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

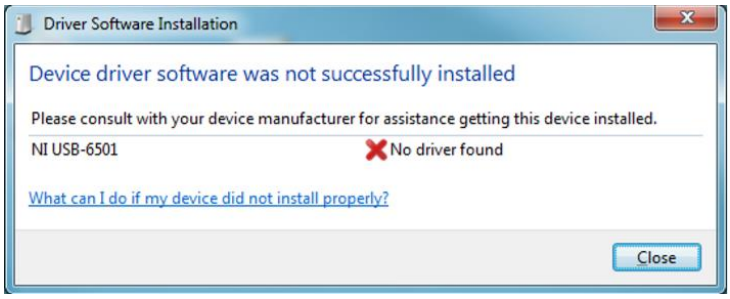
Carefully unpack the components from the shipping cartons.

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.

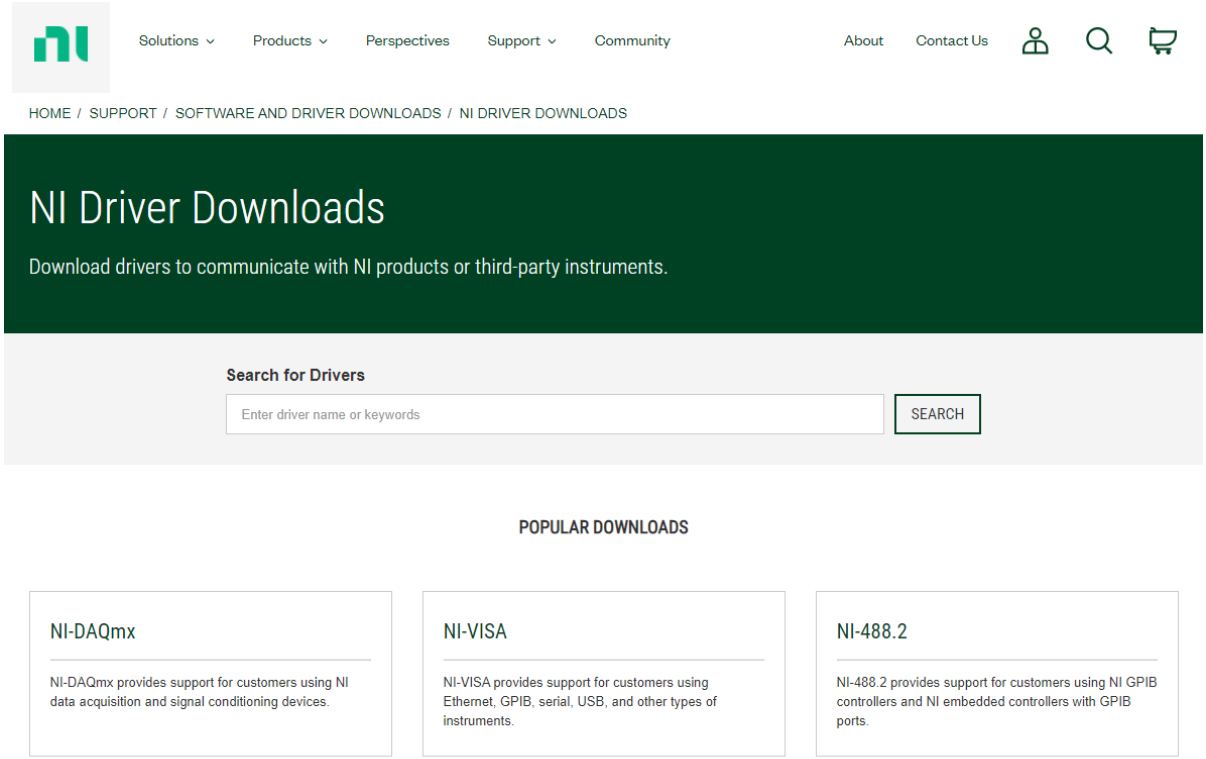
The pE-6501-8 has a 15-way connector to fit the TTL cable to the pE-800 as well as a BNC connection for the pT-100. Connect the cable to the pE-6501-8, and the BNC connection if required for the pT-100.

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.

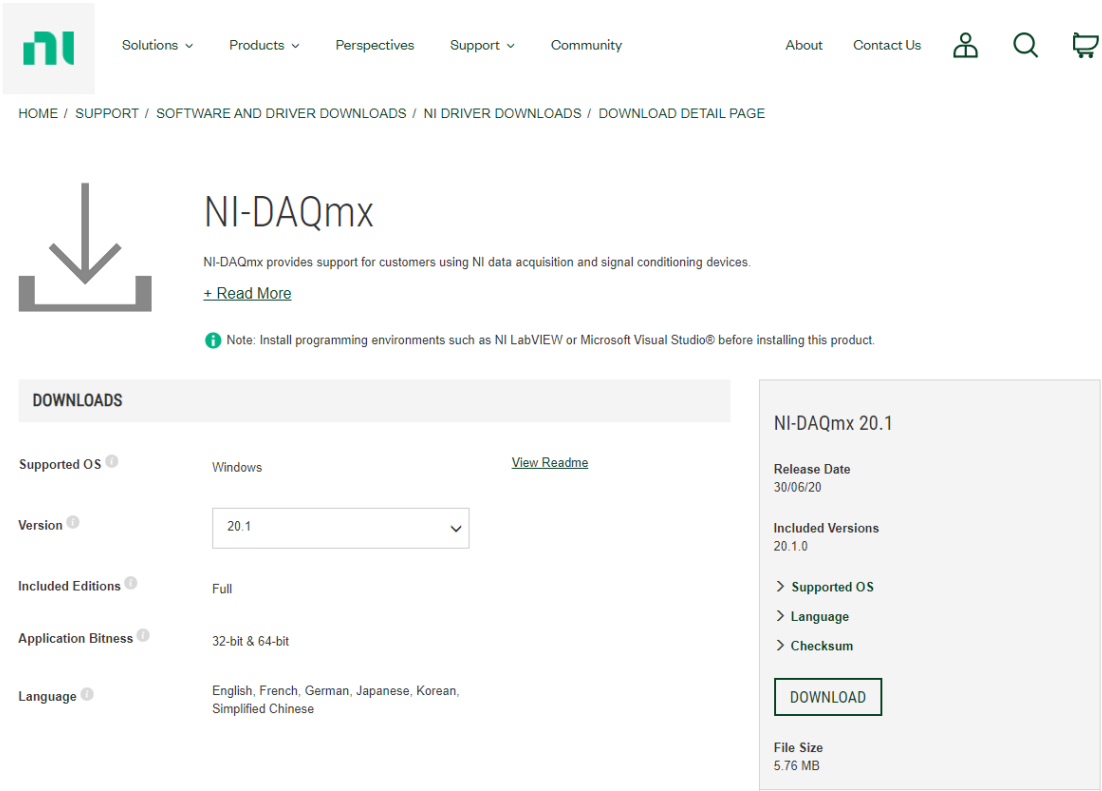


Please follow the hyperlink below to the National Instruments website to download the



latest NI Hardware Driver- NI-DAQmx.

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



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

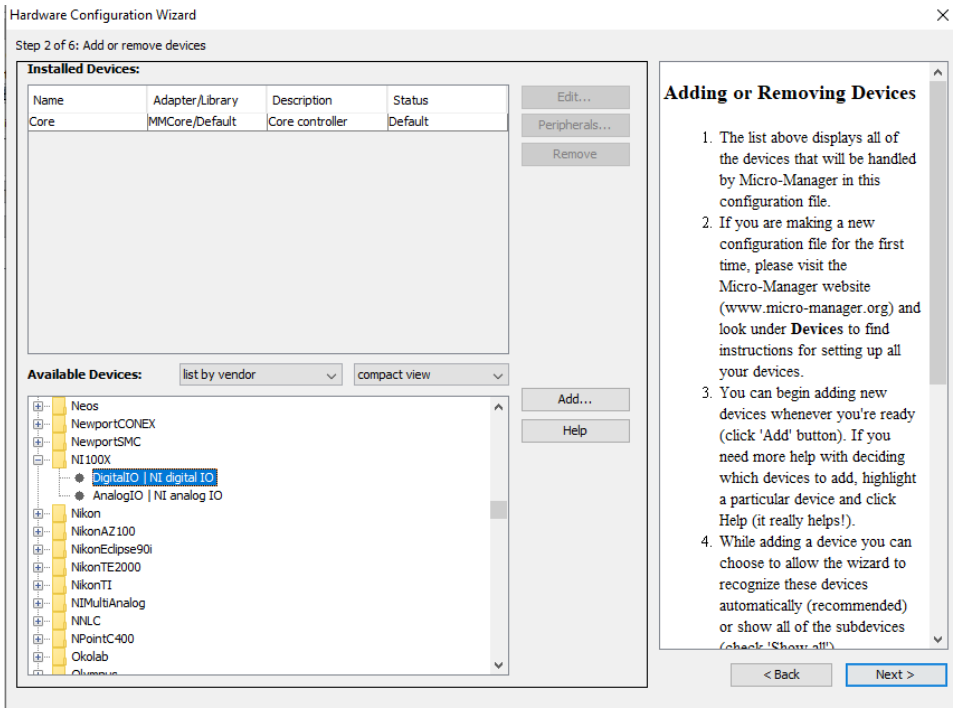
Once downloaded please continue through the steps in the National Instruments software until complete.

Setup of pE-6501-8 in µManager

Once the pE-6501-8 drivers have been installed, µManager should be installed if it has not been already. This can be found on the µManager website under the Downloads section. It is recommended to download the latest 'Version 1.4 nightly build'.

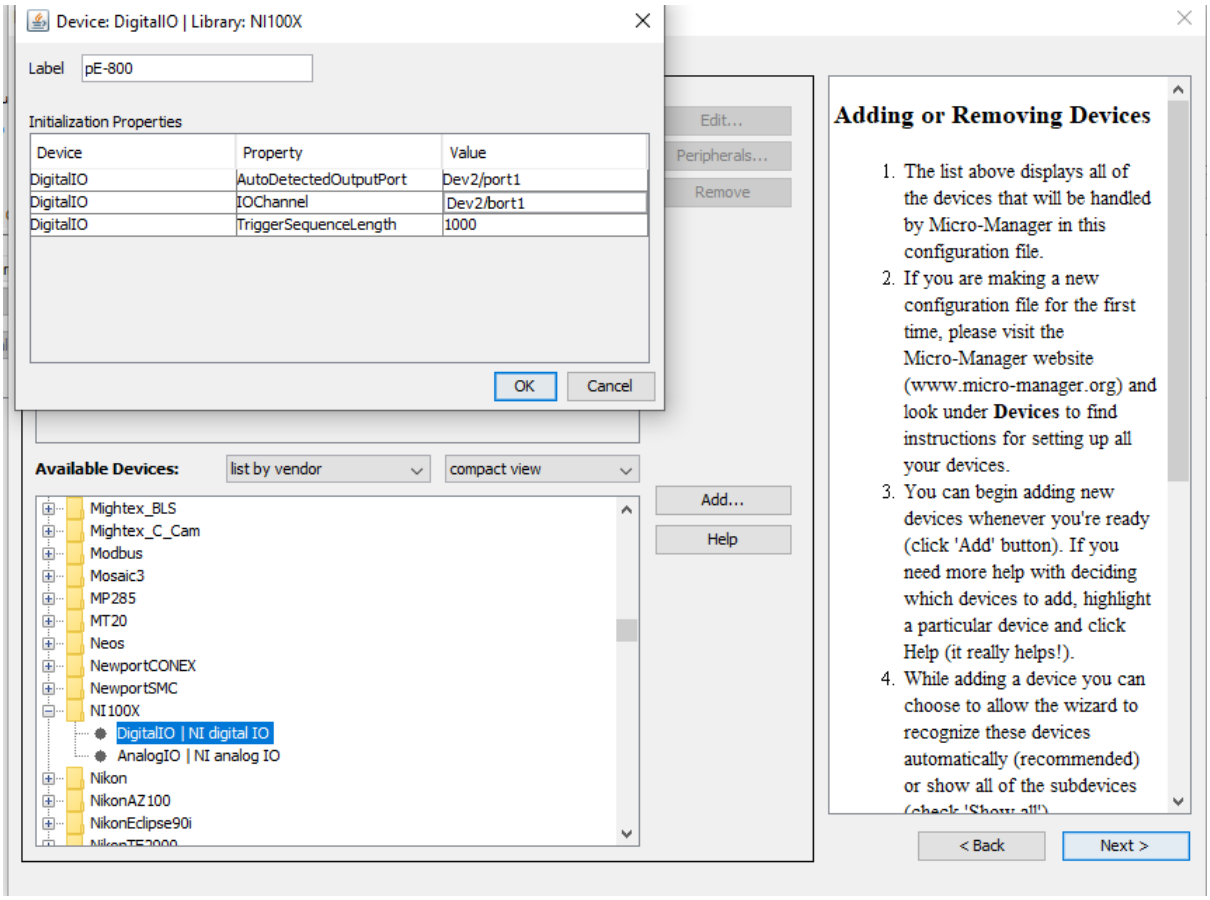
Once installed, open the µManager software. At the top of the window go to 'Tools' and open 'Hardware Configuration Wizard'. Choose whether to create a new configuration or to modify and existing one. Once decided, click 'Next'.

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

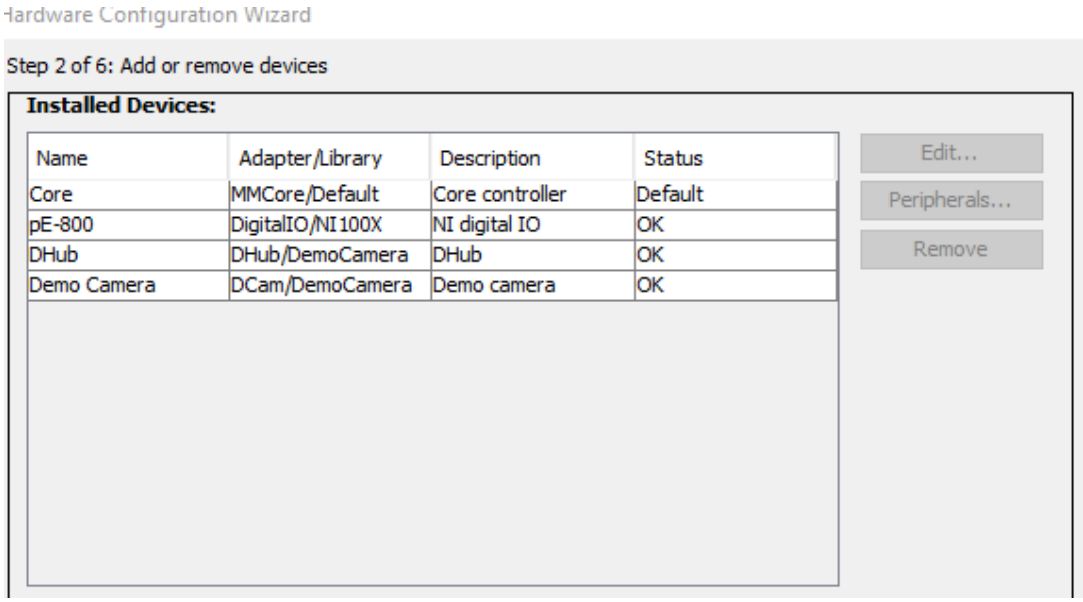


This will open a dialog box. The settings need to be changed to the same or similar as those on the screenshot below. This may differ depending on the setup being used. For example, the ‘Value’ in the row labelled ‘AutoDetectedOutputPort’ may read ‘Dev 2/port1’. If so, set the ‘Value’ in the row labelled ‘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.



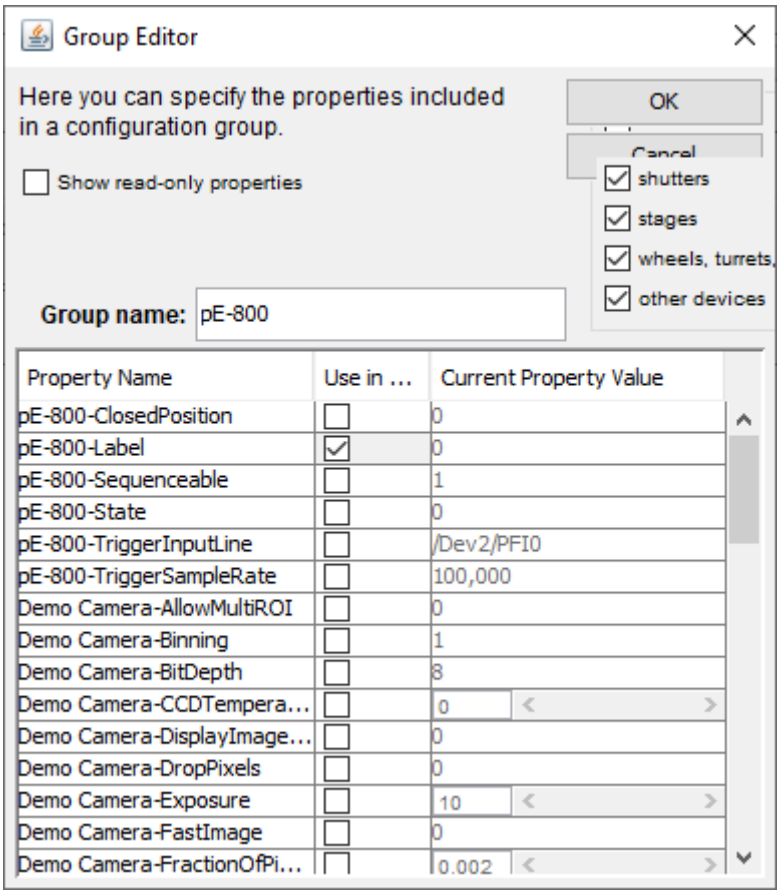
Here other devices can be added to the configuration. In this manual a demo camera will be added as an example.



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 µManager.

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

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 µManager via the pE-6501-8. Type in a suitable Group name.



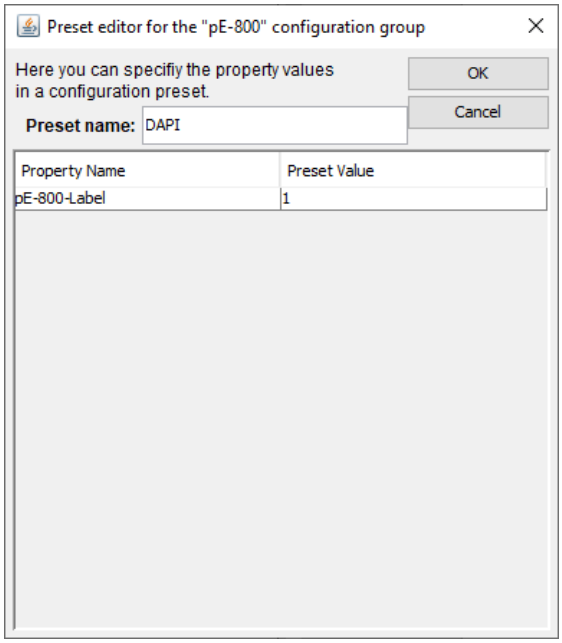
To select individual LEDs, 'Presets' can now be made and edited. Select the newly made Group and click 'Edit' next to the Preset tab.

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

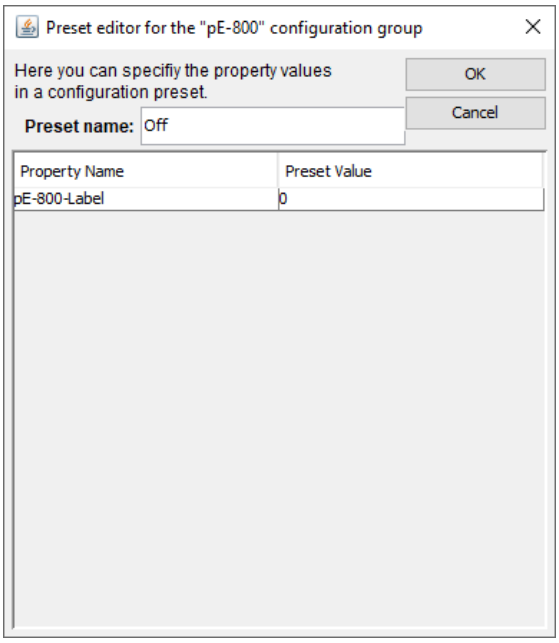
Preset	Wavelength of LED, nm
0	All LEDs off
1	365/ 400
2	435
4	470
8	500
16	550
32	580
64	635
128	740
255	All LEDs on

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

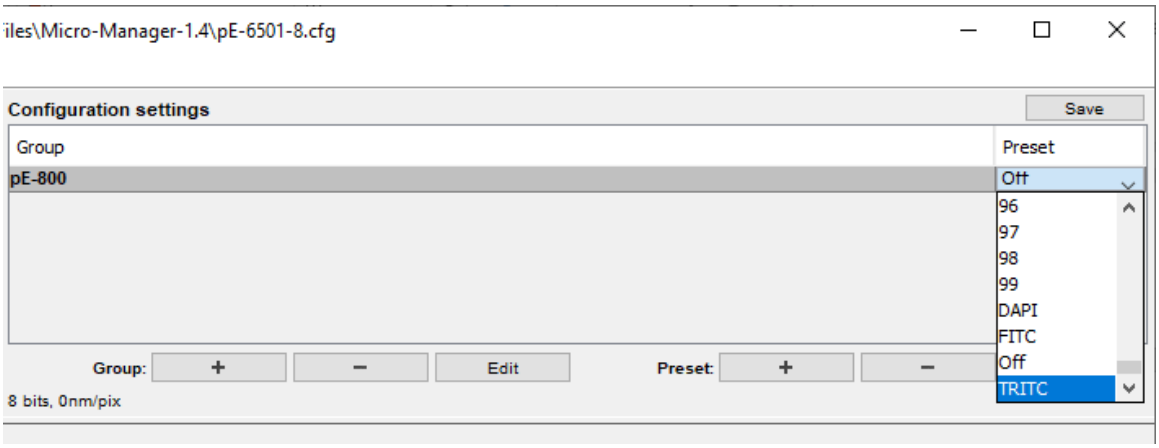
Name and edit any Preset values required. In the example below the 365 nm LED has been changed to become DAPI.



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.

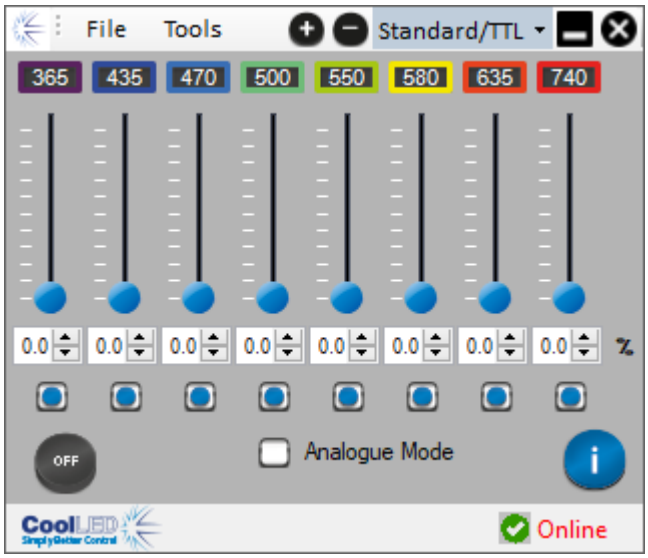


Micro-Manager will now have the pre-existing Presets and the edited ones available.



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 µManager software.

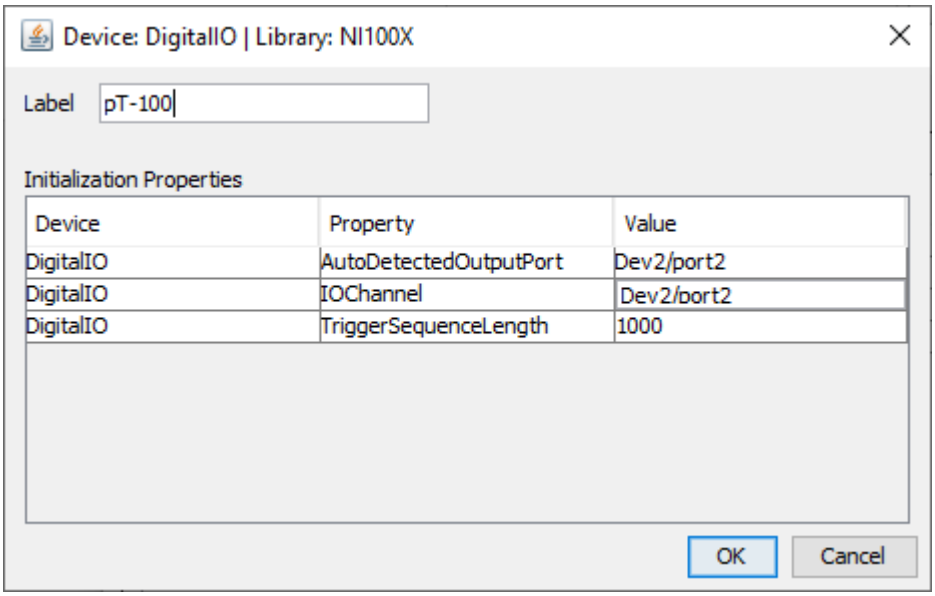
Controlling both the pE-800 and pT-100 within µManager using the pE6501-8

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.

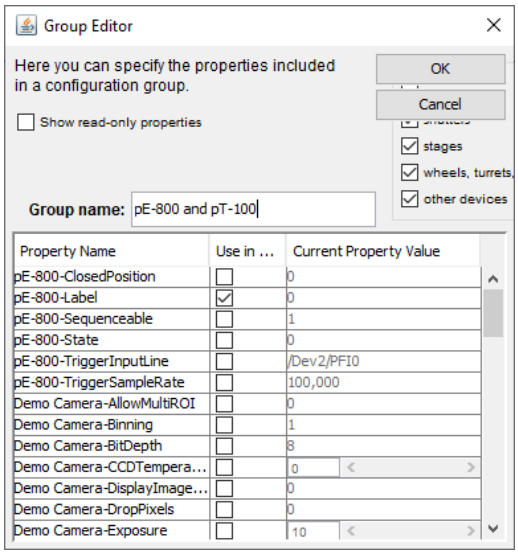
In µManager again go to Tools>Hardware Configuration Wizard and either create a new configuration or edit a previous one and click Next.

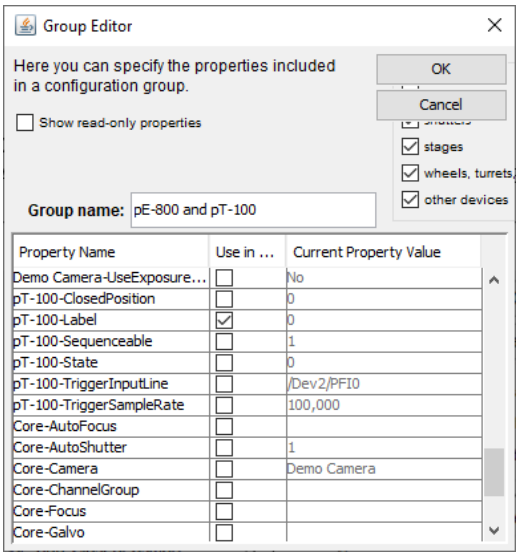
In the Devices page scroll down to find NI100X and select “Digital IO I NI Digital IO” as was done previously when setting up the pE-800.

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.

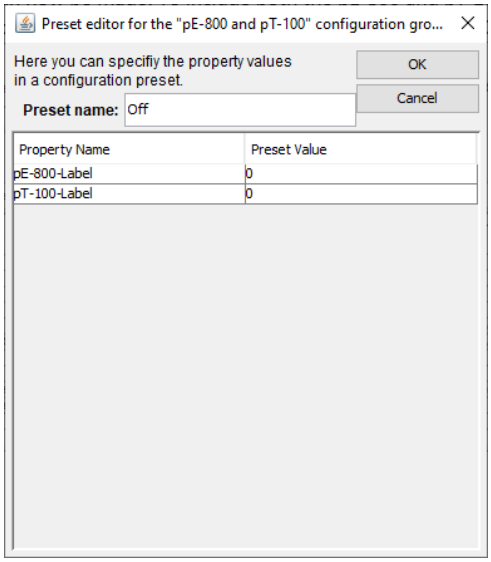


Click OK and click Next through to the finish where the configuration can be saved.
A new Group can now be made. To include both the pE-800 and pT-100 select both of them in the 'Group Editor'. Name these something memorable and select OK:

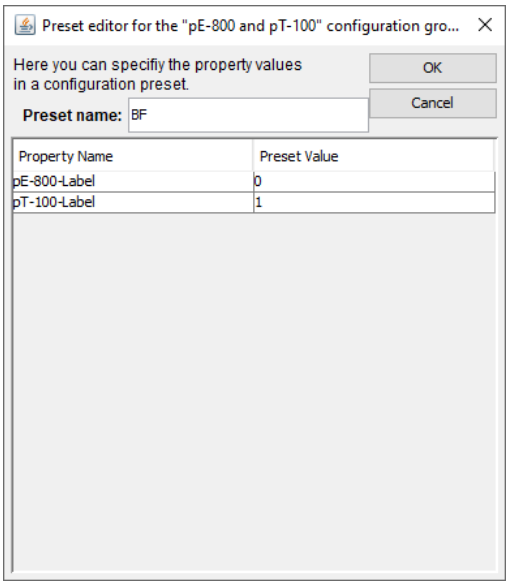




As before Presets can now be set up for whatever is required. Firstly, an 'Off' setting can be created by setting both values to 0:



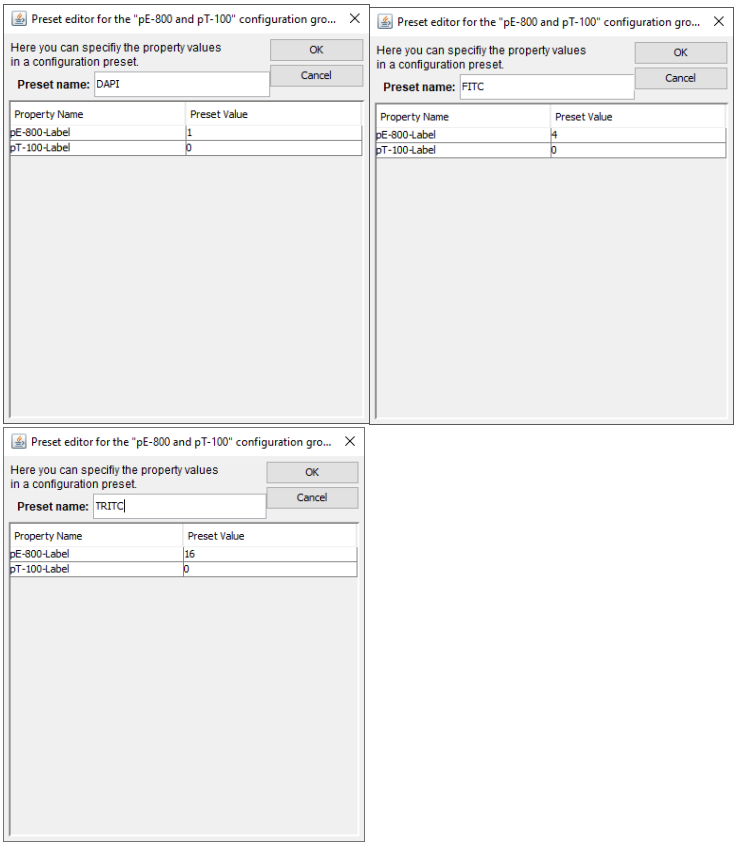
Further settings can be created for a different selection of LEDs. Firstly, to just have the pT-100 on, the preset value is set to 1 for the 'pT-100' setting.



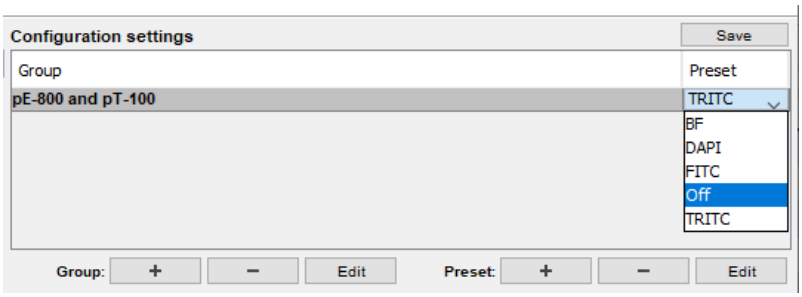
The Presets for the pE-800 remain as previously, working in binary with the following LEDs:

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:



The Presets created are now available to choose



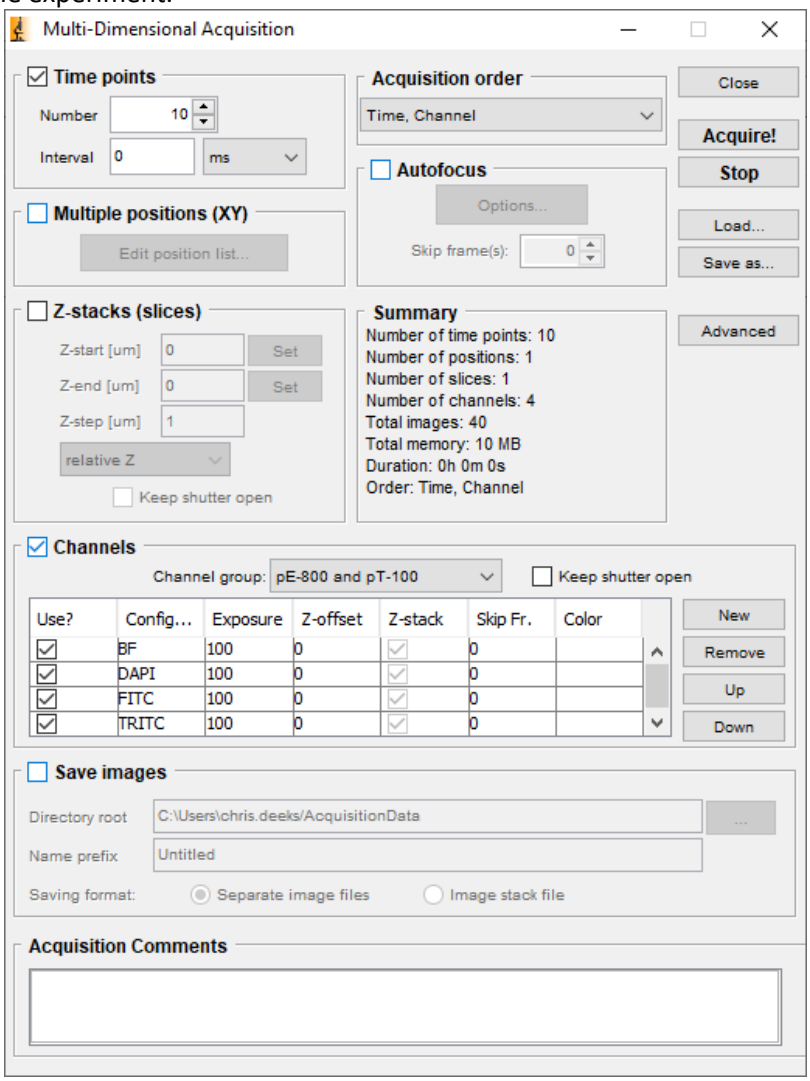
Remember the intensity of the LEDs in the pE-800 are set via the LightBridge software, but the pT-100 intensity is set from the control pod of the unit.

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

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.



Appendix: Common Preset Values

There are 256 options while using the pE-6501-8 within µManager. 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
Preset for Multi Band Sets for simultaneous viewing of DAPI, GFP/ FITC									
5	UV		470						DAPI/FITC
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
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
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