

µManager Set-up Guide for pE-800 with pE-6501-8

Issue Date: 18/2/2021

Introduction

The pE-6501-8 has been designed to allow control of the pE-800, as well as a pT-100 if required. The pE-800 can also be controlled unaccompanied if no pT-100 is connected. The pE-6501-8 utilises the National Instruments USB-6501 which has been integrated into µManager.

The pE-6501-8 allows for fast triggering of the Illumination Systems. This User Manual will provide the information required to setup the pE-6501-8 with the pE-800 into µManager and additionally show how to also add a pT-100.

Safety Precautions

The pE-6501-8 does not pose any real safety risks itself, however as it is designed to be used with CoolLED's range of high intensity light sources the appropriate precautions should be taken.

When installing the pE-6501-8, never switch on the Light Sources until they have been securely fitted to the microscope. By following this basic safety rule, protection from the collimated light beam will be provided by the microscope itself, minimising risk of injury and damage.

The pE-6501-8 or Illumination Systems should never be operated with the external covers removed, as this will result in the safety of the units being impaired.

To clean the exterior of the pE-6501-8, use a slightly dampened cloth with a simple water/detergent solution only.

Getting Started – System Components

The CoolLED pE-6501-8 is supplied with the following components:

- pE-6501-8
- TTL cable for connecting the pE-800 to the pE-6501-8

- Single BNC to BNC cable for connection to pT-100 from the pE-6501-8
- A USB cable
- A USB stick with Product User Manuals

If any components are missing or appear damaged, please contact CoolLED immediately.

Installation and Setup of pE-6501-8

Carefully unpack the components from the shipping cartons.

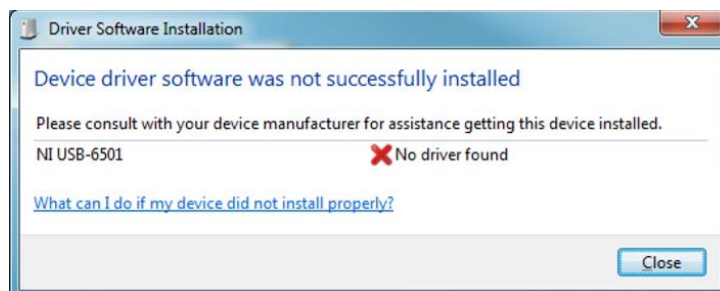
If not done so already, connect the USB that came with the pE-800 to the pE-800 and the PC. This will allow the LightBridge software to be used that controls the intensity of the LEDs. Connect the power to the pE-800.

The pE-6501-8 has a 15-way connector to fit the TTL cable to the pE-800 as well as a BNC connection for the pT-100. Connect the cable to the pE-6501-8, and the BNC connection if required for the pT-100.

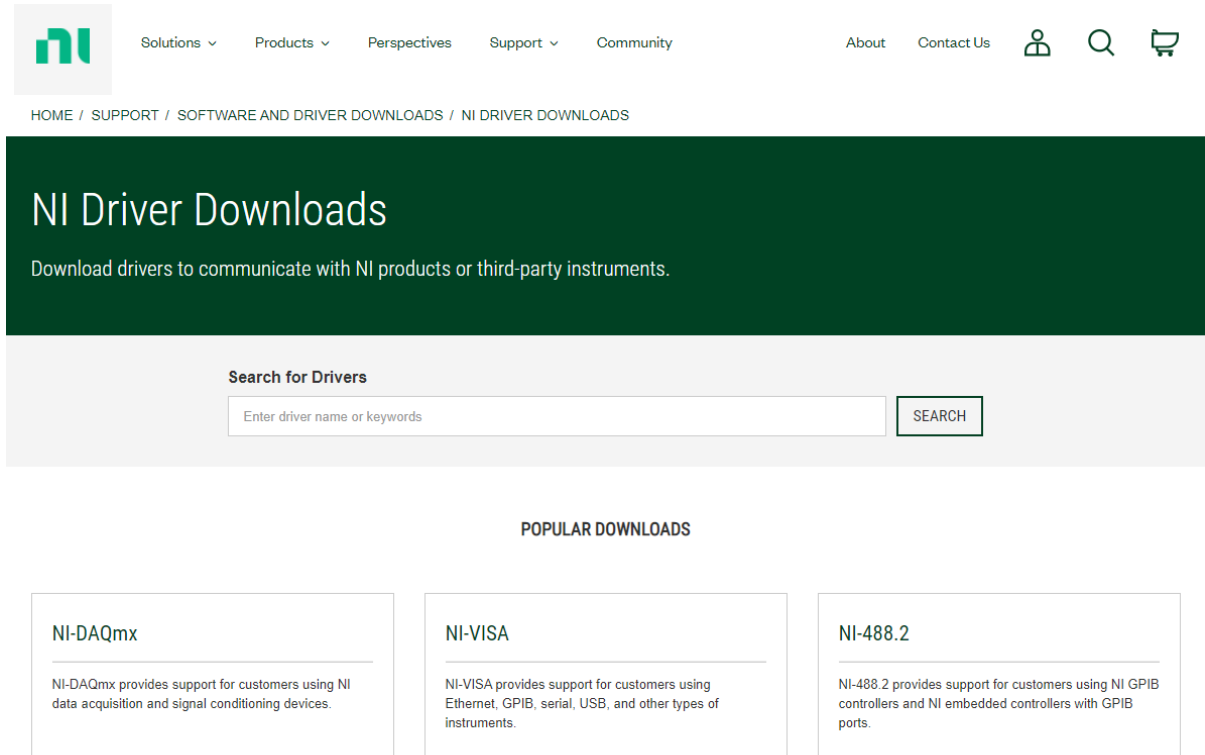


Attach the supplied USB cable to the PC and attach the other end of the cable to the pE-6501-8.

When the pE-6501-8 is first connected to a PC it shall attempt to locate a driver file. Unless a compatible National Instruments driver file has previously been used on the PC the pop-up below will be displayed.



Please follow the hyperlink below to the National Instruments website to download the



The screenshot shows the National Instruments website's 'NI Driver Downloads' page. At the top is the NI logo and a navigation menu with links for Solutions, Products, Perspectives, Support, and Community. Below this is a breadcrumb trail: HOME / SUPPORT / SOFTWARE AND DRIVER DOWNLOADS / NI DRIVER DOWNLOADS. The main heading is 'NI Driver Downloads' with the subtext 'Download drivers to communicate with NI products or third-party instruments.' Below this is a search bar labeled 'Search for Drivers' with a text input field and a 'SEARCH' button. Underneath the search bar is a section titled 'POPULAR DOWNLOADS' which contains three cards. The first card is for 'NI-DAQmx', the second for 'NI-VISA', and the third for 'NI-488.2'. Each card provides a brief description of the driver's function.

NI-DAQmx

NI-DAQmx provides support for customers using NI data acquisition and signal conditioning devices.

NI-VISA

NI-VISA provides support for customers using Ethernet, GPIB, serial, USB, and other types of instruments.

NI-488.2

NI-488.2 provides support for customers using NI GPIB controllers and NI embedded controllers with GPIB ports.

latest NI Hardware Driver- [NI-DAQmx](#).

Select 'Ni-DAQmx' which will take you to a download page.


[Solutions](#)
[Products](#)
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NI-DAQmx

NI-DAQmx provides support for customers using NI data acquisition and signal conditioning devices.

[+ Read More](#)

Note: Install programming environments such as NI LabVIEW or Microsoft Visual Studio® before installing this product.

DOWNLOADS

Supported OS	Windows	View Readme
Version	20.1	
Included Editions	Full	
Application Bitness	32-bit & 64-bit	
Language	English, French, German, Japanese, Korean, Simplified Chinese	

NI-DAQmx 20.1

Release Date
30/06/20

Included Versions
20.1.0

> Supported OS

> Language

> Checksum

DOWNLOAD

File Size
5.76 MB

Please select your OS and the version to download. The latest version is recommended. Once ready click DOWNLOAD, and the download will begin.

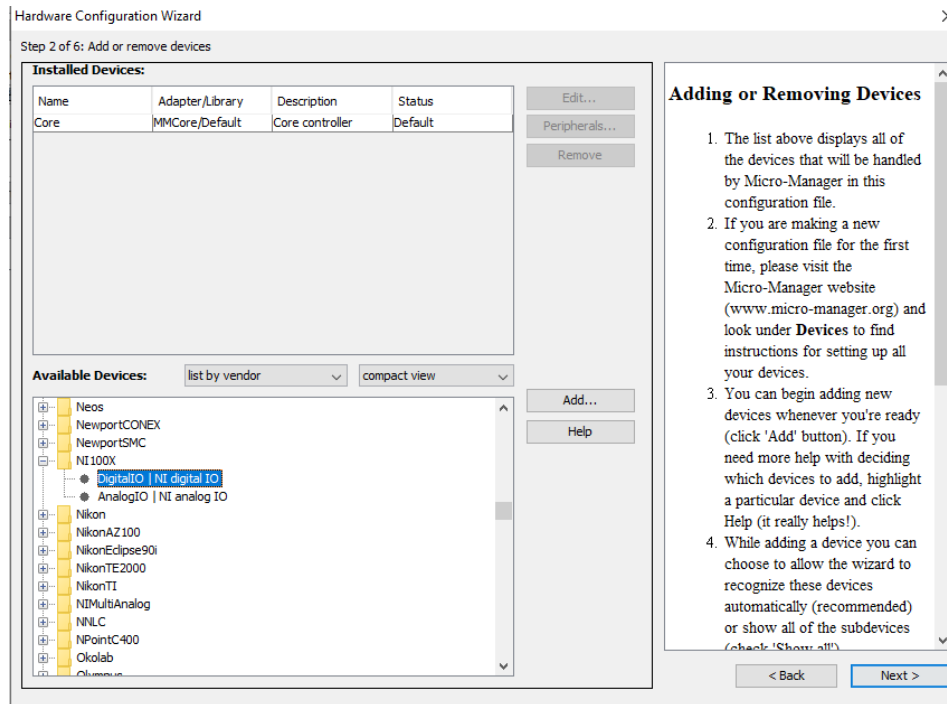
Once downloaded please continue through the steps in the National Instruments software until complete.

Setup of pE-6501-8 in μ Manager

Once the pE-6501-8 drivers have been installed, μ Manager should be installed if it has not been already. This can be found on the [\$\mu\$ Manager](#) website under the Downloads section. It is recommended to download the latest 'Version 1.4 nightly build'.

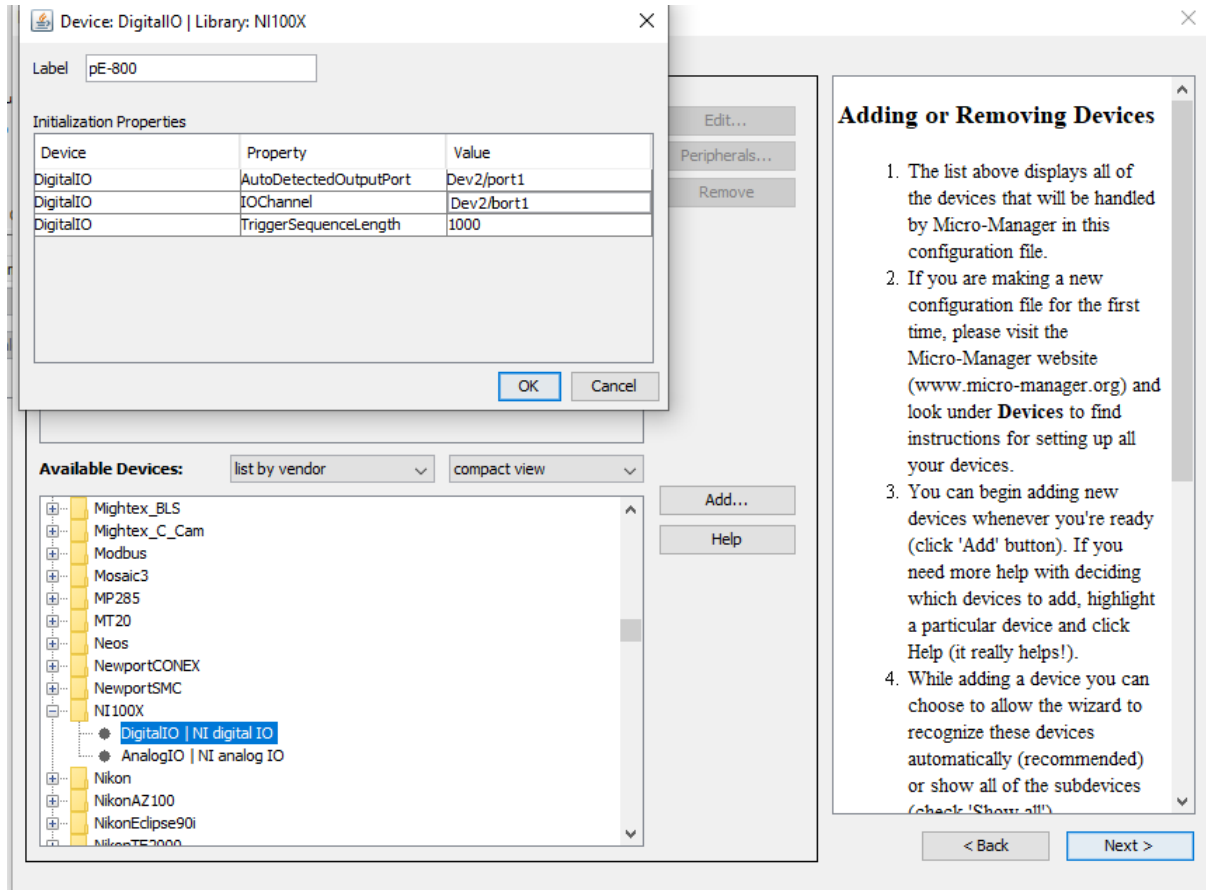
Once installed, open the μ Manager software. At the top of the window go to 'Tools' and open 'Hardware Configuration Wizard'. Choose whether to create a new configuration or to modify and existing one. Once decided, click 'Next'.

The next step installs the pE-6501-8 in the configuration. Scroll down until NI100X is found and double click 'DigitalIO | NI digital IO'



This will open a dialog box. The settings need to be changed to the same or similar as those on the screenshot below. This may differ depending on the setup being used. For example, the 'Value' in the row labelled 'AutoDetectedOutputPort' may read 'Dev 2/port1'. If so, set the 'Value' in the row labelled 'IOChannel' to match with this. The Device and port numbers can be determined from the NI software previously downloaded.

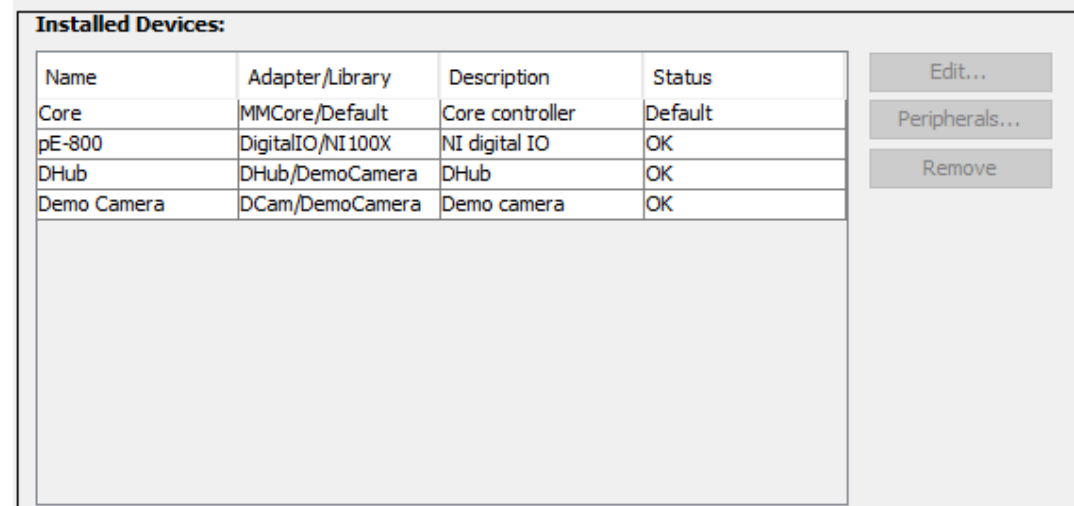
It is also possible to change the name of the label for ease of use. Here it is changed to pE-800.



Here other devices can be added to the configuration. In this manual a demo camera will be added as an example.

Hardware Configuration Wizard

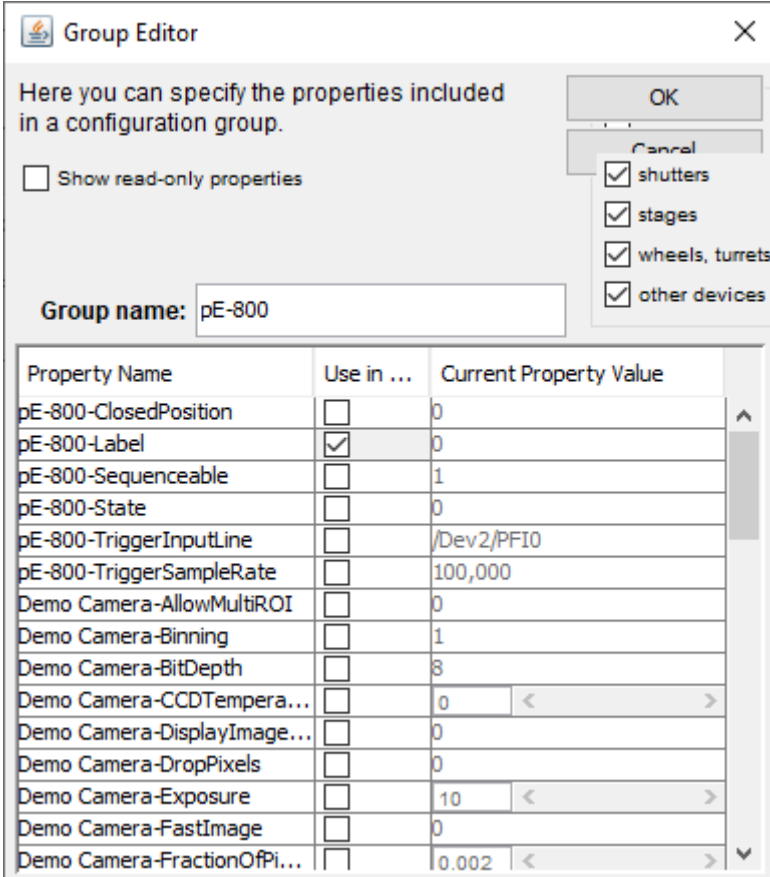
Step 2 of 6: Add or remove devices



Select OK and click through until the Hard Configuration Wizard closes. The configuration file can be saved as something memorable. The pE-6501-8 with the pE-800 will now be ready to use in μ Manager.

Setting up groups and Presets for the pE-800 with the pE-6501-8 in μ Manager

To set up the channels from the pE-800 select 'Group' and select 'pE-800-Label', or whatever it was named previously in the setup. This will allow control of the eight individual LEDs in the pE-800 from μ Manager via the pE-6501-8. Type in a suitable Group name.



Group Editor

Here you can specify the properties included in a configuration group.

☐ Show read-only properties

Group name: pE-800

OK

Cancel

☒ shutters

☒ stages

☒ wheels, turrets

☒ other devices

Property Name	Use in ...	Current Property Value
pE-800-ClosedPosition	<input type="checkbox"/>	0
pE-800-Label	<input checked="" type="checkbox"/>	0
pE-800-Sequenceable	<input type="checkbox"/>	1
pE-800-State	<input type="checkbox"/>	0
pE-800-TriggerInputLine	<input type="checkbox"/>	/Dev2/PFI0
pE-800-TriggerSampleRate	<input type="checkbox"/>	100,000
Demo Camera-AllowMultiROI	<input type="checkbox"/>	0
Demo Camera-Binning	<input type="checkbox"/>	1
Demo Camera-BitDepth	<input type="checkbox"/>	8
Demo Camera-CCDTempera...	<input type="checkbox"/>	0 < >
Demo Camera-DisplayImage...	<input type="checkbox"/>	0
Demo Camera-DropPixels	<input type="checkbox"/>	0
Demo Camera-Exposure	<input type="checkbox"/>	10 < >
Demo Camera-FastImage	<input type="checkbox"/>	0
Demo Camera-FractionOffPi...	<input type="checkbox"/>	0.002 < >

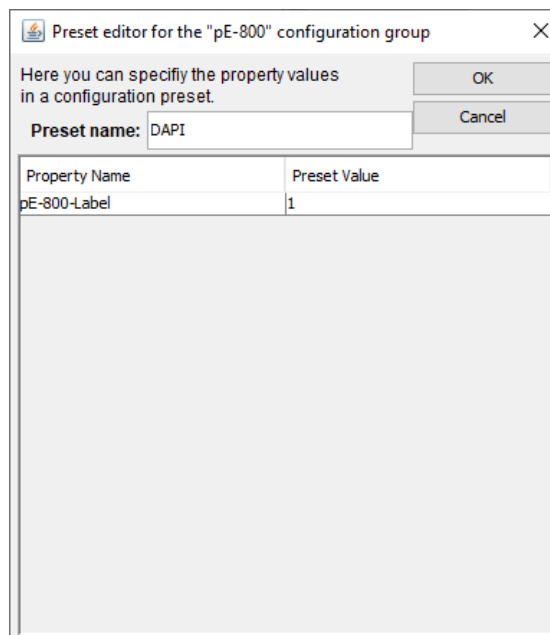
To select individual LEDs, 'Presets' can now be made and edited. Select the newly made Group and click 'Edit' next to the Preset tab.

The Preset values are pre-determined and refer to different LEDs being on/ off. This is in binary so the following Preset numbers apply:

Preset	Wavelength of LED, nm
0	All LEDs off
1	365/ 400
2	435
4	470
8	500
16	550
32	580
64	635
128	740
255	All LEDs on

Other commonly used preset values can be found in the Appendix at the end of this document.

Name and edit any Preset values required. In the example below the 365 nm LED has been changed to become DAPI.



Preset editor for the "pE-800" configuration group

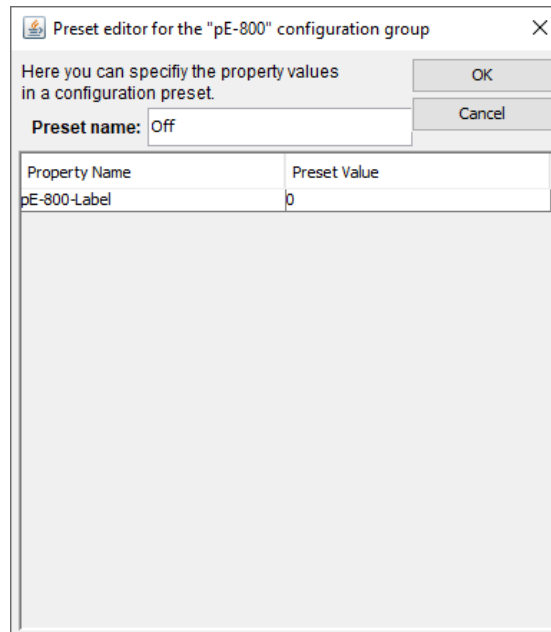
Here you can specify the property values in a configuration preset.

Preset name: DAPI

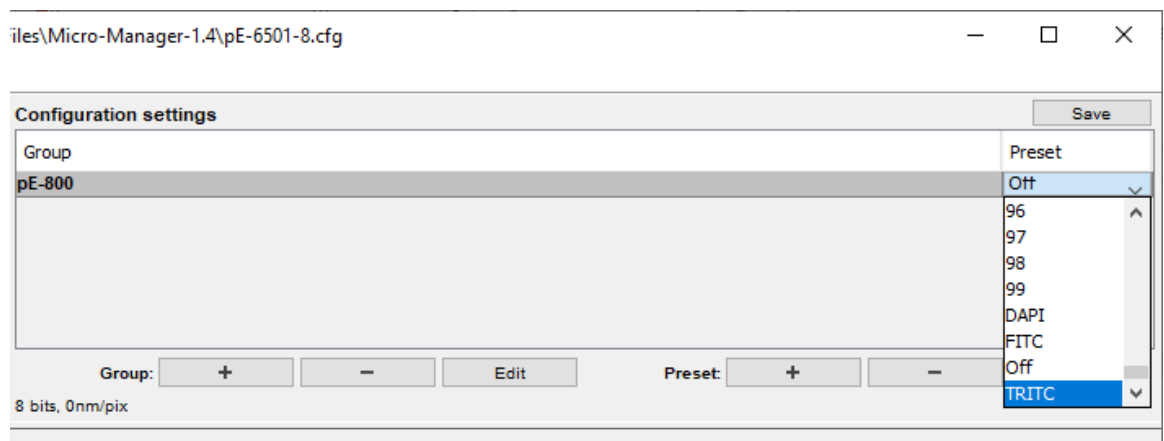
Property Name	Preset Value
pE-800-Label	1

OK Cancel

It is worth also having an 'Off' value, where no LEDs are emitting light. This is set as Preset value 0. To have all LEDs on the Preset value of 255 can be used.

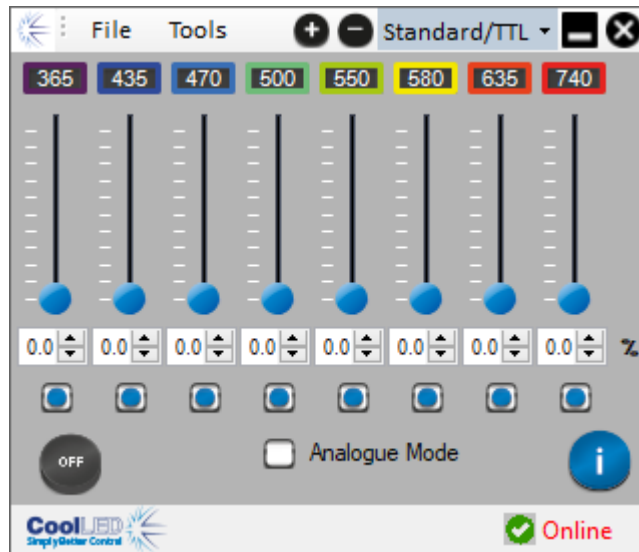


Micro-Manager will now have the pre-existing Presets and the edited ones available.



As the pE-6501-8 gives digital on/ off the intensities for the three separate LEDs should be set on the LightBridge software that comes with the pE-800.

The LightBridge software comes on the USB stick that comes with the pE-800 or can be downloaded from www.CoolLED.com. For more information on the LightBridge software please refer to the pE-800 manual.



The pE-6501-8 can now be used to trigger the pE-800 within the μ Manager software.

Controlling both the pE-800 and pT-100 within μ Manager using the pE6501-8

With the pE-800 setup, a pT-100 can also be used with the pE-6501-8 to allow for brightfield and fluorescence to be controlled via the pE-6501-8.

In μ Manager again go to Tools>Hardware Configuration Wizard and either create a new configuration or edit a previous one and click Next.

In the Devices page scroll down to find NI100X and select “Digital IO I NI Digital IO” as was done previously when setting up the pE-800.

Change the setting to “Dev2/port2” in the Value columns as in the screenshot below. The Label can also be named for ease of use.

Device: DigitalIO | Library: NI100X

Label

Initialization Properties

Device	Property	Value
DigitalIO	AutoDetectedOutputPort	Dev2/port2
DigitalIO	IOChannel	Dev2/port2
DigitalIO	TriggerSequenceLength	1000

OK Cancel

Click OK and click Next through to the finish where the configuration can be saved. A new Group can now be made. To include both the pE-800 and pT-100 select both of them in the 'Group Editor'. Name these something memorable and select OK:

Group Editor

Here you can specify the properties included in a configuration group.

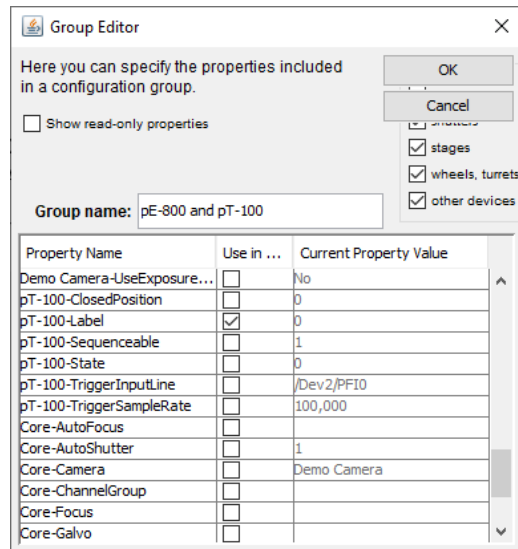
☐ Show read-only properties

Group name:

OK Cancel

☒ stages
☒ wheels, turrets
☒ other devices

Property Name	Use in ...	Current Property Value
pE-800-ClosedPosition	<input type="checkbox"/>	0
pE-800-Label	<input checked="" type="checkbox"/>	0
pE-800-Sequenceable	<input type="checkbox"/>	1
pE-800-State	<input type="checkbox"/>	0
pE-800-TriggerInputLine	<input type="checkbox"/>	/Dev2/PF10
pE-800-TriggerSampleRate	<input type="checkbox"/>	100,000
Demo Camera-AllowMultiROI	<input type="checkbox"/>	0
Demo Camera-Binning	<input type="checkbox"/>	1
Demo Camera-BitDepth	<input type="checkbox"/>	8
Demo Camera-CCDTempera...	<input type="checkbox"/>	0 < >
Demo Camera-DisplayImage...	<input type="checkbox"/>	0
Demo Camera-DropPixels	<input type="checkbox"/>	0
Demo Camera-Exposure	<input type="checkbox"/>	10 < >



Group Editor

Here you can specify the properties included in a configuration group.

☐ Show read-only properties

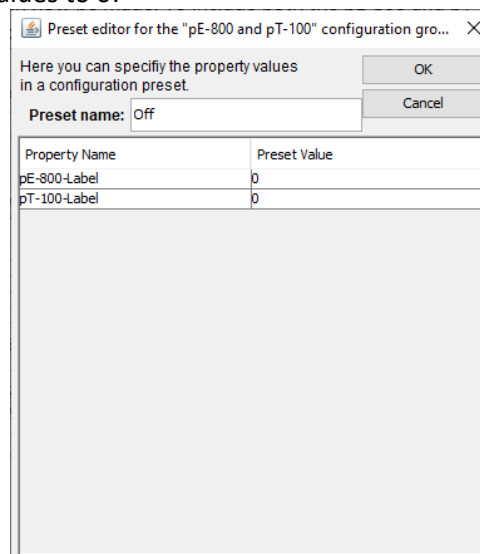
Group name: pE-800 and pT-100

OK Cancel

☒ stages
☒ wheels, turrets
☒ other devices

Property Name	Use in ...	Current Property Value
Demo Camera-UseExposure...	<input type="checkbox"/>	No
pT-100-ClosedPosition	<input type="checkbox"/>	0
pT-100-Label	<input checked="" type="checkbox"/>	0
pT-100-Sequenceable	<input type="checkbox"/>	1
pT-100-State	<input type="checkbox"/>	0
pT-100-TriggerInputLine	<input type="checkbox"/>	/Dev2/PFI0
pT-100-TriggerSampleRate	<input type="checkbox"/>	100,000
Core-AutoFocus	<input type="checkbox"/>	
Core-AutoShutter	<input type="checkbox"/>	1
Core-Camera	<input type="checkbox"/>	Demo Camera
Core-ChannelGroup	<input type="checkbox"/>	
Core-Focus	<input type="checkbox"/>	
Core-Galvo	<input type="checkbox"/>	

As before Presets can now be set up for whatever is required. Firstly, an 'Off' setting can be created by setting both values to 0:



Preset editor for the "pE-800 and pT-100" configuration gro...

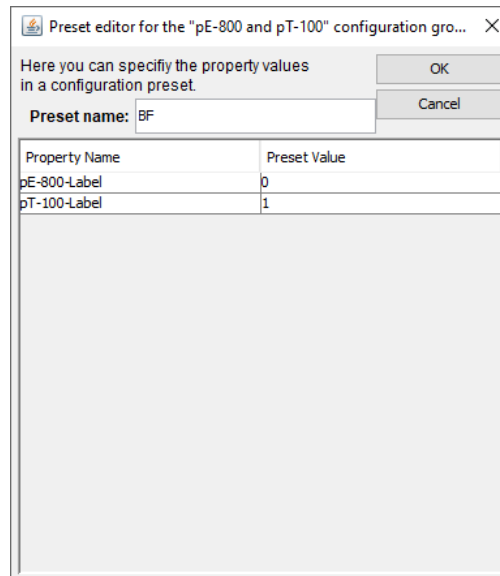
Here you can specify the property values in a configuration preset.

Preset name: Off

OK Cancel

Property Name	Preset Value
pE-800-Label	0
pT-100-Label	0

Further settings can be created for a different selection of LEDs. Firstly, to just have the pT-100 on, the preset value is set to 1 for the 'pT-100' setting.



Preset editor for the "pE-800 and pT-100" configuration gro... X

Here you can specify the property values in a configuration preset.

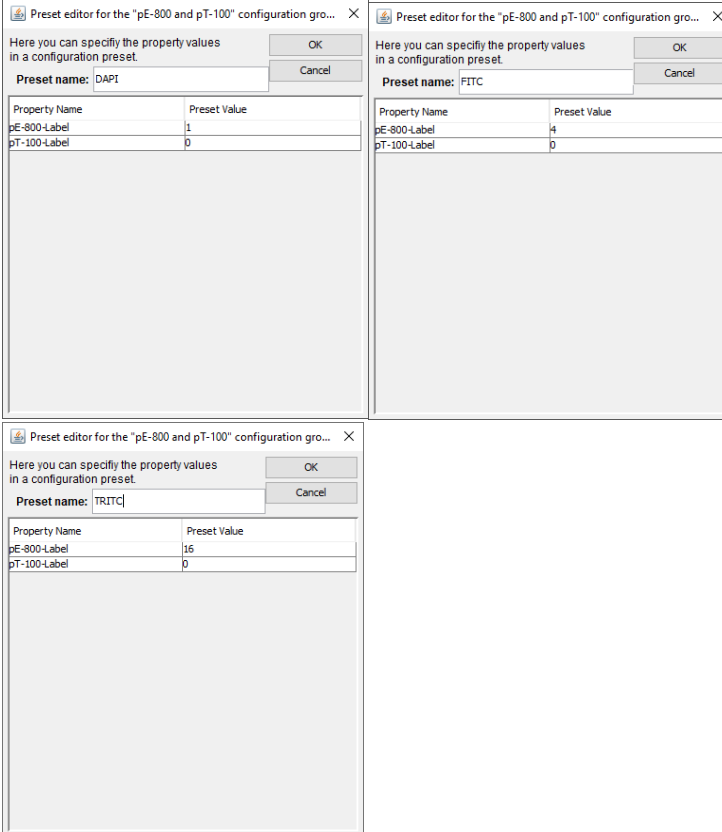
Preset name: BF

Property Name	Preset Value
pE-800-Label	0
pT-100-Label	1

The Presets for the pE-800 remain as previously, working in binary with the following LEDs:

Preset	Wavelength of LED, nm
0	All LEDs off
1	365/ 400
2	435
4	470
8	500
16	550
32	580
64	635
128	740
255	All LEDs on

Presets can be set up for as many LEDs as required. Below shows how to set up for DAPI, FITC and TRITC for example:



Here you can specify the property values in a configuration preset.

Preset name: DAPI

Property Name	Preset Value
pE-800-Label	1
pT-100-Label	0

Here you can specify the property values in a configuration preset.

Preset name: FITC

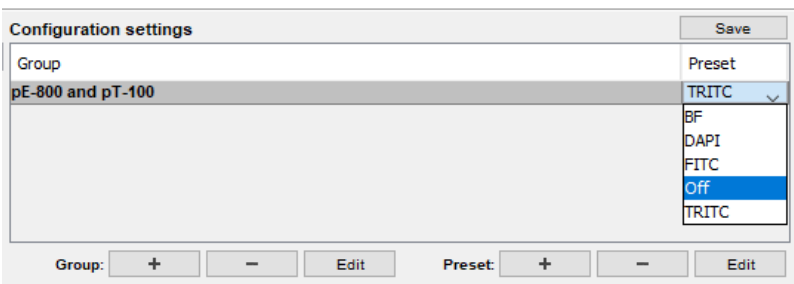
Property Name	Preset Value
pE-800-Label	4
pT-100-Label	0

Here you can specify the property values in a configuration preset.

Preset name: TRITC

Property Name	Preset Value
pE-800-Label	16
pT-100-Label	0

The Presets created are now available to choose



Configuration settings

Group: pE-800 and pT-100

Preset: TRITC

BF
DAPI
FITC
Off
TRITC

Group: + - Edit Preset: + - Edit

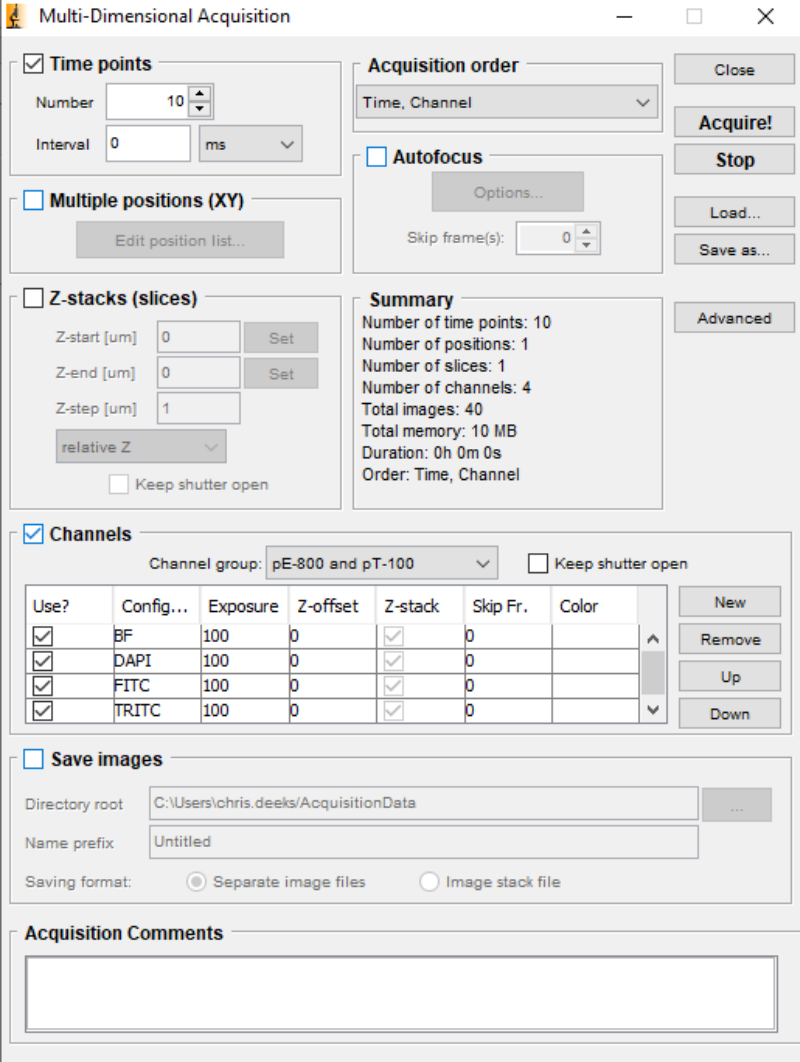
Remember the intensity of the LEDs in the pE-800 are set via the LightBridge software, but the pT-100 intensity is set from the control pod of the unit.

The pE-800 and pT-100 are now ready to use together with μ Manager

Setting up a simple experiment using the pT-100 and pE-800

To create an experiment, select Multi-Dimensional Acquisition from the Tools tab. Here the Channel Group that was created can be selected. By clicking 'New' on the right-hand side

the Presets that were defined can be selected, allowing triggering of the pT-100 and the pE-800 in a single experiment.



Multi-Dimensional Acquisition

☒ **Time points**
 Number: 10
 Interval: 0 ms

☐ **Multiple positions (XY)**
 Edit position list...

☐ **Z-stacks (slices)**
 Z-start [um]: 0 Set
 Z-end [um]: 0 Set
 Z-step [um]: 1
 relative Z
☐ Keep shutter open

Acquisition order
 Time, Channel

☐ **Autofocus**
 Options...
 Skip frame(s): 0

Summary
 Number of time points: 10
 Number of positions: 1
 Number of slices: 1
 Number of channels: 4
 Total images: 40
 Total memory: 10 MB
 Duration: 0h 0m 0s
 Order: Time, Channel

☒ **Channels**
 Channel group: pE-800 and pT-100 ☐ Keep shutter open

Use?	Config...	Exposure	Z-offset	Z-stack	Skip Fr.	Color
<input checked="" type="checkbox"/>	BF	100	0	<input checked="" type="checkbox"/>	0	
<input checked="" type="checkbox"/>	DAPI	100	0	<input checked="" type="checkbox"/>	0	
<input checked="" type="checkbox"/>	FITC	100	0	<input checked="" type="checkbox"/>	0	
<input checked="" type="checkbox"/>	TRITC	100	0	<input checked="" type="checkbox"/>	0	

☐ **Save images**
 Directory root: C:\Users\chris.deeks\AcquisitionData
 Name prefix: Untitled
 Saving format: ☒ Separate image files ☐ Image stack file

Acquisition Comments
 [Text area for comments]

Buttons: Close, Acquire!, Stop, Load..., Save as..., Advanced

Appendix: Common Preset Values

There are 256 options while using the pE-6501-8 within μ Manager. Each option turns different LEDs. The commonly used of these can be seen in the tables below.

Presets for Single Band Filter Sets

Preset #	UV	435	470	500	550	580	635	740	Suggested Preset Name
0	off	off	off	off	off	off	off	off	All Off
1	UV								LED UV
2		435							LED 435
4			470						LED 470
12			470	500					LEDs 470 & 500
8				500					LED 500
16					550				LED 550
32						580			LED 580
48					550	580			LEDs 550 & 580
64							635		LED 635
96						580	635		LEDs 580 & 635
128								740	LED 740

Preset #	UV	435	470	500	550	580	635	740	Suggested Preset Name
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Preset for Multi Band Sets for simultaneous viewing of DAPI, GFP/ FITC

5	UV		470						DAPI/FITC
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Presets for Multi Band Sets for simultaneous viewing of FITC, Texas Red or GFP, mCherry

36			470			580			GFP/ mCherry
52			470		550	580			GFP/ mCherry

Preset for Multi Band Sets for simultaneous viewing of FITC, TRITC

20			470		550				FITC/ TRITC
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Preset for Multi Band Sets for simultaneous viewing of CFP, YFP

10		435		500					CFP/ YFP
----	--	-----	--	-----	--	--	--	--	----------

Presets for Multi Band Sets for simultaneous viewing of CFP, YFP, mCherry

42		435		500		580			CFP/ YFP/ mCherry
58		435		500	550	580			CFP/ YFP/ mCherry

Preset for all relevant channels ON for DAPI, FITC/ GFP, TRITC, mCherry/ Texas Red

53	UV		470		550	580			Wide Spectrum 1
----	----	--	-----	--	-----	-----	--	--	-----------------

Preset for all relevant channels on for DAPI, FITC/ GFP, TRITC, Texas Red, Cy5

117	UV		470		550	580	635		Wide Spectrum 2
-----	----	--	-----	--	-----	-----	-----	--	-----------------

Preset for all relevant channels on for DAPI, FITC/ GFP, TRITC, Cy5

85	UV		470		550		635		Wide Spectrum 3
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Preset for all relevant channels on for DAPI, CFP, FITC/ GFP, YFP, TRITC, mCherry/ Texas Red

63	UV	435	470	500	550	580			Wide Spectrum 4
----	----	-----	-----	-----	-----	-----	--	--	-----------------