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Environmental Sensors and Actuators

Guide

Revision 1B

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If a power cable is included with this product, it must be used exclusively for this product.

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What's New in the Environmental Sensors and Actuators Guide

The following sections have changed or information has been added to the Environmental Sensors Guide based on enhancements to the Raritan environmental sensor packages and/or user documentation.

Introduction to Environmental Sensor Packages (on page 1)

Sensor Overview (on page 2)

Sensor Support Guidelines (on page 3)

DPX3 Series (on page 30)

DX Series (on page 34)

DX-PD2C5 (on page 39)

Cascading DX or DX2 Sensor Packages (on page 52)

DX2 Series (on page 55)

Available DX2 Sensor Packages (on page 55)

DX2-DH2C2 (on page 56)

Sensor Naming Conventions (on page 70)

Chapter 1 Introduction to Environmental Sensor Packages

Raritan has five types of environmental sensor packages: DPX, DPX2, DPX3, DX and DX2 series.

DPX series described in this guide refers to DPX sensor packages instead of DPX power distribution units (PDUs) unless otherwise specified.

Note that NOT all Raritan products support all types of Raritan environmental sensor packages. For specific sensor support information, see the online help of your Raritan EMX, Branch Circuit Monitor (BCM) or PDU like PX2, PX3 and so on. For a list of Raritan products that support these environmental sensor packages, refer to ***Supported Maximum Number of Sensors and Actuators*** (on page 66).

Note: Online help is accessible from your Raritan PDU, EMX or BCM application, or the Raritan website's **Support page** *(***http://www.raritan.com/support/***).*

In This Chapter

Sensor Overview 2
Sensor Comparison 2
Sensor Support Guidelines 3

Sensor Overview

An environmental sensor package may have more than one sensor or actuator function. For details, see:

- ***Available DPX Sensor Packages*** (on page 6)
- ***Available DPX2 Sensor Packages*** (on page 24)
- ***Available DPX3 Sensor Packages*** (on page 30)
- ***Available DX Sensor Packages*** (on page 35)
- ***Available DX2 Sensor Packages*** (on page 55)

A sensor is used to detect the environmental condition, such as temperature, humidity, and water presence. An actuator is used to control a system or mechanism, such as turning on or off a device.

Depending on the firmware of your Raritan PDU or EMX, the maximum number of sensors or actuators supported by your PDU or EMX differs. See ***Supported Maximum Number of Sensors and Actuators*** (on page 66).

The maximum cabling length for DPX2, DPX3 and DX sensor packages connected to a Raritan product's sensor port should not exceed 98 feet (30 meters). For the supported DPX cabling length, see ***Supported Maximum Sensor Distance*** (on page 64).

Exception: DX-PD2C5 supports a maximum cabling length of 29 feet (9 m) instead of 98 feet (30 m).

Warning: For proper operation, wait for 15~30 seconds between each connection operation or each disconnection operation of environmental sensor packages.

Sensor Comparison

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Sensor family	Connection interface	Support for sensor daisy chain	Chain position availability*	Support for a Raritan sensor hub	Automatic sensor firmware update
DPX	RJ-12	**		✓ (1) / (2)	
DPX2	RJ-12	✓ ***	✓	✓ (2)	✓
DPX3	RJ-45	✓	✓	✓ (2)	✓
DX	RJ-45	✓	✓	✓ (2)	✓
DX2	RJ-45	✓	✓	✓ (2)	✓

* Chain position availability column indicates whether a sensor's position in a sensor daisy chain is available or not. This information can be retrieved through the Raritan product where the sensor is connected, such as a PDU or EMX.

** Most DPX sensor packages do NOT support daisy chaining except the differential air pressure sensor, DPX-T1DP1.

*** DPX2 sensors can be daisy chained via one DPX2 sensor cable, but you cannot daisy chain multiple DPX2 sensor cables.

(1) The sensor hub that only DPX sensor packages support is **DPX-ENVHUB4**.

(2) The sensor hub that all Raritan sensor packages support is **DPX3-ENVHUB4**.

Sensor Support Guidelines

- The first generation of Raritan PDUs only supports DPX sensor packages so do NOT connect other Raritan sensor packages, including DX, DPX2 and DPX3 sensor packages, to the following models.
  - PX PDUs
  - DPXS PDUs
  - DPXR PDUs
  - DPCS PDUs
  - DPCR PDUs

- All other Raritan PDUs than the above models support all types of Raritan environmental sensor packages, including DPX, DPX2, DPX3, DX and DX2 sensor packages. However, a few DX and DX2 sensor packages may be supported by specific Raritan PDU models only. For example, ***DX-PD2C5*** (on page 39) and ***DX2-DH2C2*** (on page 56).
- EMX supports all types of Raritan environmental sensor packages, including DPX, DPX2, DPX3, DX and DX2 sensor packages. However, it may not support a few DX and DX2 sensor packages, such as ***DX-PD2C5*** (on page 39) and ***DX2-DH2C2*** (on page 56).

Chapter 2 DPX Series

DPX is the first generation of Raritan environmental sensor packages. Most DPX packages come with a factory-installed sensor cable with an RJ-12 connector.

DPX supports the use of a Raritan sensor hub to increase the number of connected DPX sensors.

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Available DPX Sensor Packages 6
DPX Temperature and Humidity Sensors 7
Air Flow Sensors 7
Differential Air Pressure Sensors 8
Contact Closure Sensors 10
Floor Water Sensors 18

Available DPX Sensor Packages

Sensor packages	Description
DPX-T1	• 1 temperature sensor See *DPX Temperature and Humidity Sensors* (on page 7).
DPX-T1H1	• 1 temperature sensor • 1 humidity sensor See *DPX Temperature and Humidity Sensors* (on page 7).
DPX-T3H1	• 3 temperature sensors • 1 humidity sensor See *DPX Temperature and Humidity Sensors* (on page 7).
DPX-AF1	• 1 air flow sensor See *Air Flow Sensors* (on page 7).
DPX-T1DP1	• 1 temperature sensor • 1 differential air pressure sensor See *Differential Air Pressure Sensors* (on page 8).
DPX-CC2-TR	• Two-channel contact closure sensors See *Contact Closure Sensors* (on page 10).
DPX-WSF	• 1 floor-mounted water sensor See *Floor-mounted Water Sensor* (on page 18).
DPX-WSC series	• 1 cable water sensor See *Cable Water Sensor* (on page 20).

For detailed information on sensor names, see *Sensor Naming Conventions* (on page 70).

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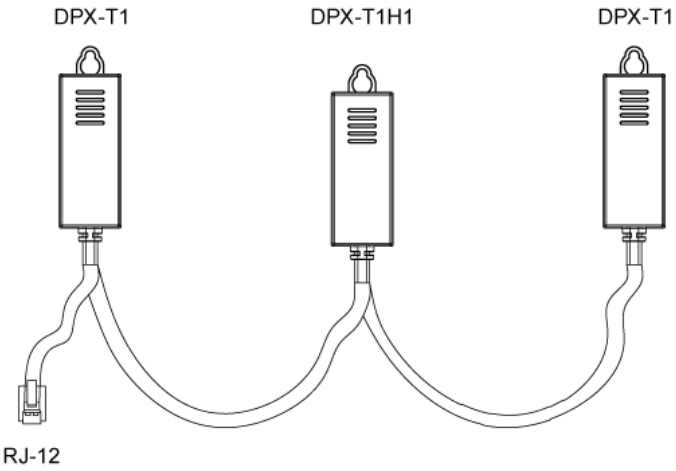
DPX Temperature and Humidity Sensors

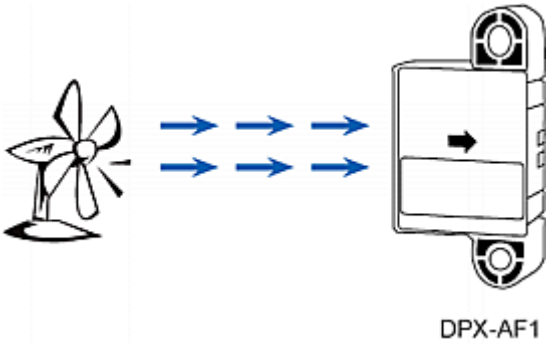
Raritan provides three types of DPX temperature and humidity sensor packages: DPX-T1, DPX-T1H1 and DPX-T3H1.

A DPX-T3H1 package contains one DPX-T1H1 and two DPX-T1 sensors. As shown in the following diagram, all sensors have been connected to the sensor cable, when shipping out of the factory, in a manner that you cannot remove or replace any individual sensor.



Air Flow Sensors

If a DPX air flow sensor (DPX-AF1) is connected, make sure the sensor faces the source of the wind (such as a fan) in the appropriate orientation as indicated by the arrow on that sensor.

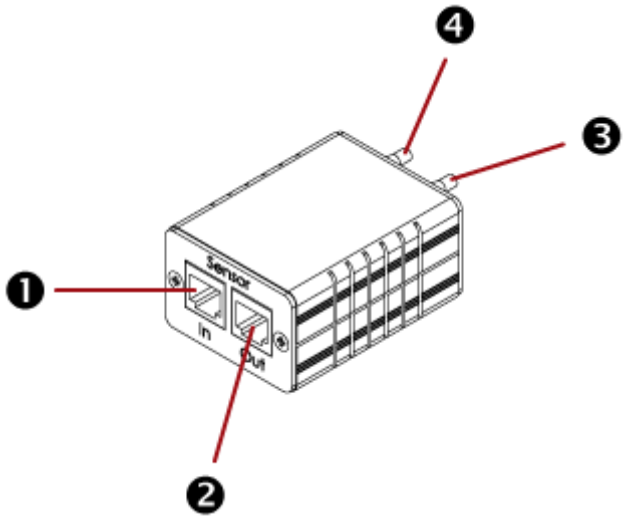


To affix this sensor to an object or place, just screw it up using the sensor's two screw holes.

Differential Air Pressure Sensors

The DPX differential air pressure sensor (DPX-T1DP1) detects not only the differential air pressure but also the temperature because it has a built-in temperature sensor.

This sensor is designed to receive the inputs of two pressure levels. Differential air pressure is measured by reading the difference of the two inputs.



Number	Component	Description
❶	'In' port (RJ-12)	Connect to a Raritan PDU or EMX. If cascading multiple air pressure sensors, connect this port to the 'Out' port of another sensor.
❷	'Out' port (RJ-12)	Use this port for cascading air pressure sensors.
❸	'Lo' pressure nozzle	Receive low air pressure inputs.
❹	'Hi' pressure nozzle	Receive high air pressure inputs.

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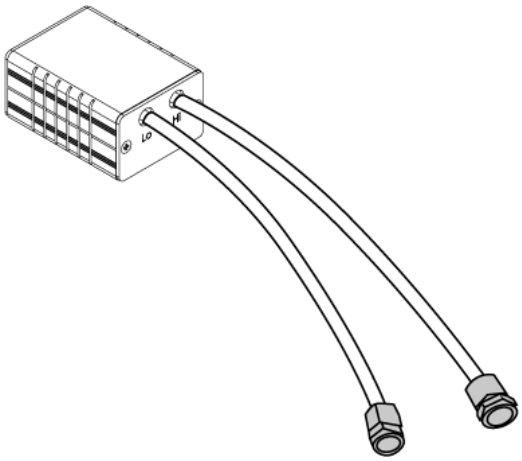
Connecting Tubes

Two tubes are shipped with the sensor. Connect the tubes to the sensor to receive two air pressure inputs. If necessary, cut the tubes so that the tube length meets your needs.

To install tubes:

1. Connect the tubes to both pressure nozzles of the sensor.



2. Place each tube's grommet in an appropriate location where you want to detect differential air pressure levels.
   - Place the "Lo" tube's grommet in a low air pressure position.
   - Place the "Hi" tube's grommet in a high air pressure position.

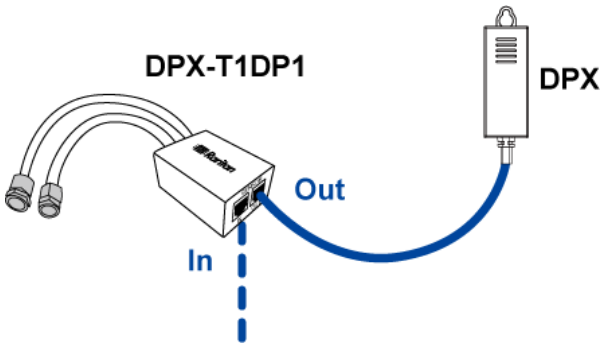
Connecting a DPX Sensor Package to an Air Pressure Sensor

You can add any DPX sensor package to a differential air pressure sensor.

To connect one DPX to one air pressure sensor:

1. Use a Raritan-provided phone cable to connect an air pressure sensor to a Raritan PDU or EMX.
   a. Plug one end of the cable into the sensor's "In" port.
   b. Plug the other end into a Raritan PDU's or EMX' sensor port.
   - An RJ-12 to RJ-45 adapter is required if your Raritan PDU uses an RJ-45 SENSOR port, such as PX3.
2. Connect one DPX sensor package to the air pressure sensor's "Out" port.

- It can be any available DPX sensor package shown in the section titled ***Available DPX Sensor Packages*** (on page 6).

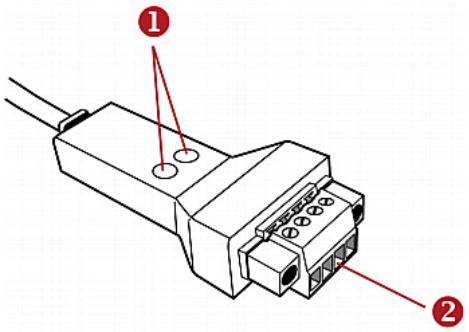


Note: You CANNOT cascade more than two sensor packages in this DPX sensor chain.

Contact Closure Sensors

Raritan's contact closure sensor (DPX-CC2-TR) can detect the open-and-closed status of connected detectors/switches.

This sensor has two channels for connecting two discrete (on/off) detectors/switches. Four termination points are available: the two to the right are associated with one channel (as indicated by the sensor's LED number), and the two to the left are associated with the other.



Number	Component
1	Two LEDs for indicating two channels' status.
2	Four termination points for connecting two discrete detectors/switches.

Supported detector/switch types:

At a minimum, a discrete detector/switch is required in order for DPX-CC2-TR to work properly. The types of discrete detectors/switches that can be connected to DPX-CC2-TR include those for:

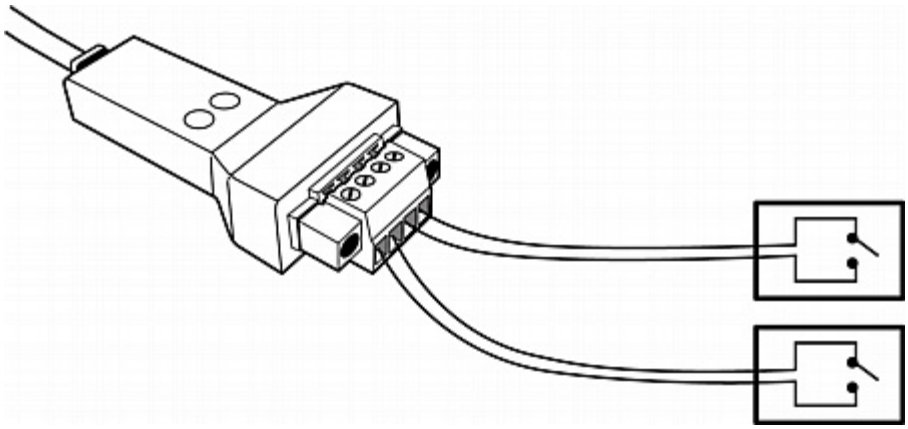
- Door open/closed detection
- Door lock detection
- Floor water detection
- Smoke detection
- Vibration detection

Raritan does NOT produce most of the above detectors/switches except floor water sensors. When using third-party probes, you must test them with DPX-CC2-TR to ensure they work properly.

Important: Integration and testing for third-party detectors/switches is the sole responsibility of the customer. Raritan cannot assume any liability as a result of improper termination or failure (incidental or consequential) of third-party detectors/switches that customers provide and install. Failure to follow installation and configuration instructions can result in false alarms or no alarms. Raritan makes no statement or claim that all third-party detectors/switches will work with DPX-CC2-TR.

Connection scheme:

A DPX-CC2-TR can connect two contact closure detectors/switches.



For details on connecting a detector/switch, see *Connecting Detectors/Switches to New DPX-CC2-TR* (on page 12) or *Connecting Detectors/Switches to Old DPX-CC2-TR* (on page 14).

Old and New Contact Closure Sensors

Since the end of 2012 Raritan provided a new contact closure sensor. Old and new contact closure sensors are functionally identical with the following exceptions.

- The old sensor type uses buttons to secure or loosen the connection of detectors/switches while the new type uses screws.
- The new sensor type's terminals can be separated from the sensor but the old type's terminals are fixed.
- The new sensor type supports Raritan's DPX water sensors (DPX-WSC and DPX-WSF) but the old type does NOT.

Both old and new contact closure sensors share the same part number: *DPX-CC2-TR*.

The latest firmware for your Raritan PDU or EMX will continuously support the old DPX-CC2-TR.

- For instructions on *new* contact closure sensors, see ***Connecting Detectors/Switches to New DPX-CC2-TR*** (on page 12).
- For instructions on *old* contact closure sensors, see ***Connecting Detectors/Switches to Old DPX-CC2-TR*** (on page 14).

Connecting Detectors/Switches to New DPX-CC2-TR

The new DPX-CC2-TR comprises two parts: sensor box and terminal module. The terminal module is detachable so it is more convenient to connect/disconnect discrete detectors/switches.

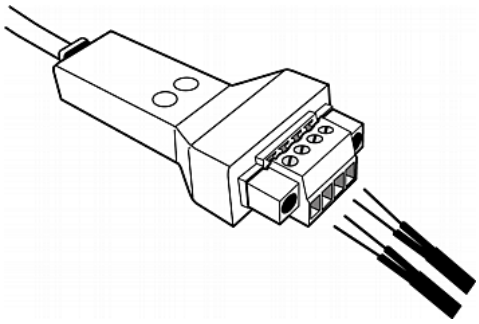
Below are the resistance values for the new DPX-CC2-TR to open and close a connected detector/switch reliably.

- Open: Greater than 320K ohm
- Closed: Less than 200K ohm

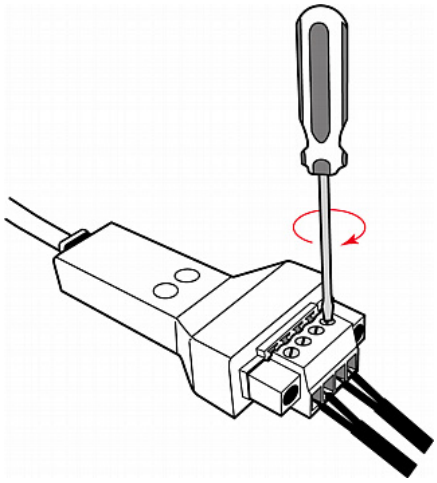
▶ To make connections when the terminal module is attached:

1. Strip the insulation around 12 mm from the end of each wire of discrete detectors/switches.
2. Fully insert each wire of both detectors/switches into each termination point.
   - Plug both wires of a detector/switch into the two termination points to the left.

- Plug both wires of the other detector/switch into the two termination points to the right.



3. Use a screwdriver with a 2.5 mm wide shaft to tighten the screws above each termination point to secure the wires, using a torque of 0.196 N·m (2 kgf·cm).

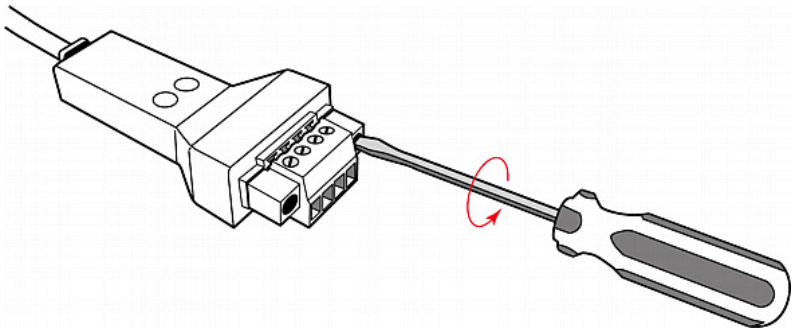


To make connections after the terminal module is separated:

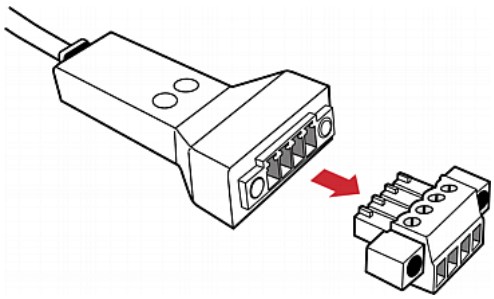
You can also connect a detector/switch when the terminal module is separated from the sensor box.

1. Loosen the screws at two sides of the terminal module.

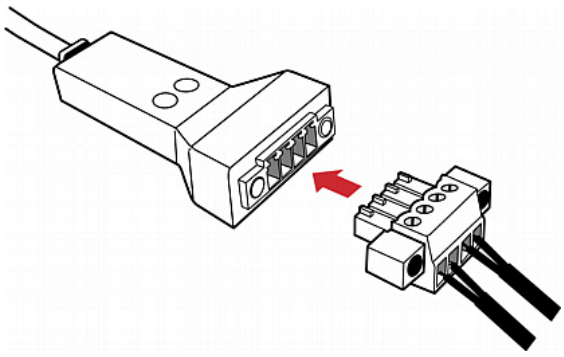
Note: The two screws are not removable so just loosen them.



2. Separate the terminal module from the sensor box.



3. After connecting detectors/switches to the terminal module, plug the terminal module back into the sensor box, and then tighten the screws at two sides of the terminal module.



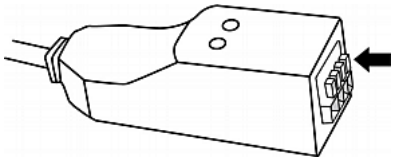
Connecting Detectors/Switches to Old DPX-CC2-TR

The old DPX-CC2-TR has four spring-loaded termination points and four little buttons to control the spring of each termination point.

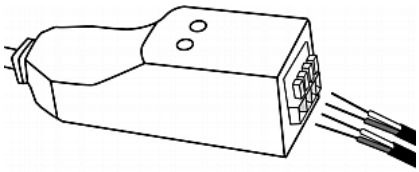
▶ **To connect third-party or Raritan's discrete detectors/switches:**

1. Strip the insulation around 12 mm from the end of each wire of discrete detectors/switches.

2. Press and hold down the tiny rectangular buttons above the termination points on DPX-CC2-TR.



3. Fully insert each wire of both detectors/switches into each termination point.
   - Plug both wires of a detector/switch into the two termination points to the left.
   - Plug both wires of the other detector/switch into the two termination points to the right.



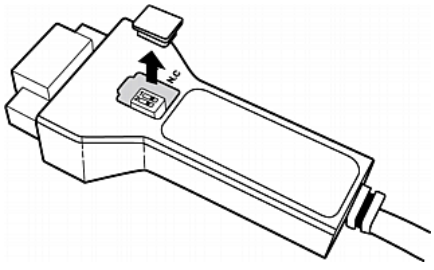
4. Release the tiny rectangular buttons after inserting the wires properly.
5. Verify that these wires are firmly fastened.

Configuring a Contact Closure Sensor

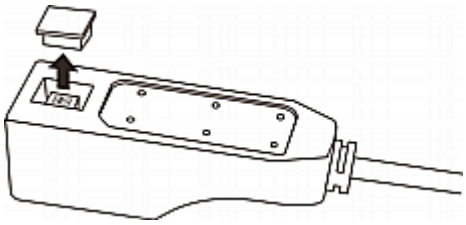
Before using DPX-CC2-TR to detect contact closure status, water, smoke or vibration, you must determine the normal state by adjusting its dip switch. The dip switch controls the LED state on DPX-CC2-TR, and is associated with a channel.

To adjust the dip switch setting:

1. Place the detectors/switches connected to DPX-CC2-TR to the position where you want to detect a specific environmental situation.
2. Uncover the dip switch on DPX-CC2-TR.
   - **New** DPX-CC2-TR

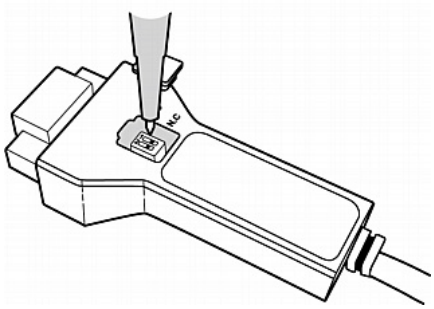


- **Old** DPX-CC2-TR

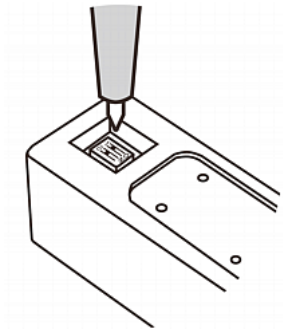


3. To set the Normal state for channel 1, locate the dip switch labeled 1.
4. Use a pointed tip such as a pen to set the slide switch to the position labeled N.O or N.C.
   - N.O (Normally Open): The open status of the connected detector/switch is considered normal.
   - N.C (Normally Closed): The closed status of the connected detector/switch is considered normal.

   For Raritan's DPX water sensors, the Normal state must be Normally Open, which indicates there is no water detected. Set the dip switch to Normally Open and verify that the LED of the channel where the Raritan's water sensor is connected remains OFF.
   - **New** DPX-CC2-TR



   - **Old** DPX-CC2-TR



5. To set the Normal state for channel 2, repeat Step 4 for adjusting the other dip switch's setting.

6. Install back the dip switch cover.

Note: The dip switch setting must be properly configured, or the sensor's LED may be incorrectly lit in the Normal state.

Contact Closure Sensor LEDs

Description in this section applies to LEDs of DPX-CC2-TR and those of DX contact closure sensor channels. See ***DX Series*** (on page 34).

LEDs indicate states of detectors/switches connected to the contact closure sensor channels.

The LED is lit when the associated detector/switch enters the "alarmed" state. See ***Configuring a Contact Closure Sensor*** (on page 15) for how to set the Normal state of DPX-CC2-TR.

The meaning of a lit LED varies depending on the Normal state settings.

- **When the Normal state is set to Normally Closed (N.C):**

LED	Sensor state
Off	Closed
Lit	Open

- **When the Normal state is set to Normally Open (N.O):**

LED	Sensor state
Off	Open
Lit	Closed

For Raritan's DPX water sensors, the Normal state must be set to Normally Open (N.O). The following is the correct LED behavior based on proper dip switch settings.

LED	Sensor state
Off	No water detected
Lit	Water detected

Floor Water Sensors

Raritan has two types of DPX floor water sensors that work in conjunction with Raritan's new contact closure sensor (DPX-CC2-TR). One is the floor-mounted water sensor (DPX-WSF), and the other is the cable water sensor (DPX-WSC series).

Note that only the NEW DPX-CC2-TR support these water sensors.

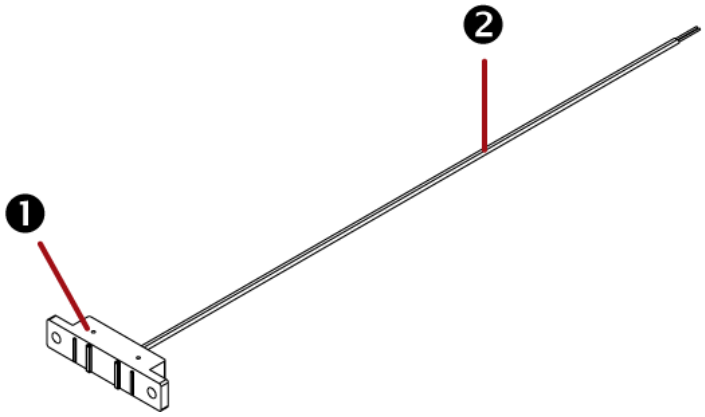
Note: If you order a Raritan DPX water sensor with the part number containing the suffix -KIT, you get the new DPX-CC2-TR that supports it.

Floor-mounted Water Sensor

The floor-mounted water sensor (DPX-WSF) has a flat bottom so it can stand on the ground. The water detector's dimension is 63.5 mm x 13.25 mm x 13.2 mm (W x L x D).

Use one of the following methods to affix this detector to the ground:

- Screw the detector to the ground with your own screws. To avoid breaking the detector's enclosure, do not over tighten the screws.
- Put something weighing around 100 to 250 grams (0.22 to 0.55 pounds) into the empty bag shipped with this water sensor. Then use cable ties to wrap the bag right above the detector. Make sure the detector is not tilted so that its bottom evenly contacts the ground.



Number	Item
1	Water detector.

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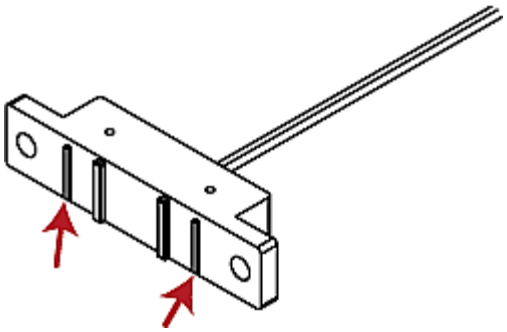
Number	Item
❷	Wires to connect to the contact closure sensor. You need a minimum of 30 cm wires to prevent the contact closure sensor from being damaged by floor water (if any). Below are the wire length limitations: • Minimum: 30 cm (11.8 inches) • Maximum: 150 cm (59 inches)

How a Floor-mounted Water Sensor Works

The floor-mounted water sensor uses *two poles* marked with red arrows below to detect the water.



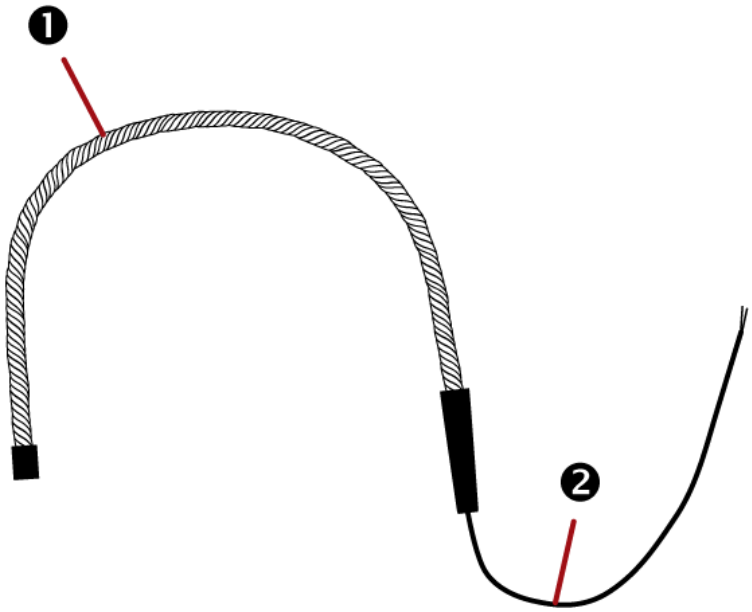
When there is some water between the two poles, it causes current loop back on the water sensor to trigger the alarm.

Cable Water Sensor

The cable water sensor is in the shape of a cable so it can be flexibly placed, twisted or wrapped around a location where water may drip, such as a ceiling tile, water pipe or the floor.

Raritan provides two types of cable water sensors. The only difference is their cable length.

- DPX-WSC-35: 3.5 meters (11.5 feet).
- DPX-WSC-70: 7 meters (23 feet).



Number	Item
1	Cable-shaped water detector.
2	Wires to connect to the contact closure sensor. You need a minimum of 30 cm wires to prevent the contact closure sensor from being damaged by floor water (if any). Below are the wire length limitations: • Minimum: 30 cm (11.8 inches) • Maximum: 150 cm (59 inches)

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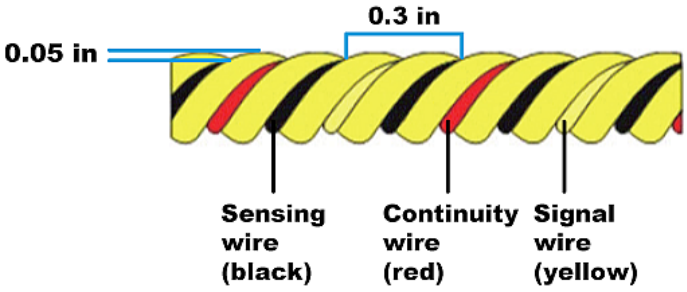
How a Cable Water Sensor Works

The cable water sensor uses *black* wires on the water rope to detect the water. When there is water **between two black wires**, it causes current loop back to trigger the alarm on the water sensor.

Mechanical information about black wires:

- The distance between two black wires is about 0.3 in.
- The distance from the black wire to the cable surface is about 0.05 in.



Water detection requirements:

- The water spot should be at least 0.5" wide so that two black wires are in the water at the same time. Otherwise, the water cannot cause current loop back on the water sensor to trigger the alarm.

  If the water spot is about 1" wide, the water sensor should detect it at any location of the water rope.
- The *thickness* of the water spot should be at least 0.1" because there is some gap between any black wire and the cable surface.

  This is why the cable water sensor does NOT work well with the concrete floor but works fine with ceramic tiles. The concrete floor absorbs the water quickly so it needs more water on the concrete floor to trigger the alarm.

- The alarm requires some water between two black wires for a while. If there are just few water drops on the cable water sensor, no alarms are triggered.
- The water sensor's rope should be mounted on the floor firmly, or the water sensor cannot detect the water.

  In the following diagram, NO alarm is triggered by the presence of the water, which is indicated by the blue color, because the water sensor's rope does not evenly contact the floor.

Chapter 3 DPX2 Series

DPX2 sensors are physically similar to DPX sensors. Below are their differences:

- DPX2 does not have a factory-installed sensor cable so you must manually connect DPX2 sensors to a DPX2 sensor cable.
- DPX2 has an LED to show the sensor status.
- DPX2 provides the chain position information.
- Individual DPX2 sensors can be replaced without the need to reconnect the DPX2 sensor cable.
- DPX2 does NOT support the use of a Raritan DPX-ENVHUB4 sensor hub.
- DPX2 can be connected to the end of a DX sensor chain while DPX sensor packages CANNOT. For details, see *Connecting a DPX2 Sensor Package to DX* (on page 53).

In This Chapter

Available DPX2 Sensor Packages....24
DPX2 Temperature and Humidity Sensors....25
Connection and Disconnection....26

Available DPX2 Sensor Packages

Sensor packages	Description
DPX2-T1	• 1 temperature sensor See *DPX2 Temperature and Humidity Sensors* (on page 25).
DPX2-T1H1	• 1 temperature sensor • 1 humidity sensor See *DPX2 Temperature and Humidity Sensors* (on page 25).
DPX2-T2H1	• 2 temperature sensors • 1 humidity sensor See *DPX2 Temperature and Humidity Sensors* (on page 25).
DPX2-T3H1	• 3 temperature sensors • 1 humidity sensor See *DPX2 Temperature and Humidity Sensors* (on page 25).

For detailed information on sensor names, see *Sensor Naming Conventions* (on page 70).

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DPX2 Temperature and Humidity Sensors

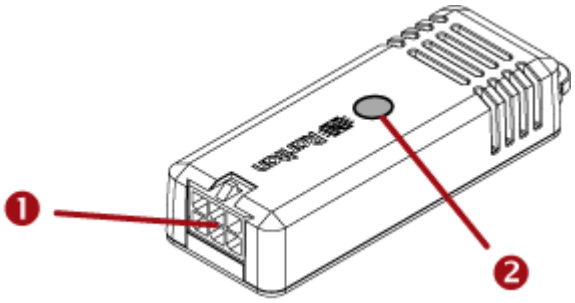
There are four types of DPX2 temperature and humidity sensor packages: DPX2-T1, DPX2-T1H1, DPX2-T2H1, and DPX2-T3H1.

A DPX2-T2H1 package contains one DPX2-T1H1 and one DPX2-T1 sensor.

A DPX2-T3H1 package contains one DPX2-T1H1 and two DPX2-T1 sensors.

Each DPX2 package is shipped with a DPX2 sensor cable for sensor connection.

The following diagram shows a DPX2 sensor package.



Number	Component	Function
1	Head connector	Connect to the DPX2 sensor cable.
2	LED	Indicate the sensor status. See *DPX2 LED States* (on page 25).

DPX2 LED States

The DPX2 sensor indicates an alert by making its LED flash on and off. The LED also flashes when the sensor is upgrading its firmware.

- DPX2-T1:

LED states	Description
Off	Temperature is in the normal state.
Flashing (1 flash and 1 off)	Temperature enters either alarmed state: warning or critical.
High-speed flashing	Sensor firmware is being updated. See *Sensor Firmware Update* (on page 69).

DPX2-T1H1:

LED states		Description
Off		Both temperature and humidity are in the normal state.
Flashing	1 flash and 1 off	Temperature enters an alarmed state: warning or critical. Humidity is in the normal state.
	2 flashes and 1 off	Temperature is in the normal state. Humidity enters an alarmed state: warning or critical.
	3 flashes and 1 off	Both temperature and humidity enter an alarmed state: warning or critical.
High-speed flashing		Sensor firmware is being updated.

Connection and Disconnection

Before connecting a DPX2 sensor to a Raritan PDU or EMX, you must connect it to a DPX2 sensor cable first.

If any connected sensor is broken, you can replace it with a new one without disconnecting the DPX2 sensor cable from the Raritan PDU or EMX.

To connect the DPX2 sensor package to the end of a DX sensor chain, see *Connecting a DPX2 Sensor Package to DX* (on page 53).

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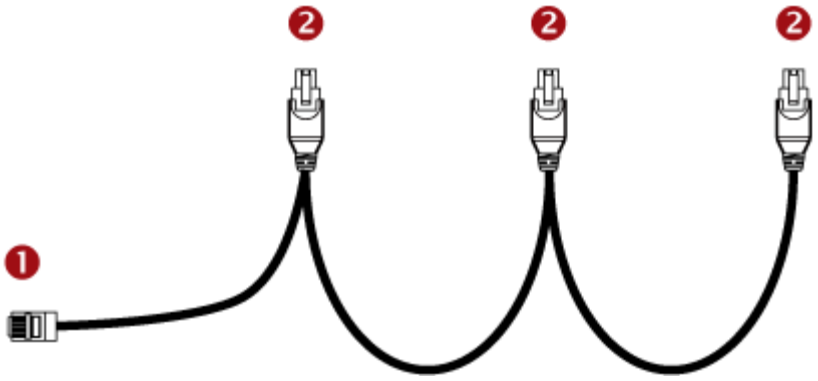
Connecting a DPX2 Sensor Cable

Raritan has three types of DPX2 sensor cables. The difference is the number of available head connectors on the cable: one to three head connectors.

DPX2 sensor cables cannot be daisy chained.

The following diagram illustrates a DPX2 sensor cable with three head connectors.



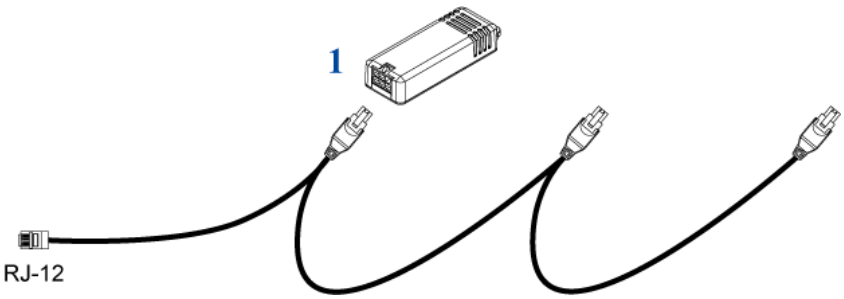
Number	Component	Function
1	RJ-12 connector	Connect to a Raritan PDU or EMX.
2	Head connectors	Connect DPX2 sensors.

Sensor connection guidelines:

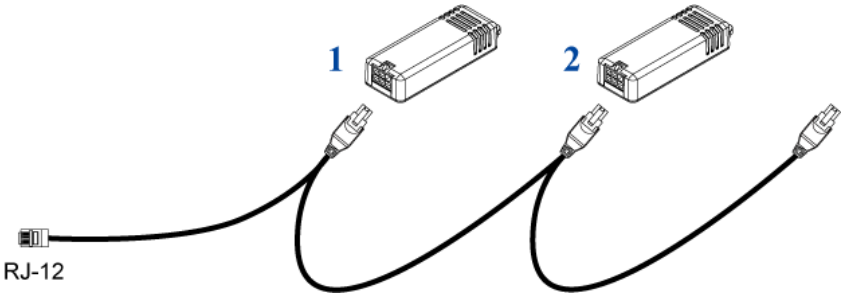
Always make sure there are NO free head connectors between the sensor cable's RJ-12 connector and the final DPX2 sensor attached to it. That is, each head connector prior to the final DPX2 sensor must be occupied with a sensor. Otherwise, those sensors following the "free" head connector(s) on the same sensor cable do not work properly.

Below illustrates the scenarios when the number of DPX2 sensors is less than the number of head connectors on a DPX2 sensor cable.

- Scenario A: *When only one sensor is connected, always connect it to the first head connector.*



- Scenario B: *When only two sensors are connected, always connect them to the first two head connectors.*



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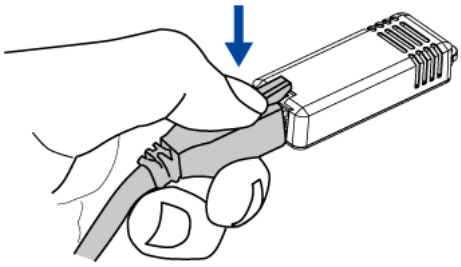
Disconnecting a DPX2 Sensor

You can remove any individual DPX2 sensor from the sensor cable whenever needed.

To disconnect a DPX2 sensor:

1. Press the latch of the cable connector so that the other side of the latch slightly goes up.



2. Pull the sensor away.
3. Connect any DPX2 sensor back to this free head connector, or move all subsequent DPX2 sensors that follow it on the same sensor cable to prior head connectors.

Warning: The final step is required, or all subsequent DPX2 sensors no longer work properly. For example, after removing the sensor from the 2nd head connector, you must either add a DPX2 sensor back to the 2nd head connector, or move the sensor attached to the 3rd head connector to the 2nd head connector.

Chapter 4 DPX3 Series

A DPX3 sensor package features the following:

- Its connection interface is RJ-45.
- You can cascade a maximum of 12 DPX3 sensor packages.

A standard network patch cable (CAT5e or higher) is needed to:

- Connect a DPX3 sensor to a Raritan product with the RJ-45 SENSOR port, such as PX3 PDU.

  Exception: For a Raritan EMX or PDU with the RJ-12 SENSOR port, use an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) instead, which you can request from Raritan.

- Daisy chain DPX3 sensor packages.

Warning: Do NOT use a crossover cable for connection.

In This Chapter

Available DPX3 Sensor Packages 30
DPX3 Temperature and Humidity Sensors 31
Making Connections 32

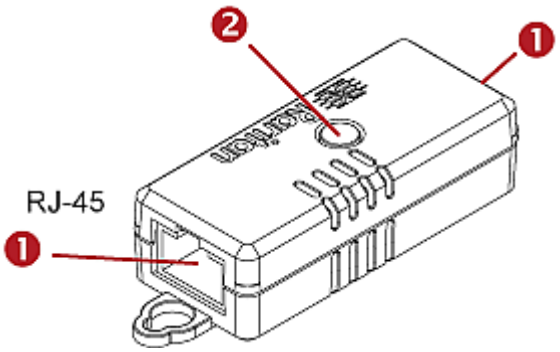
Available DPX3 Sensor Packages

Sensor packages	Description
DPX3-T1H1	• 1 temperature sensor • 1 humidity sensor See *DPX3 Temperature and Humidity Sensors* (on page 31).

For detailed information on sensor names, see *Sensor Naming Conventions* (on page 70).

DPX3 Temperature and Humidity Sensors

DPX3-T1H1 is used to detect the environmental temperature and humidity.



Number	Component	Function
1	Two RJ-45 ports	▪ Sensor connection to a Raritan product, for example, a PX3 PDU. ▪ For daisy chaining DPX3 sensor packages.
2	LED	Indicate the sensor status. See ***DPX3 LED States*** (on page 31).

DPX3 LED States

The DPX3 sensor indicates an alert by making its LED flash on and off. The LED also flashes when the sensor is upgrading its firmware.

▶ DPX3-T1H1:

LED states		Description
Off		Both temperature and humidity are in the normal state.
Flashing	1 flash and 1 off	Temperature enters an alarmed state: warning or critical. Humidity is in the normal state.
	2 flashes and 1 off	Temperature is in the normal state. Humidity enters an alarmed state: warning or critical.

LED states		Description
	3 flashes and 1 off	Both temperature and humidity enter an alarmed state: warning or critical.
High-speed flashing		Sensor firmware is being updated.

Making Connections

Cascading DPX3 Sensor Packages

To increase the number of connected DPX3 sensor packages per SENSOR port, you can cascade DPX3 using standard network patch cables (CAT5e or higher). Up to 12 DPX3 sensor packages can be daisy chained.

Tip: You can also make a sensor chain comprising DPX3 and DX sensor packages. See **Cascading DPX3 and DX Sensor Packages** *(on page 58).*

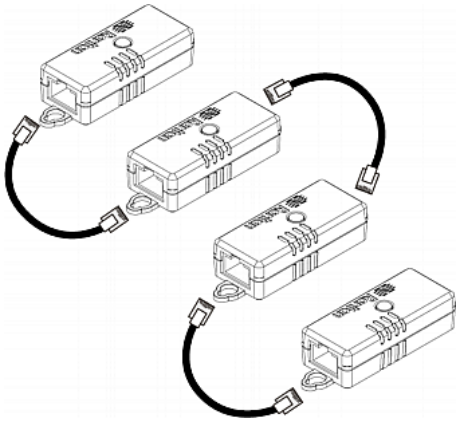
▶ **To cascade DPX3 sensor packages:**

1. Connect a standard network patch cable to either RJ-45 port of the first DPX3 sensor package.

   Note: For a Raritan EMX or PDU with the RJ-12 SENSOR port, use the RJ-12 to RJ-45 adapter cable instead.

2. If you want to cascade DPX3 sensor packages, get an additional standard network patch cable (CAT5e or higher) and then:
   a. Plug one end of the cable into the remaining RJ-45 port on the prior DPX3.
   b. Plug the other end into either RJ-45 port on an additional DPX3.

   Repeat the same steps to cascade more DPX3 sensor packages.



3. Make sure the total number of cascaded sensors does not exceed the maximum number of sensors supported per sensor port. See *Supported Maximum Number of Sensors and Actuators* (on page 66).

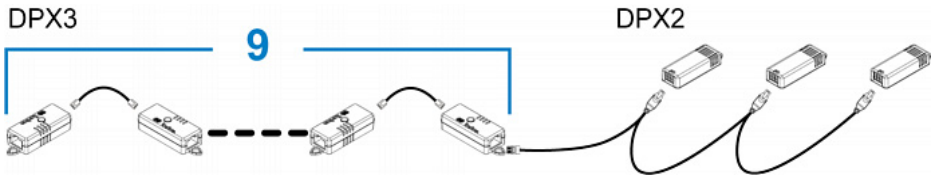
Connecting a DPX2 Sensor Package to DPX3

You can connect only one DPX2 sensor package to the "end" of a DPX3 sensor chain. It is strongly recommended to use an RJ-12 to RJ-45 adapter for connecting the DPX2 to the final DPX3 in the chain.

The maximum number of DPX3 sensor packages in the chain must be less than 12 when a DPX2 sensor package is involved.

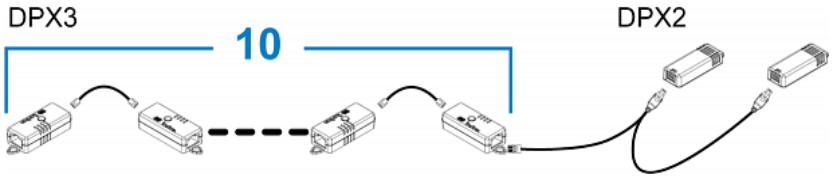
- **When connecting a DPX2 sensor package containing three DPX2 sensors:**

  A maximum of nine DPX3 sensor packages can be cascaded because 12-3=9.



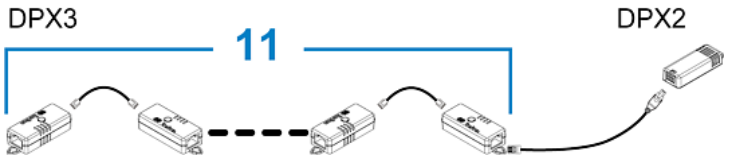
- **When connecting a DPX2 sensor package containing two DPX2 sensors:**

  A maximum of ten DPX3 sensor packages can be cascaded because 12-2=10.



- **When connecting a DPX2 sensor package containing one DPX2 sensor:**

  A maximum of eleven DPX3 sensor packages can be cascaded because 12-1=11.



Chapter 5 DX Series

A DX sensor package consists of terminals, sensors and two RJ-45 ports.

Different DX sensor packages have a different number of terminals. Every pair of terminals is a channel for connecting a sensor or actuator.

Contact closure channels on DX do not support Raritan's DPX water sensors.

Note: DX may also not support third-party leakage detectors so you must test them before using any third-party leakage detectors.

No sensor cables are shipped with DX sensor packages.

Tip: To connect DX sensors to a Raritan product with an "RJ-12" SENSOR port, you can request an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) from Raritan.

A standard network patch cable (CAT5e or higher) is needed to:

- Connect a DX sensor to a Raritan product with the RJ-45 SENSOR port, such as PX3 PDU.

  Exception: For a Raritan EMX or PDU with the RJ-12 SENSOR port, use an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) instead, which you can request from Raritan.

- Daisy chain DX or DX2 sensor packages.

Warning: Do NOT use a crossover cable for connection.

In This Chapter

Available DX Sensor Packages 35
DX-D2C6 36
DX-PD2C5 39
DX-PIR 42
DX-D4C3 44
DX-VBR 47
Making Connections 49
Adjusting Dip Switches 54

Available DX Sensor Packages

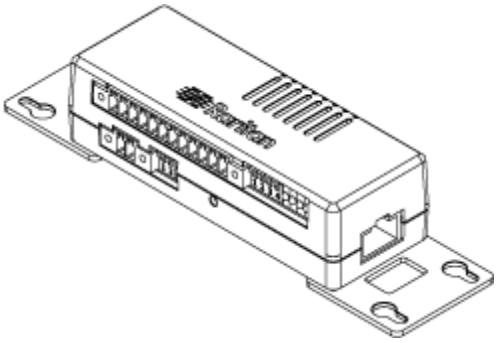
This table lists all DX sensor packages which are available at the time of writing.

Sensor packages	Description
DX-D2C6	• 7 pairs of terminals: Two for connecting dry contact signal actuators (DC) and five for contact closure sensors (CC). See *DX-D2C6* (on page 36).
DX-PD2C5	• 7 pairs of terminals: Two for powered dry contact signal actuators and five for contact closure sensors. See *DX-PD2C5* (on page 39).
DX-PIR	• 1 occupancy sensor • 1 tamper sensor • 1 pair of terminals for contact closure sensors See *DX-PIR* (on page 42).
DX-D4C3	• 7 pairs of terminals: Four for connecting dry contact signal actuators (DC) and three for contact closure sensors (CC). See *DX-D4C3* (on page 44).
DX-VBR	• 1 vibration sensor • 1 pair of terminals for contact closure sensors See *DX-VBR* (on page 47).

For detailed information on sensor names, see *Sensor Naming Conventions* (on page 70).

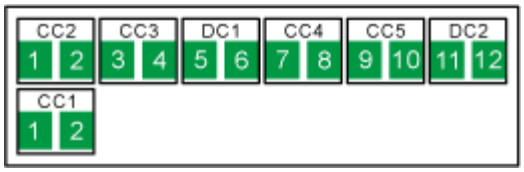
DX-D2C6

DX-D2C6 has seven channels for both contact closure sensors and dry contact signal actuators.



The label attached to DX-D2C6 helps you identify different channels.

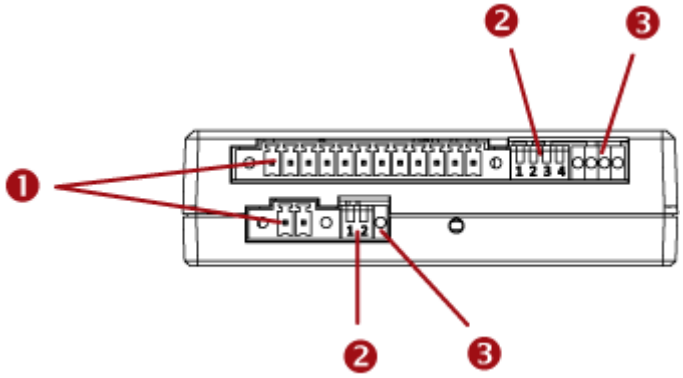
DX-D2C6 Label:

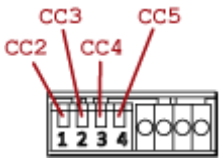


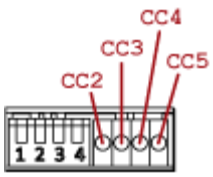
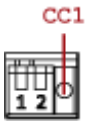
- CC represents a contact closure sensor channel. There are five CC channels: CC1 through CC5.
- DC represents a dry contact signal actuator channel. There are two DC channels: DC1 and DC2.

DX-D2C6 terminals, dip switches, and LEDs:

Terminals, dip switches, and LEDs are located in two rows as shown below.



Numbers	Components
❶	CC and DC channels. • *Top row:* Four CC channels (CC2 - CC5). Two DC channels (DC1 - DC2). • *Bottom row:* One CC channel (CC1). See ***Connecting Detectors/Actuators to DX*** (on page 49) for how to connect CC sensors or DC actuators.
❷	Dip switches for configuring the Normal state of each CC channel. See ***Adjusting Dip Switches*** (on page 54). • *Top row:* Dip switch 1 controls CC2. Dip switch 2 controls CC3. Dip switch 3 controls CC4. Dip switch 4 controls CC5.  • *Bottom row:* Dip switch 1 controls CC1.

Numbers	Components
❸	CC status LEDs. See ***Contact Closure Sensor LEDs*** (on page 17) for details. High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See ***Sensor Firmware Update*** (on page 69). • *Top row:* The four LEDs, from left to right, indicate the states of CC2, CC3, CC4 and CC5 respectively.  • *Bottom row:* The LED indicates the CC1 state. 

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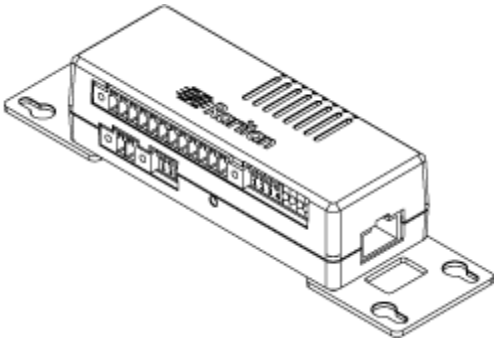
DX-PD2C5

DX-PD2C5 is physically similar to DX-D2C6 except for the following differences:

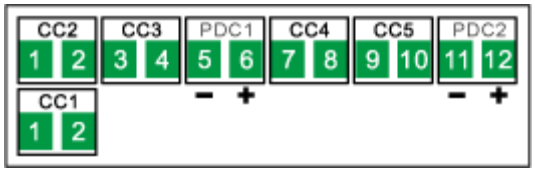
- Dry contact signal channels of DX-PD2C5 supply DC 12V power to the connected actuators.
- Dry contact signal channels of DX-PD2C5 only support the connection of EMKA (1150-U5x) doorhandles.
- DX-PD2C5 works with PX3 PDUs and PX3TS transfer switches only.
- DX-PD2C5 supports a maximum cabling length of 29 feet (9 m) instead of 98 feet (30 m). For details, see ***Supported Maximum Sensor Distance*** (on page 64).

Warning: If high security is required, it is strongly recommended that DX-PD2C5 shall NOT be used.



A label is attached to DX-PD2C5 to help you identify different channels.

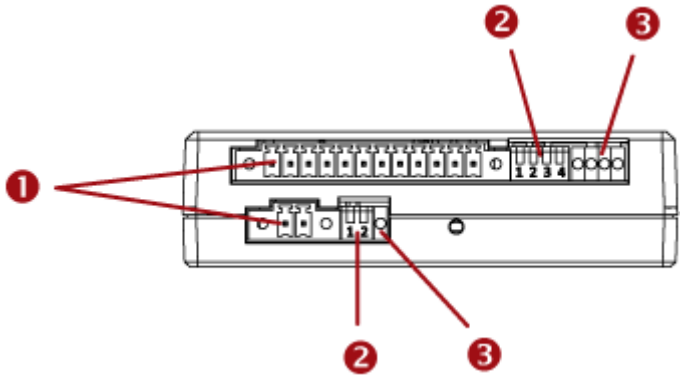
▶ DX-PD2C5 Label:

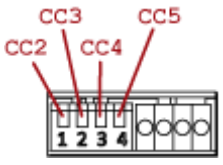


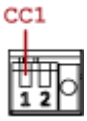
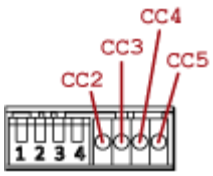
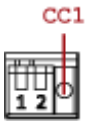
- CC represents a contact closure sensor channel. There are five CC channels: CC1 through CC5.
- PDC represents a dry contact signal actuator channel which is powered. There are two PDC channels: PDC1 and PDC2. Note that each PDC channel has two electrical polarity markings below it: - (negative) and + (positive), which you must follow when connecting an EMKA doorhandle.

DX-PD2C5 terminals, dip switches, and LEDs:

Terminals, dip switches, and LEDs are separated into two rows as shown below.

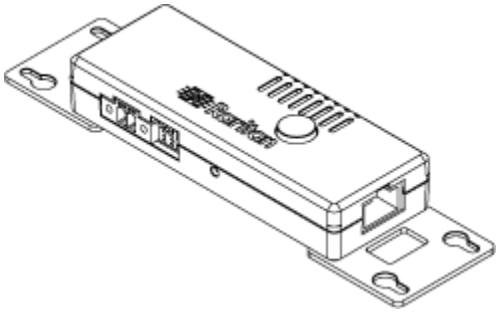


Numbers	Components
❶	CC and PDC channels. • *Top row:* Four CC channels (CC2 - CC5). Two PDC channels (PDC1 - PDC2). • *Bottom row:* One CC channel (CC1). See ***Connecting Detectors/Actuators to DX*** (on page 49) for how to connect CC sensors or DC actuators.
❷	Dip switches for configuring the Normal state of each CC channel. See ***Adjusting Dip Switches*** (on page 54). • *Top row:* Dip switch 1 controls CC2. Dip switch 2 controls CC3. Dip switch 3 controls CC4. Dip switch 4 controls CC5.  • *Bottom row:* Dip switch 1 controls CC1.

Numbers	Components
	 *Note: Dip switch 2 in the bottom row does not control any channel and can be ignored.*
❸	CC status LEDs. See ***Contact Closure Sensor LEDs*** (on page 17) for details. High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See ***Sensor Firmware Update*** (on page 69). • *Top row:* The four LEDs, from left to right, indicate the states of CC2, CC3, CC4 and CC5 respectively.  • *Bottom row:* The LED indicates the CC1 state. 

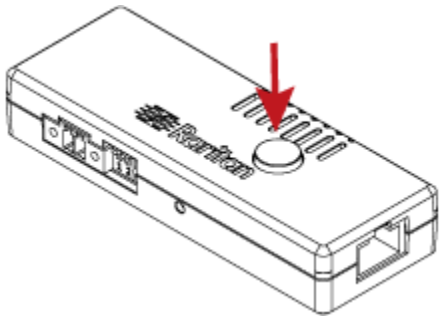
DX-PIR

DX-PIR contains one occupancy sensor (that is, presence detector), one tamper sensor and a pair of terminals for connecting a contact closure (CC) sensor.



Occupancy sensor:

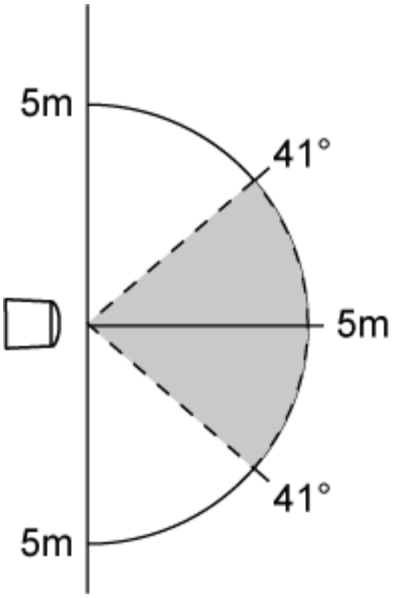
The occupancy sensor is located on the top of the DX-PIR. It uses the passive infrared technology to detect the motion of a person by sensing the temperature differences between a person and the surroundings.



The diagrams below show the occupancy sensor's detection range and sensing area.

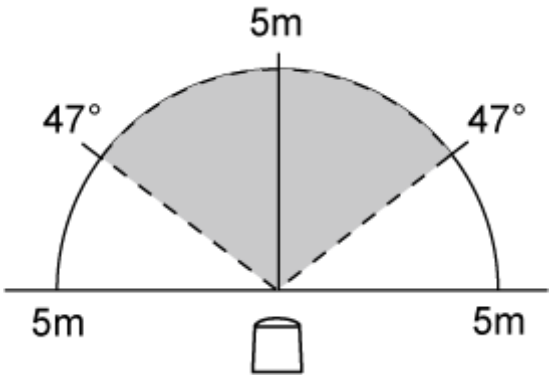
Side View

- Maximum range: 5 meters
- Vertical sensing area: 82 degrees (+/- 41 degrees)



Top View

- Maximum range: 5 meters
- Horizontal sensing area: 94 degrees (+/- 47 degrees)

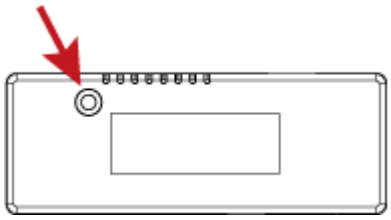


Conditions for the detected target:

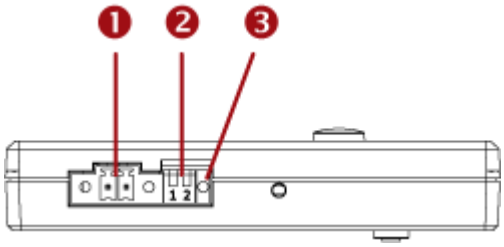
- Temperature difference between the target and the surroundings should exceed 4 degrees Celsius (7.2 degrees Fahrenheit).
- Target's movement speed: 1.0 m/s.
- Target concept is human body (size: 700 x 250 mm).

Tamper sensor:

The tamper sensor is located on the back of the DX-PIR. This sensor is used to detect whether the DX-PIR is moved away from its original position. In the normal state, the DX-PIR is firmly affixed to an object so this sensor, which is a button on the back of DX-PIR, is pressed down. If someone takes the DX-PIR away, the button springs up so the sensor is in the alarmed state.



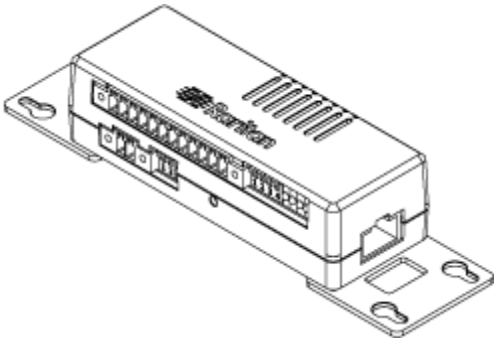
DX-PIR Terminals, dip switches and LED:



Numbers	Components
1	One CC channel comprising a pair of terminals. See *Connecting Detectors/Actuators to DX* (on page 49) for how to connect a CC sensor.
2	▪ Dip switch 1 configures the Normal state of the CC channel. ▪ Dip switch 2 controls the built-in occupancy sensor. See *Adjusting Dip Switches* (on page 54).
3	CC status LED. See *Contact Closure Sensor LEDs* (on page 17) for details. High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See *Sensor Firmware Update* (on page 69).

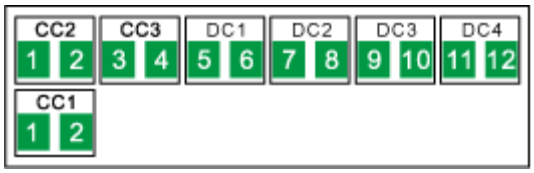
DX-D4C3

DX-D4C3 contains four channels for dry contact signal actuators and three channels for contact closure sensors.



The label attached to DX-D4C3 helps you identify each channel.

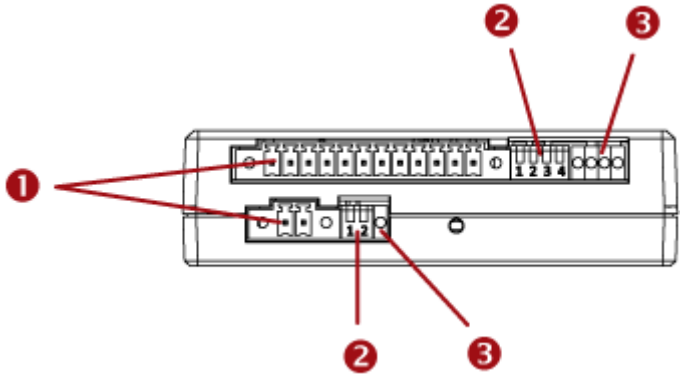
DX-D4C3 Label:



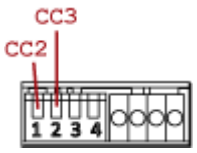
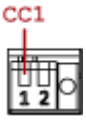
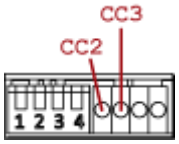
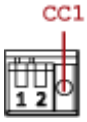
- CC represents a contact closure sensor channel. There are three CC channels: CC1 through CC3.
- DC represents a dry contact signal actuator channel. There are four DC channels: DC1 through DC4.

DX-D4C3 terminals, dip switches, and LEDs:

Terminals, dip switches, and LEDs are located in two rows as shown below.

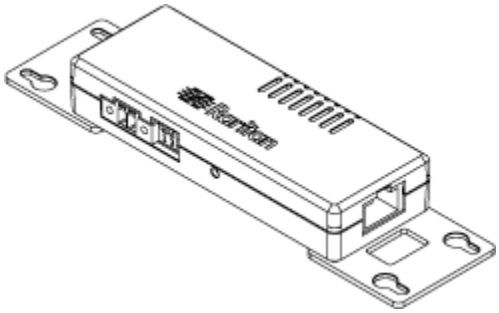


Numbers	Components
1	CC and DC channels. • *Top row:* 2 CC channels (CC2 - CC3). 4 DC channels (DC1 - DC4). • *Bottom row:* One CC channel (CC1). See ***Connecting Detectors/Actuators to DX*** (on page 49) for how to connect CC sensors or DC actuators.
2	Dip switches for configuring the Normal state of each CC channel. See ***Adjusting Dip Switches*** (on page 54). • *Top row:*

Numbers	Components
	Dip switch 1 controls CC2. Dip switch 2 controls CC3.  • *Bottom row:* Dip switch 1 controls CC1.  *Note: Dip switches 3 and 4 in the top row and dip switch 2 in the bottom row do not control any channel and can be ignored.*
❸	CC status LEDs. See ***Contact Closure Sensor LEDs*** (on page 17) for details. High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See ***Sensor Firmware Update*** (on page 69). • *Top row:* The two leftmost LEDs, from left to right, indicate the states of CC2 and CC3 respectively.  *Note: The two rightmost LEDs in the top row are not associated with any CC channels and can be ignored.* • *Bottom row:* The LED indicates the CC1 state. 

DX-VBR

DX-VBR contains one vibration sensor and a pair of terminals for connecting a contact closure (CC) sensor.



Vibration sensor:

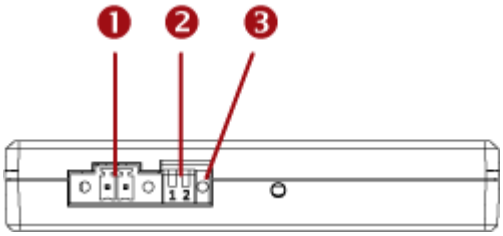
The built-in vibration sensor detects the vibration of any object where DX-VBR is affixed. The sensor determines the vibration by measuring the accelerations in three mutually perpendicular directions, and then generating a numeric value representing the magnitude of the acceleration due to gravity of the Earth. Below is the calculation formula.

$a = (a_x^2 + a_y^2 + a_z^2)^{1/2}$

- The acceleration has two measurement units: `g` and `milli-g`.
  - 1 g = 9.80665 m/s^2
  - 1 milli-g = 0.001 g
- "a" in the above formula denotes the magnitude of the acceleration.
  - 0 <= a <= 3.464 g

  Note: <= means "less than" or "equal to."
- a_x, a_y and a_z represent the accelerations in three mutually perpendicular directions x, y and z.
  - x, y and z form a Cartesian coordinate system.
  - -2 g <= a_x <= 2 g
  - -2 g <= a_y <= 2 g
  - -2 g <= a_z <= 2 g

DX-VBR Terminals, dip switches and LED:



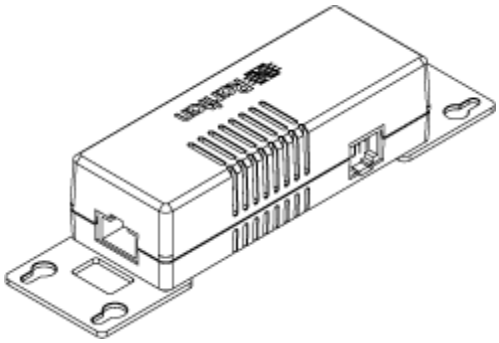
Numbers	Components
1	One CC channel comprising a pair of terminals. See *Connecting Detectors/Actuators to DX* (on page 49) for how to connect a CC sensor.
2	▪ Dip switch 1 configures the Normal state of the CC channel. ▪ Dip switch 2 does not control any CC channel and can be ignored. See *Adjusting Dip Switches* (on page 54).
3	CC status LED. See *Contact Closure Sensor LEDs* (on page 17) for details. High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See *Sensor Firmware Update* (on page 69).

Making Connections

Pre-installed DX Brackets

To allow users to hang or affix a DX onto an object or position, two brackets have been installed on the rear side of a DX sensor package when shipped out of the factory.

Below is the diagram of a DX sensor package with two brackets installed.



Connecting Detectors/Actuators to DX

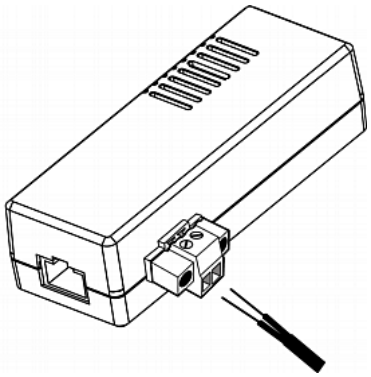
A DX sensor package comprises two parts: a sensor box and the terminal module(s). A terminal module is removable.

Note: The following diagrams illustrate a terminal module comprising two termination points only. Your DX terminal module may be larger if it has more terminals.

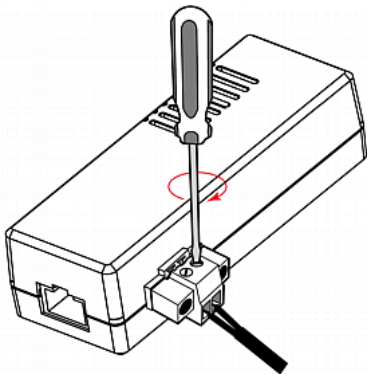
To make connections when the terminal module is attached:

1. Strip the insulation around 12 mm from the end of each wire of a detector or actuator.
   - Wire size range: AWG 28 to 20 or 0.09 to 0.5 mm^2
2. Fully insert each wire into each termination point of a CC, DC or PDC channel on the DX sensor package.

Important: For a PDC channel, you must check the electrical polarity markings (+ and -) on the DX label to make sure each wire is inserted into the correct termination point with the correct polarity.



3. Use a screwdriver with a 2.5 mm wide shaft to tighten the screws above each termination point to secure the wires, using a torque of 0.196 N·m (2 kgf·cm).

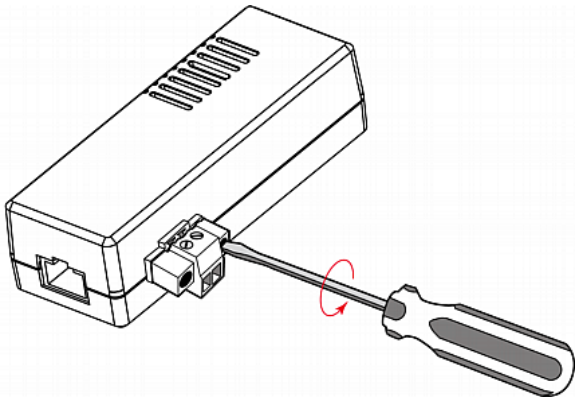


To make connections after the terminal module is detached:

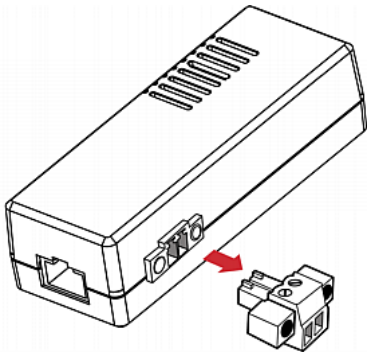
1. Loosen the screws at two sides of the terminal module.

Raritan
A brand of legrand

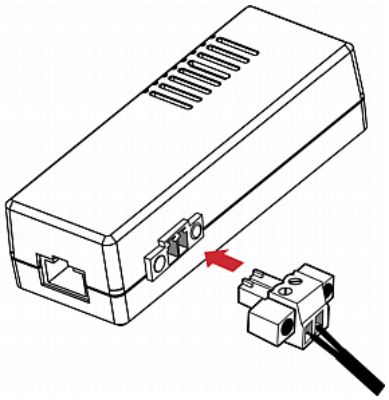
Note: The two screws are not removable so just loosen them.



2. Separate the terminal module from the sensor box.



3. After connecting detectors/switches to the terminal module, plug the terminal module back into the sensor box, and then tighten the screws at two sides of the terminal module.

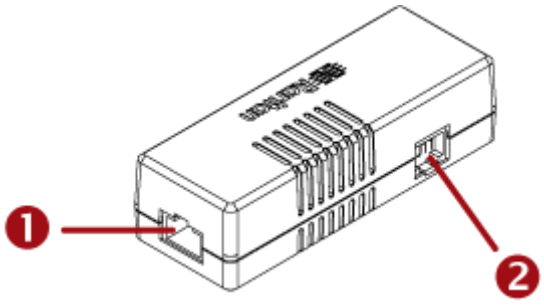


Cascading DX or DX2 Sensor Packages

The following "cascading" description applies to both DX or DX2 sensor packages. That is, you can also cascade up to twelve DX2 sensor packages.

To increase the number of connected DX sensor packages per SENSOR port, you can cascade DX using standard network patch cables (CAT5e or higher). A maximum of 12 DX sensor packages can be daisy chained.

Tip: You can also make a sensor chain comprising DPX3 and DX sensor packages. See **Cascading DPX3 and DX Sensor Packages** *(on page 58).*



Numbers	Components
1	RJ-45 ports, each of which is located on either end of a DX sensor package.
2	RJ-12 port, which is reserved for future use and is hidden now.

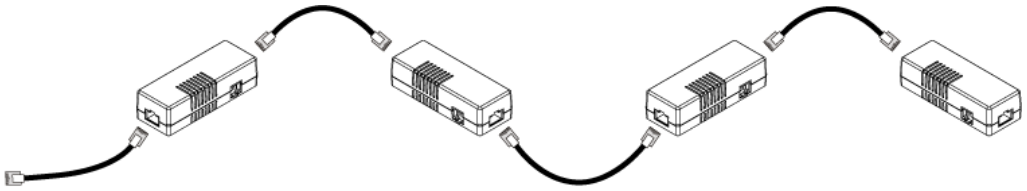
To cascade DX sensor packages:

1. Connect a standard network patch cable to either RJ-45 port of the first DX sensor package.

   Exception: For a Raritan EMX or PDU with the RJ-12 SENSOR port, use an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) instead, which you can request from Raritan.

2. If you want to cascade DX packages, get an additional standard network patch cable (CAT5e or higher) and then:
   a. Plug one end of the cable into the remaining RJ-45 port on the prior DX package.
   b. Plug the other end into either RJ-45 port on an additional DX package.

Repeat the same steps to cascade more DX packages.



Exception: You CANNOT cascade DX-PD2C5 sensor packages. For details, see **DX-PD2C5** *(on page 39).*

3. Verify that the total number of sensors and actuators connected to these DX packages does not exceed the maximum number of sensors and actuators supported per sensor port. See ***Supported Maximum Number of Sensors and Actuators*** (on page 66).

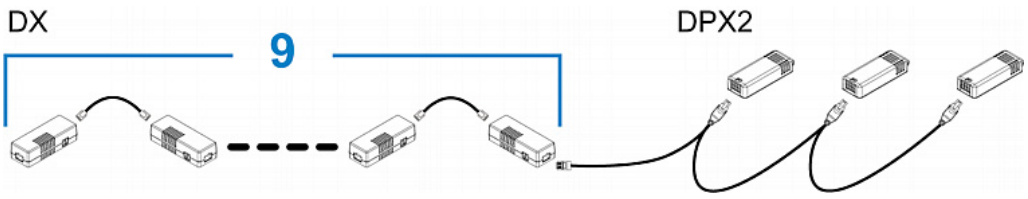
Connecting a DPX2 Sensor Package to DX

You can connect only one DPX2 sensor package to the "end" of a DX sensor chain. It is strongly recommended to use an RJ-12 to RJ-45 adapter for connecting the DPX2 to the final DX in the chain.

The maximum number of DX sensor packages in the chain must be less than 12 when a DPX2 sensor package is involved.

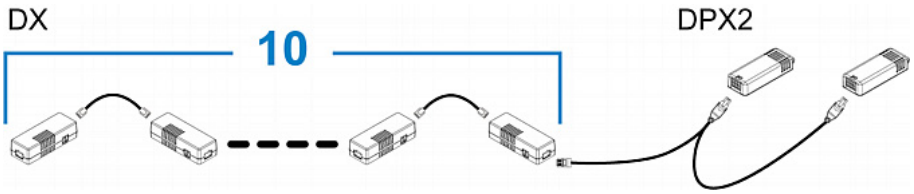
- **When connecting a DPX2 sensor package containing three DPX2 sensors:**

  A maximum of nine DX sensor packages can be cascaded because 12-3=9.



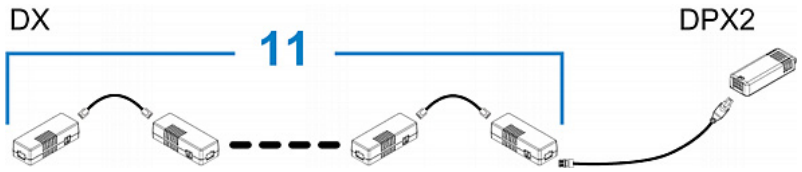
- **When connecting a DPX2 sensor package containing two DPX2 sensors:**

  A maximum of ten DX sensor packages can be cascaded because 12-2=10.



When connecting a DPX2 sensor package containing one DPX2 sensor:

A maximum of eleven DX sensor packages can be cascaded because 12-1=11.



Adjusting Dip Switches

There are two Normal settings for each CC channel on DX packages.

- N.O (Normally Open): The open status of the connected detector/switch is considered normal.
- N.C (Normally Closed): The closed status of the connected detector/switch is considered normal.

Each CC channel and the DX-PIR occupancy sensor's Normal setting is configured by turning on or off its corresponding dip switch.

To adjust dip switches for CC channels:

- N.O: Turn ON the dip switch by pressing it down.
- N.C: Turn OFF the dip switch by pushing (or keeping) it up.

To adjust the dip switch for DX-PIR occupancy sensor:

- Turn it OFF (up) when human absence is considered the normal state.
- Turn it ON (down) when human presence is considered the normal state.

Chapter 6 DX2 Series

A DX2 sensor package consists of two RJ-45 ports and sensors and/or terminals.

Different DX2 sensor packages have a different number of terminals and/or sensors.

A pair of terminals is a channel for connecting a sensor or actuator.

No sensor cables are shipped with DX2 sensor packages.

A standard network patch cable (CAT5e or higher) is needed to:

- Connect a DX2 sensor to a Raritan product with the RJ-45 SENSOR port, such as PX3 PDU.

  Exception: For a Raritan EMX or PDU with the RJ-12 SENSOR port, use an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) instead, which you can request from Raritan.

- Daisy chain DX2 sensor packages.

Warning: Do NOT use a crossover cable for connection.

In This Chapter

Available DX2 Sensor Packages 55
DX2-DH2C2 56

Available DX2 Sensor Packages

This table lists all DX2 sensor packages which are available at the time of writing.

Sensor packages	Description
DX2-DH2C2	• 2 ports for connecting door handles • 2 pairs of terminals: Terminals are for connecting contact closure sensors (CC). See *DX2-DH2C2* (on page 56).

For detailed information on sensor names, see *Sensor Naming Conventions* (on page 70).

DX2-DH2C2

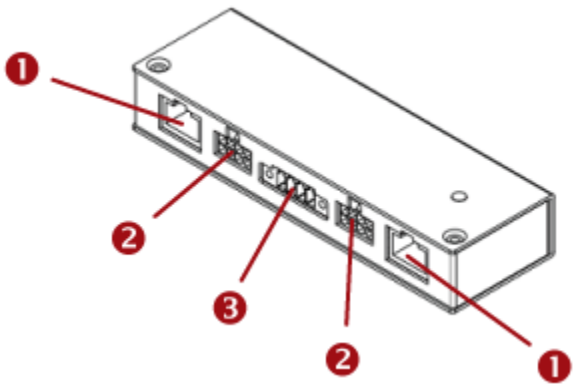
DX2-DH2C2 provides a cabinet access control solution. All you need to do is to just connect supported door handles to DX2-DH2C2, connect it to PX3 or PX3TS, and then you will be able to control the door handles via PX3 or PX3TS.

DX2-DH2C2 supports the following door handles:

- Emka 1150-U5x
- Emka Agent E
- Southco H3-EM-67-100
- Southco H3-EM-66-100

Note: Raritan provides SmartLock kits that include both DX2-DH2C2 and one of the supported door handles. For more information or installation of SmartLock kits, refer to the user documentation accompanying the SmartLock kit or download it from Raritan's **Support page** *(***http://www.raritan.com/support/***).*

DX2-DH2C2 ports and terminals:



Numbers	Components
1	RJ-45 ports, which have two features: • Connection to PX3 or PX3TS • Cascading another DX or DX2 sensor package Cascading method is the same as DX sensor packages. See ***Cascading DX or DX2 Sensor Packages*** (on page 52). Note that only a maximum of 5 DX2-DH2C2 can be cascaded.
2	Door handle ports, which you can connect the supported

Numbers	Components
	door handle.
❸	Contact closure sensor channels, which can connect contact closure sensors for detecting the door open/closed status. See *Connecting Detectors/Actuators to DX* (on page 49) for how to connect CC sensors.

Installation restrictions:

Read the restrictions before connecting DX2-DH2C2.

- Connect DX2-DH2C2 to PX3 or PX3TS PDUs only
- Only supports the listed door handles
- The cable length from the PDU to DX2-DH2C2 can be up to 16.5 feet (5 meters)
- The cable length from DX2-DH2C2 to the connected door handle can be up to 13 feet (4 meters)
- The door handle must NOT be plugged into or unplugged from DX2-DH2C2 while the contacts are powered
- A maximum of 5 DX2-DH2C2 can be cascaded per PX3's SENSOR port
- A total of 98-feet (30-meter) cable length is supported

Chapter 7 Sensor-Mixing Connections

This chapter shows how to mix different types of sensor packages on a sensor port. Other sensor-mixing connections than those shown in this chapter are NOT supported.

Make sure your Raritan products have been upgraded to version 3.2.10 to support these sensor-mixing combinations.

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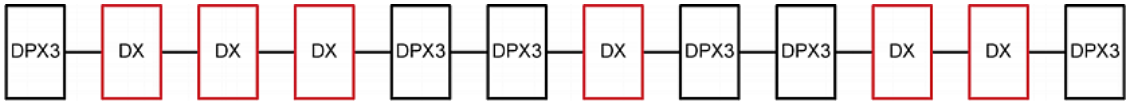
Mixing DPX, DPX2, DPX3 and DX Sensor Packages 59

Cascading DPX3 and DX Sensor Packages

You can mix DPX3 and DX in a sensor chain consisting of up to 12 sensor packages. The following diagram illustrates such a sensor-mixing chain.



The daisy chain procedure is identical to the one described in the section titled ***Cascading DPX3 Sensor Packages*** (on page 32) or ***Cascading DX or DX2 Sensor Packages*** (on page 52).

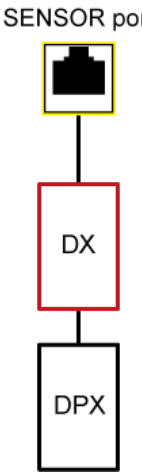
Same as the pure DPX3 or DX sensor chain, you can replace the final sensor package with a DPX2 sensor package. See ***Connecting a DPX2 Sensor Package to DPX3*** (on page 33) or ***Connecting a DPX2 Sensor Package to DX*** (on page 53).

Mixing DPX, DPX2, DPX3 and DX Sensor Packages

You can mix DPX, DPX2, DPX3 and DX sensor packages per SENSOR port according to the following sensor combinations. In some scenarios, the DPX3-ENVHUB4 sensor hub is required.

1 DX + 1 DPX:

- It is strongly recommended to use an RJ-12 to RJ-45 adapter to connect the DPX sensor package to the DX sensor package.

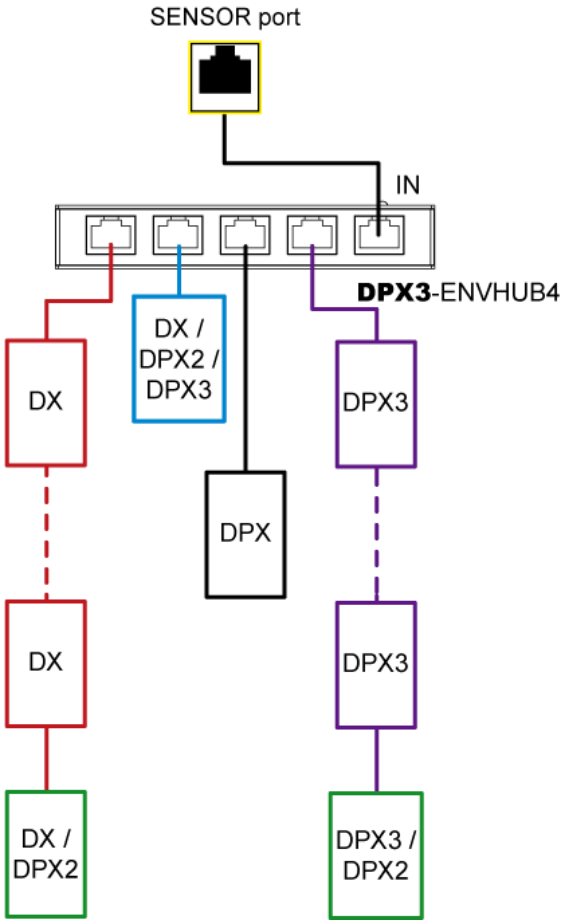


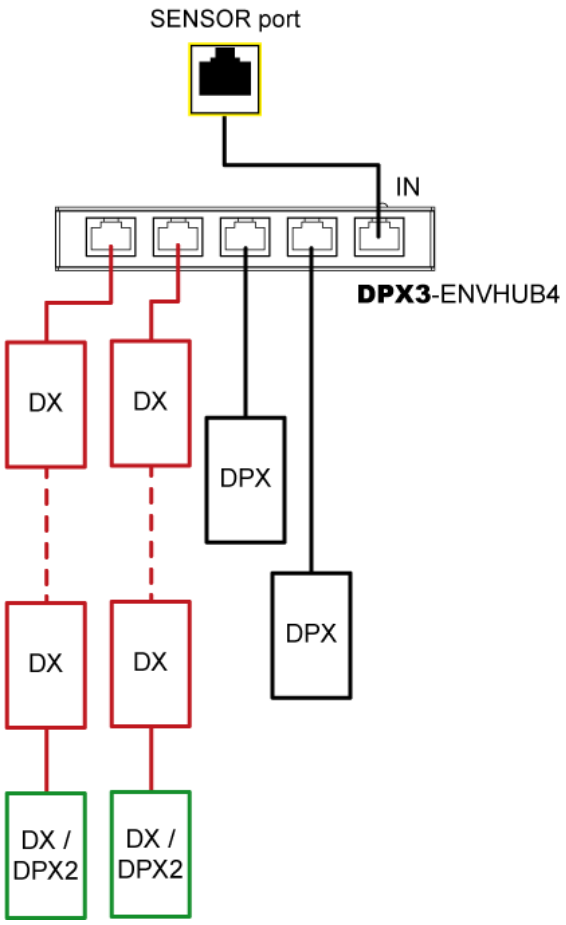
Combinations via the DPX3-ENVHUB4 sensor hub:

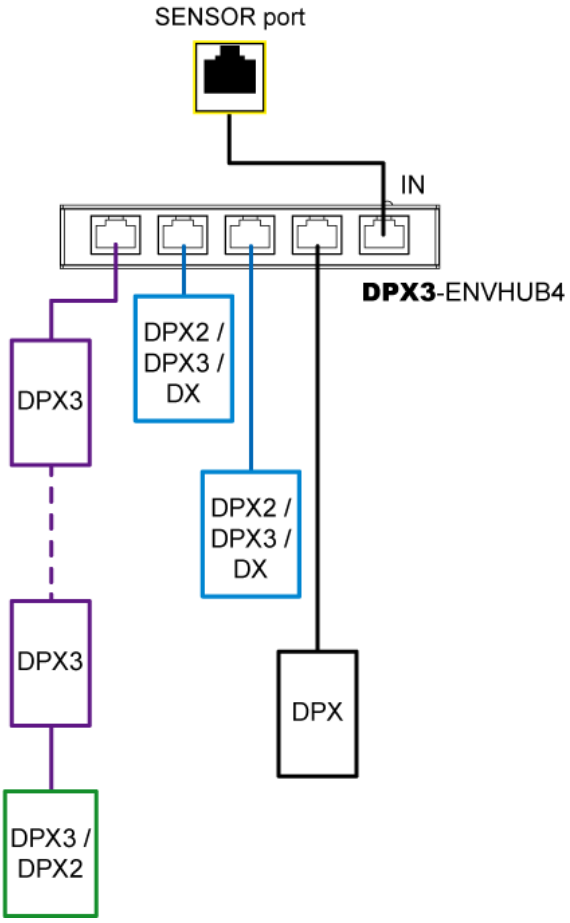
- You must use the **DPX3**-ENVHUB4 sensor hub instead of the old DPX-ENVHUB4 sensor hub. Each port on the hub supports any of the following:
  - A DX sensor package
  - A chain of DX sensor packages
  - A DPX3 sensor package
  - A chain of DPX3 sensor packages
  - A DPX2 sensor package
  - A DPX sensor package

- An RJ-12 to RJ-45 adapter is recommended to connect a DPX or DPX2 sensor package to DPX3-ENVHUB4.
- In the following diagrams, the sensor package in "green" can be replaced by a DPX2 sensor package. The sensor package in "blue" can be one DPX2, DPX3 or DX sensor package.

This section only illustrations the following three combinations, but actually there are tens of different combinations by using the DPX3-ENVHUB4 sensor hub.




SENSOR port
IN
DPX3-ENVHUB4
DX
DX
DPX
DPX
DX
DX
DX / DPX2
DX / DPX2



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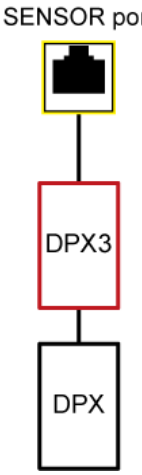
Replace DX with DPX3 or vice versa:

Any DX sensor package in the above combinations can be replaced by a DPX3 sensor package or vice versa. If intended, you can mix DX and DPX3 sensor packages in a sensor chain. See *Cascading DPX3 and DX Sensor Packages* (on page 58).

For example: 1 DPX3 + 1 DPX



Appendix A Supported Maximum Sensor Distance

DPX2, DPX3 and DX sensor package support the total cabling length up to 98 feet (30 m), except for ***DX-PD2C5*** (on page 39).

As for DPX sensor packages, the supported distance is determined by the length of the sensor cable pre-installed (or provided) by Raritan. DO NOT extend or modify the cabling length with any tool other than Raritan's sensor hubs.

A sensor hub is used to increase the total distance of a sensor package. There are two sensor hubs: DPX-ENVHUB4 and DPX3-ENVHUB4.

Different sensor hubs support different sensor packages:

- DPX-ENVHUB4 supports the DPX sensor packages only.
- DPX3-ENVHUB4 supports all Raritan sensor packages, including DPX, DPX2, DPX3 and DX.

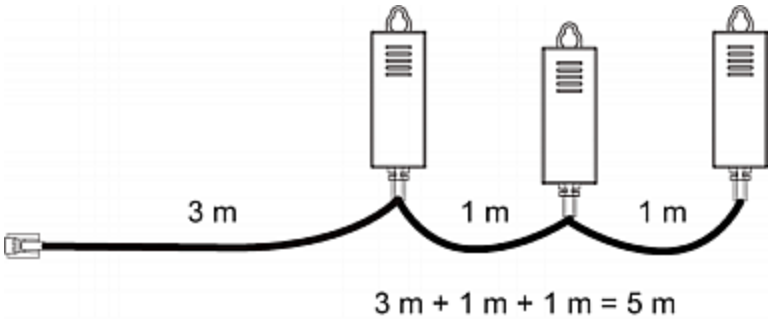
Each sensor port on a Raritan PDU or EMX supports only one Raritan sensor hub so DO NOT cascade sensor hubs.

DPX sensor connection restriction and illustration :

Restriction: When using a DPX-ENVHUB4 sensor hub, the maximum cabling distance between the PDU/EMX/BCM and the sensor hub is 33 feet (10 m).

The following illustrates the maximum distance when connecting DPX sensor packages with a maximum 16 feet (5 m) sensor cable via a DPX-ENVHUB4 sensor hub.

- The sum of a DPX-T3H1 sensor cable's length is 16' (5 m).



- The total cabling length between the PDU/EMX/BCM and one DPX-T3H1 is 49' (15 m) as illustrated below.

  Note that the length 16' (5 m) is the length of each DPX-T3H1 sensor cable, which is defined in the above diagram.

PDU/EMX/BCM → 33 feet (10 m) → 1 DPX-ENVHUB4 hub → 16 feet (5 m) → Up to 4 DPX-T3H1 sensor packages

Maximum distance for DX-PD2C5:

DX-PD2C5 supports a maximum cabling length of 29 feet (9 m) instead of 98 feet (30 m). The maximum distance must follow the following diagram.

PX3 → 16 feet (5 m) → 1 DX-PD2C5 → 13 feet (4 m) → EMKA doorhandles

Appendix B Supported Maximum Number of Sensors and Actuators

The maximum number of sensors and actuators that can be managed per sensor port of a Raritan PDU or EMX varies according to the PDU's or EMX' firmware version.

However, DPX sensor packages are always limited to a maximum of 16 *DPX* sensors per port due to hardware restrictions regardless of the firmware version.

Below lists different Raritan products and firmware versions that support a different number of managed sensors/actuators.

Note: For the latest information on the supported maximum number of sensors and actuators, see the online help of your Raritan PDU or EMX. Online help is accessible from your Raritan PDU, EMX or BCM application, or the Raritan website's Support page (http://www.raritan.com/support/)*.*

In the following list, *x* represents a number.

Manage up to 16 sensors/actuators per port:

- PX2 series: 2.5.x and earlier
- PX3 series: 2.5.x
- PX3TS series: 2.6.x
- EMX series: 2.5.x and earlier
- BCM series: 2.5.x and earlier
- PXE series: 2.5.x and earlier
- PX, DPC and DPX (PDU) series: 1.5.x and earlier

Note: PX, DPX and DPC PDUs support DPX sensor packages only.

Manage up to 32 sensors/actuators per port:

- PX2 series: 3.0.0 and later
- PX3 series: 3.0.0 and later
- PX3TS series: 3.0.0 and later
- EMX series: 3.1.0 and later
- BCM series: 3.0.0 and later
- PXE series: 3.0.0 and later

Calculation examples for 16 and 32 sensors/actuators:

A sensor package may contain more than one sensor/actuator. A sensor or actuator is a function. For example, a DX-D2C6 contains 8 functions because it has 6 sensors and 2 actuators.

- When a Raritan PDU or EMX supports 16 managed sensors or actuators:

  2*8 = 16

  Therefore, you can manage two DX-D2C6 packages per port.
- When a Raritan PDU or EMX supports 32 managed sensors or actuators:

  4*8 = 32

  Therefore, you can manage four DX-D2C6 packages per port.

Tip for DX sensor connection:

If intended, you can connect a maximum of 12 DX sensor packages without exceeding the maximum number of sensors/actuators supported by your EMX or PDU. All you need to do is to manage "partial" sensors/actuators of each DX and unmanage the rest.

For example, if your EMX or PDU can manage 32 sensors/actuators per port, you can connect 12 DX-D2C6 sensor packages to a sensor port by managing only two sensors or actuators of each DX-D2C6.

12*2 = 24

All 24 sensors/actuators can be managed because it is less than 32.

For information on how to manage and unmanage any sensors/actuators, see online help or User Guide of your PDU or EMX.

Appendix C Sensor Measurement Accuracy

This section shows the factory specifications of Raritan DPX and DPX2 environmental sensor packages. Calibration is not required for these sensor packages.

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DPX2 Sensor Accuracy 68

DPX Sensor Accuracy

- Temperature: +/-2 degrees Celsius (+/-3.6 degrees Fahrenheit)
- Humidity: +/-5% (when humidity < 60%) or +/-8% (when humidity > 60%)
- Differential air pressure: +/-1.5%
- Air flow: +/-6.5%

DPX2 Sensor Accuracy

- Temperature: +/-1.0 degree Celsius (+/-1.8 degrees Fahrenheit)
- Humidity: +/-2.5% (when humidity = 10% to 90%)

Appendix D Sensor Firmware Update

DPX2, DPX3 and DX sensor packages automatically upgrade or downgrade their firmware after being connected to a Raritan EMX or PDU that supports these sensor packages. This way it ensures that these sensor packages work properly with the connected Raritan PDU or EMX.

Automatic upgrade or downgrade is determined by comparing DPX2, DPX3 or DX sensor firmware against the environmental sensor firmware stored inside the Raritan PDU or EMX. A downgrade can be performed only when the PDU- or EMX-provided sensor firmware is either greater than or equal to the minimum firmware version requested by the connected sensor packages.

Note that a DPX sensor package does NOT support the automatic firmware update feature, and you do NOT need to manually update it.

Tip: Information regarding current sensor firmware version and the sensor's firmware update time is available in the Device Information dialog. Choose Maintenance > Device Information > Peripheral Devices in the web interface of your Raritan PDU or EMX.

Appendix E Sensor Naming Conventions

The model name of a Raritan environmental sensor package consists of sensor family, sensor functions and the total number of the specified functions.

```
[Family] - [Function_1] [Number_1]
```

- OR -

```
[Family] - [Function_1] [Number_1] [Function_2] [Number_2]
```

[Family] is DPX, DPX2, DPX3, DX or DX2.

[Number_1] and [Number_2] are integer numbers.

[Function_1] and [Function_2] are abbreviations representing diverse functions.

Note: Some sensor packages may indicate the main function only rather than indicating all functions in its name. For example, the name of DX-VBR indicates that it contains the vibration sensor while it does not indicate the contact closure sensor that it also contains.

Abbreviations	Functions
AF	Air flow sensors
CC or C	Contact closure sensor terminals
D	Dry contact signal terminals for actuators
DH	The port to connect a door handle
DP	Differential air pressure sensors
H	Humidity sensors
PD	"Powered" dry contact signal terminals
PIR	Passive infrared occupancy sensor
T	Temperature sensors
VBR	Vibration sensors
WSC or WC	Cable water sensors

Abbreviations	Functions
WSF	Floor-mounted water sensors

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