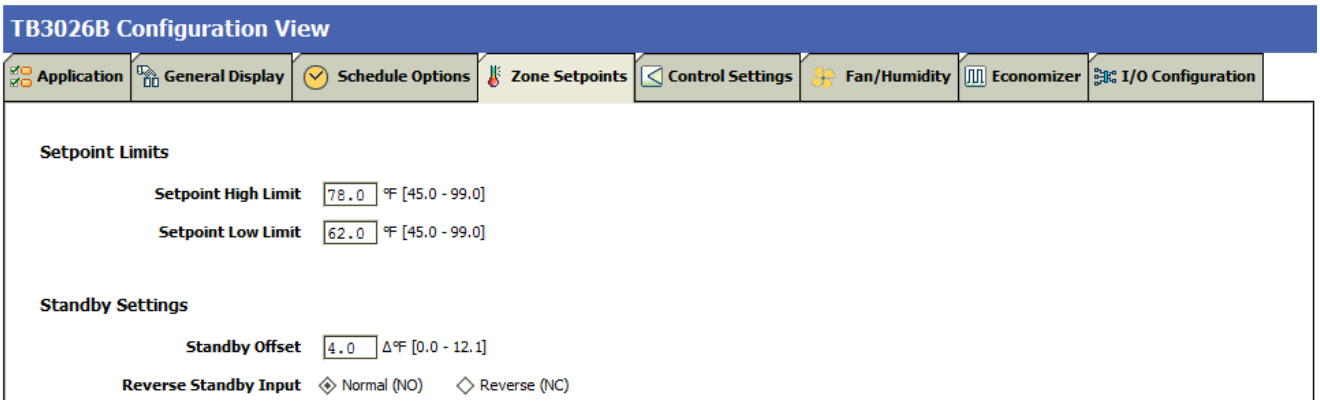



**Figure 57: Zone Setpoint Screen (Setpoint Mode)**

## Control Settings

'Control Settings' allows a user to configure following settings:

1. Cooling PI Control.
2. Heating PI Control.
3. Aux Staged Heating
4. Compressor Settings.

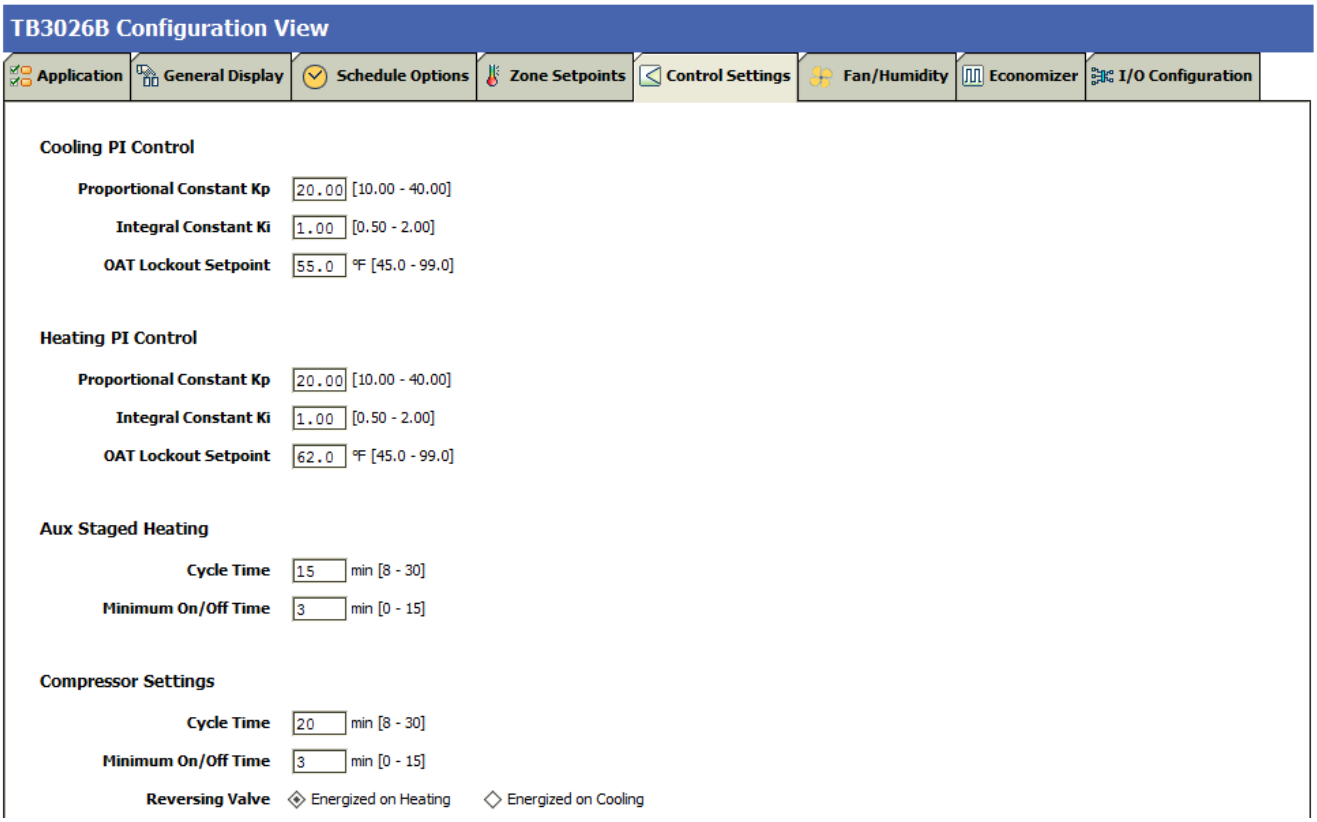



**Figure 58: Control Settings Screen (Water Source Heat Pump)**

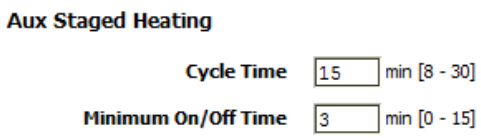
## Cooling PI Control

**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Cooling PI control will lockout when outside Temperature increases above OAT (Cooling) Lockout Setpoint. The default value is 55 ºF.

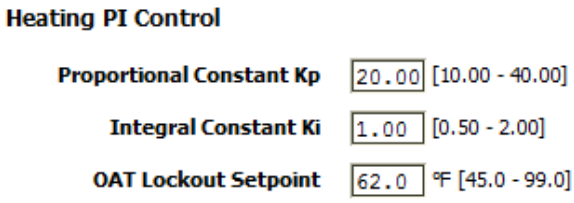
## Aux Staged Heating




**Cycle Time:** The Cycle Time ranges from minimum of 8 minutes, and a maximum of 30 minutes. The default value is 15 minutes.

**Minimum On/Off Time:** It is a minimum On/Off time for the Auxiliary Heating. The default value is 3 minutes.

## Heating PI Control

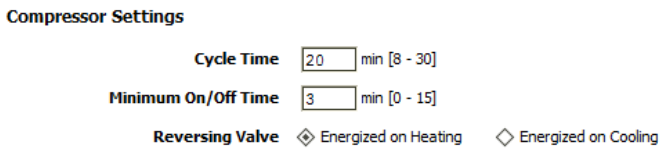



**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Heating PI control will lockout when outside Temperature decreases below OAT (Heating) Lockout Setpoint. The default value is 62 ºF.

## Compressor Settings




**Cycle Time:** The Compressor Cycle Time is adjustable; it ranges from minimum of 8 minutes, and a maximum of 30 minutes. The default value is 20 minutes.

**Minimum On/Off Time:** It is a minimum time for the compressor to stay On/Off. The default value is 3 minutes.

**Reversing Valve:** Depending upon heating/cooling demand, a user can Energize the Reversing Valve on Heating or Cooling.

## Fan / Humidity

'Fan / Humidity' allows a user to configure the following settings:

1. Fan Operation
2. Humidity Control
3. Filter Alarm

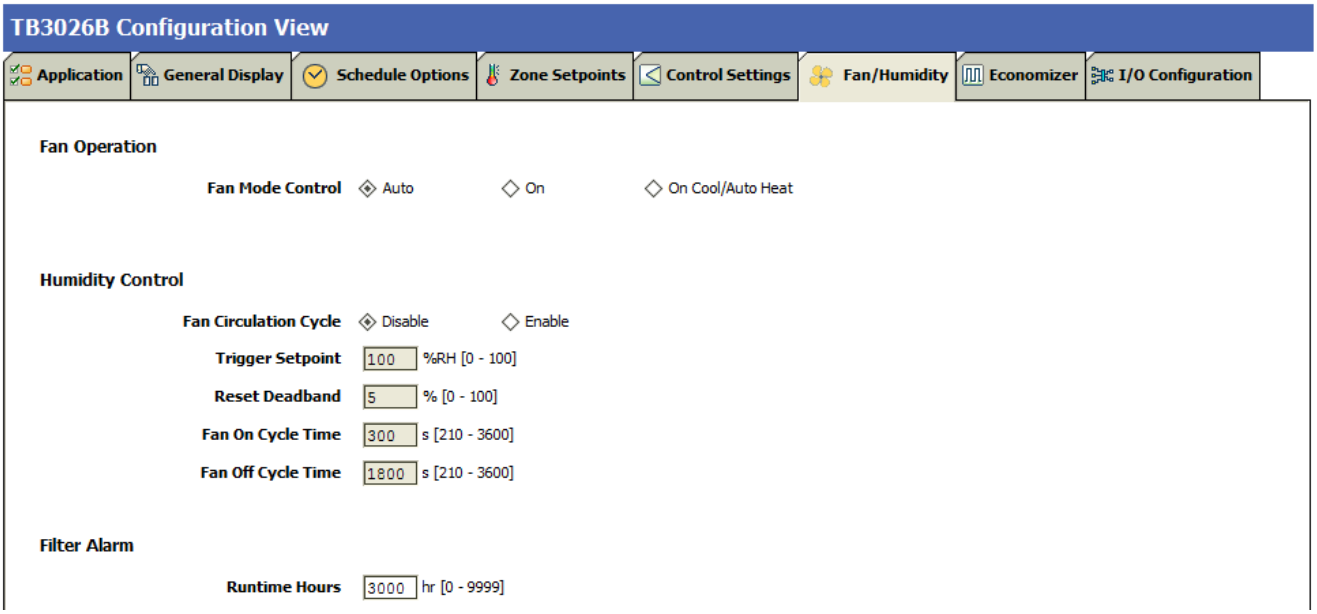
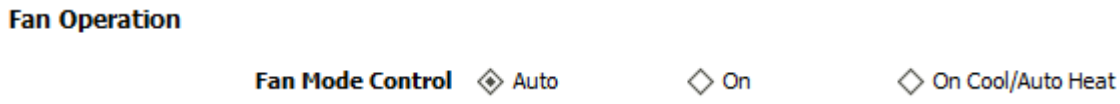



**Figure 59: Fan/Humidity Screen (Water Source Heat Pump)**

### Fan Operation

**Fan Mode Control:** During Setpoint Mode and Occupancy Mode, the fan can be configured to operate based on the selected Fan Mode Control as describe below;



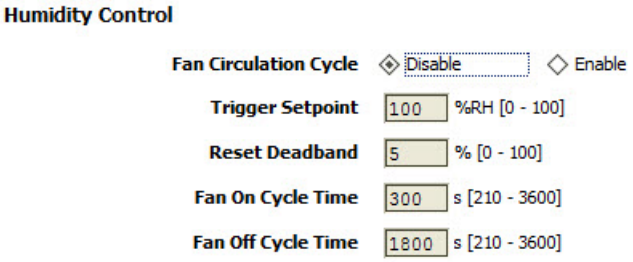

**Auto:** When this option is selected, Fan cycles ON when:

1. Cooling or heating is selected or
2. During Unoccupied mode only when called to run by cooling or heating demand.

**On:** When this option is selected the fan runs continuously for ventilation.

**On Cool/Auto Heat**: When this option is selected the fan runs continuously in cooling mode. In heating mode the fan cycles on only when the heating signal calls for the fan to run.

## Humidity Control



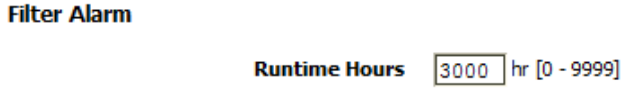

**Fan Circulation Cycle:** When a user selects the 'Enable' option from Fan Circulation Cycle, it allows a user to edit the Trigger Setpoint, Reset Deadband, and Fan On/Off Cycle Time.

**Trigger Setpoint & Reset Deadband:** When sensed humidity equals or exceeds humidity trigger setpoint, the fan cycles ON/OFF at low speed until sensed humidity drops below the trigger setpoint minus the reset deadband.

**Fan On Cycle Time:** This field allows a user to enter a time for fan ON cycle when stratification and humidity control is active. The default value is 300 seconds.

**Fan Off Cycle Time:** This field allows a user to enter a time for fan OFF cycle when stratification and humidity control is active. The default value is 1800 seconds.

## Filter Alarm




**Runtime Hours:** A filter alarm activates after the Runtime Hours mentioned in this field. The default value is 3000 hours.

## Economizer

Select Economizer from Configuration parameters. It is used to configure the economizer settings in BACnet FF controller

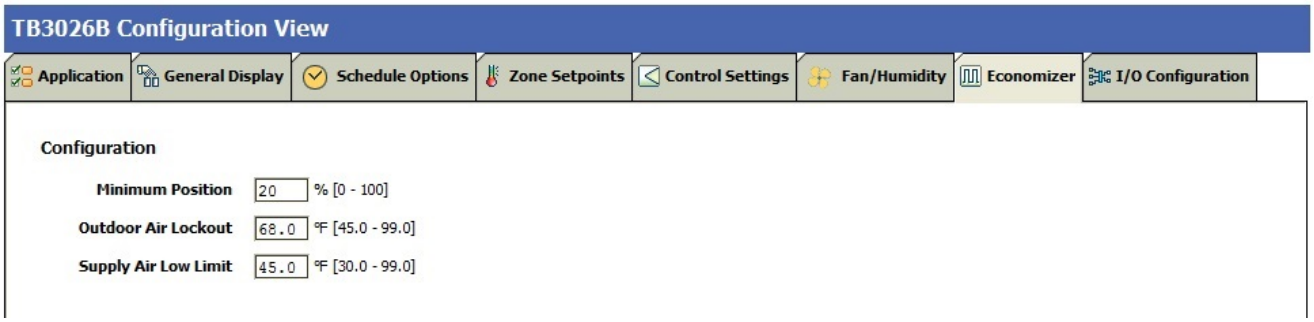



**Figure 60: Economizer Screen (Water Source Heat Pump)**

### Configuration

**Minimum Position:** When either the occupied command or the After-hours Timer is ON, the current minimum position is set to the specified Economizer Minimum Position; otherwise, it is zero. The default minimum position is 20%.

**Outside Air Lockout:** The economizer is forced to Minimum position when Outside Air Temperature goes above the Outside Air Lockout setpoint and when 'Schedule Model' is configured as 'Setpoint Mode'. The default value is 68º F.

**Supply Air Low Limit:** The economizer is forced to Minimum position when Supply Temperature goes below the Supply Air Low Limit and when Schedule Model is configured as "Setpoint Mode'. The default value is 45º F.

## I/O Configurations

Select I/O Configurations from Configuration parameters. This configuration is used for Terminal Assignment & Output Configuration.

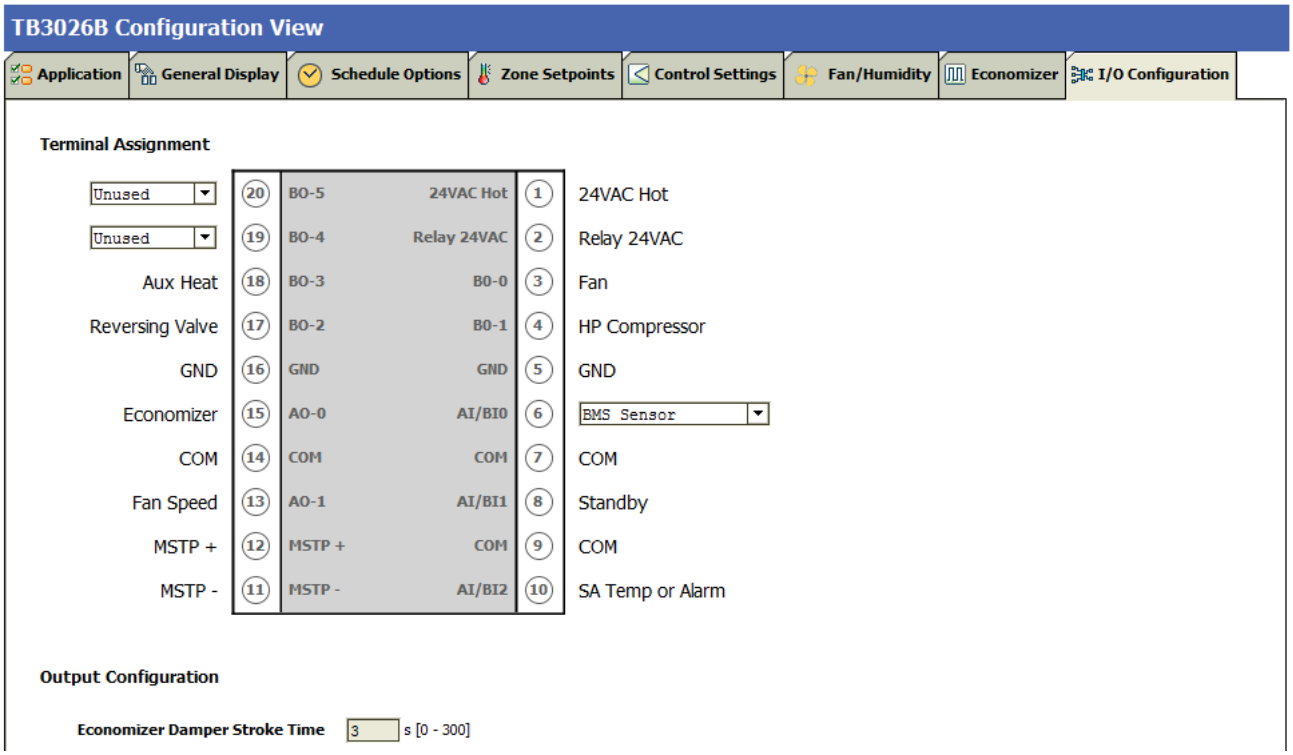



**Figure 61: I/O Configurations Screen (Water Source Heat Pump)**

### Terminal Assignment

After completing the 'Water Source Heat Pump' configuration, selected inputs and outputs get automatically assigned to the BACnet FF controller's input and output terminals. However, a user can assign the outputs as 'Economizer Open' & 'Economizer Close 'to BO-4 & BO-5 and inputs as 'BMS Sensor' or 'Remote Space Temp' or 'Outdoor Air Temp' to AI/BI0 respectively.

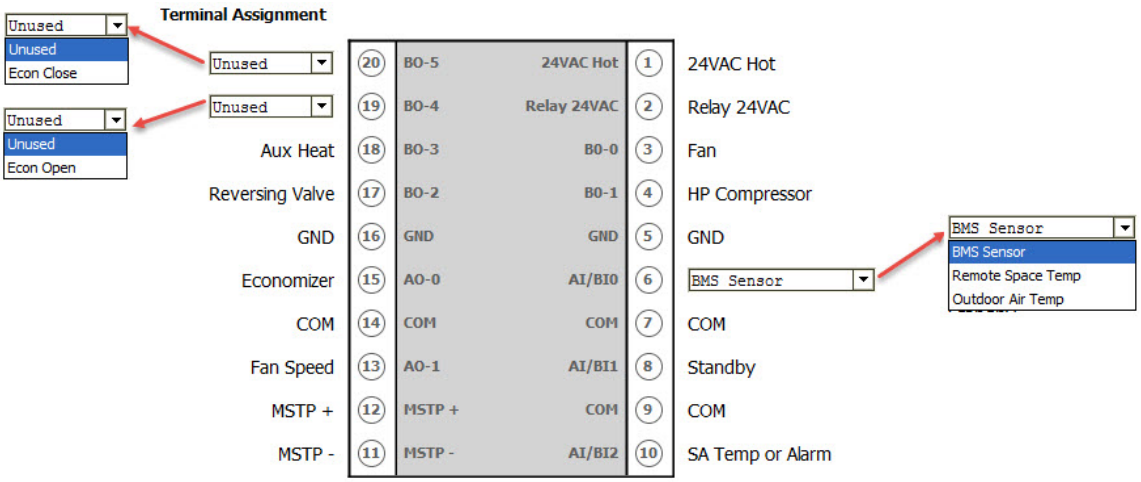



**Figure 62: Terminal Assignment View (Water Source Heat Pump)**

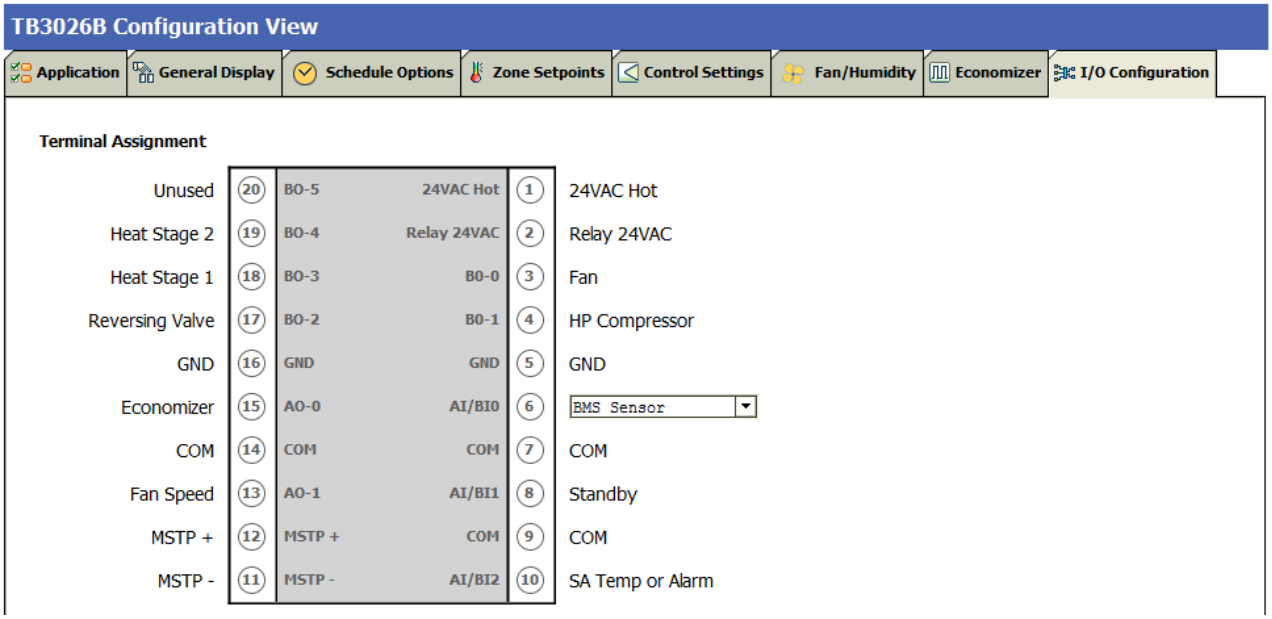
## Output Configuration

### Output Configuration

**Economizer Damper Stroke Time** 90 s [6 - 300]

When a user assigns the outputs, 'Economizer Open' and 'Economizer Close' to BO-4 and BO-5 respectively, 'Economizer Damper Stroke Time' can be mentioned in the field 'Output Configuration'. The default value is 90 seconds.

**When 'Output Stage' is selected as 'One Compressor Stage/Two Aux Heat Stages', the 'Terminal Assignment' view changes as follows:**



# Two Pipe Fan Coil Unit

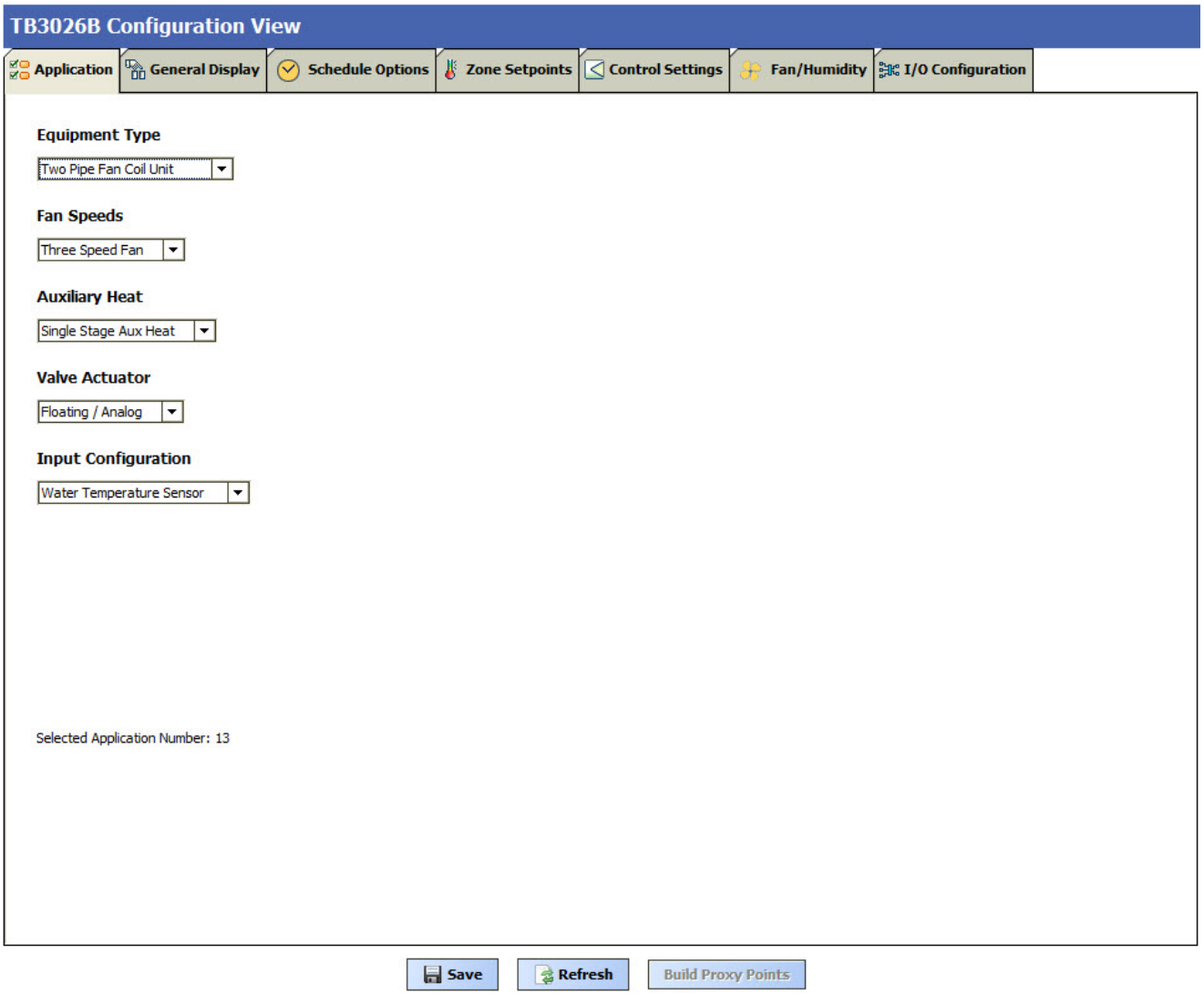
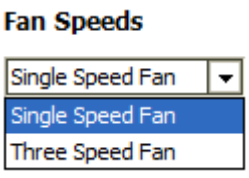



**Figure 63: Two Pipe Fan Coil Unit Window**

## Fan Speeds

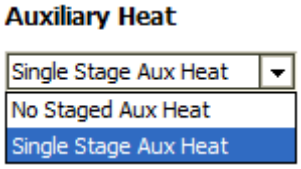
A user can select Two types of 'Fan Speeds' when the output stage is configured as 'One Compressor Stage and One Aux Heat Stage'.

1. Single Speed Fan
2. Three Speed Fan



### Auxiliary Heat

A user can select heating stages from the following options:

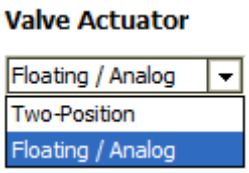



**No Stage Aux Heat:** If auxiliary heating is not required in the system, select this option.

**Single Stage Aux Heat:** For single auxiliary heating stage, select this option.

| | |
|---|---|
| | ***Note:*** |
| *The Auxilliary heat can be selected as 'No Stage Aux Heat' or 'Single Stage Aux Heat' only when Three Speed Fan is configured.* | |

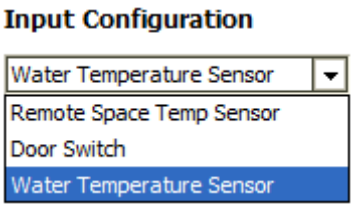
### Valve Actuator




Valve actuator can be configured as 'Two-Position' or 'Floating/Analog' based on application.

| | |
|---|---|
| | ***Note:*** |
| *The valve actuator can be selected as 'Two-Position' or 'Floating/Analog' only when 'Three Speed Fan' is configured.* | |

### Input Configuration




Input Configuration can be configured as 'Remote Space Temp Sensor' or 'Door Switch' or 'Water Temperature Sensor' based on application.

## General Display

Click 'General Display' to view the general display settings. The following parameters are used to configure the controller's display settings.

1. Engineering Units
2. Time Functions
3. Display
4. Contractor Access Codes

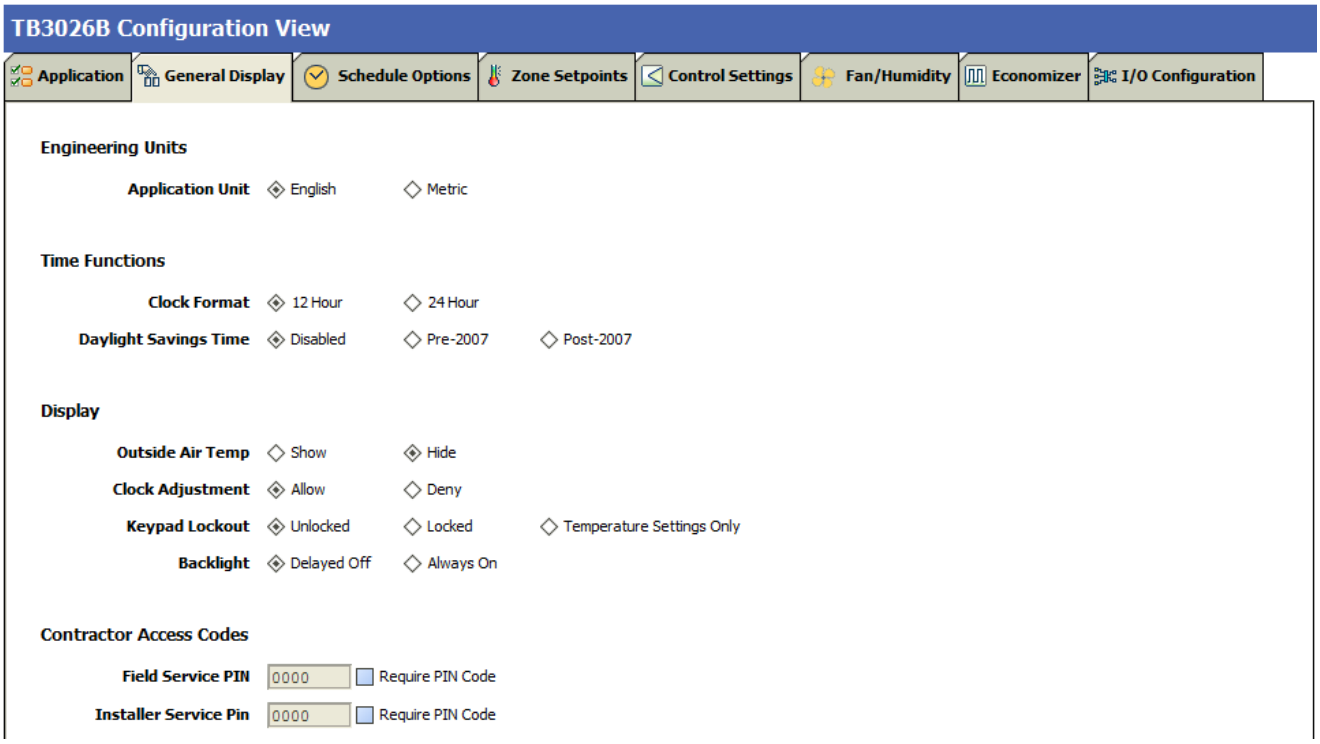
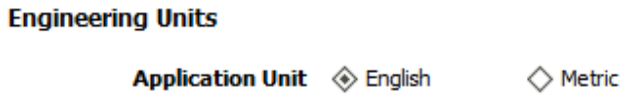


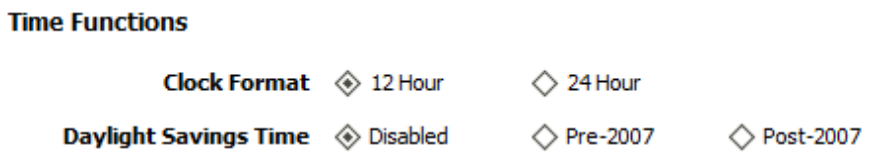

**Figure 64: General Display Screen (Two Pipe Fan Coil Unit)**

### Engineering Units




**Application Unit:** The application units contain two options to change the controller's units. By default, the controller's application units are set to 'English'. Application Unit can be changed to 'English' or 'Metric'.

## Time Function

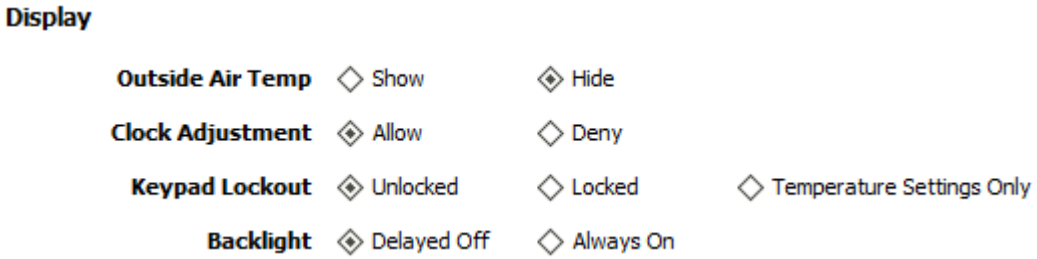



**Clock Format:** A user can select a clock format as 12-hour format or 24-hour format.

**Daylight Savings Time:** This feature enables to select the Daylight Savings Time settings. By default, Daylight Savings Time is set to 'Disabled'. Daylight Savings Time can be changed to 'Pre-2007' or 'Post-2007'.

## Display

This feature allows a user to select the Display settings.




**Outside Air Temp:** A user has an option to hide/show an outside air temperature.

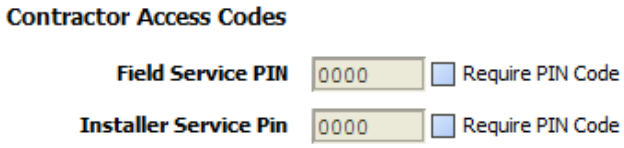
**Clock Adjustment:** This option allows a user to enable/disable the clock adjustment on the controller display.

**Keypad Lockout:** This option allows a user to lock/unlock the clock adjustment.

When an option, 'Temperature Settings Only' is selected, a user can only set the temperature through keypad.

**Backlight:** A user can keep the backlight always on or set to delayed off through this option.

## Contractor Access Codes

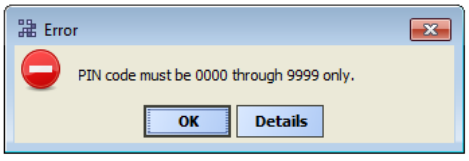



An access to the controller can be restricted with the help of Access Codes.

Field Service Pin and Installer Service Pin can be set. These codes should be enabled to restrict an access to the controller.

***Note:***

*A user can set only numerical PIN code for 'Field Service Pin' and 'Installer Service Pin'. PIN codes should be set within 0000 – 9999. The following Error Window pops up if this field is left blank after selecting.*



## Schedule Options

'Schedule' tab displays Schedule options.
The following parameters are used to configure the schedule options (i.e. Occupancy Configuration and Bypass and Standby)

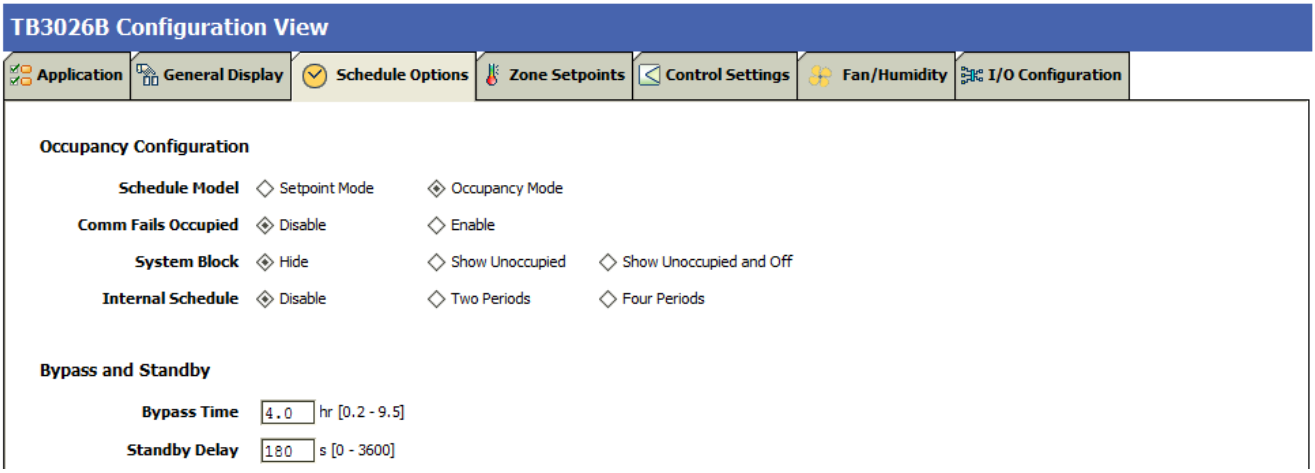



**Figure 65: Schedule Options Screen (Two Pipe Fan Coil Unit)**

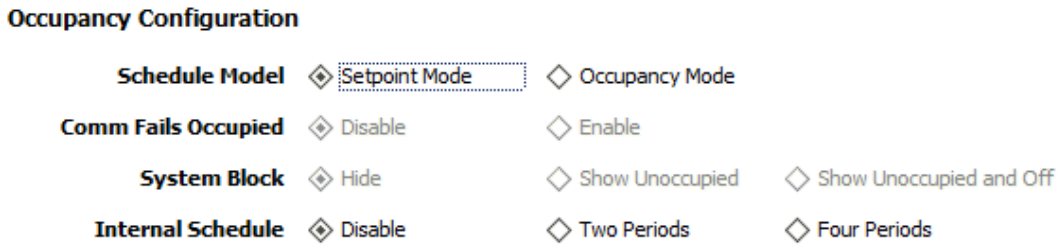
### Occupancy Configuration

**Schedule Model:** A user can set the device's schedule model as;

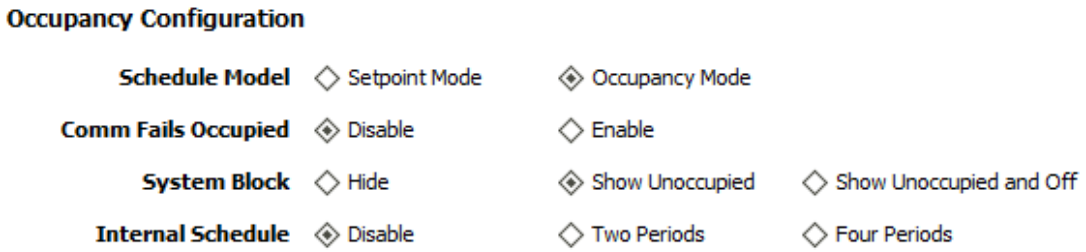
1. Setpoint Mode or
2. Occupancy Mode

**Setpoint Mode:** In setpoint mode, the controller logically emulates residential thermostats. The space temperature is controlled to "SP Mode Cooling SP" and "SP Mode Heating SP". Each schedule period consists of a start time, a heating setpoint, and a cooling setpoint.

**If a user selects 'Setpoint Mode' from the available 'Schedule Model', the fields for 'Comm Fails Occupied' and 'System Block' settings become disabled.**




**Occupancy Mode:** By default, 'Schedule Model' is in 'Occupancy Mode'. The system will be switched to 'Occupied Mode' when the occupancy sensor detects occupancy. Occupied Mode allows a user to configure 'Comm Fails Occupied', 'System Block' & 'Internal Schedule' settings.




**Comm Fails Occupied:** It allows a user to switch the system in Occupied Mode in case of MS/TP communication failure. If the MS/TP communication fails, the system enters into Occupied Mode when this option is selected as 'Enable', otherwise the system remains in its current state when this option is selected as 'Disable'.

**System Block:** The System Block is hidden when the schedule model is in 'Setpoint Mode'. When the schedule model is in 'Occupancy Mode', it allows a user to switch between the available options. Selecting "Show Unoccupied/Off" places the controller in unoccupied state.

**Internal schedule:** It can be configured in both Occupancy Mode & Setpoint Mode. By default, 'Internal Schedule' is 'Disable'.

If the internal schedule is 'Disable', a user can adjust the setpoint (within setpoint limits).

## Display Settings

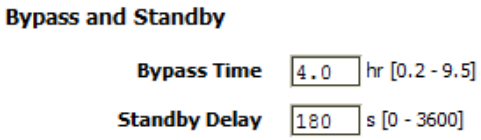
When a user selects, 'Two Periods' or 'Four Periods' options an additional 'Display Settings' appears as follows:

**Schedule Access:** When a user selects 'Edit', it allows a user to view and edit the schedule and when a user selects 'View', it allows a user to view the schedule. When a user selects 'None', it will not allow a user to view or edit the schedule.

**Vacation Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Vacation Hold".

**Permanent Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Permanent Hold".

## Bypass and Standby




**Bypass Time:** In the Unoccupied state, it forces the controller into the occupied state for up to 4 hours (default value). The override time limit is adjustable from a minimum of 0.2 hours to a maximum of 9.5 hours.

**Standby Delay:** In Occupied Mode, if any window or door is opened and closed with no motion detected after the time mentioned for the Standby Delay, the room status switches to Standby state. The default value is 180 seconds.

## Zone Setpoints

Zone Setpoints , allows a user to set the following parameters as per the requirement:

1. Temperature Setpoints
2. Setpoint Limits
3. Standby Settings
4. Display Options

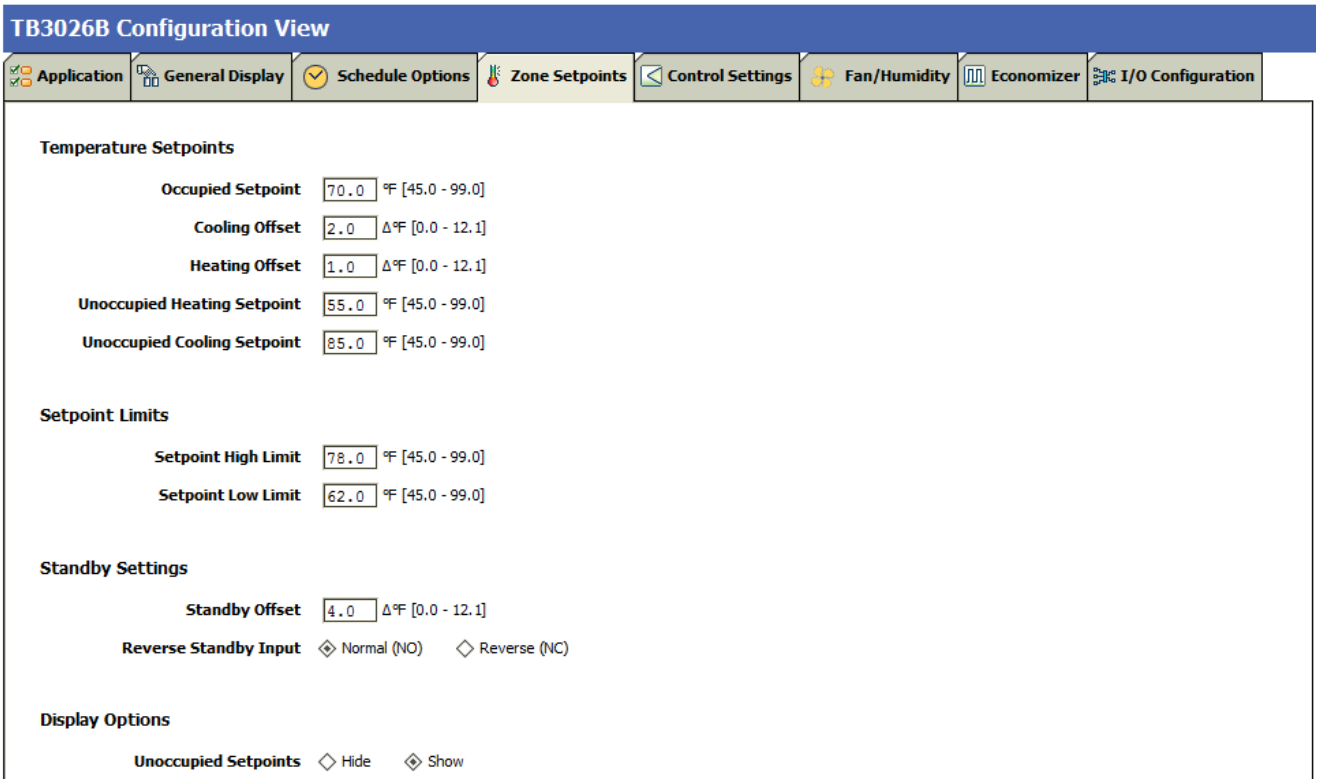
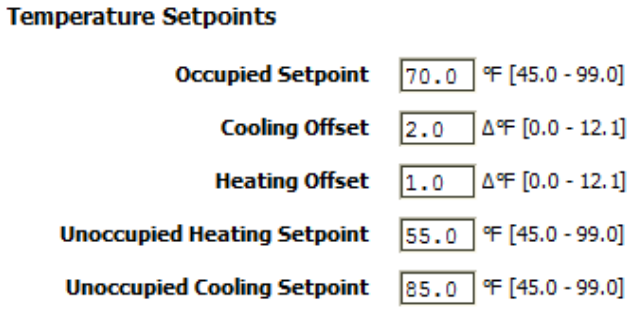



**Figure 66: Zone Setpoints Screen (Occupancy Mode)**

### Temperature Setpoints




**Occupied Setpoint:** It is a setpoint in Occupied Mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 70ºF.

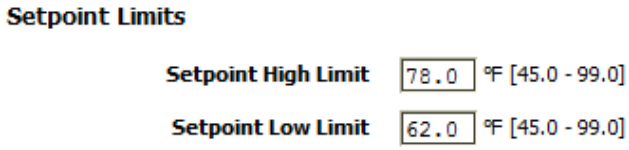
**Cooling Offset:** In the Occupied state, the cooling setpoint is calculated as cooling offset plus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 2 ΔºF.

**Heating Offset:** In the Occupied state, the heating setpoint is calculated as heating offset minus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 1 ΔºF.

**Unoccupied Heating Setpoint:** It is a setpoint for Heating in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 55 ºF.

**Unoccupied Cooling Setpoint:** It is a setpoint for Cooling in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 85 ºF.

## Setpoint Limits



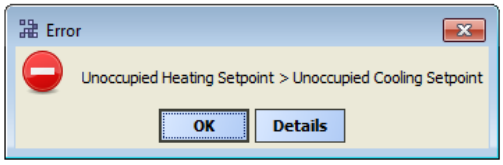

**Setpoint High Limit:** A user can enter a Setpoint High Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 78ºF.

**Setpoint Low Limit:** A user can enter a Setpoint Low Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 62ºF.

***Note:***

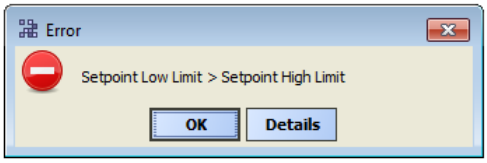
1. *Unoccupied Cooling Setpoint should always be set GREATER than Unoccupied Heating Setpoint.*

   *Following Error window appears if Unoccupied Cooling Setpoint is set lower than Unoccupied Heating Setpoint.*

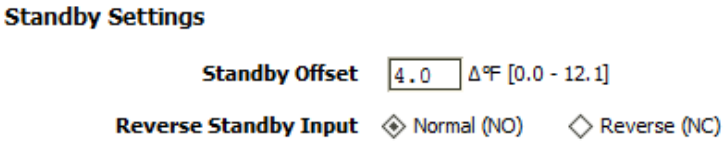



2. *Setpoint High Limit should always be set GREATER than Setpoint Low Limit.*

   *Following Error window appears if Setpoint High Limit is set lower than Setpoint low Limit.*




## Standby Settings

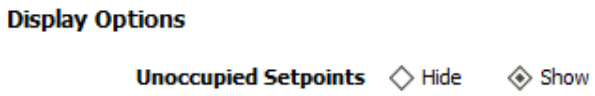



Standby state is a power-saving function of Occupancy mode. It occurs when the space is scheduled as Occupied, but sensors detect (When the Standby input is active) there are no humans in the space.

**Standby Offset:** In this case, the Standby Offset relaxes the occupied setpoints. The value of the Standby Offset [SO] can be set between a minimum of 0 ΔºF and a maximum of 12.1 ΔºF degrees. The default value is 4 ΔºF.

**Reverse Standby Input:** It allows a user to configure two types of inputs, 'Normally Open (NO)' and 'Normally Close (NC)'.

## Display Options




**Unoccupied Setpoints:** It allows a user to either 'Hide' or 'Show' the unoccupied setpoint.

**When a user selects Schedule Model under the 'Schedule Options' tab to 'Setpoint Mode', the 'Zone Setpoints' configuration window appears as follows:**

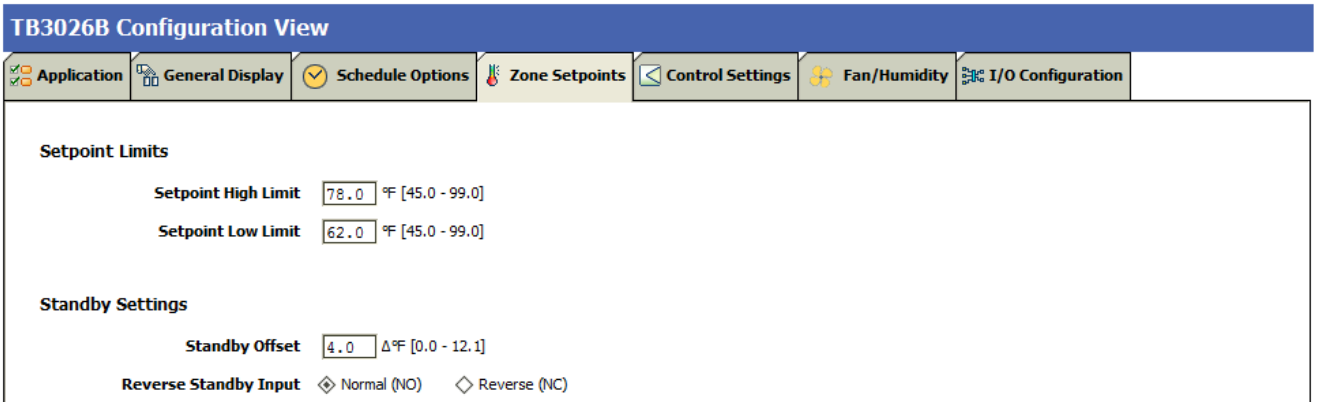



**Figure 67: Zone Setpoint Screen (Setpoint Mode)**

## Control Settings

'Control Settings' allows a user to configure following settings:

1. Cooling PI Control
2. Heating PI Control
3. Aux Staged Heating
4. FCU Configuration

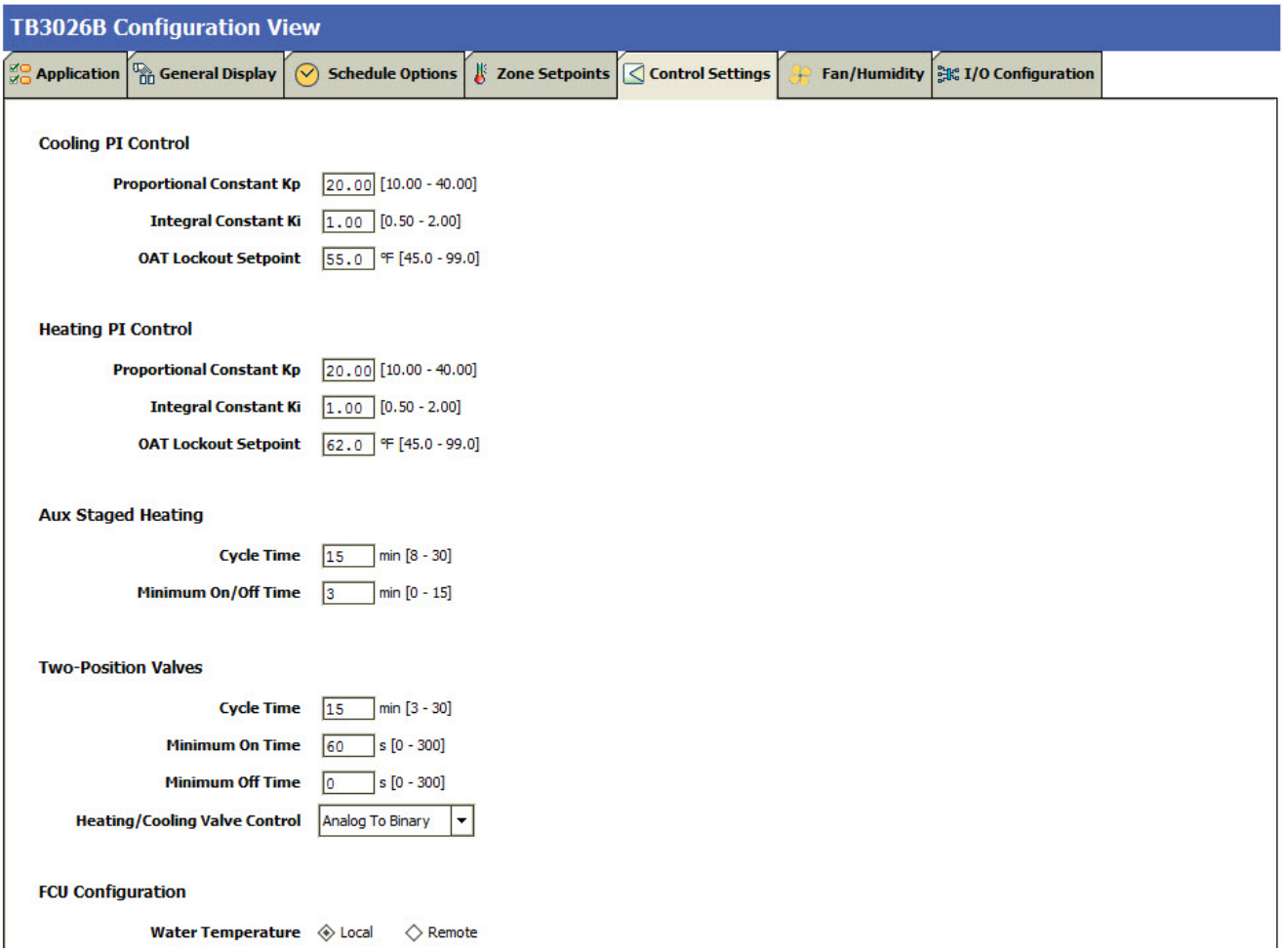
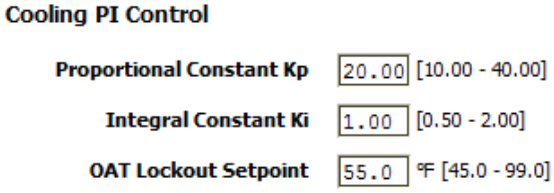



**Figure 68: Control Settings Screen (Two Pipe Fan Coil Unit)**

### Cooling PI Control

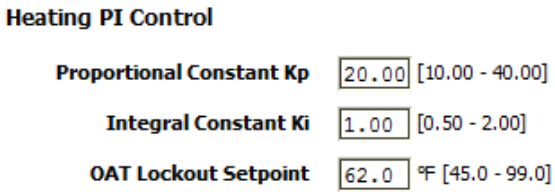



**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Cooling PI control will lockout when outside Temperature decreases below OAT (Cooling) Lockout Setpoint. The default value is 55 ºF.

## Heating PI Control



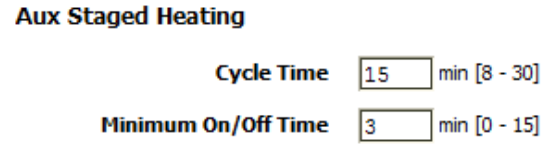

**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Heating PI control will lockout when outside Temperature increases above OAT (Heating) Lockout Setpoint. The default value is 62 ºF.

## Aux Staged Heating

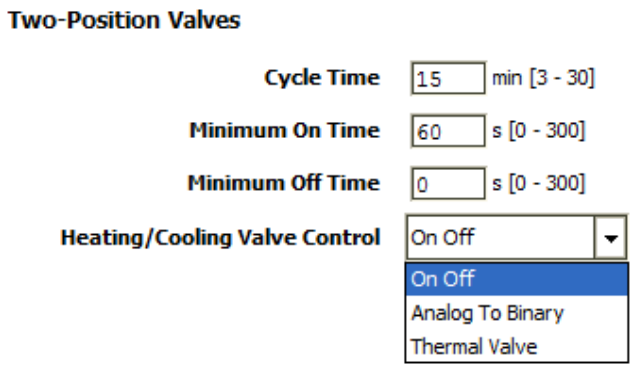
A user can configure the Cycle Time & Minimum On/Off Time when a 'Single Stage Auxiliary Heat' is selected in the application.




**Cycle Time:** The Cycle Time ranges from minimum of 8 minutes, and a maximum of 30 minutes. The default value is 15 minutes.

**Minimum On/Off Time:** It is a minimum On/Off time for the Auxiliary Heating. The default value is 3 minutes.

## Two-Position Valves




**Cycle Time:** Two-Position Valve cycle time ranges from minimum of 3 minutes, and a maximum of 30 minutes. The default value is 15 minutes.

**Minimum On Time**: It is a minimum time for the compressor to stay On.

**Minimum Off Time:** It is a minimum time for the compressor to stay Off.

**Heating/Cooling Valve Control:** Physical heating/cooling valve control has three options

**On Off:** This option selects the opening and closing of Heating valve.

**Analog To Binary:** In this mode the valve is remains open for Cycle Time.

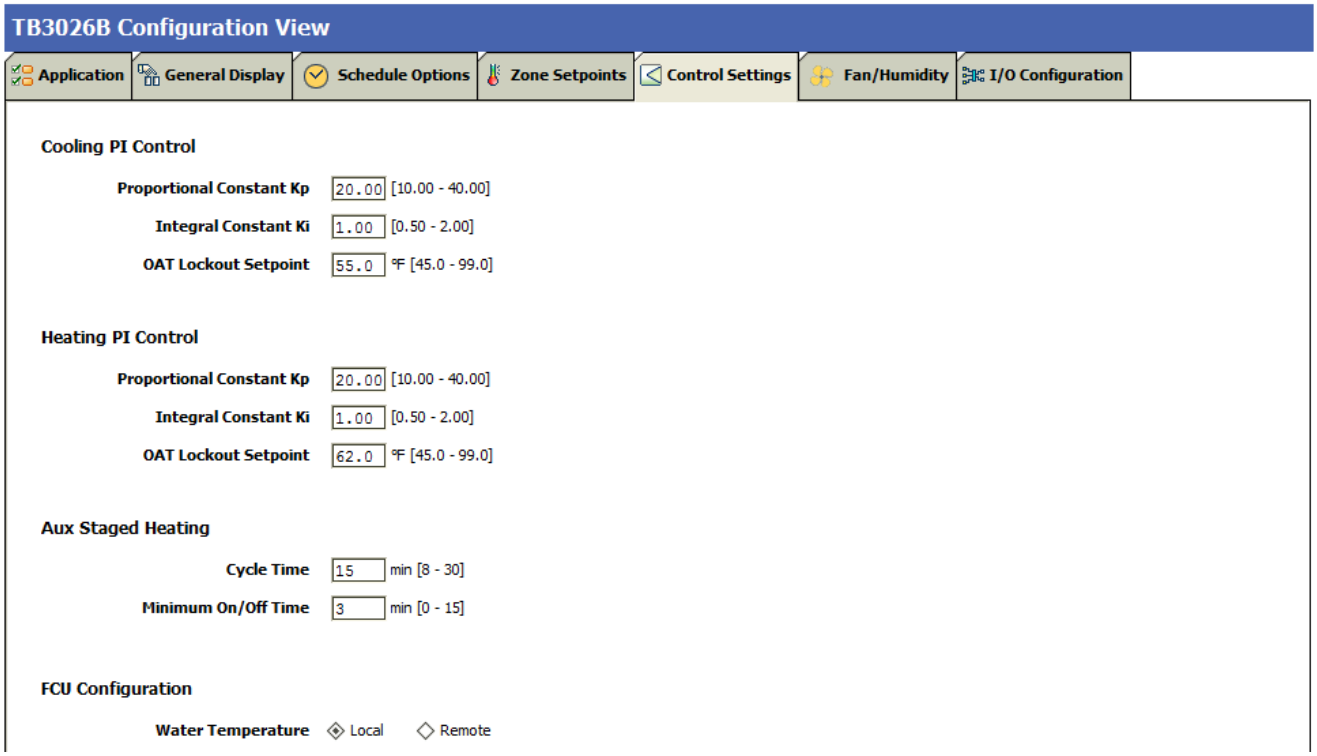
**Thermal valve:** This option allows a user to select a Thermal valve for Heating/Cooling Valve Control.

## FCU Configuration

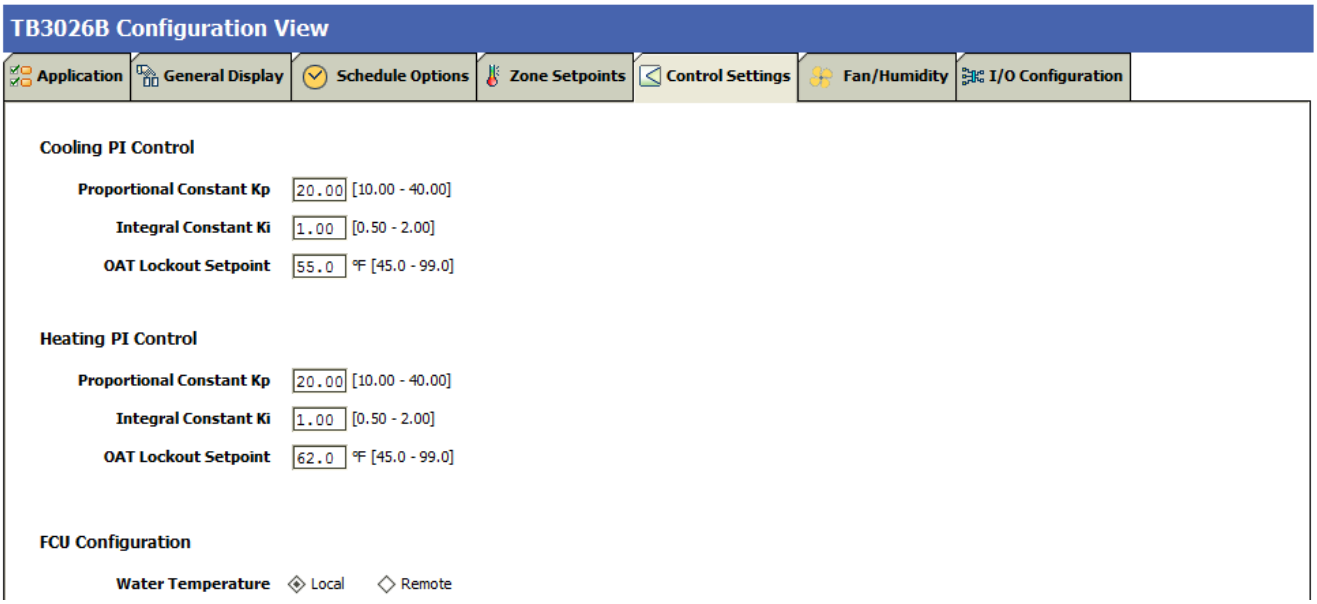
A user can configure the Water Temperature when 'Floating/Analog' valve actuator is selected in the application.

**Water Temperature:** The water temperature can be monitored either by local or by remote entity (default inactive, 'Local Mode').

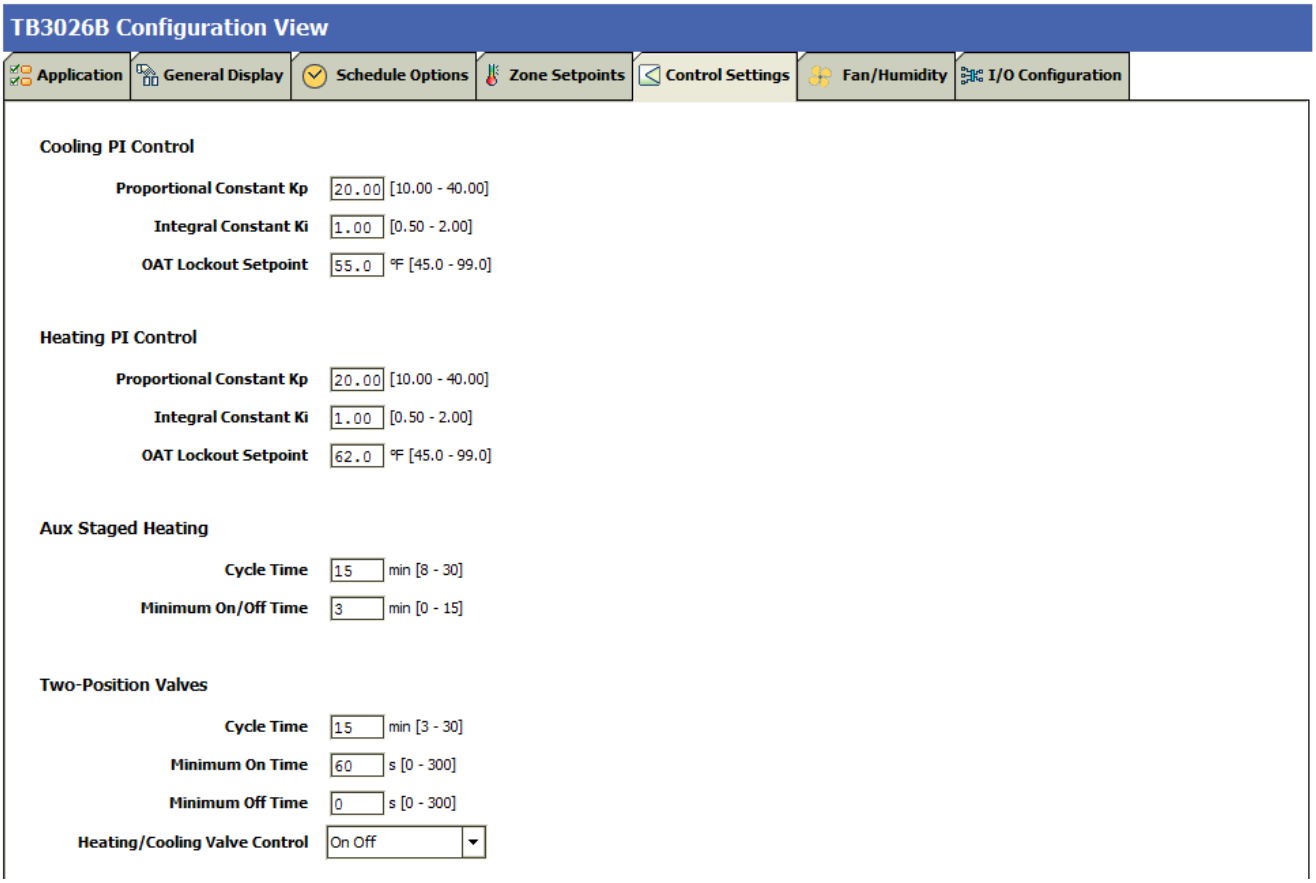
**When 'Fan Speeds' is selected as 'Three Speed Fan', the 'Control Settings' view changes as follows:**




**When 'Auxiliary Heat' is selected as 'No Stage Aux heat', the 'Control Settings' view changes as follows:**



**When 'Valve Actuator' is selected as 'Two-Position', the 'Control Settings' view changes as follows:**



## Fan / Humidity

'Fan / Humidity' allows a user to configure the following settings:

1. Fan Operation
2. Humidity Control
3. Filter Alarm

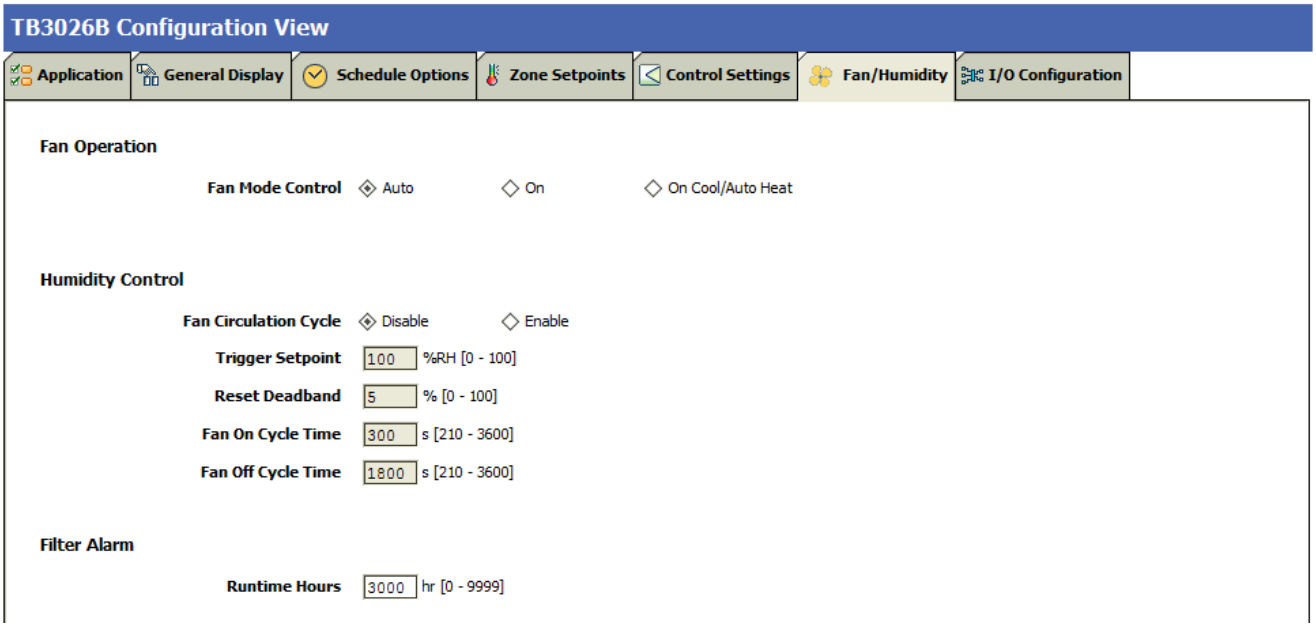
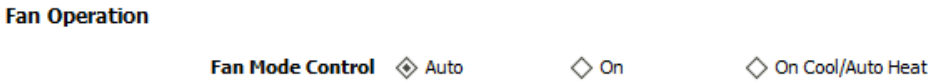



**Figure 69: Fan/Humidity Screen (Two Pipe Fan Coil Unit)**

### Fan Operation

**Fan Mode Control:** During occupancy & Setpoint mode, the fan operates based on the selected fan control modes.

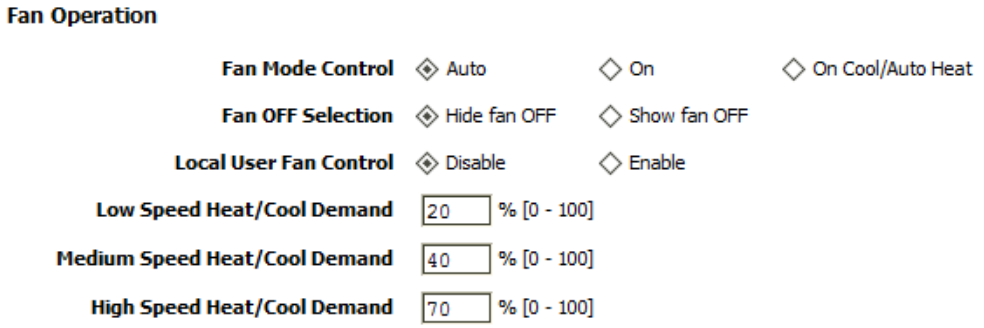



**Auto:** When this option is selected, Fan cycles ON when:

1. Cooling or heating is selected or
2. During Unoccupied mode only when called to run by cooling or heating demand.

**On:** When this option is selected the fan runs continuously for ventilation.

**When a user selects 'Three Speed Fan' in the application, the 'Fan Operation' parameter appears as follows:**




**Auto:** When this option is selected, Fan cycles ON when:

1. Cooling or heating is selected or
2. During Unoccupied mode only when called to run by cooling or heating demand.

**On:** When this option is selected the fan runs continuously for ventilation.

**On Cool/Auto Heat**: When this option is selected the fan runs continuously in cooling mode. In heating mode the fan cycles on only when the heating signal calls for the fan to run.

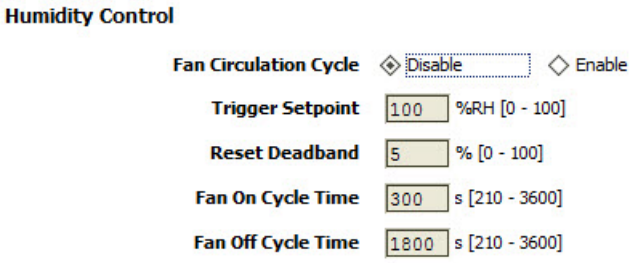
**Local User Fan Control:** This selection allows a user to enable/disable the fan Control to local user.

**Low Speed Heat/Cool Demand:** This field allows a user to set the Heating/Cooling demand limits for the Low Speed Fan.

**Medium Speed Heat/Cool Demand:** This field allows a user to set the Heating/Cooling demand limits for the Medium Speed Fan.

**High Speed Heat/Cool Demand:** This field allows a user to set the Heating/Cooling demand limits for the High Speed Fan.

**Humidity Control**



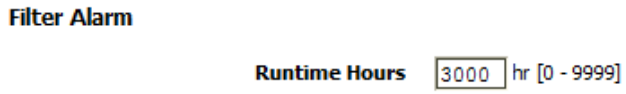

**Fan Circulation Cycle:** When a user selects the 'Enable' option from Fan Circulation Cycle, it allows a user to edit the Trigger Setpoint, Reset Deadband, and Fan On/Off Cycle Time.

**Trigger Setpoint & Reset Deadband:** When sensed humidity equals or exceeds humidity trigger setpoint, the fan cycles ON/OFF at low speed until sensed humidity drops below the trigger setpoint minus the reset deadband.

**Fan On Cycle Time:** This field allows a user to enter a time for fan ON cycle when stratification and humidity control is active. The default value is 300 seconds.

**Fan Off Cycle Time:** This field allows a user to enter a time for fan OFF cycle when stratification and humidity control is active. The default value is 1800 seconds.

## Filter Alarm




**Runtime Hours:** A filter alarm activates after the Runtime Hours mentioned in this field. The default value is 3000 hours.

## I/O Configurations

Select I/O Configurations from Configuration parameters. This configuration is used for Terminal Assignment & Output Configuration.

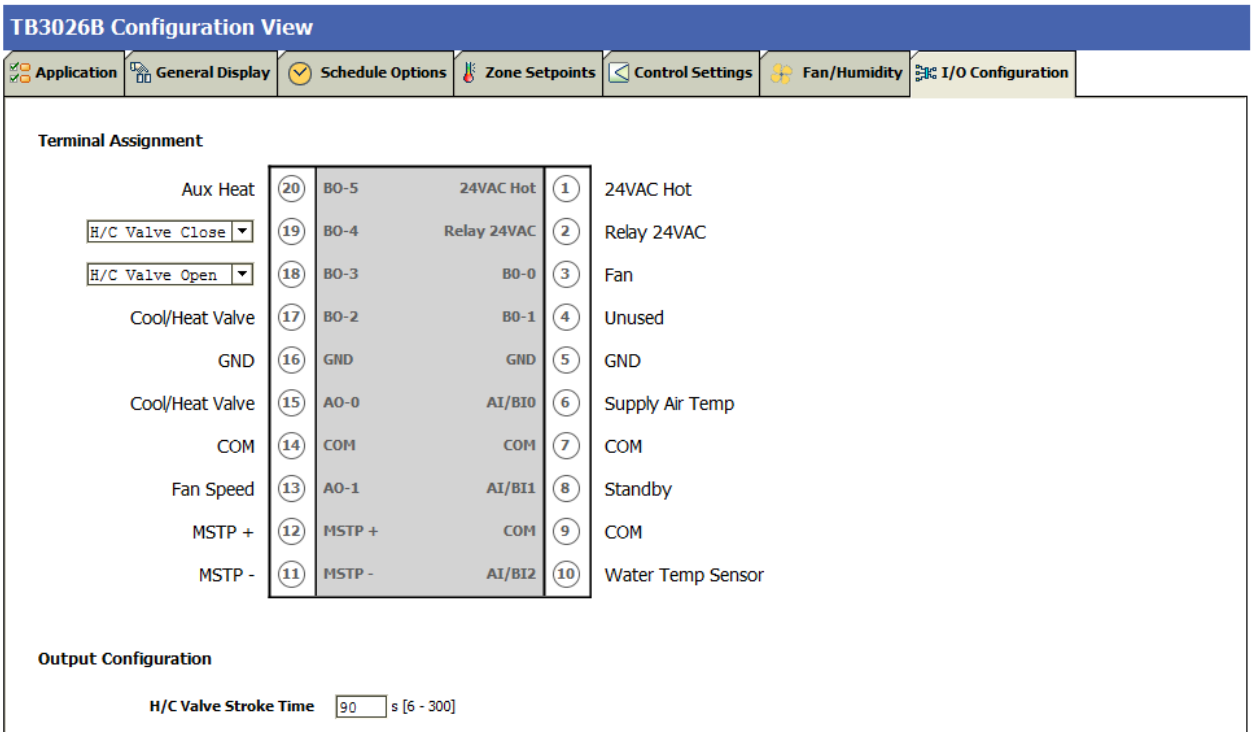



**Figure 70: I/O Configurations Screen (Two Pipe Fan Coil Unit)**

### Terminal Assignment

After completing the 'Two Pipe Fan Coil Unit' configuration, selected inputs and outputs get automatically assigned to the BACnet FF controller's input and output terminals. A user can assign the outputs as 'Heating/Cooling Valve Close' & 'Heating/Cooling Valve Open' to BO-4 & BO-3 respectively.

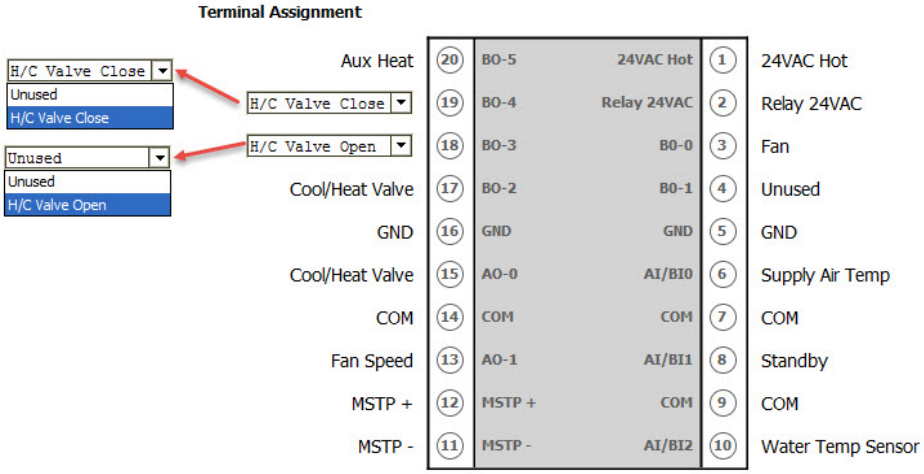
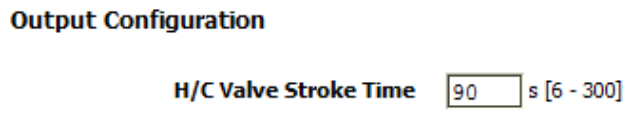


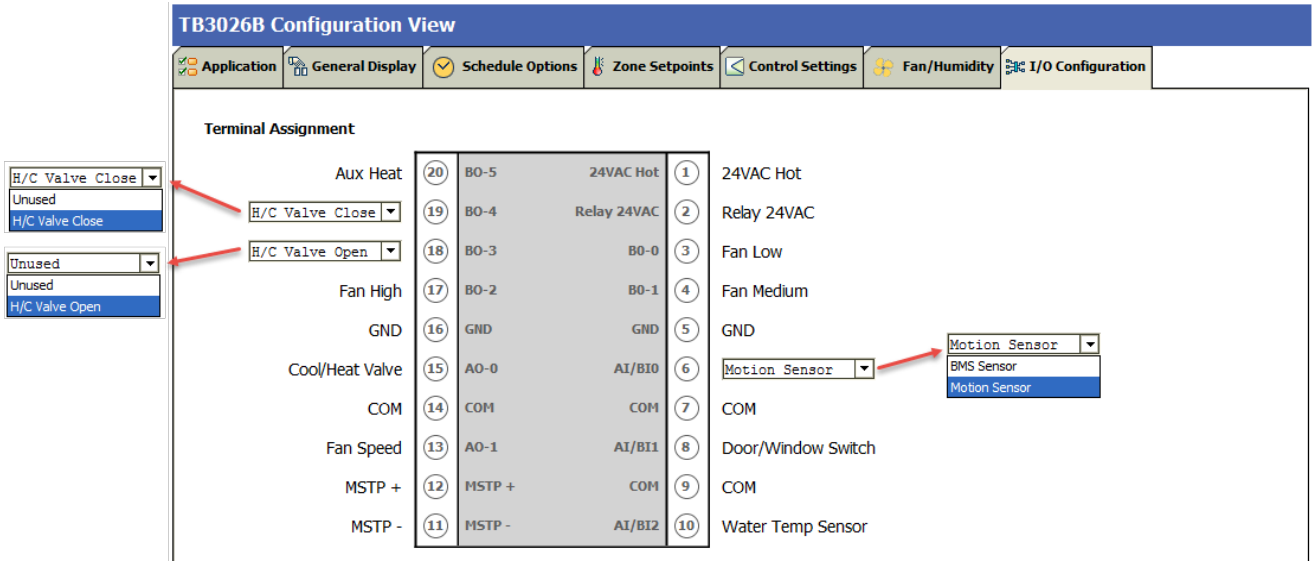

**Figure 71: Terminal Assignment View (Single Speed Fan)**

## Output Configuration

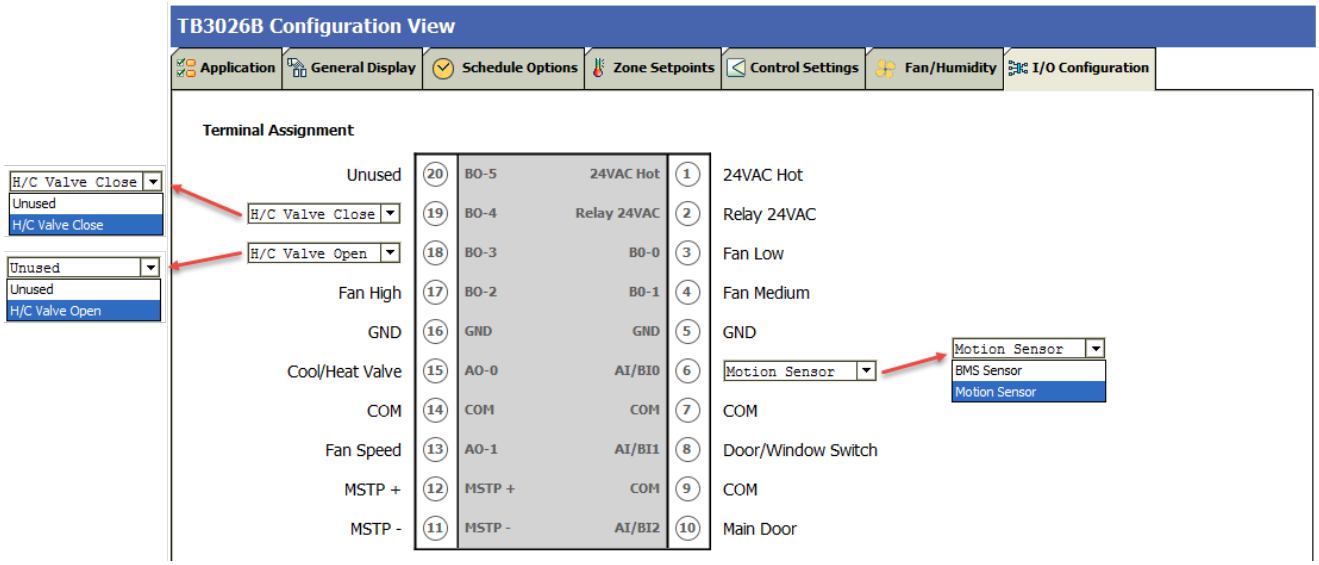



**H/C Valve Stroke Time:** This setting is available to configure, when 'Floating/ Analog' 'Valve Actuator is selected.

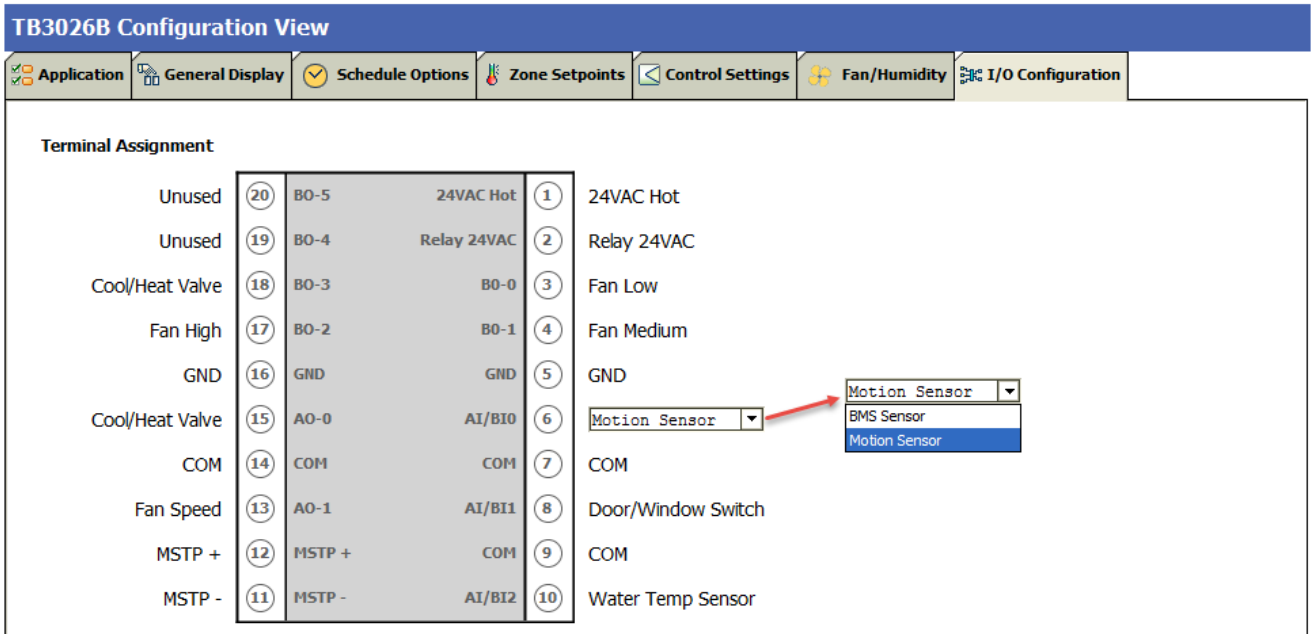
**When 'Three Speed Fan' is configured with 'Single Stage Aux Heat', the 'Terminal Assignment' view changes as follows:**



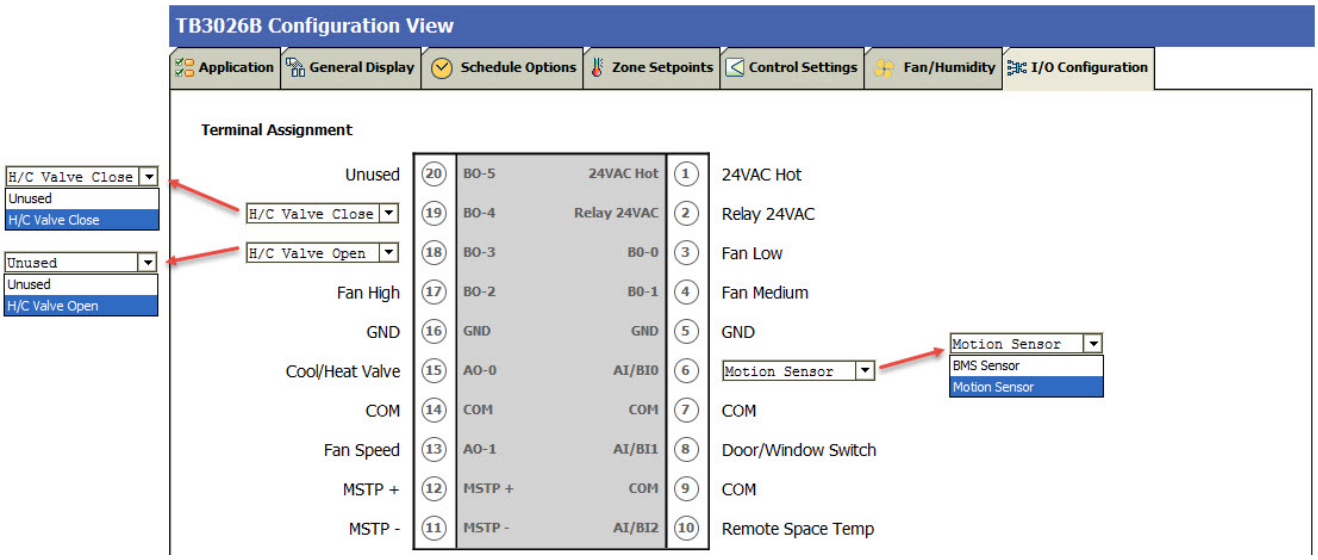

**When 'No Stage Aux Heat' is configured with 'Floating/Analog' valve actuator, 'Three Speed Fan' and 'Door Switch', the 'Terminal Assignment' view changes as follows:**



**When 'No Stage Aux Heat' is configured with 'Two-Position' valve actuator, 'Three Speed Fan' and 'Water Temperature Sensor', the 'Terminal Assignment' view changes as follows:**




**When 'Input Configuration is selected as 'Remote Space Temp Sensor' with 'No Stage Aux Heat', 'Floating/Analog' valve actuator and 'Three Speed Fan', the 'Terminal Assignment' view changes as follows:**



# Four Pipe Fan Coil Unit

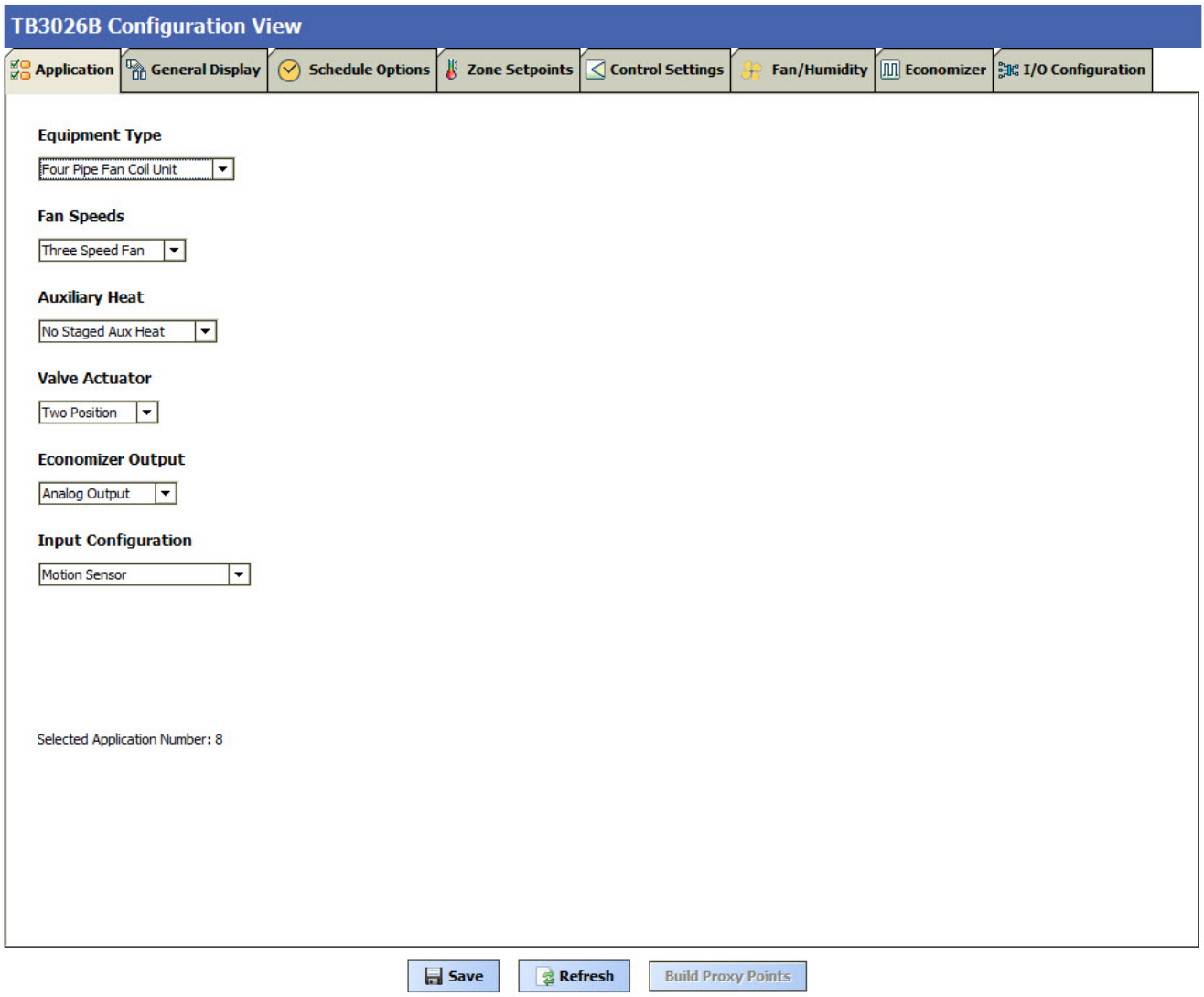
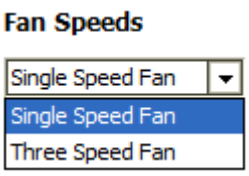



**Figure 72: Four Pipe Fan Coil Unit window**

## Fan Speeds

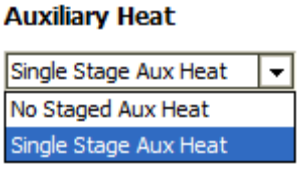
A user can select Two types of 'Fan Speeds' when the output stage is configured as 'One Compressor Stage and One Aux Heat Stage'.

1. Single Speed Fan
2. Three Speed Fan

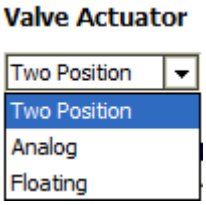



## Auxiliary Heat

A user can select heating stages from the following options:



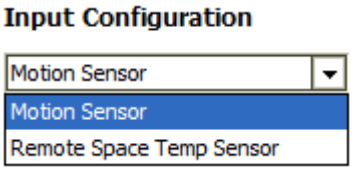
### Valve Actuator




Valve actuator can be configured as ‘Two-Position’ or ‘Floating’, or ‘Analog’ based on application.

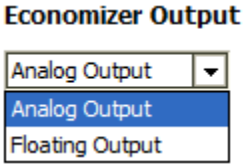
| | |
|---|---|
| | ***Note:*** |
| *The valve actuator can be selected as ‘Two-Position’ or ‘Analog’ only when ‘Three Speed Fan’ is configured. Floating valve actuator can be configured only when Single Speed Fan is configured.* | |

### Input Configuration




Input Configuration can be configured as ‘Motion Sensor’ or ‘Remote Space Temp Sensor’ based on application.

### Economizer Output




Out of the two types of parameters, select ‘Analog Output’ if Floating valve actuator ’is used. Select ‘Floating Output’ when analog valve actuator is used.

| | |
|---|---|
| | ***Note:*** |
| *Analog Type Economizer Output can be configured when Single Speed Fan is configured’.*<br>*Floating Type Economizer Output can only be configured if Three Speed Fan is configured’.* | |

## General Display

Click 'General Display' to view the general display settings. The following parameters are used to configure the controller's display settings.

1. Engineering Units
2. Time Functions
3. Display
4. Contractor Access Codes

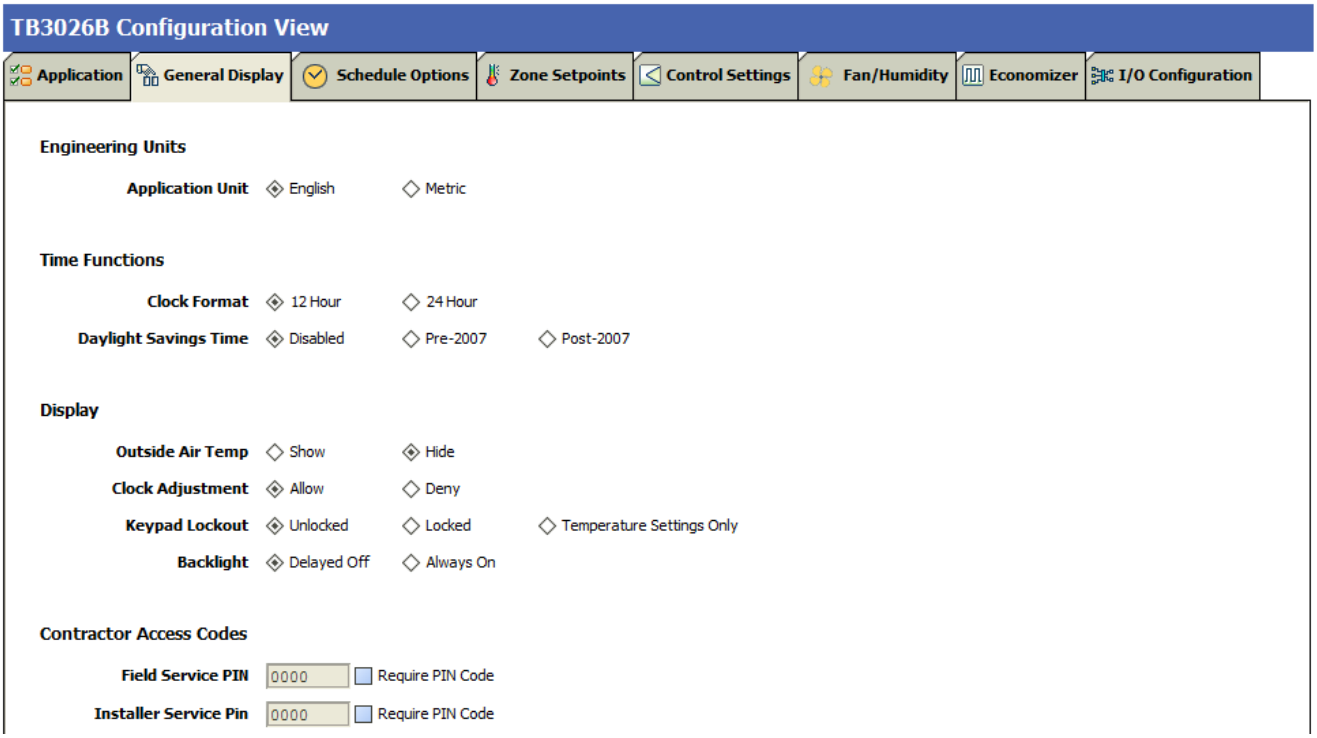
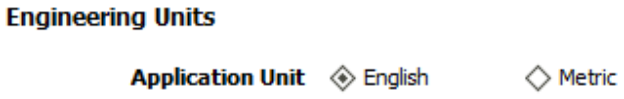


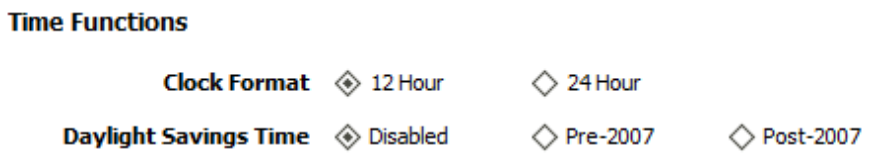

**Figure 73: General Display Screen (Four Pipe Fan Coil Unit)**

### Engineering Units




**Application Unit:** The application units contain two options to change the controller's units. By default, the controller's application units are set to 'English'. Application Unit can be changed to 'English' or 'Metric'.

## Time Function

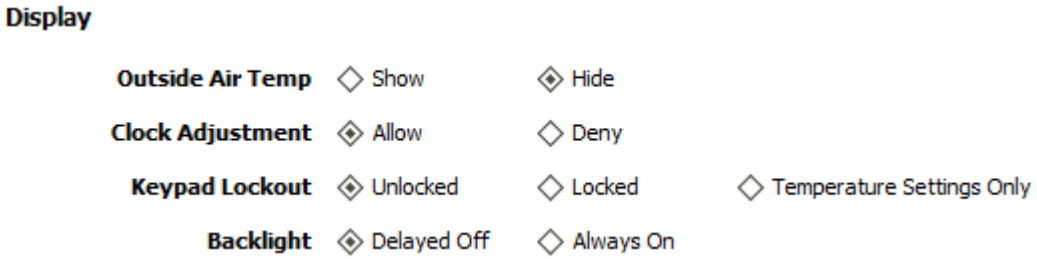



**Clock Format:** A user can select a clock format as 12-hour format or 24-hour format.

**Daylight Savings Time:** This feature enables to select the Daylight Savings Time settings. By default, Daylight Savings Time is set to 'Disabled'. Daylight Savings Time can be changed to 'Pre-2007' or 'Post-2007'.

## Display

This feature allows a user to select the Display settings.




**Outside Air Temp:** A user has an option to hide/show an outside air temperature.

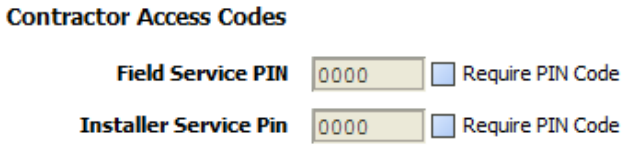
**Clock Adjustment:** This option allows a user to enable/disable the clock adjustment on the controller display.

**Keypad Lockout:** This option allows a user to lock/unlock the clock adjustment.

When an option, 'Temperature Settings Only' is selected, a user can only set the temperature through keypad.

**Backlight:** A user can keep the backlight always on or set to delayed off through this option.

## Contractor Access Codes

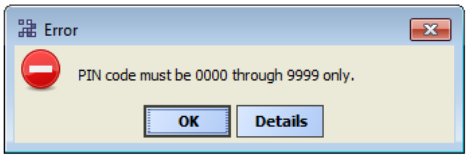



An access to the controller can be restricted with the help of Access Codes.

Field Service Pin and Installer Service Pin can be set. These codes should be enabled to restrict an access to the controller.

***Note:***

*A user can set only numerical PIN code for 'Field Service Pin' and 'Installer Service Pin'. PIN codes should be set within 0000 – 9999. The following Error Window pops up if this field is left blank after selecting.*



## Schedule Options

'Schedule' tab displays Schedule options.
The following parameters are used to configure the schedule options (i.e. Occupancy Configuration and Bypass and Standby)

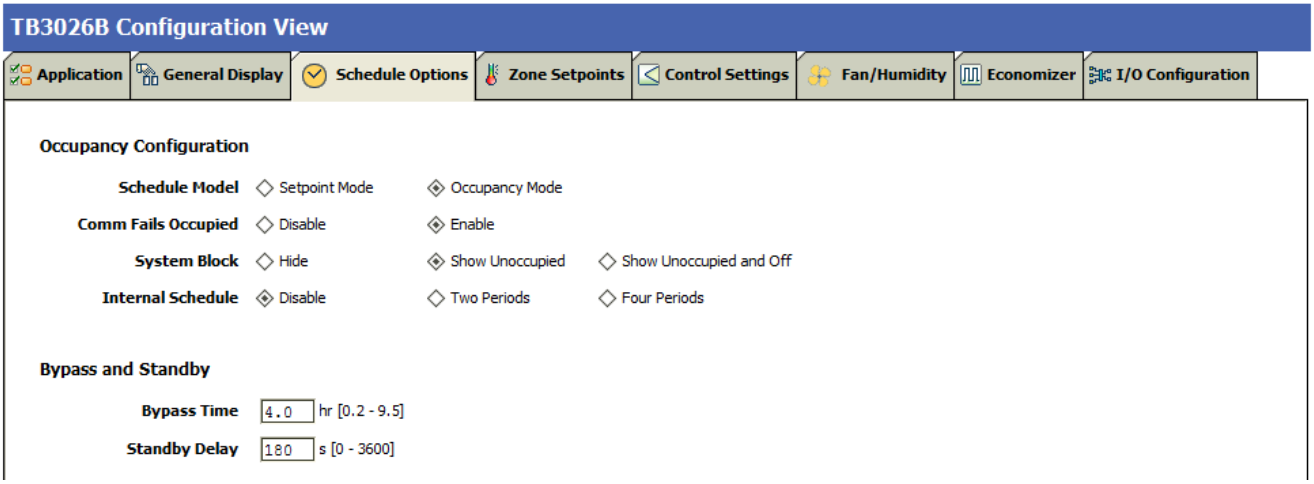



**Figure 74: Schedule Options Screen (Four Pipe Fan Coil Unit)**

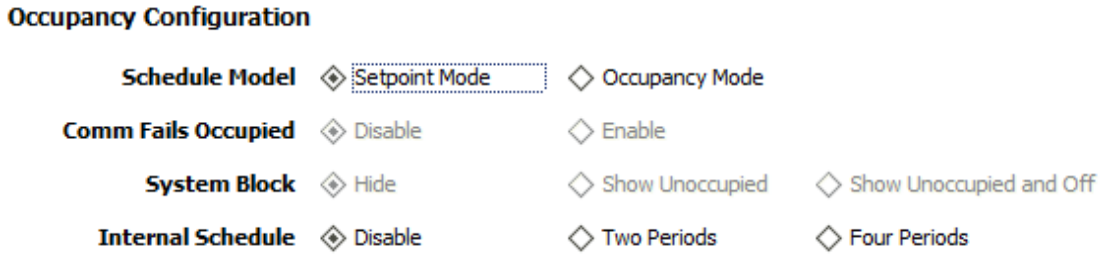
### Occupancy Configuration

**Schedule Model:** A user can set the device's schedule model as;

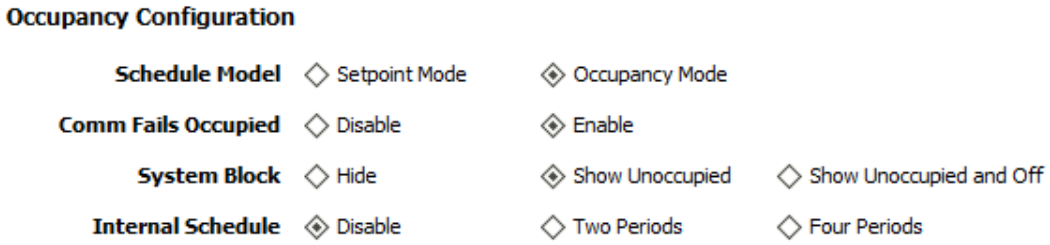
1. Setpoint Mode or
2. Occupancy Mode

**Setpoint Mode:** In setpoint mode, the controller logically emulates residential thermostats. The space temperature is controlled to "SP Mode Cooling SP" and "SP Mode Heating SP". Each schedule period consists of a start time, a heating setpoint, and a cooling setpoint.

**If a user selects 'Setpoint Mode' from the available 'Schedule Model', the fields for 'Comm Fails Occupied' and 'System Block' settings become disabled.**




**Occupancy Mode:** By default, 'Schedule Model' is in 'Occupancy Mode'. The system will be switched to 'Occupied Mode' when the occupancy sensor detects occupancy. Occupied Mode allows a user to configure 'Comm Fails Occupied', 'System Block' & 'Internal Schedule' settings.




**Comm Fails Occupied:** It allows a user to switch the system in Occupied Mode in case of MS/TP communication failure. If the MS/TP communication fails, the system enters into Occupied Mode when this option is selected as 'Enable', otherwise the system remains in its current state when this option is selected as 'Disable'.

| | |
|---|---|
| | ***Note:*** |
| *When Application 8 or 9 is selected, the 'Comm Fails Occupied' will be selected as 'Enable' by default and does not allow user to edit this field.* | |

**System Block:** The System Block is hidden when the schedule model is in 'Setpoint Mode'. When the schedule model is in 'Occupancy Mode', it allows a user to switch between the available options. Selecting "Show Unoccupied/Off" places the controller in unoccupied state.

**Internal schedule:** It can be configured in both Occupancy Mode & Setpoint Mode. By default, 'Internal Schedule' is 'Disable'.

If the internal schedule is 'Disable', a user can adjust the setpoint (within setpoint limits).

## Display Settings

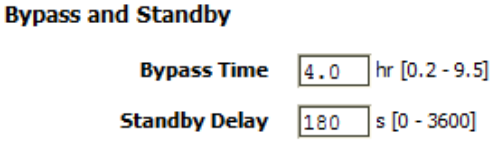
When a user selects, 'Two Periods' or 'Four Periods' options an additional 'Display Settings' appears as follows:

**Schedule Access:** When a user selects 'Edit', it allows a user to view and edit the schedule and when a user selects 'View', it allows a user to view the schedule. When a user selects 'None', it will not allow a user to view or edit the schedule.

**Vacation Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Vacation Hold".

**Permanent Hold:** It allows/denies a user to override the scheduled setpoint from BACnet FF controller's display to "Permanent Hold".

## Bypass and Standby




**Bypass Time:** In the Unoccupied state, it forces the controller into the occupied state for up to 4 hours (default value). The override time limit is adjustable from a minimum of 0.2 hours to a maximum of 9.5 hours.

**Standby Delay:** In Occupied Mode, if any window or door is opened and closed with no motion detected after the time mentioned for the Standby Delay, the room status switches to Standby state. The default value is 180 seconds.

## Zone Setpoints

Zone Setpoints , allows a user to set the following parameters as per the requirement:

1. Temperature Setpoints
2. Setpoint Limits
3. Standby Settings
4. Display Options

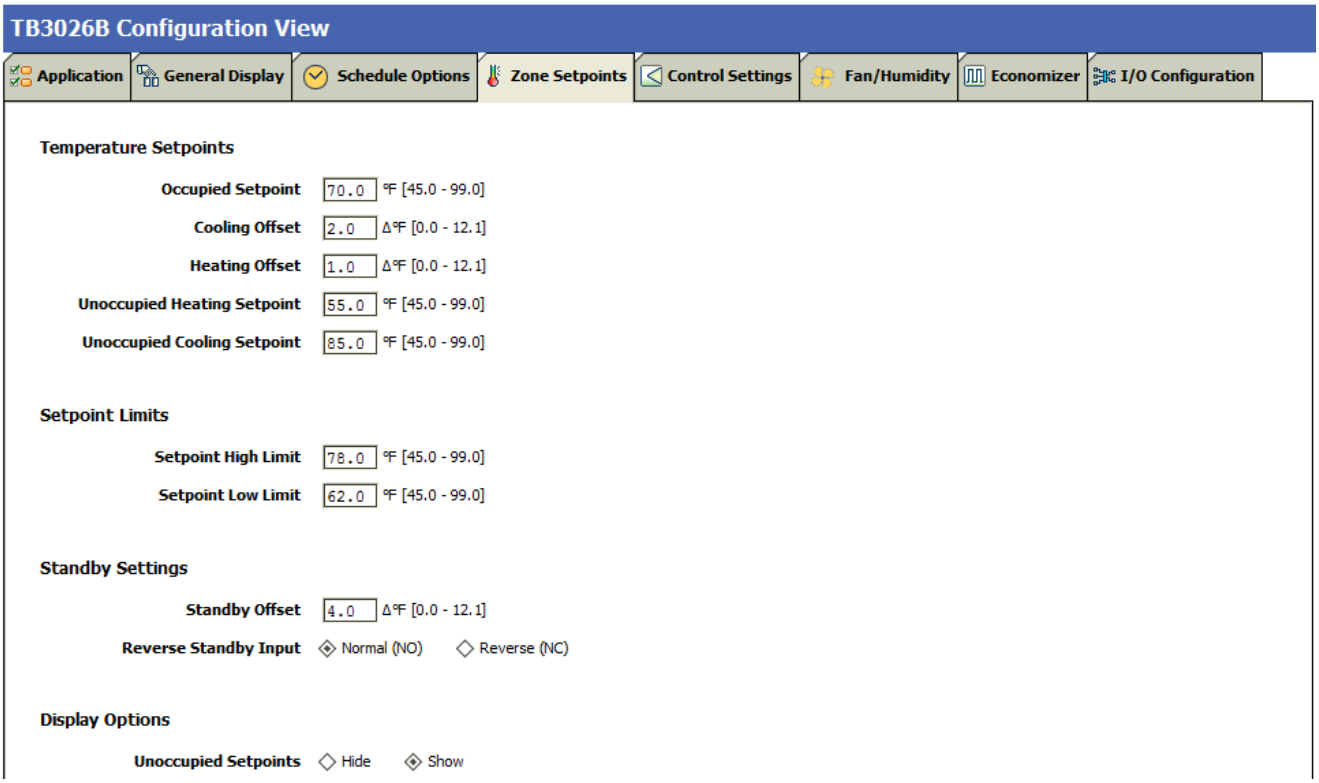
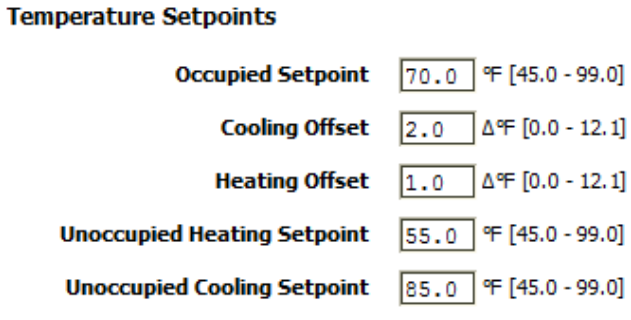



**Figure 75: Zone Setpoints Screen (Occupancy Mode)**

### Temperature Setpoints




**Occupied Setpoint:** It is a setpoint in Occupied Mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 70ºF.

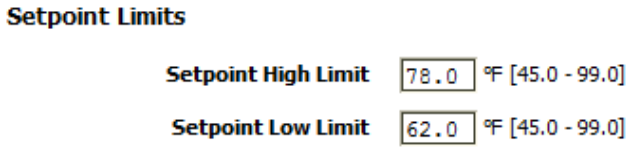
**Cooling Offset:** In the Occupied state, the cooling setpoint is calculated as cooling offset plus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 2 ΔºF.

**Heating Offset:** In the Occupied state, the heating setpoint is calculated as heating offset minus occupied setpoint. Enter the value within the range of 0ΔºF to 12.1ΔºF. The default value is 1 ΔºF.

**Unoccupied Heating Setpoint:** It is a setpoint for Heating in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 55 ºF.

**Unoccupied Cooling Setpoint:** It is a setpoint for Cooling in Unoccupied mode. Enter the value within the range of 45 ºF to 99 ºF. The default value is 85 ºF.

## Setpoint Limits



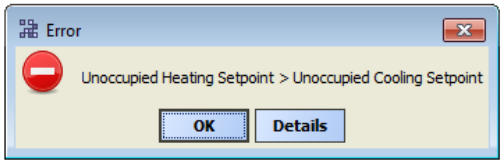

**Setpoint High Limit:** A user can enter a Setpoint High Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 78ºF.

**Setpoint Low Limit:** A user can enter a Setpoint Low Limit in Occupied Mode within the range of 45 ºF to 99 ºF. The default value is 62ºF.

***Note:***

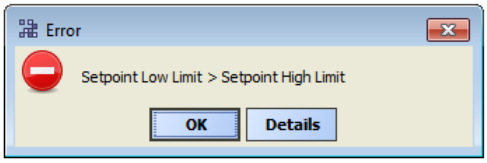
1. *Unoccupied Cooling Setpoint should always be set GREATER than Unoccupied Heating Setpoint.*

   *Following Error window appears if Unoccupied Cooling Setpoint is set lower than Unoccupied Heating Setpoint.*

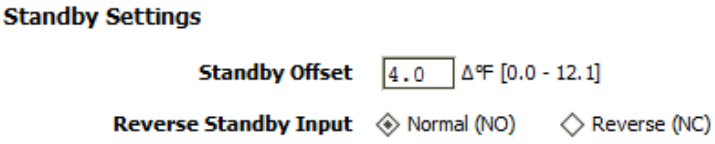



2. *Setpoint High Limit should always be set GREATER than Setpoint Low Limit.*

   *Following Error window appears if Setpoint High Limit is set lower than Setpoint low Limit.*




## Standby Settings

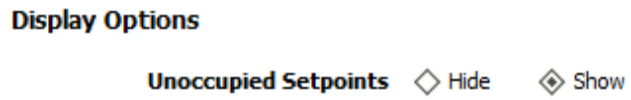



Standby state is a power-saving function of Occupancy mode. It occurs when the space is scheduled as Occupied, but sensors detect (When the Standby input is active) there are no humans in the space.

**Standby Offset:** In this case, the Standby Offset relaxes the occupied setpoints. The value of the Standby Offset [SO] can be set between a minimum of 0Δ°F and a maximum of 12.1Δ°F degrees. The default value is 4 Δ°F.

**Reverse Standby Input:** It allows a user to configure two types of inputs, 'Normally Open (NO)' and 'Normally Close (NC)'.

## Display Options




**Unoccupied Setpoints:** It allows a user to either 'Hide' or 'Show' the unoccupied setpoint.

**When a user selects Schedule Model under the 'Schedule Options' tab to 'Setpoint Mode', the 'Zone Setpoints' configuration window appears as follows:**

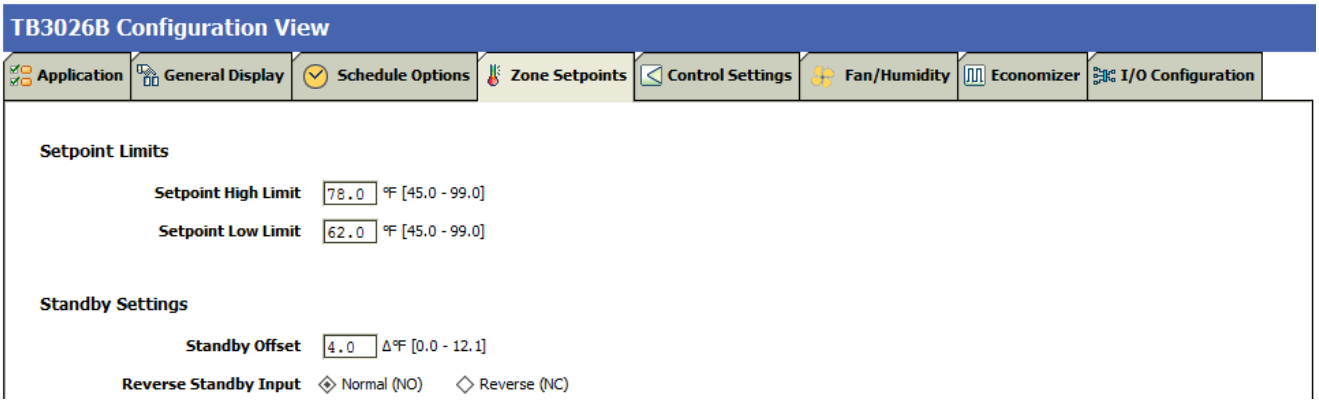



**Figure 76: Zone Setpoint Wizard Screen (Setpoint Mode)**

## Control Settings

'Control Settings' allows a user to configure following settings:

1. Cooling PI Control
2. Heating PI Control
3. Two-Position Valves

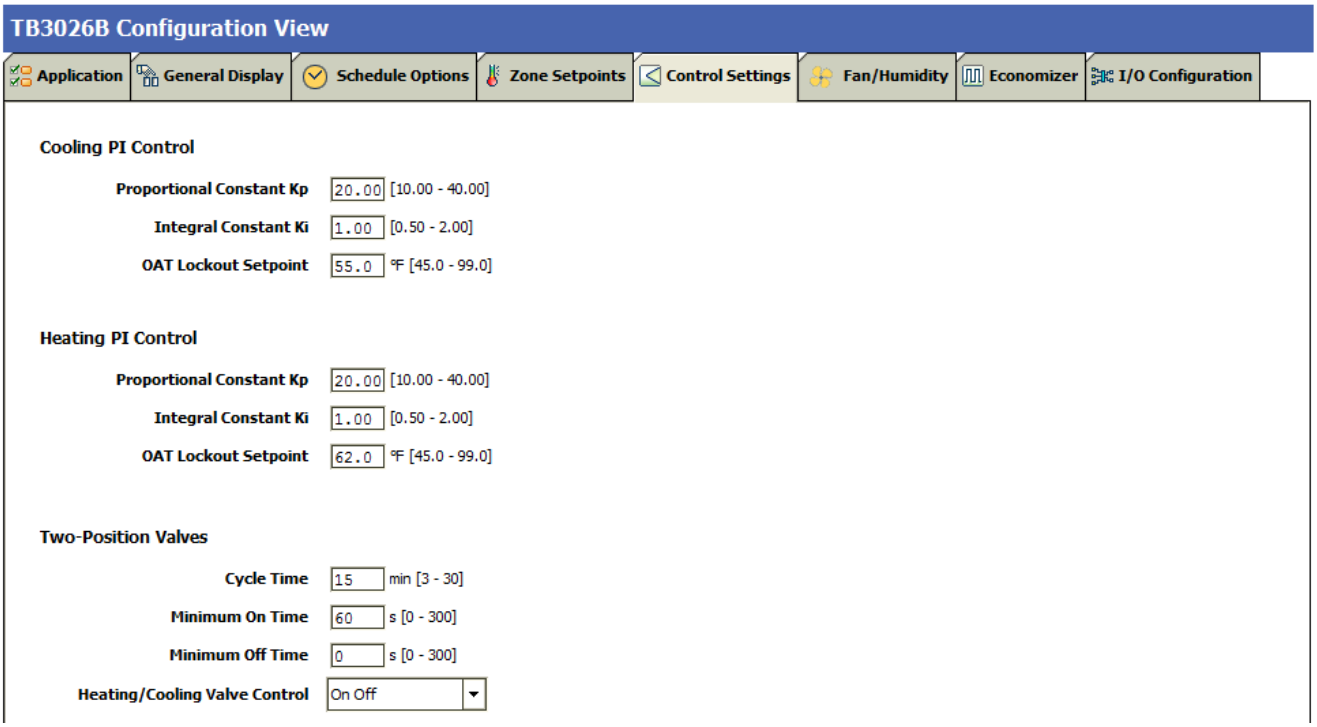
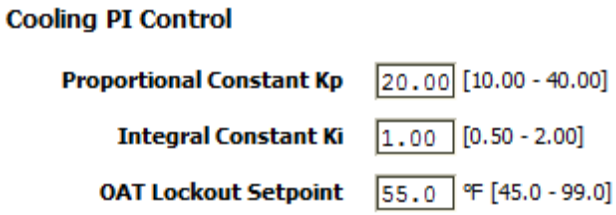



**Figure 77: Control Settings Screen (Four Pipe Fan Coil Unit)**

### Cooling PI Control

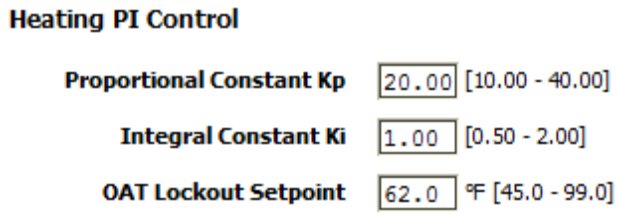



**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Cooling PI control will lockout when outside Temperature decreases below OAT (Cooling) Lockout Setpoint. The default value is 55 ºF.

### Heating PI Control

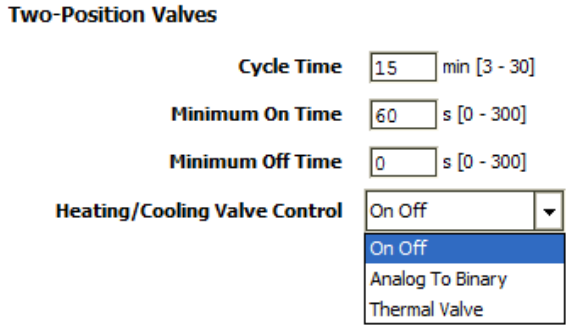



**Proportional Constant $K_p$:** A user can enter a value for $K_p$ within the range of 10 to 40. The default value is 20.

**Integral Constant $K_i$:** A user can enter a value for $K_i$ within the range of 0.50 to 2. The default value is 1.

**OAT Lockout Setpoint:** Heating PI control will lockout when outside Temperature increases above OAT (Heating) Lockout Setpoint. The default value is 62 ºF.

## Two-Position Valves




**Cycle Time:** Two-Position Valve cycle time ranges from minimum of 3 minutes, and a maximum of 30 minutes. The default value is 15 minutes.

**Minimum On Time**: It is a minimum time for the compressor to stay On.

**Minimum Off Time**: It is a minimum time for the compressor to stay Off.

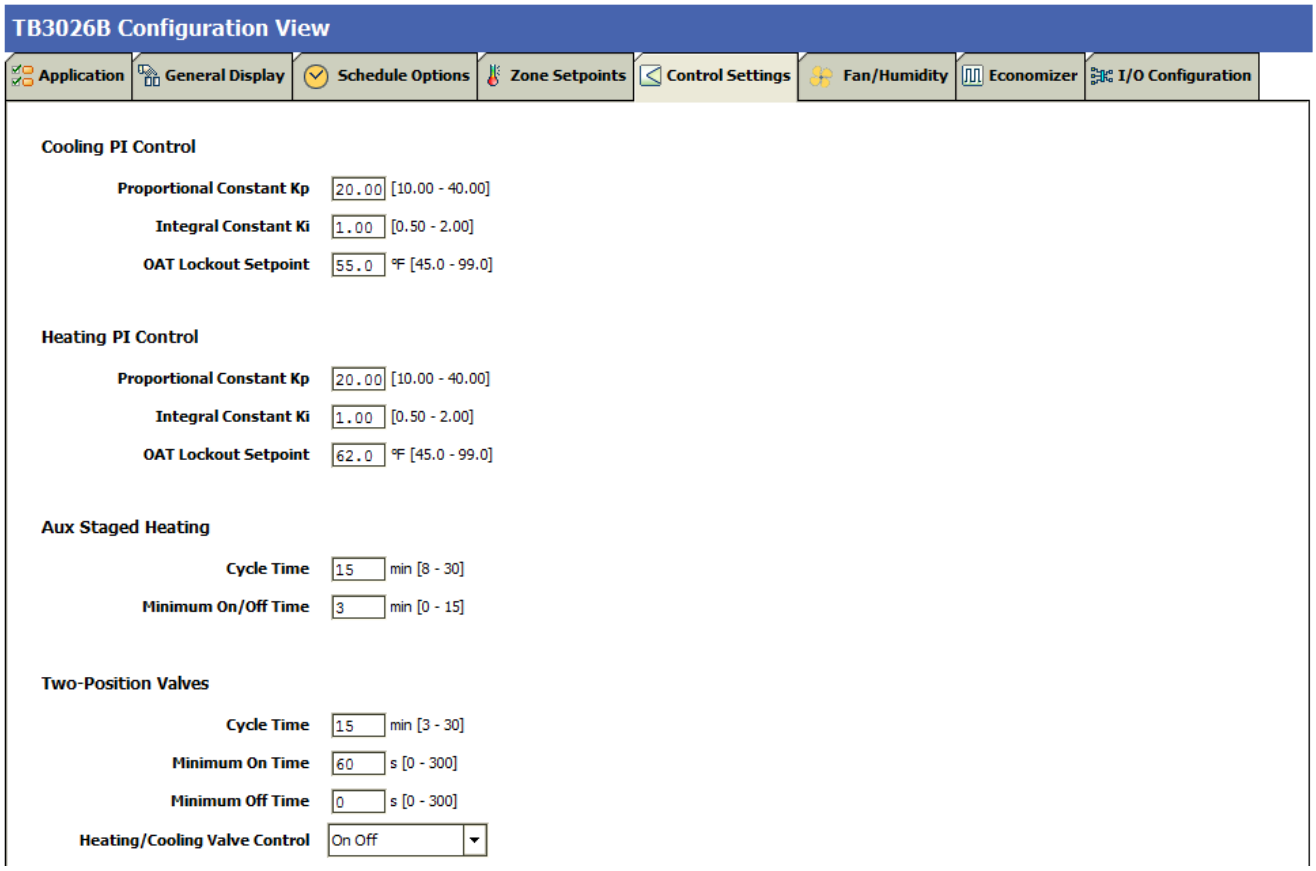
**Heating/Cooling Valve Control:** Physical heating/cooling valve control has three options

**On Off:** This option selects the opening and closing of Heating valve.

**Analog To Binary:** In this mode the valve is remains open for Cycle Time.

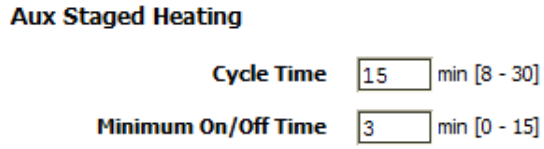
**Thermal valve:** This option allows a user to select a Thermal valve for Heating/Cooling Valve Control.

**When 'Auxiliary heat' is configured as 'Single Stage Aux Heat', the 'Control Settings' view changes as follows:**



### Aux Staged Heating

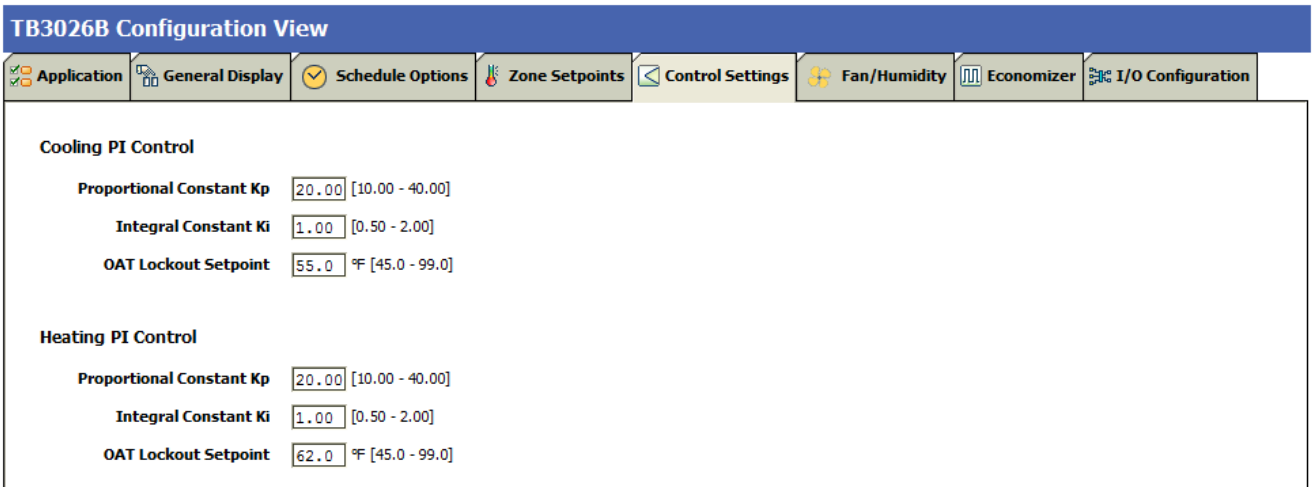
A user can configure the Cycle Time & Minimum On/Off Time when a 'Single Stage Auxiliary Heat' is selected in the application.




**Cycle Time:** The Cycle Time ranges from minimum of 8 minutes, and a maximum of 30 minutes. The default value is 15 minutes.

**Minimum On/Off Time:** It is a minimum On/Off time for the Auxiliary Heating. The default value is 3 minutes.

**When 'Analog/Floating' valve actuator is configured, the 'Control Settings' view changes as follows:**



## Fan / Humidity

'Fan / Humidity' allows a user to configure the following settings:

1. Fan Operation
2. Humidity Control
3. Filter Alarm

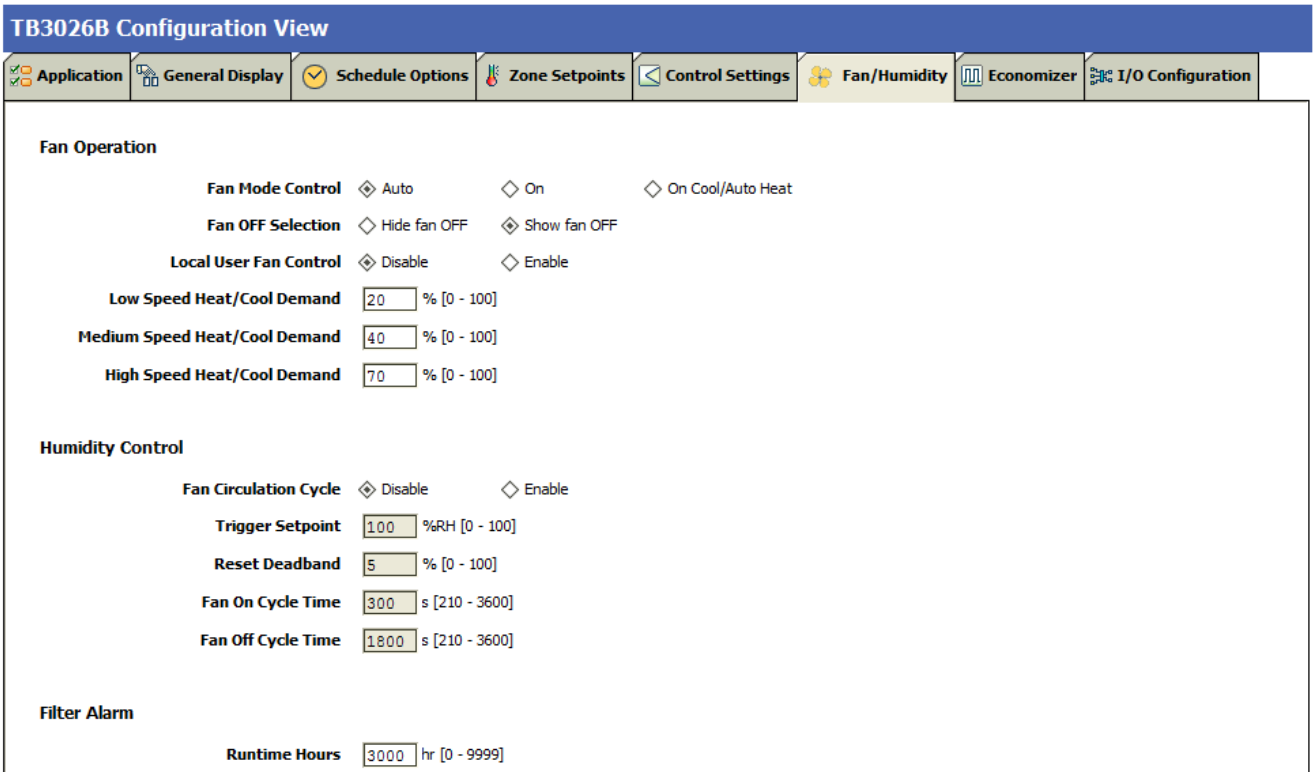
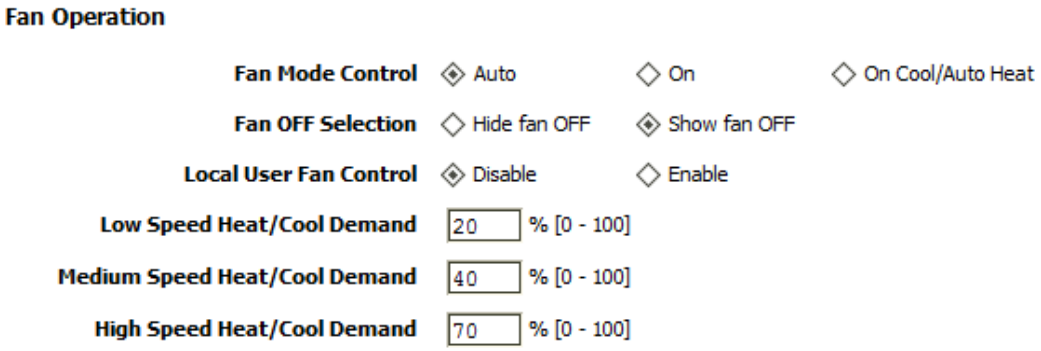



**Figure 78: Fan/Humidity Screen (Four Pipe Fan Coil Unit)**

## Fan Operation

**Fan Mode Control:** During occupancy & Setpoint mode, the fan operates based on the selected fan control modes.




**Auto:** When this option is selected, Fan cycles ON when:

1. Cooling or heating is selected or
2. During Unoccupied mode only when called to run by cooling or heating demand.

**On:** When this option is selected the fan runs continuously for ventilation.

**On Cool/Auto Heat**: When this option is selected the fan runs continuously in cooling mode. In heating mode the fan cycles on only when the heating signal calls for the fan to run.

**Fan OFF Selection:** This selection allows a user to enable/disable the selection to OFF the fan on the LCD of the controller.

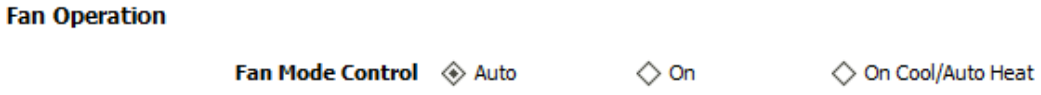
**Local User Fan Control:** This selection allows a user to enable/disable the fan Control to local user.

**Low Speed Heat/Cool Demand:** This field allows a user to set the Heating/Cooling demand limits for the Low Speed Fan.

**Medium Speed Heat/Cool Demand:** This field allows a user to set the Heating/Cooling demand limits for the Medium Speed Fan.

**High Speed Heat/Cool Demand:** This field allows a user to set the Heating/Cooling demand limits for the High Speed Fan.

**When a user selects 'Single Speed Fan' in the application, the 'Fan Operation' parameter appears as follows:**



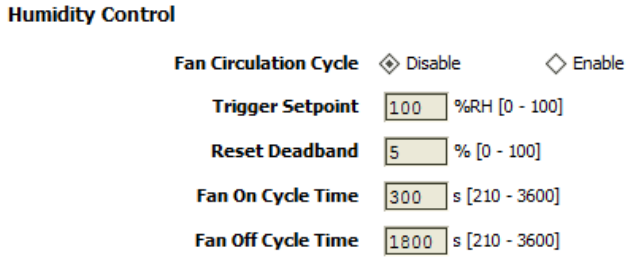

**Auto:** When this option is selected, Fan cycles ON when:

1. Cooling or heating is selected or
2. During Unoccupied mode only when called to run by cooling or heating demand.

**On:** When this option is selected the fan runs continuously for ventilation.

**On Cool/Auto Heat**: When this option is selected the fan runs continuously in cooling mode. In heating mode the fan cycles on only when the heating signal calls for the fan to run.

## Humidity Control



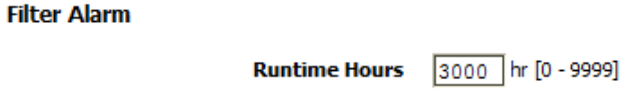

**Fan Circulation Cycle:** When a user selects the 'Enable' option from Fan Circulation Cycle, it allows a user to edit the Trigger Setpoint, Reset Deadband, and Fan On/Off Cycle Time.

**Trigger Setpoint & Reset Deadband:** When sensed humidity equals or exceeds humidity trigger setpoint, the fan cycles ON/OFF at low speed until sensed humidity drops below the trigger setpoint minus the reset deadband.

**Fan On Cycle Time:** This field allows a user to enter a time for fan ON cycle when stratification and humidity control is active. The default value is 300 seconds.

**Fan Off Cycle Time:** This field allows a user to enter a time for fan OFF cycle when stratification and humidity control is active. The default value is 1800 seconds.

## Filter Alarm




**Runtime Hours:** A filter alarm activates after the Runtime Hours mentioned in this field. The default value is 3000 hours.

## Economizer

Select Economizer from Configuration parameters. It is used to configure the economizer settings in BACnet FF controller.

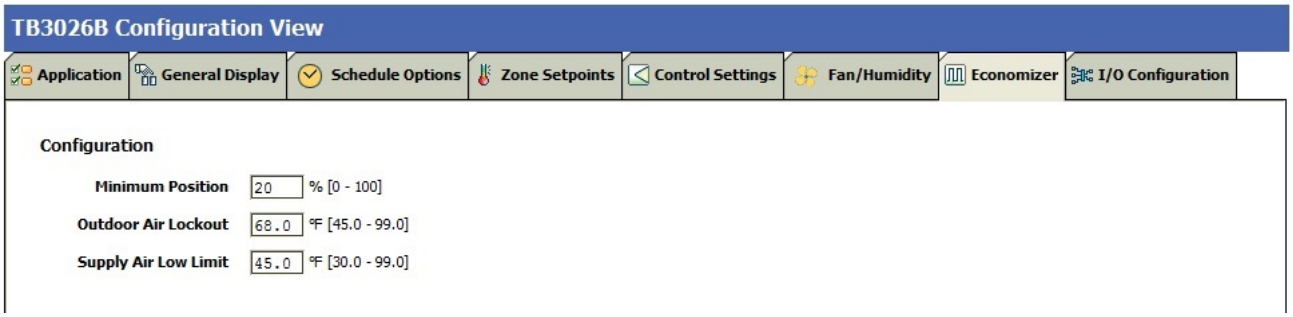



**Figure 79: Economizer Screen (Four Pipe Fan Coil Unit)**

### Configuration

**Minimum Position:** When either the occupied command or the After-hours Timer is ON, the current minimum position is set to the specified Economizer Minimum Position; otherwise, it is zero. The default minimum position is 20%.

**Outside Air Lockout:** The economizer is forced to Minimum position when Outside Air Temperature goes above the setpoint and when 'Schedule Model' is configured as 'Setpoint Mode'. The default value is 68º F.

**Supply Air Low Limit:** The economizer is forced to Minimum position when Supply Temperature goes below the Supply Air Low Limit and when Schedule Model is configured as "Setpoint Mode'. The default value is 45º F.

## I/O Configurations

Select I/O Configurations from Configuration parameters. This configuration is used for Terminal Assignment & Output Configuration.

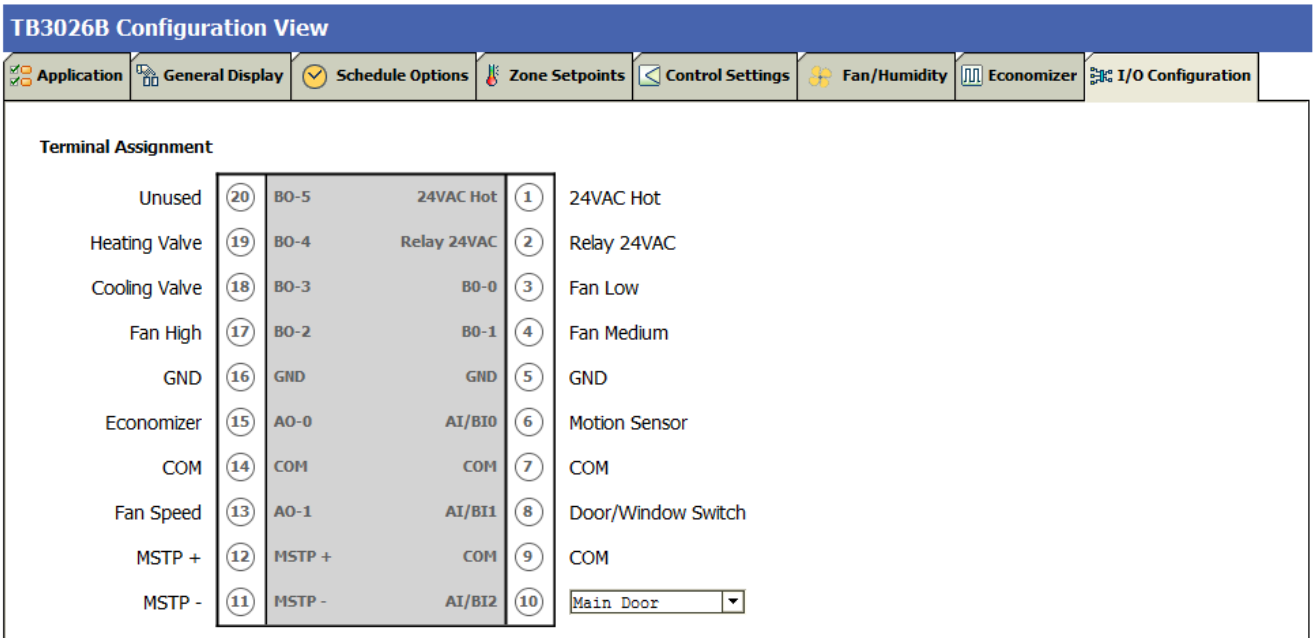



**Figure 80:I/O Configurations Screen (Four Pipe Fan Coil Unit)**

### Terminal Assignment

After completing the 'Four Pipe Fan Coil Unit' configuration, selected inputs and outputs get automatically assigned to the BACnet FF controller's input and output terminals.

A user can assign the Input as 'Main Door' or 'Supply Air Temp' to AI/BI2.

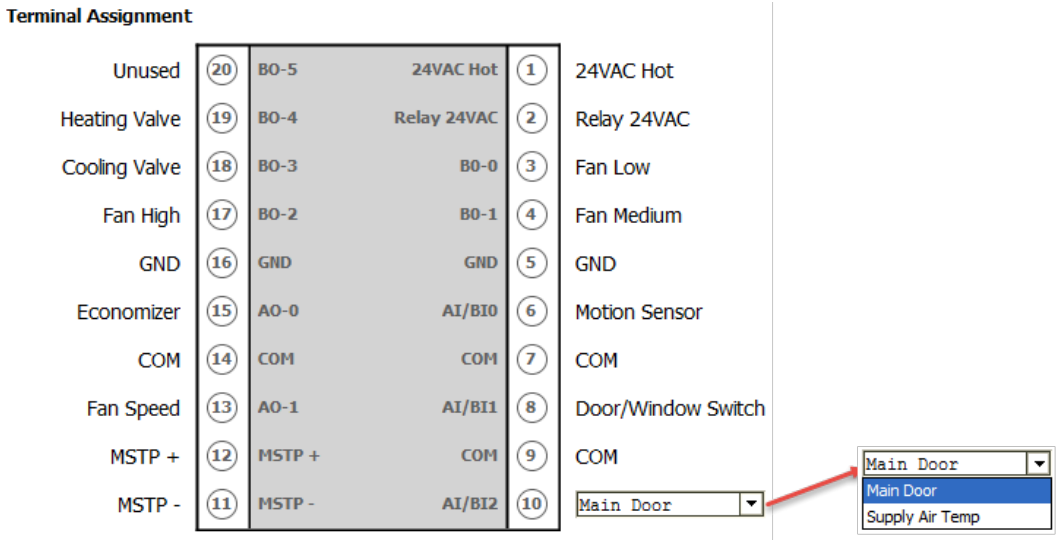
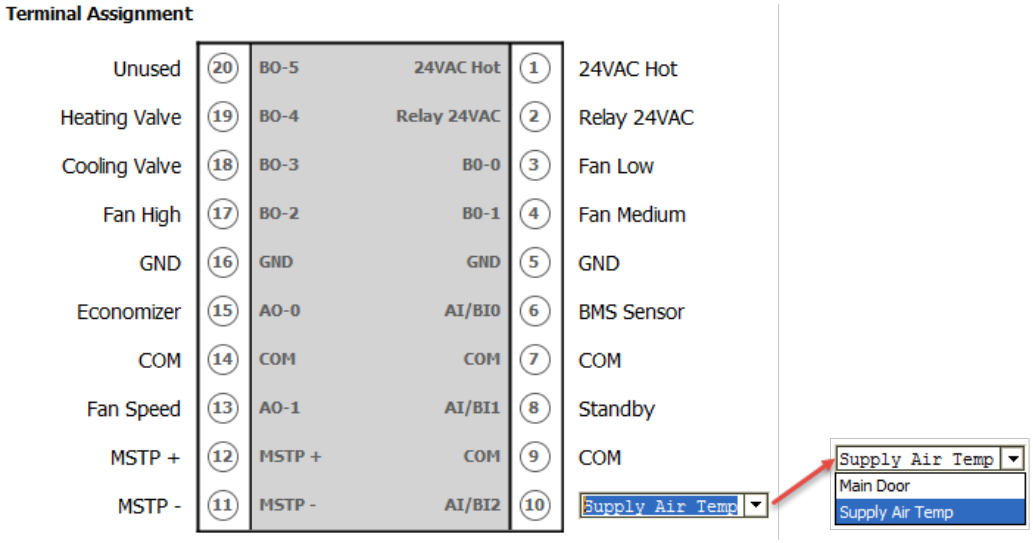
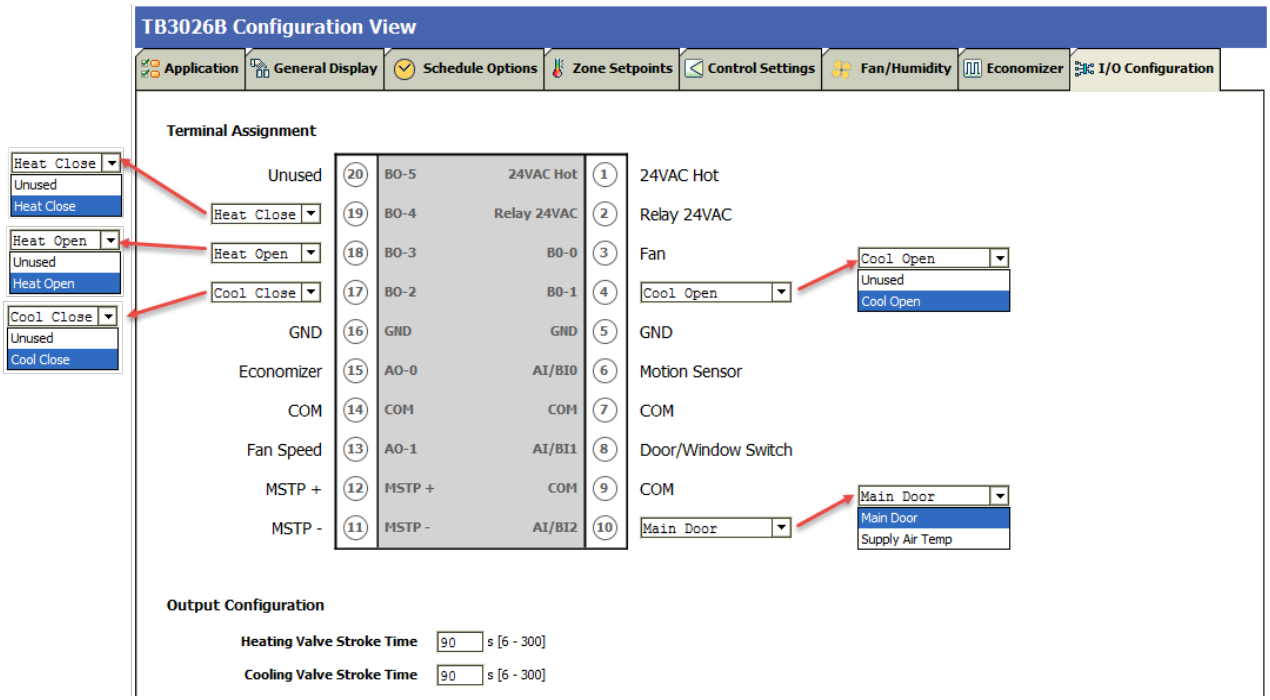



**Figure 81: Terminal Assignment View (Three Speed Fan)**

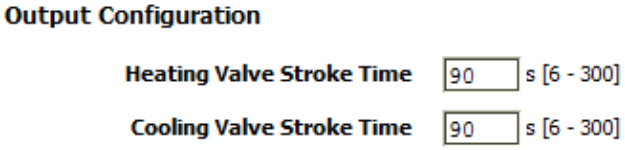
**When AI/BI2 is configured as 'Supply Air Temp' in (Application 8), AI/BI1 gets displayed as 'Standby' as follows:**




**When 'Fan Speed' is selected as 'Single Speed Fan', the 'Terminal Assignment' view changes as follows:**



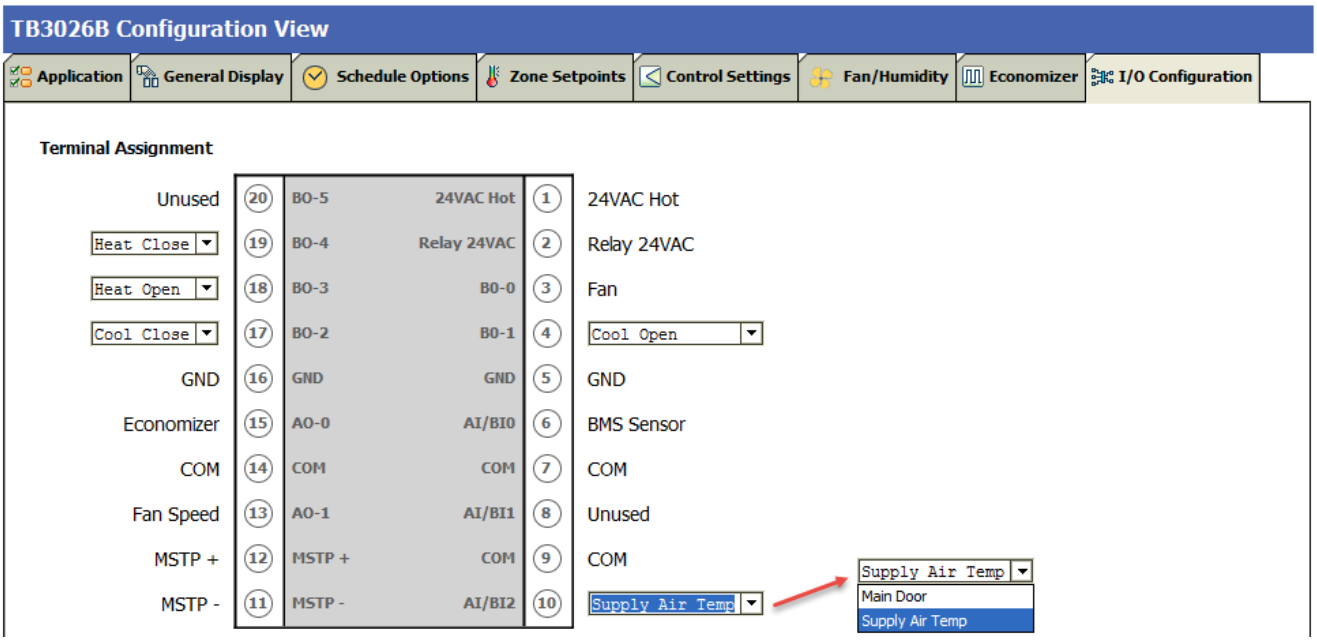

## Output Configuration



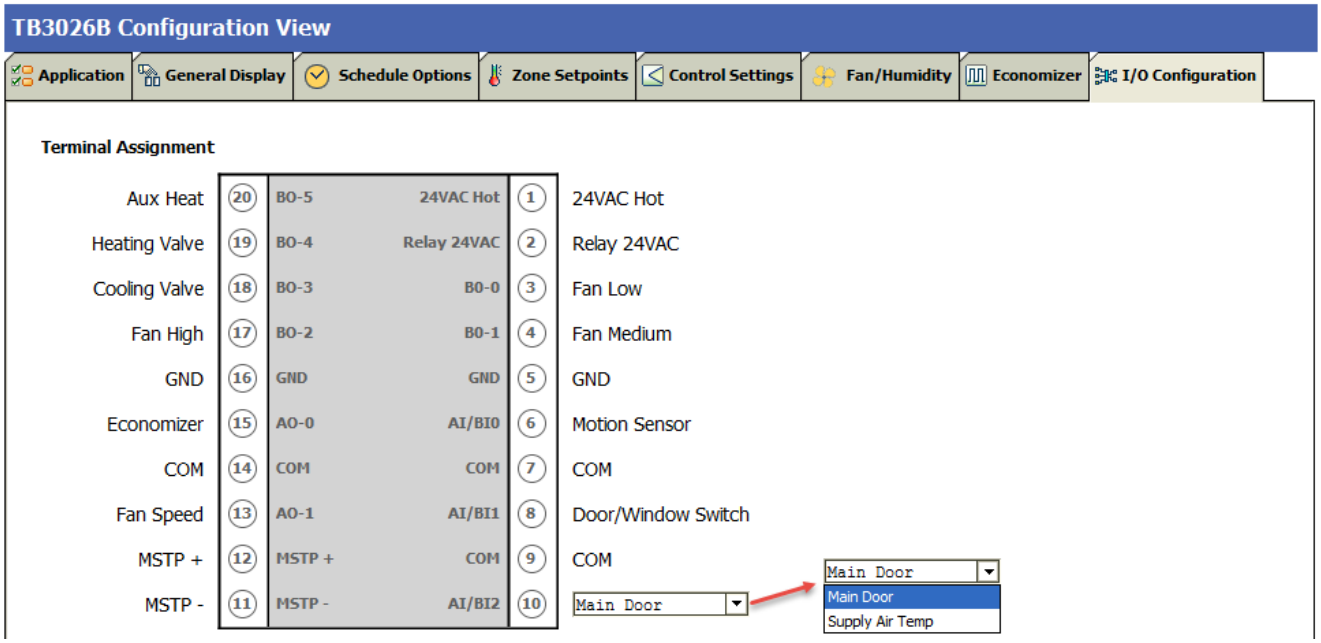

**Heating Valve Stroke Time:** This setting is available to configure, when 'Floating' 'Valve Actuator is selected and BO-3 and BO-4 are configured to 'Heat Open' and 'Heat Close' respectively. The default value is 90 seconds.

**Cooling Valve Stroke Time:** This setting is available to configure, when 'Floating' 'Valve Actuator is selected BO-1 and BO-2 are configured to 'Cool Open' and 'Cool Close' respectively. The default value is 90 seconds.

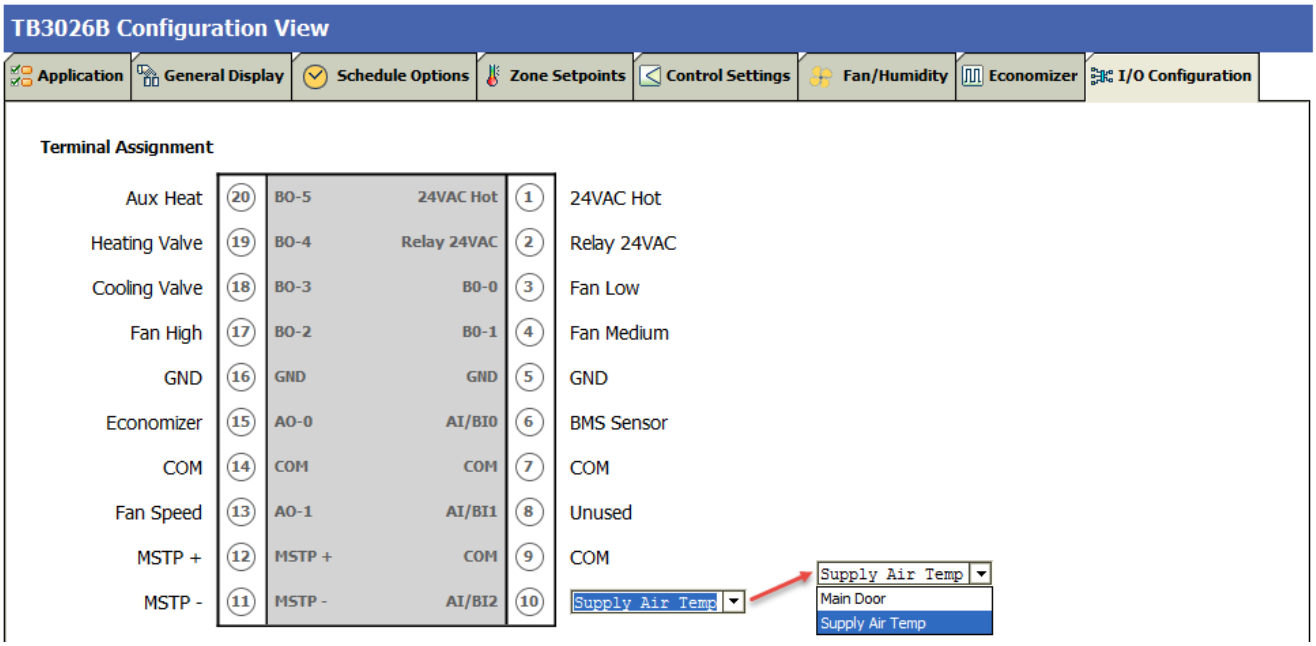
**When AI/BI2 is configured as 'Supply Air Temp' in (Application 7), AI/BI1 gets displayed as 'Unused' as follows:**



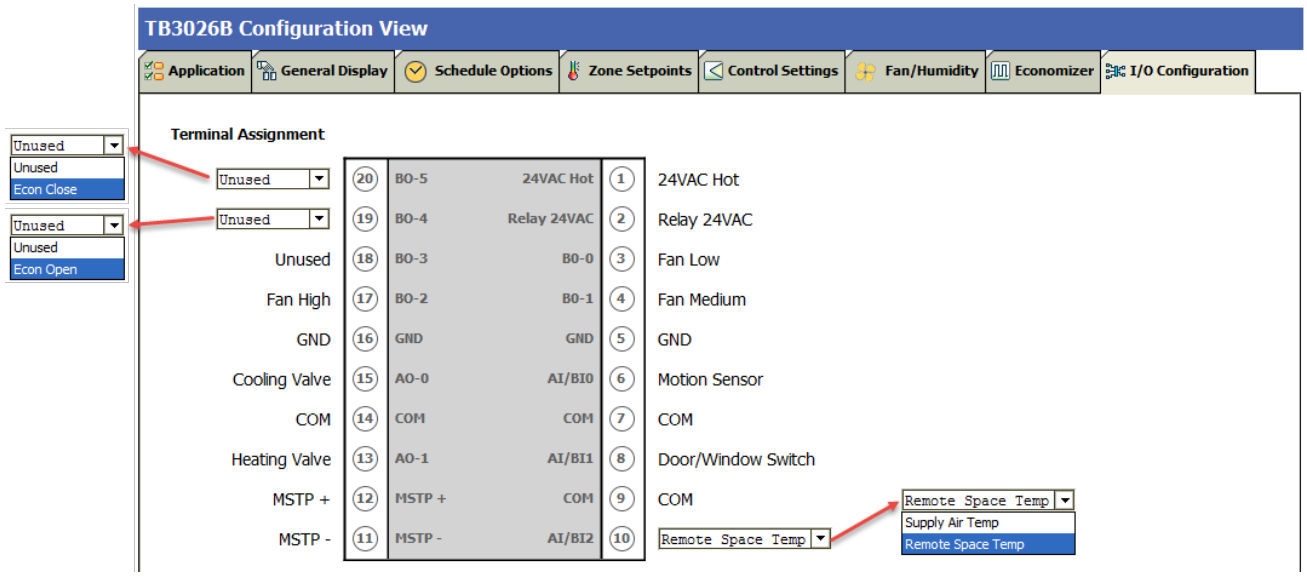

**When 'Single Stage Aux Heat' is configured, the 'Terminal Assignment' view changes as follows:**



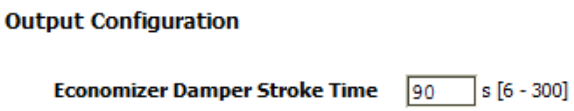
**When AI/BI2 is configured as 'Supply Air Temp' in (Application 9), AI/BI1 gets displayed as 'Unused' as follows:**




**When 'Analog' valve actuator is configured, the 'Terminal Assignment' view changes as follows:**

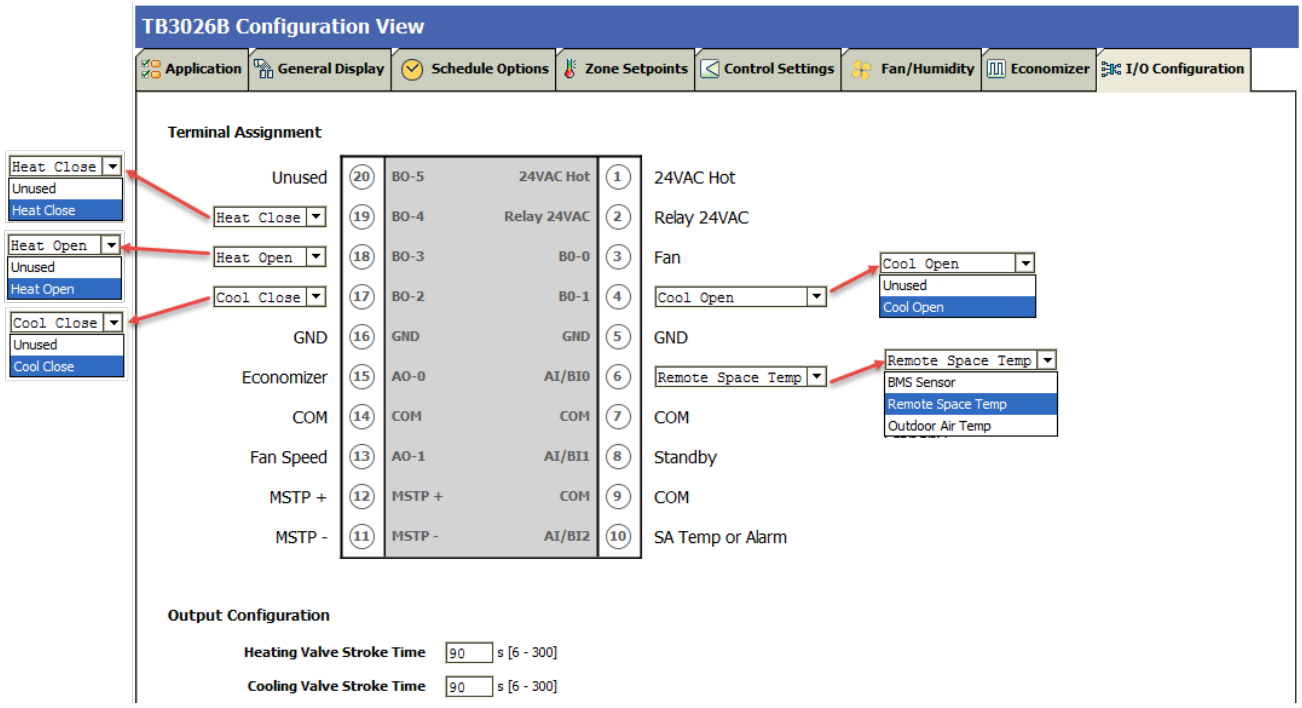



## Output Configuration

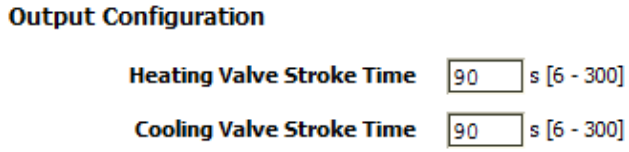



**Economizer Damper Stroke Time:** This setting is available to configure, when 'Analog' 'Valve Actuator is selected. The default value is 90 seconds.

**When 'Analog Input 2' is selected as 'Remote Space Temp Sensor', the 'Terminal Assignment' view changes as follows:**




## Output Configuration




**Heating Valve Stroke Time:** This setting is available to configure, when 'Floating' 'Valve Actuator is selected and BO-3 and BO-4 are configured to 'Heat Open' and 'Heat Close' respectively. The default value is 90 seconds.

**Cooling Valve Stroke Time:** This setting is available to configure, when 'Floating' 'Valve Actuator is selected BO-1 and BO-2 are configured to 'Cool Open' and 'Cool Close' respectively. The default value is 90 seconds.

# ONLINE OPERATIONS

BACnet FF controllers can be connected online as described in Configuration through WEBs Controller or Configuration through PC.

Following Online Operations can be performed when it is connected online.

## Download

Select the Controller from the left pane. Right click on it and select 'Download' as shown in Figure 82.

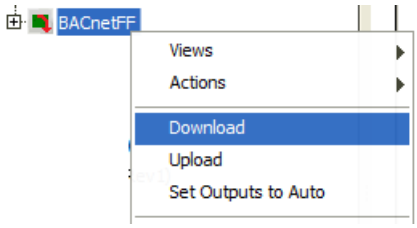



**Figure 82: Selecting 'Download'**

It is used to download the configuration from tool to controller.

| | |
|---|---|
| | ***Note:*** |
| *When a Download operation is performed;*<br>1. *Overridden outputs (if any) will be set to Auto.*<br>2. *The values written to the controller will appear as the values configured in the application unit in the wizard.* | |

## Upload

Select the Controller from the left pane. Right click on it and select 'Upload' as shown in Figure 83.

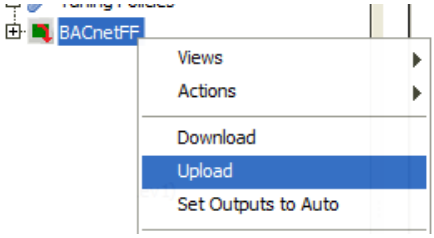



**Figure 83: Selecting 'Upload'**

Invoke this option to read configuration data from the controller and update the same in the tool database.

## Write Device Instance

A user can set the device instance number for a device so that each device in the network has a unique device instance number.

Select the Controller from the left pane. Right click on it and select Actions > 'Write Device Instance' as shown in Figure 84.

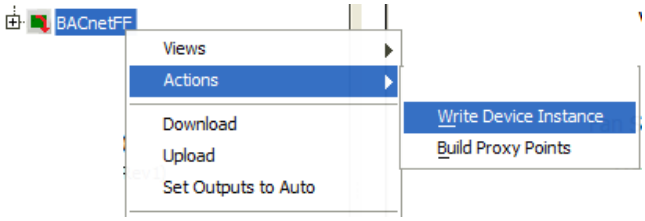



**Figure 84: Write Device Instance**

A user can view the job progress for Write Device Instance in a Job Side Bar from the workbench.

To perform online operations, right click on the controller > select Views as shown in Figure 85.

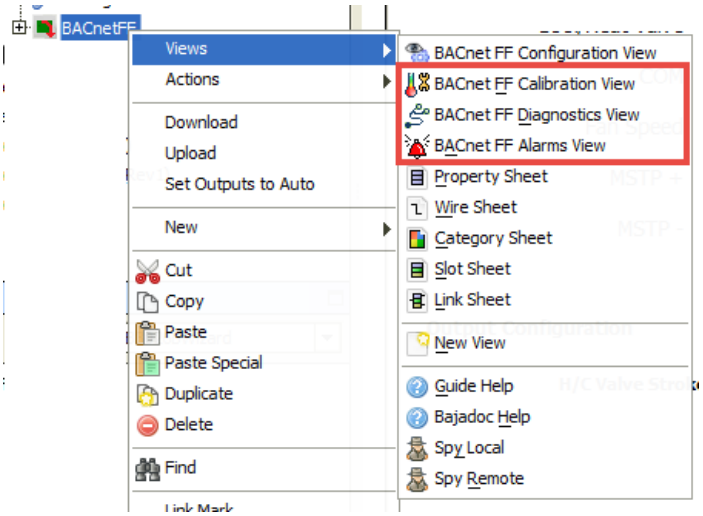



**Figure 85: Online Operations View**

# Sensor Calibration

It is used to calibrate the sensors that are connected to the device. Using Sensor Calibration feature, a user can correct the input values to the controller. This action can be performed with the device in online mode only. The controller must be in a downloaded state.

While performing Sensor Calibration, the device should not be used by another application. Only analog inputs to the controllers can be calibrated.

Select 'BACnet FF Calibration View' option as shown in Figure 85.

A window will pop up as shown in Figure 86.

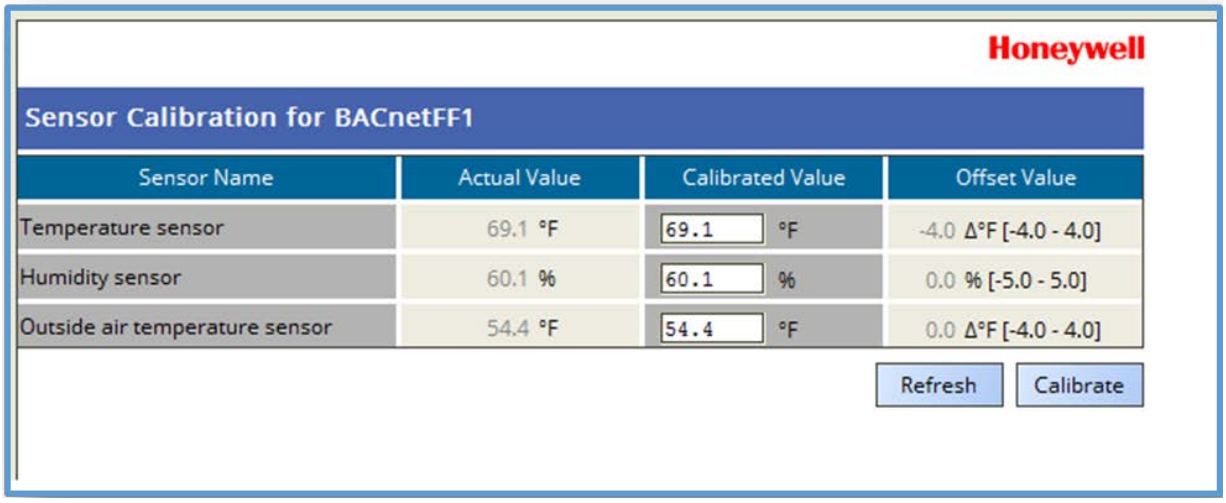



**Figure 86: Sensor Calibration**

This shows the list of total analog inputs configured to the controller.

**Sensor name:** Displays the names of the sensors configured based on the configured applications.

**Actual Value:** shows the current value of the sensor as read by controller.

**Calibrated Value:** shows the calibrated value to be entered.

**Offset value:** Click the Calibrate button to calculate the offset value. Offset value is a difference between Actual value and Calibrated value. It can be a positive or negative value.

Click Refresh button to updated the Actual Value and Offset Value.

***Note:***

*The Offset value is always calculated in Fahrenheit irrespective of the Engineering Units (English Units or Metric Units) configured in the system. Hence if the values are selected as $^{O}C$, a user should convert that value to equivalent $^{O}F$ while calculating the offset value.*

*For example, a user has configured the engineering unit to $^{O}C$ and the sensor value reported is 25 $^{O}C$ and user wants the value to be reported is 27 $^{O}C$, so the offset should be written as 3.6.*

*25 $^{O}C$ = 77 $^{O}F$*
*27 $^{O}C$ = 80.6 $^{O}F$*
*so offset should be (80.6 - 77 = 3.6)*

*Similarly, if user wants the calibrated value as 28 $^{O}C$, then it is not possible to get it, because, 28 $^{O}C$ is equal to 82.4 $^{O}F$ and in this case original value reported by the controller is 77 $^{O}F$ (25 $^{O}C$), so the offset is 5.4 which is greater than sensor offset limit. [-4.0 – 4.0] $^{O}F$*

# Diagnostics

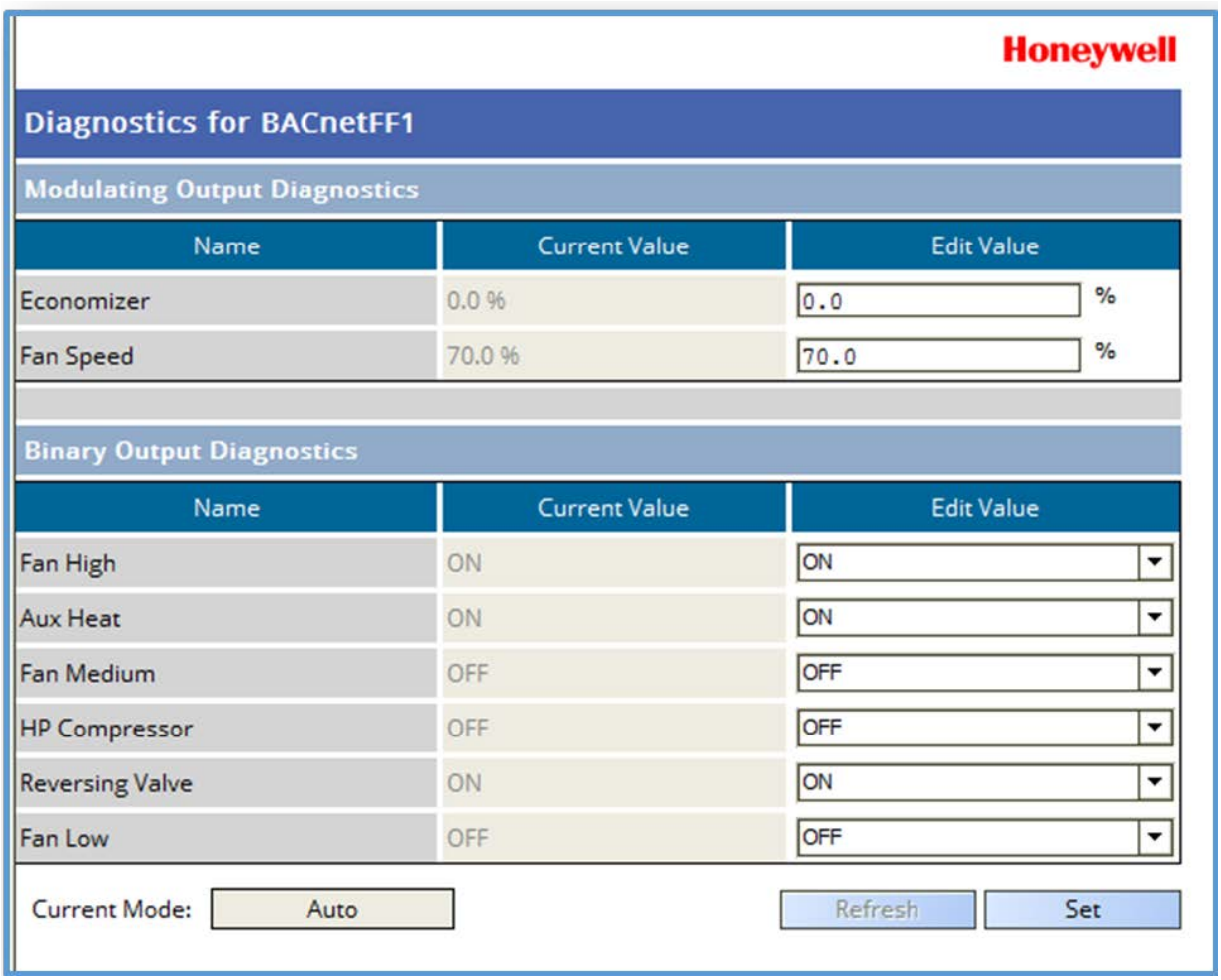



**Figure 87: Outputs Overridden Mode/Diagnostics**

It is used to test the outputs of the BACnet FF Stat device in Outputs overridden mode.

This action can only be performed with the device in online mode. The device must be in downloaded state.

The Diagnostics screen displays:

- All configured Digital Outputs to command ON/OFF.
- All configured Analog Outputs to command the values within 0 % to 100%.
- The values that are sensed (currently) at the outputs.

***Note:***

*The 'Current mode' changes to 'Outputs Overridden' from 'Auto' when the Outputs are overridden in the Diagnostics view.*

## Modulating Output Diagnostics

The number of Modulating Outputs depend on the outputs configured in the application.

**Current Value:** it displays the value of the modulating output as read from the controller
This field is non-editable.

**Edit Value:** Enter the value that is required to command the output.
The range is 0 % to 100 %.
When the value is entered, click Set button to feed the value to the selected output.

## Binary Output Diagnostics

The number of Binary Outputs depends on the outputs are configured in the application.

**Current Value:** It displays the value of the Digital or Binary output as read from the controller.
This field is non-editable.

**Edit Value:** Select the value as ON or OFF to command the output.
When the value is entered, click Set button to feed the value to the selected output.

## Refresh

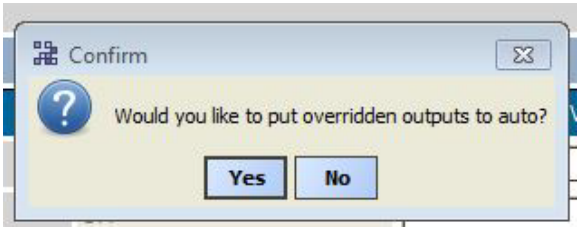
Click the Refresh button to refresh the output values. This button is enabled only when the device is in Outputs overridden mode. The values set in the 'Edit Value' column get reflected in the 'Current Value' column when user clicks 'Refresh' button.

***Note:***

*When the outputs are overridden, if a user invokes a Download operation, it puts the outputs into 'Auto' from 'Outputs Overridden'.*

***Note:***

*If a user tries to exit the diagnostics view when the outputs are Overridden, a confirmation window pops up asking a user whether user wants to put outputs to auto.*



# Alarms

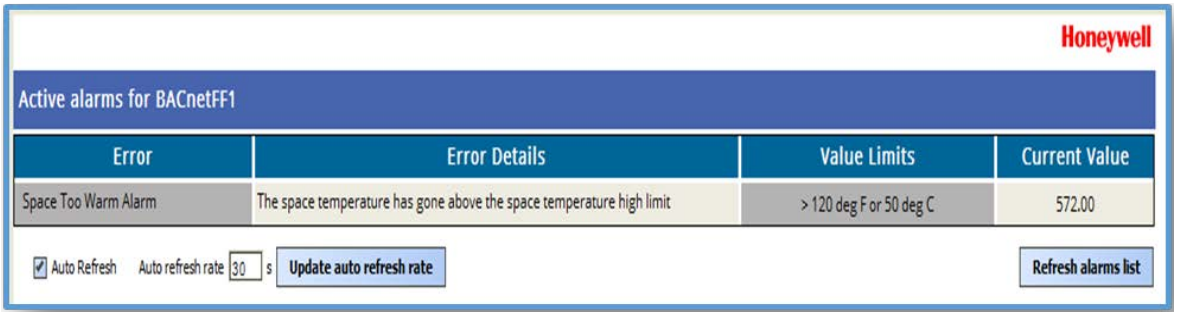



**Figure 88: Viewing Alarms**

Alarm window shows errors logged by the BACnet FF T-Stat device. This action can be performed only when the device is in the online mode.

The controller must be in a downloaded state.

| | |
|---|---|
| | ***Note:*** |
| *The controller is capable of tracking and reporting several types of errors.* | |

Groups of errors of the same type are also reported as an alarm by the controller. This means, the several different errors of the same type will be reported as a single alarm.

For Example, multiple sensors connected to the controller may read invalid values and the controller will log individual errors for each sensor. However, a single 'Bad Sensor Alarm' alarm will be reported.

As shown in Figure 88, this screen displays all the errors that are currently active and reported by the controller.

## Error

This column displays the name of the errors. Errors can be one of the following types:

- Bad Sensor Alarm
- Filter Alarm
- Low Limit Alarm
- Cooling Locked Out / Low-Supply-Temperature Alarm
- Space Too Warm Alarm
- Space Too Cold Alarm
- Bad Water Sensor Alarm

## Error Details

It shows the description for the error occurred.

## Value Limits

It displays the value or range of values for a parameter, beyond which an alarm will be generated.

## Current Value

It displays the value of the as read from the controller

## Refresh alarm list

Click the

button to refresh the error list manually and see the current errors.

## Auto Refresh / Update auto refresh rate

**Auto Refresh:** If this option is selected, the alarms view/data refreshes automatically for the time mentioned in 'Auto refresh rate' field.

For example, if Auto refresh rate is set to 30 sec, the alarm data refreshes automatically after every 30 seconds to show the current errors.

# Time Sync

It is used to set the time as per the time zone in the devices connected over BACnet network.

Features like scheduling and day light savings will not work correctly if the device does not have a valid date and time set. This action can only be performed with the device in online mode.

Right click on the 'Bacnetnetwork' > Views > select 'Honeywell Time Sync' as shown in Figure 89.

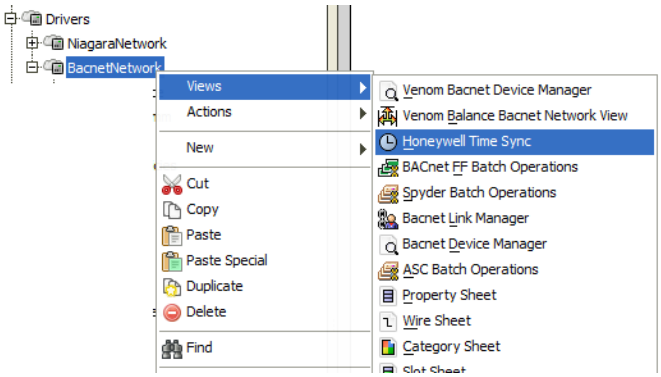
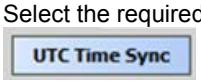



**Figure 89: Selecting 'Honeywell Time Sync'**

Select the required device and click ' UTC Time Sync' 

option as shown in Figure 90. The time will be updated for the selected device.

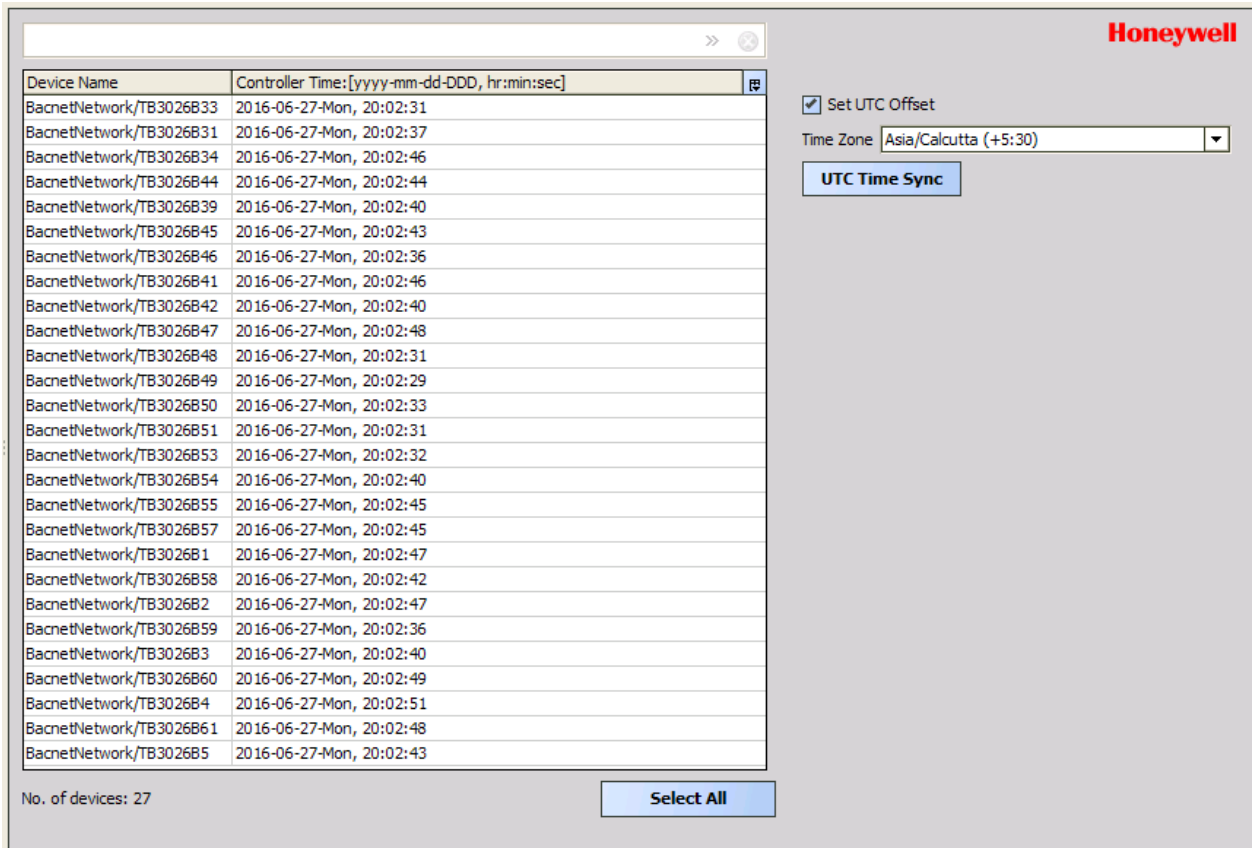



**Figure 90: Time Sync View**

# Batch Operations

In BACnet FF Batch Operations view, batch operations can be invoked on selected BACnet FF devices.

Following batch operations can be performed with the BACnet Batch Operations view

1. Download
2. Upload
3. Set Outputs To Auto

To perform BACnet FF Batch Operations, right click on the 'Bacnetnetwork' > Views > select 'BACnet FF Batch Operations' as shown in Figure 91.

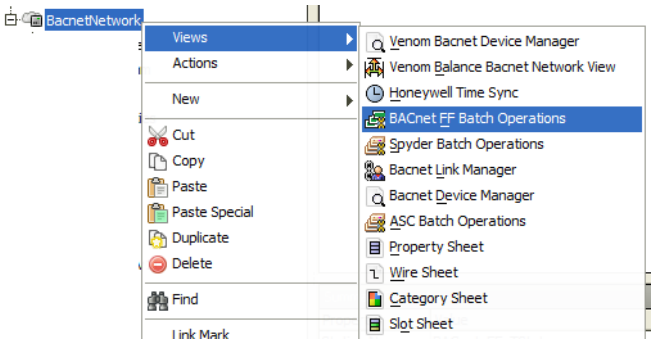



**Figure 91: Selecting 'BACnet FF Batch Operations'**

In the 'BACnet FF Batch Operations' view, the device download status and the device mode status can be viewed in a tabular format. Refer to Figure 92.

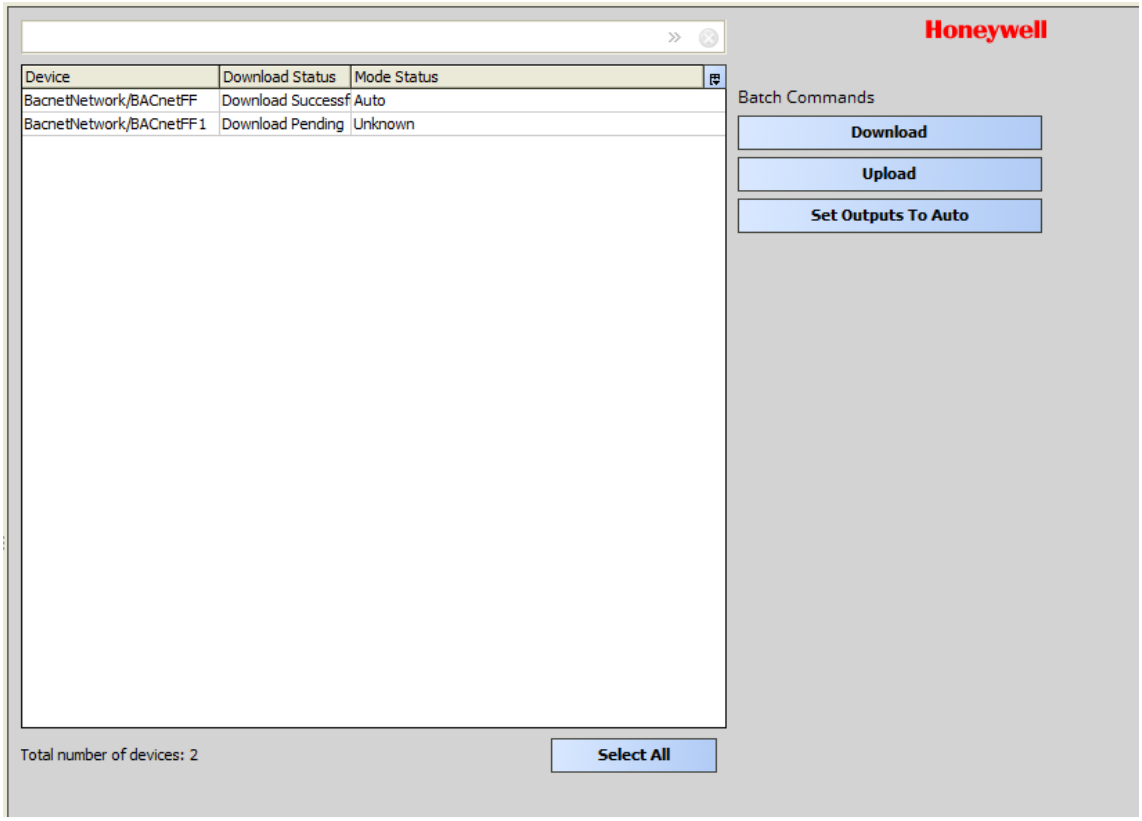



**Figure 92: BACnet FF Batch Operations' view**

**Device:** Displays the list of devices added in the network.

**Download Status:** Displays the download status for the added devices.

**Mode Status:** Displays the three types of mode status for the added devices:

- **Auto:** BACnet FF controller derives the outputs automatically.
- **Outputs Overridden:** When user manually overrides the output values using Diagnostics option.

- **Unknown:** When the output status is unknown because of connection error or if the device is offline or the device is not downloaded state.

## Download

Click Download to perform the batch download.

## Upload

Click Upload to perform the batch upload.

## Set Outputs to Auto

Selecting Set Outputs To Auto will put the overridden outputs back to “Auto” mode.

.

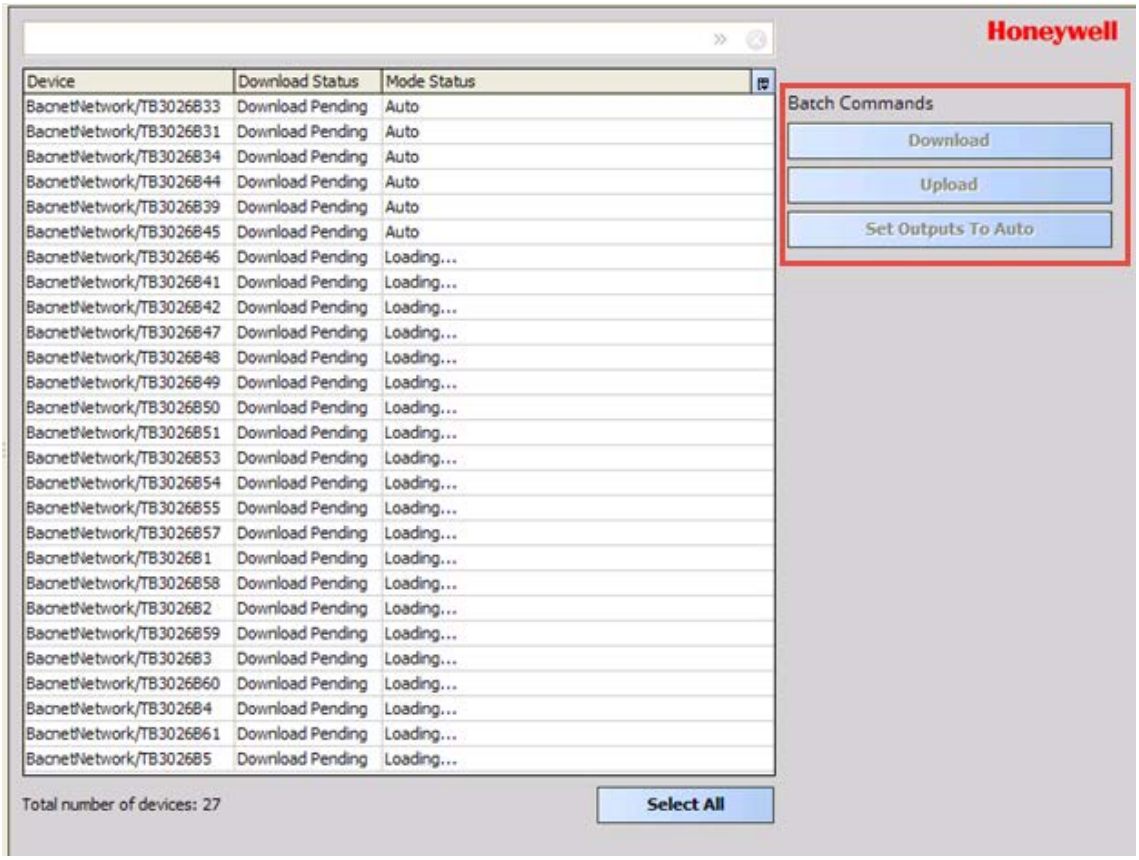



**Figure 93: BACnet FF Batch Operations’ view while loading the Mode Status**

When the ‘Download Status‘ and ‘Mode Status’ are in loading for the devices in Batch Operation, the ‘Batch Commands’ get disabled till the loading is completed for all the devices. Refer to Figure 93

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f. The failure of either party to enforce at any time any of the provisions of this Agreement shall not be construed to be a continuing waiver of any provisions hereunder nor shall any such failure prejudice the right of such party to take any action in the future to enforce any provisions hereunder.

g. In the event any provision of this Agreement is determined to be illegal, invalid, or unenforceable, the validity and enforceability of the remaining provisions of this Agreement will not be affected and, in lieu of such illegal, invalid, or unenforceable provision, there will be added as part of this Agreement one or more provisions as similar in terms as may be legal, valid and enforceable under applicable law.

h. You acknowledge that any breach of your obligations hereunder with respect to the Software or the confidential information of Honeywell will cause Honeywell irreparable injury for which it has no adequate remedy at law. You further agree that Honeywell will be entitled to seek and obtain equitable relief, including preliminary injunctions and temporary restraining orders, to prevent any unauthorized use of the Software and confidential information, without posting of bond or other security, in addition to all other remedies available to it under this Agreement or other applicable law.

i. This Agreement will be governed by and interpreted in accordance with the laws of the State of Minnesota without reference to conflict of laws principles. If for any reason a court of competent jurisdiction finds any provision of the Agreement to be unenforceable, that provision will be enforced to the maximum extent possible to effectuate the intent of the parties, and the remainder of the Agreement will continue in full force and effect. This Agreement shall not be governed by the United Nations Convention on Contracts for the International Sale of Goods, or by the Uniform Computer Information Transactions Act (UCITA). The parties agree that exclusive jurisdiction for any dispute arising out of or relating to this Agreement lies within courts located in the State of Minnesota. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court.

**8. DEFINITIONS**

a. "Designated Facility" means the particular building(s) owned or operated by you or authorized Honeywell customers at the locations authorized by Honeywell for use with the Software.

b. "Designated System" means the equipment and/or computer hardware authorized by Honeywell for use with the Software.

c. "Software" means the computer software in machine-readable, object code form only, owned and distributed by Honeywell via CD ROM, the Internet, or other distribution mechanism, including any Updates to such Software that may be provided by Honeywell to this Agreement.

d. "Updates" means any enhancement, upgrade, or modification to the Software that may be provided by Honeywell under this Agreement but excluding any items licensed, marketed or distributed by Honeywell as a separately-priced product.

By using this Honeywell literature, you agree that Honeywell will have no liability for any damages arising out of your use or modification to, the literature. You will defend and indemnify Honeywell, its affiliates and subsidiaries, from and against any liability, cost, or damages, including attorneys' fees, arising out of, or resulting from, any modification to the literature by you.

**Automation and Control Solutions**
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