



SKX Open Integration example

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1. INTRODUCTION



The purpose of this document is to make easier the integration of external systems in KNX, more specifically devices with **port RS232** as interface.

This integration is based in the special device:

 **SKX Open. Interface bus KNX to RS232**

This manual is an example of project where SKX Open is used to control the “**Panasonic Projector RS232C**” and the **motor controller** for it.

2. INSTALLATION

The no KNX devices that are desired to be controlled with KNX installation are the following ones:

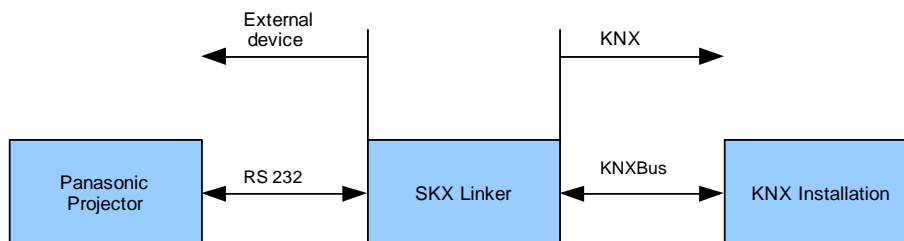
- Panasonic projector RS232C
- Motor Controller for the projector

As these devices are controlled by **RS232** but not KNX, this document provides a solution in order to integrate them in an installation based on the domotic standard KNX.

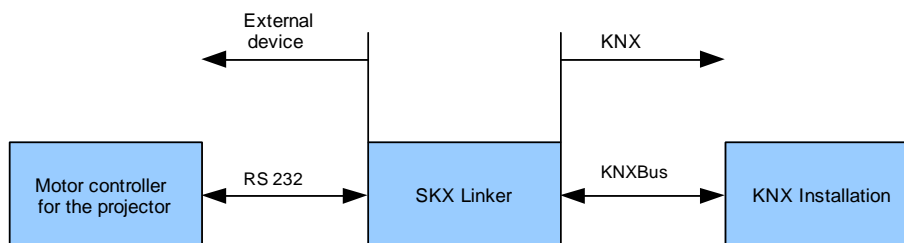
For this, it is necessary to add one more device for each external device to be controlled: Zennio **SKX Linker** with the **application program SKX Open**. This device receives values through 1 bit-typed communication objects from the KNX Bus and transmits the corresponding frames to the RS232 interface, and the opposite, as it allows bidirectional communication.

In the following diagram, the **physical connection** of the devices involved in the installation is shown, as well as the physical network where they are placed.

• First SKX OPEN: Panasonic Projector



• Second SKX OPEN: Motor controller for the Projector



2.1. INSTALLATION PERFORMANCE

This project will serve as an example of controlling a projector and its motor controller with a KNX installation thanks to the Zennio interface SKX Linker with the application program SKX Open.

The example does not try to control every single function of the projector, but the ON and OFF functions, being the configuration of the rest of them very similar.

The projector works as follows:

- When an **ON order** is sent through the KNX Bus, the projector must be turned on and the motor controller must start running in order to show the projector screen. When the projector receives this order, it sends its state to the RS232 port and the SKX Open must recognize the frame so that it can be shown, for example, in Z38i.
- When an **OFF order** is sent through the KNX Bus, the projector must be turned off and the motor controller must start running in order to hide the projector screen. When the projector receives this order, it sends its state to the RS232 port and the SKX Open must recognize the frame so that it can be shown, for example, in Z38i.

In this example we use the **Zennio devices** listed below:

- 2 **SKX Linker** with the application program **SKX Open**: Interface KNX ↔ RS232
- **Z38i touch panel**: Order sending and projector state indicator.

2.2. COMMUNICATION PARAMETERS

Before the integration, we need the communication parameters of the external devices in order to configure the SKX Open to send and receive the right hexadecimal frames through the serial port.

PANASONIC PROJECTOR

The communication parameters are not always found next to the hexadecimal command specifications in the device manual.

In this case, for example, this information is in the projector manual as follows:

Communication conditions (factory setting)

Signal level	RS-232C-compliant
Synchronization method	Start-stop synchronization
Baud rate	9,600 bps
Parity	None
Character length	8 bits
Stop bit	1 bit
X parameter	None
S parameter	None

Figure 1: Communication parameters of Panasonic Projector

PROJECTOR MOTOR CONTROLLER

The communication parameters of the projector motor controller are:

DETAILS

Band rate: 9600
Stop bit: 1
Parity: None
Databits: 8

Figure 2: Communication parameters of the Projector Motor Controller

2.3. HEXADECIMAL CODES

If we have to control an external device through a RS232 connection with SKX Open, we need to know the **frames that the device sends and receives** for the desired function. These frames are set as parameters in SKX Open, which must fulfill the following requirements:

- The characters we input in the frame fields in SKX Open must correspond with hexadecimal values (0-9, A-F)
- Maximum length of the received and sent frame is 10 bytes.

PANASONIC PROJECTOR

In the manual of the Panasonic projector, we can find the control frames that must be sent to the serial port to perform the several functions. These frames are given in ASCII and hexadecimal format, which is the needed format for SKX Open.

Thus, the required frames in our project are.

• Power ON

Power ON (Lamp ON)

Hexadecimal	02h	41h	44h	5Ah	5Ah	3Bh	50h	4Fh	4Eh	03h
Character		A	D	Z	Z	;	P	O	N	

Figure 3: Power ON frame

• Response (Callback)

Response (Callback)

In the period when the command can be accepted

Hexadecimal	02h	50h	4Fh	4Eh	03h
Character		P	O	N	

Figure 4: Response frame

• Power OFF

Hexadecimal	02h	41h	44h	5Ah	5Ah	3Bh	50h	4Fh	46h	03h
Character		A	D	Z	Z	;	P	O	F	

Figure 5: Power OFF frame

• Response (Callback)

■ Response (Callback)

In the period when the command can be accepted

Hexadecimal	02h	50h	4Fh	46h	03h
Character		P	O	F	

Figure 6: Response frame

PROJECTOR MOTOR CONTROLLER

In the manual of the motor controller for the projector we can only find the control frames in ASCII format:

PROTOCOL
ASCII
fa in, = Device IN
fa out, = Device OUT
fa stop, = Device STOP

Figure 7: Motor Controller Protocol

Since the SKX Open recognizes frames that are configured in its parameters as hexadecimal characters, those frames must be translated from ASCII to hexadecimal format:

• Device IN

“fa in,” => 66h; 61h; 20h; 69h; 6Eh; 2Ch

• Device OUT

“fa out,” => 66h; 61h; 20h; 6Fh; 75h; 74h; 2Ch

3. ETS CONFIGURATION

3.1. PARAMETERIZATION

In the following sections the necessary parameters to configure the KNX devices are detailed.

3.1.1. Z38i TOUCH PANEL

The Z38i configuration is very simple, since the only parameters we need are the 1 bit-typed communication objects for turning ON/OFF the projector and showing its state. We just need to enable one box in **Home** page as a Binary Control with two buttons (ON and OFF buttons) and the associated indicator.

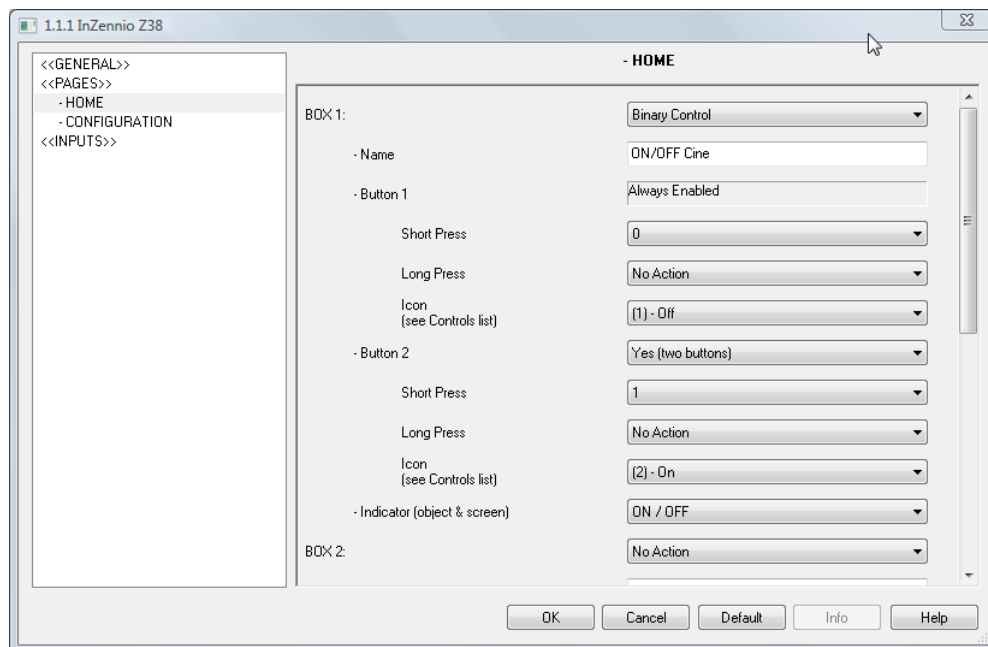


Figure 8: Parameters in Z38i

3.1.2. SKX OPEN: PANASONIC PROJECTOR

Next, we parameterize the SKX Open device that allows the communication between KNX and the Panasonic Projector.

MAIN SETUP

First of all, the communication parameters must be configured in SKX Open according to the Panasonic projector specifications:

- **Velocity:** 9600 bauds
- **Parity:** No parity
- **Time between frames to be sent:** 1

- **Reception complete mode:** Timeout (the projector does not use an end of frame byte).
- **Time out:** 5

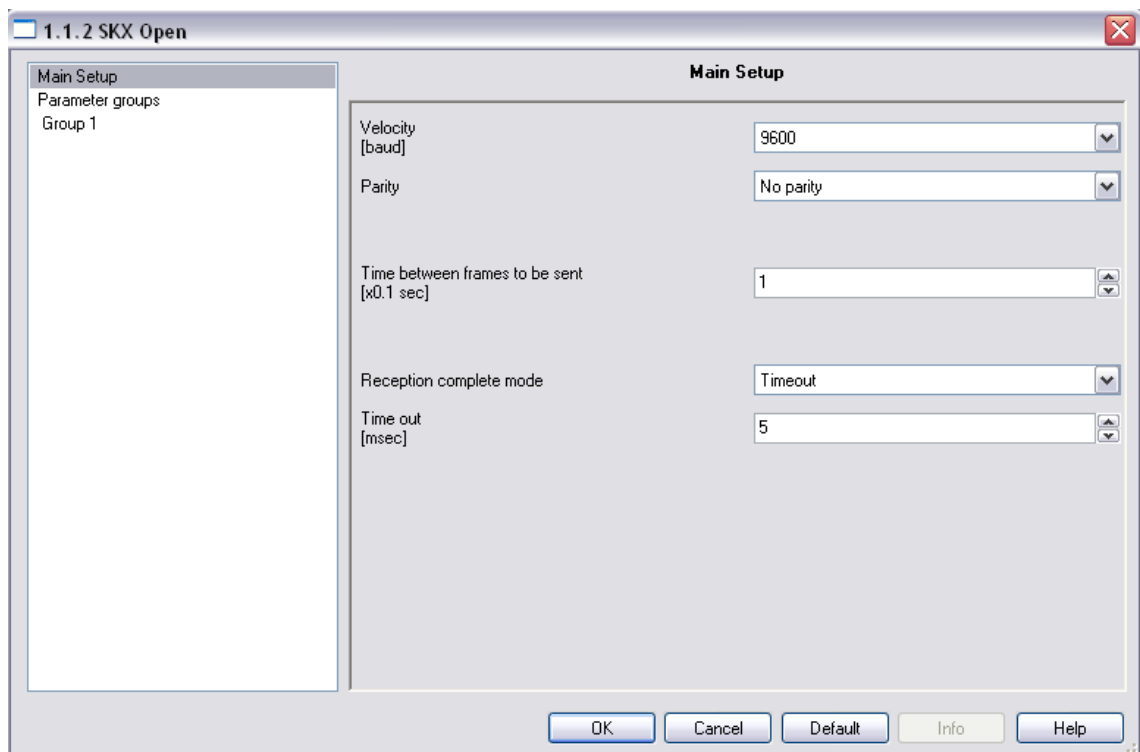


Figure 9: SKX Open for Projector – Main Setup

Important: We must bear in mind the external device specifications relative to the RS232 communication. For example, the Timeout must be a value up to the time between frames that the external device sets in sending. Otherwise, the frames would not be recognized by the SKX Open.

PARAMETER GROUPS

In the tab **Parameter Groups** the necessary communication object groups are enabled (there are 12 communication objects in each group). As we just need 4 communication objects to control the ON/OFF of the projector and its ON/OFF states, we just enable one group:

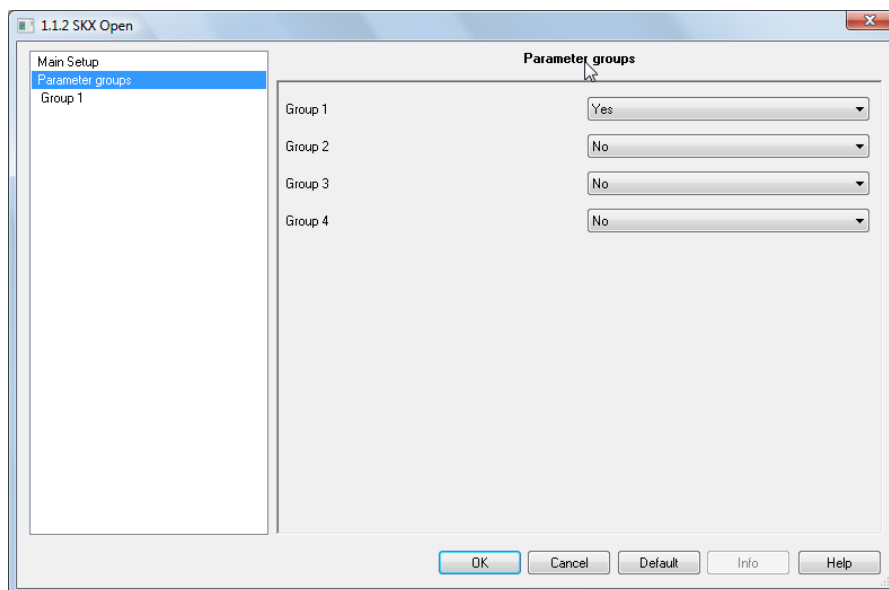


Figure 10: SKX Open for Projector – Parameter Groups

Once the group is enabled, in the **Group 1** tab we can parameterized the frames associated to any communication object in order to send and receive both orders ON and OFF.

As it was explained before, the control frames for the projector are in its specifications manual with the format: 02h; 41h; 44h; 5Ah... We need to translate the frame to the SKX Open parameters format so that it recognizes the frames. The format is two hexadecimal characters for each frame byte, which results in:

- 02h; 41h; 44h; 5Ah; 5Ah; 3Bh; 50h; 4Fh; 4Eh; 03h => 0241445A5A3B504F4E03

In some devices the control frames in the specifications manual have another format, but the translation to SKX Open format is the same:

- 0x02h; 0x41h; 0x44h; 0x5Ah ... 0x03h => 0241445A5A3B504F4E03

This way, the SKX Open parameterization regarding the frames is:

- **Object 0:** (OFF Sending)
 - **Control mode:** Send frame if object is 0
 - **Frame to send:** 0241445A5A3B504F4603
- **Object 1:** (OFF Status Reception)
 - **Control mode:** Object is 0 if frame fits
 - **Received frame:** 02504F4603
- **Object 2 :** (ON Sending)
 - **Control mode:** Send frame if object is 1
 - **Frame to send:** 0241445A5A3B504F4E03

• **Object 3 : (ON Status Reception)**

- **Control mode:** Object is 1 if frame fits
- **Received frame:** 02504F4E03

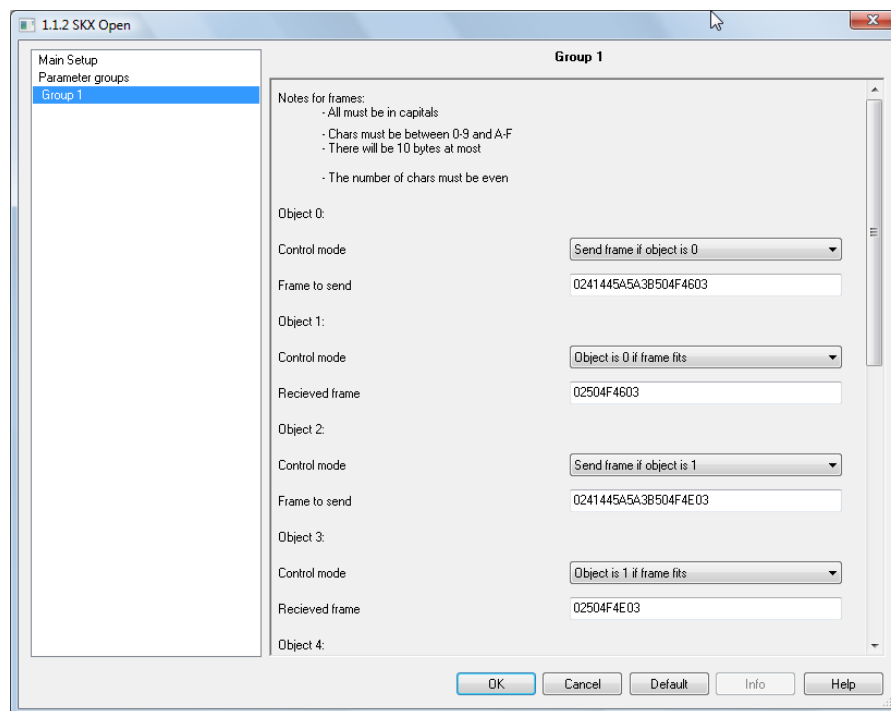


Figure 11: SKX Open for projector – Group 1

3.1.3. SKX OPEN: MOTOR CONTROLLER FOR THE PROJECTOR

We need to configure the SKX Open parameters to carry out the communication between KNX bus and the motor controller of the projector.

MAIN SETUP

First of all, the communication parameters must be configured in SKX Open according to the specifications of the motor controller for the projector:

- **Velocity:** 9600 bauds
- **Parity:** No parity
- **Time between frames to be sent:** 1
- **Reception complete mode:** Timeout (the motor controller does not use an end of frame byte).
- **Time out:** 5

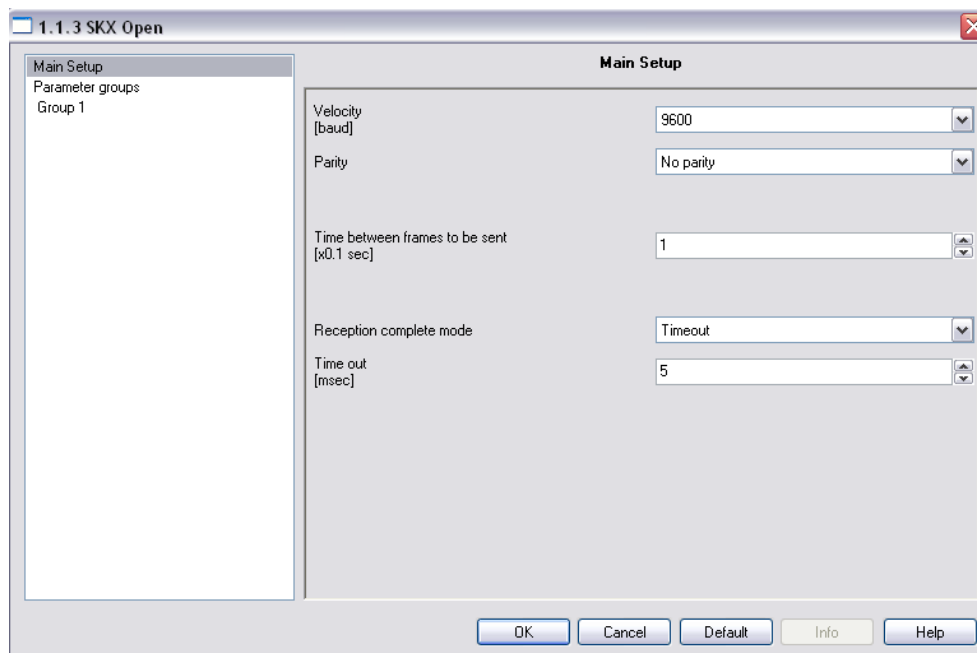


Figure 12: SKX Open for the motor controller – Main Setup.

Important: We must bear in mind the external device specifications relative to the RS232 communication. For example, the Timeout must be a value up to the time between frames that the external device sets in sending. Otherwise, the frames would not be recognized by the SKX Open.

PARAMETER GROUPS

In this case, we just need 2 communication objects:

- One for showing the screen when the projector is turned on.
- One for hiding the screen when the projector is turned off.

Thus, we just enable one group of communication objects, since each of them contains 12 communication objects.

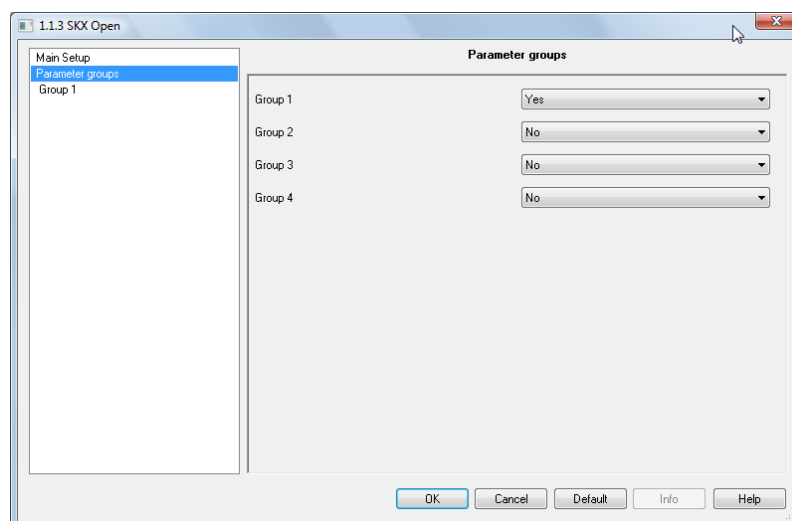


Figure 13. SKX Open for the motor controller – Parameter Groups

Once the group is enabled, in the **Group 1** tab we can parameterize the frames associated to any communication object in order to send and receive both orders, ON and OFF.

The control frames for the motor controller in its specifications manual have ASCII format. The translation to the right format for SKX Open (two hexadecimal characters for each frame byte) must be done before the parameterization.

Example: ASCII to SKX OPEN Conversion of the frame to show the screen.

ASCII Code	Hexadecimal Code	SKX Open
fa out,	66h; 61h; 20h; 6Fh; 75h; 74h; 2Ch	6661206F75742C

This way, the SKX Open parameterization regarding the frames is:

• **Object 0:** (OFF Sending)

- **Control mode:** Send frame if object is 0
- **Frame to send:** 666120696E2C

• **Object 1** (ON Sending)

- **Control mode:** Send frame if object is 1
- **Frame to send:** 6661206F75742C

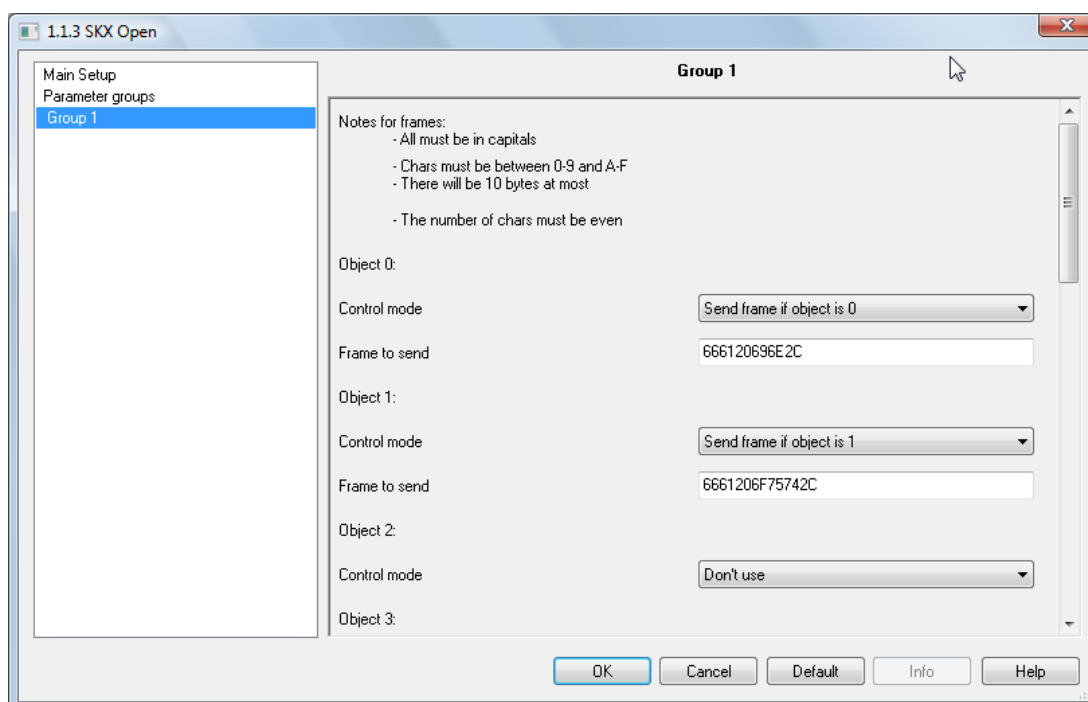


Figure 14: SKX Open for the motor controller – Group 1

3.2. TOPOLOGY

The **topology** of the programming in the ETS for this project will result in:

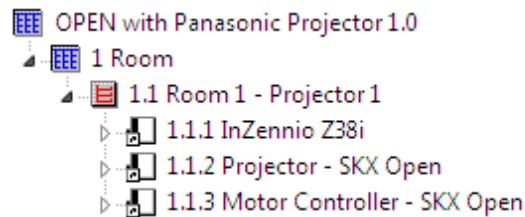


Figure 15: Topology

DEVICE	PHYSICAL DEVICE
InZennio Z38i	1.1.1
SKX Open: Projector	1.1.2
SKX Open: Motor controller	1.1.3

Number	Name	Grou...	Length	C	R	W	T	U	Data Type	Priority
18	b) [Home; Box 1] Binary Indicator	0/0/2	1 bit	C	-	W	T	U		Low
16	b) [Home; Box 1] Binary Control	0/0/1	1 bit	C	-	-	T	-		Low
5	a) [General] Touch Block		1 bit	C	-	W	-	-		Low
4	a) [General] Display Lighting		1 bit	C	-	W	-	-		Low
3	a) [General] Temperature		2 Byte	C	R	-	T	-		Low
2	a) [General] Scenes		1 Byte	C	-	-	T	-		Low
1	a) [General] Date		3 Byte	C	-	W	T	-		Low
0	a) [General] Time		3 Byte	C	-	W	T	-		Low

Figure 16: Communication objects of Z38i

Num...	Name	Grou...	Desc...	Len...	C	R	W	T	U	Da...	Priority
0	Object 0	0/0/1		1 bit	C	-	W	T	-		Low
1	Object 1	0/0/2		1 bit	C	-	W	T	-		Low
2	Object 2	0/0/1		1 bit	C	-	W	T	-		Low
3	Object 3	0/0/2		1 bit	C	-	W	T	-		Low
48	Error	0/1/0		1 bit	C	R	-	T	-		Low
49	Error: Not hexadecimal	0/1/1		1 bit	C	R	-	T	-		Low
50	Error: Lower case	0/1/2		1 bit	C	R	-	T	-		Low
51	Error: Odd length	0/1/3		1 bit	C	R	-	T	-		Low
52	Error: In current frame	0/1/4		1 bit	C	R	-	T	-		Low
53	Error: Reception	0/1/5		1 bit	C	R	-	T	-		Low
54	Error: Too long	0/1/6		1 bit	C	R	-	T	-		Low

Figure 17: Communication objects of SKX Open for the projector

Num...	Name	Grou...	Desc...	Len...	C	R	W	T	U	Da...	Priority
0	Object 0	0/0/1		1 bit	C	-	W	T	-		Low
1	Object 1	0/0/1		1 bit	C	-	W	T	-		Low
48	Error	0/1/7		1 bit	C	R	-	T	-		Low
49	Error: Not hexadecimal	0/1/8		1 bit	C	R	-	T	-		Low
50	Error: Lower case	0/1/9		1 bit	C	R	-	T	-		Low
51	Error: Odd length	0/1/10		1 bit	C	R	-	T	-		Low
52	Error: In current frame	0/1/11		1 bit	C	R	-	T	-		Low
53	Error: Reception	0/1/12		1 bit	C	R	-	T	-		Low
54	Error: Too long	0/1/13		1 bit	C	R	-	T	-		Low

Figure 18: Communication objects of SKX Open for the motor controller

3.3. GROUP ADDRESSES

The **group addresses** created for this application are listed in the table below, as well as the associated **communication objects** and a brief description for each of them:

ADDRESS	NAME	OBJECT	DEVICE	DESCRIPTION
0/0/1	Cinema ON/OFF	6	1.1.1	It turns on the projector and shows the screen with the motor controller
		2	1.1.2	
		0	1.1.2	
		1	1.1.3	
		0	1.1.3	
0/0/2	Projector State	18	1.1.1	It shows the state of the projector
		3	1.1.2	
		1	1.1.2	
0/1/0	Open Error	1.1.2: 48	1.1.2	Error in projector transmission
0/1/7	Open Error	1.1.3: 48	1.1.3	Error in motor controller transmission
0/1/1 - 0/1/2 - 0/1/3 - 0/1/4 - 0/1/5 - 0/1/6 - 0/1/8 - 0/1/9 - 0/1/10 - 0/1/11 - 0/1/12 - 0/1/13 -	Open x.x.x: Error: XXX	49 – 50 – 51 – 52 – 53 – 54	1.1.2 – 1.1.3	Kind of error

In the following figures the associations of the communication objects and the group addresses are shown:

Object	Device	Len...	Sendin
0: Object 0 -	1.1.2 Projector - SKX Open	1 bit	S
0: Object 0 -	1.1.3 Motor Controller - SKX...	1 bit	S
1: Object 1 -	1.1.3 Motor Controller - SKX...	1 bit	S
2: Object 2 -	1.1.2 Projector - SKX Open	1 bit	S
6: b) [Home; Box 1] Binary Control - 1 bit generic control	1.1.1 InZennio Z38i	1 bit	S

Figure 19: Group Address 0/0/1: Cinema ON / OFF

Maingroups	Object	Device	Len...
0 Room 1	1: Object 1 -	1.1.2 Projector - SKX Open	1 bit
0 Projector 1	3: Object 3 -	1.1.2 Projector - SKX Open	1 bit
1 Cinema ON / OFF	18: b) [Home; Box 1] Binary Indicator - 1 bit generic indicator	1.1.1 InZennio Z38i	1 bit
2 Projector Status			
1 Error			

Figure 20: Group Address 0/0/2: Projector State

Maingroups	Address	Name	D
0 Room 1	0	Open 1.1.2: Error	
0 Projector 1	1	Open 1.1.2: Error: Not hexadecimal	
1 Error	2	Open 1.1.2: Error: Lower case	
0 Open 1.1.2: Error	3	Open 1.1.2: Error: Odd length	
1 Open 1.1.2: Error: Not hexadecimal	4	Open 1.1.2: Error: In current frame	
2 Open 1.1.2: Error: Lower case	5	Open 1.1.2: Error: Reception	
3 Open 1.1.2: Error: Odd length	6	Open 1.1.2: Error: Too long	
4 Open 1.1.2: Error: In current frame	7	Open 1.1.3: Error	
5 Open 1.1.2: Error: Reception	8	Open 1.1.3: Error: Not hexadecimal	
6 Open 1.1.2: Error: Too long	9	Open 1.1.3: Error: Lower case	
7 Open 1.1.3: Error	10	Open 1.1.3: Error: Odd length	
8 Open 1.1.3: Error: Not hexadecimal	11	Open 1.1.3: Error: In current frame	
9 Open 1.1.3: Error: Lower case	12	Open 1.1.3: Error: Reception	
10 Open 1.1.3: Error: Odd length	13	Open 1.1.3: Error: Too long	
11 Open 1.1.3: Error: In current frame			
12 Open 1.1.3: Error: Reception			
13 Open 1.1.3: Error: Too long			

Figure 21: Group Address 0/1: Projector and Motor Error



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