

Monochromator App vrs41_fixed

User Manual

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Quick Start

- Connect: select the serial port and baud, then press Connect. The drive is initialized with EN, HP0, and V0.
- Go To: enter a wavelength and press Go. The app moves, waits until in position, and updates the current wavelength.
- Scan: set Start, End, Step, and Wait; press Start Scan. Watch the live plot. Use Pause, Resume, and Stop as needed. Prefer Pause then Stop during scans.
- Export: enable Auto-save or click Save CSV now to write the current scan to disk.

Defaults

Setting	Default
Port	COM3
Baud	9600
Steps per nm	361,765
Direction mapping	INVERT_DIRECTION = True (nm ↑ → negative LR)
Jog step (nm)	0.5
Auto-save CSV after scan	Off by default

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1. Purpose

The app provides a desktop interface to move a Faulhaber driven monochromator to target wavelengths, run linear scans, read a voltage signal from a DAQ device if present, show a live plot, and export results to CSV.

The app keeps the wavelength in software. The motor moves in steps and the app converts between nm and steps using a fixed steps-per-nm value.

2. Requirements

Python 3. Packages: tkinter, matplotlib, pyserial. For real measurements you can add nidaqmx. Without nidaqmx, the app shows a simulated voltage so you can test the workflow.

3. Before you start

Connect the hardware. Note the serial port name and the DAQ device and channel if you will read a signal. Start the program and select the port and baud rate. Press Connect. Disconnect closes the link when you are done.

Connect uses EN, HP0, and V0 to initialize the drive. Disconnect sends the safe stop sequence ST → HP0 → V0 and then closes the port.

4. Working with the app

4.1 Go To Enter a target wavelength and press Go. The app computes relative steps from the current wavelength, sends LR and M, waits until the move completes using POS polling, applies the safe stop sequence if enabled, and updates the current wavelength in the field.

4.2 Scan Set Start, End, Step, and Wait. Press Start Scan. The app goes to Start and then steps from Start to End. At each step it waits, averages the voltage according to the averaging settings, records the point, and steps again. Pause lets the current

step finish and holds the scan. Resume continues. Stop ends the scan after a safe stop.

4.3 Jog and Mark Point Jog minus and jog plus move by the jog step size and update the current wavelength. Mark Point reads one averaged voltage at the current wavelength and plots a marker on the graph.

4.4 Scan Queue You can collect several scans and run them in order. Add items with their Start, End, Step, and Wait. Run executes them one by one. Clear removes the list. You may export all completed scans at the end.

5. Averaging explained

Averaging reduces noise in the recorded voltage. There are two modes.

Samples mode. The app takes N immediate readings and averages them. Use this for quick smoothing when the signal is steady. You can set how many samples to take, the fraction of the wait time used for sampling, and a short pre-settle time before sampling starts.

Time equals Wait mode. The app spreads reads over the wait time and averages them. Use this when you want the averaging to follow the dwell time of each step. You can set the fraction of the wait that is used for sampling and a pre-settle time before sampling begins.

Practical tips. If the trace is noisy, increase sample count or the time fraction, and consider a pre-settle of at least 50 ms (typically 100-300 ms). If the mechanism needs time to settle after a move, use pre-settle so you do not record transients.

6. Operator guidance

During a scan it is better to press Pause first and then Stop. This keeps the device and the software in sync and ends the run cleanly. For a single Go To move it is fine to press Stop directly.

7. Data export

Save CSV now writes the active scan to a CSV file with a small metadata header and columns for index, wavelength in nm, and voltage in volts. You can enable auto save so a file is written when a scan completes. The file name pattern can include date, time, start, end, step, wait, and other simple tokens.

8. Safety and reliability

The app can issue a safe stop after each move and after each scan step. The sequence is ST then HP0 then V0. Timers respect Pause so the app does not time out while paused. If a read times out the app drains the serial buffer and re-checks position before continuing. The statusword SDO is not used to end moves in this build. If it is available, a passive post move audit may be logged.

9. Troubleshooting

No live voltage. Install nidaqmx and select the correct device and channel. Jitter in the signal. Increase averaging or pre-settle, or increase the wait time. Move timeouts. Check the port and cabling, reduce step size, and make sure a previous motion has finished.

10. Version notes

This manual matches vrs41_fixed.py. It does not claim features that are not in this file.

Appendix A — Averaging Examples

Scenario 1: Samples mode

Wait is 2.0 s. Samples mode takes N immediate reads and averages them. With N = 8 and fraction = 100%, all eight reads occur near the start of the 2 s dwell (after any pre-settle). Use this when the signal is steady and you want fast smoothing.

Scenario 2: Time equals Wait

Wait is 2.0 s. Time equals Wait spreads reads across the dwell and averages them. With fraction = 50%, sampling covers ~1.0 s of the 2 s dwell after pre-settle. Use this when you want the averaging window tied to the step timing.

Tip: if you see jitter, increase Samples (in Samples mode) or the fraction (in Time equals Wait). Add 100–300 ms pre-settle if the mechanism needs to stabilize after a move.