Jarrell-Ash MonoSpec 27 Monochromator/Spectrograph Models: 82-497, 82-498, 82-499

Operator's Manual

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Thermo Jarrell Ash Corporation

8E Forge Parkway
Post Office Box 9101
Franklin, MA 02038-9101

Tel: (508) 520-1880
Fax: (508) 520-1732
Telex: 174230 TJA UT

A subsidiary of Thermo Instrument Systems, Inc.

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1.0 INTRODUCTION

The MonoSpec 27 monochromator/spectrograph is used in measuring absorption, transmission, emission, reflection, polarization, photometry, and spectral isolation. The instrument has excellent resolution, high throughput, and functions in the ultraviolet, visible, and infrared ranges.

The Jarrell-Ash MonoSpec 27 features a triple grating holder that lets you change between 3 gratings blazed at different wavelengths and groove frequencies by simply rotating an external control knob.

This manual describes the basic operating procedures and maintenance for your MonoSpec 27 in brief, step-by-step instructions. To obtain the best performance, read this manual before operating the instrument. The monochromator and spectrograph are combined in this manual as the instruments operate similarly.

2.0 UNPACKING

The MonoSpec 27 is shipped with the gratings and slits, that you ordered. Carefully unpack the instrument. DO NOT TOUCH THE GRATING SURFACE WITH FINGERS OR ANYTHING ELSE. Visually inspect the instrument for damage. You, the customer, are responsible for filing damage claims against the carrier.

NOTE

IMPORTANT - TO AVOID SHIPPING DAMAGE, WE HAVE REMOVED THE GRATINGS. SEE SECTION 6.1 ON "MOUNTING THE GRATING". EACH GRATING HAS BEEN LABELED 1, 2, OR 3 FOR CORRECT INSERTION ONTO THE GRATING HOLDER BASE PLATE. WHEN YOU TIGHTEN THE PLUNGER SET SCREW 3, CHECK THAT THE TENSION IS ADEQUATE ENOUGH TO HOLD THE GRATING HOLDER IN PLACE. IF THE TENSION IS TOO TIGHT THE GRATING HOLDER WILL BE DISTORTED.

2.1 Additional Equipment

Periodically and after shipment, you need to perform a focus check and a wavelength calibration check. The following items are necessary to complete these procedures:

Monochromator

-Low pressure mercury lamp (AAS No. 45-544)
-Precision square
-1 entrance and 1 exit slit, both of the same size. from 50-250 microns

Spectrograph

-Low pressure mercury lamp (AAS No. 45-544)
-Precision square
-Entrance slit between 50 and 250 microns.
-7 X hand magnifier (AAS Cat. No. 31-211)
-Alignment exit port screen (optional AAS Cat. No. 00400)

2.2 Identification of the Components

After unpacking the MonoSpec 27, take time to become familiar with its major components. Figure 1 and Figure 2 identifies the various components of the instrument.

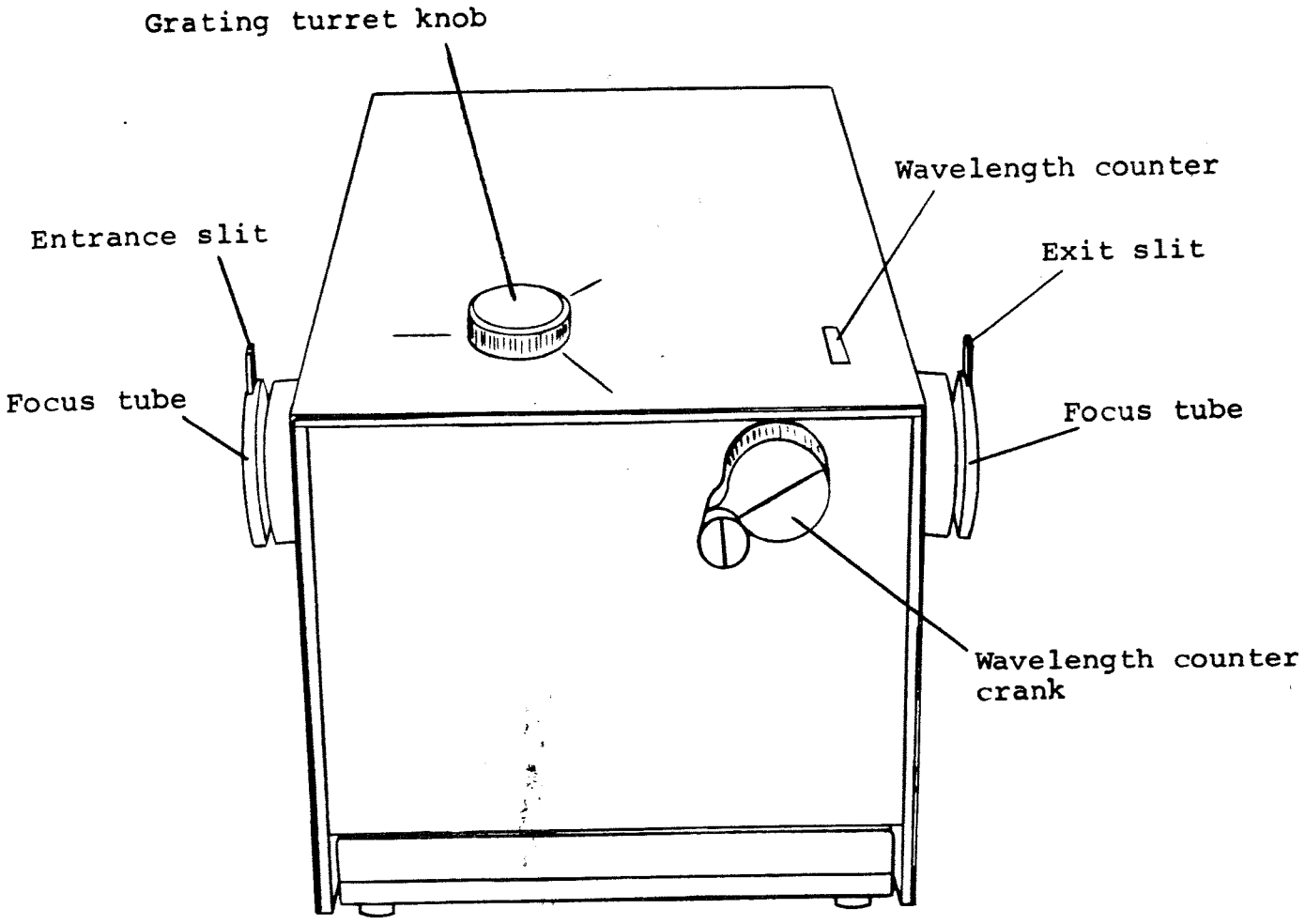


Figure 1. Major components of the MonoSpec 27 Monochromater.

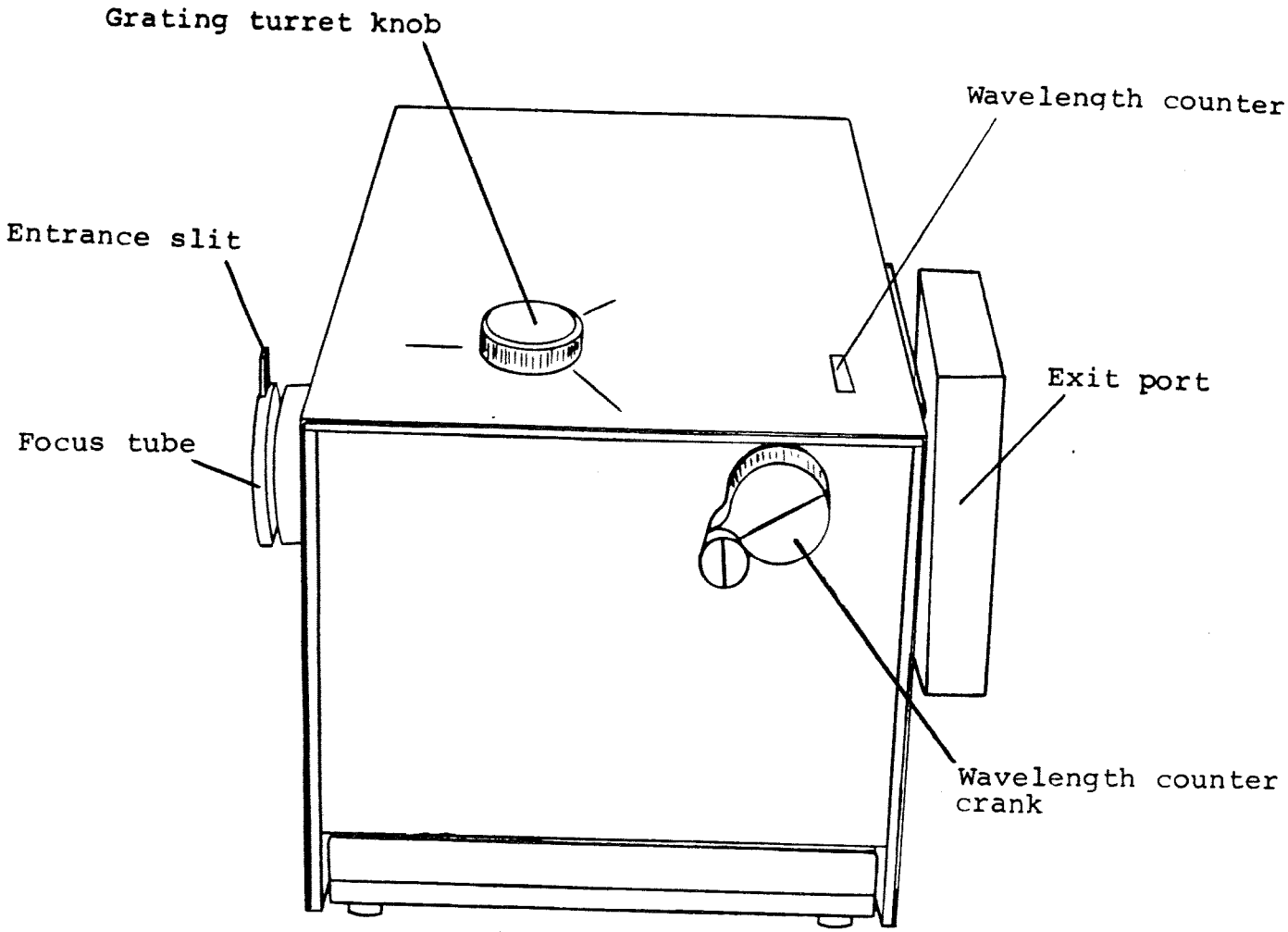


Figure 2. Major components of the MonoSpec 27 Spectrograph.

3.0 OVERVIEW

3.1 Physical Specifications

Length:	16 1/8 in. (41 cm)
Width:	7 1/2 in. (19 cm)
Height:	6 3/4 in. (17 cm)
Weight:	20 lb (9 kg)
Focal Length:	275 mm
Focal Ratio:	f/3.8
Stray Light Levels:	0.05% at 500 nm using an incandescent lamp& high pass filter. 0.001% at 10 nm away from the 632.8 nm laser line.
Entrance and exit slit dimensions:	Fixed: 18 mm high; 25, 50, 100, 150, 250, 500, 1000, and 2000 microns wide. Variable: 15 mm high; Opens from 10 to 2000 microns.
Readout:	One 4-digit Veeder-Root counter reading from 0 to 1000 nm. for the 1200g/mm grating.

Grating size, spectral range, and dispersion:

Ruling(g/mm)	Blaze	Range	Dispersion(nm/mm)
2400	350 nm	190-450 nm.	1.5
2400	260 nm	200-450 nm.	1.5
1800	550 nm	300-600 nm.	2.0
1200	520 nm	380-900 nm.	3.0
1200	400 nm	300-900 nm.	3.0
1200	300 nm	190-600 nm.	3.0
600	450 nm	300-900 nm.	6.0
600	500 nm	.480- 1.2**	6.0
600	1.0	750-1.8	6.0
300	2.0	1.3-3.6	12.0
150	4.0	3.6-7.2	24.0
100	6.5	4.5-10.8	36.0
50	10	7.0-21	72.0
30	30	21-40	120.0

**Microns

Holographic Gratings

Spacing g/mm	Range	Dispersion nm/mm
2400 g/mm blaze,	190-450nm	1.5
1800 g/mm blaze,	190-700	2.0
1200 g/mm blaze,	250-900	3.0
600 g/mm blaze,	300-900	6.0
300 g/mm blaze,	200-800	12.0
150 g/mm blaze,	200-800	24.0

Resolution*

Slit width (microns)	Slit height(mm)	Resolution (nm)
150	18	0.8
50	18	0.5
25	5	0.3

*With 1200 grooves/mm grating and various slit widths and heights.

3.2 Optical Design

The MonoSpec 27 uses a crossed Czerny-Turner design to minimize re-entry spectra. Light passes through the entrance slit and follows the path shown in Figure 3.

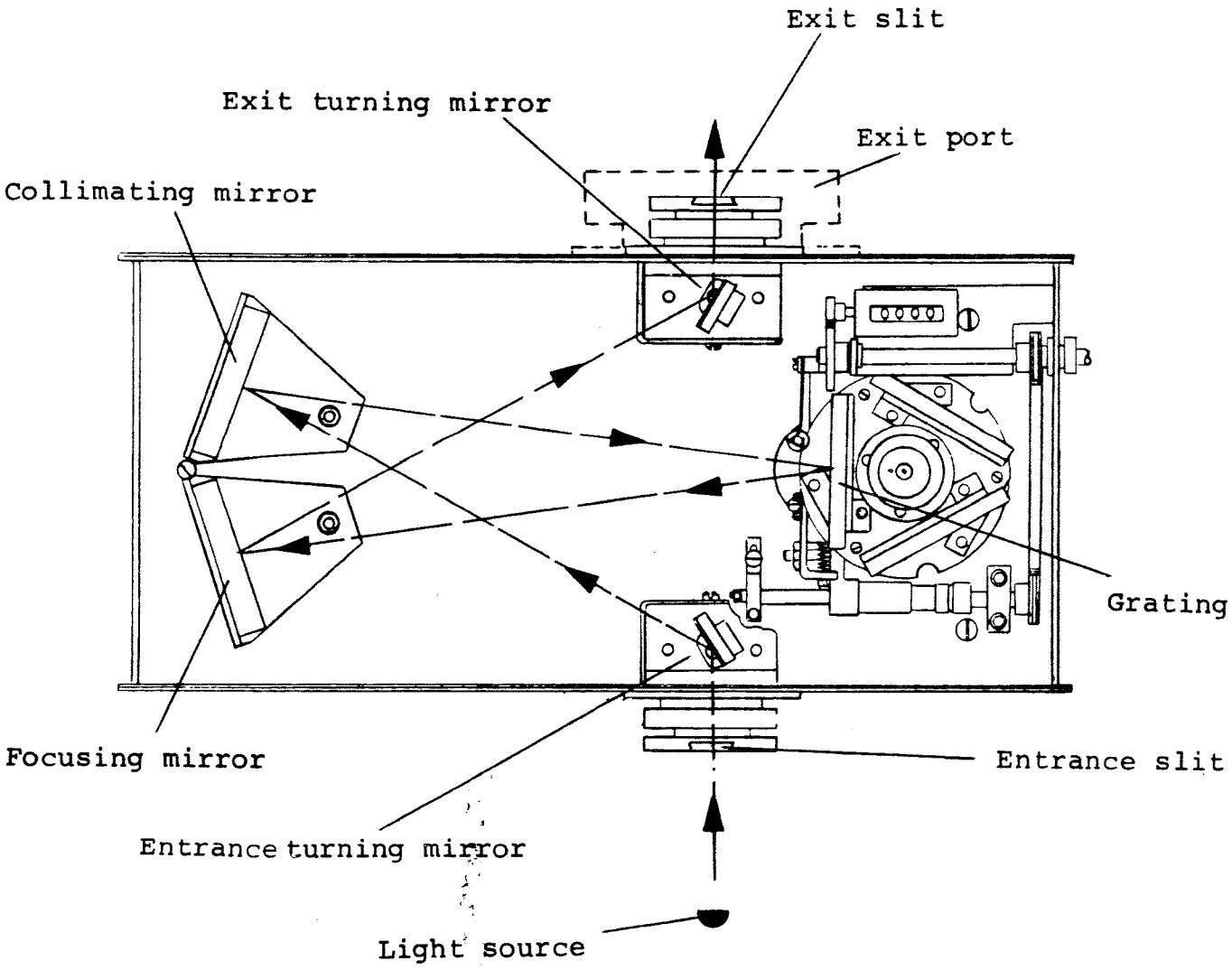


Figure 3. Light path through the optical system.

4.0 BEFORE YOU OPERATE

Once you have unpacked the Monospec 27, check the focus and the wavelength calibration. The MonoSpec 27 optics have been aligned and calibrated with the grating(s) you specified at **Thermo Jarrell Ash Corp.** before shipment. Although no further adjustment should be required, check the focus and the wavelength calibration to insure that no damage has occurred during shipment. These two procedures are performed only after shipment, as part of yearly inspection, or when the instrument has been mishandled.

When the focus and wavelength calibration are satisfactory, mount the MonoSpec 27 in its permanent location.

4.1 Checking the Focus

To check the focus you need a low pressure mercury lamp, an entrance slit and an exit slit between 50 and 250 (the narrower the slit, the more precisely you can focus). Both slits should be the same size.

1. Slide the entrance and exit slits into place, (See Figure 4).

2. Check that the grating turret is engaged in the highest groove frequency ruled grating (1200 g/mm preferred). Select the 1200 groove per mm grating or the grating with the greatest number of grooves per mm.

3. Place the Hg lamp as close as possible to the entrance slit.

4. Rotate the counter to first-order green line, 546.1 nm.

5. Observe the grating through the exit slit with your eye as close as possible to the slit. Slowly scan back and forth through the 546.1 nm wavelength. The instrument is in focus when the grating is a fully illuminated, and this illumination disappears from the sides of the grating to the center. The instrument is out of focus if a vertical line of color moves across the grating.

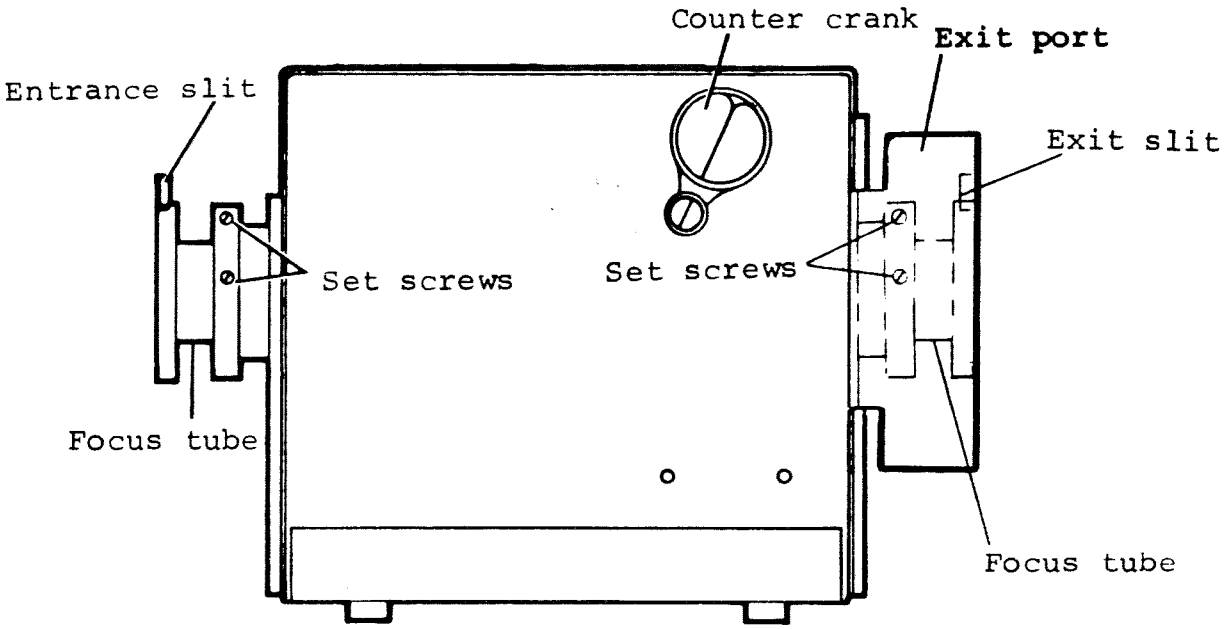


Figure 4. Focus tube and slit location.

6. If the image is out of focus, refer to Figure 5. Adjust the focus at the exit slit by releasing the two set screws in the focus tube support and slightly moving the focus tube in or out until the image is in focus. If necessary, make the same adjustments on the focus tube at the entrance slit. Both focus tubes should be the same distance out of their sleeves.

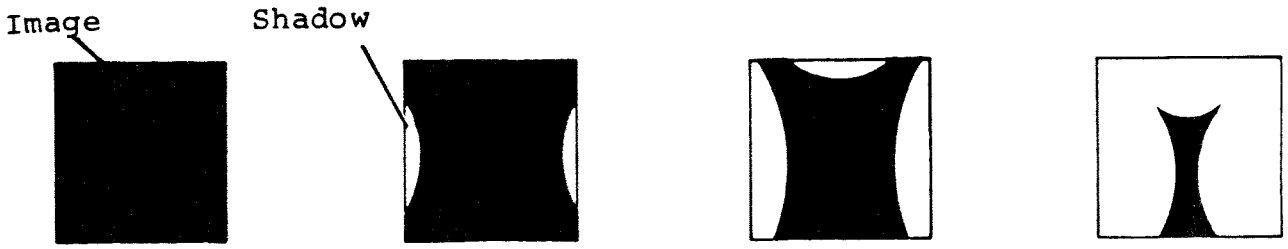
7. For correct entrance slit orientation, check that the entrance slit is vertical. Place the square on a flat surface next to the slit and rotate the slit assembly until it aligns vertically with the square. Tighten the set screws in the focus tube support.

8. To check the exit slit orientation, observe the image through the exit slit from approximately two feet away. Scan through the 546.1 nm wavelength. An aligned image is a slender line of illumination that disappears from the center of the slit to the top and bottom of the slit. It is out of alignment if a small area of illumination appears to move up and down the slit as you scan, (See Figure 6). If necessary rotate the exit slit assembly until the image scans correctly. Tighten the set screws in the focus tube support.

9. Rotate the counter until the zero order line (0000 on the counter) passes through the exit slit.

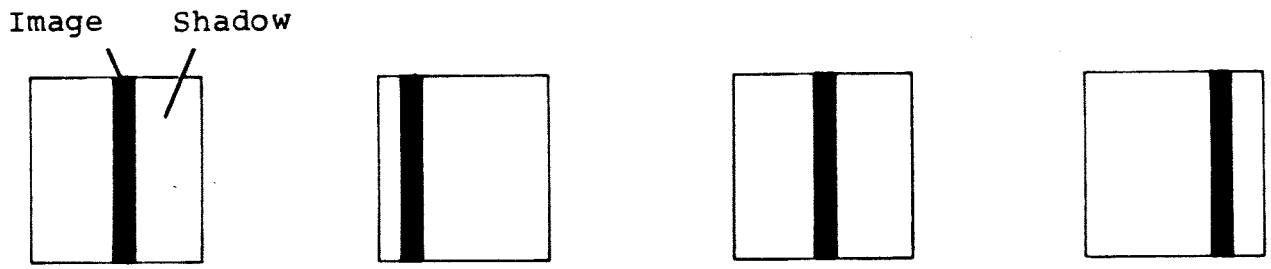
10. Repeat steps 3 through 5 to check focus.

11. If the focus is correct on the zero order line, proceed to the next section. If it seems incorrect, the optical alignment may have been disturbed. (Refer to the instructions on Aligning the grating, Section 6.2).



Correctly Focused image.

Image disappears from the sides of the grating toward the center.



Out-of-focus image.

Image scans across mirror.

Figure 5. Proper and improper focus viewed on the grating.

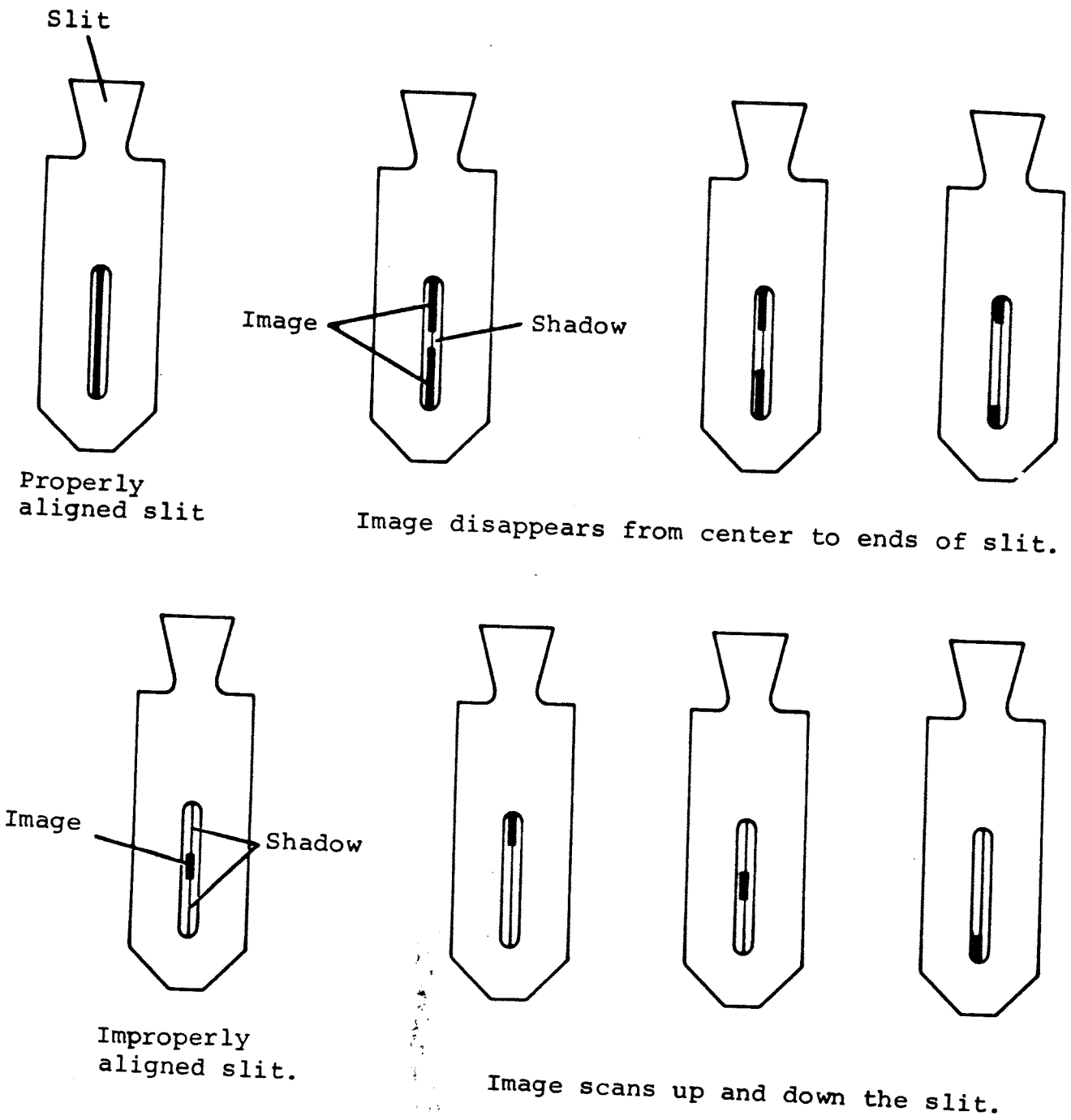


Figure 6. Proper and improper alignment viewed on the exit slit.

4.2 Checking the Wavelength Calibration

You need a low pressure mercury lamp to perform the calibration check.

1. Place the Hg lamp as close as possible to the entrance slit.

2. The counter should be at zero order (0000 on the counter). Check that the maximum intensity of the beam passes through the exit slit. The counter should read 0 +/- 1 nm. If the reading is outside this range, note the difference.

3. Rotate the counter to observe the maximum intensity of the 1st order green Hg line passing through the exit slit. The counter should read 546.1 nm. If the reading is off by more than +/- 1 nm, note the difference.

4. Rotate the counter to observe the maximum intensity of the 1st order blue Hg line passing through the exit slit. The counter should read 871.7 nm. If the reading is off by more than +/- 1 nm, note the difference.

5. If all readings are correct to within +/- 1 nm, then the calibration is satisfactory. If the readings are off by more than +/- 1 nm, refer to Section 8.3, Instrument Service.

4.3 Mounting the Instrument

When the focus and the wavelength calibration are satisfactory, you can permanently mount the MonoSpec 27 on a table or attach it to other instruments. To mount the MonoSpec 27 you need a drill to tap holes in the base support.

1. Remove the exterior casing of the instrument by unscrewing the 14 buttonhead screws around the base, if the casing is not already off.

2. On the inside bottom of the instrument are three screws with washers which hold the instrument to the base support, (See Figure 7). Unscrew these screws, lift the instrument off the base support, and set it aside

3. Drill or tap holes in the base to support the permanent mounting location.

4. Screw or otherwise securely mount the base in its permanent location.

5. Screw the instrument back onto the base.

6. Replace the exterior casing of the instrument.

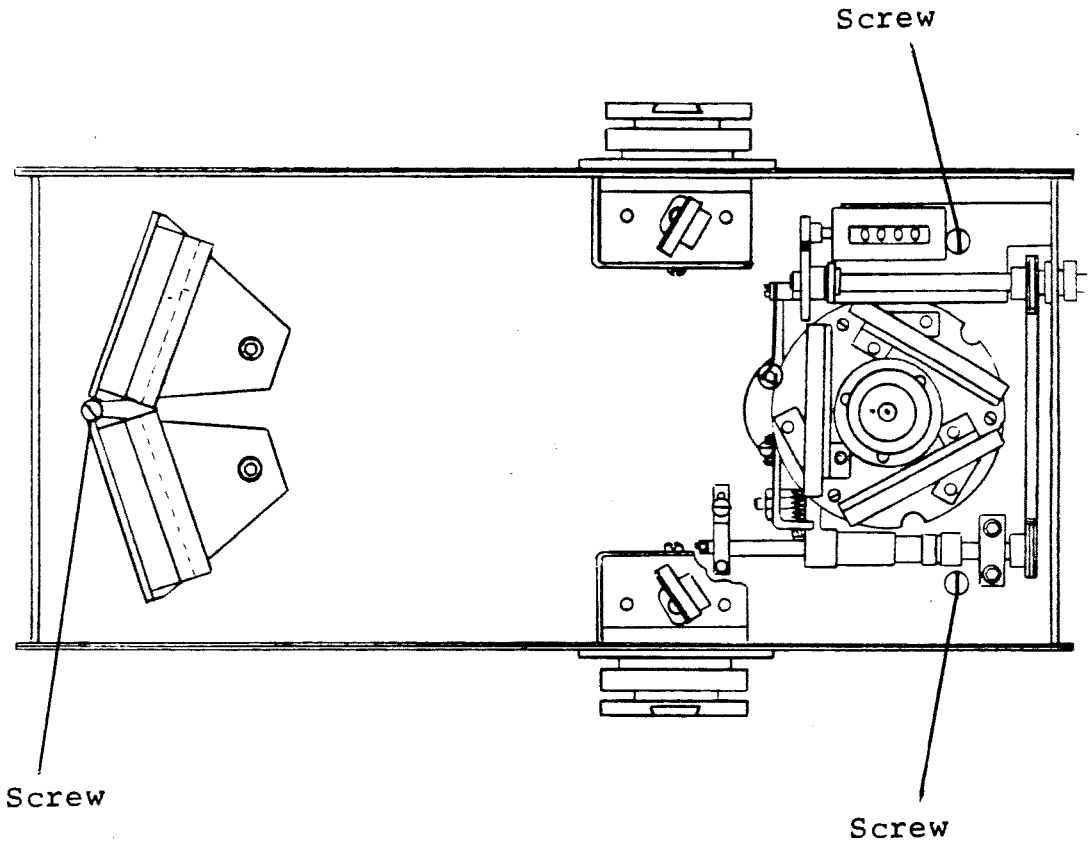


Figure 7. Location of screws attaching to the base support.

5.0 OPERATION

For daily operation of the MonoSpec 27 you need to understand a few simple procedures. First, select the proper grating for the wavelength range in which you plan to work. Then learn to read the wavelength counter when using any grating other than the 1200 grooves/mm grating. Finally, focus the exterior light source to maximize the energy passing through the instrument.

5.1 Selecting a Grating

Select a group of three gratings that will cover the spectral range that you desire to examine. Gratings are cemented to bracket with adjustments for alignment.

11-080 985-30-19-22,	Ruled, 1200g/mm blaze, 520 nm.
11-081 985-30-19-18,	Ruled, 1200g/mm blaze, 300 nm.
11-090 985-30-14-17,	Ruled, 1800g/mm blaze, 260 nm.
11-082 985-30-09-17,	Ruled, 2400g/mm blaze, 260 nm.
11-083 985-30-29-22,	Ruled, 600g/mm blaze, 500 nm.
11-084 985-30-29-30,	Ruled, 600g/mm blaze, 1.0 mic.
11-085 985-30-39-36,	Ruled, 300g/mm blaze, 2.0 mic.
11-086 985-30-49-40,	Ruled, 150g/mm blaze, 4.0 mic.
11-087 985-30-54-45,	Ruled, 100g/mm blaze, 6.5 mic.
11-088 985-30-69-50,	Ruled, 50g/mm blaze, 10 mic.
11-089 985-30-79-58,	Ruled, 30g/mm blaze, 30 mic.
11-092 985-30-09-19,	Holographic,2400g/mm blaze,350 nm.
11-093 985-30-14-23,	Holographic,1800g/mm blaze,550 nm.
11-094 985-30-19-20	Holographic,1200g/mm blaze,400 nm.
11-095 985-30-29-21	Holographic,600g/mm blaze,450 nm.
11-096 985-30-39-20	Holographic,300g/mm blaze, 200-800 nm.
11-097 985-30-49-18	Holographic,150g/mm blaze, 200-800 nm.

5.2 Reading the Wavelength Counter

The MonoSpec 27 wavelength counter reads in nanometers for the 1200 grooves/mm grating. To determine the proper wavelength for all other gratings, multiply the counter reading by the proper factor given in the following chart.

Grating g/mm	Multiplication factor
2400	X 1/2
1800	X 2/3
1200	X 1
600	X 2
300	X 4
150	X 8
100	X 12
50	X 24
30	X 40

5.3 Focusing Exterior Light Sources

To ensure that the MonoSpec 27 optics are filled, you must maximize the energy passing through the instrument. First, if you are using a lens or concave mirror to focus the light on the entrance slit, the diameter of the lens or mirror should be at least 1/4 of the distance from the slit to the lens or mirror.

CAUTION

If you have attached a photomultiplier tube (PMT) at the exit slit, turn off the power to the tube before checking the illumination. If you do not turn off the power to the PMT then it may be destroyed.

For example, if the lens is one foot away from the instrument, then the diameter of the lens should be three inches. Visually check the focus of your light source at the exit slit. A focused image should be formed. Next, check the illumination of the collimating mirror.

With a mirror, bring a light into the entrance slit at an angle as shown in Figure 8.

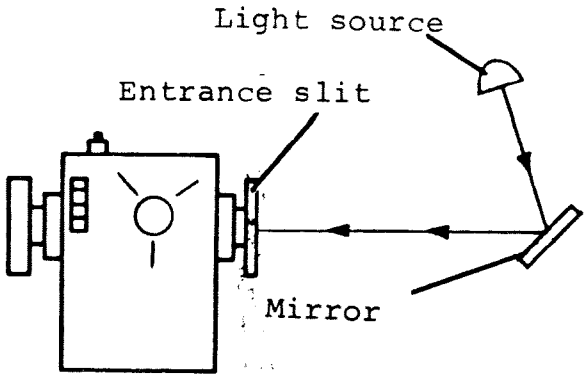


Figure 8. Focusing exterior light source with a mirror.

With a lens, the light should pass to the entrance slit on a straight line as shown in Figure 8a.

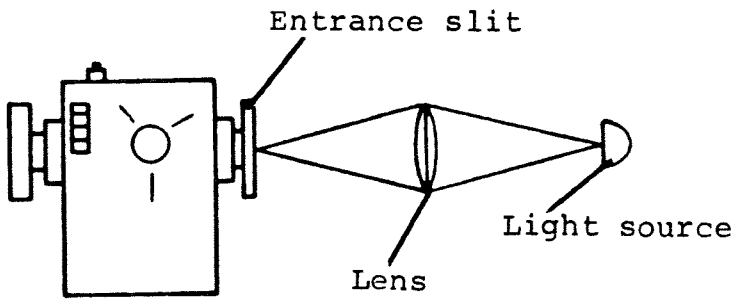


Figure 8a. Focusing exterior light sources with a lens.

Verify the illumination by removing the exit slit and visually checking the light path, or:

1. Remove the instruments cover.

2. If the light source is dim, remove the entrance slit to allow more light onto the collimating mirror.

3. Check that the light beam is centered on the collimating mirror. If necessary, reposition the light source to direct the light onto the center of the mirror.

If you are working in the infrared, check the focus and illumination by one of two methods. Substitute a visible light for the infrared source and run through the checks described above. Or, use an infrared detector at the exit slit and adjust the alignment between the source and the instrument by trial and error until the maximum signal is reached.

6.0 CALIBRATION OF ADDITIONAL GRATINGS

When you receive your Monospec 27 the gratings you ordered were calibrated at **Thermo Jarrell Ash Corp.** You may purchase additional gratings at any time. However, gratings purchased after your instrument has been shipped to you must be calibrated and aligned. To calibrate additional gratings you need:

*Low pressure mercury lamp

*G.E. Glyptal #1201 red enamel

*Alignment slits which you can construct.

*Tape a black thread horizontally across the center of your widest entrance and exit slits. The thread must be placed at the exact same location on both slits.

6.1 Mounting the Grating

NOTE

IMPORTANT NEVER TOUCH THE GRATINGS SURFACE, THE TWO TURNING MIRRORS, THE FOCUSING MIRRORS, OR THE COLLIMATING MIRROR. Do not touch these optical surfaces with your fingers or any other object, such as sleeves, paper, etc.

1. Place the instrument with the crank facing you and the entrance slit on your left. See Figures 9 & 10 throughout this procedure.

2. Remove the grating turret knob.

3. Remove the cover by unscrewing the 14 buttonhead screws, (See Figure 18).

4. Hold the grating by the metal side strips and place the grating into it's respective slot and hole at the base of the grating holder. Be careful not to hit the grating on the instrument housing, (See Figure 9).

5. Slide the grating assembly under the cylinder

toward you until set screw #2 and the eccentric pin slip into place on the grating plate. (The grating should be facing away from you.)

6. Tighten set screw #3 on the right side of the turret cylinder.

7. Check that the instrument is aligned. (See section 8.2 Optical alignment of the MonoSpec 27).

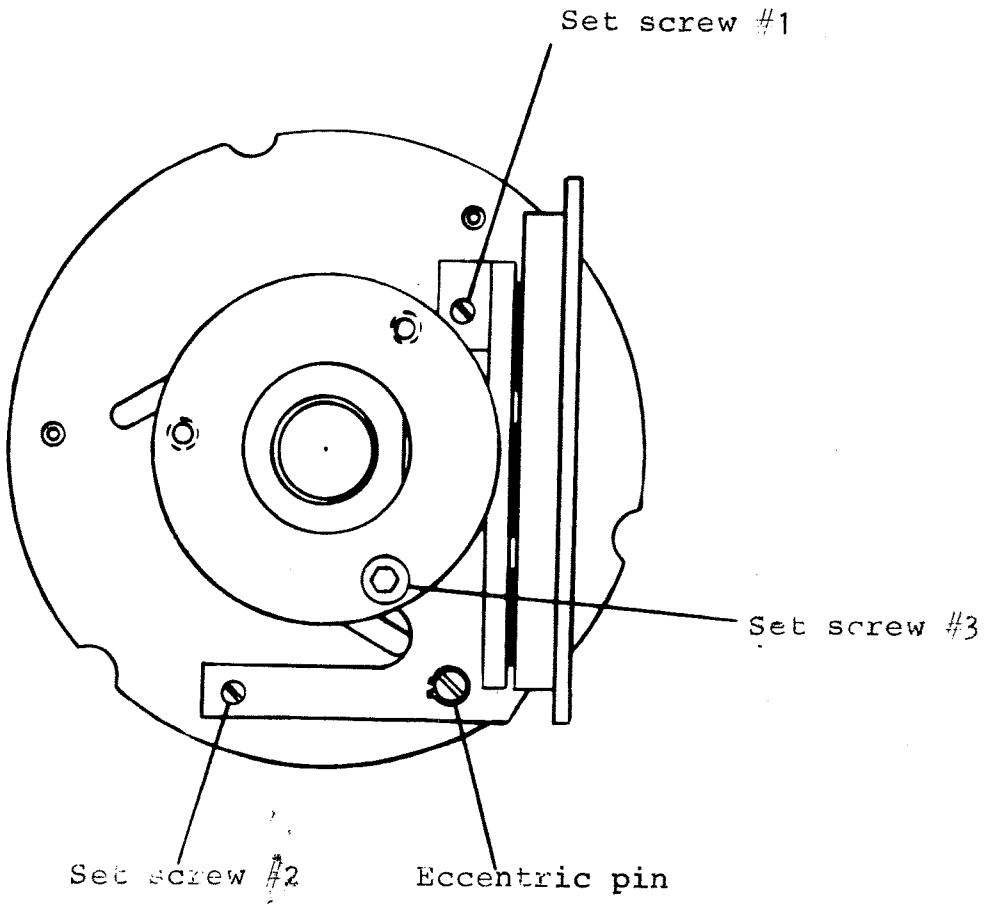


Figure 9. Mounting the grating assembly.

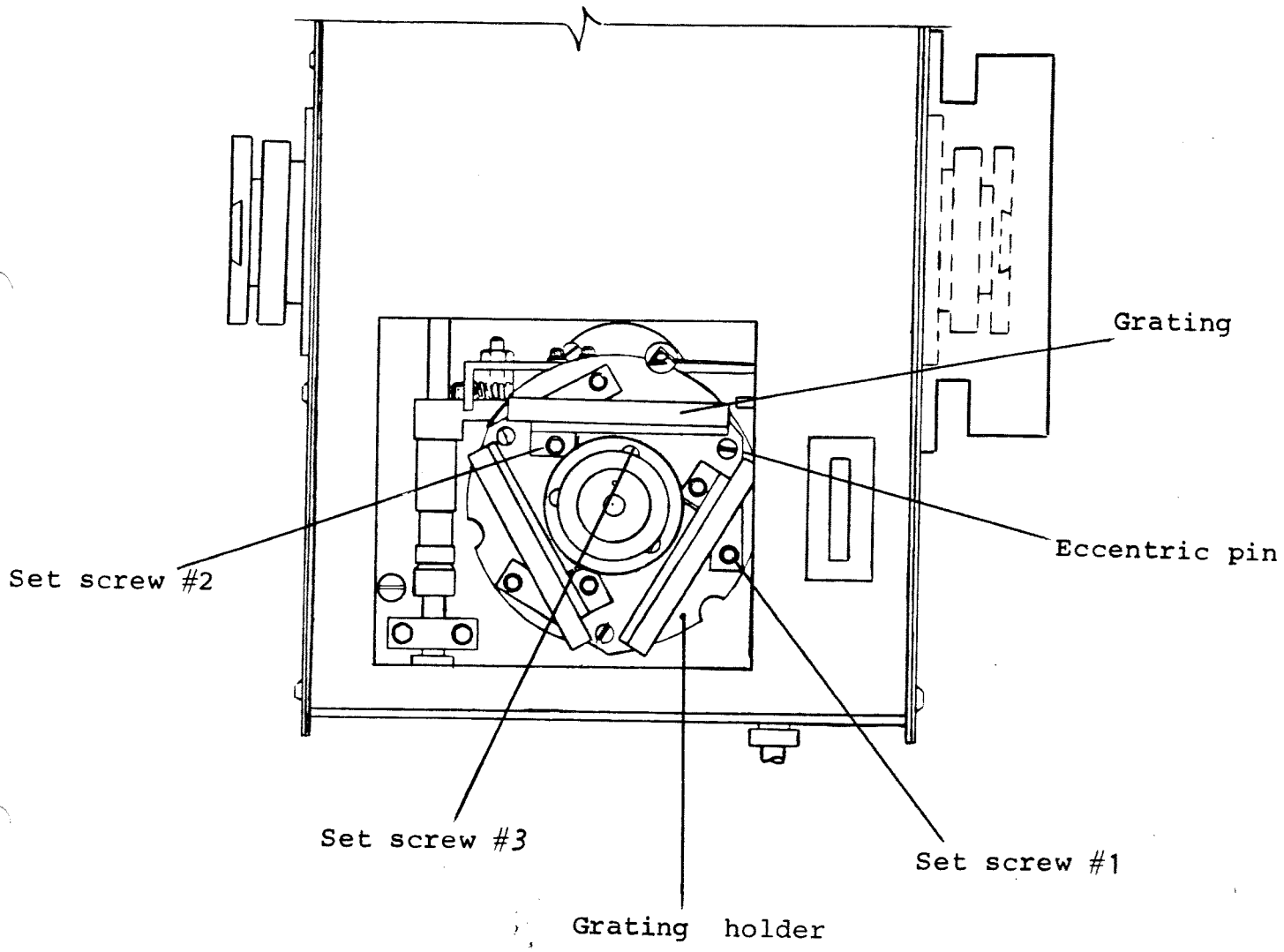


Figure 10. Grating assembly.

6.2 Aligning the Grating

Check the wavelength calibration with the grating you received (See Section 4.2). When the calibration checks out, align and calibrate the new grating.

1. Insert the entrance and exit alignment slits.

2. Place the Hg lamp as close as possible to the entrance slit.

3. Rotate the counter to the zero position (0000).

4. Rotate the grating eccentric pin so that the zero order passes through the exit slit.

5. Adjust the grating set screw #2 so that the horizontal cross line of the entrance slit image is superimposed on the horizontal line of the exit slit.

6. Rotate the counter to the first order green line, 546.1 nm. The line should match up with the exit slit. If it does not, adjust the set screw #1 until the entrance cross line image is superimposed on the exit slit horizontal line.

7. Rotate the counter to the zero order position, (0000 on the counter), and check that the entrance image remains superimposed in the exit slit. If it does not, repeat steps 7,8 and 9 until the line remains superimposed.

8. When the image remains superimposed after viewing these orders, put a drop of Glyptal enamel on both set screws, #1 and #2.

9. Replace the alignment slits with 150 or narrower slits.

10. Rotate the counter to the zero order position.

11. Rotate the eccentric pin until the maximum zero order line appears on the exit slit.

12. Put a drop of Glyptal enamel on the eccentric pin.

13. Replace the instrument cover and grating turret knob.

6.3 Removing the Grating

1. Place the instrument with the crank facing you and the entrance slit on your left.

2. Remove the grating turret knob.

3. Remove the cover by unscrewing the 14 buttonhead screws, (See Figure 18).

4. Release the set screws on the right side of the turret cylinder,(See Figure 9).

5. Hold the grating by the metal side strips and slide the grating away from you. Do not bump the grating on the instrument casing or on the spur gear.

7.0 PERIODIC MAINTENANCE

The wavelength calibration and focus should be checked yearly or whenever the instrument has been moved or subjected to shock or vibration. Refer to Sections 4.1-Checking the Focus, and 4.2-Checking the Wavelength Calibration. At the same time, check the optical surfaces for dust accumulation. It is unlikely that these surfaces will need cleaning throughout the life of your instrument.

7.1 Inspecting the Optical Surfaces

The optical surfaces in the MonoSpec 27 are: two turning mirrors, the focusing mirror, the collimating mirror, and the grating, (See Figure 11). These surfaces can accumulate dust, but unless you work in a dusty atmosphere as the instrument operates, the dust coating will not become thick enough to require cleaning.

NOTE

It is very unlikely that the optical surfaces will require cleaning throughout the lifetime of the instrument. IMPORTANT: NEVER TOUCH THE OPTICAL SURFACES. Make sure that fingers, sleeves, papers, etc. do not touch these surfaces.

Should the mirrors in the instrument ever require cleaning, carefully remove the dust with an application of canned air. DO NOT CLEAN THE OPTICAL SURFACES IN ANY OTHER FASHION - no tissue, water, brushes, etc.

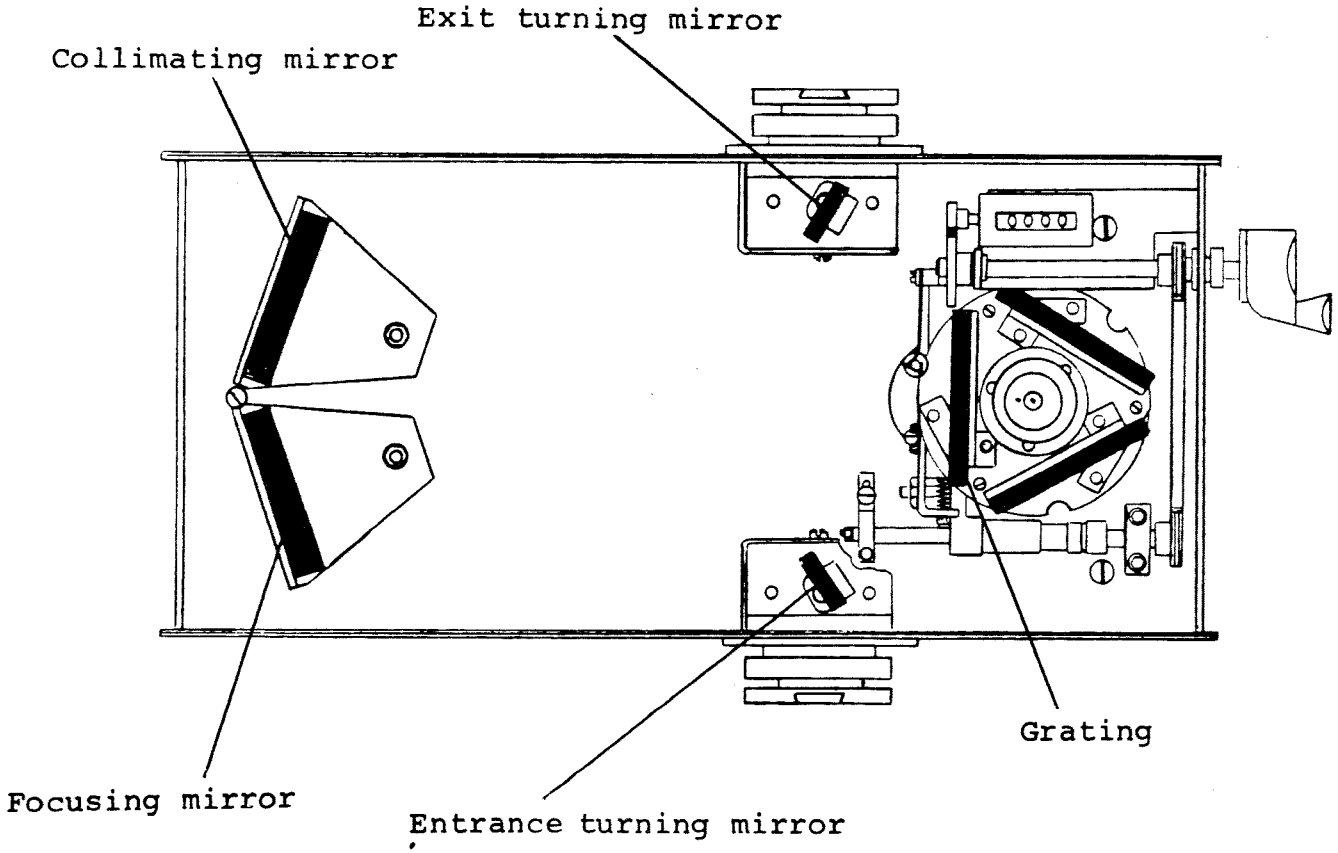


Figure 11. Optical surfaces

8.0 INSTRUMENT SERVICE

This section includes procedures for pin construction, wavelength calibration and counter calibration. Do not attempt to service the MonoSpec 27 unless you are throughly familiar with the instrument and the following procedures.

First, perform the focus and wavelength calibration check, (Section 4.1 and 4.2). If the focus does not check out or the resolution is poor, then align the optical system and refocus the instrument (Section 5.3). This will be necessary if the instrument has been subjected to shock. If the wavelength check produces readings which differ more than +/- 1 nm, then calibrate the grating drive.

8.1 Alignment Pin Construction

Order alignment pins, (AAS Cat No. 003743), or construct them. The best materials is either steel or hard brass. Use the dimensions in Figure 12.

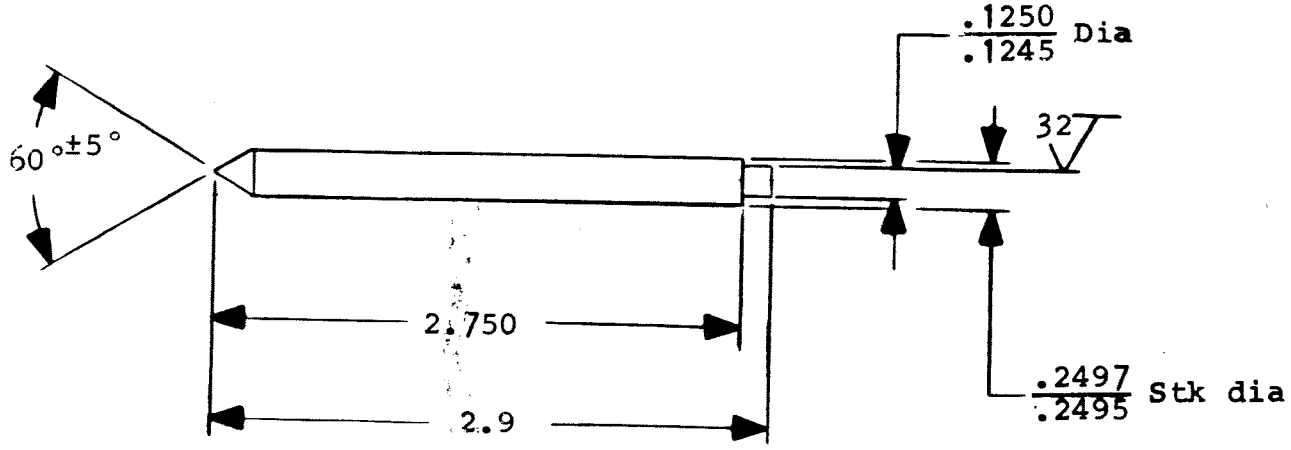


Figure 12. Alignment pin dimensions.

8.2 Optical Alignment of the MonoSpec 27

Please consult your **Thermo Jarrell Ash** optical engineer before attempting this procedure. Perform Checking the Focus, (Section 4.1). If the focus cannot be corrected then align the instruments optics. (Refer to Figures 13 & 14 during alignment). To perform these procedures, you need the following equipment:

* Two alignment pins (AAS Cat. No. 003743). You can construct these pins. (See Section 8.1 Alignment Pin Construction).
* HeNe laser
* 150 or wider entrance and exit slits.
* Low pressure mercury lamp (AAS Cat. No. 45-544)

CAUTION: DO NOT TOUCH THE OPTICAL SURFACES.

1. Set the instrument with the crank facing you, the counter to your right.
2. Remove the grating turret knob.
3. Remove the cover by unscrewing the 14 buttonhead screws around the base.
4. Remove the entrance slit and exit slit or port baffles by unscrewing the two baffle screws, (See Figure 13).
5. Remove the entrance and exit turning mirrors by releasing the set screw in the mirror platform (in the same location as the front baffle screw).
6. Grasp the mirrors by their metal holders and pull the mirrors up.
7. Remove the collimating and the focusing mirrors by unscrewing the two screws and the nut for the knurled disc in each mirror base.
8. Carefully pull each mirror assembly straight up so as not to damage the pin in each base.
9. Rotate the counter to zero order position.

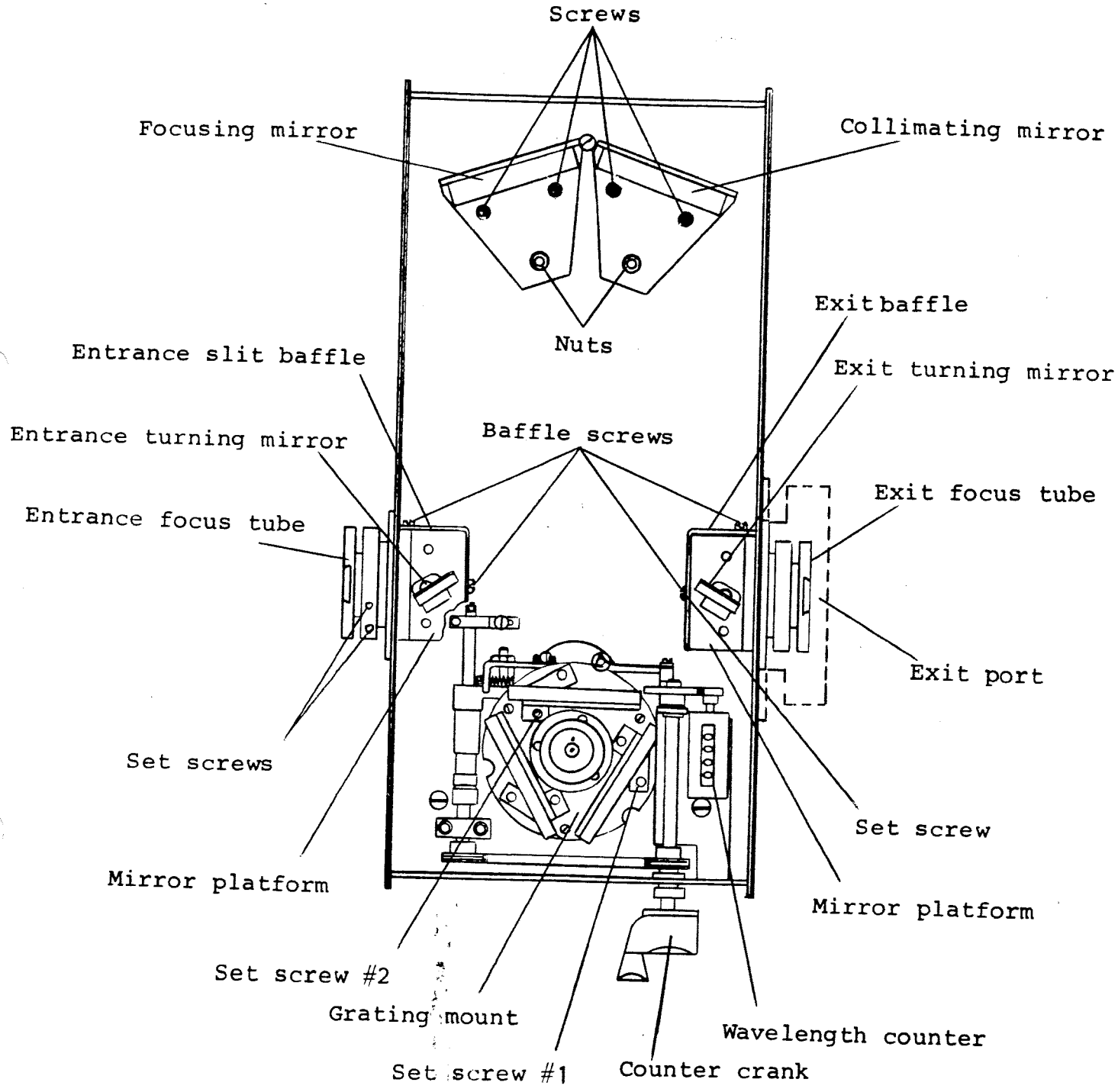


Figure 13. Assemblies for optical alignment.

10. Unscrew the two set screws in the entrance focus tube assembly and slide the focus tube so it is flush with the inner wall of the slit bracket (or on the entrance slit of the spectrograph).

11. Place the square on a flat surface next to the entrance slit and rotate the focus tube so the slit is at a right angle to the base. Tighten the set screws in the focus tube.

12. Insert the 150 microns entrance and exit slits.

13. Place the HeNe laser approximately 50 cm. from the entrance slit.

14. Adjust the laser so the beam passes through the entrance slit and exit port.

15. Remove the 150 slit.

16. Insert the alignment pins into the holes in front of the entrance and exit turning mirrors, (See Figure 14).

17. Adjust the height of the laser so the beam is centered on the tip of the pins.

18. Mount a white card or target in the path of the exit beam 200mm from the exit port and parallel to the side of the instrument.

19. Mark the position of the beam on the target.

20. Replace the entrance and exit slits.

21. Remove the pin from the entrance mirror position and place it in the collimating mirror position.

22. Put the entrance turning mirror in place and rotate it to center the beam on the tip of the pin at the collimating mirror position.

23. Once this alignment is correct, tighten the mirror set screw to lock the mirror in position.

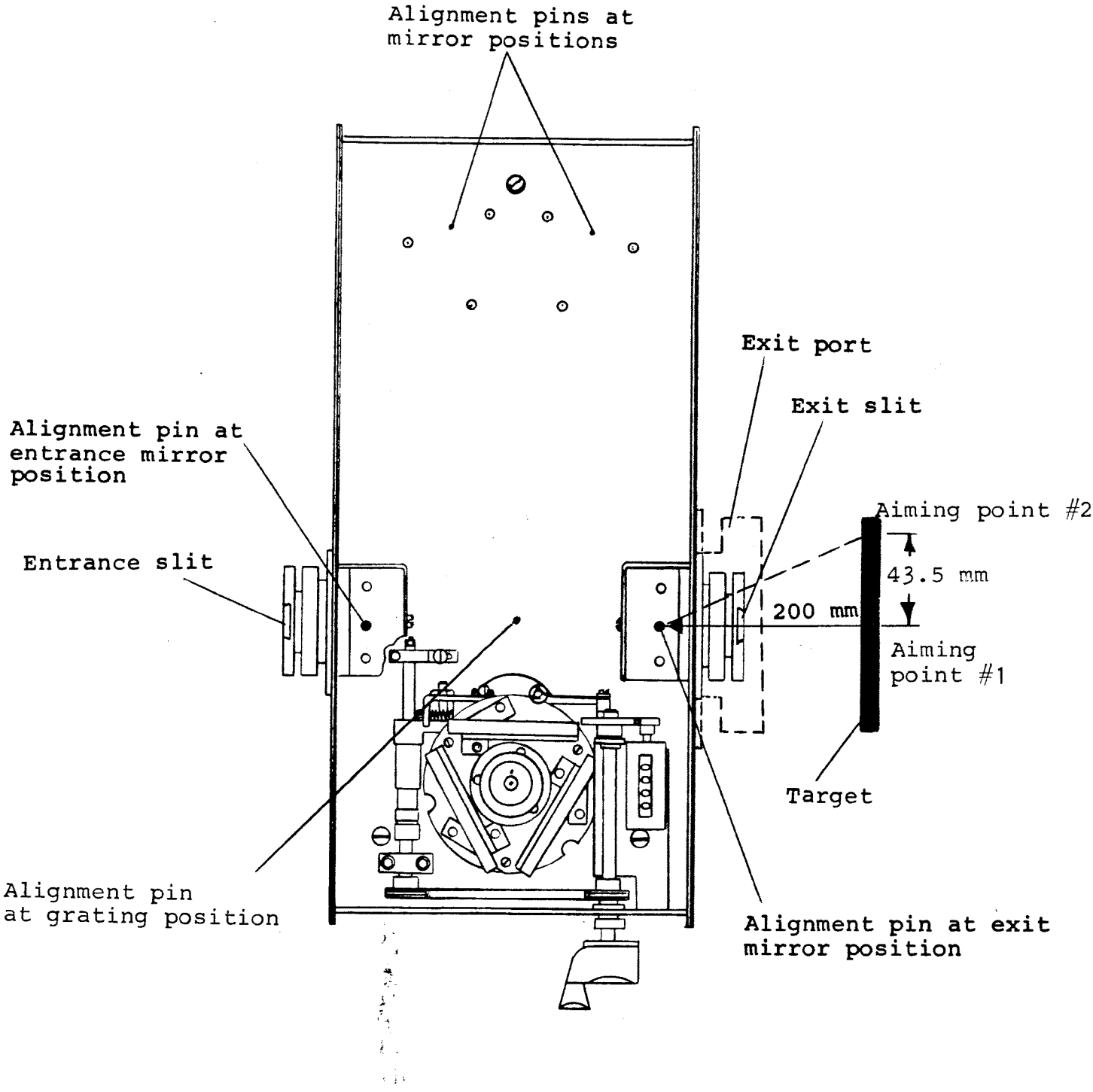


Figure 14. Alignment diagram.

24. Move the alignment pin from the collimating mirror to the hole in front of the grating.

25. Put the collimating miror in place and adjust it so the beam is centered on the grating alignment pin.

NOTE

The collimating mirror is marked with an "A" on the left hand side when the mirror is facing you. The focusing mirror is marked with a "A" on the right hand side when the mirror is facing you.

26. Adjust the beam height with the knurled disc on the mirror base.

27. Verify that the beam is horizontally centered on the grating. Use the grating pivot screw as a guide to centering.

28. When the beam is centered on the grating pin, lock the collimating mirror in position by tightening the screws and the nut for the knurled disc on the mirror base.

29. Move the grating alignment pin to the focusing mirror position.

30. Rotate the grating to zero order to center the laser on the pin at the focusing mirror position.

31. Correct the beam height on the pin by adjusting set screw #1 on the grating mount, (See Figure 10).

32. Rotate the grating to 632.8 nm and adjust set screw #2 to center the beam on the pin.

33. Check the position of the zero order beam. If necessary, readjust set screws #1 and #2.

34. Remove the alignment pin from the focusing mirror and place it in the exit turning mirror position.

35. Put the focusing mirror in place and adjust it so the beam is centered at the tip of the pin at the exit turning mirror.

36. Adjust the beam height with a knurled disc at the front of the mirror base. When the beam is centered on the pin tip, lock the focusing mirror in position by tightening the screws and the nut for the knurled disc on the mirror base.

37. Remove the alignment pin at the exit mirror and put the mirror in place.

38. Rotate the exit mirror until the laser beam is centered on the exit slit (or centered on the target mark for the spectrograph).

39. When the beam is centered, tighten the set screw in the mirror platform.

40. Replace the entrance slit and exit port mirror baffles by screwing the two baffle screws in place.

41. Refocus the instrument (refer to section 4.1).

42. Replace the cover by screwing in the 14 button head screws around the base of the instrument.

43. Replace the grating turret knob.

8.3 Wavelength Calibration

Perform the wavelength calibration check. If the readings differ more than + 1 nm, then the grating drive should be calibrated. You need a low pressure mercury lamp to calibrate.

1. Remove the outside cover of the instrument by unscrewing the 14 buttonhead screws around the base.

2. Remove the grating turret knob.

3. Place the Hg lamp as close as possible to the entrance slit.

4. Turn the crank until zero order beam (0000 on the counter) passes through the exit slit.

   CAUTION; DO NOT TOUCH THE GRATING SURFACE.

5. Visually check that the ball plunger on the sine arm is in line with the front surface of the grating, (See Figure 15).

6. If the ball plunger is in line, proceed to step 8. If it is not in line, loosen the lock nut of the ball plunger adjustment screw and unscrew the ball plunger.

7. Bring the micrometer arm flush in front of the grating surface by rotating the crank.

8. Slowly screw the ball plunger adjustment screw until it lightly touches the micrometer arm and then tighten the lock nut, (See Figure 16).

9. Crank the counter to 435.8 nm.

10. Adjust the maximum intensity of the blue line. Release the two sine arm locking screws and adjust the length of the sine arm by rotating the spring-loaded cap screw, (See Figure 15).

11. When the maximum intensity of the blue line is reached, tighten the two grating screws.

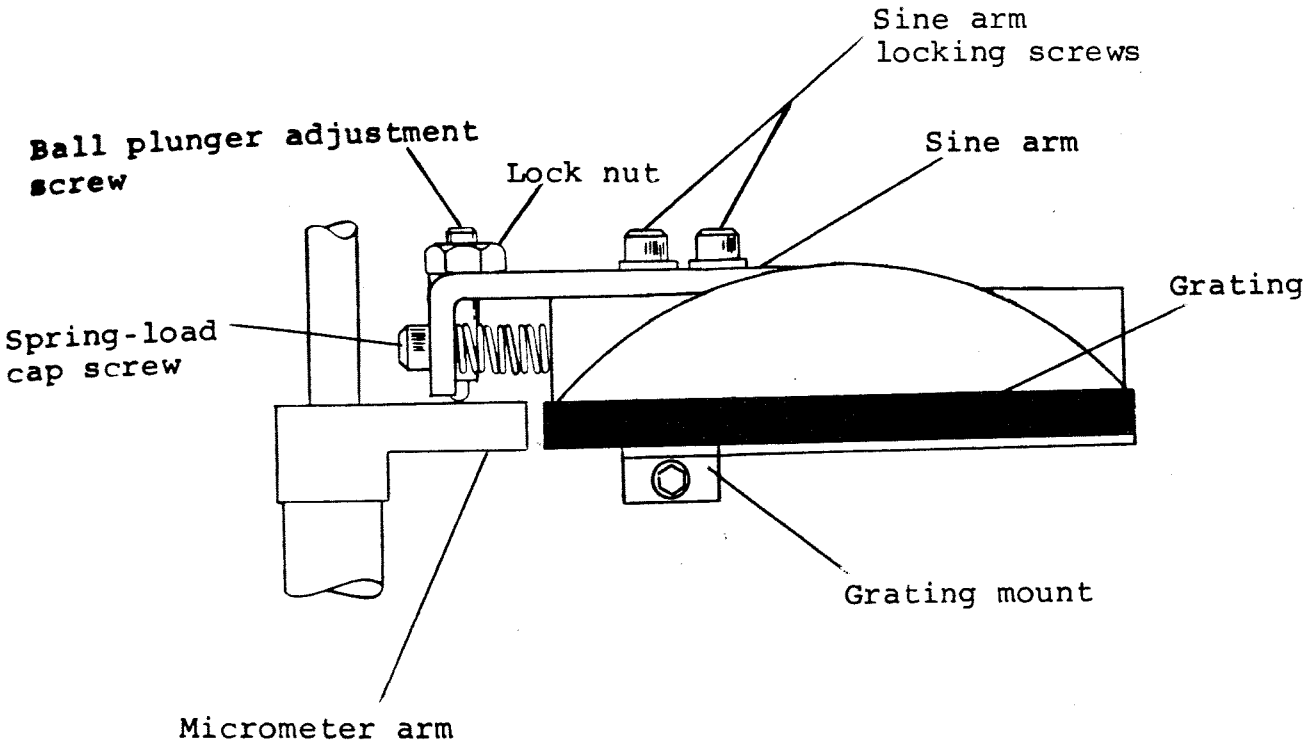


Figure 15. Ball plunger adjustment.

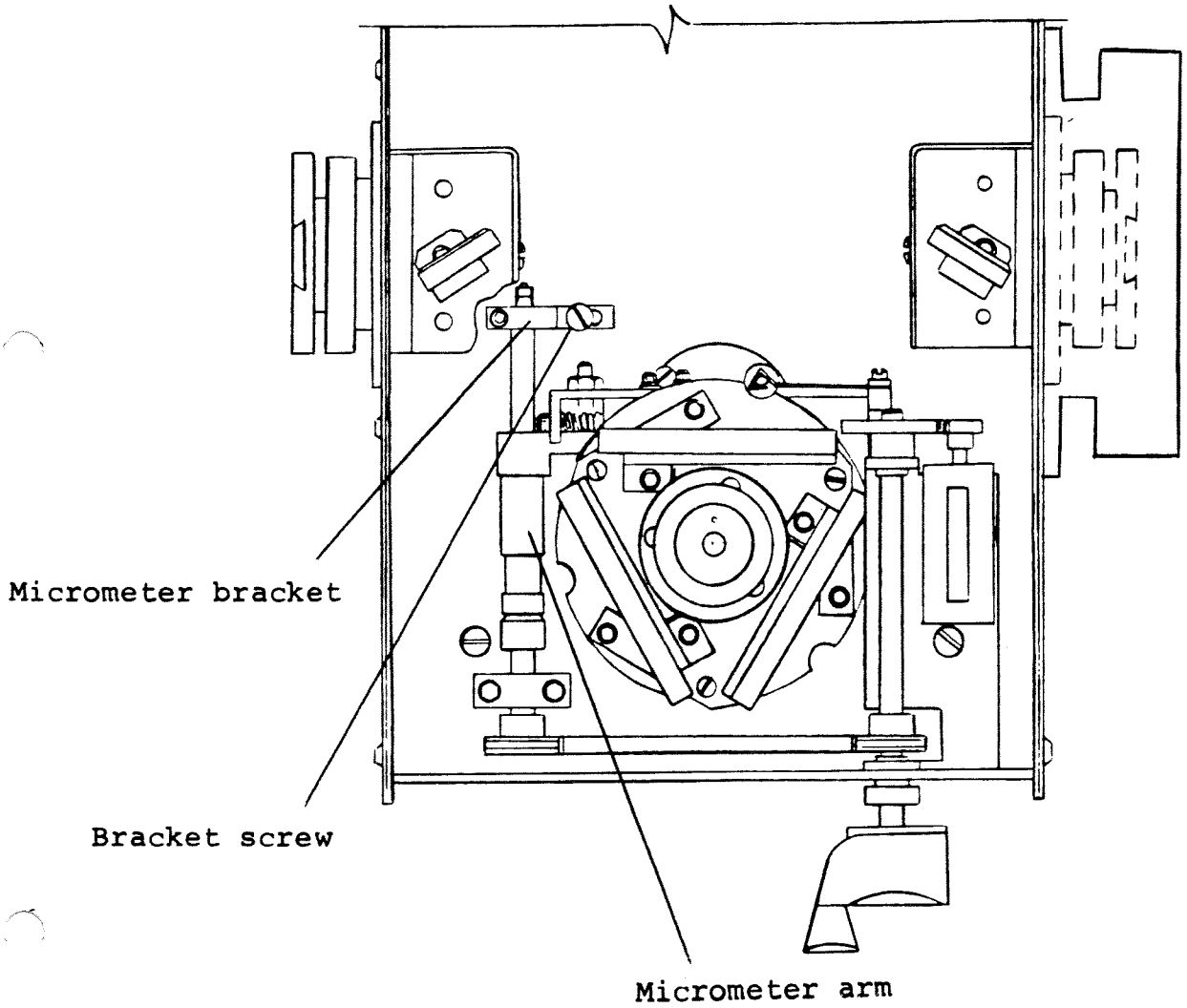
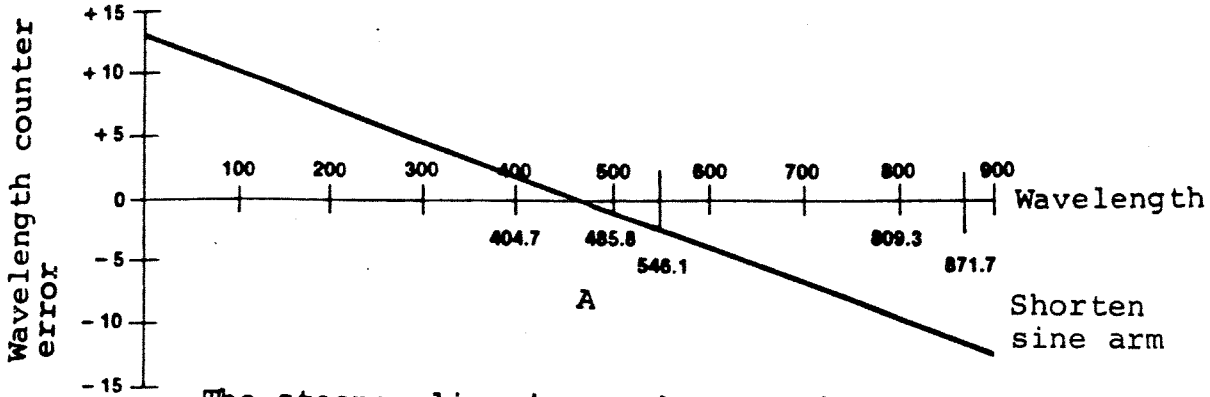
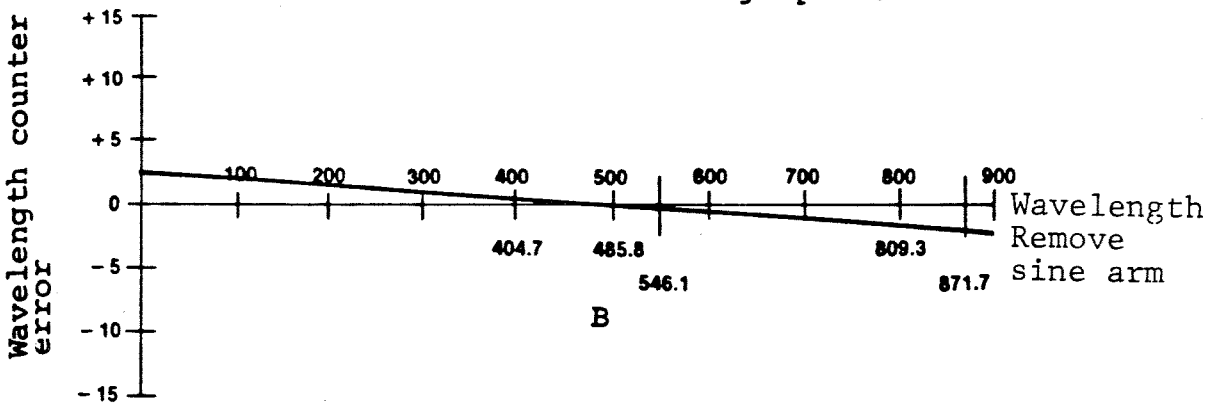
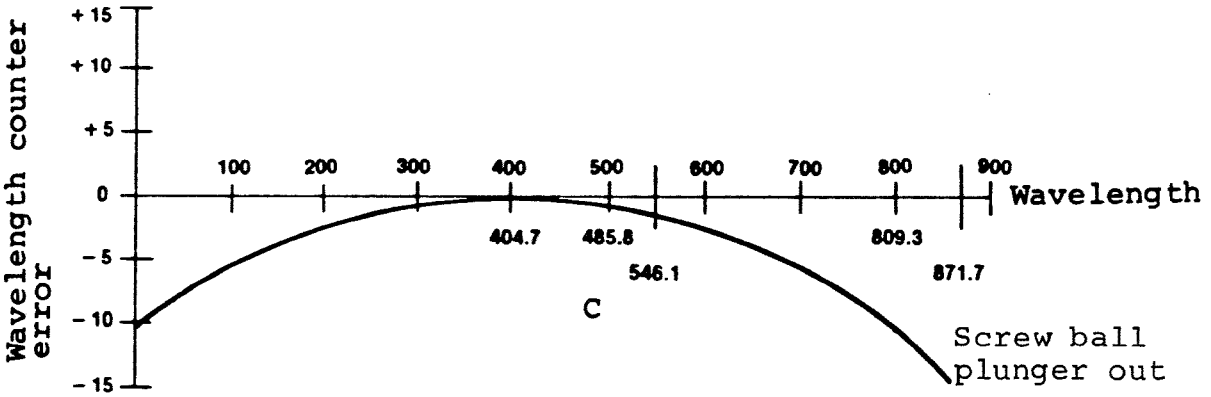


Figure 16. Sine bar and grating assemblies.



The steeper line in graph A requires a larger adjustment than the more horizontal in graph B.





The steeper curve of graph C requires a larger adjustment than the flatter curve in graph D.

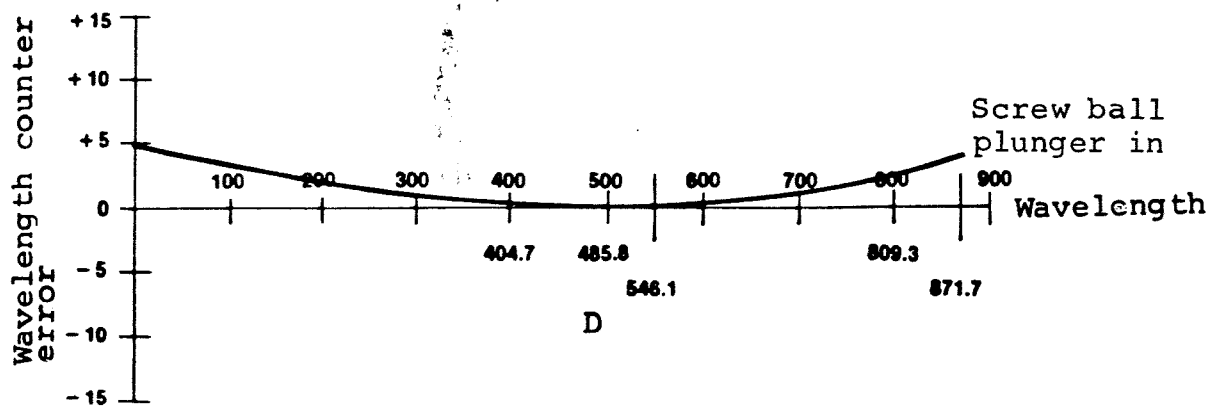


Figure 17. Wavelength calibration.

12. Crank the counter to 871.7 nm.

13. Release the screws in the micrometer bracket. See Figure 16. Move the bracket from side to side to find the maximum intensity of the second-order blue line.

14. When maximum intensity is observed, tighten the bracket screw at that position.

15. Check maximum intensity and calibration at these wavelengths: 0000, 404.7, 485.8, 546.1, 809.3, and 871.7 nm. If the readings are off, note the difference.

16. If the error is constant, proceed to the next section, 8.4 Counter Calibration. If the error is not constant, plot the error readings on a graph with the vertical axis labeled "Wavelength Counter Error" and the horizontal axis labeled "Wavelength", (See Figure 17). Connect the points, A straight line error plot indicates that the problem is in the sine arm adjustment, and you need to repeat this calibration procedure starting at step 9. A curved error plot indicates that the problem is with the ball plunger adjustment, and you need to repeat this procedure starting at step 5.

17. When the calibration checks to within +/- 1 nm, replace the cover of the instrument and replace the grating turret knob.

18. Recalibrate the counter, (See Section 8.4).

8.4 Counter Calibration

Refer to Figure 18 throughout this procedure.

1. Remove the grating turret knob.
2. Remove the cover of the instrument by unscrewing the 14 buttonhead screws around the base of the instrument.
3. Release the two caps screws directly beneath the counter.
4. Disengage the spur gear by pulling the counter to the outside edge.
5. Rotate the counter by the noted difference.
6. Re-engage the gear and tighten the screws.
7. Replace the exterior casing.

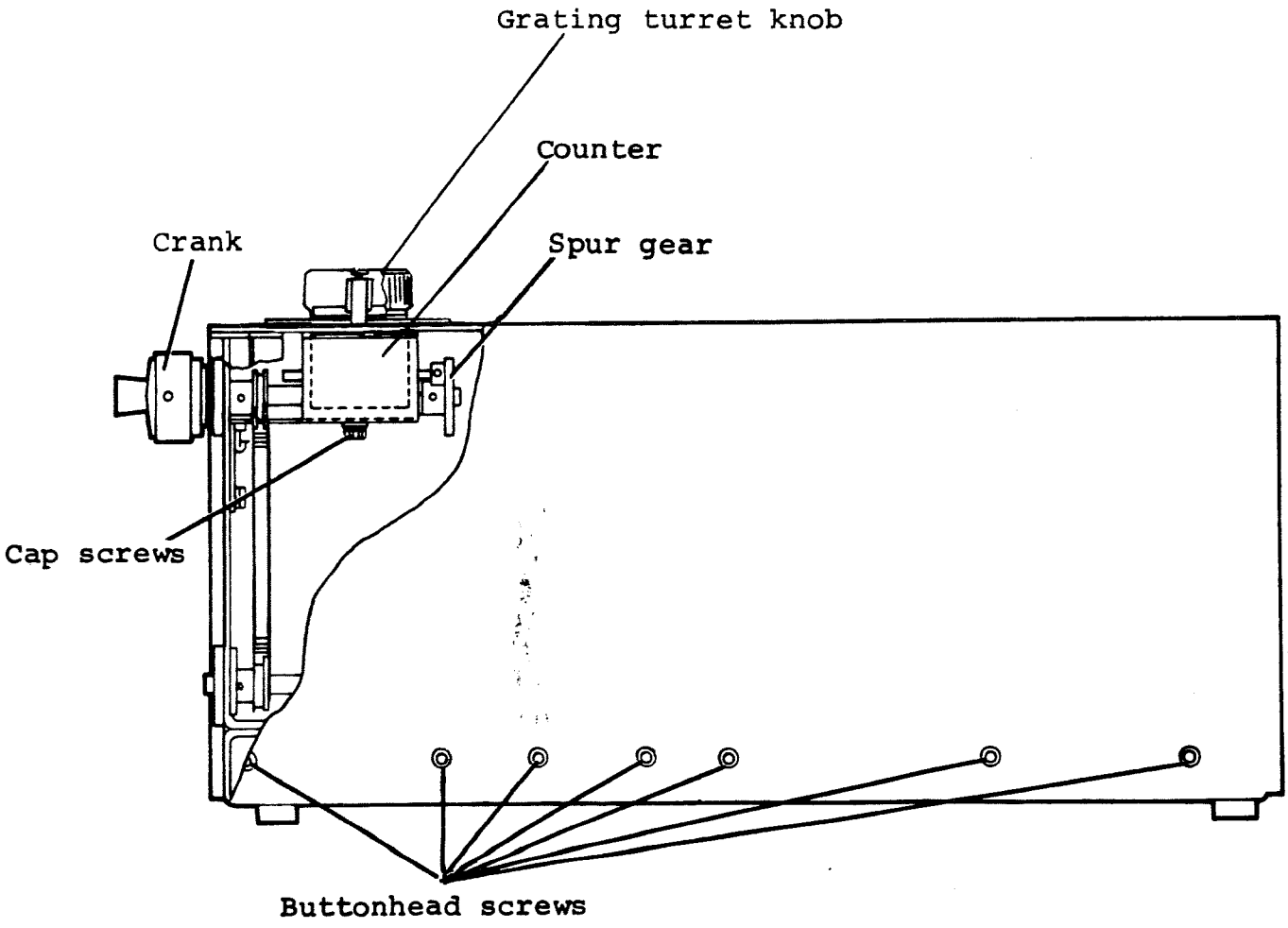


Figure 18. Wavelength counter calibration.

9.0 ACCESSORIES

Once you become familiar with the MonoSpec 27 you may find that you can utilize additional accessories for more precise operation. The various MonoSpec 27 accessories are described with their AAS catalog numbers. For more information or to order, contact Inside Sales, Thermo Jarrell Ash Corp., 8E Forge Pkwy, Franklin, Massachusetts, 02038, (508) 520-1880 or contact your nearest sales representative.

9.1 Gratings*

Gratings are cemented to the bracket with adjustments for alignment.

PART NO.	CATALOG NO	DESCRIPTION
11-080	985-30-19-22,	Ruled, 1200g/mm blaze, 520 nm.
11-081	985-30-19-18,	Ruled, 1200g/mm blaze, 300 nm.
11-090	985-30-14-17,	Ruled, 1800g/mm blaze, 260 nm.
11-082	985-30-09-17,	Ruled, 2400g/mm blaze, 260 nm.
11-083	985-30-29-22,	Ruled, 600g/mm blaze, 500 nm.
11-084	985-30-29-30,	Ruled, 600g/mm blaze, 1.0 mic.
11-085	985-30-39-36,	Ruled, 300g/mm blaze, 2.0 mic.
11-086	985-30-49-40,	Ruled, 150g/mm blaze, 4.0 mic.
11-087	985-30-54-45,	Ruled, 100g/mm blaze, 6.5 mic.
11-088	985-30-69-50,	Ruled, 50g/mm blaze, 10 mic.
11-089	985-30-79-58,	Ruled, 30g/mm blaze, 30 mic.
11-092	983-30-09-19,	Holographic,2400g/mm blaze,350 nm.
11-093	983-30-14-23,	Holographic,1800g/mm blaze,550 nm.
11-094	983-30-19-20,	Holographic,1200g/mm blaze,400 nm.
11-095	983-30-29-21,	Holographic,600g/mm blaze,450 nm.
11-096	983-30-39-20,	Holographic,300g/mm blaze,400 nm.
11-097	983-30-49-18,	Holographic,150g/mm blaze,300 nm

11-098 Grating mount assembly to be used for any non-standard grating, 69mm W X 69mm H X 6mm thick.
11-099 Grating mount assembly to be used for any Echelle grating, 100mm W x 69mm H x 6mm thick. 82-481 Wood box for holding three Monospec 27, (11-XXX Series) mounted gratings.

*For other non-standard Ruled and Holographic gratings consult our gratings price list.

9.2 Slits

All slits are photo-etched.

15050001 Individual Bi-lateral Adjustable Slit with straight jaws. Opening from 5 to 2000 mic. 15mm high.

12-509 Slit, width 25 microns
12-514 Slit, width 50 microns
12-525 Slit, width 100 microns
12-527 Slit, width 150 microns
12-535 Slit, width 250 microns
12-540 Slit, width 500 microns
12-560 Slit, width 1000 microns
12-570 Slit, width 2000 microns
12-590 Circular aperture, 3mm diameter.
12-591 Circular aperture, 6mm diameter.

9.3 Light Sources

AAS Part Number	Description
45-542	Tungsten iodide lamp and power supply; self contained blower cooled unit with on/off switch tungsten iodide gas filled lamp with quartz envelope; mounts directly on entrance slit.
45-544	Mercury lamp, lamp housing and power supply; for 115 volts, 50/60 Hz, single phase.
11330045	Deuterium lamp.
11330051	Tungsten iodide lamp for 45-542.
11330011	Mercury lamp.

9.5 Photomultiplier Housing and Photomultipliers

AAS Part Number	Description
83-017	Side window photomultiplier tube housing with two coaxial cables terminated with MHV and BNC connectors.
17-724	Photomultiplier, R212, for use in 185-670 nm range, (spectral response S-5).
17-742	Photomultiplier, R955, for use in 185-800 nm range.
17-736	Photomultiplier, R406, for use in 800-1100 nm range, (spectral response S-1).