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1. General

The X-Dot I/O can interface generic Input and Output devices to the Nexmosphere platform This document provides explanation of the available functionalities and instructions on how to install and integrate the interface into your digital signage installation.

The information in this document is created for users who are familiar with the Nexmosphere API and are able to control a basic setup with a Nexmosphere API controller. If this is not the case yet, please read the general documentation on the Nexmosphere serial API first.

2. Product overview

The X-Dot I/O interface is available in 2 models

|	XDW-I36	XDW-I56
I/O voltage	3.3V	5V
Interface Input devices	✔	✔
Interface Output devices	✔	✔

The X-Dot I/O has a wire-to-board connector which allows for connecting 3rd party I/O devices such as buttons, pressure matts and relays to the Nexmosphere platform. There are 3 connections: Input, Ground and Output.

input
ground
output
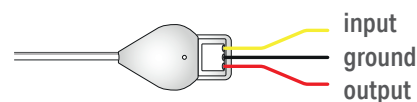
When connecting **input devices** such as buttons, switches or pressure matts, one wire needs to be connected to the output pin and the other to the input pin. Typically, it doesn't matter which of the 2 wires is connected to which pin, as these types of IO devices simply make an interconnection between the output and the input pin when activated (e.g. button press or person on pressure matt).
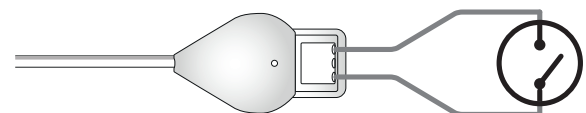
When connecting **output devices** such as button LEDs or relays. The supply (or +) wire - *typically red* - needs to be connected to the output pin and the ground (or -) wire - *typically black* - needs to be connected to the ground pin.
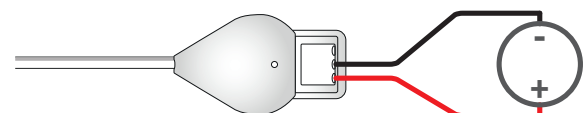
3. Functionalities and API commands

The X-Dot I/O provides the following functionalities:

1. **Interface input devices** - and indicate if their state is HIGH (activated) or LOW (deactivated)
2. **Control output devices** - and set them ON or OFF
3. **Control button LEDs** - and create smooth dimming -and pulsing patterns

The following section will cover these functionalities in detail. Please note that for each API example in this document, X-talk interface address 001 is used (X001). When the sensor is connected to another X-talk channel, replace the "001" with the applicable X-talk address.
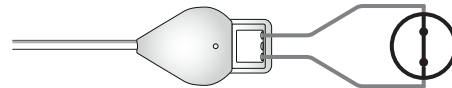
3.1 - Interface input devices

An Input device can have 2 states: HIGH or LOW. Typically, the state is HIGH when the device is activated, such as a button that is pressed or a pressure matt that is stepped on. Vice versa, a state is usually LOW when a device is deactivated, such as the release of a button or a pressure matt which is stepped off from. Both of these states (HIGH and LOW) will trigger an API command:

X001A[1]	*State input device is HIGH*
X001A[0]	*State input device is LOW*

When implementing input triggers, consider the following:

- For compatible Nexmosphere accessories, additional information is available on page 4.
- When using 3rd party input devices, we recommend to check when the state will be HIGH or LOW.
- Most Input devices will make an interconnection between the output and input pin when activated, and disconnect when deactivated. Therefore the output pin must be ON, which is the default status. In this case, activation will result into a HIGH signal and deactivation in a LOW signal.

A button is pressed / pressure matt is stepped on. State of input device is HIGH.

A button is released / pressure matt is stepped off from. State of input device is LOW.
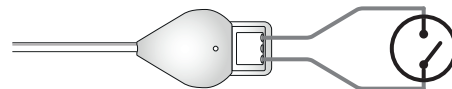
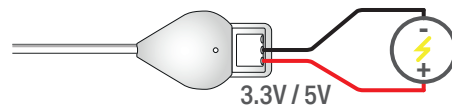### 3.2 - Control output devices (ON/OFF)

An Output device can be set ON or OFF. When the device is set to ON, the Output pin of the X-Dot I/O will supply 3.3V or 5V, depending on the model. When the device is set to OFF, the Output pin will not supply any power. Setting the Output device ON or OFF can be done by sending the following API commands:

|	
X001A[1]	Set output device ON
X001A[0]	Set output device OFF

When controlling output devices, consider the following:

- For compatible Nexmosphere accessories, additional information is available on page 5
- Per default, at start-up the Output is set to ON
- The maximum amount of power which the Output pin can provide is 200mA. In case of connecting 3rd party output devices, please make sure the specifications comply.

Set output ON (e.g. to activate button LED or Relay)

3.3V / 5V

Set output OFF (e.g. to deactivate button LED or Relay)
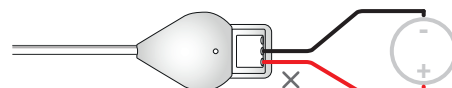
3.3 - Control button LEDs

A button LED is an Output device and can be set ON or OFF via the method explained on the previous page. Additionally, the X-Dot I/O can control the button LED with a PWM signal on the Output pin, offering the option to smoothly dim the LED up and down and create pulsing patterns. This can be done by sending the following API command:

`X001B[MSSEEDD]`

M= *Mode* — **1**=on, **2**=off, **3**=single ramp, **4**=pulse continuous
SS= *Brightness Start value* — value between **00-99** (% brightness)
EE= *Brightness End value* — value between **00-99** (% brightness)
DD= *Duration* — value between **00-99** (in 0.1 seconds)

When controlling button LEDs with a PWM signal, consider the following:

- When Mode is set to 1 (On) or 2 (Off), all other parameters are irrelevant and therefore ignored.
- When Mode is set to 3 (Single ramp), the button LED will transition 1x from the Start value to the End value in the indicated Duration time.
- When Mode is set to 4 (Pulse), the button LED will continuously transition back-forth between the Start value and the End value in the indicated Duration time.
- When sending a Mode 3 or 4 command, the Output pin will immediatly be set to the Start value. There is no fade transition between the current state of the Output pin and the Start value.

Example commands

Set button LED on
`X001B[1]`

Set button LED off
`X001B[2]`

Ramp from 00% brightness to 99% brightness in 1.2s
`X001B[3009912]`

Ramp from 80% brightness to 20% brightness in 0.7s
`X001B[3802007]`

Continuously pulse from 00% to 99% brightness in 1.0s
`X001B[4009910]`

Continuously pulse from 10% to 50% brightness in 0.5s
`X001B[4105005]`

4 - Installation requirements and guidelines

When integrating an X-Dot I/O into your digital signage installation, several installation requirements and guidelines need to be taken into account in order for the sensor to perform optimal and operate stable.

### 4.1 Electrical installation requirements

The maximum amount of power which the Output pin can provide is 200mA. In case of connecting 3rd party output devices, please make sure the specifications comply.

4.2 Connection Diagrams

The X-Dot I/O can be connected to any X-talk interface and is therefore compatible with all Xperience controllers. Make sure the X-Dot I/O is connected to the X-talk interface before powering the Xperience controller. Otherwise, the X-Dot I/O will not be recognized by the Xperience controller and no output will be provided.
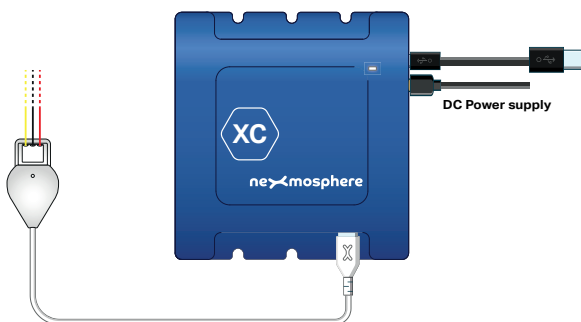
Example connection to XC Controller
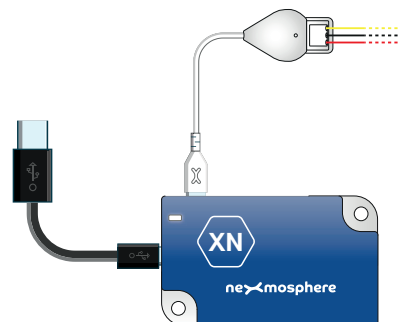
Example connection to XN Controller

4.3 X-Dot I/O - Accessories

Push buttons

Nexmosphere offers 19mm stainless steel push buttons with LED ring, which are compatible with the XDW-I36. The part codes for these push buttons are:

S-B90W4S	*White LED ring*
S-B90B4S	*Blue LED ring*
S-B90G4S	*Green LED ring*
S-B90R4S	*Red LED ring*

They come with 60cm color-coded wires soldered onto the button, and with ferrules for easy connection to the X-Dot I/O. Please see the schematic on the right for the correct pinning.

The buttons are "Normally open", meaning that when they are not pressed, the wires are not interconnected and the signal will be LOW. When a button is pressed, the signal will be HIGH. The IP Rating of is IP65.
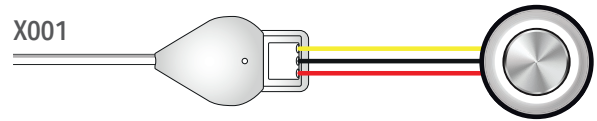
X001

API commands button input

Button is pressed	X001A[1]
Button is released	X001A[0]

Example API commands button LED control
Ramp from 00% brightness to 99% brightness in 1.2s

`X001B[3009912]`

Continuously pulse from 00% to 99% brightness in 1.0s

`X001B[4009910]`

Pressure matts

Nexmosphere offers pressure matts which are compatible with the XDW-I56 and XDW-I36. The part codes are:

S-PM6017S	*595 x 170mm x 3mm*
S-PM7239S	*720 x 390mm x 3mm*
S-PM7256S	*720 x 560mm x 3mm*

They come with 180cm color-coded twisted wire pairs connected to the pressure matt, and with ferrules for easy connection to the X-Dot I/O.

The white/black twisted wires should be connected to the X-Dot I/O for detecting when a person steps on or off the pressure matt. The pressure matts are "Normally open", meaning that when nobody stands on the pressure matts, the wires are not interconnected and the signal will be LOW. When someone steps on the pressure matt, the signal will be HIGH.

The red/black twisted wires are always interconnected, and when connected will therefore always generate a HIGH signal, regardless of whether a person stand on the pressure matt or not. Typically, this is used for security purposes, as when the wired are cut, the signal will become LOW. In case both options need to be utilized, each of the wire pairs needs to be connected to a separate X-Dot I/O.

The pressure matts have an actuation pressure of 25KG over 50mm2. The IP Rating is IP64.
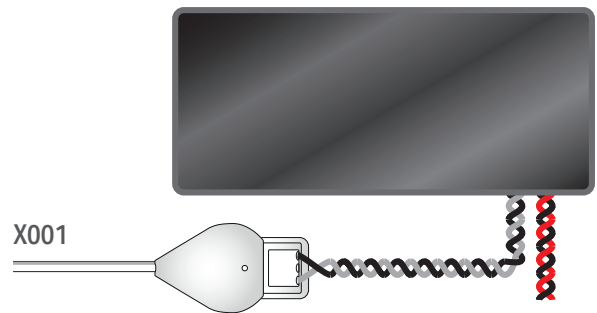
X001

API commands pressure matt trigger

Person steps on pressure matt	X001A[1]
Person steps off pressure matt	X001A[0]

X001
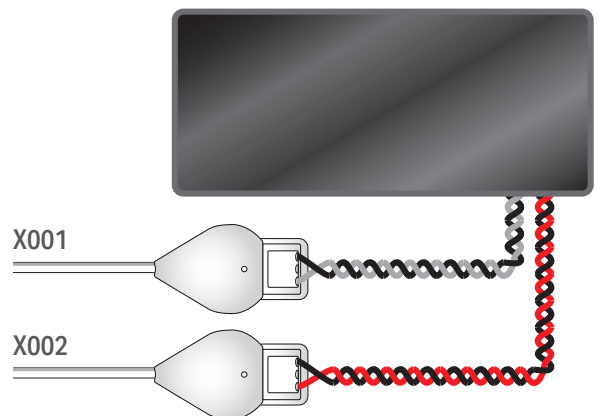
X002

API commands security trigger

No security breach (wires intact)	X002A[1]
Security breach (wires cut)	X002A[0]

Relay

Nexmosphere offers a Solid State Relay (SSR) which is compatible with the XDW-I56. The part code is:

S-RL05231   *output max 230VAC/10A*

It comes with a 180cm color-coded twisted wire pair already connected to the screw input terminals of the relay, and with ferrules for easy connection to the X-Dot I/O.

The red wire needs to be connected to the Output terminal *of the X-Dot I/O*. The black wire needs to be connected to the Ground terminal *of the X-Dot I/O*.

The AC device which is controlled by the relay should be connected to the OUTPUT terminals *of the relay* as indicated in the schematic on the right. This should be done by a qualified technician according to local regulations. For correct wiring color codes, please check local standards.

When the relay is switched ON, the red status LED on the relay is lit. When the relay is switched off, the red status LED will be off as well.

Please note the S-RL05231 can only switch AC voltages as it switches at zero-crossing. It is not possible to switch DC voltages.

At start-up the output pin on the X-Dot IO will be ON per default, meaning that the AC device will be ON as well.
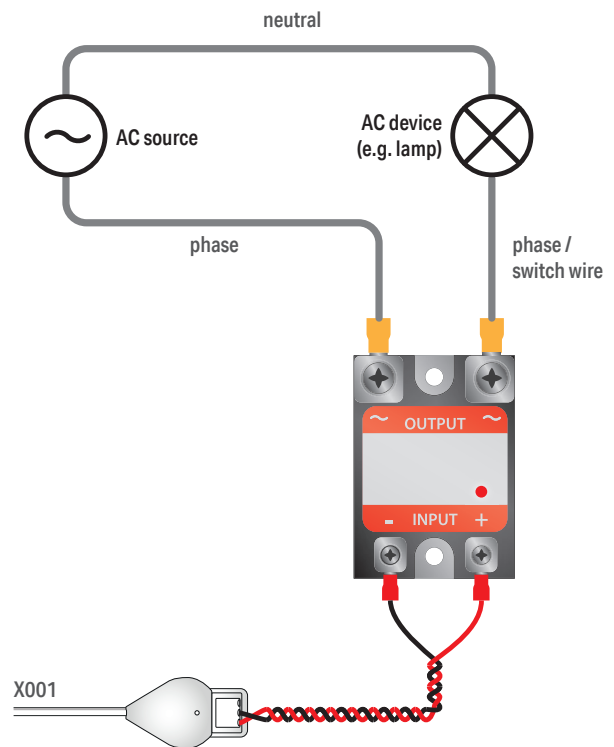
API commands relay control

X001A[1]	*Set Relay ON*
X001A[0]	*Set Relay OFF*

5 - Settings

The X-Dot I/O has one setting which determines the status LED behaviour of the sensor. The setting can be adjusted by sending X-talk setting commands via the API. After a power cycle, the setting always returns back to default.

Setting 1: Status LED behaviour

1. LED always on	`X001S[1:1]`
2. LED always off	`X001S[1:2]`
3. LED on when input is HIGH (def)	`X001S[1:3]`
4. LED off when input is HIGH	`X001S[1:4]`

When set to 4:3, the status LED will be on when the input is HIGH and off when the input is LOW. Vice versa, when set to 4:4, the status LED will be off when the input is HIGH and on when the input is LOW.

6. Quick test

In order to test if the X-Dot I/O is installed correctly, please follow the test procedure below:

Step 1 - Setup

First, connect an Input device such as a push button to the X-Dot I/O. Secondly, connect the X-Dot I/O to an Xperience controller and power the Xperience controller.
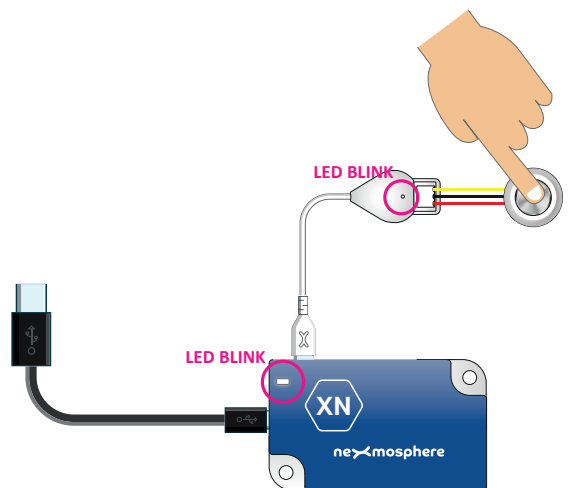
The green status LED of the X-Dot I/O should go on. The status LED of the controller will start to blink and once power-up is completed will be lit continuously

Connect to powered USB port
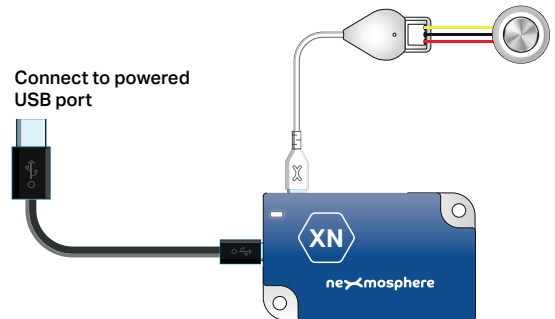
Step 2 - Test

Activate the Input device (e.g. push the button)

Both the green status LED of the sensor and the status LED of the controller should blink.

LED BLINK

LED BLINK

In case any of the steps above does not provide the expected result, please check the installation guidelines in this document.

For a full test we recommend to connect the setup to a mediaplayer or PC and test all API commands listed in this document (see section 3, page 2-3). For more information on how to setup a test for your controller, please see the Quick Start Guide of the Xperience controller you are using. These are available on nexmosphere.com/support-documentation

Please contact support@nexmosphere.com for any support questions you may have.