# PXLNET TRANSCEIVER MANUAL

CTRLPIXELTRKITSP, CTRLPIXELTRKITST, CTRLPIXELTRKITRJ

CE    RoHS    SPI    DMX    IP00

REV. 22SEP2023

Acolyte | Architectural Lighting Solutions                Acolyte is a quality division of GENLED Brands™ | www.AcolyteLED.com | Page 1

# THANK YOU FOR CHOOSING ACOLYTE AND DIGIDOT!

Acolyte and DiGidot offer powerful products and solutions to control LED pixels. C4 controllers are the heart of our control system, offering great flexibility and simple infrastructures. To benefit from all our system advantages, we offer innovative accessories like range extending equipment like the PxLNet Transceiver.

These products allow you to send PxLNet, which is a high speed, long-range SPI protocol. Install C4 controllers in a central place for easy access and maintenance while drastically reducing the amount of hardware required.

Have fun creating mesmerizing lighting installations!

**The Acolyte and DiGidot teams**

# INDEX

# INTRODUCTION

SPI protocols are sensitive to data distortion and often only work reliably over cable of up to 6.5 ft (2 m) between the controller and the first SPI IC/LED. The PxLNet Transceiver is a small module that can be used as a receiver or transmitter to extend the range of an SPI signal. The PxLNet Transceiver converts PxLNet, which is sent from a PxLNet Transmitter or Transceiver in transmit mode, based on the original SPI protocol that is sent from an SPI controller. A PxLNet Transmitter or Transceiver converts sensitive SPI protocols to PxLNet, which can cover up to 820 ft (250 m). Any SPI protocol can be received or transmitted by this module. Connect the same number of universes as the connected SPI controller can send per port. Installation is easy thanks to the simple solder pads. The output side can be soldered directly to most industry standard SPI controlled LED ribbons. When this module is connected to the end of an LED ribbon or pixel-controlled product, it can be used as a transmitter when the Tx/Rx jumper is removed. In transmit mode, a PxLNet Transceiver can also be connected to a C4 controller output port to convert the SPI signal to PxLNet. The PxLNet Transceiver can also be used to convert a DMX signal from a C4 controller or a PxLNet Transmitter to DMX TTL.

# CONTENTS

- PxLNet Transceiver module (PCB only, quantity depends on the order)
- Header jumper (pre-installed)
- Optional: 3-way screw terminal(s) (if ordered separately)

NOTE: We take great care with our products and have a standard of quality control, but we advise you to double-check for missing or damaged items. In case of any missing or damaged items, please contact your supplier immediately. Never use damaged products!

# PXLNET TRANSCEIVER 2 FEATURES

- Flexible operating voltage from 5 to 48 VDC
- RJ45 bus for PxLNet in/out
- Solder pads for input/output signals
- Status LED indicators for power and incoming data
- Auxiliary network cable breakout solder pads
- Selectable operating mode (Receiver/Transmitter) by header jumper
- Overvoltage protection
- Reverse polarity protection
- Data, VCC and GND input and output connections on both sides

# TECHNICAL DRAWINGS

0.59 in.
(15 mm)

1.71 in.
(45.3 mm)

0.55 in.
(14 mm)
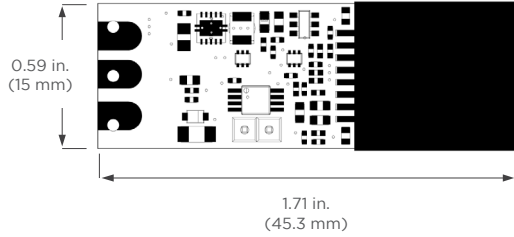
# PRODUCT DESCRIPTION

**Top**

**Bottom**

1. Power (VCC / DC + / 5-24V)
2. BUS I/O (Data Out/In)
3. Power (GND / DC -)
4. RJ45 BUS (Data Input)
5. Jumper (Tx / Rx mode)
6. White LED Power Indicator
7. Blue LED Power Indicator

8. GND / DC -
9. Data OUT / IN
10. VCC / DC + / 5-24V
11. PxLNet Data IN / OUT +
12. PxLNet Data IN / OUT -
13. PxLNet GND
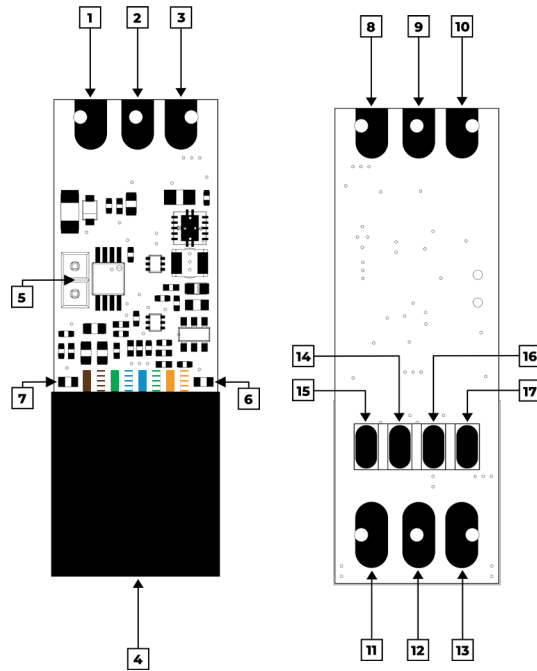
**Pin 1:** PxLNet Data + In
**Pin 2:** PxLNet Data - In
**Pin 3:** --
**Pin 4:** --
**Pin 5:** --
**Pin 6:** --
**Pin 7:** PxLNet GND
**Pin 8:** PxLNet GND / DC -

# TECHNICAL SPECIFICATIONS

### Electrical

| | |
|---|---|
| Input Voltage: | 5-24VDC |
| Max. power consumption: | 1 W |
| Inrush current: | Max. 200 mA @ Ta 20°C |
| RMS current Rx mode: | 5VDC: 11.5 mA<br>24VDC: 2.7 mA |
| RMS current Tx mode: | 5VDC: 81 mA<br>12VDC: 31.5 mA<br>24VDC: 16.6 mA |

### Mechanical

| | |
|---|---|
| Dimensions: | 1.71 x 0.59 x 0.55 in. \| 43.5 x 15 x 14 mm (L x W x H) |
| Net weight: | 0.11 oz (6 g) |

### Environmental

| | |
|---|---|
| Ambient Temp. (Ta) in operation: | -4°F - 113°F (-20°C - 45°C) |
| Storage temperature: | -4 to 122°F (-20 to 50°C) |
| Max. operating relative humidity: | 90% (indoor use only) |

### Protection

| | |
|---|---|
| IP rating: | IP00 (unprotected, indoor use only) |
| Voltage input: | Overvoltage protection (max. 48 VDC) |

### Connectivity

| | |
|---|---|
| Solder pad wiring: | 20-24 AWG (0.3-0.5 mm$^2$) |
| Terminal wiring power: | 14 AWG (Max. 2.5 mm$^2$) |
| Terminal wiring data: | Recommended: 20-24 AWG (Max. 2.5 mm$^2$) |

### Quality

| | |
|---|---|
| Warranty: | 1 year factory warranty |
| Compliances: | CE, RoHS, all components are UL pending |
| Certification: | ETL certification pending |
| Applied standards: | EN60950-1:2006 +A11:2009 + A1:2010 + A12:2011 +<br>A2:2013, IEC60950-1 / EN60950-1, EN61006-6-3, EN55032 |
| HS Code: | 85176990 |

# BEFORE INSTALLATION

Before installing our products it's important to note the following safety and installation instructions.

## SAFETY INSTRUCTIONS

- Before installation and use of this product, read this manual carefully.

- Make sure these instructions are given to those responsible for installation, use and maintenance of this product.

- Local electrical and safety rules and guidelines always overrule this manual.

- Acolyte and DiGidot Technologies B.V. cannot be held liable for improper handling, product installation, usage or storage.

- Installation should only be done by a professional certified installer who is qualified to work on electrical installations.

- Do not conduct any repairs of the device (there are no user serviceable parts inside). Any unapproved repairs and/or product modifications will void product warranty. Acolyte and DiGidot Technologies B.V. cannot be held liable for any consequences.

- Repairs of this product may only be carried out by DiGidot Technologies B.V.

- Repairs and maintenance of the installation may only be carried out by qualified technicians.

- Always disconnect the mains power when working on a high voltage electric installation. Failure to do so may result in product damage or personal injury.

- Do not connect or modify this product other than as described in this manual.

- Never use a product that is visibly damaged or does not work correctly. Never use a product if it starts to smoke or if a crackling/sizzling noise is audible. If this is the case, disconnect the power to the device and contact Acolyte immediately.

- This is a low voltage device. The working voltage is 5-24 VDC.

- The only way to power off this product is to disconnect it from the power source.

- The product is designed for indoor use (dry locations) only. Exposure to rain or moisture may cause fatal damage.

## WARNING! TAKE ESD SAFETY PRECAUTIONS!

When working with PCB modules such as this product, you must work according to ESD guidelines and undertake all necessary ESD safety precautions to minimize the risk of ESD-inflicted product damage.

# MOUNTING OPTIONS

We recommend placing this product in a protected enclosure such as an electrical junction box. Double-sided (foam) tape or acid-free, non-conductive and non-corrosive glue/adhesives can be used on the underside of this product to hold it in place. Please be careful when applying pressure. Small components can come off when applying excessive force. To prevent malfunction or damage, ensure that none of the conductive parts, including the header pins on the underside, make any contact with conducting surfaces or materials. When using heat shrink, please cover the entire module. Be careful when applying heat, especially with heat guns. When this product is overheated, components and soldering may come loose, resulting in fatal damage.

**TIP:** It's safe to cover this product with appropriate electronic protection resin to improve the IP rating. Another option to improve the IP rating is to use a conformal coating spray for electronics after all wires have been connected/soldered.

## WARNING!

- This product should not be subjected to higher temperatures than indicated in the specification range (risk of fatal damage)!

- Keep this product away from direct sunlight, rain or other moisture (short-circuit risk).

- Do not use this product outdoors or in humid environments (short-circuit risk).

# INSTALLATION & WIRING

There are several ways to connect and integrate the PxLnet Transceiver module. Use the RJ45 bus on the PxLNet input/output side or solder PxLNet signal wires to the underside of the product. Please refer to the wiring schemes in this manual.

## PXLNET DATA IN/OUT

There are two ways to connect the PxLNet data:

1. Use the RJ45 bus to connect a Cat-5E network cable or better.

2. Solder a DMX cable (110Ω impedance STP) or Cat-5E (or better) to the D+, D- and GND solder pads [11][12][13] on the underside of the PCB.

If you've ordered an additional screw terminal for the PxLNet Transmitter, you can solder the 3- way terminal to the output by placing the terminal on the top side of the PCB. Insert the 3 pins in the solder pad holes and make sure that the wire openings face outwards. Solder the pins on the underside. The screw terminal allows you to insert the wires of your LED lighting product with wire gauges up to max. 14 AWG (2.5 mm$^2$).

**NOTE:** Keep wires between the output and LED product within 6.5 ft (2m) in length. The ground output wire from the PxLNet Transceiver must be equal in length to the Data wire. Don't use wire gauges bigger than 24 AWG (0.5 mm2) for the data signal.

## DATA IN/OUT & POWER IN

There are two ways to connect the SPI data:

1. Solder this module directly to the solder pads of a pixel-controlled LED ribbon that has a matching solder pad layout. Most industry standard SPI (Data only) controlled LED ribbons will match the solder pads of the PxLNet Transceiver.

2. Solder wires with a wire gauge of 20-24 AWG (0.3-0.5 mm$^2$) to solder pads [1][2][3] on the upper side or to [10][11][12] on the underside of the PCB.

If you've ordered an additional screw terminal for the PxLNet Transmitter, you can solder the 3- way terminal to the output by placing the terminal on the top side of the PCB. Insert the 3 pins in the solder pad holes and make sure that the wire openings face outwards. Solder the pins on the underside. The screw terminal allows you to insert the wires of your LED lighting product with wire gauges up to max. 14 AWG (2.5 mm$^2$).

**NOTE:** Keep wires between the output and LED product within 6.5 ft (2m) in length. The ground output wire from the PxLNet Transceiver must be equal in length to the Data wire. Don't use wire gauges bigger than 24 AWG (0.5 mm$^2$) for the data signal.

# SOLDER INSTRUCTIONS

Soldering of this product should be carried out carefully by a trained and certified electronics professional.

- Please pre-solder all wires.

- Max. soldering temperature: 752°F (400°C) for max. 3 seconds.

- Use RoHS compliant lead-free solder wire.

**WARNING! TAKE ESD SAFETY PRECAUTIONS!**

This product is ESD sensitive. Work in an ESD safe environment and take all necessary ESD protective precautions before installing and soldering this product to minimize the risk of ESD inflicted product damage.

# POWER SUPPLY

To power this product, the DC+ and GND must be connected to a SELV rated power supply that provides appropriate power at the required supply voltage. Before applying power, make sure that the outputs are wired and soldered correctly to avoid short circuits.

**WARNING!** Applying AC power and/or higher voltages can cause fatal damage to this product.

**IMPORTANT:** Make sure to equalize the ground potentials. Always connect grounds (DC-) of the C4 controller and the power supply connected to each product that is controlled by a single C4 controller. The ground connection between a PxLNet Transmitter and a PxLNet Transceiver or multiple Transceivers are automatically established when using the RJ45 bus with a network cable in between.

# OPERATING MODES (Rx/Tx)

### RECEIVER MODE (Rx)

The default operating mode of the PxLNet Transceiver is Receive mode (Rx). Please make sure that the Rx/Tx jumper [5] is installed. The PxLNet data is received, converted to the original protocol and outputted on the Data out side.

### TRANSMIT MODE (Tx)

In order to use the PxLNet Transceiver as a single channel transmitter, connect the D (solder pad [2] or [9] as indicated on page 5) to the incoming SPI Data signal. Remove the Tx/Rx jumper [5] as indicated, to activate transmit (Tx) mode.

Connect a network cable to the RJ45 bus and connect it to the next PxLNet Transceiver in receiving mode (Rx). Instead of connecting a network cable to the RJ45 bus, a cable can also be soldered to solder pads [11][12][13] on the underside (as indicated on page 5). The distance between two PxLNet Transmitters is max. 820 ft (250 m).
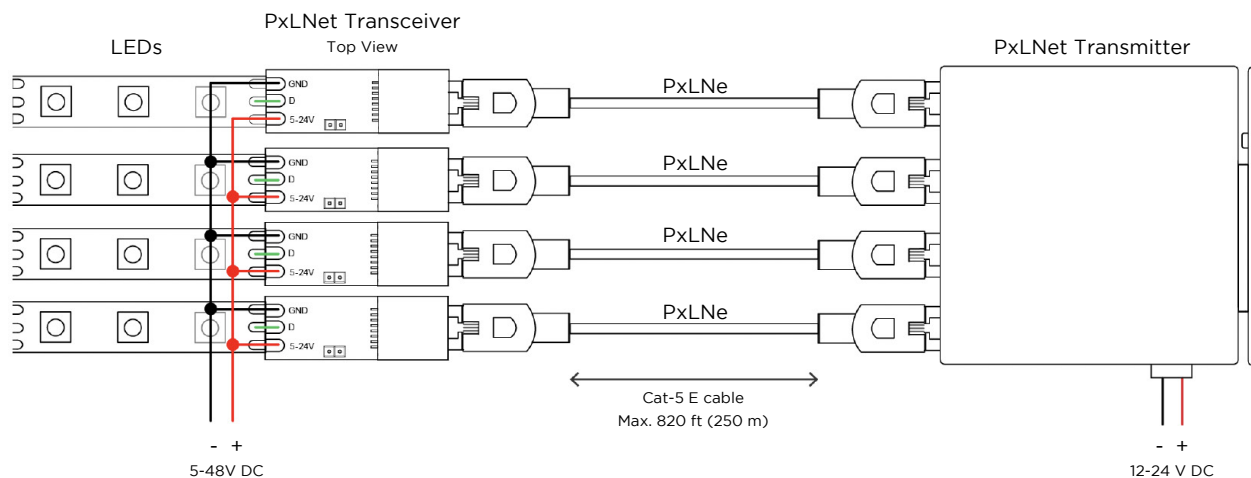
# WIRING SCHEMES

The following wiring schemes show assorted options to connect this product. There are many more connection options and combinations possible which may not be listed in this manual. If the following wiring principles are followed, a wide range of installation options can be created.

• PxLNet Transceivers must be powered properly as indicated.

• If LED products need to be powered at voltages other than 5-48 VDC, separate powering is required. In this case, all grounds must be connected at any time.

• Use proper network cables or DMX cables as indicated on page 8. Thicker wires and higher cable impedance may result in unstable or corrupted data.

### WIRING SCHEME 1 OPTION 1: CONVERT PXLNET TO SPI DATA, SOLDERED DIRECTLY

The C4 controller and PxLNet Transmitter are connected by Cat-5E network cables to PxLNet Transceivers which are soldered directly to a pixel-controlled LED ribbon. Please double check if the solder pads of the LED ribbon align correctly and are in the correct order to match the PxLNet Transceiver solder pads. If not, please follow wiring scheme 1 option 2.
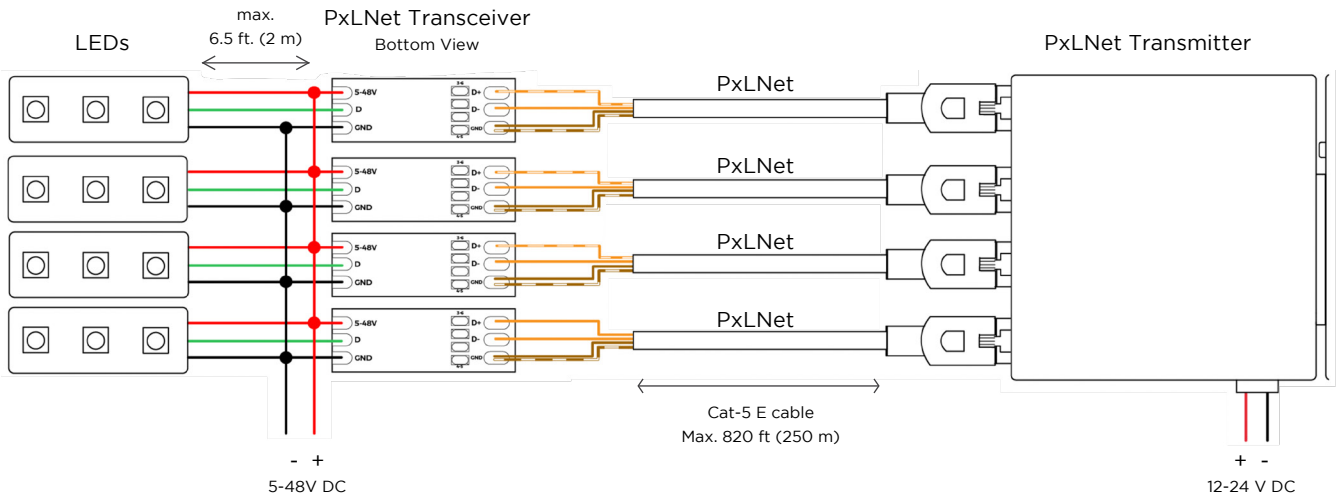


### WIRING SCHEME 1 OPTION 2: SUPPLY POWER AT ALTERNATIVE LOCATION
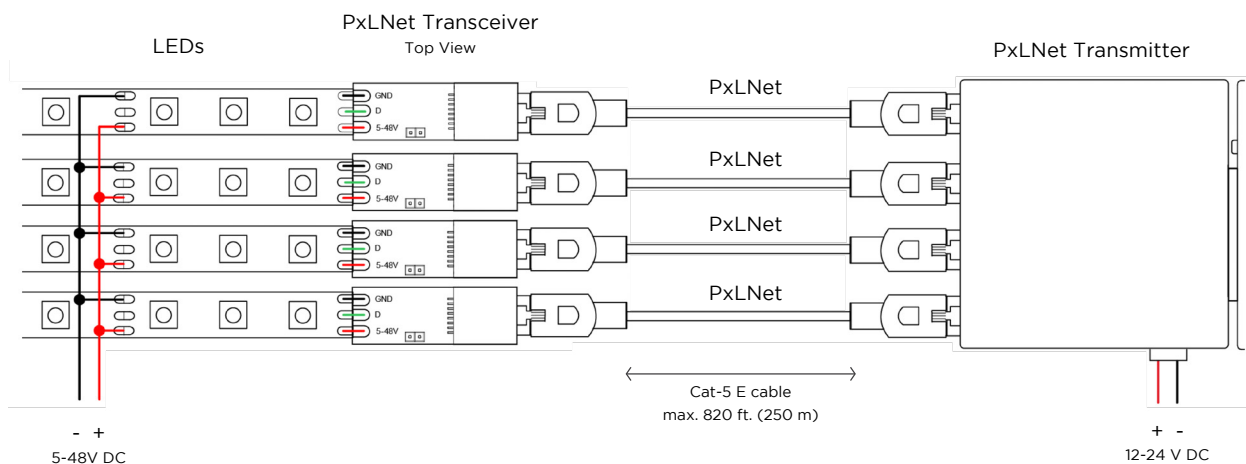
## WIRING SCHEME 2: CONVERT TO SPI AND WIRED LUMINAIRE CONNECTION

The C4 controller and PxLNet Transmitter are connected by Cat-5E network cables which are soldered to PxLNet Transceivers that are soldered directly to a pixel-controlled LED product.
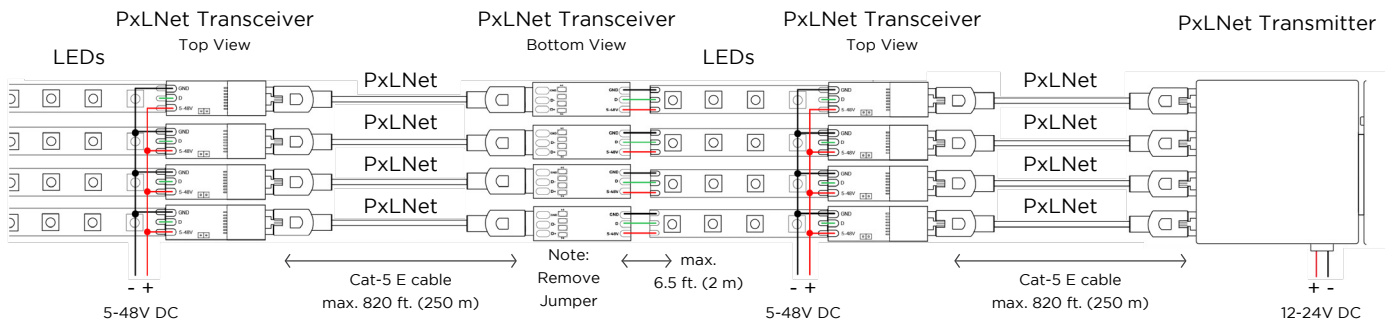


## WIRING SCHEME 3: DIFFERENT OPERATING VOLTAGES

The C4 controller and PxLNet Transmitter are connected by Cat-5E network cables which are connected to PxLNet Transceivers, which are wired to pixel-controlled LED products that run on another power supply and/or voltage.
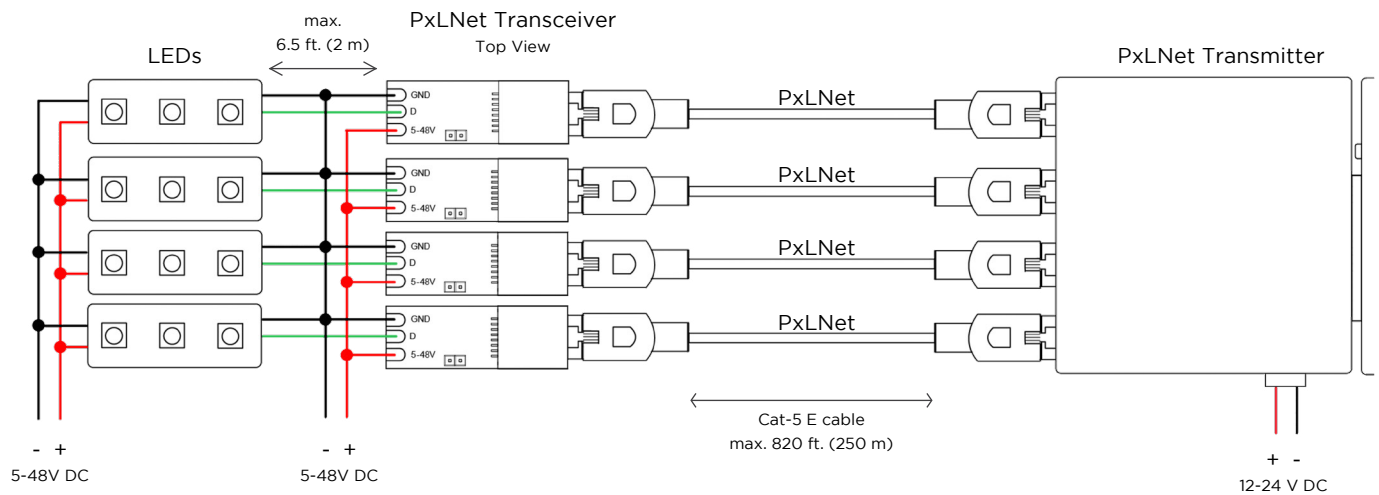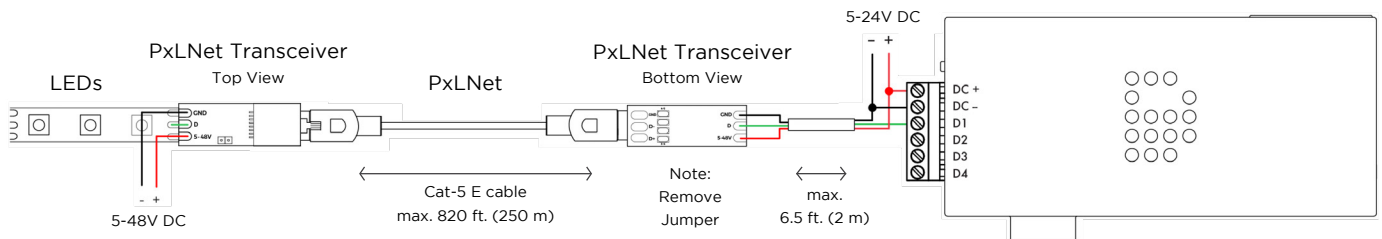
## WIRING SCHEME 4: TRANSCEIVER IN TRANSMIT MODE

The C4 controller and PxLNet Transmitter are connected by Cat-5E network cables to PxLNet Transceivers which are soldered directly to a pixel-controlled LED ribbon. At the end of every LED ribbon, another PxLNet Transceiver is placed in transmit mode to send the remaining signal to the next LED ribbon. Please note that the operating mode jumper [5] on the top side must be removed to change it to transmit (Tx) mode.
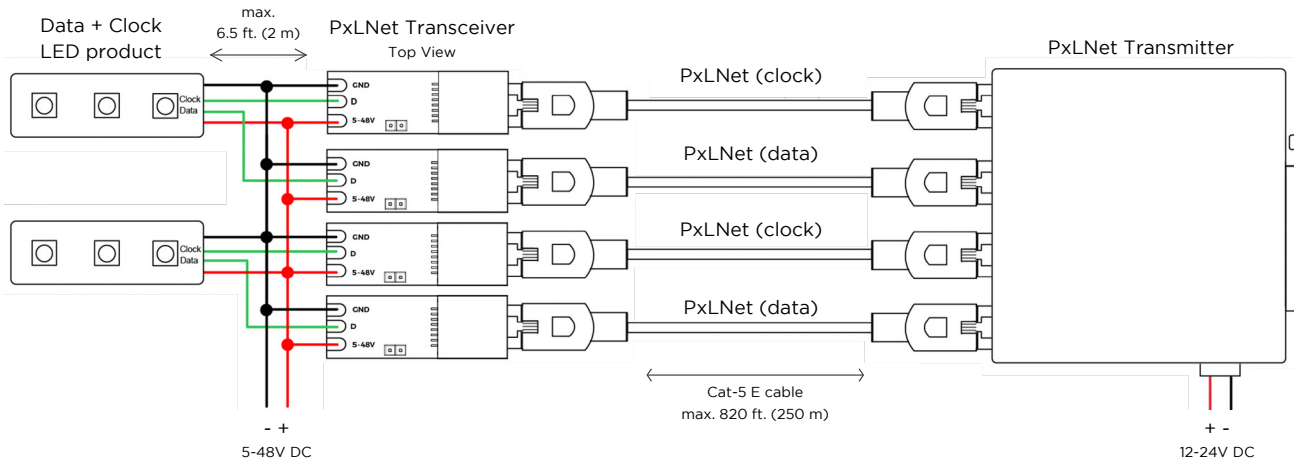


## WIRING SCHEME 5: SINGLE PORT SPI RANGE EXTENSION

The C4 controller and PxLNet Transmitter are connected by Cat-5E network cables to PxLNet Transceivers which are soldered directly to a pixel-controlled LED ribbon. At the end of every LED ribbon, another PxLNet Transceiver is placed in transmit mode to send the remaining signal to the next LED ribbon. Please note that the operating mode jumper [5] on the top side must be removed to change it to transmit (Tx) mode.

## WIRING SCHEME 6: CONVERT PXLNET TO SPI DATA + CLOCK

PxLNet Transceivers can also be used to convert two PxLNet data lines to Data + Clock SPI signals. For this option, a dual Transceiver setup is required.

## WIRING SCHEME 7: COMBINE SHORT- & LONG-RANGE DATA + CLOCK SPI

PxLNet Transceivers can also be used to convert two PxLNet data lines to Data + Clock SPI signals. For this option, a dual Transceiver setup is required.
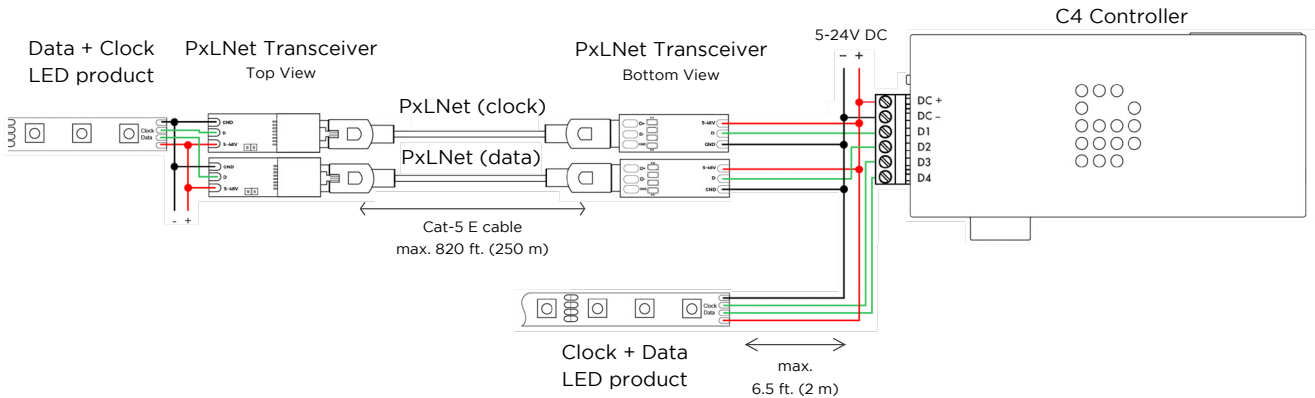
## WIRING SCHEME 8: EXTENDING DMX TTL SIGNALS

A C4 controller and PxLNet Transmitter are connected by Cat-5E network cables to PxLNet Transceivers. Please note that DMX TTL must be configured on the C4 controller in/out configuration page. Configure all ports to DMX TTL in the C4 controller in/out configuration.
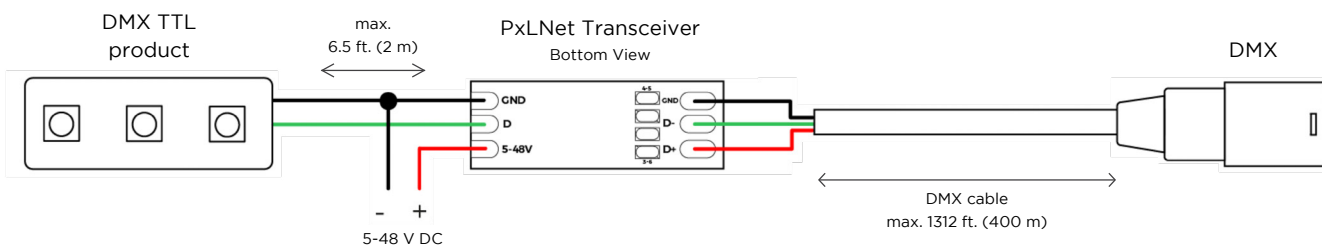
## WIRING SCHEME 9: CONVERTING DMX TO DMX TTL

Use an external DMX signal connected to a PxLNet Transceiver which is connected to a DMX TTL-controlled LED product. The DMX signal can be soldered, as indicated in the drawing, or inserted in the RJ45 bus on the top side (DMX pinout according to USITT standard, see page 5).
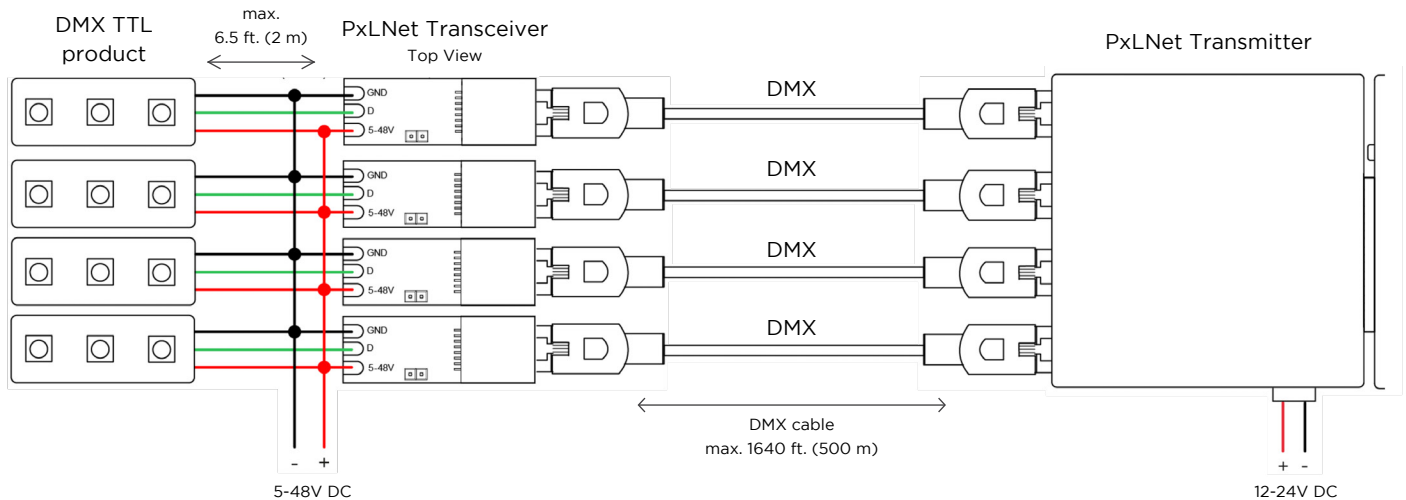


**NOTE:** These wiring schemes do not necessarily show the correct powering of your LED products. All wiring schemes in this manual are for reference only. Please refer to the technical information or user manual of your LED product.

# PROPOGATION DELAY

The PxLNet Transceiver is designed to relay signals at extremely high speeds. When multiple PxLNet Transceivers are used to extend the signal, there is a negligible buildup of propagation delay of only 1,6 Qs (microseconds), which is equal to 3 6 SPI ICs. This means that large numbers of PxLNet Transceivers (more than 100) can be used without visual decline of performance. It is safe to assume that any visual performance decrease is due to other (external) factors.

# AUXILIARY BREAK OUT

The PxLNet Transceiver uses at least three wires -- Data +, Data -, GND (GND is connected twice) -- for the PxLNet signal. This means that there are two unused wire pairs inside a network cable (not applicable to DMX cable). These wires can be used for low voltage purposes up to 48 VDC and a maximum current of 200 mA. Use solder pads [14][15][16][17] to make use of these wires.

# TIPS & TROUBLESHOOTING

If run into any trouble, please check your setup according to following checklist:

1. Double check all cables and connections.

2. Double check any soldered connections.

3. Double check the network cable pinout and crimped connectors.

4. Is the C4 controller powered correctly?

5. Are the LEDs powered correctly?

6. Are all power supplies connected correctly to your mains power supply?

7. Are the power and data LED indicators lit on the PxLNet Transceiver?

8. Are the C4 controller inputs and outputs configured correctly?

   • Ensure that the correct IC/SPI protocol is configured.

   • Ensure that input and output match the system setup. Use the highlight option to test the outputs.

9. Is your C4 network setup done correctly?

   • Prevent IP Address conflicts

   • Make sure that the subnet mask is set correctly and that all IP addresses are set within the appropriate range.

   • Refer to further troubleshooting tips in the C4 Controller user manual.

10. Is the C4 controller output terminal ground (DC-) connected to the grounds of all the LED product power supplies? The grounds run through the network cables.

11. Is the Rx/Tx jumper installed or removed correctly?

# GENERAL INFORMATION

### ONLINE RESOURCES

For technical specifications, latest documentation, manuals, product information and further support please visit www.digidot.eu.

### REMARKS

We've taken great care in writing this manual. However, if you encounter any discrepancies or something isn't clear, please contact us. This manual and function-specific instructions are based on firmware and interface versions mentioned in the 'Manual version' section.

# COMPLIANCES & EU DECLARATION OF CONFORMITY

This product was designed and produced by DiGidot Technologies B.V., Amsterdam, The Netherlands.

### CE MARKING

DiGidot Technologies BV hereby declares that this product complies with and was tested according to all essential requirements of all relevant CE directives.

### WARRANTY

This product has a carry-in manufacturer's warranty of 1 year which covers any design faults, production faults and component failures. Warranty is void if the product was installed or used incorrectly or not in accordance with this manual, and/or if the product was damaged due to external factors, modified or electrically overloaded. Warranty conditions of DiGidot Technologies B.V. apply. Warranty claims must be issued by email to support@digidot.eu.

### DISPOSAL AND RECYCLING

This product should not be disposed of with other household waste. When you decide to dispose of this product and/or its battery, obey local environmental and recycling regulations.

### FEEDBACK

Tell us all about your experience with PxLNet! The continuous development of this control platform is only possible thanks to feedback from our users. If you have any suggestions, please contact us by email: info@digidot.eu.

### IMPRINT

DiGidot Technologies BV Valschermkade 27-28 1059 CD Amsterdam The Netherlands

Phone: +31 (0)20 820 1849

info@digidot.eu www.digidot.eu

Chamber of commerce registration: 67637825

VAT identification no.: NL857103581B01

Managing director: Stefan Verhoef

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