Environmental Sensors and Actuators User Guide

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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 and Actuators guide based on enhancements to the environmental sensor packages and/or user documentation.

- *Sensor Power Requirements (on page 6)*

Sensor Overview

► *Sensors versus actuators:*

A sensor can detect the environmental condition, such as temperature, humidity, and water presence.

An actuator can control a system or mechanism, such as opening and closing a door handle.

► *Suggested interval between connections (or disconnections) of diverse sensor package connections:*

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

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Supported Managing Products. 5
Sensor Support Guidelines. 6
Sensor Power Requirements. 6
Sensor Comparison. 7
Sensor Hubs. 7

Supported Managing Products

The following products support Legrand environmental sensor packages. For exceptions, see Sensor Support Guidelines (on page 6).

► *Raritan products:*

- PX2
- PX3
- PX3TS transfer switch
- PX4
- Branch Circuit Monitor 2 (BCM2), PMC and PMMC
- PXC
- PXO
- Smart Rack Controller (SRC)

- *Legrand products:*
  - Legrand PDUs
- *Server Technology products:*
  - PRO3X
  - PRO4X

Sensor Support Guidelines

The products listed in the section Supported Managing Products (on page 5) support all types of Legrand environmental sensor packages except for the following restriction.

- Only PX3, PX3TS, SRC, PXC and Legrand PDUs support door handle controllers, such as DX2-DH2C2.

Sensor Power Requirements

The Sensor port can supply up to 500 mA. This is best measured by peak amperage. Use the table here to estimate the requirements of your planned daisy chain of sensors.

Powered sensors cannot be mixed with AMS: DX2-PD2C5, DX2-PD2

Component	V	mA (peak)	mW (peak)
DX2-CC2	12	11.8	141.6
DX2-T1 & DX2-T1H1	12	6.7	80.4
DX2-DH2C2	12	20.4	244.8
DX2-D2	12	9.2	110.4
DX2-PS	12	35.4	424.8
DX2-VBR	12	5.1	61.2
DX2-PIR	12	8.2	98.4
DX2-PD2C5	12	19.4	232.8
DX2-D2C6	12	19.1	229.2
DX2-WS1	12	11	132
DX2-TVOC	12	8.2	98.4
DX2-AF1	12	14.1	169.2
DX2-T1DP1	12	7.8	93.6
DX2-ENVHUB	12	10.9	130.8
DX2-PD2	12	9.9	118.8

AMS2-54, LED white, fully equipped with tags and blade extensions	12	357	4284

Sensor Comparison

Sensor family	Connection interface	Support for sensor daisy chain	Support for a sensor hub	Automatic sensor firmware update
DX	RJ-45	✔	✔	✔
DX2	RJ-45	✔	✔ (1)	✔

(1) The hubs, DX2-ENVHUB4 and DX2-REMHUB4, are supported by DX2 sensor packages only. DX2-REMHUB4 is only supported with SRC-0800/0803.

Sensor Hubs

► *DX2-ENVHUB4*

The DX2-ENVHUB4 Sensor Hub is designed to increase the number of DX/DX2 SmartSensors deployments, where each of the hub's downstream RJ45 ports can support up to 32 sensor or actuator functions or up to 12 sensor packages*. The hub has two types of ports: upstream one (1) x RS485 and downstream four (4) x RJ45 ports.

Note: The DX2-ENVHUB4 does not support DPX-xx, DPX2-xx, DPX3-xx, DX2-PD2C5, or DX2-DH2C2 sensors.

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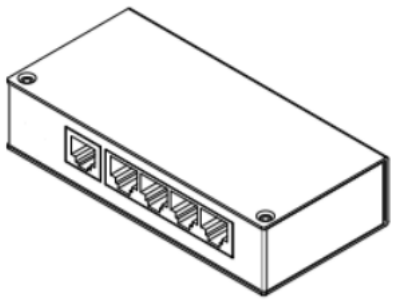
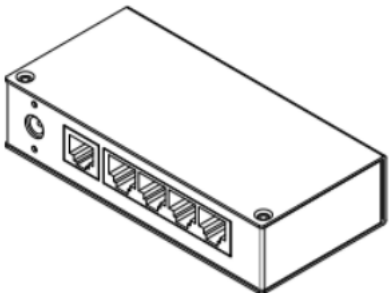
*Sensor packages may contain one or multiple sensors or actuators, such as a DX2-T1H1 sensor, which is one (1) package with two (2) sensors.



► *DX2-REMHUB4*

The DX2-REMHUB4 Remote Hub is an accessory to Raritan SRC-0800 and SRC-0803 Smart Rack Controller devices. When an SRC-0800 and/or SRC-0803 device is deployed, the DX2-REMHUB4 is designed to connect to its dedicated RJ45 Remote Hub port(s) to increase the number of DX/DX2 SmartSensor and SmartLock deployments. The hub has two types of ports: upstream one (1) x RS485 and downstream four (4) x RJ45 ports and is powered by an external 12V AC power adapter.

The DX2-REMHUB4 is best used for powering longer-distance sensor deployments—it can extend sensors up to 50m away from a compatible Raritan Smart Rack Controller device. Each of the DX2-REMHUB4's RJ45 Sensor ports can handle up to 32 sensor or actuator functions or up to 12 sensor packages and can support DX2-DH2C2 controllers and up to eight (8) SmartLock handles. When the SRC-0800 or SRC-0803 deploys two Remote Hubs, it turns an 8-port Raritan Smart Rack Controller into a 16-port Raritan Smart Rack Controller.



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 sensors, actuators and/or terminals.

See Sensor Comparison (on page 7) for supported optional hubs.

► *With standard network patch cables (CAT5e or higher), you can:*

- Connect a DX2 sensor to a supported managing product with the "RJ-45" SENSOR port.

  Exception: For a device with an "RJ-12" SENSOR port, an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) is needed.

- Daisy chain DX2 sensor packages.

Warning: Do NOT use a crossover cable for connection.

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DX2-DH2C2 Door Handle Controller

DX2-DH2C2 provides a cabinet access control solution. Connect supported door handles to DX2-DH2C2, then connect DX2-DH2C2 to a supported managing device, and you will be able to control a cabinet's door handles via the device's web interface.

► *Door handles supported by DX2-DH2C2:*

a. SouthCo H3-EM series:

- H3-EM-60-100
- H3-EM-62-100
- H3-EM-64-100
- H3-EM-65-100
- H3-EM-66-100
- H3-EM-67-100
- H3-EM-68-100

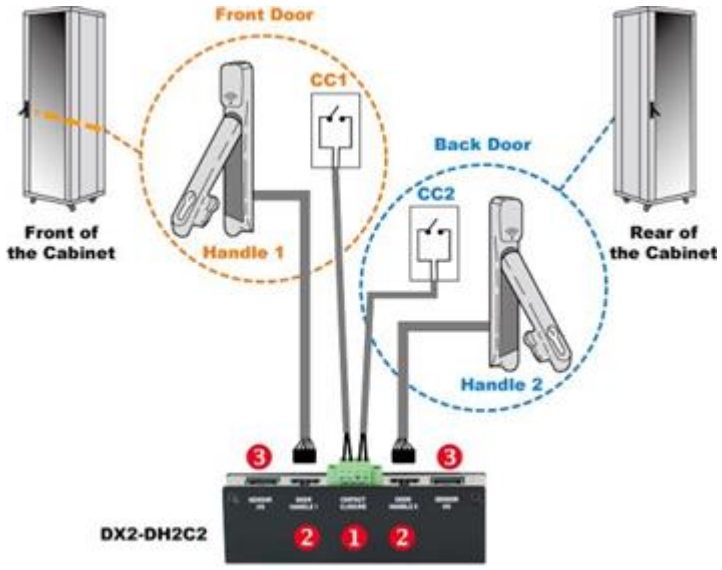
b. EMKA series:
   - 1150-U5x
   - Agent-E

c. Dirak series:
   - MLR1000
   - MLR2000
   - MLR2000KP

Note: SmartLock kits include both DX2-DH2C2 and one of the listed door handles.

With some door handles, while you open and close one door handle, the second door handle is powered off briefly to conserve power. Once the first door handle is closed and locked, power resumes to the second handle and it is ready to use.

► *DX2-DH2C2 ports and terminals:*



Number	Component	Function
❶	Two pairs of contact closure sensor terminals	Connect to third-party contact closure detectors/switches for detecting the door open/closed status. For information on connecting CC sensors, see Connecting Detectors/ Switches to DX2-CC2 (on page 25).
❷	Two door handle ports	Connect to the standard category cable of the door handle contained in the DX2-DH2C2 kit. The two door handles are usually attached to different doors of the same cabinet.
❸	Two RJ-45 ports	Connect a standard network patch cable to: • Connect to the SENSOR port (yellow) of a supported managing device. Cascade DX2 sensor package(s). Exception: You CANNOT cascade DX2-DH2C2 packages.

► *Installation restrictions:*

Read the restrictions below before connecting DX2-DH2C2.

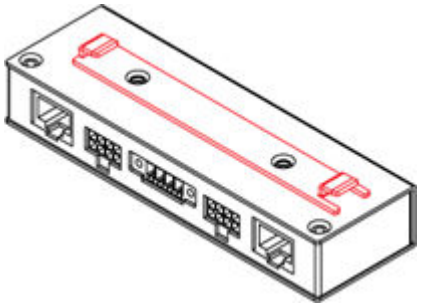
- Only PX3, PX3TS, PXC, PXO, SRC or Legrand PDUs are supported managing devices for DX2-DH2C2.
- Up to one DX2-DH2C2 package can be connected per supported managing device.
- Always connect DX2-DH2C2 directly to the sensor port. If you are cascading with other sensors, the DX2-DH2C2 must be in the first position, directly connected to the sensor port.
- Only the door handles sold with DX2-DH2C2 are supported.

- No asset management strips can be connected simultaneously.
- No hot plugging or hot swapping with door handles while DX2-DH2C2 is being connected.
  - That is, no connection or disconnection of door handles when they are powered.
- Maximum cabling length of 29 feet (9 meters). For details, see Supported Maximum Sensor Distances (on page).

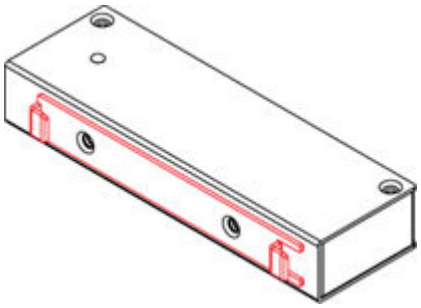
Bracket Installation

You can install the bracket accompanying DX2-DH2C2 in order to hang or fasten it properly on an object or position. The bracket can be installed either onto the bottom of DX2-DH2C2 or onto one of its sides.

► *Bracket installed onto DX2-DH2C2's bottom:*



► *Bracket installed onto the side of DX2-DH2C2:*



DX2-DH2C2 LED States

The DX2-DH2C2 controller's LED flashes when performing any of the following actions.

Actions	LED states
A valid smart card is being scanned	Fast blinking • 5 Hz frequency
The door handle lock is open	Slow blinking • 1 Hz frequency
Sensor firmware is being updated. See Sensor Firmware Update (on page).	Slightly fast blinking • 2.5 Hz frequency

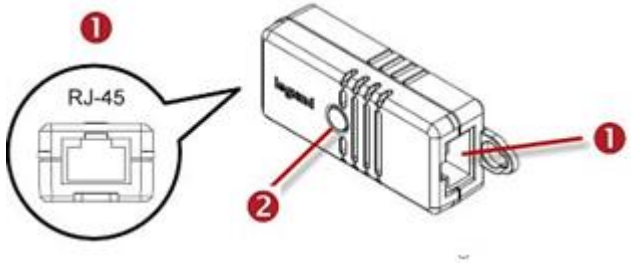
DX2 Temperature and Humidity Sensors

There are five types of DX2 temperature and humidity sensor packages.

Package	Package content
DX2-T1	Contains one DX2-T1 sensor package, which detects the temperature.
DX2-T1H1	Contains one DX2-T1H1 sensor package, which detects both the temperature and humidity.

DX2-T2H1	Contains the following: • One DX2-T1H1 sensor package. • One DX2-T1 sensor package.
DX2-T3H1	Contains the following: • One DX2-T1H1 sensor package. • Two DX2-T1 sensor packages.
DX2-T2H2	Contains the following: • Two DX2-T1H1 sensor package.

The following diagram shows a DX2-T1 or DX2-T1H1 sensor package.



Number	Component	Function
1	Two RJ-45 ports	Connect a standard network patch cable to: • Connect to the Sensor port of the supported managing device Cascade DX2 sensor package(s).
2	Status LED	Indicate the sensor status. See DX2 LED States for Temperature and Humidity (on page 14).

DX2 LED States for Temperature and Humidity

The DX2 sensor indicates an alert by making its LED flash on and off. The LED also flashes when the sensor is upgrading its firmware.

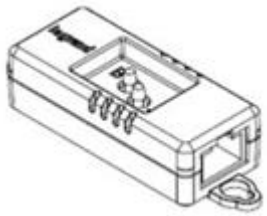
► *DX2-T1:*

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).*

► *DX2-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.*

DX2-T1DP1 - Temperature and Differential Air Pressure Sensors



DX2-T1DP1 detects temperature and differential air pressure. 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.

DX2-T1DP1 sensor packages come with one DX2-T1DP1 sensor and 2 tubes for connecting to the air pressure nozzles.

► *Connecting the DX2-T1DP1 Sensor:*

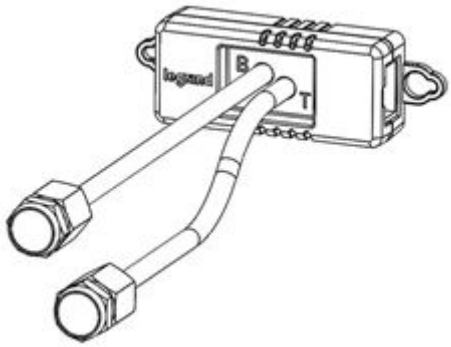
When the DX2-T1DP1 sensor is plugged into the RJ-45 sensor port of a supported managing device, it will be automatically detected.

► *Connecting Tubes to the DX2-T1DP1:*

1) Connect the tubes to each pressure nozzle of the sensor to receive two air pressure inputs.

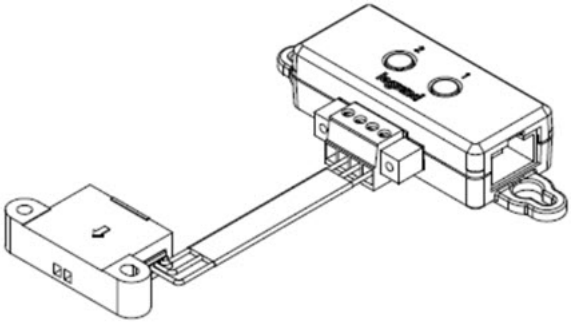
If necessary, cut the tubes so that the tube length meets your needs.

2) Place each tube's grommet in an appropriate location where you want to detect differential air pressure levels, positioning the higher tube in the higher air pressure area, and the lower tube in the lower air pressure area.



- The B label indicates the tube connected to bottom side of the sensor. The T label indicates the tube connected to the top side of sensor. The T tube measures positive pressure. An increase in positive pressure will result in an increase in sensor output.
- When tubes are disconnected, or when there is no airflow, consider a reading of +-.75pa as a neutral/zero reading.

DX2-AF1 - Airflow Sensors



The DX2-AF1 monitors indoor airflow, measuring the increase and decrease of air movement and flow velocity. The airflow sensor packages come with one DX2-AF1 airflow sensor and one airflow detector with a 2-pin connector.

► *Connecting the DX2-WS1 Sensor:*

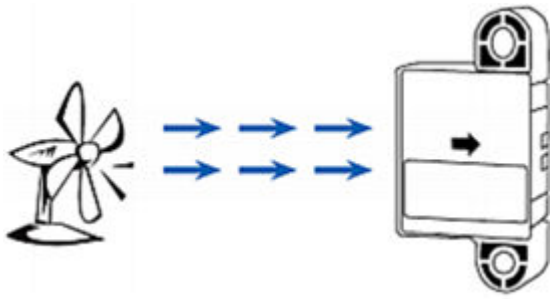
When the DX2-AF1 sensor is plugged into the RJ-45 sensor port of a supported managing device, it will be automatically detected.

The DX2-AF1 provides a terminal to attach the airflow sensing accessory.

See DX2-CC2 Contact Closure Sensor (on page 23) for more details on general terminal connections.

► *Connecting airflow detectors:*

Connect the airflow detector so that the sensor faces the source of the air movement (such as a fan) in the appropriate orientation as indicated by the arrow on that sensor.

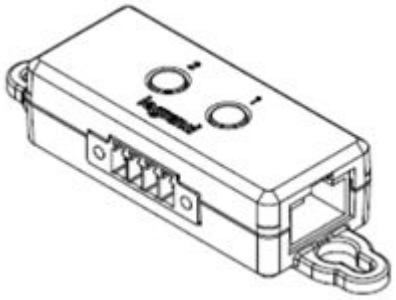


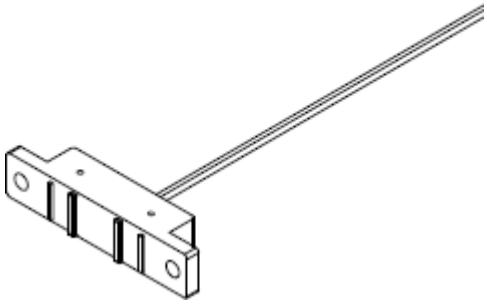
DX2-AF1 LED States

The airflow sensor shows alerts or firmware updates through its LED states.

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

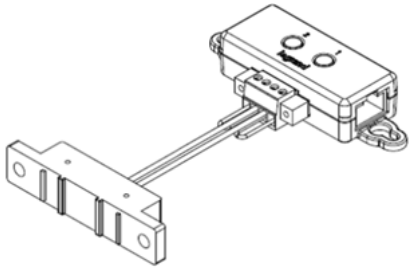
DX2-WS1 - Water Sensors





DX2-WS1 water sensors are available in Rope and Floor Sensor packages. Each package contains one DX2-WS1 water sensor head with 2 terminals, and either one Rope sensor cable, or one floor mounted sensor cable.

- Water/Leak Floor Sensor (DX2-WSF-35-KIT, DX2-WSF-70-KIT, DX2-WSF-100-KIT)
- Water/Leak Rope Sensor (DX2-WSC-35-KIT, DX2-WSC-70-KIT, DX2-WSC-100-KIT)



► *Connecting the DX2-WS1 Sensor:*

When the DX2-WS1 sensor is plugged into the RJ-45 sensor port of a supported managing device, it will be automatically detected.

The DX2-WS1 provides terminals to attach the water sensing accessories.

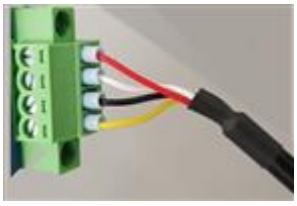
- 1 Water Rope input channel with water present status, cable and leakage distance detection
- 1 Floor Water Cable input channel with water present status detection only

► *Rope Sensor:*

- Detects the presence of water/liquid
- Detects nearest leak position on the cable and reports the distance
- Available in 3.5m, 7m and 10m lengths
- See How a Cable Water Sensor Works (on page 22)

► *Connecting the Rope Sensor to the terminals:*

- Connect the rope sensor wires to the terminals as shown in the diagram.
- The black wire is the sensing wire that changes leak detection status.



► *Floor Sensor:*

- Detects the presence of water/liquid
- Available in 3.5m, 7m and 10m lengths
- See How a Floor-mounted Water Sensor Works (on page 21)

► *Connecting the Floor Sensor to the DX2-WS1:*

- Connect the floor sensor wires to the terminal as shown in the diagram.

► *Mounting the Floor Sensor:*

- See Floor-mounted Water Sensor (on page 20).

DX2-WS1 LED States

The water sensor shows alerts or firmware updates through its LED states.

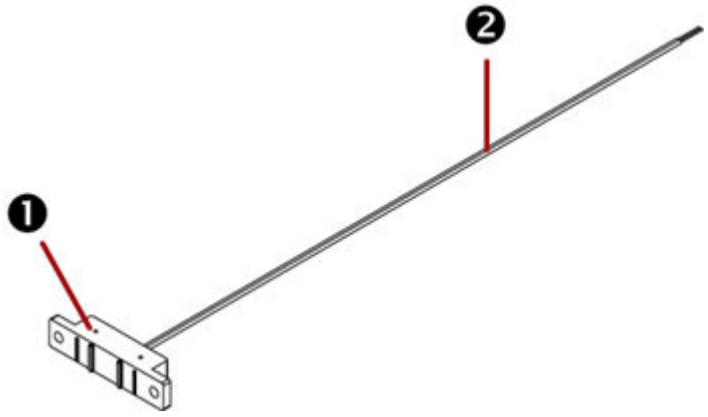
LED states	Description
Off	Water Leakage state is normal.
Flashing (1 flash and 1 off)	Water Leakage enters either alarmed state: warning or critical.
High-speed flashing	Sensor firmware is being updated. See Sensor Firmware Update (on page).

Floor-mounted Water Sensor

The floor-mounted water sensor 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:

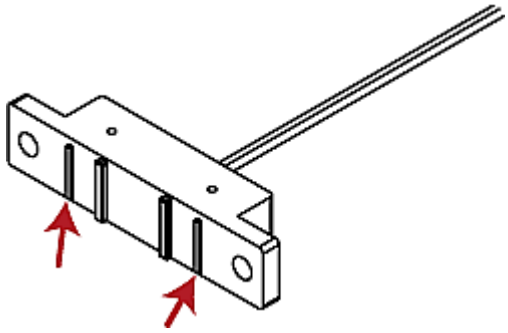
- Screw the detector to the ground with your own screws. To avoid breaking the detector's enclosure, do not over tighten the screws.
- Put something weighing around 100 to 250 grams (0.22 to 0.55 pounds) into the empty bag shipped with this water sensor. Then use cable ties to wrap the bag right above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



Number	Item
❶	Water detector.
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

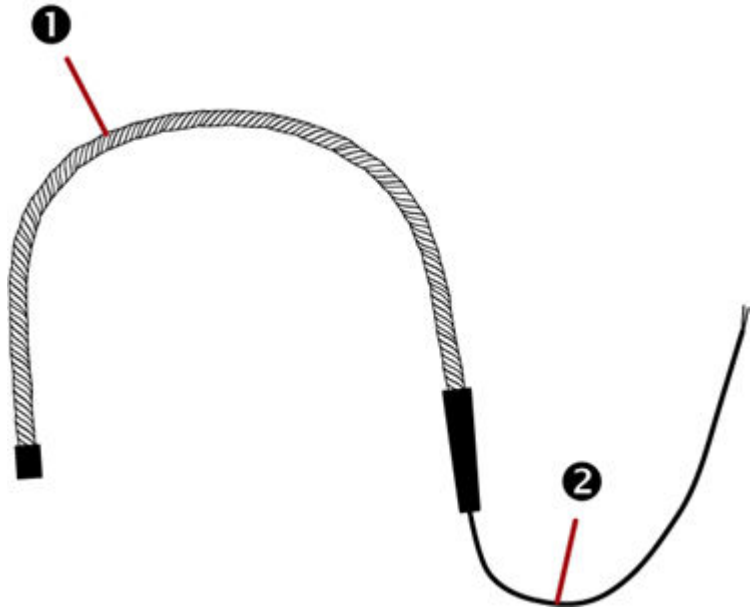
The floor-mounted water sensor uses *two poles* marked with red arrows below to detect the water.



When water is present between the 2 poles, the water sensor will 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.



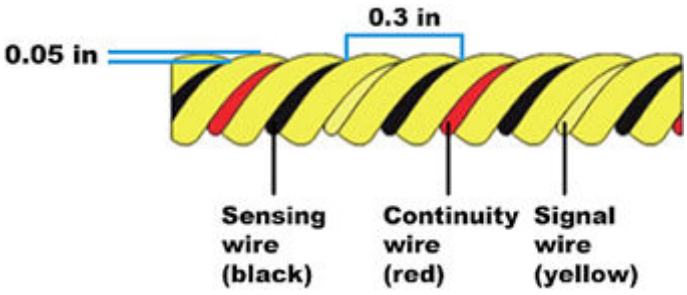
Number	Item
1	Cable-shaped water detector.
2	Wires to connect to the contact closure sensor. You need a minimum of 30 cm wires to prevent the contact closure sensor from being damaged by floor water (if any). Below are the wire length limitations: • Minimum: 30 cm (11.8 inches) • Maximum: 150 cm (59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

How a Cable Water Sensor Works

The cable water sensor uses *black* wires on the water rope to detect the water. When water is present between two black wires, the water sensor will trigger the alarm.

► *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 must be at least 0.5" wide so that two black wires are in the water at the same time. When water is present between the two black wires the water sensor will 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.

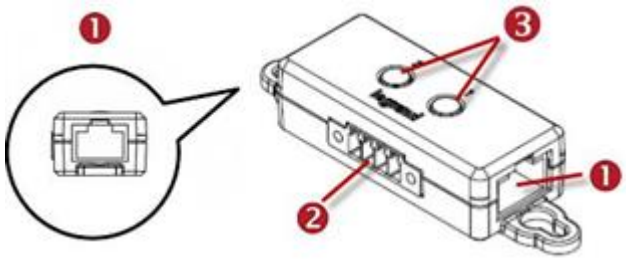
  In the following diagram, NO alarm is triggered by the presence of the water, which is indicated by the blue color, because the water sensor's rope does not evenly contact the floor.

DX2-CC2 Contact Closure Sensor

Contact closure sensors can detect the open-and-closed status of connected detectors/switches.

There are two channels for connecting two discrete detectors/switches (state: on/off).

Four termination points are available on this sensor: the two to the right are associated with one channel, and the two to the left are associated with the other.



Number	Component	Function
1	Two RJ-45 ports	Connect a standard network patch cable to: • Connect to the Sensor port of the supported managing device Cascade DX2 sensor package(s).
2	Two pairs of termination points	Connect two discrete detectors/switches.
3	Two LEDs	Indicate two channels' status.

► *Supported detector/switch types:*

At a minimum, a discrete detector/switch is required for DX2-CC2 to work properly. The types of discrete detectors/switches that can be connected to DX2-CC2 include those for:

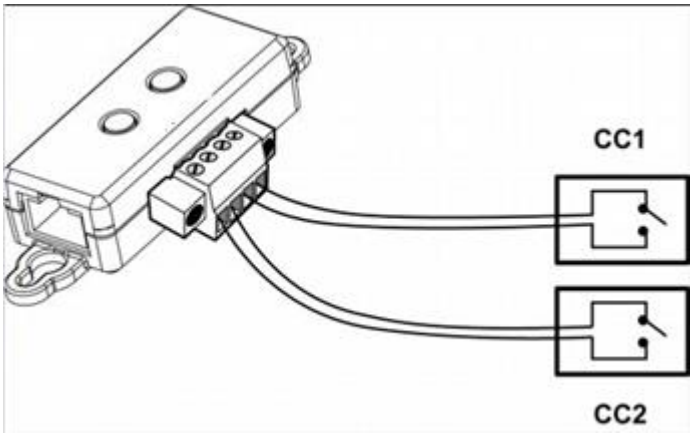
- Door open/closed detection
- Door lock detection
- Smoke detection
- Vibration detection

When using third-party probes, you must test them with DX2-CC2 to ensure they work properly.

Important: Integration and testing for third-party detectors/switches is the sole responsibility of the customer. Legrand 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. Legrand makes no statement or claims that all third-party detectors/switches will work with Legrand's contact closure sensors.

► *To make DX2-CC2 work properly:*

1) Connect 1 to 2 contact closure detectors/switches to DX2-CC2. See Connecting Detectors/Switches to DX2-CC2 (on page 25).



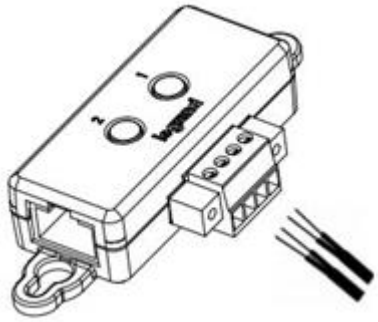
2) Connect DX2-CC2 to a supported managing device.
3) Log in to the managing device, and configure Normally Open or Normally Closed for DX2-CC2.
   - See Configuring DX2-CC2's Normal State (on page 27).

Connecting Detectors/Switches to DX2-CC2

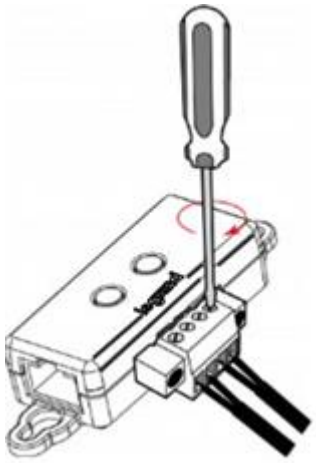
DX2-CC2 comprises two parts: sensor box and terminal module. The terminal module is detachable so it is convenient to connect/disconnect discrete detectors/switches.

► *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).

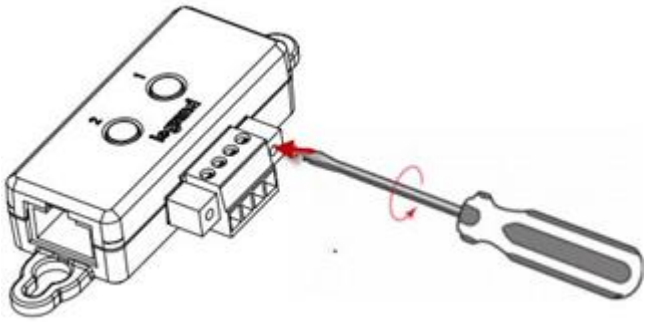


► *To make connections after the terminal module is separated:*

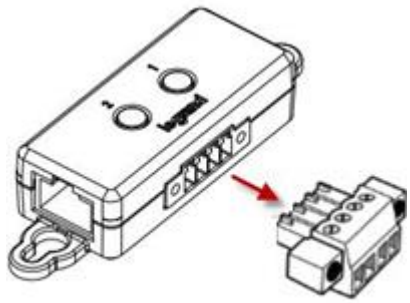
You can also connect a detector/switch when the terminal module is separated from the sensor box.

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

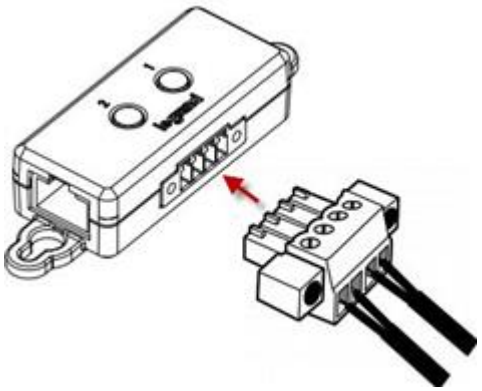
Note: The two screws are not removable so just loosen them.



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.



Configuring DX2-CC2's Normal State

Before using DX2-CC2 for detection, select the normal state of DX2-CC2 via the software application of the supported managing device where this DX2-CC2 is being connected.

► *To select the normal state of DX2-CC2:*

1) Log in to the web interface of the product where DX2-CC2 is being connected.
2) On the Peripherals page, select the sensor you want to configure. Click Edit Settings to configure polarity.
   a. Choose one of the normal state options.

Option	Description
Normally Open	Factory default. • It is considered normal when the switch/detector connected to DX2-CC2 is open. • When the switch/detector turns closed, an alarm is shown.

Option	Description
Normally Closed	• It is considered normal when the switch/detector connected to DX2-CC2 is closed. • When the switch/detector turns open, an alarm is shown.

DX2-CC2 Contact Closure Sensor LEDs

LED description in this section applies to all contact closure sensors.

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.

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):

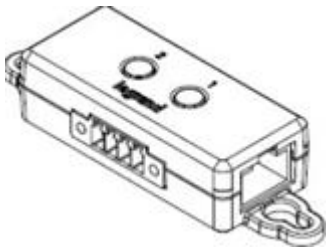
LED	Sensor state
Off	Open
Lit	Closed

DX2-D2 Dual Dry-Contact Sensor

The DX2-D2 is an actuator that detects and controls a signal to/from connected dry contacts. The DX2-D2 is widely used to remotely control two wired dry contacts.

DX2-D2 provides:

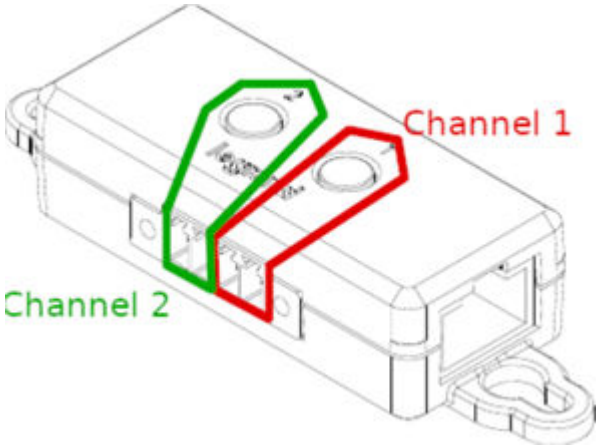
- Two RJ45 connectors - for connection to sensor port and chaining
- Two LEDs
- Two dry contacts



► *Details:*

- Each dry contact has two terminals that DX2-D2 connects/disconnects from each other similar to a relay.
- Initial state after power up is OFF.
- If auto-management is enabled, dry contacts will be auto-managed.
- Dry contact port's LED is lit if this port is in "on" state.

► *Channel Assignment:*

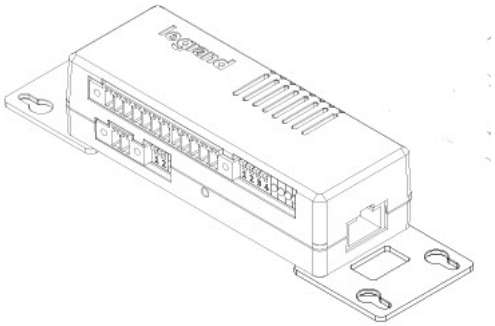


DX2-D2C6 Dry Contact Contact Closure Sensor

The DX2-D2C6 is an actuator that detects and controls a signal to/from connected third-party dry contacts and contact closures and can change their electrical signal into an action. It is a multiple dry contact and contact closure sensor. It has seven channels for both contact closure sensors and dry contact signal actuators.

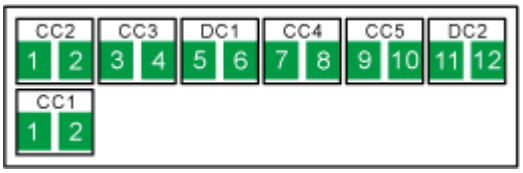
DX2-D2C6 sensor package provides:

- Two RJ45 connectors - for connection to the Sensor port of the supported managing device and chaining
- Five contact closures
- One magnetic sensor
- Two dry contacts (max. 48V AC/DC, max. 1A non inductive load)
- Six DIP switches
- Five LED



► *DX2-D2C6 Label:*

The label attached to DX2-D2C6 helps you identify different channels.



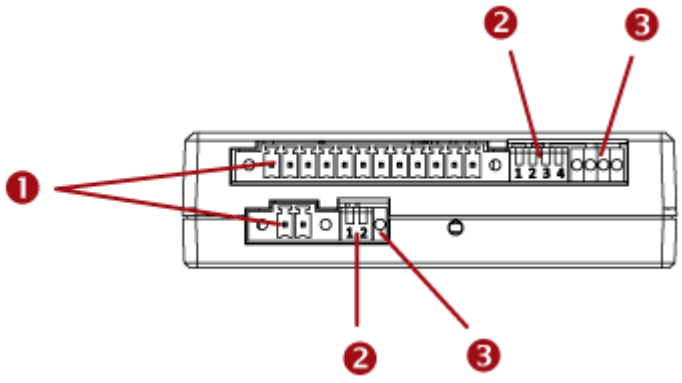
- CC represents a contact closure sensor channel. There are five CC channels: CC1 through CC5
- DC represents a dry contact signal actuator channel. There are two DC channels: DC1 and DC2

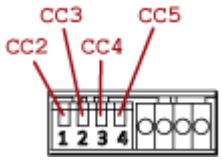
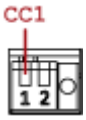
► *DX2-D2C6 hall effect sensor (reserved):*

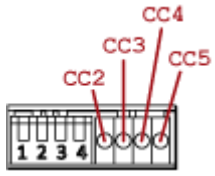
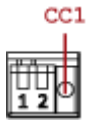
DX2-D2C6 contains a built-in hall effect sensor, which can detect whether a door is open or closed. The hall effect sensor is reserved for future use. After connecting DX2-D2C6 to a managing device, this built-in sensor will be detected and show up the web interface and SNMP MIB, which is normal.

► *DX2-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/Switches to DX2-CC2 (on page 25) 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 59). • *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.  Dip switch 2 controls the built in hall effect sensor. Tip: If an alert is shown for this hall effect sensor, you can disable it by turning on/off DIP switch 2.

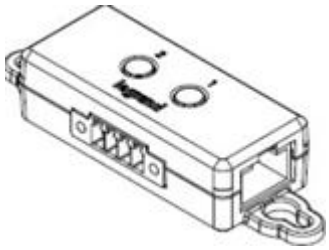
Numbers	Components
❸	CC status LEDs. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28). High-speed flashing of CC1 LED indicates that the sensor is currently upgrading firmware. • *Top row:* The four LEDs, from left to right, indicate the states of CC2, CC3, CC4 and CC5 respectively.  • *Bottom row:* The LED indicates the CC1 state. 

DX2-PD2 - Dual Powered Dry-Contact Sensor

The DX2-PD2 is an actuator that detects and controls a signal to/from connected powered dry contacts. The DX2-PD2 is widely used to remotely control two powered dry contacts.

DX2-PD2 provides:

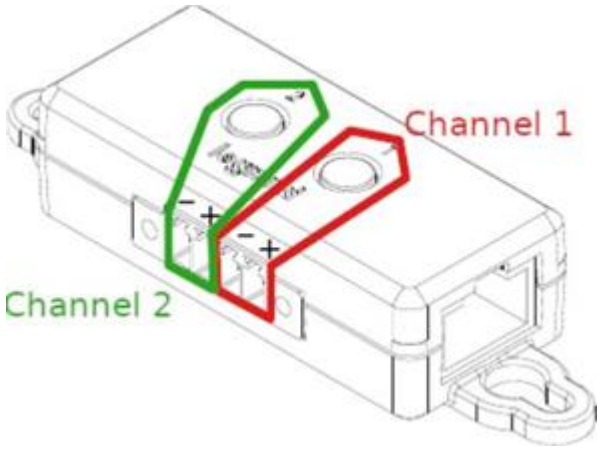
- Two RJ45 connectors - for connection to the Sensor port of the supported managing device and chaining
- Two LEDs
- Two powered dry contacts



► *Details:*

- Powered dry contact is a switchable
- Used for low power control applications, such as indicator light, buzzer, or 12 volt relay
- The initial state (after power on) of a powered dry contact is OFF
- During firmware update, the powered dry contact states are preserved
- If auto-management is enabled, dry contacts will be auto-managed
- Powered Dry Contact port's LED is lit if this port is in "on" state

► *Channel Assignment:*

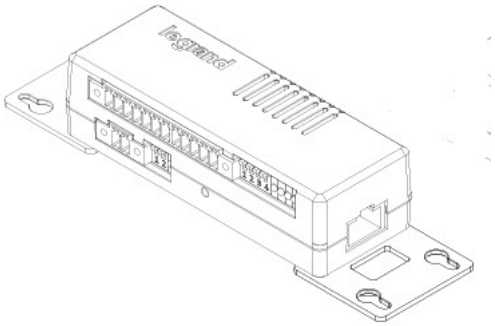


DX2-PD2C5 Powered Dry Contact and Contact Closure Sensor

The DX2-PD2C5 is an actuator that detects and controls a signal to/from connected third-party powered dry contacts and contact closures.

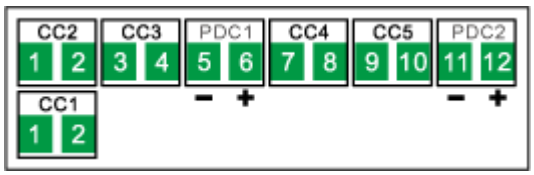
DX2-PD2C5 sensor package provides:

- Two RJ45 connectors - for connection to the Sensor port of the supported managing device and chaining
- Five contact closure sensors
- Two powered dry contacts
- Six DIP switches
- Five LEDs



A label is attached to DX2-PD2C5 to help you identify different channels

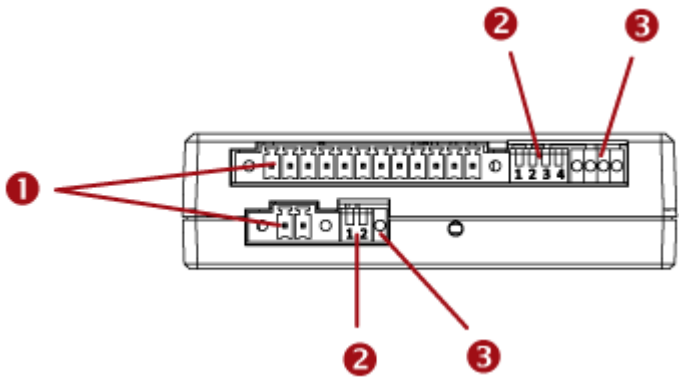
► *DX2-PD2C5 Label:*

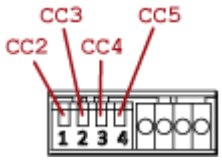
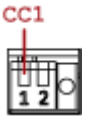


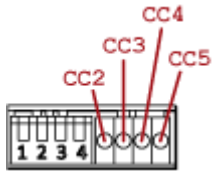
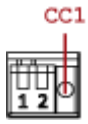
- CC represents a contact closure sensor channel. There are five CC channels: CC1 through CC5
- PDC represents a dry contact signal actuator channel that is powered. There are two PDC channels: PDC1 and PDC2. Note that each PDC channel has two electrical polarity markings below it: - (negative) and +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

► *DX2-PD2C5 terminals, DIP switches, and LEDs:*

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



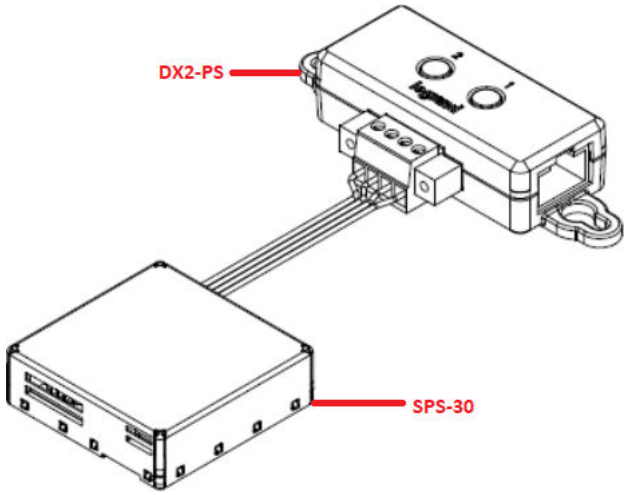
Numbers	Components
❶	CC and PDC channels. • *Top row:* Four CC channels (CC2 - CC5). Two PDC channels (PDC1 - PDC2). • *Bottom row:* One CC channel (CC1). See Connecting Detectors/Switches to DX2-CC2 (on page 25) for how to connect CC sensors or DC switches.
❷	Dip switches for configuring the Normal state of each CC channel. See Adjusting DIP Switches (on page 59). • *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.  Note: Dip switch 2 in the bottom row does not control any channel and can be ignored.

Numbers	Components
❸	CC status LEDs. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28). High-speed flashing of CC1 LED indicates that the sensor is currently upgrading firmware. See Sensor Firmware Update (on page). • *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. 

DX2-PS - Dust/Particle Sensor

DX2-PS detects dust or particles flowing through it. The sensor package provides:

- Two RJ45 connectors: for connection to the Sensor port of a supported managing device and chaining
- One PS: particle/dust sensor device (SPS30)
- One 150mm cable [EC350VM-04P] to [ZHR-05P]: for connection of the DX2-PS to the SPS30



► *Dust/Particle Sensor*

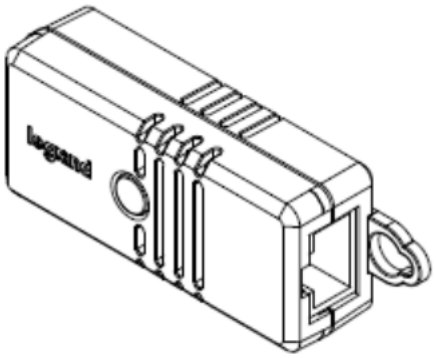
- Reports dust density in µg/m^3
- Detection range: 1-1000 µg/m^3
- Operating range: 0 - 60°C, 0 - 85% RH
- Measures total dust density of categories PM1.0, PM2.5, PM4, PM10
- By default lower critical and lower warning thresholds are deactivated
- Upper critical threshold is set to: 100µg/m^3
- Upper warning threshold is set to: 50µg/m^3

Particulate Matter category	Mass Concentration Measurements of Particles	Accuracy
PM 10	0.3 to 10.0 µm	±25 µg/m3 @ 0 to 100 µg/m³ ±25 % @ 100 to 1000 µg/m³
PM 4	0.3 to 4.0 µm	Same as PM 10
PM 2.5	0.3 to 2.5 µm	±10 µg/m³ @ 0 to 100 µg/m³ ±10 % @ 100 to 1000 µg/m³
PM 1.0	0.3 to 1.0 µm	Same as PM 2.5

Note: Each higher category reading contains all particles of the lower categories: PM10 >= PM4 >= PM2.5 >= PM1.0.

DX2-VBR- Vibration Sensor

DX2 VBR detects vibrations over a range of frequencies. The sensor package contains one vibration sensor and a pair of terminals for connecting a contact closure (CC) sensor. You can connect the sensor directly to the RJ45 sensor port or with in a cascade/daisy chain.



► *Vibration sensor:*

The built-in vibration sensor detects the vibration of any object where DX2-VBR is affixed. It measures acceleration in three mutually perpendicular directions and are summed up into the magnitude of the acceleration vector. The sensor output is the maximum magnitude since the last read access from the main controller.

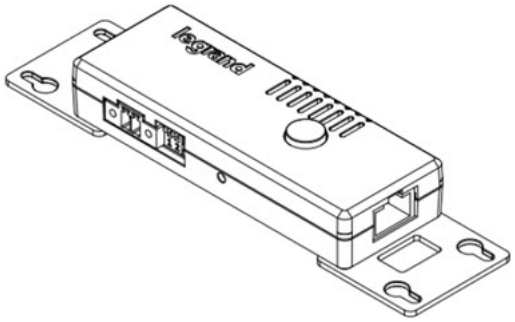
- Measurement Range: 0 - 13.85g
- Measurement Accuracy: +-0.1g

DX2-PIR Proximity Infrared Sensor

The DX2-PIR Proximity/Motion and Tamper SmartSensor is a single combination sensor that detects motion and if the sensor's tamper button state changes. It contains one occupancy sensor (that is, presence detector), one tamper sensor and a pair of terminals for connecting a contact closure (CC) sensor. The Proximity/Motion function of the sensor uses passive infrared technology to detect motion changes that are in a direct line of sight of the sensor. The Tamper function of the sensor is used to detect whether the DX2-PIR is moved away from its original position.

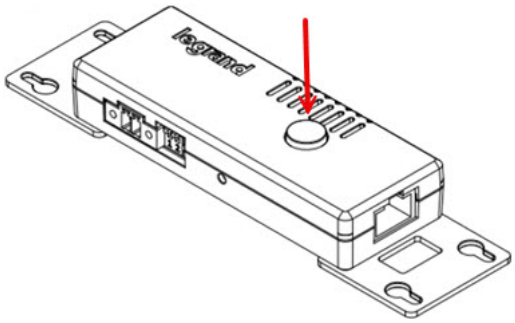
The sensor package provides:

- Two RJ45 connectors - for connection to sensor port and chaining
- One infrared sensor for motion detection
- One contact closure sensor
- One tamper sensor
- Two DIP switches
- One LED



► *Occupancy sensor:*

The occupancy sensor is located on the top of the DX2-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.



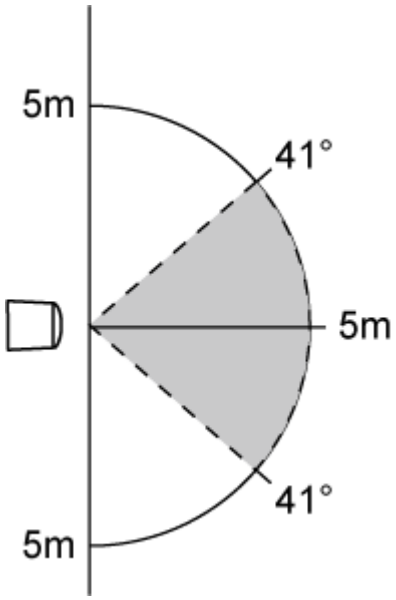
The diagrams below show the occupancy sensor's detection range and sensing area.

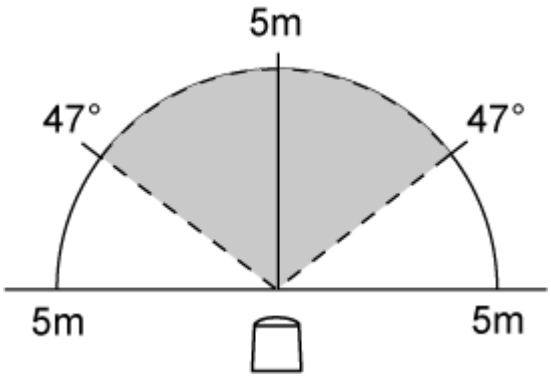
Side View

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

Top View

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



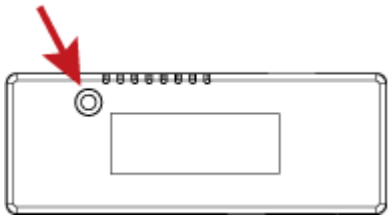


Conditions for the detected target:

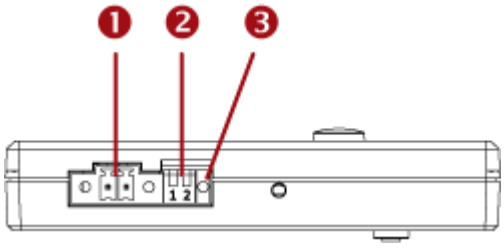
- Temperature difference between the target and the surroundings should exceed 4 degrees Celsius (7.2 degrees Fahrenheit).
- Target's movement speed: 1.0 m/s.
- Target concept is human body (size: 700 x 250 mm).

► *Tamper sensor:*

The tamper sensor is located on the back of the DX2-PIR. This sensor is used to detect whether the DX2-PIR is moved away from its original position. In the normal state, the DX2-PIR is firmly affixed to an object so this sensor, which is a button on the back of DX2-PIR, is pressed down. If someone takes the DX2-PIR away, the button springs up so the sensor is in the alarmed state.



► *DX2-PIR Terminals, DIP switches and LED:*



Numbers	Components
1	One CC channel comprising a pair of terminals. See Connecting Detectors/Switches to DX2-CC2 (on page 25) 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 59).
3	CC status LED. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28). High-speed flashing of CC1 LED indicates that the sensor is currently upgrading firmware. See Sensor Firmware Update (on page).

Cascading DX2 Sensor Packages

To increase the number of connected DX2 sensor packages per Sensor port of a supported managing device, you can cascade DX2 using standard network patch cables (CAT5e or higher).

See Supported Maximum Number of Sensors and Actuators (on page).

► *To cascade DX2 sensor packages:*

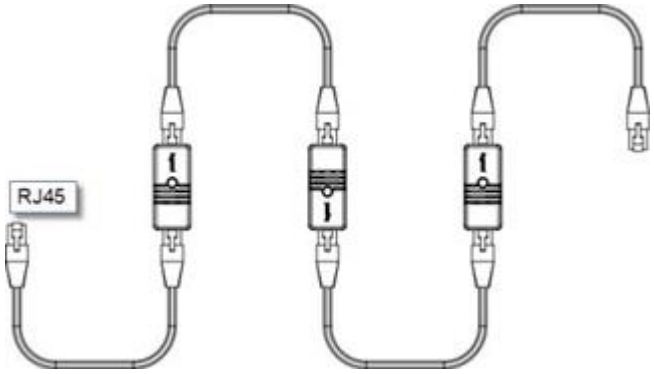
1) Connect a standard network patch cable to either RJ-45 port of the first DX2 sensor package.

Exception: For a device with an "RJ-12" SENSOR port, an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) is needed.

---

2) If you want to cascade DX2 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 DX2 package.
   b. Plug the other end into either RJ-45 port on an additional DX2 package.

Repeat the same steps to cascade more DX2 packages.



Exception: You CANNOT cascade DX2-DH2C2 packages. For details, see DX2-DH2C2 Door Handle Controller (on page 9).

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.

DX contact closure channels support the following types of sensors:

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

DX contact closure channels do NOT support any water detection sensors.

Important: Third-party leakage detectors may also not work, so you must test them before using.

No sensor cables are shipped with DX sensor packages.

► *With standard network patch cables (CAT5e or higher), you can:*

- Connect a DX sensor to a supported managing device with the RJ-45 SENSOR port.

  Exception: For a device with an "RJ-12" SENSOR port, an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) is needed.

- Daisy chain DX sensor packages.

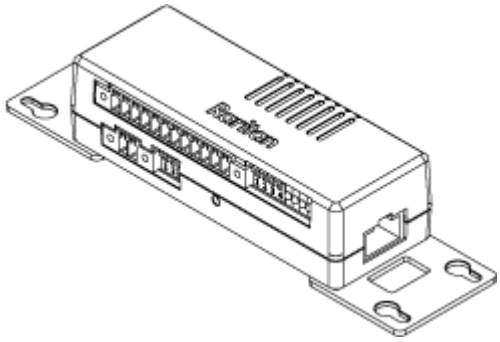
Warning: Do NOT use a crossover cable for connection.

In This Chapter

DX-D2C6 Dry Contact and Contact Closure Sensor. 43
DX-PD2C5 - Powered Dry Contact and Contact Closure. 46
DX-PIR Proximity Infrared Sensor. 49
DX-D4C3 Dry Contact and Contact Closure Sensor. 51
DX-VBR Vibration Sensor. 54
Making Connections. 55
Adjusting DIP Switches. 59

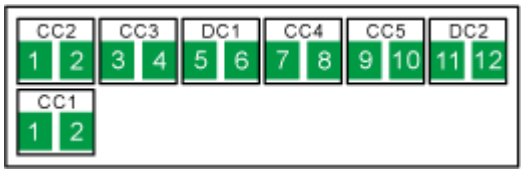
DX-D2C6 Dry Contact and Contact Closure Sensor

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:*



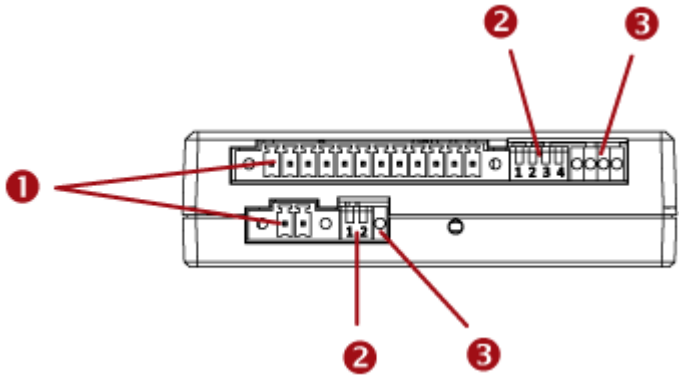
- CC represents a contact closure sensor channel. There are five CC channels: CC1 through CC5.
- DC represents a dry contact signal actuator channel. There are two DC channels: DC1 and DC2.

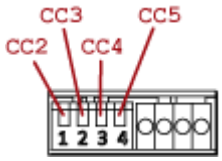
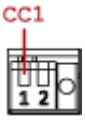
► *DX-D2C6 hall effect sensor (reserved):*

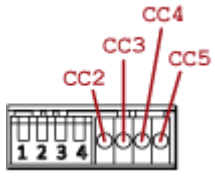
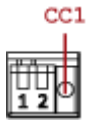
DX-D2C6 contains a built-in hall effect sensor, which can detect whether a door is open or closed. The hall effect sensor is reserved for future use and currently shall NOT be used. After connecting DX-D2C6 to a managing device, this built-in sensor will be detected and show up in the web interface and SNMP MIB, which is normal.

► *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 56) 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 59). • *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.  DIP switch 2 controls the built in hall effect sensor. Tip: If an alert is shown for this hall effect sensor, you can disable it by turning on/off DIP switch 2.

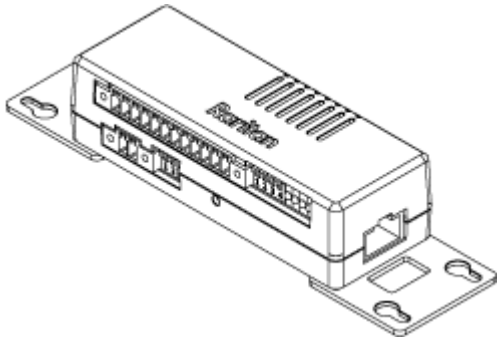
Numbers	Components
❸	CC status LEDs. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28). High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See Sensor Firmware Update (on page). • *Top row:* The four LEDs, from left to right, indicate the states of CC2, CC3, CC4 and CC5 respectively.  • *Bottom row:* The LED indicates the CC1 state. 

DX-PD2C5 - Powered Dry Contact and Contact Closure

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

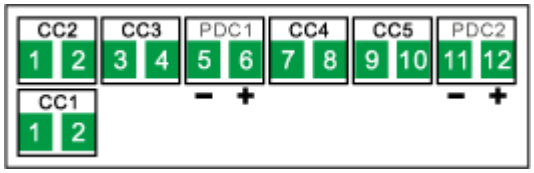
- Dry contact signal channels of DX-PD2C5 supply DC 12V power to the connected actuators.
- Dry contact signal channels of DX-PD2C5 only support the connection of EMKA (1150-U5x) door handles.
- DX-PD2C5 works with PX3 PDUs, PX3TS transfer switches and Legrand PDUs only.
- Maximum cabling length of 29 feet (9 meters). For details, see Supported Maximum Sensor Distances (on page).
- No asset management strips can be connected simultaneously.

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.

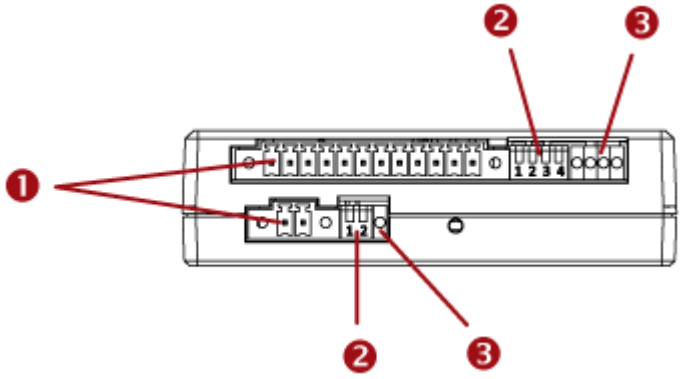
► *DX-PD2C5 Label:*

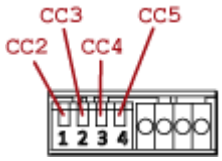
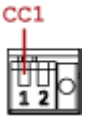


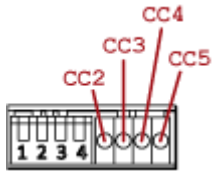
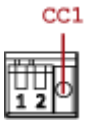
- CC represents a contact closure sensor channel. There are five CC channels: CC1 through CC5.
- PDC represents a dry contact signal actuator channel which is powered. There are two PDC channels: PDC1 and PDC2. Note that each PDC channel has two electrical polarity markings below it: - (negative) and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

► *DX-PD2C5 terminals, DIP switches, and LEDs:*

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

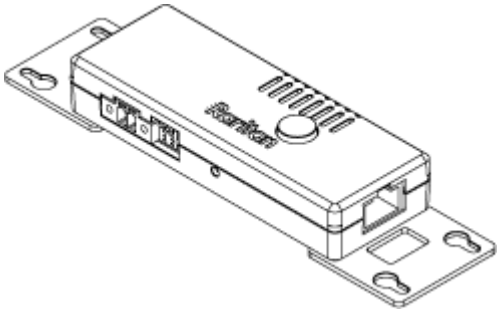


Numbers	Components
❶	CC and PDC channels. • *Top row:* Four CC channels (CC2 - CC5). Two PDC channels (PDC1 - PDC2). • *Bottom row:* One CC channel (CC1). See Connecting Detectors/Actuators to DX (on page 56) for how to connect CC sensors or DC actuators.
❷	Dip switches for configuring the Normal state of each CC channel. See Adjusting DIP Switches (on page 59). • *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.  Note: Dip switch 2 in the bottom row does not control any channel and can be ignored.

Numbers	Components
❸	CC status LEDs. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28). High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. • *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. 

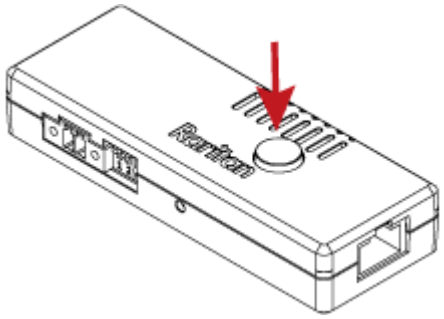
DX-PIR Proximity Infrared Sensor

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:*

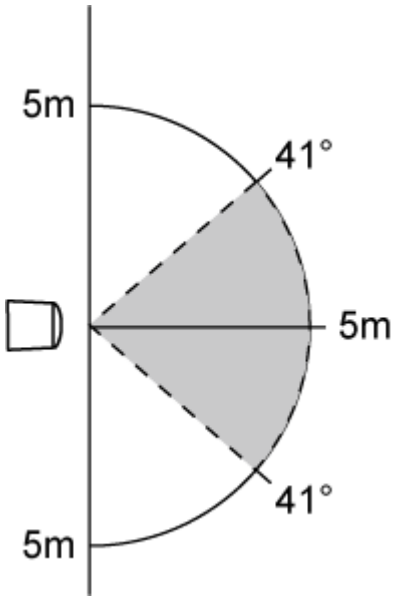
The occupancy sensor is located on the top of the DX-PIR. It uses the passive infrared technology to detect the motion of a person by sensing the temperature differences between a person and the surroundings.



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

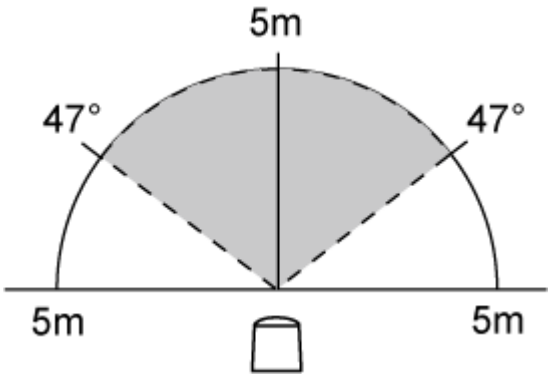
Side View

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



Top View

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

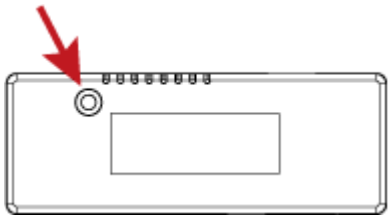


Conditions for the detected target:

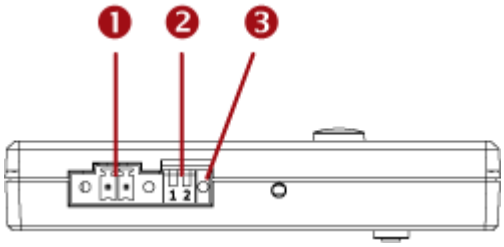
- Temperature difference between the target and the surroundings should exceed 4 degrees Celsius (7.2 degrees Fahrenheit).
- Target's movement speed: 1.0 m/s.
- Target concept is human body (size: 700 x 250 mm).

► *Tamper sensor:*

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



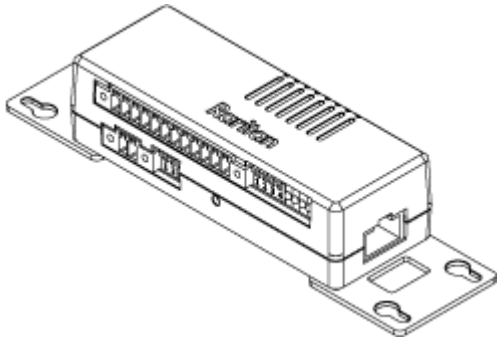
► *DX-PIR Terminals, DIP switches and LED:*



Numbers	Components
1	***One CC channel comprising a pair of terminals.*** ***See Connecting Detectors/Actuators to DX (on page 56) for how to connect a CC sensor.***
2	● ***DIP switch 1 configures the Normal state of the CC channel.*** ● ***DIP switch 2 has no effect.*** ***See Adjusting DIP Switches (on page 59).***
3	***CC status LED. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28).*** ***High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See Sensor Firmware Update (on page).***

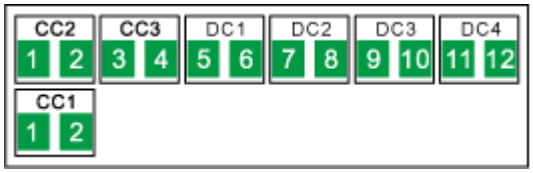
DX-D4C3 Dry Contact and Contact Closure Sensor

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.

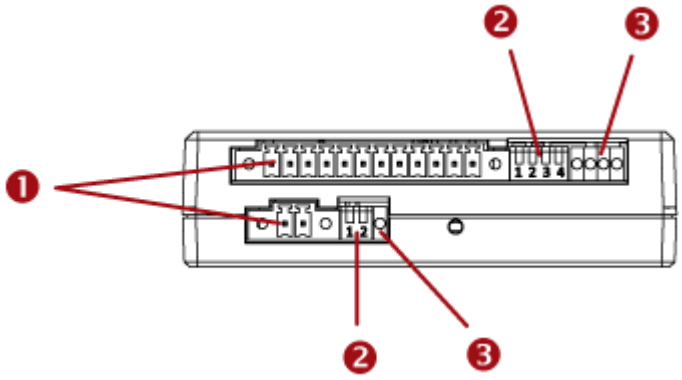
► *DX-D4C3 Label:*

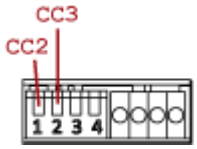
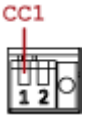


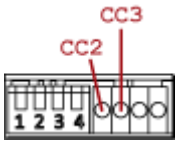
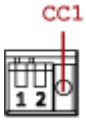
- CC represents a contact closure sensor channel. There are three CC channels: CC1 through CC3.
- DC represents a dry contact signal actuator channel. There are four DC channels: DC1 through DC4.

► *DX-D4C3 terminals, DIP switches, and LEDs:*

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

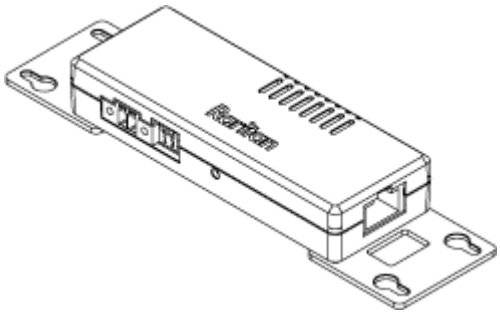


Numbers	Components
❶	CC and DC channels. • *Top row:* 2 CC channels (CC2 - CC3). 4 DC channels (DC1 - DC4). • *Bottom row:* One CC channel (CC1). See Connecting Detectors/Actuators to DX (on page 56) for how to connect CC sensors or DC actuators.
❷	Dip switches for configuring the Normal state of each CC channel. See Adjusting DIP Switches (on page 59). • *Top row:* 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.

Numbers	Components
❸	CC status LEDs. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28). High-speed flashing of CC1 LED indicates that the DX firmware upgrade is in progress. See Sensor Firmware Update (on page). • *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 Vibration Sensor

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

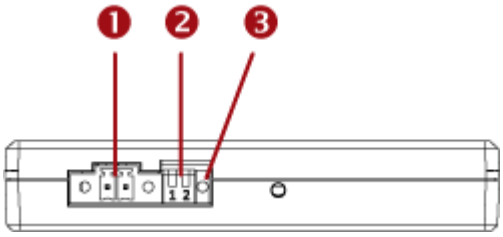


► *Vibration sensor:*

The built-in vibration sensor detects the vibration of any object where DX-VBR is affixed.

- Range: 0 - 13.85g
- Accuracy: +-0.1g

► *DX-VBR Terminals, DIP switches and LED:*



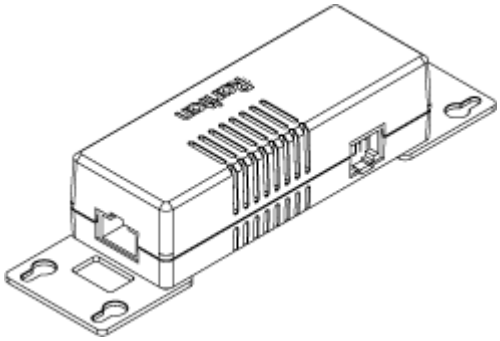
Numbers	Components
❶	***One CC channel comprising a pair of terminals.*** ***See Connecting Detectors/Actuators to DX (on page 56) for how to connect a CC sensor.***
❷	● ***Dip switch 1 configures the Normal state of the CC channel.*** ● ***Dip switch 2 does not control any CC channel and can be ignored.*** ***See Adjusting DIP Switches (on page 59).***
❸	***CC status LED. For details, see DX2-CC2 Contact Closure Sensor LEDs (on page 28).***

Making Connections

Pre-installed DX Brackets

To allow you 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

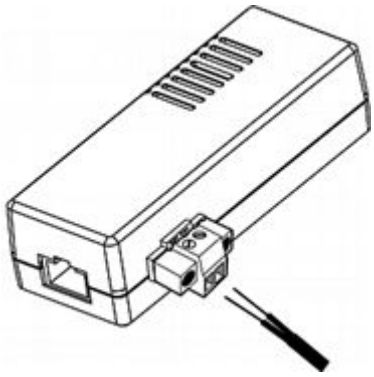
A DX sensor package comprises two parts: a sensor box and the terminal module(s). A terminal module is removable.

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.

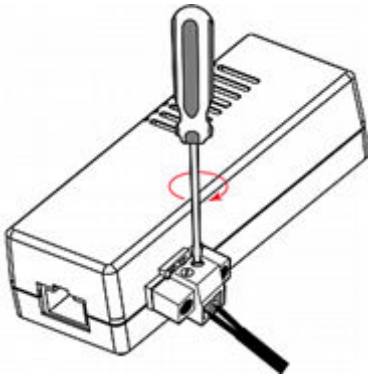
► *To make connections when the terminal module is attached:*

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.



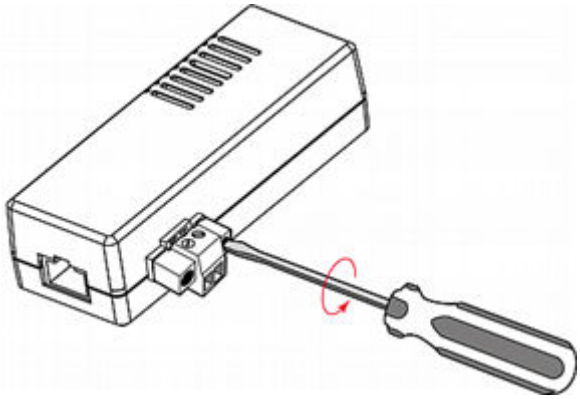
3) Use a screwdriver with a 2.5 mm wide shaft to tighten the screws above each termination point to secure the wires, using a torque of 0.196 N·m (2 kgf·cm).



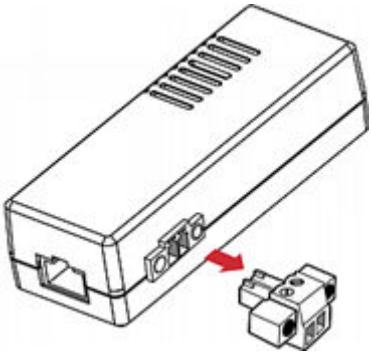
► *To make connections after the terminal module is detached:*

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

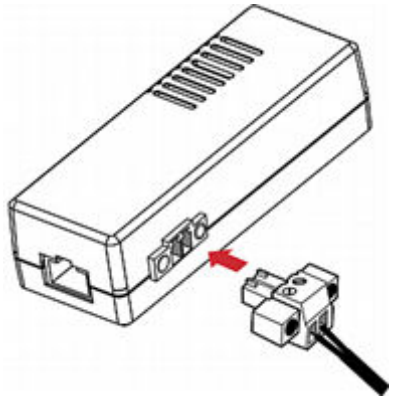
Note: The two screws are not removable so just loosen them.



2) Separate the terminal module from the sensor box.



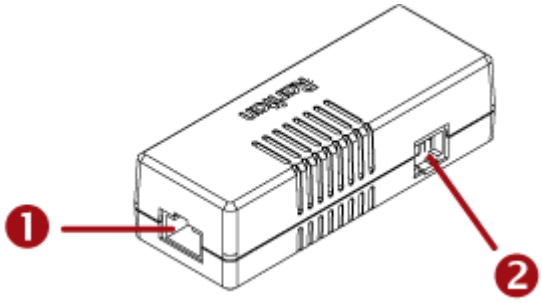
3) After connecting detectors/switches to the terminal module, plug the terminal module back into the sensor box, and then tighten the screws at two sides of the terminal module.



Cascading DX 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).

See Supported Maximum Number of Sensors and Actuators (on page).



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 device with an "RJ-12" SENSOR port, an RJ-12 to RJ-45 adapter cable (part number: RJ12M-RJ45M) is needed.

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 - Powered Dry Contact and Contact Closure (on page 46).

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. An alarm is triggered when the detector/switch turns closed.
- N.C (Normally Closed): The closed status of the connected detector/switch is considered normal. An alarm is triggered when the detector/switch turns opened.

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.

Gateway Sensors

The Gateway Sensors feature in Xerus allows you to integrate sensor values of external third-party devices.

You can connect an external device to your PDU or other Xerus-firmware product using either a Modbus RTU or a Legrand USB-MOD-Dongle, then configure as needed using JSON RPC, USB-stick configuration upload, or Modbus RTU. Once the configuration is completed, you can experience the external device as a Gateway Sensor, in the Peripheral Devices page of your Xerus product.

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Supported Configurations

External third-party devices are supported in the following installations:

Xerus Products	Supported Interfaces	
	USB-A port with USB-MOD-Dongle	**REM-HUB 1/2 Port with Modbus RTU RS-485**
SRC-0800	✓	✓
All other SRC models and all Xerus-firmware Raritan, ServerTechnology, and Legrand PDUs	✓	✗

Connecting External Devices

External devices that contain sensors and actuators can be connected to supported managing products using dedicated cables.

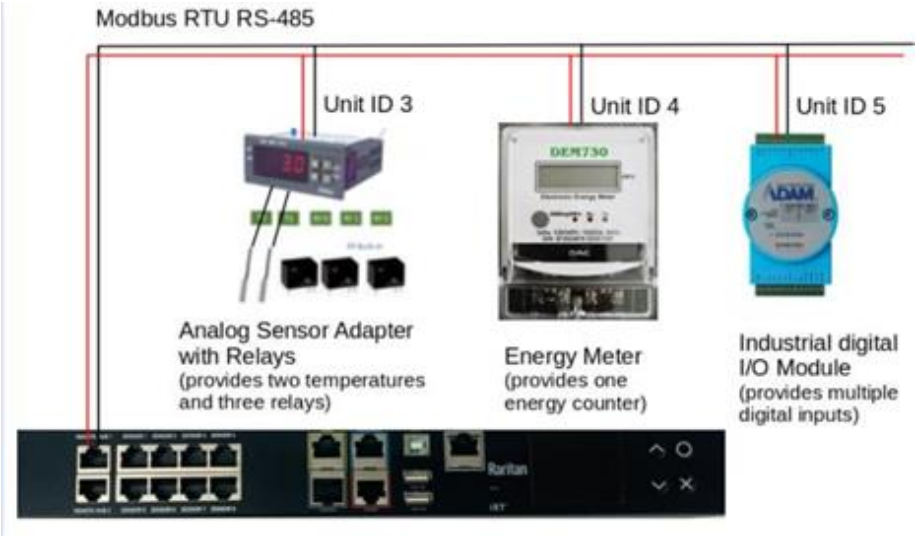
For Modbus RTU, the following interfaces are supported:

- SRC-080X: REMOTE HUB 1/2 port, and/or the USB-A port with Raritan USB-MOD-DONGLE
- All other Xerus-firmware products: USB-A port with Raritan USB-MOD-DONGLE

Note: When multiple external devices are connected to one port, the devices must have different addresses/unit IDs.

► *To connect external devices to SRC-080X REMHUB1/2:*

- Connect the REMOTE HUB1/REMOTE HUB 2 port of the SRC-08XX to the external device using two-wire RS485 for Modbus RTU or Ethernet for Modbus-TCP or SNMP.



► *To connect external sensors to all Xerus-firmware devices USB-A with USB-MODBUS-DONGLE:*

You can connect Raritan's USB-MOD-DONGLE to the USB-A Port of the supported Xerus device, and the green connector to an external third-party device terminal.

Configure External Devices with JSON Method

You can use JSON method using Python scripts to configure your external devices for the Gateway Sensors feature. To configure third party sensors, you must have the following four different object types as unique ids:

- SensorClass (multiple use)
- RemoteDevice (multiple use for all sensors of one device)
- ValueEncoding (multiple use)
- Sensor (one object instance per sensor)

► *SensorClass*

A sensor class describes the type of sensor, unit of the measurement, value ranges, tolerances and can specify default values for thresholds. Based on the sensor type one of the three (NumericSensorClass, StateSensorClass, or SwitchSensorClass) special classes is used.The following examples show how to configure these sensorclasses.

python code for a NumericSensorClass object:

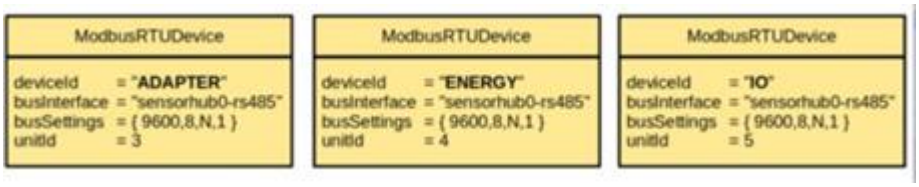
```
ClassTemperature = GatewaySensorsCfg.NumericSensorClass(
   classId = "Temperature",
   metadata = sensors.NumericSensor.MetaData(
      type = sensors.Sensor.TypeSpec(
         sensors.Sensor.NUMERIC,
         sensors.Sensor.TEMPERATURE,
         sensors.Sensor.DEGREE_CELSIUS
      ),
      decdigits = 1,
      accuracy = 0.0,
      resolution = 0.1,
      tolerance = 0,
      noiseThreshold = -45,
      range = sensors.NumericSensor.Range(-45.0, 105),
      thresholdCaps = sensors.NumericSensor.ThresholdCapabilities(True, True, True, True),
   ),
   defaultThresholds = sensors.NumericSensor.Thresholds(
      upperCriticalActive = True,
      upperCritical = 45.0,
      upperWarningActive = True,
      upperWarning = 32.0,
      lowerWarningActive = True,
      lowerWarning = 10.0,
      lowerCriticalActive = True,
      lowerCritical = 5.0,
      assertionTimeout = 3,
      deassertionHysteresis = 2.0
   ),
   preferCommonThresholds = False
)
```

python code for a StateSensorClass object:

```
ClassState = GatewaySensorsCfg.StateSensorClass(
   classId = "State",
   type = sensors.Sensor.TypeSpec(
       sensors.Sensor.DISCRETE_ON_OFF,
       sensors.Sensor.CONTACT_CLOSURE,
       sensors.Sensor.NONE,
   )
)
```

- *RemoteDevice*

Remote device connectivity is defined by RemoteDevice description object. For example: ModbusRTUDevice is used when the connectivity is via Modbus RTU,and SnmpV1V2Device, or SnmpV3Device are used when the connectivity is via Ethernet.



The following examples show how to configure ModbusRTUDevice, SnmpV1V2Device, and SnmpV3Device.

python code for a ModbusRTUDevice object:

```
PMMCDevice = GatewaySensorsCfg.RemoteModbusRTUDevice(
   deviceId = "PMMC",
   name = "PMMC PDU",
   timeoutMs = 100,
   detectionIdentifiers = {
      GatewaySensorsCfg.MODBUS_VENDOR_NAME: "Raritan",
      GatewaySensorsCfg.MODBUS_PRODUCT_CODE: "iPDU",
      GatewaySensorsCfg.MODBUS_REVISION: "3\\.6.*"
   },
   busInterface = "REMOTE-HUB-1",
   busSettings = ModbusCfg.SerialSettings(
      baud = 38400,
      parity = ModbusCfg.SerialSettings.Parity.NONE,
      dataBits = 8,
      stopBits = 1
   ),
   unitId = 247
)
```

python code for a SnmpV1V2Device object:

```
RemoteDeviceV1V2 = GatewaySensorsManager.RemoteSnmpV1V2Device(
   deviceId = "SNMPV2",
   name = "Localhost",
   timeoutMs = 100,
   host = "127.0.0.1,
   community = "public",
)
```

Python code for a SnmpV3Device object:

```
RemoteDeviceV3 = GatewaySensorsManager.RemoteSnmpV3Device(
   deviceId = "SNMPV3",
   name = "Localhost",
   timeoutMs = 100,
   retry = 0, # use default
   host = "127.0.0.1",
   authProtocol = GatewaySensorManager.SnmpAuthProtocol.SHA,
   authPassphrase = "raritan1", # min length 8 chars
   level = GatewaySensorManager.SnmpSecurityLevel.AUTH_PRIV,
   user = "admin",
   privacyProtocol = GatewaySensorManager.SnmpPrivProtocol.AES,
   privacyPassphrase = "raritan1" # min length 8 chars,
)
```

► *ValueEncoding*

A ValueEncoding objects are used to process the measurements and signals received from the remote device. The following list shows the objects used based on the type of remote device.

- ModbusValueEncodingBit
- ModbusValueEncoding8
- ModbusValueEncoding16
- ModbusValueEncoding32
- ModbusValueEncoding64
- NumericEncoding (SNMP only)

The following examples of python code show how to configure Modbus or Numeric ValueEncoding:

python code for a ModbusValueEncoding32 object:

```
EncodingIEEE754 = GatewaySensorsCfg.ModbusValueEncoding32(
   encodingId = "IEEE754_32",
   type = GatewaySensorsCfg.EncodingType.IEEE754,
   interpretationRules = [
      GatewaySensorsCfg.InterpretationRuleIEEE754NAN(
         interpretation = GatewaySensorsCfg.Interpretation.UNAVAILABLE,
      ),
      GatewaySensorsCfg.InterpretationRuleIEEE754INF(
         interpretation = GatewaySensorsCfg.Interpretation.NUMERIC_INVALID,
      ),
   ],
   scalingFactor = 1.0,
   offset = 0.0,
   byteSwap = False,
   endianness = GatewaySensorsCfg.ModbusEndianness.MODBUS_BIG_ENDIAN
)
```

python code for a NumericValueEncoding object for SNMP:

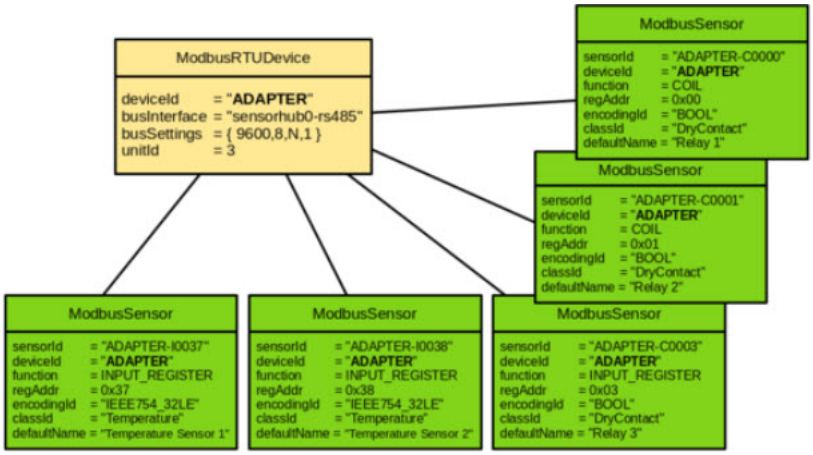
```
Gauge = GatewaySensorsCfg.NumericValueEncoding(
   encodingId = "GAUGE",
   type = GatewaySensorsCfg.EncodingType.UINT
)
```

python code for a NumericValueEncoding object for SNMP as State:

```
State = GatewaySensorsCfg.NumericValueEncoding(
   encodingId = "STATE",
    type = GatewaySensorManager.EncodingType.BOOL,
    interpretationRules = [
        GatewaySensorManager.InterpretationRuleEnum(
            interpretation = GatewaySensorManager.Interpretation.STATE_OFF, # values for state off
            enumValues = [5, 7, 11] # above upper warning/on/alarmed
        ),
        GatewaySensorManager.InterpretationRuleEnum(
            interpretation = GatewaySensorManager.Interpretation.STATE_ON, # values for state on
            enumValues = [8] # off
        )
    ]
)
```

- *Sensor*

Sensor description objects are used to define the Gateway Sensors. These sensor description objects must have a unique sensor id, a device id of the remote device, an encoding Id with detailed decoding information and the reference classId which holds type information. The following example shows 5 gateway sensors for one remote device called "ADAPTER".



The following examples show how to configure sensor objects:

python code for a ModbusSensor object:

```
sensor1 = GatewaySensorsCfg.ModbusSensor(
   sensorId = "PMMC-H0802",
   deviceId = "PMMC",
   classId = "Temperature",
   encodingId = "IEEE754_32",
   defaultName = "Temperature 1",
   function = ModbusCfg.ModbusFunction.HOLDING_REGISTER,
   regAddr = 2050
)
```

python code for a SnmpSensor object:

```
outletVoltageSensor = GatewaySensorsCfg.SnmpSensor(
   sensorId = "outletVoltage1",
   deviceId = "SNMPV2",
   classId = "Voltage",
   encodingId = "GAUGE",
   defaultName = "Outlet 1 Voltage",
   oid = "1.3.6.1.4.1.13742.6.5.4.3.1.4.1.1.4"
)
```

Configure External Devices with JSON RPC

You can use JSON RPC to configure your external devices for the Gateway Sensors feature.

► *Standard method:*

Define all data structures using the respective classes and call gwcfg::getConfiguration() to read all active configuration. You can insert or replace one or more configuration packages by calling GatewaySensorCfg::set Configuration().

```
cfg = gwcfg.getConfiguration()

cfg["PMMC"] = GatewaySensorManager.ConfigurationPackage(
    name = "PMMC Example",
    classes = [ ClassTemperature ],
    devices = [ PMMCDevice ],
    encodings = [ EncodingIEEE754 ],
    sensors = [ sensor1 ]
)

if 0 != gwcfg.setConfiguration(cfg):
   print("failed")
```

► *JSON method:*

Create a readable JSON file with internal interfaces names and version numbers for the configuration. You can use provided python scripts of support add, clear, get, and set.

EXAMPLE 1

```
cd px2_utils/gateway-sensors ./gateway-sensors-PMMC.py 192.168.0.243
```

or (make sure SNMP configuration is turned on)

```
./gateway-sensors-snmp.py 192.168.0.243
```

EXAMPLE 2

```
cd px2_utils/gateway-sensors
./gateway-sensors-config.py --ip 192.168.0.243 add gateway-sensors-example-PMMC.json
```

EXAMPLE 3 (TW Mobile "dual" setup)

```
cd px2_utils/gateway-sensors
./gateway-sensors-config.py --ip 192.168.0.243 set ../customer_tools/twmobile/gateway-sensors-via-gw.json
./gateway-sensors-config.py --ip 192.168.0.243 merge ../customer_tools/twmobile/gateway-sensors-direct-with-product-id-check.json
```

Configure External Devices using Bulk or Raw Configuration

You can use the special configuration methods provided by Xerus to create and upload your Gateway Sensors configurations.

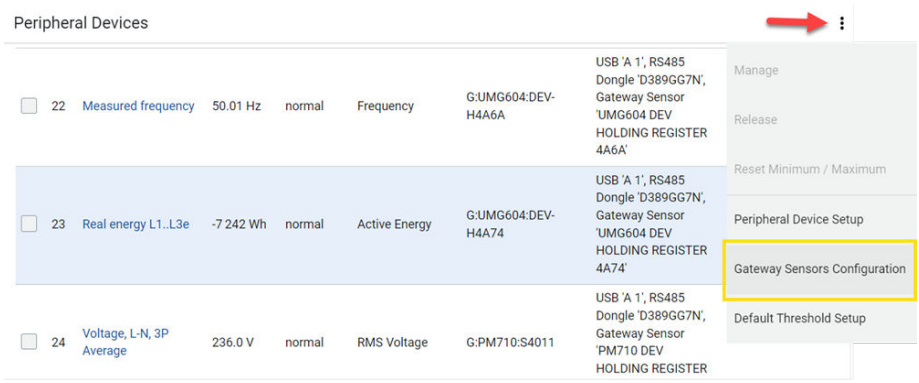
These processes are documented in the online help and user guides for all Xerus products. Search for "Special Configuration and Upgrade Methods," then follow instructions for Bulk Configuration or Raw Configuration.

► *Tips for configuring via bulk or raw configuration:*

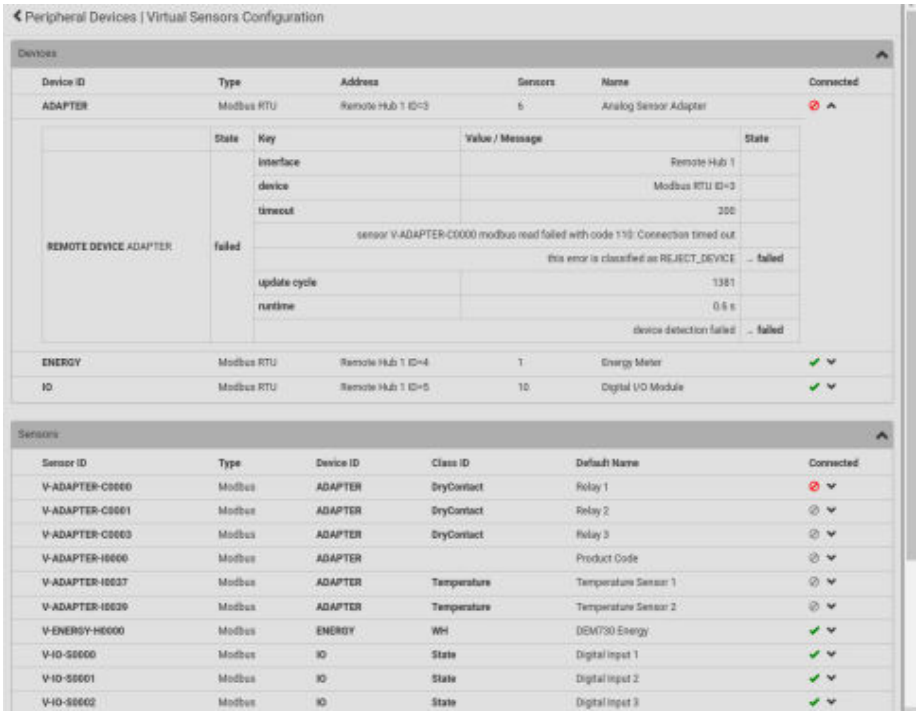
- Download the Mass Deployment Utility from the support page of your product. This tool assists in creating the files you need for uploading configurations. The utility is named mass_deployment-xxx (where xxx is the firmware version number).
- Include the Peripheral Sensors section in the bulk config file to get a defined and stable mapping without relying on auto-assignment.

Viewing the Gateway Sensors Configuration in the Web Interface

Once everything is correctly connected and configured, the devices will appear in the Peripherals page. Click the 3-dot icon to open the Gateway Sensors Configuration that has been loaded.



If sensors are missing, or display unexpected values, check the status and detailed information about usage of the configuration, communication errors and decoding steps.


Peripheral Devices | Virtual Sensors Configuration
Devices
Device ID
Type
Address
Sensors
Name
Connected
ADAPTER
Modbus RTU
Remote Hub 1 ID=3
6
Analog Sensor Adapter
State
Key
Value / Message
State
REMOTE DEVICE ADAPTER
failed
interface
Remote Hub 1
device
Modbus RTU ID=3
timeout
200
sensor V-ADAPTER-C0000 modbus read failed with code 110: Connection timed out
this error is classified as REJECT_DEVICE
failed
update cycle
1381
runtime
0.6 s
device detection failed
failed
ENERGY
Modbus RTU
Remote Hub 1 ID=4
1
Energy Meter
IO
Modbus RTU
Remote Hub 1 ID=5
10
Digital I/O Module
Sensors
Sensor ID
Type
Device ID
Class ID
Default Name
Connected
V-ADAPTER-C0000
Modbus
ADAPTER
DryContact
Relay 1
V-ADAPTER-C0001
Modbus
ADAPTER
DryContact
Relay 2
V-ADAPTER-C0003
Modbus
ADAPTER
DryContact
Relay 3
V-ADAPTER-I0000
Modbus
ADAPTER
Product Code
V-ADAPTER-I0037
Modbus
ADAPTER
Temperature
Temperature Sensor 1
V-ADAPTER-I0039
Modbus
ADAPTER
Temperature
Temperature Sensor 2
V-ENERGY-HE000
Modbus
ENERGY
WH
DEM730 Energy
V-IO-S0000
Modbus
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State
Digital Input 1
V-IO-S0001
Modbus
IO
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V-IO-S0002
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