

1. General

BrightSign's digital signal media players and Nexmosphere's Xperience platform can seamlessly integrate to create a robust and reliable setup in which digital content and real-life sensor input are easily combined into an engaging experience. Nexmosphere and BrightSign are Technology Partners, meaning that compatibility between all BrightSign Players and Nexmosphere controllers is guaranteed. This document offers step-by-step instructions for first-time users on how to set up a BrightAuthor:connected presentation with integrated Nexmosphere sensor-input.

The information, instructions and examples provided in this document are categorized in 2 different levels:

- ESSENTIAL** gain a basic understanding which enables you to create an interactive Nexmosphere/Brightsign application
- ADVANCED** learn how to create more advanced presentations with dynamic behavior

The information in this document is created for users who have basic knowledge of BrightSign players and BrightAuthor:connected software. If this is not the case and you have never worked with BrightSign / BrightAuthor:connected before, please follow BrightSign's Quick Start instructions before continuing reading this document: <https://brightsign.zendesk.com/hc/en-us>.

Table of content

1.	General	1
2.	Ess API principles	2
3.	Ess Hardware setup	3
4.	Ess BrightAuthor:connected setup	4
5.	Ess Embedding Nexmosphere sensor input	5
	Ess 5.1 Serial input events	5
	Ess Example: RFID Serial Input Event	6
	Adv 5.2 Assign Serial Input to User Variable	7
	Adv Example: Assign presence sensor value to User Variable	8
6.	Ess Embedding Nexmosphere control output	9
	Ess 6.1 Serial output events	9
	Ess Example: X-Wave Serial output command	10
	Adv 6.2 Assign User Variables to Serial Output	11
	Adv Example: Assign User Variable to X-Wave Serial output command	12
7.	Terminology and Additional sources	13

2. API principles

Nexmosphere controllers have a USB or Serial interface which is used to communicate with the BrightSign digital signage player. How the BrightSign player and Nexmosphere controller communicate is defined by Nexmosphere’s serial API protocol. In this section, the main principles of the API are explained. It is not necessary to fully understand the API structure in order to complete the instructions in this document. To keep it simple, the applicable API commands for each example are explicitly provided. However, in order to fully comprehend how the API works, we recommend reading the API manual, which can be downloaded on the Nexmosphere support documentation page: <https://nexmosphere.com/support-documentation>.

2.1 - General API logic

The general concept of the API is to offer a flexible command set for both input and output operations which provides full scripting control to the BrightSign player. The Nexmosphere controller acts as a sensor/actuator hub which provides serial output when a specific sensor Element is triggered (for example a pick-up, motion or touch) and provides control over output Elements (for example animated LED strips) via serial input commands.

2.2 - API command structure

The command structure for each command is as follows:

TYPE ADDRESS FORMAT [COMMAND]

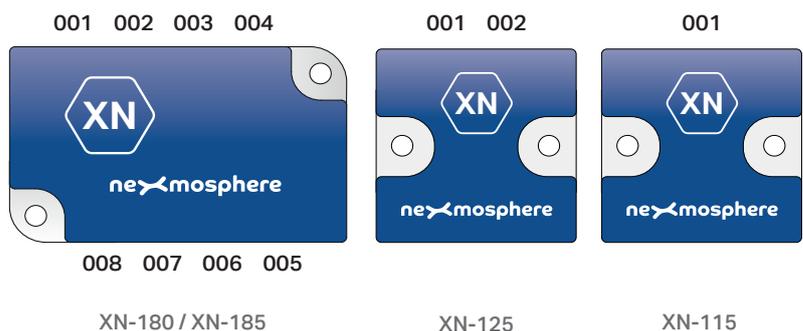
- TYPE =** **type of command**
 X= X-Talk command - this type of command is used to receive from / control any Element connected to an X-Talk interface
 G = Generic control command - not in the scope of this document
 S = System command - not in the scope of this document
 D = Diagnostic command - not in the scope of this document
- ADDRESS =** **channel address to which the command is send**
 value between 0-999
- FORMAT =** **format of the command**
 A = short command (number between 0-65535)
 B = long command (ascii string of 0-30 characters)
 S = setting command (custom format for each setting)
- [=** **start of command**
 fixed
- COMMAND =** **the actual command**
 for each function and element the command is specified in the serial API document
-] =** **end of command**
 fixed

2.3 - API addressing and structure

When an Xperience controller sends an API command to the BrightSign player, the address indicates by which Element the command was triggered. Vice versa, when sending an API command from a BrightSign player to an Xperience controller, the address indicates to the Xperience controller to which X-Talk Element the command is addressed. Nexmosphere has several ranges of Xperience controllers: XN, XC and XM. For first time users, it is recommended to start with the XN range. Therefore, only XN controllers are used in the examples provided in this document.

XN-Range

The XN-180 and XN-185 both have 8 X-Talk interfaces, addressed 1 to 8. As an address in an API command should always consist out of 3 digits, the addresses are numbered 001, 002, and so on. The physical layout of the addresses on the XN-180 and XN-185 controller is indicated in the image on the right. The XN-125 and XN-115 respectively have 2 and 1 X-Talk interfaces.

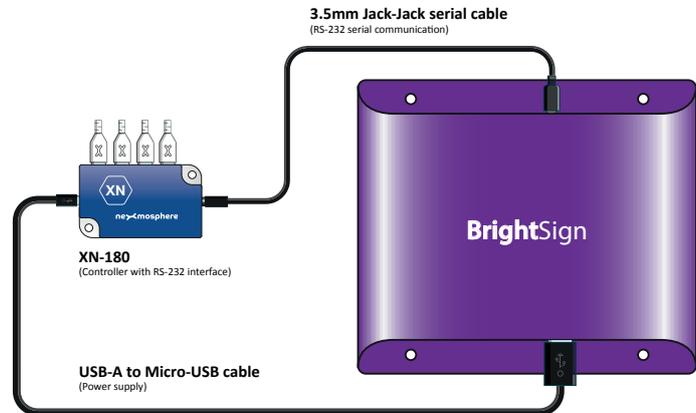


There are two options for connecting an XN controller to a BrightSign player: via Serial or USB.

- XN-180 can be connected via Serial
- XN-185 / XN-125 / XN-115 can be connected via USB

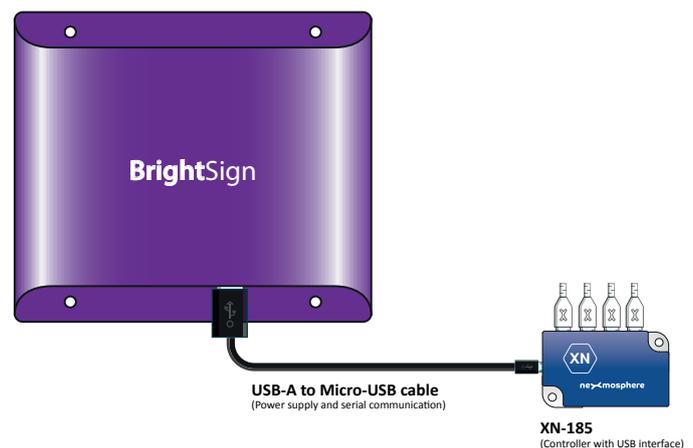
Serial connection

- When using an XN controller with Serial connection such as the XN-180, a 3.5mm Jack-Jack cable is used to connect the serial interface of the XN-180 to the serial interface of the BrightSign player. For powering the XN-180 either the USB port of the BrightSign player, or a regular USB power supply can be used.



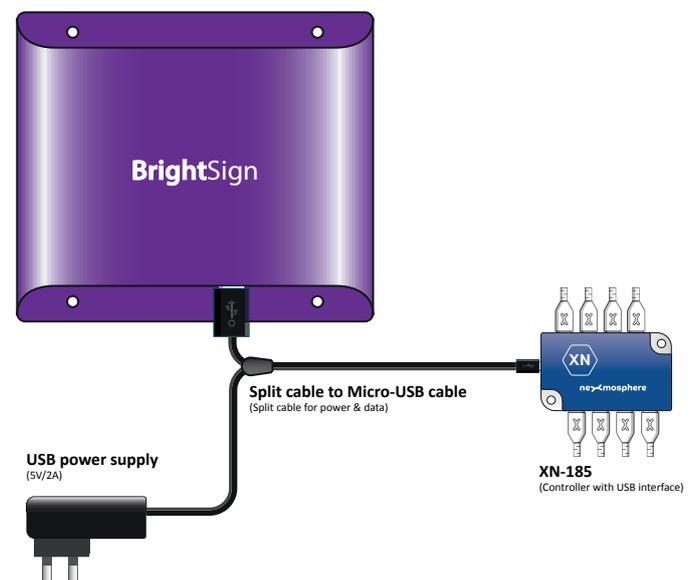
USB connection

- When using an XN controller with USB connection such as the XN-185, XN-125 or XN-115, a USB-A to Micro-USB cable should be used to connect the micro USB interface of the XN controller to the USB-A interface on the BrightSign player. The XN controller is powered via the USB port of the BrightSign player in this case. **Make sure the XN controller is connected to the USB port before powering up the BrightSign player.**



USB connection - Split Cable

- In case the XN-controller and the connected Elements need more power than the USB-A interface of the BrightSign player can provide, a split cable with separate power supply should be used.



BrightAuthor software

1. Download the latest version of BrightAuthor:connected from <https://www.brightsign.biz/downloads/overview>
2. Open BrightAuthor:connected

Create New Presentation

3. Click "New Presentation"
4. In the left column, select "Single Zone" -> "Playlist"
5. Fill in the required information. On the right, an example is provided
6. Click "START"



Name	Nexmosphere_base
Destination	C:\Documents
Target Device	HD1024
Connector	HDMI
Target Resolution	1920x1080
Target Frame Rate	60p
Orientation	Landscape

Set playlist type to "interactive"

7. Select the "Content" tab
8. In the upper right corner of the Content area, switch to "interactive" as playlist type



Set Serial settings

9. In the upper right corner click "Presentation settings" -> "Interactive" -> "Connectors"

Set the Serial settings to match the Serial specifications of the API protocol:

Baudrate:	115200
Data bits:	8
Parity:	None
Stop Bits:	1
Protocol:	ASCII
EOL:	CR+LF

Do this for port "0" and port "2".

Place content in Library

10. Place your digital content in a dedicated folder somewhere on your PC. In BrightAuthor:connected, add your content folder to the Library (left part of screen).

Save your presentation

11. Go to "File" -> "Save as" and save your BrightAuthor:connected presentation.

You now have a BrightAuthor:connected presentation which you can use as a base setup for all your future interactive BrightSign / Nexmosphere presentations.

TOUCH	CONNECTORS	NETWORKING
Serial		
Port	0	
Protocol	ASCII	
Baud rate	115200	
Data bits	8	
Parity	none	
Stop bits	1	
Send EOL	CR + LF	
Receive EOL	CR + LF	
<input type="checkbox"/> Invert signals		

The XN controller sends a serial command to the BrightSign player each time a sensor is triggered (changed sensor value). Embedding Nexmosphere sensor-input into a BrightAuthor:connected presentation is therefore done via Serial Input Events.

5.1 - Serial Input Event

In BrightAuthor:connected, "Events" can be used to trigger a transition to a new state. There are multiple types of events such as "Timeout", "Media End" and "Keyboard Input". However, for embedding the input of a Nexmosphere sensor Element into a BrightAuthor:connected presentation, only 1 type of event can be used: "Serial Input". For each "Serial Input" event. There are 4 variables which need to be specified:

1. Specify port

The port specifies from which hardware interface the Serial Input will be received.

In case of serial interface (XN-180): **0**
 In case of USB interface (XN-185/XN-125/XN-115): **2**

2. Specify serial input

This is the actual command which the XN controller sends when the desired trigger is detected by one of the connected sensor Elements. For all of Nexmosphere's Elements, every available trigger command is listed in the API manual, which can be downloaded on Nexmosphere's support documentation page: <https://nexmosphere.com/support-documentation>. Example: when a XY-240 presence sensor connected to X-talk interface 1 detects an object at distance zone 4, the serial command will be: **X001B[Dz=04]**

3. Start state

This is the state to which the Serial Input event is linked. In other words: only when the BrightAuthor presentation is in this state, the Serial Input event is active.

4. Action

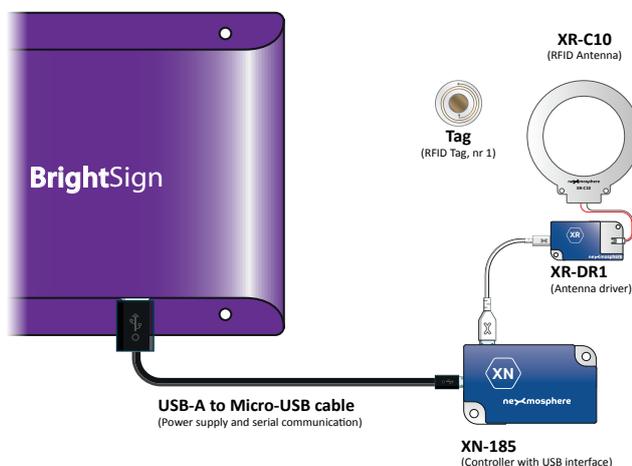
This determines which action the BrightAuthor presentation should execute when the specified Serial Input is received. There are 3 options:

Transition to new state + specifying which state

Return to prior state

Remain on current state (option: Continuous, Stop playback, Stop playback and clear screen)

Example - RFID Serial Input Event



On the following page, a practical step-by-step example is provided on how to implement a Serial Input Event. In this specific example:

Hardware Setup

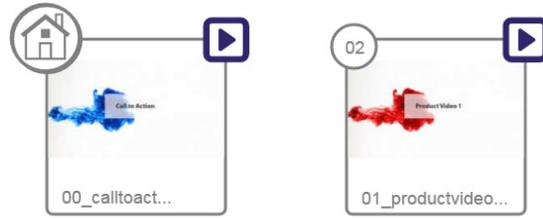
- XN-185, XN-125 or XN-115 controller
- XR-DR1 + antenna + RFID tags
- BrightSign player

Functionality

- The BrightAuthor:connected presentation has 2 states: "Default" and "State 1". Each state contains a video file.
- If RFID Tag 1 is picked up, the BrightSign switches to "State 1".
- If RFID tag 1 is placed back, the BrightSign switches back to "Default".

Step 1 - Create 2 states

1. Drag a video file from the Assets section (bottom) into the interactive playlist. Click on the state, and fill in "Default" as State name in the State Properties on the right.
 2. Repeat with a second video and name it "State 1"
- Please note that renaming the states to "Default" and "State 1" is only done to make this example clear and unambiguous.



Step 2 - Add Serial Input Event (for pick-up of tag 1)

3. Select "Serial Input Event" in the Events ribbon (right). Click on the bottom section of the "Default" state.



Step 3 - Fill in parameters of Serial Input Event

4. Fill in the parameters of the Serial Input Event as shown in the screenshot below.
- Note that the serial input **XR[PU001]** is the API command which is sent from the XN controller to the BrightSign player when RFID tag 1 is picked up.

Event Type
Serial Input

Start State
Default

Specify Port
2

Specify Serial Input
XR[PU001]

Assign input to variable
 Assign wildcard to variable

Target State
Transition to new state
State 1

Step 4 - Add 2nd Serial Input Event (for tag place-back)

5. Select "Serial Input Event" in the Events ribbon and click on the bottom section of the "State 1" state. Fill in the parameters of the Serial Input Event as shown in the screenshot below.
- Note that the serial input **XR[PB001]** is the API command which is sent to the Brightsign player when RFID tag 1 is placed back.

Event Type
Serial Input

Start State
State 1

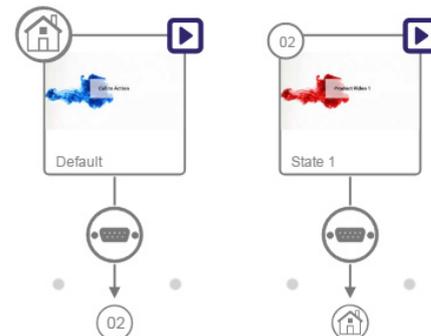
Specify Port
2

Specify Serial Input
XR[PB001]

Assign input to variable
 Assign wildcard to variable

Target State
Transition to new state
Default

The end result of your presentation should look similar to the screenshot on the right: two states, which are linked to each other via Serial Input events.



5.2 - User variables

In BrightAuthor:connected, User Variables are customizable values which can be used to create dynamic behavior in your presentation. When used in "Live Text", User Variables display the current value of the variable. The value can also dynamically be changed during a presentation using the "Set Variable" or "Increase/Decrease" commands.

You can use Serial Input Events to modify the value of a User Variable. By using the so-called <*> wildcard, you can assign part of a serial input to a User Variable. In practice, this means that you can assign the value of a Nexmosphere sensor to a variable, and use this variable to set Conditional Targets or to display the value live in your presentation. In order to assign part of a serial input to a User Variable and create a Conditional Target, follow the steps below:

1. Create User Variables

Go to "Presentation Settings"-> Select the "Variables" drop-down.
Click + "Add Variable. Fill in the desired parameters for your variable:



- Variable Name: any name you deem fit, e.g. "variable_1"
- Default Value: any value, if not sure leave blank
- Access: Select "Private" ("Shared: is outside the scope of this document)
- Type: Select "Local" ("Networked" and "System variable" are outside the scope of this document)

2. Assign serial input to User Variable

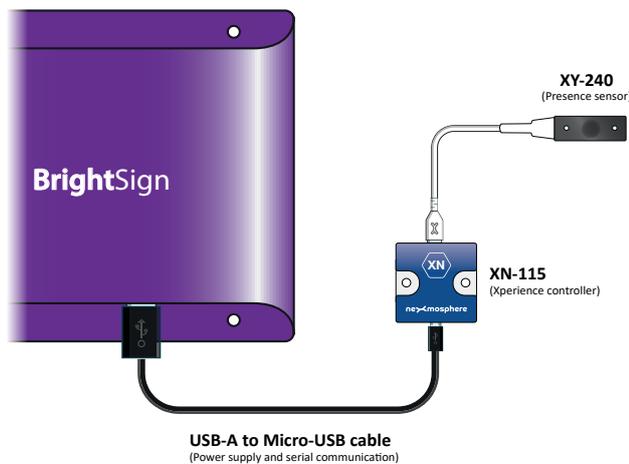
Add a serial input event to your presentation. In the "Specify serial input" field (Event Properties), enter the expected serial input and replace the part you want to assign to a variable with <*>. For example X003B[Dz=<*>]. Select "Assign wildcard to variable" and choose the variable in the dropdown menu to which you want to assign the <*> wildcard. Select "Remain on current state" -> "Continuous" as Target State.

3. Set User Variable as Conditional Target

In the Event Properties of the serial event, click "Advanced"
Click + "Add Conditional Target" and fill in the conditions.
E.g. "variable_1" | "greater than" | "1".
Specify what should happen when the conditional target is met,
E.g. "Transition to new state".



Example - Assign presence sensor value to User Variable and set Conditional Target



On the following page, a practical step-by-step example is provided on how to assign the value of a presence sensor to a User Variable and set a Conditional Target.

In this specific example:

Hardware Setup

- XN-115 controller
- XY-240 Presence sensor
- BrightSign player

Functionality

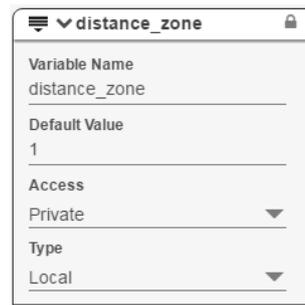
- The BrightAuthor:connected presentation has 2 states: "Default" and "State 1". Each state contains a video file.
- If the presence sensor value is ≥ 4 , the BrightSign switches to "State 1".
- If the presence sensor value is < 4 , the BrightSign switches back to "Default".

Step 1 - Create 2 states

1. Create 2 states and name them "Default" and "State 1".
For detailed instructions see the example on page 6.

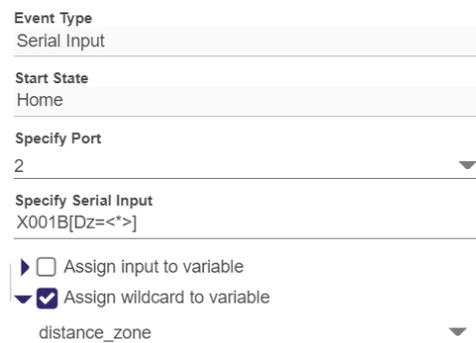
Step 2 - Create a User Variable named "distance_zone"

2. Go to "Presentation settings" -> "Variables"
3. Select the "Variables" drop down. Click + "Add Variable"
4. Fill in the parameters of the variable as shown in the screenshot on the right.



Step 3 - Add a Serial Input event to state "Default"

5. In the Serial Event Properties, fill in:
 - Specify port **2**
 - Specify serial input **X001B[Dz=<*>]**
 - Target State: **"Remain on current state" - "Continuous"**

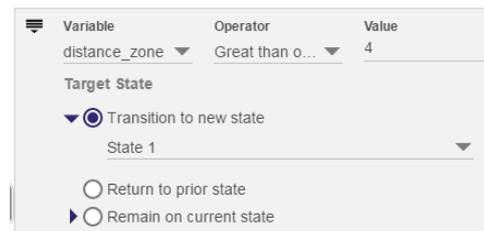


Step 4 - Assign <*> wildcard in Serial Input to variable

6. In the Serial Event Properties:
 - Select **"Assign wildcard to variable"**
 - Select **"distance_zone"** in the drop-down

Step 5 - Set Conditional Target for transition to "State 1"

7. In the Serial Event Properties, click "Advanced".
8. Click on + "Add Conditional Target".
9. Fill in the Conditional Target parameters as shown in the screenshot on the right.

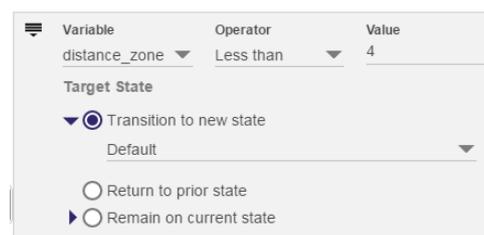


Step 6 - Add a Serial Input event to state "State 1"

10. Repeat the instructions described in step 3 and 4.

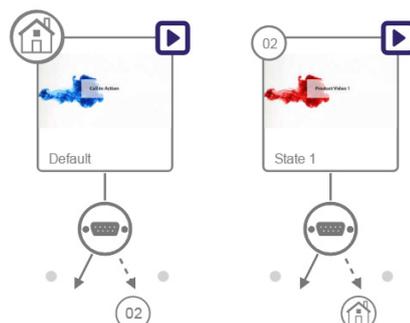
Step 7 - Set Conditional Target for transition back to "Default"

11. In the Serial Event Properties, click "Advanced".
12. Click on + "Add Conditional Target".
13. Fill in the Conditional Target parameters as shown in the screenshot on the right.



The end result of your presentation should look similar to the screenshot on the right: two states, with each a separate Serial Input Event, which both have a Conditional Target.

The presentation can now be published and tested on the BrightSign player.



In order to set the output or a setting of an Element, a Serial Command needs to be sent from the BrightSign to the XN controller to which the Element is connected. Embedding Nexmosphere control output - for example LED control- into a BrightAuthor:connected presentation is therefore done via a "Send Serial" command.

6.1 - Send Serial string (EOL)

In BrightAuthor, "Commands" can be implemented to control output on one of the available interfaces. There are multiple types of Commands such as "Set Audio" and "GPIO". However, for controlling the output of a Nexmosphere sensor Element in a BrightAuthor:connected presentation, only 1 type of Command can be used: "Send". For each "Send" command, there are 3 variables which need to be specified:

1. Command Parameters

The command parameter specifies the type of command which needs to be sent. For controlling Nexmosphere output, this should always be **Serial string (EOL)**.

2. Specify port

The port specifies to which hardware interface the Serial string will be sent.

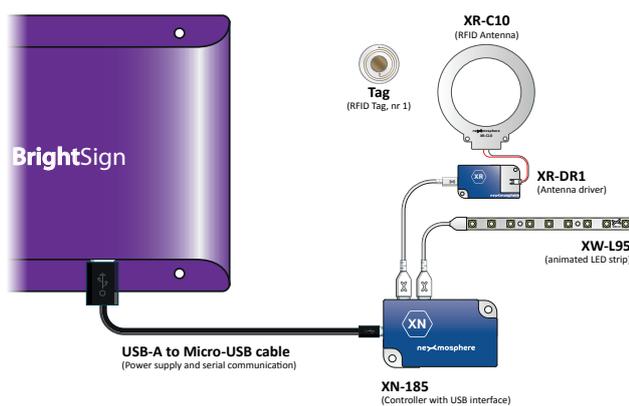
In case of serial interface (XN-180): 0
 In case of USB interface (XN-185/XN-125/XN-115): 2

3. String

This is the actual ASCII string which the BrightSign sends to the XN controller to control the output of the connected Elements. Every available output and setting command for each of Nexmosphere's Elements is listed in the API manual, which can be downloaded from Nexmosphere's support documentation page: <https://nexmosphere.com/support-documentation>. Example: to set the output of an X-Wave LED connected to X-talk interface 1 to solid blue, the serial command to be used is: **X001B[299305]**.

When sending consecutive control commands to an Xperience controller, it is recommended to incorporate a 50mS delay. In the next example it is explained how to do this.

Example - X-Wave Serial output command with User Variables



On the following page, a practical step-by-step example is provided on how to implement a "Send Serial String EOL" command. In this specific example:

Hardware Setup

- BrightSign player
- XN-185, XN-125 or XN-115 controller
- XR-DR1 + antenna + RFID tags
- XW-L95 animated LED strip

Functionality

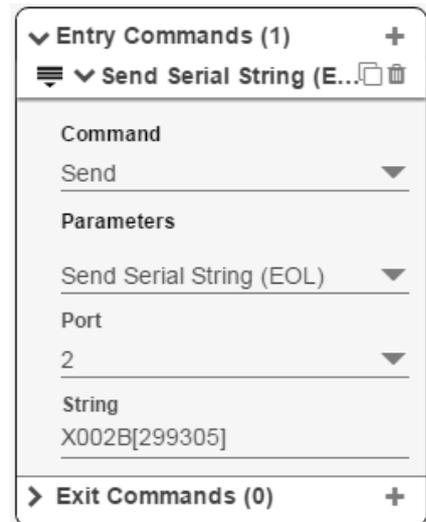
- The presentation has 2 states: "Default" and "State 1". Each state contains a video file.
- If RFID Tag 1 is picked up, the BrightSign switches to "State 1" and sets the X-Wave LED to a red wave pattern.
- If RFID tag 1 is placed back, the BrightSign switches back to "Default" and sets the X-Wave LED to solid blue.

Step 1 - Open the BA presentation created in the first example

1. In the example on this page, we will expand the BrightAuthor:connected presentation created in the first example on page 6.

Step 2 - Add Send command in state "Default"

2. Click on state "Default".
3. Select the "Advanced" tab in the State Properties
4. Click on + , to the right of "Entry Commands".
5. Fill in the parameters of the Command as shown in the screenshot on the right.



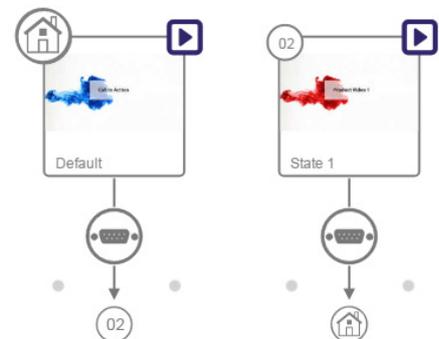
Step 3 - Add Send command in state "State 1"

6. Click on state "State 1".
7. Select the "Advanced" tab in the State Properties
8. Click on + , to the right of "Entry Commands".
9. Fill in the parameters of the Command as shown in the screenshot on the right.



The end result of your presentation should look similar to the screenshot on the right: two states, which are linked to each other via Serial Input events. When entering each state, a serial command to control the X-Wave LEDs is send.

The presentation can now be published and tested on the BrightSign player.



In BrightAuthor, User Variables are customizable values which can be used to create dynamic behavior in your presentation. When used in "Live Text", User Variables display the current value of the variable. The value can also dynamically be changed during a presentation using the "Set Variable" or "Increase/Decrease" commands.

A User Variable can also be utilized in a "Send Serial" command. By entering the name of the variable between two sets of brackets (e.g. "{{variable1}}") into the serial string, the value of the variable can be embedded in the serial output. The advantage of using this method is that in case the same serial output command is embedded in multiple states, and you need to change it, you only need to change 1 variable instead of having to change the serial output separately in each state. In order to assign User Variables to serial output:

1. Create User Variables

Go to "Presentation Settings" -> Select the "Variables" drop-down.
Click + "Add Variable. Fill in the desired parameters for your variable:

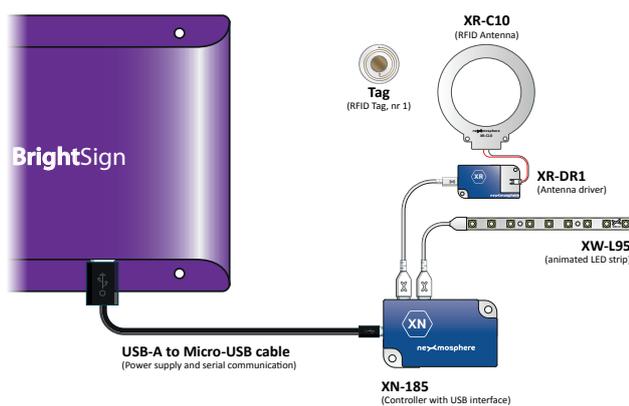


- Variable Name: any name you deem fit, e.g. "variable_1"
- Default Value: any value, if not sure leave blank
- Access: Select "Private" ("Shared" is outside the scope of this document)
- Type: Select "Local" ("Networked" and "System variable" are outside the scope of this document)

2. Assign User Variable to Serial output

Go to the "Advanced" tab of the State Properties window of the state to which you want to add a "Send Serial" command. Select "Send" command and "Serial string (EOL)" as Command parameter. In the "string" field, enter the serial output and replace the part of the string you want to have replaced with the User Variable name. Place the name of the User Variable between two brackets {{ .. }}. For example: **X002B[{{variable_1}}]**. In case the value of variable_1 is 299305, the serial output will be **X002B[299305]**.

Example - X-Wave Serial output command with User Variables



On the following page, a practical step-by-step example is provided on how to implement a "Send Serial String EOL" command. In this specific example:

Hardware Setup

- BrightSign player
- XN-185, XN-125 or XN-115 controller
- XR-DR1 + antenna + RFID tags
- XW-L95 animated LED strip

Functionality

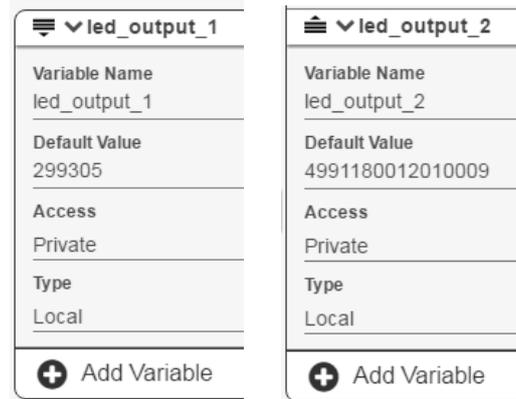
- The presentation has 2 states: "Default" and "State 1". Each state contains a video file.
- If RFID Tag 1 is picked up, the BrightSign switches to "State 1" and sets the X-Wave LED to a red wave pattern.
- If RFID tag 1 is placed back, the BrightSign switches back to "Default" and sets the X-Wave LED to solid blue.

Step 1 - Open the BA presentation created in the first example

1. In the example on this page, we will expand the BrightAuthor:connected presentation created in the first example on page 6.

Step 2 - Create a User Variables

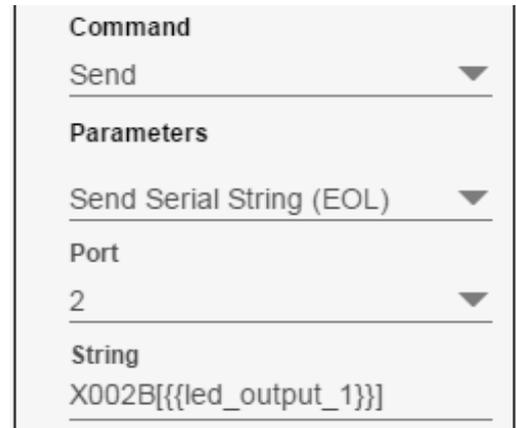
2. Go to "Presentation settings" -> "Variables"
3. Select the "Variables" drop down. Click + "Add Variable"
4. Fill in the parameters of the variables as shown in the screenshot on the right.



Step 3 - Add User Variable to Send command in state "Default"

5. Click on state "Default".
6. Select the "Advanced" tab in the State Properties
7. Click on + , to the right of "Entry Commands".
8. Fill in the parameters of the Command as shown in the screenshot on the right.

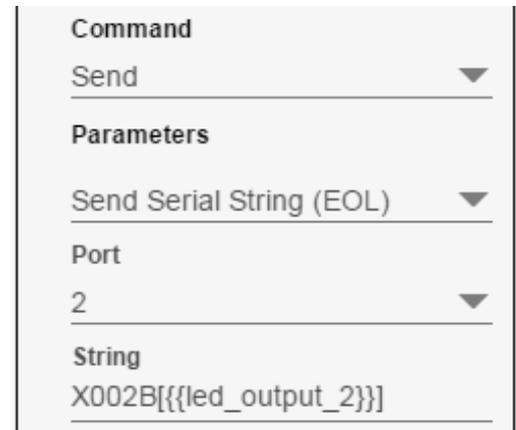
Note that the name of the variable is placed between brackets {{...}}.



Step 4- Add User Variable to Send command in state "State 1"

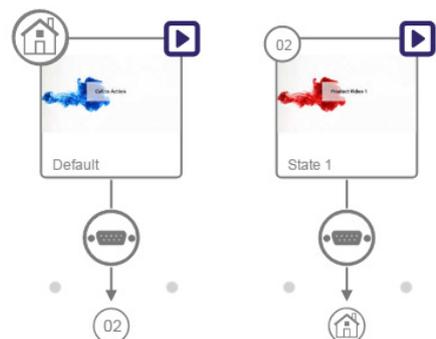
9. Click on state "State 1".
10. Select the "Advanced" tab in the State Properties
11. Click on + , to the right of "Entry Commands".
12. Fill in the parameters of the Command as shown in the screenshot on the right.

Note that the name of the variable is placed between brackets {{...}}.



The end result of your presentation should look similar to the screenshot on the right: two states, which are linked to each other via Serial Input events. When entering each state, a serial command to control the X-Wave LEDs is sent.

The presentation can now be published and tested on the BrightSign player.



7 - TERMINOLOGY AND ADDITIONAL SOURCES

In following the instructions in this manual you'll be able to set up your own interactive presentations using the Nexmosphere sensor hub in combination with BrightSign and BrightAuthor:connected. If wanting to go more in detail on advanced/other topics please refer to the following sources:

<https://nexmosphere.com/support-documentation/>

<https://docs.brightsign.biz/display/DOC/BrightAuthor%3Aconnected>

Element (Nexmosphere)

Any of Nexmosphere's sensors and actuators which can be connected to an Xperience controller.

Xperience controller (Nexmosphere)

The controller to which Nexmosphere's Elements are connected and which serves as an interface hub between the sensors and the BrightSign player.

API (Nexmosphere)

Nexmosphere's serial API protocol defines how the BrightSign player and Nexmosphere controller communicate.

<https://nexmosphere.com/support-documentation/>

Serial Input Event (BrightAuthor)

The Serial Input Event specifies the action that occurs when the BrightSign player receives input from a device connected to a serial port.

<https://docs.brightsign.biz/display/DOC/Event+Properties>

Commands (BrightAuthor)

Commands can be implemented to control output on one of the available interfaces. For controlling the output of a Nexmosphere Element in a BrightAuthor:connected presentation, the "Send" - "Serial string (EOL)" is used. You can add commands to interactive events or to states. If you add a command to the interactive event, the command will be performed when that event occurs.

<https://docs.brightsign.biz/display/DOC/Conditional+Targets+and+Commands>

User Variables (BrightAuthor)

User Variables are customizable values which can be used to create dynamic behavior in your presentation. By using the so-called <*> wildcard, you can assign part of a serial input to a User Variable. In practice, this means that you can assign the value of a Nexmosphere sensor to a variable, and use this variable to set Conditional Targets.

<https://docs.brightsign.biz/display/DOC/Presentation+Settings>

Conditional Target (BrightAuthor)

Conditional Targets allow you to change the settings of an event transition depending on the value of a User Variable. With this feature, you can associate the behavior of a presentation to the value of a Nexmosphere sensor.

<https://docs.brightsign.biz/display/DOC/Conditional+Targets+and+Commands>