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Operating Instructions
Acton Research Corporation
SpectraPro-300i



0.300 Meter Focal Length Triple Grating Imaging Monochromator / Spectrograph

SP-300i Manual Rev. 997.1

Acton Research Corporation
SpectraPro-300i Operating Instructions

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Thank you for your purchase of the ARC ***SpectraPro-300i*** monochromator/spectrograph, and for selecting Acton Research Corporation as your provider of precision spectroscopic equipment. ARC strives to manufacture equipment of the highest quality, and to design our monochromators and spectrographs for easy installation and operation. If you have any questions during set up or use of ARC equipment, please do not hesitate to contact our experience technical staff.

I: Brief Introduction and SpectraPro-300i Description

Brief Introduction:
This instruction manual is intended to assist you in set-up and operation of your new SpectraPro-300i monochromator/spectrograph. Even if you are an experienced user of spectroscopic equipment, we suggest that you follow the manual (at least initially) to insure proper setup and operation. If you have any questions about the information contained in this manual, please feel free to contact the ARC customer service department.

SpectraPro-300i Description:
The SpectraPro-300i is a 300mm focal length monochromator/spectrograph.

Key Features:

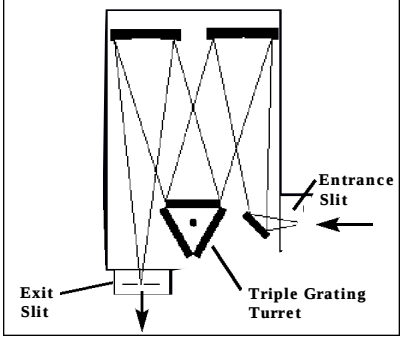
- An astigmatism-corrected optical system with multichannel imaging capabilities.
- Integrated microstepped stepping motor with controller, controlled by a powerful 32-bit microprocessor.
- Built-in RS232 and IEEE488 computer interfaces for control of the SpectraPro-300i
- A triple grating turret which accepts 1, 2, or 3 gratings, selectable by computer control or by use of the Model 300-749 remote scan controller.
- Direct digital scan drive system, consisting of a worm/worm gear which rotates the grating turret. It is an extremely rugged drive, permitting the gratings to be mounted at the ARC factory and shipped installed in the SpectraPro-300i.
- Bilaterally adjustable slits, with micrometer controlled slit width settings from 10µm to 3mm. Aperture plates are provided for 4mm and 14mm slit heights.
- 14mm high by 27mm wide focal plane for CCDs and other array detectors.
- A focal plane which extends 1.0" (25mm) outside the instrument housing, designed to accept CCDs with shutters installed.
- Unique 3-point focus stop and fine focus adjustment for CCDs.
- 0.1nm resolution with a 1200g/mm grating.
- Dual exit port option, including either dual exit slits, or the combination of an exit slit with a CCD port. Both dual exit port versions include a motorized beam diverter mirror for rapid exit port selection.

II: SpectraPro-300i Specifications

NOTE: Each SpectraPro-300i is operated for at least 15 minutes prior to calibration to insure optimum stability. End users should follow this practice if their application calls for optimum stability & reproducibility.

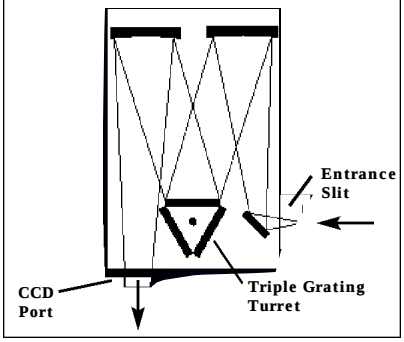
Every SpectraPro-300i monochromator or spectrograph includes a triple grating turret for 1, 2, or 3 gratings, an imaging optical system, 32-bit microprocessor controlled scanning, built-in RS232 and IEEE488 interfaces, and micrometer controlled entrance slit (optional second entrance slit available).

SP-305 Monochromator



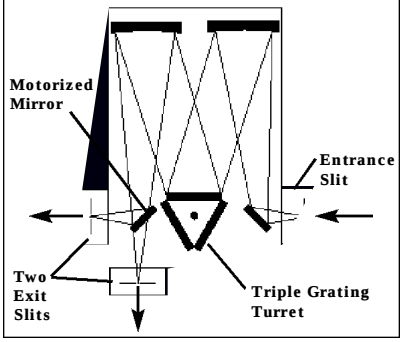
The standard monochromator includes a 90° optical path, and includes micrometer adjustable entrance and exit slits.

SP-306 Spectrograph



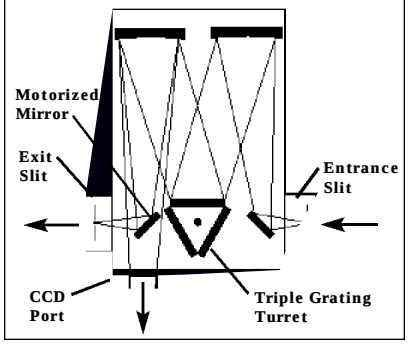
Standard spectrograph includes a 90° optical path, large 14mm X 27mm focal plane, plus sliding tube CCD adapter with exclusive focus-stop.

SP-307
Dual Exit Port Monochromator



Monochromator with dual exit slits, and motorized mirror for rapid, computer controlled exit slit selection.

SP-308
Monochromator/Spectrograph



Monochromator/Spectrograph with dual exit ports (1=monochromator, 1=spectrograph) and motorized mirror for rapid, computer controlled exit port selection.

Specifications (1200g/mm Grating)

Focal length: 300mm
Aperture Ratio: f/4
Optical Design: Imaging Czerny-Turner with original polished aspheric mirrors provide imaging capabilities
Optical Paths: 90° standard, 180° and multi-port optional
Scan Range: 0 to 1400nm mechanical range
Operating Range: 185nm to the far infrared with available gratings and accessories
Resolution: 0.1nm at 435.8nm
Dispersion: 2.7nm/mm
Accuracy: ±0.2nm
Repeatability: ±0.05nm
Drive Step Size: 0.0025nm (nom.)
Focal Plane Size: 27mm wide x 14mm high
Focal Plane Position: 1.0" (25mm) beyond the CCD mounting flange when it is positioned against the instrument housing.
CCD Focus Arrangement: Exclusive o-ring sealed sliding tube with unique 3-point focus stop/fine focus adjustment mechanism.
Detector Coverage: ~68.5nm across a 1.0" wide focal plane (~137nm: 600g/mm grating)
Standard Slits: Micrometer adjustable from 10µm to 3mm wide. Slit heights: 4 & 14mm
Grating Mount: Triple Indexable grating turret for 1, 2, or 3 gratings.
Interchangeable Grating Turrets: Optional
Grating Change Time: Less than 20 seconds
Grating Drive System: 32-bit microprocessor controlled direct digital scanning (DDS) system.
Scan Linearity: The SpectraPro-300i scans linear with respect to wavelength
Size: 13.25" long (337mm)
10" wide (254mm)
8" high (203mm)
4.875" (123.8mm) optical axis height
Weight: 35lbs. (15.9kg)

Tested and conforms to **European CE Standards**

III. SpectraPro-300i Setup

Section III-A: Unpacking and Inspection

Carefully unpack and examine the SpectraPro-300i and any accessories purchased.

> **Note:** **Report any damage immediately to the carrier and to Acton Research Corporation, and save all packing material.**

Section III-B: Connecting the SpectraPro-300i Monochromator/Spectrograph to the Optional Model 300-749 Remote Scan Controller or Computer

The SpectraPro-300i is designed for operation by computer using RS232 or IEEE488, or by using the optional Model 300-749 Remote Scan Controller. Either method of control enables wavelength scanning at a pre-set linear scan rate, change of scanning speeds, grating selection, rapid GOTO wavelength positioning, change of grating turrets if available, and "jog" wavelength positioning. Figure 1 below shows the cable connections necessary for operation from a computer through the COM ports or with a GPIB controller card. Figure 2 below shows the cable connections necessary for operation of the SpectraPro-300i with the optional Model 300-749 remote scan controller. Refer to the SpectraPro Monochromator Control Software for Windows for operation with a computer. Refer to Section IV-B for details on operation with the Model 300-749 remote scan controller.

SpectraPro-300i Cable Connections: Optional 300-749 Remote Scan Controller, RS232, or IEEE488

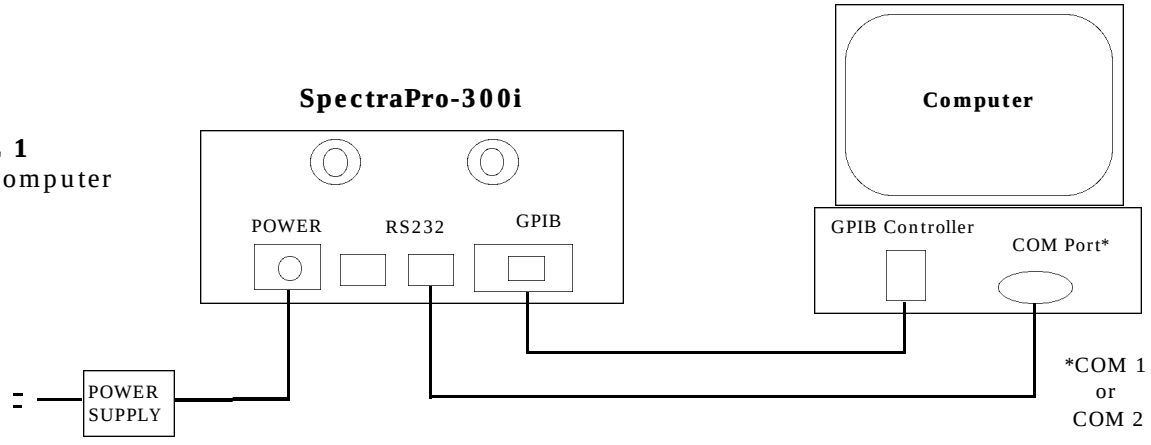


FIGURE 1
Control from Computer

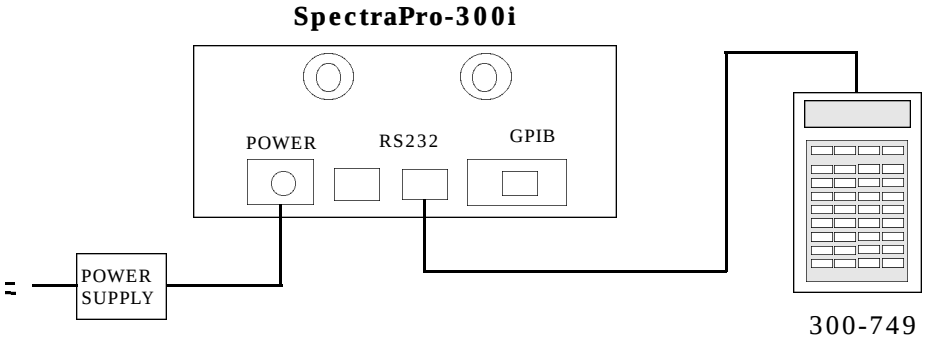


FIGURE 2
Control from Optional 300-749 Remote Scan Controller

Section III-C: Cables and Connections for SpectraPro-300i

ARC offers the following computer cables as options:

CC-499-1	IBM PC or XT compatible 25 pin female (DB25S) connector to 9 pin male connector (DB9P).
CC-499-2	IBM AT or compatible 9 pin female (DB9S) connector to 9 pin male connector (DB9P).
CC-499-3	Computer terminal type 25 pin male (DB25S) connector to 9 pin male connector (DB9P).
CC-499-4	9-pin cable for Macintosh computer
CC-499-5	IEEE488 cable, 4 meters long

The cable CC-499-2 is included with the SpectraPro-300i. The other cables are optional. If none of these cables are compatible with your system, consult ARC for a custom cable. If you have facilities for constructing a custom cable, use the RS232 pin arrangement shown in Table 1, or the IEEE488 pin arrangement shown in Table 2. See also Appendix B.

Table 1: RS232 Computer Interface Pin Arrangement:

pin #		description
1		open
2		RD data from SP-300i to computer
3		TD data from computer to SP-300i
4		open
5		ground
6		open
7	⊐	RTS connect these two pins together
8		CTS
9		open

A terminal or RS232 computer port must be set up as follows: 9600 baud, 8 data bits, no parity, 1 start bit, 1 stop bit.

Table 2: IEEE488 Computer Interface Pin Arrangement:

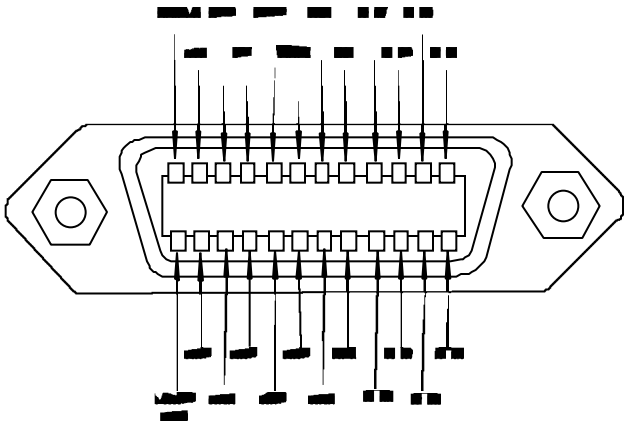
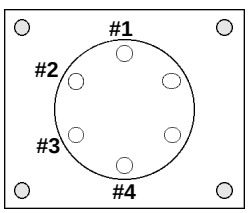


Table 3: Power Input Pin Arrangement:

PIN#	DESCRIPTION
1	+5V
2	GND
3	GND
4	+24V



Section III-D: Mounting Accessories to the SpectraPro-300i Slit Assemblies

All ARC accessories come with their own set of instructions for proper mounting and operation. The instructions below are only general information. Please refer to the individual instructions for detailed information.

Accessories: The full range of ARC SpectraPro accessories mount directly to the SpectraPro-300i slit assemblies. A drawing of the standard slit assembly can be found in the Appendices Section to assist you in mounting of accessories. To mount an accessory to the slit, the general procedure is as follows:

1. Place the accessory directly against the face of the slit body. Light sources normally mount on the entrance slit, detectors on the exit slit. Other accessories such as fiber bundles normally mount on the entrance slit, but are also compatible with the exit slit.

2. Using four (4) 8-32 screws normally provided with the accessory, secure the accessory to the slit body.

Light sources fitted with light collection/focusing optics are normally factory aligned to the standard slit.

Note: In some instances with light sources, there is limited access to the bottom two screw holes. In this case ARC provides special slotted holes in the light source housing to facilitate mounting of the source to the slit.

Section III-E: Detector Mounting Instructions: Mounting Focal Plane Detectors to the SpectraPro-300i Spectrograph

The standard mounting flange for CCDs and diode arrays accommodates detectors with two different bolt circles. There are three (3) equally spaced #10-32 tapped holes on a 3.60" bolt circle, and three (3) equally spaced holes on a 3.88" bolt circle designed to accept #10-32 button head screws. A baffle is mounted in the array detector mounting flange to define the focal plane area. This baffle has two sets of mounting holes 90 degrees apart which permit the mounting to be rotated 90 degrees to accept different array detectors.

To mount an array detector to the SpectraPro-300i, use the following procedure:

1. The array detector mounting flange has a sliding tube, which fits inside the front plate of the SpectraPro-300i.

NOTE: At this point it is very important to check the focal plane distance of the array detector. This is the distance from the front mounting surface of the array detector to the actual CCD or diode array element. Because array detector focal distances vary, the correct distance is crucial in order to determine if a spacer is required for proper focus. This spacer is provided with spectrographs. If the detector focal plane distance falls between .67" and 1.00", then no spacer is required.

2. Using a 1/8" allen wrench, loosen the two (2) set screws located at the top and side of the front plate. Gently slide the array detector mounting flange all the way out of the SpectraPro-300i housing. Make sure that the sliding tube and o-ring are kept clean.

3. Remove the shipping cover from the sliding tube, and the spacer if not required.

4. Position the array detector mounting flange against the array detector, and match the hole patterns. When correctly positioned, the baffle aperture orientation should match the detector array orientation. If it does not align properly, contact ARC.

5. Fasten the array detector mounting flange to the detector, then carefully slide this assembly back into the SpectraPro-300i housing.

6. Tighten the #10-32 set screw on the top of the front plate first, and then tighten the one on the side.

Section III-F: Slit Width Adjustments in the Model 716 Bilateral Slits

The slit width of each bilateral slit assembly (716 type) is adjustable from 0.010 millimeters to 3 millimeters (10µm to 3,000µm) by a micrometer located on the top of the slit housing. The micrometer knob is graduated in 0.010 millimeter (10µm) increments.

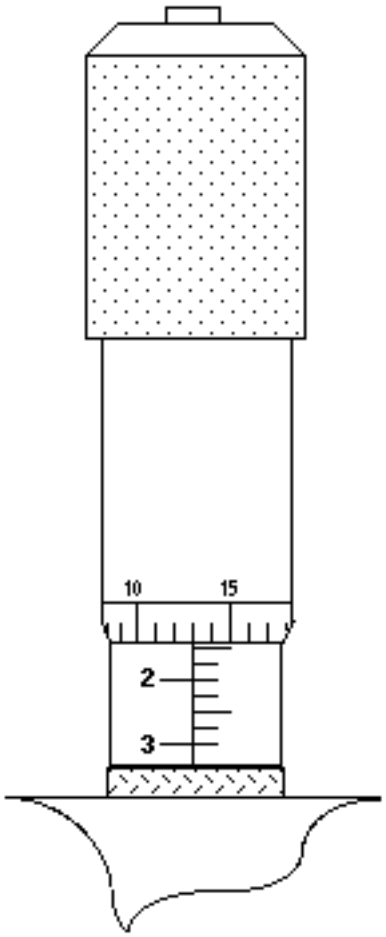
Each clockwise revolution of the micrometer knob increases the slit width 0.25 millimeters (250µm). For maximum reproducibility, the slit width should be set in a clockwise direction (increasing slit widths) each time it is changed. Refer to the drawing below.

The micrometer knob should not be rotated below a reading of 0.00 or above 3.00. A micrometer setting of less than 0.010 millimeters (10µm) should not be used, because a stop is provided to prevent the slit jaws from contacting each other.

Note: Damage May Be Done If Slit Jaws Are Opened Wider Than 3.0mm.



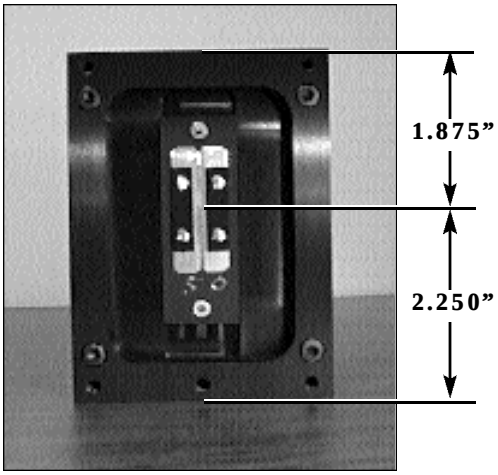
Slit Width Setting: 200 Micrometers (0.200mm)



Slit Width Setting:
1380 Micrometers (1.38mm)

Section III-F Continued: Interchanging Fixed Width Slit Plates in the Model 715 Fixed Slit Assemblies:

If your SpectraPro-300i was purchased with the Model 715 type fixed slit assemblies, the following procedure should be used in order to change slit widths. First, at least one additional fixed slit plate, Model 715-4-XX or 715-14-XX, must be available to permit changing widths in the 715 type slit assemblies.



Standard Model 715 Fixed Slit Assembly NOTE: Optical Axis Position

Changing Fixed Slit Plates in the 300-715-1 and 300-715-2 Assemblies:

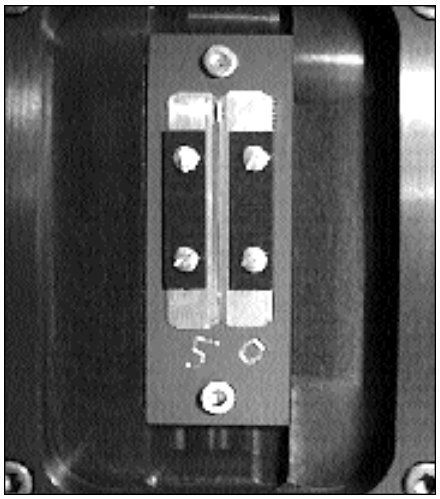
1. Remove any accessories from the slit body.

2. Using an allen wrench, loosen the two slit plate screws which hold the slit plate to the slit body. Remove the slit plate without contacting the slit blades. Store the removed slit plate in a clean, dry area.

Note: Align the new slit plate to the SpectraPro-300i optical axis by orienting it so that the slit width label is upright and readable. When correctly mounted, the slits are off-centered height-wise, slightly above the center of the slit body. See the slit assembly drawing in the appendices section for details, or pictures on this page for reference.

3. Place the new slit plate in the slit body and secure it in position using the slit plate screws. The cone shaped holes in the slit plate are designed to align the slits to the optical system.

4. The slit width has now been changed.


Fixed Width Slit Plate
Note Orientation for Correct Installation

IV: SpectraPro-300i Operation

Section IV-A: Initialization

When power is turned ON to the SpectraPro-300i, it initializes to a wavelength of 0.0nm for grating number 1. If the power is switched OFF and then ON again to the SpectraPro-300i, it will re-initialize. Initialization gives the system a reference, or starting position to keep track of wavelength position, grating location, and other parameters. Alternative start-up parameters can be programmed if the factory defaults are not suitable (See Appendix A).

Section IV-B: Using the Optional Model 300-749 Remote Scan Controller

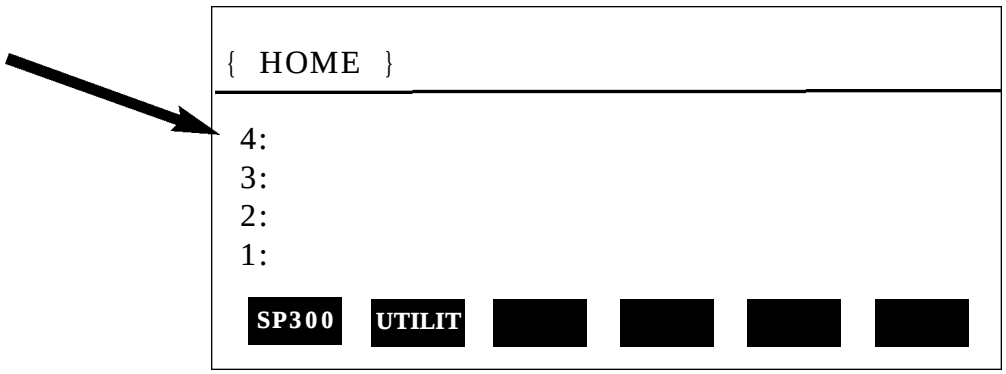
The Model 300-749 is a Remote Scan Controller (referred to as "controller" for the remainder of this manual) for the SpectraPro-300i Monochromator/Spectrographs. Functions include scanning of wavelengths, GOTO for rapidly moving the monochromator to a specific center wavelength, grating selection, and interchanging of grating turrets. It consists of an H-P Model HP 48G Graphics Calculator with RS232 interface, and ARC-written scan control software. The controller is programmed with all the instrument scan functions displayed as convenient menu items, with simple keystrokes enabling any of the scan functions to be performed.

The controller is connected to the SpectraPro-300i through the standard RS232 port with the cable provided. It is designed to send commands and receive information about the specific SpectraPro-300i it is attached to, therefore a single controller can be used with many different instruments (one at a time, however). When the power is switched OFF and then ON again to the SpectraPro-300i and the controller, the SpectraPro-300i will re-initialize. If the controller power is switched OFF then ON again, and the SpectraPro-300i power is left ON, then the controller will return to the last menu selected.

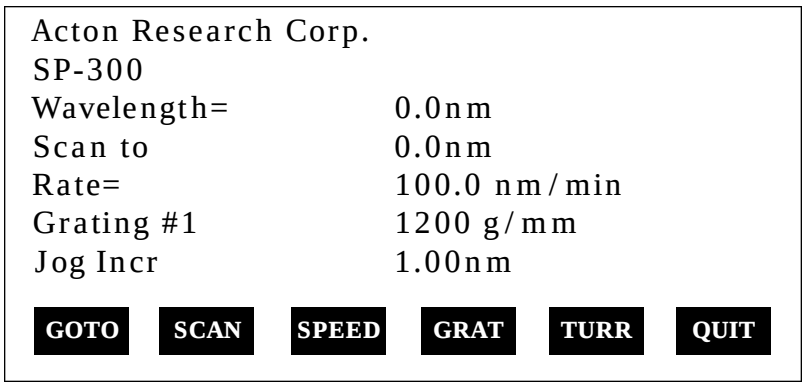
> **Battery Power Management Feature:**
> **If the controller is not used for a few minutes, the LCD screen will turn off to save battery power. If this happens, simply press the ON button to return to the menu you were using.**

Operation of the Controller with the SP-300i:

With the controller connected to the SpectraPro-300i, turn the power ON to both components. After the SpectraPro-300i initializes, the following menu should be displayed:



If the above menu **does not** appear (for example, if the controller was operated in the calculator mode), press the RIGHT FUNCTION KEY (➡), followed by the LIBRARY key, then select SP300. When the above menu is displayed, press the white key below the **SP300** function to begin operation (see Appendices Section for use of the "UTILIT" functions). The following menu will be shown:



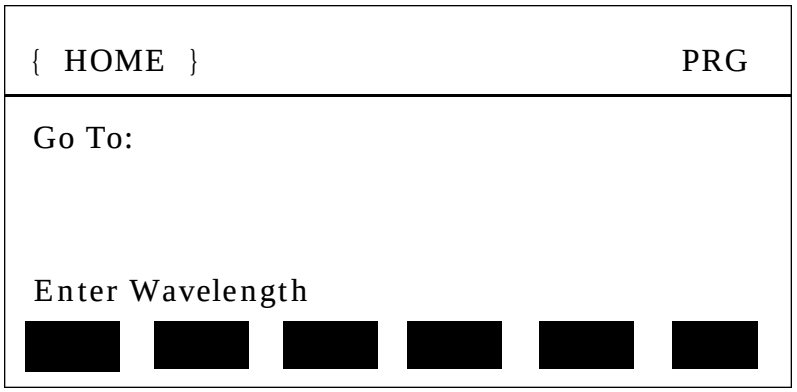
Main Menu

All functions of the SpectraPro-300i are accessed while the controller displays the Main Menu.

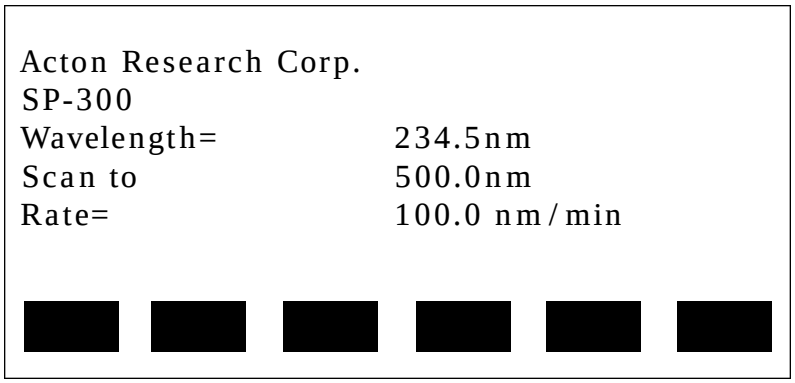
> **Note: When entering a number for GOTO, SCAN or SPEED, the controller will accept an integer or a number to the nearest tenth of a nanometer (nm). If you enter a number with hundredths or lower, it rounds up to the nearest tenth nanometer.**

GOTO Menu:

Press the white key below the GOTO command. The following menu will appear (with a flashing arrow next to the **Enter Wavelength** line):

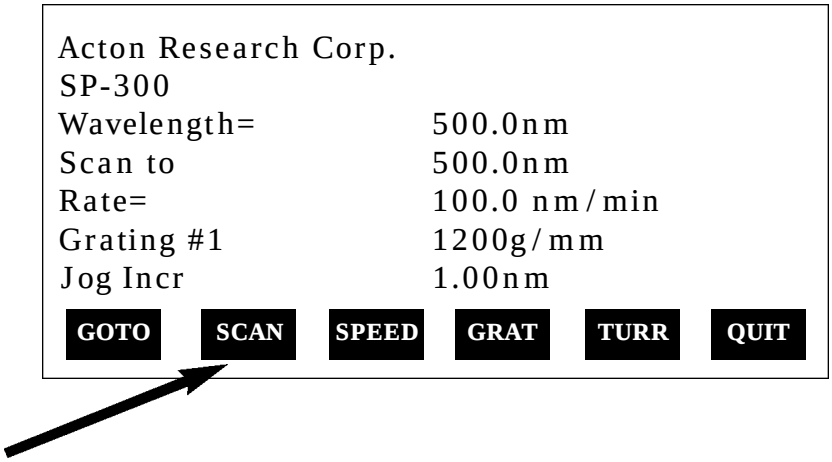


Key in the desired wavelength (in nm) and then push the <ENTER> key (ex: 500 <ENTER>). The SpectraPro-300i will then race at the maximum motor speed to the selected wavelength and display this interim menu.



GOTO Interim Menu

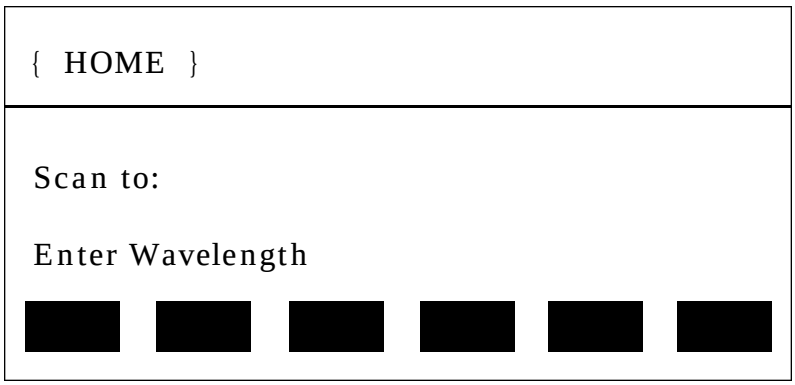
After the GOTO command is completed, the Main Menu will appear again showing the new center wavelength (in a monochromator this is the wavelength at the exit slit, in a spectrograph it is the center of the focal plane).



Main Menu

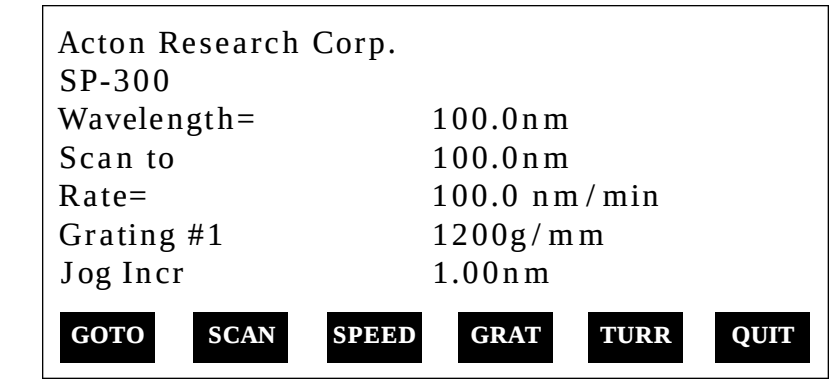
SCAN Menu:

SCAN moves the SpectraPro-300i to a desired wavelength at a pre-set scanning rate in nanometers per minute. To use the SCAN menu function, press the white key under the SCAN command while in the Main Menu. The following menu will appear (with a flashing arrow after Enter wavelength):



SCAN Menu

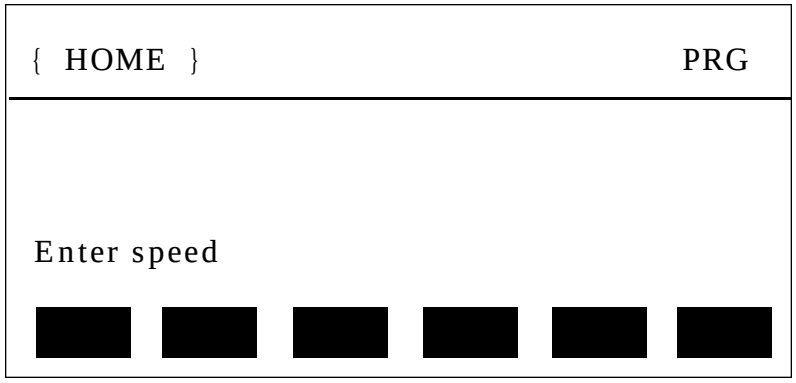
As with GOTO, key in the desired wavelength (in nm) followed by <ENTER>. The SpectraPro-300i will scan to the selected wavelength at the preset scanning rate. To change the scanning rate, see the **SPEED (Scanning Rate)** instructions following this section. The controller will continue to update the wavelength display as scanning takes place. When the scanning is complete, the controller returns to the Main Menu with updated information:



Main Menu

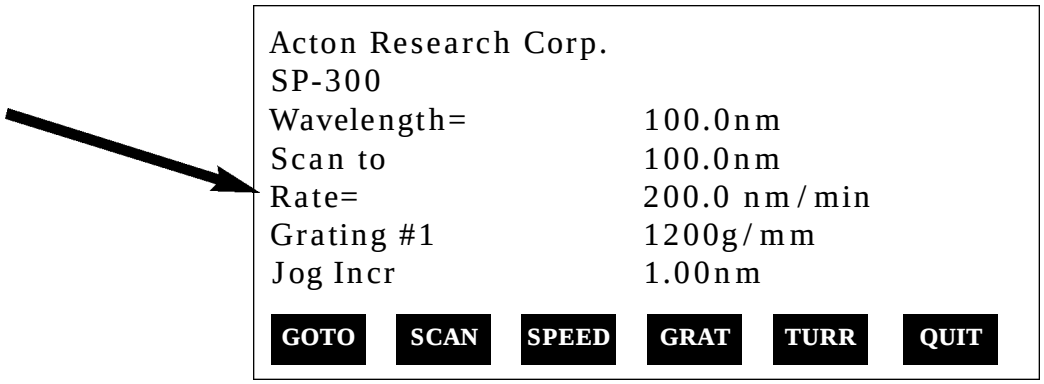
SPEED (Scanning Rate) Menu:

To change the wavelength scanning speed of the SpectraPro-300i, press the white key below the SPEED function in the Main Menu. The following menu will be displayed (with a flashing arrow after Enter speed):



SCAN Menu

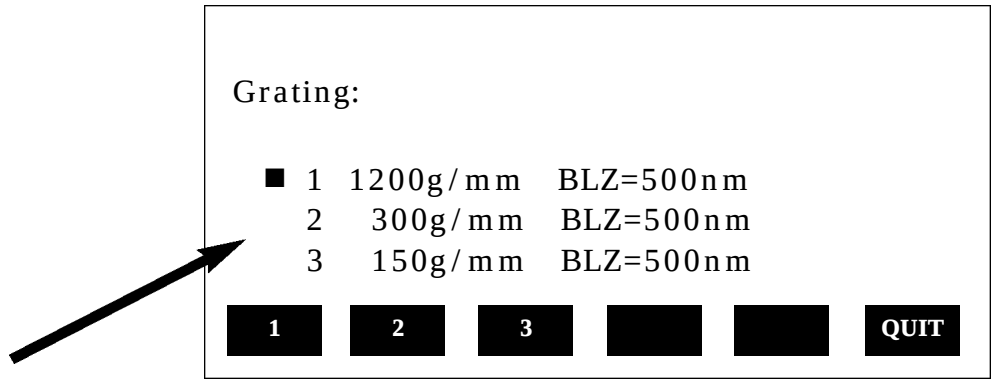
Key in the desired scanning speed in nm/min then press <ENTER> (ex: 200.0 <ENTER>). If you enter a wavelength above the maximum scanning speed for a specific grating, the SpectraPro-300i and controller will default to the maximum scanning speed allowed for the specific grating. The controller will return to the Main Menu with updated scan speed, as shown in the menu below:



Main Menu

GRAT (Grating Change) Menu:

Use the GRAT menu to index a desired grating into the operating position (only if there is more than one grating installed in your SpectraPro-300i). From the Main Menu, press the white key below the GRAT command. This will display a menu that shows the available gratings for the turret currently installed, with a dot (■) indicating the grating currently in operating position. For example:



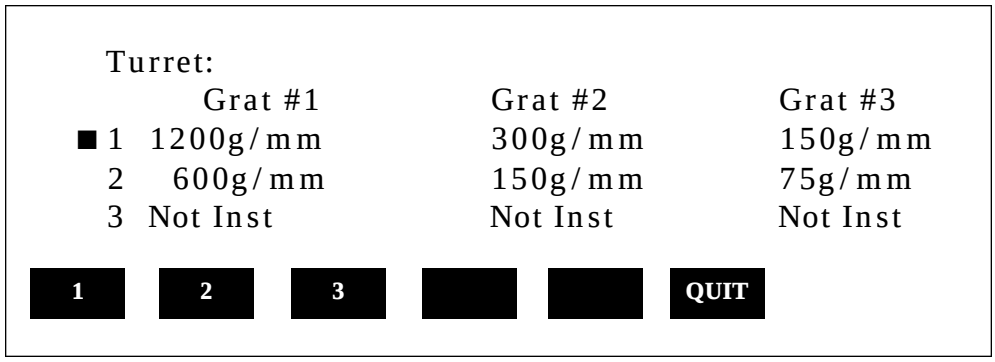
GRAT Menu

This menu shows that Grating #1 (1200g/mm, blazed at 500nm) is in the operating position. To select grating #2, press the white button under the number 2 on the display. During the 20 seconds required for a grating change, the controller displays "Changing Grating". When the change is complete, the dot (■) appears next to the #2 grating. To return back to the Main Menu, press the white key below the QUIT function. The Main Menu will now display the new grating.

TURR (Turret Change) Menu:

The SpectraPro-300i comes with a triple grating turret which accepts 1, 2 or 3 gratings. If more than 3 gratings are required, optional interchangeable turrets are available. If your SpectraPro-300i has been purchased with more than one turret (up to three turrets are possible for a total of nine gratings), you must input the appropriate turret number using the TURR menu each time a turret is changed. For example, if you switch from turret #1 to turret #2, use the TURR Menu to let the software know you made the change. This enables the SpectraPro-300i and controller to scan correctly and provide correct wavelength display.

To select the **Turret Change Menu** from the Main Menu, press the white key below TURR on the controller display. The TURR menu displays, with a dot (■), which grating turret is currently installed in the SpectraPro-300i, along with available turrets. A display of "Not Inst" means that no gratings have been installed in the specified turret position. For example, the following menu shows that turret #1 is installed with Grating #1 (1200g/mm) and Grating #2 (300g/mm). It also shows that turret #2 is available, and that #3 is not installed. To input the correct turret information, press the white key below the numbers 1, 2, or 3 (in this case, nothing will happen if you select turret 3).



TURR Menu

Press the key below the QUIT function to return to the Main Menu.

JOG Instructions:

The controller for the SpectraPro-300i allows the user to change wavelengths without accessing GOTO or SCAN, and without keying in a destination wavelength. This function is useful for rapidly scanning from one wavelength region to another, searching for the peak of a line, or accurately positioning a source image on an array detector. This function is called JOG, and it can be accessed at any time that the other functions (GOTO, SCAN, etc.) are not in operation. The controller has four direction keys marked with arrow indicators (▲,▼, ◀, and ▶). JOG operates by moving the SpectraPro-300i in wavelength increments ranging from 0.1nm to 1000nm, and also in "single motor step" increments. Pressing the UP arrow (▲) increases the JOG increment a factor of 10 each time it is pressed, while the DOWN arrow (▼) decreases the increment a factor of 10. To access the single motor step JOG, press the DOWN arrow (▼) until the increment setting decreases below 0.1nm.

JOG direction is controlled by the arrow keys marked (◀ and ▶). To JOG to increasing wavelengths (by the increment chosen), press the (◀) key. To JOG to decreasing wavelengths, press the (▶) key. If you press either key more than once, the SpectraPro-300i will move the preset JOG increment multiplied by the number of times the key is pressed. The maximum wavelength possible depends on the grating in the operating position (1400nm maximum with a 1200g/mm grating, 2800nm maximum with a 600g/mm grating, etc.). The minimum wavelength possible is -10nm for all gratings.

Section IV-C: Operating the SpectraPro-300i Using a Computer

The Acton Research Corporation SpectraPro Monochromator can be controlled from an RS232 terminal or computer using RS232 or IEEE488. The same command set, listed below, is used for both RS232 and IEEE488.

Commands can be sent as single commands or grouped in strings of commands. All commands are single words (contain no spaces) and all commands in a string are separated by at least one space. Parameters, if needed, precede the command and are separated from the command by at least one space (e.g. 546.7 GOTO).

For RS232 operation, the port set-up is 9600 baud, 8 data bits, 1 stop bit and no parity. All commands or strings of commands must be terminated with a carriage return (0D hex). The SpectraPro-300i responds to a command when the command has been completed by returning the characters **OK** followed by carriage return and line feed (hex ASCII sequence 20 6F 6B 0D 0A). The default condition is to echo each character that is sent to the SpectraPro-300i.

When using the IEEE488 (or GPIB) interface, the default device address is 11. The device address can be set to any value from 1 to 30 using the command **SET-ID.** The command **?ID** is used to read back the IEEE address. Each command or string of commands must be terminated with a carriage return (0D hex). When sending a command or string of commands, it is important to wait for the SpectraPro to complete the processing of that command string before sending another command. This is accomplished by checking the status byte. The SpectraPro controls bits in the IEEE488 status byte which can be read from the IEEE488 controller. The command for reading this status byte will be unique to your IEEE controller. For example, with National Instrument controllers, the command is IBRSP. With CEC controllers, the command is SPOLL.

IEEE488 Status Byte Bits:

Bit 0
0 = command is being processed
1 = SP-300i ready for another command

Bit 1
0 = no errors
1 = SP-300i detected an error in the command

Bit 7
0 = no response or response has been read
1 = SP-300i generated a response which is now ready to be sent

Note that with some fast computers, it is necessary to add a few milliseconds delay in your program after sending a command and before checking the status byte to allow time for the status byte to be updated.

Monochromator Wavelength Movement Commands:

GOTO Goes to a destination wavelength at maximum motor speed. Accepts destination wavelength in nm as a floating point number with up to 3 digits after the decimal point or whole number wavelength with no decimal point.

<GOTO> Same as GOTO (For compatibility with software written for previous SpectraPro models.)

NM Goes to a destination wavelength at constant nm/min rate specified by last NM/MIN command. Accepts destination wavelength in nm as a floating point number with up to 3 digits after the decimal point or whole number wavelength with no decimal point.

<NM> Same as NM (For compatibility with software written for previous SpectraPro models.)

Monochromator Wavelength Movement Commands (cont) :

>NM Similar to NM except it returns control to user immediately rather than waiting for completion of monochromator wavelength move. Can be used with **?NM** or **MONO-?DONE** below. This command must be terminated with **MONO-STOP** listed below. **NOTE:** Use the **NM** command when communication with the monochromator during the scan is not required.

?NM Returns present wavelength in nm to 0.01nm resolution with units nm appended.
E.G. ?NM 300.00 nm

MONO-?DONE Used with **>NM** command to determine if monochromator has reached the destination. Returns 0 if move is not complete, 1 if move is complete.

MONO-STOP Stops the monochromator wavelength move after use of the **>NM** command.

NM/MIN Returns present scan rate in nm/min to 0.01 nm/min resolution with units nm/min appended.
E.G. ?NM/MIN 100.00 nm/min

Grating Control Commands:

GRATING Places specified grating in position to the wavelength of the wavelength on the present grating. Up to nine (9) gratings are allowed on three (3) turrets. This command takes a grating number from 1 - 9. **IMPORTANT NOTE:** This command assumes that the correct turret is specified by the **TURRET** command. For example, using grating numbers 1, 4 and 7 will place the first grating on the installed turret into that position and call up the parameters for the grating number specified.

?GRATING Returns the number of gratings presently being used numbered 1 - 9.

?GRATINGS Returns the list of installed gratings with position groove density and blaze. The present grating is specified with an arrow.

TURRET Specifies the presently installed turret or the turret to be installed.
E.G. If installing the second turret, issue the command 2 TURRET to insure using the correct parameters.

?TURRET Returns the correctly installed turret numbered 1 - 3.

The following command is used for grating installation by ARC part #:

INSTALL Installs new grating parameters into the non-volatile memory of the SpectraPro monochromator. Uses the part # of the grating to specify the parameters.
E.G. 1-120-500 5 INSTALL places a 1200 g/mm grating blazed at 500nm into the second grating position on turret #2.

Grating Control Commands (cont) :

The following commands are used for grating installation by grating parameters:

SELECT-GRATING Specifies the grating number to be installed 1 - 9.

G/MM Specifies groove density of grating to be installed in g/mm.
E.G. 1200 G/MM

BLAZE Specifies the blaze wavelength and units of the grating to be installed with 7 characters of the user's choice. Unlike other commands, this command is issued before the parameters. After the command is issued, the SP-300i responds with **"_____"** . Seven characters are then entered (these may be numbers, letters, spaces or special characters).

UNINSTALL Used to remove a grating and its parameters from the SP-300i non-volatile memory.

Diverter Control Commands:

EXIT-MIRROR Designates the exit diverter mirror to receive the diverter control commands. This command is for SpectraPro monochromators which can accept two diverter mirrors. The SP-300i monochromators will accept this command but it is not required in these monochromators.

ENT-MIRROR Designates the entrance diverter mirror to receive the diverter control commands. This command is for SpectraPro monochromators which can accept two diverter mirrors. The SP-300i monochromators will not accept this command.

FRONT Moves the designated diverter mirror to position the beam to the front port position.

SIDE Moves the designated diverter mirror to position the beam to the side port position.

?MIRROR Returns the position of the designated diverter mirror with the responses **"front"** and **"side".**

?MIR Returns the position of the designated diverter mirror with the responses **0** for front and **1** for side.

Slit Width Control Commands:

FRONT-EXIT-SLIT Designates front exit slit to receive slit control commands. **NOTE:** The designation remains in effect until changed by another slit designator. This command does not have to be repeated until the designated slit is changed.

SIDE-EXIT-SLIT Designates side exit slit to receive slit control commands.

FRONT-ENT-SLIT Designates front entrance slit to receive slit control commands.

SIDE-ENT-SLIT Designates side entrance slit to receive slit control commands.

MICRONS Sets the slit width for the designated slit in the range of 10 to 3000 microns to 1 micron resolution.

?MICRONS Returns the slit width setting in microns to the nearest 1 micron.

GRATING CALIBRATION COMMANDS:

INIT-OFFSET Sets the offset value for the designated grating. Default values are 0 for gratings 1, 4 and 7; 1536000 for gratings 2, 5 and 8; and 3072000 for gratings 3, 6, and 9. The limits on the settings are +/- 2500 for a 1200 g/mm grating. This corresponds to an error of greater than +/- 5nm for a 1200 g/mm grating. The limits are adjusted for grating groove density, e.g. error for a 600 g/mm grating is +/- 5000. The grating density designator used with this command is grating# - 1.
E.G. 3072056. 8 INIT-OFFSET for setting offset on grating #9 - 3rd grating on turret #3.
NOTE: This command requires a decimal point after the offset value.

INIT-SP300-OFFSET Same as INIT-OFFSET above except no decimal point is used after the offset value.
E.G. 3072056 8 INIT-SP300-OFFSET

INIT-GADJUST Sets grating adjustment value for the designated grating. Default values are 10000 for all gratings. The limits on the parameter for this command are +/- 1000 for all gratings. The grating designator used with this command is the grating # - 1.
E.G. 9993 1 INIT-GADJUST for setting gadjust on the second grating of turret #1.
NOTE: This command is to maintain compatibility with previous SpectraPro applications. For new applications, use the INIT-SP300-GADJUST command below.

INIT-SP300-GADJUST Sets grating adjustment value for the designated grating. Default values are 1000000 for all gratings. The limits on the parameter for this command are +/-100000 for all gratings. The grating designator used with this command is the grating# - 1.
E.G. 999322 4 INIT-SP300-GADJUST for setting gadjust on the second grating of turret #2.

MONO-EESTATUS Returns setup and grating calibration parameters for all gratings.

RESTORE FACTORY SETTINGS Returns all parameters including grating calibration parameters to the original factory calibrated settings. **NOTE:** This command will overwrite any calibration parameters set by the user.

MONO-RESET Initializes SpectraPro monochromator. Necessary after using INIT-OFFSET, INIT-GADJUST or INIT-SP300-GADJUST.

HELLO Same as MONO-RESET. Used to maintain compatibility with existing applications.

MODEL Returns model number of SpectraPro monochromator.
E.G. MODEL SP-558

SERIAL Returns serial number of SpectraPro monochromator. Format is 7 digits with the first 3 digits being the model #.
E.G. SERIAL 3060232

The following are the Start-Up parameters and their default values:

Default Values:

TURRET	#1
GRATING	#1
WAVELENGTH	0.0 nm
SCAN SPEED	100.0 nm/min

INIT-GRATING Selects which of the three gratings on the installed turret the SpectraPro will go to after finding 0.0 nm on the first grating of the installed turret.
E.G. 2 INIT-GRATING selects the second grating as the default. Accepts values 1 - 9.

INIT-WAVELENGTH Sets an initial wavelength for the SpectraPro after initialization.
E.G. 435.84 INIT-WAVELENGTH

INIT-SRATE Sets an initial scan rate for the SpectraPro.
E.G. 500.0 INIT-SRATE

Section IV-D: Focusing and Alignment of Array Detectors

With the array detector properly mounted to the SpectraPro-300i, use the following procedure to align and focus the array detector to the SpectraPro-300i optical system. It is assumed that the array detection system is running for the following procedure.

1. Mount a light source such as a mercury pen-ray type to the entrance slit of the SpectraPro-300i. ARC offers a standard mercury lamp, Model MS-416, designed for this purpose. Any light source with line output can be used. If there are no "line" sources available, it is possible to use a broad band source such as tungsten for the alignment. If this is the case, use only a wavelength setting of 0.0nm for alignment purposes.

2. With the SP-300i properly connected to the controller or computer, turn the power ON and move the spectrograph to a wavelength of 435.8 nm if using a mercury lamp, or 0.0 nm for a broad band source, or another wavelength corresponding to a spectrum produced by another "line" source.

3. With the array detector operating, check the image of the light source if running in an imaging mode with a CCD. Otherwise check the line intensity and shape.

4. Using a 1/8" allen wrench, loosen the two (2) #10-32 set screws (approximately 2 turns) located on the top and side of the front plate, and slowly slide the array detector IN or OUT until the sharpest image is achieved, or the sharpest line is achieved.

CAUTION: **The set screws must be loose when turning the thumb wheel adjustment, or severe damage will occur. The distance between the edge of the array detector mounting flange and the instrument MUST NOT exceed .33".**

5. Move the thumb wheel until it just makes contact with the array detector mounting flange. This enables you to rotate the detector without changing the focus position. Rotate the detector for correct alignment. The thumb wheel adjustments may be used to precisely position the detector - one eighth of a turn of the thumb wheel changes the detector position by approximately 1/10th of a millimeter.

6. After each adjustment, ensure the array detector mounting flange is in contact with the thumb wheel and the two (2) push screws. Tighten the #10-32 set screw on the top of the front plate first, and then tighten the one on the side to secure the detector.

7. Best spectral resolution is obtained when the array detector is aligned to the SpectraPro-300i. The light source can be removed if desired, and replaced by fiber optics or other light sources.

8. If fibers or other imaging optics are used to bring light into the SpectraPro-300i, they may require adjustment along the optical axis to achieve best vertical image quality.

Section IV-E: Converting the SpectraPro-300i from Monochromator to Spectrograph, or Spectrograph to Monochromator

Monochromator to Spectrograph: This procedure requires that you have the monochromator version, Model SP-305, plus the array detector mounting flange.

1. Loosen the two (2) set screws.

2. Remove the four (4) 8-32 socket head cap screws (SHCS) which secure the exit slit to the SpectraPro-300i housing. Details of the slit assemblies can be found in the drawing located in the Appendices Section.

3. Gently slide the slit assembly out of the SpectraPro-300i housing and store in a clean, dry area. The exit slit assemblies are attached to a sliding tube which is removed along with the slit body.

4. Slide the array detector mounting flange into the SpectraPro-300i housing so that it rests against the housing. It may be necessary to turn the focus-stop thumb wheel counter clockwise so that it does not interfere with the array detector mounting flange.

5. The SpectraPro-300i has now been converted from monochromator to spectrograph.

6. Refer to Sections III-E “Mounting Focal Plane Detectors...”, and IV-D “Focus and Aligning Array Detectors” for actual mounting, alignment, and focus of array detectors.

Spectrograph to Monochromator : This procedure requires that you have the spectrograph version, Model SP-306, plus the Model SP-716-2 exit slit assembly.

1. Loosen the two (2) set screws and gently slide the array detector mounting flange out of the SpectraPro-300i housing.

2. Remove the array detector if attached, then store the array detector mounting flange in a clean, dry place.

3. Locate the Model SP-716-2 exit slit assembly, then gently slide it into the SpectraPro-300i housing until it rests against the housing. Exit slit assemblies are attached to a sliding tube to fit the SpectraPro-300i housing.

4. Using four (4) 8-32 socket head cap screws (SHCS), secure the slit assembly against the SpectraPro-300i housing. There are four (4) tapped holes in the SpectraPro-300i housing to facilitate mounting the exit slit.

Note: The slit aperture is slightly offset in the slit assembly. It should be oriented so that the aperture is on the upper side when properly mounted to the SpectraPro-300i. On the bilateral slits, the micrometer points upward. On the fixed slit assemblies you should be able to read the slit width marking (it will be upright). Please refer to the drawing in the appendices section of this manual for correct orientation if necessary.

5. The SpectraPro-300i has now been converted from spectrograph to monochromator .

V. Appendices and Schematic Drawings

Appendix V-A: Selecting Alternate Start-Up Parameters

The following are the Start-Up parameters and their default values:

GRATING	#1
WAVELENGTH	0.0 nm
SCAN SPEED	100.0 nm/min

Each of the above may be changed through the RS232 port or IEEE488 port using the following commands. These values are stored in non-volatile memory and will be in effect after the next power-up.

INIT-GRATING Selects which of the two gratings on the installed turret the SpectraPro-300i will go to after finding 0.0 nm on the first grating.
E.G. 2 **INIT-GRATING** selects the second grating as the default

INIT-WAVELENGTH Sets an initial wavelength for the SpectraPro-300i after initialization.
E.G. 435.84 **INIT-WAVELENGTH** Notice that two digits after the decimal point are required

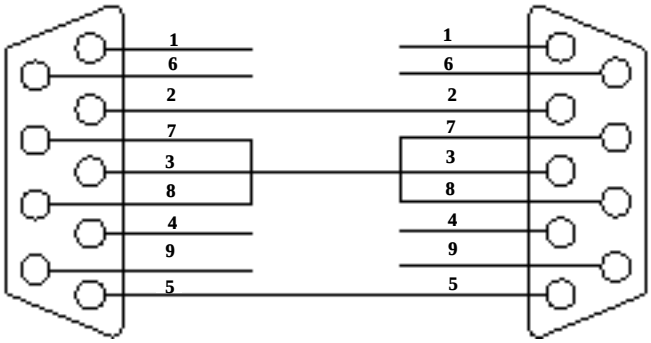
INIT-SRATE Sets an initial scan rate for the SpectraPro-300i.
E.G. 500.00 **INIT-SRATE** Notice that two digits after the decimal point are required

The following command is used to return all grating parameters and start-up parameters to the original factory settings.

Note that any gratings installed at a later date (after initially receiving the SpectraPro-300i) will be erased from memory using this “restore command”.

RESTORE-FACTORY-SETTINGS Returns all parameters, including grating calibration parameters, to the original factory calibrated settings. **NOTE**: This command will overwrite any calibration parameters set by the user.

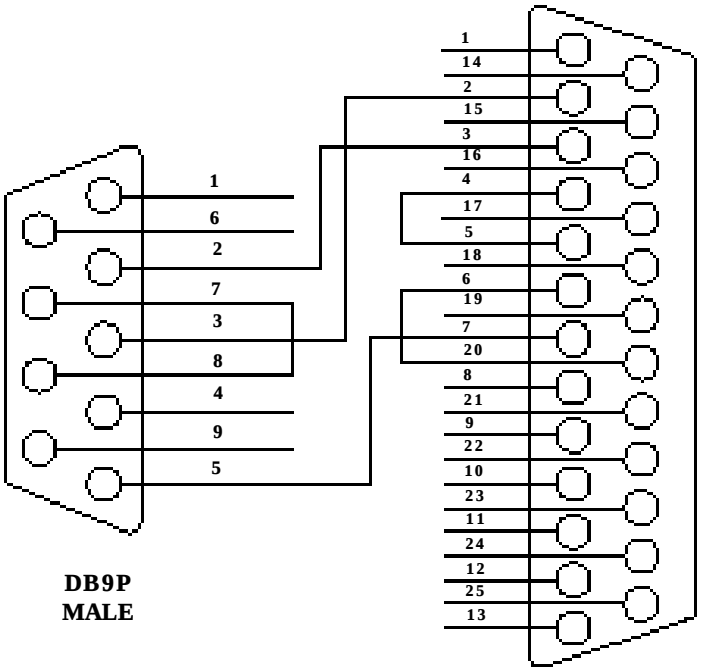
Appendix V-B: Cable Connection Diagrams - SpectraPro-300i Monochromators & Spectrographs To Various Computers



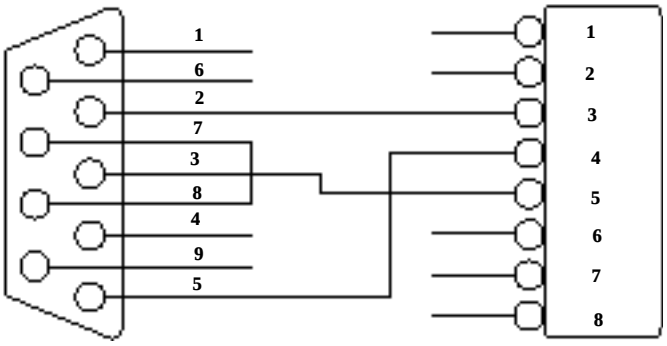
DB9P
MALE

SpectraPro-300i to PC-AT or Compatible

SpectraPro-300i to PC-XT or Terminal



DB9P
MALE

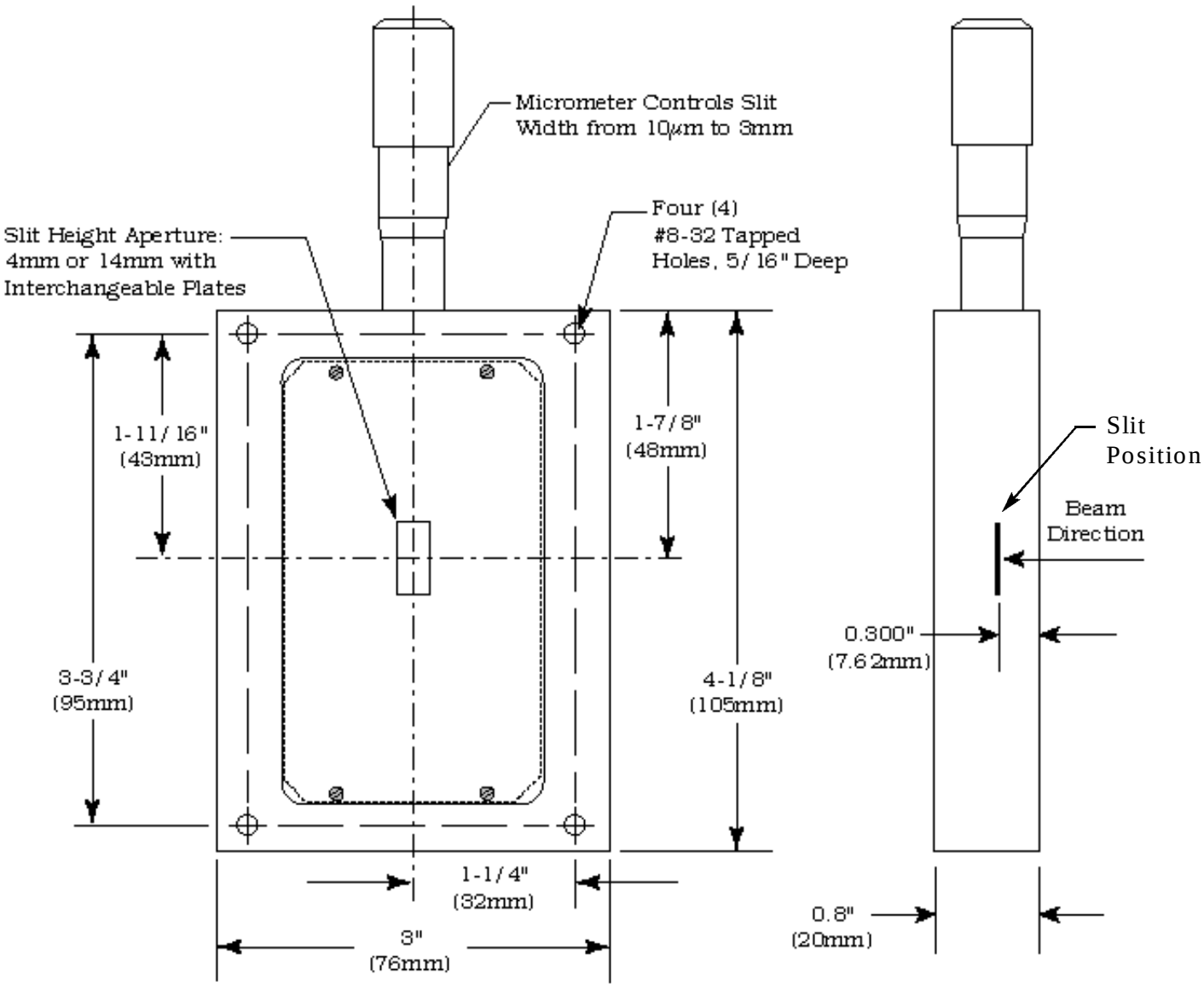


DB9P
MALE

8 PIN
MALE

SpectraPro-300i to Macintosh Computer (Modem or Printer Port)

Appendix V-C: Standard SpectraPro Slit Assembly Drawing



Appendix V-D: Accessories Listing

SpectraPro-300i Monochromators & Spectrographs

SP-305 **SpectraPro-300i, 300mm Monochromator** with micrometer adjustable entrance/exit slits, 90° optical path, internal image correction with original polished aspheric optics, a triple grating turret, exclusive SpectraDrive™ stepping motor scanning system with 32-bit microprocessor control, RS232 and IEEE488 computer interfaces, plus scan control software for Windows. Computer with RS232 or IEEE488 and gratings are required for operation.

SP-306 **SpectraPro-300i, 300mm Spectrograph:** Same as above Model SP-305, except with micrometer controlled entrance slit, 14mm X 27mm focal plane, sliding tube CCD adapter with exclusive focus stop and standard multichannel detector adapter flange. Provides a 90° optical path.

SP-307 **SpectraPro-300i, 300mm Dual Exit Port Monochromator:** Same as SP-305, except with micrometer controlled entrance slit, two micrometer controlled exit slits and a motorized exit port selection mirror. Provides 90° and 180° optical paths.

SP-308 **SpectraPro-300i, 300mm Monochromator/Spectrograph:** Same as SP-305, except with micrometer controlled entrance and exit slits 180° apart, motorized port selection mirror and multichannel detector adapter on 90° port.

Remote Scan Controller

300-749 **Remote Scan Controller with Software:** Functions include scanning, change of scan speeds, wavelength readout in nanometers, GOTO, and grating selection. Includes controller (H-P Graphics Calculator with RS232 output port), 5 foot long connecting cable and dedicated scan control software.

Assemblies: Bilaterally Adjustable and Fixed Width

SP-716-1 **Bilaterally adjustable ENTRANCE slit assembly** for SpectraPro-300i monochromator or spectrograph. Micrometer adjustable widths from 10µm to 3mm. Supplied with interchangeable 4.0mm and 14.0mm high baffles.

SP-716-2 **Bilaterally adjustable EXIT slit assembly** with adapter for SpectraPro-300i monochromator. Micrometer adjustable widths from 10µm to 3mm. Supplied with interchangeable 4.0mm and 14.0mm high baffles.

Triple Grating Turret

GT-483 **Optional interchangeable triple grating turret** for the SP-300i. Must be specified at time of SpectraPro manufacture. Includes second turret, requires gratings.

Other SpectraPro Monochromators & Spectrographs

SP-150-M **SpectraPro-150, 150mm Monochromator** withinternal image correction with original polished aspheric optics, interchangeable dual grating turret, exclusive SpectraDrive™ stepping motor scanning system with 32-bit microporcessor control, Rs232 and IEEE488 computer interfaces, micrometer controlled entrance and exit slits, 90• optical path and scan control software for Windows. Gratings are required for operation.

SP-150-S **SpectraPro-150 150mm Spectrograph**: Same as above with a standard multichannel detector adapter flange on exit port. Provides a 90° optical path.

SP-555 **SpectraPro-500i: 500mm Monochromator:** Base instrument with 90˚ optical path, direct digital wavelength drive, Autotrack™ electronics, built-in RS232 and IEEE488 computer compatibility and triple indexable grating mount with one triple grating turret. Requires grating(s), entrance slit, exit slit, and a #300-749 remote scan controller or computer for operation. Includes PC-based software for control of SpectraPro-300i.

SP-556 **SpectraPro-500i: 500mm Spectrograph:** Same as above, with an array detector mounting flange mounted on the exit port, compatible with standard Princeton Instruments, EG&G PARC, or Photometrics (Spectra 9000 type) array detectors.

SP-557 **SpectraPro-500i: 500mm Dual Exit Port Monochromator**: Same as SP-555, with a micrometer controlled entrance slit, two micrometer controlled exit slits and a motorized exit slit selection mirror. Provides 90° and 180° optical paths.

SP-558 **SpectraPro-500i: 500mm Monochromator/SpectroGraph**: Same as SP-555, with micrometer controlled entrance and exit slits 180° apart, motorized exit port selection mirror and a multichannel detector adapter flange on end port.

SP-755 **SpectraPro-750, 750mm Monochromator** with a triple indexable grating turret, micrometer controlled entrance and exit slits 180° apart, exclusive SpectraDrive™ stepping motor scanning system, remote scan controller with RS232 computer interface (IEEE488 optional), plus scan control software for Windows. Gratings are required for operation.

SP-756 **SpectraPro-750, 750mm Spectrograph**: Same as above, with micrometer controlled entrance slit and standard multichannel detector adapter flange on exit port. Provides a 90° optical path.

SP-757 **SpectraPro-750, 750mm Dual Exit Port Monochromator**: Same as SP-755, with micrometer controlled entrance slit, two micrometer controlled exit slits and an exit slit selection mirror. (90° and 180° optical path).

SP-758 **SpectraPro-750, 750mm Monochromator/Spectrograph**: Same as SP-755, with micrometer controlled entrance and exit slits 180° apart, exit port selection mirror and a multichannel detector adapter flange on end port.

Light Sources

MS-416 **Low Pressure Mercury Light Source** with power supply and mounting flange for SpectraPro monochromators and spectrographs. Provides output at typical mercury wavelengths (line output).

DS-421 **30 Watt Deuterium Light Source** with housing, power supply, mounting flange, and light collection mirror. Provides output from 190 to 350nm.

Light Sources (cont.)

TS-425 **30 Watt Tungsten-Halogen Light Source** with housing, power supply, mounting flange, and light collection mirror. Provides output from 350nm to >2.0µm

TS-428 **250 Watt Tungsten-Halogen Light Source** with housing, AC power supply, mounting flange, variable brightness control and light collection mirror. Provides output from 350nm to >2.0µm.

TS-428-DC **Same as TS-428** with Regulated DC Power Supply .

TDS-429 **Dual Light Source** with 30 watt deuterium & 30 watt tungsten-halogen lamps. Includes housing with light collection mirror, mounting flange, and power supply. Provides combined output from 190 to >2.0µm.

XS-432 **75 Watt Xenon Light Source** includes power supply, housing, mounting flange and light collection mirror. Provides continuous spectral output from 190nm to 750nm and declining continuum out to 2.6µm.

IS-434 **Infrared Source** for wavelength region 2.6-16 microns includes silicon carbide resistor, housing, mounting flange, light collection mirror and power supply.

Detectors and Accessories

PD-438 **Universal Photomultiplier Tube Housing** for standard 1 1/8" side window photomultiplier tubes. Requires side window PMT, and photometer/power supply for operation. Accepts ARC tubes P1, P2 or P3 below, or customer specified 1 1/8" side window PMTs.

PD-439 Same as PD-438 above, also includes integrated **light tight shutter.**

P1 **IP28 side window photomultiplier tube** (or equivalent) for wavelength region 185-650nm. Fits PD-438 or PD-439 housing.

P2 **R928 side window photomultiplier tube** (or equivalent) for wavelength region from 185-900nm. Fits PD-438 or PD-439 housing.

P3 **R5108 side window photomultiplier tube** (or equivalent) for wavelength region from 300-1100nm. Fits PD-438 or PD-439 housing.

ID-441 **InGaAs Detector**, includes pre-amplifier, uncooled version.

ID-441-C **InGaAs Detector,** includes pre-amplifier, cooled version, requires either Model 442-1 or 442-1A thermoelectric cooling for operation.

ID-442 **Infrared Detection Assembly (PbS)** with housing, power supply, and mounting flange for SpectraPro-300i, for wavelength region from 1.1 - 2.9 microns. (Requires 442-2 preamplifier or customer supplied pre-amplifier for operation).

442-1 **Thermoelectric cooling** for ID-441 or ID-442 detectors; includes direct temperature readout.

442-1A **Thermoelectric cooling** for ID-441 or ID-442 detectors.

442-2 **Preamplifier** for ID-442 detection assembly.

ID-443 **IR Detection Assembly (InSb)** for 1.5 to 5.0 microns. Includes detector housing, pre-amplifier, and dewar.

Detectors and Accessories (cont.)

ID-444 **MCT IR Detector** (Mercury Cadmium Telluride). Covers 2 - 15 µm, includes power supply, LN2 dewar and pre-amplifier.

SC-1 **SpectraCard data acquisition system**, 16-bit PC expansion card with Windows data acquisition software.

Filter Wheels and Order Sorting Filter Assemblies

FA-448 **Six Position Filter Wheel Assembly**. Manual sample indexing, holds up to six samples, each 1.0" diameter.

FA-448-1 **Order Sorting Filter Assembly**. Includes 320nm, 590nm, 665nm, and 715nm filters mounted in FA-448 filter wheel. Manual indexing of filters for elimination of unwanted second order radiation.

FA-448-2 **Motorized Six Position Filter Wheel Assembly,** with stepping motor and FA-448-4 controller. Enables indexing via thumb wheel control, or by computer with RS232. Requires computer with RS232 for computerized operation.

FA-448-3 **Motorized Order Sorting Filter Assembly.** Includes 320nm, 590nm, 665nm,and 715nm filters mounted in FA-448-2 filter wheel. Enables computer controlled indexing of order sorting filters for elimination of unwanted second order radiation. Requires computer with RS232 for operation.

FA-448-4 **Controller Only** for FA-448 or 448-1 filter wheel assemblies. Retrofit kit which enables changing the FA-448 or 448-1 from manual to computer controlled indexing. Requires FA-448 type filter wheel and computer with RS232 for operation.

488-03 **IEEE488 Interface option** for Models FA-448-2, FA-448-3 and FA-448-4.

Software

SW-417 **Data Acquisition Software Package:** ARC data acquisition and scan control software with graphical user interface. Functions include spectral data acquisition, reflectance, transmittance, plus storage and printing of acquired data. Data saved in ASCII format. Requires ARC monochromator with SpectraDrive (SD-748) scan system, PS-445 detector readout system, PMT detector and a 486 or higher PC-computer with Windows operating system for operation. Pentium highly recommended for optimum performance.

Fiber Optic Light Guides: All Fiber optic light guides contain 19 fibers, 200µm diameter, arranged in a line pattern at the slit end, and round at the source end.

LG-455-020-1 UV-VIS Fiber Optic Bundle 1.0 meter long, for 190nm to 1100nm. Requires mount.

LG-455-020-3 UV-VIS Fiber Optic Bundle 3.0 meter long, for 190nm to 1100nm. Requires mount.

LG-456-020-1 VIS-NIR Fiber Optic Bundle 1.0 meter long, for 400nm to 2200nm. Requires mount.

LG-456-020-1 VIS-NIR Fiber Optic Bundle 3.0 meter long, for 400nm to 2200nm. Requires mount.

FC-446-020 Slit mount with horizontal translation capability for 10mm diamter fiber optic bundle.

Connecting Cables

CC-499-1 Cable for IBM-PC or XT compatible computer. 25 pin **female** connector to 9 pin **male** connector.

CC-499-2 Cable for IBM-PC AT or compatible computer. 9 pin **female** connector to 9 pin **male** connector.

CC-499-3 Computer terminal type connector. 25 pin **male** connector to 9 pin **male** connector.

CC-499-4 9-pin cable for Macintosh computer.

CC-499-5 IEEE488 cable, 4 meters long.

If the above cables are not compatible with your system, contact ARC for a custom cable.

Gratings for SpectraPro-300i

Grooves/mm	Blaze Wavelength	Part Number
20	45µm	1-002-45
75	8µm	1-075-8
50	12µm	1-050-12
150	500nm	1-015-500
150	4µm	1-015-4
300	300nm	1-030-300
300	500nm	1-030-500
300	2µm	1-030-2
600	300nm	1-060-300
600	1µm	1-060-1
600	1.6µm	1-060-1.6
1200	300nm	1-120-300
1200	500nm	1-120-500
1200	750nm	1-120-750
1200	holographic †	1-120-HUV
1200	holographic ††	1-120-HVIS
1800	250nm	1-180-250
1800	500nm	1-180-500
2400	240nm	1-240-240
2400	holographic †††	1-240-H
3600	240nm	1-360-240

NOTES:

† Blazed Holographic, 190-400nm optimum range

†† Blazed Holographic, 450-1400nm optimum range

††† Blazed Holographic, 190-400nm optimum range

Gold coated optics are available on request.

Ordering Information

Telephone Orders
Telephone orders may be placed between 7:30AM and 5:00PM EST. Written "Confirmations" are required on all verbal orders.
Telephone: (978) 263-3584

Fax Orders
Orders may be placed by fax with written confirmation. Please include complete name and address with these orders
FAX: (978) 263-5086

MasterCard / VISA
MasterCard & VISA accepted for purchases.

Written Orders
Submit all written orders to our mailing address:

Acton Research Corporation
P.O. Box 2215
Acton, MA 01720
U.S.A.

Orders accepted subject to current pricing. All orders FOB Acton or shipping charges & insurance added separately.

• SpectraPro® is a registered trademark of Acton Research Corporation •

Appendix V-E: Certification and Warranty

Certification

Acton Research Corporation (ARC) certifies that this instrument was thoroughly tested and inspected and found to meet the specifications furnished by ARC when it was shipped from the factory.

Warranty

Acton Research Corporation (ARC) instruments and accessories are warranted for a period of one full year from date of delivery to be free from defects in material and and to conform to the specifications furnished by ARC. The corporation's obligation under this warranty is limited to servicing or adjusting an instrument returned to the factory, prepaid, and to repairing or replacing at the factory any part or parts thereof. All purchased items carry the original manufacturers warranty.

Acton Research Corporation shall not be liable for consequential damages resulting from accident, alteration, misuse, improper installation, operation on low or excessive voltages or any use in violation of the operating instructions furnished by ARC.

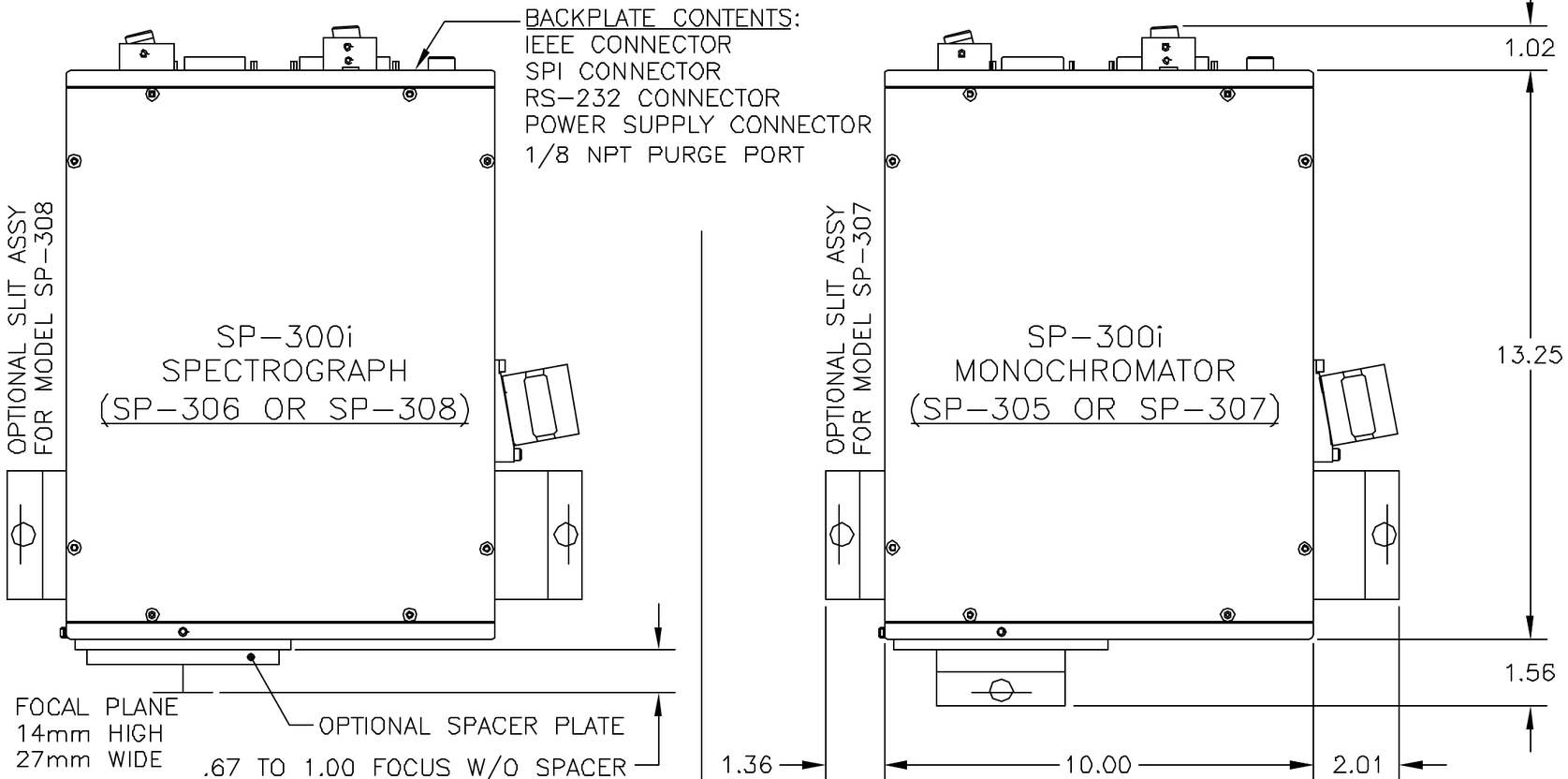
If any defect appears within the warranty period, the purchaser shall promptly notify ARC. No material will be accepted for repair or replacement without prior authorization from ARC. Upon such authorization and in accordance with instructions of Acton Research Corporation, parts, materials or equipment for which repair or replacement is requested shall be returned to ARC for examination, with shipping charges prepaid by the purchaser. Final determination as to whether a product or part is actually defective rests with Acton Research Corporation.

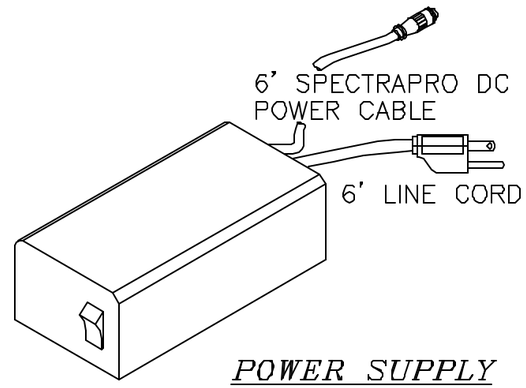
In such cases where necessary repairs are not covered by this warranty, an estimate of repair charges will be submitted to the purchaser before servicing the equipment.

Acton Research Corporation reserves the right to make changes or improvements upon its products without imposing any obligations upon itself to install the same upon its products previously manufactured.

This warranty is expressly in lieu of all other obligations or liabilities on the part of ARC, and ARC neither assumes, nor authorizes any other person to assume for them, other obligations or liability in connection with the sale of equipment manufactured by Acton Research Corporation.

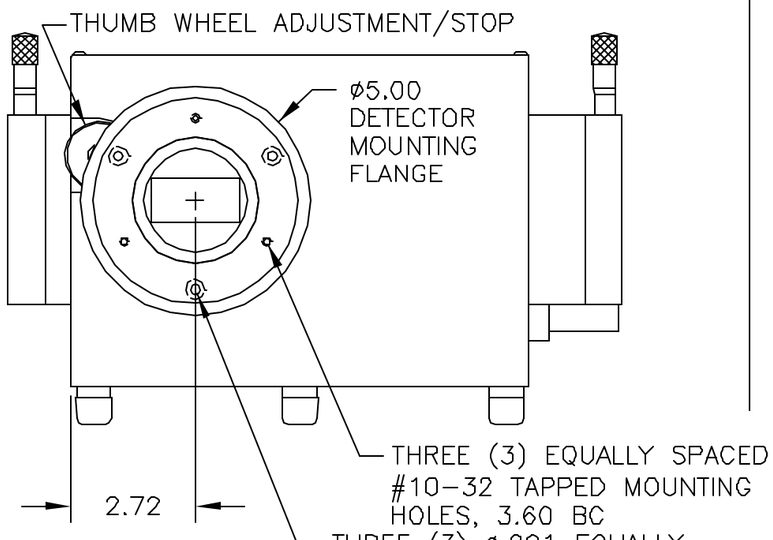
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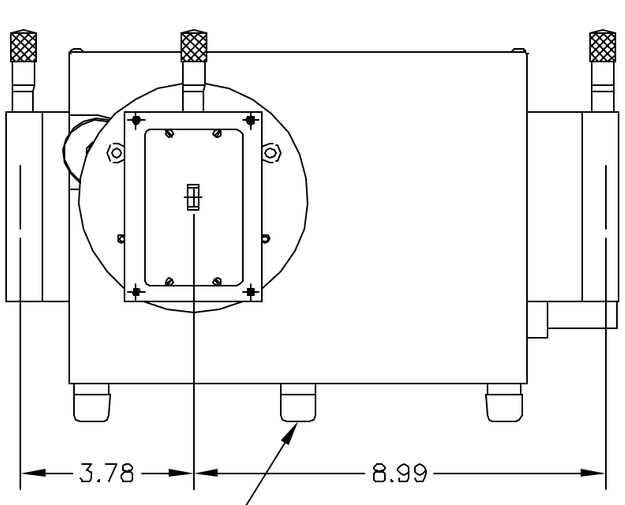


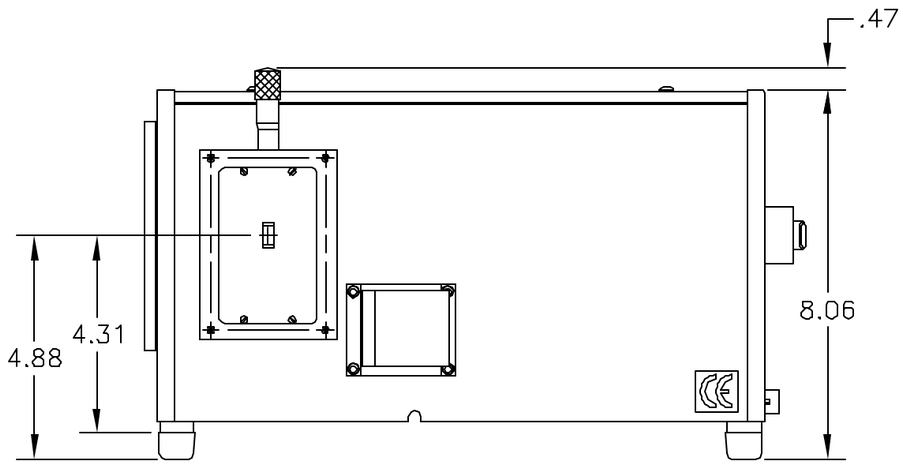


POWER SUPPLY

APPROXIMATE WEIGHT: 35 LBS (15.9 Kg)



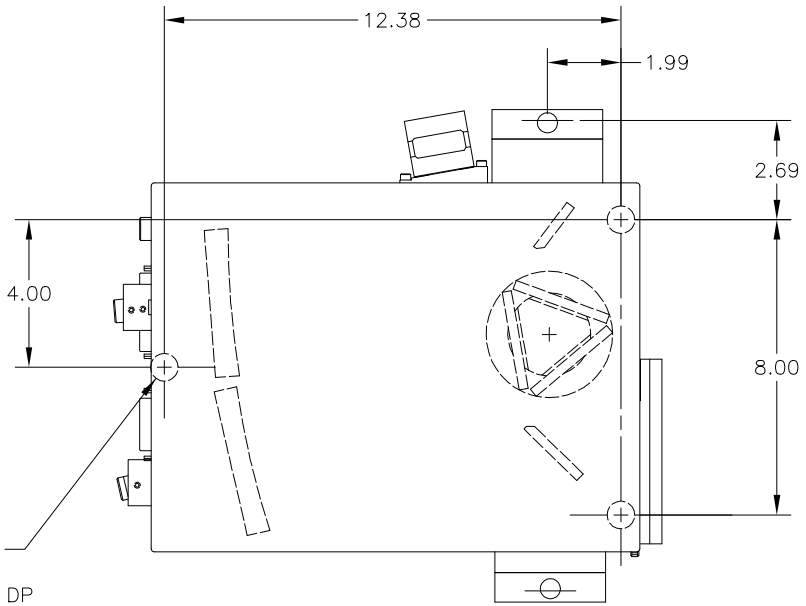




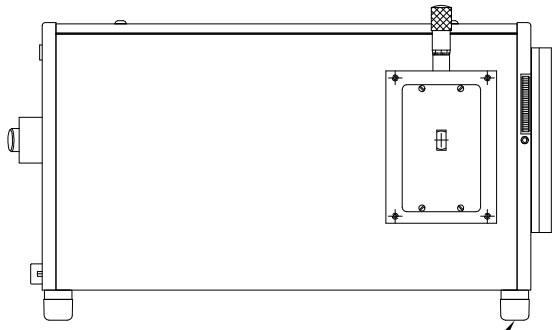
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DATE: 5-14-96		QTY: 1
ACTON RESEARCH CORPORATION		BOX 2215/525 MAIN ST. ACTON, MA 01720
DWG. TITLE: SPECTRAPRO 300i	DWG NO.: 8430-000-30	REV.

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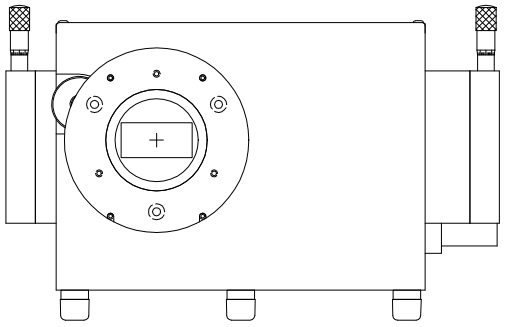
REV	DESCRIPTION	DATE
1	UPDATED SUPPORT PAD DIMENSIONS	6-14-96



LOCATION OF THREE (3) SUPPORT PADS ON THE BOTTOM SURFACE WITH #8-32 TAPPED HOLES, 3/8 DP



THREE (3) RUBBER SUPPORT PADS



SCALE: NONE	DIMENSIONS ARE IN INCHES	DRAWN BY: MEM
DATE: 6-5-96		QTY: 1
ACTON RESEARCH CORPORATION		BOX 2215/525 MAIN ST. ACTON, MA 01720
DWG. TITLE: SP-300i SUPPORTS	DWG NO.: 8430-000-31	REV.: 1

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