MD-1000

Monochromator (Shutter) Controller and MoCo program

OPERATION MANUAL

OPTICAL BUILDING BLOCKS

CORPORATION

MD-1000 Monochromator (Shutter) Controller and MoCo program

INTRODUCTION

The MD-1000 Monochromator Controller and the MoCo program allow you to control your OBB monochromator via a LabView based interface to:
- set the COM port to communicate to your computer
- change the grating groove frequency
- change the backlash compensation
- change the speed of wavelength movement
- adjust the calibration of your monochromator
- move your monochromator to a particular wavelength
- move your monochromator by a incremental value
- open and close an optional shutter

The MD-1000 Monochromator Controller contains a microprocessor that receives commands from your computer, translates wavelength commands into motor steps, then sends the monochromator to the requested wavelength.

The range in wavelength and speed to which your monochromator may be set depends upon the grating that you are using. A table of wavelength and speed limits is given below.

Grating [grooves/mm]	Lower wavelength limit nm	Upper wavelength limit nm	Maximum speed nm/second
150	0	8000	1600
300	0	4000	800
600	0	2000	400
1200	0	1000	200
1800	0	750	133
2400	0	500	100

FEATURES OF STANDARD UNIT:

- ➢ Communication Interface – RS-232 (USB 1.1 and USB 2.0 optional)
- ➢ Universal power supply included
- ➢ Solenoid type shutter control up to 0.6 A
- ➢ Synchronization TTL output each time when the motor stops
- ➢ LabView drivers and source code
- ➢ Number of phases: 2
- ➢ Maximum output current per phase: 1 A (2 A optional)
- ➢ Stepper motor voltage 5 – 12 V (up to 34 V optional)
- ➢ Stepping modes: Full, Half and Micro steps: 1/8, 1/16, 1/32, 1/64
- ➢ Slew rate: 1 to 62,500 micro steps per second
- ➢ Total monitoring of the motor current state and positioning
- ➢ Build–in microcontroller coordinates are maintained: -2,147,483,647 to +2,147,483,647
- ➢ Linear ramping rate (starting slew with acceleration and stopping slew with deceleration) for heavy duty, fast, precision operation.
- ➢ Programmatically reducing or removing current from winding when motor is not moving.
- ➢ Optional: 2 stepper motors control, no shutter

COMPUTER REQUIREMENTS

MoCo version 1.1 uses NI-VISA 3.1 and requires Windows 2000 or XP.

NI-VISA 3.1 does not support Windows 9x. If you need to run your VISA application on Windows 95, you must install NI-VISA 2.6.1 or lower. If you need to run your VISA application on Windows 98 or Windows Me, you must install NI-VISA 3.0.1 or lower.

Before you install NI-VISA 3.1, we strongly recommend that you uninstall any versions of VISA prior to NI-VISA 2.0.1. NI-VISA 3.1 should upgrade properly over NI-VISA versions 2.0.1 through 3.0.1.

SPECIFICATIONS

Interface:	RS232
Parameters:	9600 baud, 1 stop bit, no parity
Power:	External power pack
Input:	100 – 240 VAC, 50 – 60 Hz, 1 A
Output:	12 V, 2.5 A
AC Connector:	IEC 320
Size (inches):	5.07 x 3.80 x 2.66
(cm):	12.88 x 9.65 x 6.76

INDICATORS

Power: single green LED indicator light that indicates the controller is receiving sufficient power.

EXTERNAL CONNECTIONS

The MD-1000 Monochromator Controller has four external connections.

12 V INPUT: connects the MD-1000 to its external power pack. Attach the cable from the power pack here.

RS-232: connects the MD-1000 to the controlling computer. Attach the male end of the serial cable here.

STEPPER MOTOR: connects the MD-1000 to the monochromator motor and autocalibration connector. Attach the 9-pin black circular plastic connector here.

SHUTTER (optional): connects the MD-1000 to the optional shutter inside the monochromator. Attach the 3-pin DIN connector here.

FAN

The MD-1000 is air cooled by an internal fan beside the 12 V INPUT connector. Do not block the airflow out from the fan or the air inlet ports below the STEPPER MOTOR and SHUTTER connectors.

NOTE

There are no user serviceable parts inside the MD-1000 monochromator controller.

<u>INSTALLATION</u>

The MD-1000 Monochromator Controller is normally shipped with a monochromator assembly. It is, however, also available as an upgrade for field installation onto an existing monochromator.

<u>INCLUDED PARTS</u>

The following parts come with the MD-1000 Monochromator Controller:

- this operation manual
- the MD-1000 Monochromator Controller
- a power pack
- an AC power cord
- an RS-232 serial cable
- a CD with the MoCo (<u>Mo</u>nochromator <u>Co</u>ntroller) version 1.1 software installer

When the MD-1000 is used with an OBB monochromator we provide a cable and basic software to control our monochromator. The software (MoCo version 1.1) is based on LabView 7.1 but it is not required to have LabView installed to operate this software. The monochromator control can be easily added in any LabView based software: in this case we provide the LabView driver and the source code.

HARDWARE SETUP

Although the order of connecting cables is not important and will not damage any of the components, we suggest you first connect the motor and shutter cables between the monochromator and MD-1000, the serial cable between the computer and MD-1000, the power pack 12 V cable to the MD-1000, then the AC power cord to the power pack and to an AC line (mains) outlet. When power is applied to the MD-1000 the indicator LED should glow green.

For a review of the microprocessor features, see PotStepper.pdf in the docs section on the MoCo CD.

SOFTWARE SETUP

Place the MoCo CD in a CD drive on your computer. The MoCo Installation Wizard will appear. Choose the default settings to install the software.

To place a MoCo icon on your desktop, click on the Windows Desktop **START** button > **Programs** > **Mono control** . Right-click and drag the MoCo icon to an empty space on the desktop, then choose **Create Shortcut Here**.

OPERATION – NORMAL VIEW

To open the MoCo program, click on the Windows Desktop **START** button > **Programs** > **Mono control** > **Moco**, or click on the MoCo icon on the Windows Desktop if you have created a shortcut icon there.

Until you open the MoCo program, the monochromator wavelength adjustment knob can be moved by hand. When the program is opened power is applied to the monochromator motor and you will find it very difficult to move the monochromator wavelength adjustment knob and should not attempt to do so. You may also notice a decrease in the sound intensity of the MD-1000 fan. Upon closing the program, power remains applied to the monochromator and the MD-1000 retains the parameter settings. To remove power to the monochromator, disconnect the powerpack connector from the MD-1000 or disconnect the power cord from the power pack.

Upon opening, the MoCo program will show the **Setup** window.
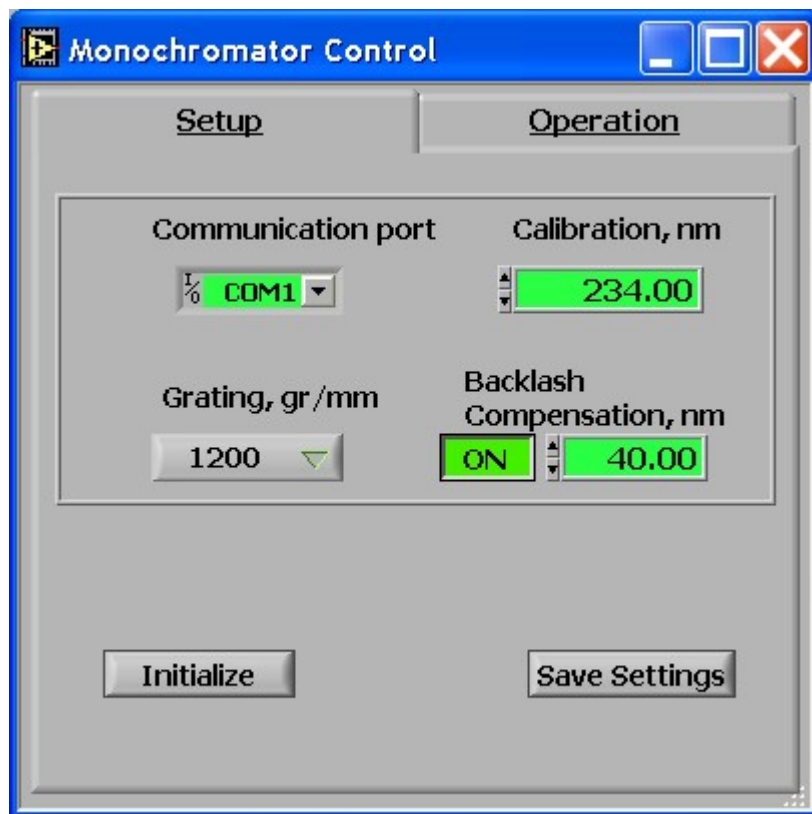
FIRST-TIME OPERATION

The MoCo program default communication port is COM1.

If this is not the desired setting, click on the Communication port drop list arrow and select the port you wish to use. To change to an unlisted COM# port, highlight the digit after COM and type the number of the COM port you want.

Click on **Save Settings**, close and re-open MoCo to enable the new communications port. Make sure the serial cable is connected to the desired port on the computer. Once the communication port has been set, leave it unless you change the cable connection.

ROUTINE OPERATION – SETUP WINDOW

The MoCo program opens to the default reduced window size and this is usually all that is required for normal operation. To see the LabView command values during operation, click on the maximize window button in the upper right corner.

When the MoCo program is opened, the **Initialize** button will repeatedly flash yellow. This indicates that you should click on this button to calibrate the flag position in the monochromator. A horizontal slide bar will appear and show the progress of the MD-1000 in finding the flag position. The monochromator will move the lead screw and the wavelength dial until the flag edge is found. This is the reference position for the monochromator and all subsequent

movements are performed by moving calculated numbers of motor steps with respect to this position. If the value on the wavelength dial on the monochromator disagrees with the value in the **Calibration** text box, enter the value from the dial in this box and click on **Save Settings** to store the new value as the default value.

Backlash compensation is used so that movements to a particular wavelength always occur from lower wavelengths to remove the effects of any mechanical discrepancy in decreasing or increasing wavelengths. I.e., if the monochromator is to go to a lower wavelength, it will go to that wavelength, then further by the backlash amount, then advance to the target wavelength. 40 nm is the default backlash value. The **ON/OFF** button must be on to enable backlash compensation.

The **Grating** value informs the MD-1000 of the groove density of the grating in the monochromator. Click on the button to choose a different value if the grating in the monochromator is changed.

The default grating value is 1200 grooves/mm. If you choose another grating, the wavelength, backlash, and speed settings must be multiplied by the inverse of the grating multiplication factor. E.g., if you choose the 600 groove/mm grating (a change by ½) then you will need to multiply the monochromator dial, MoCo wavelength readout, calibration, backlash, and speed settings by 2 for proper operation.

If the **Calibration, Backlash** or **Grating** settings have been changed, you must click on **Save Settings** to bring these into effect for proper operation of the controller.

ROUTINE OPERATION – OPERATION WINDOW

Once the values in the Setup window have been chosen, click on the **Operation** tab to change to the wavelength control window.
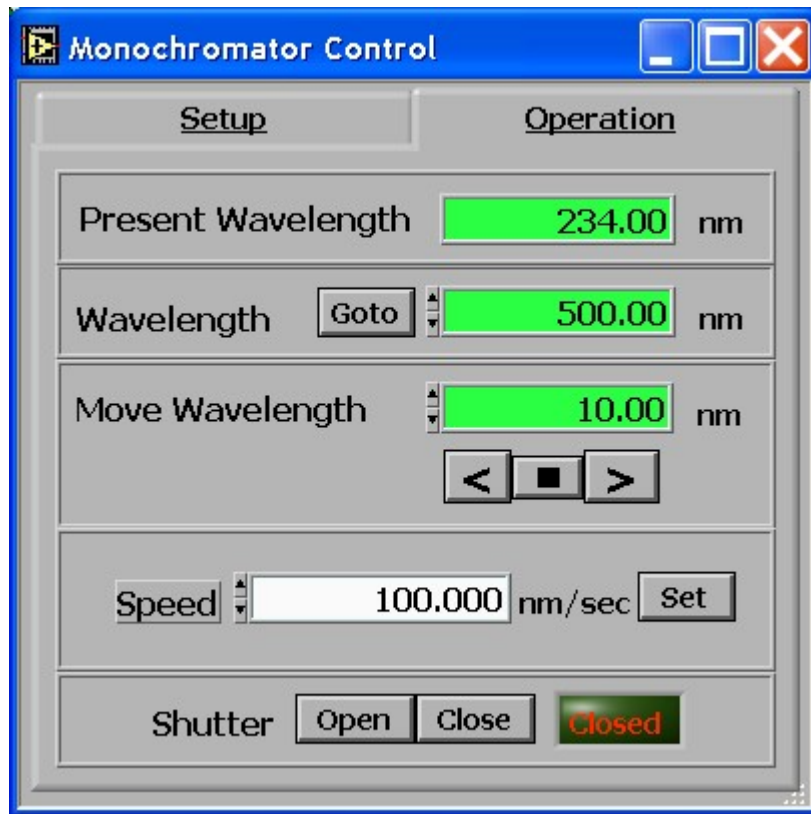
Present Wavelength
Shows the value of the present wavelength.

Wavelength
Enter a value (or use the up and down arrows to the left of the text box) and click on the **Goto** button to move the monochromator to the desired wavelength.

CAUTION: Do NOT enter values below 0.0 nm or over the Upper wavelength limit as shown in the table on page 1 of this manual. If the monochromator tries to move to a value beyond the lower or upper wavelength limits, the MD-1000 will not be aware of any missed motor steps after the mechanical limits are reached and subsequent wavelengths will be in error. Also, the monochromator may become stuck at the mechanical limits.

Move Wavelength
Enter a value (or use the up and down arrows to the left of the text box) and click on the left < or right > arrow to move the monochromator wavelength by the value.

Clicking on the stop button ■ will stop the wavelength movement before it has reached the target wavelength. The wavelength actually reached will be shown in the Present Wavelength text box.

Speed
This value controls the speed at which the monochromator moves from one wavelength to another. The monochromator will ramp up to this speed at the start of movement and ramp down the speed when approaching the desired wavelength.

Enter a value (or use the up and down arrows to the left of the text box) and click on the **Set** button to change this speed. OBB recommends keeping the speed at 200 nm/sec or less when used with the standard 1200 grooves/mm grating. The default is 100 nm/sec.

Shutter Open or **Closed**
Clicking on these buttons opens or closes the optional shutter in the monochromator. The box to the right of the **Close** button indicates the shutter status.

TROUBLESHOOTING

If the power to the MD-1000 is disconnected while the MoCo program is open, you will see the error message
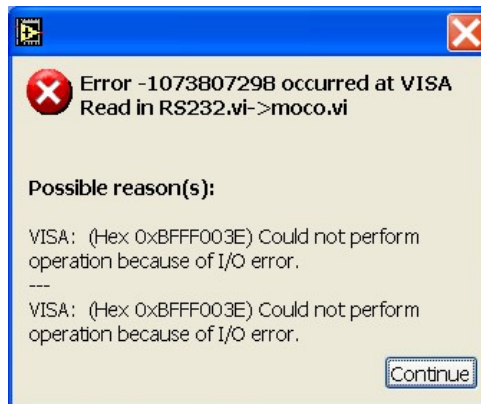
Reconnect the power to the MD-1000, then click on **Continue**. MoCo will revert to the Setup window, expanded to show a menu and the toolbar Run arrows ⬦⬦ on top. Click on the Run arrow ⬦. The window will remove the menu and toolbar. You should check the Present Wavelength before continuing to make sure it is correct.

If the serial cable is disconnected while the MoCo program is open, nothing will move in the monochromator if you click on any of the wavelength or shutter buttons and the Present Wavelength will not change, but no error message will be displayed.

If the monochromator/shutter cable is disconnected while the MoCo program is open you may hear an increase in fan noise. Clicking the Operation window **Goto** button will change the **Present wavelength** display, but the monochromator wavelength will not have moved and no error message will be displayed.

Thus, if any cable is disconnected from the system, you should reconnect the cable, check the Present Wavelength, and if necessary click on **Do Backlash**, enter the actual wavelength and click on the **Reset** button before continuing.

OBB STANDARD INSTRUMENT WARRANTY

Warranty Period and Extent

Optical Building Blocks Corporation (OBB) warrants that its instruments will be delivered in a functional state and free from defect, and will meet stated specifications for a period of one (1) year. The warranty period will start on the date of shipment by OBB.

This warranty is in lieu of all other warranties, expressed or implied, including, without limitation, the implied warranties of merchantability and fitness for a particular purpose. OBB shall not be responsible for any liability, loss or damages, caused or alleged to be caused, by the instrument, as a result of use or operation including, without limitation, consequential damages and loss of profit.

Specific Exclusions and Limitations

1) It is recognized that the performance of consumable items will diminish as a function of use, and that it may be necessary to replace such items to restore the stated specifications. Consumable items (arc lamps, filters, cuvettes, lenses, etc.) are not covered by the warranty.
2) The original manufacturer's warranty will be maintained for instrument components not manufactured by OBB (e.g. computers and components thereof).
3) Fiber optic bundles and liquid light guides are not covered by the warranty.
4) The use of arc lamps not supplied by OBB (or approved in writing by OBB) will void OBB's warranty on all illuminator subsystem components.
5) If there is any evidence of physical contact with coated optics (e.g. fingerprints), the warranty on that item will be voided.
6) If the optical components are realigned by the customer without specific permission from OBB, the warranty will be voided. Please note that the customer is responsible for changing lamps and aligning the lamp after installation. Aligning the lamp will not void the warranty unless other exclusions are applicable (nos. 4 and 5).
7) Damage or loss caused by shipping is not covered by the warranty.
8) Damage caused by improper operation of the instrument will void the warranty.
9) Damage caused by equipment not purchased from OBB that is attached to the instrument is not covered by the warranty.
10) Warranty is valid only in the state, province or country of the original purchase.
11) Software upgrades performed on an OBB supplied computer workstation (e.g., adding word processors, image editors, etc.) not authorized by OBB will void the warranty on the computer.
12) Hardware upgrades performed on an OBB supplied computer workstation (e.g., adding network boards, sound cards, etc.) not authorized by OBB will void the warranty on the computer.

Warranty Returns

A Return Material Authorization (RMA) Number must be obtained from the OBB Service Department before any items can be shipped to the designated service facility. Returned goods will not be accepted without an RMA Number. All goods to be returned should be properly packed to avoid damage and clearly marked with the RMA Number.

Warranty Repairs

The customer will bear all shipping charges for warranty repairs. All service rendered by OBB will be performed in a professional manner by qualified personnel.

Software

OBB makes no warranties regarding either the satisfactory performance of the software or the fitness of the software for any specific purpose. OBB shall not be responsible for any liability, loss or damages caused or alleged to be caused by our software as a result of its use, including, without limitation, consequential damages and loss of profit.

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