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Basic / Advanced / Expert

Application note

DMX control using spaceLYnk

How to use RS485 communication of spaceLYnk for DMX control.



Schneider Electric

Safety Information

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- Do not base your maintenance or service actions solely on messages and information displayed by the software.
- Do not rely solely on software messages and reports to determine if the system is functioning correctly or meeting all applicable standards and requirements.
- Consider the implications of unanticipated transmission delays or failures of communications links.

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Failure to observe this information can result in injury or equipment damage.

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1 Introduction

This application note describes how to configure spaceLYnk for DMX control. RS485 (Modbus) terminal of spaceLYnk can be used for connection to DMX line to control DMX lights.

DMX is communication protocol for light control, which is widely used in theaters, concert halls or other entertainment applications. It is very specific area of light control, where specialized controllers for DMX are used. There are also applications as facade light control or scene settings in show rooms.

spaceLYnk brings the opportunity to interconnect KNX architecture with DMX light control. This is the main benefit of this application note.

Note that resident script with sleep interval equal to zero needs to be running in spaceLYnk. It can cause high load of CPU and all applications have to be tested with focus on this point.

A glossary is available in the appendix chapter of this document. Please refer to it whenever necessary.

Competencies

This document is intended for readers who have been trained on homeLYnk and spaceLYnk products. The integration should not be attempted by someone who is new to the installation of either product. In addition we recommend that you are familiar with:

- KNX
- DMX
- Lua scripting

System prerequisites

Software	Version	Download
spaceLYnk	2.1	http://www.schneider-electric.com

Table 1: software versions of used software

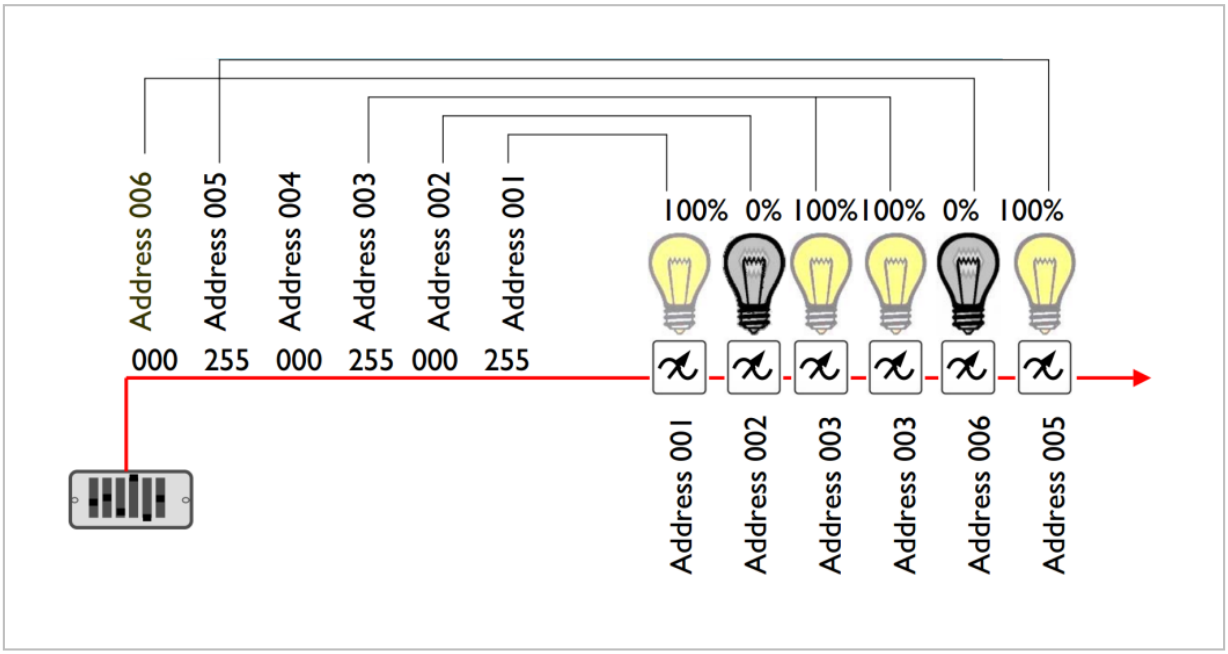
2 DMX introduction

DMX abbreviation is often explained as Digital Multiplexed Signal. It is a protocol, which is used for communication between DMX controller and DMX luminaires.

DMX has been developed by USITT in 1986 and the specification is based on industrial standard EIA485 (RS485). It is mainly used for controlling lights in professional entertainment scenes like theaters or concert halls. Recently, DMX is more often used in architectural scene setting (e.g. light facades) or in commercial lighting systems (e.g. car showrooms).

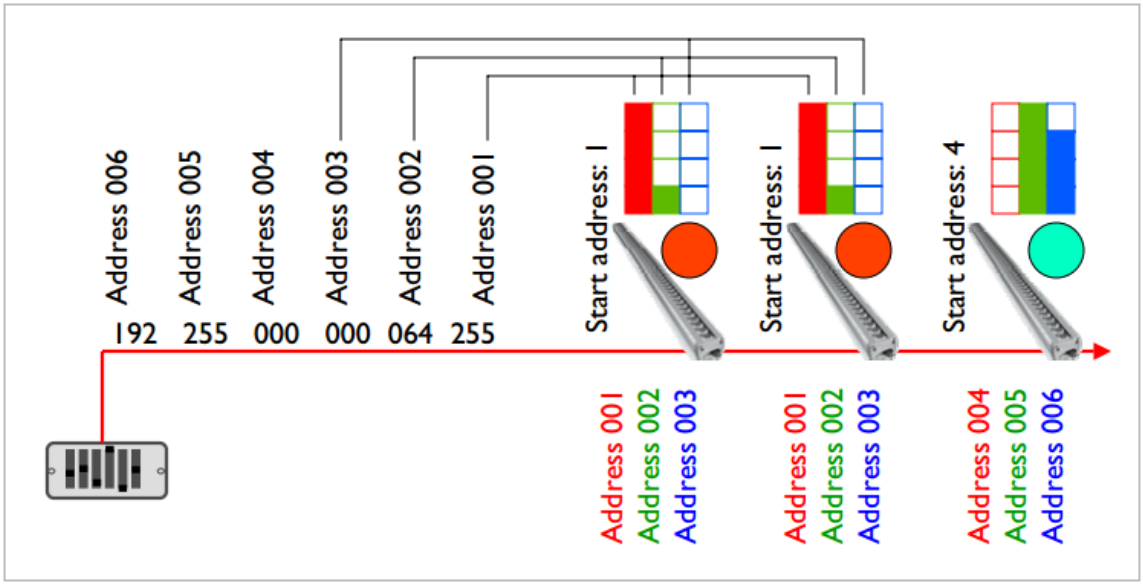
2.1 How does the communication work?

The full name of the protocol is DMX512, because string of 512 byte values is sent 40 times per second. Each value (0-255) represents the intensity of the light. Position in the string represents the address of lighting device. The DMX string of bytes is graphically explained in the Picture 1.



Picture 1: DMX signal explanation [1]

In the case of RGB control 3 addresses must be reserved for 1 light, because each of RGB colors needs its own 1byte value of intensity. DMX is only one-way communication. There is no address information in the message sent by controller, receiver must count the messages. Luminaires with the same address will behave the same as it is shown in the picture below (Picture 2).



Picture 2: DMX signal explanation - RGB [1]

2.2 Cabling for DMX

It is recommended to use shielded twisted pair, where two wires are used for the signal transmission and the shield is used as GND reference. Standard CAT5 cable can be used as well.

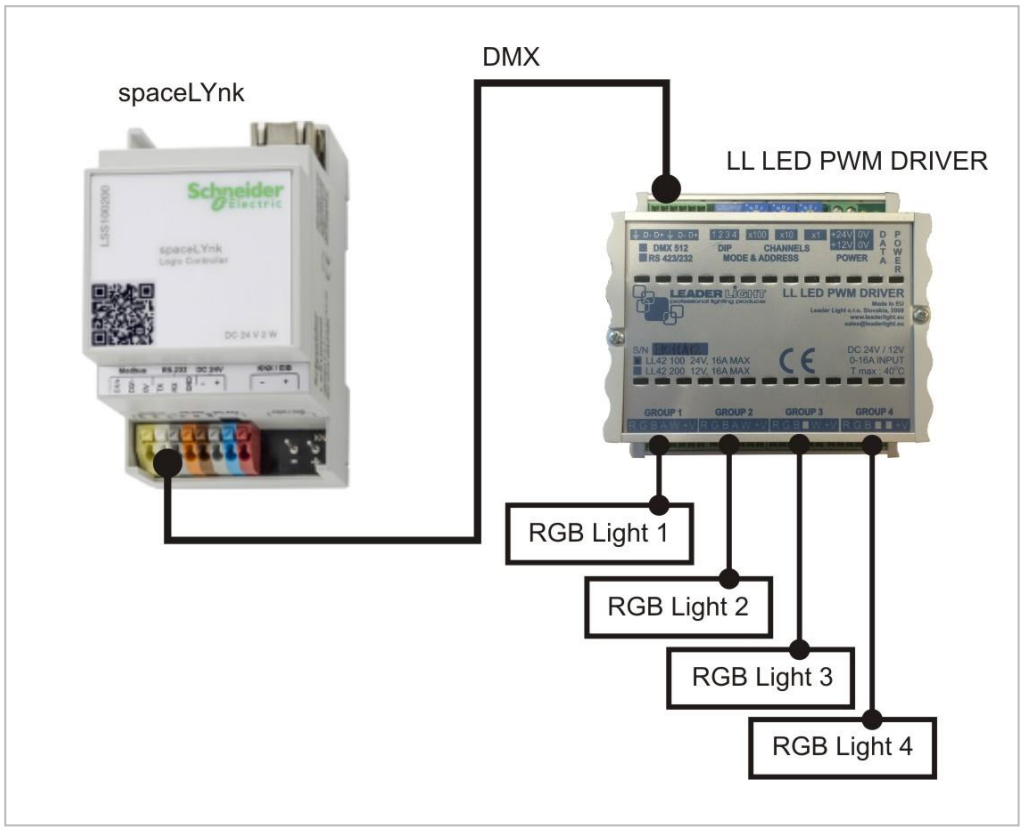
Main description and limitation of DMX cabling is captured by points below:

- Ground must be connected for reference and to prevent interference.
- All devices on DMX line must be connected serially.
- Maximum length of the line is 300 m.
- Maximum 30 DMX devices on one line (due to power consumption).
- For more devices DMX-Booster must be used or the line can be split by DMX-splitter.
- Each end of DMX line should be terminated with a 120 Ohm resistor.

3 DMX with spaceLYnk

3.1 Architecture

Architecture, which has been used for testing of spaceLYnk DMX features, is shown in the picture below. spaceLYnk sends periodically DMX values to LL LED PWM DRIVER, which sets color and intensity of LED lights based on the message coming from spaceLYnk. LL LED PWM DRIVER is device manufactured by Leader Light company. It is a professional LED driver, which can be controlled by DMX512 or RS232 commands.



Picture 3: Tested architecture

More information about LL LED PWM DRIVER can be found on the manufacturer's website [3].

3.2 spaceLYnk Scripts

In order to make spaceLYnk work as DMX controller you have to create scripts described in subchapters bellow.

3.2.1 User Llibrary and Resident Script (Handler)

User Library *user.dmx* and resident script *dmx_handler* are stored in script file *AN033_DMX_scripts.tar.gz.* Restore the scripts following steps below.

Step 1 Navigate to *Configurator >> Scripting >> Tools >> Restore scripts*.
Step 2 Select "Append keeping existing scripts".
Step 3 Chose File: *AN033_DMX_scripts.tar.gz*
Step 4 Click **Save** button.
Step 5 Check that library *user.dmx* is present in *Configurator >> Scripting >> User Libraries*.
Step 6 Check that library *dmx_handler* is present in *Configurator >> Scripting >> Resident*.
Step 7 Modify the parameters in *dmx_handler* script according to table below.

Resident script *dmx_handler* is an example how the DMX init function can be used. There can be used 3 optional parameters in *init* function. If the parameter is not set, default value is used. See the details below.

Parameter	Default value	Description
channels	4	Total numbers of channels to use. Maximum is 512.
transition	2	Transition time in seconds, does not include DMX transfer time.
resolution	20	Number of DMX updates per second. Larger value gives smoother transition, but increases CPU load.

Table 2: DMX parameters

Note: According to DMX standard the resolution parameter should be set to 40. When you decrease this value in order to lower the CPU load of spaceLYnk, it may cause problems with your DMX driver.

3.2.2 Event Scripts

If you proceed the script restore correctly (in previous subchapter), you see two event scripts in *Configurator >> Scripting >> Event-based.*

These event scripts are examples how group address can be connected to RGB value of DMX light.

In the scripts is used function *getRgbParts(RGBvalue),* which is used to disassemble KNX RGB object (3byte) into 3 values (1 byte for each RGB color).

Example of event script for group address 1/1/1:

```
R,G,B = getRgbParts(event.getvalue())    -- converts 3byte RGB value of group address 1/1/1
                                         -- into 1byte values for each color (R, G, B)
DMX.set(215, R)                          -- set DMX address 215 to value R
DMX.set(216, G)                          -- set DMX address 216 to value G
DMX.set(217, B)                          -- set DMX address 217 to value B
```

When the DMX value is changed using Lua command *DMX.set(address, value),* resident script starts periodically send this value to DMX light until new change of value is done using the same command.

Note: DMX drivers needs to receive the DMX string periodically. When the DMX line is disconnected or spaceLYnk is powered off all the light will turn off.

4 Conclusion

The demand of using DMX in high-end buildings is on the rise. There are many possible applications from simple effects in the shop window to complex lighting control of facade lights.

It is real advantage to use spaceLYnk for such applications, because it brings benefit of interconnection between KNX and DMX. Then it is possible to control DMX light by commands coming from KNX installation. The effects of DMX lights can be controlled by pushbuttons, different sensors and logic can be implemented or smartphone visualization of spaceLYnk can be used as control interface.

Moreover DMX system can be cheaper than DALI system in some scenarios. Due to this fact, it can be interesting alternative for small lighting system in residential area.

Note: spaceLYnk is not certified for DMX use. Schneider Electric cannot guarantee full compatibility with DMX standard.

Note: Using spaceLYnk as DMX controller brings high load to spaceLYnk CPU, especially with increasing resolution parameter in the resident script. Remember to always check, if the CPU load is lower than 0.7, which is the recommended maximum in order to not have any delays in communication.

5 Appendix

5.1 Glossary

The following table describes the acronyms and defines the specific terms used in this document.

Abbreviation	Description
DMX	Digital Multiplexed Signal

Table 3: specific terms

5.2 Reference

ID	Document title	Reference
[1]	Introduction to DMX	https://erg.abdn.ac.uk/users/gorry/eg3576/resources/Introduction%20to%20DMX%20philips.pdf
[2]	spaceLYnk User Guide	www.schneider-electric.com
[3]	Leader Light website	www.leaderlight.eu

Table 4: reference

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