SIEMENS

P1 DXR

TEC Heat Pump Migration

A6V11504412

Building Technologies

2019-07-11

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Security best practices

Network setup must avoid direct connection from Internet to the end device.

- Implement Port Security to disallow the connection and network participation of any unauthorized laptop/device to a switch.

- Unauthorized access should be prevented by physical security measures. Meaning, access to the devices (controllers) must be limited only to people who require it. Equipment can further be monitored via CCTV.

- When possible, physically segment control systems from non-control systems. Apply the concept of Least Privilege to minimize the impact in case of a compromise of user credentials.

- Ensure that complex and strong passwords are required. Furthermore, ensure that administrator passwords are at least 12 characters long for users with administrative privileges and at least 8 characters long for non-administrative users.

- Ensure that the same username/password credentials are unique for each site within the country/office.

- Ensure that users each have their own individual unique login accounts. User accounts must not be shared.

- Configure account lockout settings (Threshold, Observation Windows, Duration) to protect the system from password guessing or brute force attacks.

- Ensure that accounts are removed within a reasonable time when users no longer work at the site.

- Ensure that firmware is downloaded only from legitimate / known locations.

Cyber security disclaimer

Siemens provides a portfolio of products, solutions, systems and services that includes security functions that support the secure operation of plants, systems, machines and networks. In the field of Building Technologies, this includes building automation and control, fire safety, security management as well as physical security systems.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art security concept. Siemens' portfolio only forms one element of such a concept.

You are responsible for preventing unauthorized access to your plants, systems, machines and networks which should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place. Additionally, Siemens' guidance on appropriate security measures should be taken into account. For additional information, please contact your Siemens sales representative or visit https://www.siemens.com/global/en/home/company/topic-areas/future-of-manufacturing/industrial-security.html.

Siemens' portfolio undergoes continuous development to make it more secure. Siemens strongly recommends that updates are applied as soon as they are available and that the latest versions are used. Use of versions that are no longer supported, and failure to apply the latest updates may increase your exposure to cyber threats. Siemens strongly recommends to comply with security advisories on

the latest security threats, patches and other related measures, published, among others, under https://www.siemens.com/cert/en/cert-security-advisories.htm.

Before You Begin

This document contains guidelines and procedures for selecting and configuring a P1 DXR device to replace a TEC running a Heat Pump (HP) application. P1 DXR configuration is done using ABT Site.

Prerequisites

- ABT Site installed and license enabled.
- Cable for connecting to P1 DXR:
  - If USB connection: USB "A/B"
  - If connecting via room unit: USB-KNX Interface (Siemens OCI702 stock number S55800-Y101)
- Users should be trained and knowledgeable regarding:
  - ABT Site features and functionality;
  - DXR2 setup and configuration;
  - Technical principles and concepts of Desigo Room Automation (RA).

Review ABT Site features and functionality using ABT Site Help as needed.

!	***NOTICE***
	Smoke Control Not Supported The P1 DXR is not rated for smoke control. You cannot replace a smoke control rated TEC with a P1 DXR.

!	***NOTICE***
	P1 DXR Not Supported on Wireless FLN P1 DXR devices are not supported on the Wireless Field Level Network (FLN).

Replacement Work vs. New Work

The procedures covered in this document are intended for service or replacement work, e.g. replacing one or several P1 TEC's on the network. They are not intended for new work or new construction.

P1 DXR Installation and Wiring

Existing P1 trunk wiring can be used for P1 DXR automation stations, **but new wiring for PL-Link room unit(s) is required and will need to be pulled**.
See Wiring [→ 19] for special P1 DXR wiring concerns.
(This Migration Guide does not cover all steps for the physical installation and wiring of the P1 DXR. Standard installation and wiring procedures are the responsibility of assigned and trained personnel. For additional information see *Wiring Guidelines for Field Panels and Equipment Controllers* (125-3002).)

Application Help in ABT Site

Application Help in ABT Site describes functions and features of the application types and templates loaded in the ABT Site Library (library must be installed for the help to be available). To access, right click on the engineered or discovered device and select Application help.

Application Template Documentation

"Application Note" documents are available for standard templates (14xxx). These contain sequence diagrams and wiring diagrams and describe the functions associated with the templates.
Application Notes are available here:
https://extranet.w3.siemens.com/buildingtechnologies/partner/CPSUSEN/Documentation/Pages/Default.aspx

Terminology

"ABT Inside" - new term that replaces ABT SSA (Setup & Service Assistant).

P1 DXR Migration Overview

The P1 DXR is a specially configured MSTP version DXR2 device, used to replace an existing TEC on a P1 network (including Desigo CC systems with P1 TECs). Only MSTP DXR's are used. IP/Ethernet versions of the DXR cannot be used as a P1 DXR.

The P1 DXR:

- Uses existing P1 network wiring and panels
- Uses ABT Site to configure TEC functionality in the P1 DXR
- Supports US and CA engineering units
- Requires PL-Link room operator unit or standalone room temperature sensor

!	***NOTICE***
	P1 DXR Point Team The P1 DXR generates the Point Team after determining that the application template load is completed and device status is operational. This sequence is repeated with each power cycle.

!	***NOTICE***
	P1 DXR Point Team Exceptions and Limitations Read the section Special Requirements [→ 11] to understand P1 DXR point team exceptions and limitations.

Migration Steps

1. Obtain the correct replacement hardware (see P1 DXR Replacement Hardware [→ 17])
2. Select the correct P1 DXR application template in ABT Site (see P1 DXR Template Selection [→ 24])
3. Configure the P1 DXR template to match the TEC application being replaced (see P1 DXR Template Configuration [→ 26])
4. Download the configured template to P1 DXR
5. Install P1 DXR on the network (see Install and Commission [→ 38])
6. Commissioning, including input/output points (see Install and Commission [→ 38])

Before attempting migration operation the user should understand:

- Assigning application numbers to replacement devices
- Point number limitations and "Reserved points" in a P1 DXR
- TEC features not provided

See Special Requirements [→ 11] for detailed information on these topics.

For future use
To understand how a P1 DXR may be converted for use on a BACnet network, see BACnet Network Conversion [→ 52].

Special Requirements

Areas requiring special attention for a successful migration include:

- Assigning application numbers to replacement devices (see Application Number Requirements [→ 11])
- Point number limitations in a P1 DXR (see Point Team Limitations [→ 12])
- Reserved points in a P1 DXR (see Reserved Points [→ 12])
- ABT Site – special concerns (see ABT Site [→ 14])
- Wiring – special concerns (see Wiring [→ 19])
- Insight support (see APOGEE Insight Support [→ 14])

Additional information, see TEC Features Not Provided [→ 16]

Application Number Requirements

Care must be taken when assigning application number(s) for multiple devices on a project. As with standard DXRs on BACnet MS/TP and IP networks, custom template numbers (15xxx range) for P1 DXRs must represent **unique I/O and HVAC configurations**. In addition, these numbers cannot be reused for BACnet DXRs added to the project in the future.

!	***NOTICE***
	P1 DXR Application Numbers Must Be Unique for the Point Team A migrated P1 DXR application must have a unique application number on the network. Multiple devices may share the same application number only if they share the same point team.

Numbering Guidelines

14xxx range (14000 to 14899) is reserved for US HQ templates for HvacLgtShd11, 12, 13 and 17.
15xxx range can be assigned in ABT Site when default templates are unlocked by the field.

Templates must be unlocked for any change in I/O or PL-Link assignments, or in any change to configuration tabs (e.g. HVAC configuration or Room coordination configuration). Setpoint configuration does not require unlocking / changing the template number.

The last three digits assigned to default templates – and suggested, but not enforced, for unlocked 15xxx templates – are assigned as follows:

- 14 [*XYZ*] - **YZ** derives from the last two digits of the TEC/PTEC application that best matches the 14xxx template's I/O configuration and control. For example, 140**23** is the closest available match for TEC application 20**23** (PTEC 6623).
- **X** digit indicates variations in hardware or control configurations. For example:
  - 14**0**23 and 14**1**23 differ in configuration for supply air temperature control (14123 has it; 14023 does not).
  - 14**0**23 and 14**7**23 are the same except for automation station (14023 = DXR2-12P; 14723 = DXR2-10PL).

When template number variations exceed the available number of "X" digits (0-8), the YZ couplet must be altered. This means the last two digits will no longer derive from the TEC/PTEC application number. For example, 14X**58** (chilled beam variations) use 14058 through 14858. Therefore, additional chilled beam variations require 14X**59**.

Different engineering units (US, CA) do not require separate application numbers.

Point Team Limitations

Point teams for P1 protocol networks are limited to 127 points. Any points above this limit will be dropped from the point team; if this occurs, an indication is provided by point 99 (ERROR STATUS).

Reserved Points

P1 protocol requires seven "reserved points" be present in every P1 point team. These are:

- Controller Address [→ 12] point #1
- Application Number [→ 13] point #2
- Override Time [→ 13] point #20
- Day/Night [→ 13] point #29
- Error Status [→ 14] point #99
- Internal point 100 [→ 14]
- Device Status [→ 14] point #127

Note
The P1 DXR **does not** contain these points natively. Reserved point functionality is handled via firmware in the P1 DXR.

!	***NOTICE***
	Reserved Points and Off-line Engineering Due to the P1 reserved points requirement, off-line engineering of a P1 DXR for Commissioning Tool (CT), Design Tool (DT) and Desigo CC (Apogee visualization) is not supported. This means: - Templates created off-line in ABT Site will not contain the P1 "reserved points". - Device instances created off-line in ABT Site cannot be imported into the system profile.

Controller Address

CTLR ADDRESS, point #1
The MAC address assigned in ABT Site prior to downloading the template to the P1 DXR – should be assigned as a unique node number for the trunk on which it will be used. Set from 1 – 127 (1– 99 recommended).

CTLR ADDRESS can only be changed by ABT Site/ABT Inside – not changeable by P1 command.

Application Number

APPLICATION, point #2
Five-digit template number (14xxx or 15xxx).

The P1 DXR is limited to application numbers in the ranges 14xxx and 15xxx. The 14xxx range includes the standard default templates in ABT Site. Even if a default template is used as-is, its 14xxx number should be changed to a 15xxx number (best practice to match job site configuration requirements).

Override Time

OVRD TIME, point number 20. This is derived from the DXR parameter **Time for comfort button** (TiCmfBtn). TiCmfBtn default is 120 minutes, but the P1 DXR's engineering units display as "HRS", so OVRD TIME default will display 2 HRS.

All P1 applications have point number 20 OVRD TIME, even if it is not enabled or used in the application. The value of OVRD TIME can be written with P1 commands which will update the **Time for comfort button** parameter in the P1 DXR (2 HRS will set Time for comfort button to 120 minutes).

!	***NOTICE***
	NOTE: In ABT Site, time entered in minutes into **Time for comfort button** is truncated as whole hours and shown in OVRD TIME. The actual minutes specified will be used by the DXR, but OVRD TIME will display truncated hours. Examples: 45 minute override will display as 0 HRS; actual override = 45 minutes. 60 minute override will display as 1 HRS; actual override = 60 minutes. 90 minute override will display as 1 HRS; actual override = 90 minutes.

Day/Night

DAY.NGT, point number 29
The value of DAY.NGT will derive from the P1 DXR multi-state point **RM OP MODE**.
RM OP MODE possible states:
1:Protection
2:Economy
3:Pre-Comfort
4:Comfort

If RM OP MODE = "1" or "2", DAY.NGT will be **NGT**.
If RM OP MODE = "3" or "4", DAY.NGT will be **DAY**.

Commands from P1:
P1 command to DAY will result in RM OP MODE set to 4:Comfort.
P1 command to NGT will result in RM OP MODE set to 2:Economy.

NOTE:
In the P1 DXR, DAY.NGT is a multi-state "process value" object with priority array. P1 commands to DAY.NGT will be set at priority 8. Values set at priority 8 will persist through a power cycle once they have been present for 30 min.

Other Reserved Points

- *ERROR STATUS, point #99*
  Default = 0; a non-zero value means the point team contains more than 127 points.
- *Internal point 100* is hidden and not accessible.
- *DEV STATUS, point #127*
  Possible values:
  - Idle = 0
  - Loading = 1
  - Running = 2 (indicates application is functioning correctly)
  - Waiting = 3
  - Halted = 4
  - Unloading = 5

  DEV STATUS cannot be written to by a P1 command.

ABT Site

P1 Baud Rate

P1 only runs at 4800 baud. Although 4800 is not included as an option in ABT Site project settings, communication on the P1 network will run at 4800 baud. The baud rate shown in ABT Site can be ignored. Note that if, at some point in the future, the P1 network will be converted to MS/TP, then setting the baud rate to the future value (if it is known now) can save this step in the future.

Auto Addressing – Not Supported

When adding a P1 DXR device in ABT Site, make sure the project settings do not have auto-addressing enabled. Auto-addressing is not supported on a P1 network.

BACnet Settings Visible for Non BACnet Device

In project settings, some BACnet settings will be visible even though they will have no effect on P1 function and can be ignored; for example, network number.

ABT Inside

For P1 DXRs, ABT Inside will allow editing for

- MAC/CTLR Address
- P1/MSTP Mode

APOGEE Insight Support

On current Apogee proprietary networks (RS485 and IP), the P1 DXR application can be uploaded to Insight, but it will have an Undefined application description.

This means any online activity related to the device is limited or unavailable. To overcome this limitation, use the Import Application feature.

The Import Application feature allows you to import application descriptions that have been discovered by using the Commissioning Tool **Learn TEC** option. This feature is useful for proprietary networks with newly added P1 DXRs. (BACnet/P1 or BACnet/MSTP devices can correctly upload DXR application descriptions without this option.)

Import Steps

1. Ensure that the Insight patch containing the new import application feature is installed.
2. Open or create a Commissioning Tool Project and ensure that the proper ALN and Field Panel are defined.
3. Open the MMI Database Transfer application and connect to the field panel's HMI port using the appropriate COM port and baud rate.
4. Select the field panel's FLN from the left view and refresh the right view to see the newly added P1 DXR(s) in the FLN list. At least one P1 DXR for each application must be visible in the right-side view to complete the next step.
5. While still connected to the field panel's HMI, select a P1 DXR and then select **File** > **Learn TEC** to discover the Application Descriptor.
6. Repeat steps 4-5 for each different application.
7. Exit the MMI Database Transfer application to update and save the Application Database files.
8. Open Windows Explorer and navigate to the Application Database folder. Assuming a typical Installation to C:CommTool folder, navigate to C:CommTool/Product folder.
9. Copy the following three files from your CommTool pc to your Insight pc: TECAppl.dbf, TECpnts.dbf, and MSTPPNTS.dbf.
10. On the Insight PC, create or navigate to a folder within the Insight installation folder (C:Insight/*Product in typical installation*) and paste the three TEC Application database files into that folder.
11. From **System Profile**, select **Tools** > **Auto Unbundling**. The **Auto Unbundling** dialog appears.
12. Select the **Import Application** button. The **TEC import dialog** appears.
13. Locate and select all new P1 DXR applications and select **Add** to add the applications to the Insight database.
14. Return to the **System Profile Tools** > **Auto Unbundling** dialog box to verify that the applications imported correctly.
15. Perform the Auto Unbundling of points as for any TEC Application for the points required for Graphics, Commanding, Reporting and so on.

Notes:

- After the application is imported to the Insight database, the offline TEC Application database can be overwritten with another copy of the application database, for example if a new P1 DXR application needs to be imported.
- There is no way to merge multiple offline TEC Application database files on Insight.
- In order to have multiple P1 DXR applications in the same offline database, a single Commissioning Tool user must discover all the P1 DXR applications to

one Commissioning Tool offline TEC Application database, and copy them to the Insight PC.

TEC Features Not Provided

Control Function Match Between TEC and P1 DXR

An exact control function match between the TEC and its P1 DXR replacement may not exist for every feature in the application.

The following list describes which TEC features are not provided, or are not required, in a P1 DXR device.

- Differential pressure sensor periodic zero calibration:
  - The differential pressure sensor in the DXR does not require initial or periodic zero differential pressure calibration.
- Autozero modules:
  - Not required for DXR actuators calibration or differential pressure zero correction.
- Spare floating control actuator:
  - No spare output is provided for floating control actuators in DXR devices.
  - Spare outputs are provided for analog (0-10v), or binary outputs.
  - Spare inputs are provided for binary input or analog (0-10v) inputs.
- Single heating/cooling temperature setpoint and control:
  - DXRs conform to building and industry requirements for separation of heating and cooling temperature setpoints.
  - Unlike TEC, the comfort cooling and comfort heating setpoint, both internal and from a room unit, cannot be the same value, but must have at least 1 degree of separation (e.g. Cooling = 74 degrees; Heating = 73 degrees).
- More than one terminal hot water coil:
  - A second heating coil can be configured by selecting a terminal heating/cooling 2 pipe with a fixed h/c changeover set to heating.
- Primary air or water local temperature sensor for changeover control:
  - Changeover control for air or water is provided by network or PPCL commands.
- More than two stages of electric heating coils (FCU and HP):
  - Three stage of electric heat can be provided in VAV and FPB applications.
- PWM control for more than one electric heat stage:
  - Option for analog control of electric heat for full modulating control.
- Dual Duct single discharge pressure sensor, or
  Dual Duct with one inlet and one discharge pressure sensor:
  - Option provided for two inlet pressure sensors.
- Face-by-pass damper control (FCU and HP)
- More than two HP or DX stages (FCU and HP)

P1 DXR Replacement Hardware

There are two hardware options available (T12P, T18) based on application type and required I/O.

Table 1: P1 DXR Hardware Options.

Application Type	P1 DXR Hardware
VAV, FPB	DXR2.**T12P**-102B (2-AI/UI, 1-BI, 1-Δ P, 2-AO, 6-BO)
	DXR2.**T18**-101B[1)] (4-AI/UI, 2-BI, 4-AO, 8-BO)
FCU, HP	DXR2.**T18**-101B (4-AI/UI, 2-BI, 4-AO, 8-BO)

1) T18 hardware does not have onboard DP sensing. If T18 hardware is selected for VAV or FPB, an external DP sensor must be provided and wired.

Room Unit Replacement

PL-Link room units are required for use with P1 DXR. Select the appropriate room operator unit required for the site, keeping the following in mind:

- The footprint of the PL-Link room unit or PL-Link sensor is larger than the TEC thermostat being replaced.
- Use the recommended 2-conductor solid PL-Link cable from the P1 DXR to the room units.
- If not using a PL-Link room unit/sensor, select a hard-wired room sensor (e.g., 10K or 100K thermistor).

NOTE:

TEC 10K thermistor room sensors are not compatible with P1 DXR inputs. Select DXR 10K or other sensors for room or supply air temperature sensing.

Replacement room unit options include:

- QMX3.P30 – Temperature with no display
- QMX3. P34 – HVAC and temperature with display
- QMX3.P40 – Temperature and RH without display
- QMX3.P70 – Temperature, RH and CO2 without display
- QMX3.P74 – HVAC, temperature, RH and CO2 with display

Table 2: Replacement Options for P1 Thermostats.

P1 Thermostat	DXR Room Operator Unit	Comment
Sensing Only Series 1000 540-660x Series 2000 QAA2280.EWSC QAA1280.FWSC (semi flush)	QMX3.P30 QMX3.P40 QMX3.P70	P30: Blank – no display; temperature sensor P40: Blank – no display; temperature and RH sensors P70: Blank – no display; temperature, RH and CO2 sensors
Sensing with Display Series 1000 540-666x Series 2000 QAA2280.DWSC	QMX3.P34	P34: Display screen, HVAC functions; display room temperature or temperature setpoint
Sensing w/ Override and Setpoint Adjust Series 1000 540-670x	QMX3.P34	P34: Display screen, HVAC functions; display room temperature or temperature setpoint; temporary override
Sensing w/ Display, Override and Setpoint Adjust Series 1000 540-680xx Series 2000 540-650 QAA2280.FWSC QAA1280.FWSC	QMX3.P34 QMX3.P74	P34: Display screen, HVAC functions; display room temperature or temperature setpoint; temporary override P74: Display screen, HVAC functions; display room temperature, temperature setpoint, temporary override; sensors for room temperature, humidity and CO2
Room Temperature Sensors with Fan-Speed Control Series 2000 540-652x	QMX3.P34	P34: Display screen, HVAC functions; display room temperature or temperature setpoint; temporary override, auto/manual fan speed
Flush Mount 540-520x (Plastic Housing) 540-995 (Metal Housing)	No equivalent KNX device; replace with hard-wired sensor or upgrade to QMX3	
Stainless Steel Button QAA1031.AASU QAA1031.AATU (with wall plate)	No equivalent KNX device; replace with hard-wired sensor or upgrade to QMX3	
Stand alone sensor (room temperature)	10 K or 100K wall-mounted temperature sensor	Configure and wire to X1 analog input

See the section Room Unit Configurations [→ 30] for configuration options to match TEC thermostat functions.

Wiring

Special wiring concerns for P1 DXR migration are included below. For additional information see *Wiring Guidelines for Field Panels and Equipment Controllers* (125-3002).

Existing Wiring vs. New Wiring

Existing P1 trunk wiring can be used for P1 DXR automation stations, but new wiring for PL-Link room unit(s) is required and will need to be pulled.

⚠ CAUTION

Unexpected USB Ground Path in Laptop Computer

When connected via USB cable to P1 DXR, a grounded USB port on laptop computer may provide unintended ground path for 24Vac when power trunk transformer neutral is not earth grounded. This may cause injury to user and damage to laptop computer.

- Always use a USB Isolator (SP386A) when connecting the laptop USB to the DXR USB.

NOTICE

Loss of Sensor Communication

Wire used for TEC Room Sensors is 24 AWG and will not connect securely in the KNX/PL-Link push terminals which require 20 AWG or 18 AWG solid BC wire.

- Pull KNX/PL-Link wire for QMX3 Sensors and any new KNX/PL-Link devices.

NOTICE

Loss of Network Communication

Both TEC and DXR are capable of running on 1 pair (2-wire) cable using internal impedance only when neutral is earth grounded at the 24 Vac transformer.

- Verify that neutral is earth grounded at the 24 Vac transformer.

!	***NOTICE***
	Loss of Triac Control TEC only requires 19.2 VAC input and DXR requires 20.4 Vac input. It may be necessary to recalculate the power trunk or install additional or larger transformer. ● Verify that the input voltage is enough to ensure Triac control.

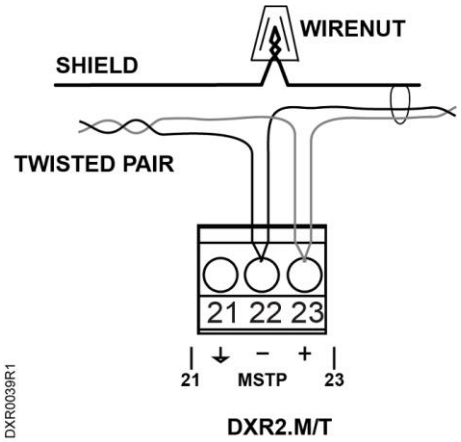
!	***NOTICE***
	Loss of Triac Control TEC will supply up to 12 VA to a Triac load and DXR will supply up to 6 VA to a Triac load. It may be necessary to install an interposing relay and larger transformer. ● Verify that the correct Triac load is supplied.

!	***NOTICE***
	P1 DXR Compatibility with SSC81.5U Valve Actuator If the TEC being replaced used an SSC81.5U valve actuator that required resistors to be wired across the TEC's actuating DO terminals, then remove the resistors from the DO terminals and install them across the P1 DXR's actuating terminals. ● SSC81.5U actuator needs a pair of 1.5K Ohm resistors across each signal line to common on the DO pair controlling the actuator. ● Reuse the resistors installed on TEC for the P1 DXR.

Replacing TEC with P1 DXR

Wiring replacement steps:

1. Disconnect the FLN cable wires from the TEC terminals.
2. Reconnect the FLN cable + and – signal wires to the P1 DXR + and – terminals.
3. Do not connect the FLN cable shield wires to the P1 DXR reference terminal.
4. Wire nut the FLN cable shield wires to maintain a continuous shield.



5. Remove the two #8 sheet metal screws securing the TEC snap track.
6. Cut an 8 inch or 11-1/2 inch TH 35-7.5-1 steel DIN Rail and secure it with two #8 screws, or drill new holes at DXR mounting tabs for four #6 sheet metal screws.
7. If using SSC81.5U valve actuator, remove the TEC resistors and install on equivalent P1 DXR terminals.
8. Verify that the 24 Vac transformer has earth-ground secondary neutral.
9. Verify that input voltage is greater than 20.4 Vac. If input voltage is less than 20.4 Vac, install an additional or larger transformer.
10. Verify that Triac loads are no more than 6 VA. Install an interposing relay if required.
11. See Install and Commission [→ 38] for additional / final steps.

I/O Connection Options

P1 DXR I/O connection options are shown below. I/O selections are made in ABT Site.

HP Inputs - DXR2.T18	Type	D1	D2	Type	X1	X2	X3	X4
Room temperature				AI - 1	TR			
				AI - 2	TR			
Supply air temperature				AI - 1		TSu		
				AI - 2		TSu		
Room air quality				AI - 6			AQualR	
Relative humidity for room				AI - 7				HuRelR
Extract air temperature				AI - 1	TEx	TEx	TEx	TEx
				AI - 2	TEx	TEx	TEx	TEx
Mixed air temperature				AI - 1	TMx	TMx	TMx	TMx
				AI - 2	TMx	TMx	TMx	TMx
Outside air temperature local				AI - 1	TOaLoc	TOaLoc	TOaLoc	TOaLoc
				AI - 2	TOaLoc	TOaLoc	TOaLoc	TOaLoc
Setpoint shift input value				AI - 11	SpShftIn	SpShftIn	SpShftIn	SpShftIn
Power				AI - 10	Pwr	Pwr	Pwr	Pwr
Brightness				AI - 8	Brgt	Brgt	Brgt	Brgt
Presence detector 1	BI - 1	PscDet						
Presence detector 2	BI - 1		PscDet					
Window contact	BI - 2	WndCont	WndCont	BI - 2	WndCont	WndCont	WndCont	WndCont
Fan state	BI - 1	FanSta	FanSta	BI - 1	FanSta	FanSta	FanSta	FanSta
Heat pump fault 1…5	BI - 2	HpuFlt	HpuFlt	BI - 2	HpuFlt	HpuFlt	HpuFlt	HpuFlt
Heat pump source state	BI - 2	HpuSrcSta	HpuSrcSta	BI - 2	HpuSrcSta	HpuSrcSta	HpuSrcSta	HpuSrcSta
Heat pump source input available	BI - 2	HpuSrcInAvl	HpuSrcInAvl	BI - 2	HpuSrcInAvl	HpuSrcInAvl	HpuSrcInAvl	HpuSrcInAvl
Heating coil overtemperature detector	BI - 2	HclOvrTDet	HclOvrTDet	BI - 2	HclOvrTDet	HclOvrTDet	HclOvrTDet	HclOvrTDet
Radiator overtemperature detector	BI - 2	RadOvrTDet	RadOvrTDet	BI - 2	RadOvrTDet	RadOvrTDet	RadOvrTDet	RadOvrTDet
Condensation monitor	BI - 2	CdnMon	CdnMon	BI - 2	CdnMon	CdnMon	CdnMon	CdnMon
Condensation level monitor	BI - 2	CdnLvlMon	CdnLvlMon	BI - 2	CdnLvlMon	CdnLvlMon	CdnLvlMon	CdnLvlMon
Frost protection monitor	BI - 2	FrPrtMon	FrPrtMon	BI - 2	FrPrtMon	FrPrtMon	FrPrtMon	FrPrtMon
Blinds collision detector 1…2	BI - 2	BlsClsnDet	BlsClsnDet	BI - 2	BlsClsnDet	BlsClsnDet	BlsClsnDet	BlsClsnDet
Binary inputs 1…6	BI - 2	BI	BI	BI - 2	BI	BI	BI	BI
Analog inputs 1…4				AI - 9	AI	AI	AI	AI

Input types	
AI - 1	AI, 0...10 V, temperature
AI - 2	AI, LG-Ni1000, temperature
	AI, NTC 100k, temperature
	AI, NTC 10k, temperature
	AI, T1 (PTC), temperature
	AI, Pt1000 (EU), temperature
	AI, Pt1000 (NA), temperature
AI - 3	AI, 0...10 V, pressure
AI - 4	AI, 0...10 V, velocity
AI - 5	AI, 0...10 V, air flow
AI - 6	AI, 0...10 V, air quality
AI - 7	AI, 0...10 V, humidity
AI - 8	AI, 0...10 V, brightness
AI - 9	AI, 0...10 V
AI - 10	AI, 0...10 V, power
AI - 11	AI, 1000...1175 Ω, temp. shift
BI - 1	BI, NO
BI - 2	BI, NC

HP Outputs - DXR2.T18	Type	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Type	Y10	Y20	Y30	Y40
Outside air damper position	AO - 1	DmpOaPos		DmpOaPos		DmpOaPos		DmpOaPos		AO - 5	DmpOaPos	DmpOaPos	DmpOaPos	DmpOaPos
Fan speed 1-stage	BO - 1	FanSpd												
2-stage	MO - 1	FanSpd												
Variable speed										AO - 5	FanSpd			
Enable fan speed	BO - 1	EnFanSpd												
Heat pump 1-stage, reversing valve	BO - 1		HpuRvrVlv	HpuCmd					HpuRvrVlv					
2-stage, reversing valve	BO - 1		HpuRvrVlv	HpuCmd1St	HpuCmd2St				HpuRvrVlv					
2-stage, w/o reversing valve	BO - 1			HpuCmdC1St	HpuCmdC2St			HpuCmdH1St	HpuCmdH2St					
Variable, reversing valve	BO - 1		HpuRvrVlv						HpuRvrVlv	AO - 5		HpuVarSpd		
Enable heat pump variable speed	BO - 1		EnHpuSpd	EnHpuSpd										
Enable heat pump source	BO - 1	EnHpuSrc	EnHpuSrc		EnHpuSrc	EnHpuSrc	EnHpuSrc	EnHpuSrc						
Enable heat pump hot gas reheating coil	BO - 1	EnHpuReHcl	EnHpuReHcl				EnHpuReHcl	EnHpuReHcl						
Heating coil valve position	AO - 1					HclVlvPos				AO - 5			HclVlvPos	
	AO - 4					HclVlvPos								
	AO - 3					HclVlvPos								
Electric 1-stage	BO - 1					HclElPos								
Electric 2-stage	BO - 1					HclEl1StPos	HclEl2StPos							
Electric modulating	AO - 2					HclElPos				AO - 5			HclElPos	
Enable heating coil electric position	BO - 1					EnHclElPos								
Radiant ceiling valve position 1	AO - 1			RcgVlvPos..				RcgVlvPos..		AO - 5		RcgVlvPos..		RcgVlvPos..
2-Pipe for ..Ccg, ..HCcg or ..Hcg	AO - 4			RcgVlvPos..				RcgVlvPos..						
	AO - 3			RcgVlvPos..				RcgVlvPos..						
4-Pipe 6-Way for HCcg										AO - 5		RcgVlvPos		RcgVlvPos
	AO - 1	RcgVlvPosC		RcgVlvPosH		RcgVlvShofC		RcgVlvShofH			RcgVlvPosC	RcgVlvPosH	RcgVlvShofC	RcgVlvShofH
4-Pipe for HCcg	AO - 4	RcgVlvPosC		RcgVlvPosH		RcgVlvShofC		RcgVlvShofH						
	AO - 3	RcgVlvPosC		RcgVlvPosH		RcgVlvShofC		RcgVlvShofH						
Radiant ceiling valve position 2	AO - 1			RcgVlvPos..				RcgVlvPos..		AO - 5		RcgVlvPos..		RcgVlvPos..
2-Pipe for ..Ccg, ..HCcg or ..Hcg	AO - 4				RcgVlvPos..				RcgVlvPos..					
	AO - 3				RcgVlvPos..				RcgVlvPos..					
4-Pipe 6-Way for HCcg										AO - 5		RcgVlvPos		RcgVlvPos
Radiator valve position 1	AO - 1			RadVlvPos				RadVlvPos		AO - 5		RadVlvPos		RadVlvPos
	AO - 4			RadVlvPos				RadVlvPos						
	AO - 3			RadVlvPos				RadVlvPos						
Electric 1-stage	BO - 1			RadElPos				RadElPos						
Electric modulating	AO - 2			RadElPos				RadElPos		AO - 5		RadElPos		RadElPos
Enable radiator electric position 1	BO - 1			EnRadElPos				EnRadElPos						
Radiator valve position 2	AO - 1			RadVlvPos				RadVlvPos		AO - 5		RadVlvPos		RadVlvPos
	AO - 4				RadVlvPos				RadVlvPos					
	AO - 3				RadVlvPos				RadVlvPos					
Electric 1-stage	BO - 1				RadElPos				RadElPos					
Electric modulating	AO - 2				RadElPos				RadElPos	AO - 5		RadElPos		RadElPos
Enable radiator electric position 2	BO - 1				EnRadElPos				EnRadElPos					
Binary outputs 1...4	BO - 1	BO	BO	BO	BO	BO	BO	BO	BO					
Analog outputs 1, 2										AO - 5	AO	AO	AO	AO

Output types	
AO - 1	AO, 3-position
AO - 2	AO, PWM, constant period
AO - 3	AO, PWM, spring return
AO - 4	AO, PWM, thermic
AO - 5	AO, 0...10 V, position
AO - 6	AO, 0...10 V, air flow
BO - 1	BO, 1 Triac, NO
BO - 2	BO, 1 Relais, NO
MO - 1	MO, 2 Triac, NO
MO - 2	MO, 3 Relais, NO
MO - 3	MO, 2 Relais, NO
MO - 4	MO, 3 Triac, NO

P1 DXR Template Selection

In this step you select the "base template" and configure general HVAC hardware options.

First, create a project in ABT Site and select a template that matches as closely as possible the application type and hardware being replaced. Use the following table as a guide.

After adding the base template to the project, select or deselect hardware options to match the physical items present for the job (e.g. change 2-stages of electric heat to 3-stages, etc.).

Heat pump templates require some changes to the I/O selections:

- *Fan*. Select Single stage, two stage or variable speed.
- *Compressor*. Selections are tied with or without reversion valve. In some cases, it will be necessary to select a two stage compressor to also have the desired reversing relay and or the hot gas for dehumidification control.

Table 3: Heat Pump Template Options.

Existing TEC Application[1)]	Base Template	P1-DXR Hardware[1)]	Description	Notes
2460	14070	DXR2.T18	Heat Pump Variable Speed with Rev Vlv, Vari-Spd Fan, 2-Stage Electric Heat and 1-Stage Electric Radiator and OA Damper	Sample template for variable speed compressors
2460	14170	DXR2.T18	Water Source Heat Pump Variable Speed with Rev Vlv, Vari-Spd Fan, HW Heat and Modulating Electric Radiator and OA Damper	Water Source input/control optional example
2070 2460	14270	DXR2.T18	Heat Pump Single Stage with Rev Vlv, 1-Spd Fan, 1-Stage Electric Heat and HW Radiator and OA Damper	
2070 2071 2273 2276	14071	DXR2.T18	Heat Pump Multi-Stage with Rev Vlv, Multi-Spd Fan, 2-Stage Electric Heat and HW Radiator and OA Damper	Multi-Stage compressor limited to two stages.
2326	14171	DXR2.T18	Heat Pump Multi-Stage with Rev Vlv, Hot Gas Heat, Multi-Spd Fan, 1-Stage Electric Heat and HW Radiator and OA Damper	
2072 2274 2277 2278 2279	14072	DXR2.T18	Ground Source Heat Pump Multi-Stage w/o Rev Vlv, with Hot Gas Heat, Vari-Spd Fan, 1-Stage Electric Heat and HW Radiator and OA Damper	Hot Gas control for dehumidification option.

1) DXR2-T18 automation station only.

P1 DXR Template Configuration

In this step you configure the selected template to match the TEC application being replaced. This includes:

- Input and output device selections and configuration
- HVAC control options
- Room unit configuration
- Temperature and ventilation setpoints/options
- Coil configurations/options
- Fan configurations/options

NOTE:
Specific P1 DXR migration steps are described here. Additional explanations regarding how to select and use other configurations and defaults are covered in the *Application Note* documentation for standard templates, as well as DXR Start-up documents for the different application types (VAV, FPB, FCU, HP).

Output Device Selection and Configuration

Selection and configuration of output devices are covered in the sections that follow.

Actuators

The P1 DXR supports floating control and analog actuators, as well as multi-state and binary outputs.

NOTE:
Unlike a TEC, DXRs handle output devices generically. Example: floating control actuators are configured/controlled by an analog output object 0-100%. Access to the individual floating digital outputs is not provided or needed in a P1 DXR.

Table 4: Actuator Outputs.

Output	Description TEC	P1-DXR	Comment	Default
Floating control actuator (i.e. DAMPER)	MTRx TIMING	DXR Rise and fall times entered separately in 0.10s increments; e.g., 900 seconds	0-100 pct Rise time 100-0 pct fall time DXR sets motor timing via default object parameters, not as a point value. TEC sets a single motor timing as a point team.	90 seconds 90 seconds (e.g., 900 1/10s)
	MTR SETUP (enable, direct/reverse)	Action: Direct/reverse	Leave for floating control actuators (direct) and change if action needs to be reversed during commissioning. DXR config as part of output object parameter (direct; reverse).	direct

Output	Description TEC	P1-DXR	Comment	Default
	(none)	Startup synchronization	Base single close will drive actuator closed at each power up cycle. Optional set to Single open for 20 to 50 percent of the terminal units to minimize startup overpressure.	Single close
	(none)	End position synchronization	At 0 and 100 percent commands, drives actuator additional time base on rise and fall time configured. Use the Single default to provide correct floating control calibration.	Single
	(via Motor setup)	Control action		Direct
	DAMPER ANGLE MTR1 ROT ANG MTR2 ROT ANG	(none)	Not required. Where less than 90 rotation is required, fixed stop on actuator should be used and motor rise/fall time (in output configuration) set accordingly.	
Binary Output	(direct/reverse)	Action	Output selection in ABT site specifies NO or NC operation. Fixed by Output selection.	
Binary Output – PWM	SWITCH TIME HTG STG TIME	Pulse period	Single stage PWM only – pulse period fixed.	10 minutes
	STAGE MIN HTG STG MIN (in percent)	Minimum switch-on time	Set in Site in 1/10 seconds (e.g. 600 for 60). “Minimum switch-on time" defines the minimal time the device has to be switched-on during a switching cycle.	0 1/10s
	STAGE MAX HTG STG MAX (in percent)	Minimum switch-off time	Set in Site in 1/10 seconds (e.g. 600 for 60). "Minimum switch-off time" defines the minimal time the device has to be switched-off during a switching cycle.	0 1/10s
Analog actuator (0-10 Vdc)	AO1 START AO1 END (etc.)	Start and end output voltage	Part of analog output configuration parameters. Set min and max voltage for Process of 0 to 100 pct.	
	N/A	Start and end process input value	Part of analog output configuration parameters. Actuators: Process 0pct to 100pct, Signal 0v to 10v (can be set to 10 to 0vdc for reverse (normally open) valves.	direct acting.
Analog Fan	FAN MIN FAN MAX (etc.)	Analog Fan control	Part of analog output configuration parameters. Set min and max voltage for Process of 0 to 100 percent. Additionally, an optional binary output can be separately configured to enable/disable the analog fan.	

Binary Outputs

Up to three electric heat stages are supported. Polarity for normally open: **Normal**. The spare DO and AO outputs should be configured per device requirements.

Fan Powered Box

Supported options for fan stage control include:

- Single stage fan (parallel or series configuration in the FPB)
- Multi-stage fan (1 to 3 stages for FPB, 1 to 2 stages for FCU and HP) controlled by heating and cooling demand
- Variable speed fan

Input Devices

TECs provide sensor inputs for control and monitoring. P1 DXR provides the following points:

Table 5: Input Devices.

TEC Setpoint	P1 DXR	Description	Notes
ROOM TEMP	ROOM TEMP 4	Temperature sensor from Room Unit	Input from the Room Unit (combined with other room temperature sensors, if configured, and averaged for RM TEMP EVAL below).
SUPPLY TEMP PIPE TEMP	(no direct) Optional use: MIXED TEMP	Pipe temperature sensor	Two pipe heat/cool sensor and switchover. This feature is provided by the changeover point, HC CHOVR, controlled by the field panel (e.g. PPCL). Select 'Mixed air temperature sensor' to monitor or as input to field panel logic.
OFFSET RM OFFSET	(none)	All AI sensors have property to set correction offset if needed	Access property as part of object in ABT Site
(none)	RM TEMP EVAL	Average of all valid room temperature sensors	For display only. Current templates have only one room temperature sensor input.
AUX TEMP DISCH TEMP	SPLY TEMP 4 SUPPLY TEMP	Supply air (discharge) temperature sensor	Default 10K thermistor. Used for monitoring in all applications. Optional applications use supply sensor for cascade heating temperature control.
(sensor offset)	(none)	All AI sensors have property to set correction offset if needed	Access property as part of object in ABT Site
(none)	OA TEMP 1	Outside air temperature	Optional input from central or field panel (not used in control for VAV or FPB applications).

NOTE:
Digits at the end of point objects are assigned by the system based on the module or input/output assignment.

Table 6: Input Point Configurations (Differences).

TEC	P1 DXR
“AUX” sensor can be used for spare temperature input (e.g. 10K or 100K NTC)	Spare AI can be configured for 0-10v inputs, (0-100pct or 0-10v)
Spare Temperature	DXRs allow a number of pre-defined temperature that can be used as spare if they are not used for control (e.g. Return Temperature is not used in the VAV or FPB control applications)
Spare CO2 (or spare Humidity)	DXRs allow some pre-defined IAQ (CO2) or Humidity input that can be used as spare if they are not used for control (e.g. CO2 sensors, but no DCV enabled)
“AUX” sensor can be used for spare temperature input (e.g. 10K or 100K NTC)	Spare AI can be configured for 0-10v inputs, (0-100pct or 0-10v)

CO2 and Other Inputs

Option monitoring (and/or control) for IAQ (indoor air quality) sensors, specifically CO2, are provided on room units (e.g. QXM3.P74 or QXM3.P70) or via an analog (0-10v) input. The demand control ventilation (DCV) option requires a local CO2 (IAQ) sensor to function as designed.

See the section Demand Control Ventilation [→ 35] for more information.

Other Inputs

Supply Air Temperature Sensor

Supply air temperature (terminal unit discharge temperature) can be assigned for use as an AUX sensor or for a cascade control configuration option. Temperature sensors, including the supply air sensor, can be configured as 0-10v or standard RTD and NTC types (e.g. 10k or 100k NTC sensors). The supply temperature sensor is connected to the X2 terminal on the P1 DXR2-12P.

Return (Extract) Air Temperature Sensor

- Sensing only, can be configured to extract air temperature input (terminal X1 or X2).
- Room temperature control (connect to room temperature input, but it must be a DXR type RTD or NTC sensor; TEC type 10k sensor not supported).
- Sensor in the return or extract duct may be used as the room temperature value. In this case, assign the sensor to ‘Room Temperature “ to terminal X1 and select sensor type from the drop-down menu.

Room Humidity Sensor

Room humidity sensors, for sensing or control (when enabled per application options) can be provided by standalone analog input or by a room unit (QXM3.P74, P70 or P40). Room humidity and room temperature are used to provide room dew point temperature calculation and for optional cooling coil or chilled beam enable/disable control.

Wall Switch, etc.

The DXR12P boards only have one DI and two AI/UI's. These can be used to connect optional digital inputs for occupancy (presence) detection or status inputs (e.g., fan status).

If the TEC being replaced uses a wall switch to indicate occupancy, select "presence detector" on a binary input and connect the switch there.

Room Unit Configurations

TEC room units and point configurations are provided by DXR2-compatible room operator units. In addition, other features are available that can be optionally configured.

Up to two QXM3.P34 or P74 Room units can be assigned to one P1 DXR – both room units must be same type. Only one room sensor (P30, P70 or P40) can be assigned to a P1 DXR. The following table provides common configuration capabilities and items.

Table 7: Room Unit Configurations.

Feature	Available with	Description	Configuration - Default value: Room operator unit
Room temperature sensor	QMX3.P30 QMX3.P40 QMX3.P70 QMX3.P34 QMX3.P74	Temperature sensor from Room Unit (combined with other room temperature sensors, if configured, and averaged for RM TEMP EVAL below)	Default temp sensor enabled
Display room temperature	QMX3.P34 QMX3.P74	Enables or disables display of room temperature (average of all available sensors)	Room unit, display temperature – set *Display room temperature* = Yes
Display symbol for heat/cool status	QMX3.P34 QMX3.P74	Symbol on room unit for cooling or heating (and none for h/c deadband)	*Room unit, display heat./cool status* = Yes
Enable setpoint adjust	QMX3.P34 QMX3.P74	Enables buttons to raise and lower heating and cooling Comfort setpoints	*Enable operation: room temp.setpoint* = Yes
Setpoint display actual or plus/minus	QMX3.P34 QMX3.P74	Setpoint display can be an Absolute value (76 F) or an 'offset' (-3) from current comfort setpoint	*Room unit, room temp. setpoint display* Set Absolute temperature setpoint or Relative setpoint shift (displays plus or minus shifts)
Enable temporary override	QMX3.P34 QMX3.P74	Enable operation of button to put unit into comfort mode for 2 hours (default)	*Enable operation: temporary comfort* = Yes
Set max and min setpoint limits	QMX3.P34 QMX3.P74	Set shift limits for setpoint adjustments (to shift both cooling and heating setpoints together)	*Setpoint shift input value* *Present maximum value 5.4 F* *Present minimum value -5.4 F*

NOTE:
Absolute temperature setpoint can be displayed as Present value (default) or Average value (i.e. (Cooling + Heating)/2). Present value switches between heating, cooling setpoints depending on operating mode. Average value allows only one value to display regardless of mode.

Temperature Setpoints

TECs provide heating and cooling setpoints for occupied and unoccupied modes as well as setpoints derived from the room thermostat input. In the P1 DXR point team, during day mode (DAY.NGT = DAY) either the CMF HTG STPT or CMF CLG STPT provide the control temperature setpoint when there is no Room Unit setpoint feature enabled. In night mode (DAY.NGT = NIGHT) the ECO HTG STPT or ECO CLG STPT are used for unoccupied times and are not affected by Room Unit setpoint changes. Other P1 DXR temperature setpoints are typically not used /not needed for TEC controllers.

In all modes, the current temperature control setpoint is provided by two points: CLG STPT EFF or HTG STPT EFF. (TECs provide this as a single point: CTL STPT)

The active DAY heating or cooling setpoint can be shifted by enabling the Room Unit Setpoint Shift. This will shift the heating and cooling setpoints up or down together, keeping the width of the deadband constant.

P1 DXRs provide these and other setpoints as shown in the following diagram and table.

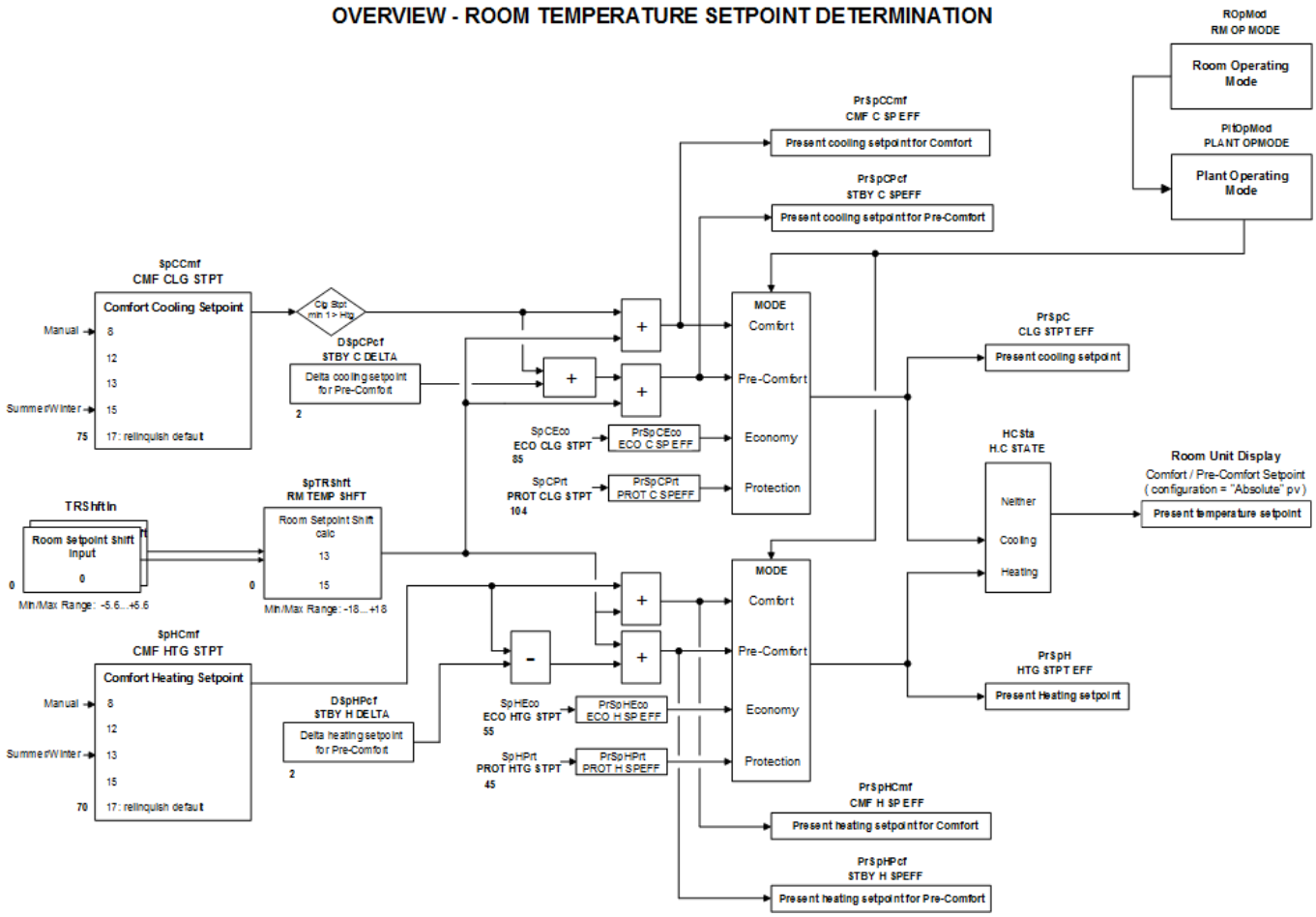


Table 8: Temperature Setpoints.

TEC Setpoint	P1 DXR (New Name)	Description	Notes
DAY CLG STPT	CMF CLG STPT	Comfort cooling setpoint	Comfort setpoints used for day mode. System will adjust to be above heating setpoint by minimum of 1 deg F. Set for base cooling setpoint.
(none)	CMF C STPT EFF	Comfort cooling setpoint effective	Present cooling setpoint in comfort. Calculation from CMF CLG STPT and shift.
DAY HTG STPT	CMF HTG STPT	Comfort heating setpoint	Comfort setpoints used for day mode. Changes to Day heating setpoint may shift Day cooling setpoint to be at least 1 deg F separation. Set for base heating setpoint.
(none)	CMF H STPT EFF	Comfort heating setpoint effective	Present heating setpoint in comfort. Calculation from CMF HTG STPT and shift.
NGT CLG STPT	ECO CLG STPT	Economy cooling setpoint	Economy setpoints used for night mode. Must be higher or equal to Day cooling setpoint.
(none)	ECO C SP EFF	Economy cooling setpoint effective	Present cooling setpoint in economy. Room unit shift is not applied to economy setpoints.

TEC Setpoint	P1 DXR (New Name)	Description	Notes
NGT HTG STPT	ECO HTG STPT	Economy heating setpoint	Economy setpoints used for night mode. Must be less than Day heating setpoint.
(none)	ECO H SP EFF	Economy heating setpoint effective	Present heating setpoint in economy. Room unit shift is not applied to economy setpoints.
(none)	STBY C DELTA	Pre-Comfort delta shift	Setpoint shift (up) from comfort cooling setpoint. Shift 0 or larger. If not using Pre-comfort mode, can be left at default.
(none)	STBY C SPEFF	Pre-Comfort cooling setpoint effective	Derived from Pre-comfort delta shift from comfort cooling setpoint. Includes room setpoint shift input.
(none)	STBY H DELTA	Pre-Comfort heating delta shift	Setpoint shift (down) from comfort heating setpoint. Shift 0 or larger. If not using Pre-comfort mode, can be left at default.
(none)	STBY H SPEFF	Pre-Comfort heating setpoint effective	Derived from Pre-comfort delta shift from comfort heating setpoint. Includes room setpoint shift input.
(none)	PROT CLGSTPT	Protection cooling setpoint	Extended off periods – Protection mode. If not using Protection mode, can be left at default.
(none)	PROT C SPEFF	Protection cooling setpoint effective	Derived from Protect cooling setpoint and adjusted if less than Protection heating setpoint.
(none)	PROT HTGSTPT	Protection heating setpoint	Extended off periods – Protection mode. If not using Protection mode, can be left at default.
(none)	PROT H STEFF	Protection heating setpoint effective	Derived from Protect heating setpoint and adjusted if greater than Protection cooling setpoint.
RM STPT DIAL	RM TEMP STPT	Room Temperature setpoint	Derived from occupancy mode and setpoint shift. Used for display on Room unit (do not command). Displays only: Day setpoints (heating or cooling) last value display in deadband (neither) for h/c mode.
(none)	RM TEMP SHIFT	Room temperature shift	Only applies to Comfort mode (or Pre-comfort mode). Plus/minus shift (and limit) enabled and set in ABT Site defaults (default – 'Yes'; +5.4 and – 5.4 deg).
RM STPT MIN RM STPT MAX	(none)	SpShftIn: Present maximum value SpShftIn: Present minimum value	Only via ABT Site Defaults Tab. In default; set max min shift.
CTL TEMP STPT	CLG STPT EFF HTG STPT EFF	Present Cooling setpoint effective Present Heating setpoint effective	Effective setpoints in effect for cooling and heating. Based on Room operating mode – Actual current control temperature setpoints.
AUX DSH STPT	(none)		FCU discharge setpoint
DISCH STPT	(none)		FCU – supply setpoint cascade control from heating or cooling demand as reset supply temp min and max configurations
DSH MIN DSH MAX	(none)	Default tab: *Heating coil: Max supply air temp setpoint for heating. (90 F)* *Heating coil: Min supply air temp setpoint for heating (50 F)*	Configurations for modules that are configured for cascade control (e.g. HclHw12) – P1 DXR define sensor as 'Supply air temperature'

NOTE: TECs provide heating and cooling setpoints for occupied and unoccupied modes as well as setpoints derived from the optional room unit setpoint input. The

P1-DXRs provides these and other additional setpoints. (Digits at the end of any point object are assigned by the system based on the module or input/output assignment.)

Outside Air Damper Setpoints

Outside air damper minimum position setpoints are configured to provide ventilation and are set for each occupancy mode (DAY, NIGHT). Furthermore, the maximum ventilation positions (in demand control ventilation) can be limited by current outside air temperature provided by network information.

Heat Pump applications control outside air dampers when the economizer is enabled for based on a mixed air temperature sensor and setpoint.

(Digits at the end of any point object are assigned by the system based on the module or input/output assignment.)

Ventilation Damper Setpoints/Options

Ventilation in each fan coil or heat pump unit is provided by outside air damper position control. In the TEC there is a single occupied minimum damper position. DXRs provide configurable minimum positions for each occupancy mode. In addition, all applications have the option to provide an indoor air quality sensor (CO2) [→ 29] and demand control ventilation [→ 35].

Each occupancy mode is configured to allow or prevent damper minimum positions for ventilation. DAY (set Comfort or Pre-comfort) or NIGHT (set Economy or Protection).

Table 9: Base and Minimum Ventilation Configurations.

TEC Setpoint	P1 DXR (New Name)	Description	Notes
(none)	ABT Site: Defaults: *Ventilation control*	*Minimum position for outside air damper for comfort (e.g. 20 pct)*	Set this for the damper position for ventilation in a normally occupied space. This is TEC day/night mode = DAY.
(none)	ABT Site: Defaults: *Ventilation control*	*Minimum position for outside air damper for pre-comfort*	Set this for the damper position for ventilation in pre-comfort mode. This is TEC day/night mode = DAY.
(none)	ABT Site: Defaults: *Ventilation control*	*Minimum position for outside air damper for economy (e.g. 0 pct)*	Set this for the damper position for ventilation in pre-comfort mode. .This is TEC day/night mode = NGT.
(none)	ABT Site: Defaults: *Ventilation control*	*Minimum position for outside air damper for protection*	Set this for the damper position for ventilation in pre-comfort mode. This is TEC day/night mode = NGT.

TEC Setpoint	P1 DXR (New Name)	Description	Notes
(none)	ABT Site: Defaults: *Ventilation control*	*Comfort configuration*	Set = Min ventilation 1= OFF 2= Min ventilation 3 = Min ventilation & DCV 4 = DCV Allow damper position for ventilation for selection control.
(none)	ABT Site: Defaults: *Ventilation control*	*Pre-Comfort configuration*	Set = Min ventilation Allows flow in h/c and deadband; and/or enables DCV control.
(none)	ABT Site: Defaults: *Ventilation control*	*Economy configuration*	Set = OFF Typically not required.
(none)	ABT Site: Defaults: *Ventilation control*	*Protection configuration*	Set = OFF Typically not required.

Demand Control Ventilation

Options for all FCU (and HP) applications include enabling and controlling ventilation to maintain indoor air quality by sensing and increasing damper positions for ventilation to control the CO2 level. IAQ (CO2) setpoints for each occupied mode are configurable and will be used to modulate the ventilation rate through a PID algorithm.

The configurations for DCV as well as the setpoints are enabled in ABT Site.

Table 10: Demand Control Ventilation.

TEC Setpoint	P1 DXR (New Name)	Description	Notes
(none)	VENT SP EFF	Present ventilation setpoint	Used when DCV is active/enable for a given occupancy mode.
(none)	CMF IAQ STPT	Setpoint room air quality for comfort	Default 1000 ppm.
(none)	STBY DCV SP	Setpoint room air quality for pre-comfort	Default 1200 ppm.
(none)	ECO DCV STPT	Setpoint room air quality for economy	Default 1500 ppm.
(none)	PROT DCV SP	Setpoint room air quality for protection	Default 1500 ppm.

Heating Coil Configurations/Options

P1 DXR configurations for heating coils include electric and hot water in the terminal unit as well as options for radiant heating coils (radiator) and radiant ceiling coils.

Current designs allow for the terminal unit heating coils to be controlled by room heating demand (as current TEC control) or by discharge temperature cascade control. Discharge temperature control (with a supply air temperature sensor) is reset by the room temperature demand for heating and can be sequenced with other heating elements.

Note that discharge temperature control for the terminal unit is limited to hot water coils or modulation electric coils.

Terminal Unit Coils (Electric/Hot Water)

DXR applications typically have terminal heating coils. These may be modulating hot water, staged electric or analog electric. The sample templates provide give examples of selecting and configuring hot water coils or staged electric.

Output types, including floating, two position and analog can be selected and configured as shown in the section Actuators [→ 26].

Table 11: Electric Terminal Heating Coils: Number and Control Types.

Electric Coil Type	P1 DXR type Configuration	Description	Notes
Single stage electric	Yes; configure a two-position BO	On-off control based on a Staged (PID) controller.	Can be sequence with other heating elements in the VAV/FPB.
Two or three stage electric	Yes; configure as two or three stage BO	Staged on-off control, with interstage delay, based on a Staged (PID) controller	VAV/FPB allow up to 3 stages; FCU and HP are limited to 2 stages.
Single stage PWM	Yes; configure as two stage PWM spring return	Pulse width modulation control for single stage only PWM Spring return configuration can also be used for hot water actuator (“hot wax type”)	Configure pulse duration and min on/off cycle times.
Two or Three stage PWM	(not avail in DXR)		Determine need and provide request for custom solution.
(analog Electric-SCR 0-10v)	Yes; configure as modulating electric	Analog output (0-10v) to control electric or other heating devices.	Single stage modulating electric as a standard configuring and control option. Can be configured to be controlled by discharge air temperature (see below).

Table 12: Hot Water Terminal Heating Coils: Number and Control Types.

Electric Coil Type	P1 DXR type Configuration	Description	Notes
Hot water coil	Yes; Configure hot water modulating coil	Control from room heating demand	Can be sequence with other heating elements in the application. Configure as floating or analog output control.
TWO hot water coil	NO	Sequenced in TEC –	Determine need and provide request for custom solution.
Hot water coil controlled by discharge air (custom or PPLC)	Standard option in DXR (see templates 14125 and 14127)	Cascade control reset by room heating demand	Min and Max range for discharge (Supply Temp) can be configured.

Table 13: Supply Temperature Setpoints/Control.

TEC Point	P1 DXR (Name)	Description	Notes
(none)	Point – app extension	Minimum supply temperature setpoint	Default 50 F. This value must be set lower than the expected cold air supplied from the AHU to prevent simultaneous heating and cooling.
(none)	Point – app extension	Maximum supply temperature setpoint	Default 95 F. In effect when the room heating demand is 100 percent to prevent excess heat being delivered directly to users.
n/a	configure	Enable “Supply Temperature control”	In ABT Site tab ‘HVAC coordination’ set heating coil control to .”··· cascade control···.”

Radiator (Electric/Hot Water)

Some existing TEC applications have an option for control of a radiator coil valve or actuator. In addition, spare outputs in the TEC may have been configured to control this function through PPCL from a field panel. If existing radiator coils are present/needed for the TEC being replaced, they can be directly configured in the P1-DXR and sequenced with the VAV heating elements. Output types, including floating, two position and modulating electric analog can be selected and configured as shown in the section Actuators [→ 26].

Fan Configurations/Options

Fan types in the P1 DXR application templates are configured as follows:

- FPB application templates are configured for series or parallel single speed fans.
- FCU application templates are configured for single speed fans.
- Heat Pump application various templates are configured for single speed, multi-speed or variable speed fans.

Sequencing Options

Sequencing options between heating or cooling elements that have been enabled in the output configuration are controlled in the DXR as set for heating or cooling. This does not provide for the option for overlapping or simultaneous control (except where indicated for fan operation).

For the heating sequence, the following is the default and can be changed in ABT Site:

Table 14: Heating Sequencing Options.

Sequence (Heating)	Parameter	Default
Radiator heating sequence	RadHSeq	1 [1..8 unique]
Radiant ceiling heating sequence	RcgHSeq	2 [1..8 unique]
Heating/cooling coil heating sequence	HCcHSeq	3 [1..8 unique]
Heating coil heating sequence	HclHSeq	4 [1..8 unique]
Fan heating sequence	FanHSeq	5 [1..8 unique]

Install and Commission

!	***NOTICE***
	NOTE: See caution notes in Wiring [→ 19] before beginning the installation.

Install the P1 DXR device in place of the TEC controller:

1. If the TEC has not been physically replaced yet, see Replacing TEC with P1 DXR [→ 20].
2. Wire the field inputs and outputs per the DXR I/O configuration assigned in ABT Site (e.g. Hot water coil, floating control, to terminal Y5/Y6). See I/O Connection Options [→ 22] if needed for additional information.
3. Replace the existing TEC room unit or room temperature sensor with a PL-Link Room unit to satisfy the inputs and features enabled in ABT Site.

Commission the P1 DXR device:

1. All physical input and output points should be commissioned and verified in the P1 Data base. If sensor offset corrections are necessary, the property (sensor offset) can be accessed in ABT Site or via Tech Op.
2. Insure all setpoints are entered for the specific terminal unit or site requirements. This includes temperature setpoints and, if applicable, flow setpoints. In addition, all applications will have unique ventilation configuration and flow or damper setpoints.
3. Application commissioning may be done to insure configurations correctly enable and allow each heating or cooling element to function in sequence correctly.

Point Team Examples

This section contains examples of P1 DXR point teams.

Note
Multistate points are mapped as analog points in a P1 point team. See Multistate Point Enumerations [→ 49] for a complete list of these points.

See also

- Application Number Requirements [→ 11]
- P1 DXR Template Selection [→ 24]

HP 15070 (14070)

This is an example of a P1 DXR point team replacing a TEC Heat Pump with variable speed compressor, variable speed fan, 2-stage electric, electric radiator and outside air damper. Application number 14xxx range reserved for US HQ templates; 15xxx number assigned when default templates are unlocked by the field.

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
1	CTLR ADDRESS	99	--		1	0	--	--
2	APPLICATION	15070	--		1	0	--	--
{03}	SPLY TEMP 4	78.1 (25.6)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{04}	MIXED TEMP15	55.0 (12.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{05}	POWER 4	0	KW		0.1	0	--	--
{06}	ROOM DCV 2	450	PPM		1	0	--	--
{07}	ROOM HUM 2	10	RH		0.1	0	--	--
{08}	ROOM TEMP 17	76.7 (24.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{09}	OA DMP POS 7	0	PCT		0.1	0	--	--
{10}	FAN VAR SD 1	0	PCT		0.1	0	--	--
{11}	HP VAR SPD 1	0	PCT		0.1	0	--	--
{12}	CMF CLG STPT	75.0 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
13	STBY C DELTA	2.0 (1.1)	DEGF (DEGC)		0.1 (0.05556)	-25.0 (-13.8889)	--	--
{14}	CLG STPT EFF	75 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
15	PROT CLGSTPT	104.0 (40.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
16	ECO CLG STPT	85.0 (29.4)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{17}	STBY C SPEFF	77.0 (25.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{18}	CMF C SP EFF	75 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{19}	ECO C SP EFF	85.0 (29.4)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{20}	OVRD TIME	2	HRS		1	0	--	--
{21}	PROT C SPEFF	104.0 (40.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{22}	CMF HTG STPT	70.0 (21.1)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
23	PROT HTG SP	45.0 (7.2)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
24	ECO HTG STPT	55.0 (12.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
25	STBY H DELTA	2.0 (1.1)	DEGF (DEGC)		0.1 (0.05556)	-25.0 (-13.8889)	--	--
{26}	CMF H SP EFF	70.0 (21.1)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{29}	DAY.NGT	DAY	--		--	--	NIGHT	DAY
{30}	ECO H SP EFF	55.0 (12.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{31}	PROT H SPEFF	45.0 (7.2)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{32}	RM TEMP STPT	75 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{33}	RM TEMP SHFT	0.0 (0.0)	DEGF (DEGC)		0.1 (0.05556)	-25.0 (-13.8889)	--	--
{34}	FAN VAR SP	0	PCT		0.1	0	--	--
35	ECO RH STPT	70	RH		0.1	0	--	--
36	PROT RH STPT	70	RH		0.1	0	--	--
{37}	DEHUM STPT	60	RH		0.1	0	--	--
38	CMF RH STPT	60	RH		0.1	0	--	--
39	STBY RH STPT	60	RH		0.1	0	--	--
40	STBY DCV SP	1200	PPM		1	0	--	--
41	ECO DCV STPT	1500	PPM		1	0	--	--
42	PROT DCV SP	1500	PPM		1	0	--	--
{43}	VENT SP EFF	1000	PPM		1	0	--	--
44	CMF IAQ STPT	1000	PPM		1	0	--	--
{45}	RM DCV EVAL	0	PPM		1	0	--	--
{46}	RM TEMP EVAL	76.7 (24.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{47}	OA TEMP 1	32.0 (0.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{48}	OA HUM 1	0	RH		0.1	0	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{49}	RM HUM EVAL	0	RH		0.1	0	--	--
50	FAN VENT MAX	100	PCT		0.1	0	--	--
51	FAN VENT MIN	50	PCT		0.1	0	--	--
52	FAN HTG MAX	100	PCT		0.1	0	--	--
53	FAN HTG MIN	50	PCT		0.1	0	--	--
54	FAN SPD STRT	50	PCT		0.1	0	--	--
55	FAN END SPD	100	PCT		0.1	0	--	--
56	FN SPD DEHUM	50	PCT		0.1	0	--	--
57	VAV FLOW END	100	--		1	0	--	--
58	FAN CLG MIN	50	PCT		0.1	0	--	--
{59}	FAN CLG REQ	0	PCT		0.1	0	--	--
{60}	FAN HTG REQ	0	PCT		0.1	0	--	--
{61}	AV 59	0	--		1	0	--	--
{62}	FAN VENT REQ	5	PCT		0.1	0	--	--
63	FAN CLG MAX	100	PCT		0.1	0	--	--
{64}	RAD ELEC PWR	0	KW		0.1	0	--	--
{65}	RAD HTG REQ	0	PCT		0.1	0	--	--
{66}	HTG ELEC PWR	0	KW		0.1	0	--	--
{67}	HTG COIL REQ	0	PCT		0.1	0	--	--
{68}	OADMPR C REQ	0	PCT		0.1	0	--	--
{69}	OA VENT REQ	20	PCT		0.1	0	--	--
70	MIXED TEMPSP	53.6 (12.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{71}	HC CW REQ	0	PCT		0.1	0	--	--
{72}	HC HW REQ	0	PCT		0.1	0	--	--
{73}	DEHUM RQ	0	PCT		0.1	0	--	--
{74}	HP ELEC PWR	0	KW		0.1	0	--	--
75	HP MAX CLG	100	PCT		0.1	0	--	--
76	HP MIN CLG	20	PCT		0.1	0	--	--
77	HP MAX HTG	100	PCT		0.1	0	--	--
78	HP MIN HTG	20	PCT		0.1	0	--	--
79	HP MAX DEHUM	100	PCT		0.1	0	--	--
80	HP MIN DEHUM	20	PCT		0.1	0	--	--
{81}	FAN STATUS 2	OFF	--		--	--	ON	OFF
{82}	COND LEVEL 1	ON	--		--	--	ON	OFF
{83}	HP FAULT 3	ON	--		--	--	ON	OFF
{84}	FAN ENABLE 1	OFF	--		--	--	ON	OFF
{85}	HTG EL 1ST 1	OFF	--		--	--	ON	OFF

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{86}	HTG EL 2ST 1	OFF	--		--	--	ON	OFF
{87}	RAD EL POS 2	OFF	--		--	--	ON	OFF
{88}	DO 4	INACT	--		--	--	ACTIVE	INACT
{89}	HP REV VLV 2	INACT	--		--	--	ACTIVE	INACT
{90}	HP ENABLE 2	OFF	--		--	--	ON	OFF
{91}	CMF BTN	INACT	--		--	--	ACTIVE	INACT
{92}	FRE CLGREQ 1	INACT	--		--	--	ACTIVE	INACT
{93}	COOL DN REQ	INACT	--		--	--	ACTIVE	INACT
{94}	WARM UP REQ	INACT	--		--	--	ACTIVE	INACT
{95}	NGT CLG REQ	INACT	--		--	--	ACTIVE	INACT
{96}	RADHI T RSLT	OFF	--		--	--	ON	OFF
{97}	RAD ELEC VAL	OFF	--		--	--	ON	OFF
{98}	ECON STATUS	OFF	--		--	--	ON	OFF
{99}	ERROR STATUS	0	--	0=No error Bit 1=greater than 127 points	1	0	--	--
{101}	HP FT RSLT	ON	--		--	--	ON	OFF
{102}	HP SRC AVL	OFF	--		--	--	ON	OFF
{103}	HP SRC DMD	OFF	--		--	--	ON	OFF
{104}	RM OP MODE	4	--	1:Protection 2:Economy 3:Pre-Comfort 4:Comfort	1	0	--	--
{105}	OP MODE EFF	4	--	1:Protection 2:Economy 3:Pre-Comfort 4:Comfort	1	0	--	--
{106}	GREEN LEAF	5	--	1:Undefined 2:Poor 3:Satisfied 4:Good 5:Excellent	1	0	--	--
{107}	RMHVAC GRNLF	5	--	1:Undefined 2:Poor 3:Satisfied 4:Good 5:Excellent	1	0	--	--
{108}	H.C STATE	1	--	1:Neither 2:Heating 3:Cooling	1	0	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{109}	PLANT OPMODE	5	--	1:Off 2:Protection 3:Economy 4:Pre-Comfort 5:Comfort 6:Warm-up 7:Cool down 8:Room low temp. protection 9:Cond.overflow protection 10:Free cooling 11:Night cooling 12:Ventilation 13:Equipment temp. protection 14:Air volume flow off 15:Smoke control positive pressure 16:Smoke control negative pressure 17:Purge	1	0	--	--
{110}	DCV IND EVAL	1	--	1:Undefined 2:Poor 3:Okay 4:Good	1	0	--	--
{111}	HC DEMAND	1	--	1:Neither 2:Heating 3:Cooling	1	0	--	--
{112}	FAN MODE	2	--	1:Off 2:Control mode 3:Maximum speed 4:Manual speed	1	0	--	--
{113}	RAD DEV MODE	2	--	1:Off 2:Control mode 3:Fully open 4:Control mode & downdraft 5:Downdraft	1	0	--	--
{114}	HTG DEV MODE	2	--	1:Off 2:Control mode 3:Fully open	1	0	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{115}	OADMPR MODE	2	--	1:Off 2:Control mode 3:Fully open 4:Maximum allowed	1	0	--	--
{116}	HC DEV MODE	2	--	1:Off 2:Control mode 3:Fully open, heating 4:Fully open, cooling	1	0	--	--
{117}	HP STATE	1	--	1:Off 2:Heating 3:Cooling	1	0	--	--
{127}	DEV STATUS	2	--	0:Idle 1:Loading 2:Running 3:Halted 4:Unloading	1	0	--	--

HP 15171 (14171)

This is an example of a P1 DXR point team replacing a TEC Heat Pump with 2-stage heat pump, hot gas heat, 2-stage fan, electric heat, hot water radiator and outside air damper. Application number 14xxx range reserved for US HQ templates; 15xxx number assigned when default templates are unlocked by the field.

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
1	CTLR ADDRESS	99	--		1	0	--	--
2	APPLICATION	15171	--		1	0	--	--
{03}	SPLY TEMP 4	78.4 (25.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{04}	MIXED TEMP15	53.6 (12.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{05}	POWER 4	0	KW		0.1	0	--	--
{06}	ROOM DCV 2	0	PPM		1	0	--	--
{07}	ROOM HUM 2	10	RH		0.1	0	--	--
{08}	ROOM TEMP 17	32.0 (0.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{09}	OA DMP POS 7	0	PCT		0.1	0	--	--
{10}	RAD V POS 8	0	PCT		0.1	0	--	--
{11}	CMF CLG STPT	75.0 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
12	STBY C DELTA	2.0 (1.1)	DEGF (DEGC)		0.1 (0.05556)	-25.0 (-13.8889)	--	--
{13}	CLG STPT EFF	75.0 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
14	PROT CLGSTPT	104.0 (40.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
15	ECO CLG STPT	85.0 (29.4)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{16}	STBY C SPEFF	77.0 (25.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{17}	CMF C SP EFF	75.0 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{18}	ECO C SP EFF	85.0 (29.4)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{19}	PROT C SPEFF	104.0 (40.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{20}	OVRD TIME	2	HRS		1	0	--	--
{21}	CMF HTG STPT	70.0 (21.1)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
22	PROT HTG SP	45.0 (7.2)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
23	ECO HTG STPT	55.0 (12.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
24	STBY H DELTA	2.0 (1.1)	DEGF (DEGC)		0.1 (0.05556)	-25.0 (-13.8889)	--	--
{25}	CMF H SP EFF	70.0 (21.1)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{26}	STBY H SPEFF	68.0 (20.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{27}	HTG STPT EFF	70.0 (21.1)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{28}	ECO H SP EFF	55.0 (12.8)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{29}	DAY.NGT	DAY	--		--	--	NIGHT	DAY
{30}	PROT H SPEFF	45.0 (7.2)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{31}	RM TEMP STPT	75.0 (23.9)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{32}	RM TEMP SHFT	0.0 (0.0)	DEGF (DEGC)		0.1 (0.05556)	-25.0 (-13.8889)	--	--
33	ECO RH STPT	70	RH		0.1	0	--	--
34	PROT RH STPT	70	RH		0.1	0	--	--
{35}	DEHUM STPT	60	RH		0.1	0	--	--
36	CMF RH STPT	60	RH		0.1	0	--	--
37	STBY RH STPT	60	RH		0.1	0	--	--
38	STBY DCV SP	1200	PPM		1	0	--	--
39	ECO DCV STPT	1500	PPM		1	0	--	--
40	PROT DCV SP	1500	PPM		1	0	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{41}	VENT SP EFF	1000	PPM		1	0	--	--
42	CMF IAQ STPT	1000	PPM		1	0	--	--
{43}	RM DCV EVAL	0	PPM		1	0	--	--
{44}	RM TEMP EVAL	32.0 (0.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{45}	OA TEMP 1	32.0 (0.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
{46}	OA HUM 1	0	RH		0.1	0	--	--
{47}	RM HUM EVAL	0	RH		0.1	0	--	--
{48}	DEHUM RQ	0	PCT		0.1	0	--	--
{49}	HC HW REQ	0	PCT		0.1	0	--	--
{50}	HC CW REQ	0	PCT		0.1	0	--	--
{51}	FAN CLG REQ	0	PCT		0.1	0	--	--
{52}	FAN VENT REQ	5	PCT		0.1	0	--	--
{53}	FAN HTG REQ	0	PCT		0.1	0	--	--
{54}	RAD VLV VAL	0	PCT		0.1	0	--	--
{55}	RAD HTG REQ	0	PCT		0.1	0	--	--
{56}	HTG ELEC PWR	0	KW		0.1	0	--	--
{57}	HTG COIL REQ	0	PCT		0.1	0	--	--
{58}	OADMPR C REQ	0	PCT		0.1	0	--	--
{59}	OA VENT REQ	20	PCT		0.1	0	--	--
60	MIXED TEMPSP	53.6 (12.0)	DEGF (DEGC)		0.1 (0.05556)	-40.0 (-40.0)	--	--
61	VAV FLOW END	100	--		1	0	--	--
{62}	HP ELEC PWR	0	KW		0.1	0	--	--
{63}	FAN STATUS 2	OFF	--		--	--	ON	OFF
{64}	COND LEVEL 1	OFF	--		--	--	ON	OFF
{65}	HP FAULT 3	OFF	--		--	--	ON	OFF
{66}	HTG EL POS 1	OFF	--		--	--	ON	OFF
{67}	DO 7	INACT	--		--	--	ACTIVE	INACT
{68}	HP REV VLV 2	INACT	--		--	--	ACTIVE	INACT
{69}	HP 1ST CMD 1	OFF	--		--	--	ON	OFF
{70}	HP 2ND CMD 1	OFF	--		--	--	ON	OFF
{71}	HP HGAS EN 3	OFF	--		--	--	ON	OFF
{72}	CMF BTN	INACT	--		--	--	ACTIVE	INACT
{73}	FRE CLGREQ 1	INACT	--		--	--	ACTIVE	INACT
{74}	COOL DN REQ	INACT	--		--	--	ACTIVE	INACT
{75}	WARM UP REQ	INACT	--		--	--	ACTIVE	INACT

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{76}	NGT CLG REQ	INACT	--		--	--	ACTIVE	INACT
{77}	ECON STATUS	ON	--		--	--	ON	OFF
{78}	HP FT RSLT	OFF	--		--	--	ON	OFF
{79}	HP SRC AVL	OFF	--		--	--	ON	OFF
{80}	HP SRC DMD	OFF	--		--	--	ON	OFF
{81}	FAN MLT SD 1	1	--	1:Off 2:Speed 1 3:Speed 2 4:Speed 3	1	0	--	--
{82}	RM OP MODE	4	--	1:Protection 2:Economy 3:Pre-Comfort 4:Comfort	1	0	--	--
{83}	OP MODE EFF	4	--	1:Protection 2:Economy 3:Pre-Comfort 4:Comfort	1	0	--	--
{84}	GREEN LEAF	5	--	1:Undefined 2:Poor 3:Satisfied 4:Good 5:Excellent	1	0	--	--
{85}	FAN 2 SPD SP	1	--	1:Off 2:Speed 1 3:Speed 2	1	0	--	--
{86}	RMHVAC GRNLF	5	--	1:Undefined 2:Poor 3:Satisfied 4:Good 5:Excellent	1	0	--	--
{87}	H.C STATE	1	--	1:Neither 2:Heating 3:Cooling	1	0	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{88}	PLANT OPMODE	5	--	1:Off 2:Protection 3:Economy 4:Pre-Comfort 5:Comfort 6:Warm-up 7:Cool down 8:Room low temp. protection 9:Cond.overflow protection 10:Free cooling 11:Night cooling 12:Ventilation 13:Equipment temp. protection 14:Air volume flow off 15:Smoke control positive pressure 16:Smoke control negative pressure 17:Purge	1	0	--	--
{89}	DCV IND EVAL	4	--	1:Undefined 2:Poor 3:Okay 4:Good	1	0	--	--
{90}	HC DEMAND	1	--	1:Neither 2:Heating 3:Cooling	1	0	--	--
{91}	HC DEV MODE	1	--	1:Off 2:Control mode 3:Fully open, heating 4:Fully open, cooling	1	0	--	--
92	FN SPD DEHUM	2	--	1:Off 2:Speed 1 3:Speed 2 4:Speed 3	1	0	--	--
{93}	FAN MODE	1	--	1:Off 2:Control mode 3:Maximum speed 4:Manual speed	1	0	--	--
{94}	RAD HW DMD	1	--	1:Off 2:Heating demand 3:Warm-up	1	0	--	--
{95}	RAD DEV MODE	2	--	1:Off 2:Control mode 3:Fully open 4:Control mode & downdraft 5:Downdraft	1	0	--	--
{96}	HTG DEV MODE	1	--	1:Off 2:Control mode 3:Fully open	1	0	--	--

Point No.	Descriptor	Value (SI Units)	Eng Units (SI Units)	Enumerations	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{97}	OADMPR MODE	1	--	1:Off 2:Control mode 3:Fully open 4:Maximum allowed	1	0	--	--
98	FAN SPD STRT	2	--	1:Off 2:Speed 1 3:Speed 2 4:Speed 3	1	0	--	--
{99}	ERROR STATUS	0	--	0=No error Bit 1=greater than 127 points	1	0	--	--
101	FAN END SPD	4	--	1:Off 2:Speed 1 3:Speed 2 4:Speed 3	1	0	--	--
{102}	HP STATE	1	--	1:Off 2:Heating 3:Cooling	1	0	--	--
{127}	DEV STATUS	2	--	0:Idle 1:Loading 2:Running 3:Halted 4:Unloading	1	0	--	--

Multistate Point Enumerations

These multistate points are mapped as analog points.

Table 15: Multi-state Point Enumerations.

APOGEE	Desigo	Enumerations
DCV IND EVAL	RAQualInd	1:Undefined 2:Poor 3:Okay 4:Good
CW COIL DMD HC CW DMD PANEL CW DMD	CclChwDmd HCclChwDmd RcgChwDmd	1:Off 2:Cooling demand 3:Free cooling
DEV STATUS IO STATUS PLNK STATUS RM STATUS SEGM STATUS	AsSta IOBusSta PlnkBusSta RSta RSegmSta	1:Normal 2:Intervention active 3:Fault 4:Alarm 5:Fault & alarm
GREEN LEAF RMHVAC GRNLF RM LGT GRNLF RM SHD GRNLF	REei RHvacEei RLgtEei RShdEei	1:Undefined 2:Poor 3:Satisfied 4:Good 5:Excellent
FAN MODE	FanDevMod	1:Off 2:Control mode 3:Maximum speed 4:Manual speed

APOGEE	Desigo	Enumerations
FAN 2 SPD SP	SpFan2Spd	1:Off 2:Speed 1 3:Speed 2
FAN MLT SD FN SPD DEHUM FAN SPD STRT FAN END SPD FAN 3 SPD SP	FanMultiSpd FanSpdDhu FanSttSpdFpb FanEndSpdFpb SpFan3Spd	1:Off 2:Speed 1 3:Speed 2 4:Speed 3
HC CHOVR HC DEMAND H.C STATE PANL CHGOVR	HCclChovrCnd HCDmd HCSta RcgChovrCnd	1:Neither 2:Heating 3:Cooling
HC HW DMD HTG COIL DMD RAD HW DMD PANEL HW DMD	HCclHwDmd HclHwDmd RadHwDmd RcgHwDmd	1:Off 2:Heating demand 3:Warm-up
HP STATE	HpuSta	1:Off 2:Heating 3:Cooling
HVAC MODE	HvacPscMod	1:None 2:Consider present 3:Consider absent 4:Consider present and absent
NEXT OP MODE OP MODE EFF RM OP MODE	NxROpMod PrOpMod ROpMod	1:Protection 2:Economy 3:Pre-Comfort 4:Comfort
OADMPR MODE	DmpOaDevMod	1:Off 2:Control mode 3:Fully open 4:Maximum allowed
PANEL MODE[1)] CLG DEV MODE HTG DEV MODE	RcgDevMod[1)] CclDevMod HclDevMod	1:Off 2:Control mode 3:Fully open
PANEL MODE[2)] HC DEV MODE	RcgDevMod[2)] HCclDevMod	1:Off 2:Control mode 3:Fully open, heating 4:Fully open, cooling
PLANT OPMODE SUP AIR DMD SU AIR1DMD SU AIR2DMD	PltOpMod VavSuAirDmd VavSuAirDmd1 VavSuAirDmd2	1:Off 2:Protection 3:Economy 4:Pre-Comfort 5:Comfort 6:Warm-up 7:Cool down 8:Room low temp. protection 9:Cond.overflow protection 10:Free cooling 11:Night cooling 12:Ventilation 13:Equipment temp. protection 14:Air volume flow off 15:Smoke control positive pressure 16:Smoke control negative pressure 17:Purge

APOGEE	Desigo	Enumerations
RAD DEV MODE	RadDevMod	1:Off 2:Control mode 3:Fully open 4:Control mode & downdraft 5:Downdraft
VAV CHGOVR 1VAV CHGVR 2VAV CHGVR	VavSuChovrCnd VavSuChovrCnd1 VavSuChovrCnd2	1:Neither 2:Heating 3:Cooling 4:Neutral
VAV MODE	VavExDevMod VavSuDevMod	1:Off 2:Control mode 3:Maximum speed 4:Minimum air volume flow 5:Smoke control air flow setpoint
ERROR STATUS	(P1 DXR point 99)	0=No error Bit 1=greater than 127 points
DEV STATUS	(P1 DXR point 127)	0:Idle 1:Loading 2:Running 3:Halted 4:Unloading

[1] RcgDevMod for a chilled beam or a heating beam.

[2] RcgDevMod is for a heating/cooling beam.

BACnet Network Conversion

(For future use)

When the P1 DXR installation is no longer required on the P1 network, the P1 DXR hardware/firmware can be converted for use on a standard BACnet MS/TP network.

1:1 Conversion Process for P1 to BACnet MS/TP

Converting P1 DXR hardware/firmware to BACnet MS/TP is a "one at a time" process. Converting multiple devices from the field panel or work station is not possible.

Conversion Steps

▷ Prerequisite: All remaining P1 TECs must be migrated to standard DXRs and/or any P1 DXRs must be changed from P1 to BACnet.

1. Disconnect the automation station P1 trunk cable and delete the FLN.
2. Install 550-975 End of Line Terminators (550-975P100) on each end of the FLN cable to support the higher BACnet speeds.
   NOTE: 550-974 reference terminator is not used when existing 2-wire cable is reused for BACnet MSTP.
3. Replace the P1 TECs with standard DXRs:
   - Verify that 24 Vac transformers have earth grounded secondary neutral.
   - Verify that the voltage at the DXR.M power terminals is greater than 20.4Vac.
   - Verify that loads do not exceed Triac capability.
   - Remove any resistors from TEC Triac terminals and install on corresponding DXR2.M Triac terminals.
4. Using ABT Site/ABT Inside, connect to the P1 DXR via room unit or directly to USB port and go online.
5. Change the communication mode of Network port for MSTP from "P1" to "MSTP".
   (Navigation: Device > List view> Infrastructure > Network port for MSTP > Communication mode > select MSTP from the dropdown and click OK > locate Command property and click Activate)
   ⇨ After a delay a restart is initiated – the DXR restarts as an MS/TP device. Note: P1 network baud rate was fixed at 4800. The restarted MS/TP device baud rate can be set or verified in ABT Site (in ABT Site Help, search for "baud rate"). Network number can also be assigned in ABT Site.
6. Do one of the following:
   - Change the application number (best practice = do not re-use the previous 15xxx P1 DXR template number(s).
     OR
   - Download application (from engineered device to discovered device) using the Merge online feature. This is done by right clicking on the engineered

device and selecting "Download application configuration (merge online data)"

7. Add the MSTP FLN to the automation station P1 trunk cable and connect the trunk cable.

Once the above steps are completed, commission and verify communications on the network.

Issued by
Siemens Industry, Inc.
Smart Infrastructure
1000 Deerfield Pkwy
Buffalo Grove IL 60089
+1 847-215-1000