



# Quick Start Guide for USB-TTL Trigger Kit in $\mu$ Manager 2.0

IQS017- Rev 05

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## 1 Introduction

New CoolLED Illumination Systems are not always immediately supported in imaging software. However, on/off control is possible in  $\mu$ Manager when using the CoolLED USB to TTL Trigger Kit. LED intensity is controlled either through the manual control pod or the LightBridge virtual control pod GUI.

**Note:** This example uses the four-channel pE-400<sup>max</sup> with the pE-6501, but the information can be applied to other CoolLED Illumination Systems – for example, the pE-800 with the pE-6501-8 and pE-800<sup>fura</sup> with the pE-6501-8-FR.

## 2 Hardware Installation

See Figure 1 for hardware setup.

1. Ensure CoolLED Light Source is switched on and the Control Pod is plugged in.
2. Connect pE-6501 to PC via USB cable (supplied with CoolLED USB to TTL Trigger Kit).
3. Connect CoolLED Illumination System to pE-6501 using multi-BNC cable (supplied with CoolLED USB to TTL Trigger Kit). The cables of the pE-6501 are labelled A-E. For the pE-400<sup>max</sup>, connect these in wavelength order:

Cable	LED	Position on pE-400 <sup>max</sup>
A	UV – 365 or 400 nm	Top  Bottom
B	Blue – 450 nm	
C	Teal-Green-Yellow (TGY) – 550 nm	
D	Red – 635 nm	

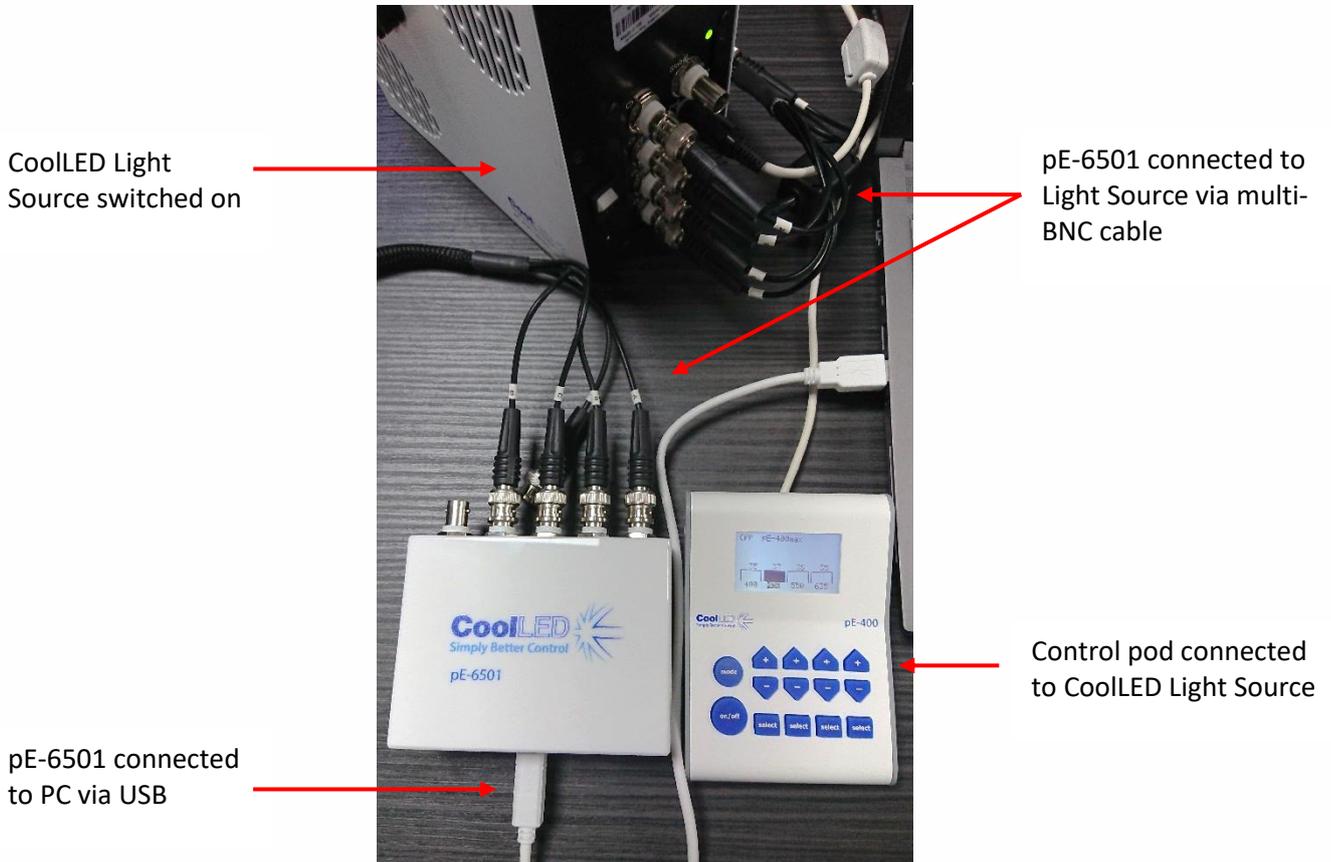


Figure 1: Hardware setup showing pE-400<sup>max</sup> and pE-6501

### 3 Installing the Windows NI6501 driver

The National Instruments NI6501 driver is required to control the pE-6501.

1. Download the National Instruments driver: [NI-DAQ™mx Download - NI](#). If installing on a PC without administrator rights or access to the internet, we recommend first saving the file to a USB memory stick, and using this to transfer the file.
2. Follow the instructions in the installation wizard. To test the pE-6501 is recognised in Windows, open Device Manager. The National Instruments icon should appear under 'Data Acquisition Devices' to confirm it is connected successfully (Figure 2).

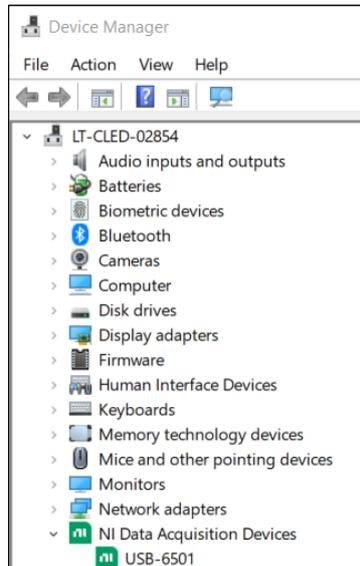


Figure 2: Device Manager showing successfully installed pE-6501 under 'NI Data Acquisition Devices'

## 4 $\mu$ Manager Hardware Configuration

1. If not done so already, install the latest version of  $\mu$ Manager from <https://micro-manager.org/>
2. Once installed, at startup (Figure 3), select your desired hardware configuration file, or a start a new one by selecting (none).

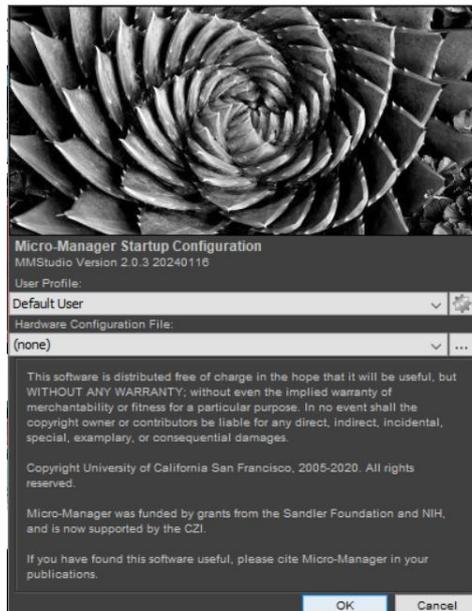


Figure 3: Starting up  $\mu$ Manager, select or start new Hardware Configuration File



- To add the pE-6501 to  $\mu$ Manager, open the 'Hardware Configuration Wizard...' from the main menu, and create or modify a new configuration.

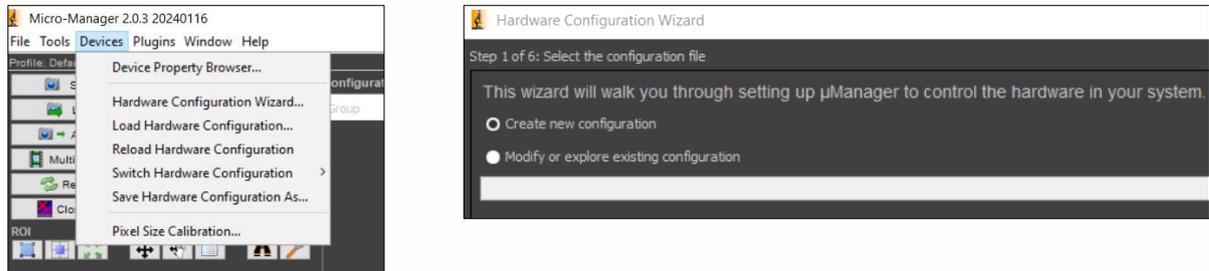


Figure 4: Open Hardware Configuration Wizard from main menu (left), and create new configuration (right)

- From the list of available devices, select 'NI100X' and 'DigitalIO: NI digital IO'. Click 'Add.'

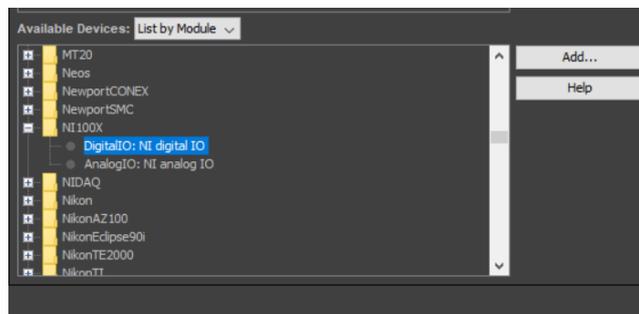


Figure 5: Add the pE-6501 device, known as the 'DigitalIO: NI digital IO' in the device list

- Configure the pE-6501 by selecting the correct the Output Port, and also typing this into IOChannel (Figure 6). To determine the correct parameters here requires opening the NI Device Manager program installed on Windows alongside the NI Driver.

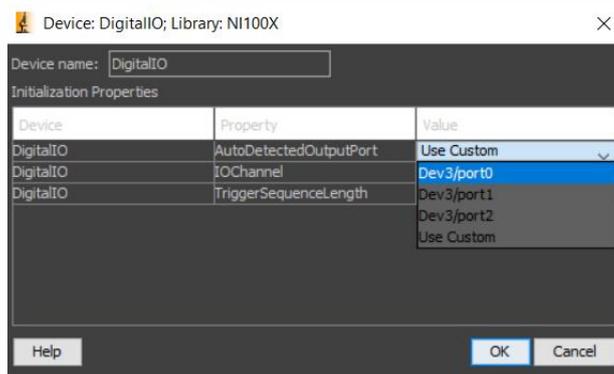


Figure 6: Configuring the pE-6501 requires knowing the correct port

- Open the NI Device Monitor from the Windows Taskbar and select the NI USB-6501. This confirms 'Dev3' is correct, and we now need to determine the correct port.

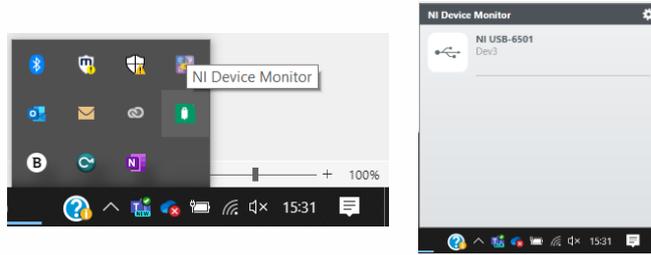


Figure 7: Open NI Device Monitor from Windows taskbar (left) and select NI USB-6501 (right)

- b. To confirm the correct port, select 'Configure and test this device', and select 'Test Panels...' from the window (Figure 8).

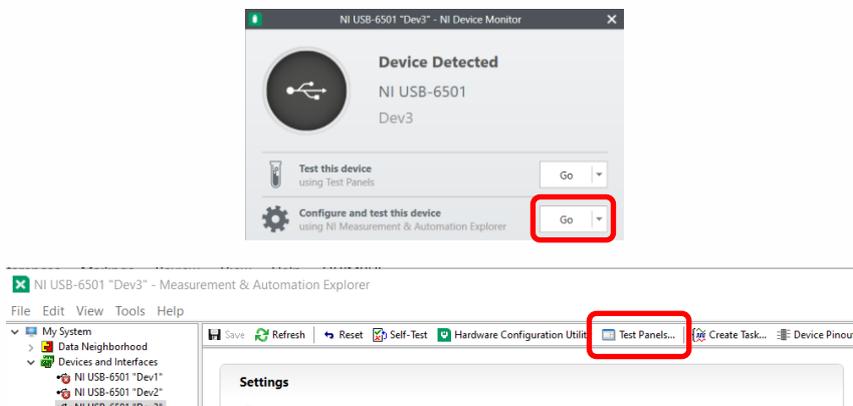


Figure 8: Open NI Device Manager, select 'Configure and test this device' (top, red square), and select 'Test Panels...' (bottom, red square)

- c. In the test panel window (Figure 9), set '2. Select Direction' to 'All Output'.

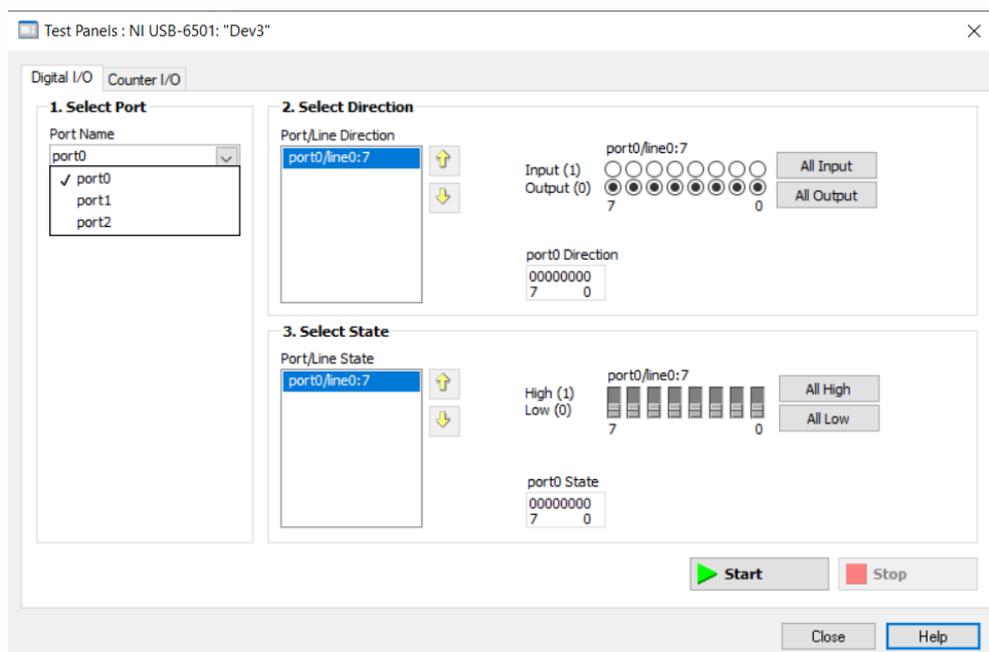


Figure 9: Test Panels to determine which port results in LED triggering when direction is set to 'All Output' and state is set to 'All High'



d. Click 'Start' and in 'Section 3. Select State', change 'All Low' to 'All High'. This now sends a TTL signal from the pE-6501 to the Light Source.

- **Note: Use the control pod to ensure the LED intensity is set above 0%**

e. If the LEDs do not illuminate, select 'port1' under '1. Select Port' and repeat steps 'c' and 'd'. Then repeat with port2 selected. The port selected when the LEDs illuminate when set to 'All High' is the port to include in Figure 6.

6. Follow the instructions to complete the hardware configuration wizard.

## 5 Controlling Device Properties

It is important to note that the pE-6501 only controls the LED triggering. Controlling the 0-100% intensity of each LED is achieved using the manual control pod, or in the case of the pE-400<sup>max</sup>, [the LightBridge GUI](#), which functions as a virtual control pod.

1. Create a new Group to control the LEDs of the pE-400<sup>max</sup> by selecting the '+' on the main screen.



Figure 10: Adding a new Group (circled in red)

2. In the Group Editor window, name this group 'pE-400max' and select the tick box for 'DigitalIO-Label'. Click 'OK'.

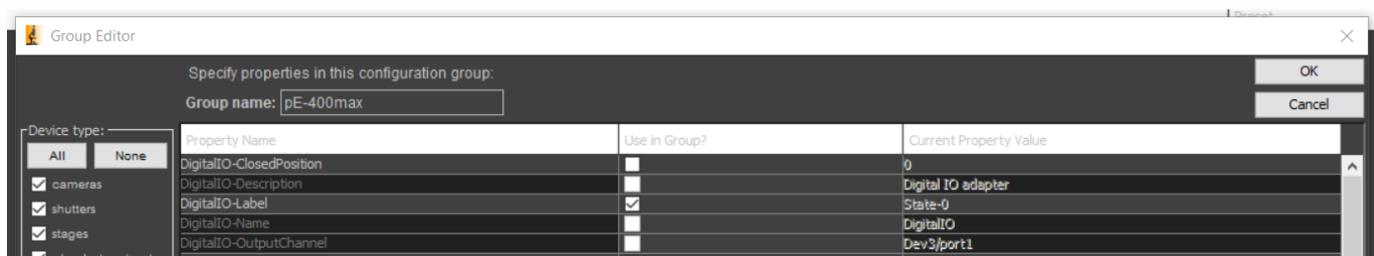


Figure 11: Configure pE-400max Group by selecting 'DigitalIO-Label'

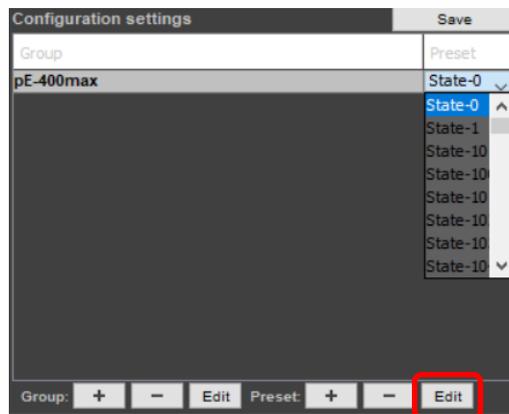
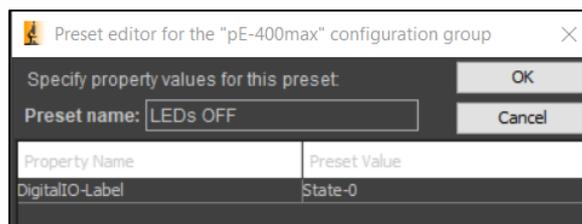


Figure 12: A list of presets are available in the dropdown menu of the pE-400<sup>max</sup> Group, each selecting a different combination of LEDs (at the intensity defined on the control pod or LightBridge). To relabel these, select 'Edit' (red box)

3. For ease of use, rename the presets of the pE-400<sup>max</sup> Group which are to be used in future experiments. The following table shows which presets relate to individual LED triggering, and switching all LEDs off.

Preset name	LEDs
State-0	LEDs off
State-1	UV 400 nm ON
State-98	470 nm ON
State-100	TGY 550 nm ON
State-104	Red 635 nm ON

- a. With the relevant preset selected from the dropdown menu, select the Preset 'Edit' button (red, Figure 12).



- b. Rename the Preset name to a relevant name, for example the LED triggered or the fluorophore this preset is to be used for.

## 6 Running an experiment

The Presets can now be used either in 'Live' mode or as channels within a Multi-dimensional Acquisition experiment, as per the standard  $\mu$ Manager guidance.

For further software information, please refer to the  $\mu$ Manager website. For questions regarding CoolLED Illumination Systems, please contact [info@cooled.com](mailto:info@cooled.com).