

## XC800 Family

# Guide to using the DALI LightNet tool

AP08104

## Application Note

V1.4, 2012-10

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**XC83x**

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Page	Subjects (major changes since last revision)
–	Updated DALI Control Gear Schematic Part 1; Changed R5 from 1K to 560R

**Trademarks**

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# 1 Overview

Digital Addressable Lighting Interface (DALI) is a communication protocol for lighting control in buildings. The interface was first described in the IEC60929 standard for fluorescent lamp ballast, Annex E. The standard was subsequently updated to include other lighting devices, such as LED, HID, etc., to become IEC-62386. The complete standard for control interface of electronic control gears was published in June 2009, while the standard for lighting control devices is scheduled to be published in 2012.

Only a pair of wires are required to form the bus for communication to all devices on a single DALI network. Each piece of operating equipment with a DALI interface can be communicated with individually. Using a bi-directional data exchange, a DALI controller can query and set the status of each connected lighting device. As a standalone system, DALI can be operated with a maximum of 64 devices. Alternatively, DALI can be used as a subsystem via DALI gateways for connection to building management systems.

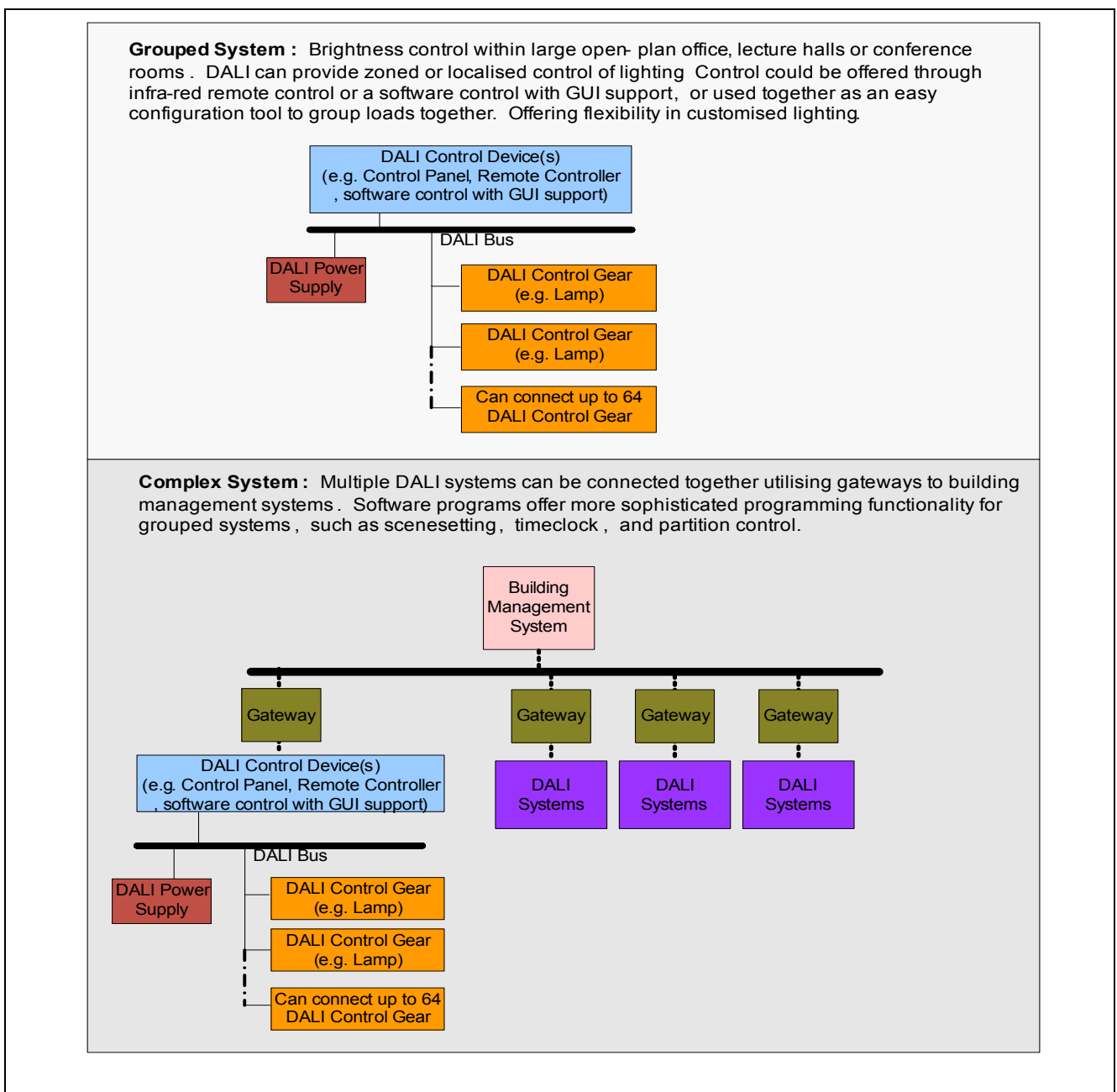
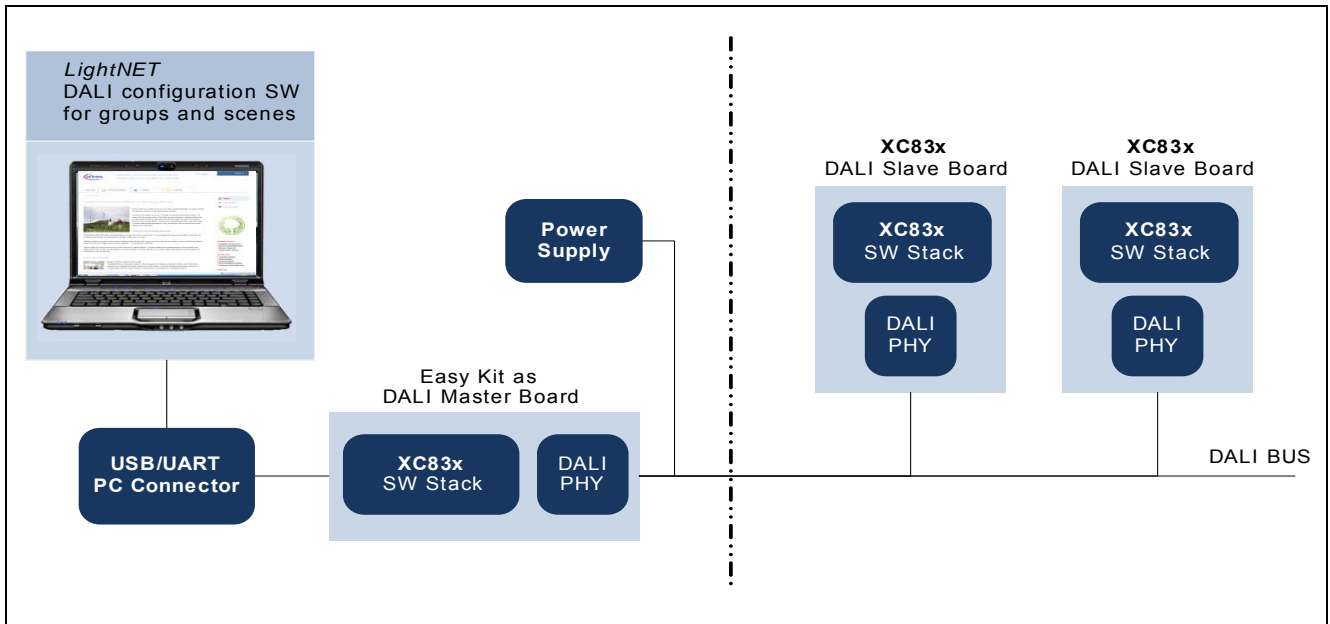


Figure 1 DALI system types



**Figure 2 Block Diagram for DALI Control Device and Control Gear**

Infineon has developed a solution for control gears based on the published IEC standard. The DALI Software Stack for Control Gear has been designed around the Infineon XC83x devices. 'LightNet' has been created to mimic the basic functions of a lighting control device and can therefore be used to evaluate the software. This document describes the setup of the LightNet tool.

The following items are required for use with this application note:

- 1x XC836 Easy Kit (to serve as a DALI Control Device; KIT\_XC836\_EK\_V1)
- 1x DALI PHY (KIT\_XC822\_XC836\_DALI)
- 1x XC836 DALI Slave (KIT\_DALI\_RGB\_XC836\_DKV1) including DALI Control Gear Software Stack (AP08102)
- Infineon DALI LightNet tool

## 2 Getting started

This section is a guide to installing LightNet.

### 2.1 AP08104 Software Package

This software package consists of the installation package for the LightNet software running on the computer and a DALI Software for Control Device developed to support the use of the LightNet tool.

The following figures step through the software installation on the user's computer.

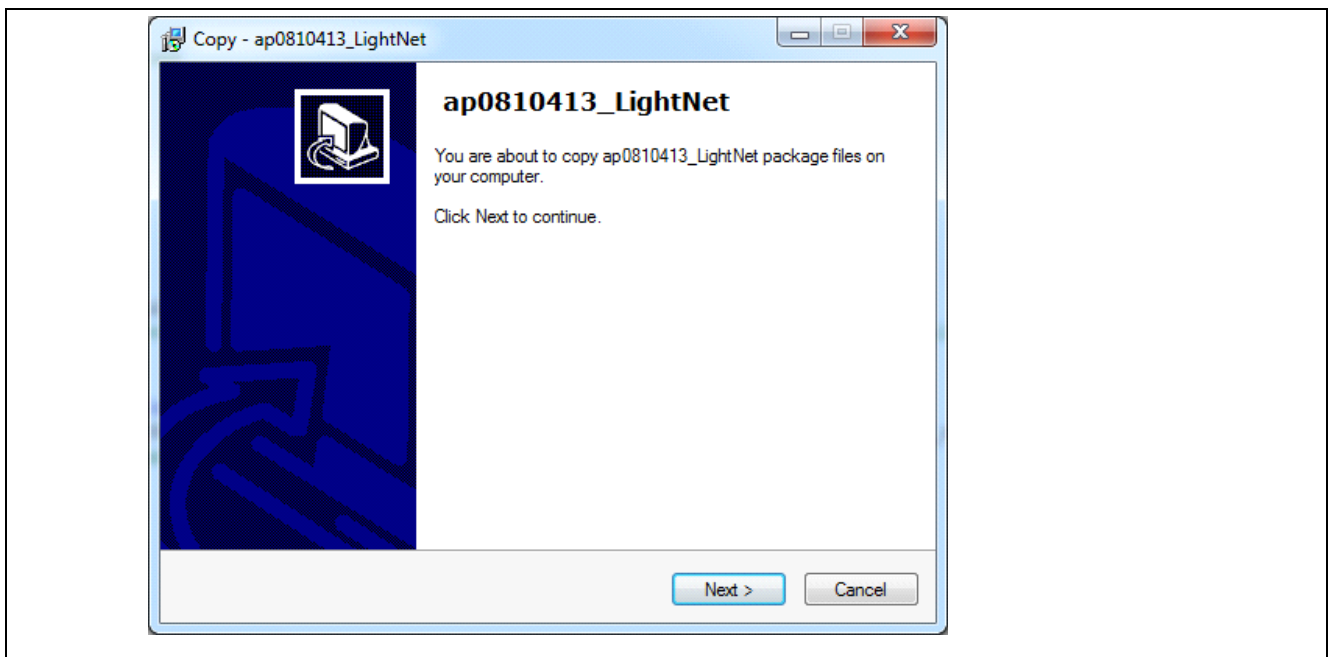


Figure 3 Copying ap08104

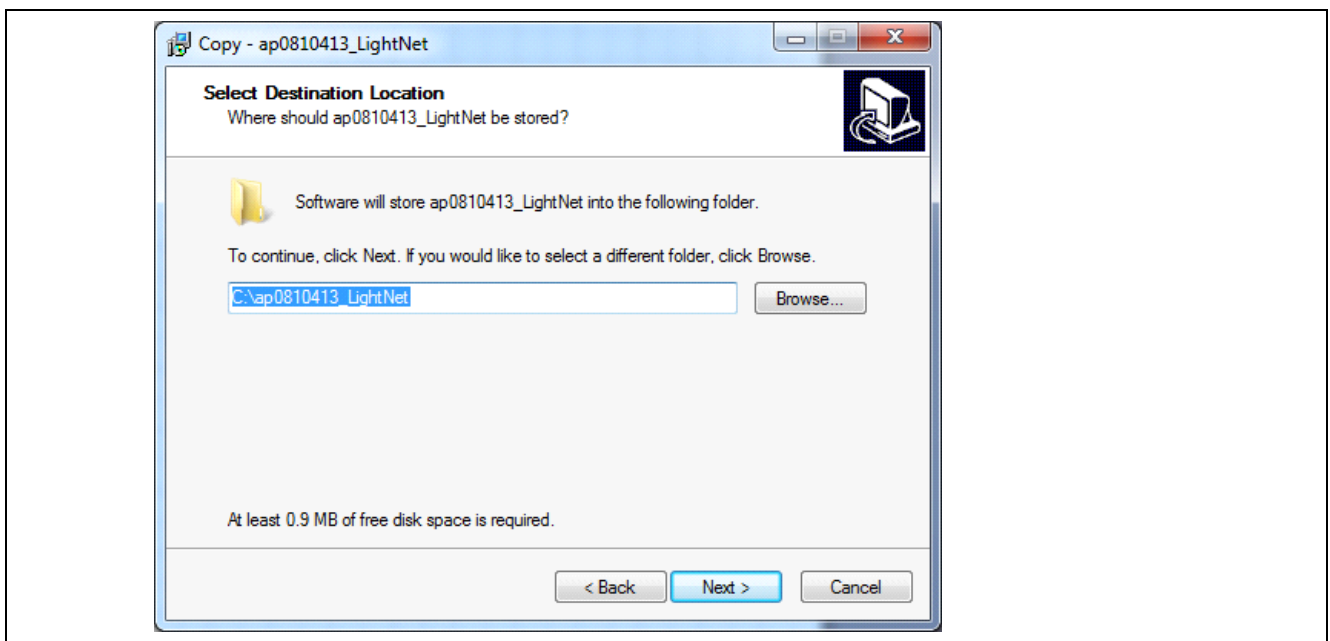
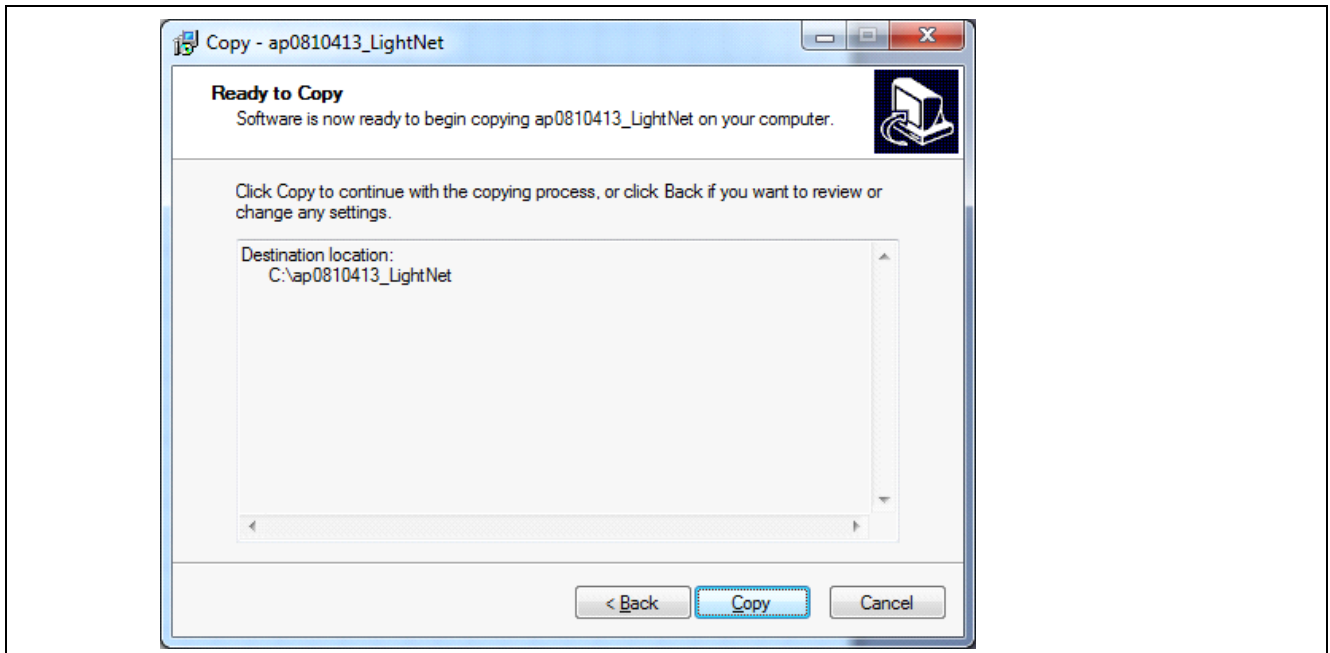
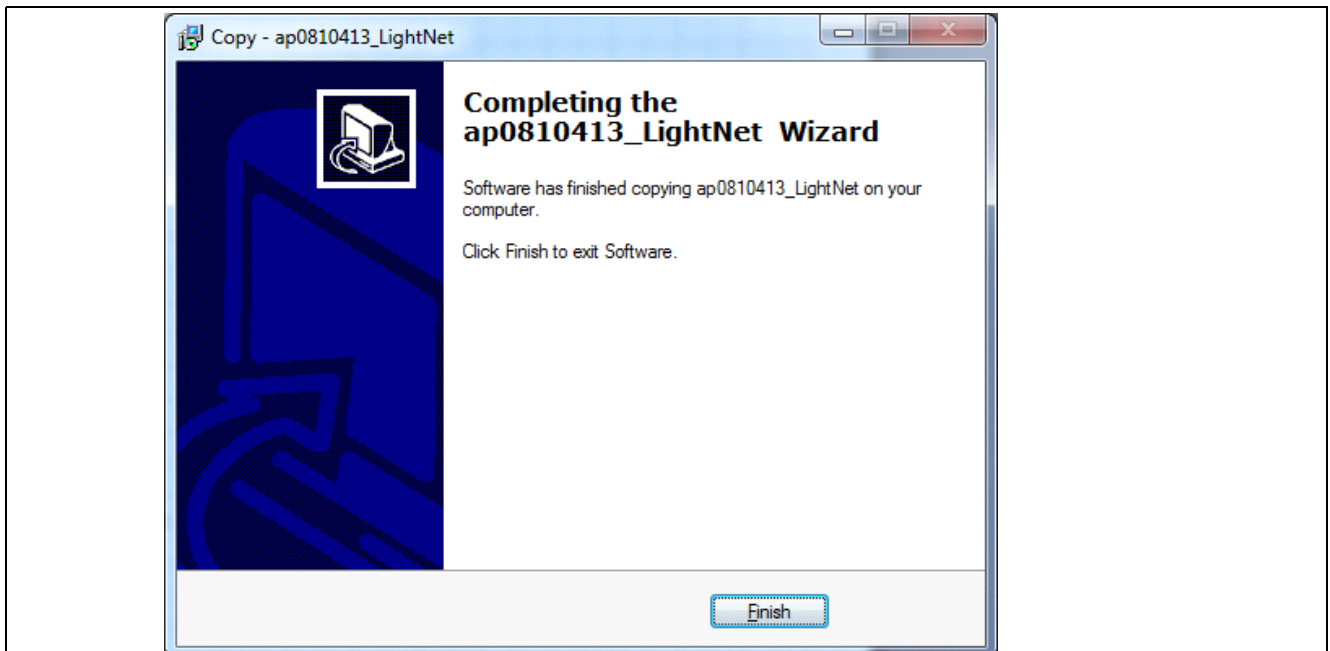


Figure 4 Selecting destination location



**Figure 5** Start the copy process



**Figure 6** Copy completed

## 2.2 LightNet Installation

The LightNet software is designed to provide the control device the facility to send basic DALI commands to the connected control gear. Installation is only to be performed once, using the file: LightNet\_setup\_V1\_3.exe.

The following figures step through the LightNet tool installation process.



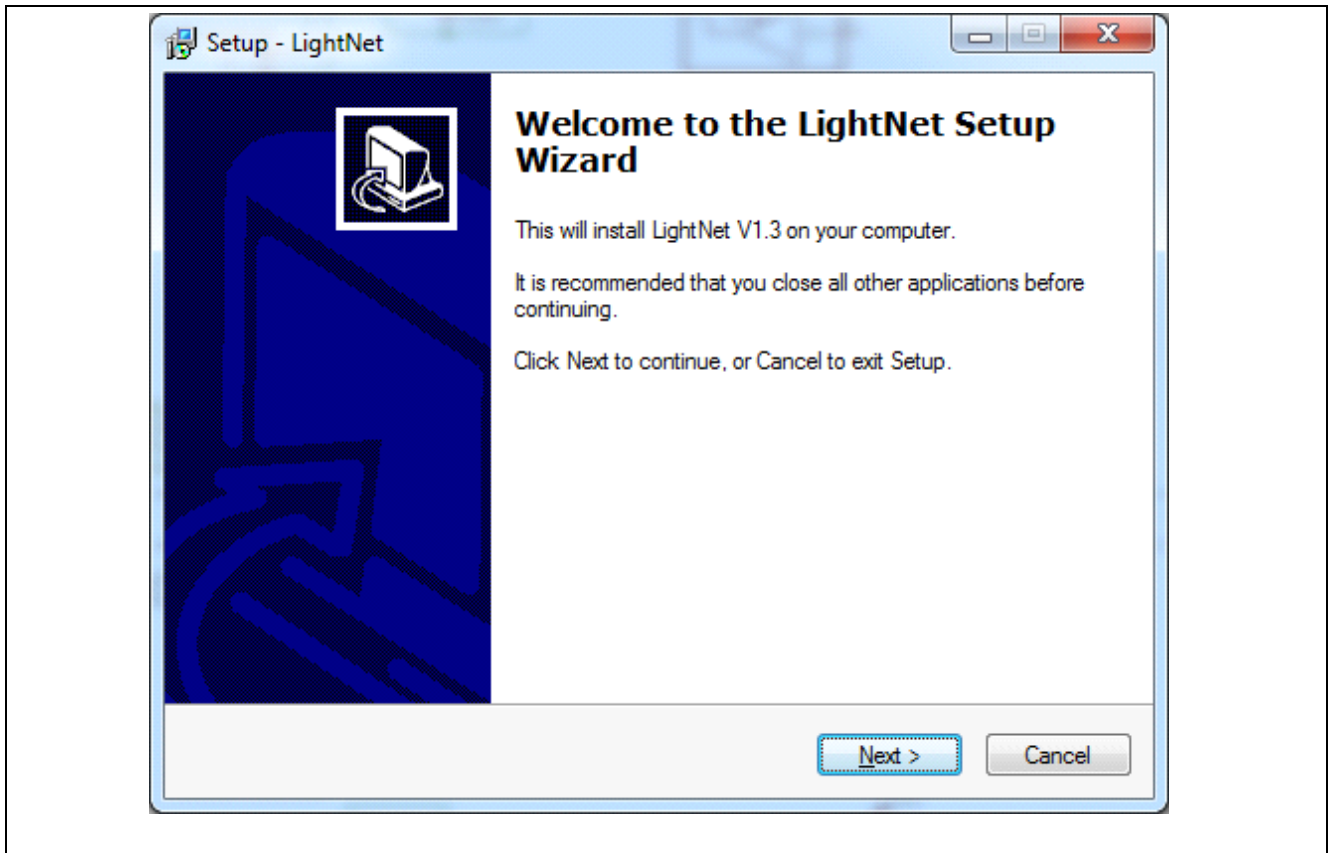


Figure 7 LightNet tool installation window

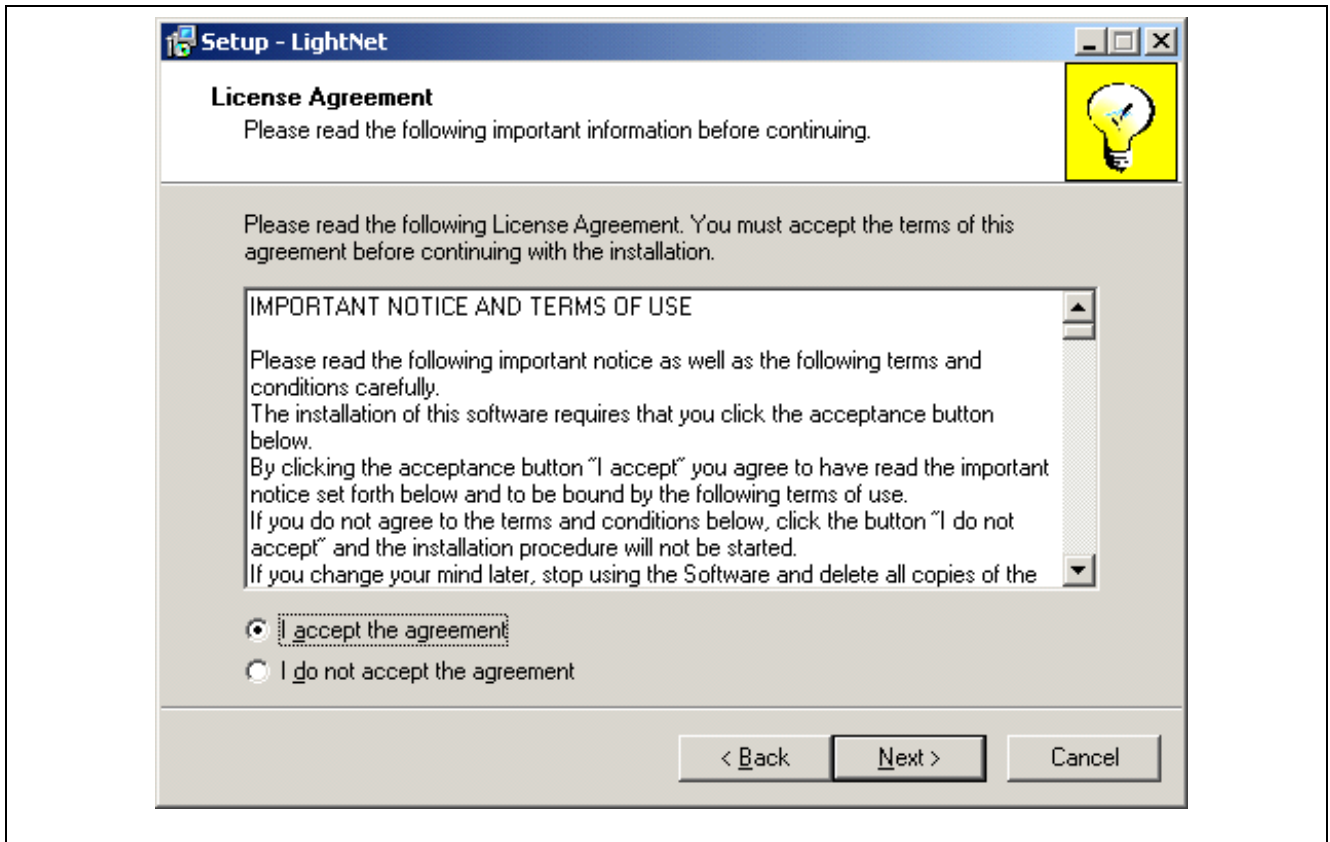


Figure 8 LightNet tool license agreement

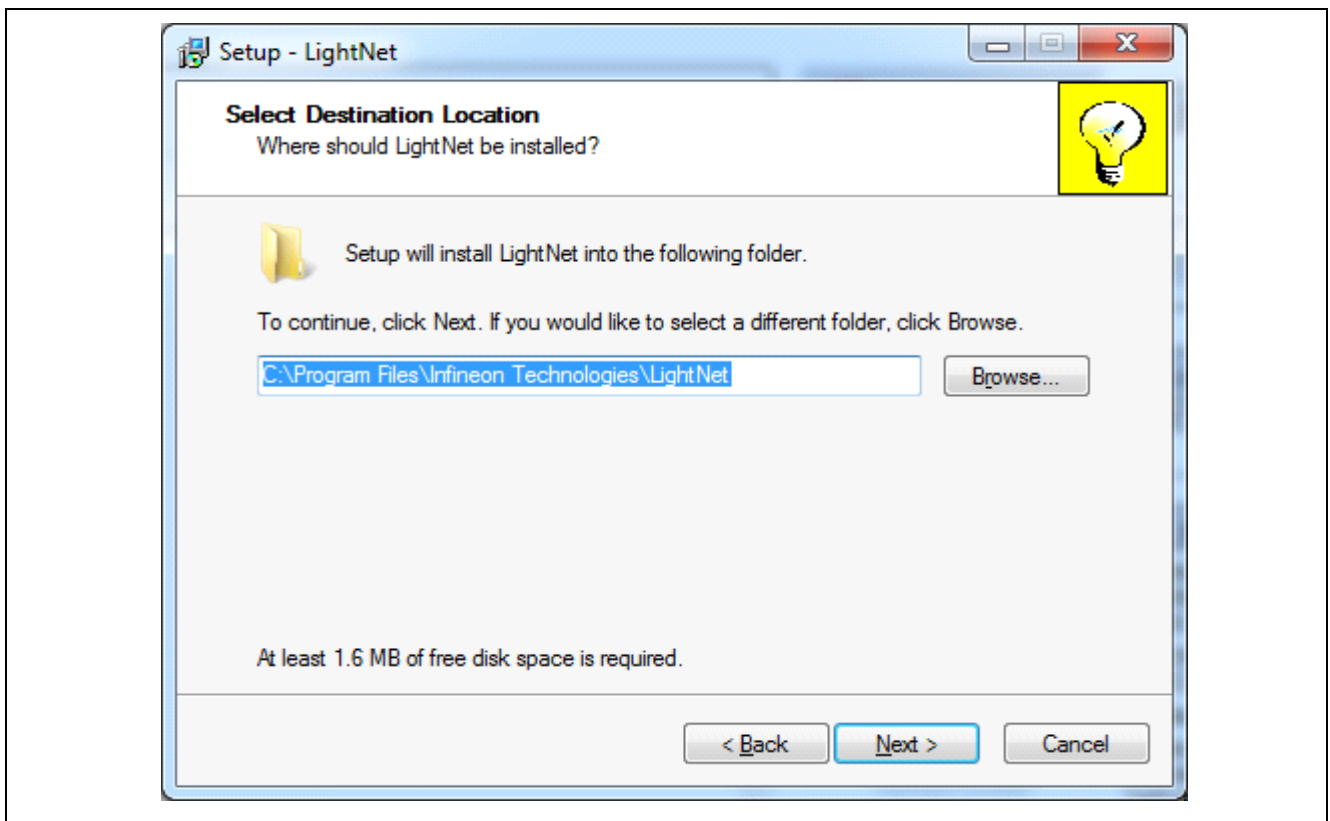


Figure 9 LightNet tool destination location selection

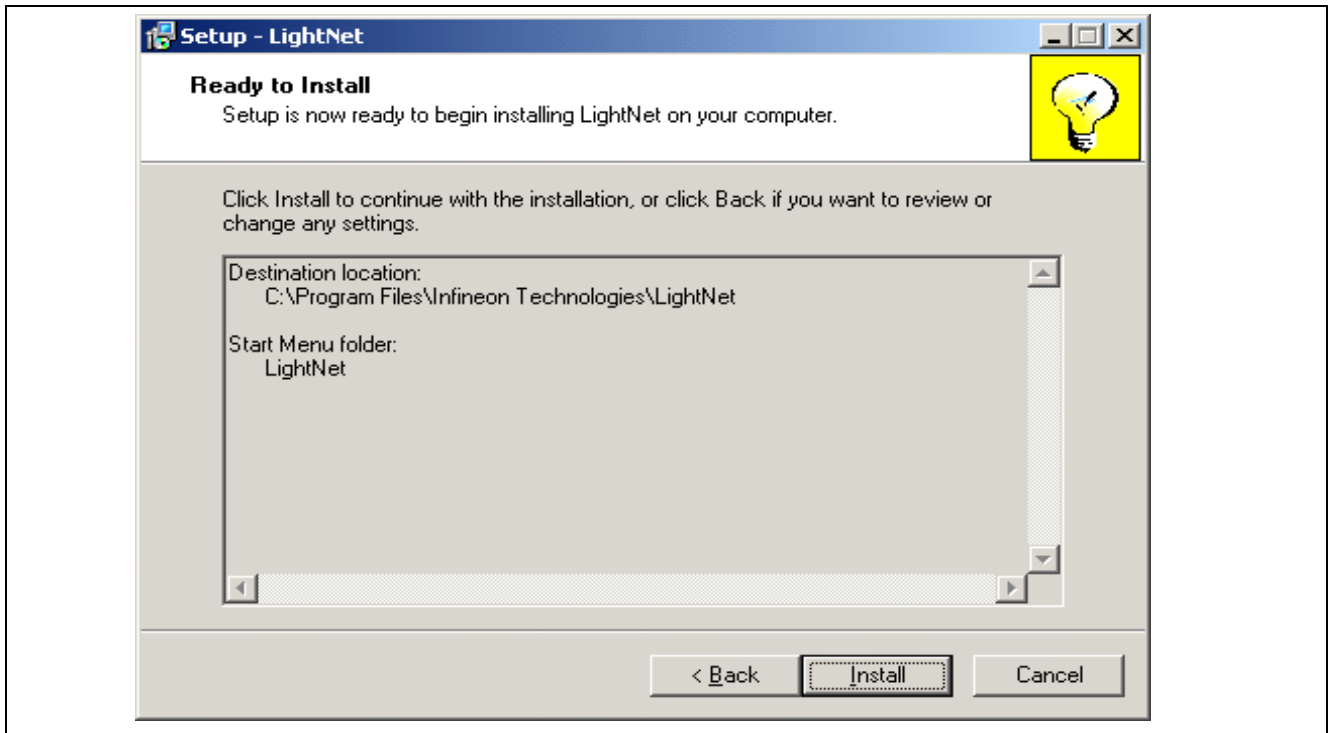


Figure 10 LightNet tool installation start

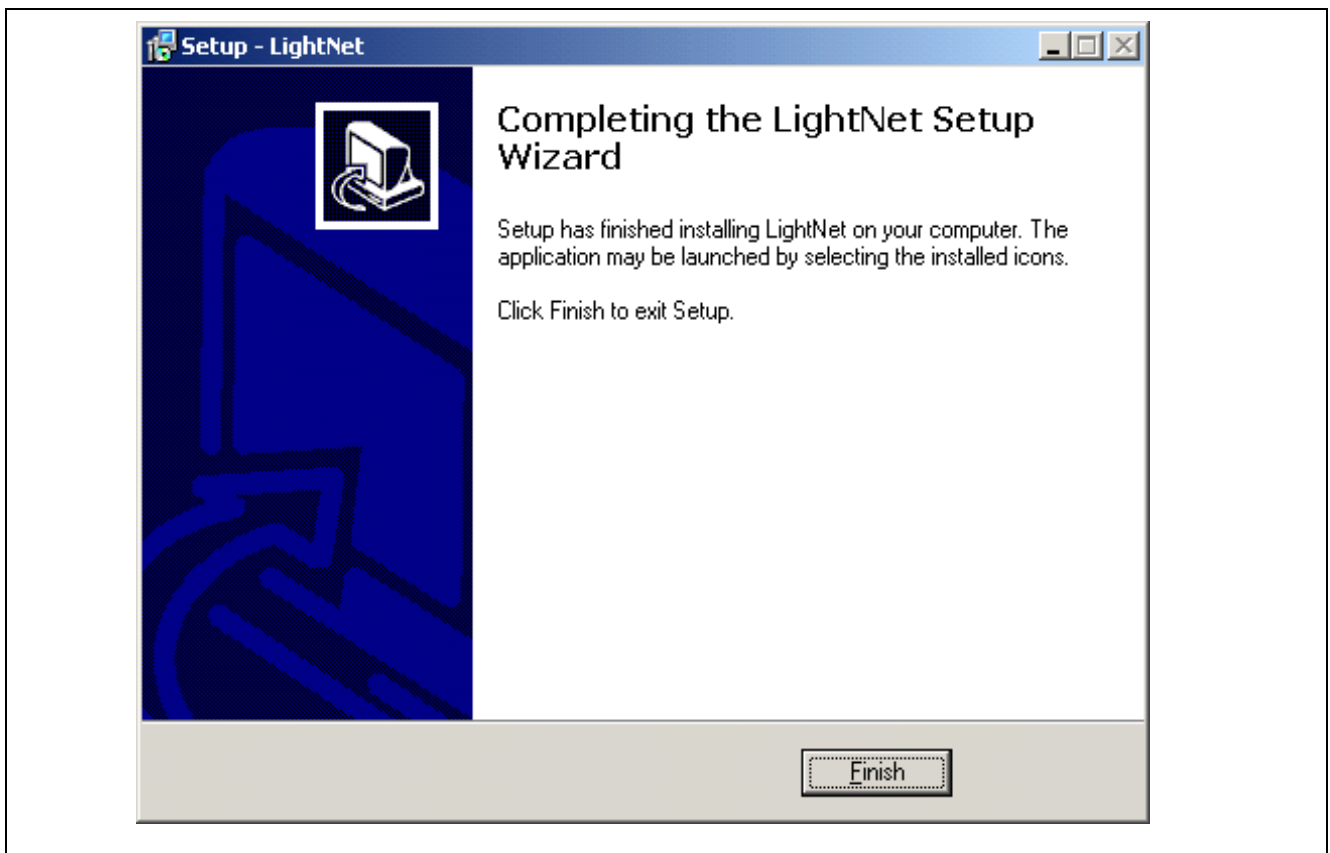


Figure 11 LightNet tool setup completed



Figure 12 Screenshots of LightNet tool

## 2.3 DALI Control Device Software

The DALI Software for Control Device has been developed to support the use of the LightNet tool and can work on XC836 Easy Kit boards. This software must be downloaded to the XC836 Easy Kit board prior to calling the LightNet tool. (File: AP0810413\_LightNet\_XC800Master\_code.exe) In addition to control via LightNet, touch pad control is available.

## 2.4 DALI Control Gear Software

The DALI Software for Control Gear has been developed on the XC83x devices to support the features specified in the International Standard IEC-62386 / Part 102 for control gears. This software includes application code for driving an LED module, supplied with the XC836 DALI Control Gear (KIT\_DALI\_RGB\_XC836\_DKV1). Through a control device, the LightNet software allows DALI commands to be issued to control the brightness of the LED module attached to the control gear. This software must be downloaded to the XC836 DALI Control Kit. For further details, please refer to *AP08102 DALI Control Gear Software Stack*.

## 2.5 Hardware Setup

The LightNet tool acts as the software for the DALI Control Device, used with the XC836 Easy Kit.

The following sections describe how to setup the LightNet tool to evaluate the DALI protocol.

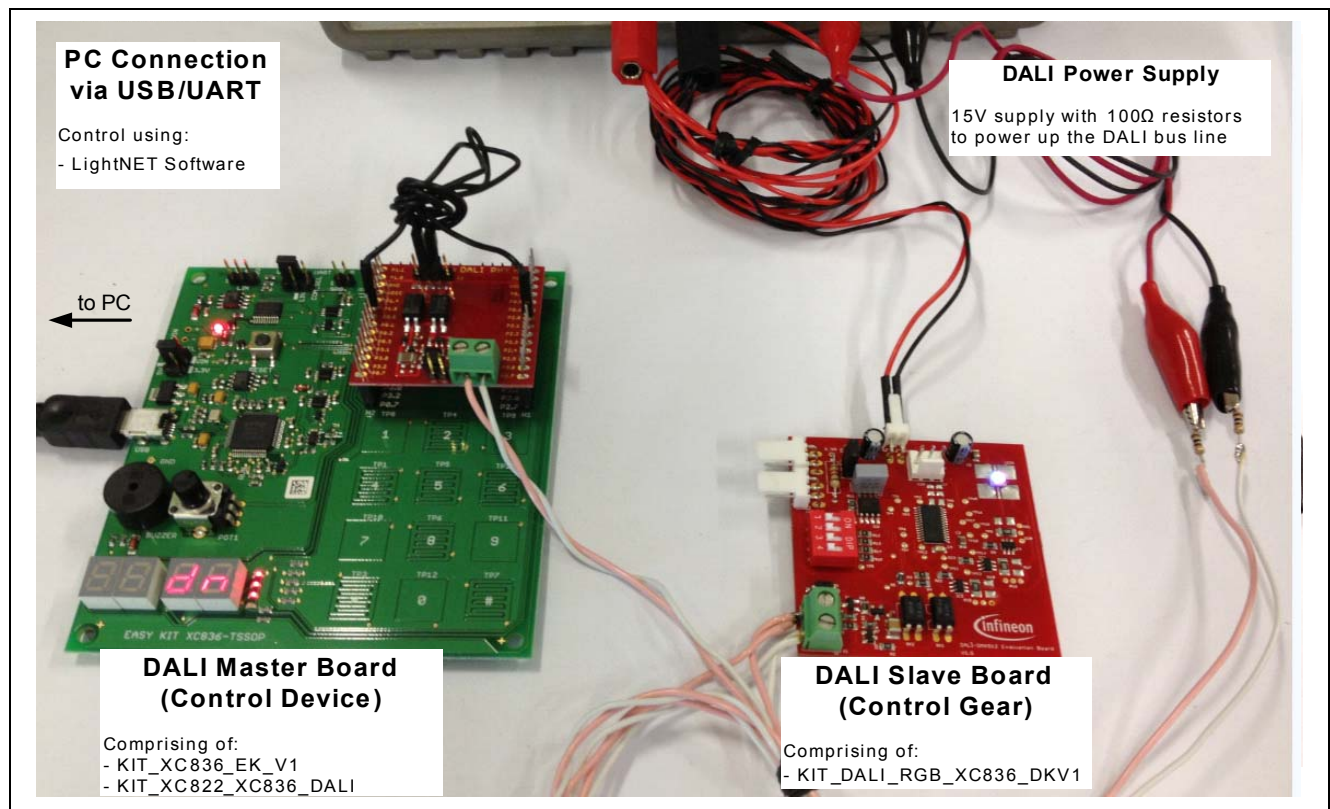


Figure 13 Hardware Setup for Infineon Control Device and Control Gear

### 2.5.1 Setting up the Control Device for LightNet

The XC836 Easy Kit board can be used as the LightNet DALI Control Device, with the following steps:

1. Connect and download the generated hexfile (File:Lightnet\_XC800Master.hex) from [Section 2.3](#) into the XC836 Easy Kit board using XC800 FLOAD in DAVEBENCH™ or KEIL UVision4.

Note: To ensure the success of the following procedures, please ensure that the device is configured to User Mode Diagnostic and COM\_SEL settings is set to USB.

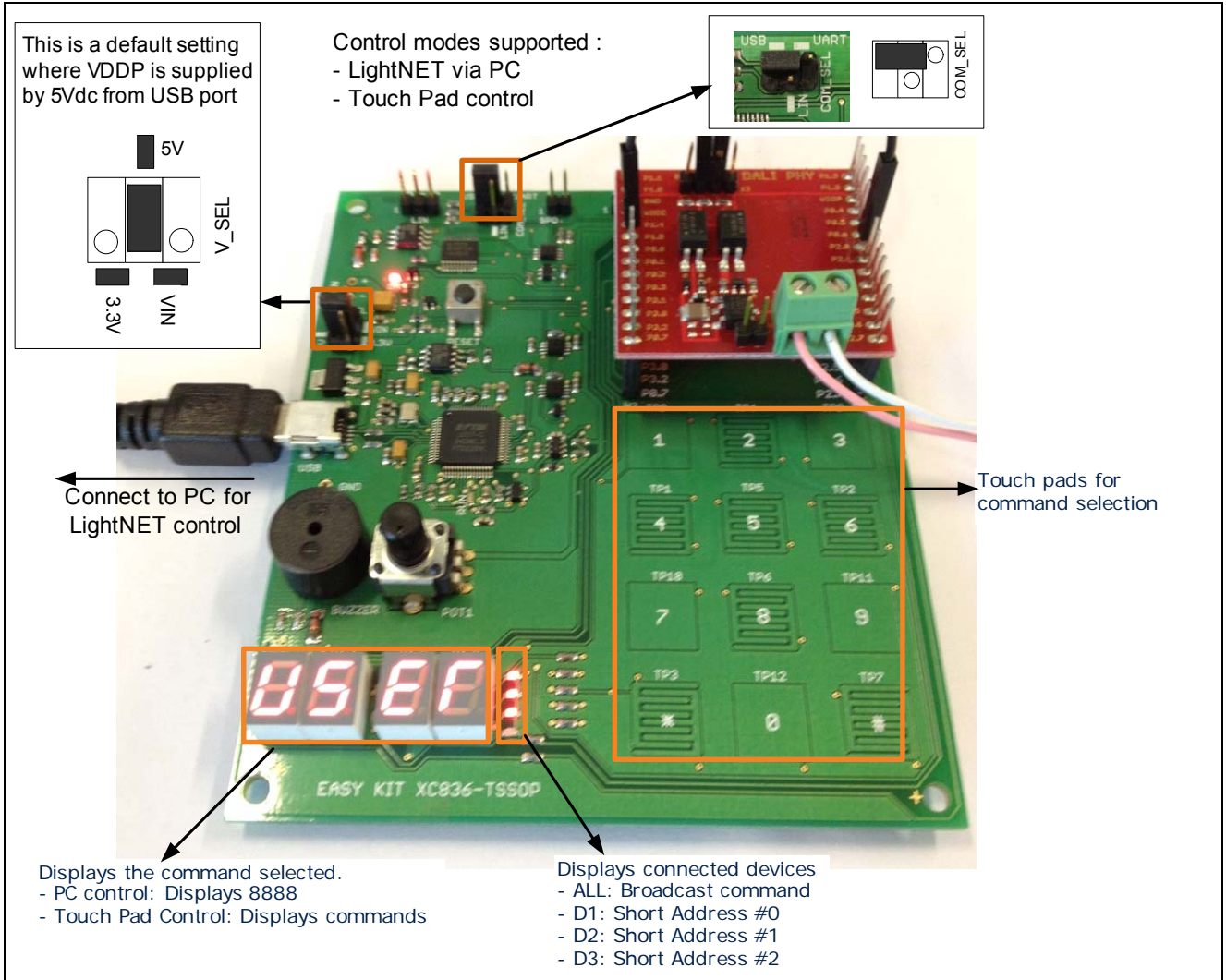


Figure 14 Overview for DALI Master (Control Device)

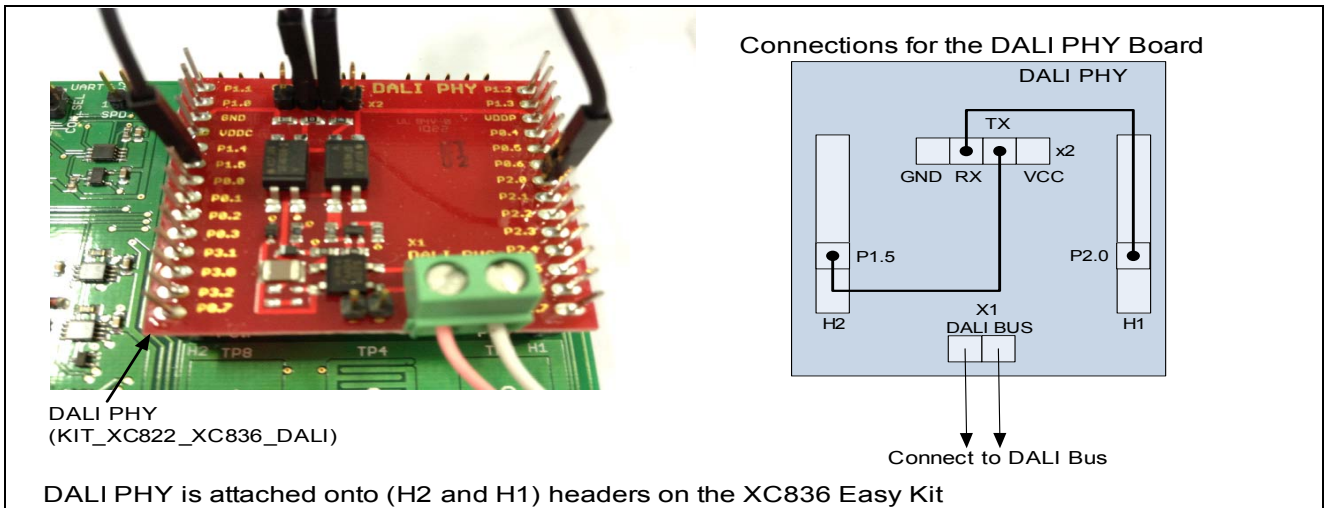


Figure 15 DALI PHY connection for XC836 Easy Kit

### METHOD 1: PC Control via LightNet



The LED display shows 8888 whenever LightNet is used.  
LightNet functions are described in this document

### METHOD 2: TOUCH PAD Control



Upon powering up, default control mode using touch pad control is entered.


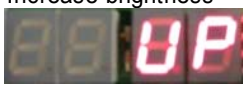


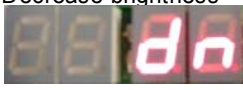







Sends Broadcast Address 	1 [ALL]	Increase brightness 	2 [UP]	3 [SCENE0]	Goto Scene 0 
Sends Short Address 0 	4 [DEVICE1]	Decrease brightness 	5 [DOWN]	6 [SCENE1]	Goto Scene 1 
Sends Short Address 1 	7 [DEVICE2]	Turns on connected device 	8 [ON]	9 [SCENE2]	Goto Scene 2 
Sends Short Address 2 	* [DEVICE3]	Turn off connected device 	0 [OFF]	# [SCENE3]	Goto Scene 3 

Figure 16 DALI Control using PC and Touch Pad description

- The DALI Control Device is now ready to be connected to the DALI bus.
- User can control the DALI network using LightNet (via PC) and through the Touch Pad available on the XC836 Easy Kit.

### 2.5.2 Setting up the Control Gear

The DALI Control Gear can be setup with the following steps:

- Connect the DAP MiniWiggler to the DALI Control Gear as shown in [Figure 17](#). Download the hexfile (File:AP08102\_v1\_2\_Slave.hex) from [Section 2.4](#) into the DALI Slave Board using XC800 FLOAD in DAVEBENCH™ or KEIL UVision4.
- The DALI Control Gear is now ready to be connected to the DALI bus.

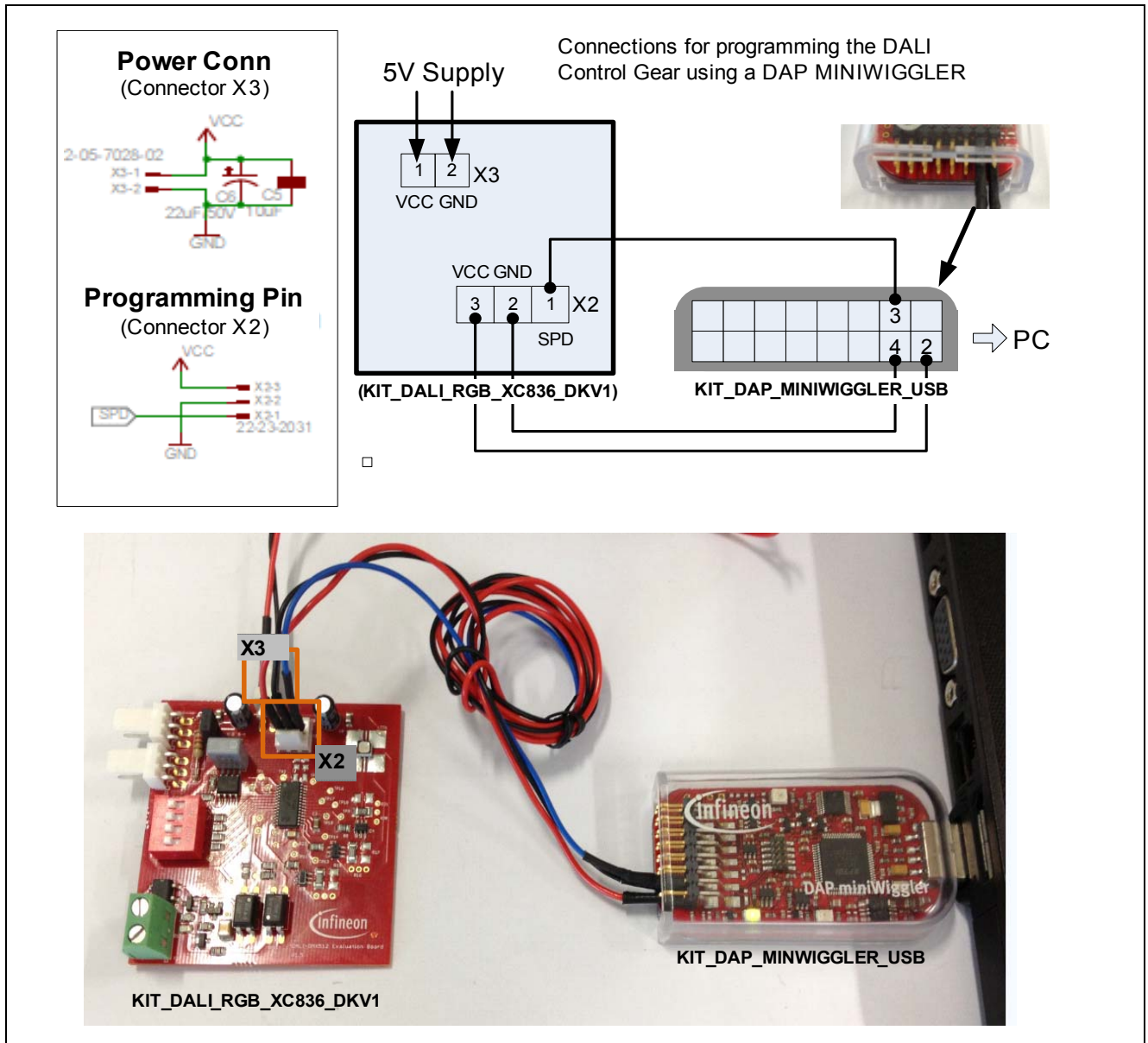


Figure 17 Programming the Control Gear using DAP miniWiggler



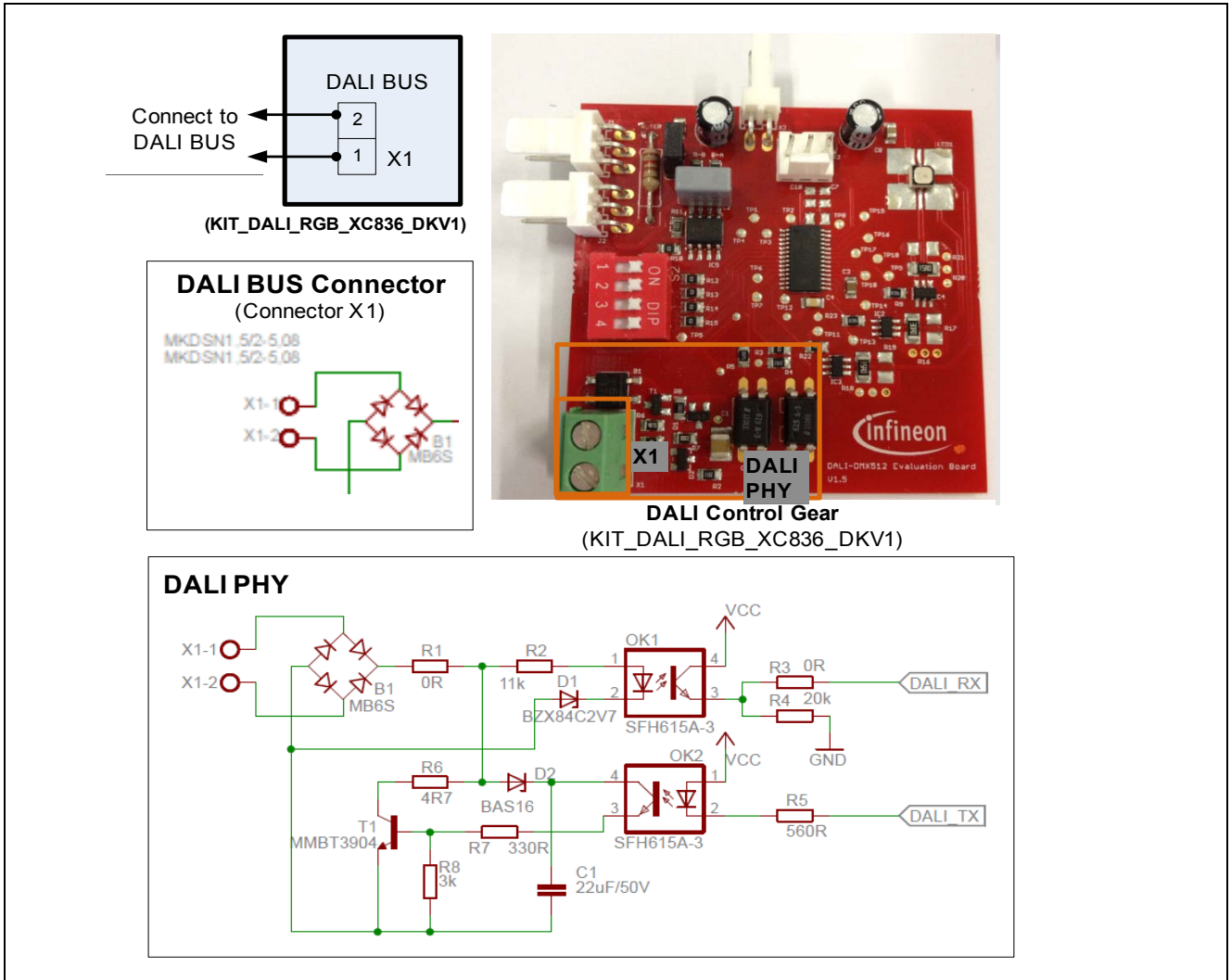


Figure 18 Connecting the DALI Control Gear

### 2.5.3 Connecting DALI Master and Slave to the DALI Bus

The DALI network can be setup with the following steps:

1. To supply power for the DALI bus, connect 100Ω resistors in series to each terminal of a power supply unit supplying 15VDC. This supplies the DALI bus for the DALI network devices.
2. Connect the DALI Control Device (Master) and Control Gear (Slave) to the DALI bus. This completes the DALI setup to control the devices using LightNet!

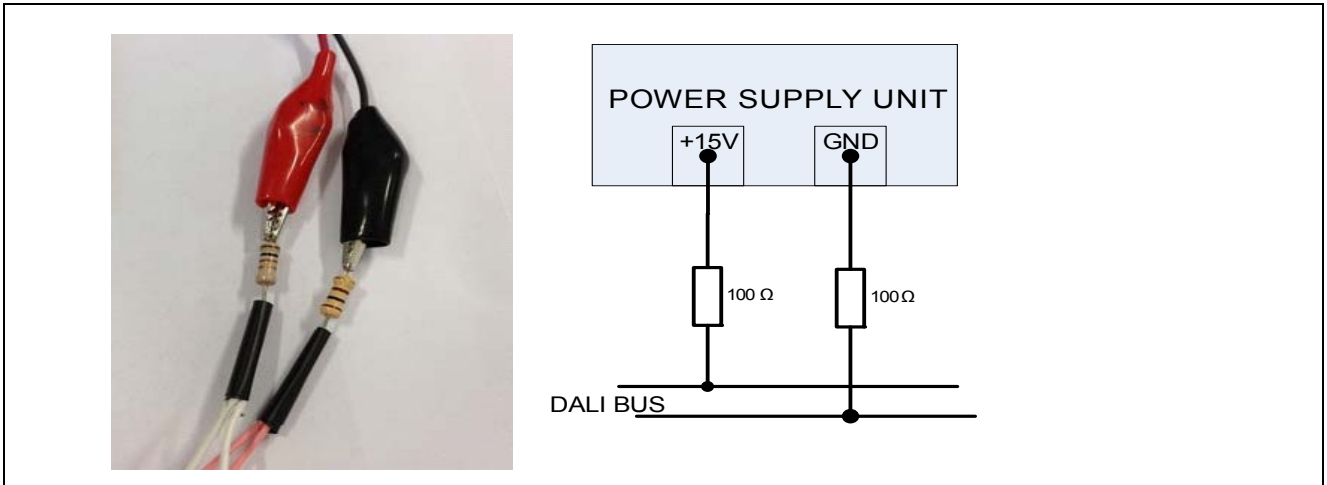


Figure 19 Adding 100Ω resistors to Power Supply

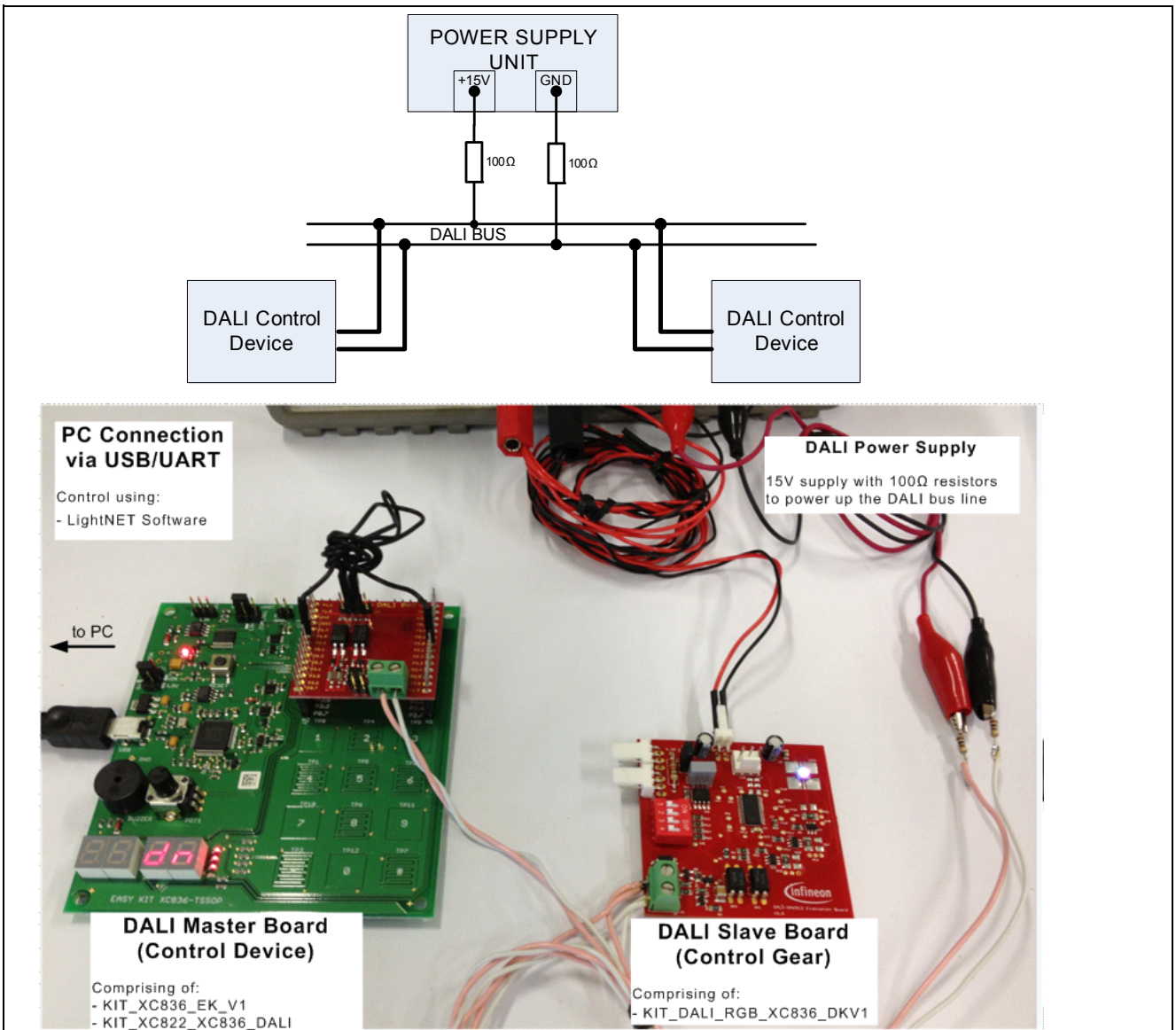


Figure 20 DALI Network Hardware connection

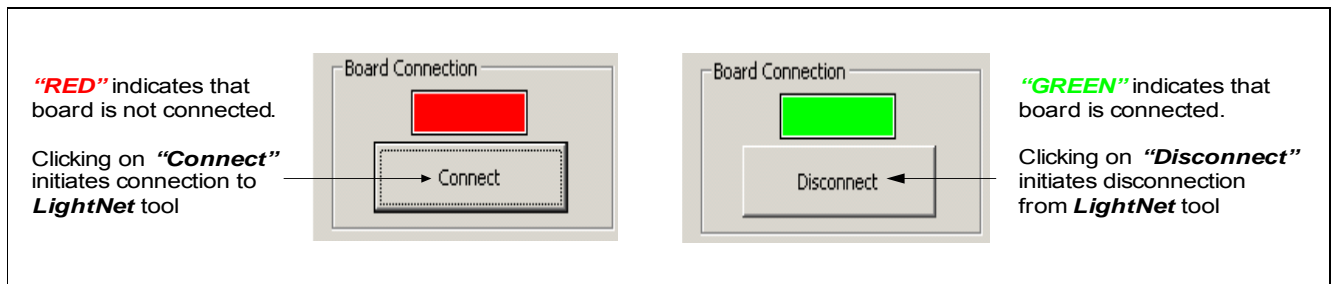
### 3 LightNet Tool

This chapter describes how the LightNet software is organised.

#### 3.1 Connecting the LightNet tool

Once the recommended hardware setup has been completed, LightNet can be used. **Figure 21** shows how to connect to the LightNet tool.

*Note: The LightNet tool cannot be activated if the recommended setup has not been completed as described; i.e. the XC836 Easy Kit is not connected, or the BMI is incorrectly selected.*



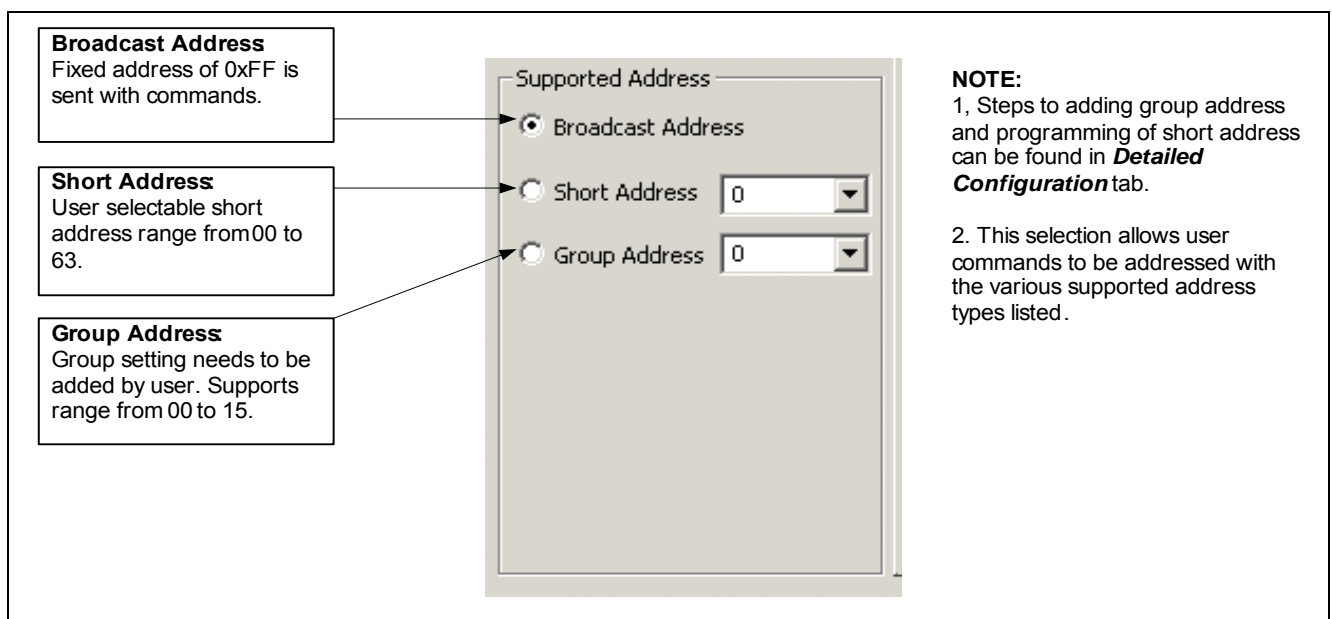
**Figure 21** Connecting the Board

#### 3.2 Address Selection

LightNet supports 3 types of DALI addressing:

- Broadcast
- Short Address
- Group Address

The user decides the type of addressing to be sent with each command by selecting from the available options. For Group Address, the user is required to add the group address to the detailed configuration settings tab, as shown in **Chapter 3.4**.



**Figure 22** Address Selection

### 3.3 General Control & Status Tab

This section describes the general device control and status functions.

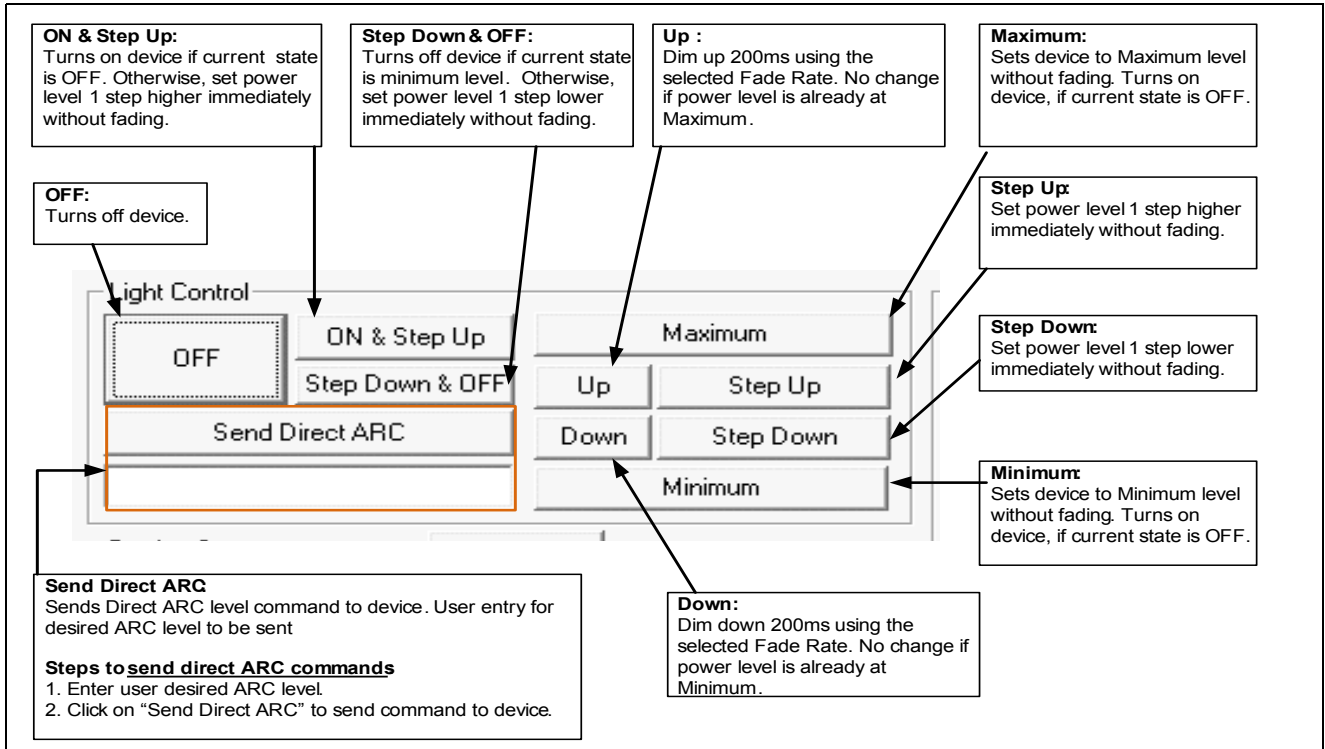


Figure 23 Light Control

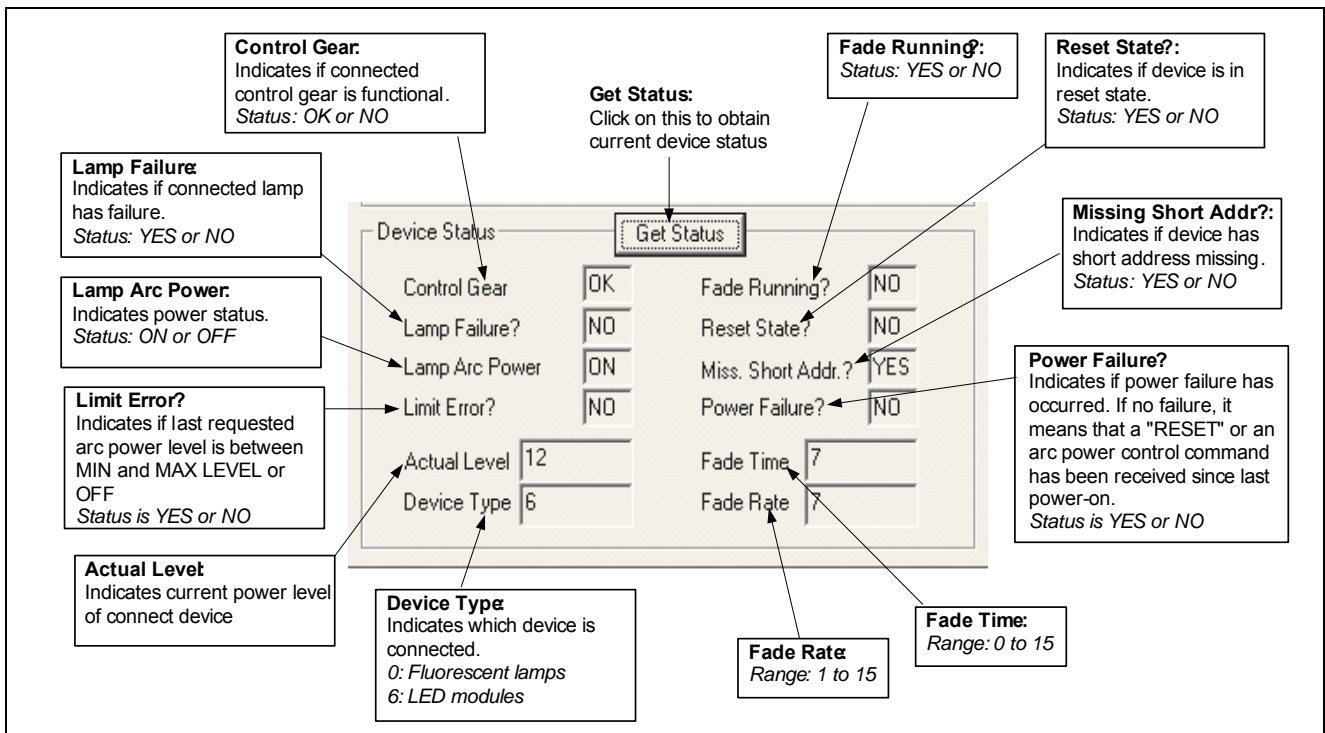


Figure 24 Device Status

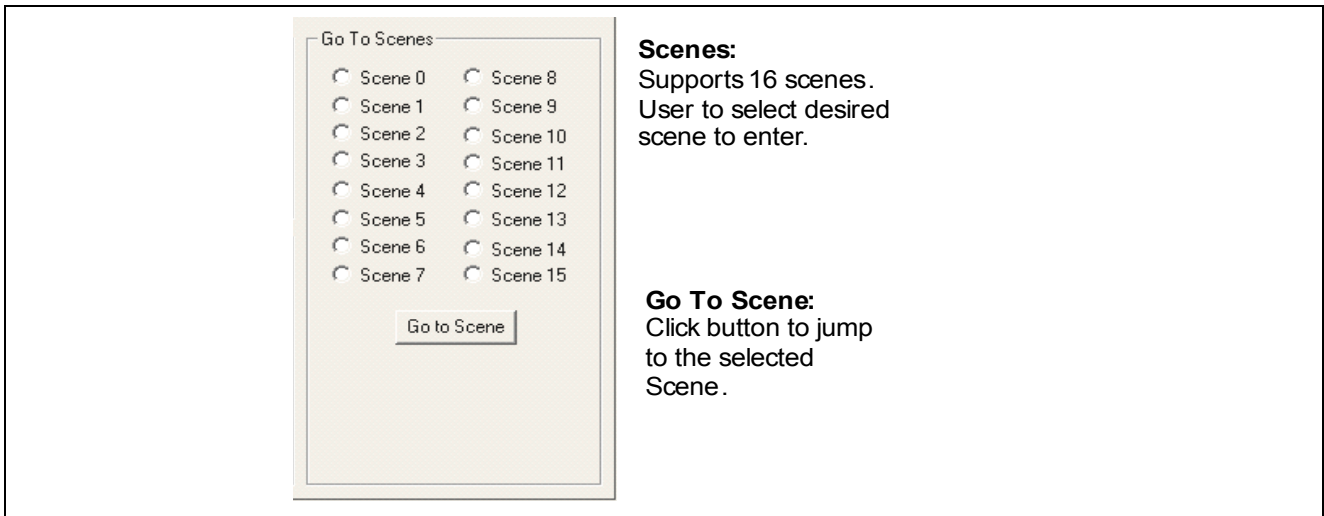
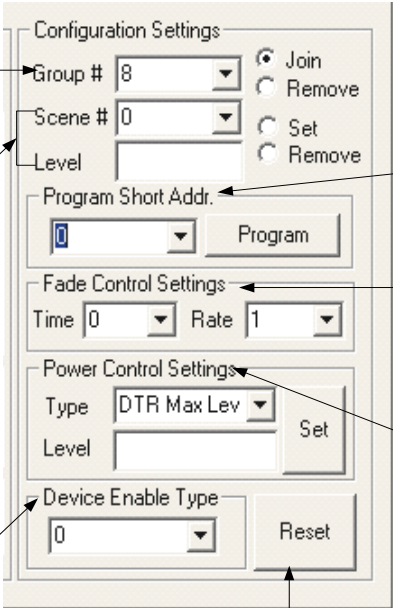


Figure 25 Go to scenes

### 3.4 Detailed Configuration Command Tab

This section describes the options in the configuration settings.



**Group #:**  
Selects group for selected device to join or remove.

**Steps to Join / Remove group:**  
1. Select the desired group from the drop down list provided.  
2. Click on the radio button for the desired action. (Join / Remove)

**Scene # / Level:**  
Selects the scene for selected device to be set or removed. To set the scene level, user can enter desired scene level in the level field provided.

**Steps to Set / Remove Scene info:**  
1. Select the desired scene from the drop down list provided.  
2. Enter the desired level in the Level field. *Skip this step if intention is to remove scene.*  
3. Click on the radio button for the desired action. (Set / Remove)

**Device Enable Type**  
Set the device enable type.  
Supported types: 0 and 6.

**Steps to enable type settings**  
1. Select from drop down list. Once setting, new setting takes effect.

**Program Short Addr**  
Programs user selected short address to connected device.  
Range: 0 to 63

**Steps to Program Short Address**  
1. Select from drop down list desired short address.  
2. Click on Program button, Once completed, new setting takes effect.

**Time / Rate:**  
Selects the device fade time / rate.  
Fade Time Range 0 to 15  
Fade Rate Range 1 to 15

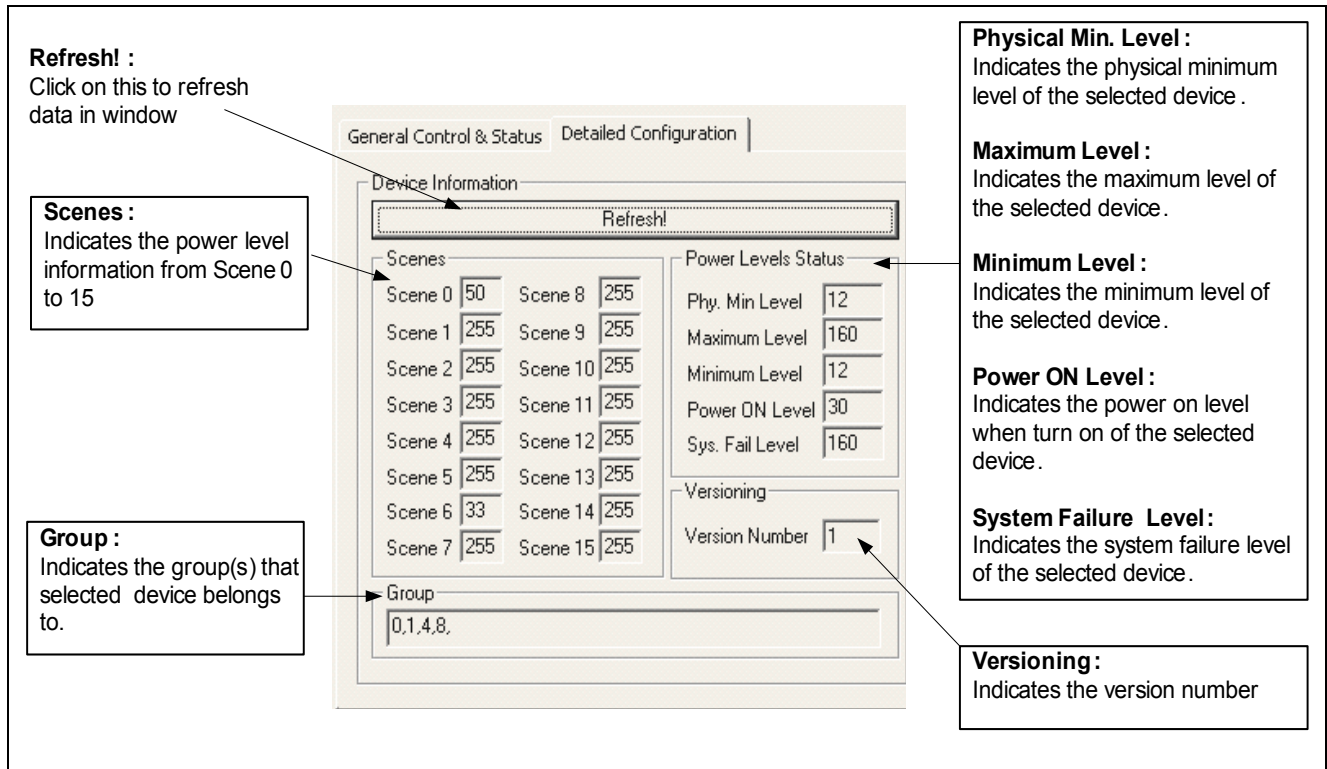
**Steps to select Fade Control Settings**  
1. Select from drop down list. Once setting, new setting takes effect.

**Power Control Settings**  
Sets the desired power setting for selected device. Supports following setting:  
- Maximum level  
- Minimum level  
- System Failure level  
- Power ON level.

**Steps to Set power settings:**  
1. Select the type of power setting to be changed.  
2. Enter the desired level in the Level field.  
3. Click on the Set to activate setting.  
4. The new settings will only be programmed to the flash upon "OFF" selection in the Lights Control tab.

**Reset:**  
Reset selected device to reset condition.

Figure 26 Configuration Settings



**Refresh! :**  
Click on this to refresh data in window

**Scenes :**  
Indicates the power level information from Scene 0 to 15

**Group :**  
Indicates the group(s) that selected device belongs to.

**Physical Min. Level :**  
Indicates the physical minimum level of the selected device .

**Maximum Level :**  
Indicates the maximum level of the selected device.

**Minimum Level :**  
Indicates the minimum level of the selected device.

**Power ON Level :**  
Indicates the power on level when turn on of the selected device .

**System Failure Level:**  
Indicates the system failure level of the selected device.

**Versioning:**  
Indicates the version number

Scenes	
Scene 0	50
Scene 1	255
Scene 2	255
Scene 3	255
Scene 4	255
Scene 5	255
Scene 6	33
Scene 7	255
Scene 8	255
Scene 9	255
Scene 10	255
Scene 11	255
Scene 12	255
Scene 13	255
Scene 14	255
Scene 15	255

Power Levels Status	
Phy. Min Level	12
Maximum Level	160
Minimum Level	12
Power ON Level	30
Sys. Fail Level	160

Versioning	
Version Number	1

Group: 0,1,4,8.

Figure 27 Device Information

### 3.5 Memory Access Control Tab

This section describes the options for memory access feature.

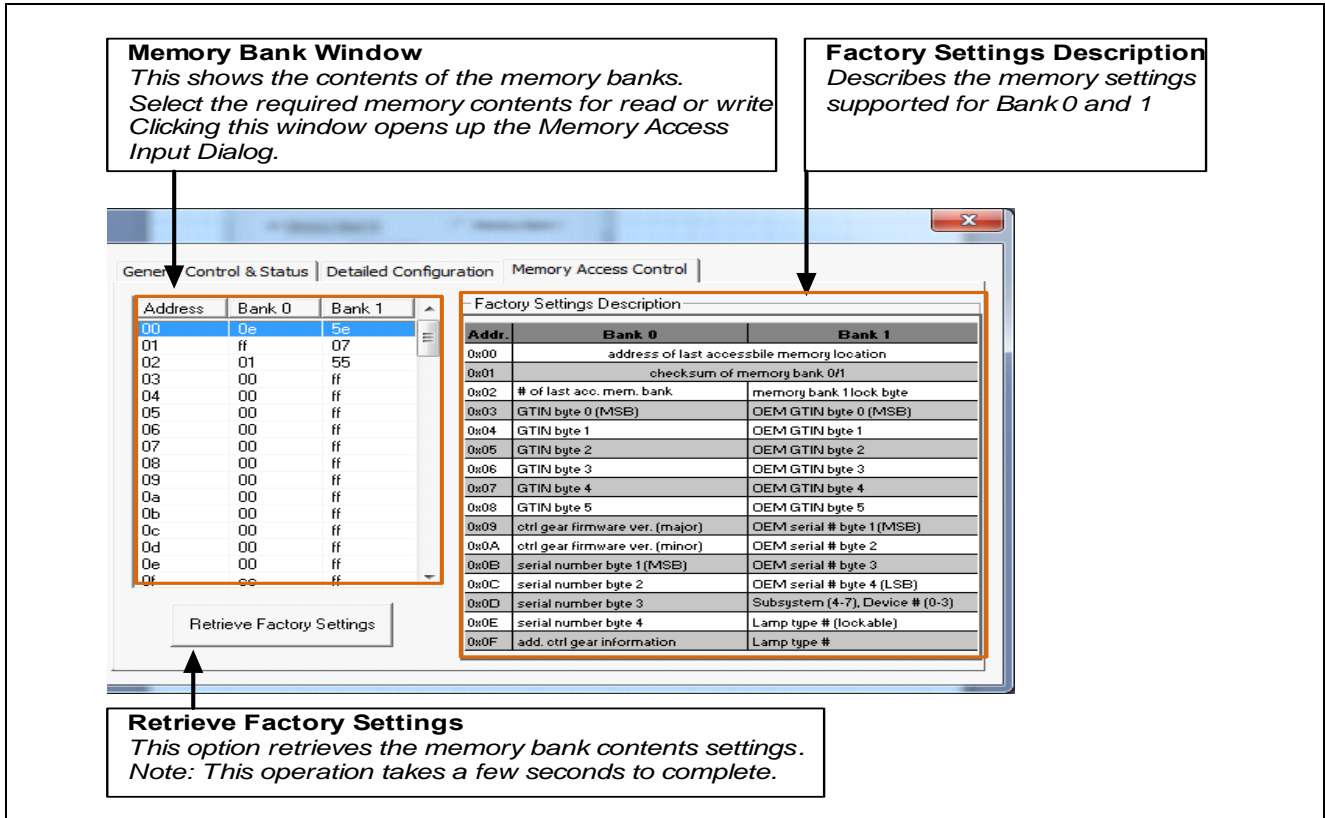


Figure 28 Memory Bank Window

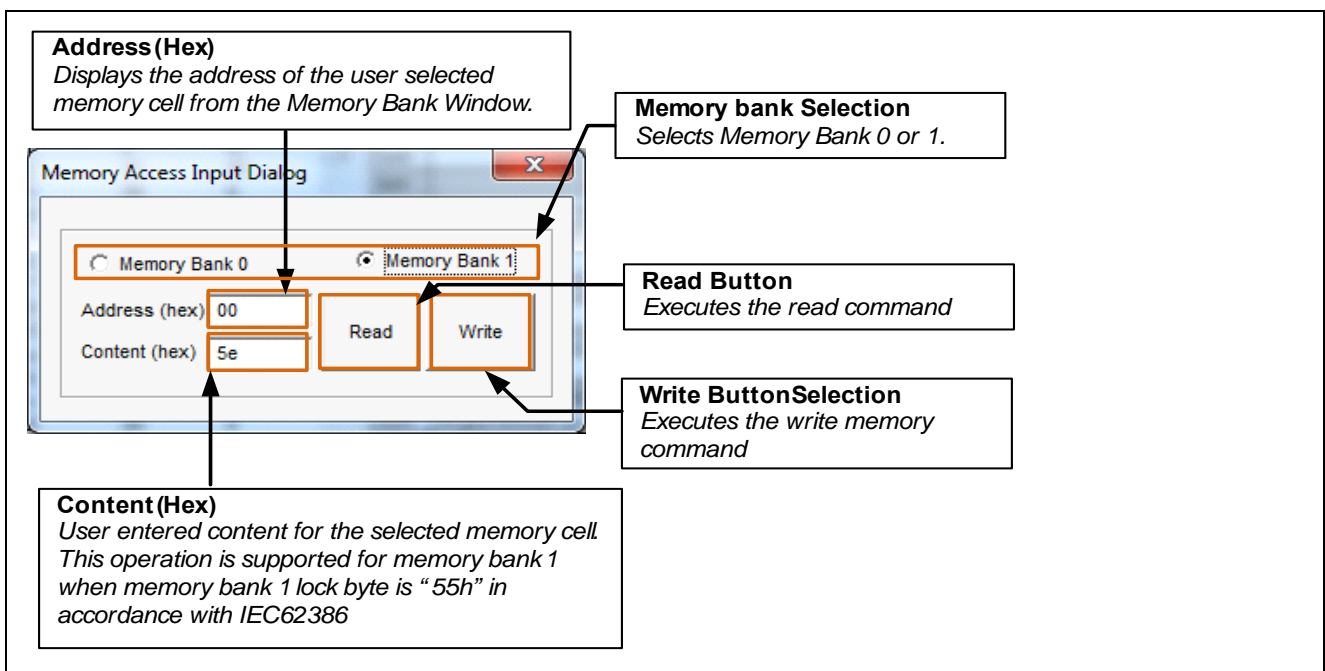


Figure 29 Memory Input Dialog

## 4 Summary

Infineon's LightNet tool models the function of a lighting control device, controlling DALI control gears. This document demonstrates how easy the tool is to use, to evaluate a DALI system.

## 5 References

- [1] IEC 62386 Digital addressable lighting interface; Part 101: General requirements - System (Edition 1.0, 2009-06)
- [2] IEC 62386 Digital addressable lighting interface; Part 102: General requirements - Control gear (Edition 1.0, 2009-06)
- [3] AP08102 DALI Control Gear Software Stack
- [4] XC82x User Manual 1.1 Hardware Manual Easy Kit XC822-TSSOP16 board V1.0
- [5] XC83x User Manual 1.0 Hardware Manual Easy Kit XC836-TSSOP board V1.0



## APPENDIX - DALI PHY Board

Infineon DALI PHY circuit construction to support device evaluation within a typical DALI network, using the XC836 Easy Kit board. This following figure shows the schematic for a DALI PHY circuit construction that can be used with the XC822 Easy Kit board.

*Note: The DALI PHY board design supports a DALI bus level from 14.5V to 22.5V. The values of R1 and R4 can be adjusted to support a wider DALI bus voltage range if required.*

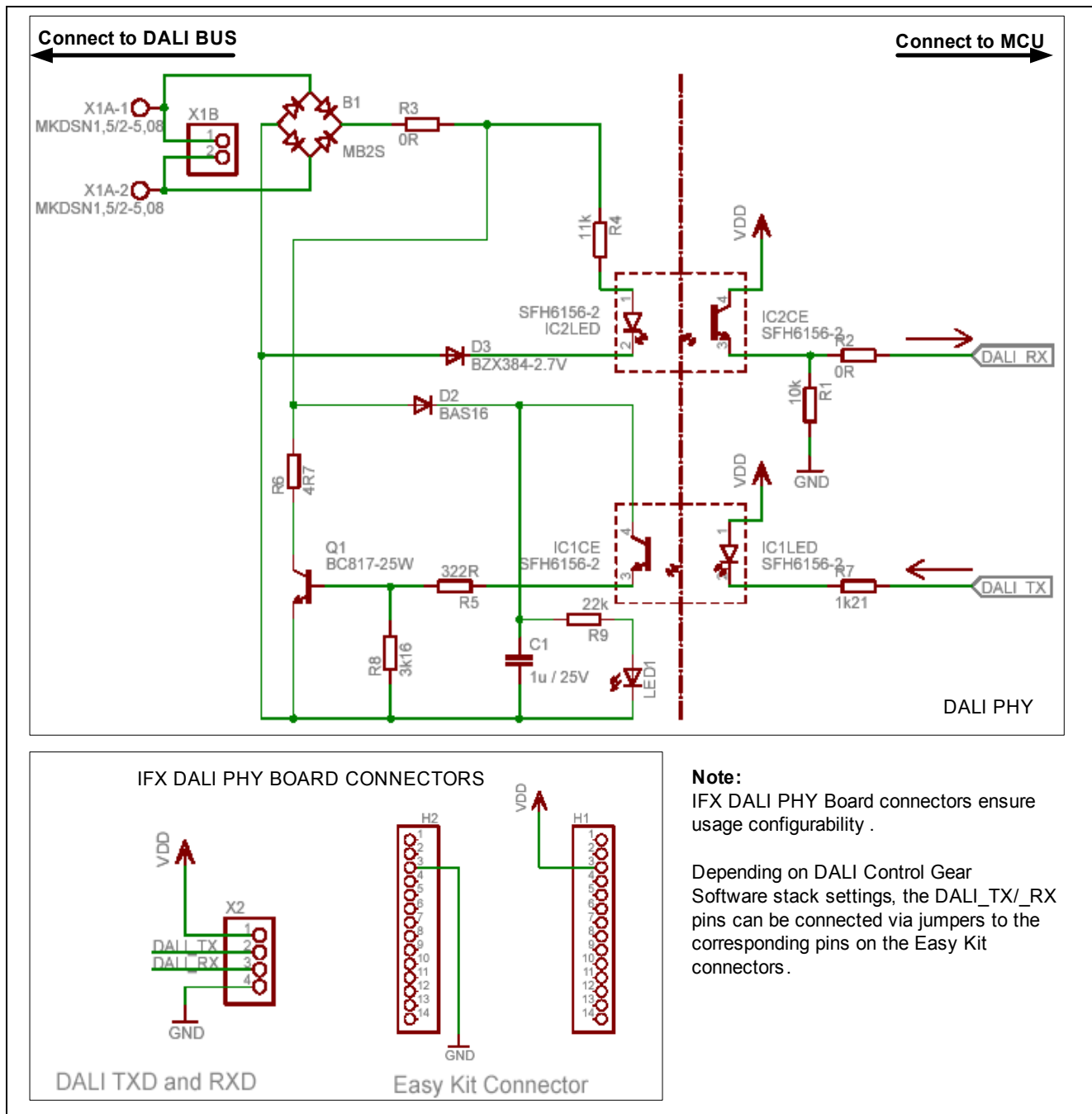


Figure 30 DALI PHY Board Schematics

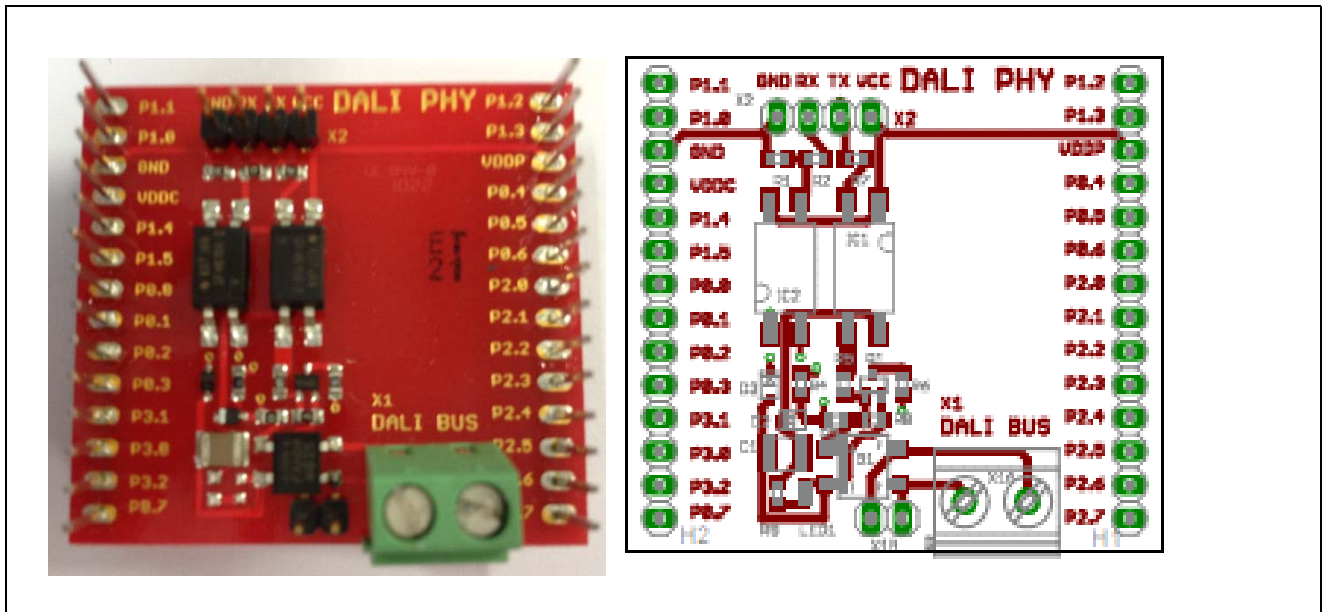


Figure 31 Infineon DALI PHY Board and Layout

Table 1 Bill of Material for DALI PHY Circuit

Item	Reference	Value	Device	Package	Description
1	B1	MB2S	MB2S	SOIC-4	Bridge Rectifier
2	C1	1u / 25V	C-EUC1210	C1210	Capacitor
3	D2	BAS16	DIODE-SOD323-R	SOD323-R	Diode
4	D3	BZX384-2V7	DIODE-SOD323-R	SOD323-R	Diode
5	IC1	SFH6156-2	SFH6156	SFH	5.3 kV TRIOS High Reliability Optocoupler
6	IC2	SFH6156-2	SFH6156	SFH	5.3 kV TRIOS High Reliability Optocouplerstor
7	Q1	BC817-25W	BC817-25WSMD323	SOT323	NPN Transistor
8	R1	10R	R-EU-R0603	R0603	Resistor
9	R2	0R	R-EU-R0603	R0603	Resistor
10	R3	0R	R-EU-R0603	R0603	Resistor
11	R4	11k	R-EU-R0603	R0603	Resistor
12	R5	324R	R-EU-R0603	R0603	Resistor
13	R6	4R7	R-EU-R0603	R0603	Resistor
14	R7	1k21	R-EU-R0603	R0603	Resistor
15	R8	3k16	R-EU-R0603	R0603	Resistor
16	X1A	MKDSN1,5/2-5,08	MKDSN1,5/2-5,08	MKDSN1,5/2-5,08	MKDSN 1,5/2-5,08 Printklemme
17	X1B	2x1	PINHD-1X2	1X02	Pin Header
18	X2	4x1	PINHD-1X4	1X04	Pin Header

**Table 1 Bill of Material for DALI PHY Circuit**

Item	Reference	Value	Device	Package	Description
19	H1	SAMTEC SSQ-1-14-03-S-S	PINHD-1X14	1X14	Pin Header
20	H2	SAMTEC SSQ-1-14-03-S-S	PINHD-1X14	1X14	Pin Header

## APPENDIX - DALI Control Gear Board

Schematic for KIT\_DALI\_RGB\_XC836\_DKV1

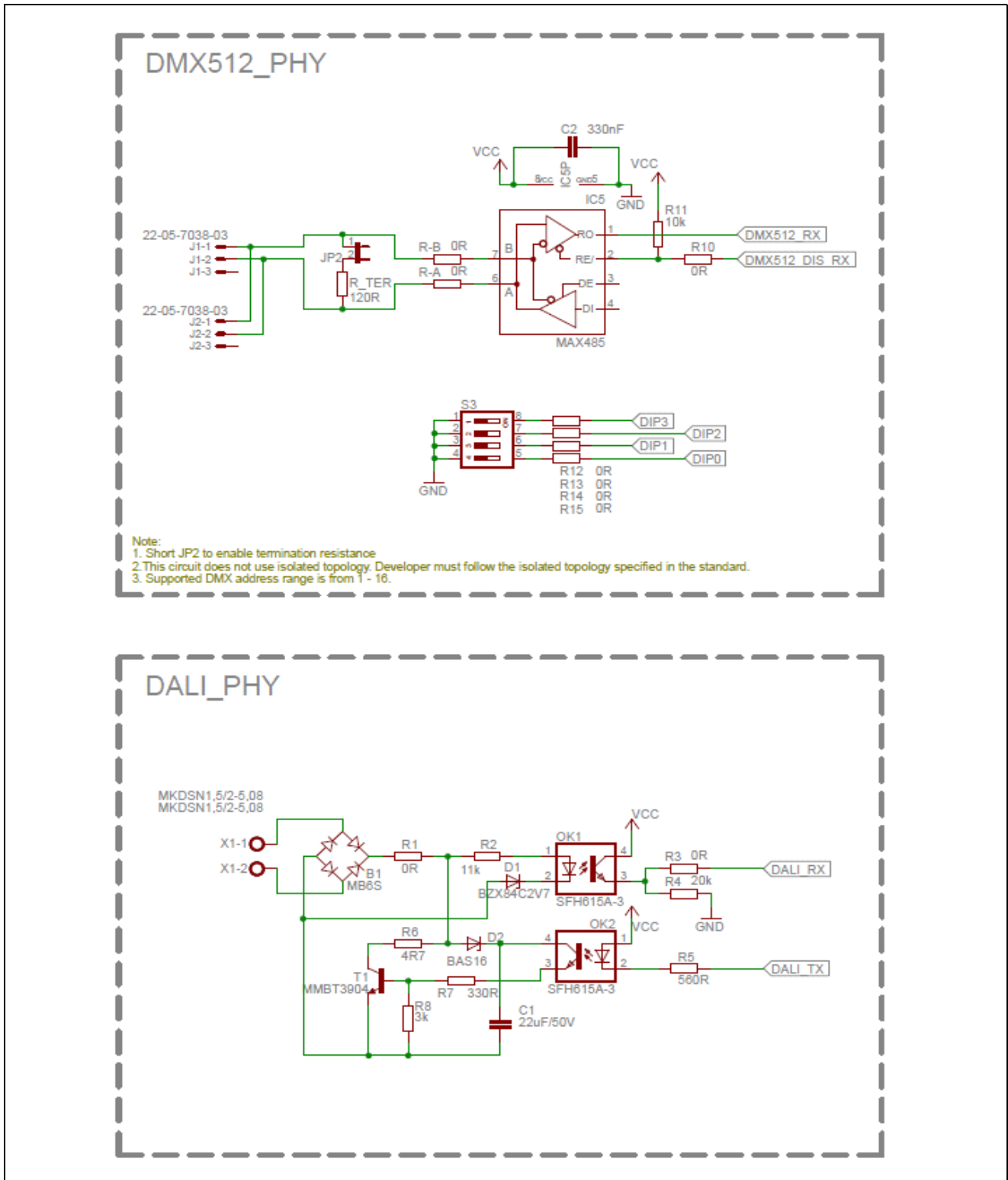


Figure 32 Control Gear Board Schematics - Part 1

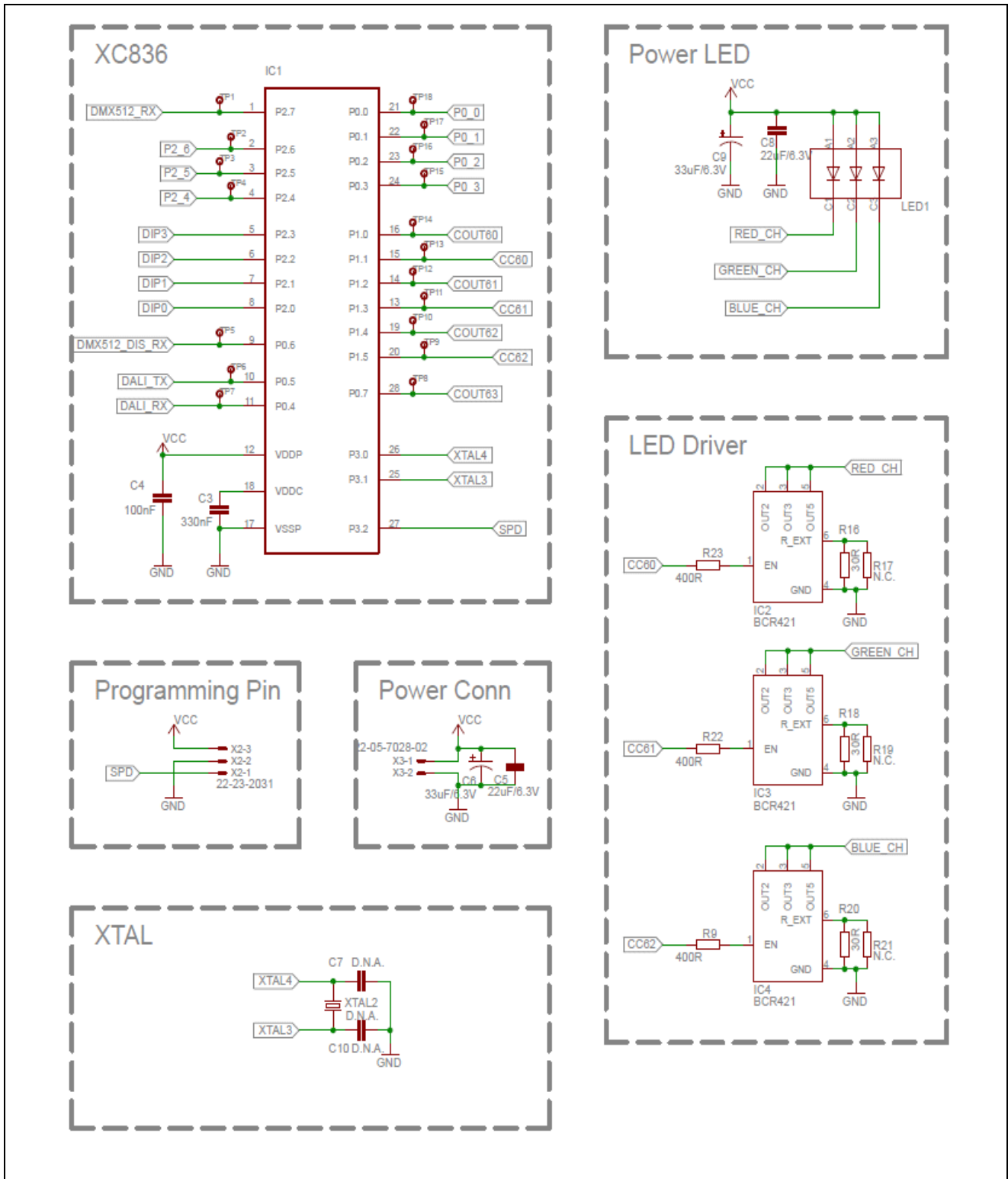
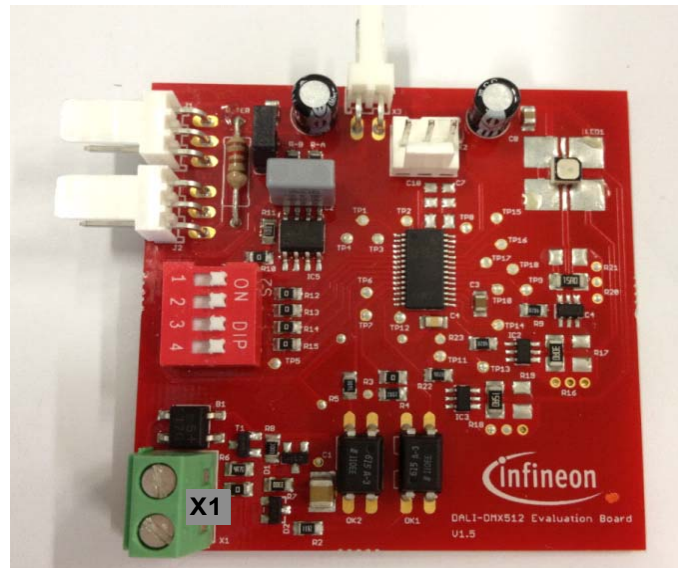


Figure 33 Control Gear Board Schematics - Part 2



**DALI Control Gear**  
(KIT\_DALI\_RGB\_XC836\_DKV1)

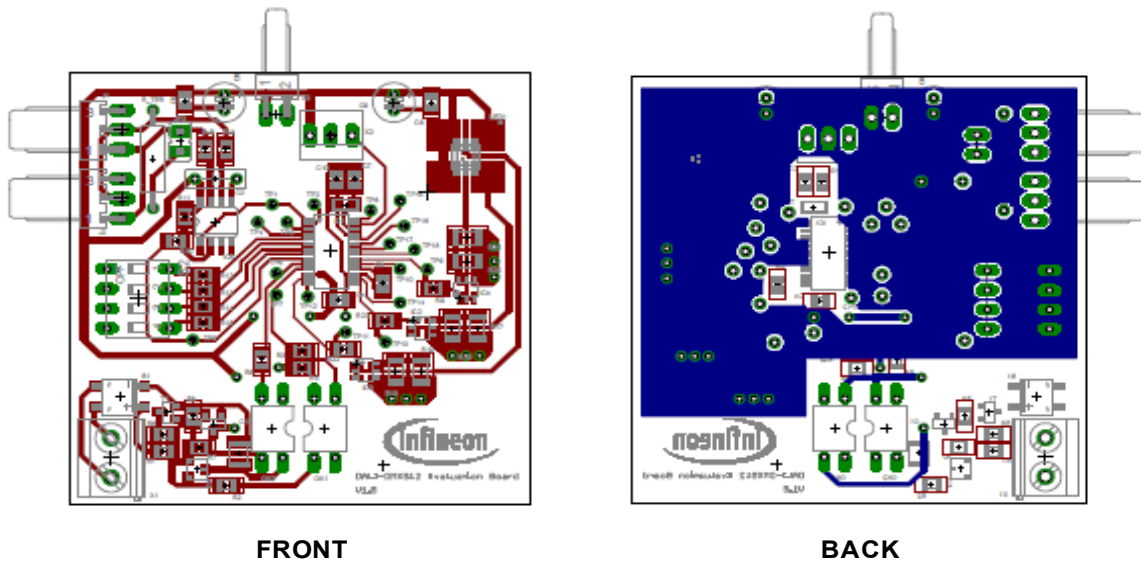


Figure 34 Control Gear Board Layout

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