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Operating Instructions
ARC Model AM-510
1.0 Meter Scanning Monochromator

Ver. 2.0

SECTION 1: INDEX TO INSTRUCTION MANUAL

SECTION 2: UNPACKING AND INSTALLATION

Unpacking Instructions

1. Open boxes and inspect all items for damage. Report any damage or discrepancies immediately to the carrier, and Acton Research Corporation (ARC).

2. While the boxes are designed for safe shipment of the equipment, they are not intended for extended storage of the equipment supplied. If the equipment is to be stored for extended periods of time, keep the equipment in a clean, temperature controlled, and dry environment.

3. Remove packing material from the top of the large instrument container.

4. Carefully lift the instrument at its sides and by its base. Place the instrument on an optical table that is free from mechanical vibrations. Refer to figure 1, Section 7.

DO NOT LIFT INSTRUMENT BY THE SLIT ASSEMBLIES OR THE STEPPING MOTOR HOUSING.

Installation:

To insure safe shipment of the monochromator, several parts have been mechanically tied down by rubber bands or clips. The "tie-downs" must be removed before operation of the instrument.

Grating Drive Assembly:

First, remove the tie downs for the grating drive assembly, using the following procedure:

A. Remove grating/screw access cover “A” as shown in Figure 1. Refer to figures 2-2 and 2-3 in this section. Become familiar with the various components as labeled on the figures.

B. Remove the two 10-32 nuts which secure the screw cover. CAUTION: DO NOT LOOSEN OR REMOVE ANY OTHER SCREWS. Carefully lift up on the screw cover and remove it from the instrument.

CAUTION: THE PRECISION DRIVE SCREW CAN BE PERMANENTLY DAMAGED IF ANYTHING COMES INTO CONTACT WITH IT. THEREFORE, DO NOT ALLOW ANYTHING TO CONTACT THE PRECISION DRIVE SCREW.

Assure that the studs and spacers remain on the bearing blocks (figure 2-3) as the screw cover must be replaced.

C. Observe that the grating sine bar is held against the grating drive block with elastic bands. Additionally, a shipping pad has been placed between the sine bar and drive block. (figure 2-3) cut and remove the elastic bands from the sine bar. Push the lever arm away from the driving block and remove the shipping pad. CAREFULLY AND SLOWLY allow the lever arm to move back and contact the driving block.

CAUTION: DO NOT ALLOW THE LEVER ARM TO STRIKE THE DRIVING BLOCK WITH ANY FORCE.

The tie downs for the grating drive assembly are now removed.

D. Replace the screw cover (figure 2-2) and grating/screw access cover “A”, Figure 1.

Mirrors:

Mirror shipping covers have been placed in front of the mirrors to prevent damage to the mirrors during shipment. Remove the mirror shipping covers using the following procedure:

A. Remove mirror access cover “B” as shown in Figure 1..

B. Locate the two mirror assemblies, as shown in figure 2-1 in this section. The mirrors have been covered with protective aluminum covers, held in place by elastic bands secured with tape. Remove the tape from both mirror covers. With one hand, hold the aluminum cover against the mirror holder, and with the other hand cut and remove the elastic bands. Now the aluminum cover can be removed, exposing the mirror surface. Repeat for the other mirror cover. NOTE: Do not loosen any screws.

CAUTION: Do not breathe over or contact the mirror surfaces in any manner or permanent damage to the optical surface will occur. Replace the instrument access cover.

Optional Side Ports and Slits:

Instruments supplied with optional side ports or slits normally include movable beam-diverter mirrors, located inside the instrument chamber. The movable diverter mirror is identifiable by a beam-diverter knob on the top of the chamber. Refer to Figure 1. Movable diverter mirrors are shipped with the mirrors mechanically held in place by a retaining clip. Remove the clip using the following procedure:

Movable Diverter Mirrors (Optional)

A. Remove access cover from the top of the instrument "A" (figure 1), and locate the beam-diverter mirror.

B. Locate the one red colored socket head cap screw with the bronze clip under it. Loosen and remove the red socket head cap screw and bronze clip. These are used for shipping purposes only and are not required for operation.

C. Refer to figure 1, Section 7 and remove the tape from the beam-diverter knob.

D. Replace the access cover.

SD2 Connections:

Locate the SD2 controller, two interconnecting cables, a power supply and power cable. Connect the cable with the 15 pin connectors to the Instrument and SD2. Assure the switch on the power supply is OFF and connect it to the SD2. Connect the power supply to a proper power source.

If the SD2 is to be controlled from a customer supplied computer, use the remaining cable to connect the SD2 to the computer. If the SD2 is to be controlled by a hand held controller, connect the cable supplied with the hand held controller to the SD2.

Purging Ports:

Purging ports are provided in each end of the instrument housing. The ports are 1/8 NPT.

FIGURE 2-1

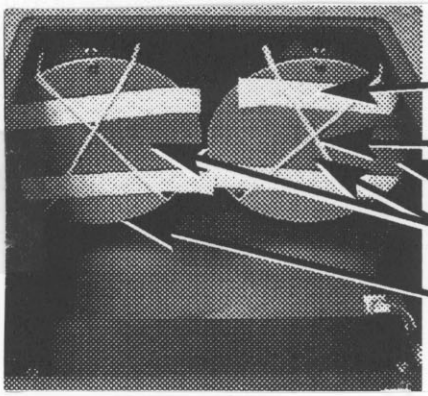
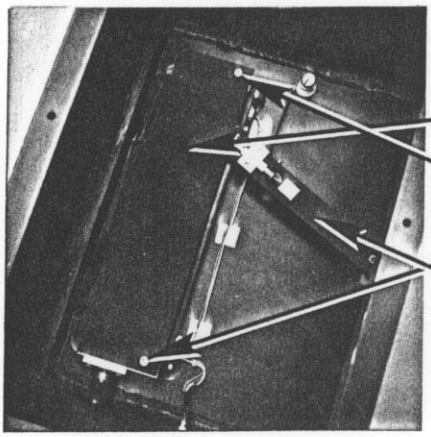
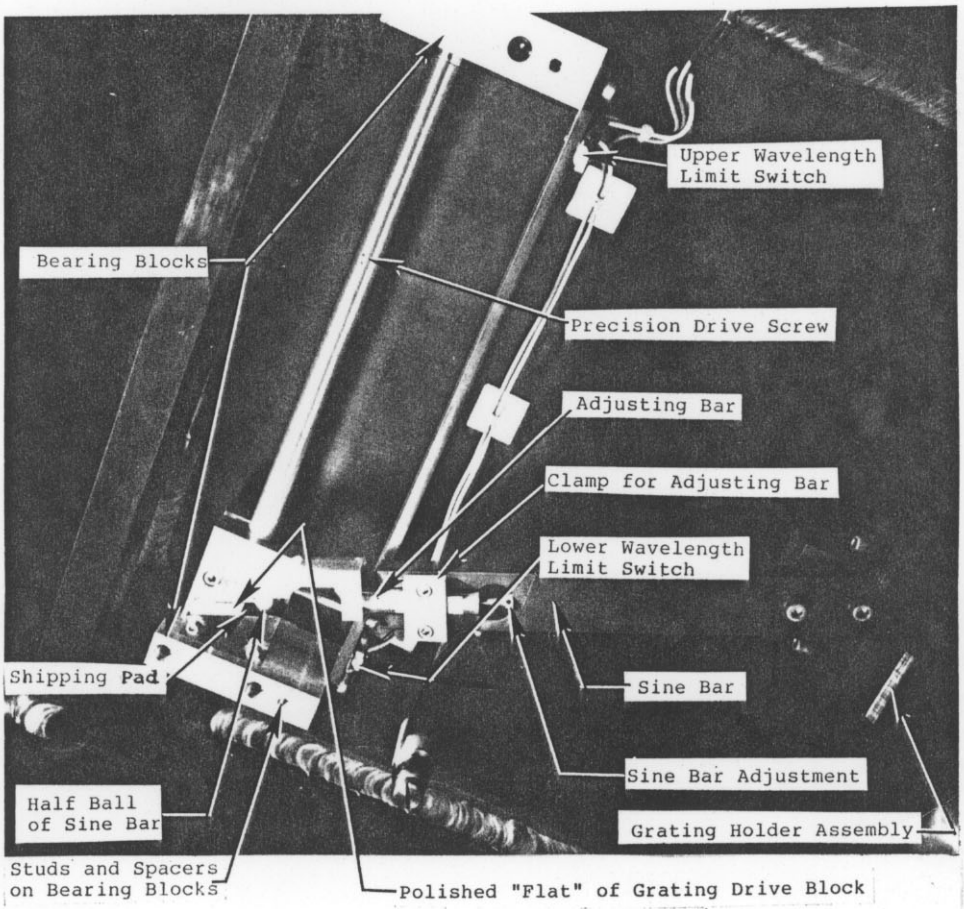


FIGURE 2-2



NOTE: This is a photograph of a typical instrument. Actual instrument supplied may vary

FIGURE 2-3



SECTION 3: AM-510 SPECIFICATIONS

Description: The ARC Model AM-510 is a 1.0 meter Czerny-Turner scanning monochromator, designed for use from 185nm to 72µm with available gratings and optical coatings.

Focal Length: Nominal 1.0 Meter

Optical System: Czerny-Turner

Aperture Ratio: f/8.7 with standard 110 X 110mm gratings

Reciprocal Linear Dispersion: Nominally 0.833 nm/mm, with a 1200 g/mm grating, in the first order.

Wavelength Range: Mechanical scanning range is zero order to 1200nm, with a 1200 g/mm grating installed.

Optical Coatings: The standard optical coating on mirrors is a high efficiency Al+MgF2 coating (ARC #2000). Other optical coatings are also available.

Grating Assembly: The grating assemblies are "snap-in" types (figure 5), which allows gratings to be easily interchanged without requiring realignment of the monochromator.

Scanning Mechanism: A sine drive mechanism provides a linear wavelength change with the rotation of a precision lead screw. A Model SD2 controller is provided for scanning drive control using a computer (customer provided). The SD2 can also be controlled by an optional hand held scan controller.

Slits: Bilateral slits are supplied (figure 1), offering precision micrometer controlled slit width adjustment from 5µm to 3 mm. The micrometer is graduated in 10µm increments, therefore each division of the micrometer equals a 10µm change in slit width. The slit height is manually adjustable from 0-20mm.

Grating (G/mm)	Reciprocal Linear Dispersion (nm/mm)	Range (nm)
150	6.66	0-9600
300	3.33	0-4800
600	1.67	0-2400
1200	0.833	0-1200
1800	0.555	0-800
2400	0.417	0-600
3600	0.277	0-400

SECTION 4: PROCEDURE FOR INSTALLATION OF ARC SNAP-IN GRATINGS

General:

Gratings are individually boxed (figure 4) for protection during shipment, and for storage when not in use. Each box is marked with individual grating information and identification numbers. Gratings should remain in protective boxes until you have read and understand the handling and installation instructions. Each grating is further identified by markings on the back surface of the grating blank.

DO NOT TALK OR BREATHE OVER THE GRATING SURFACE

Please Note: Gratings are extremely delicate optical components, therefore only trained optical personnel should be allowed to handle the gratings. Any contact with the grating surface, including vapors, liquids and solids, will result in damage that will drastically effect the performance of the monochromator.

Installation of the Grating:

1. Remove the grating/screw cover “A”, Figure 1 from the top of the instrument.

2. Locate the box (figure 4) containing the grating to be installed and proceed as follows:

   A. Place the box in a convenient location with the box face up. (ARC name tag readable). Familiarize yourself with the grating holder (Figures 5A-5C).

   B. Keep the box on the working surface and remove tape from around box.

   C. Carefully open the box.

CAUTION: GRATING FACE IS NOW EXPOSED AND MAY BE DAMAGED BEYOND REPAIR BY CONTACT WITH ANY VAPOR, LIQUIDS OR SOLIDS. DO NOT BREATHE OVER OR TOUCH RULED AREA OF GRATING

   D. Refer to figures 5A-5C, and visually locate the kinematic mounting points of the grating and grating holder. The two half round rods (figures 4 and 5A), locate in the "V" grooves, of the grating holder. The half ball (figures 4 and 5A) locates in the hole in the cantilever spring.

   E. Locate the thumb and finger recesses, Figure 4, in the grating box.

Grating Handling:

As previously indicated, the ruled area of the grating is easily damaged. The following procedures will assist in preventing damage during mounting.

A. Carefully grasp grating with thumb, middle and ring fingers. Keep thumb, middle and ring fingers arched, index and little fingers straight to avoid contact with ruled surface of the grating, as shown in figures 5A and 5B.

B. Carefully lift the grating out of the box and check sticker on back to assure correct grating is being installed. Insert grating into the holder, by positioning the rods into the "V" grooves, Figure 5A, then tilt grating toward the holder until the ball locates in spring hole, Figures 5B and 5C.

C. Use light side to side and down pressure to assure that grating is properly positioned.

Note: If the instrument is provided with the larger optional gratings, 120 X 140mm, the following alternate handling procedure is suggested.

1. Using both hands, grasp the grating at each end, with the thumb on the top and the middle finger at the bottom edge, assuring that the other fingers do not touch the grating surface.

2. Install the grating into the holder as shown, except that the installer uses two hands as described above.

Focus Adjustment:

Due to variations in the wavefront (flatness) of the available plane gratings, a focus adjustment may be required to assure to assure best performance when interchanging gratings in a high performance spectrometer.
The monochromator is factory aligned and focus adjusted with each grating originally purchased. A micrometer/block assembly is supplied for attachment to the focusing mirror post to adjust the focus, if necessary. Micrometer settings for best performance of gratings supplied with this instrument are listed in Table II.

TABLE II
FOCUS ADJUSTMENT

Grating Serial No.	g/mm	Blaze	Micrometer Setting on Focusing Mirror

When it has been determined from Table II that focusing mirror, Figure 3, should be repositioned for best performance, proceed as follows:

A. Attach the micrometer/block assembly to the focussing mirror post as shown in figure 3, assuring it is horizontal. Adjust the micrometer until the micrometer spindle just contacts the mirror base. Record the micrometer reading.

B. Locate the clamp screw in the mirror boss. Loosen the clamping screw approximately 1/4 turn.

C. Adjust focusing mirror micrometer to the setting indicated for the grating installed. With the other hand maintain enough pressure against the mirror post to assure a light but positive contact of the micrometer spindle against the mirror boss.

D. While maintaining contact of the micrometer spindle against the mirror boss, tighten clamp screw.

SECTION 5: OPERATION INSTRUCTIONS

Scanning Drive:

This instrument is supplied with an ARC Model SD2 Scanning Drive System.
Refer to the section labeled SD2 for operation.

Bilateral Slit Assemblies:

Changing the slit width: The slit width of each bilateral slit assembly is adjustable from 0.005 mm to 3.0 mm, by means of a micrometer located on the top of the slit assembly (figure 1). The micrometer is graduated so that each division equals a 0.01mm (10 µm) change in width.

One counterclockwise turn of the micrometer knob increases the slit width by 0.25 mm (250 microns). **For maximum reproducibility, the slit width should always be set in the counterclockwise (increasing slit width) direction.** This means that the user will have to close the slit width to a setting less than desired, then open the slit width to the desired setting.

The micrometer knob should not be rotated below a setting of 0.00, or above a setting of 3.00. A micrometer setting of less than 0.005 mm (5 microns) should not be used, because a stop is provided to prevent the slit jaws from touching each other.

Slit Height:

The slit height is controlled by a pair of horizontal baffles located in the slit housing, and must be set up prior to mounting of accessories on the slit housings. The horizontal baffles are mounted on a pair of graduated blocks, located in the slit housing. The graduations on the blocks are 1 mm apart, with the center graduation being the point of reference, or the center of the image height at the exit slit. To adjust the baffles, loosen the screws at each end of the horizontal baffle and set the baffles 1/2 the total desired slit height above and below the center graduation.

NOTE: In most optical systems, resolution degrades with increasing slit height; therefore, if maximum resolution is required, slits of one to four millimeters is recommended. Under normal operating conditions, ARC recommends a slit height of 3mm.

Snap-In Gratings:

The gratings are a **snap-in design** which enable easy installation and removal when desired. To install or remove gratings, the following procedure is recommended:

Installation of the Grating:

1. Remove grating/screw access cover “A”, Figure 1, from the top of the instrument.

2. Locate the box (figure 4) containing the grating to be installed and proceed as follows:

   A. Place the box in a convenient location with the box face up. (ARC name tag readable). Familiarize yourself with the grating holder (Figures 5A-5C).

   B. Keep the box on the working surface and remove tape from around box.

   C. Carefully open the box.

CAUTION: GRATING FACE IS NOW EXPOSED AND MAY BE DAMAGED BEYOND REPAIR BY CONTACT WITH ANY VAPOR, LIQUIDS OR SOLIDS. DO NOT BREATHE OVER OR TOUCH RULED AREA OF GRATING

   D. Refer to figures 5A-5C, and visually locate the kinematic mounting points of the grating and grating holder. The two half round rods (figures 4 and 5A), locate in the "V" grooves, of the grating holder. The half ball (figures 4 and 5A) locates in the hole in the cantilever spring.

   E. Locate the thumb and finger recesses, Figure 4, in the grating box.

Grating Handling:

As previously indicated, the ruled area of the grating is easily damaged. The following procedures will assist in preventing damage during mounting.

A. Carefully grasp grating with thumb, middle and ring fingers. Keep thumb, middle and ring fingers arched, index and little fingers straight to avoid contact with ruled surface of the grating, as shown in figures 5A and 5B. (Note: If a 120x140mm grating is supplied it is suggested that the grating be held with both hands, thumbs on top edge and middle fingers on the bottom edge of the grating)

B. Carefully lift the grating out of the box and check sticker on back to assure correct grating is being installed. Insert grating into holder, by positioning the rods into the "V" grooves, Figure 5A, then tilt grating toward the holder until the ball locates in spring hole, Figures 5B and 5C.

C. Use light side to side and down pressures to assure that grating is properly positioned.

Note: If the instrument is provided with the larger optional gratings, 120 X 140mm, the following alternate handling procedure is suggested.

3. Using both hands, grasp the grating at each end, with the thumb on the top and the middle finger at the bottom edge, assuring that the other fingers do not touch the grating surface.

4. Install the grating into the holder as shown, except that the installer uses two hands as described above.

Removal of Snap-In Gratings:

To remove gratings from the monochromator, reverse the installation procedure outlined above.

Focus Adjustment:

Due to variations in the wavefront (flatness) of the available plane gratings, a focus adjustment may be required to assure best performance when interchanging gratings.

The instrument is factory aligned and focused with each grating originally purchased. The focusing mirror (figure 3) includes a micrometer for translation of the mirror to adjust the focus, if necessary. Micrometer settings for best performance of gratings supplied with this instrument are listed in Table II, section 4. The micrometer setting is also specified on the grating information tag on the back of each grating.

Procedure for Adjusting the Focusing Mirror:

A. Remove mirror access cover “B”, Figure 1. Locate the focusing mirror assembly, focusing mirror assembly clamping screw, and focusing micrometer, as shown in Figure 3.

CAUTION: DO NOT CONTACT OR BREATHE ON MIRROR SURFACES OR PERMANENT DAMAGE MAY OCCUR.

B. Record the micrometer reading.

C. Loosen the focusing mirror assembly clamping screw (5/16-24) approximately one turn in a counterclockwise direction.

D. Adjust the micrometer to the desired reading.

E. Assure the mirror assembly is against the micrometer and properly seated. Tighten the mirror assembly clamping screw to the original position by turning in a clockwise direction to 90(ninety) inch pounds of torque. This will assure reproducibility of the alignment.

F. Replace mirror access cover “B”.

G. Check focus (resolution).

H. Repeat the above procedure until best focus (resolution) is achieved, then record the micrometer reading.

NOTE: The collimating mirror is factory adjusted, and under normal operating conditions will not require adjustments. If it is desired to make adjustments to the collimating mirror, please contact the ARC technical staff before attempting any adjustments.

Pre-Rotatable Grating Mechanism

The instrument utilizes a user adjustable pre-rotatable grating mechanism. This mechanism allows the user to rotate the grating an additional 13 degrees to allow the use of Echelle Gratings. The instrument is shipped with the pre-rotatable grating mechanism in the standard position.

Procedure for Using the Pre-Rotatable Grating Mechanism:

1. Remove the snap-in grating as previously outlined in Section 5.

IMPORTANT: DO NOT ATTEMPT TO PRE-ROTATE THE GRATING MECHANISM WITHOUT REMOVING THE GRATING **FIRST**.

2. Locate lever arm, lever arm support, stop screws, clamp screw, hold down screw, & pivot pin as shown in Figure 6.

3. Loosen the 10-32 "Clamp Screw" 1 turn, & remove the 10-32 "Hold Down Screw" in the lever arm.

CAUTION: DO NOT ALLOW SINE BAR TO CONTACT LEAD SCREW

4. Holding the lever arm against the drive block, carefully turn the lever arm support until the lever arm contacts stop Screw "B". The lever arm will rotate around the pivot pin.

5. Reinsert the hold down screw through the lever arm and into the other tapped hole in the lever arm support.

6. While maintaining light pressure on the lever arm against Stop Screw "B", re-tighten the hold down screw.

7. Re-tighten the clamp screw.

8. Refer to Section 5 and install the grating.

Reverse the above procedure and press the lever arm against stop screw "A" to return the pre-rotatable grating mechanism to the standard position.

NOTE: Stop screws "A" & "B" are factory set. If it is desired to make any adjustments to the stop screws, please contact the ARC technical staff before attempting any adjustments.

MOVABLE DIVERTER MIRROR (Optional)

An optional movable beam diverter mirror is available at time of instrument manufacture, to enable direction of the beam to be changed from the standard end position ("0"), to a side position ("S"). A knob located on the top of the instrument indexes a mirror inside the instrument, so that it is out of the beam (to allow end position operation), or so that it intersects the beam position (to allow side position operation). The index position is marked with "O" and "S", the "O" indicating operation at the end position, and the "S" indicating operation at the side position. To change mirror position, gently rotate the knob to the desired "O" or "S" position.

SECTION 6: Maintenance

General: the monochromator has been designed for precise, trouble-free operation, and requires minimal care and maintenance. We have outlined the necessary maintenance procedures for your use below:

1. Instrument Chamber (figure 1):

The instrument chamber should be kept sealed at all times to reduce the possibility of contamination to delicate internal components.

2. Bilateral Slit Assemblies (figure 1):

The bilateral slit assemblies are designed for maintenance-free operation. The knife edges that form the slit aperture are mounted on precision ball-slides, and therefore require no lubrication. Nothing should contact the slit jaws directly, as this may cause misalignment and improper operation.

3. Scanning Mechanism (figure 2):

The precision drive screw that enables accurate scanning is located inside the main chamber, as shown in figure 2, and should be lubricated every three to six months with the oil supplied. To lubricate, remove the screw cover, place 2 to 3 drops of the oil along the precision drive screw, and scan the instrument so that the drive block travels the entire length of the drive screw several times. This distributes the oil evenly along the drive screw. Replace the screw cover.

4. Optical Surfaces: Mirrors (figure 3) and Gratings (figures 4 & 5):

The optical surfaces are extremely delicate, and can be permanently damaged by mechanical contact with anything. Do not touch, talk, or breathe over the optical surfaces. Otherwise, the mirrors and gratings require no maintenance.

SECTION 7: FIGURES

Figure 1: Overall View of Monochromator

Figure 2: Wavelength Scanning Mechanism

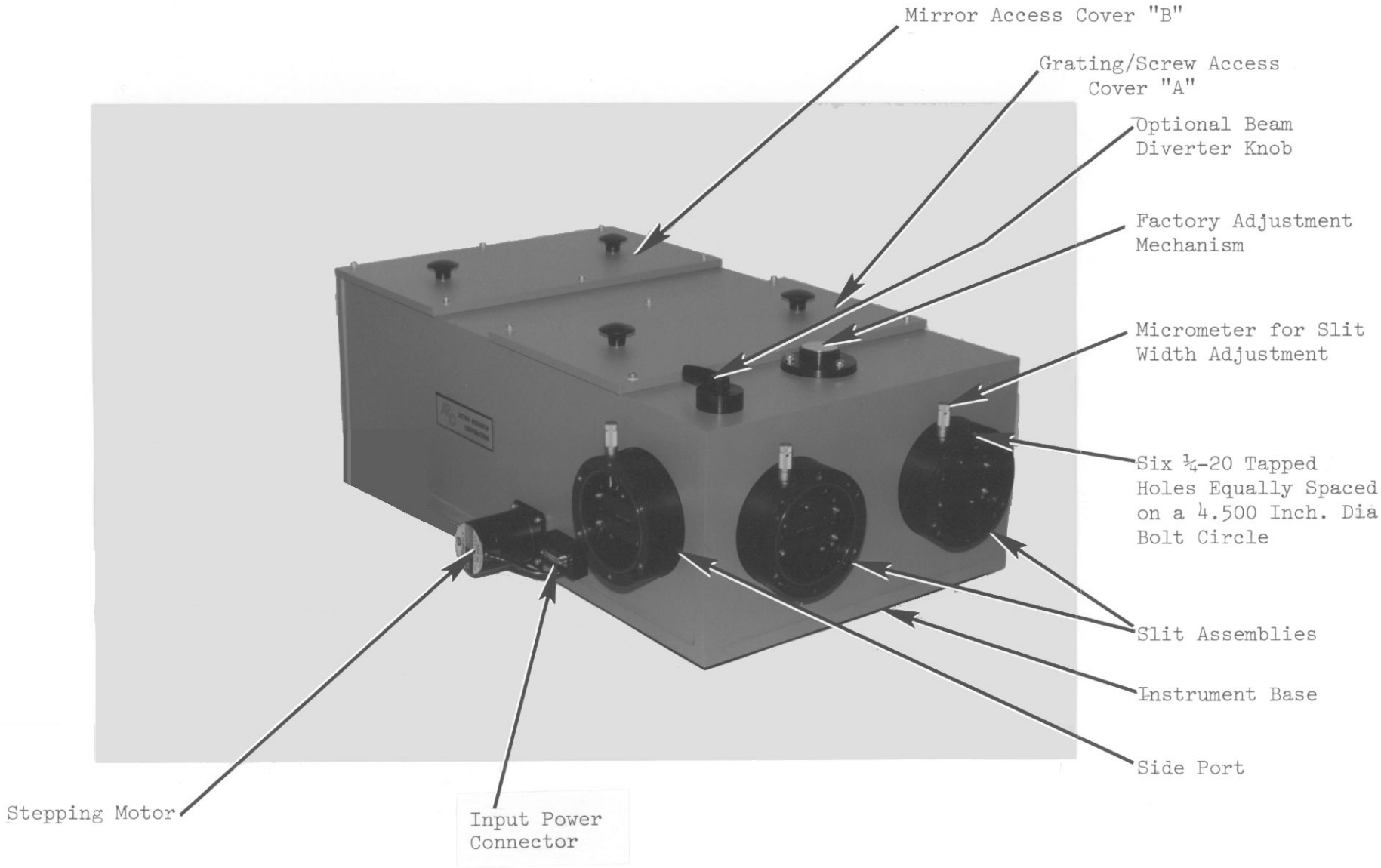
Figure 3: Focus Adjustment Micrometer

Figure 4: Grating Assembly in Protective Box

Figure 5: Installation Sequence for ARC Snap-In Gratings

Figure 6: Grating Pre-Rotation Mechanism

Figure 7: Stepping Motor Schematic



Monochromator

Figure 1

NOTE: This is a photograph of a typical instrument. Actual instrument supplied may be slightly different.

FIGURE 2
WAVELENGTH SCANNING MECHANISM
(SHOWN WITH "SCREW COVER PLATE" REMOVED)

NOTE: This is a photograph of a typical instrument. Actual instrument supplied may be slightly different.

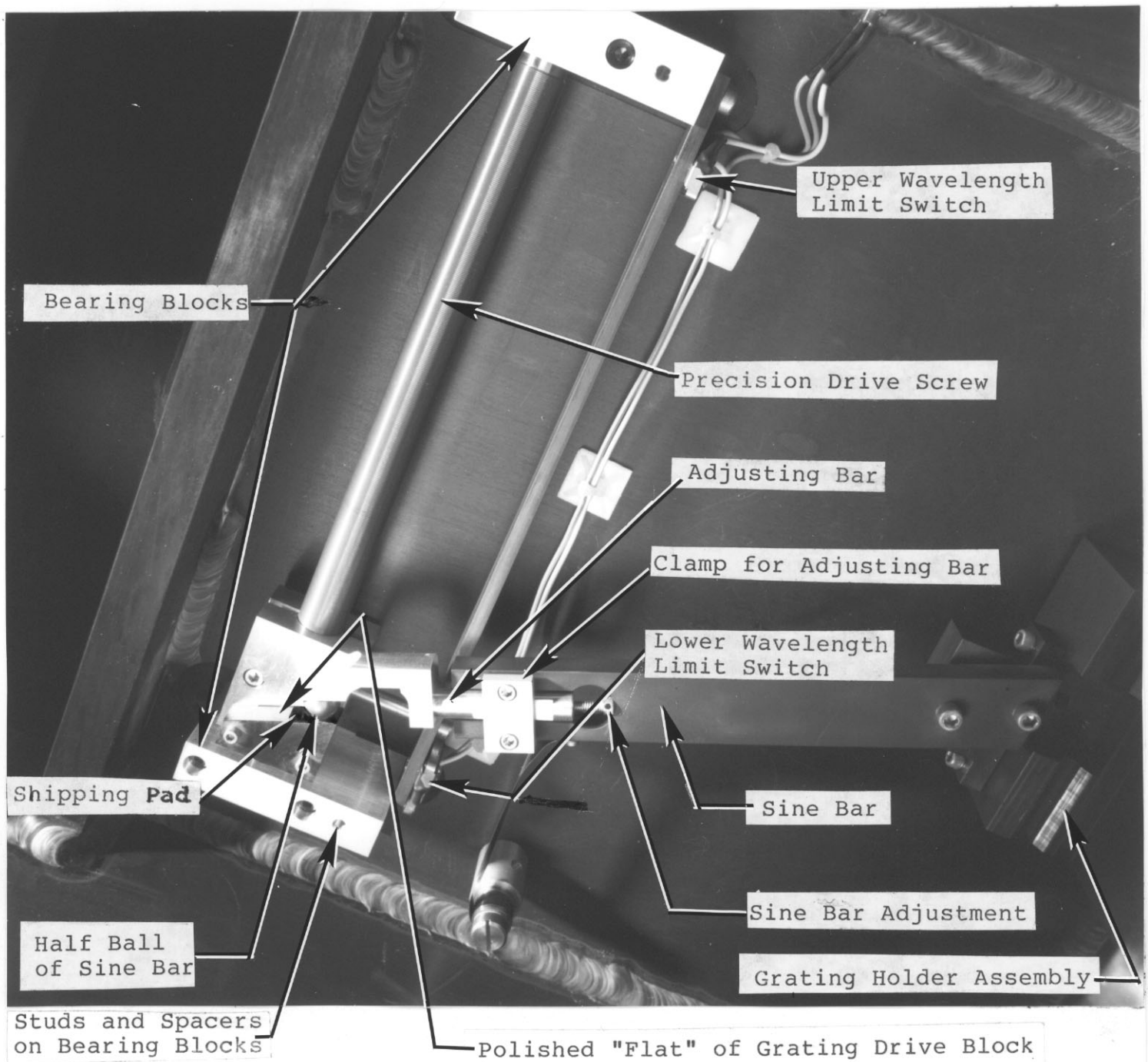


FIGURE 3
MIRROR ASSEMBLIES

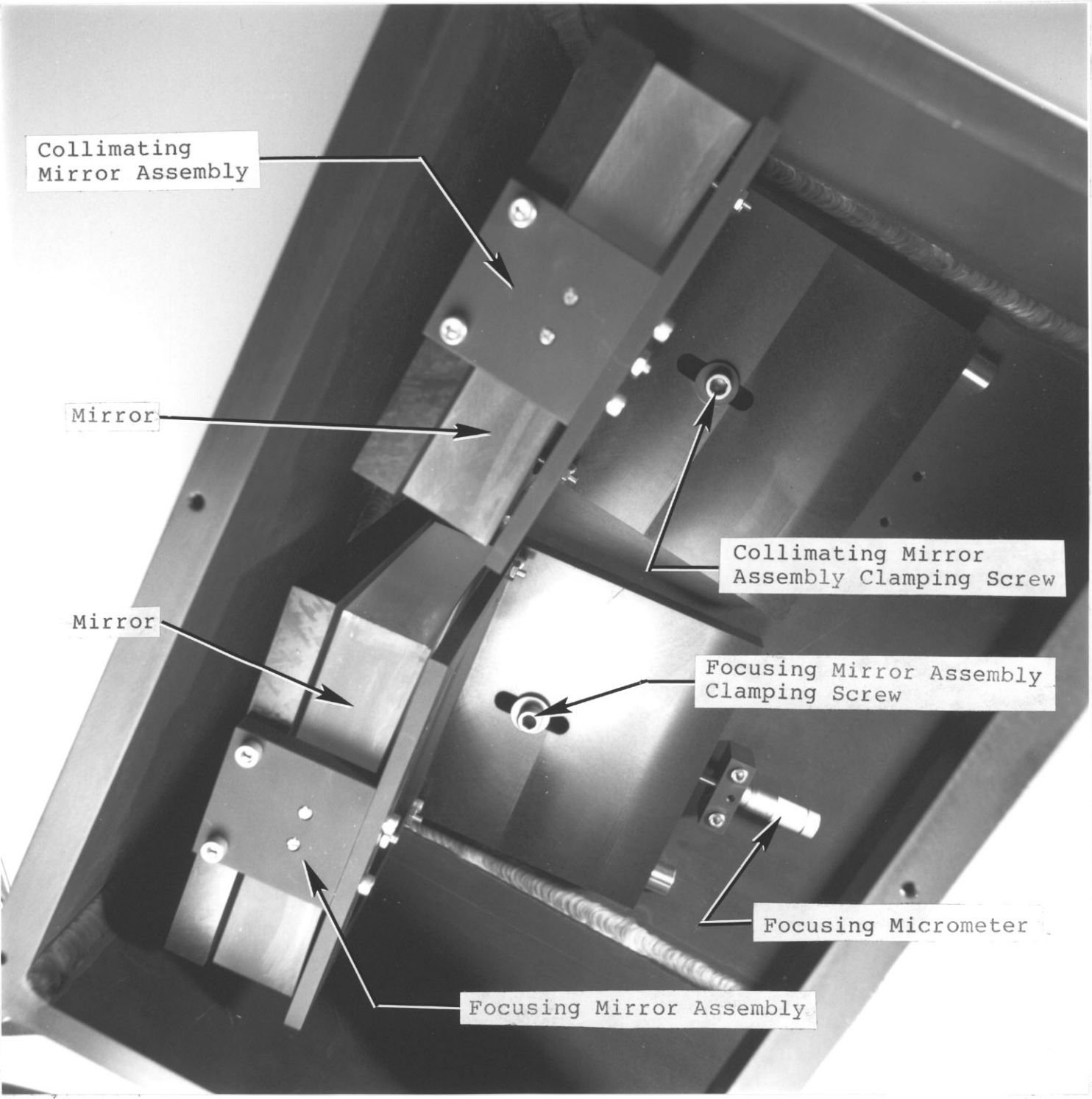


FIGURE 4: GRATING ASSEMBLY IN PROTECTIVE SHIPPING/STORAGE BOX

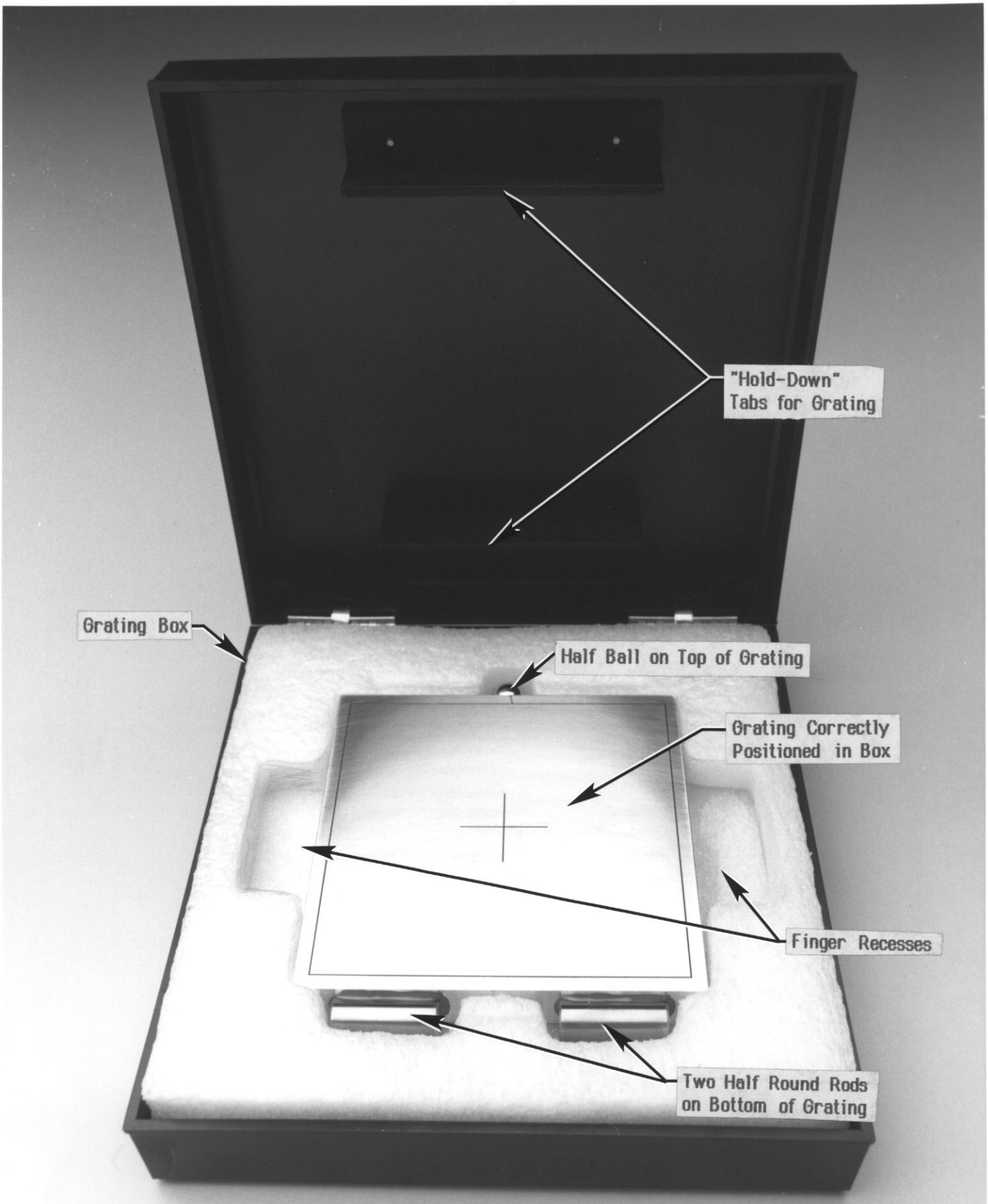
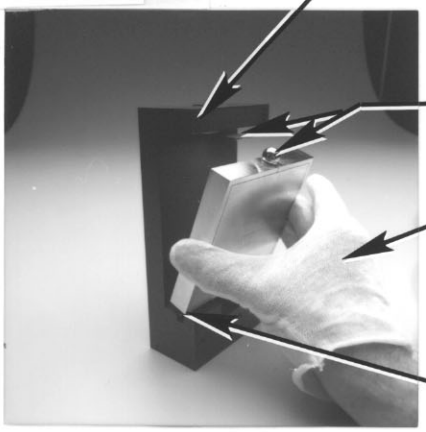


FIGURE 5: SNAP-IN GRATINGS INSTALLATION SEQUENCE

NOTE: For handling purposes, and for ease in photographing this installation sequence, an alignment blank was substituted for an actual grating. A typical grating holder was removed from an instrument and used for photographic purposes. The customer must install gratings into the grating holder which is positioned inside the instrument. Do not atempt to remove the grating holder from the instrument.

FIGURE A



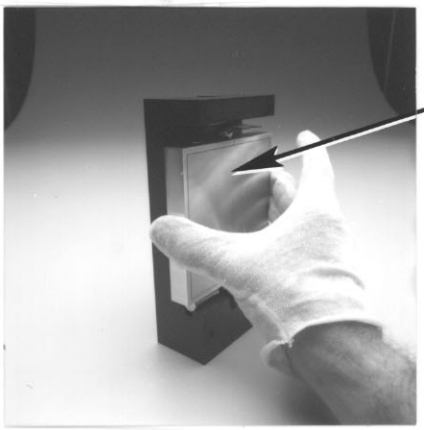
Typical Grating Holder removed from the instrument.

Half Ball of Grating Aligned with Hole in Cantilever Type Spring of Grating Holder

White Gloves Recommended when Handling Gratings

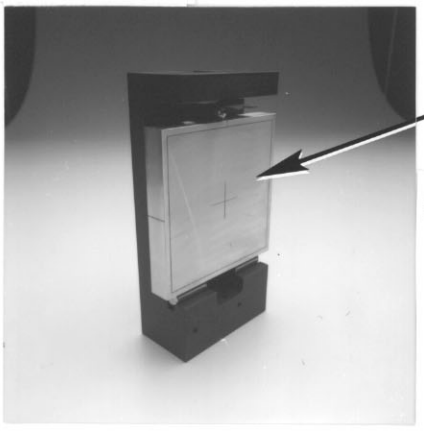
Half Round Rods of Grating Locate in the "V" Groove of the Grating Holder

FIGURE B



Grating is Tilted Back Torward the Grating Holder until the Half Ball Locates in the Spring Hole

FIGURE C



Grating Correctly Positioned in the Grating Holder

NOTE: If the instrument is provided with larger gratings, 120 x 140mm, the following alternate handling procedure is suggested:

1. Using both hands, grasp the grating at each end, with the thumb on the top and the middle finger at the bottom edge, assuring that the other fingers do not touch the grating surface.

2. Install the grating into the holder as shown, except that the installer used two hands as described above.

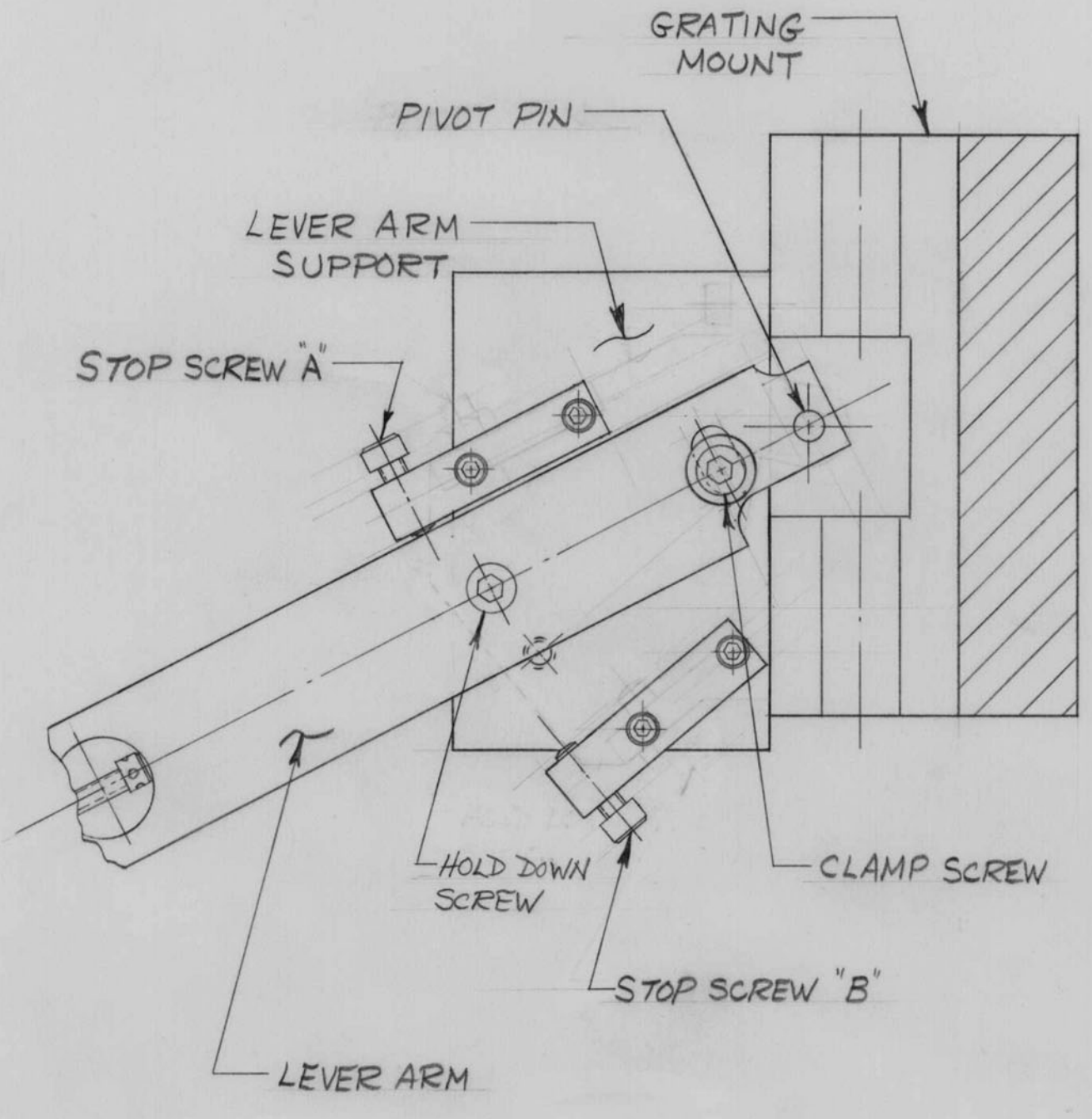
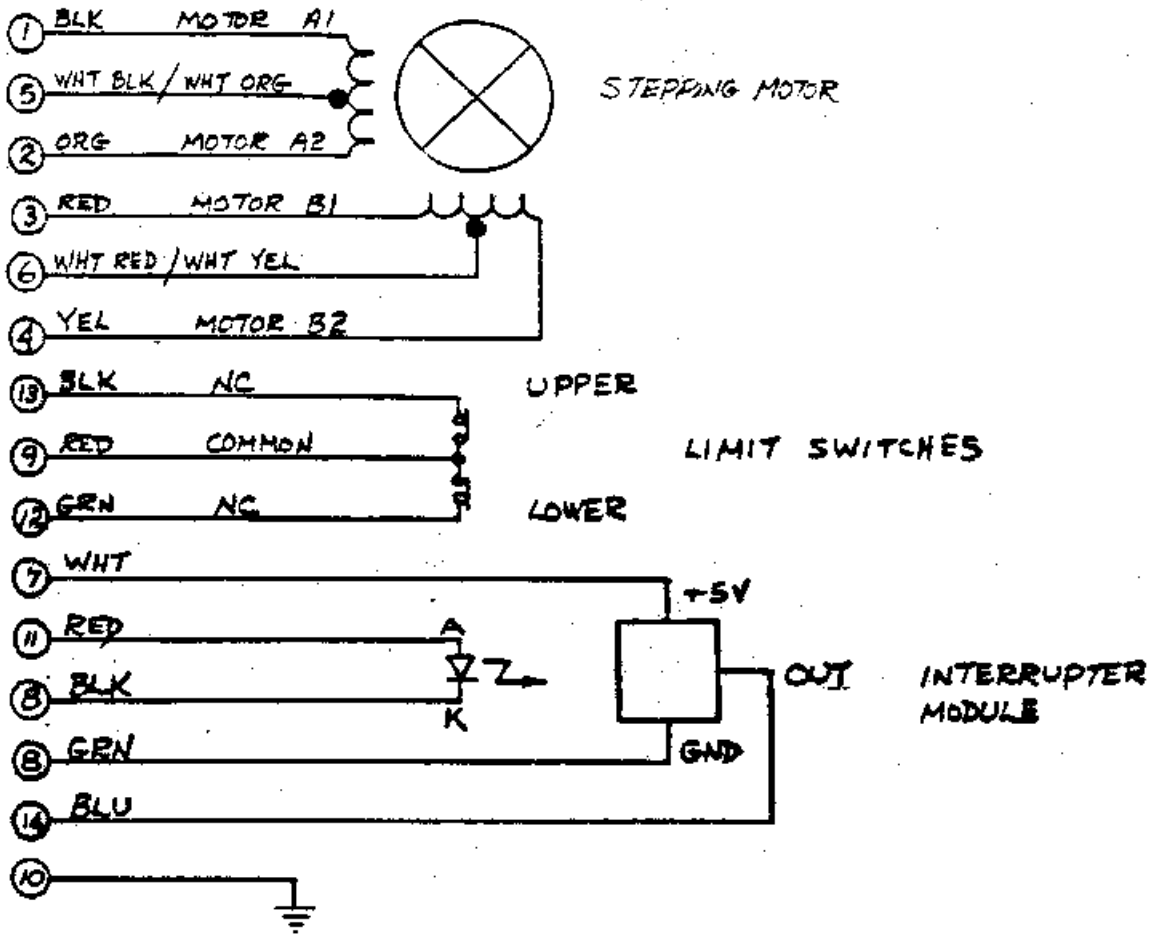


FIGURE 6
GRATING PREROTATION MECHANISM

REV.	DESCRIPTION	DATE
1	PINS 12 & 13 SWAPPED JOB# 13216 S/N ONLY MM	5-2-91
2	ADDED AM-510-M1 1ST #16931 KRA	12-7-92

NOTES:
1. COLORS ARE TYPICAL & FOR REFERENCE ONLY
2. NUMBERS REFER TO PIN #'S IN 15 PIN "D" TYPE CONNECTOR



AM-505F	6
VSN-515	5
AM-507F	4
AM-511	3
AM-510-M1	2
506	
USED ON:	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE ON
FRACTIONS ± 1/64 DECIMALS .xx ± .010 .xxx ± .005 ANGLES ± 15 MIN
MACH. SURFACE 32 MAX.
REMOVE ALL BURRS & BREAK SHARP EDGES .010R. MAX.

MATERIAL ~ FINISH ~

SCALE: ~ 1ST # 13216 DRAWN BY KRA

DATE: 5-2-91 NEXT ASSY QTY 1

ACTON RESEARCH CORPORATION
BOX 215/525 MAIN ST.
ACTON, MA 01720

DWG. TITLE: SCHEMATIC
SIZE: A
DWG NO.: 8748-112-04
REV.: 6

FOTOBEAM/BROOKSIDE

Instrument Division Fax: 978-263-5086 • Instrument Division Phone: 978-263-3584
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Web Site: www.acton-research.com

Instructions for Operation of the Model SD2 SpectraDrive Controller

Operating the SD2 Using a Computer

The Acton Research Corporation AM or VM 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 SD2 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 SD2.
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 SD2 to complete the processing of that command string before sending another command. This is accomplished by checking the status byte. The SD2 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 = SD2 ready for another command
Bit 1	0 = no errors
	1 = SD2 detected an error in the command
Bit 7	0 = no response or response has been read
	1 = SD2 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 4 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 4 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.)
>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	Sets constant scan rate in nm/min to 0.01 nm/min resolution. e.g. 10.0 NM/MIN
?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	Recalls parameters for the specified grating from non-volatile memory. Up to nine (9) gratings are allowed. This command takes a grating number from 1 - 9. e.g. 3 GRATING
?GRATING	Returns the number of the grating 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.

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

INSTALL	Installs new grating parameters into the non-volatile memory of the AM 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 #5.

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 SD2 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 SD2 non-volatile memory e.g. 3 UNINSTALL

Diverter Control Commands:

EXIT-MIRROR Designates the exit diverter mirror to receive the diverter control commands. This command is for AM monochromators which can accept two diverter mirrors. The AM 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 AM monochromators which can accept two diverter mirrors.

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.

CALIBRATION COMMANDS:

INIT-OFFSET Sets the offset value for the designated grating. Default values are 25600 for all gratings. The grating designator used with this command is grating# - 1.
e.g. 25590. 0 INIT-OFFSET for setting offset on grating #1.
NOTE: This command requires a decimal point after the offset value. For the new parameters of this command to take effect, the monochromator must be initialized with the MONO-RESET command or by turning the power off and back on.

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.
NOTE: This command is to maintain compatibility with previous SpectraPro applications. For new applications, use the INIT-SP300-GADJUST command below. No decimal point is used with this command. For the new parameters of this command to take effect, the monochromator must be initialized with the MONO-RESET command or by turning the power off and back on.

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 fifth grating.
NOTE: No decimal point is used with this command. For the new parameters of this command to take effect, the monochromator must be initialized with the MONO-RESET command or by turning the power off and back on.

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 AM 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 AM or VM monochromator.
e.g. MODEL AM-505

SERIAL Returns serial number of AM or VM monochromator.
e.g. SERIAL 27480263

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

GRATING	#1
WAVELENGTH	0.0 nm
SCAN SPEED	200.0 nm/min

INIT-GRATING Selects which of the three gratings on the installed in the AM monochromator 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 SD2 after initialization.
E.G. 435.84 INIT-WAVELENGTH

INIT-SRATE Sets an initial scan rate for the SD2.
E.G. 200.0 INIT-SRATE