

**Table of content**

<b>1. General</b>	<b>1</b>
<b>2. Product overview</b>	<b>1</b>
<b>3. Functionality and API commands</b>	<b>2</b>
3.1 -3.3 Read functionalities	2
3.4 -3.7 Write functionalities	4
3.8 -3.10 Other functionalities	6
<b>4. Installation requirements and guidelines</b>	<b>7</b>
4.1 Connection Diagrams	7
4.2 Specifications and Hardware integration guidelines	8
<b>5. Settings</b>	<b>11</b>
5.1 Settings: Driver behaviour	11
5.2 Settings: API output	12
<b>6. Quick test</b>	<b>13</b>

**1. General**

The Nexmosphere XR-2 RFID drivers offer read and write functionalities for NTAG213 RFID tags. This document provides explanation of the available functionalities and instructions on how to install and integrate the sensor 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**

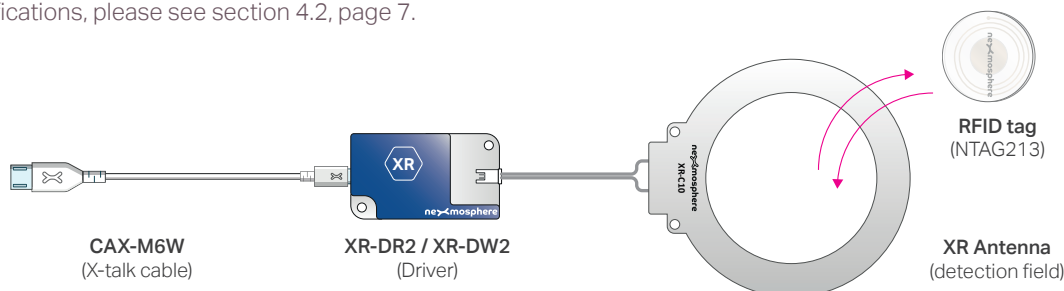
The XR-2 RFID drivers are available in two models: XR-DR2 and XR-DW2. Both drivers are compatible with all RFID antennas from the Nexmosphere XR Range.

	XR-DR2	XR-DW2
Read UID (Unique Identifier)	✓	✓
Read Tag number (1-65535)	✓	✓
Read custom text Labels	✓	✓
Write Tag number (1-65535)	✗	✓
Write custom text Labels	✗	✓



XR-DR2 / XR-DW2

To create an RFID sensor, an XR antenna needs to be connected to an XR-2 driver. The XR-2 driver can then be connected to one of Nexmosphere's Xperience controllers using a **CAX-M4W** (60cm) or **CAX-M6W** (180cm) X-talk cable. The driver creates an electromagnetic field on the XR antenna at a frequency of 13.56Mhz. When a RFID tag is placed in the antenna field, the data on the RFID tag is read by the XR-2 driver. This data (UID, Tagnr and Labels) is communicated to the Xperience controller as either a "tag detected" or "tag removed" event. For a detailed overview of all available antennas and their specifications, please see section 4.2, page 7.



## 3. Functionalities and API commands

The XR-DR2 and XR-DW2 both provide the following read functionalities:

1. **Read the UID of the RFID tag** - and indicate if the tag is removed (picked-up) or detected (placed)
2. **Read the Tagnr of the RFID tag** - and indicate if the tag is removed (picked-up) or detected (placed)
3. **Read custom text labels of the RFID tag** - and indicate if the tag is removed (picked-up) or detected (placed)

The XR-DW2 provides additional write functionalities:

4. **Write the Tagnr on the RFID tag** - a number between 1-65535 which can serve as an identifier
5. **Write custom text labels on the RFID tag** - which can contain 16 ASCII characters each
6. **Erasing data on the RFID tag** - erase the Tag number or custom text label
7. **Password protection** - lock or unlock a tag with a password

The following sections will cover each of 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 - Read the UID

When a tag is detected or removed, an API message is triggered. Per default, this API message indicates the UID of the tag which was detected or removed. This API message has the following format:

---

<code>X001B[TD=UID:XXXXXXXXXXXXXXXX]</code>	<b>Tag detected (TD)</b>	XXXXXXXXXXXXXXXX = UID	14 characters
<code>X001B[TR=UID:XXXXXXXXXXXXXXXX]</code>	<b>Tag removed (TR)</b>	XXXXXXXXXXXXXXXX = UID	14 characters

---

*examples provided on following page*

### 3.2 - Read the Tag number

Next to the UID, a tag also contains a Tag number. This number can serve as an identifier. Unlike the UID, the tag number can be adjusted and multiple tags can have the same Tag number. In order to read the Tag number instead of the UID, the following setting must be send:

`x001s[10:2]` Set output to Tag number

When a tag is detected or removed, an API message is triggered. This API message has the following format:

---

<code>X001B[TD=TNR:XXXXX]</code>	<b>Tag detected (TD)</b>	XXXXX=Tag nr	5 digits (00001 - 65535)
<code>X001B[TR=TNR:XXXXX]</code>	<b>Tag removed (TR)</b>	XXXXX=Tag nr	5 digits (00001 - 65535)

---

*examples provided on following page*

### 3.3 - Read the custom text Labels

A tag can also contain up to 3 custom text labels. These labels each have a text field up to 16 ASCII characters. In order to read Label 1, the following setting must be send:

`x001s[10:3]` Set output to text Label 1

When a tag is detected or removed, an API message is triggered. This API message has the following format:

---

<code>X001B[TD=LB1:XXXXXXXXXXXXXXXXXX]</code>	<b>Tag detected (TD)</b>	XXXXXXXXXXXXXXXXXX= text Label	1-16 characters
<code>X001B[TR=LB1:XXXXXXXXXXXXXXXXXX]</code>	<b>Tag removed (TR)</b>	XXXXXXXXXXXXXXXXXX= text Label	1-16 characters

---

*examples provided on following page*

Next to text label 1, the sensors can also be set to read label 2 or 3:

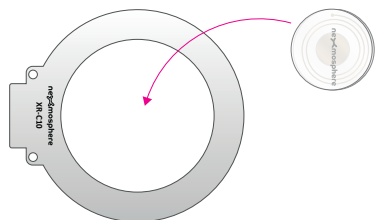
`x001s[10:4]` Set output to text Label 2

`x001s[10:5]` Set output to text Label 3

**UID example commands**

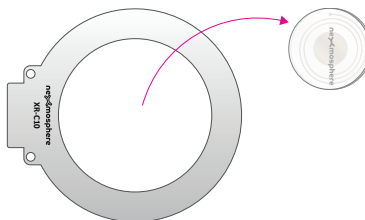
Tag detected with UID 045CDBA2DF4980, on RFID sensor connected to X-talk address 003:

**X003B[TD=UID:045CDBA2DF4980]**



Tag removed with UID 0475DAA2DF5980 on RFID sensor connected to X-talk address 005:

**X005B[TR=UID:0475DAA2DF5980]**



**Tag number example commands**

Tag detected with Tag number 1, on RFID sensor connected to X-talk address 006:

**X006B[TD=TNR:00001]**

Tag removed with Tag number 27, on RFID sensor connected to X-talk address 001:

**X001B[TR=TNR:00027]**

**Custom text label example commands**

Tag detected with label 1 "TENNIS SHOE", on RFID sensor connected to X-talk address 002:

**X002B[TD=LB1:TENNIS SHOE]**

Tag removed with label 2 "DISCOUNT A", on RFID sensor connected to X-talk address 004:

**X004B[TR=LB2:DISCOUNT A]**

**Combined output modes**

The output mode of the XR-2 driver can also be set to have several combinations of the available data types (UID, Tag number and Custom labels). For more information please see page 12, setting 10.

**Data requests**

Each data type can also be requested at any time by sending one of the following API command:

- X001B[UID?]** Request UID
- X001B[TNR?]** Request Tag number
- X001B[LB1?]** Request Label 1
- X001B[LB2?]** Request Label 2
- X001B[LB3?]** Request Label 3

The reply will be identical to the triggered API messages such as the examples listed on the top of this page.

In case multiple tags are placed on the antenna, a data request can also be addressed to a specific tag number.

- X001B[UID?#\*\*\*\*\*]** \*\*\*\*\* = tagnr 1-65535
- X001B[LB1?#\*\*\*\*\*]** \*\*\*\*\* = tagnr 1-65535
- X001B[LB2?#\*\*\*\*\*]** \*\*\*\*\* = tagnr 1-65535
- X001B[LB3?#\*\*\*\*\*]** \*\*\*\*\* = tagnr 1-65535

**Example API messages**

Request UID of tag number 3

**X001B[UID?#3]**

Request Label 1 of tag number 12

**X001B[LB1?#12]**

Request Label 2 of tag number 136

**X001B[LB2?#136]**

Request Label 3 of tag number 51819

**X001B[LB3?#51819]**

### 3.4 - Write the Tag number (XR-DW2 only)

The XR-DW2 can write the tag number of a tag which is placed within its detection field. This can be done by sending the following API command:

```
X001B [WR=TNR:XXXXX]
```

Overwrite Tag number XXXXX= tagnr 1-65535

When writing Tag numbers, consider the following:

- Alternatively to using a XR-DW2, a Tag number can also be written using a smartphone with NFC functionality. Please see page 6 for more information.
- A RFID tag can be locked with a password. If this is the case, the correct password must be set on the XR-DW2 before a write operation or unlock command will be accepted by the tag. The commands to do so are indicated on page 5.

In case multiple tags are placed on the antenna, a write command can also be addressed to a specific tag number.

```
X001B [WR=TNR#*****:XXXXX]
```

\*\*\*\* = current tagnr 1-65535 to be overwritten

##### = new tagnr 1-65535 to be written

#### Example API messages

Write Tag number 9 to the tag which is placed on an antenna connected to X-talk interface 003

```
X003B [WR=TNR:9]
```

Write Tag number 1234 to the tag which is placed on an antenna connected to X-talk interface 002

```
X002B [WR=TNR:1234]
```

Write Tag number 17 to a tag which currently has tag number 21 and is placed on an antenna connected to X-talk interface 006

```
X006B [WR=TNR#21:17]
```

### 3.5 - Write custom text label (XR-DW2 only)

The XR-DW2 can write the custom text labels of a tag which is placed within its detection field. This can be done by sending the following API commands:

```
X001B [WR=LB1:XXXXX.XXXXX]
```

(Over)write label 1 XXXXX..XXXXX= text Label 1-16 chars.

```
X001B [WR=LB2:XXXXX.XXXXX]
```

(Over)write label 2 XXXXX..XXXXX= text Label 1-16 chars.

```
X001B [WR=LB3:XXXXX.XXXXX]
```

(Over)write label 3 XXXXX..XXXXX= text Label 1-16 chars.

When writing custom text labels, consider the following:

- Alternatively to using a XR-DW2, a custom text Label can also be written using a smartphone with NFC functionality. Please see page 6 for more information.
- A RFID tag can be locked with a password. If this is the case, the correct password must be set on the XR-DW2 before a write operation or unlock command will be accepted by the tag. The commands to do so are indicated on page 5.

In case multiple tags are placed on the antenna, a write command can also be addressed to a specific tag number.

```
X001B [WR=LB1#*****:XXXXX.XXXXX]
```

\*\*\*\* = tagnr 1-65535

XXXXX..XXXXX = text Label 1-16 characters

#### Example API messages

Write "WINE BOTTLE A" to Label 1 on the tag which is placed on an antenna connected to X-talk interface 005

```
X005B [WR=LB1:WINE BOTTLE A]
```

Write "€14,95" to Label 2 on the tag which is placed on an antenna connected to X-talk interface 001

```
X001B [WR=LB2:€14,95]
```

Write "VIP ACCESS" to Label 3 on the tag with Tag number 32 and is placed on an antenna connected to X-talk interface 003

```
X001B [WR=LB3#32:VIP ACCESS]
```

## 3.6 - Erasing data fields on RFID tags (XR-DW2 only)

The XR-DW2 can erase specific data fields of a tag which is placed within its detection field. This can be done by sending the following API commands:

---

<b>X001B [ERASE=ALL]</b>	Erase all data fields (Tag number and Label 1, Label 2 and Label 3)
<b>X001B [ERASE=TAGNR]</b>	Erase the Tag number
<b>X001B [ERASE=LABELS]</b>	Erase all Labels (Label 1, Label 2 and Label 3)
<b>X001B [FORMAT]</b>	Format RFID tag (Erase all data on the RFID tag*) <small>*This will erase all NDEF records on the RFID tag, including non-Nexmosphere records</small>

---

When erasing data fields, consider the following:

- The UID of a tag is fixed and can't be erased.
- Alternatively to using a XR-DW2, a RFID tag can also be erased using a smartphone with NFC functionality. Please see page 6 for more information.
- A RFID tag can be locked with a password. If this is the case, the correct password must be set on the XR-DW2 before an erase operation or unlock command will be accepted by the tag. The commands to do so are indicated on this page.

In case multiple tags are placed on the antenna, an erase command can also be addressed to a specific tag number.

---

```
X001B [ERASE=ALL#*****]
X001B [ERASE=TAGNR#*****]
X001B [ERASE=LABELS#*****]
X001B [FORMAT#*****]
```

---

\*\*\*\*\* = tagnr 1-65535

## 3.7 - Password protection (XR-DW2 only)

The XR-DW2 can lock and unlock a RFID tag (which is placed within its detection field) with a password. In order to do so, first the password must be set on the XR-DW2. Once the password is set, the RFID tag can be locked and unlocked. This can be done by sending the following API commands:

---

<b>X001B [PASSWORD=XXXXXXXX]</b>	Set password on XR-DW2 XXXXXXXX= password 8 chars. 0-9 A-F
<b>X001B [LOCK]</b>	Lock RFID tag using the password set on the XR-DW2
<b>X001B [UNLOCK]</b>	Unlock RFID tag using the password set on the XR-DW2

---

When locking/unlocking tags, consider the following:

- Alternatively to using a XR-DW2, a RFID tag can also be locked or unlocked using a smartphone with NFC functionality. Please see page 6 for more information.

In case multiple tags are placed on the antenna, a lock or unlock command can also be addressed to a specific tag number.

---

```
X001B [LOCK#*****]
X001B [UNLOCK#*****]
```

---

\*\*\*\*\* = tagnr 1-65535

### 3.8 Reload tag data

When a new tag is detected, the XR-2 driver reads all data of the NTAG213 and stores this in its internal memory. For all subsequent reads of this tag, the driver only needs to read the UID of the tag and based on this, will look up all other info in its internal memory. This facilitates fast triggering on tag detection. However, if the data (Tag nr and Custom text labels) on the tag is changed (overwritten), the data of the tag which is stored in the XR-2 driver will be outdated. Therefore it is possible to reload all NDEF data on a detected tag by sending the following command:

---

<b>X001B [RELOAD=NDEF]</b>	Reload all tag data (NDEF records)
<b>X001B [RELOAD=NDEF#*****]</b>	Reload all tag data (NDEF records) of a specific Tag number

---

\*\*\*\*\* = tagnr 1-65535

When reloading tag data, consider the following:

- Reloading NDEF data can also be done automatically at a specific interval. For more information please see setting 17, page 11.

### 3.9 XR-DR1 EMULATION MODE

An XR-2 driver can be set to emulate a XR-DR1 driver. This can be done by sending the following API command:

---

<b>X001B [MODE=DR1]</b>	Set the XR-2 driver to XR-DR1 mode
-------------------------	------------------------------------

---

After sending this command, the complete setup (controller and XR-2 driver) must be repowered before XR-DR1 mode will become active. For more information on the XR-DR1 emulation mode, please see the product manual of the XR-DR1.

The XR-2 driver can be set back to its normal XR-2 mode by sending the following API command:

---

<b>X001B [MODE=DR2]</b>	Set the XR-2 driver back to its normal operation mode
-------------------------	---

---

After sending this command, the complete setup (controller and XR-2 driver) must be repowered before its normal XR-2 mode will become active.

The current mode of the XR-2 driver can be requested by sending the following API command:

---

<b>X001B [MODE?]</b>	Request current mode
----------------------	----------------------

---

In case the XR-2 driver is in its normal XR-2 mode, the reply will be as follows:

**X001B[MODE=DR2]**

In case the XR-2 driver is in DR1 mode, there will be no reply.

### 3.10 Write tag data using Smartphone with NFC

The Tag Number and Custom text labels can also be written on an NTAG213 RFID tag using a smartphone with NFC. There are several apps available which have NFC write capabilities, for example "NFC Tools". In order to write a Tag Number or Custom text label, create and write an **NDEF "text" record with UTF-8 encoding** and use the formats indicated below:

NDEF record for Tag number:	<b>TNR:*****</b>
NDEF record for text label 1:	<b>LB1:XXXXXXXXXXXXXXXXXX</b>
NDEF record for text label 2:	<b>LB2:XXXXXXXXXXXXXXXXXX</b>
NDEF record for text label 3:	<b>LB3:XXXXXXXXXXXXXXXXXX</b>

\*\*\*\*\* = tagnr 1-65535

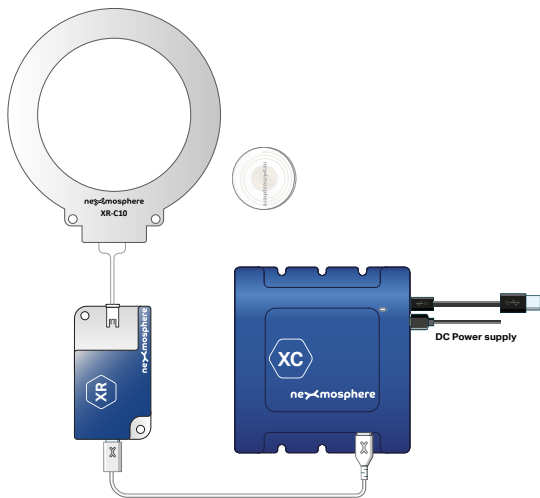
XXXXX..XXXXX = text Label 1-16 characters

**4 - Installation requirements and guidelines**

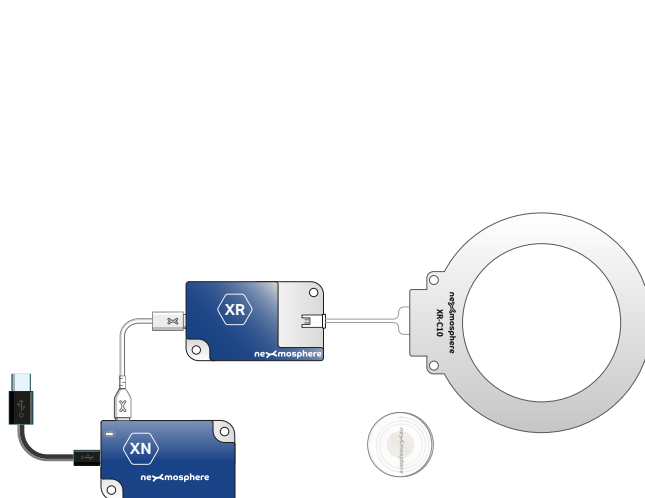
When integrating an RFID sensor with XR-2 driver into your digital signage installation, several installation requirements and guidelines need to be taken into account in order for the sensor to perform optimal and operate stable.

**4.1 Connection Diagrams**

The XR-2 RFID driver can be connected to any X-talk interface and is therefore compatible with all Xperience controllers. Make sure the driver is connected to the X-talk interface before powering the Xperience controller. Otherwise, the sensor will not be recognized by the Xperience controller and no sensor output will be provided.



Example connection to XC Controller



Example connection to XN Controller

**4.2 Specifications and Hardware integration guidelines**

**Antenna sizes**

The available shapes and sizes of the XR antennas are listed in the table below.

Antenna	Shape	Dimensions antenna			Dimensions detection area	
		Width	Height	Thickness	Width	Height
XR-A80	Rectangular	74mm	62mm	1.6mm	74mm	52mm
XR-A70	Rectangular	105mm	84mm	1.6mm	105mm	74mm
XR-A60	Rectangular	148mm	115mm	1.6mm	148mm	105mm
XR-A50	Rectangular	210mm	158mm	1.6mm	210mm	148mm
XR-A65	Stretched	148mm	62mm	1.6mm	148mm	52mm
XR-A55	Stretched	210mm	84mm	1.6mm	210mm	74mm
XR-A45	Stretched	297mm	115mm	1.6mm	297mm	105mm
XR-C05	Circular	50mm	60mm	1.6mm	50mm	50mm
XR-C10	Circular	100mm	110mm	1.6mm	100mm	100mm

Mechanical drawings of each RFID antenna are provided in the datasheets.

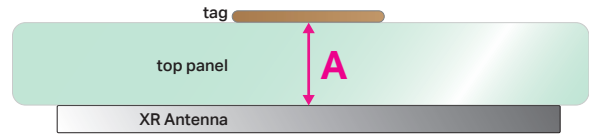
Each antenna size has a different detection range and installation specification with regards to clearance from metal objects and other XR antennas. On the followings page, these specifications are listed.

# PRODUCT MANUAL | XR-2 RFID DRIVER

## Detection range and top panel

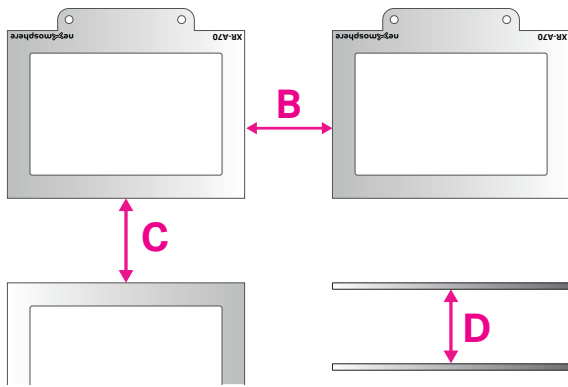
Each antenna size has a specific detection range. The detection range is also influenced by the size of the RFID tag. In general, the larger the RFID tag the higher the detection range and vice versa. In the table below, the detection range is indicated for a circular NTAG213 RFID tag with 23mm coil diameter. When installing the antennas, make sure that the thickness of the top panel is well within the detection range of the antenna.

Please note: **the XR antenna does not work behind a metal top panel (!)**. All other materials can be used for the top cover on the antenna, the type of material used can have a minor influence (both positive & negative) on the detection range. We recommend to always test and validate the final setup before starting production.



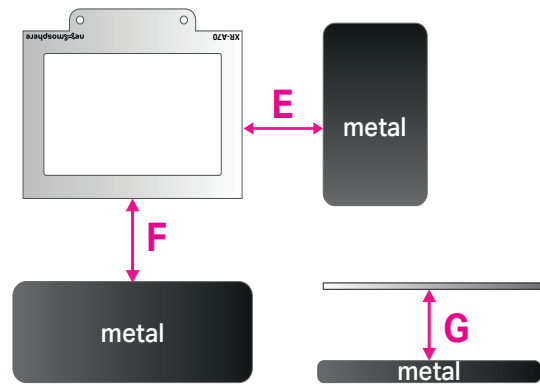
## Clearance between multiple XR Antennas

When using multiple XR antennas, the electromagnetic fields of the antennas will interfere with each other when placing the antennas too close to each other. Therefore please make sure that the minimum spacings indicated in the **table below** are taken into account.



## Clearance between XR Antenna and metal objects

Metal objects in or near the electromagnetic field of the antennas can cause interference which results into unstable behaviour of the sensor. Make sure that the minimum clearances indicated in the **table below** are implemented accordingly.



Antenna
XR-A80
XR-A70
XR-A60
XR-A50
XR-A65
XR-A55
XR-A45
XR-C05
XR-C10

A (mm)
<i>detection range</i>
<39
<30
<24
<39
<36
<33
<42
<39
<36

B (mm)	C (mm)	D (mm)
<i>recommended clearance from XR antennas</i>		
<i>short side</i>	<i>long side</i>	<i>parallel</i>
>45	>50	>130
>45	>60	>140
>75	>105	>230
>300	>360	>550
>60	>110	>190
>65	>140	>240
>170	>300	>490
>40	>40	>110
>60	>60	>180

E (mm)	F (mm)	G (mm)
<i>recommended clearance from metal surfaces</i>		
<i>short side</i>	<i>long side</i>	<i>parallel</i>
>10	>15	>45
>10	>15	>45
>20	>30	>50
>40	>50	>75
>20	>30	>50
>20	>30	>50
>40	>50	>70
>10	>15	>45
>10	>15	>45

these values were obtained in a test setup with the following specification: - NTAG213 with 23mm coil diameter - Default gain settings (38dB) - Top panel: 6mm acrylic - 3 antennas side-by-side / parallel - 1 tag placed on each antenna

Both the proximity of metal and other XR antennas cause interference. The specifications in the columns above therefore cannot be seen separately, as both contribute to the interference level which causes instable behaviour. We recommend to design your installation in such a way that not all specification above are at a critical level, as in this case the total accumulated level of interference might become too high. Please note that in different setups, the required clearances can vary.

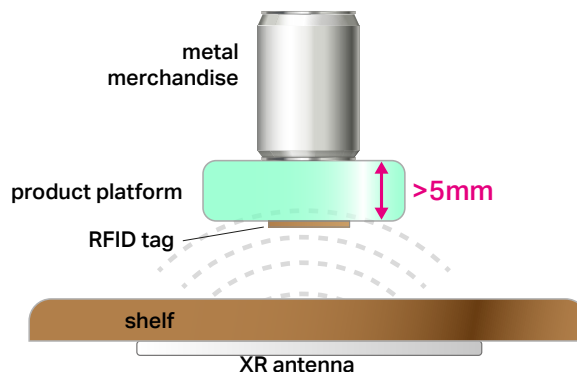
**We recommend to always test and verify before making your installation or technical drawings final.**



**Merchandise containing metal**

Metal objects in or near the electromagnetic field of the antennas can cause interference which results in unstable behaviour of the sensor. Therefore the XR antennas are not able to detect a tag which is placed on merchandise containing metal.

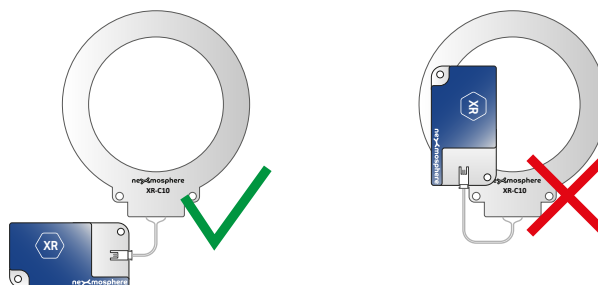
If nevertheless an RFID sensor is used with metal products, a suggested solution is to place a non-metal platform between the merchandise and the tag, creating space between the electromagnetic field and the metal merchandise. The results of this solution vary highly depending on the specific characteristics of the setup. In any case, it is discouraged to use metal merchandise with the XR range. For setup-specific advice please contact [applications@nexmosphere.com](mailto:applications@nexmosphere.com).



**Mounting XR-2 driver**

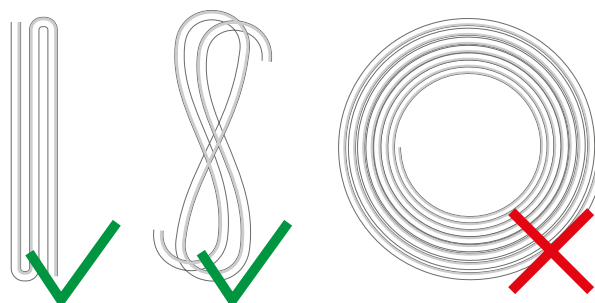
The XR-2 driver should be mounted outside the antenna area in order to prevent interference and unstable behaviour.

The antenna cables have a length of 10cm. These can't be extended as this would detune the antenna which would result into unstable behavior.



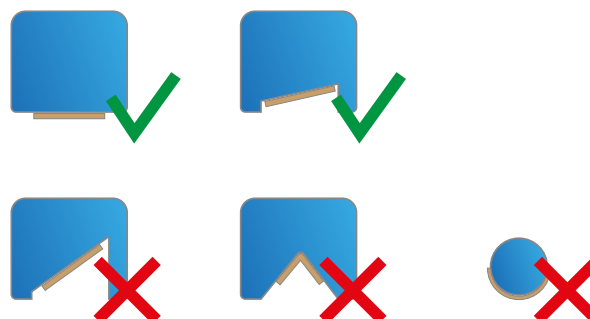
**Excess cable**

In case of excess cable length (for example when using the CAX-M6W X-talk cable), it is recommended to mount this in straight lines or in an "8" pattern instead of rolling the cable up in a circle. A cable rolled-up in a circle can create a coil which can interfere with the electromagnetic field of the antenna. Also keep in mind that shorter cables (e.g. CAX-M4W) are available.



**Tag placement**

The tag should be placed on the merchandise in such a way that it does not contain any sharp folds and that the angle between the tag and antenna does not exceed **30 degrees**. Placing the tag on a highly curved object (e.g. lipstick) will also cause unstable behaviour. The flatter a tag is placed on the merchandise, the better the responsiveness will be.



## Tag size and specifications

The default Nexmosphere XNN tags are circular NTAG213 tags with a diameter of 28mm. The actual coil size of the tags is 23mm.

Third party tags must have an **NXP NTAG213 chip** in order to be compatible with the Nexmosphere XR-2 drivers. It is possible to use tags with a different size and shape than the Nexmosphere XNN Tags. However, please take into account that the smaller the RFID tag the lower the detection range will be. We always recommend to test and verify before starting production.



## Detecting multiple tags on 1 antenna (Multi-tag)

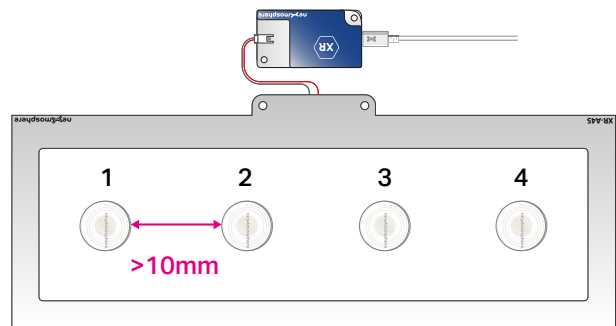
The XR-2 RFID drivers are able to detect **up to 4 tags simultaneously** on one antenna. In this situation, the RFID tags should have a minimum clearance of 10mm between them.

Multi-tag detection works most stable on the default gain setting (38dB).

When placing multiple tags on one antenna, the detection range for 100% stable operation can be less than the single-tag detection range indicated in the table on page 8, depending on the specific setup and environment.

Please keep in mind that the detection time of a pick-up will be longer when placing multiple tags on one antenna simultaneously.

In case a setup with multiple tags on one antenna is not working stable, we recommend to increase the filter level via setting 6. For more information please see page 11.



## Red Error LED

The XR-2 Driver has a Red Error LED. In case there is interference which causes the driver to potentially operate less stable, the Red Error LED will blink. Please see page 11 (setting 5) for more information.



## 5 - Settings - Driver behaviour

The XR-2 RFID driver has multiple settings which determine the behaviour of the sensor. The settings can be adjusted by sending X-talk setting commands via the API. After a power cycle, the settings always return to back to default.

### Setting 1: Status LED behaviour

- |                                      |                          |
|--------------------------------------|--------------------------|
| 1. LED on                            | <code>X001S [1:1]</code> |
| 2. LED off                           | <code>X001S [1:2]</code> |
| 3. LED on, off when tag placed (def) | <code>X001S [1:3]</code> |
| 4. LED off, on when tag placed       | <code>X001S [1:4]</code> |

### Setting 4: Antenna gain level

- |  |                          |
|--|--------------------------|
| 1. 23dB - minimum detection range        | <code>X001S [4:1]</code> |
| 2. 33dB - medium detection range         | <code>X001S [4:2]</code> |
| 3. 38dB - high detection range (default) | <code>X001S [4:3]</code> |
| 4. 43dB - very high detection range      | <code>X001S [4:4]</code> |
| 5. 48dB - maximum detection range        | <code>X001S [4:5]</code> |

The gain level determines how much power is sent from the driver to the antenna. The higher the gain level, the larger the electromagnetic field of the antenna becomes and the higher the detection range will be.

Please note that increasing the antenna gain will also result into more cross interference when using multiple antennas and will require a larger interspacing between the antennas. Vice versa, the required spacing can be decreased by decreasing the gain.

All components of the XR Range are calibrated to function optimally at the default gain level (38dB). **We therefore recommend to not change the gain level unless absolutely necessary.**

### Setting 5: Interference indication on Red LED

- |  |                          |
|--|--------------------------|
| 1. Show interference level 3 (default) | <code>X001S [5:1]</code> |
| 2. Show all interference levels        | <code>X001S [5:2]</code> |
| 3. Off, don't show interference levels | <code>X001S [5:3]</code> |

Internally in the driver, a tag read-cycle consists out of multiple steps and actions. The amount and frequency of errors and retries within this process is an indication of the amount of interference and distortion in the antenna field. The driver keeps track of these errors and based on this can indicate a distortion level on the Red LED of the driver.

#### Level 3 - Red LED blink 3 times - (heavy interference)

a tag was completely "lost" multiple times in 1 second.

#### Level 2 - Red LED blink 2 times - (medium interference)

4 consecutive communication errors during tag-read

#### Level 1 - Red LED blink 1 times - (light interference)

communication error during tag-read, but retry succeeded

### Setting 6: Filter level for ghost pick-ups

Set filter Level `X001S [6:X]`

X is a value between **1-20** and its default value is **2**. The filter level determines how many read cycles a tag must be completely lost in order for it to be considered a valid pick-up and trigger an API command.

In case of interference, a tag can be "lost" (not detected) by the driver for one or more read cycles, causing an API command trigger although the tag was not removed (aka a "ghost trigger"). This setting is intended to decrease/eliminate the amount of undesired ghost triggers.

Increasing the filter level decreases the negative effect of interference and the amount of ghost triggers, but it will also decrease the responsiveness of the sensor.

Vice versa, decreasing X will increase the responsiveness of the sensor but can also result into more ghost triggers, as it will take less read-cycles of a tag not being detected for it to trigger an API command.

### Setting 18: Auto-reload tag data (NDEF records)

Set auto-reload interval `X001S [18:X]`

X is a value between **1-20** or **100** and its default value is **100**. It sets the interval in seconds in which the NDEF records of an NTAG are reloaded into the memory of the XR-2 driver. When X is set to 100 (default), auto-reload is set off.

When a new tag is detected, the XR-2 driver reads all data of the NTAG and stores this in its internal memory. For all subsequent reads of this tag, the driver only needs to read the UID of the tag and based on this, will look up all other info in its internal memory. This facilitates fast triggering on tag detection. However, if the data (Tag nr and Custom text labels) on the tag is changed (overwritten), the data of the tag which is stored in the XR-2 driver will be outdated. Therefore it is possible to reload all NDEF data on a detected tag at a given interval.

Reloading the NDEF data can also be done manually. Please see page 6 for more information.

**5 - Settings - API output**

The XR-2 RFID driver has multiple settings which determine the API output of the sensor. The settings can be adjusted by sending X-talk setting commands via the API. After a power cycle, the settings always return to back to default.

**Setting 9: Trigger mode**

- 1. Trigger on tag detected/removed (d) `X001S[9:1]`
- 2. Trigger only on tag detected `X001S[9:2]`
- 3. Trigger only on tag removed `X001S[9:3]`
- 4. No triggers (use data requests) `X001S[9:4]`

**Setting 10: Trigger output format**

- 1. UID (default) `X001S[10:1]`
- 2. Tag number `X001S[10:2]`
- 3. Custom text label 1 `X001S[10:3]`
- 4. Custom text label 2 `X001S[10:4]`
- 5. Custom text label 3 `X001S[10:5]`
- 6. UID, Tag number, label 1 `X001S[10:6]`
- 7. Label 1, label 2, label 3 `X001S[10:7]`
- 8. Custom output format `X001S[10:8]`

For more detailed information on each output format, please see page 3 and 4. When selecting an option with multiple outputs (6, 7 or 8), each data type will be provided in a separate API output command. For setting 10:8, please see setting 11-13 and 14-16 for more information.

**Setting 17: Success and Error output**

- 1. Never `X001S[17:1]`
- 2. Success only `X001S[17:2]`
- 3. Error only `X001S[17:3]`
- 4. All (default) `X001S[17:4]`

When sending commands to the XR-2 driver, the driver can automatically provide feedback on whether the action has succeeded or failed. This setting determines what type of feedback output should be provided. The following feedback commands are available:

- `X001B[SUCCESS]`
- `X001B[ERROR=UNKNOWN COMMAND]`
- `X001B[ERROR=AUTHENTICATION]`
- `X001B[ERROR=UNKNOWN TAG NUM]`
- `X001B[ERROR=TAG MEMORY FULL]`
- `X001B[ERROR=TAG UNRESPONSIVE]`
- `X001B[ERROR=NO TAGS FOUND]`

**Setting 11-13: Custom output for tag detected** (only applies when setting 10 is set to 10:8 "Custom output format")

A total of 3 API output commands per "tag detected" trigger can be set to a specific output format. Setting 11 sets the 1st API output command, setting 12 sets the 2nd API output command and setting 13 sets the 3rd API output command. For all 3 settings, the options are the same:

	<b>Setting 11</b> Output 1	<b>Setting 12</b> Output 2	<b>Setting 13</b> Output 3
1. None	<code>X001S[11:1]</code>	<code>X001S[12:1]</code>	<code>X001S[13:1]</code>
2. UID	<code>X001S[11:2]</code>	<code>X001S[12:2]</code>	<code>X001S[13:2]</code>
3. Tag number	<code>X001S[11:3]</code> (def)	<code>X001S[12:3]</code>	<code>X001S[13:3]</code>
4. Custom text label 1	<code>X001S[11:4]</code>	<code>X001S[12:4]</code> (def)	<code>X001S[13:4]</code>
5. Custom text label 2	<code>X001S[11:5]</code>	<code>X001S[12:5]</code>	<code>X001S[13:5]</code> (def)
6. Custom text label 3	<code>X001S[11:6]</code>	<code>X001S[12:6]</code>	<code>X001S[13:6]</code>

**Setting 14-16: Custom output for tag removed** (only applies when setting 10 is set to 10:8 "Custom output format")

A total of 3 API output commands per "tag detected" trigger can be set to a specific output format. Setting 14 sets the 1st API output command, setting 15 sets the 2nd API output command and setting 16 sets the 3rd API output command. For all 3 settings, the options are the same:

	<b>Setting 14</b> Output 1	<b>Setting 15</b> Output 2	<b>Setting 16</b> Output 3
1. None	<code>X001S[14:1]</code>	<code>X001S[15:1]</code>	<code>X001S[16:1]</code>
2. UID	<code>X001S[14:2]</code>	<code>X001S[15:2]</code>	<code>X001S[16:2]</code>
3. Tag number	<code>X001S[14:3]</code> (def)	<code>X001S[15:3]</code>	<code>X001S[16:3]</code>
4. Custom text label 1	<code>X001S[14:4]</code>	<code>X001S[15:4]</code> (def)	<code>X001S[16:4]</code>
5. Custom text label 2	<code>X001S[14:5]</code>	<code>X001S[15:5]</code>	<code>X001S[16:5]</code> (def)
6. Custom text label 3	<code>X001S[14:6]</code>	<code>X001S[15:6]</code>	<code>X001S[16:6]</code>

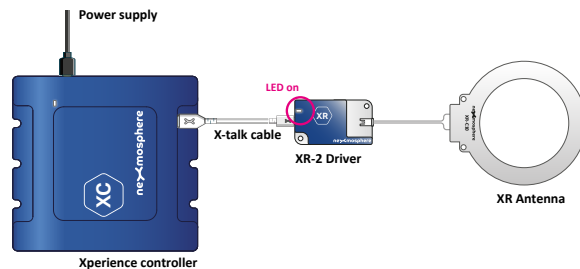
## 6. Quick test

In order to test if the XR-2 driver is installed correctly, please follow the test procedure below:

### Step 1 - Setup

First, connect the RFID sensor (XR-2 Driver + XR Antenna) to an Xperience controller. Secondly, power the Xperience controller.

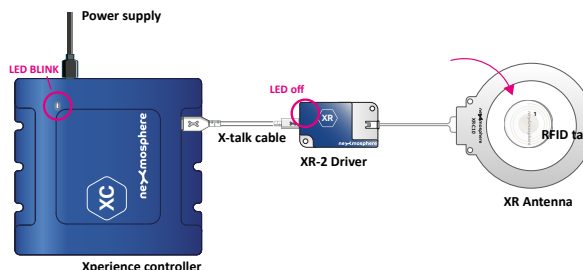
The white status LED of the XR driver should go on. The status LED of the controller will start to blink and once power-up is completed will be lit continuously



### Step 2 - Test "tag detected" trigger

Place an RFID tag on the XR Antenna.

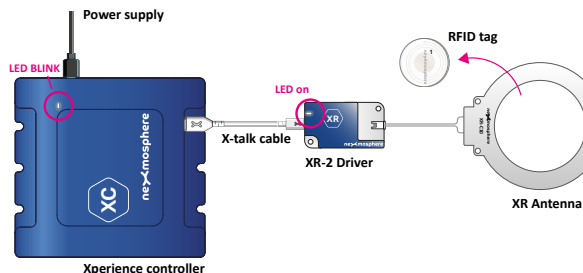
The white status LED of the XR driver should switch off. The status LED of the controller should blink once.



### Step 3 - Test "tag removed" trigger

Remove the RFID tag on the XR Antenna.

The white status LED of the XR driver should switch on. The status LED of the controller should blink once.



In case any of the 3 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 media player or PC and test all API commands listed in this document (see section 3, page 2-6). 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](https://nexmosphere.com/support-documentation)

Please contact [support@nexmosphere.com](mailto:support@nexmosphere.com) for any support questions you may have.