Operating the “Mini-Maurice” S2D2 instrument

Contents

1 Material Requirements

1. S2D2 Lamp fixture (Boxed contents)
    - Mini-Maurice S2D2 instrument
    - Universal power cord
    - Nuc computer
    - Monitor
    - Keyboard
    - Mouse
    - Network cable
    - USB memory stick
2. #2 Phillips head screwdriver
3. 2mm allen hex key

2 Initial Setup

There should be a total of three (3) boxes of materials shipped that make up the entire fixture. One box contains the fixture itself with S2D2 lamp PT2862 installed. Another box will contain a monitor, and the third box will contain an Intel Nuc computer with mouse and keyboard, a short network cable, a USB memory stick, a universal power cord, and the boxed “bad” qualified lamps PU2553 & PU3710.

The entire fixture with computer and monitor should take up less than $1.25m^2$ of area when assembled. After verifying the contents of the boxes, plug the universal power cord into the rear of the fixture, and place the fixture onto a secure location on a table. Assemble the mouse, keyboard, monitor, and Nuc computer on the table next to the fixture.

Fixture: Box 1 Contents

S2D2 lamp transport padding

The fixture has the S2D2 lamp PT2862 installed, but is wrapped in padding for shipping transport. Open the door of the fixture and unwrap the brown paper padding from the S2D2 lamp housing. Reassemble the S2D2 lamp back in the enclosure as outlined in section 6.1.

With the short network cable, connect the Nuc computer to the fixture using the network port on the back of the Nuc computer labeled “instrument,” directly to the network port on the back of the fixture.

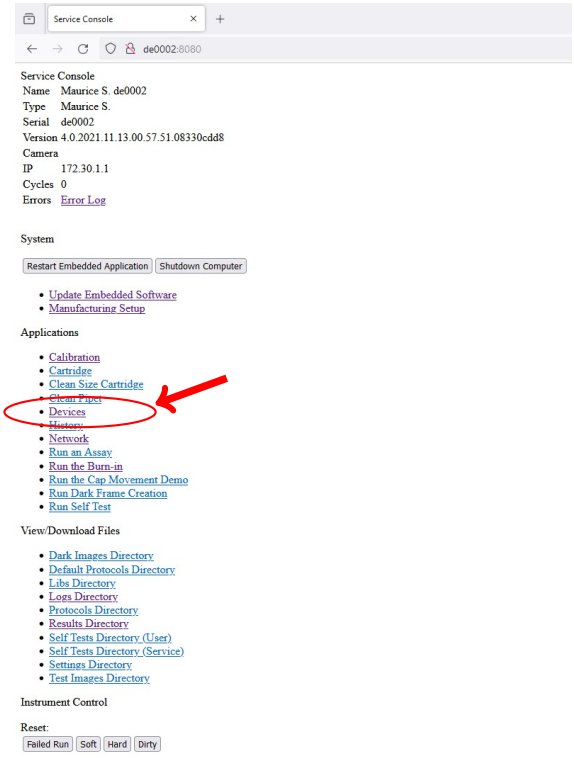
At this point, plug the computer, the monitor, and the fixture into an available 120-220V power source. Once plugged in, turn on the monitor, computer, and the fixture (with the power switch in the back where the power cord plugs in). You should see the desktop on the screen like this:

Ignore the “Unidentified Network” indicator for the windows network connections at the bottom of the page. This is normal for connecting to the fixture.

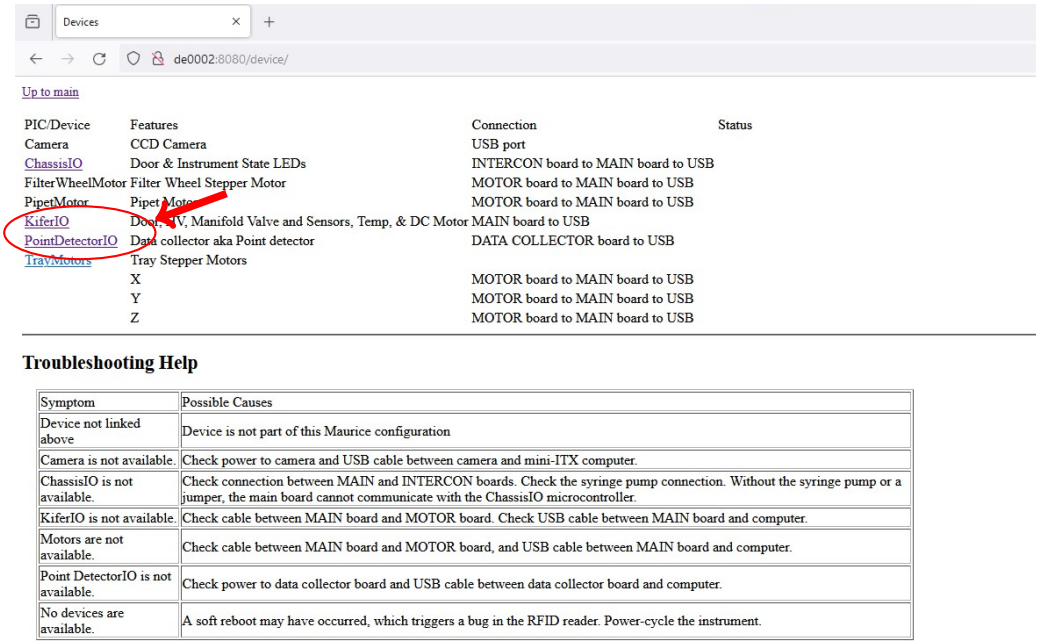
3 Getting Started

3.1 Navigating the Service Console

To get started with the basic operation functions of the fixture, double click with the mouse on the ‘Firefox’ desktop icon. The homepage is set to connect directly with the fixture through Firefox. Upon starting Firefox, you should see our service console with a list of various hyperlinks to different functions and folders on the fixture, as shown here to the right.
The primary link that we use for operating the fixture to generate data from the S2D2 lamps are found under the Devices page.
When collecting the data, we will use the link of the Results Directory page. Use the mouse and click on the link for the Devices page.



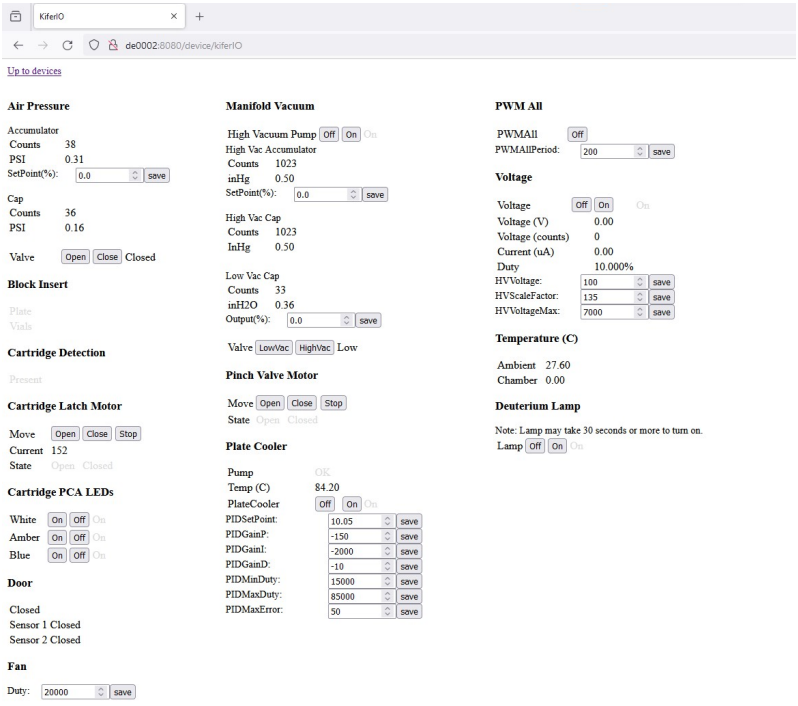
The Devices page should appear as below.



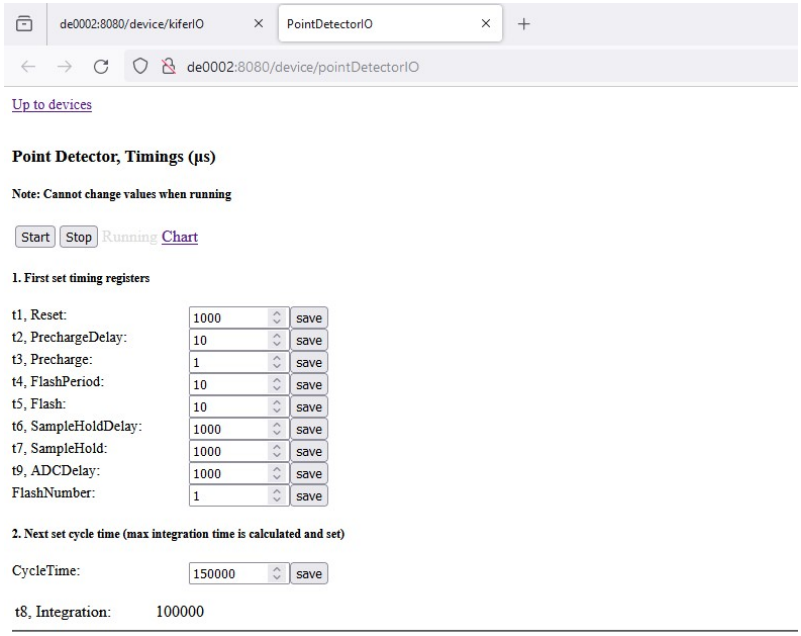
The two links we will use from this page (bookmark them if you prefer), will be the KiferIO and the PointDetectorIO pages.

Right click on the PointDetectorIO link and select ‘Open Link in New Tab’ and then left click on the KiferIO link.

The KiferIO page appears as:



And the PointDetectorIO page appears as:



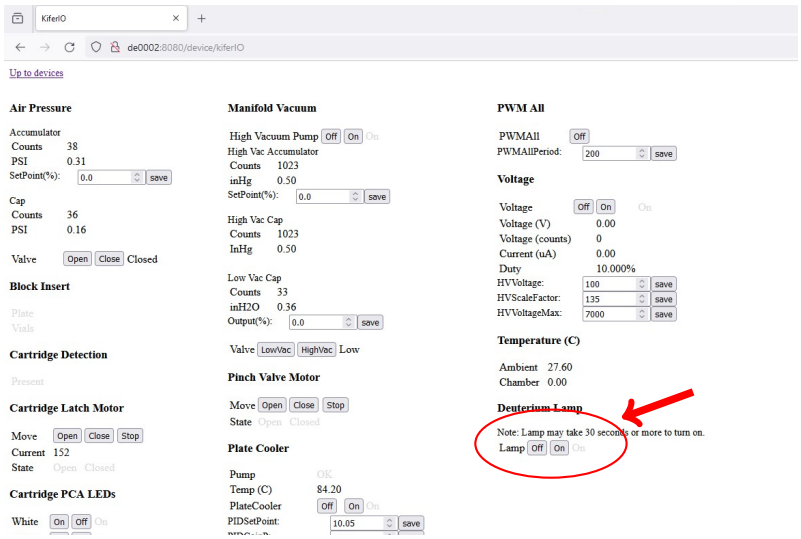
4 Generating Lamp Data

In order to generate data and record power from the S2D2 lamps, the KiferIO and PointDetectorIO pages will be used to control the fixture's powering on of the S2D2 lamp and can be used for preliminary control of the lamp power data collection.

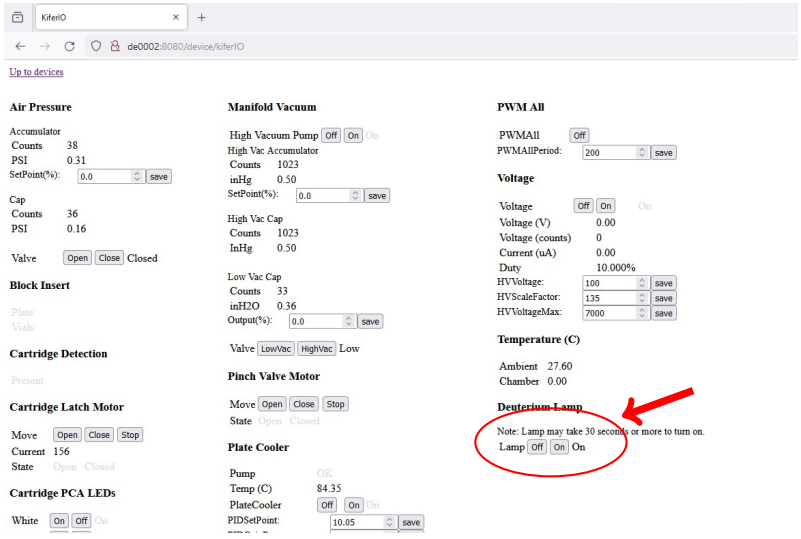
4.1 Preliminary Lamp Data

The S2D2 lamp On/Off is controlled directly from the KiferIO page. When powering on the fixture, you should notice that the **Deuterium Lamp** On is greyed out,

indicating that the lamp is *not* on, as shown in the image below.



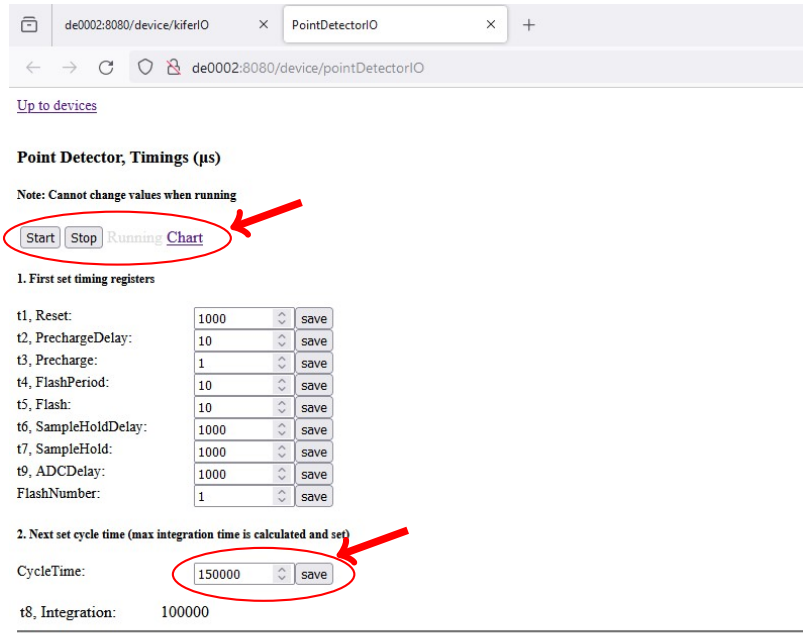
Ensure that the front door of the fixture is closed (the lamp will not turn on if the door is open). Use the mouse and left click the On button; be aware that the lamp will start the warm-up process and can take up to 30 seconds to turn on. When the lamp has turned on, the **On** indicator is now black as shown below.



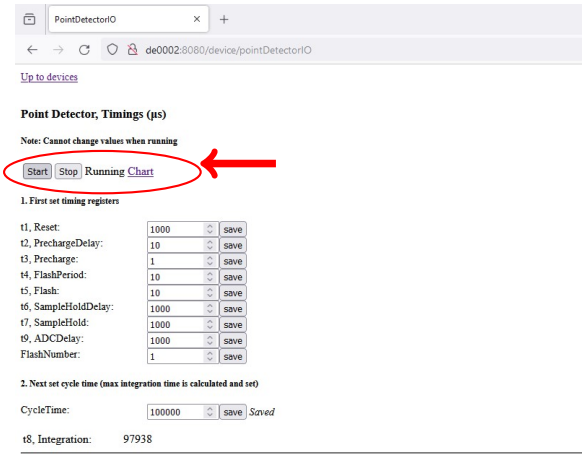
Return to the PointDetectorIO page. From here, you can control the integration chip.

The main controls are the **CycleTime** (bottom of the page), the Start & Stop

buttons, and the Chart link near the top of the page.



Change the **CycleTime** to the value 100000, representing 100ms cycle time on the integration chip[1]. Left click with the mouse on the Save button after entering the cycle time value. Then left click with the mouse on the Start button. This will change the greyed out Running to **Running** as shown below. Also note the cycle time and **t**8, the integration time at the bottom.



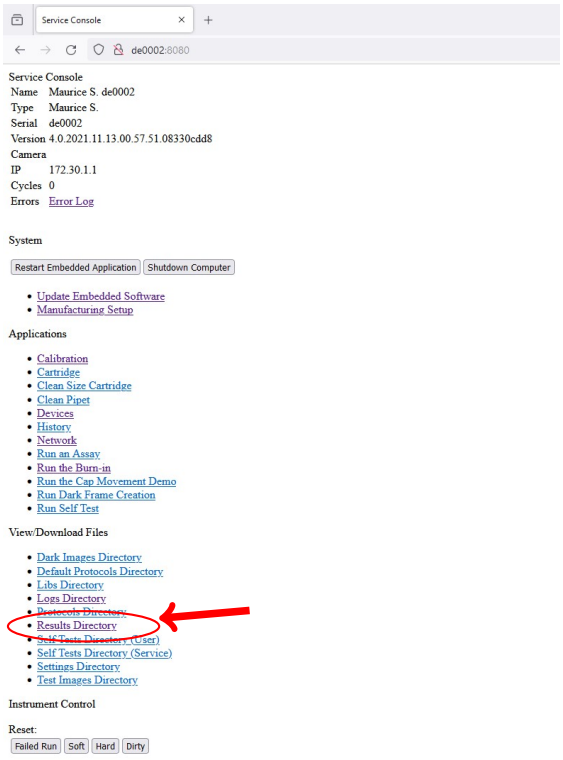
At this point, we have the S2D2 lamp on and with the point detector on we are collecting power output data for the S2D2 lamp. We can verify this by left clicking

[1] 100ms is a good time for comparison of S2D2 lamps. More integration time can be used (as can less) but too much can saturate the photodiode+integration chip system.

with the mouse on the Chart hyperlink. This will open a new tab in Firefox with a chart displaying the real-time data as shown here.

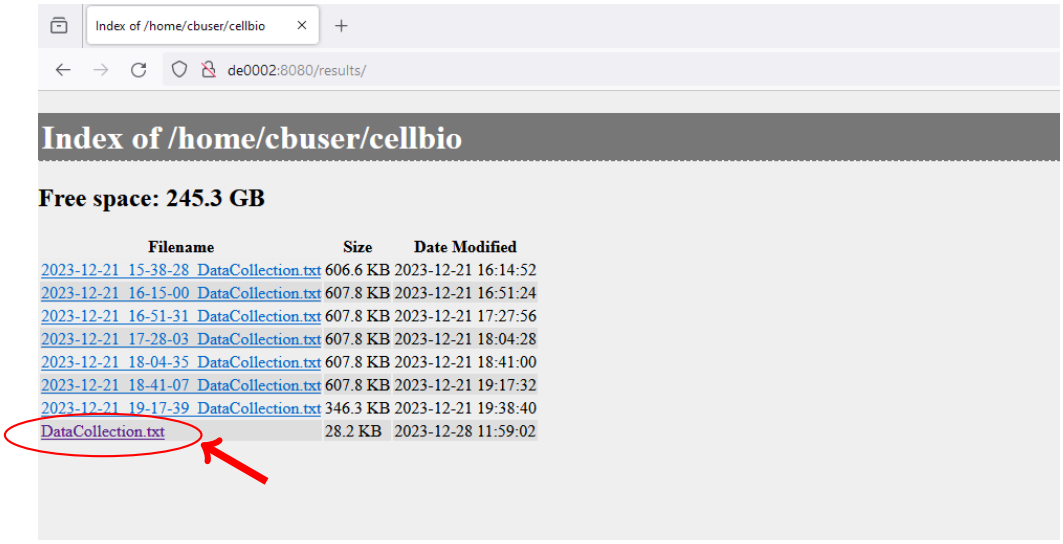
For this fixture, we want to ensure that CHNL1_End is selected. When the lamp is on, the signal for CHNL1_End should read above 3×10^6 integration (ADC) counts as shown above. If the lamp is *not* on, the signal for CHNL1_End should read around 1.4×10^3 integration (ADC) counts.

The graph of the data displayed in the Chart page is only for heuristic purposes; this should be able to give a quick and dirty evaluation of the operation of the fixture. The power data of the lamp is being stored in the file DataCollection.txt under the Results Directory link from the homepage.
Using the mouse, return to the homepage and click on the link for the Results Directory.



The Results Directory will contain a list of data files generated from the S2D2 lamp, but only the latest data file generated using the PointDetectorIO will be

retained since each time the Start button on the PointDetectorIO is pressed, the file DataCollection.txt shown below is overwritten.



The other files listed in the Results Directory are power data (ADC counts) for the S2D2 lamp generated in a different way which will be covered in the next section.

Limitations of collecting S2D2 lamp data from the PointDetectorIO page. There are two severe limitations on collecting data from the PointDetectorIO page.

1. The power data is not stored persistently; as noted above, the data in the DataCollection.txt is overwritten each time the Start button is pressed.

2. There is a limitation on the memory allocated to this function in the embedded software. This limitation is approximately 40 minutes of data collected; the workaround is covered next.

4.2 Extended Lamp Data Tools

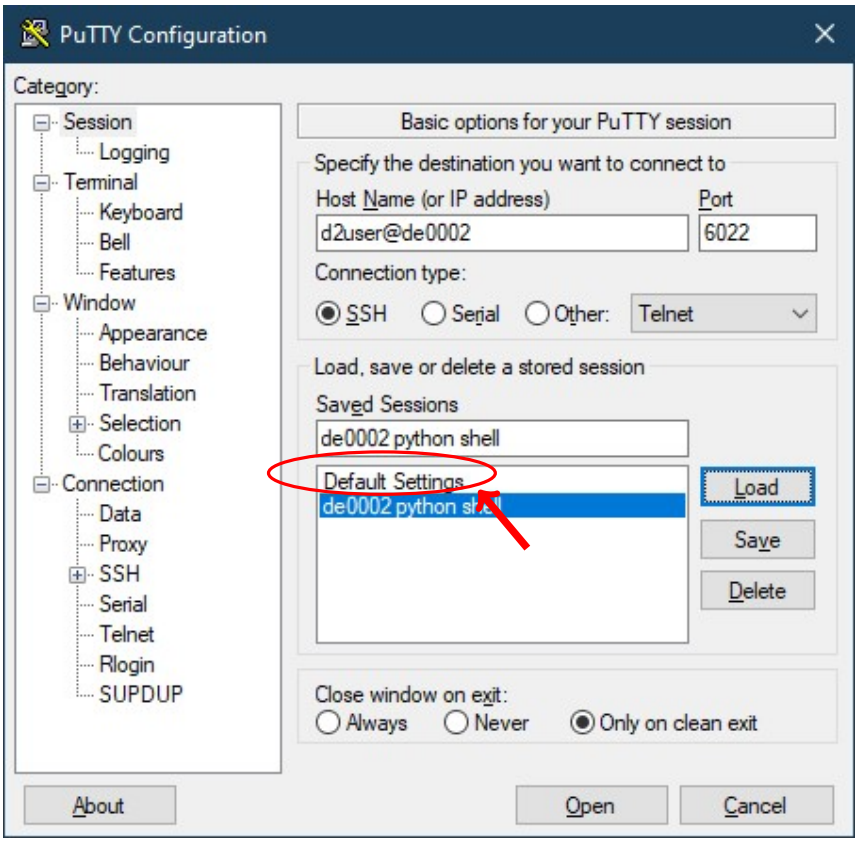
In order to get around the limitations listed above, we are providing access to a python script which

1. stores the data in a file with the timestamp as part of the name (so the file will not be overwritten) and

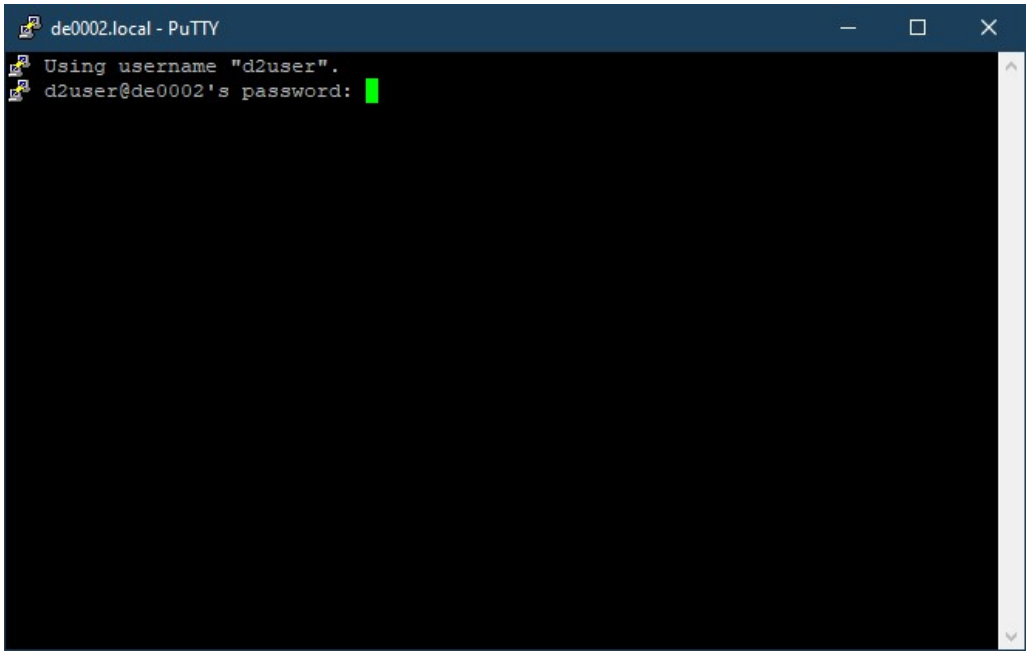
2. generates data for a longer time frame by stopping and re-starting the data collection process.

This will allow the user to generate S2D2 lamp data for a longer amount of time on this fixture.

Using PuTTY From the Desktop, locate the PuTTY icon and double click the icon to start PuTTY. The program should look as shown below.



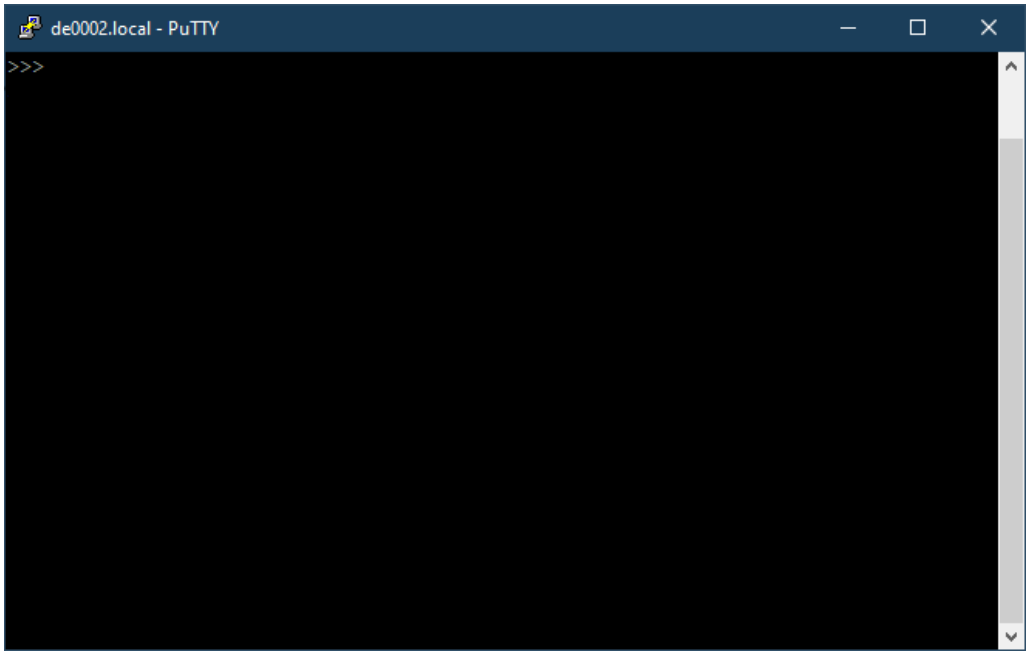
Double click on the saved **de0002 python shell**, which will automatically load the correct Hostname and Port. This will bring up a python shell environment prompting for a password as shown below.



The case-sensitive password is:

Hamamatsu

After hitting enter, the python prompt >>> will show.



The script needs to be loaded into memory prior to running. The command to load the script into memory is

- `>>> import mfgLampTest as collect`

The basic operation of the extended S2D2 lamp data collection script has the following operational commands:

- `>>> collect.start()`
- `>>> collect.stop()`

The ‘stop’ command doesn’t accept any parameters, but the ‘start command’ accepts a decimal number of hours; the default time value is 1 hour. For example:

Python Console

```
>>> import mfgLampTest as collect
>>> collect.start(.05) #This collects data for 3 minutes = .05 hr*60 min/hr
>>> collect.start(2)   #This collects data for 2 hours
>>> collect.stop()     #This stops the data collection at any point
```

4.3 Generating Extended S2D2 Lamp Data

The Python script is already located on the fixture, and since we have PuTTY available, we are ready to start generating extended S2D2 lamp data. The procedure for generating extended S2D2 lamp data is as follows.

1. Power on the fixture and the Nuc computer attached to the fixture.
2. Double click Firefox and wait until the fixture reports through Firefox with the Service Console.
3. Navigate to the KiferIO page (Click on the Devices link, then the KiferIO link).
4. From the Desktop, double click the PuTTY icon and enter the password to login.
5. Start four (4) hours[2] of data collection with the following Python console commands.

   Python Console

   ```
   >>> import mfgLampTest as collect
   >>> collect.start(4)
   ```

6. Return to Firefox at the KiferIO page and left click the **Deuterium Lamp** On button; wait 30 seconds until the greyed out On indicator reports back as **On**.
7. Close out the PuTTY terminal.
8. Return to the fixture after four (4) hours have elapsed and left click the **Deuterium Lamp** Off button.

Limitations of the Extended S2D2 Lamp Data. The only drawback to the extended collection of lamp power output is that there is about a seven (7) second gap between when the memory buffer is full, prompting the script to close the writing of the data on the disk, and then restarting the lamp power data collection. This does mean that there is a loss of data during this stopping and starting of the data collect recording.

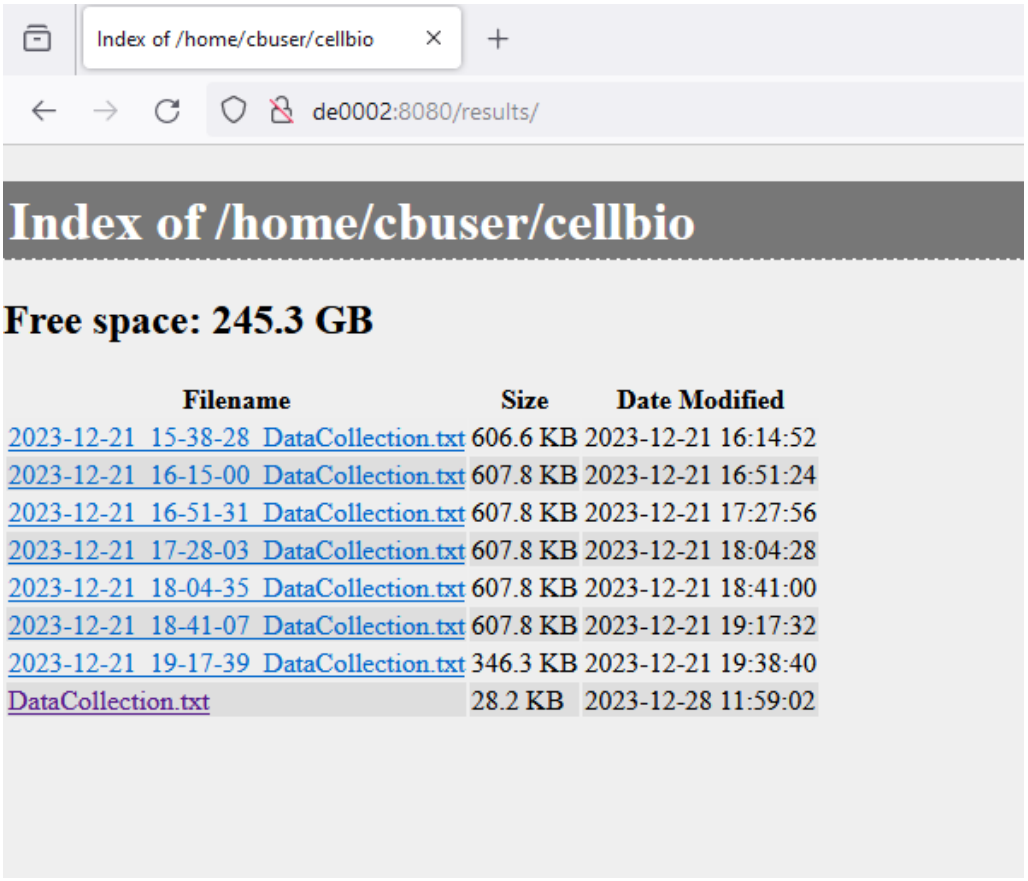
[2] Or any length of time agreed upon to test lamps.

5 Collecting Lamp Data

Now that the data has been recorded for four hours, we can now download the recorded data and analyze it.

5.1 Transferring Collected Data

From the Desktop, double click the Firefox icon. At the Firefox homepage, locate the Results Directory and left click on that link.The page should appear like the image below, where the last set of data collected will have a timestamp in the name of the files corresponding to the files generated from the time the Python script collected extended lamp data. For four hours of lamp data, there should be seven files generated as shown below.

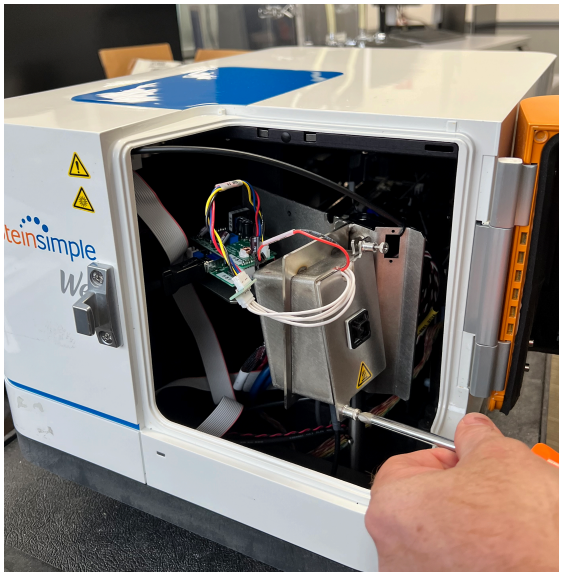


Right click on each of the files generated, and from the Firefox context menu, select ‘Save Link As…’ to whichever folder you choose. The USB drive included with the fixture can be plugged in to the Nuc computer and used to transfer files to any computer where you want to perform general analysis of the S2D2 lamp power output.

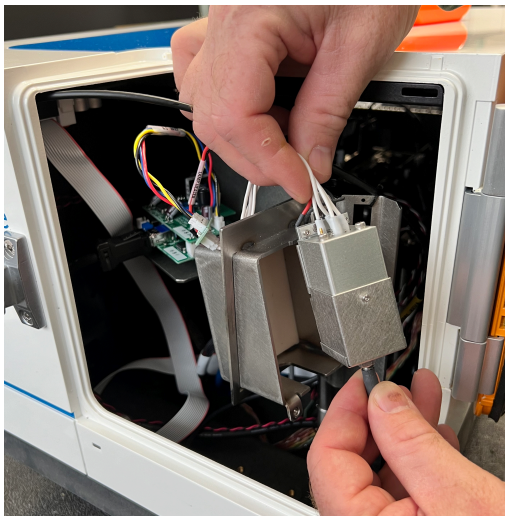
6 General Care and Maintenance

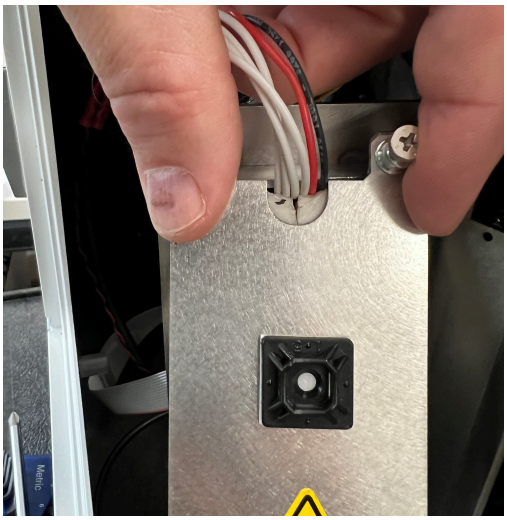
6.1 Replacing the S2D2 Lamp

The main operation on this fixture beyond S2D2 power data collection is the replacement of the S2D2 lamps. In order to replace the lamps, first open the door. Immediately inside the door is the housing for the S2D2 lamp; the cover contains two screws. Remove the two screws of the cover with the Phillips head screwdriver.



Inside is the custom S2D2 lamp housing (L10671H).





Since this is a Hamamatsu part, the replacement of the S2D2 lamp following this point is not covered. Reassembly is the reverse of disassembly; please ensure that the five (5) cables to the S2D2 lamp socket pass through the cutout on the top of the cover as shown above and that the fiber optic passes cleanly through the cutout in the bottom of the enclosure.

6.2 Replacing the S2D2 Lamp Power Supply

The S2D2 lamp power supply (L10671P) is held in place with three M2.5 screws. To access these three screws, you must remove the top piece of the power supply first.

Once the top board is removed, access to the three screws is enabled. Again, since this is a Hamamatsu part, the replacement of the S2D2 lamp power supply following this point is not covered. Reassembly is the reverse of disassembly. Take care that the three plastic sleeves are installed between the power supply and the mounting ports.