3 GENERAL OPERATING INSTRUCTIONS

3A. START UP

1.) Ensure that the sample beam and reference beam are unblocked and then press the POWER toggle switch (located on the right side of the instrument at the lower back corner) forward to ON to turn on all power to the instrument. Wait sixty seconds for the system to initialize (see Section 2D). The CHART EXPANSION 1 LED (default parameter) lights and the SCAN TIME 12 LED (default parameter) lights.

3B. SETTING THE STARTING WAVENUMBER

1.) Press WAVENUMBER (the WAVENUMBER LED lights). The wavenumber at which the instrument is set will appear on the display.

2.) Press PARAMETER ADJUST ↑ and/or ↓ to set the wavenumber to the value desired.* PARAMETER ADJUST ↑ moves the grating to lower wavenumbers while PARAMETER ADJUST ↓ moves the grating to higher wavenumbers.**

3C. SELECTING THE CHART EXPANSION

1.) Press CHART EXPANSION 0.5, 1 or 5*** to select chart expansions of 0.5, 1.0 or 5.0, respectively. The appropriate LED illuminates.

3D. SETTING THE CHART PAPER

1.) Press CHART (the CHART LED lights).

2.) Press PARAMETER ADJUST ↑ and/or ↓ buttons to move the chart paper left and right, respectively, in one centimeter intervals until properly aligned.

3E. DETERMINING AND SETTING THE SCAN TIME/SLIT PROGRAM***

1.) Press SCAN TIME 3 to select a three-minute scan with wide slits. The SCAN TIME 3 LED illuminates.

2.) Press SCAN TIME 3 and X4 to select a twelve-minute scan with wide† slits.*** Both the SCAN TIME 3 and X4 LED's illuminate.

3.) Press SCAN TIME 12 to select a twelve-minute scan with narrow slits.†† The SCAN TIME 12 LED illuminates.

4.) Press SCAN TIME 12 and X4 to select a forty-eight-minute scan with narrow slits.*** The SCAN TIME 12 and X4 LED's illuminate.

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*The Chart paper may reposition itself up to ±1.0 cm while making these adjustments.

**If the WAVENUMBER LED is not illuminated, the chart paper will move synchronously with the wavenumber.

***Models 1330 and 1320 only.

†Wide slits are twice the width (in wavenumbers) of narrow slits.

††When switching from wide to narrow slits, or vice-versa, while in the automatic slit mode, the instrument automatically scales the gain by a factor of four.

3F. CHECKING THE GAIN; USE OF THE BASELINE CONTROL

1.) Ensure that the monochromator is set to 4000 cm^{-1}.

2.) Press GAIN CHECK. The GAIN CHECK LED illuminates, a unitless gain value appears on the display and the pen deflects on the recorder. If the gain is set correctly, the pen should deflect ten divisions (10%T).

3.) If the pen does not deflect ten divisions, press PARAMETER ADJUST ↑ or ↓ until a ten-division pen deflection is obtained. The instrument will normally initialize at the correct gain setting.

> **Note:** The gain setting should normally be checked at 4000 cm^{-1}. If the scan is to be made over a limited frequency region, however, the gain may be adjusted at a frequency within this region. It should not be adjusted in regions where atmospheric absorption occurs.

4.) To adjust the baseline, with nothing in either beam, set the pen at 100% Transmittance with the Baseline control. The Baseline control is located on the left wall of the sample compartment (see Figure 1-1, item 8).

3G. USE OF THE MANUAL SLIT CONTROL (Models 1330 and 1320)

1.) Press MANUAL SLIT. The MANUAL SLIT LED illuminates indicating that the slits have returned to the previously adjusted manual slit width and previously adjusted manual gain.

2.) To select the programmed slit mode, press MANUAL SLIT again. The MANUAL SLIT LED extinguishes indicating that the slits will adjust automatically and the gain will return to the value used for programmed slits.

To scan in the MANUAL SLIT mode (MANUAL SLIT LED must be illuminated), press the appropriate button, e.g., 3 selects a scan time of three minutes, 12 selects a scan time of twelve minutes and X4, when pressed after having pressed 3 or 12, selects a scan time of twelve minutes or forty-eight minutes, respectively.

If MANUAL SLIT and SCAN TIME have been pressed, both the MANUAL SLIT and SCAN TIME LED's are on.* In this mode, if the slits are being adjusted, the SLIT ADJUST LED will also be on, adding a third illuminated LED to the display. To leave the Manual program, press MANUAL SLIT again. The MANUAL SLIT LED goes out. Whatever Scan Time/Slit Program the instrument is in will be the Slit Program that the instrument returns to.

3H. USE OF THE SLIT ADJUST CONTROL (Models 1330 and 1320)

1.) To adjust the slit width in the Manual Slit mode, press MANUAL SLIT (the MANUAL SLIT LED illuminates).

2.) Press SLIT ADJUST (the SLIT ADJUST LED illuminates and the band width appears in units of 0.1 wavenumbers on the display meter, e.g., a reading of 0070 corresponds to 7.0 cm^{-1}).

*One of the two SCAN TIME LED's is always on.

3.) Press PARAMETER ADJUST ↑ and/or ↓ to adjust the slit width. The default value at 4000 cm^{-1} is approximately 0070 (this value may vary from instrument to instrument) which corresponds to a bandwidth of 7.0 cm^{-1}. When scanning in the manual mode, the mechanical slit width remains constant over the entire range. However, the spectral slit width changes with frequency and the servo response will vary with the amount of energy falling on the detector. If the instrument is in the programmed slit mode and SLIT ADJUST is pressed, the spectral slit width of the programmed slit mode appears on the display. However, the slit width cannot be adjusted.

3L. USE OF THE TIME DRIVE CONTROL (Models 1330 and 1320)

1) To perform a Time Drive, press TIME DRIVE (the TIME DRIVE LED illuminates). The chart paper moves at a rate determined by the CHART EXPANSION selected. (CHART EXPAN 0.5 moves the chart paper 0.5 cm/min; CHART EXPANSION 1.0 moves the chart paper 1.0 cm/min; and CHART EXPANSION 5.0 moves the chart paper 5 cm/min.)

2) To abort Time Drive, press TIME DRIVE.

3J. STARTING THE SCAN

After the appropriate instrument settings have been selected, the sample is placed in the sample beam and the SCAN control is pressed. The instrument will automatically record the spectrum over the full wavelength range of the instrument.

3K. ENDING THE SCAN

To abort a scan in progress, press SCAN.

4 CONTROLS AND INDICATORS

The following controls and indicators are provided on the Model 1330, Model 1320, and Model 1310 IR Spectrophotometers unless noted otherwise. Note that the Model 1330 has a range of from 4000 to 200 wavenumbers while the Model 1320 and Model 1310 cover the range of from 4000 to 600 wavenumbers. Where these controls refer to the maximum ending wavenumber available, the notation "200 (600)" is made to distinguish the difference in instrument Models.

1. POWER ON/OFF Switch - Controls line power to the instrument. It is located on the right side of the instrument at the lower back corner. The forward position is ON and the back position is OFF. (See Figure 1-1.)

Refer to Figure 4-1 which shows the Model 1320 Control Panel.

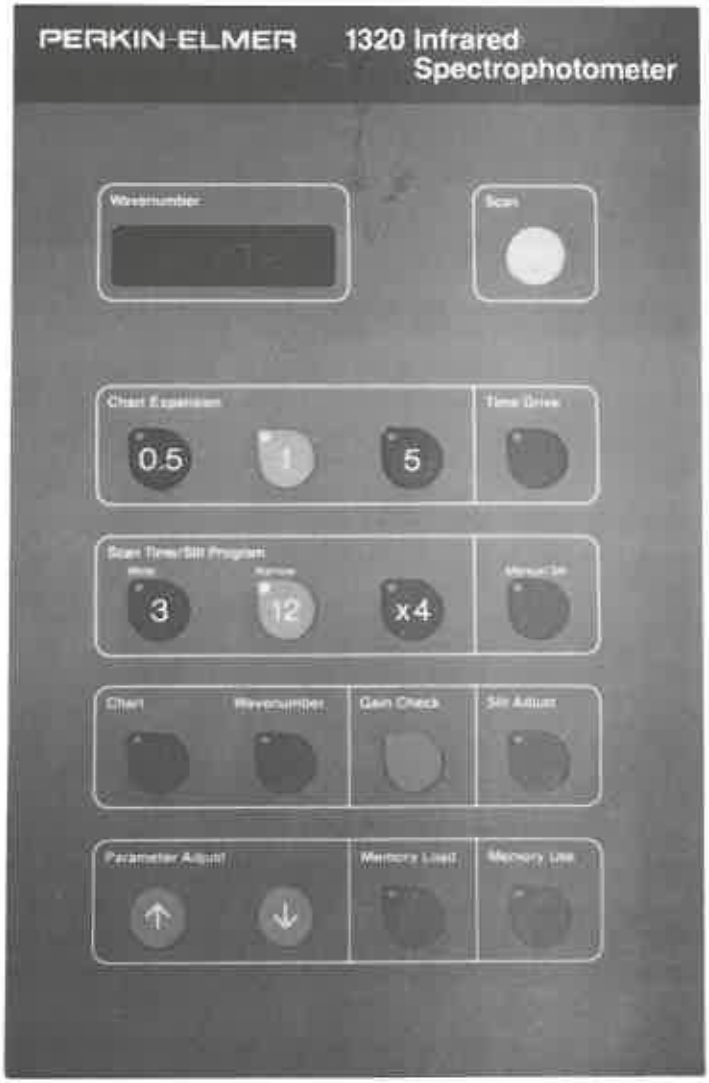

Figure 4-1 - Model 1320 Control Panel (Memory Load and Memory Use controls are available with the Parameter Memory Accessory only)

Note: All of the following controls except SCAN and PARAMETER ADJUST have LED indicators at the upper-left corner of the button. When a control is in operation, its LED lights, providing an immediate visual display of the operating mode of the instrument.

2. WAVENUMBER Display - This display provides a frequency readout in wavenumbers to indicate the position of the monochromator from 4000 to 200 (600) with a readout accuracy of ±6 wavenumbers (4000 to 2000 wavenumbers) and ±3 wavenumbers (2000 to 200 (600) wavenumbers).

   On the Model 1330 and Model 1320, use of the SLIT ADJUST control produces a slit width readout of spectral bandpass.

   When using the GAIN CHECK control to check or reset the gain, the display indicates a unitless factor representing the gain. (See Gain Check.)

3. SCAN Touch Control - When pressed causes the instrument to begin scanning (with the POWER switch ON). The pen automatically drops to the chart paper and rises at the end of the scan. Pressing the SCAN control during a scan stops the scan.

   When MEMORY USE* is pressed (the MEMORY USE LED is illuminated), pressing the SCAN control causes the instrument to scan the frequencies previously loaded into the memory, in sequence.

4. CHART EXPANSION Touch Controls - Three controls (two on the Model 1310) for selecting the number of wavenumbers (cm^{-1}) recorded per cm of chart paper.

   When 0.5 Chart Expansion is chosen, 20 cm^{-1}/mm are recorded on the chart paper in the 4000 to 2000 cm^{-1} range and 10 cm^{-1}/mm are recorded in the 2000 to 200(600) cm^{-1} range. (Use 28 cm chart paper, part no. 0199-1042 (ordinate - %T) or part no. 0199-1041 (ordinate - absorbance).)

   When 1.0 Chart Expansion is chosen, 10 cm^{-1}/mm are recorded on the chart paper in the 4000 to 2000 cm^{-1} range and 5 cm^{-1}/mm are recorded in the 2000 to 200(600) cm^{-1} range. (Use 56 cm chart paper, part no. 0510-4367 (ordinate - %T) or part no. 0510-4366 (ordinate - absorbance).)

   When 5.0 Chart Expansion is chosen** 2 cm^{-1}/mm are recorded on the chart paper in the 4000 to 2000 cm^{-1} range and 1 cm^{-1}/mm is recorded in the 2000 to 200(600) cm^{-1} range. (Use blank chart paper, part no. 0472-5158 or continuous grid chart paper, part no. 0472-5090 (ordinate - %T) or part no. 0472-5199 (ordinate -absorbance).)

5. TIME DRIVE Touch Control** - Permits recording spectra of samples as a function of time, at a particular wavenumber. Can be used with any of the three CHART EXPANSION controls. The reading of the CHART EXPANSION control will then be the Time Drive rate in centimeters per minute. For example, pressing control "0.5" will result in a time drive rate of 0.5 centimeters/minute.

*Available with Parameter Memory Accessory, N014-0149 (Model 1320) or N014-0150 (Model 1330).

**Models 1330 and 1320 only.

In this mode, both the TIME DRIVE LED and one of the CHART EXPANSION LED's are on.

6. *SCAN TIME/SLIT PROGRAM Touch Controls - Pressing control 3 selects a WIDE slit program and a scan time of three minutes. Pressing control 12 selects a NARROW slit program and a scan time of twelve minutes. Press X4*, to multiply the scan time by a factor of four. In the WIDE slit program, when X4 is pressed, the scan time increases to twelve minutes. In the NARROW slit program, when X4 is pressed, the scan time increases to forty-eight minutes.

7. *MANUAL SLIT Touch Control - Pressing MANUAL SLIT sets the slits to their previously adjusted manual slit width, and the gain to the previously adjusted "manual" value. Pressing MANUAL SLIT again returns the slits and the gain to the programmed slit (wide or narrow).

8. *SLIT ADJUST Touch Control - When pressed, the slit width is displayed in units of 0.1 wavenumbers on the display, e.g., a display of 0075 indicates a band width of 7.5 cm^{-1}. In the programmed mode, the slit width cannot be adjusted. SLIT ADJUST can be used in conjunction with MANUAL SLIT to change the slit width. (See Section 3H.) SLIT ADJUST** aborts after pressing SCAN, TIME DRIVE, MEMORY USE, MEMORY LOAD, CHART, WAVENUMBER or GAIN CHECK or aborts by pressing the SLIT ADJUST control again. The display then returns to frequency readout.

9. CHART Touch Control** - Pressing CHART in conjunction with a PARAMETER ADJUST control slews the chart either forward or reverse. Press CHART and the PARAMETER ADJUST ↑ control to slew the chart to lower wavenumbers. Press CHART and the PARAMETER ADJUST ↓ control to slew the chart to higher wavenumbers. Pressing CHART lights the LED at the upper-left of the CHART control.

   Pressing and immediately releasing one of the PARAMETER ADJUST controls moves the chart paper one cm. Holding the PARAMETER ADJUST control results in a continuous chart movement, which ends when the PARAMETER ADJUST control is released.

10. WAVENUMBER Touch Control** - Pressing WAVENUMBER and then pressing the PARAMETER ADJUST control slews the wavenumber either forward or reverse. Press PARAMETER ADJUST ↑ to slew the wavenumber to lower wavenumbers. Press PARAMETER ADJUST ↓ control to slew the wavenumber to higher wavenumbers. Pressing WAVENUMBER lights the LED at the upper-left of the WAVENUMBER control.

    Pressing and immediately releasing one of the PARAMETER ADJUST controls changes the frequency by one wavenumber. Holding the PARAMETER ADJUST control results in a continuous increase or decrease of wavenumber which accelerates with time and ends when the PARAMETER ADJUST control is released. It can be resumed by releasing the PARAMETER ADJUST control and then pressing it again.The slew ends at 4000 cm^{-1} or 200(600) cm^{-1}.

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*Models 1330 and 1320 only.

**CHART, WAVENUMBER, GAIN CHECK and SLIT ADJUST are mutually exclusive controls. Only one can be adjusted at a time. All abort under the same circumstances.

After WAVENUMBER is released, the chart paper may move up to ±1 cm to index the chart paper with the wavenumber. When the wavenumber is changed independently of the chart, the chart may have to be moved some whole number of centimeters to reindex it with wavenumber before resuming a scan.*

11. GAIN CHECK Touch Control** - When pressed, a gain value is displayed on the readout and the pen deflects 10% if gain is set at the correct value. The PARAMETER ADJUST controls are used to adjust the gain. GAIN CHECK aborts after GAIN CHECK is pressed again.

12. PARAMETER ADJUST Touch Controls - When the left control ↑ is pressed,*** the grating and the chart slew to lower wavenumbers (cm^{-1}). When the right control ↓ is pressed***, the monochromator and the chart slew to higher wavenumbers (cm^{-1}). When PARAMETER ADJUST is pressed and held, the slew begins slowly and then accelerates. PARAMETER ADJUST is also used in combination with CHART, WAVENUMBER, GAIN CHECK and SLIT ADJUST† (see each for specific operating procedure).

13. MEMORY LOAD Touch Control†† - This control is used to load up to thirty-four discrete frequencies into the instrument memory.

14. MEMORY USE Touch Control†† - This control has two functions. When pressed initially, the instrument slews to the first frequency in memory (or to 4000 cm^{-1}, the default position). When it is pressed again (the MEMORY USE LED is illuminated) and the SCAN control is pressed, the instrument sequentially scans all the frequencies in memory.

15. BASELINE - Hand-operated, mechanical control for adjusting the transmittance to 100%, when no sample is present in the sample holder. Located on the left wall of the sample compartment, in front of the sample holder.

16. TEST - When pressed, enables the operator to enter the service diagnostic routine and the grating calibration/single-beam mode. Located beneath the instrument cover (see Figure 6-1).

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*If the WAVENUMBER LED is not illuminated, the chart paper will move synchronously with the wavenumber.

**CHART, WAVENUMBER, GAIN CHECK and SLIT ADJUST are mutually exclusive controls. Only one can be adjusted at a time.

***CHART, WAVENUMBER, GAIN CHECK and SLIT ADJUST LED's must be extinguished.

†Models 1330 and 1320 only.

††Available on Parameter Memory Accessory for Models 1320 and 1330, N014-0149 (Model 1320) and N014-0150 (Model 1330).

5 MAINTENANCE

5A. GENERAL CARE

The Models 1310, 1320 and 1330 require a minimum of care to keep them in good operating condition. As with any precision instrument, the effort taken to provide reasonable care will repay the user in yielding a long trouble-free instrument life.

Keep the instrument clean and free from dust.

Avoid touching optical surfaces.

Keep moisture and corrosive vapors out of the instrument.

5B. PERIODIC MAINTENANCE

Several important adjustments and performance checks should be made periodically. Use Table 5-1 as a guide.

TABLE 5-1 - PERIODIC MAINTENANCE ADJUSTMENT SCHEDULE

Check or Adjust	Procedure	Reference
weekly	Polystyrene Test Spectrum	Sec. 5C
weekly	Zero Adjustment	Sec. 5D
pen motion is not smooth	Clean Pen Carriage Rod	Sec. 5G

5C. POLYSTYRENE TEST SPECTRUM

This procedure is used as a test to determine that the instrument is performing within specification. Every week, obtain a test spectrum and evaluate it.

1) Using the polystyrene test film provided, record a spectrum using SCAN TIME 12.

2) Compare the spectrum with the one illustrated in Figure 5-1.

Resolution - Shoulders A and B (shown in Figure 5-1) should remain quantitatively the same in their depth of resolution from the main bands.

Frequency Position - The following bands, shown in Figure 5-1, should appear at the frequencies indicated and should not deviate from the designated frequency by more than the tolerance indicated.

Band No.	Frequency	Tolerance
1	3027	± 6 cm^{-1}
2	2851	± 6 cm^{-1}
3	1944	± 3 cm^{-1}
4	1601	± 3 cm^{-1}
5	1181	± 3 cm^{-1}
6	1028	± 3 cm^{-1}
7	907	± 3 cm^{-1}
8	699	± 3 cm^{-1}
9	540*	± 3 cm^{-1}

*Model 1330 only.

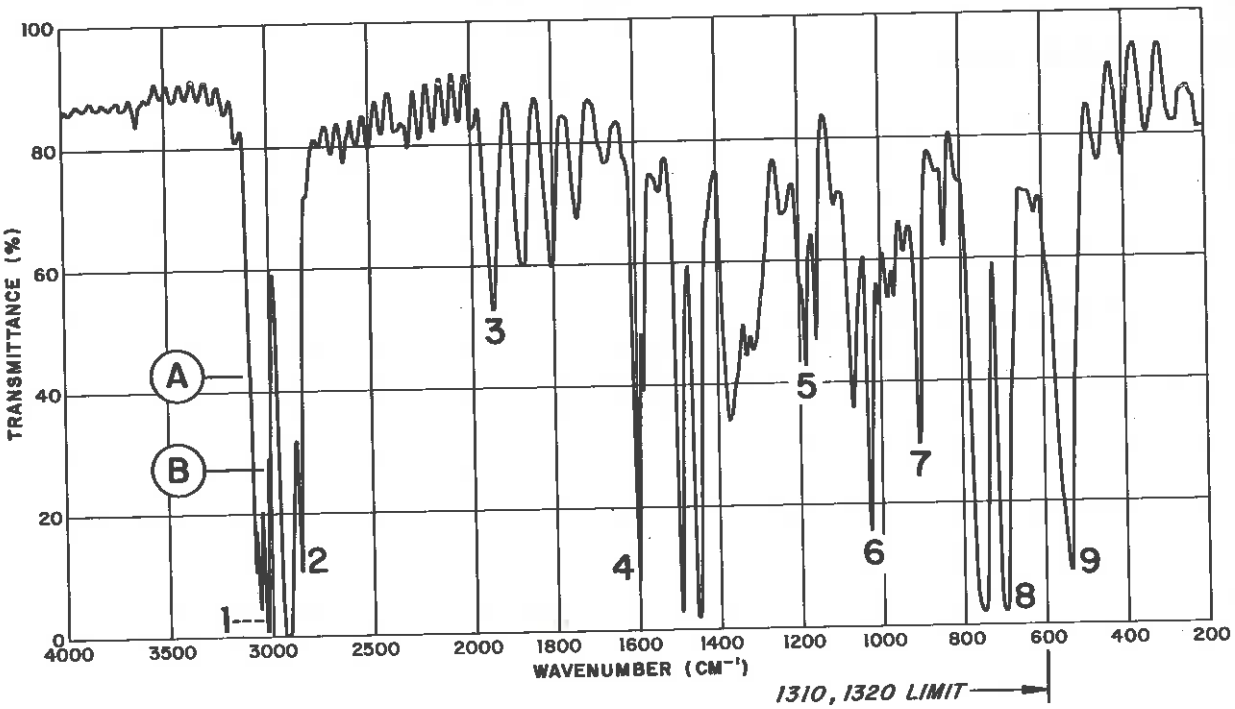


Figure 5-1 - Polystyrene Test Spectrum (Model 1330)

Ordinate Accuracy - The bands whose depths range between 80% and 10% transmittance should vary by no more than 2% transmittance between tests.

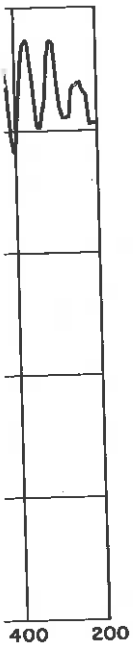
General Contour - The test spectrum should have the same general shape and appearance as illustrated in Figure 5-1.

3) If the test spectrum is not within the tolerance indicated, adjustment is necessary. If the error is linear, each band between 4000 - 2000 cm^{-1} is displaced by the same frequency difference and each band between 2000 - 200 cm^{-1} (2000 - 600 cm^{-1})* is displaced by half that frequency difference. The error can be corrected by repositioning the pen carriage. If the error is nonlinear, the grating requires adjustment. These adjustments should be performed by a Perkin-Elmer Service representative.

5D. ZERO ADJUSTMENT

1) With nothing in either beam, the gain properly set and the pen at the 3000 cm^{-1} position, block the sample beam sufficiently to bring the pen to between 5 and 10% transmittance on the chart paper.

* Models 1310 and 1320.



2) Gradually block the sample beam completely.

3) When the downscale pen motion stops, the pen should be at 0 %2% transmittanc not, loosen the screw on the pen carriage (see Figure 5-4) and reposition the p zero. Tighten the screw and recheck. Repeat, if necessary.

5E. REMOVAL OF INSTRUMENT COVERS

The procedures in Sections 5F and 5H,2 require removal of the instrument covers remove the covers, proceed as follows:

1) Turn off the power.

2) Disconnect the line power cord.

3) Remove the chart well cover panel and loosen the captive Allen cap screw visib the lower edge of the main cover. Unsnap the latch at the lower left front o main cover and lift off the main (left-hand) cover.

4) Carefully lift off the source cover (right-hand cover). Detach the flat ribbon and the Molex connector from the control panel P.C. board. Remove the cover.

> **Warning:** Line voltage will be exposed at certain locations within the instrument if the line power cord is reconnected after the instrument cover is removed. Keep away from exposed electrical connections within the instrument.

5F. SOURCE ASSEMBLY (0007-0049) REPLACEMENT

1) Remove the source (right-hand) instrument cover as described in Section 5E, le the power cord disconnected.

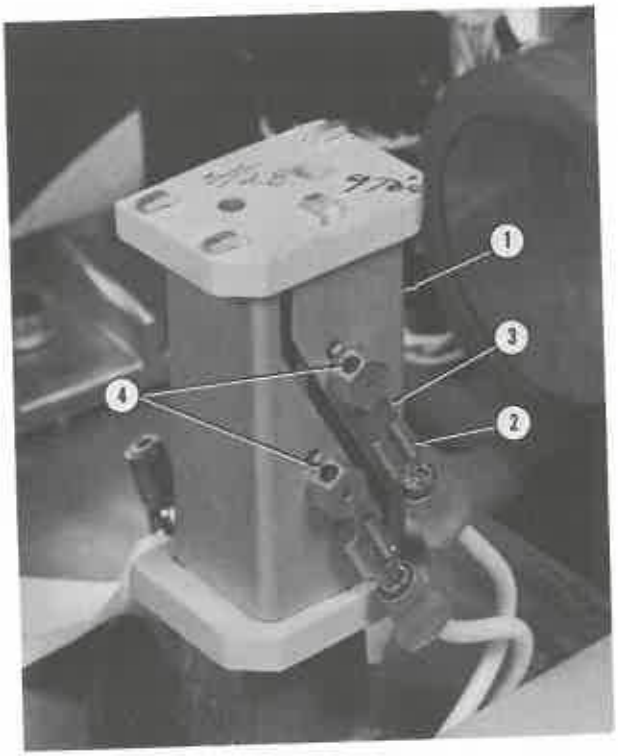
2) Loosen the setscrews in the hexagonal bushings at the rear of the source asse (Figure 5-2).

3) Grasp the source coil (0007-1009, see Figure 5-3) and slide it out with the cer rod (0007-1010) along the slots in the top and base of the source assembly. Re the defective part with a new one and reassemble the source. Be sure to retig the setscrews after sliding the ceramic rod back along the slots.

5G. CLEANING PEN CARRIAGE ROD

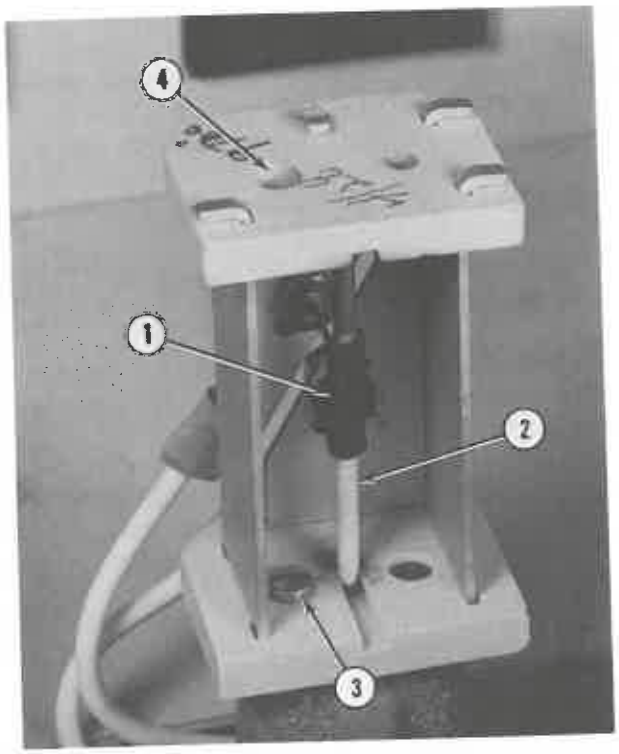
Use a dry paper tissue to clean accumulated dust and dirt from the rod on which the carriage rides. After cleaning the rod, wipe it with a cloth moistened with vacuum p oil (non-evaporative). The pen carriage rod should be cleaned whenever the pen moti no longer smooth.

Note: Do not use a silicone-based oil.



1 *Source Assembly*
2 *Solder*
3 *Terminal Standoff*
4 *Setscrew*

Figure 5-2 - Infrared Source (rear view)



1 *Source Coil (0007-1009)*
2 *Ceramic Rod (0007-1010)*
3 *Holddown Screw*
4 *Access Hole for Holddown Screw*

Figure 5-3 - Infrared Source (front view)

5H. CORRECTING LINEAR AND NONLINEAR FREQUENCY ERRORS

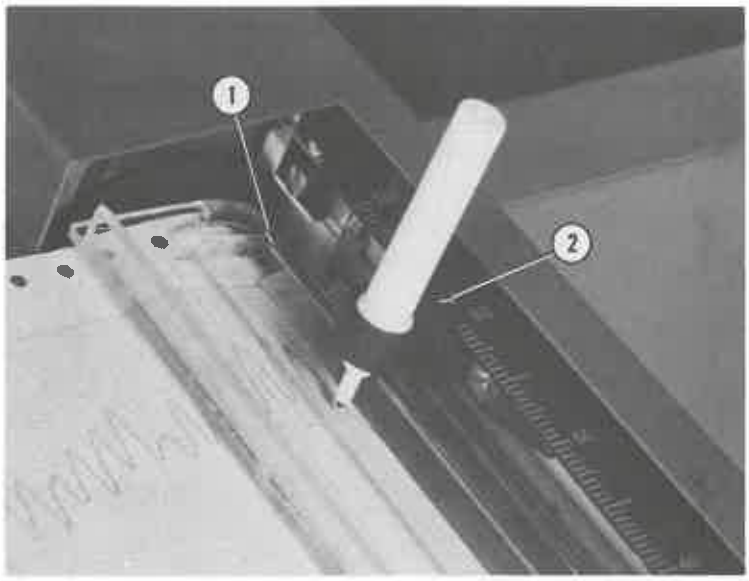
If the observed frequencies of absorption bands are incorrect* (and the chart paper is properly positioned), the pen carriage should be repositioned if the frequency shift is linear, and the grating angle screw at the front of the diffraction gratings should be adjusted if the frequency shift is nonlinear. This adjustment is normally performed by a Perkin-Elmer Service representative and is performed as follows:

5H,1. Linear Frequency Errors

1) Using the polystyrene test film provided, check the bands which should occur at 2851 and 907 cm^{-1} (see Figure 5-1) on a trial spectrum using a 12-minute scan time and narrow slits. If the bands which should occur at 2851 and 907 cm^{-1} are displaced the same number of millimeters, note the displacement and proceed to step 2. If they are not displaced the same number of millimeters, proceed to Section 5H,2.

2) Loosen the adjusting screw at the top of the pen carriage (see Figure 5-4) and move the pen carriage relative to the chart paper grid the amount the 907 and 2851 cm^{-1} bands were displaced in step 1, above.

* The recorded absorption bands should be checked against the instrument specifications.



1 Pen Carriage *2 Adjusting Screw*

Figure 5-4 - Pen Carriage and Adjusting Screw

3) Tighten the adjusting screw loosened in step 2, above.

4) Run another polystyrene test spectrum to make certain that the absorption bands fall within instrument specification.

5H,2. Nonlinear Frequency Error

For the Models 1310, 1320 and 1330, check the polystyrene bands which should occur at 2851 and 1601 cm^{-1} (see Figure 5-1). For the Model 1330, also check the indene bands which should occur at 551 and 381 cm^{-1}.

To record the indene spectrum (see Figure 5-5), indene calibration standard solution (P-E Part No. 0186-0010) in a 0.025 mm sealed cell is used.

Frequency Position - The following indene bands, shown in Figure 5-5, should appear at the frequencies indicated and should not deviate from the designated frequency by more than the tolerance indicated.

Band No.	Frequency	Tolerance
1	3927	± 6 cm^{-1}
2	3140	± 6 cm^{-1}
3	2771	± 6 cm^{-1}
4	1915	± 3 cm^{-1}
5	1553	± 3 cm^{-1}
6	1361	± 3 cm^{-1}
7	1205	± 3 cm^{-1}
8	1018	± 3 cm^{-1}
9	830	± 3 cm^{-1}
10	591	± 3 cm^{-1}
11	551	± 3 cm^{-1}
12	381	± 3 cm^{-1}

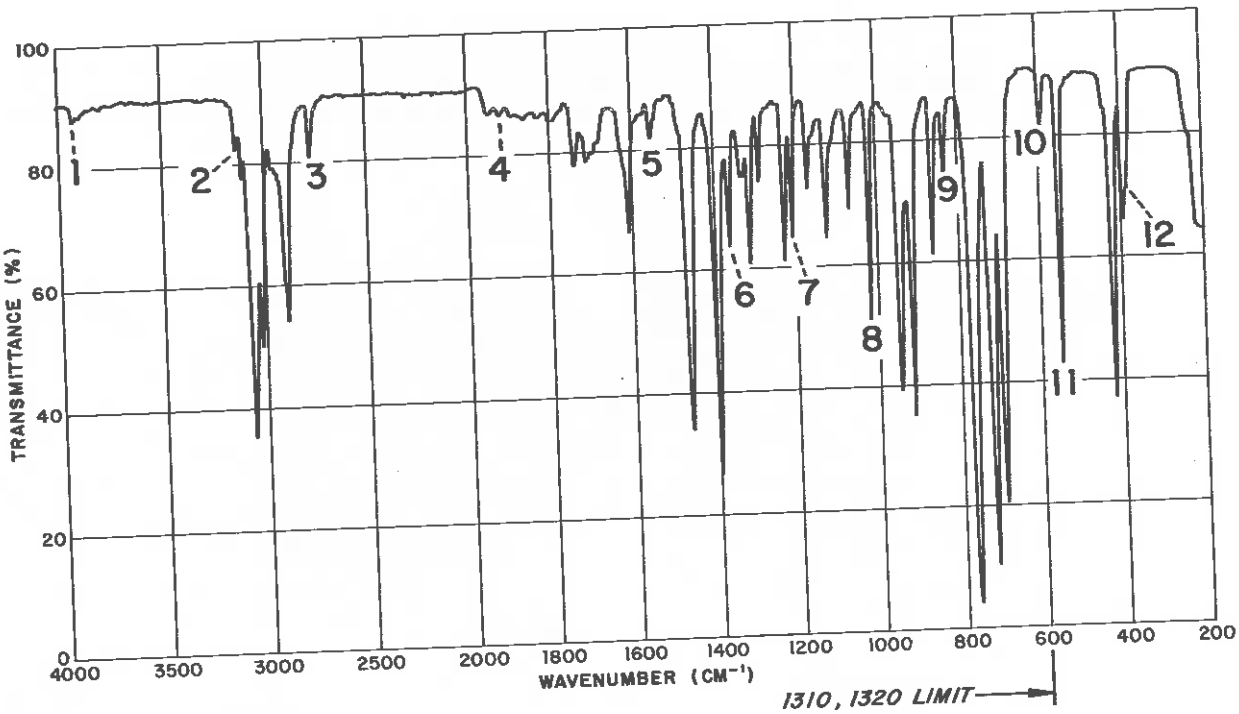


Figure 5-5 - Indene Reference Spectrum

If the bands on a trial polystyrene spectrum are not displaced the same number of millimeters, proceed as follows:

1) Be certain that a polystyrene test film is inserted in the sample holder.

2) Remove the main instrument cover (left-hand cover). (See Section 5E.)

3) Press the TEST button (see Figure 6-1). ABCD will appear on the display.

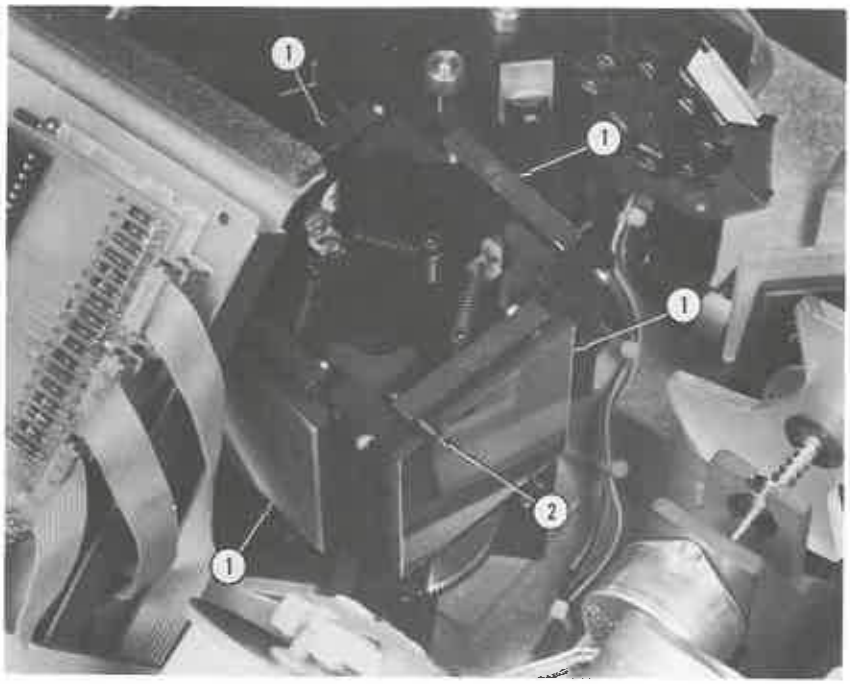
4) Press CHART EXPANSION 1.

5) Press CHART EXPANSION 0.5. The instrument slews to 2851 cm^{-1} on the frequency display. (See Figure 5-1.)

6) Rotate the angle adjustment setscrew (see Figure 5-6) for the 200 line/mm grating.* Rotate the screw clockwise to decrease the wavenumber setting and counterclockwise to increase the wavenumber setting. Adjust the screw until the pen reaches the absorption band maximum and then make a mark on the chart paper with the pen.

   Scan (using a 12-minute scan time) from 3000 to 2700 cm^{-1} and check to be sure that the band occurs at 2851 cm^{-1}. If it is within instrument specifications, proceed to step 7. If it is not within the instrument specifications, continue to adjust the grating angle adjustment screw until it is.

*The number of lines/mm for each grating is labeled on the top of the die casting which supports the gratings and an arrow points from the label to the appropriate grating.



1 Grating
2 Grating Angle Adjustment Screw

Figure 5-6 - Model 1330. Gratings as Viewed from Center Front of Instrument with Main Cover Removed*

7) Press CHART EXPANSION 1. The instrument slews to 1601 cm^{-1} on the display.

8) Rotate the angle adjustment setscrew for the 57.6 line/mm grating.** Rotate the screw clockwise to decrease the wavenumber setting and counterclockwise to increase the wavenumber setting. Adjust the screw until the pen reaches the absorption band maximum and then make a mark on the chart paper with the pen. Scan (using a 12-minute scan time) from 1700 to 1500 cm^{-1} and check to be sure that the band occurs at 1601 cm^{-1}. If it is within instrument specifications, proceed to step 9. If it is not within the instrument specifications, continue to adjust the grating angle adjustment screw until it is.

9) To calibrate the 25 line/mm (600 to 400 cm^{-1} range) and the 9 line/mm (400 to 200 cm^{-1} range) gratings on the Model 1330, remove the polystyrene test film and insert the indene standard in the sample holder.

10) Press CHART EXPANSION 5. The instrument slews to 551 cm^{-1} as indicated on the display.

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*Models 1310 and 1320 have only two gratings, the 200 line/mm grating and the 57.6 line/mm grating.

**The number of line/mm for each grating is labeled on the top of the die casting which supports the gratings and an arrow points from the label to the appropriate grating.

11) Rotate the angle adjustment setscrew for the 25 line/mm grating.* Rotate the screw clockwise to decrease the wavenumber setting and counterclockwise to increase the wavenumber setting. Adjust the screw until the pen reaches the absorption band maximum and then make a mark on the chart paper with the pen. Scan (using a 12-minute scan time) from 600 to 500 cm^{-1} and check to be sure that the band occurs at 551 cm^{-1}. If it is within instrument specifications, proceed to step 12. If it is not within the instrument specifications, continue to adjust the grating angle adjustment screw until it is.

12) Press TIME DRIVE. The instrument slews to 381 cm^{-1} as indicated on the display.

13) Rotate the angle adjustment setscrew for the 9 line/mm grating.* Rotate the screw clockwise to decrease the wavenumber setting and counterclockwise to increase the wavenumber setting. Adjust the screw until the pen reaches the absorption band maximum and then make a mark on the chart paper with the pen. Scan (using a 12-minute scan time) from 400 to 300 cm^{-1} and check to be sure that the band occurs at 381 cm^{-1}. If it is within instrument specifications, proceed to step 14. If it is not within the instrument specifications, continue to adjust the grating angle adjustment screw until it is.

14) Press the TEST button to exit the Grating Calibration Routine.

* The number of lines/mm for each grating is labeled on the top of the die casting which supports the gratings and an arrow points from the label to the appropriate grating.