Model J-1100/1500

CD Spectrometer

Hardware/Function Manual

JASCO

P/N:0302-3800H April 2021

Safety Considerations

To ensure operation safety, this instrument must be operated correctly and maintained according to a regular schedule. Read carefully to fully understand all safety precautions in this manual before operating the instrument. To avoid injuries or health hazards, strictly follow the safety precautions mentioned in this manual. Please take a moment to understand what the signal words ***WARNING!***, **CAUTION**, and *Note* mean in this manual.

(1) Safety symbols

Instruction manual symbol. If the product is marked with this symbol, refer to the instrument manuals to protect the instrument against damage.

WARNING! A ***WARNING!*** indicates a potentially hazardous situation which, if not avoided, could result in serious injury or even death.

CAUTION A **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against damaging the equipment.

Do not proceed beyond a ***WARNING!*** or **CAUTION** notice until you understand the hazardous conditions and have taken the appropriate steps.

Note *A Note provides additional information to help the operator achieve optimal instrument performance.*

(2) Warning Label

Warning labels are attached at several locations on this instrument. Do not remove, deface or damage the warning labels. If a warning label peels off the instrument or becomes illegible, contact your local JASCO distributor and state the part number of the label you want to replace.

Figure 1 Warning indications

1) Warning for Xenon Lamp (No.1 of Figure 2, Figure 3 and Figure4)

- The xenon lamp is made of quartz glass and is filled with high-pressure gas (5 to 10 atm. pressure, about four times when the lamp is lit). Twisting, bending or impact can burst the lamp, causing danger with glass fragments. Never open the lid of the light source unit if the lamp is lit or hot.
- When handling the xenon lamp, wear protective clothing such as a thick, long-sleeved shirt, a mask, thick gloves, etc.
- Before replacing the xenon lamp, turn the lamp off and allow it to cool for about 30 minutes.
- When replacing the xenon lamp, be careful not to give an impact to the lamp. Never twist the lamp by holding it at both ends.
- Do not mistake the mounting direction (polarity) of the lamp. The cathode will be damaged if the lamp is mounted incorrectly, rendering the lamp inoperable.
- Do not touch the glass portion of the xenon lamp with bare skin.
- If the glass portion of the xenon lamp is contaminated, wipe it with clean gauze moistened with alcohol.
- After removal and before disposal, place the xenon lamp in its case, and store the case in a safe place. If the case is not available, carefully wrap the lamp in foamed plastic or other protective wrapping, and store it in a same place.

2) Warning for Dangerous voltage (No.2 of Figure 2, Figure 3 and Figure4)

Dangerous voltage exposed when cover is removed.

3) Warning for FUSE and GROUND (No.3 of Figure 2, Figure 3 and Figure4)

Only use fuses of the designated rating to protect both operator and instrument from fire and other hazards. Before replacing a fuse, be sure to turn OFF the "POWER" switch and unplug the cable from the power outlet to avoid the risk of electric shock.

Be sure to ground the mains plug ground pin. If the instrument is operated without being properly grounded, you run the risk of electric shock.

Do not use water supply pipes made of nonconductive material for grounding. For safety reasons, do not use gas piping for grounding.

4) The crossed-out wheeled trash bin WEEE Label (No.3 of Figure 2, Figure 3 and Figure4)

This symbol [crossed-out wheeled trash bin WEEE] indicates separate collection of waste electrical and electronic equipment in the EU countries.

Please do not throw the equipment into the domestic refuse.

Please use the return and collection systems available in your country for the disposal of this product.

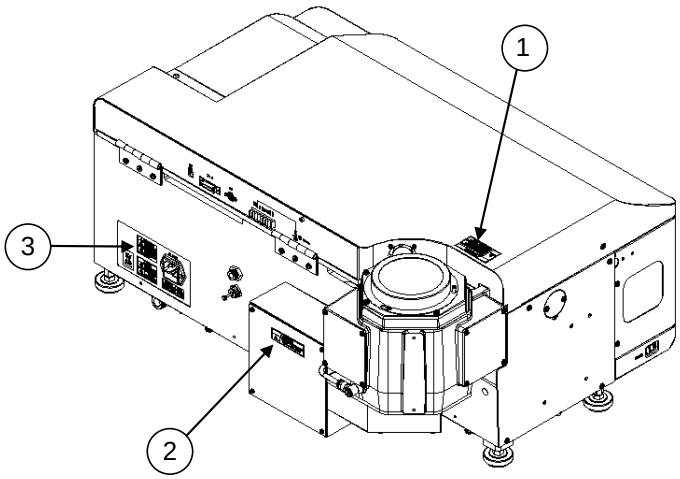

Figure 2 Warning indications of Model J-1100 CD spectrometer

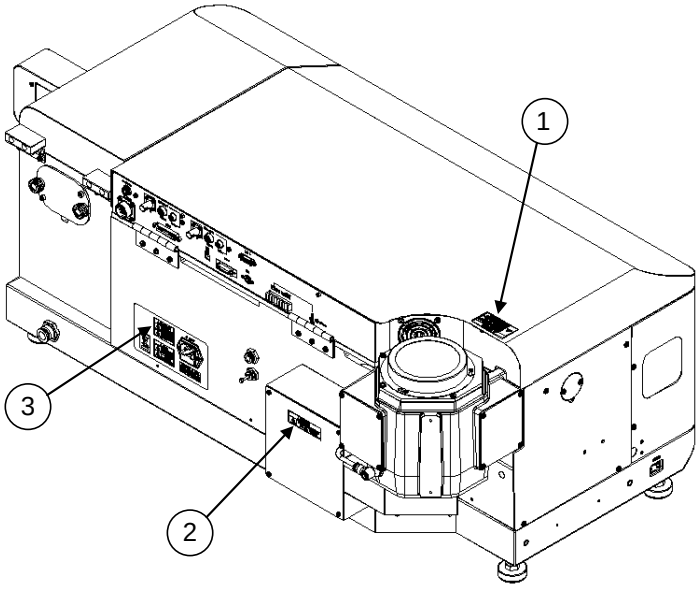

Figure 3 Warning indications of Model J-1500 CD spectrometer (150 W light source)

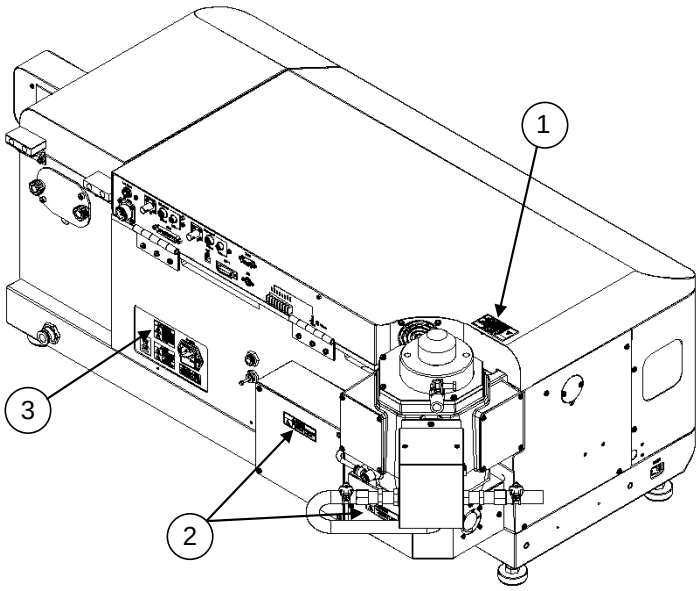

Figure 4 Warning indications of Model J-1500 CD spectrometer (450 W light source)

(3) Warning for carrying

When carrying the instrument, hold firmly near the four legs (See Figure 5 or Figure 6).

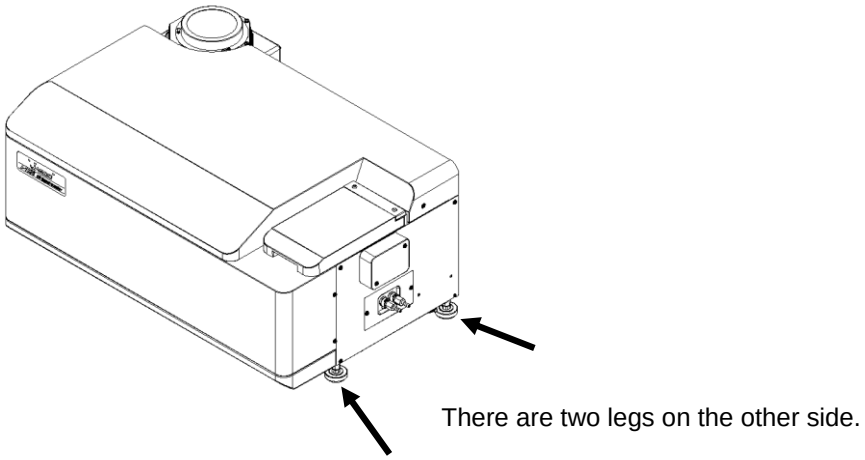

Figure 5 Carrying of Model J-1100 CD spectrometer

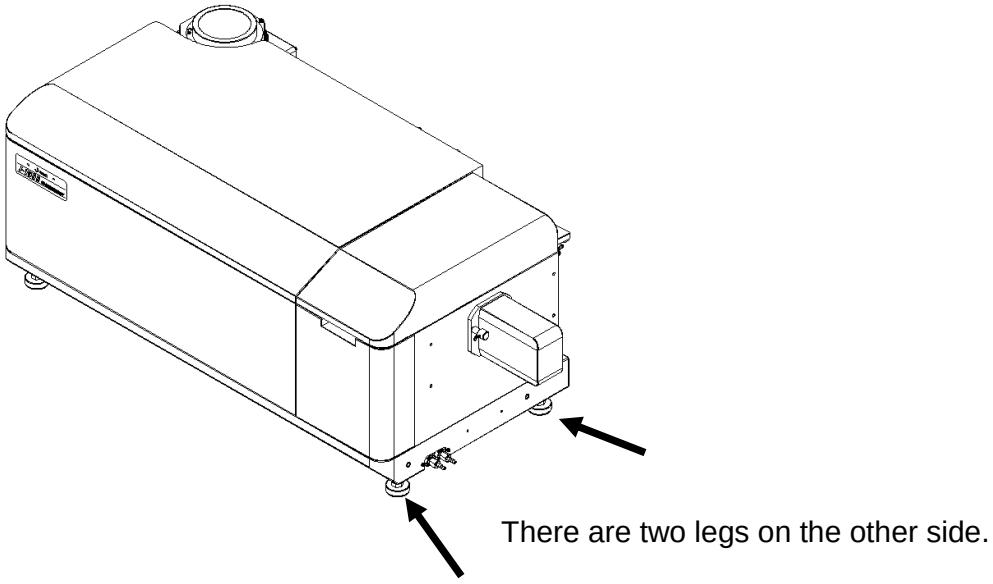

Figure 6 Carrying of Model J-1500 CD spectrometer

Connecting the power cable

WARNING!: The green/yellow ground core of the mains lead must be connected to a ground that complies with the local electricity supply authority (or equivalent body). The instrument is dangerous if not correctly grounded.

240 Volt (nominal) Supply

	Wire Color
Ground	**Green/Yellow**
Line	**Brown**
Neutral	**Blue**

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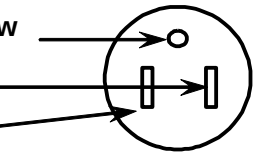
115 Volt (nominal) Supply

	Wire Color
Ground	**Green/Yellow**
Line	**Black**
Neutral	**White**



View of pin side of plug

Note: Instruments intended for operation at 115 V, 60 Hz are supplied with a mains cable with a molded plug and socket.

Preface

This instruction manual is your guide for using this instrument. It instructs first-time users on how to use the instrument, and serves as a reference for experienced users.

Before using the instrument, please read this instruction manual carefully, and make sure that the contents are fully understood. This manual should be easily accessible to the operator at all times during instrument operation. When not using the instrument, keep this manual in a safe place. If this instruction manual becomes lost, order a replacement from your local JASCO distributor.

Servicing

Contact your local JASCO distributor for instrument servicing. In addition, contact your JASCO distributor before moving the instrument to another location. Consumable parts should be ordered according to part number from your local JASCO distributor. If a part number is unknown, give your JASCO distributor the model name and serial number of your instrument.

Do not return contaminated products or parts that may constitute a health hazard to JASCO employees.

Installation Requirements

To ensure operation safety, observe the following conditions:

(1) Do not operate the instrument under voltage fluctuations exceeding 10% of the recommended line voltage. Otherwise, the instrument may not function properly.

(2) Frequency or spike noise in the power supply should be minimal.

(3) Ensure that the instrument is grounded.

(4) Operate the instrument in a temperature range of 15 to 30 °C.
Do not connect the instrument to the power source if any condensation is present. Otherwise, it may become damaged or an electrical shock may be received. Let the instrument dry naturally before connecting to the power source, especially when unpacking or relocating.

(5) Operate the instrument in humidity below 85% (RH). JASCO recommends operating the instrument in humidity below 60% to avoid the deterioration of the optical components due to the condensation caused by high humidity.

(6) Operate the instrument in an atmospheric pressure range of 750 to 1060 hPa.

(7) Avoid strong magnetic fields and sources of high frequency. The instrument may not function properly when near a strong magnetic field or high frequency source.

(8) Avoid vibration from vacuum pumps, electric motors, processing equipment and machine tools.

(9) Avoid dust and corrosive gas. Do not install the instrument where it may be exposed to dust, especially in locations exposed to outside air or ventilation outlets that discharge dust particles.

(10) Do not install the instrument in a location where it may be exposed to direct sunlight.

(11) Install the instrument in a horizontal and stable position. (This includes a table or desk upon which the instrument is installed.)

(12) Ensure that no air conditioner blows air directly onto the instrument. This may prevent stable measurement.

(13) Install the instrument in a location that ensures sufficient space around and beneath it for efficient air circulation and allows easy access for maintenance.

Note: The above conditions do not guarantee optimal performance of this instrument.

Notices

(1) JASCO shall not be held liable, either directly or indirectly, for any consequential damage incurred as a result of product use.

(2) Prohibitions on the use of JASCO software

- Copying software for purposes other than backup
- Transfer or licensing of the right to use software to a third party
- Disclosure of confidential information regarding software
- Modification of software
- Use of software on multiple workstations, network terminals, or by other methods (not applicable under a network licensing agreement concluded with JASCO)

(3) The contents of this manual are subject to change without notice for product improvement.

(4) This manual is considered complete and accurate at publication.

(5) This manual does not guarantee the validity of any patent rights or other rights.

(6) If a JASCO software program has failed causing an error or improper operation, this may be caused by a conflict from another program operating on the PC. In this case, take corrective action by uninstalling the conflicting product(s).

(7) *Windows* is a registered trademark of *Microsoft Corporation* in the United States and other countries. In general, company names and product names are trademarks or registered trademarks of the respective companies. However, the ™ and ® marks are not used in all cases in this manual.

(8) When disposing of the instrument, parts, and waste solvents, take appropriate measures in compliance with applicable regulations regarding waste disposal, and correctly dispose of them by yourself, or entrust disposal to a licensed industrial waste disposal company. In any case, comply with the regulations in your country, state, region or province to ensure they are disposed of legally and correctly.

(9) JASCO and the JASCO logo are registered trademarks of JASCO Corporation in Japan and other countries.

Limited Warranty

Products sold by JASCO, unless otherwise specified, are warranted for a period of one year from the date of shipment to be free of defects in materials and workmanship. If any defects in the product are found during this warranty period, JASCO will repair or replace the defective part(s) or product free of charge.

THIS WARRANTY DOES NOT APPLY TO DEFECTS RESULTING FROM THE FOLLOWING:

(1) IMPROPER OR INADEQUATE INSTALLATION
(2) IMPROPER OR INADEQUATE OPERATION, MAINTENANCE, ADJUSTMENT OR CALIBRATION
(3) UNAUTHORIZED MODIFICATION OR MISUSE
(4) USE OF CONSUMABLE PARTS NOT SUPPLIED BY AN AUTHORIZED JASCO DISTRIBUTOR
(5) CORROSION DUE TO THE USE OF IMPROPER SOLVENTS, SAMPLES, OR DUE TO SURROUNDING GASES
(6) ACCIDENTS BEYOND JASCO'S CONTROL, INCLUDING NATURAL DISASTERS

This warranty does not cover the consumable parts listed below:

(1) Tungsten lamp, and other light sources
(2) Mirrors in the light source section, and cell windows
(3) Fuses, batteries, glassware, chart paper and ink

THE WARRANTY FOR ALL PARTS SUPPLIED AND REPAIRS PROVIDED UNDER THIS WARRANTY EXPIRES ON THE WARRANTY EXPIRATION DATE OF THE ORIGINAL PRODUCT. FOR INQUIRIES CONCERNING REPAIR SERVICE, CONTACT YOUR JASCO DISTRIBUTOR AFTER CONFIRMING THE MODEL NAME AND SERIAL NUMBER OF YOUR INSTRUMENT.

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Contents

1. Overview and Specifications

1.1 Overview

1.1.1 Principles of CD operation

When linearly-polarized light passes through an optically-active substance, its two circularly polarized components (i.e. the right and left circularly polarized beams of light) travel at different speeds, and are absorbed in differing degrees by the substance. Thus, the light that passes through the substance is elliptically polarized, and the substance is said to have "Circular Dichroism (CD)". The magnitude of circular dichroism is usually expressed in terms of the molar ellipticity [θ], which is determined according to the following formula:

$$[\theta] = \frac{4500}{\pi}(\varepsilon_L - \varepsilon_R)\log_e 10 \tag{1-1}$$

where, ε_L and ε_R are the molecular extinction coefficients for the right and left circularly polarized beams of light. The difference ($\Delta\varepsilon$) between ε_L and ε_R is determined using the following formula:

$$\Delta\varepsilon \equiv \varepsilon_L - \varepsilon_R = \frac{1}{LC}\log_{10}\left(\frac{I_R}{I_L}\right) \tag{1-2}$$

Substituting this expression into equation (1) gives:

$$[\theta] = \frac{4500}{\pi LC}\log_e 10 \log_{10}\left(\frac{I_R}{I_L}\right) \tag{1-3}$$

In equations (2) and (3), L represents the thickness (in cm) of the absorbing layer, C represents the molar concentration, and I_R and I_L represent the intensities of the right and left circularly polarized beams of light, respectively, after passing through the substance. Theoretically, the molar ellipticity can be derived using equation (3). However, in practice, determining [θ] with a high degree of accuracy is very difficult using equation (3), because the value of I_R/I_L is nearly 1. To avoid this difficulty, we substitute the following quantities.

$$I_A = \frac{1}{2}(I_R + I_L) \tag{1-4}$$

$$S = I_R - I_L \tag{1-5}$$

Since S/2 I_A is less than 1, equation (3) can be re-expressed as follows, by substituting the expressions from equations (4) and (5):

$$\begin{aligned}[\theta] &= \frac{4500}{\pi LC}\log_e 10 \log_{10}\left(\frac{1+\dfrac{S}{2I_A}}{1-\dfrac{S}{2I_A}}\right) \\ &\cong \frac{4500}{\pi LC}\log_e 10\left(\frac{S}{I_A}\log_{10} e\right)\end{aligned} \tag{1-6}$$

Thus, the ratio between I_A and S can be approximated with a sufficiently high accuracy for practical applications.
If E_A and E_S represent the output voltages of photomultiplier tube corresponding to light intensities I_A and S, respectively, then $S/I_A = E_S/E_A$. By substituting this expression into equation (6), it can be expressed as follows:

$$[\theta] = \frac{4500}{\pi LC} \log_e 10 \left(\frac{E_S}{E_A} \log_{10} e \right). \tag{1-7}$$

If E_S can be amplified independently of E_A, equation (7) can be expressed as follows.

$$[\theta] = \left(\frac{4500}{\pi LC} \log_e 10 \right) \left(\frac{E_S G}{E_A} \right) \left(\frac{\log_{10} e}{G} \right), \tag{1-8}$$

where G represents the amplification factor of E_S. Since the value $E_S G$ can be brought very close to the value of E_A by choosing an appropriate value for G, $[\theta]$ can be determined with a high degree of accuracy.

1.1.2 Principles of LD operation

LD (Linear Dichroism) is a phenomenon that the absorption of light differs depending on the direction of polarization, which is observed with an oriented film and others. Given that $I_\perp$ is the energy of vertically polarized transmitted light and $I_{/\!/}$ the energy of horizontally polarized transmitted light, LD is defined by the following formula.

$$LD \equiv OD_{/\!/} - OD_\perp = \log_{10}(I_\perp / I_{/\!/}) \tag{2-1}$$

The light from the light source is monochromated and turned into linearly polarized light by the double-prism monochromator that also functions as a polarizer. The linearly polarized light from the monochromator is modulated into horizontal and vertical polarized lights by the modulator. And the light that has transmitted the sample is converted into an electrical signal by the photomultiplier tube. The component of $(I_\perp + I_{/\!/})/2$ is always maintained constant by the photomultiplier cathode voltage. The component of $(I_\perp - I_{/\!/})$ is amplified and recorded. The signal of $(I_\perp + I_{/\!/})/2$ corresponds to the DC component and that of $(I_\perp - I_{/\!/})$ corresponds to the AC component at 100kHz. LD can be expressed by the following formula using AC and DC signals.

$$LD = \log_{10} \frac{(1 + AC/2DC)}{(1 - AC/2DC)} \tag{2-2}$$

If AC<<DC, LD can be approximated by the following formula.

$$LD_{ap} = (AC/DC) \log_{10} e \tag{2-3}$$

The error will be 1% or more if LD is 0.2△OD or more. Here, LD can be corrected by the following formula.

$$LD_{cor} = \log \frac{1 + (LD_{ap})/2(\log_{10} e)}{1 - (LD_{ap})/2(\log_{10} e)} \tag{2-4}$$

ε (LD) is defined by the following formula.

$$\varepsilon(LD) = LD / cl \tag{2-5}$$

where c: Concentration(mol/l) l: Cell length(cm)

E(LD) is defined by the following formula.

$$E(LD) = LD / cl \qquad (2\text{-}6)$$

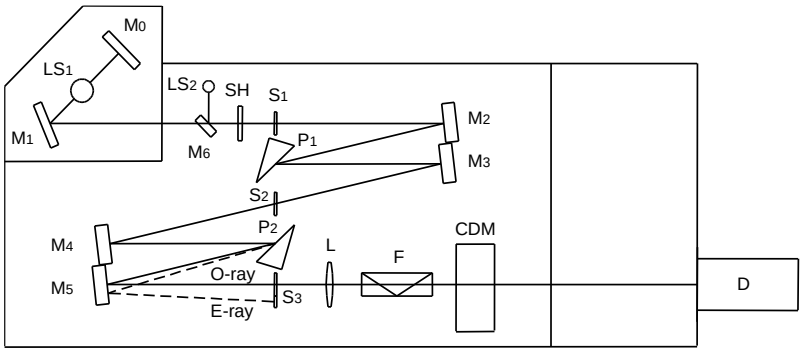
where c: Concentration(mol/l) l: Cell length(cm)

These calculations can be performed using [processing]-[CD options]-[Optical Constant…] of spectra analysis program.

The LD scale has been set at 0.133△OD (when two windows of the 45° quartz plates are used) or 0.066△OD (when one window of the 45° quartz plate is used) at a wavelength of 500nm using a quartz plate tilted 45° with respect to incident light as sample.

1.1.3 Optical system

A schematic diagram of the optical system of the Model J-1100/1500 CD spectrometer is shown in Figure 1.1.



M_0 ~ M_6	: Mirrors	O-ray	: Ordinary ray
LS_1	: Xenon lamp (for sample measurement)	E-ray	: Extraordinary ray
LS_2	: Mercury lamp (for the instrument inspection)	L	: Lens
SH	: Shutter	F	: Filter
S_1 ~ S_3	: Slits	CDM	: Modulator
P_1	: First prism (horizontal optical axis)	D	: PMT
P_2	: Second prism (vertical optical axis)		

Note: In case of Model J-1100, there is not the M_0 mirror.

Figure 1.1 Schematic diagram of optical system

Light source for measuring the sample is a xenon lamp. The light emitted from the xenon lamp is focused by the M_1 mirror onto the S_1 entrance slit. The optical system between the S_1 entrance slit and the S_2 intermediate slit is referred to as the first monochromator, and the optical system between the S_2 intermediate slit and the S_3 exit slit is referred to as the second monochromator. Such an optical system, composed of two monochromators, is known as a double monochromator. The ability of a double monochromator to reduce stray light makes it indispensable for CD measurement.

The instrument uses crystal prisms (P_1 and P_2) that have different axial orientations, so that the light that passes through the monochromator is not only monochromated, but is also linearly polarized in the horizontal direction.

This linearly-polarized light is modulated by the modulator into right and left circularly polarized beams of light. The modulator subjects a quartz crystal to mechanical stress in order to produce circular polarization in the quartz crystal, based on the principle of the Piezo effect.

When a sample with circular dichroism is placed in the sample chamber, the intensity, I, of the transmitted light is modulated as shown in Figure 1.2.

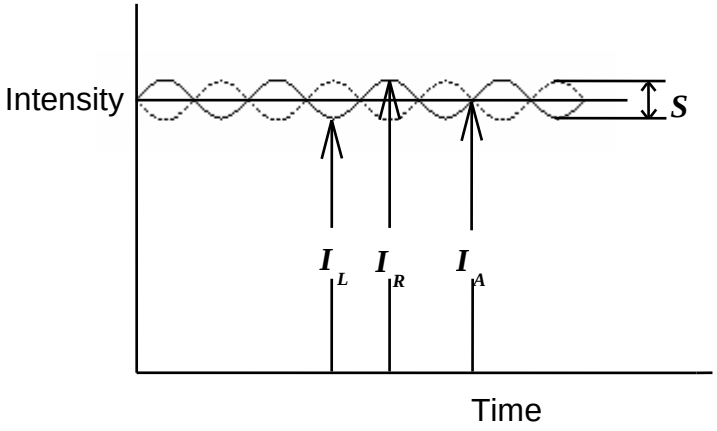


Figure 1.2 Intensity of transmitted light

The relationship between the minimum and maximum intensities and the right and left circularly polarized light depends on whether the value E_R is smaller or larger than the value E_L. In Figure 1.2, the solid line represents the case when E_R is greater than E_L, and the dotted line represents the case when E_R is smaller than E_L. For the definitions of I_A and S, refer to Section 1.1.1 “Principles of CD operation”.
When light having a modulated intensity such as that shown in Figure 1.2 is incident on a photomultiplier tube, the output signal consists of a DC component equivalent to I_A, and an AC component equivalent to S.

1.1.4 Electrical system

The output signal from the detector (photomultiplier tube PMT) consists of an AC component which is electrically modulated by the modulator and a DC component that represents the average intensity of the transmitted light. The CD and LD value can be determined from the ratio of the DC component to the AC component. This instrument varies the HT voltage in order to maintain a constant DC component, and utilizes the AC component as the CD and LD signal. Therefore, once the AC signal has been calibrated using a standard sample, the correct CD and LD value can be determined.
Figure 1.3 and Figure 1.4 show the block diagrams of the electrical system. J-1100 can get the signal from one detector and simultaneously measure CD/LD/Absorbance/HT voltage/DC voltage (up to four). J-1500 can get the signal from two detectors (one is optional) and simultaneously measure CD/LD /Absorbance/FDCD/FDLD/Fluorescence intensity/HT voltage /DC voltage (up to four). Furthermore, J-1100/1500 can get the signal from the external device and simultaneously measure the signal.
Signal from the detector is divided into the two circuits for AC signal and DC signal. DC signal is used to control the HT voltage applied to the PMT. The other hand, Analog AC signal is converted to digital signal after unwanted frequency band was cut in the filter block.
The instrument and the personal computer communicate through the USB interface. The various signals are communicated to the personal computer through the USB interface.

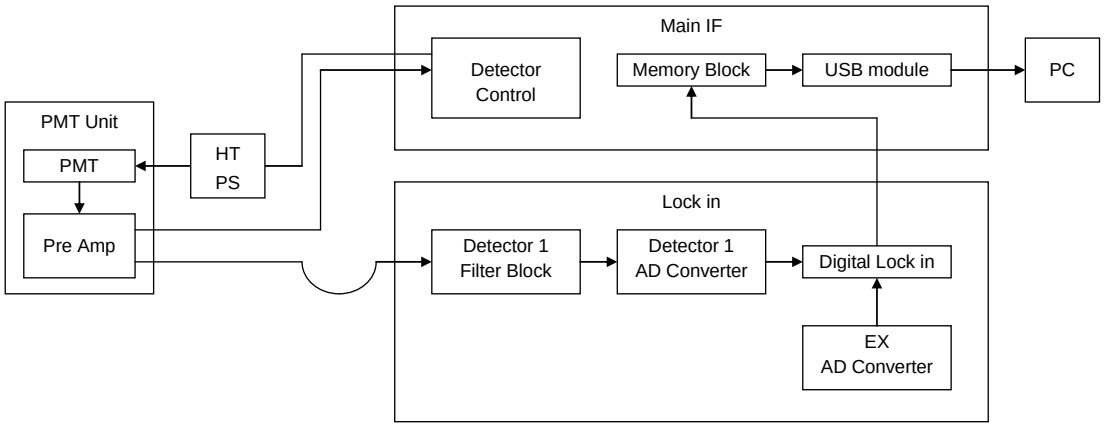


Figure 1.3 Block diagram of electrical system (Model J-1100)

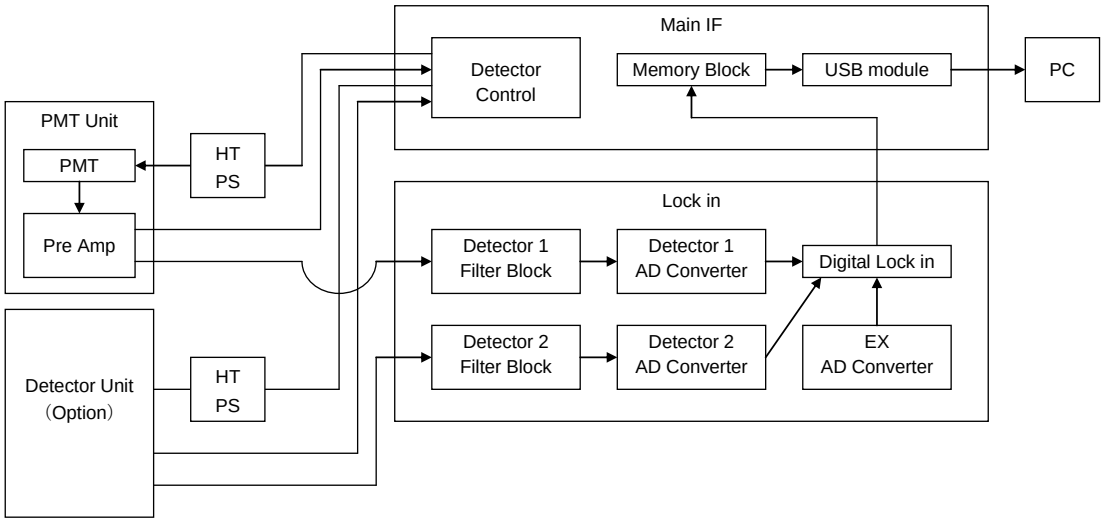


Figure 1.4 Block diagram of electrical system (Model J-1500)

1.2 Specifications

1.2.1 Model J-1100 CD Spectrometer Specifications

Light source	: 150 W air-cooled Xenon lamp
Detector	: Head-on photomultiplier tube PMT
Modulator	: Photoelastic modulator
Measurement wavelength range	: 180 to 600 nm
Wavelength accuracy	: ±0.2 nm from 180 to 250 nm ±0.4 nm from 250 to 500 nm ±0.8 nm from 500 to 600 nm
Wavelength repeatability	: ±0.05 nm from 180 to 500 nm ±0.1 nm from 500 to 600 nm
Spectral bandwidth	: 1 nm
Slit width	: 1 to 4000 μm
Digital Integration Time (D.I.T.)	: 8 msec to 8 sec
Scanning mode	: Continuous scan, Step scan, Auto response (D.I.T) scan
Scanning speed	: up to 5000 nm/min
Photometric Mode	: CD, LD, Transmittance, Absorbance, HT voltage, DC voltage, External input (Temperature, PH, etc. are available)
CD full scale	: ±8000 mdeg
CD resolution	: 0.00001 mdeg
Wavelength resolution	: 0.025 nm
Stray light	: Not more than 0.0003% (at 200 nm)
RMS noise	: 0.03 mdeg (at 200 nm, at 500 nm, D.I.T. 8 sec)
Baseline stability	: 0.05 mdeg/hr
LD measurement	: Full scale ±1 Δ OD Resolution 0.000001 Δ OD
UV measurement	: Single beam measurement Photometric range: 0 to 5 Abs Photometric accuracy: ±0.01 Abs (0 to 1 Abs, checked using NIST SRM 930 filter)
External input terminal	: Two channels (input range: -1 to 1 V DC)
Mercury lamp	: Used for the instrument inspection
Shutter	: Located the light source unit
Sample chamber	: 105 mm wide × 150 mm deep × 110 mm high Exists the water inlet/outlet ports
Nitrogen gas purging	: Atmosphere in the light source unit, monochromator unit, and sample chamber can be purged using dry nitrogen gas. 2L/Min (more than 185nm)
Dimensions	: 740 mm wide × 545 mm deep × 325 mm high
Weight	: 70 kg
Power requirements	: 100, 115, 200, 220, 230, 240 V, 50/60 Hz, 360 VA

1.2.2 Model J-1500 CD Spectrometer Specifications

Light source	: 150 W air-cooled Xenon lamp or 450 W water-cooled Xenon lamp (factory-installed option)
Detector	: Head-on photomultiplier tube PMT Optional photomultiplier tube PMT Optional InGaAs
Modulator	: Photoelastic modulator
Movable wavelength range	: 163 to 1600 nm
Measurement wavelength range	: 163 to 950 nm 400 to 1250 nm (optional PMT detector) 800 to 1600 nm (optional InGaAs detector)
Wavelength accuracy	: ±0.1 nm from 163 to 250 nm ±0.2 nm from 250 to 500 nm ±0.5 nm from 500 to 800 nm ±1.5 nm from 800 to 1200 nm ±2.0 nm from 1200 to 1600 nm
Wavelength repeatability	: ±0.05 nm from 163 to 500 nm ±0.1 nm from 500 to 800 nm ±0.5 nm from 800 to 1600 nm
Spectral bandwidth:	0.01 to 16 nm
Slit width	: 1 to 4000 μm
Digital Integration Time (D.I.T.)	: 0.1 msec to 30 sec.
Scanning mode	: Continuous scan Step scan Auto response(D.I.T) scan
Scanning speed	: up to 10000 nm/min
Photometric Mode	: CD, LD, ORD, FDCD, FDLD, Transmittance, Absorbance, FL intensity, Anisotropy, DFP, HT voltage, DC voltage, External input (Temperature, PH, etc. are available)
CD full scale	: ±8000 mdeg
CD resolution	: 0.00001 mdeg
Wavelength resolution	: 0.025 nm
Stray light	: Not more than 0.0003% (200 nm)
RMS noise	: 0.004 mdeg (185 nm, 150 W light source) 0.003 mdeg (185 nm, 450 W light source) 0.007 mdeg (200 nm, 150/450 W light source) 0.007 mdeg (500 nm, 150/450 W light source) (spectral bandwidth 1 nm, D.I.T. 8 sec)
Baseline stability	: 0.02 mdeg/hr
LD measurement	: Full scale ±1 Δ OD Resolution 0.000001 Δ OD
UV measurement	: Single beam measurement Photometric range: 0 to 5 Abs Photometric accuracy: ±0.01 Abs (0 to 1 Abs, checked using NIST SRM 930 filter)
External input terminal	: Two channels (input range: -1 to 1 V DC)

Mercury lamp	: Used for the instrument inspection
Shutter	: Located the light source unit
Sample chamber	: 150 mm wide × 310 mm deep × 165 mm high Exists the water inlet/outlet ports
Nitrogen gas purging	: Atmosphere in the light source unit, monochromator unit, and sample chamber can be purged using dry nitrogen gas. 2L/Min (more than 185nm)
Dimensions	: 1055 mm wide × 545 mm deep × 390 mm high (150 W light source) 1135 mm wide x 610 mm deep × 420 mm high (450 W light source)
Weight	: 77 kg (150 W light source) 82 kg (450 W light source)
Power requirements	: 100, 115, 200, 220, 230, 240 V, 50/60 Hz 360 VA (150 W light source) 770 VA (450 W light source)

2. Unpacking and Installation

WARNING!: This section is intended for trained JASCO servicemen. If the user attempts unpacking and installation, injury may result. Please leave unpacking and installation to your JASCO serviceman.

CAUTION: Use this manual when you are unpacking/installing the instrument in conjunction with a JASCO serviceman's instructions in the case of a problem.

2.1 Unpacking

(1) Take out the main unit from the carton and make sure that the serial No. displayed on the serial No. label located on the left side of the unit and the serial No. on the inspection certificate agree. Also ensure that the line voltage is consistent with the power requirement of the instrument.

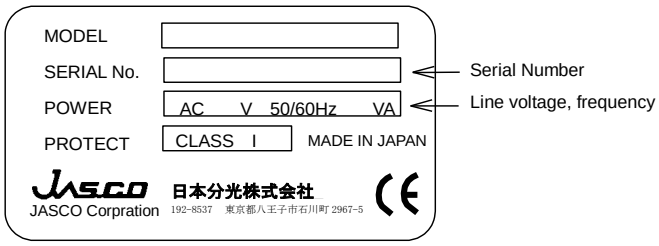


Figure 2.1 Serial No. label

(2) Check the parts received against the list of components (Table 2.1). If any part is missing or damaged, contact your local JASCO distributor.

Table 2.1 List of Components for Model J-1100 CD spectrometer

Description	Q'ty	Remarks
J-1100 main unit	1	
Modulator element	1	
Nitrogen gas tube	1	3m, OD8mm
Leaked water outlet tube	1	1m, For sample chamber
Cell holder	1	
CD standard sample	1	Ammonium d-10-camphor sulfonate, 1g
45° quartz plate	1	For LD inspection
Tools	3	Allen wrench(two types), Screwdriver
Fuse	2	
Cable	2	AC input, USB
Fittings (plug)	2	
Sample chamber piping tube	4	For optional accessories
Barb fittings	2	
Software setup CD	1	
Certificate of inspection	1	
Instruction manual	1 set	

Table 2.2 List of Components for Model J-1500 CD spectrometer

Description	Q'ty	Remarks
J-1500 main unit	1	
Modulator element	1	
Detector unit	1	
Nitrogen gas tube	1	3m, OD8mm
Leaked water outlet tube	1	1m, For sample chamber
Cooling water tube	1	10m, ID12mm, For the 450 W light source
Cooling water tube band	3	For the 450 W light source
Nitrogen purge case	1	
Lid of nitrogen purge case	1	
Nitrogen purge pipe	1	
Nitrogen purge pipe holder	1	
Cell holder	1	
Standard sample	1	Ammonium d-10-camphor sulfonate, 1g
45° quartz plate	1	For LD inspection
Tools	3	Allen wrench(two types), Screwdriver
Fuse	2	
Cable	4	AC input, USB, Signal, HT
Fittings (plug)	2	
Sample chamber piping tube	4	For optional accessories
Barb fittings	2	
Software setup CD	1	
Certificate of inspection	1	
Instruction manual	1 set	

2.2 Reassembly

2.2.1 Removing the cushion from the main unit

The cam and lever on the bottom of the main unit are separated by a cushion and secured with a rubber band to protect the cam from damage and prevent the wavelength from shifting during transit

CAUTION: When removing the cushion, be careful not to knock the cam.

(1) Remove the side cover from the main unit.

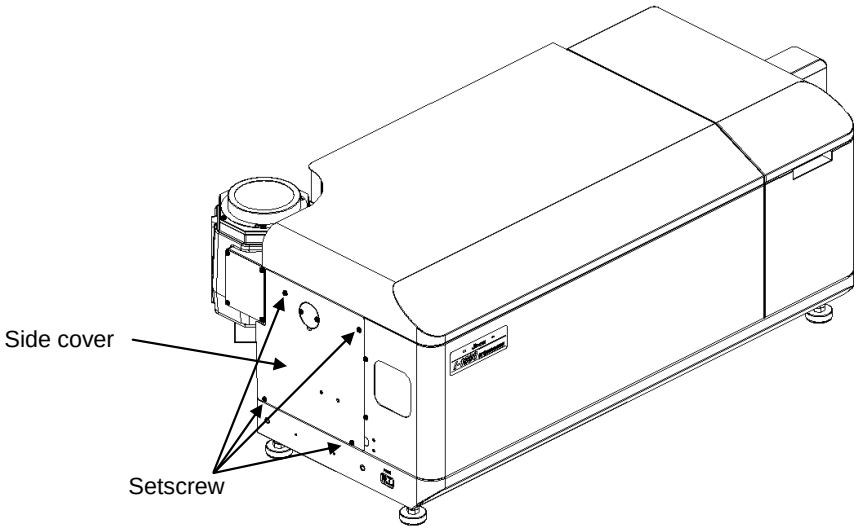


Figure 2.2 Removing the side cover

(2) Remove the cushion and rubber band.

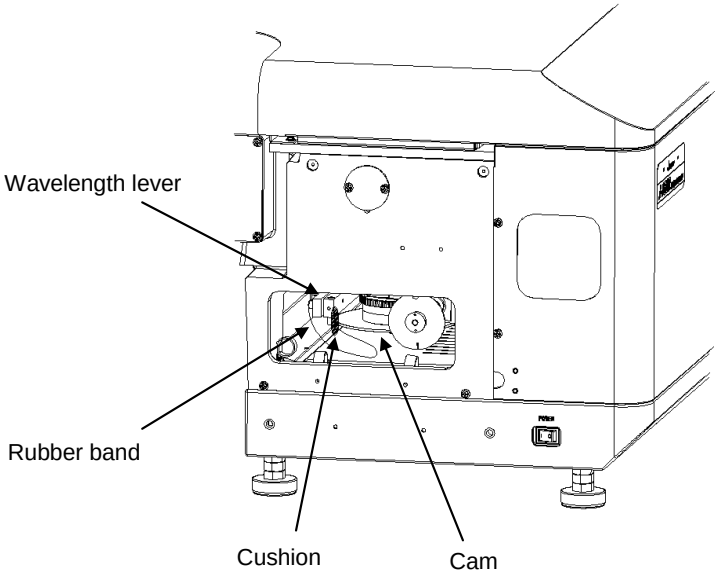


Figure 2.3 Removing the cushion and rubber band

2.2.2 Installing the modulation element

The modulation element is removed from the main unit prior to shipment to prevent damage from occurring during transit. Install the modulator element in the main unit after installing the main unit.

(1) Remove the amplifier unit cover from the main unit.

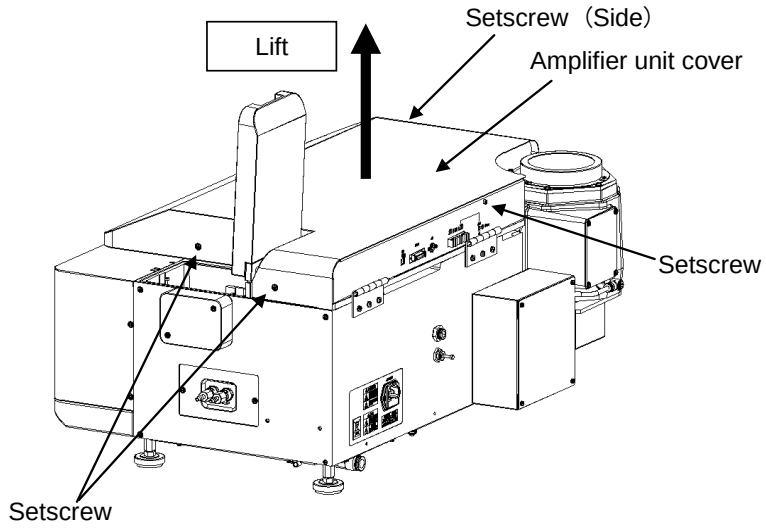


Figure 2.4 Removing the amplifier unit cover (Model J-1100)

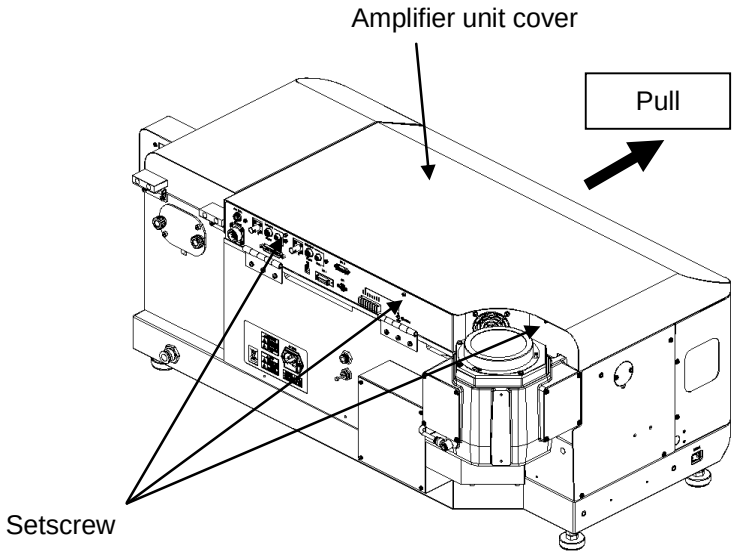


Figure 2.5 Removing the amplifier unit cover (Model J-1500)

(2) Open the monochromator lid.

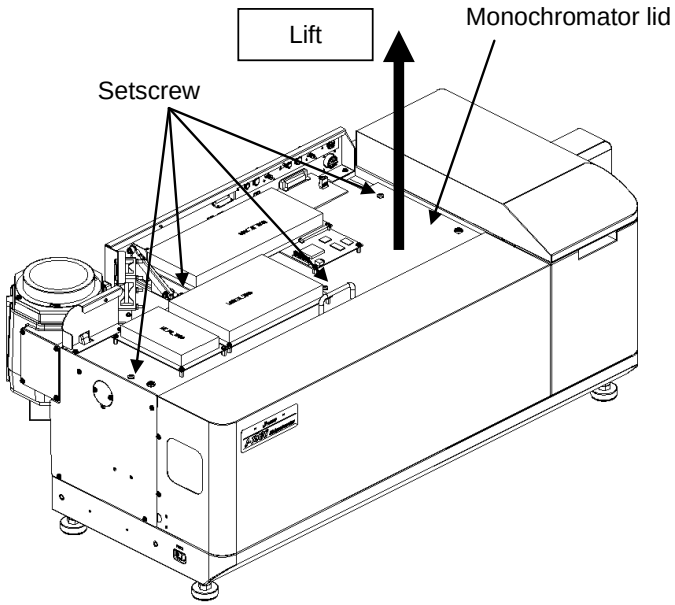


Figure 2.6 Opening the monochromator lid

(3) Mount the modulator element in the holder and mount it in the main unit. Solder the leads to the terminals.

CAUTION 1: Be careful not to damage the modulator element or break the leads.
CAUTION 2: Ensure that the leads do not come into contact with the holder, cover or with each other.

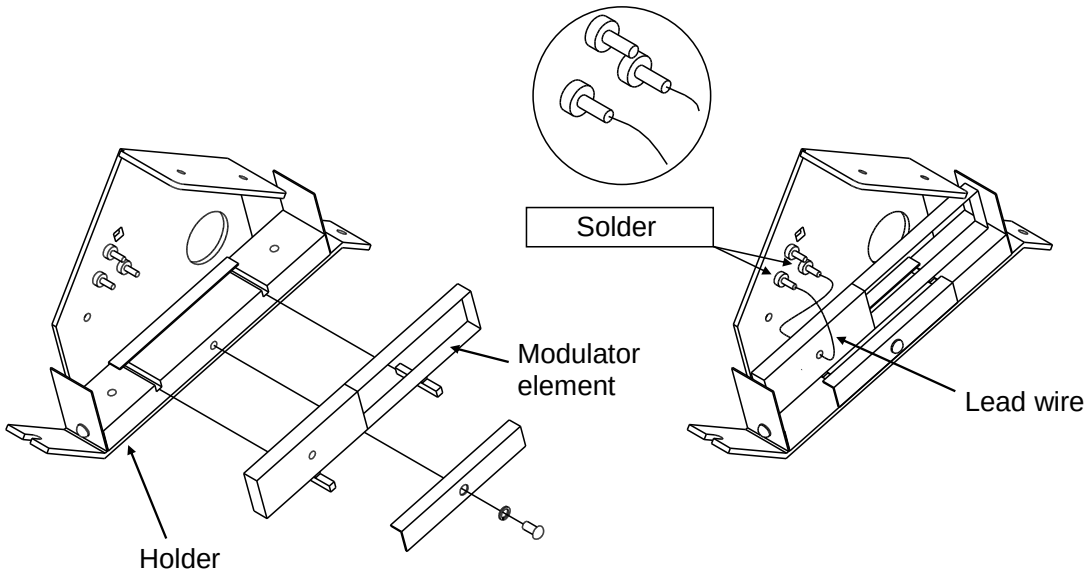


Figure 2.7 Mounting the modulator element (1)

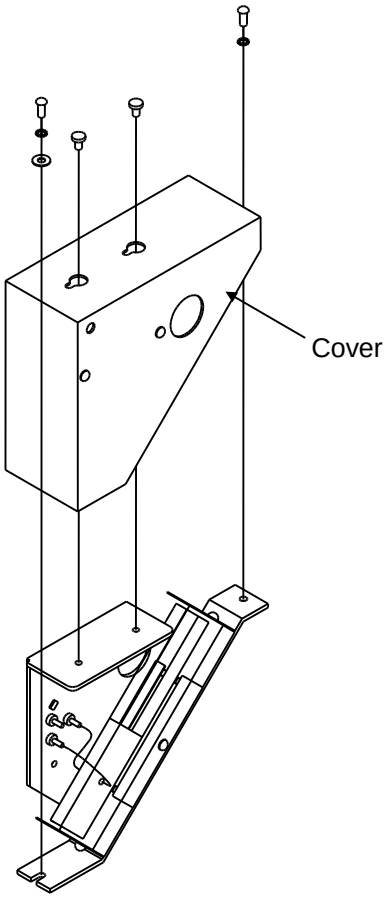


Figure 2.8 Mounting the modulator element (2)

2.2.3 Installing the cell holder

Put the cell holder on top of the cell holder mount in the sample chamber.

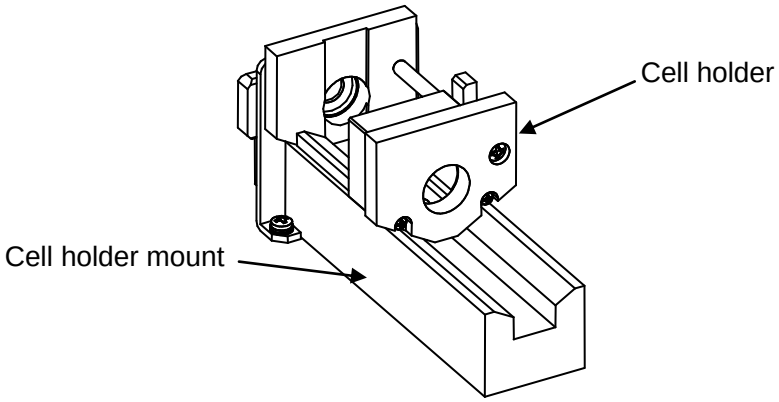


Figure 2.9 Mounting the sample holder

2.2.4 Installing the nitrogen purge case and the lid (only Model J-1500)

(1) Set the nitrogen purge pipe and holder to the light inlet in the sample chamber.

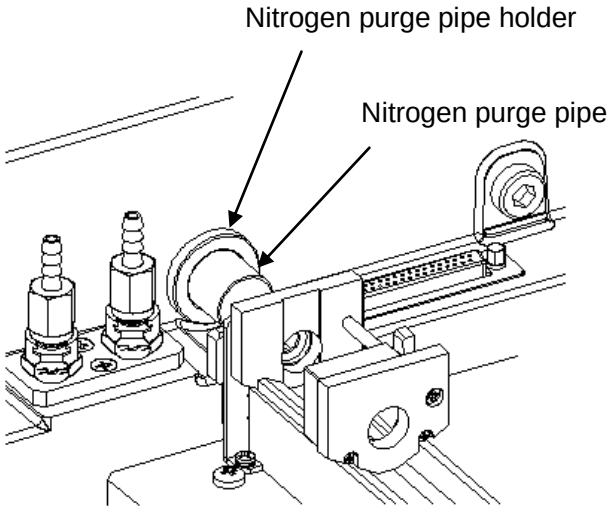


Figure 2.10 Mounting the nitrogen purge pipe and holder

(2) Put the nitrogen purge case on top of the sample stage base (2).

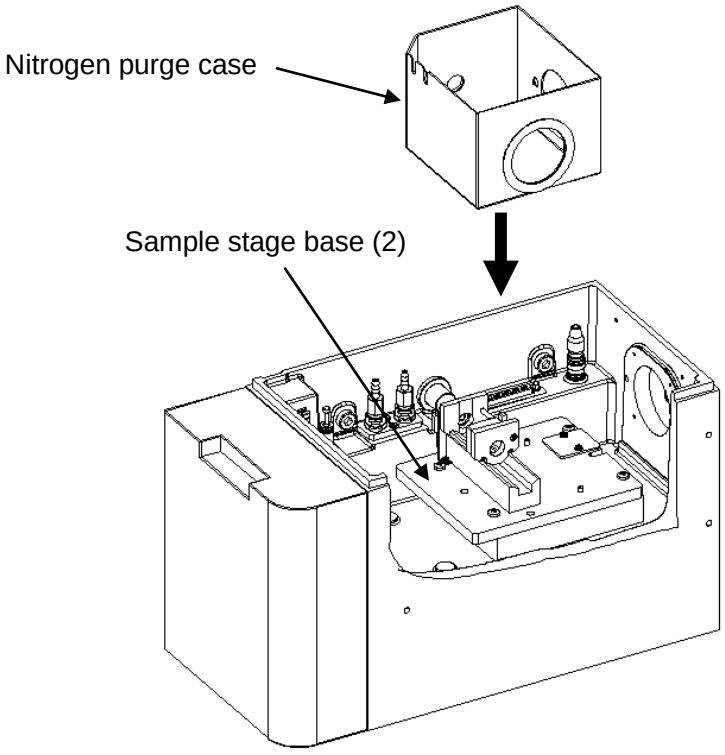


Figure 2.11 Mounting the nitrogen purge case

(3) Mount the nitrogen purge case lid to the sample chamber lid.

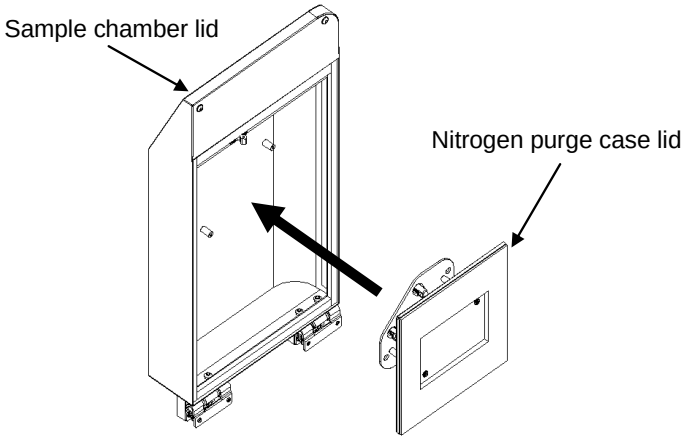


Figure 2.12 Mounting the nitrogen purge case lid

2.2.5 Installing the detector unit (only Model J-1500)

CAUTION 1: Handle the detector unit with great care. Do not give knock the detector unit.
CAUTION 2: Do not expose the detector window to intense light.

Note: Model J-1100 is not required to install the detector unit.

(1) Remove the cover from the detector mounting hole located in the right side panel of the main unit.
(2) Remove the cover from the detector unit.
(3) Gently mount the detector unit on the main unit and secure it using the lock screw.

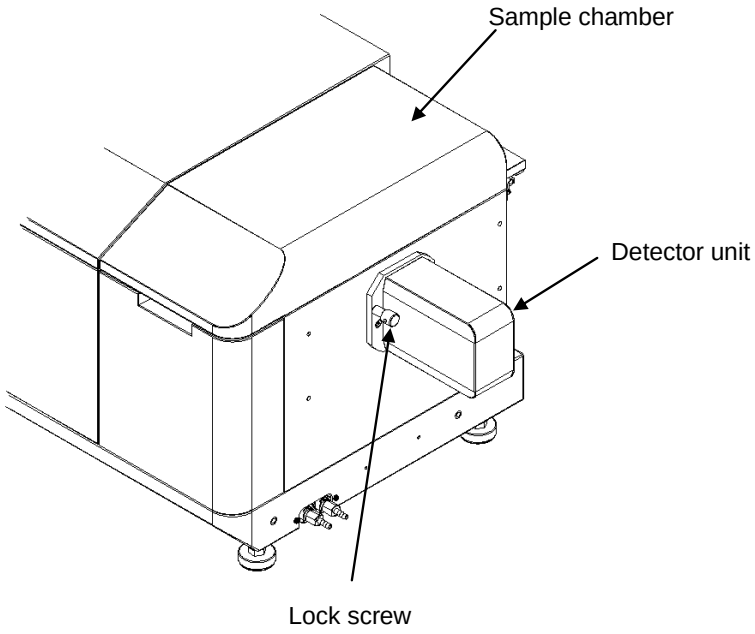


Figure 2.13 Installation of detector unit

2.2.6 Connecting the cables and tubes

(1) Connecting the cables

1) Using a digital voltmeter, confirm that the supplied line voltage corresponds to the voltage shown on the rating plate.

CAUTION: The line voltage must be confirmed. An outlet can provide an incorrect voltage due to faulty wiring.

2) Confirm that the "POWER" switch is turned OFF.
3) For the Model J-1500, connect the connectors of detector unit and the "Detector1 Signal and HT" connectors located on the rear panel of amplifier unit using the cables.
4) Connect the "USB" port located on the rear panel of amplifier unit and the USB port on the PC using the USB cable.

CAUTION: For details regarding the wiring and connections of the personal computer and printer, refer to their respective instruction manuals.

5) Connect the AC power cable to the "AC INPUT" connector located on the rear panel of monochromator unit. Connect the other end of the AC power cable to an electrical outlet.

CAUTION: Ground the grounding terminal of the power cable.

(2) Connecting the cooling water tubes (only Model J-1500 450 W light source)

CAUTION: Fix the tube using the tube bands.

1) Connect the "Water Inlet" of the light source cooling water flow sensor to the faucet using the tube (length: 10m, inside diameter: 12mm).
2) Connect the "Water Outlet" of the 450 W light source unit to the water drain port.
3) Feed cooling water to confirm that the system is free from leakage (flow rate: 2 L/min, pressure: 0.5～2.0 kg/cm^2).

CAUTION: Do not use water at pressures greater than 2.0 kg / cm^2.

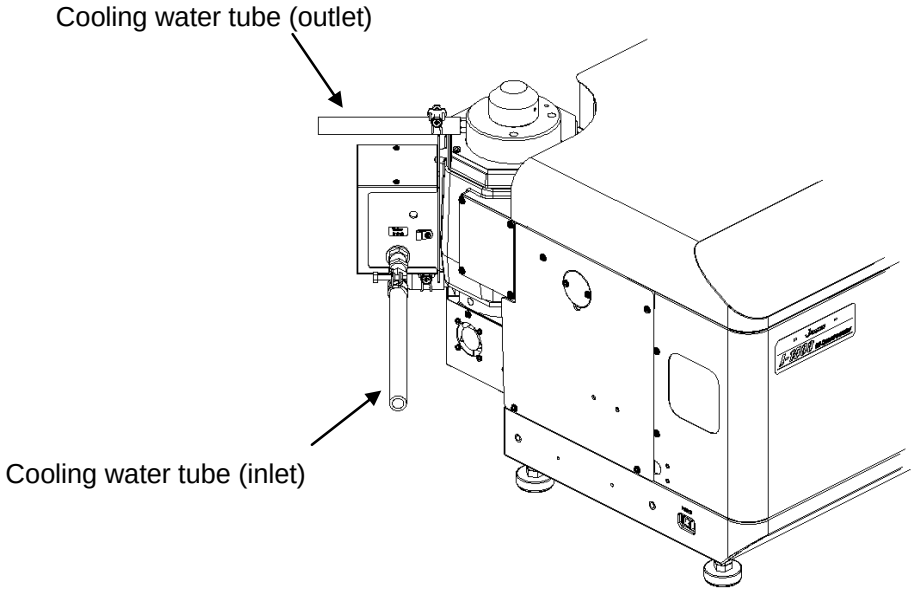


Figure 2.14 Connection of the cooling water tubes

(3) Connecting the nitrogen gas tube

Connect a nitrogen gas cylinder (flow meter) to the nitrogen gas inlet using the tube (length: 3m, outside diameter: 8mm).

CAUTION: Connect the nitrogen gas tube to the quick-fittings.

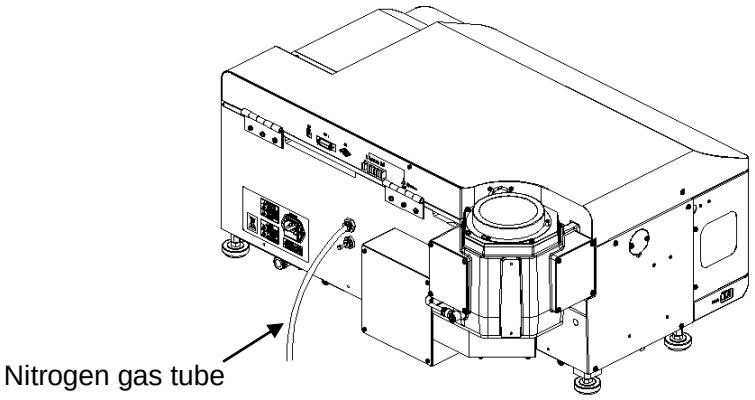


Figure 2.15 Connection of the nitrogen gas tube (Model J-1100)

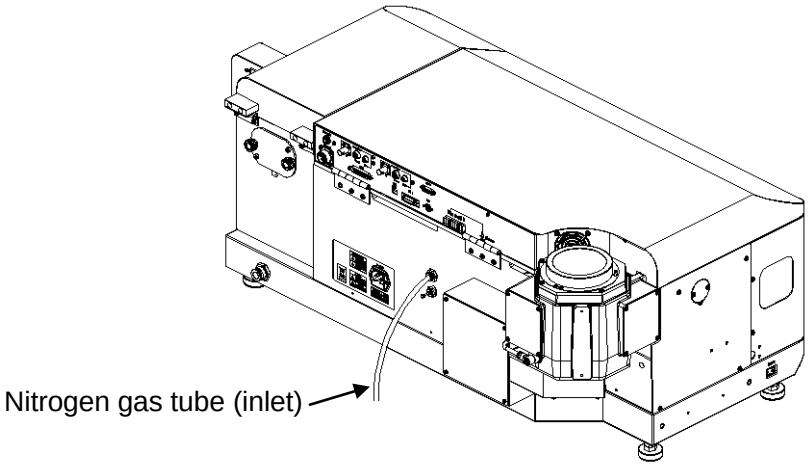


Figure 2.16 Connection of the nitrogen gas tube (Model J-1500)

(4) Connecting the leaked water outlet tube

Connect the tube to the leaked water outlet port. Connect the tube to the drain port, if necessary.

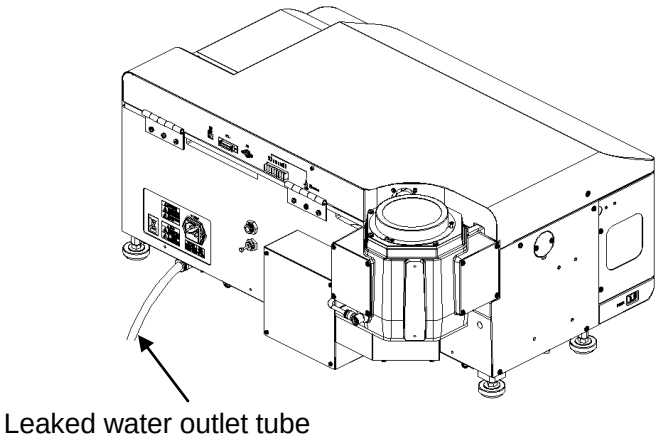


Figure 2.17 Connection of the leaked water outlet tube (Model J-1100)

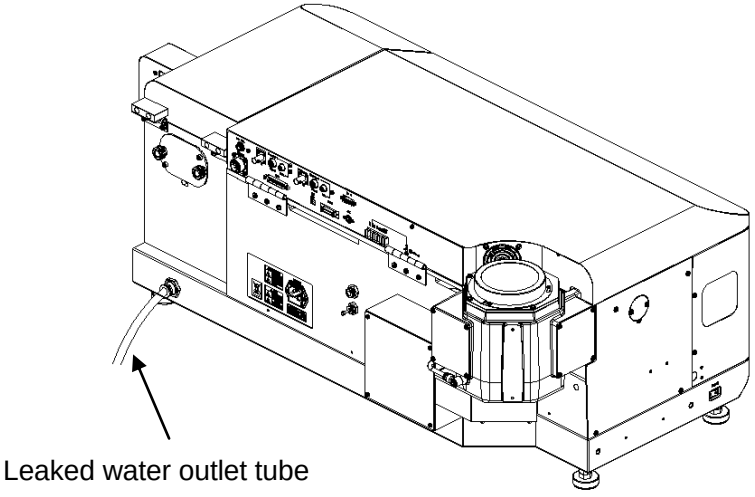


Figure 2.18 Connection of the leaked water outlet tube (Model J-1500)

3. Names and Functions of Components

3.1 Model J-1100

3.1.1 Overview

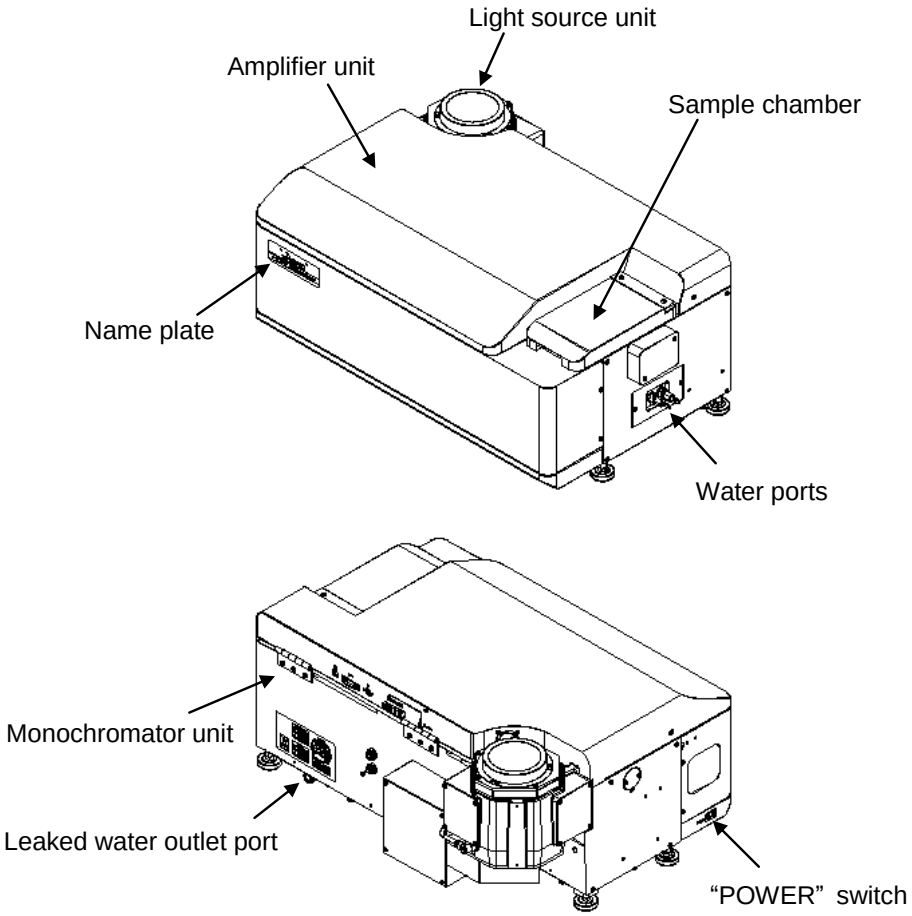


Figure 3.1 Model J-1100 overview

Component	Function
Light source unit	Houses the light source.
Sample chamber	Set sample.
Amplifier unit	Houses the amplifier and other elements.
Name plate	Lights the LED (startup color: orange, normal color: green, error color: red).
Water ports	Inlet and outlet ports of water.
Monochromator unit	Houses the monochromator and modulator.
Leaked water outlet port	Outlet for water leaking from the sample chamber.
“POWER” switch	Power switch of the instrument.

3.1.2 Rear panel

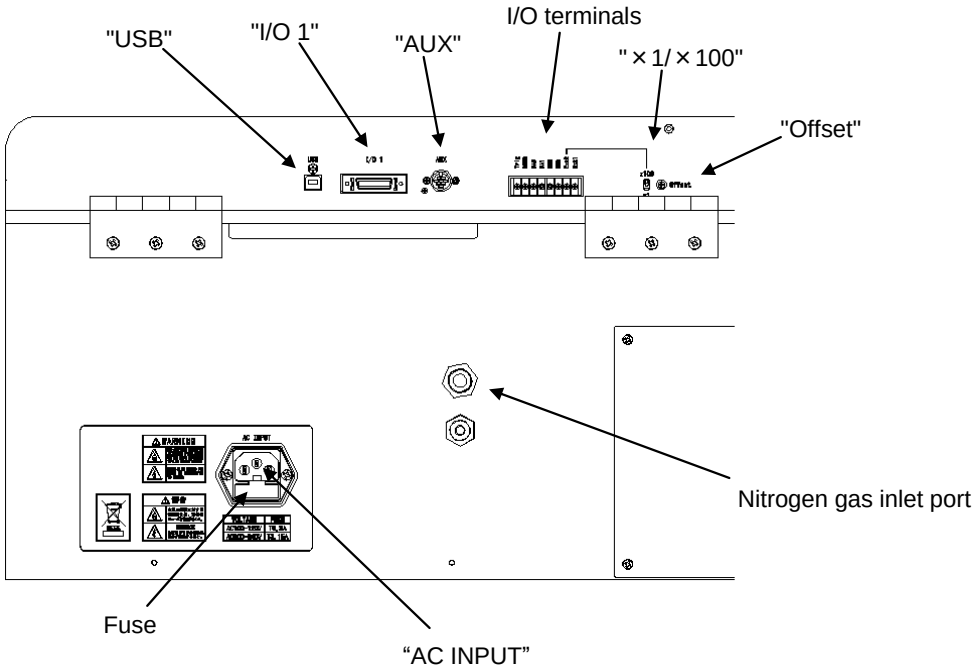


Figure 3.2 Model J-1100 rear panel

Component	Function
Nitrogen gas inlet port	Connects the tube from a nitrogen gas cylinder (flow meter).
“AC INPUT“ connector	Power inlet receptacle.
Fuse	Fuses.
"USB" connector	Connects to the USB port of a computer.
"I/O 1" connector	Connects to an optional accessory.
“AUX” connector	Connects to an optional accessory.
I/O terminals	
'Trig' terminal	Trigger signal input terminal.
'DGND' terminal	Grounding terminal (for digital signal).
'DA5' terminal	Output terminal for analog signal (0 to 5 VDC).
'DA1' terminal	Output terminal for analog signal (0 to 1 VDC).
'GND' terminal	Grounding terminal (for analog signal).
'Ext2' terminal	Input terminal for analog signal (-1 to 1 VDC).
'Ext1' terminal	Input terminal for analog signal (-1 to 1 VDC).
"x1/x100" selector switch	Changes over the “Ext2” terminal input voltage gain. Set it to x100 to amplify the gain by a factor of 100.
“Offset” trimmer	Trimmer for adjusting offset when selector switch set to x100.

3.1.3 Sample chamber

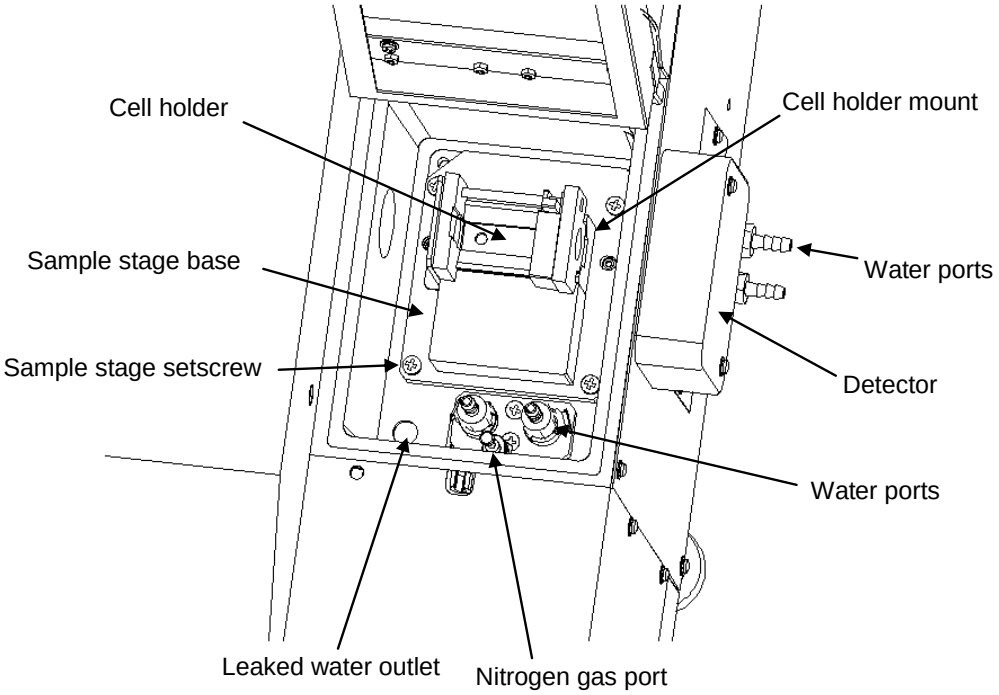


Figure 3.3 Model J-1100 sample chamber

Component	Function
Cell holder	Sets the cell.
Cell holder mount	Sets the cell holder.
Sample stage base	Remove this when an optional accessory is mounted. When removing, raise it straight up because there is an accessory recognition connector on the back.
Sample stage setscrew	Secures the sample stage.
Nitrogen gas port	Connects to an optional accessory.
Leaked water outlet	Leaked water outlet.
Water ports	Inlet and outlet ports of water.
Detector	Detector.

3.2 Model J-1500

3.2.1 Overview

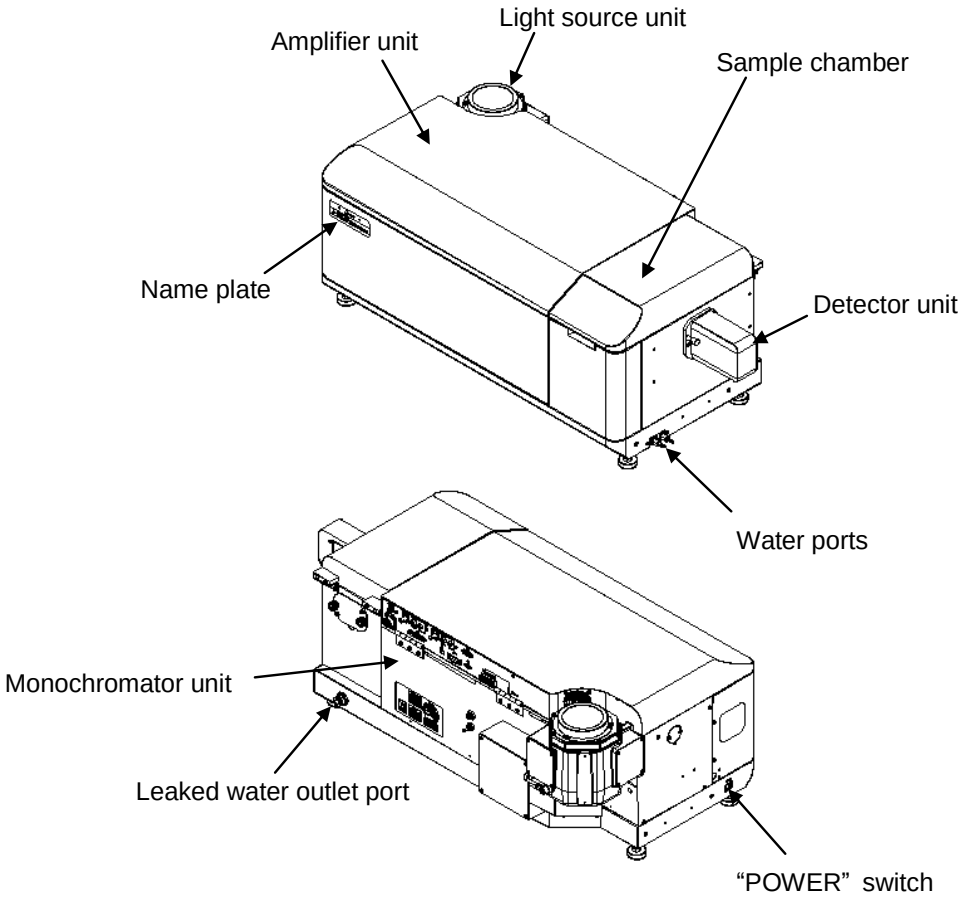


Figure 3.4(a) Model J-1500 overview (150W light source)

Component	Function
Light source unit	Houses the light source.
Sample chamber	Set sample.
Amplifier unit	Houses the amplifier and other elements.
Detector unit	Houses the photomultiplier tube and pre amplifier.
Name plate	Lights the LED (startup color: orange, normal color: green, error color: red).
Water ports	Inlet and outlet ports of water.
Monochromator unit	Houses the monochromator and modulator.
Leaked water outlet port	Outlet for water leaking from the sample chamber.
“POWER” switch	Power switch of the instrument.

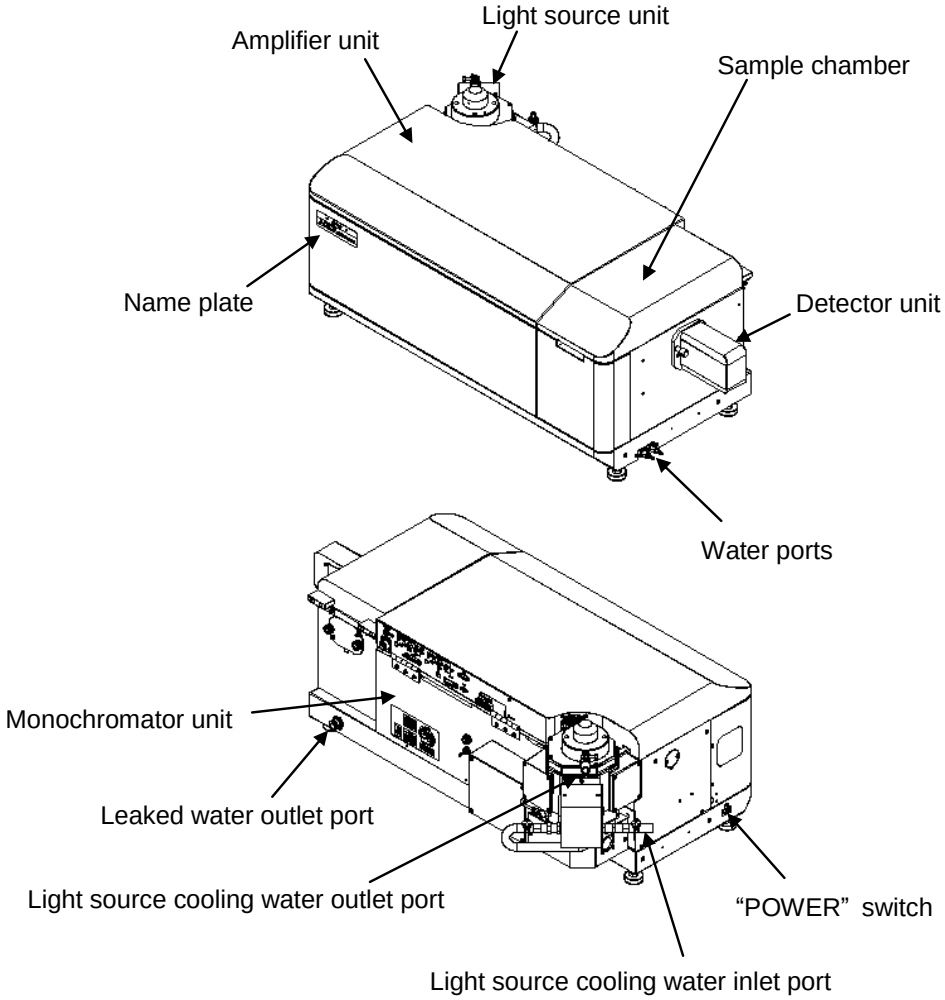


Figure 3.4(b) Model J-1500 overview (450 W light source)

Component	**Function**
Light source unit	Houses the light source.
Sample chamber	Set sample.
Amplifier unit	Houses the amplifier and other elements.
Detector unit	Houses the photomultiplier tube and pre amplifier.
Name plate	Lights the LED (startup color: orange, normal color: green, error color: red).
Water ports	Inlet and outlet ports of water.
Monochromator unit	Houses the monochromator and modulator.
Leaked water outlet port	Outlet for water leaking from the sample chamber.
"POWER" switch	Power switch of the instrument.
Light source cooling water inlet port	Cooling water inlet to the light source.
Light source cooling water outlet port	Cooling water outlet from the light source.

3.2.2 Rear panel

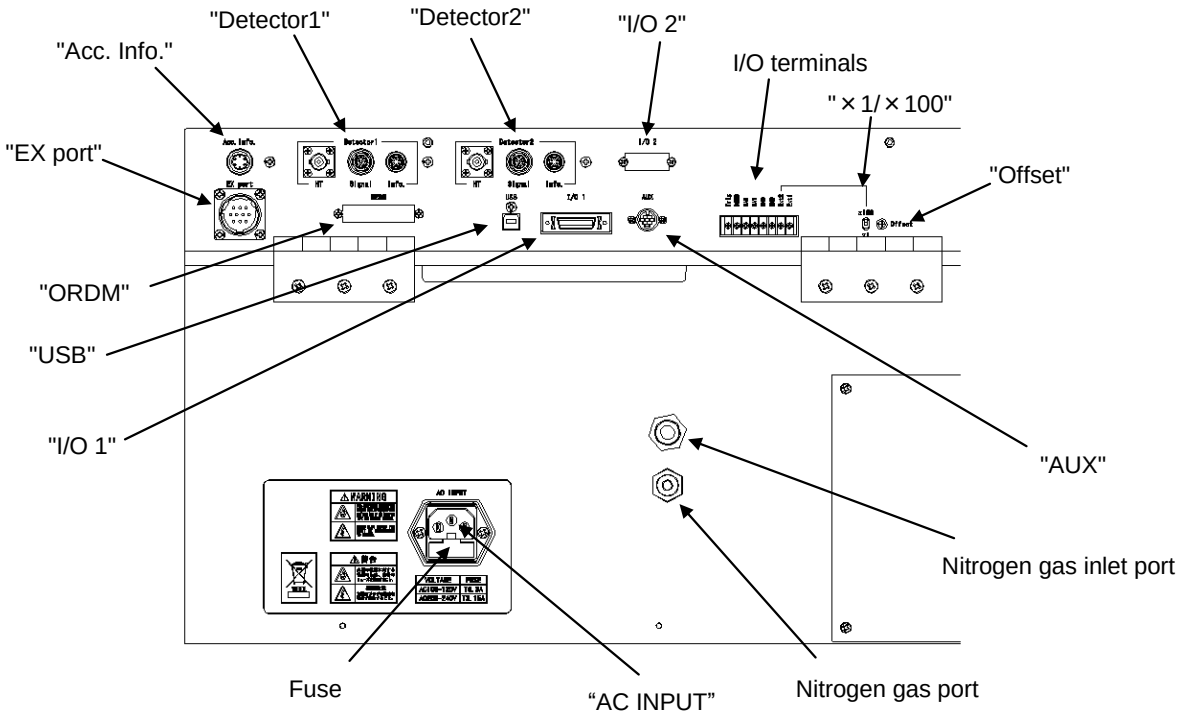


Figure 3.5 Model J-1500 rear panel

Component	Function
Nitrogen gas inlet port	Connects the tube from a nitrogen gas cylinder (flow meter).
Nitrogen gas port	Port for supplying nitrogen gas to an optional accessory.
“AC INPUT“ connector	Power inlet receptacle.
Fuse	Fuses.
"Acc . Info." connector	Connector for information input of an optional accessory.
"EX port" connector	Connects to an optional accessory.
"Detector1" connector	Connects to the detector unit for CD measurement.
'HT' connector	Connector for control voltage output of PMT.
'Signal' connector	Connector for measurement signal input.
'Info.' connector	Connector for control information output of the detector unit.
"Detector2" connector	Connects to the detector unit for FL (FDCD) measurement.
'HT' connector	Connector for control voltage output of PMT.
'Signal' connector	Connector for measurement signal input.
'Info.' connector	Connector for control information output of the detector unit.
"ORDM" connector	Port for mounting the connector of an optional ORD accessory.
"USB" connector	Connects to the USB port of a computer.
"I/O 1" connector	Connects to an optional accessory.
"I/O 2" connector	Port for mounting the connector of an optional accessory.
“AUX” connector	Connects to an optional accessory.
I/O terminals	
'Trig' terminal	Trigger signal input terminal.
'DGND' terminal	Grounding terminal (for digital signal).
'DA5' terminal	Output terminal for analog signal (0 to 5 VDC).
'DA1' terminal	Output terminal for analog signal (0 to 1 VDC).
'GND' terminal	Grounding terminal (for analog signal).

'Ext2' terminal	Input terminal for analog signal (-1 to 1 VDC).
'Ext1' terminal	Input terminal for analog signal (-1 to 1 VDC).
"x1/x100" selector switch	Changes over the “Ext2” terminal input voltage gain. Set it to x100 to amplify the gain by a factor of 100.
“Offset” trimmer	Trimmer for adjusting offset when selector switch set to x100.

3.2.3 Sample chamber

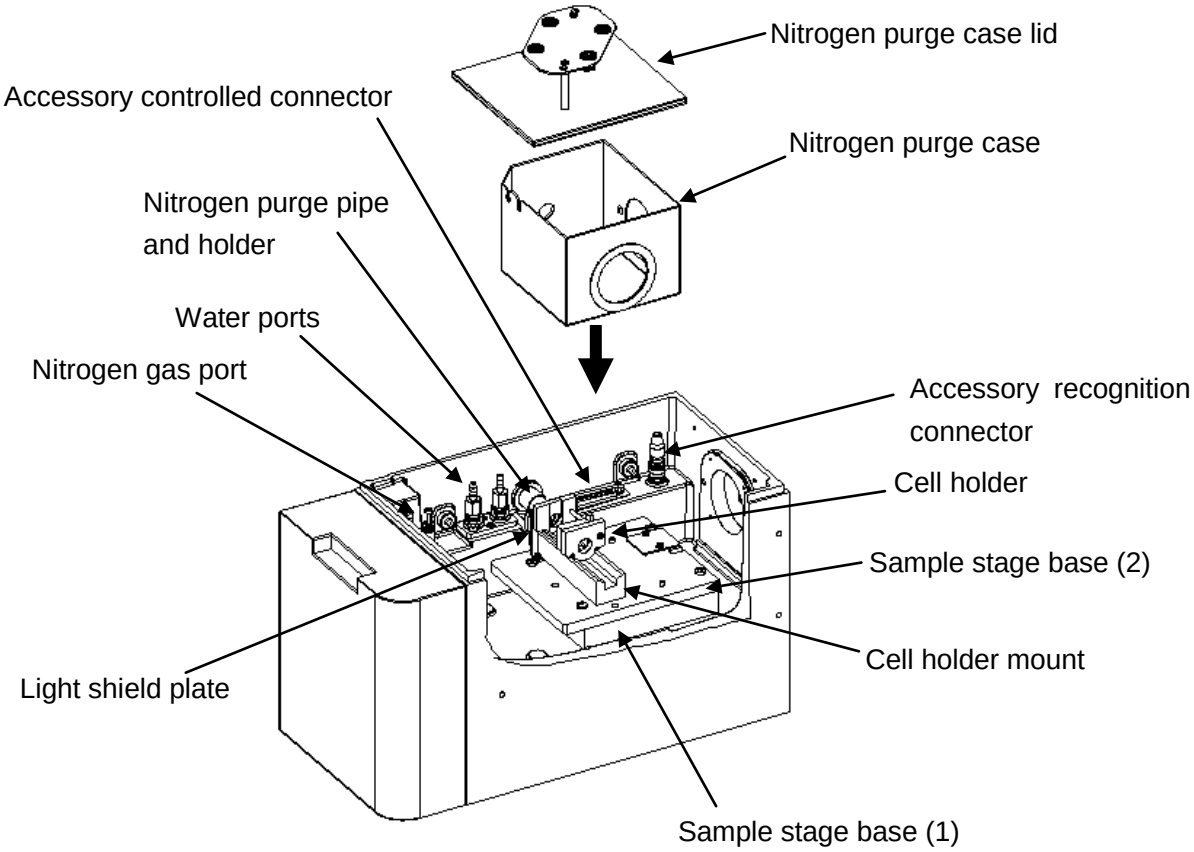


Figure 3.6 Model J-1500 sample chamber

Component	Function
Cell holder	Sets the cell.
Cell holder mount	Sets the cell holder.
Sample stage base (1)	Remove this when a medium-sized accessory such as a Peltier thermostatted cell holder is mounted.
Sample stage base (2)	Remove this when a small-sized accessory such as a thermostatted cylindrical cell holder is mounted.
Light shield plate	Changes the beam diameter to 8 mm or 13 mm depending on the cell to be used.
Water ports	Inlet and outlet ports of water.
Nitrogen gas port	Connects to an optional accessory.
Accessory recognition connector	Connector for input information of an optional accessory.
Accessory controlled connector	Connects to an optional accessory.
Nitrogen purge case	Improves the efficiency of nitrogen purge.
Nitrogen purge case lid	Lid of the nitrogen purge case. Mount it to the sample chamber lid.
Nitrogen purge pipe and holder	Improves the efficiency of nitrogen purge.

3.2.4 Detector unit

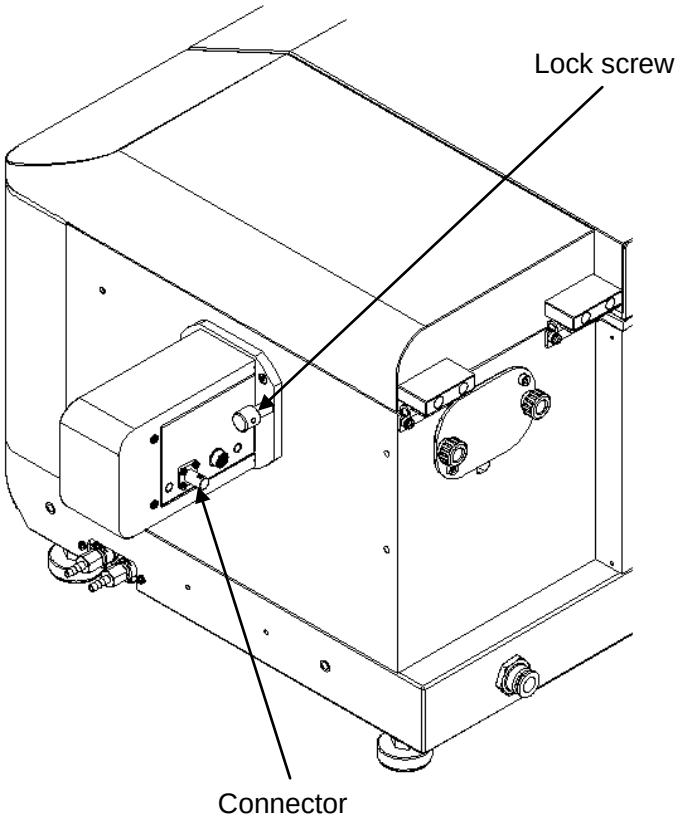


Figure 3.7 Model J-1500 detector unit

Component	Function
Lock screw	Secures the detector unit to the main unit.
Connector	Connect to the “Detector1” connector located on the rear panel of the amplifier unit.

4. Maintenance

4.1 Light Source Check and Replacement

The service life of the xenon lamp is 300 to 500 hours, but it varies considerably from one lamp to another. It is therefore difficult to predict life expectancy from operating hours. It is generally predicted from the noise on the measured data. Compare the current data with the data obtained immediately after delivery (i.e. data obtained with a new lamp) to decide whether to replace the lamp or not.

Note: Noise may also appear if the line voltage fluctuates rapidly.

Observe the following guidelines in order to maximize the service life of the xenon lamp.

. If the light source is not used for an extended period, turn it off. However, if the light source will be not be required for an hour or less, leave it on. Frequently turning the light source on and off will shorten its service life.

. Always supply cooling water to the light source (J-1500 450 W light source).

<Procedure>

WARNING!: Read carefully the ″Safety Considerations″ at the beginning of this manual.

(1) Turn OFF the ″POWER″ switch located on the instrument.

(2) For the 150 W light source, remove the light source cover and then remove the anode holder and the light source. For the 450 W light source, remove the anode holder, remove the cathode cover, and then loosen the cathode fixing screw to remove the light source.

Note: The 150 W light source is attached to the anode holder.

(3) For the 150 W light source, remove the anode holder and cathode adapter from the light source, and attach them to a new light source.

(4) Mount a new light source in the position of the old light source.

CAUTION 1: Confirm that the glass protrusion of the xenon lamp does not face the M_0 and M_1 mirrors.

CAUTION 2: Do not mistake the polarity of the xenon lamp.

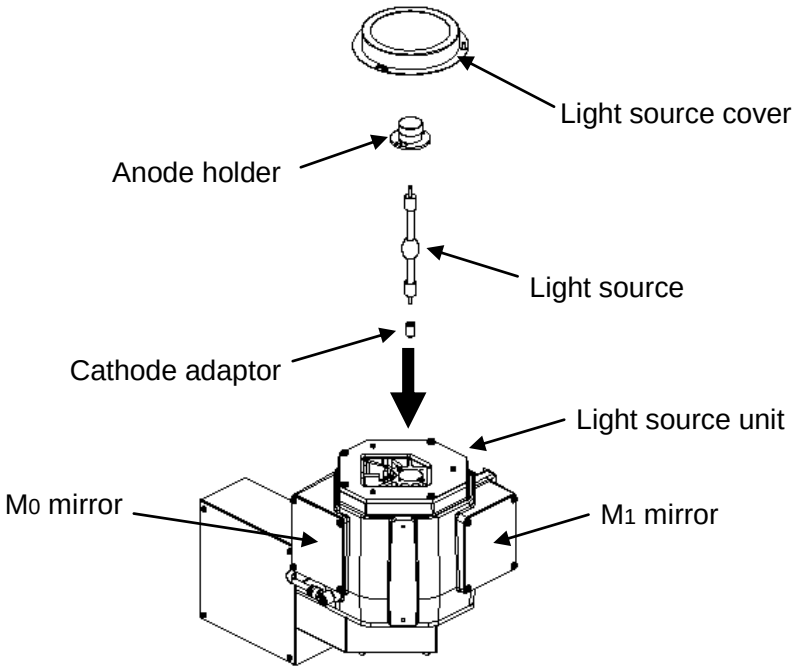


Figure 4.1 Light source replacement (150W light source)

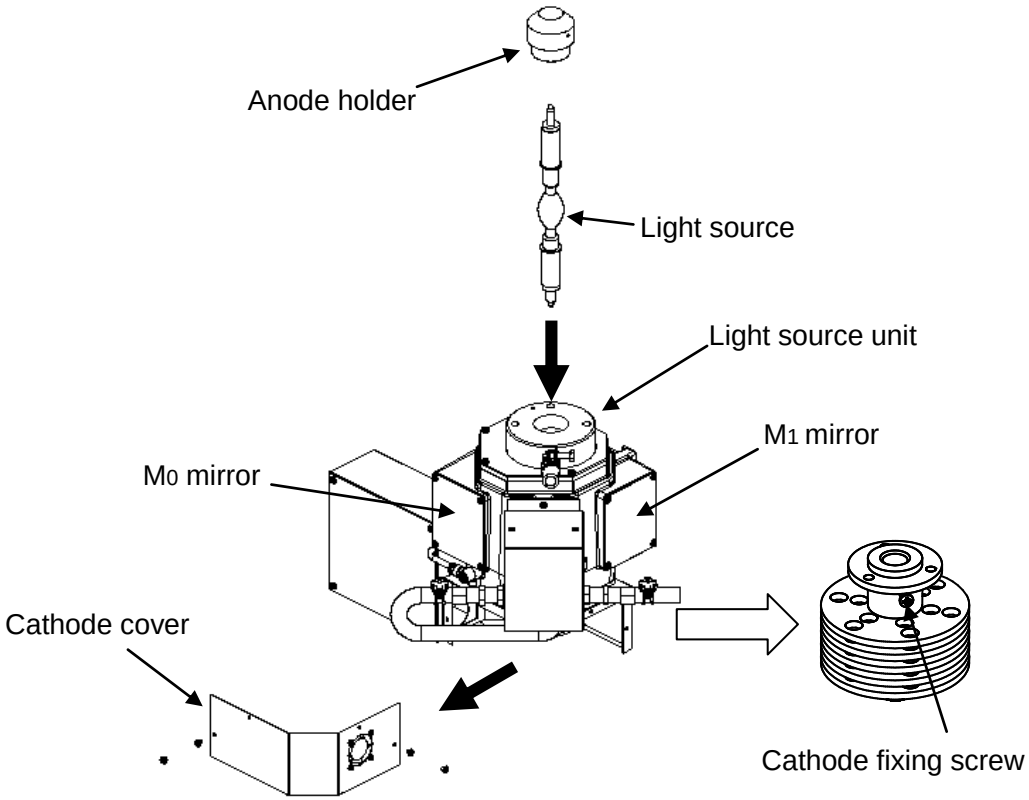


Figure 4.2 Light source replacement (450 W light source)

(5) For the 450 W light source, tighten the cathode fixing screw.
(6) For the 450 W light source, mount the anode holder.
(7) Start up the instrument.
(8) Start up [Data Monitor] program from [Spectra Manager].
(9) Set he wavelength to ″546 nm″.
(10) For the Model J-1100, remove the M_1 mirror cover from the light source unit. For the Model J-1500, remove the M_0 and M_1 mirror covers from the light source unit.
(11) Adjust the adjustment screws for the M_1 mirror so as to minimize the value of HT voltage when the sample chamber is empty. In addition, for the Model J-1500, adjust the adjustment screws for the M_0 mirror so as to minimize the value of HT voltage.

Note: In case of Model J-1100, there is not the M_0 mirror.

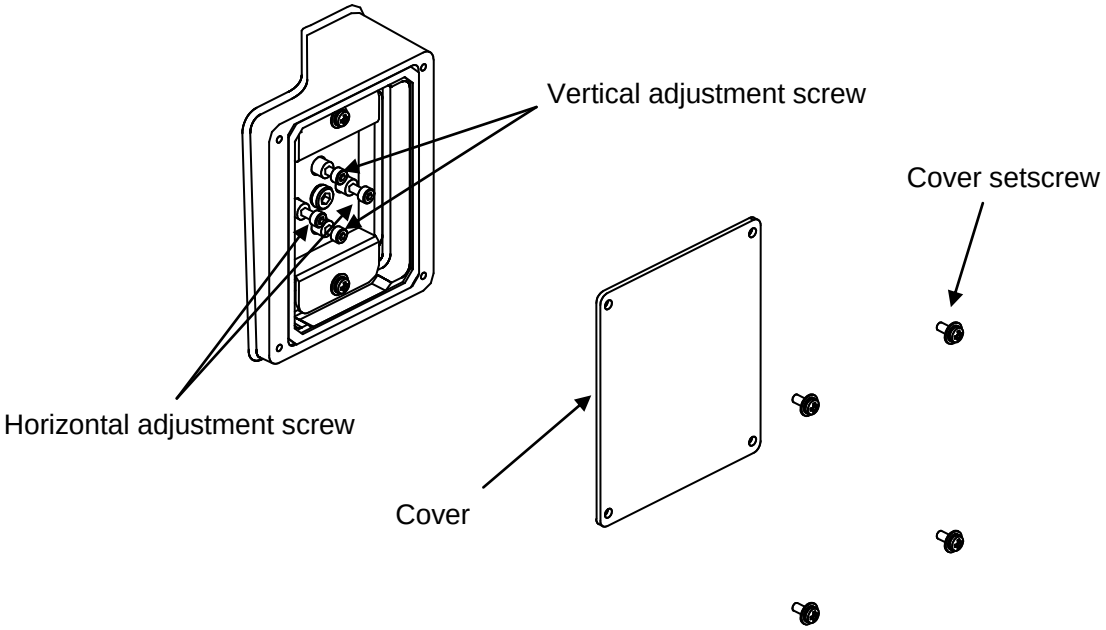


Figure 4.3 Light source adjustment screws

(12) For the Model J-1100, re-install the M_1 mirror cover to the light source unit. For the Model J-1500, re-install the M_0 and M_1 mirror covers to the light source unit.

4.2 Wavelength Accuracy Check and Adjustment

Note1: Before checking wavelength accuracy, warm up the instrument for about one hour after turning the light source ON.
Note2: Perform this check using the internal Hg lamp.

<Procedure>

(1) Start up [Administrative Tools] program from [Spectra Manager] and turn on the Hg lamp.

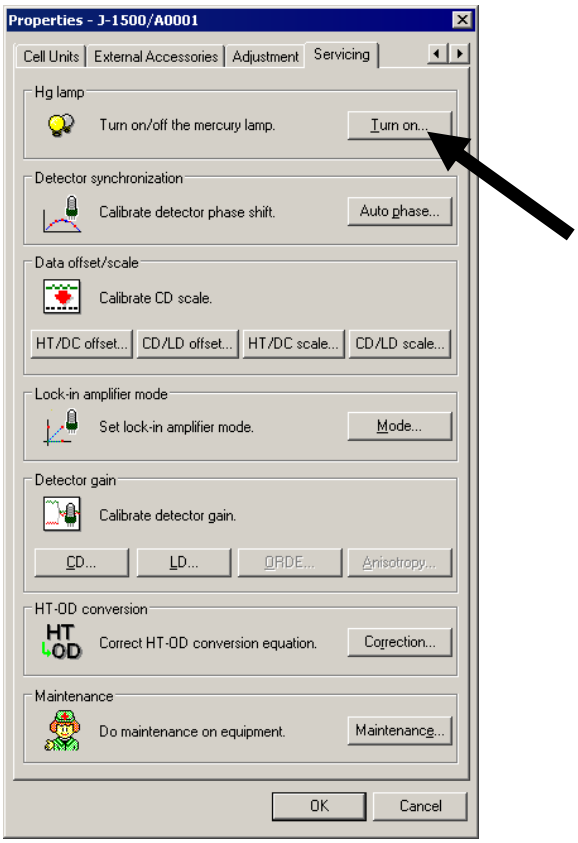


Figure 4.4 Lighting the Hg lamp

(2) Start up [Spectrum Measurement] program from [Spectra Manager].
(3) Set the following spectrum measurement parameters.

Photometric mode	: DC
Wavelength range	: 530 to 560 nm
Band width	: 1 nm
D.I.T	: 0.25 sec
Scanning speed	: 20 nm/min
Data pitch	: 0.1 nm

(4) Set the following detector condition parameters.

HT volt mode	: Manual
HT voltage	: About 600V

(5) Measure a spectrum.

(6) Using the [Spectra Analysis] program, verify that the peak wavelength of the DC spectrum is the following range.

546.1±0.8 nm (J-1100)

546.1±0.5 nm (J-1500)

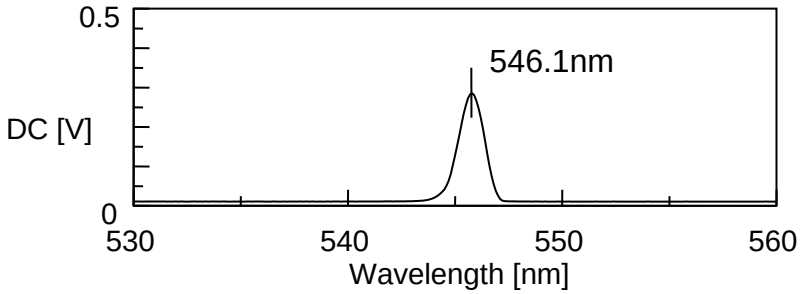


Figure 4.5 DC spectrum of the Hg emission line (546.1nm)

(7) If the peak wavelength does not fall within this range, adjust the adjustment screws on the wavelength lever. If the instrument is mounted in the optional cabinet, the wavelength cam and wavelength lever will be visible from below by removing the bottom plate. If the instrument is mounted on a table or bench, lay the instrument across two tables or benches to permit access to the adjustment screws.

Note: Correct the wavelength by adjusting the fine and coarse adjustment screws located on the wavelength lever. Turning the adjustment screw 1 clockwise shifts the DC spectrum to shorter wavelengths and turning the adjustment screw 2 clockwise shifts the DC spectrum to longer wavelengths.

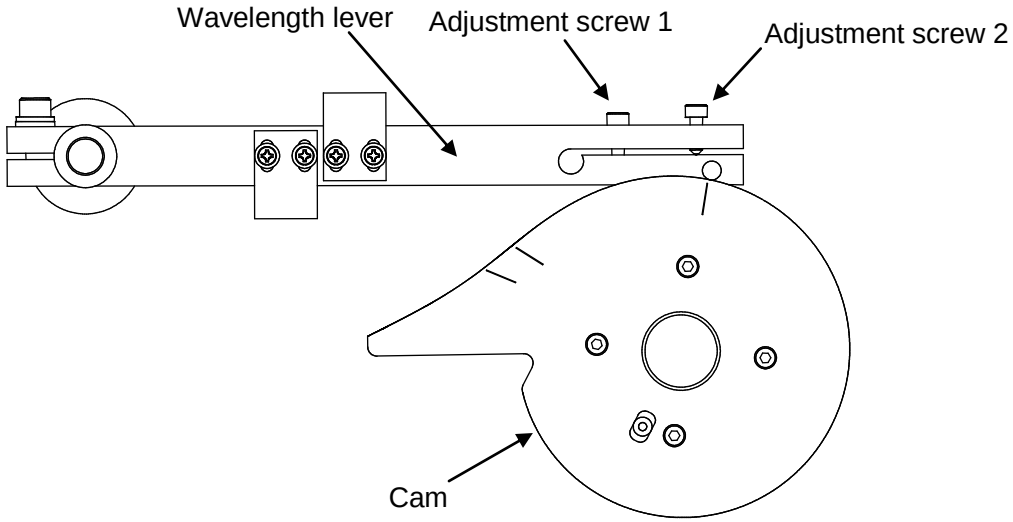


Figure 4.6 Wavelength adjustment screws

(8) Measure the DC spectrum of Hg emission line to check the wavelength setting.

(9) Start up [Administrative Tools] program from [Spectra Manager] and turn off the Hg lamp.

4.3 CD Scale Check and Adjustment

Note1: Before checking the CD scale, warm up the instrument for about one hour after turning the light source ON.
Note2: Use a 0.06% (w/v) aqueous solution of ammonium d-10-camphor sulfonate (10 mm cell) as the sample.

<Procedure>

(1) Start up [Spectrum Measurement] program from [Spectra Manager].
(2) Set the following spectrum measurement parameters.

Photometric mode	: CD
CD scale	: 2000 mdeg
Wavelength range	: 250 to 350 nm
Band width	: 1 nm
D.I.T	: 1 sec
Scanning speed	: 50 nm/min
Data pitch	: 0.1 nm

(3) Fill the 10 mm light path cell with 0.06% aqueous solution of ammonium d-10-camphor sulfonate (solvent: distilled water) and mount the cell in the sample chamber.
(4) Measure a sample spectrum.
(5) Using the spectrum analysis program, confirm that the peak value of CD spectrum.
190.4±2 mdeg (291.0 nm)

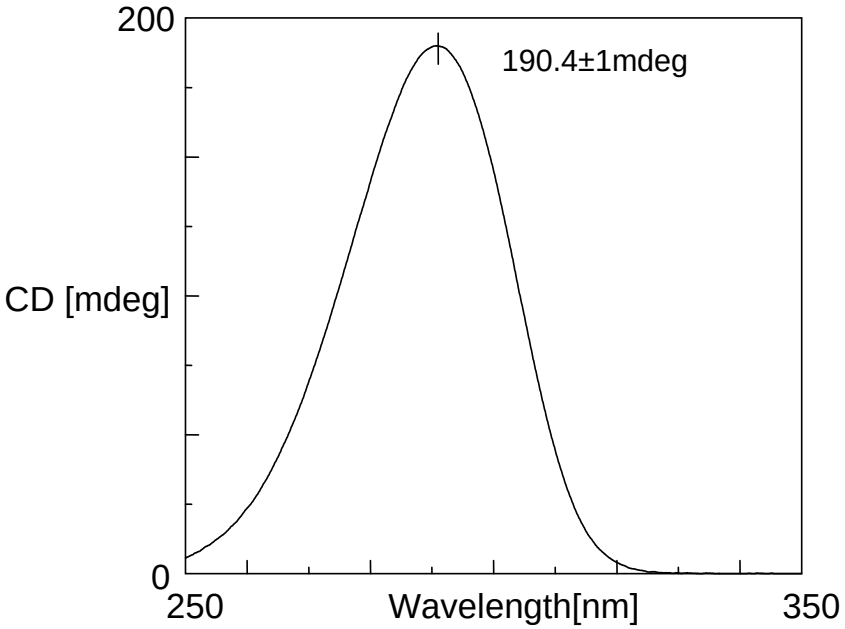


Figure 4.7 CD spectrum of 0.06% ammonium d-10-camphor sulfonate

(6) If the peak value does not fall within this range, start up [Administrative Tools] program from [Spectra Manager] and adjust the CD scale.

Note: In order to adjust the scale a password is required.

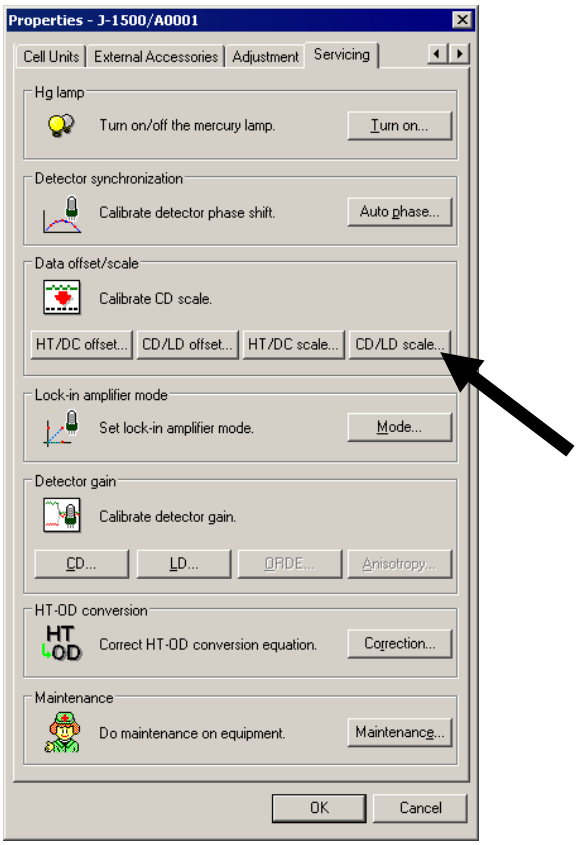


Figure 4.8 Adjustment of CD scale

4.4 LD Scale Check and Adjustment

Note1: Before checking the LD scale, warm up the instrument for about one hour after turning the light source ON.
Note2: Use a 45° quartz plate as the sample.

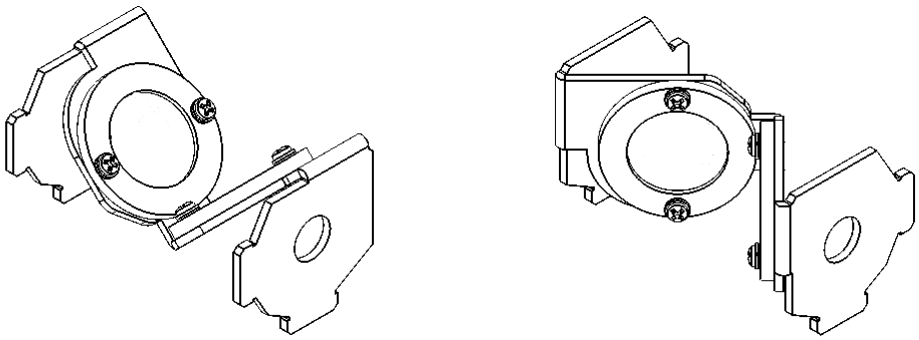
<Procedure>

(1) Start up [Spectrum Measurement] program from [Spectra Manager].
(2) Set the following spectrum measurement parameters.

Photometric mode	: LD
CD scale	: 1.0 dOD
Wavelength range	: 450 to 550 nm
Band width	: 1 nm
D.I.T	: 1 sec
Scanning speed	: 50 nm/min
Data pitch	: 0.5 nm

(3) Mount the 45° quartz plate in the sample chamber.

Note: Set the light shield plate of sample chamber to 8mm diameter.



(Plus placement) (Minus placement)

Figure 4.9 45° quartz plate placement

(4) Measure sample spectra.

(5) Using the spectrum analysis program, confirm that the 500nm photometric value of LD spectrum.
0.1328±0.007dOD (plus placement)
-0.1328±0.007dOD (minus placement)

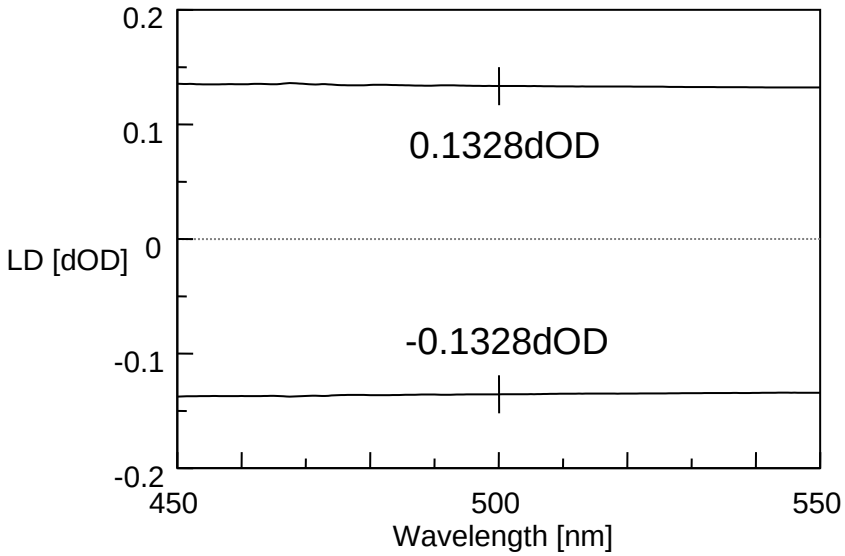


Figure 4.10 LD spectrum of 45° quartz plate

(6) If the photometric value does not fall within this range, start up [Administrative Tools] program from [Spectra Manager] and adjust the LD scale.

Note: In order to adjust the scale a password is required.

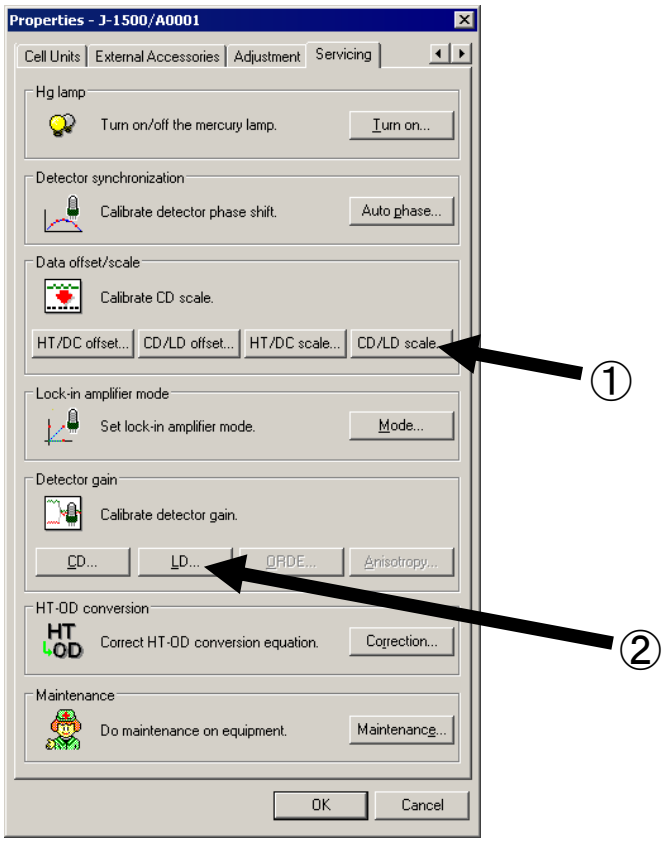


Figure 4.11 Adjustment of LD scale

4.5 Replacement of Fuse

WARNING 1!: Only use fuses of the rated capacity to prevent injury to personnel and overheating of the instrument.
WARNING 2!: To avoid electric shock, always turn off the power switch and unplug the AC power cable from the outlet before replacing a fuse.

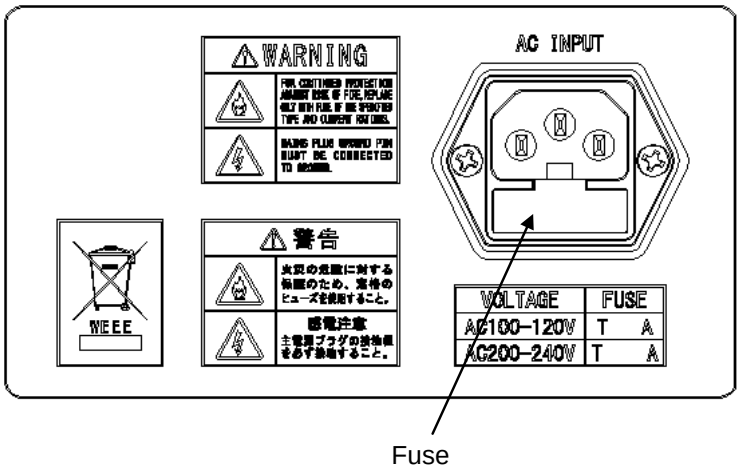


Figure 4.12 Monochromator unit rear panel

Note: Replace both fuses, even if only one is burned out.

(1) Turn off the power and disconnect the AC power cable from the “AC INPUT”.
(2) Insert a flat-head screwdriver on the fuse holder, then pull forward to remove the fuses with the holder.
(3) Take the old fuses out of the holder, and replace with new ones. Insert the fuse holder in its original position.
(4) Plug the power cable into the “AC INPUT” and turn the power switch on, then check that the instrument can be operated.

Note: If the fuses burn out again soon after replacement, contact your nearest local JASCO distributor.

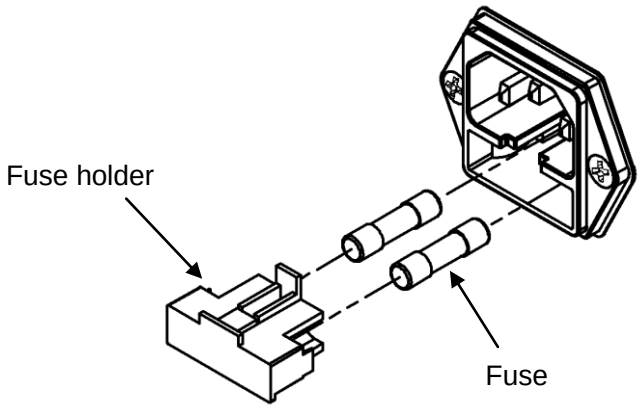


Figure 4.13 Replacement of fuse

4.6 List of Consumable parts

Table4.1 gives consumable parts necessary for maintenance. On any order, please quote the part names and also the part numbers

Table 4.1 List of consumable parts

Item	Part No.	Remarks
Xenon lamp	5330-0061	150 W
Xenon lamp	5330-0014B	450 W
M_0 mirror	1002-0268A	For J-1500
M_1 mirror	1003-0285C	For J-1100/1500
Standard sample	0730-0358	Ammonium d-10-camphor sulfonate, 1g
Cooling water tube	0501-9002A	For the 450 W light source
Tube	0917-1015A	ID3 x D5 x 1200 mm
Tube	6784-0619A	ID5 x OD7 x 1500 mm
Cell holder	6784-J034A	
Barb fittings	2303-H124A	
Fittings (plug)	2303-0363	
Fuse (3.15A Time-lag fuse)	5840-H111A	5pcs/set
Fuse (6.3A Time-lag fuse)	5840-H108A	5pcs/set
Fuse (10A Time-lag fuse)	5840-H110A	5pcs/set
Fuse (12.5A Time-lag fuse)	5840-H117A	5pcs/set

5. Troubleshooting

If the instrument does not operate properly, the one of the following is likely to be the cause:

- Erroneous operation
- Deterioration of consumable components
- Failure of instrument

The following table describes basic corrective actions to be taken for specific symptoms. If the difficulty cannot be corrected by performing these actions, failure of the instrument is suspected. In this case, contact your local JASCO distributor with detailed information about your difficulty, including the model name, serial number, and date of manufacture of your instrument.

Symptom	Check	Corrective action
Power cannot be turned ON.	Is the power cable plugged into the outlet?	Correctly plug in the cable.
	Does the fuse burn off?	Replace the fuse.
The light source does not come on.	Is it not set to be the light source does not turn on at startup?	Set to turn on the light source at startup.
	Is the flow rate of cooling water supplied to the 450 W light source sufficiently high?	Increase the cooling water flow rate.
	Anode holder is correctly installed.	Install correctly.
	Is the cathode fixing screw tightened? (450 W light source)	Tighten the cathode fixing screw.
	Can a sparking sound be heard?	When a sparking sound can be heard, replace the lamp.
HT voltage does not increase.	Is the shutter open?	Open the shutter.
	Is the photometric mode set correctly?	Set the measurement mode to ″CD″ (not ″Test signal″).
	Is the HT voltage mode set correctly?	Set it to ″Auto″ (not ″Manual″ or “Off”).
	Is the sample chamber lid completely closed?	Completely close the lid.
HT voltage has risen and will not decrease.	Is there a sample in the sample chamber?	Remove the sample.
	Is the spectral bandwidth setting too small? (Model J-1500)	Increase the spectral bandwidth.
	Is the cable correctly connected to the detector unit and to the connector located on the rear panel of the amplifier unit? (Model J-1500)	Correctly connect the cable.
	Is the wavelength set to a value at which the detector is not sensitive?	Set the wavelength to a value at which the detector is sensitive.
	Is the nitrogen gas flow rate high enough when the wavelength is set below 180 nm?	Increase the nitrogen gas flow rate.

	Is the HT voltage mode set correctly?	Set it to ″Auto″ (not ″Manual″).
The noise level is high.	Is the spectral bandwidth setting too small? (Model J-1500)	Increase the spectral bandwidth.
	Does the sample have high light absorption?	Reduce the sample concentration, or shorten the light path of the cell.
	Is noise detected in the HT voltage?	Replace the Xe lamp.
	Is the HT voltage at below 250 nm too high?	Adjust the M_0 and M_1 mirrors.
	Is there any noise source that generates electromagnetic waves nearby?	Remove the noise source from the vicinity of the instrument.
	Is there any source of mechanical vibration nearby?	Remove the source of vibration.
	Does the line voltage vary abruptly?	Use stabilized line voltage.
The baseline curves strongly.	Is the curvature of the baseline within ±10 mdeg when the baseline is not corrected?	Perform baseline correction.
A CD value is displayed even though the sample is not optically active.	Is the sample fluorescent?	Decrease sample absorbance to 2 or less by adjusting the concentration of the sample.
	Is the sample a film or liquid crystal?	A spurious CD signal from the sample is probable.
	Does the cell contain accidentally any optically active residue?	Prepare a new sample.
The displayed CD value is smaller than normal, or no display appears.	Is the HT voltage mode set correctly?	Set it to ″Auto″ (not ″Manual″ or “Off”).
	Is the photometric value 18±2 mdeg when the photometric mode is ″Test signal″?	When out of range, failure of the electrical system or modulator element is probable.
Repeatability of CD values is low.	Has the instrument warmed up sufficiently?	Before performing CD measurement, warm up the instrument for approximately one hour after turning on the light source.
	Has the sample deteriorated due to irradiation by the light from the light source?	Use the shutter function or narrow the spectrum bandwidth.
	Is the variation in the peak value of aqueous solution of ammonium d-10-camphor sulfonate (distilled water, 10 mm cell) at 291.0 nm within 2 mdeg/hr?	Normal. When out of range, check another item.
	Is the room temperature variation within the prescribed limits?	Be stabilized at room temperature.

	Is air being blown on the instrument from an air conditioner or another source?	Install the instrument in a location away from the direct path of air currents.
	Is the scanning speed too high?	Slightly lower the scanning speed.
	Is the noise level too high?	Increase D.I.T. Or, refer to the “The noise level is high” symptom.
Wavelength repeatability is low.	Has the instrument warmed up sufficiently?	Measure the wavelength repeatability after warming up the instrument for approximately one hour after the light source is turned on.
	Is the room temperature variation within the prescribed limits?	Be stabilized at room temperature.
No communication with the computer.	Is the USB cable connected properly?	Reconnect the cable correctly.
Water was leaking in the sample chamber.	Is there any water into the nitrogen inlet hose of the sample chamber?	Wipe off the spilled water in the sample chamber with a dry cloth. Disconnect the nitrogen hose from the bottom of the sample chamber and put out the water from the nitrogen hose.

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