Using the Optronic Laboratories 740A-D Monochromator to Measure Transmittance
By Katie Carpenter, 7/27/2017
Based on guide and directions by Dave Wyble

The monochromator allows the user to measure the output of light at individual wavelengths. Light goes in through an entrance slit, reflects off a mirror, a diffraction grating, and another mirror, and comes out through an exit slit. The amount of light that comes out can then be measured.

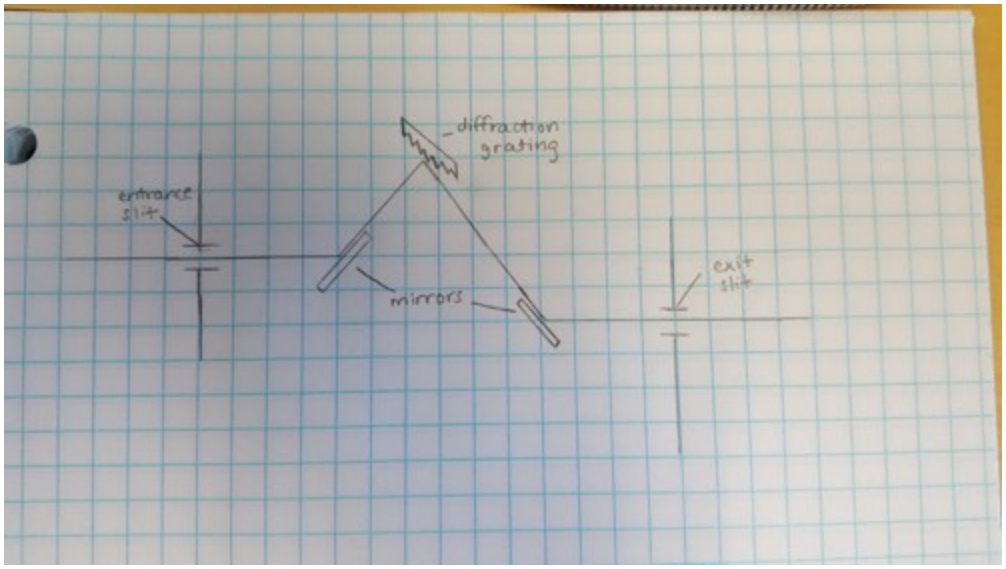


Figure 1: A diagram of the interior of the monochromator

Figure 2: The various devices used in taking measurements with the monochromator

I. Before Taking Measurements:

1. Turn on the lamp fan. There is a switch on the back side of the black box containing the fan. The lamp fan is the device in the red box in **Figure 2**.

2. On the power supply, turn the "Coarse Voltage" and "Coarse Current" knobs as far as they can go counter-clockwise. The voltage knob is in the green circle in **Figure 3** and the current knob is in the orange circle.

Figure 3: The power supply used to control the output of the lamp

3. Flip the switch to turn on the power supply, the gray box shown in **Figure 3**. The switch is in the blue circle. This should be done at least 20 minutes before taking measurements. Also turn on the HP 34901A DC Voltmeter, the topmost box. The power button is pink.

4. Rotate the "Coarse Voltage" knob a few times clockwise.

5. Rotate the "Coarse Current" knob slowly, keeping an eye on the meter. The value on the meter should eventually read 0.0600. This means there are 6.00 amps across the lamp. DO NOT exceed this value; if the current is too high, turn the knobs back counter-clockwise.
   (If you reach a point where spinning the current knob doesn't increase the reading on the meter, rotate the voltage clockwise a few more times, then go back to using the current knob.)

6. Set the knob on the front of the monochromator to “Manual,” as shown in the brown oval in **Figure 4**.

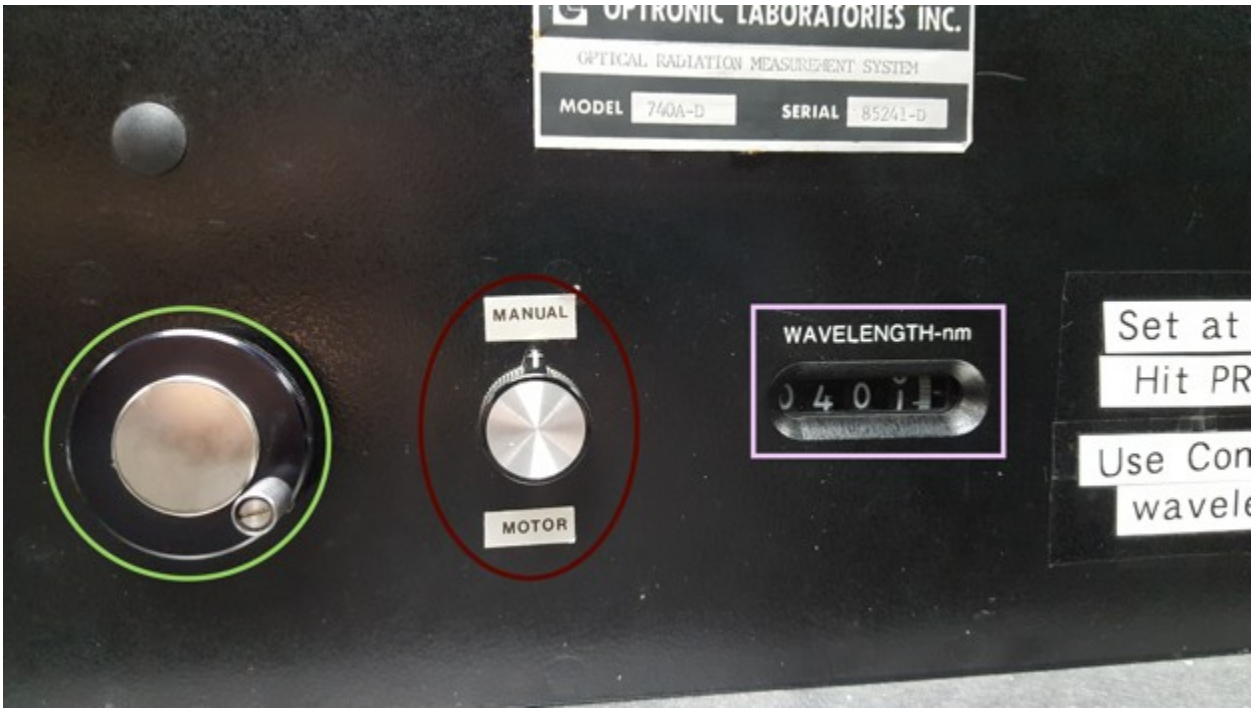


Figure 4: The front of the monochromator

7. Press the red buttons on the Model 730A Radiometer and the Model 740-1C Controller to turn them on. The radiometer is in the blue rectangle in **Figure 3** and the controller is in the purple rectangle.

8. Spin the crank on the front of the monochromator until the wavelength readout on the front is 400.7 nm, then press the PRESET button on the controller, circled in blue in **Figure 5**. The crank is circled in green in **Figure 4** and the starting wavelength setting is displayed in the pink rectangle.
   The controller will be set to 400.0 nm. Continue to use the crank to change the wavelength of the light but use the readout from the controller as the wavelength.

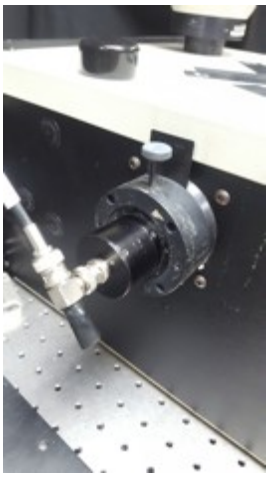
Figure 5: The controller display

II. Taking Measurements

Once the lamp has warmed up for a sufficient length of time, you may begin taking measurements.

1. Check the entrance and exit slits to make sure the proper slits are in place. For example, if you want to take measurements every 10 nm, make sure the 2.50 mm slits are in place at both the entrance and the exit slit.

2. If you just want to measure the light from the lamp, the detector may stay in place at the exit to collect light. If you want to measure a characteristic of something, such as the transmittance of a filter, mount the filter in front of the exit so the light passes through it. Mount the detector behind the filter. The detector should be line up so that light theoretically passes straight out the exit, through the filter, and into the detector. The lights in the room must be turned off if the detector is not mounted in the exit itself.



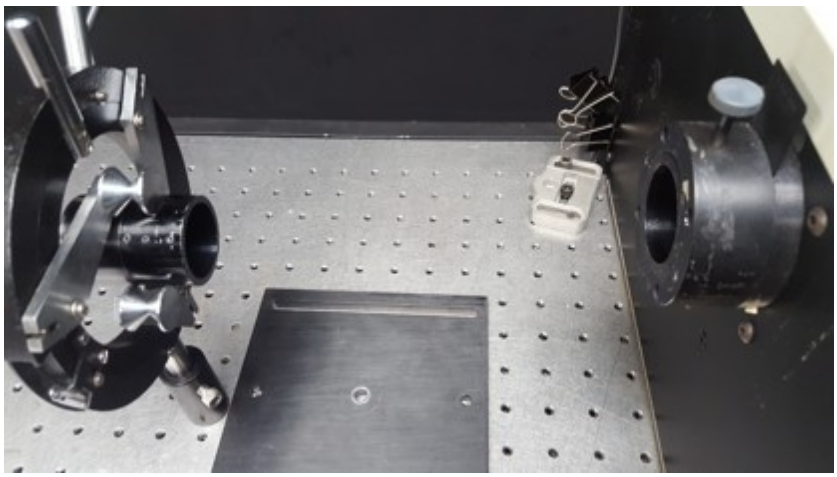


Figure 6a (left): The detector mounted in the exit slit
Figure 6b (right): The detector mounted outside the exit slit

3. Spin the crank to each wavelength at which you want to measure the light. The output value will be read from the radiometer. You can choose from a variety of units for the output, such as amperes, lumens, or watts.

4. In the case of filter transmittance, make the measurements at each wavelength with and without the filter in place. It would likely be easiest to take the measurements with the detector mounted without the filter in place, reset with the filter, then go through the set of wavelengths again with the filter.

III. After Taking Measurements

1. Rotate the “Coarse Current” knob SLOWLY counter-clockwise until it cannot be turned farther.

2. Rotate the “Coarse Voltage” knob all the way counter-clockwise. This can be done more quickly than the current knob.

3. Flip the switch on the power supply back down to turn it off.

4. Turn off the lamp fan using the switch at the back.