

SOFTWARE INSTALLATION AND CONFIGURATION SPECIFICATION

PM1 Pachymeter Automated System Level Test Platform

Prepared for:

Occuity Ltd

2nd March 2022

1 TABLE OF CONTENTS

2	INTRODUCTION	5
2.1	PURPOSE	5
2.2	SCOPE	5
2.3	DOCUMENT OVERVIEW	5
3	SOFTWARE INSTALLATION	6
3.1	OVERVIEW	6
3.2	THIRD PARTY SOFTWARE SETUP	6
3.2.1	<i>Overview</i>	6
3.2.2	<i>Python Programming Language</i>	6
3.2.2.1	Download	6
3.2.2.2	Installation	7
3.2.2.3	Verification	7
3.2.3	<i>NI-DAQmx</i>	7
3.2.3.1	Download	7
3.2.3.2	Installation	7
3.2.3.3	Verification	8
3.2.3.3.1	NI Package Manager	8
3.2.3.3.2	NI MAX	9
3.2.4	<i>NI-DAQmx Python API</i>	9
3.2.4.1	Installation	10
3.2.5	<i>Install & Fix FT232H Driver with Zadig</i>	10
3.2.5.1	Download	10
3.2.5.2	Installation	10
3.2.6	<i>Python Packages pyftdi and pyusb</i>	11
3.2.7	<i>Git (Client)</i>	12
3.2.8	<i>Visual Studio Code (IDE)</i>	12
4	SOFTWARE CONFIGURATION	13
4.1	HEADING 2	13

DISCLAIMERS

The information contained in this document is for information purposes only and is subject to change without prior notice. While LeoTel Software Systems Limited endeavours to provide the updated document to all project parties, the user is advised to check that they are using the latest version of the document.

LeoTel Software Systems Limited disclaims all warranties, express or limited, including, but not limited, to the implied warranties of merchantability and fitness for a particular purpose, except as provided for in a separate software licence agreement.

TRADEMARKS

All trademarks recognised.

CHANGE HISTORY

Version	Author	Date of Change	Description
0.1	James Bridson	02-Mar-2022	Initial version.

DOCUMENT REFERENCES

Ref.	Document Id	Title	Author	Issue	Date

APPLICABLE STANDARDS

Term	Description
ISO 13485	Medical devices – quality management systems – Requirements for regulatory purposes
IEC 62304	Medical device software – software lifecycle processes
ISO 14971	Medical devices – Application of risk management to medical devices
ISO/IEC 12207	Systems and software engineering – Software life cycle processes

GLOSSARY & ACRONYMS

Term	Description
AI	Analogue Input
AO	Analogue Output

APFI	Analogue Programmable Function Interface
CC	Constant Current
COTS	Commercial Off-The-Shelf
DI	Digital Input
DIO	Digital Input / Output
DNC	Do Not Connect
DNF	Do Not Fit
DO	Digital Output
DUT	Device Under Test
FFC	Flexible Flat Cable
FPC	Flexible Printed Circuit
GPIO	General Purpose Input / Output
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
LDA PCB	Laser Driver and Amplifier Printed Circuit Board
LSC PESS	Linear Scanner Controller Programmable Electronic Sub-System
OTS	Off-The-Shelf
Pachymeter	A scientific instrument used to measure the thickness of the cornea using laser, light waves or ultrasound.
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly
PDA PESS	Pachymeter Data Acquisition Programmable Electronic Sub-System
PE PESS	Pachymeter Environmental Programmable Electronic Sub-System
PFI	Programmable Function Interface
PI PESS	Pachymeter Interface Programmable Electronic Sub-System
TBC	To Be Confirmed
UUT	Unit Under Test
WP n	Work Package n

2 INTRODUCTION

This guide documents the software installation and configuration for the Occuity PM1 Pachymeter Automated System Level Test Platform.

2.1 PURPOSE

This document is primarily intended to be used:

- By software engineers during the PM1 Pachymeter Automated System Level Test Platform project when installing and configuring the software components.

2.2 SCOPE

This document covers installation and configuration of the software components of the PM1 Pachymeter Automated System Level Test Platform.

2.3 DOCUMENT OVERVIEW

The remainder of this document is organised into sections as follows:

Section 3 documents the software installation

Section 4 documents the software configuration

3 SOFTWARE INSTALLATION

3.1 OVERVIEW

The software components in the PM1 Pachymeter Automated System Level Test Platform are summarised in the following diagram:

[INSERT DIAGRAM HERE]

3.2 THIRD PARTY SOFTWARE SETUP

3.2.1 OVERVIEW

The third party software components in the PM1 Pachymeter Automated System Level Test Platform are summarised in the following diagram:

[INSERT DIAGRAM HERE]

Third party software components are those software components provided by third parties to provide drivers for hardware components as well as library and language resources used to implement the PM1 Pachymeter Automated System Level Test Platform Python Framework.

3.2.2 PYTHON PROGRAMMING LANGUAGE

Python is an interpreted, object-orientated, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.

Python is used to implement the PM1 Pachymeter Automated System Level Test Platform Python Framework gluing together the various hardware entities within the platform, implementing an object-orientated abstraction layer to that hardware and then to implement scripts to support automated testing.

The PM1 Pachymeter Automated System Level Test Platform is based on Python 3.9.5 (64-bit).

[ADD REASON WHY / DEPENDENCIES]

All Python releases are Open Source.

3.2.2.1 DOWNLOAD

The Python 3.9.5 Windows Installer (64-bit) file can be downloaded from this link:

<https://www.python.org/ftp/python/3.9.5/python-3.9.5-amd64.exe>

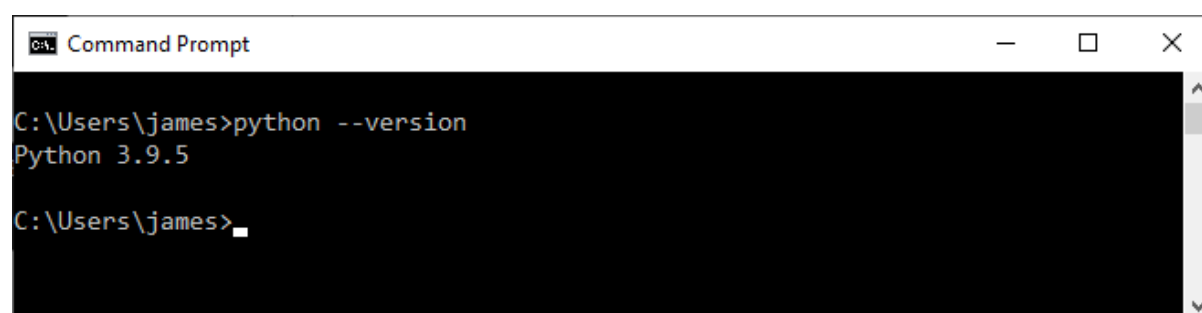
3.2.2.2 INSTALLATION

Run the downloaded Python Windows Installer:

- Make sure you select “Install Launcher for all users (recommended)” and “Add Python 3.9 to PATH” checkboxes.
- Now select ‘Customize installation – choose location and features’. Make sure all the ‘Optional Features’ are selected.
- Click ‘Next’ and select ‘Install for all users’, ‘Associate files with Python’, ‘Create shortcuts for installed applications’, ‘Add Python to environment variables’ and ‘Precompile standard library’.
- The installation path should be displayed as ‘C:\Program Files\Python39’ (or similar all user program file path).
- Now click ‘Install’.
- On display of the ‘Setup was successful’ message click on ‘Disable path length limit’ to make sure Windows Python can bypass the 260-character MAX_PATH limit.
- Now click ‘Close’.

3.2.2.3 VERIFICATION

Once the Python Windows Installer has completed successfully check that the Python interpreter is available from a command prompt as shown below:



```

C:\Users\james>python --version
Python 3.9.5
C:\Users\james>
  
```

3.2.3 NI-DAQmx

NI-DAQmx provides support when using NI data acquisition and signal conditioning devices (i.e. the NI USB-6363 in the case of the PM1 Pachymeter Automated System Level Test Platform).

The PM1 Pachymeter Automated System Level Test Platform is based on NI-DAQmx 21.3 (64-bit).

3.2.3.1 DOWNLOAD

NI-DAQmx 21.3 can be downloaded from this link:

<https://www.ni.com/en-gb/support/downloads/drivers/download.ni-daqmx.html#428058>

3.2.3.2 INSTALLATION

Run the downloaded NI Package Manager to install NI-DAQmx 21.3:

- Accept the license agreement.
- Ensure ‘Disable Windows fast startup’ is selected.

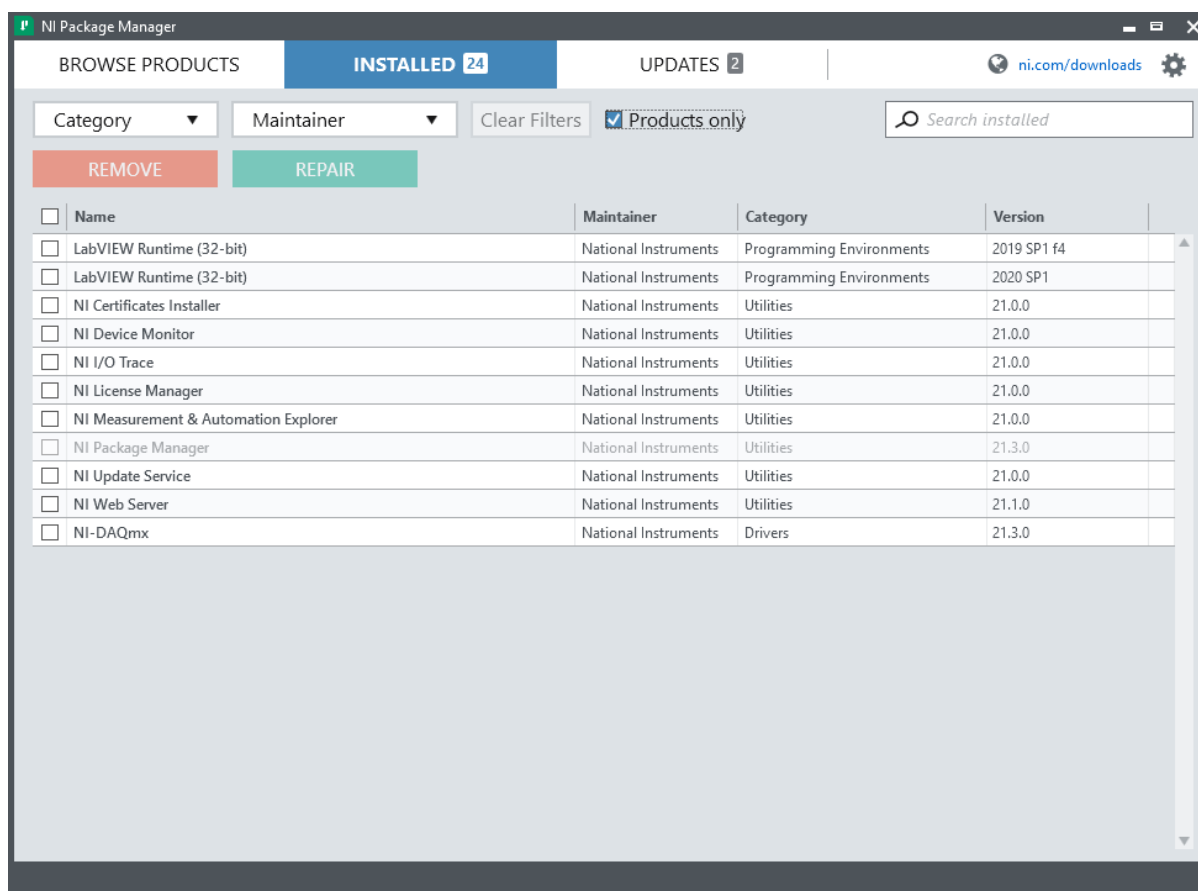
- Click on 'Next'.
- Click on 'Next to install the NI Package Manager.
- Once installed NI Package Manager will display 'Additional items you may wish to install'.
- Select all the items and click on 'Next'.
- Accept the license agreement.
- Review the summary and click on 'Next'.
- Once the installation has been completed you will be asked if you wish to check for updates periodically, click on 'No'.
- When asked 'Do you want to participate in the NI Customer Experience Improvement Program' select 'No' and click on 'Ok'.

You must reboot to complete the installation operation and make sure all the NI services are correctly initialised.

3.2.3.3 VERIFICATION

3.2.3.3.1 NI Package Manager

Once the NI Package Manager has completed successfully, and you have rebooted, check that all the components shown below have been installed by launching the 'NI Package Manager' app from the Windows Start Menu:



The NI Package Manager allows you to update your installed options if it should be required.

3.2.3.3.2 NI MAX

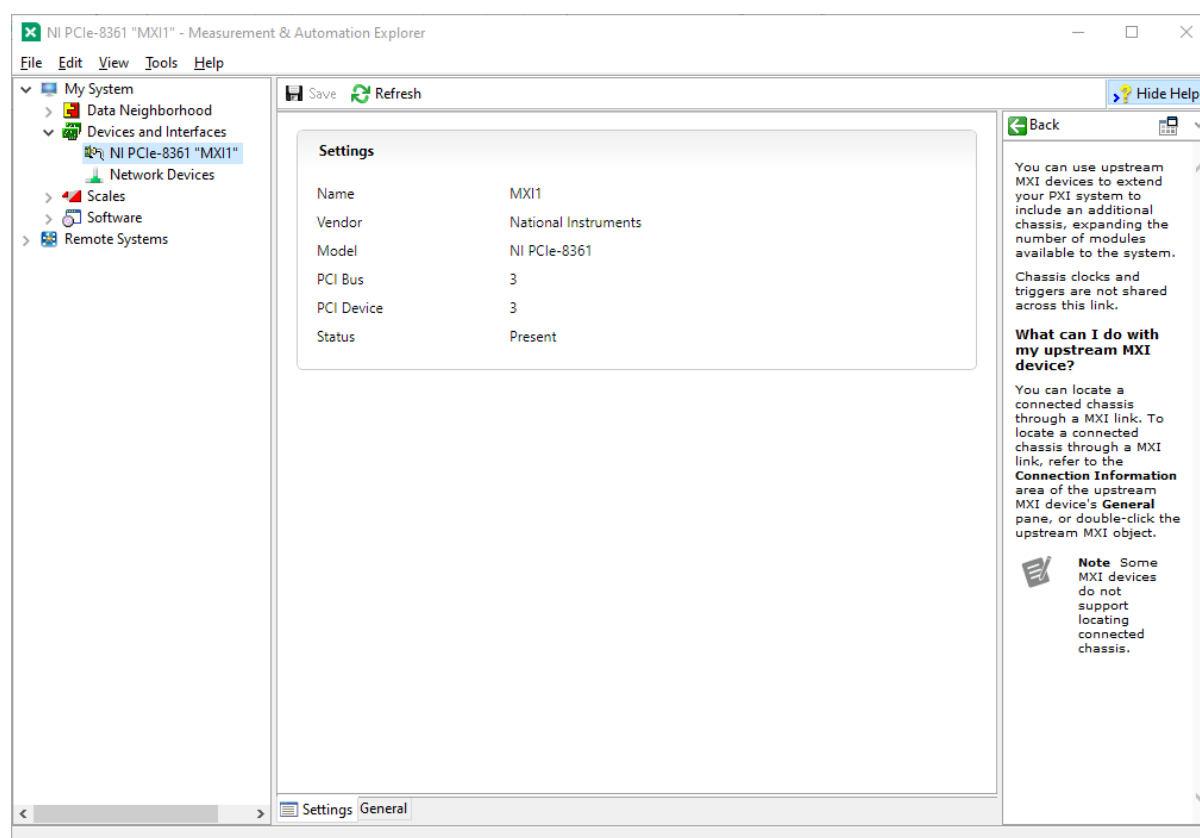
NI Measurement & Automation Explorer (MAX) provides access to the NI hardware (i.e. the NI USB-6363 in the case of the PM1 Pachymeter Automated System Level Test Platform).

It is a free piece of software that cannot be downloaded by itself but is included, and automatically installed, with all NI drivers.

With NI-MAX, you can:

- Configure the NI hardware and software
- Export/Import the system configuration
- Create and edit channels, tasks, interfaces, scales, and virtual instruments
- Create simulated devices
- Execute system diagnostics and run test panels
- View devices/instruments connected to your system and software installed on your system

NI MAX is not normally needed in order to use the PM1 Pachymeter Automated System Level Test Platform but can be convenient for checking the NI hardware connection and executing system diagnostics if required.



3.2.4 NI-DAQMX PYTHON API

The Python package 'nidaqmx' contains an API (Application Programming Interface) for interacting with the NI-DAQmx driver installed previously. This package was created and is supported by NI. The

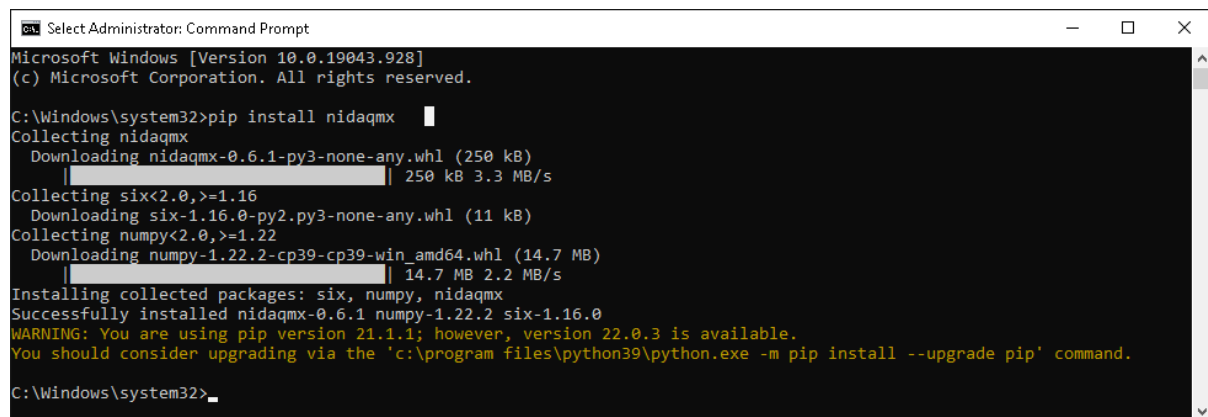
package is implemented as a complex, highly object-orientated wrapper around the NI-DAQmx C API using the 'ctypes' Python library.

3.2.4.1 INSTALLATION

The Python package 'nidaqmx' can be installed with 'pip' which will also install any necessary dependencies.

Whilst it is possible to install Python packages without administrator privileges, for a test machine that may be used by many users it is more convenient to install them with administrative privileges.

In order to do this launch a command prompt using 'Run as Administrator' and run the following command:



```

Select Administrator: Command Prompt
Microsoft Windows [Version 10.0.19043.928]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\system32>pip install nidaqmx
Collecting nidaqmx
  Downloading nidaqmx-0.6.1-py3-none-any.whl (250 kB)
    | 250 kB 3.3 MB/s
Collecting six<2.0,>=1.16
  Downloading six-1.16.0-py2.py3-none-any.whl (11 kB)
Collecting numpy<2.0,>=1.22
  Downloading numpy-1.22.2-cp39-cp39-win_amd64.whl (14.7 MB)
    | 14.7 MB 2.2 MB/s
Installing collected packages: six, numpy, nidaqmx
Successfully installed nidaqmx-0.6.1 numpy-1.22.2 six-1.16.0
WARNING: You are using pip version 21.1.1; however, version 22.0.3 is available.
You should consider upgrading via the 'c:\program files\python39\python.exe -m pip install --upgrade pip' command.

C:\Windows\system32>
  
```

3.2.5 INSTALL & FIX FT232H DRIVER WITH ZADIG

In order to use the FT232H breakout board in SPI mode with the Python package pyftdi/pyusb we need to also install drivers for libusb support.

The easiest way to do this is to use an application called Zadig.

3.2.5.1 DOWNLOAD

Zadig can be downloaded from the following link:

<https://github.com/pbatard/libwidi/releases/download/v1.4.1/zadig-2.7.exe>

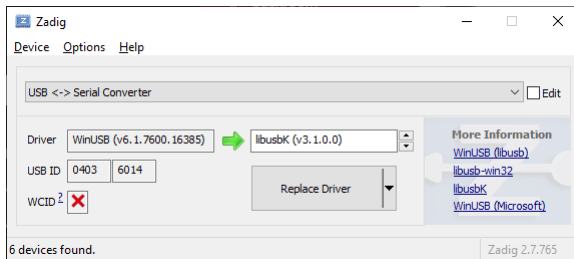
3.2.5.2 INSTALLATION

Unplug all FTDI devices from the test computer. After all the FTDI devices are unplugged plug in the PM1 Pachymeter Automated System Level Test Platform FT232H breakout board via a USB-C cable to the test computer so it is the only FTDI device connected to the test computer.

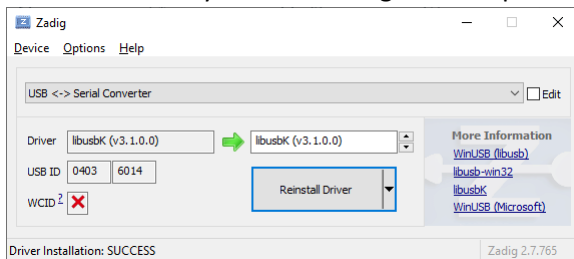
Launch the downloaded Zadig application:

- When asked about the allowing Zadig to automatically update online, click on 'No'.
- Click on the options menu and select 'List all Devices'.
- Locate the FT232H serial converter device in the drop down list. Be careful you are picking the correct device with USB ID 0403 6014.

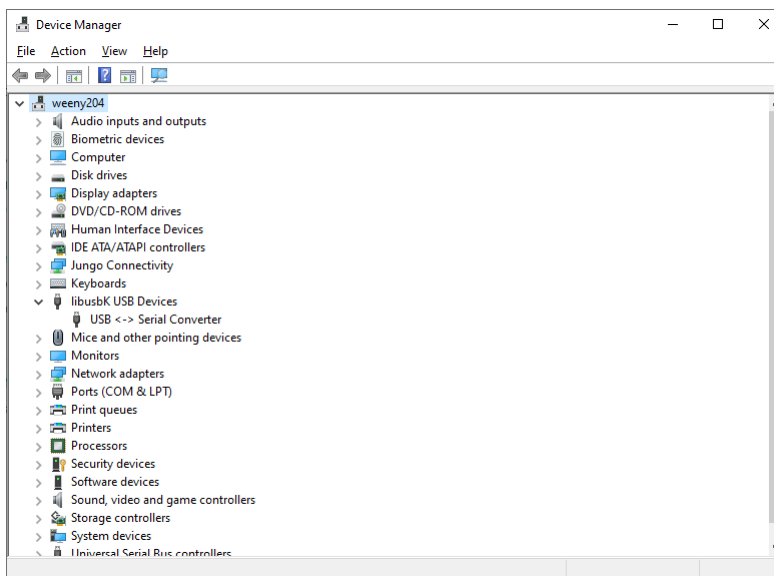
- Click the 'Up/Down' arrow buttons on the replacement driver box and select the 'libusbK' based driver:



- Click on 'Replace Driver'.
- Once successfully installed Zadig should update as follows:



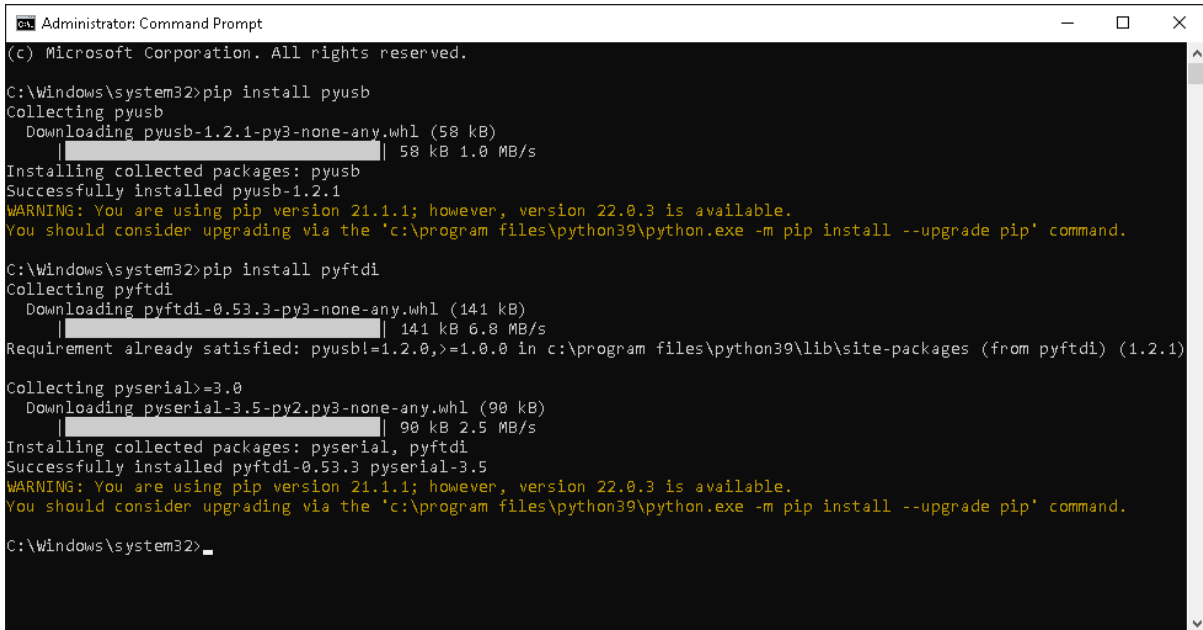
and device manager should show the USB <-> Serial Converter under the libusbK USB Devices node:



3.2.6 PYTHON PACKAGES PYFTDI AND PYUSB

In order to use the FT232H breakout board for SPI communication the PM1 Pachymeter Automated System Level Test Platform Framework uses the Python packages 'pyftdi' and 'pyusb'.

As with the Python package 'nidaqmx' these are installed with 'pip' from a command prompt that has been launched via 'Run as Administrator':



```

Administrator: Command Prompt
(c) Microsoft Corporation. All rights reserved.

C:\Windows\system32>pip install pyusb
Collecting pyusb
  Downloading pyusb-1.2.1-py3-none-any.whl (58 kB)
    |#####| 58 kB 1.0 MB/s
Installing collected packages: pyusb
Successfully installed pyusb-1.2.1
WARNING: You are using pip version 21.1.1; however, version 22.0.3 is available.
You should consider upgrading via the 'c:\program files\python39\python.exe -m pip install --upgrade pip' command.

C:\Windows\system32>pip install pyftdi
Collecting pyftdi
  Downloading pyftdi-0.53.3-py3-none-any.whl (141 kB)
    |#####| 141 kB 6.8 MB/s
Requirement already satisfied: pyusb<1.2.0,>=1.0.0 in c:\program files\python39\lib\site-packages (from pyftdi) (1.2.1)

Collecting pyserial>=3.0
  Downloading pyserial-3.5-py2.py3-none-any.whl (90 kB)
    |#####| 90 kB 2.5 MB/s
Installing collected packages: pyserial, pyftdi
Successfully installed pyftdi-0.53.3 pyserial-3.5
WARNING: You are using pip version 21.1.1; however, version 22.0.3 is available.
You should consider upgrading via the 'c:\program files\python39\python.exe -m pip install --upgrade pip' command.

C:\Windows\system32>_

```

3.2.7 GIT (CLIENT)

TBD

3.2.8 VISUAL STUDIO CODE (IDE)

TBD

pylint

PyYAML

4 SOFTWARE CONFIGURATION

4.1 HEADING 2
