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**Acton Research Corporation
SpectraPro® Monochromator
Control Software for Windows**

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I. Description

The Acton Research Corporation SpectraPro Monochromator Control Software allows the control of all SpectraPro monochromators with a PC compatible computer running Microsoft Windows from either the COM1 or COM2 serial ports. This program also allows control of Acton Research Corporation monochromators using a SpectraDrive Scan Controller. Functions include advancing the monochromator quickly to a wavelength, scanning at fixed speeds, changing gratings, changing turrets or diverters if installed, adjusting slit width with the motorized slit option, installing new gratings and optimizing the parameters of the monochromators.

II. Installation

System requirements include a Pentium class computer with 64 Mbyte .of RAM running Windows 95, 98, NT 4.0 or Windows 2000 and at least one RS-232 COM port.

Insert the Acton Research Corporation SpectraPro Monochromator Control Software Installation Disk into the CD drive of the computer. On most computers the disk will automatically open and present the following screen. If autorun is not automatically executed on your computer, then double click on the autorun file located on the SpectraPro install disk from your CD ROM drive in Windows Explorer to bring up the following screen.



Figure 1

Click on the “Install” button to install the SpectraPro Monochromator Control Software onto your computer.

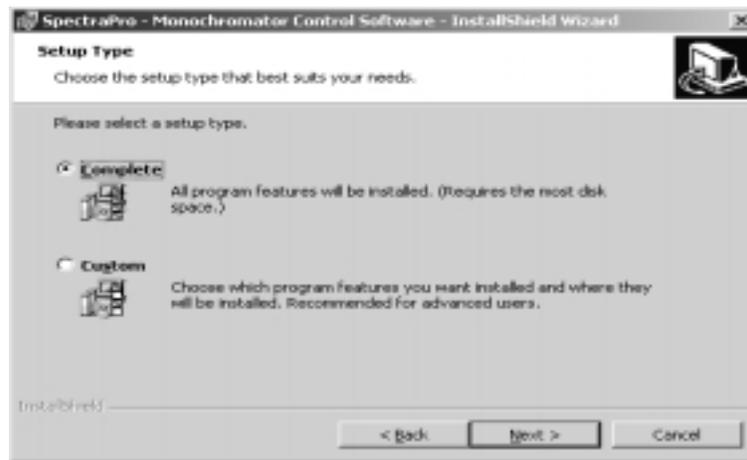


Figure 2.

The necessary files for operating all of the SpectraPro Monochromators will be installed on the computer hard drive. The default directory for these files is C:\Program Files\MONO the SpectraPro Monochromator Control software will be installed in this directory if **Complete** install is selected. This directory can be changed to any desired drive and directory name by clicking on **Custom** install and following the directions presented. Click **Next** to continue the install process. A SpectraPro icon will be placed on the desktop when install is complete.

Also included on the SpectraPro Monochromator Control Software install CD are a manual folder which contains the user manuals for each of the SpectraPro monochromators and a SpectraPro SDK folder which contains information on the SpectraPro COM interface. The files and folders in this Software Developer’s Kit describe the SpectraPro OLE COM interface functions which allow users to access the monochromator functions from their own software. Included is the complete documentation of each function with examples with a Readme file explaining the usage of this SDK. There are six folders with major examples demonstrating the SDK in Delphi 5 and Visual Basic 6. Also included is a LabVIEW SDK folder which describes the use of the SpectraPro ActiveX control through LabVIEW with examples in LabVIEW 6.

III. User Functions:

Before starting the SpectraPro Monochromator Control Software connect the RS-232 connector on the SpectraPro Monochromator to the Com1 or Com2 port of the PC compatible computer using a serial cable supplied with the monochromator or one constructed as described in the SpectraPro monochromator Instruction Manual. Turn on the SpectraPro Monochromator and allow it to initialize. If using an SD-748 controller with keyboard and display, the last line of the SpectraPro controller display should read "Computer Control". If it does not, check the connections and repeat the above procedure until the message appears. If using any SpectraPro monochromator monochromator with integrated monochromator scan drive, no display is provided.

The Monochromator Control software allows the SpectraPro Monochromator to be controlled from either the Com1 serial port or the Com2 serial port. Port selection is in software and is automatically determined by which port is connected to the SpectraPro Monochromator. It is important that the SpectraPro be connected to the Com port and be initialized before the software is started. Also, it is important that no other application have control of the serial port while the Monochromator Control software is operating. There will be a short delay while the parameters for the serial port are setup.

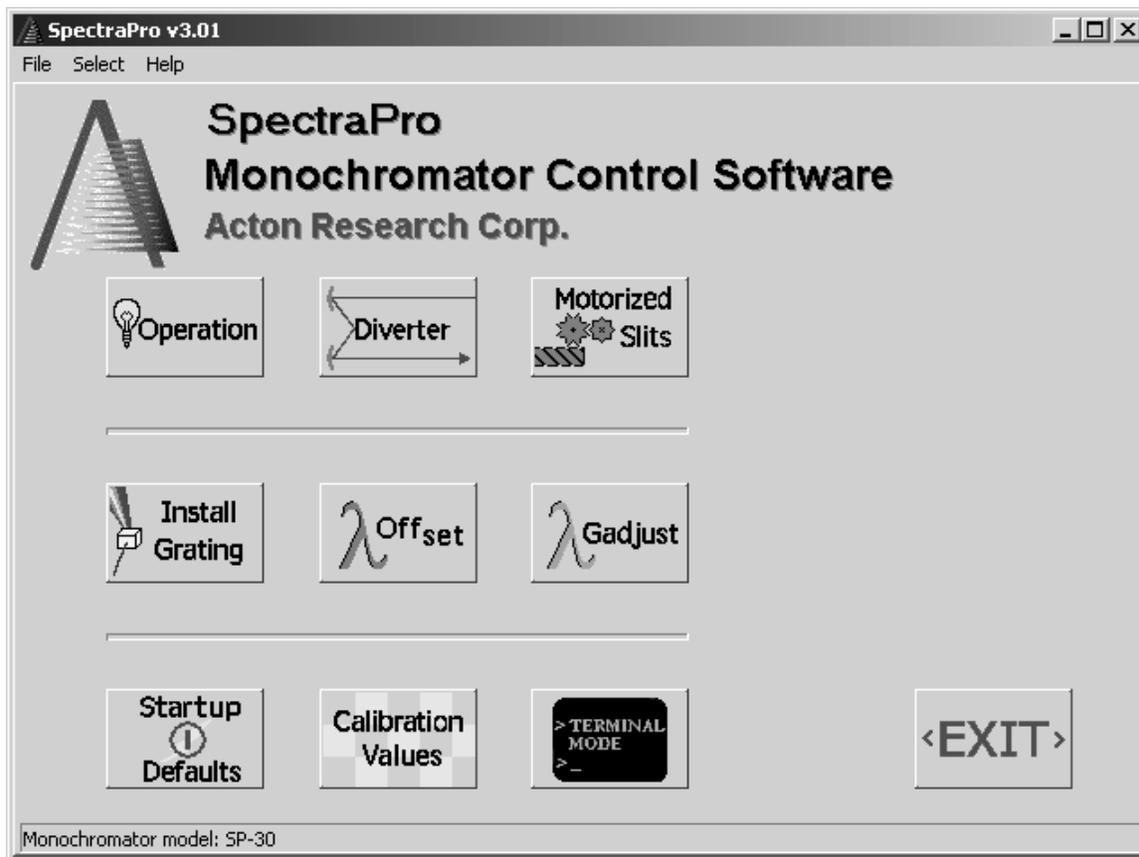


Figure 3.

This is the main operating window for the Monochromator Control Software. All of the functions of the software are selected from this menu and control is returned to this menu when RETURN is selected in any function.

Operation:

Selecting the **Operation** button allows control of the wavelength position, scan speeds and grating selection of the monochromator. When this button is clicked, the following menu is displayed.

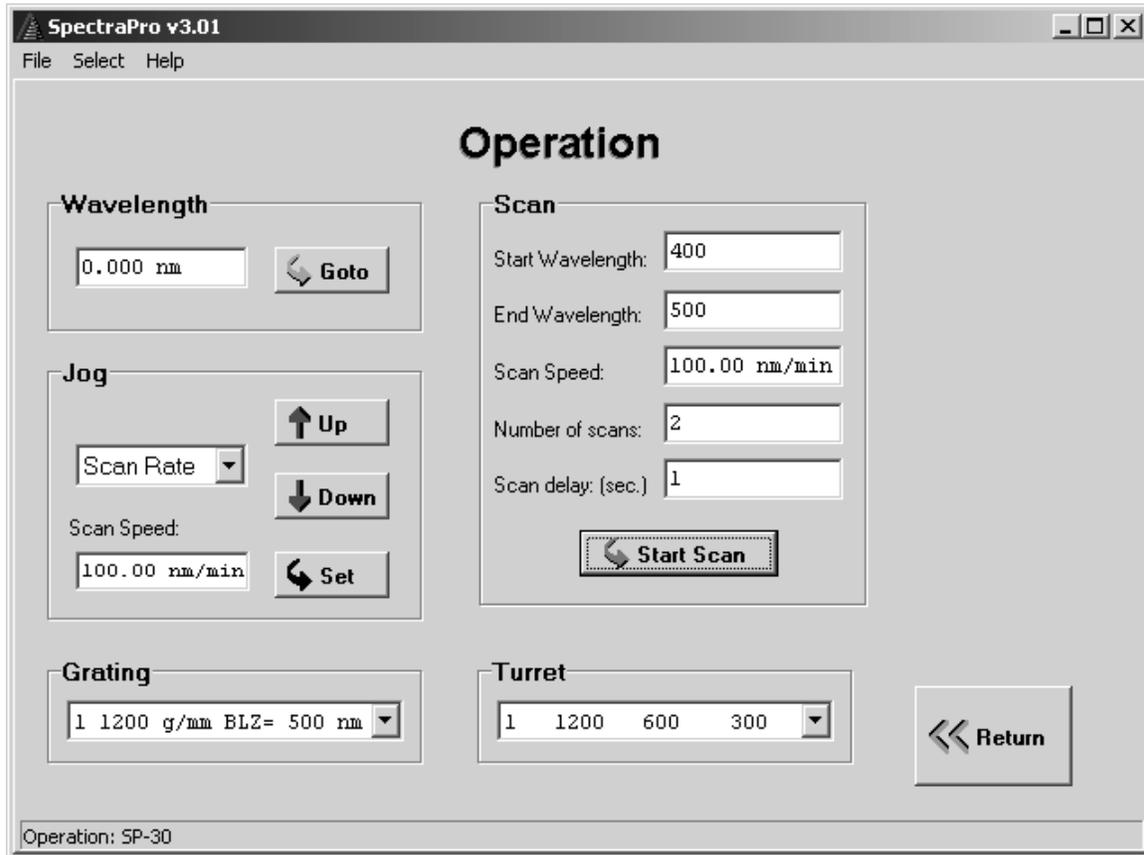


Figure 4

There are five major functions controlled from the Operation window

- GOTO a wavelength
- Jog
- Grating selection
- Turret selection
- Repeat scans

The "Wavelength" box in the "Operation" window indicates the current monochromator wavelength. Clicking the number in the "Wavelength" box will highlight the wavelength value and allow entering a new value. Values entered are in nanometers and can be to the nearest nm, nearest 0.1nm or 0.01nm. Clicking the "GoTo" button starts the monochromator moving at maximum speed to the

selected wavelength. The display shows the new wavelength when the destination is reached.

The JOG function allows jogging the monochromator in the increasing or decreasing wavelength direction by clicking and holding down the "Up" or "Down" buttons for as long as it is desired to move the monochromator. The jog speed is set by the three selections between the "Up" and "Down" buttons. "Maximum" is the same speed as GOTO, "Scan Rate" is the speed set in the "Scan Speed" selection under "Scan" and single step is a single motor step for a click of the "Up" or "Down" button. Note that single step will not necessarily change the wavelength display each time a click is performed.

The "Grating" section allows changing the selected grating to any of the installed gratings for the SpectraPro monochromator. Click the circle beside the desired grating to move to that grating. The circle beside the selected grating will darken when the grating is in place. Note that two gratings are shown for the SP-150 and three gratings are shown for all other SpectraPro monochromators.

A "Turret" selection box is provided when controlling an SP-150, SP-300i, SP-500i, SP-750i or other SpectraPro monochromators with the turret option. If a turret option is not included in the monochromator being controlled this box is not displayed. To select an alternate turret, click the arrow beside the turret box and a drop down selection list will appear. Double click on the desired turret selection. The grating box will change to reflect the updated turret selection.

The "Scan" box allows the SpectraPro monochromator to make repetitive scans. The parameters for start wavelength, end wavelength, scan speed number of scans and delay in seconds between scan are set up in the boxes provided and the scans are started with the "Start Scan" button. Again, the wavelength display box will track the wavelength of the monochromator as it is scanning.

To exit the **Operation** window and return to the initial "SpectraPro" window click in the **Return** box near the bottom of the window.

Diverter Mirror Control:

The **Diverter** selection button is to the right of the operation button on the main screen. Clicking on this button brings up the following screen:

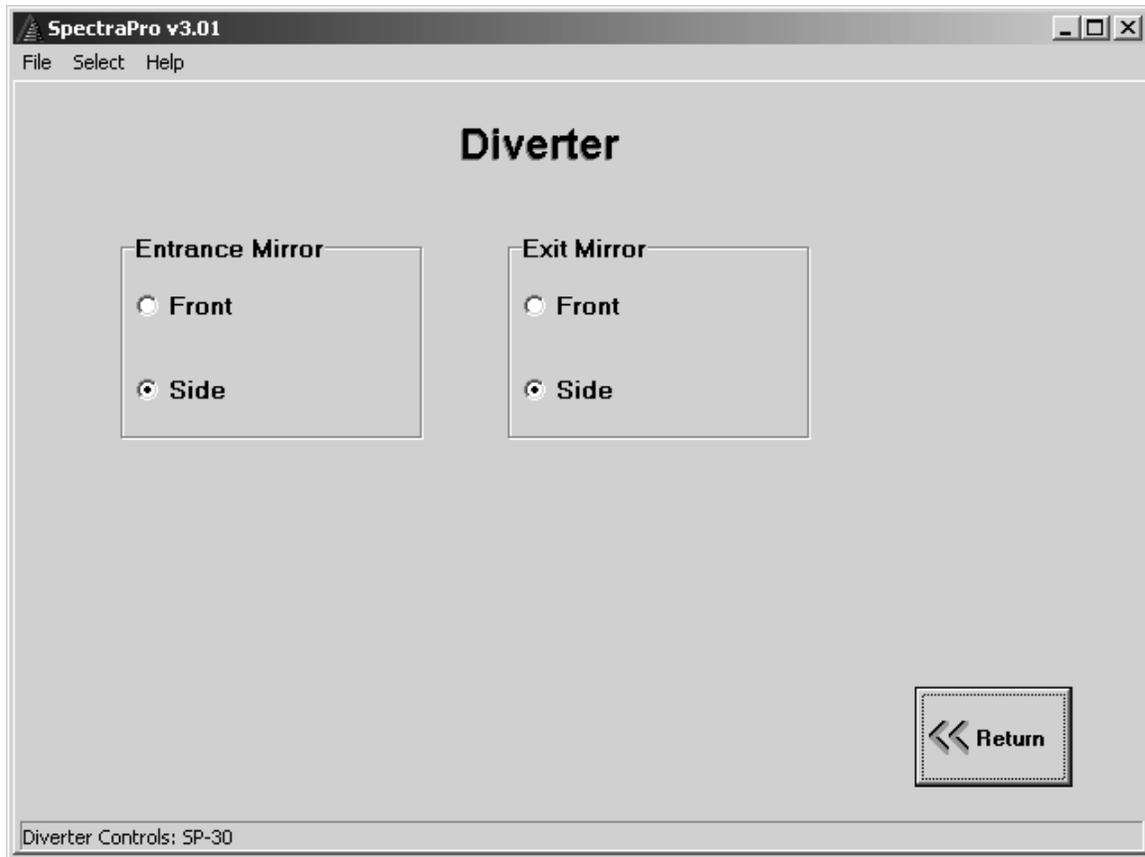


Figure 5

Clicking beside Front or Side for any of the displayed diverter controls will move the diverter mirror to the selected position. If only one diverter is present, only that active diverter control will be displayed.

Click the **Return** button to return to the **Main** menu.

Slit Width Control:

Clicking the **Motorized Slits** button will bring up the screen shown below for controlling the position of each of the installed motorized slits.

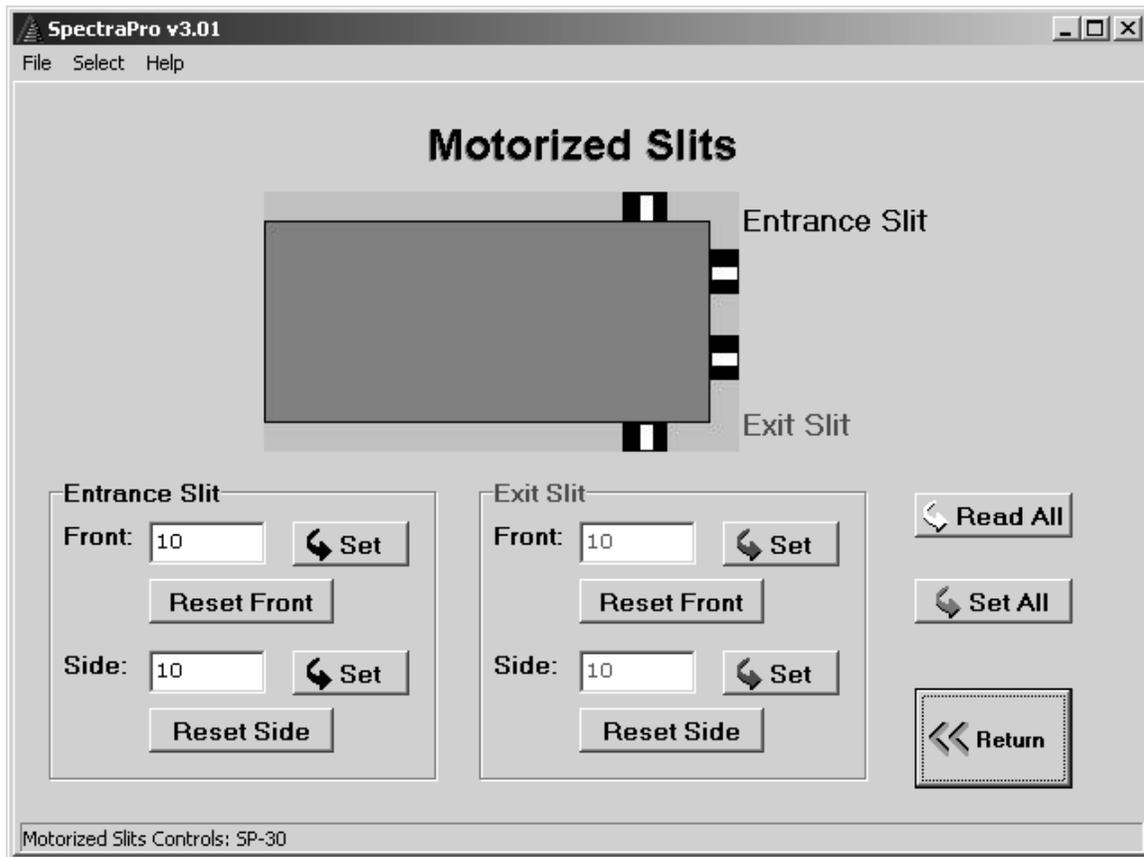


Figure 6

Controls for only the motorized slits installed in the monochromator will be displayed. For each active motorized slit, the user can control of the slit width by double clicking in the box which displays the width for the desired slit and entering a new value in increments of 1 micron. The range of the slit width is 10 microns to 3000 microns for standard motorized slits. If using an optional 12mm slit, the range is 10 microns to 12000 microns in 5 micron increments. To make the slit go the the new value, click the **Set** button. The width of the slit is not affected by initialization of the monochromator or by turning the power off or on. Clicking the **Reset Front** or **Reset Side** button will cause the selected slit to initialize to its home position of 10 microns.

Click the **Return** button to return to the **Main** menu.

Install Grating:

Below the **Operation** button in the main window is the **Install Grating** button. Clicking this button brings up the following window shown in figure 5 and allows the installation of additional gratings to the SpectraPro Controller.

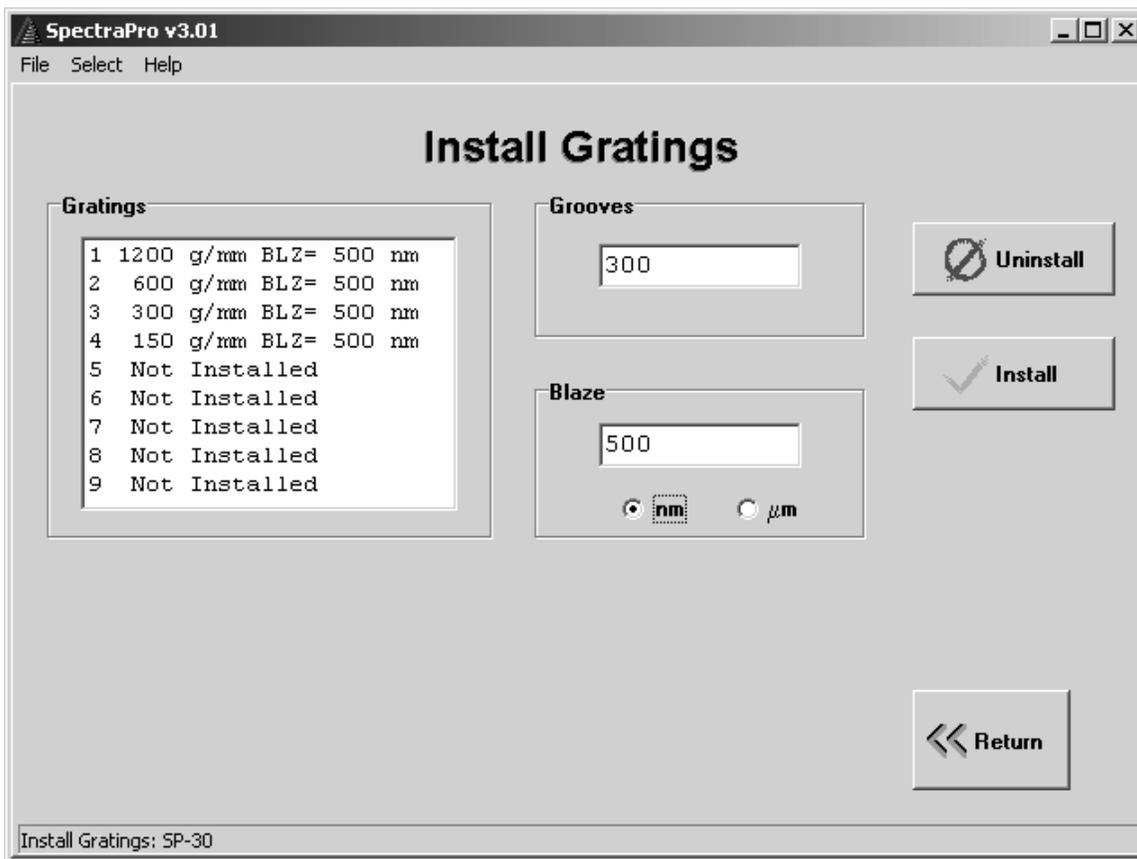


Figure 7.

Note: Before installing a new grating it is advised that the monochromator parameters as shipped be saved in a file. This can be done in the **Calibration Values** window. Refer to page 15 of this manual for instructions.

Select the grating position in which the new grating is to be installed by clicking the desired grating position in the Gratings list. When a monochromator with replaceable turrets is used, position 4 is grating #2 in turret #2 for an SP-150 and is grating #1 in turret #2 for a SP-275, SP-500 or SP-750. Enter the number of grooves per millimeter in the "Grooves" box to the right. The number of grooves can range from 20 to 3600; no decimal points are allowed in the groove box. Enter the blaze wavelength in the "Blaze" box. The blaze can contain three numbers or

letters. For example 300, 1.2 and HOL are all acceptable. Select nanometers or microns for the units of numerical blazes. Click the “Install” button to put the selected grating into the memory of the SpectraPro controller. The SpectraPro controller will automatically reset when install is clicked. If a mistake is made during the installation process or if it is desired to remove a grating from a selected position, click the "Uninstall" button after making the grating selection. Click the **Return** box of the **Install Gratings** window to return to the **Main** menu.

When a new grating is installed, it is usually necessary to calibrate the monochromator in this grating position. There are two values stored in non-volatile memory which affect calibration for each grating installed in the monochromator. These values are called “Offset” and “Gadjust”. These values can be set using the **Wavelength Offset** and **Wavelength Gadjust** functions. Offset should be set first.

Wavelength Offset:

Selecting the **Wavelength Offset** function causes the following window shown in figure 8 to be displayed.

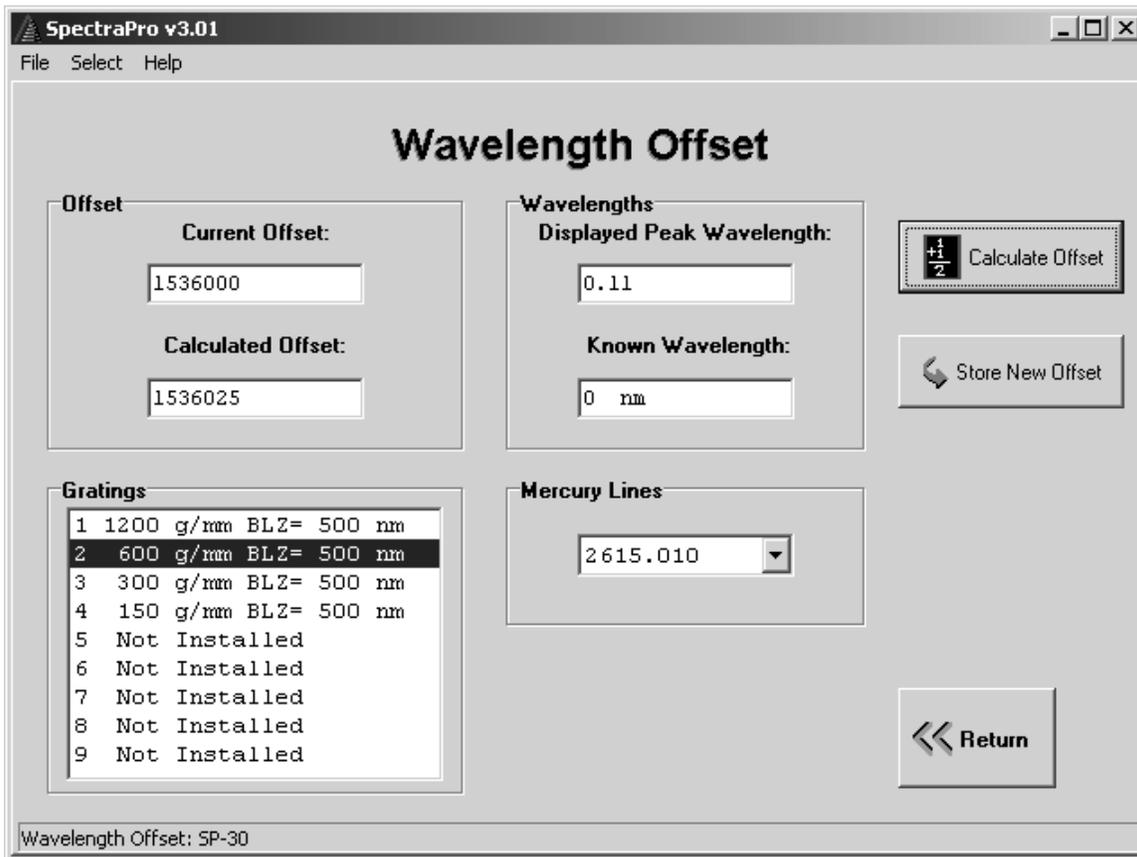


Figure 8.

The **Offset** window allows changing the offset value for any of the installed gratings. This is typically done by finding the wavelength of peak intensity near zero wavelength using calibration source and a readout system such as the Acton Research Corporation NCL with SpectraSense software. If the NCL and SpectraSense is not available, any detector and readout system may be used by scanning or jogging in the operation window of this software and noting the value of the wavelength display for the wavelength that is found to have maximum intensity near zero. Return to the **Wavelength Offset** window shown above and select the grating that is being adjusted. The wavelength value found in the procedure above is then entered into the "Displayed Peak Wavelength" box. "0.0" is then entered into the "Known Wavelength" box. Click on the **Calculate Offset** button and the new calculated value for offset on the selected grating will be shown in the **Calculated Offset** box. If this was only a test or if the value is not one you want to save you can try other values before saving. If you wish to save the value in non-volatile memory, click the **Store New Offset** button. The monochromator will then reset and the new value of offset will be used for future monochromator activity. It is also possible to enter a value directly in the **Calculated Offset** box and click **Store New Offset**. This allows resetting a parameter to its original value if desired.

Although it is advisable to use zero wavelength to set the offset, values other than zero wavelength may be used. It is best, however, to use low values of wavelength for adjusting the offset of a grating and high values of wavelength for setting the gadjust.

Use the **Return** button to return to the **Main** menu.

Wavelength Gadjust:

A similar window exists for setting the “GADJUST” parameter for a grating. Selecting **Wavelength Gadjust** will show the following window.

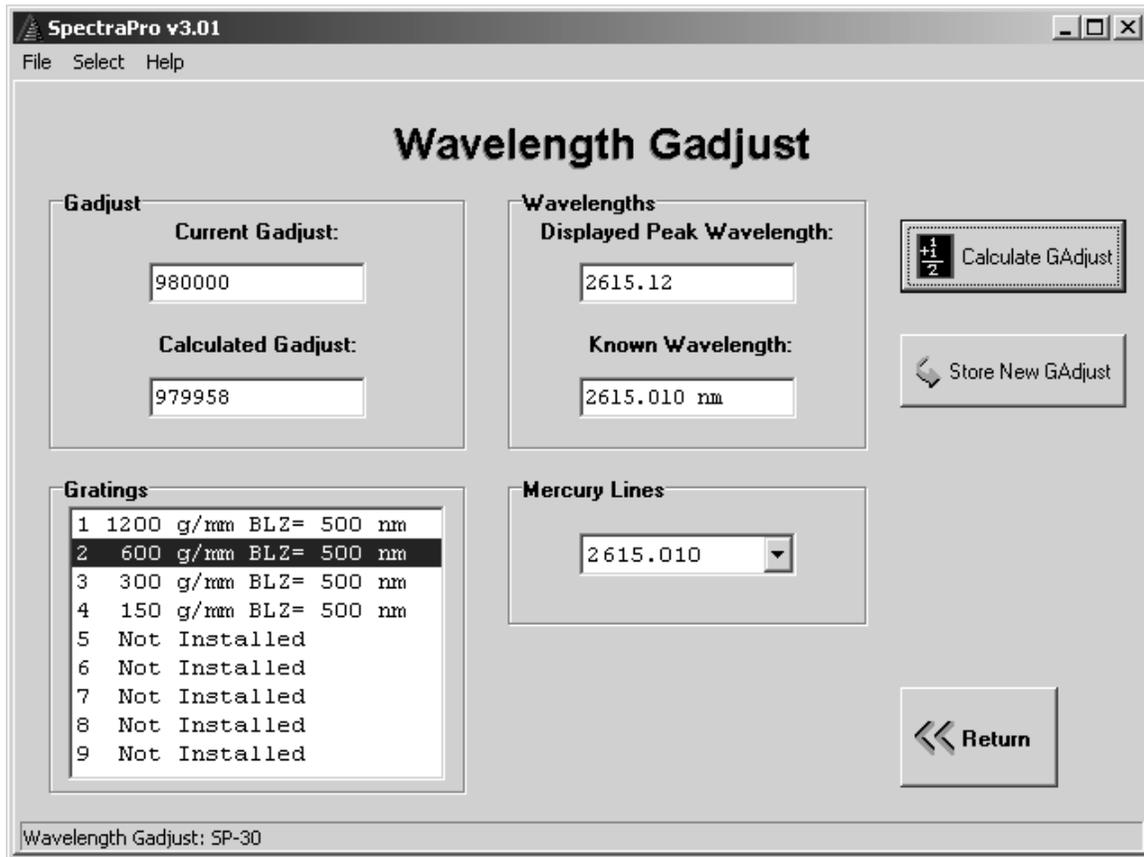


Figure 9.

Again, the usual way of setting the Gadjust value is to find a known optical calibration line using a readout system and enter the wavelength value of peak intensity into the **Displayed Peak Wavelength** box. If a mercury calibration lamp is used, one of the values from the **Mercury Lines** table can be selected and this value will appear in the **Known Wavelength** box. A value can also be directly entered into the **Known Wavelength** box. Typically, a wavelength value near the high limit of the grating is used for setting the Gadjust as this gives the greatest resolution to the setting. When both wavelengths are entered, clicking the **Calculate Gadjust** button will cause a new calculated value to be displayed in the **Calculated Gadjust** box. To save this value for future use, click **Store New Gadjust**.

As before, a Gajdust value can be directly entered into the **Calculated Gajdust** box and saved with the **Store New Gajdust** button.

To return to the **Main** menu, click the **Return** button.

Defaults:

Selecting the **Set Defaults** menu option displays the following window:

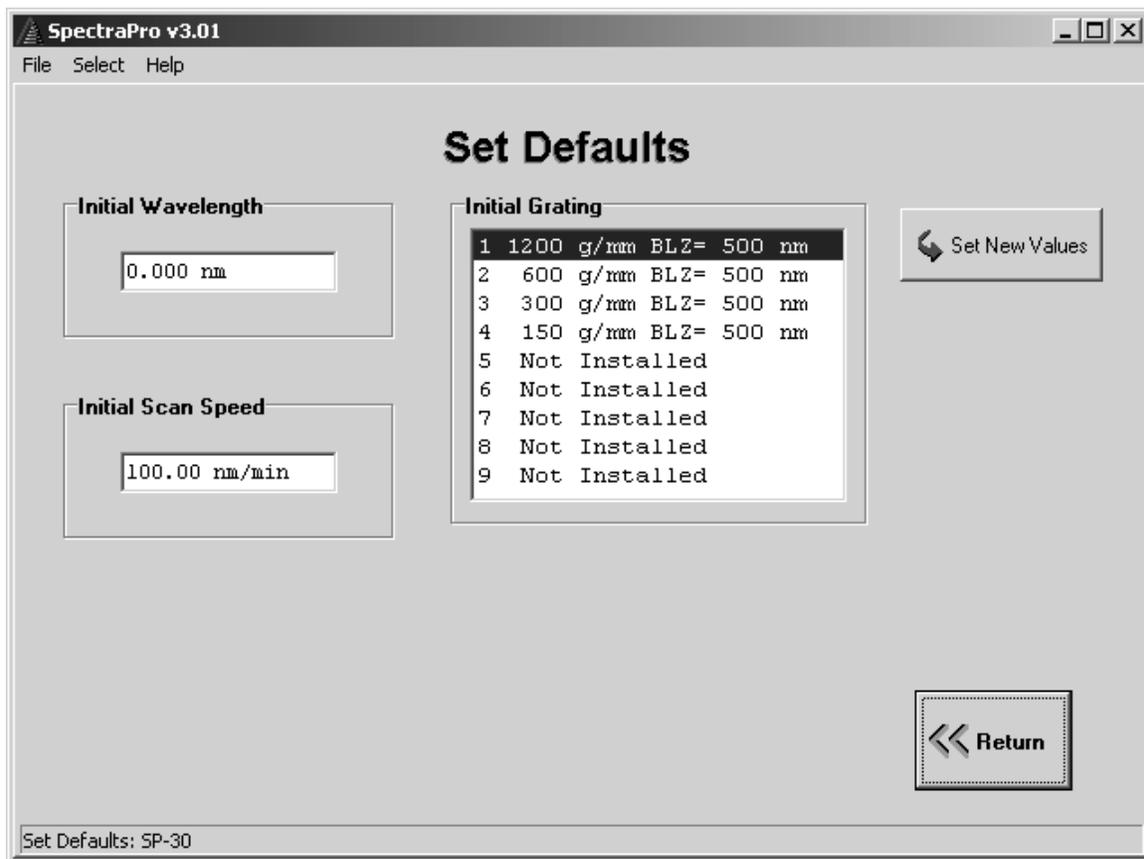


Figure 10.

This screen allows setting alternate grating, wavelength and scan rate values to be used at initialization of the monochromator. The original values for these properties are Grating 1, 0.0 wavelength and 100nm/min scan rate. If an alternate grating or wavelength value is selected to be used at initialization, the monochromator will first go to 0.0 wavelength on grating 1 and then automatically move to the selected grating and wavelength. New values may be entered into the boxes shown above and saved using the **Set New Values** button. To restore the values to their original state use the button **Restore Defaults**.

Calibration Values:

The **Calibration** Values table in the window shown below displays the current state of the offset and gadjust values stored in the monochromator's non-volatile memory.

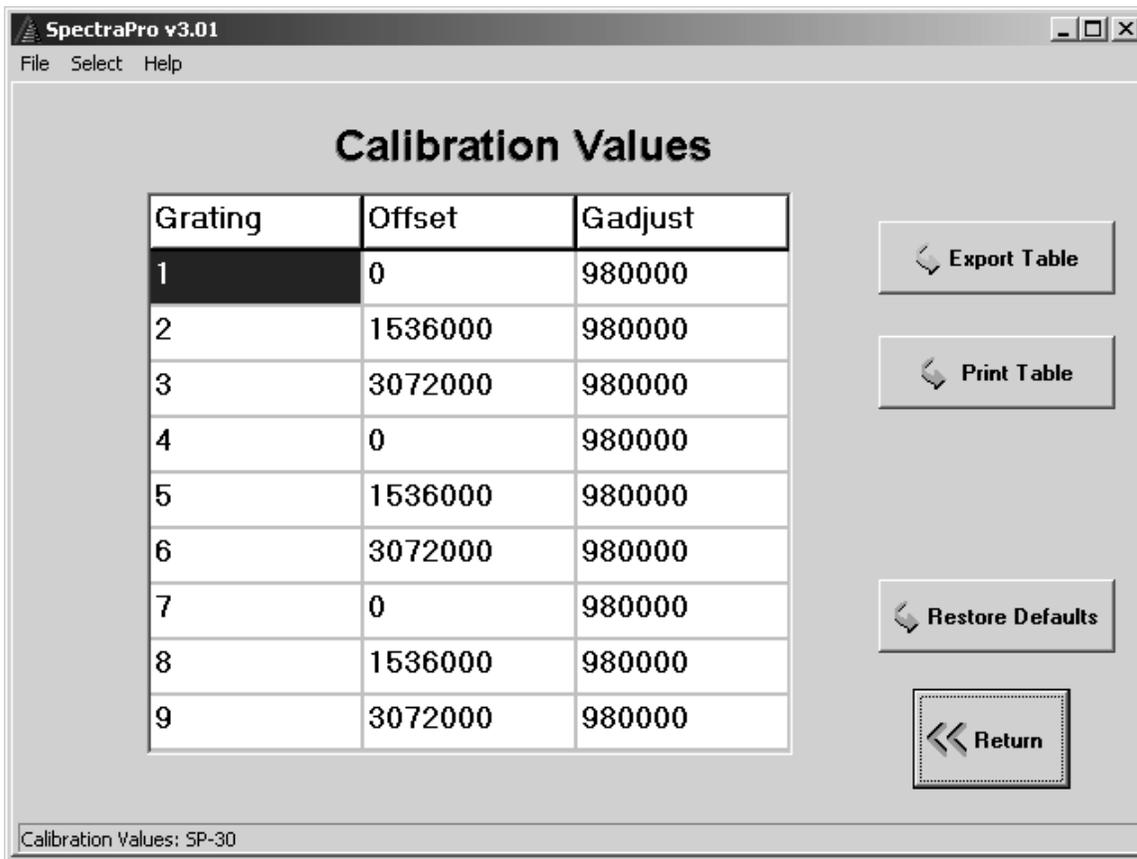


Figure 11.

Note that this screen displays the calibration values setup in **Wavelength** Offset and **Wavelength** Gadjust; it does not allow setting them. There are two calibration values for each grating position. The **Offset** value is the location of zero wavelength in motor steps from the monochromator initialization point for the specified grating. The **Gadjust** value is a factor used to make fine adjustments to the higher wavelengths for a selected grating. The default values for these parameters are listed for any grating position for which a grating is not installed.

Terminal Mode:

The function **Terminal Mode** allows direct control of the SpectraPro monochromator using the commands described in the Instruction Manual for the monochromator. A list of the more common commands is also listed in the window of the **Terminal Mode** function. Selecting **Terminal Mode** causes the following window to be displayed.

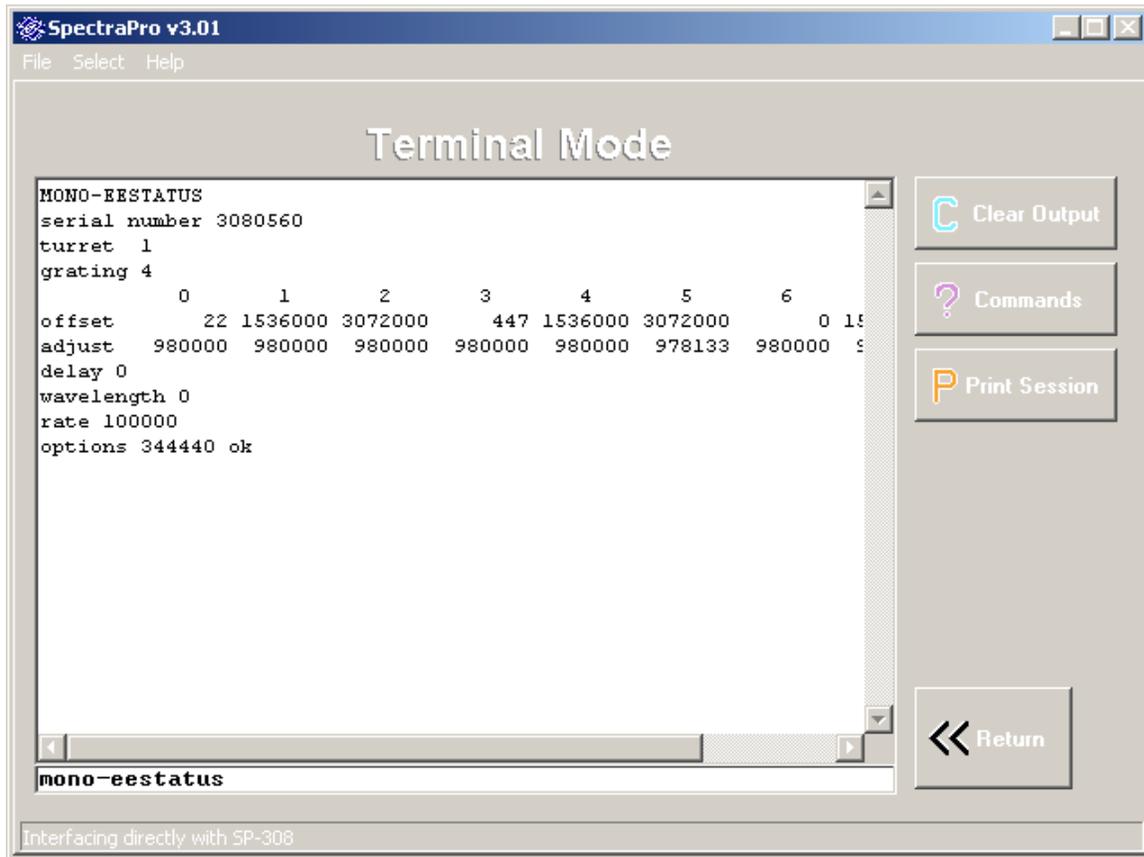


Figure 12.

Note that this screen only displays the values and does not allow changing them; to change the values, use the **Wavelength Offset** or **Wavelength Gadjust** screens. It is recommended that a copy of this table be saved before making any changes using the **Wavelength Offset** function or **Wavelength Gadjust** function. This can be done in two ways. The table can be printed using the **Print Table** function or can be saved to a file using the **Export Table** function. The **Wavelength Offset** and **Wavelength Gajdust** screens can then be used to restore any values to their original state.

Terminal:

Selecting **Terminal** allows direct control of the SpectraPro monochromator by typing in commands as described in the user manual for each monochromator. To enter a command, click in the single line near the bottom of the screen and type the desired command. Note that all commands are single words – no spaces – and multiple commands may be entered on one line with spaces between the commands. Parameters are entered first followed by the command (e.g. 500.0 GOTO). Commands are not case sensitive. Execution of the command or string of commands begins when the "ENTER" key is pressed. The command or string of commands is complete when "ok" is returned to the screen. To exit from terminal mode and return to the Setup menu, click on the **Return** key.

The **?Commands** button brings up the manual for the monochromator attached to the computer serial port. The commands for each monochromator are listed in the on-line manual. The **Clear Output** button clears the terminal output screen. The **Print** button allows printing out the terminal interaction for the current session.

To return to the **Main** menu click the **Return** button.

To exit the SpectraPro Monochromator Control Program click **Exit** in the **Main** menu.