206-97457
Aug. 2011

ISR-2600 for UV-2600/2700
ISR-2600Plus for UV-2600

Integrating Sphere Attachment

INSTRUCTION MANUAL

Read the instruction manual thoroughly before you use the product.
Keep this instruction manual for future reference.

SHIMADZU CORPORATION
KYOTO JAPAN

ANALYTICAL & MEASURING INSTRUMENTS DIVISION

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Preface

Read this manual thoroughly before using the product.

Thank you for purchasing this product.

This manual describes operation of this product and details about its accessories and options. Read the manual thoroughly before using the product. Use the product in accordance with the manual's instructions.

Keep this manual for future reference.

■ IMPORTANT

- If the user or usage location changes, be sure this manual is always kept with the product.
- If the product's documentation, including this manual and the product's warning labels, become lost or damaged, contact your Shimadzu representative immediately.
- Safety Instructions are provided to ensure safe operation of the product.
- To ensure safe operation, contact your Shimadzu representative for installation, adjustment, or reinstallation after moving the product to a different site.

■ COPYRIGHT

- Information in this manual is subject to change without notice and does not represent a commitment on the part of the vendor.
- Any errors or omissions which may have occurred in this manual despite the utmost care taken in its production will be corrected as soon as possible, but not necessarily immediately upon detection.
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- Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. All other brand names and product names are trademarks or registered trademarks of their respective companies. The TM and ® symbols are omitted in this manual.

Notations Used in This Manual

In this manual, warnings, cautions, and notes are indicated using the following conventions:

Notation	Description
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.

The following pictorial symbol is used in this manual:

Notation	Description
Reference	Indicates the location of related information in the instruction manuals.

Safety Instructions

To ensure safe operation of the product, carefully read the Safety Instructions in the INSTRUCTION MANUAL of the spectrophotometer to which this product is connected before using this product. Observe all of the WARNINGS and CAUTIONS described in that section. They are extremely important for safety.

☞ Reference

Refer to "Shimadzu UV-Visible Spectrophotometer UV-2600/2700 INSTRUCTION MANUAL".

■ Operation Precautions

⚠ WARNING

- **Always wear gloves, goggles, and other protective gear when handling any toxic or biologically infectious samples.**
- **Do not use flammable sprays (hair sprays, insecticide sprays, etc.) near the product.**
  They could ignite and cause a fire.
- **It is recommended that Sealed-type be used when any toxic, biologically infectious, or flammable sample is handled.**

☞ Reference

See "6.3 Cells".

⚠ CAUTION

If a sample is spilled, follow the handling and disposal instructions in the Material Safety Data Sheet (MSDS).

■ Precautions for Product Inspection, Maintenance, Adjustment, and Care

⚠ WARNING

Do not remove the cover under any circumstances.

Doing so may cause injury or product malfunction.

The cover does not need to be removed for routine maintenance, inspection, and adjustment. Before attempting repairs that require the cover to be removed, contact your Shimadzu representative.

■ Procedures in Emergency or Power Failure Situations

There are no procedures specifically required for this product. Procedures required in the case of an emergency or power failure are based on those for the spectrophotometer to which this product is connected.

☞ Reference

Refer to "Shimadzu UV-Visible Spectrophotometer UV-2600/2700 INSTRUCTION MANUAL".

Warranty

Shimadzu provides the following warranty for this product.

1. Period:

Please contact your Shimadzu representative for information about the period of this warranty.

2. Description:

If a product/part failure occurs for reasons attributable to Shimadzu during the warranty period, Shimadzu will repair or replace the product/part free of charge. However, in the case of products which are usually available on the market only for a short time, such as personal computers and their peripherals/parts, Shimadzu may not be able to provide identical replacement products.

3. Limitation of Liability:

1. In no event will Shimadzu be liable for any lost revenue, profit or data, or for special, indirect, consequential, incidental or punitive damages, however caused regardless of the theory of liability, arising out of or related to the use of or inability to use the product, even if Shimadzu has been advised of the possibility of such damage.
2. In no event will Shimadzu's liability to you, whether in contract, tort (including negligence), or otherwise, exceed the amount paid for the product.

4. Exceptions:

Failures caused by the following are excluded from the warranty, even if they occur during the warranty period.

1. Improper product handling
2. Repairs or modifications performed by parties other than Shimadzu or Shimadzu designated companies
3. Product use in combination with hardware or software other than that designated by Shimadzu
4. Computer viruses leading to device failures and damage to data and software, including the product's basic software
5. Power failures, including power outages and sudden voltage drops, leading to device failures and damage to data and software, including the product's basic software
6. Turning OFF the product without following the proper shutdown procedure leading to device failures and damage to data and software, including the product's basic software
7. Reasons unrelated to the product itself
8. Product use in harsh environments, such as those subject to high temperatures or humidity levels, corrosive gases, or strong vibrations
9. Fires, earthquakes, or any other act of nature, contamination by radioactive or hazardous substances, or any other force majeure event, including wars, riots, and crimes
10. Product movement or transportation after installation
11. Consumable items
    Note: Recording media such as floppy disks and CD-ROMs are considered consumable items.

* If there is a document such as a warranty provided with the product, or there is a separate contract agreed upon that includes warranty conditions, the provisions of those documents shall apply.

After-Sales Service and Replacement Parts Availability

After-Sales Service

If any problem occurs with the product, inspect it and take the corresponding action as described in "5 Troubleshooting".

If the problem cannot be solved, or if symptoms not covered in the Troubleshooting section occur, contact your Shimadzu representative.

Replacement Parts Availability

Replacement parts for this product will be available for a period of seven (7) years after the product is discontinued. Thereafter, such parts may cease to be available. Note, however, that the availability of units or parts not manufactured by Shimadzu shall be determined by the relevant manufacturers. If Shimadzu receives notice of the discontinuation of units or parts, the necessary quantity for the above period is immediately calculated and secured. However, such units or parts may cease to be available within seven years after the discontinuation of the product, depending on individual manufacturer conditions and on changes in the quantity required.

Disposal Precautions

When disposing of the product, contact your Shimadzu representative.

If you dispose them yourself, do so in accordance with the processing standards determined by law, separately from general industrial waste and household garbage.

Action for Environment (WEEE)

To all users of Shimadzu equipment in the European Union:

WEEE Mark

Equipment marked with this symbol indicates that it was sold on or after 13th August 2005, which means it should not be disposed of with general household waste.
Note that our equipment is for industrial/professional use only.

Contact Shimadzu service representative when the equipment has reached the end of its life. They will advise you regarding the equipment take-back.

With your co-operation we are aiming to reduce contamination from waste electronic and electrical equipment and preserve natural resource through re-use and recycling.

Do not hesitate to ask Shimadzu service representative, if you require further information.

Contents

1 Overview

1.1 Instrument Overview

The ISR-2600/2600Plus attachment is designed to be mounted in the sample compartment of a spectrophotometer to measure diffuse and specular reflectance of solid samples and transmittance of liquid samples and films.

- The ISR-2600 is an integrating sphere unit equipped with a photomultiplier. The measurable wavelength range is 220 nm to 850 nm.
- The ISR-2600Plus is an integrating sphere unit equipped with two detectors: a photomultiplier and an InGaAs detector.
  The measurable wavelength range is 220 nm to 1400 nm.
- It uses a 0-degree/8-degree incidence integrating sphere unit. Diffuse and specular reflectance can be measured by using the S/R exchange function of the measurement condition settings for UVProbe, which is control software for spectrophotometers.
- Measurement can be performed on liquid samples contained in a cell and solid samples.
- The ISR-2600 can be mounted to the UV-2600/2700, and the ISR-2600Plus to the UV-2600.

1.2 Parts List

This instrument contains the following parts. After opening the shipping container, be sure that all of the listed parts are accounted for.

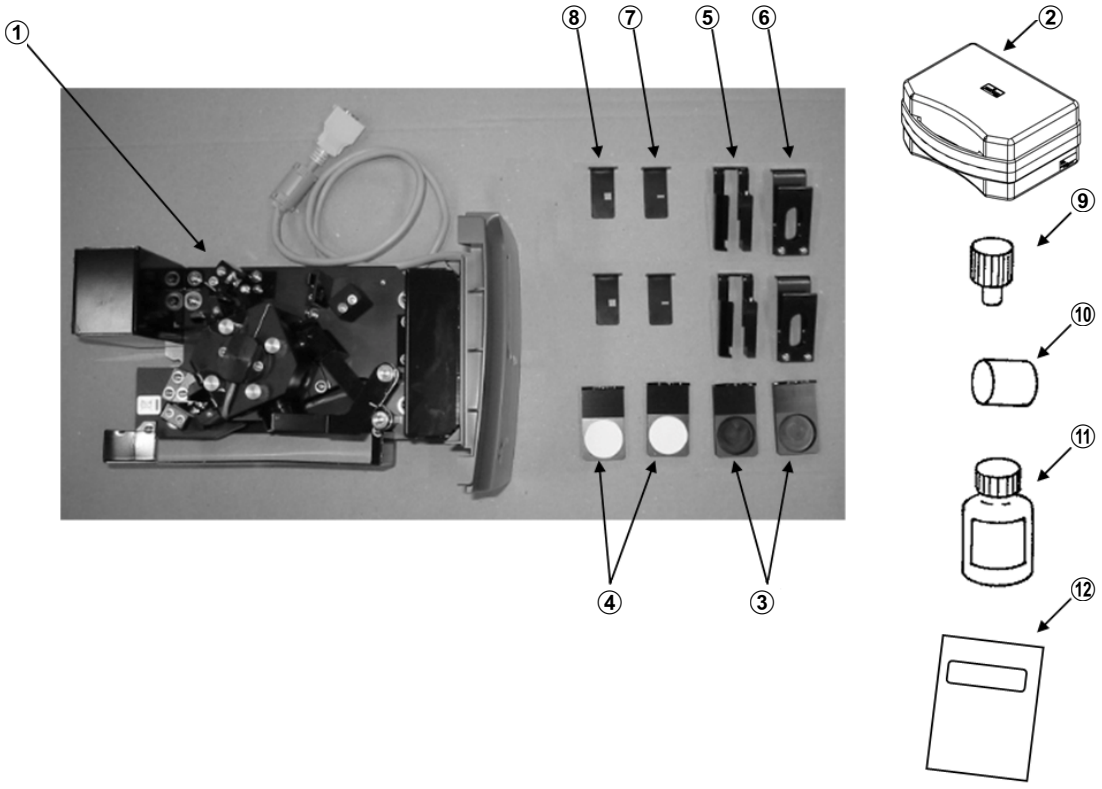

Fig 1.1 Standard Composition

No.	Check	Part Name	No.	Q'ty
①		Integrating sphere main unit	206-28224-91 (ISR-2600) 206-28224-92 (ISR-2600Plus)	1
②		Housing case	206-28466-91	1

No.	Check	Part Name	No.	Q'ty
③		Powder sample holder	204-05189-01	2
④		Powder sample holder (Filled with barium sulfate powder)	206-21865-91	2
⑤		Square cell holder for transmission measurement	204-52472-01	2
⑥		Film holder	204-03878-03	2
⑦		Mask (2 x 5)	206-61585-03	2
⑧		Mask (5 x 5)	206-61585-02	2
⑨		Knurled screw	202-31975-01	4
⑩		Glass rod	201-99041	1
⑪		Barium sulfate powder, 500 g	017-41646-01	1
⑫		Instruction Manual (this manual)	206-97457	1

1.3 Mounting

This section describes the procedure for mounting this instrument to the spectrophotometer UV-2600/2700.

1. Turn off the power switch of the spectrophotometer.

2. After loosening two fixing screws located at the front bottom of the standard sample compartment unit, lift it up and remove it.

   Reference

   Refer to "5.2 Remove/Install the Sample Compartment Unit (Standard)" in "Shimadzu UV-Visible Spectrophotometer UV-2600/2700 INSTRUCTION MANUAL".

3. Fit this instrument into the sample compartment section.

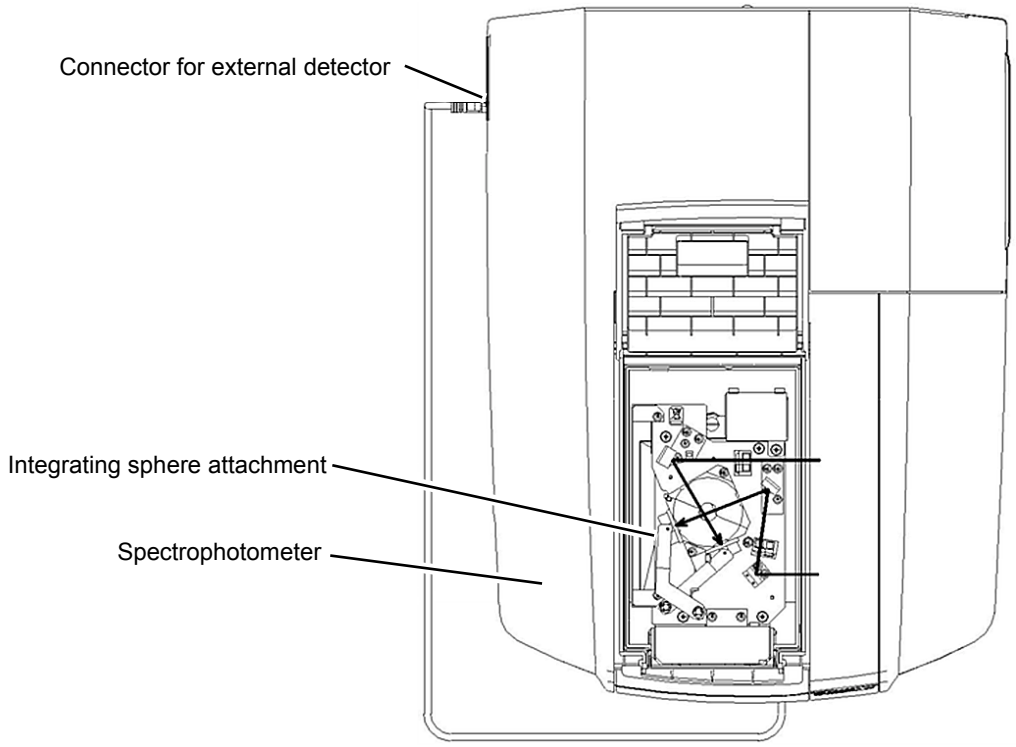

Fig 1.2 Mounting Drawing for Spectrophotometer UV-2600/2700

4. After ensuring that the front bottom of the spectrophotometer is aligned with the bottom of the front cover, fix this instrument in place by fastening the two fixing screws of the sample compartment unit.

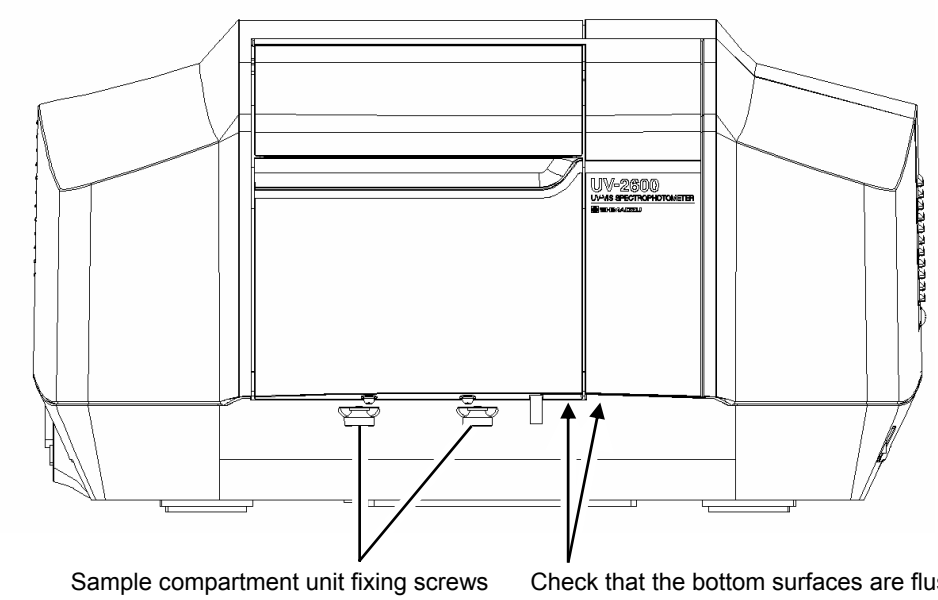

Fig 1.3 Cheking the Mounting Position on the Sample Compartment Unit

5. While ensuring the orientation is correct, connect the signal cable connector of this instrument to the [I/O 1] connector for the external detector on the left side of the spectrophotometer.
When correctly oriented, the hinges at both ends of the connector will fit into place with a click.

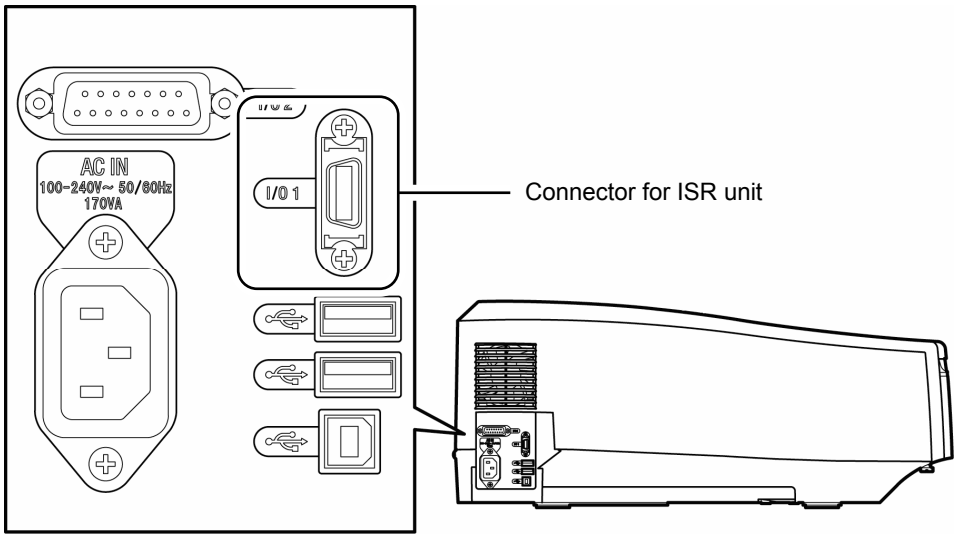

Fig 1.4 Connector for the External Detector of the Spectrophotometer

6. Fix solid sample holders for the standard white plate (powder sample holders filled with barium sulfate (Fig 1.1-④)) in the reflectance measurement position on each of the sample and reference sides, using knurled screws (Fig 1.1-⑨).

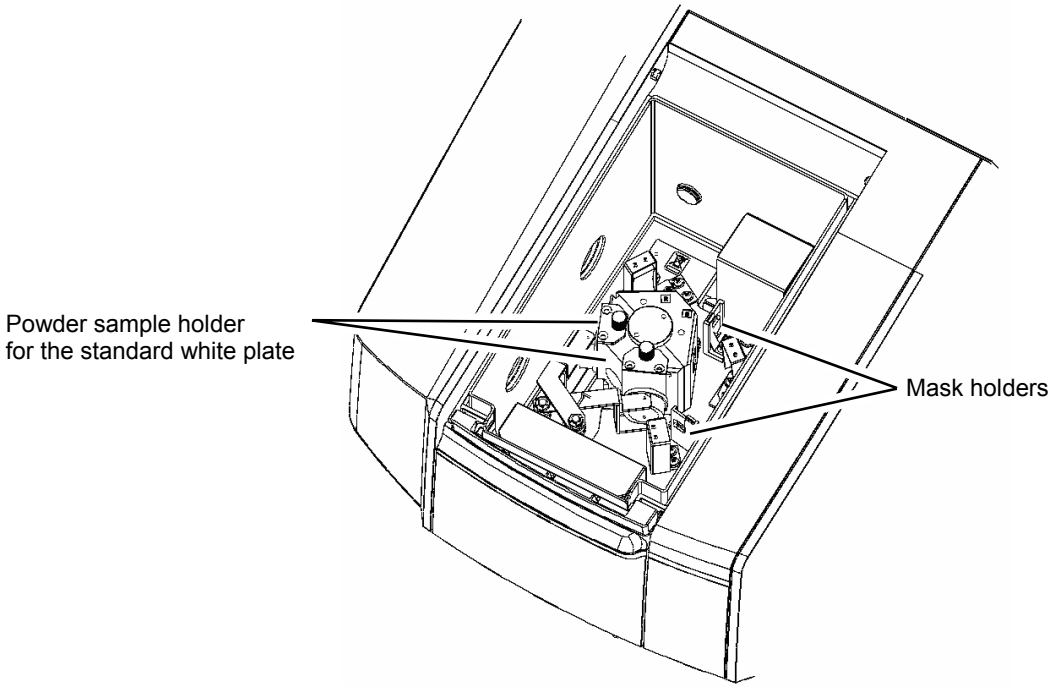

Fig 1.5 Mounting Standard White Plates

7. When masks are not necessary, remove any, if present, from the mask holders.
During normal measurement, nothing is set in the mask holders (Fig 1.5).

Reference

See "3.7 Using (Optical Beam) Masks".

8. Close the sample compartment cover.

9. Turn on the power switch of the spectrophotometer.

1.4 Removal

When you want to use the standard sample compartment, use the following procedure to remove this instrument.

1. Turn off the power switch of the spectrophotometer.
2. While pressing the both sides of the connector of the signal cable, remove the cable of this instrument from the [I/O 1] connector for external detector on the spectrophotometer.

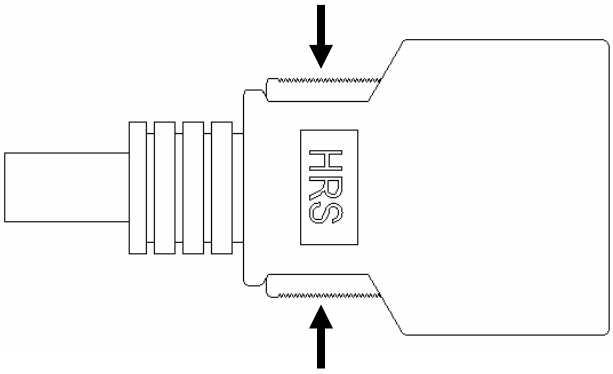

Fig 1.6 Signal Cable Connector Overview

3. Loosen the two sample compartment unit fixing screws at the bottom of the sample compartment that secure this instrument onto the spectrophotometer (Fig 1.3).
4. Remove this instrument from the sample compartment of the spectrophotometer.
   Lift up to remove the attachment as you did in step 2 of "1.3 Mounting" to remove the standard sample compartment unit.
5. After removing this instrument, mount the standard sample compartment unit.

⚠ CAUTION

- **Do not connect or remove the signal cable connector while the spectrophotometer is turned on.**
  Doing so may cause an electrical board failure. Connect and remove the connector when the spectrophotometer is powered off.
- **Do not touch the mirrors or place them in a dusty area or environment containing corrosive gases. Keep them in a special container (Fig 1.1-②).**
  A smudged mirror may degrade performance.
- **Handle this instrument with care so that you do not drop it or bang it against surrounding objects.**
  Strong impact brought to this instrument may damage the barium sulfate coating on the inner surface of the integrating sphere, leading to possible performance degradation.

2 Structure

2.1 Optical System Diagram

Fig 2.1 shows a schematic diagram of the optical system of this instrument.

Sample light makes a 0-degree incidence (normal incidence) and reference light makes an 8-degree incidence to the integrating sphere.

By using the S/R exchange function of the UVProbe software's spectrum method parameters, you can measure diffuse reflectance in the reflectance measurement position on the sample side or measure a 8-degree specular reflectance in the reflectance measurement position on the reference side.

Reference

See "3.1 Setting the Conditions".

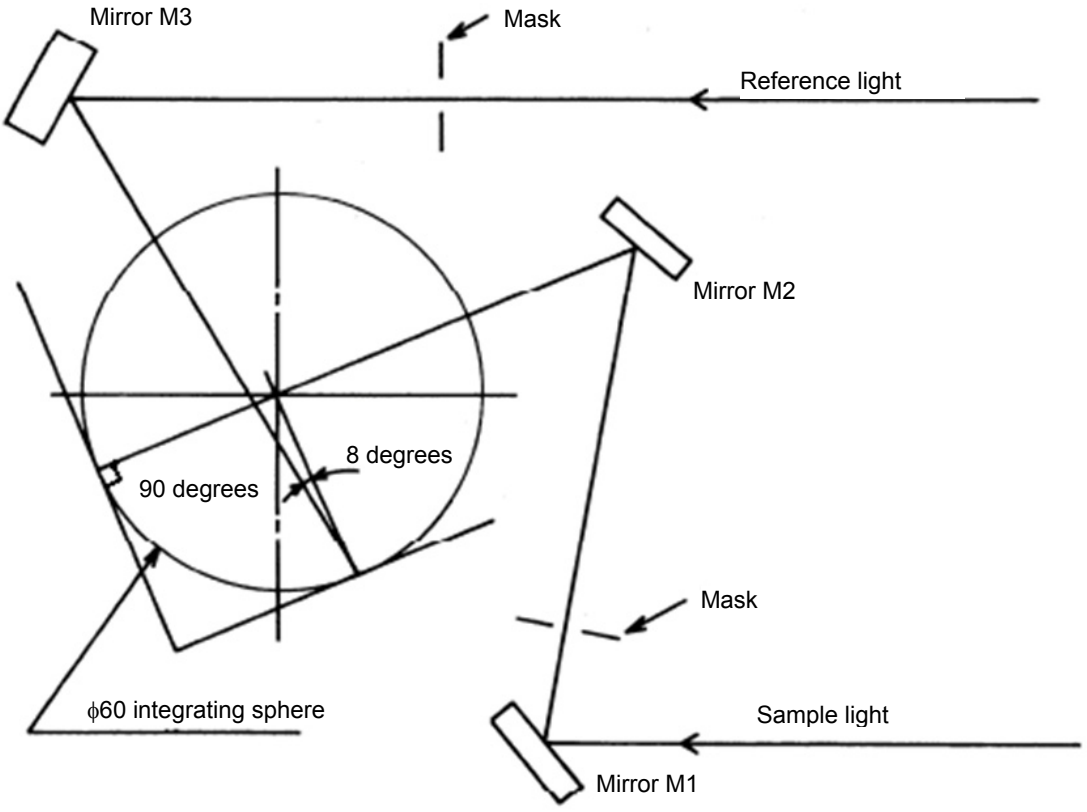

Fig 2.1 Optical System Diagram

2.2 Components

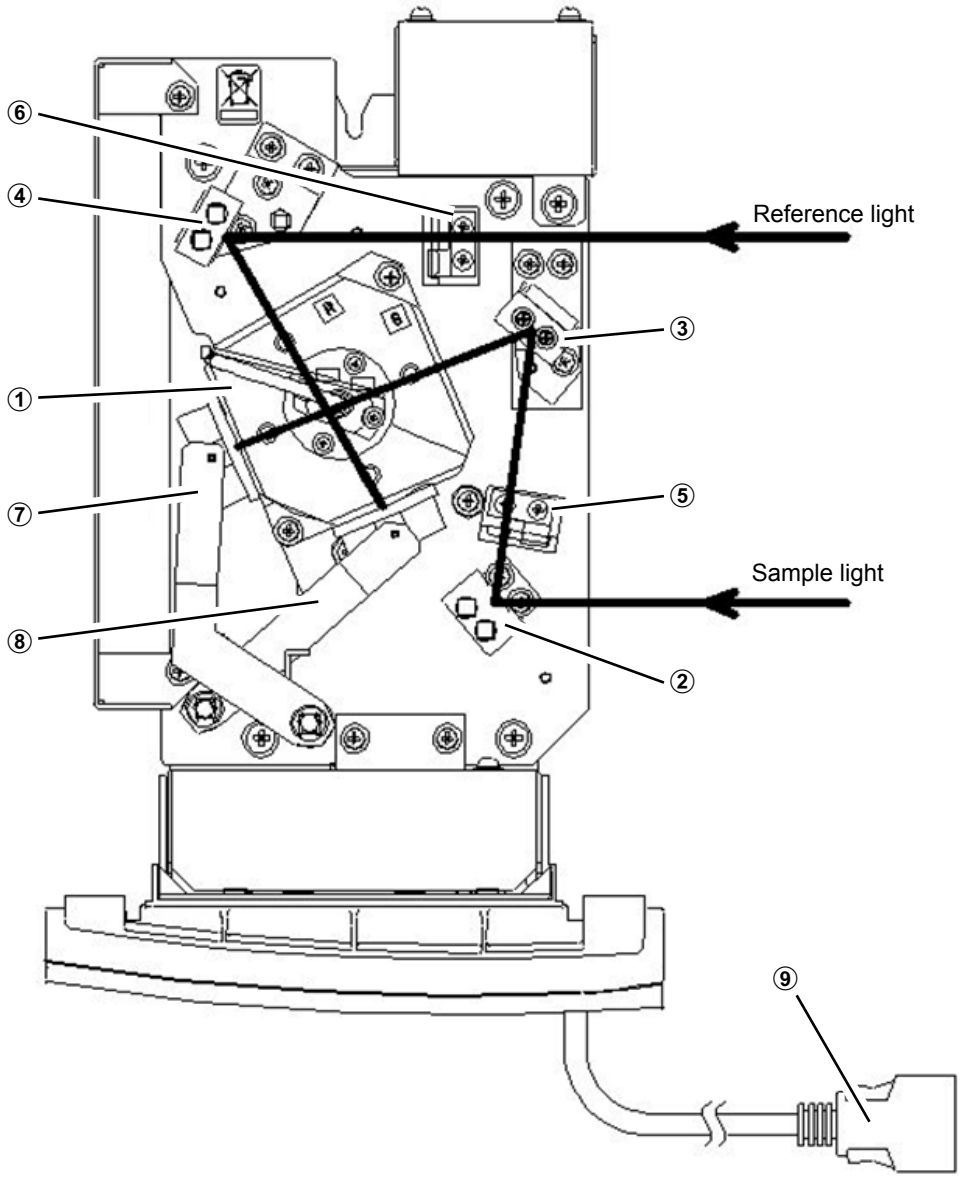

Fig 2.2 ISR-2600Plus Front View

No.	Name	Description
①	Integrating sphere ASSY	The assembly consists of an integrating sphere coated with barium sulfate.
②	Mirror M1	This mirror leads the light on the sample side to the integrating sphere.
③	Mirror M2	This mirror leads the light on the sample side to the integrating sphere.
④	Mirror M3	This mirror leads the light on the reference side to the integrating sphere.
⑤	Mask holder (S side)	This holder is used to reduce the beam size in the reflectance measurement position on the sample side.
⑥	Mask holder (R side)	This holder is used to reduce the beam size in the reflectance measurement position on the reference side.
⑦	Sample holder (S side)	This bar keeps the sample on the sample side in close contact.
⑧	Sample holder (R side)	This bar keeps the sample on the reference side in close contact.
⑨	Signal cable	This cable connects to the spectrophotometer and helps send measurement signals.

3 Basic Operation

3.1 Setting the Conditions

This section describes the procedure for setting measuring conditions in the [Spectrum Method] window of the UVProbe software.

Click [Method] in the [Edit] menu to display the [Spectrum Method] window. Then, click the [Instrument Parameters] tab.

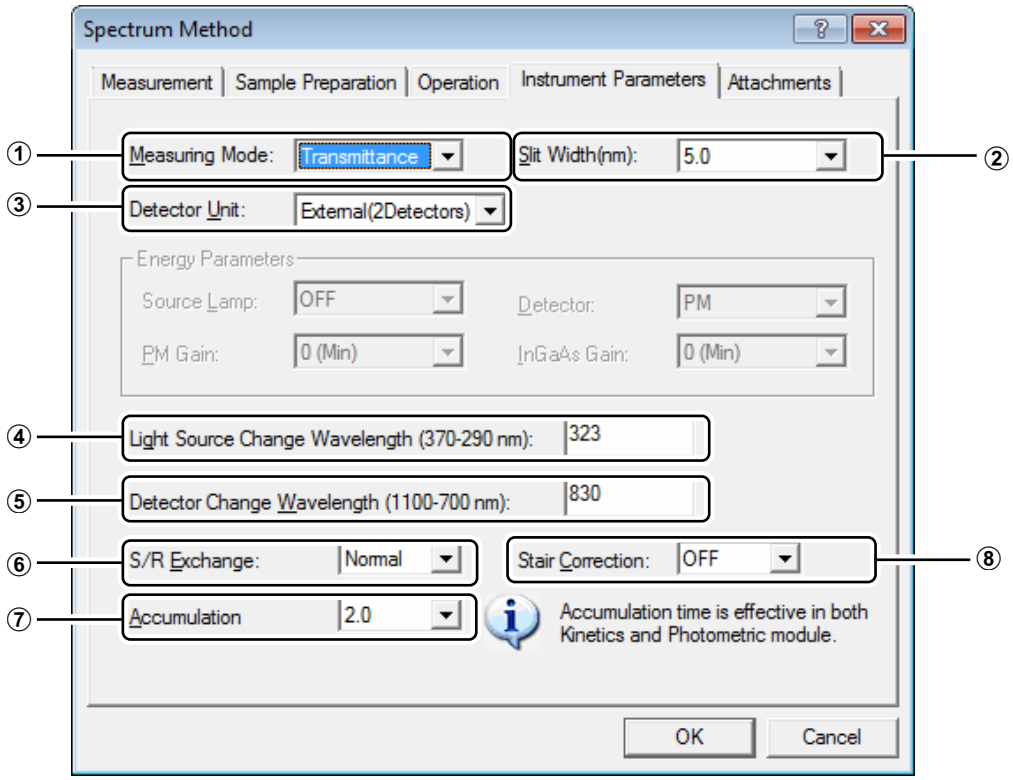

Fig 3.1 [Instrument Parameters] Tab

No.	Name	Description
①	Measuring Mode	Select the photometric type for your measurement. Select one of the following: Transmittance, Reflectance, Absorbance, or Energy.
②	Slit Width	Select the slit width for your measurement. Normally, set it to 5 nm for this instrument. When the slit width is reduced, the light intensity is also reduced and thus the noise increases.
③	Detector Unit	When using this instrument, switch the setting for the detector unit. • [Direct]: Use the detector mounted on the spectrophotometer. • [External(1Detector)]: Use the integrating sphere attachment ISR-2600. • [External(2Detector)]: Use the integrating sphere attachment ISR-2600Plus.
④	Light Source Change Wavelength	Set the switching wavelength for the D2 (deuterium) and WI (halogen) lamps from 290 nm to 370 nm in 0.1 nm increments. The default setting is 323 nm. When there is a spectrum peak near the variable wavelength or when you do not wish to switch the light source during measurement, change the wavelength as required.

No.	Name	Description
⑤	Detector Change Wavelength	When [External(2Detectors)] is selected, set the switching wavelength of the detectors (the photomultiplier and the InGaAs detector) between 700 nm and 1100 nm in 0.1 nm increments. The default setting is 830 nm. When a peak appears near the detector switching wavelength or when you want to use the same detector across the measurement wavelength range, change this wavelength setting.
⑥	S/R Exchange	Switch between sample light (S) and reference light (R) for data processing, according to the measuring purposes. • [Normal]: 0-degree incident transmittance measurement/0-degree incident reflectance measurement • [Reverse]: 0-degree incident transmittance measurement/8-degree incident reflectance measurement
⑦	Accumulation	Set the elapsed time for one unit of measurement data in the photometric or time course measurement. The longer the elapse time, the more stable measurement values become. On the other hand, reducing the elapse time may result in inability to follow fast status changes of the sample.
⑧	Stair Correction	When switching the detector or light source, a step may appear in the spectrum. Add a check mark to make the appearance of such steps obscure by smoothening transitions.

NOTE

You can reduce noise on a spectrum using one of the following three methods:

- Slow down the scan speed.
- Reduce the sampling pitch.
- Increasing the elapse time.

3.2 Basic Operation

This section describes the basic procedure used for measuring samples.

1. Set the measuring conditions in the [Spectrum Method] window of the UVProbe software.
2. Set a reference reflectance sample at each exit window on both the sample and reference sides of the integrating sphere.

   During normal measurement, a powder sample holder (P/N206-21865-91) filled with the supplied barium sulfate ($BaSO_4$) powder (hereinafter referred to as a standard white plate) is used as a reference reflectance sample.
3. Perform baseline correction in the measurement wavelength range.
4. Remove the standard white plate on the sample side of the integrating sphere and then set a target sample in its place for measurement.

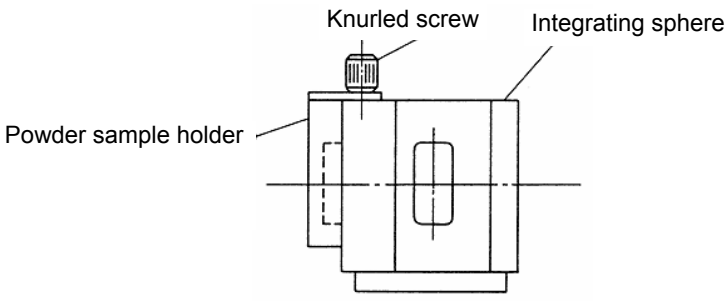

Fig 3.2 Mounting a Powder Sample Holder

This completes the description of the basic measuring method.

Sections from "3.3 Measuring Diffuse Reflectance" to "3.6 Measuring Transmittance of a Film Sample" introduce various measurement cases. Also see those sections.

3.3 Measuring Diffuse Reflectance

This section describes the procedure used for measuring diffuse reflectance for an incident angle of 0 degrees using a standard white plate.
This procedure is used to measure samples with high diffusibility (resin plates, powders, etc.).

1. Set a standard white plate at each exit window on both the sample and reference sides of the integrating sphere to correct the baseline.

2. After correcting the baseline, replace the standard white plate on the sample side with the measurement sample, and carry out the measurement.

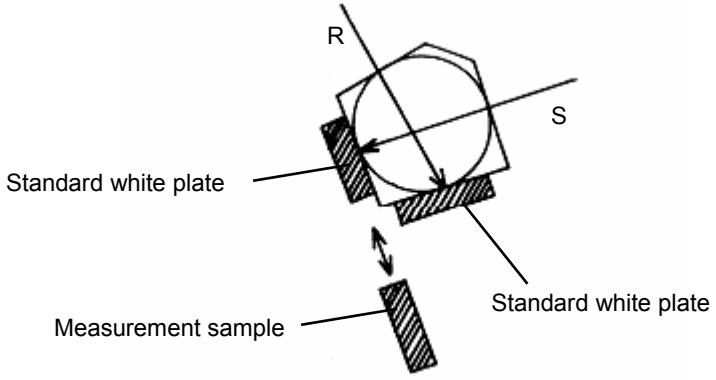

Fig 3.3 Measurement of Diffuse Reflectance

3.4 Measuring Relative Specular Reflectance

This section describes the procedure for measuring relative specular reflectance for an incident angle of 8 degrees.

Use this procedure to measure samples with specular surfaces (mirrors, wafers, etc.).

1. Click [Method] in the [Edit] menu.
   The [Spectrum Method] window appears.

2. Click the [Instrument Parameters] tab and set [S/R Exchange] from [Normal] to [Reverse].

3. Set a standard white plate at the exit on the sample side of the integrating sphere, set a reference mirror on the exit on the reference side, and perform baseline correction.

NOTE

An aluminum mirror is usually employed as a reference mirror.

Reference mirrors are not supplied as standard accessories. If you do not have any appropriate mirrors, procure them separately.

4. After correcting the baseline, replace the reference mirror at the exit on the reference side with the measurement sample, and carry out the measurement.

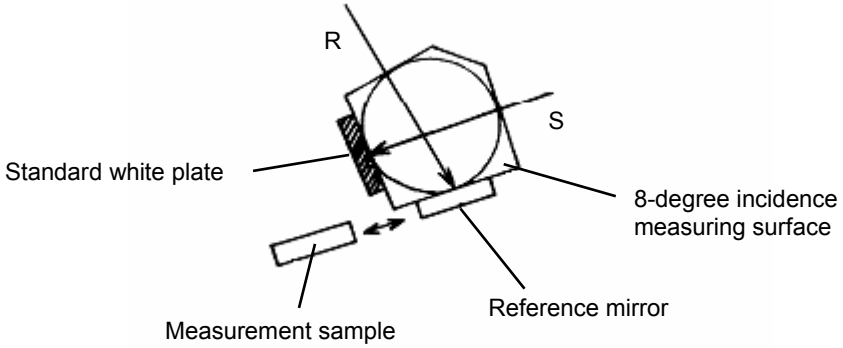

Fig 3.4 Measurement of Relative Specular Reflectance

3.5 Measuring Transmittance of a Liquid Sample

This section describes the procedure used for measuring transmittance using 10-mm square cell (square cells are not included in the standard accessories).
When the spacer for short optical length cells that is available as an optional accessory is used, short optical length cells can be used.

Reference

See "6.3 Cells".

1. As shown in Fig 3.5, mount the square cell holder supplied as a standard accessory (Fig 1.1-⑤) to the entrance window on each of the sample and reference sides, using the knurled screw (Fig 1.1-⑨).

2. Perform baseline correction under the condition where there are no square cells or where a blank sample is put into a 10-mm square cell.

3. Put the sample in the square cell and carry out the measurement.

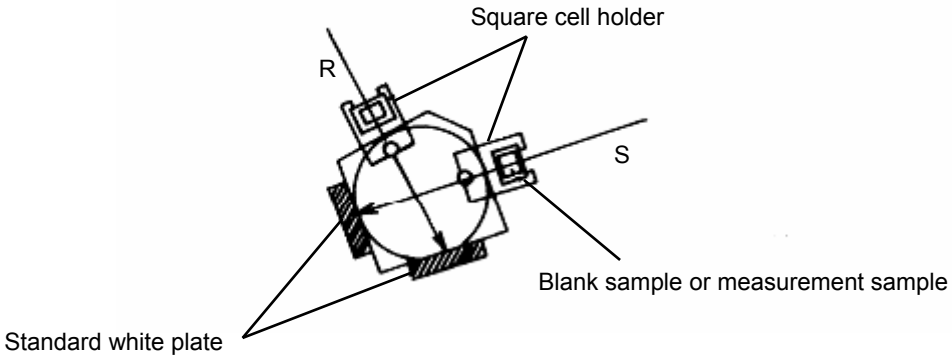

Fig 3.5 Measurement of Transmittance of a Liquid Sample

3.6 Measuring Transmittance of a Film Sample

This section describes the procedure used for measuring transmittance of a solid sample using a film folder.

Samples with a size of 30 mm to 40 mm square and with a thickness of up to 3 mm can be used (cellophanes, acrylic plates, etc.).

1. As shown in Fig 3.6, mount the film holder supplied as a standard accessory (Fig 1.1-⑥), to the entrance window on the sample side of the integrating sphere, using the knurled screw (Fig 1.1-⑨).

2. Perform baseline correction.

3. Set the sample in the film holder and carry out the measurement.

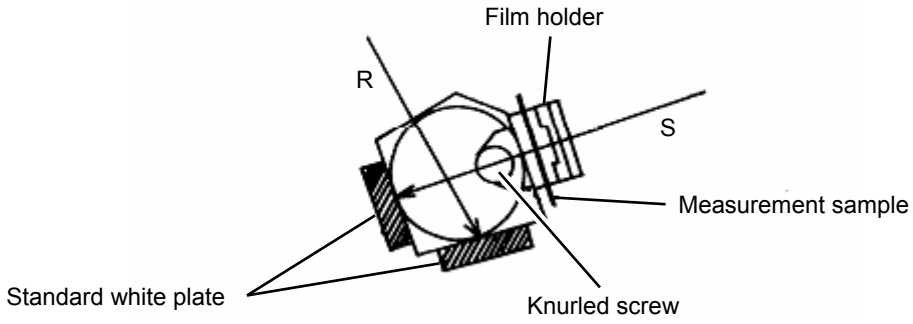

Fig 3.6 Measurement of Transmittance of a Film Sample

3.7 Using (Optical Beam) Masks

By placing masks supplied as standard accessories (Fig 1.1-⑦ and ⑧) into the mask holders on both sample and reference sides, measurement can be carried out with an optical beam whose dimension (only height) in the measurement position on the reflection side of the integrating sphere is reduced as shown in Table 3.1.

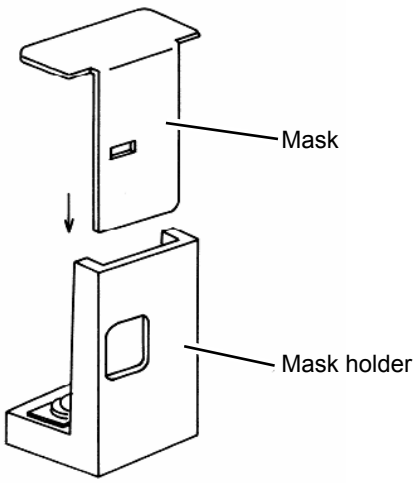

Fig 3.7 Using Masks

Table 3.1 Beam Height

Mask	Beam Height at the Reflectance Measurement Window
None	Approx. 15 mm
5 x 5	Approx. 7.5 mm
2 x 5	Approx. 3 mm

The use of masks reduces the beam angle with respect to the center line of the sample light beam (to less than 5 degrees with 5 x 5 masks), providing an irradiation beam that is closer to parallel light as compared to that obtained without masks.

NOTE

- Be sure to use masks of the same size on both sample and reference sides. In the range of ultraviolet and visible light, using a mask only on one side impairs the intensity balance between the sample and reference sides. This may result in increased noise.
- Compared to a case without a mask, the noise increases by a factor of approximately 1.5 to 2 with 5 x 5 masks and by a factor of approximately 2.3 to 5 with 2 x 5 masks.

3.8 Using the Powder Sample Holder

Using the powder sample holder (Fig 1.1-③) supplied as a standard accessory, you can carry out the measurement on powder samples.
When filling a measurement powder sample in the powder sample holder or when replacing barium sulfate (Fig 1.1-⑪) placed in the powder sample holder for the standard white plates (Fig 1.1-④), follow the procedure below.

NOTE

After barium sulfate in the powder sample holders for the standard white plates is replaced, the same sample as that used in the measurement prior to the replacement may yield a different measurement result even under the same conditions.
Also, when measurement takes place using the same powder sample holders for the standard white plates without replacement of barium sulfate over a long period of time, for example, in a case where the surfaces of the white plates have turned yellow due to discoloration, measurement values may differ from the previous results. To obtain accurate measurement results, we recommend that you periodically replace barium sulfate in the powder sample holders for standard white plates.

1. While supplying barium sulfate or the powder sample in the hollow of the powder sample holder, compact it by pressing the powder with the glass rod (Fig 1.1-⑩) from above.

2. Repeat the step *1.* until the powder sample or barium sulfate is filled evenly up to the upper surface of the powder sample holder's hollow.

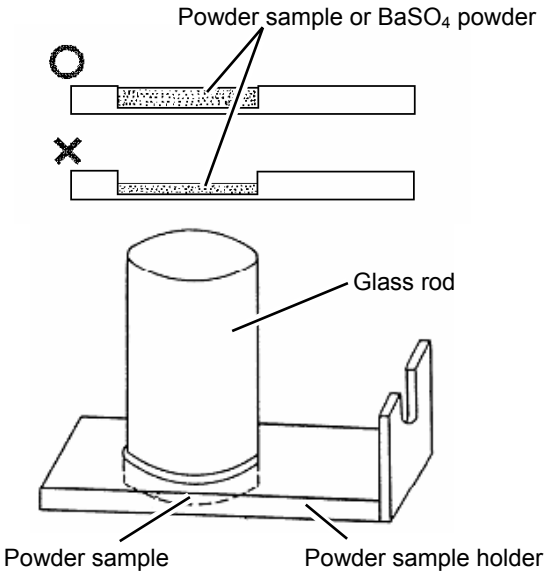

Fig 3.8 Filling the Powder Sample Holder

NOTE

Compacting using chemical wrapping paper inserted between the glass rod and barium sulfate or the powder sample makes filling of the powder sample holder easier.This technique is an effective way out when the filling is not easy due to the powder sticking to the glass rod.

4 Inspection and Maintenance

4.1 Inspection and Maintenance

To use this instrument safely, be sure to inspect and maintain the instrument.

⚠ WARNING

- **Do not remove the covers of this instrument under any circumstances.**
  Doing so may cause an electric shock, injury, or instrument malfunction.
  Repairs that require any covers to be removed must be performed by a Shimadzu representative. If you require such repairs to be carried out, contact your Shimadzu representative.
- **Before starting inspection or maintenance, be sure to turn off the spectrophotometer and remove the electric plug from the outlet.**
  Fire, electric shock, or instrument malfunction may result.

⚠ CAUTION

When replacing parts, use only Shimadzu parts.
Using other parts may cause part failure, injury, or instrument malfunction.

■ List of Periodic Inspection & Maintenance Items

Inspection and Maintenance Item	Daily	1 year	2 years	3 years	Reference
Sample Compartment Inspection	○				"4.2 Sample Compartment Inspection"

4.2 Sample Compartment Inspection

⚠ CAUTION

- **Exercise care so that you do not spill any liquid sample on this instrument.**
  Electrical parts are mounted around the integrating sphere assembly. Spilled liquid may cause instrument failures.
- **Wipe up spilled samples immediately.**
  Vapors from a spilled sample may be a health hazard. Also, organic solvents left in the sample compartment may cause corrosion or lead to measurement error.

■ Removal of Liquid Samples

When using this instrument for measuring a liquid sample, check for any spilled/deposited solution sample in the sample compartment or around the integrating sphere assembly before and after the measurement.

Wipe up spilled samples during measurement immediately.

■ Removal of Powder Samples

When using this instrument to measure a powder sample, check for any spilled powder sample in the sample compartment, around the integrating sphere assembly or in the integrating sphere before and after the measurement.

Remove spilled powder samples using a vacuum cleaner.

■ Maintenance of the Standard White Plate

Due to aged deterioration, the barium sulfate in the powder sample holders for standard white plates becomes contaminated, turns yellow, or causes peeling. We recommend that you periodically replace barium sulfate by following the "Fig 3.8 Filling the Powder Sample Holder", for example, semi-annually. Note that measurement value may differ from the previous results after the replacement. In case you use the holders without replacing barium sulfate over a long period of time, you should keep the powder sample holders filled with barium sulfate in a dry and dark place.

4.3 Cleaning the Exterior

When this instrument is soiled, wipe it off using a dry, soft cloth or tissue.

NOTE

When wiping off any soil from the openings of the integrating sphere, use a cloth or tissue paper very carefully so that it does not contact the barium sulfate coating.The barium sulfate coating on the inner surface of the integrating sphere may be damaged or areas that had contact with a cloth or tissue may turn yellow, resulting in measurement failure.

Also, do not leave it wet with any liquid or never wipe using alcohol or a thinner-based solvent. It may cause rust or discoloration.
A chemical spilled on the barium sulfate filling section of the powder sample holders for standard white plates may cause them to turn yellow due to discoloration. If the barium sulfate filling section has become discolored, replace the barium sulfate (see "Fig 3.8 Filling the Powder Sample Holder"). Should the interior of the integrating sphere have become discolored, it cannot be re-coated with barium sulfate. In this case, contact your Shimadzu representative to have the integrating sphere assembly replaced.

4.4 Maintenance Parts

Part Name	No.	Remarks
Barium Sulfate Powder	017-41646-01	500 g (net weight)

5 Troubleshooting

5.1 Symptoms and Remedial Actions

This chapter describes problems that may occur on the instrument and remedial actions against those problems.

Check whether the problem exhibits the following symptoms before requesting repairs.

Contact your Shimadzu representative if the error cannot be resolved through the remedial action described below, or if any symptom occurs that is not listed below.

Symptom	Typical Cause	Remedial Action	Reference Page
Photometric values are incorrect.	Is the instrument correctly mounted to the spectrophotometer?	Check that it is correctly mounted in the sample compartment. Also check that the signal cable connector of this instrument is correctly connected to the connector (Fig 1.4) on the spectrophotometer.	P. 3
	Are the measurement parameters correctly set?	In the [Spectrum Method] window of the UVProbe software, check the parameter settings for the detector unit. For the ISR-2600: Detector unit: [External(1Detector)] For the ISR-2600Plus: Detector unit: [External(2Detectors)]	P. 10
	Is the slit width appropriately set?	When setting the slit width in the [Spectrum Method] window of the UVProbe software, select a slightly larger than the currently set width. If the slit width is too small, the light intensity may be insufficient, which may result in incorrect measurement. For normal measurement using this instrument, set the slit width to 5.0 nm.	P. 10
	Are the standard white plate and sample correctly mounted?	Check that the powder sample holders for standard white plates and powder sample holder containing a sample are correctly mounted onto the integrating sphere assembly when performing measurement or baseline correction.	P. 5
	Are barium sulfate and sample correctly loaded into the powder sample holders?	See "Fig 3.8 Filling the Powder Sample Holder" to fill the powder sample holders with barium sulfate and sample. Barium sulfate left in the holders deteriorates over time. Replace it as necessary.	P. 14
	Are the mirrors and other optical parts clean?	Remove dust, if any exists, from the mirrors in the sample compartment using a blower. If any optical part is deteriorated due to prolonged use or is smudged with fingerprints, ask Shimadzu to replace it.	P. 8
	Is an appropriate cell being used?	Do not use a glass cell in the ultraviolet range.	P. 20

Symptom	Typical Cause	Remedial Action	Reference Page
	Are any cell phones being used near the spectrophotometer?	The measured value may be influenced depending on the type of cell phone or the radio wave conditions. Avoid using a cell phone near the spectrophotometer during measurement.	
Initialization of the spectrophotometer fails.	Is the instrument correctly connected when the spectrophotometer is initialized?	Check that this instrument is correctly mounted in the sample compartment. Also check that the signal cable of this instrument is correctly connected to the connector on the spectrophotometer.	P. 3
	Are the powder sample holders for standard white plates correctly mounted on the sample and reference sides of the integrating sphere?	Mount the powder sample holders for the standard white plates correctly. If an error occurs even though they are correctly mounted, check the surface of the barium sulfate that has been filled into the holders, and replace it if the coating is discolored or damaged.	P. 5
	Is a mask mounted?	Remove the masks supplied as standard accessories, and initialize the instrument.	P. 13
The baseline curve is too large (fails to satisfy the specifications).	When correcting the baseline, did you put a solvent with high absorbance in the cell holder only on either the sample or reference side?	Place cells containing the same solvent in both the sample and the reference sides, and perform baseline correction again before measurement.	
	Are you using an optional accessory?	Depending on an optional accessory you use, the performance specifications for the baseline, etc., of the spectrophotometer may not be satisfied.	

6 References

6.1 Specifications

Table 6.1 Specifications

	ISR-2600	ISR-2600Plus
Measurement wavelength range	220 nm to 850 nm	220 nm to 1,400 nm
Max. dimensions of measurable samples	Reflectance measurement (S side): 95 (W) x 135 (H) x 20 (t) mm Reflectance measurement (R side): 70 (W) x 70 (H) x 12 (t) mm Transmittance measurement (S side): 50 (W) x 60 (H) x 5 (t) mm (when a film holder is used) Transmittance measurement (R side): 70 (W) x 60 (H) x 5 (t) mm (when a film holder is used)	
Measurement on a liquid sample	Optical length: 10 mm (a square cell holder for transmission measurement is used)	
Integrating sphere	Inner diameter: 60 mm ϕ. The inner wall is coated with $BaSO_4$. Sample transmission side, sample reflection side, and reference transmission side: 0-degree incidence; reference reflection side: 8-degree incidence	
Dimensions of the openings in the integrating sphere	Transmission (S side): 12 (W) x 20 (H) mm Reflection (S side): 12 (W) x 20 (H) mm Transmission (R side): 11 (W) x 15 (H) mm Reflection (R side): 12.5 (W) x 20 (H) mm	
Dimensions of beams at the openings in the integrating sphere	Slit: 5 nm, masks: none Transmission (S side): Approx. 2.5 (W) x 5 (H) mm Reflection (S side): Approx. 7 (W) x 15 (H) mm Transmission (R side): Approx. 3 (W) x 6 (H) mm Reflection (R side): Approx. 8 (W) x 15 (H) mm Slit: 2 nm, masks: 5 x 5 Reflection (S side): Approx. 2.5 (W) x 7.5 (H) mm Reflection (R side): Approx. 3 (W) x 7.5 (H) mm Slit: 2 nm, masks: 2 x 5 Reflection (S side): Approx. 2.5 (W) x 3 (H) mm Reflection (R side): Approx. 3 (W) x 3 (H) mm	
Ratio of the openings in the integrating sphere	For measurement of transmittance: 5.6% For 0-degree incident reflectance measurement: 7.5% For 8-degree incident reflectance measurement: 7.5%	For measurement of transmittance: 7.4% For 0-degree incident reflectance measurement: 9.2% For 8-degree incident reflectance measurement: 9.3%
Detectors	PMT	PMT/InGaAs
Baseline flatness	UV-2600: ±0.5%T (220 nm to 850 nm) UV-2700: ±1.5%T (220 nm to 850 nm) 1 hour after the light source turns on Slit width: 5 nm, scan speed: low	±UV-2600: 0.5%T (220 nm to 1,300 nm) 1 hour after the light source turns on Slit width: 5 nm, scan speed: low
Noise level	Slit width: 5 nm UV-2600: Max. 0.1%T RMS at a wavelength of 500 nm UV-2700: Max. 0.3%T RMS at a wavelength of 500 nm	Slit width: 5 nm UV-2600: Max. 0.1%T RMS at a wavelength of 500 nm

6.2 Optional Accessories

Table 6.2 List of Optional Accessories

No.	Description
206-35988	Mirror ASSY

6.3 Cells

Table 6.3 List of Optional Cells

Name		Shape	Quartz (S Cell)	Glass (G Cell)	Q'ty	Special Holder
Square cell, optical length 10 mm		A	200-34442	200-34565	1	Not required.
Square cell, matching type		A	201-98716	201-98746	2/sets	Not required.
Square cell with stopper, optical length 10 mm		B	200-34444	200-34444-01	1	Not required.
Semi-micro black cell, optical length 10 mm Required sample volume min. 1.0 ml		C	200-66551		1	Not required.
Short optical length cell	l = 1 mm	D	200-34660-01	200-34662-01	1	Spacer for short optical length cell is required.
	l = 2 mm		200-34655	200-34662-11	1	
	l = 5 mm		200-34449	200-34449-01	1	
Spacer for short optical length cell	For 1 mm	E	204-21473-03		1	Not required.
	For 2 mm		204-21473-01			
	For 5 mm		204-21473-02			

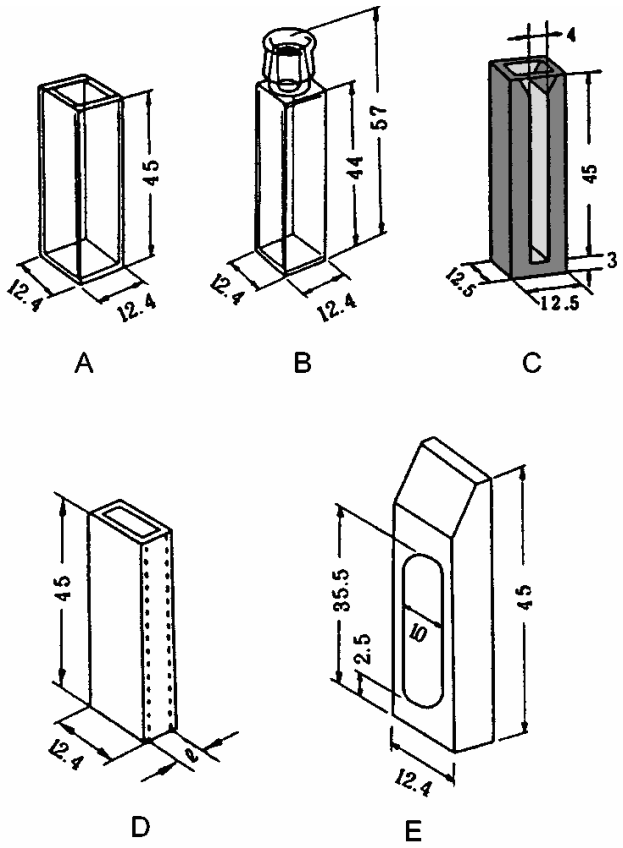

Fig 6.1 Cell Appearances

Record of Revision

Date	Revision	Changed Page	Description