472-9000 A

MODEL 257

SPECTROPHOTOMETER
INSTRUCTION MANUAL

NOTE: In accordance with the general policy of the Company, improvements are constantly being sought and when developed are immediately built into the instrument. For this reason, later models may differ in detail from earlier models, while the principle of operation remains unchanged.

PERKIN-ELMER LIMITED, BEACONSFIELD, BUCKS.,
ENGLAND.

MODEL 257

SPECTROPHOTOMETER
INSTRUCTION MANUAL

Modification Sheet

Fig. 3.20 reissued in modified form.

The Control System modifications also apply to Fig. 3.18.

Page 3.18, paragraph 49 – Scan Control Circuit, 4000 to 625 cm^{-1}.

In order to eliminate the critical phasing of the operation of micro switches S414a, S414b and S414c, relay F has been added to perform the function of these switches. The relay is energized by S414; RLF1, RLF2 and RLF3 then function as S414a, S414b and S414c respectively.

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Amendment Sheet

Fig. 3.18 reissued to correspond with Figure 3.20.

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MODEL 257 SPECTROPHOTOMETER

INSTRUCTION MANUAL

PREFACE

This manual has been prepared with the object of helping operators to obtain maximum performance from their instrument at all times. To maintain this performance operators must employ the correct operating procedures (Section 2) and should have a thorough understanding of how the instrument operates (Section 3).

The instructions for maintenance and basic servicing (Section 4), together with a knowledge of the operation of the instrument, will enable competent engineers to diagnose and correct simple faults. Signal waveform and voltage information characteristic of a typical instrument are included but it is recommended that the engineers compile separate data for each instrument for subsequent comparison purposes.

Obscure faults, especially when optical misalignment is suspected, are best dealt with by contacting a Perkin-Elmer Service Department.

The wide range of applications of infrared spectroscopy precludes a complete description of the subject in this publication. Some excellent text books dealing with the interpretation of spectra, sample handling techniques and the theory of instrumentation are:–

"Infrared Methods", G.K.T. Conn and D.G. Avery, (Academic Press, 1960).

"Molecular Spectroscopy", G.H. Beaven, E.A. Johnson, H.A. Willis and R.G.J. Miller, (Heywood 1961).

"Spectroscopy; Vol. 2; U.V., Visible, I.R., and Raman Spectroscopy". S. Walker and H. Straw, (Chapman & Hall, 1962)

"An Introduction to Infrared Spectroscopy", W. Brugel, (Trans. from the German, Methuen, 1962).

"The Infrared Spectra of Complex Molecules", L.J. Bellamy, (Methuen, 1958)

"Infrared and Raman Spectra", G. Herzberg, (Van Nostrand, 1945)

and the review article:–

"Infrared Spectrometry", Evans, J.C. Analytical Chemistry, 36, 240R, (Annual Review 1964)

Accessories developed for the Model 137 Infracord, 237, 337 and 257 spectrophotometers are interchangeable.

MODEL 257 SPECIFICATION

The following specification represents the maximum tolerance limits permitted in the manufacture of the Model 257 Spectrophotometer. The performance of each instrument will be equal to or better than the figure given below. Note that these specifications relate to the full range scan mode of operation. Measurements and calibration are made at an ambient temperature of about 20°C.

SPECIFICATION

Principle	Double beam, optical null, linear transmittance versus linear wavenumber recording.
Optics	f/5 monochromator, two gratings, reflecting optical system employing planar and aspheric mirrors.
Chart Presentation	Chart size 21½ x 52 cm with a grid size 15 cm ordinate and 47½ cm abscissa.
Abscissa Range	Full Range : 4000 to 625 cm^{-1} with the grating change at 2000 cm^{-1} Range 1 : 4000 to 1250 cm^{-1} using the first grating only.
Abscissa Accuracy	$\pm$ 5 cm^{-1} at 3000 cm^{-1} $\pm$ 2.5 cm^{-1} at 1750 cm^{-1} $\pm$ 2 cm^{-1} at 625 cm^{-1}
Abscissa Repeatability	3 cm^{-1} at 3000 cm^{-1} 1.5 cm^{-1} at 1750 cm^{-1} 1 cm^{-1} at 625 cm^{-1}
Ordinate Range	0 to 100% Linear in Transmission
Ordinate Accuracy	$\pm$ 1% of full scale
Ordinate Repeatability	4000 to 2000 cm^{-1} : within ½% of full scale 2000 to 625 cm^{-1} : within 1% of full scale
Double Beam I_o	Flat within 4% of full scale. I_o change at 2000 cm^{-1} not more than 2% of full scale.
Noise	4000 to 2000 cm^{-1} : not more than ½% of full scale. 2000 to 625 cm^{-1} : not more than 1% of full scale.
Resolution : Normal Programme	4 cm^{-1} at 3000 cm^{-1} 2 cm^{-1} at 1000 cm^{-1}
Narrow Programme	2 cm^{-1} at 3000 cm^{-1} 1 cm^{-1} at 1000 cm^{-1}

SPECIFICATION (Contd.)

Slit Control	The slit programme gives approximately constant energy over the complete wavenumber range and the slit control allows operation at energy levels differing by a factor of approximately 8.
Stray Light	Less than 1% from 4000 to 666 cm^{-1} Less than 2% at 645 cm^{-1} Less than 3% at 625 cm^{-1}
Scan Times	Approximately 5, 12 and 48 minutes for the full range scan including automatic grating change.
Pen Servo Response	Full Scale deflection of the pen in 0.8 seconds with maximum signal to the servo motor.
Supply Requirements	210 to 250 V, 50 c/s, 150 W
Overall Dimensions	70 x 46 x 38 cm
Weight	57 kg

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AMENDMENT SHEET

READOUT ACCESSORY

The readout accessory produces a voltage output indicative of the pen position; the maximum output is 10 mV and is equivalent to full scale deflection of the pen. The readout signal, obtained from the socket on the panel at the left-hand side of the instrument, may be connected to an external recorder by the lead supplied in the instrument shipping kit. The recorder should have a 'floating' input i.e. neither side of the input connected to earth, and an input impedance greater than 10k. The ordinate scale may be expanded (or contracted) by applying the readout output to a multi-range-input recorder the zero of which can be offset.

The readout signal is derived from the velocity feedback potentiometer, which is driven from the pen system by a chain and pulley coupling. Before the instrument is shipped the potentiometer is adjusted to provide zero output when the instrument transmittance reading is zero. If either the potentiometer or chain is replaced, or for any other reason the potentiometer pulley setting is disturbed, the potentiometer must be readjusted to provide zero readout signal when the instrument transmittance reading is zero; it will then also be set to provide the correct velocity feedback signal. To perform this adjustment proceed as follows:-

(a) Move the small pivoted bracket on which the velocity feedback potentiometer is mounted to release the drive tension.

(b) Holding the quadrant stationary rotate the small helical pulley slightly.

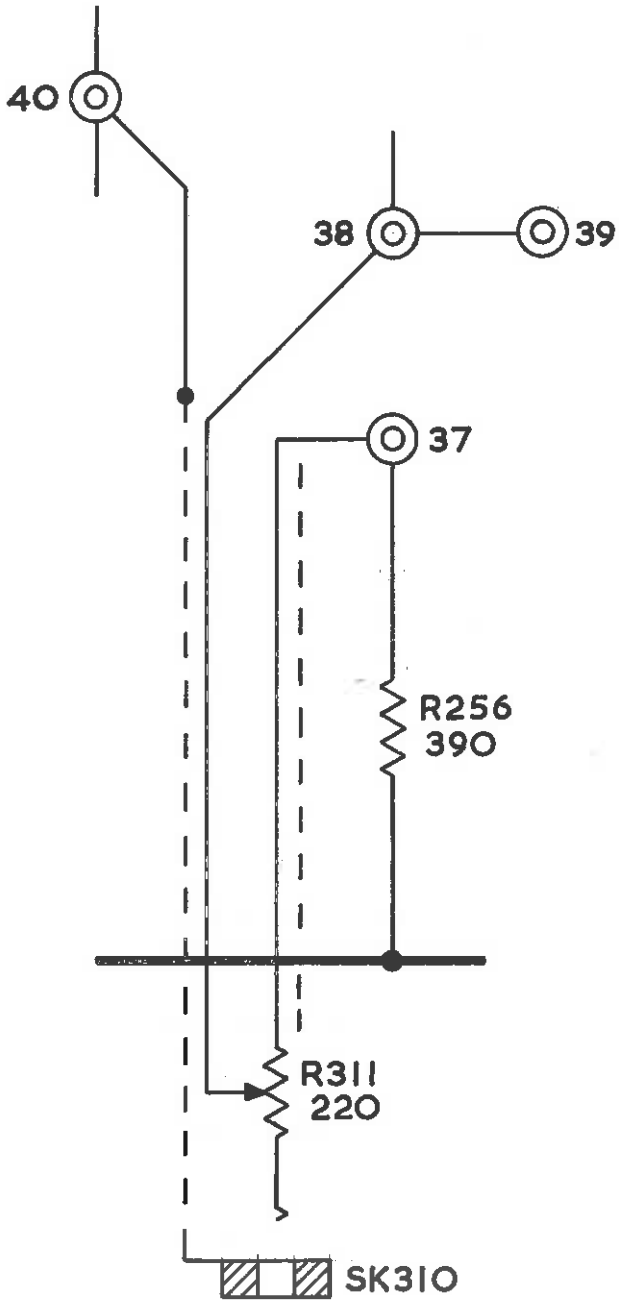
(c) Release the velocity feedback bracket and ascertain whether the output at the zero position has increased or decreased.

(d) Repeat the adjustment in the appropriate direction (determined in step (c)) until zero readout output is obtained when the transmittance reading is zero.

Also before shipment, potentiometer R311, the spindle slot of which is visible above the recorder socket, is preset to obtain an output of 10 mV when the instrument indicates 100% transmittance. If the sensitivity of the external recorder is not precisely 10 mV f.s.d. a small adjustment of R311 may be made to compensate for the discrepancy.

NOTE: For accurate transmittance measurements the instrument chart should still be used to avoid the additional slight inaccuracies that may be introduced by the readout system.

The connection of the readout socket to the amplifier board connectors is as shown below:-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