



Spectral Products

Grating Addition

Digikröm
DK 240 $\frac{1}{4}$ Meter
DK 242 Double $\frac{1}{4}$ Meter
DK 480 $\frac{1}{2}$ Meter
Monochromator / Spectrograph

Grating Addition

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Spectral Products

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Introduction

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The staff at Spectral Products will be happy to answer any questions about our products and our services. For immediate assistance, please contact the Spectral Products Group directly at (505) 296-9541, by fax (505) 998-4746, or by e-mail at sales@spectralproducts.com

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Packing List

- | | |
|----------------------------|--------------------------|
| 1. Grating with back plate | 4. Mounting hardware |
| 2. Novram utility software | 5. Grating leveling tool |
| 3. Slot query software | |





Grating Installation

1. Remove power from the monochromator.
2. Remove the slit cover plates by removing the six #8-32 screws on each plate.
3. Remove the cover by removing the four #4-40 screws securing it.
4. Remove the end plate nearest the spherical mirrors by removing the three #8-32 screws on the bottom of the monochromator.
5. If adding a grating, remove the black tape covering the relevant slot on the grating table. Grating slot numbers increment clockwise around the grating table. Grating 1 is defined as the grating facing the spheres when the thinnest slot is positioned at the slot detector. See the illustration in the back of this manual.
6. Apply power to the monochromator and allow it to reset. Connect to an available communications port of your PC.
7. Run the Novram utility software (8-0114-d.exe) and change the factory settings to reflect the new configuration of gratings being added or changed. Please see the step-by-step instructions in the next section of this manual for this procedure.
8. Once reprogrammed, remove power, and then reapply power to the monochromator to allow the new settings to be set into memory.
9. Change to the position of the grating that is being added, then run the Slot.exe software. Record the slot value as explained in the last section of this manual. Repeat this step if another grating is being added.
10. Run the Novram utility software again to enter the new grating slot identifier into memory.
11. Choose a grating position of a current grating, for example grating number one.
12. Shine a visible light source such as a HeNe laser into the entrance slit. Care must be given to ensure the laser beam is entering the monochromator as level and straight as possible. Open the slits wide enough to easily see the laser beam. Instruct the monochromator to GOTO zero. If the beam does not exit the monochromator, check the laser alignment. Slight change of the monochromator zero offset may also be necessary to permit the beam to exit (consult the User's Manual for this procedure).
13. Mark the beam exiting the monochromator at least several feet away from the exit slit (typically with paper taped to a wall). Once marked, do not change the mark, the laser, or the monochromator position.
14. Unplug the power to the grating turret motor (the colored wires leaving the motor to the small circuit board – note the polarity of the connector wire by color orientation). Rotate the grating by turning the motor shaft by hand from the zero position downward until the laser beam passes between the two spherical mirrors. Mark the beam at this point, again several feet from the monochromator.
15. Plug in the motor wires and change to the position desired for the grating addition.
16. Install the new grating with the hardware supplied. Tighten the bottom screw securely. The top screw should be just snug enough to keep the grating from flopping about. Tighten the two side set screws so that the grating looks level.
17. Unplug the motor wires once again and rotate the grating downward until the laser beam is visible close to the mark made in step 14 above. Adjust the top screw and nut assembly to put the beam exactly on this mark. Rotate the grating upward and observe the various orders of the laser beam passing the mark. Pick a beam order toward the end of the grating's range and stop it at the mark. If the beam is higher than the mark, the grating is tilted with this side being high. If it is lower than the mark, this side is low. Adjust the side screws to bring the beam on to the mark. The idea is to get all of the laser beam orders to pass through the mark. This process may have to be repeated several times to level the grating. Once level, tighten all hardware.





Grating Calibration

Once you are satisfied with the grating alignment, the monochromator must be calibrated.

1. Reset the monochromator and set the slit width to 50 microns. Instruct the monochromator to GOTO zero, and then step the grating turret until the zero order of the laser exits the monochromator. The beam should be at the mark made in step 13 of the grating installation procedure. Execute the zero command.
2. Instruct the monochromator to GOTO a laser wavelength near the blaze of the grating (multiples of the laser wavelength may be used. For example, if you are using a 632.81nm HeNe laser, and are installing a 600 g/mm grating blazed at 1200nm, you should calibrate at 1265.62nm, the second order of the HeNe laser. Step the grating turret until the laser beam exits the monochromator. Execute the calibrate command. The monochromator will perform a RESET routing, and is then ready for use.
3. Repeat the first two steps for any additional gratings being added.
4. You should run the Novram utility software again to program the new calibration values into the monochromator.
5. Replace the end plate, baffles, cover, and slit plates.





Novram Address

Address	The meaning of the content
1	AAAAH if programmed, else random
2	Serial Number
3	Source 1 (not used)
4	Source 2 (not used)
5	Source 3 (not used)
6	Source 4 (not used)
7	High byte: Current source (not used) Low byte: IEEE address
8	Number of motor steps of Slot 1
9	Number of motor steps of Slot 2
10	Number of motor steps of Slot 3
11	Grating 1 Blaze
12	Grating 2 Blaze
13	Grating 3 Blaze
14	Zero Offset of Machine 1, Grating 1
15	Zero Offset of Machine 1, Grating 2
16	Zero Offset of Machine 1, Grating 3
17	Zero Offset of Machine 2, Grating 1
18	Zero Offset of Machine 2, Grating 2
19	Zero Offset of Machine 2, Grating 3
20	Grating 1 Calibration
21	Grating 1 Calibration
22	Grating 2 Calibration
23	Grating 2 Calibration
24	Grating 3 Calibration
25	Grating 3 Calibration
26	Entrance Slit Offset
27	Exit Slit Offset
28	Middle Slit Offset
29	High byte: # of gratings Low byte: Bit 0 – 0 = Full step, 1 = Micro step (1) Bit 1 – 0 = 1 machine, 1 = 2 machine (2) Bit 2 – 0 = no OMA, 1 = OMA (4) Bit 3 – 0 = no CSR, 1 = CSR (8) Bit 4 – 0 = no GPIB, 1 = BPIB (16) Bit 5 – 0 = Unilateral, 1 = Bilateral (32)
30	Model Number
31	Grating 1 groove/mm
32	Grating 2 groove/mm
33	Grating 3 groove/mm
34	Machine 2 Slot 1
35	Machine 2 Slot 2
36	Machine 2 Slot 3
37	Hi byte not used Low byte subtractive
38-41	Reserved





Novram Instructions

Enter the serial port (1-4) to communicate to the Digikrom:

1st screen – enter communications port and press enter

Retrieve NOVRAM values from UUT or Disk File? [U or D, Def = U]

2nd screen – UUT=Unit Under Test, or your monochromator. Disk File would be Novram values saved to a disk file. Once you have installed your gratings and alignment/calibration is complete, it is a good idea to save this data to disk. Press the enter key to read your monochromator.

NOVRAM contents have been read

Skip MENU to change values? [Y/N or QUIT: Def=No]

3rd screen—Skipping this screen will bring up a screen of all Novram addresses. Press enter to view the next screen.





NOVRAM PARAMETERS:

This Novram has been previously programmed

Serial number = 40309	Min = 0	Max = 65535
IEEE-488 Address = 0	Min = 0	Max = 255
Grating 1 type: = 2400 grv/mm	Min = 50 grv/mm	Max = 3600 grv/mm
Grating 2 type: = 1200 grv/mm	Min = 50 grv/mm	Max = 3600 grv/mm
Grating 3 type: = 600 grv/mm	Min = 50 grv/mm	Max = 3600 grv/mm
Grating 1 Blaze = 240 nm	Min = 200 nm	Max = 20000 nm
Grating 2 Blaze = 500 nm	Min = 200 nm	Max = 20000 nm
Grating 3 Blaze = 1200 nm	Min = 200 nm	Max = 20000 nm
Number of Gratings = 1	Min = 1	Max = 3
MicroStep(1) or not(0) = 1	Min = 0	Max = 1
Double(1) or Single(0) = 0	Min = 0	Max = 1
OMA(1) or not(0) = 0	Min = 0	Max = 1
CSR(1) or not(0) = 1	Min = 0	Max = 1
GPIB(1) or not(0) = 0	Min = 0	Max = 1

Do you wish to change these values? [Y/N or QUIT, Def=No]

4th screen—this is the screen in which you will identify the new grating. Press the ‘Y’ to enter this screen, then the enter key to scroll down to the appropriate grating number. Type in the grating groove density, then scroll down to the grating blaze and type in the blaze wavelength. Also enter the new correct number of gratings. When completed, scroll to the bottom and press enter.

Enter Model Number [2400/4800, Def=4800]

5th screen—Models DK240 And DK242 would appear as 2400, Dk480 as 4800. Press enter to leave this screen.





Update factory calibration? (Copy 11-33 to 42-64) [Y/N, Def=N]

6th screen—Novram values are split into 2 categories, what we refer to as the lower level and the upper level. The lower level contains all offset values for your monochromator. The upper level is a backup of sorts for critical offsets such as zero offsets and calibration values. The CLEAR command will copy the upper level values to the lower level. You should enter ‘Y’ to this question.

Print the values to printer? [Y/N, Def=N]

6th screen—This will print a copy of all Novram address values in both hexadecimal and decimal. It might be more convenient to print screen for this printout on the next screen.





```
1:AAAA 2:9D75 3:03E8 4:07D0 5:0BB8 6:0FA0 7:0000 8:1183
43690 40309 1000 2000 3000 4000 0 4483
9:16A6 10:1CBF 11:00F0 12:01F4 13:04B0 14:4BED 15:4D19 16:4D03
5798 7359 240 500 1200 19437 19737 19715
17:0000 18:0000 19:0000 20:C61C 21:00FE 22:5A27 23:00FE 24:7F91
0 0 0 50716 254 23079 254 32657
25:00FE 26:00B4 27:010E 28:0000 29:0309 30:4800 31:0960 32:04B0
254 180 270 0 777 18432 2400 1200
33:0258 34:FFFF 35:FFFF 36:FFFF 37:FFFF 38:FFFF 39:FFFF 40:FFFF
600 65535 65535 65535 65535 65535 65535 65535
41:FFFF 42:00F0 43:01F4 44:04B0 45:4BED 46:4D19 47:4D03 48:0000
65535 240 500 1200 19437 19737 19715 0
49:0000 50:0000 51:C61C 52:00FE 53:5A27 54:00FE 55:7F91 56:00FE
0 0 50716 254 23079 254 32657 254
57:00B4 58:010E 59:0000 60:0309 61:4800 62:0960 63:04B0 64:0258
180 270 0 777 18432 2400 1200 600
```

P= Program the NovRam, C= Change the NovRam value, Q= Quit:

7th screen—This is a list of all Novram values. The main thing to look for in this area is the values for addresses 8, 9, and 10, which are the slot identifiers for grating 1, 2, and 3. If your machine is equipped with microstepping option, these values will be in the thousands, i.e. 4500, 5500, 6500. There should be a difference of about 1000 between address 8 and nine, and another 1000 between 9 and 10. If it does not have microstep, these values will be in the hundreds, i.e. 450, 550, 650 and the differences will be about 100. These are only approximate default slot values, so you should run the Slot.exe program to correctly identify the slot values. **Incorrect slot values could result in your monochromator confusing the current grating.** When satisfied, enter 'P' to program the monochromator.

Save NOVRAM values in a Disk File? [Y/N, Def=N]:

8th screen—This is where you should save values to a disk for backup.





Slot.exe Program

```
High byte is 18
Low byte is 72
Status byte is 0
Final byte is 24
High byte in hex is 12
Low byte in hex is 48
Combined, that's 1248 in hex
or, in decimal, it's 4680
Command was 59 , Echo was 37
```

After running the Slot.exe program, in the case above, 4680 would be entered into the appropriate Novram address for the slot being read. Note: this program must be run in DOS or a DOS window.

white is grating 1 slot/grating.
red is grating 2 slot/grating
yellow is grating 3 slot/grating

