SIEMENS

BACnet PTEC Controller

VAV with Series Fan and 3-Stage Electric Heat

Start-up Procedures

140-1192
2014-08-13

Building Technologies

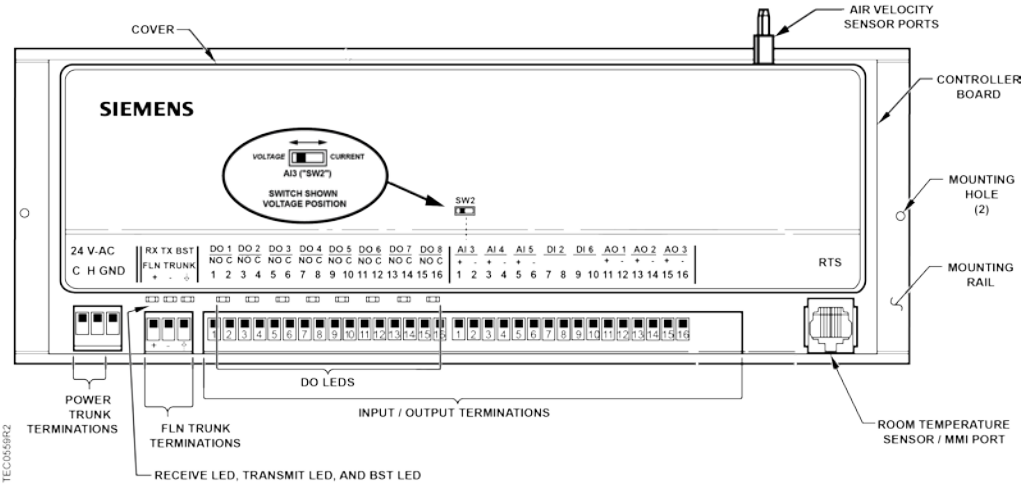
Table of Contents

Before You Begin

NOTE:
For information on applications with Firmware Revision B*x*40 or earlier, see InfoLink and/or Asset Portal for documentation.

NOTE:
WCIS version 4.0 or later must be used to configure and auto-address Siemens BACnet MS/TP Equipment Controllers.

If you need metric units and the controller is communicating through the MS/TP driver in the field panel, uncheck the Metric check box. The conversion must be handled in the field panel.



Generic Controller I/O Layout. See *Wiring Diagram* for application specific details.

NOTE:
Digital Room Units (Firmware Revision 26 and later) will update their controlled inputs without putting them Out Of Service. However, a command from an external source through the digital room unit will put the associated BACnet Input point Out Of Service.

Communication and DO Indicators

The Siemens BACnet PTEC VAV with a Variable Speed Series Fan and 3-Stage Electric Heat has LEDs to indicate communication (yellow) and DO (digital output) status BST (yellow).

The RX LED will flash for data packets received by the controller from the MS/TP network. The TX LED will flash for data packets sent by the controller to the MS/TP network. Each DO has an associated LED located above its termination point. This LED point is on when the associated DO is commanded ON; otherwise, it is OFF.

The BACnet PTEC will automatically detect the MS/TP baud rate at start up and will communicate with other devices when configured as a master MS/TP device (address 1 through 127). The TX LED will start flashing as it attempts to communicate with other devices.

Room Unit Identification

- For Analog Room Units – The revision number is visually identified by its case.
- For Digital Room Units (Firmware Revision 25 or earlier) – The revision number displays for 5 seconds when the room unit is first powered up. These room units will display `laptop` when a laptop is connected and will no longer update room temperature sensor values.
- For Digital Room Units (Firmware Revision 26 and later) – The revision number displays for 5 seconds when the room unit is first powered up or when a laptop is disconnected. These room units will continue to display and update the room temperature sensor values when a laptop is connected.

Enabling Actuators

⚠ CAUTION

The controller's DOs control only 24 Vac loads.
The maximum rating is 12 VA for each DO.

The point that determines actuator run times are:

- MTR 1 TIMING
- MTR 2 TIMING
- MTR 3 TIMING

Your application may not have or use all three points.

1. Use the following table to set run time(s) for the actuator used by your application.
2. For damper rotation angles other than 90°, set ROT ANG to the appropriate value.

Damper Actuator Run Time		
Damper Actuator	**Setting (seconds)**	
	50 Hz	**60 Hz**
349-0101	106	88
GDE 131.1U	108	90
GDE 131.1P	108	90
GLB 131.1P	150	125
1GBB 171.1U	150	150
2GDE 161.1P	108	90
2GLB 161.1P	150	125

Valve Actuator Run Time		
Valve Actuator	Setting (seconds)	
	50 Hz	60 Hz
SSB81U (Powermite - MZ Series)	180	150
SQS 82	155	130
SQS 65U (analog output 0 to 10V)	35	30
SQS 65.5U (analog output 0 to 10V)	35	30
SSB 61U (analog output 0 to 10V)	N/A	150

Specifying Motor Setup

⚠ CAUTION

If an Autozero Module is used, do not enable MTR3 (valve 2).

MTR SETUP determines which actuators are controlled by the application and whether they are direct or reverse acting. Set MTR SETUP according to Table *MTR SETUP Values*.

NOTE:
When MTR SETUP is changed, all enabled actuators will calibrate. Wait until each actuator has completed its calibration before continuing.

MTR SETUP Values									
	Motor 1 Enabled			Motor 1 Enabled and Reversed			Motor 1 Not Used		
	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed
Motor 3 Not Used	1	5	13	3	7	15	0	4	12
Motor 3 Enabled	17	21	29	19	23	31	16	20	28
Motor 3 Enabled and Reversed	49	53	61	51	55	63	48	52	60

Verifying Actuator Setup

1. Command all actuators closed. Verify that they close and remain closed. If not, adjust the setting for MTR SETUP according to Table *MTR SETUP Values*.
2. If any of the actuators still do not close completely, then the actuators have been installed or set up incorrectly. See the Siemens BACnet PTEC VAV with a Variable Speed Series Fan and 3-Stage Electric Heat Installation Instructions (550-143), the iKnow Troubleshooting Tool, or contact Field Support.

Setting the Application

Add the TEC to your job database and select Application 6657.

After you set the application, the controller goes through a shut-down/load sequence as it switches to the application selected. After the application loads, the calibration cycle begins.

At the start of the calibration cycle, the controller automatically sets CAL AIR to YES. When the cycle is complete, CAL AIR returns to NO.

The air velocity sensor calibration cycle begins within three minutes of an application start-up or initialization, depending on the controller's address. After this delay, the calibration cycle takes from 2 to 5 minutes to complete. The air damper closes during calibration.

NOTE:
You can continue the startup procedure while calibration is underway. However, the controller will ignore commands to control end devices (such as the damper) until calibration of the air velocity sensor is finished.

Setting Number of Heat Stages or Valves

Depending on the application, STAGE COUNT, HTG STG CNT, VALVE COUNT, or VLV CNT (if present) refers to electric heat stages or valves used (enabled), some point names may vary.

- For water or steam valve applications, set VALVE COUNT or VLV CNT to the number of valves used (1 or 2).
- For electric heat applications, check the hardware to verify the number of electric heat stages wired to the controller (1 to 3) and set STAGE COUNT or HTG STG CNT to this value.

⚠ CAUTION

For installations using electric heat coils and without terminal fans, never set min airflow settings to 0.

Equipment damage can occur if electric heat is on without airflow.

- For applications with Electric Heat and no terminal fan and when the heating coil is located in the terminal unit, supply airflow is required to allow heat transfer from the coil to the room. EHEAT FLOW (in percent of HTG FLOW MAX) provides a means

to ensure that there is sufficient air flow present before activating any heating stage.

- For applications with a terminal Series Fan, the fan is ON during DAY modes. To insure air flow across the heating coils in the night mode, set SERIES ON and SERIES OFF (in percentage of HTG FLOW MAX) to provide fan control for the required airflow.

Selecting Automatic Calibration Option

1. Using the following table, set CAL SETUP to the value that best meets your job requirements.
2. If appropriate, change CAL TIMER from the default of 12 hours. This setting applies only if your choice for CAL SETUP includes Option 4.

NOTE:
The air velocity sensor should be calibrated at least once every 24 hours. Make sure that the sensor has been calibrated before balancing takes place, as this will affect the balancer's results.

CAL SETUP Options.	
CAL SETUP (value)	**Description**
0	Calibration occurs ONLY when the point CAL AIR is set to **YES**.
1	Calibration occurs when the field panel commands a day/night mode changeover. Actual calibration is subject to a time delay of 0, 1, 2, or 3 minutes. This delay is determined by the point CTLR ADDRESS divided by 4. The remainder is the time delay in minutes. **Example:** If CTLR ADDRESS = 11, then the controller will wait 3 minutes (11 ÷ 4 = 2 R3) after it receives the day/night mode changeover command before beginning the calibration routine.
2	Calibration occurs immediately after the override switch is pressed.
4 (factory default value)	Calibration occurs on the time interval set in the point CAL TIMER. **Example:** If CAL TIMER = 12, then the calibration period is 12 hours. Actual calibration is subject to a time delay based on the value of CTLR ADDRESS. See the example in Option 1.

NOTE:
Options can be combined by summing their numbers. For example, to calibrate in Options 1 and 2, set CAL SETUP to **3**.

Setting Room Temperature Offset (optional)

Enter plus or minus corrections for room temperature sensor in RMTMP OFFSET.

Example

If the actual room temperature is 72.0°F (22.2°C), but the value of ROOM TEMP is showing 73.0°F (23.8°C), then the value to be entered into RMTMP OFFSET (or TEMP

OFFSET) would be –1.0 (negative 1 degree). In this case, ROOM TEMP would read the raw value 73.0°F (23.8°C), but CTL TEMP would equal 72.0°F (22.2°C).

CTL TEMP = ROOM TEMP + RMTMP OFFSET (or TEMP OFFSET)

Setting Room Temperature Setpoints (Digital and Analog Room Units)

Set the following basic control temperature setpoints:

- Day (or OCC) cooling setpoint: DAY CLG STPT (default 74°)
- Day (or OCC) heating setpoint: DAY HTG STPT
- Night (or UOC) cooling setpoint: NGT CLG STPT
- Night (or UOC) heating setpoint: NGT HTG STPT

If STPT DIAL is set to NO, CTL STPT will use the above setpoint depending on the HEAT.COOL mode and the day/night mode.

Setting STPT SPAN

Set STPT SPAN = 0 for Room Unit setpoint use as standard (absolute values for example, 74 F). For configurations for warmer/cooler (per *Selecting Options for Room Unit Setpoints*), set STPT SPAN = 1 degree or greater (for example, STPT SPAN = 2 will allow -2 to +2 degrees from the current heating or cooling setpoint).

Selecting Options for Room Unit Setpoints

In addition to the base room temperature setpoints that should be entered above, when STPT DIAL = YES, the following options are provided for room units using Standard/Absolute or Warmer/Cooler temperature setpoints, depending on the room unit provided.

The following sections provide the setup configurations based on desired room unit setpoint option:

- Standard/Absolute Setpoints Mode (Digital Room Units [→ 9])
- Warmer/Cooling Setpoints Mode (Digital Room Units [→ 10])
- Standard/Absolute Setpoints Mode (Analog or Digital Room Units [→ 11])
- Warmer/Cooling Setpoints Mode (Analog Room Units) [→ 12]

NOTE:
For all of these configurations, if a zero shift of setpoint is desired or specified when changing from heating to cooling, set DAY CLG STPT = DAY HTG STPT. This may not be in compliance with various energy and control standards.

Standard/Absolute Setpoint Mode (Digital Room Unit)

Digital Room Unit (2200/2300 Series Firmware Revision 26 and later)

The setpoint value entered on the room unit will be equal to the RM STPT DIAL and will be used for CTL STPT.

1. Set STPT DIAL = **YES**.

2. Set STPT SPAN = **0**.
3. Set SENSOR SEL = **1** (additive value)
   Enables Room Unit Temperature and setpoint options. Other room unit options can then be added as needed. See *Setting SENSOR SEL*.
4. Set RM STPT MIN and RM STPT MAX to a limit range for setpoint adjustment.
5. Set DAY CLG STPT and DAY HTG STPT to the initial values to be used by the room unit and to establish the heating/cooling setpoint and shift.

Configuration values used by the digital room unit are sent from the points configured above in the PTEC and do not need to be individually entered into the room unit. These include, SET PT MIN, SET PT MAX and SEL PT DIS (display option).

Example

DAY CLG STPT = 74, DAY HTG STPT = 70

In cooling mode, the current room setpoint in RM STPT DIAL displays when you press a setpoint UP/DOWN button. You can change the displayed value and the RM STPT DIAL value within the min/max limits.

When you press the UP button to the new cooling setpoint of 78 (an increase from the base cooling setpoint of plus 4 degrees), it will be displayed in RM STPT DIAL. When the controller switches to heating mode, the RM STPT DIAL will display the DAY HTG STPT, also offset by plus 4 degrees (74).

In this Standard/Absolute configuration, the value of RM STPT DIAL will display the actual control setpoint.

Warmer/Cooler Setpoint Mode (Digital Room Unit)

Digital Room Unit (2200/2300 Series Firmware Revision 26 and later)

NOTE:
The revision number displays for 5 seconds when the room unit is first powered up or when a laptop is disconnected.
Digital Room Units (Firmware Revision 26 and later) will continue to display and update the room temperature sensor values when a laptop is connected.

The room unit setpoint shift (warmer/cooler) will be used to set the RM STPT DIAL temperature and will be used for CTL STPT.

1. Set STPT DIAL = **YES**.
2. Set STPT SPAN = **1** (or greater).
3. Set SENSOR SEL = **1** (additive value)
   Enables Room Unit Temperature and setpoint options. Other room unit options can then be added as needed. See *Setting SENSOR SEL*.
4. Set RM STPT MIN and RM STPT MAX to a limit range for setpoint adjustment.
5. Set DAY CLG STPT and DAY HTG STPT to the initial values to be used by the room unit and to establish the initial heating/cooling setpoint shift.

Configuration values used by the digital room unit are sent from the points configured above in the PTEC and do not need to be individually entered into the room unit. These include, SET PT MIN, SET PT MAX and SEL PT DIS (display option).

Example

DAY CLG STPT = 74, DAY HTG STPT = 70; STPT SPAN = 2

In cooling mode, this warmer/cooler configuration, when you press the UP or DOWN button, the graphic display will indicate the current shift, if any. You can change the graphic display two steps UP or DOWN. You press UP (warmer) by two steps (maximum shift allowed with the setup). The RM STPT DIAL will display the new cooling setpoint of 76; (a shift from the base cooling setpoint of 2 degrees). When the controller switches to heating mode, the RM STPT DIAL will display the DAY HTG STPT, also offset by plus 2 degrees (72), while the room unit graphic display will maintain its + 2 shift.

RM STPT DIAL value will be limited to RM STPT MIN and RM STPT MAX values.

In this warmer/cooler configuration, the value of RM STPT DIAL will display the actual control setpoint.

Standard/Absolute Setpoint Mode (Analog or Digital Room Unit)

Analog (1000 Series) or Digital Room Units (Firmware Revision 25 or earlier)

NOTE:
The revision number displays for 5 seconds when the room unit is first powered up.

For the configuration for these devices, the CTL STPT is an offset calculation from the value set on the room unit. This offset is established by the difference between the DAY CLG STPT and the DAY HTG STPT. The value on the RM STPT DIAL, as set by the room unit, is the midpoint of this offset.

1. Set STPT DIAL = **YES**.
2. Set STPT SPAN = **0**.
3. Do one of the following:
   - Digital Room Unit: Set SENSOR SEL = **1** for Digital Room units (additive value)
     Enables Room Unit Temperature and setpoint options. Other room unit options can then be added as needed. See *Setting SENSOR SEL*.
   - Analog Room Unit: Set SENSOR SEL = **0** for Analog Room units (additive value)
     Disables Digital Room Unit Temperature and setpoint options. Other sensor select options for type of thermistor used can then be added as needed. See *Setting SENSOR SEL*.
4. Set RM STPT MIN and RM STPT MAX to limit range for setpoint adjustment.
5. Set DAY CLG STPT and DAY HTG STPT to establish the heating/cooling deadband only (actual value are not used to establish CTL STPT).

Example

DAY CLG STPT = 74, DAY HTG STPT = 70

This provides a setpoint deadband of 4 degrees.

In either cooling or heating mode, the RM STPT DIAL will display the value set by the room unit (limited by RM STPT MIN and MAX).

- In cooling mode, CTL STPT will be RM STPT DIAL + 0.5 * setpoint deadband
- In the heating mode, CTL STPT will be RM STPT DIAL – 0.5 * setpoint deadband

Example

When the user selects a setpoint on the room unit of 78 degrees it will be displayed in RM STPT DIAL. However, the control setpoint will be offset from this value. In cooling mode, CTL STPT will be 78 + 2 = 80 degrees, and in heating mode CTL STPT will be 78-2 = 76 degrees.

The displayed temperature setpoint on the room unit and the value of RM STPT DIAL will display MID POINT of the actual control setpoints.

Warmer/Cooler Setpoint Mode (Analog Room Unit Only)

Analog Room Unit (1000 Series)

The room unit setpoint shift (warmer/cooler) will be used to set the RM STPT DIAL temperature and will be used for CTL STPT.

1. Set STPT DIAL = **YES**.
2. Set STPT SPAN = **1** (or greater).
3. Set SENSOR SEL = **0** (additive value)
   Disables Digital Room Unit Temperature and setpoint options. Other sensor select options for type of thermistor used can then be added as needed. See *Setting SENSOR SEL*.
4. In this option, RM STPT MIN and RM STPT MAX are not used to limit setpoint range (this is accomplished by the STPT SPAN adjustment).
5. Set DAY CLG STPT and DAY HTG STPT to the initial values to be used by the room unit and to establish the initial heating/cooling setpoint shift.

The analog room unit setpoint slider is mapped to + and – the STPT SPAN configured.

When the slider is at mid point, there is no shift in cooling or heating setpoint used by CTL STPT and displayed in RM STPT DIAL.

Example

DAY CLG STPT = 74, DAY HTG STPT = 70; STPT SPAN = 4

In cooling mode, In this warmer/cooler configuration, when the user moves the slider half way up to the top (a 2 degree shift), the CTL STPT and RM STPT DIAL will display the new cooling setpoint of 76 (a shift from the base cooling setpoint of 2 degrees). When the controller switches to heating mode, CTL STPT and RM STPT DIAL will display the DAY HTG STPT also offset by plus 2 degrees (72) while the slide remains at the previous position.

In this warmer/cooler configuration, the value of RM STPT DIAL will display the actual control setpoint.

Setting SENSOR SEL

SENSOR SEL is a configurable, enumerated point (values are additive). This point tells the controller what type of room unit is being used and how to handle loss of data. It also provides the ability to enable the optional RH and CO2 sensors and which thermistor type is connected.

Room Temperature, Setpoint, RH and CO2

- When the digital room unit (Series 2200/2300) is used, SENSOR SEL selects the source for temperature and setpoint and enables a loss of communications indication:
  - Temperature/Setpoint enable and supervision for fail communications (temperature) with a value of 1.
  - Relative humidity enable and supervision for fail communications with a value of 2.
  - CO2 enable and supervision for fail communications with a value of 4.
- When the analog room unit (Series 1000/2000) is used, default temperature sensing (0) from an analog room unit is enabled (relative humidity and CO2 sensing are not available and should not be selected).

Thermistor Inputs

- Default for either input is 10K.
- To enable 100K thermistor on input, see the following table for additive values of 8 or 16.

Other Inputs (only available on Digital Room Unit)

- Use the following table to select and enable communications supervision of room temperature/setpoint dial, relative humidity or CO2 for additive values of 1, 2 and 4.

SENSOR SEL Value * (additive)	Description (include values to enable feature)
1	Select Digital Room Unit (for temperature sensing and setpoint dial)
2	Relative Humidity (RH) sensing
4	CO_2 sensing
8	If short board: 100K Ω thermistor on AI 3 (else input is 10K Ω) If long board: 100K Ω thermistor on AI 5 (else input is 10K Ω)
16	Long board only: 100K Ω thermistor on AI 4 (else input is 10K Ω)

Room DEW POINT

When the SENSOR SEL enables the relative humidity sensor, the controller will calculate a DEW POINT for information and use when the application is adopted (PPCL) for chilled ceiling configurations. Calculations will be based on valid (or overridden) values of the control temperature (CTL TEMP) and room humidity (RM RH).

Setting Override Time

If using night/unoccupied override, set OVRD TIME to the number of whole hours that an override should last. If OVRD TIME equals 0 (default), this feature is disabled.

Setting FAN MODE

Set FAN MODE to the desired value, CONST or VARI. (VARI is the default, and means variable volume; CONST means constant volume.)

Setting Fan Flow Points (STAGE COUNT less than 3)

If STAGE COUNT equals 3, continue to the next section *Setting Fan Flow Points (STAGE COUNT equals 3)*.

1. Set FAN FLO CMAX to the maximum desired value that FAN FLOW should be during the occupied cooling mode. FAN FLO CMAX is also the value of FAN FLOW if FAN MODE equals CONST and the fan is ON.
2. Do one of the following:
   - If FAN MODE equals VARI, proceed with Step 3 of this section.
   - If FAN MODE equals CONST, and STAGE COUNT equals 2, skip to Step 4.
   - If FAN MODE equals CONST but STAGE COUNT is less than 2, skip Steps 2 through 4, but READ THE NOTE at the end of this section, and then go to the *Setting FAN TIME* section.
3. Enter into FAN FLOW MIN the minimum value that you want FAN FLOW to be during the occupied heating and cooling modes.
4. Enter into FAN FLO HMAX the maximum value that you want FAN FLOW to be during the occupied heating mode.

NOTE:
If FAN MODE = CONST, it is STRONGLY recommended that FAN FLO MID be set equal to or greater than FAN FLO HMAX.

Setting Fan Flow Points (STAGE COUNT equals 3)

1. Set FAN FLO CMAX to the maximum desired value that FAN FLOW should be during the occupied cooling mode. FAN FLO CMAX is also the value of FAN FLOW if FAN MODE equals CONST and the fan is ON.
2. Do one of the following:
   - If FAN MODE equals VARI, proceed with Step 3 of this section.
   - If FAN MODE equals CONST, and STAGE COUNT equals 2, skip to Step 4.
   - If FAN MODE equals CONST but STAGE COUNT is less than 2, skip Steps 2 through 4, but READ THE NOTE at the end of this section, and then go to the *Setting FAN TIME* section.
3. Enter into FAN FLOW MIN the minimum value that you want FAN FLOW to be during the occupied heating and cooling modes.
4. Enter into FAN FLO HMAX the maximum value that you want FAN FLOW to be during the occupied heating mode.
5. If you do not want any heating stage to modulate until the airflow out of the fan is equal to FAN FLO HMAX, then set both FAN FLOW MID and FAN FLO MORE equal to or greater than FAN FLO HMAX. Proceed to the *Setting FAN TIME* section.
6. If you want the 1st heating stage to be able to time modulate at a lower airflow than the 2nd heating stage does and if you want the 2nd heating stage to be able to time modulate at a lower airflow that than the 3rd heating stage does then set FAN

FLO MORE less than FAN FLO HMAX and set FAN FLOW MID less than FAN FLO MORE.

7. When the fan flow points are set this way, the 1st stage of heat can time modulate when FAN FLOW becomes equal to or greater than FAN FLOW MID, the 2nd stage of heat can modulate when FAN FLOW becomes equal to or greater than FAN FLOW MORE and the 3rd stage of heat can time modulate when FAN FLOW becomes equal to or greater than FAN FLOW HMAX. Proceed to the *Setting FAN TIME* section.
8. If you want the 1st heating stage to time modulate at a lower airflow than the 2nd heating stage does and if you want the 2nd heating stage to time modulate at the same airflow that the 3rd heating stage does, then set FAN FLO MID less than FAN FLO HMAX and set FAN FLO MORE greater than FAN FLO HMAX.
9. When the fan flow points are set this way, then the 1st stage of heat will be allowed to time modulate when FAN FLOW becomes equal to or greater than FAN FLOW MID, while the 2nd and 3rd stages of heat will not be allowed to time modulate until FAN FLOW becomes equal to or greater than FAN FLOW HMAX. Proceed to the *Setting FAN TIME* section.
10. If you want the 1st heating stage to time modulate at the same airflow that the 2nd heating stage does and if you want the 2nd heating stage to time modulate at a lower airflow than the 3rd heating stage, then set FAN FLO MID greater than FAN FLO HMAX and set FAN FLO MORE less than FAN FLO HMAX. (Alternatively, you can get the same results by setting FAN FLOW MID less than FAN FLO HMAX and setting FAN FLO MORE less than FAN FLOW MID.)

When the fan flow points are set this way, then the 1st and 2nd stages of heat won't be allowed to time modulate until FAN FLOW becomes equal to or greater than FAN FLO MORE, while the 3rd stage of heat will not be allowed to time modulate until FAN FLOW becomes equal to or greater than FAN FLOW HMAX.

NOTE:
If FAN MODE = CONST, it is STRONGLY recommended that both FAN FLO MID and FAN FLO MORE be set equal to or greater than FAN FLO HMAX.

Setting FAN TIME

FAN TIME is used as a speed limit. It means different things under different circumstances.

- When FAN TIME is set to be less than LOOP TIME (regardless of the value of STAGE COUNT, the application does not use FAN TIME. When this occurs, FAN FLOW can change its value as fast as the Heating PID Loop wants it to change.
- When FAN MODE equals CONST, FAN TIME is not used (regardless of the value of STAGE TIME). This is because FAN TIME is not needed for constant volume fans.

The following two bullet items describe how FAN TIME functions when FAN TIME is set equal to or greater than LOOP TIME and FAN MODE equals VARI.

- When STAGE COUNT equals 1, OR, when STAGE COUNT equals 2 and FAN FLOW MID is equal to or greater than FAN FLO HMAX, FAN FLOW is not allowed to change from FAN FLOW MIN to FAN FLO HMAX (or vice versa) faster than the length of time set in FAN TIME.

- When STAGE COUNT equals 2 and FAN FLOW MID is less than FANFLO HMAX, FANFLOW is not allowed to change from FAN FLOW MIN to FAN FLOW MID (or vice versa) faster than the length of time set in FAN TIME. Also, under these conditions, the same length of time is required for FAN FLOW to change from FAN FLOW MID to FAN FLO HMAX (or vice versa).

The remaining bullet items in this section describe how FAN TIME functions when STAGE COUNT is 3. If you have set STAGECOUNT to be less than 3, you can skip the remainder of this section and proceed to the next section. Otherwise, enter a value for FAN TIME.

- When STAGE COUNT equals 3 and FAN FLOW MID and FAN FLO MORE are both greater than or equal to FAN FLO HMAX, FAN FLOW is not allowed to change from FAN FLOW MIN to FAN FLO HMAX (or vice versa) faster than the length of time set in FAN TIME.
- When STAGE COUNT equals 3, and FAN FLOW MID is less than FAN FLO HMAX, and FAN FLO MORE is greater than or equal to FAN FLO HMAX, FAN FLOW is not allowed to change from FAN FLOW MIN to FAN FLOW MID (or vice versa) faster than the length of time set in FAN TIME. Also, under these conditions, the same length of time is required for FAN FLOW to change from FAN FLOW MID to FAN FLO HMAX (or vice versa).
- When STAGE COUNT equals 3, and FAN FLOW MID is greater than or equal to FAN FLO HMAX, and FAN FLO MORE is less than FAN FLO HMAX, FAN FLOW is not allowed to change from FAN FLOW MIN to FAN FLO MORE (or vice versa) faster than the length of time set in FAN TIME. Also, under these conditions, the same length of time is required for FAN FLOW to change from FAN FLO MORE to FAN FLO HMAX (or vice versa).
- When STAGE COUNT equals 3, and FAN FLOW MID is less than both FAN FLO MORE and FAN FLO HMAX, and FAN FLO MORE is less than FAN FLO HMAX, FAN FLOW is not allowed to change from FAN FLOW MIN to FAN FLOW MID (or vice versa) faster than the length of time set in FAN TIME. Also, the same length of time as stored in FAN TIME is required for FAN FLOW to change from FAN FLOW MID to FAN FLO MORE (or vice versa). Furthermore, under these conditions, the same length of time as stored in FAN TIME is required for FAN FLOW to change from FAN FLO MORE to FAN FLO HMAX (or vice versa).

Setting Stage Times

1. If STAGE COUNT equals 2 or 3, enter into STG 1 TIME the amount of time HEAT STAGE 1 must be ON before HEAT STAGE 2 may turn ON.
2. If STAGE COUNT equals 2, enter into STG 2 TIME the amount of time HEAT STAGE 2 must be OFF before HEAT STAGE 1 may turn OFF.
   If STAGE COUNT equals 3, then enter into STG 2 TIME the amount of time HEAT STAGE 2 must be OFF before HEAT STAGE 1 may turn OFF and the amount of time that HEAT STAGE 2 must be on before HEAT STAGE 3 may turn ON.
3. If STAGE COUNT equals 3, then enter into STG 3 TIME the amount of time HEAT STAGE 3 must be OFF before HEAT STAGE 2 may turn OFF.

Setting HTG DBAND

BASE DO6 cannot turn ON in the unoccupied mode unless CTL TEMP < CTL STPT − HTG DBAND.

Enter the desired value for HTG DBAND.

Setting MORN DBAND

At the beginning of the occupied mode WARMUP (Point 60) cannot turn ON unless CTL TEMP < CTL STPT − MORN DBAND.

Enter the desired value for MORN DBAND.

Setting TEMP HLIMIT and TEMP LLIMIT

The supply air damper cannot modulate in the unoccupied mode until CTL TEMP rises above TEMP HLIMIT.

1. Enter the desired value for TEMP HLIMIT.
   The electric heat will not time modulate in the unoccupied mode until CTL TEMP drops below TEMP LLIMIT.
2. Enter the desired value for TEMP LLIMIT.

Setting the Heat Sequencing Points (STAGE COUNT less than 3)

If STAGE COUNT equals 3, continue to Setting the Heat Sequencing Points (STAGE COUNT equals 3).

When FAN MODE equals CONST, the airflow out of the fan is constant at FAN FLO CMAX. In this case, the electric heat works best if FLOW END is set equal to 0.

- If FAN MODE equals CONST, enter the desired value for FLOW END and skip the rest of this section. If FAN MODE equals VARI, continue with the rest of this section.

When Application 6657 is configured with only one stage of electric heat (STAGE COUNT, equals 1), FAN FLOW will be set equal to FAN FLO HMAX and the heat stage will time modulate whenever HTG LOOPOUT is equal to or greater than FLOW END.

- Enter the desired value for FLOW END and skip the rest of this section. (If you are not sure where to set FLOW END, try setting it to 33.)

If the application is configured with two stages of electric heat (STAGE COUNT equals 2), and FAN FLOW MID is set equal to or greater than FAN FLO HMAX, FAN FLOW will be set equal to FAN FLO HMAX (and both heat stages will time modulate) whenever HTG LOOPOUT is equal to or greater than FLOW END.

- Enter the desired value for FLOW END and skip the rest of this section. (If you are not sure where to set FLOW END, it is recommended that you set it to 33.)

If the application is configured with two stages of electric heat, and FAN FLOW MID is set less than FAN FLO HMAX, then the following four conditions and caution apply:

- When HTG LOOPOUT is equal to FLOW 1 END, FAN FLOW will be set equal to FAN FLOW MID.
- When HTG LOOPOUT is between FLOW 1 END and FLOW 2 START, HEAT STAGE 1 will time modulate.
- When HTG LOOPOUT goes from FLOW 2 START to FLOW END, FAN FLOW will go from FAN FLOW MID to FAN FLO HMAX.
- When HTG LOOPOUT is greater than FLOW END, HEAT STAGE 2 will time modulate.

⚠ CAUTION

Make sure that FLOW 1 END < FLOW 2 START < FLOW END.

If this is not done, the application can lock up. (For example, if FLOW 2 START is < FLOW 1 END, the fan flow and electric heat will remain frozen in place indefinitely.)

Set FLOW 1 END, FLOW 2 START, and FLOW END to the desired values. (If you are not sure what value to set these points to, it is recommended that you set FLOW 1 END to 25, FLOW 2 START to 50 and FLOW END to 75).

Setting the Heat Sequencing Points (STAGE COUNT equals 3)

When FAN MODE equals CONST, the airflow out of the fan is constant at FAN FLO CMAX. In this case, the electric heat works best if FLOW END is set equal to 0.

- If FAN MODE equals CONST, enter the desired value for FLOW END and skip the rest of this section. If FAN MODE equals VARI, continue with the rest of this section.

If the application is configured with three stages of electric heat (STAGE COUNT equals 3), and FAN FLOW MID and FAN FLO MORE are both set equal to or greater than FAN FLO HMAX, FAN FLOW will be set equal to FAN FLO HMAX (and all three heat stages will be allowed to time modulate) whenever HTG LOOPOUT is equal to or greater than FLOW END.

- Enter the desired value for FLOW END and skip the rest of this section. (If you are not sure where to set FLOW END, it is recommended that you set it to 25.)

If the application is configured with three stages of electric heat, and FAN FLOW MID is set less than FAN FLO HMAX, and FAN FLO MORE is greater than or equal to FAN FLO HMAX, then the following four conditions and caution apply:

- When HTG LOOPOUT is equal to FLOW 1 END, FAN FLOW will be set equal to FAN FLOW MID.
- When HTG LOOPOUT is between FLOW 1 END and FLOW 2 START, HEAT STAGE 1 will time modulate.
- When HTG LOOPOUT goes from FLOW 2 START to FLOW 2 END, FAN FLOW will go from FAN FLOW MID to FAN FLO HMAX.
- When HTG LOOPOUT is greater than FLOW 2 END, HEAT STAGE 2 and HEAT STAGE 3 will time modulate.

⚠ CAUTION

Make sure that FLOW 1 END < FLOW 2 START < FLOW END.

If this is not done, the application can lock up. (For example, if FLOW 2 START is <FLOW 1 END, the fan flow and electric heat will remain frozen in place indefinitely.)

Set FLOW 1 END, FLOW 2 START, and FLOW 2 END to the desired values and skip the rest of this section. (If you are not sure what value to set these points to, it is recommended that you set FLOW 1 END to 20, FLOW 2 START to 40, and FLOW 2 END to 60.)

If the application is configured with three stages of electric heat, and FAN FLOW MID is set greater than or equal to FAN FLO HMAX, and FAN FLO MORE is less than FAN FLO HMAX, then the following four conditions and caution apply:

- When HTG LOOPOUT is equal to FLOW 1 END, FAN FLOW will be set equal to FAN FLO MORE.
- When HTG LOOPOUT is between FLOW 1 END and FLOW 3 START, HEAT STAGE 1 and HEAT STAGE 2 will time modulate.
- When HTG LOOPOUT goes from FLOW 3 START to FLOW END, FAN FLOW will go from FAN FLO MORE to FAN FLO HMAX.
- When HTG LOOPOUT is greater than FLOW END, HEAT STAGE 3 will time modulate.

⚠ CAUTION

Make sure that FLOW 1 END < FLOW 3 START < FLOW END.

If this is not done, the application can lock up. (For example, if FLOW END is <FLOW 3 START, the fan flow and electric heat will remain frozen in place indefinitely.)

Set FLOW 1 END, FLOW 3 START, and FLOW END to the desired values and skip the rest of this section. (If you are not sure what value to set these points to, it is recommended that you set FLOW 1 END to 20, FLOW 3 START to 60, and FLOW END equal to 80.)

If the application is configured with three stages of electric heat, FAN FLOW MID is set less than both FAN FLO MORE and FAN FLO HMAX and FAN FLO MORE is less than FAN FLO HMAX, then the following six conditions and caution apply:

- When HTG LOOPOUT is equal to FLOW 1 END, FAN FLOW will be set equal to FAN FLOW MID.
- When HTG LOOPOUT is between FLOW 1 END and FLOW 2 START, HEAT STAGE 1 will time modulate.
- When HTG LOOPOUT goes from FLOW 2 START to FLOW 2 END, FAN FLOW will go from FANFLOWMID to FANFLO MORE
- When HTG LOOPOUT is between FLOW 2 END and FLOW 3 START, HEAT STAGE 2 will time modulate.
- When HTG LOOPOUT goes from FLOW 3 START to FLOW END, FAN FLOW will go from FAN FLO MORE to FAN FLO HMAX.
- When HTG LOOPOUT is greater than FLOW END, HEAT STAGE 3 will time modulate.

⚠ CAUTION

Make sure that FLOW 1 END < FLOW 2 START < FLOW 2 END < FLOW 3 START < FLOW END.

If this is not done, the application can lock up. (For example, if FLOW 3 START is < FLOW 2 END, the fan flow and electric heat will remain frozen in place indefinitely.)

Set FLOW 1 END, FLOW 2 START, FLOW 2 END, FLOW 3 START and FLOW END to the desired values. (If you are not sure what value to set these points to, it is recommended that you set FLOW 1 END to 10, FLOW 2 START to 30, FLOW 2 END equal to 45, FLOW 3 START equal to 65 and FLOW END equal to 80.)

Setting Box Size

One of the functions of Application 6657 is to determine the proper airflow value for the terminal box's VAV fan. This value is stored in FAN FLOW. Once a value for FAN FLOW has been determined, a Table Statement embedded in the application's firmware uses it to determine the proper value for FAN AOV1. The application actually contains four such Table Statements, but only one will be used. Selecting the correct Table Statement depends on the value of BOX SIZE.

- BOX SIZE should be set to 3, 5, or 7 when a Nailor box is using a size of 3, 5, or 7. When this is done, the application will use 1 of 3 pre-coded Table Statements with pre-determined FAN AOV1 voltage levels that correspond to airflow values of FAN FLOW. The voltage and flow values in these pre-coded Table Statements are fixed and cannot be changed by the user.
- BOX SIZE should be set to 0 when a box other than a Nailor box is being used, or when a Nailor Box is using a size other than 3, 5 or 7. When this is done, the application uses an embedded, general purpose Table Statement to adjust the value of FAN AOV1 based on the value of FAN FLOW. The flow and voltage values of this table statement are not pre-coded and must be entered into the controller.

Enter the desired value for BOX SIZE.

If BOX SIZE is set to a value other than 0, READ THE NOTE at the end of this section, then proceed with Setting Controller Address.

If BOX SIZE is set to 0, the controller needs to have the following fan AOV Table Statement parameters entered into it:

- FLO LO – This is the lowest flow the fan can produce. (FLO LO must be equal to or less than FAN FLOW MIN.)

⚠ CAUTION

Make sure that FLO LO is high enough that the fan can actually maintain it.

If FLO LO is set too low, the fan could shut off without the application being aware of it. If this happens, there is a possibility that the electric heat could turn on while the fan is off. Consult with the fan manufacturer to find out what the lowest airflow is that the fan can maintain.

- FLO LO VOLTS – This is the voltage value that FAN AOV1 must have in order to get the fan to produce the amount of airflow that is stored in FLO LO.
- FLO HI – This is the highest flow that the fan can produce. FLO HI must be set greater than or equal to both FAN FLO HMAX and FAN FLO CMAX.
- FLO HI VOLTS – This is the voltage value that FAN AOV1 must have in order to get the fan to produce the amount of airflow that is stored in FLO HI.

Enter the desired values for FLO LO, FLO HI, FLO LO VOLTS and FLO HI VOLTS.

When properly set up, the Table Statement works as follows:

- When FAN FLOW is equal to or less than FLO LO, FAN AOV1 will be set to FAN LO VOLTS.
- When FAN FLOW is equal to or greater than FAN HI, FAN AOV1 will be set to FAN HI VOLTS.
- When FAN FLOW is in between FLO LO and FLO HI, the Table Statement will use linear interpolation to set the value of FAN AOV1 to a value that is between FAN LO VOLTS and FAN HI VOLTS.

NOTE:
Once FAN AOV1 is set to a particular voltage, this signal is sent to an intelligent motor controller that controls the fan and which is provided by others. This controller must be configured to know what airflow corresponds to a given voltage of FAN AOV1. Consult the operating instructions provided by the manufacturer of the intelligent motor controller for proper set-up information.

Setting Duct Area

If provided, enter the duct area (sq ft or sq m) into DUCT AREA and continue to *Setting Flow Coefficient*.

If you do not know the duct area, use the following table:

Area =	Round Duct	Rectangular Duct
Area in Sq. Ft.	$(\pi \times R^2)/144$ (where $\pi = 3.14$ and R = radius of duct in inches)	Width x Height/144 (in inches)
Area in Sq. M	$(\pi \times R^2)/10{,}000$ (where $\pi = 3.14$ and R = radius of duct in centimeters)	Width x Height/10,000 (in centimeters)

Setting Flow Coefficient

1. Set CLG FLO COEFF to the appropriate value found in Table *Box Manufacturer Flow Coefficients*. This value is a starting point for the air balancer.
2. To fine tune the flow coefficient, use the following formula:
   ⇨ **New Flow Coefficient = (Actual Volume ÷ Controller Volume) × Old Flow Coefficient**
   The actual volume is the value obtained from the balancer's measurements. The controller volume is the value obtained from AIR VOLUME.
3. If the controller volume is not within 5% of the actual volume, repeat this procedure until it is within 5%.

Box Manufacturer Flow Coefficients		
Manufacturer	**Sensor Type**	**Value**
Anemostat	2-pipe without orifice 2-pipe with orifice Spider without orifice Spider with orifice	0.79 0.59 0.73 0.39
Carnes	2-pipe Flow cross	0.66 0.59
Carrier		0.59
E.H. Price/Siemens Industry Terminal Boxes		0.78
Environmental Technologies		0.79
Krueger		0.68
Metal Aire		0.72
Nailor Industries		0.69
Titus		0.60
Trane		0.66

Setting Airflow Setpoints

NOTE:
Maximum flow(s) must be set ≥ minimum flow(s).

1. Set CLG FLOW MIN to the desired minimum cooling airflow setpoint. (Use fixed cooling flow minimum or VENT DMD MIN for commandable cooling flow minimum.)
2. Set CLG FLOW MAX to the desired maximum cooling airflow setpoint.
3. Set HTG FLOW MAX to the desired maximum heating airflow setpoint.
4. Set VENT DMD MIN to the desired minimum ventilation airflow setpoint. (The larger of CLG FLOW MIN or VENT DMD MIN used, set to CTL FLOW MIN.)
5. Set NGT FLOW MIN to the airflow for night (unoccupied) mode.
   - During night mode, airflow can modulate to CLG FLOW MAX or HGT FLOW MAX to satisfy the unoccupied temperature setpoints

For more information see, *Setting Fan Flow Points (STAGE COUNT less than 3)*, *Setting Fan Flow Points (STAGE COUNT equals 3)*, *Setting the Heat Sequencing Points (STAGE COUNT less than 3)* and *Setting the Heat Sequencing Points (STAGE COUNT equal 3)*.

Enabling Wall Switch

If a wall switch is used for day/night (occupied/unoccupied) control, enable it by setting WALL SWITCH to **YES**.

Otherwise, leave WALL SWITCH at its default value of **NO**.

Setting Controller Address

1. In WCIS select **View > Edit/View Reports**.
2. Select a report from list and click **Apply**.
3. Set CTLR ADDRESS to the BACnet MS/TP MAC address. (0 through 127 = Master; 128 through 254 = Slave).

NOTE:
See the *WCIS Online Help* for instructions on auto-addressing on the network. Otherwise, set the controller address and MS/TP network baud rate prior to connecting the controller to the network. See Configuring BACnet Parameters [→ 23].

Configuring BACnet Parameters

Using WCIS, do the following:

1. From the **Device** menu, select **Device Properties** to configure BACnet parameters.
2. In the **Object** section, enter information for the following fields:
   - **Name** – unique to BACnet network, (12 alphanumeric character limit).
   - **ID** – unique to BACnet network (valid values are 0 through 4,194,303).
   - **Description** – description of controller (60 alphanumeric character limit).
   - **Location** – physical location of controller (60 alphanumeric character limit).
3. In the **BACNet Communication Settings** section:
   - **Set the CIS/MMI Command Priority to the desired value.**
   - Set **Baud Rate** to the MS/TP network baud rate. Options are; 9600, 19200, 38400 or 76800 (default is19200).
4. In the **MSTP Slave** section:
   - Check the box for a slave device.
   - Set the **MAC Master Node** number.
5. In the **Device Settings** section (configuring the Room Unit port), do one of the following:
   – If using a sensing only Room Unit, the baud rate can be 1200 to 76800. For optimal use with WCIS use **38400**.
   – If using a communicating digital Room Unit, the baud rate must be set to **1200**.

6. Press the **Write** button. The controller accepts the configuration values and then resets.

   ⇨ When the BACnet MS/TP TEC is successfully installed, the RX and TX LEDs flash On/Off rapidly and continuously (indicating proper communication with other devices on the network).

Auto Discover and Auto Addressing

An improved commissioning workflow has been designed for all BACnet PTEC controllers (standard 66xx applications) along with WCIS (Revision 4.0 and later). This provides the option to use the MS/TP network (using the field panel or a router) and the WCIS tool to discover and auto-address each controller. For more information, see the *WCIS Online Help*.

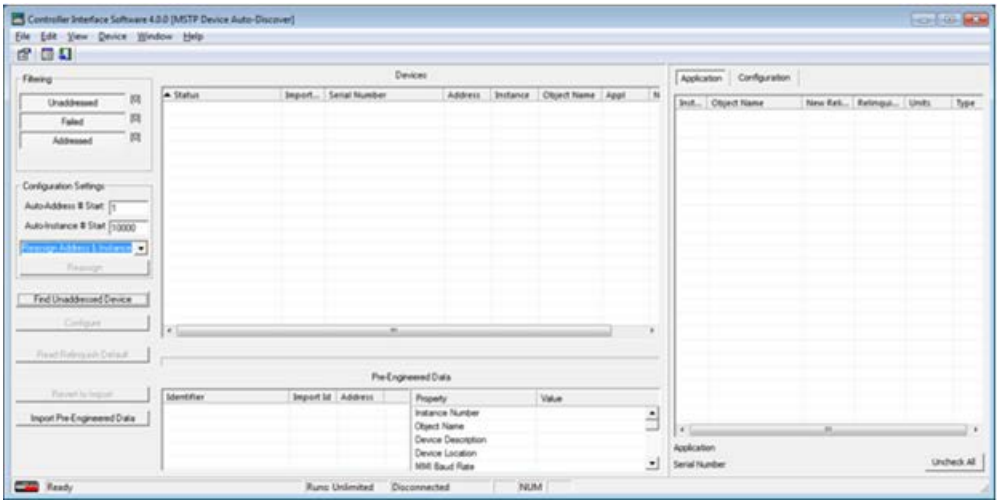
NOTE:
The current workflow will continue to support setting the baud rate and address for each controller using the HMI port or at the room unit.

▷ All BACnet PTEC controllers (standard 66xx applications) will have an internal unique serial number and a two part serial number label.

1. Connect WCIS to the field panel or use a router connected to MS/TP network.
2. Assign one PTEC a valid address (using the serial number). This will establish and set the baud rate for the entire network.

Auto Discovery allows you to automatically discover and identify PTEC controller devices on the BACnet MS/TP Network. There are two basic configurations:

- Devices not configured with an address. (Devices are discovered by their unique serial number.)
- Devices configured with an address and available for modification.



Filtering

These buttons allow you to select what you see in the Auto-discovery window. All three buttons are selected by default.

- **Unaddressed** - Displays unaddressed devices
- **Failed** - Displays failed devices
- **Addressed** - Displays addressed devices

Configuration Settings

- **Auto Address # Start** - Beginning address number. An address is reserved for each discovered device starting with this number.
- **Auto Instance # Start** - Beginning instance number. An instance number is reserved for each discovered device starting with this number.
- **Reassign Address and Instance** (pull-down menu) - Reassigns the address and instance number of the selected device(s).
- **Reassign Address Only** (pull-down menu) - Reassigns the address of the selected device(s).
- **Reassign Instance Only** (pull-down menu) - Reassigns the instance of the selected device(s).

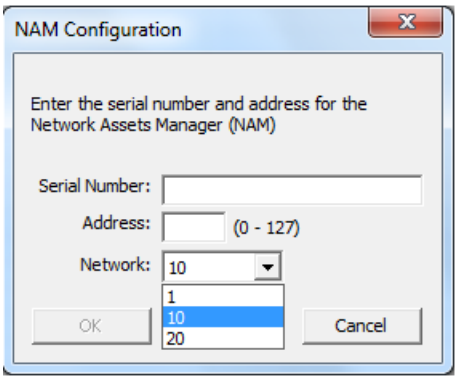
Auto-Discovery

- **Network** (pull-down menu) - Allows you to enter or select a specific network, if multiple networks are available.
- **Find Unaddressed Device** - Searches the connected network for all devices (addressed and unaddressed).
- **Configure** - Sends modified application data to the controller(s).
- **Relinquish Default** - Refreshes relinquish default column of the Application tab with values from the controller.
- **Revert to Import** - Returns to Pre-Engineered Data after changes have been made.
- **Import Pre-Engineered Data** - A .csv file can be used to set initial values in the controller. The file can be taken from Commissioning Tool or exported from Excel. See Commissioning a Controller [➞ 27].

Auto-Discovery Procedure

- Click **Find Unaddressed Device**.

  ⇨ If a NAM device is not defined, the **NAM Configuration** window displays. (NAM - Network Asset Manager; All new TECs can be assigned as a NAM.)



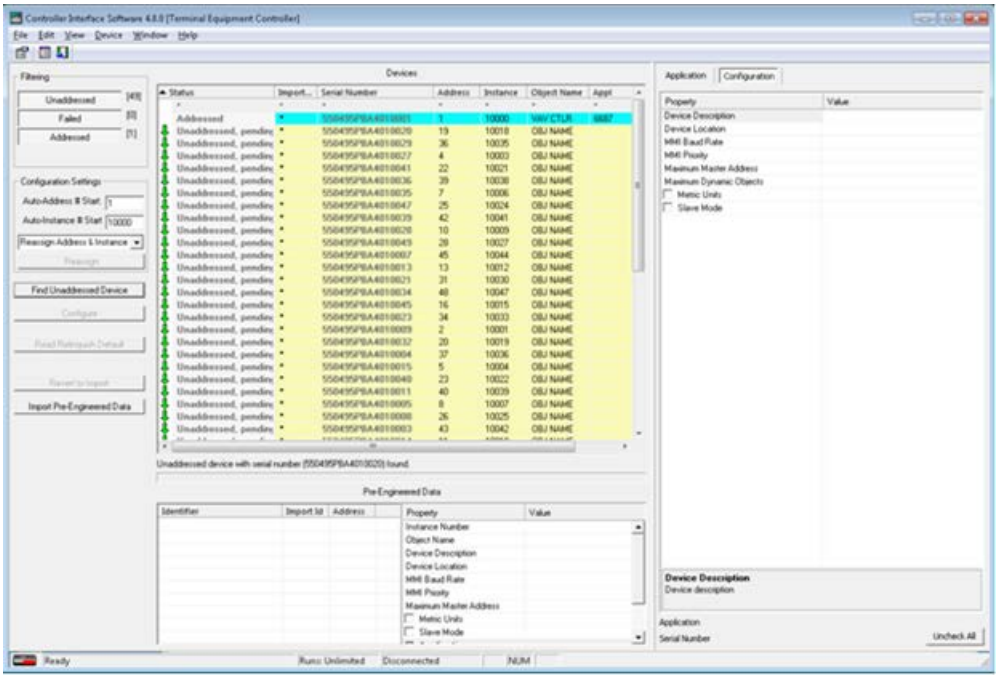
  - Enter the serial number (found on print from electrician).

- Enter a unique (unused) address (0 - 127).
- Click **OK**.

⇨ The device will be assigned as the NAM for the network with the address you specified.

⇨ The NAM device will auto-discover all other devices on the network.

⇨ WCIS will display all devices.

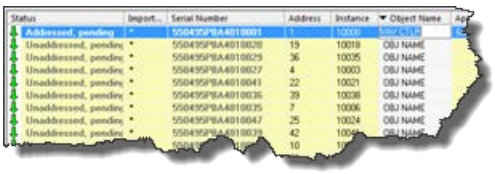


Configuring discovered devices

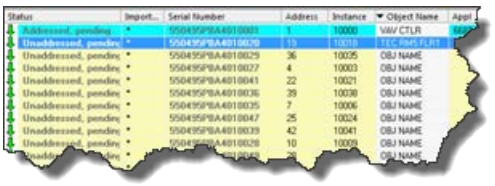
Each device on the network must have unique identifiers in the following fields:

- Address
- Instance
- Object Name - 30 alphanumeric character limit for Siemens field panels.

1. To change any of these fields, click in that field and enter the desired value.

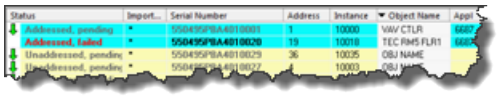


2. When all fields are defined, click **Configure**.



⇨ All devices defined properly will display `Addressed`.

⇨ If a device has not been defined properly, it will display `Unaddressed` and the problem field displays red text.



3. Correct any issues and click **Configure**.

Commissioning a Controller

Learning the Application Point Team

Once a device has been addressed, select your application.

- Do one of the following:
  - Right-click in the **Application** column and select the desired Application from the menu.
  - Click **Configure** to load the device for your application.
  - Right-click on the controller and select **Learn Point Team Descriptor**.

Import Data

1. Click the **Import Data** button.
   ⇨ The **Import Configuration Data** dialog box displays.
2. Browse to the desired .csv file and click **Open**.

⇨ The imported files are listed in the **Pre-Engineered Data** section of the Auto-Discovery window.

Each line in the window is a grouping of data for a controller.

Assigning Import Data to controller.

1. Click in the **Import ID** column of the desired controller in the devices section.
2. Select the appropriate **Import ID number** of the Pre-Engineered Data you want to assign.

⇨ The Application and Configuration tabs will update with the new (Pre-Engineered) data. You can manually change/update any data.

Assigning Import Data to Multiple Controllers

1. Click on the desired **Import Data** from the list in the Pre-Engineered Data section.
2. Select all desired controllers in the Devices window.
3. Right-click the selection in the Devices window and then select **Assign Import Data from Import ID x** in the pop-menu.
4. Click **Configure**.

⇨ The Application will load into each controller selected. The Application and Configuration tabs will update with the new (Pre-Engineered) data.

Commissioning Multiple Controllers

If you're commissioning multiple controllers with the same application all values can be loaded to each controller selected.

You can multi-select by holding either the SHIFT or CTRL key and clicking on multiple controllers listed.

You can configure values for multiple controllers with different applications by first selecting and making changes to one controller and then selecting all controllers and clicking Configure.

NOTE:
Once you select multiple controllers with different applications the Application tab goes blank. However, WCIS retains all changes and send the data for all selected controllers.

Flashing Controller Firmware

FLT Procedure

Use the Firmware Loading Tool (FLT) for this procedure.

1. Connect to RTS port of PTEC.
2. Set Communications to **1200 baud** and **ID**.
3. Click the **Identify** button in FLT.
4. Browse for new firmware.
5. Select **Load**.

WCIS Procedure

1. Connect to device.
2. From the **Device** menu, select, **Load TEC Firmware**.
   ⇨ The **Load TEC Firmware** dialog box displays.
3. Click the **Browse** button.
4. Select the firmware.
5. Select **Load**.

Issued by
Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Pkwy
Buffalo Grove IL 60089
Tel. +1 847-215-1000

Document ID	140-1192	140-1192(AA)
Edition	2014-08-13	Restricted