

# **Spectrophotometer CM-5**

## **Instruction Manual**



**KONICA MINOLTA**

# Safety Symbols

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The following symbols are used in this manual to prevent accidents which may occur as a result of incorrect use of the instrument.



Denotes an instruction regarding a safety warning or note.  
Read the instruction carefully to ensure safe and correct use.



Denotes a prohibited operation.  
This operation must never be performed.



Denotes an instruction.  
This instruction must be strictly adhered to.



Denotes a prohibited operation.  
Never disassemble the instrument.



Denotes an instruction.  
Be sure to disconnect the AC adapter from the AC outlet.

## Trademarks

- Windows® is a registered trademark of Microsoft Corporation in the United States and other countries.

## Notes on this Manual

- Copying or reproduction of all or part of the contents of this manual without KONICA MINOLTA SENSING's permission is strictly prohibited.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents.
- However, should you have any questions or find any errors, please contact your retailer or a KONICA MINOLTA SENSING-authorized service facility.
- KONICA MINOLTA SENSING will not accept any responsibility for consequences arising from the use of the instrument.

# Safety Precautions

To ensure correct use of this instrument, read the following points carefully and adhere to them.

After you have read this manual, keep it in a safe place where it can be referred to anytime a question arises.

<b>WARNING</b>		(Failure to adhere to the following points may result in death or serious injury.)
	<p>Do not use the instrument in places where flammable or combustible gases (gasoline etc.) are present. Doing so may cause a fire.</p>	 <p>Do not disassemble or modify the instrument or the AC adapter. Doing so may cause a fire or electric shock.</p>
	<p>Always use the AC adapter supplied as a standard accessory or the optional AC adapter, and connect it to an AC outlet of the rated voltage and frequency. If an AC adapter other than those specified by KONICA MINOLTA SENSING is used, it may result in damage to the unit, fire or electric shock.</p>	 <p>Take special care not to allow liquid or metal objects to enter the instrument. Doing so may cause a fire or electric shock. Should liquid or metal objects enter the instrument, turn the power OFF immediately, disconnect the AC adapter plug from the AC outlet, and contact the nearest KONICA MINOLTA SENSING-authorized service facility.</p>
	<p>If the instrument will not be used for a long time, disconnect the AC adapter plug from the AC outlet. Accumulated dirt or water on the prongs of the AC adapter's plug may cause a fire and should be removed.</p>	 <p>The instrument should not be operated if it is damaged or the AC adapter is damaged, or if smoke or odd smells occur. Doing so may cause a fire. In such situations, turn the power OFF immediately, disconnect the AC adapter plug from the AC outlet and contact the nearest KONICA MINOLTA SENSING-authorized service facility.</p>
	<p>Do not forcibly bend, twist, or pull the AC adapter power cable. Do not scratch or alter the power cable or place heavy objects on it. Doing so may damage the power cable and cause a fire or electric shock.</p>	 <p>Always hold the plug itself when disconnecting the AC adapter plug from the AC outlet. Pulling on the power cable may damage it and cause a fire or electric shock.</p>
		 <p>Do not insert or disconnect the AC adapter plug from an AC outlet with wet hands. Doing so may cause electric shock.</p>

<b>CAUTION</b>		(Failing to adhere to the following points may result in injury or damage to the instrument or other property.)
	<p>Do not perform measurement with the specimen measuring port directed towards your eyes. Doing so may damage your eyes.</p>	 <p>Do not place the instrument on an unstable or sloping surface. Doing so may result in its dropping or overturning, causing injury. Be careful not to drop the instrument when carrying it.</p>
	<p>Be careful not to get your hand caught in the openable section of the instrument. Doing so may result in injury.</p>	 <p>Make sure that the AC outlet is located near the instrument and that the AC adapter plug can be connected to and disconnected from the AC outlet easily.</p>

# Introduction

Thank you for purchasing the CM-5.

This is a precise, benchtop type spectrophotometer developed for color and color difference measurement of reflective/transmitted objective colors in various industries.

## Packing materials of the product

Be sure to keep all packing materials used for shipping the product (cardboard box, cushioning material, plastic bags, etc.).

The CM-5 is a precision measuring instrument. When transporting the instrument to a service facility for maintenance or for other reasons, be sure to use the packing materials to minimize shock or vibration.

If the packing materials are lost or damaged, contact a KONICA MINOLTA SENSING-authorized service facility.

## Notes on Use

Be sure to use this instrument properly. Use of this instrument in ways other than those specified in this manual may result in risk of injury, electric shock, instrument damage, or other problems.

### Operating Environment

- Use the CM-5 at an ambient temperature between 13°C and 33°C and relative humidity 80% or less (at 35°C) with no condensation.  
Be sure to use the instrument within this range. Do not use it in areas of rapid temperature changes.
- Do not leave the CM-5 in direct sunlight or near sources of heat, such as stoves etc. The internal temperature of the instrument may become much higher than the ambient temperature in such cases.
- Do not use the CM-5 in areas where dust, cigarette smoke or chemical gases are present. Doing so may cause deterioration in performance or a breakdown.
- Do not use the CM-5 near equipment which produces a strong magnetic field (such as speakers etc.).
- The CM-5 belongs to installation category I products (equipment which is powered by an AC adapter connected to commercially available power).
- The CM-5 belongs to pollution level 2 products (equipment which may cause temporary electrical hazards due to contamination or condensation or products which are used in such an environment).
- Do not use the CM-5 at altitudes higher than 2,000 m.
- The CM-5 and the AC adapter supplied as a standard accessory have been designed exclusively for indoor use. They should never be used outdoors because rain or other factors may damage the instrument.

### Measurement

- Make sure no dirt or dust get into the specimen measuring port.
- Use a blower to remove dust and dirt from the shutter before using the instrument after a long period of disuse.
- When using the instrument for long periods of time, the measurement value may change depending on changes in the environment. Therefore, in order to achieve accurate measurements, we recommend that white calibration be done regularly using the White Calibration Cap.

### White Calibration Plate

There are two types of white calibration plate for use with this instrument: the built-in White Calibration Plate inside the shutter and an optional accessory for Petri Dish measurement.

- The calibration data for the White Calibration Plate was measured at 23°C.  
To achieve the highest accuracy when measuring absolute values (colorimetric values), calibration and measurement should be performed at 23°C.
- Do not allow the White Calibration Plate (optional accessory) to get scratched or stained.
- When the White Calibration Plate (optional accessory) is not in use, be sure to close the cap so that the White Calibration Plate is not exposed to ambient light.

### Target Mask

There are three types of Target Masks for use with this instrument: the standard  $\varphi 30$  mm mask, and optional  $\varphi 3$  mm and  $\varphi 8$  mm masks.

- The  $\varphi 30$  mm Target Mask must be used in combination with the instrument that bears the same pairing number.
- Do not touch the Target Mask's inner surface by hand, scratch it or make it dirty.
- When not in use, Target Masks should be stored in the packing used for shipment or in the optional accessory case so that they will not be exposed to ambient light.

## **Power Source**

- Make sure that the power switch is set to OFF (“○”) when the CM-5 is not in use.
- This instrument can be powered from the AC adapter (AC-A305).
- Always use the AC adapter supplied as a standard accessory (AC-A305) and connect it to an AC outlet of the rated voltage and frequency. Use an AC power supply of the rated supply voltage (within ±10%).

## **System**

- Do not subject the CM-5 to strong impact or vibration. Doing so may cause deterioration in performance or a breakdown.
- Since the specimen measuring port and integrating sphere are extremely precise optical components, great care should be taken to prevent them getting dirty or exposing them to impact.
- The CM-5 may cause interference if used near a television, radio, etc.
- When the instrument is exposed to strong external static electricity, the LCD may go blank or the measurement result may not be displayed properly. If the instrument is communicating with an external device, the communication may be interrupted. In these cases, turn the power OFF and then turn it ON again. If black smudges appear on the LCD, wait until they disappear naturally.
- When turning the power OFF and then ON again, wait several seconds after turning the power OFF.

## **Backup Battery**

- Measured data and various settings are stored in the memory backed up by batteries. The backup batteries are automatically charged during operation of this instrument, and can retain the contents of the memory for three months if they have been fully charged. At the time of purchase, the backup battery may not be fully charged. To charge the backup battery, set the power switch to ON. The backup battery is fully charged in 72 hours while the instrument is switched on, and there is no danger of overcharging.
- It is recommended to keep a backup of your important data on another recording medium using the optional Color Management Software SpectraMagic™ NX (CM-S100w).

### **Notes**

- The backup batteries' model number is ML2020 (3 V).
- Do not try to replace the backup batteries by yourself. Contact a KONICA MINOLTA SENSING-authorized service facility.

## **Notes on Storage**

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- The CM-5 should be stored at temperatures between 0°C and 40°C, and at a relative humidity of 80% or less (35°C) without condensation. Do not store the instrument in areas subject to high temperatures, high humidity, sudden changes in temperature, or where freezing or condensation may occur, because these circumstances may cause a breakdown. It is recommended to store the CM-5 with a drying agent (such as silica gel) at a temperature around 20°C.
- Do not leave the CM-5 inside a car such as in the cabinet or trunk. Otherwise, the temperature and/or humidity may exceed the allowable range for storage during midsummer or midwinter, resulting in a breakdown.
- Keep the packing materials used for shipment and use them to transport the CM-5. This protects the instrument from sudden changes in temperature, vibration, and shock.
- Do not store the CM-5 in areas where dust, cigarette smoke or chemical gases are present. Doing so may cause deterioration in performance or a breakdown.
- Entry of dust into the specimen measuring port will hinder accurate measurement. When the instrument is not in use, you must close the transmittance specimen chamber and cover the instrument with the supplied Dust Cover to prevent the entry of dust into the integrating sphere.
- The White Calibration Plate (optional accessory) may become discolored if left exposed to light. Therefore, make sure to close the cap when it is not in use so that the White Calibration Plate is not exposed to ambient light during storage.
- The Target Masks may discolor if they are left exposed to light. When they are not in use, keep them in a safe place to prevent exposure to light and to protect them from scratches and dust.
- Be sure to keep all packing materials (cardboard box, cushioning material, plastic bags, etc.). They can be used to protect the instrument during transportation to the service facility for maintenance (re-calibration etc.).

## **Notes on Cleaning**

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- If the CM-5 becomes dirty, wipe it with a soft, clean dry cloth. Never use solvents such as thinner or benzene.
- If the White Calibration Plate (optional accessory) becomes dirty, wipe it with a soft, clean dry cloth. If dirt is difficult to remove, wipe it off with a cloth dampened with commercially-available lens cleaning solution. Then remove the solution with a cloth dampened with water, and leave the plate to dry.
- If the inner surface of the Target Masks, the inside of the integrating sphere , or the built-in White Calibration Plate get dirty, contact a KONICA MINOLTA SENSING-authorized service facility.
- Should the CM-5 break down, do not try to disassemble and repair it by yourself. Contact a KONICA MINOLTA SENSING-authorized service facility.

## **Disposal Method**

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- Make sure that the CM-5 and its accessories are either disposed of or recycled correctly in accordance with local laws and regulations.



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# Conventions

This manual describes how to safely operate the CM-5 using a specific procedure to perform measurement.

## • Page layout

Symbols used in this manual are explained below.

\* Note that the page shown in the illustration is for explanatory purposes only, and is not an actual page from this manual.

### [Memo]

Provides useful information, supplementary explanations, and similar details.

### [Notes]

Provides information that you need to know in order to operate the CM-5 correctly. Always read this information before operating the CM-5.

### Procedure

Indicates an operating procedure.

### Settings

Describes ranges and provides explanations regarding settings for the screen in question.

## Condition Setting

The CM-5 requires condition settings (measurement condition, measurement option, and color) before measurement can be started.

**[Memo]** To configure condition settings, select "Meas. Condition" (measurement conditions), "Meas. Option" (measurement options) or "Color" (display conditions) from the <Configuration> screen to open an appropriate screen.

**[Notes]** If any predefined condition is selected, the condition setting (measurement condition/measurement option/color) is disabled. Set the condition to OFF before starting condition setting.

### Setting the Measurement Conditions

To set measurement conditions, select "Meas. Condition" from the <Configuration> screen.

You can select or specify the following three items as the measurement conditions:

- Meas. Type: Select the measurement type such as reflectance measurement or transmittance measurement.
- Meas. Area: When the measurement type is reflectance measurement, select an measurement area.
- SCI/SCE: When the measurement type is reflectance measurement, select the specular component mode.

#### [Setting Procedure]

1. Press the [MENU] button.  
The <Configuration> screen is displayed.



2. Use the or button of the cross key to move the cursor to "Meas. Condition" and then press the [OK/ Edit] button.  
The <Measurement Condition Settings> screen is displayed.

- The <Measurement Condition Settings> screen shows the current settings.

3. After you set the measurement conditions, you can press the [Back] button to return to the screen displayed before you press the [MENU] button in Step 1.

**[Memo]** To return to the <Configuration> screen, press the [MENU] button.

E50

### Start screen

Indicates the initial screen from which the operation is commenced.

### Screenshot

Indicates the state of the screen when the operation described in the procedure to the left is carried out.

## For the version of the instrument firmware

The version of the instrument firmware can be confirmed on the <Instrument> screen. For details, refer to page E-102 "Displaying the Instrument Information" in this manual.

# Chapter 1

1

Before Using the Instrument

## Before Using the Instrument

# Accessories

Standard and optional accessories are available with the instrument.

## Standard Accessories

Make sure that all the following items are present.

### Target Mask: $\varnothing 30\text{ mm}$ CM-A197

During reflectance measurement, this target mask can be replaced with the optional target mask ( $\varnothing 3\text{ mm}$  or  $\varnothing 8\text{ mm}$ ) to change the illumination area (specimen measuring port size) according to the specimen.



### Transmittance Mask $\varnothing 20\text{ mm}$ CM-A200

Attached to the instrument.

Guides light to the Transmittance Specimen Chamber when conducting transmittance measurement.

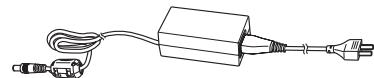


### AC Adapter: AC-A305

Used to supply power from an AC outlet to the instrument.

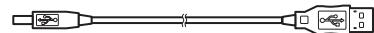
Input: 100-240 V  $\sim$  50/60 Hz 24-38 VA

Output: 5 V  $\equiv$  2 A



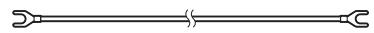
### USB Cable (2 m): I F-A19

Used to connect the instrument to a personal computer (PC).



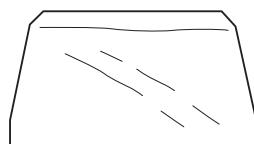
### Functional Ground Cable: CM-A211

Used to prevent communication problems caused by static electricity when connected to a PC.



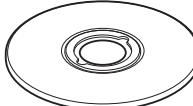
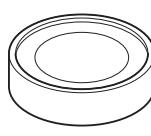
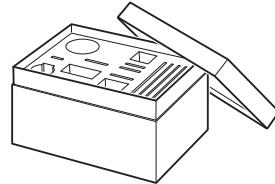
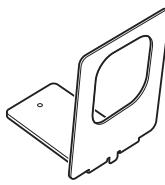
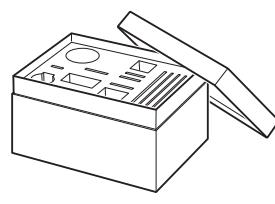
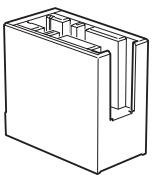
### Dust Cover: CM-A191

Used to protect the instrument by preventing dust from entering the inside.



# Optional Accessories

You may purchase the following accessories if necessary.

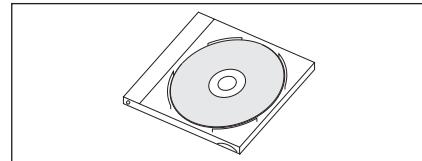
<b>Petri Dish Measurement Set CM-A205</b>		
<b>Petri Dish: CM-A128</b>  	<b>Target Mask (for Petri Dish): CM-A203</b> Used to perform reflectance measurement using a Petri Dish.  	<b>Calibration Glass (for Petri Dish): CM-A212</b> Used for calibration for reflectance measurement using a Petri Dish.  
<b>Zero Calibration Box: CM-A124</b>  Used to perform zero calibration.  	<b>White Calibration Plate: CM-A210</b> (w/ white calibration data and data writing software CD-ROM) Can be used in place of the built-in White Calibration Plate to perform white calibration.  	<b>Accessory Case: CM-A193</b>  
<b>Transmittance Measurement Set CM-A206</b>		
<b>Transmittance Zero Calibration Plate: CM-A213</b>  A light-shielding plate used for zero calibration for transmittance measurement.  	<b>Transmittance Specimen Holder Attachment: CM-A199</b> Used to attach the transmittance specimen holder to the receiving window side.  	<b>Accessory Case: CM-A193</b>  
<b>Transmittance Specimen Holder: CM-A96</b>  		
<b>10 mm Cell Measurement Set CM-A207</b>		
<b>Transmittance Specimen Holder (10 mm): CM-A198</b>  		<b>Transmittance Zero Calibration Plate (10 mm): CM-A204</b>  

Set of accessories used to perform transmittance measurement of liquid specimen using a commercially available 10 mm-wide Cell.

## **Color Management Software SpectraMagic™ NX**

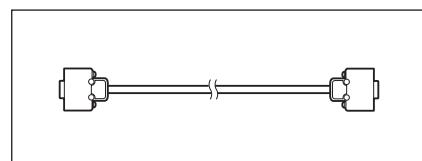
### **CM-S100w**

Used to operate the instrument from a PC for data processing and file management.



### **Connecting Cable: CM-A58**

Used to connect the instrument to the Data Printer DP-S2.

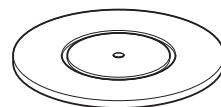


### **Target Mask**

**Target Mask: φ3 mm**  
**CM-A195**



**Target Mask: φ8 mm**  
**CM-A196**



Used to switch the illumination area (specimen measuring port size) according to the specimen.

### **Cell**

**Cell: 2 mm**  
**CM-A97**



**Cell: 10 mm**  
**CM-A98**



**Cell: 20 mm**  
**CM-A99**



A glass container to contain the liquid specimen during transmittance measurement.

### **Plastic Cell**

**Plastic Cell: 2 mm**  
**CM-A130**



**Plastic Cell: 10 mm**  
**CM-A131**



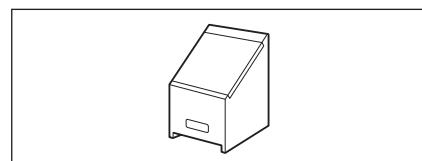
**Plastic Cell: 20 mm**  
**CM-A132**



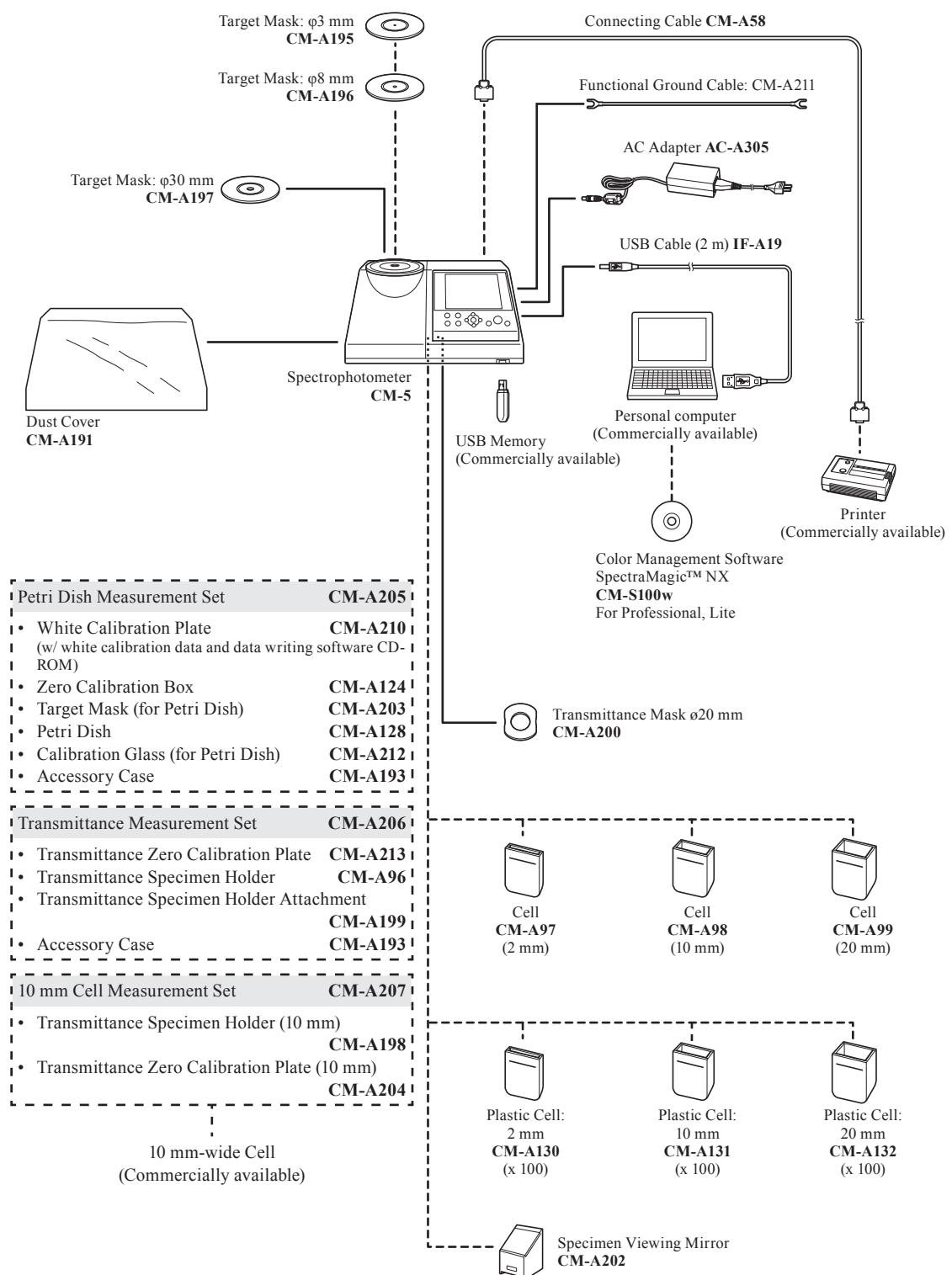
A plastic container to contain the liquid specimen during transmittance measurement.

### **Specimen Viewing Mirror CM-A202**

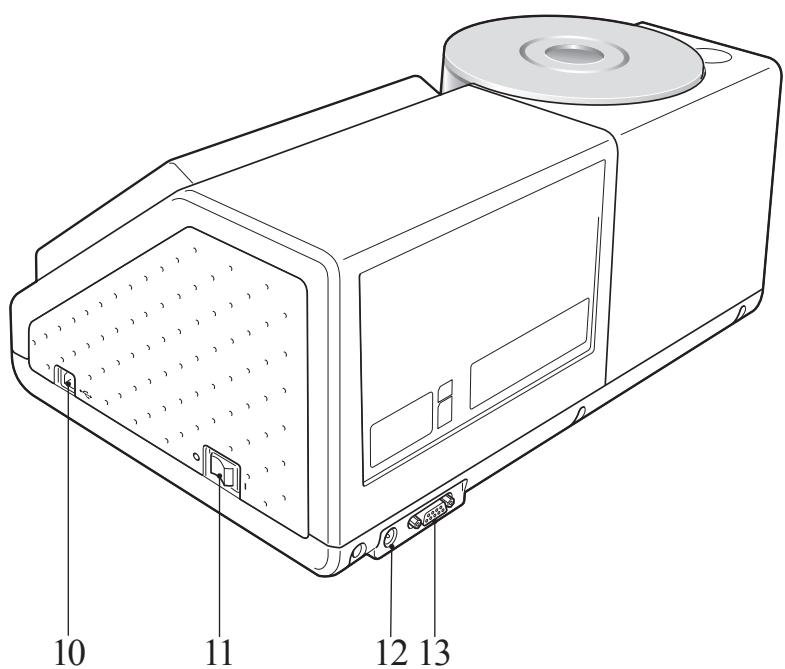
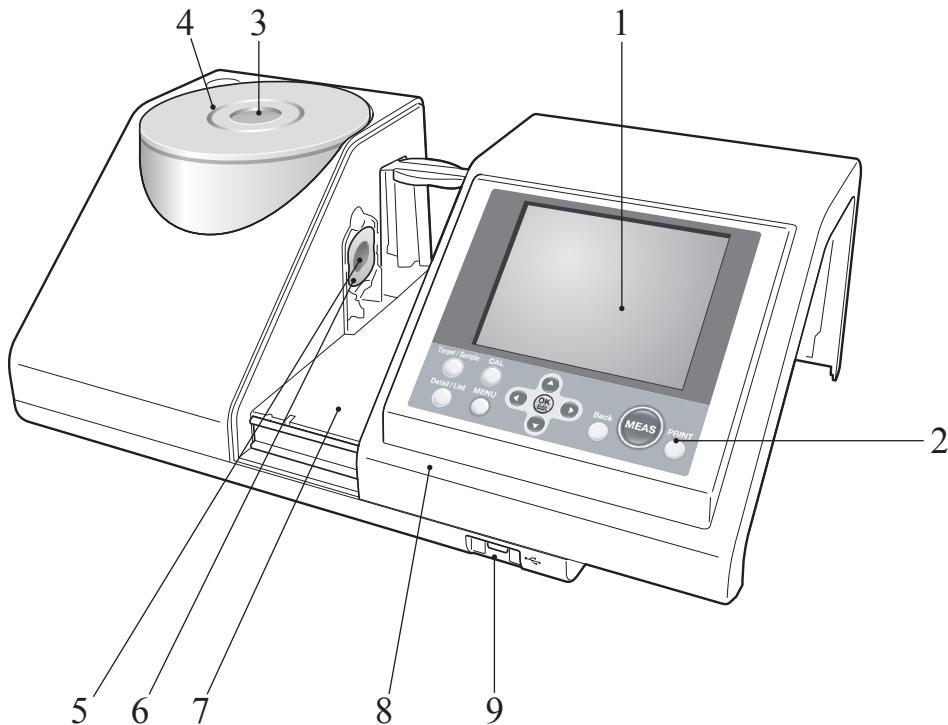
Used to check the measurement points on the specimen for reflectance measurement.



# System Diagram



# Names and Functions of Parts



1	<b>LCD screen</b>	Displays setting items, measurement results and messages.
2	<b>Control panel</b>	Used to switch screens or select/determine/save setting items. For details, refer to page 22 “Control Buttons”.
3	<b>Specimen measuring port</b>	The port for measuring the specimen. The port size can be changed by changing the Target Masks. This port opens its shutter only for measurement. Inside the shutter is the built-in White Calibration Plate.
4	<b>Target Mask</b>	During reflectance measurement, this target mask can be replaced with the optional target mask ø3 mm (CM-A195) or ø8 mm (CM-A196) to change the illumination area (specimen measuring port size) according to the specimen.
5	<b>Illumination window</b>	The port for measuring the specimen.
6	<b>Transmittance Mask</b>	Guides light to the Transmittance Specimen Chamber when conducting transmittance measurement.
7	<b>Transmittance Specimen Chamber</b>	For transmittance measurement, set a specimen in this chamber.
8	<b>Transmittance Specimen Chamber Cover</b>	Slide this cover to open/close the Transmittance Specimen Chamber.
9	<b>USB connection terminal (A type)</b>	Used to attach a USB memory device to the instrument. When a USB memory device is properly connected to the instrument, the  (USB memory device connected) icon is displayed.
10	<b>USB connection terminal (B type)</b>	Used to connect the instrument to a PC with the supplied USB cable (IF-A19).
11	<b>Power switch</b>	Used to turn ON/OFF power. Setting this switch to “○” turns the power OFF, and setting it to “■” turns the power ON.
12	<b>AC adapter terminal</b>	When using the supplied AC adapter (CM-A305), connect the adapter’s plug to this terminal.
13	<b>RS-232C Connector</b>	Used to connect the instrument to the optional data printer with the optional connecting cable (CM-A58).

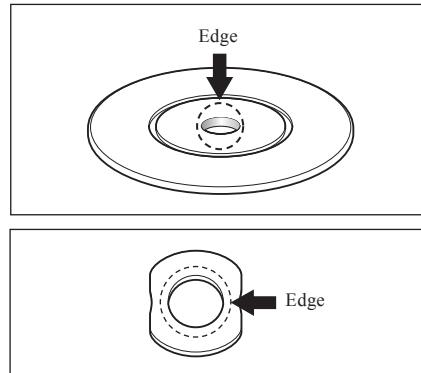
# Cleaning Parts

This section explains how to clean the Target Mask, White Calibration Plate, Zero Calibration Box, and the inside of the integrating sphere.

## Target Mask and Transmittance Mask (Standard/optional accessory)

Use a blower to remove dirt and dust from the Target Masks.

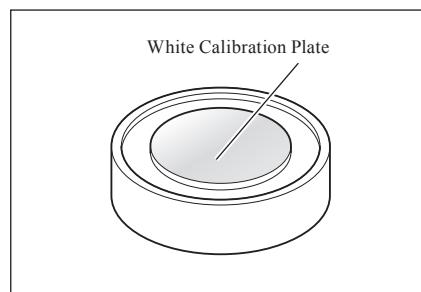
**Notes** Do not touch the inside (edge) of the Target Mask with your fingers. If it becomes dirty, wipe it with a soft, clean dry cloth.



## White Calibration Plate (Optional)

- When the White Calibration Plate becomes dirty, gently wipe the dirt off with a soft dry cloth. If the dirt is difficult to remove, wipe it off with a cloth dampened with commercially available lens cleaning solution. Then remove the solution with a cloth dampened with water, and leave the plate to dry.
- When parts other than the White Calibration Plate become dirty, lightly wipe the dirt off with a cloth dampened with water or soapy water. Never use solvents such as thinner or benzene.

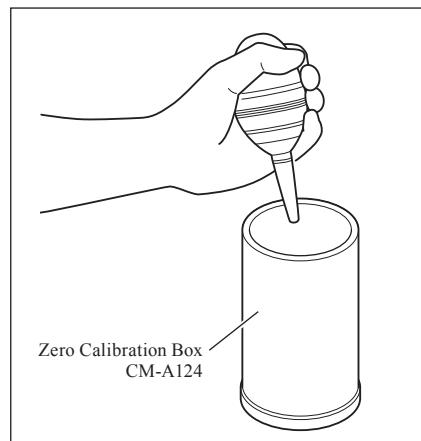
**Notes** Be careful not to scratch the White Calibration Plate.



## Zero Calibration Box (Optional)

Use a blower to remove dirt from the inside of the box.

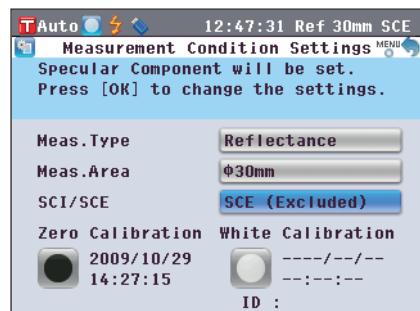
If the inner surface is accidentally touched with hands or fingers, wipe off the fingerprints or other traces gently with a soft dry cloth.



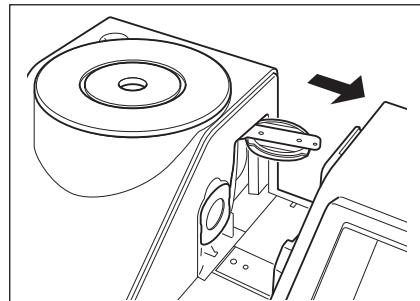
## Inside the Integrating Sphere

### 1. Set specular component to SCE.

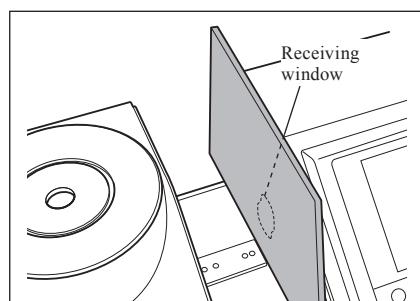
**Memo** For the procedure for switching the specular component, refer to “SCI/SCE” on page 53.



### 2. Ensure that there is nothing in the Transmittance Specimen Chamber.



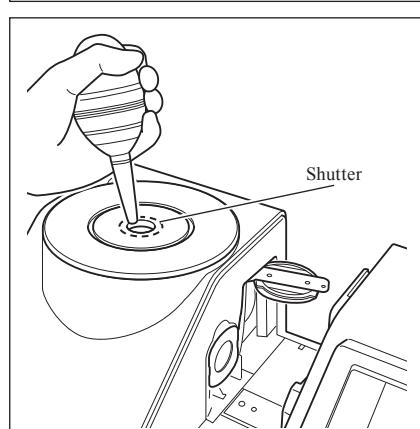
### 3. Block the receiving window of the Transmittance Specimen Chamber so that no dust or dirt enters through it.



### 4. Open the shutter and blow off the dust and dirt in the Integrating Sphere with a blower.

**Memo** For the procedure for opening/closing the shutter, refer to page 57 “Shutter Open/Close”.

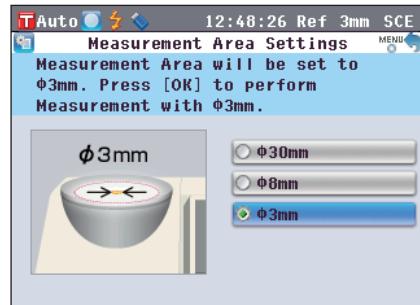
**Notes** Do not touch the white-coated inner surface of the integrating sphere, wipe it with a cloth or put an object inside it. If the inside is so dirty that dirt cannot be removed with a blower, contact the nearest KONICA MINOLTA SENSING-authorized service facility.



## Receiving window of the Transmittance Specimen Chamber

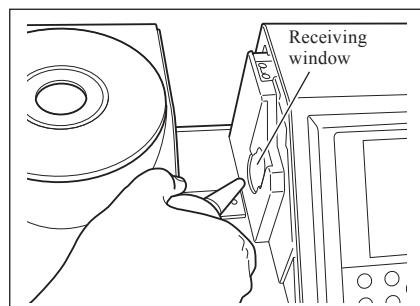
### 1. Set measuring diameter to $\phi 3$ mm.

**Memo** For the procedure for switching measuring diameter, refer to page 52 "Measurement Area".



### 2. Use a blower to remove dirt and dust from the receiving window.

**Notes** Do not insert your finger through the receiving window to touch the lens of the light-receiving optical system.

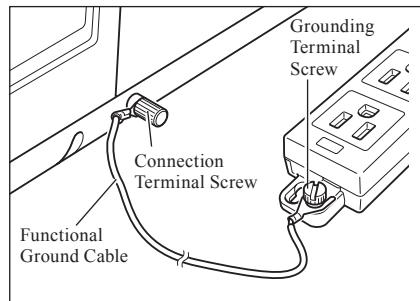


## Connecting the Functional Ground Cable

**Notes** Attach the Functional Ground Cable (CM-A211) in order to avoid communication problems with the PC caused by static electricity.

### [Procedure]

#### 1. Connect the Y terminal of the Functional Ground Cable to the Connection Terminal Screw on the rear of the instrument.



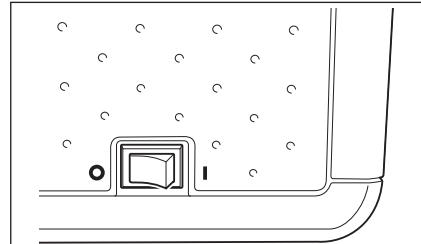
#### 2. Connect the other Y terminal of the Functional Ground Cable to a reliably grounded object (e.g. a 100-240 VAC earth terminal or a metal desk).

# Connecting the AC Adapter

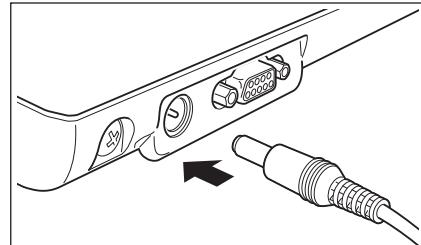
- Notes**
- To supply AC power to the instrument, always use the AC adapter (AC-A305) supplied with the instrument.
  - Before connecting or disconnecting the AC adapter jack or plug, make sure that the instrument is turned OFF.

## [Procedure]

1. Make sure that power is OFF (Power switch is set to “○”).



2. Connect the AC adapter's connector plug to the adapter's terminal.



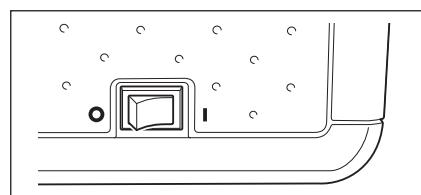
3. Insert the AC adapter power plug into an AC outlet (100 to 240 VAC, 50-60 Hz).

# Turning power ON/OFF

## [Procedure]

### Turning power ON

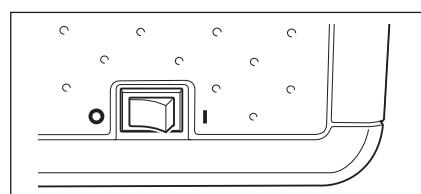
1. Turn the power switch to the “I”.
- The power will be turned ON (energized).



## [Procedure]

### Turning power OFF

1. Turn the power switch to the “○”.
- The power will be turned OFF.



# Items You Must Know

## Initial Settings of the CM-5

When the instrument is turned ON, “**Welcome to Easy Setup Wizard!**” will appear automatically in English. For normal measurement, you do not need to change the initial settings.

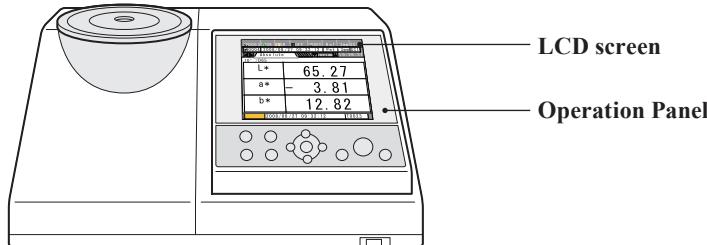
Nevertheless, you can check the date setting or change the display language before using the instrument. To do so, use the <Configuration> screen.

The display language can be selected from seven languages including Japanese.

For details, refer to page 77 “Other Settings”.

## Control Panel

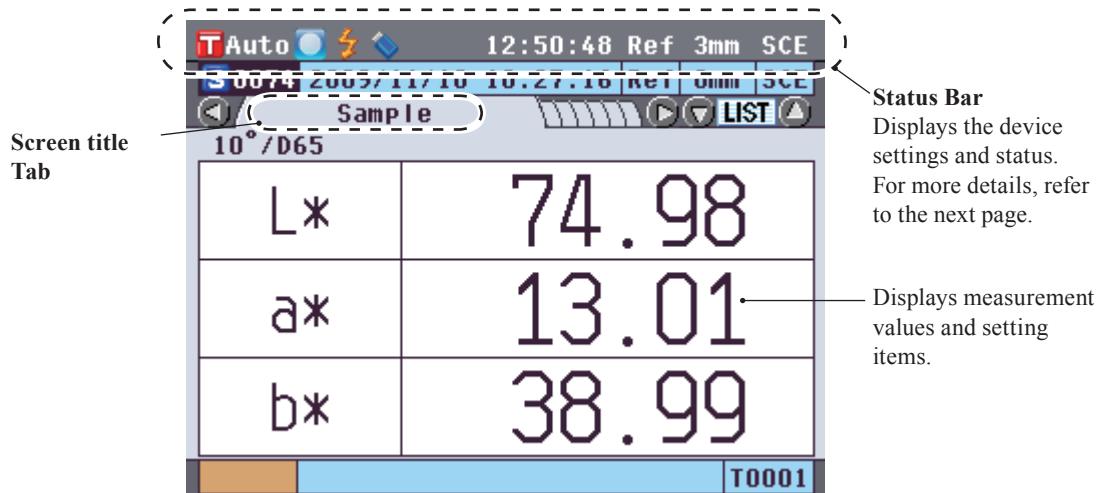
The front of the CM-5 contains the LCD screen on which the instrument displays measurement results and messages, and the control buttons which are used to set measurement options or to change displays.



### Screen Display (LCD Screen)

The LCD screen displays measurement settings, measurement results and messages. It also indicates the status of the instrument with icons.

The basic screen layout is shown below.



Screen title  
Tab

Status Bar  
Displays the device settings and status.  
For more details, refer to the next page.

Displays measurement values and setting items.

T0001

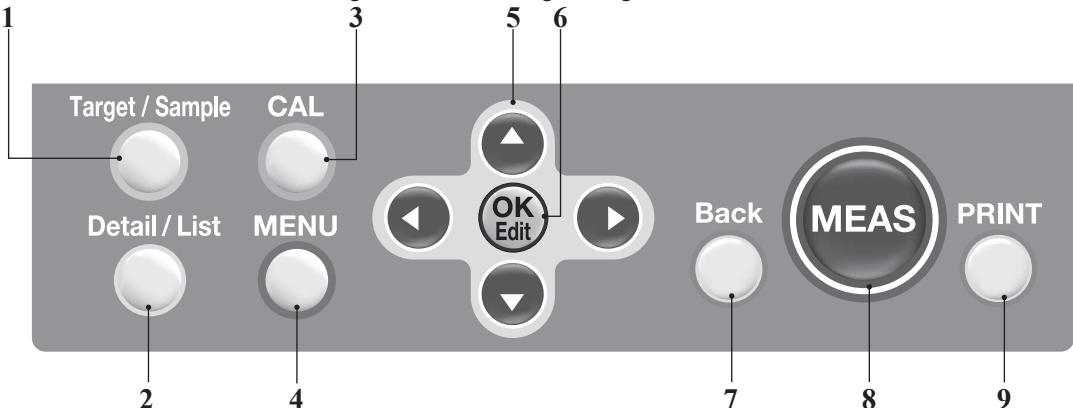
## Status Bar



	Display	Description (Status)	Meaning
1	xxxx /  Auto	Active Target number Auto Target set to ON	Target number currently set in the instrument/ Auto Target set to ON
2	/  /  / None	Calibrating	Zero Calibration / White Calibration / User Calibration not performed or Calibration is complete
3	None /	Flash ready	Measurement possible or not possible
4	None /	USB Memory Device	Connected or not connected
5	None /	Serial Printer	Automatic printing ON/OFF
6	xx:xx:xx	Current time	Hour : Minute : Second
7	Ref / Tra / Pet / Liq	Measurement Type	Reflectance measurement/Transmittance measurement/Petri Dish measurement/ Liquid measurement
8	30 mm / 8 mm / 3 mm	Measurement area	ø 30 mm / ø 8 mm / ø 3 mm
9	SCE / SCI	Specular component	SCE (Specular Component Excluded) / SCI (Specular Component Included)

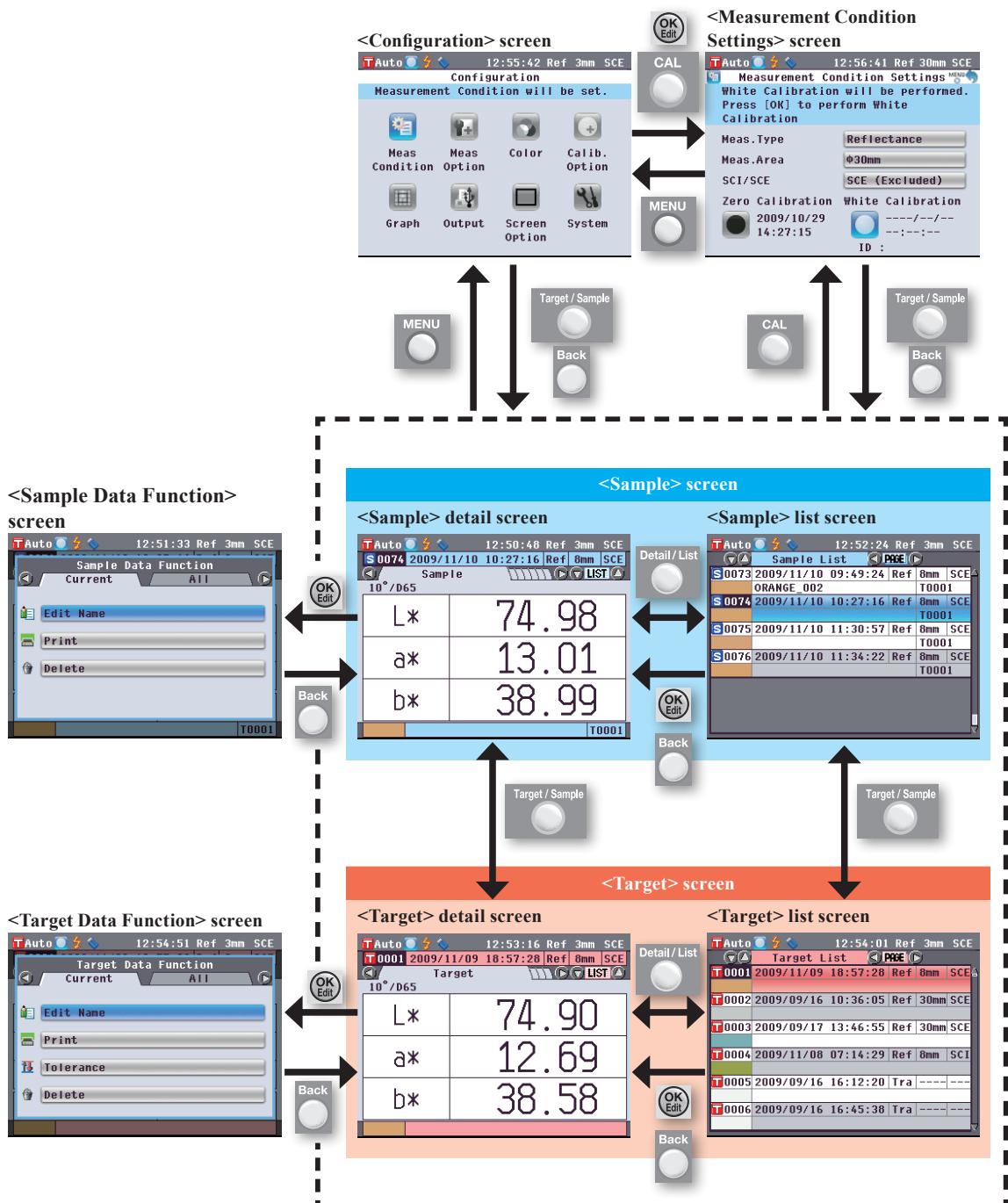
## Control Buttons

Use these buttons to set items or change screens according to the guide on the LCD screen.



- |                                    |   |
|------------------------------------|---|
| 1    [Target/Sample] button        | Switches between <Target> screen and <Sample> screen.   |
| 2    [Detail/List] button          | When the <Sample> or <Target> screen is displayed, use this button to switch between the detail display and list display.                   |
| 3    [CAL] button                  | Displays the <Calibration> screen.  |
| 4    [MENU] button                 | Displays the <Configuration> screen.<br>Holding down the [MENU] button displays the <Welcome to Easy Setup Wizard!> screen.                 |
| 5    Cursor key<br>(◀ / ▲ / ▼ / ▶) | Moves the cursor on the screen or changes the selected value.<br>To determine the item indicated by the cursor, press the [OK/Edit] button. |
| 6    [OK/Edit] button              | Sets the item indicated by the cursor or saves the setting.   |
| 7    [Back] button                 | Cancels the setting or returns to the previous step on each setting screen.   |
| 8    [MEAS] button                 | Performs calibration or measurement.  |
| 9    [PRINT] button                | Outputs the sample data to the connected serial printer.  |

The screen will change depending on the button operation.



## **Data Saving**

---

Data used with this instrument are saved automatically.

# Chapter 2

## Preparation for Measurement

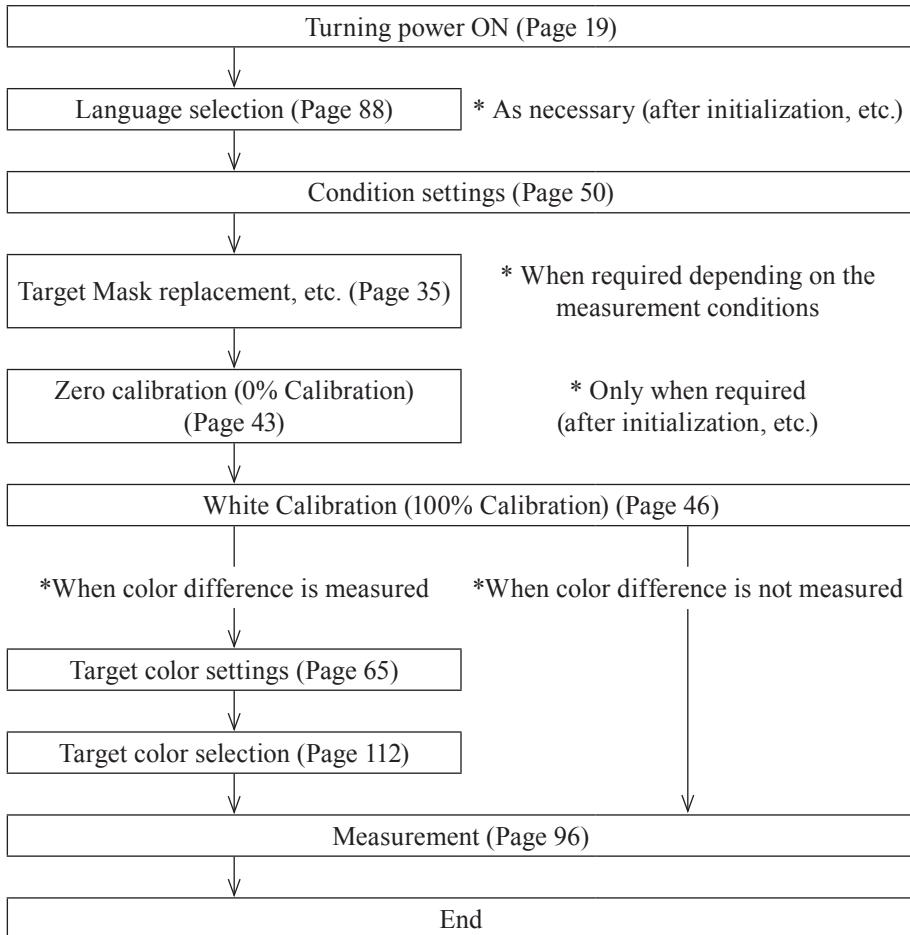
2

Preparation for Measurement

# Flow of Measurement

## ■Optional settings

## ■Basic procedure

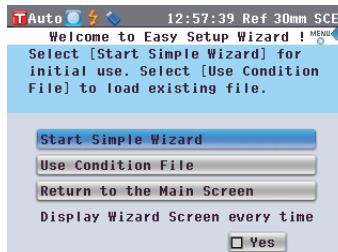


# Quick Setting Wizard

When you use the instrument for the first time, you can set the measurement conditions and calibrate the instrument step by step by following the instructions on the screen.

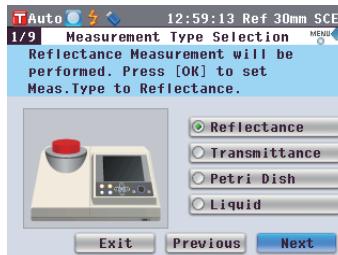
## [Procedure]

- Turn the instrument ON.**  
The <Welcome to Easy Setup Wizard!> screen appears after the initial screen.



- Use the or button of the cross key to move the cursor to "Start Simple Wizard" and then press the [OK/Edit] button.**

The <Measurement Type Selection> screen appears.



## Memo

To move the cursor to select a setting item, press the or button of the cross key.

To move the cursor between "Exit", "Previous" and "Next", press the or button of the cross key.

When you select "Exit" and then press the [OK/Edit] button, the wizard is interrupted and the <Sample> screen is displayed.

When you select "Previous" and then press the [OK/Edit] button, the screen which was displayed immediately before the Quick Setting Wizard is displayed.



- Go to the appropriate step according to the measurement type.**

<Reflectance measurement> Refer to Steps 3 to 15 (Pages 28 to 30).

<Reflectance measurement using Petri Dish> Refer to Steps 3 to 10 (Pages 30 to 31).

<Transmittance measurement> Refer to Steps 3 to 9 (Pages 32 to 33).

<Liquid transmittance measurement> Refer to Steps 3 to 8 (Pages 33 to 34).

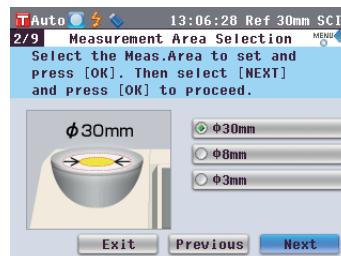
## <Reflectance measurement>

- Use the or button of the cross key to move the cursor to "Reflectance" and then press the [OK/Edit] button.

Move the cursor to "Next".

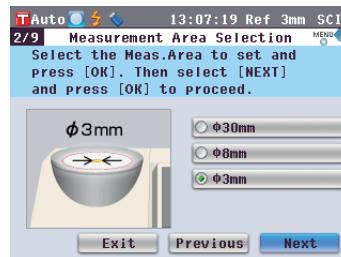


- Press the [OK/Edit] button.  
The <Measurement Area Selection> screen appears.



- Use the or button of the cross key to move the cursor to the desired measurement area and then press the [OK/Edit] button.

Move the cursor to "Next".



- Press the [OK/Edit] button.  
The <Target Mask Setting> screen appears.



- Attach the Target Mask which has the same diameter as the measurement area.



### Memo

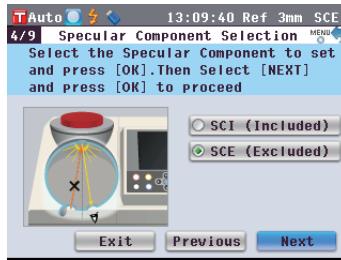
For the procedure of attaching the Target Mask, refer to page 35.

- Check that the cursor is on "Next", and press the [OK/Edit] button.  
The <Specular Component Selection> screen appears.



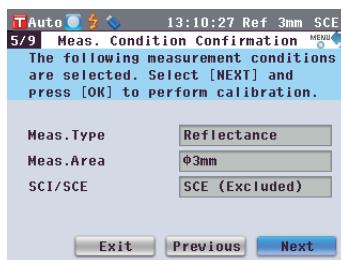
9. Use the or button of the cross key to move the cursor to the desired specular component and then press the [OK/Edit] button.

Move the cursor to “Next”.



10. Press the [OK/Edit] button.

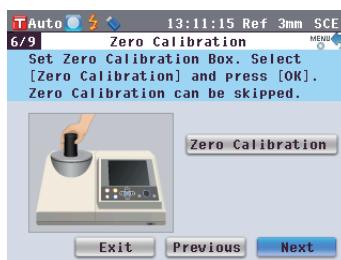
The <Meas. Condition Confirmation> screen appears.



11. Check that the cursor is on “Next”, and press the [OK/Edit] button.

The <Zero Calibration> screen appears.

The following is the explanation for skipping zero calibration.

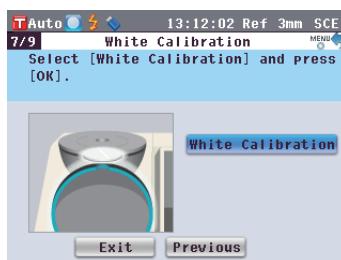


#### Memo

Since the CM-5 stores the data of the zero calibration performed at the factory, it is unnecessary to repeat the zero calibration every time you turn ON the instrument. For details of zero calibration, refer to page 43.

12. Check that the cursor is on “Next”, and press the [OK/Edit] button.

The <White Calibration> screen appears.



#### Memo

For details of white calibration, refer to page 46.

13. Check that the cursor is on “White Calibration”, and press the [OK/Edit] button.

White calibration is performed by using the built-in White Calibration Plate of the instrument. When the white calibration is completed, the <Auto White Cal. Selection> screen appears.



**14. Check that the cursor is on “Next”, and press the [OK/Edit] button.**

The following is the explanation for automatic white calibration not set to ON.

The <Meas. Cond. Settings completed> screen appears.



**15. Check that the cursor is on “Finish”, and press the [OK/Edit] button.**

The Easy Setup Wizard is completed and the <Sample> screen appears.

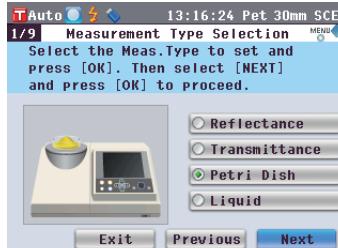
10°/D65	
L*	74.98
a*	13.01
b*	38.99

T0001

### <Reflectance measurement using Petri Dish>

**3. Use the or button of the cross key to move the cursor to “Petri Dish” and then press the [OK/Edit] button.**

Move the cursor to “Next”.



**4. Press the [OK/Edit] button.**

The <Meas. Condition Confirmation> screen appears.



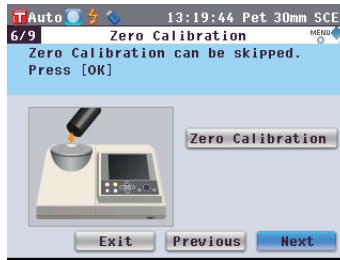
**5. Attach the Target Mask for Petri Dish (Optional).**



**Memo**

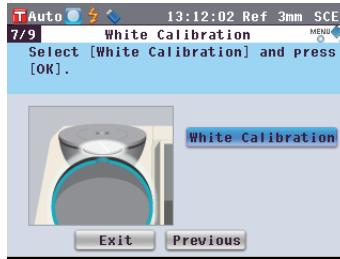
The next time you turn on the instrument after you set automatic white calibration to ON, white calibration is automatically performed before the <Welcome to Easy Setup Wizard!> screen appears. This function is useful when you perform measurement without changing the measurement type or other measurement conditions each time. For details of automatic white calibration, refer to page 46.

- 6. Check that the cursor is on “Next”, and press the [OK/Edit] button.**  
The <Zero Calibration> screen appears.  
The following is the explanation for skipping zero calibration.

**Memo**

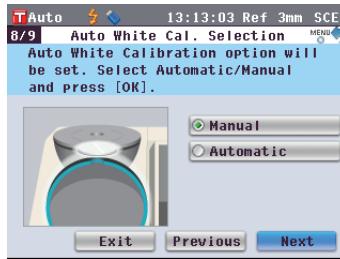
If you complete zero calibration once, the CM-5 stores the data of the zero calibration performed. It is unnecessary to repeat the zero calibration every time you turn ON the instrument. For details of zero calibration, refer to page 43.

- 7. Check that the cursor is on “Next”, and press the [OK/Edit] button.**  
The <White Calibration> screen appears.

**Memo**

For details of white calibration, refer to page 46.

- 8. Check that the cursor is on “White Calibration”, and press the [OK/Edit] button.**  
White calibration is performed by using the built-in White Calibration Plate of the instrument. When the white calibration is completed, the <Auto White Cal. Selection> screen appears.

**Memo**

The next time you turn on the instrument after you set automatic white calibration to ON, white calibration is automatically performed before the <Welcome to Easy Setup Wizard!> screen appears. This function is useful when you perform measurement without changing the measurement type or other measurement conditions each time. For details of automatic white calibration, refer to page 46.

- 9. Check that the cursor is on “Next”, and press the [OK/Edit] button.**  
The following is the explanation for automatic white calibration not set to ON.

The <Meas. Cond. Settings completed> screen appears.



- 10. Check that the cursor is on “Finish”, and press the [OK/Edit] button.**  
The Easy Setup Wizard is completed and the <Sample> screen appears.

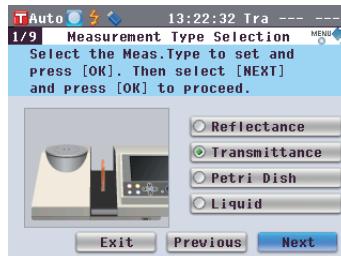
L*	74.98
a*	13.01
b*	38.99

T0001

## <Transmittance measurement>

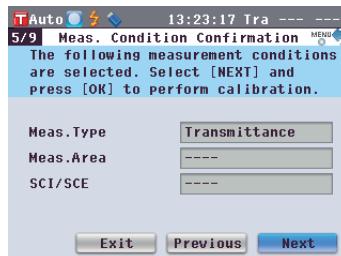
- Use the **▲** or **▼** button of the cross key to move the cursor to the “Transmittance” and then press the [OK/Edit] button.

Move the cursor to “Next”.



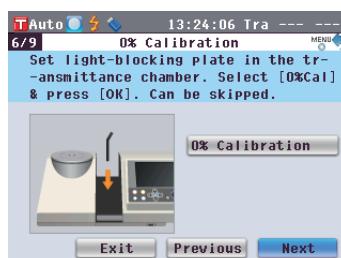
- Press the [OK/Edit] button.

The <Meas. Condition Confirmation> screen appears.



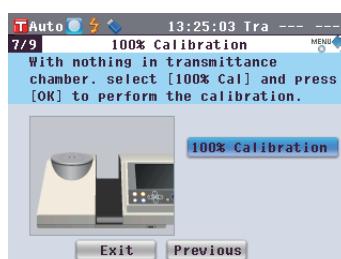
- Check that the cursor is on “Next”, and press the [OK/Edit] button.

The <0% Calibration> screen appears. The following is the explanation for skipping 0% calibration.



- Check that the cursor is on “Next”, and press the [OK/Edit] button.

The <100% Calibration> screen appears.



- Check that the Transmittance Specimen Chamber is empty and that the cursor is on “100% Calibration”, and press the [OK/Edit] button.

100% calibration will be performed. When the 100% calibration is completed, the <Auto 100% Cal. Selection> screen appears.



### Memo

Since the CM-5 stores the data of the 0% calibration performed at the factory, it is unnecessary to repeat the 0% calibration every time you turn ON the instrument. For details of 0% calibration, refer to page 43.

### Memo

For details of 100% calibration, refer to page 46.

**8. Check that the cursor is on “Next”, and press the [OK/Edit] button.**

The following is the explanation for automatic 100% calibration not set to ON.

The <Meas. Cond. Settings completed> screen appears.



**9. Check that the cursor is on “Finish”, and press the [OK/Edit] button.**

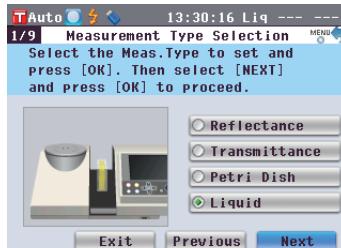
The Easy Setup Wizard is completed and the <Sample> screen appears.



### <Liquid transmittance measurement>

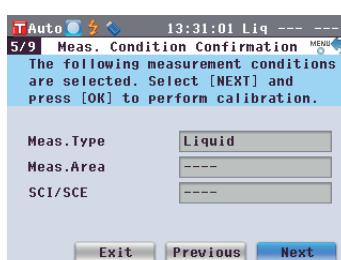
**3. Use the or button of the cross key to move the cursor to “Liquid” and then press the [OK/Edit] button.**

Move the cursor to “Next”.



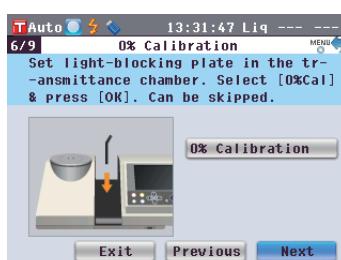
**4. Press the [OK/Edit] button.**

The <Meas. Condition Confirmation> screen appears.



**5. Check that the cursor is on “Next”, and press the [OK/Edit] button.**

The <0% Calibration> screen appears. The following is the explanation for skipping 0% calibration.



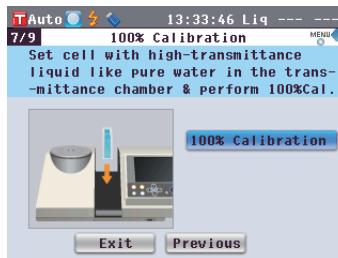
### Memo

The next time you turn on the instrument after setting automatic 100% calibration to ON, 100% calibration is automatically performed before the <Welcome to Easy Setup Wizard!> screen appears. This function is useful when you perform measurement without changing the measurement type or other measurement conditions each time. For details of automatic 100% calibration, refer to page 46.

### Memo

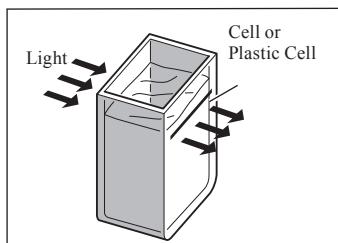
Since the CM-5 stores the data of the 0% calibration performed at the factory, it is unnecessary to repeat the 0% calibration every time you turn ON the instrument. For details of 0% calibration, refer to page 43.

- 6. Check that the cursor is on “Next”, and press the [OK/Edit] button.**  
The <100% Calibration> screen appears.



- 7. Place a specimen for 100% calibration (a container containing a liquid with high transmittance such as distilled water) in the Transmittance Specimen Chamber, check that the cursor is on “100% Calibration”, and then press the [OK/Edit] button.**

100% calibration will be performed. When the 100% calibration is completed, the <Meas. Cond. Settings completed> screen appears.



**Memo**

For details of 100% calibration, refer to page 48.

- 8. Check that the cursor is on “Finish”, and press the [OK/Edit] button.**  
The Easy Setup Wizard is completed and the <Sample> screen appears.



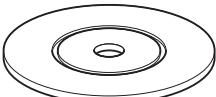
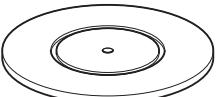
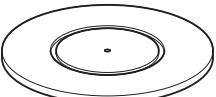
S 0074 2009/11/10 10:27:16 Ref 8mm SCE	
Sample	LIST
10°/D65	
L*	74.98
a*	13.01
b*	38.99
	T0001

# Setting a specimen

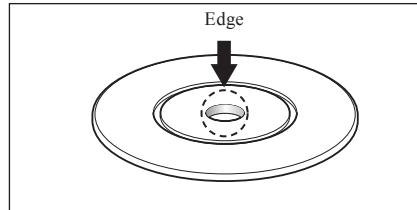
## Reflectance measurement

To use the instrument for reflectance measurement of specimens other than powder or paste, attach the Target Mask to the specimen measuring port and set a specimen on it. The Target Mask can be selected from three types based on the illumination area (specimen measuring port size):  $\varnothing 30$  mm,  $\varnothing 8$  mm and  $\varnothing 3$  mm, depending on the specimen and application.

### Required accessory

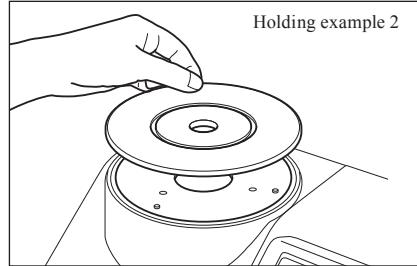
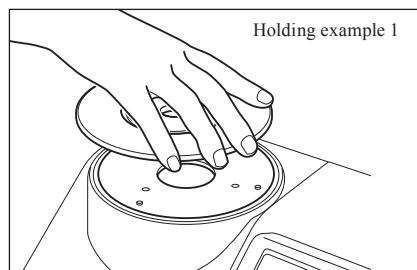
Target Mask: $\varnothing 30$ mm CM-A197	Target Mask: $\varnothing 8$ mm CM-A196 (Optional)	Target Mask: $\varnothing 3$ mm CM-A195 (Optional)
 For LAV	 For MAV	 For SAV

**Notes** Do not touch the inside (edge) of the Target Masks with your fingers. If it becomes dirty, wipe it with a soft, clean dry cloth.



### Attaching the Target Mask to the instrument

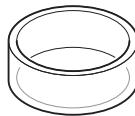
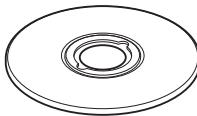
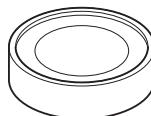
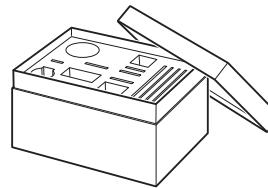
1. Align the Target Mask with the positioning groove on the instrument and push the mask in.



# Petri Dish measurement

Use a Petri Dish to allow the instrument to measure the reflectance of powder or paste specimens.

## Required accessory

<b>Petri Dish Measurement Set CM-A205 (Optional)</b>		
<b>Petri Dish: CM-A128</b> 	<b>Target Mask for Petri Dish: CM-A203</b> 	<b>Calibration Glass for Petri Dish: CM-A212</b> 
<b>Zero Calibration Box: CM-A124</b> 	<b>White Calibration Plate: CM-A210</b> (w/ white calibration data and data writing software CD-ROM) 	<b>Accessory Case: CM-A193</b> 

### Notes

Be careful that the Petri Dish bottom or the Calibration Glass for Petri Dish does not get scratched or stained. If it becomes dirty, wipe it with a soft, clean dry cloth. If dirt is difficult to remove, wipe it off with a cloth dampened with commercially-available cleaning solution. Then remove the solution with a cloth dampened with water and allow the plate to dry. If the scratch or stain cannot be removed, replace the Petri Dish or the Calibration Glass for Petri Dish.

### Notes

When the Zero Calibration Box is not in use, be sure to attach the cap to prevent the entry of dust. If dust enters the box, blow it off with a commercially-available blower.

Be careful that the inner surface of the Zero Calibration Box (black-coated side) does not get scratched or stained. If the scratch or stain cannot be removed, replace the Zero Calibration Box.

### Notes

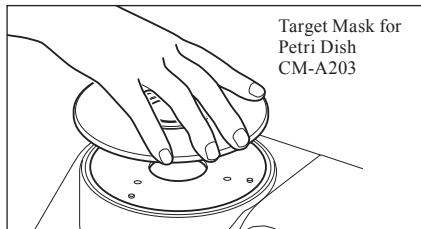
The White Calibration Plate (optional accessory) may become discolored if left exposed to light. Therefore, make sure to close the cap when it is not in use so that the White Calibration Plate is not exposed to ambient light.

Do not allow the White Calibration Plate (optional accessory) to get scratched or stained. If it becomes dirty, wipe it with a soft, clean dry cloth. If dirt is difficult to remove, wipe it off with a cloth dampened with commercially-available cleaning solution. Then remove the solution with a cloth dampened with water, and leave the plate to dry. If the scratch or stain cannot be removed, replace the White Calibration Plate.

When you replace the White Calibration Plate (optional accessory), use the data of the new White Calibration Plate to overwrite the white calibration data stored in the instrument as user calibration data.

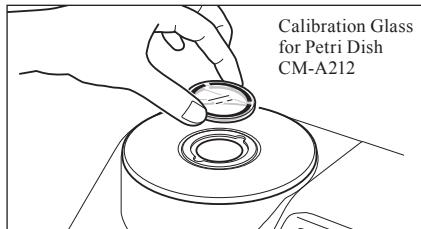
## Attaching the Target Mask to the instrument

1. Align the Target Mask for Petri Dish with the positioning groove on the instrument and push the mask in.

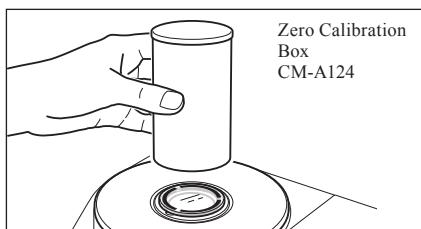


### <To perform zero calibration>

2. Insert the Calibration Glass for Petri Dish into the recess in the Target Mask for Petri Dish.



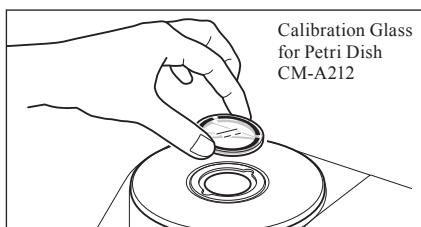
3. Align the Zero Calibration Box with the positioning groove on the Target Mask for Petri Dish and push the box in.



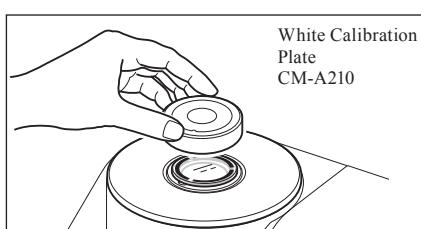
### <To perform white calibration>

Normally, calibration is performed using the built-in White Calibration Plate inside the shutter, so there is no need to set the calibration plate. Use the following procedure to perform white calibration as user calibration using an optional White Calibration Plate.

2. Insert the Calibration Glass for Petri Dish into the recess in the Target Mask for Petri Dish.

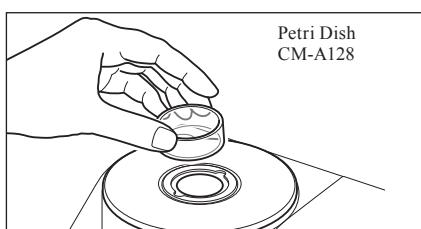


3. Align the White Calibration Plate with the positioning groove on the Target Mask for Petri Dish and push the plate in.



### <To measure a specimen>

2. Insert the Petri Dish containing a specimen into the recess in the Target Mask for Petri Dish.

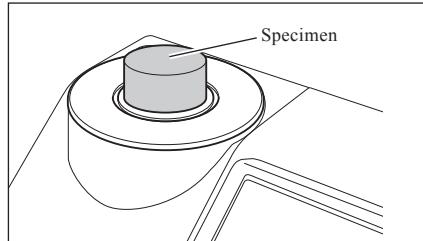


# Specimen Viewing Mirror (Optional)

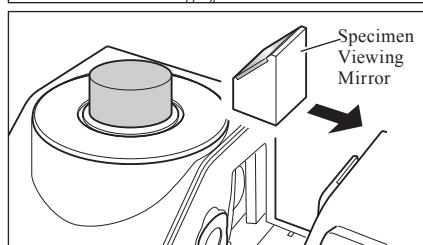
The Specimen Viewing Mirror allows you to check the measurement points for a specimen when using the instrument for reflectance measurement.

## How to use the Specimen Viewing Mirror

1. Place a specimen on the Target Mask.

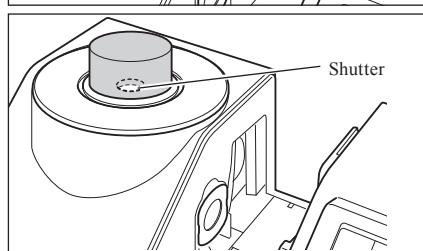


2. Open the Transmittance Specimen Chamber Cover and set the Specimen Viewing Mirror on the Chamber.

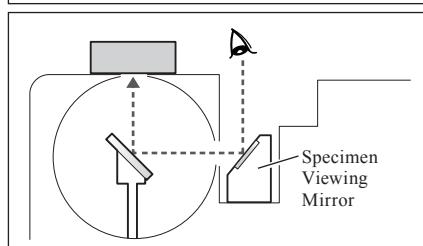


3. Open the shutter.

For the procedure of opening/closing the shutter, refer to page 57.

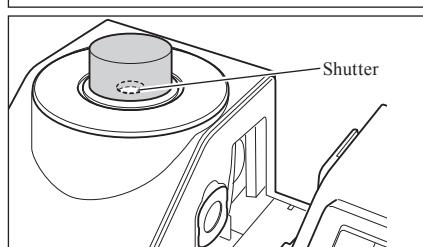


4. Look into the Specimen Viewing Mirror from the Top and adjust the position of the specimen.

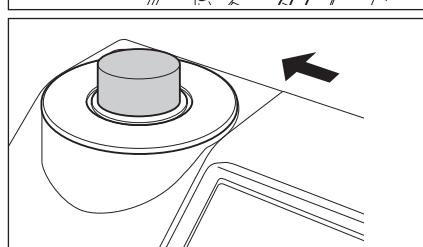


5. Close the shutter.

For the procedure of opening/closing the shutter, refer to page 57.



6. Remove the Specimen Viewing Mirror and close the Transmittance Specimen Chamber Cover.



# Transmittance Measurement and Liquid Measurement

To use the instrument for transmittance measurement, attach the Transmittance Mask on the illumination window of the Transmittance Specimen Chamber and then set a specimen.

The Transmittance Measurement Set allows you to set a container containing a liquid specimen or a specimen in the form of plate or film easily and reliably.

To conduct measurement using a commercially-available 10 mm-wide Cell, using the 10 mm Cell Measurement Set allows you to set the attachment easily and reliably.

## Required accessory

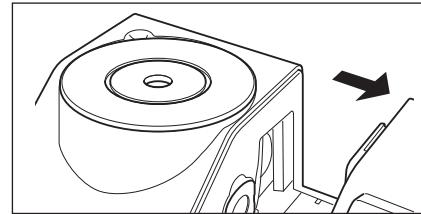
<b>Transmittance Mask</b> ø20 mm CM-A200		<b>Notes</b> Do not touch the inner surface (edge) of the Transmittance Mask with your fingers or wipe it with a cloth to remove dust.	
<b>Transmittance Measurement Set CM-A206 (Optional)</b>			
Transmittance Zero Calibration Plate CM-A213	Transmittance Specimen Holder CM-A96	Transmittance Specimen Holder Attachment CM-A199	Accessory Case CM-A193
<b>Cell (Optional)</b>			
Cell: 2 mm CM-A97	Cell: 10 mm CM-A98	Cell: 20 mm CM-A99	
<b>Plastic Cell (Optional)</b>			
Plastic Cell: 2 mm CM-A130	Plastic Cell: 10 mm CM-A131	Plastic Cell: 20 mm CM-A132	
<b>10 mm Cell Measurement Set CM-A207 (Optional)</b>			
Transmittance Specimen Holder (10 mm) CM-A198		Transmittance Zero Calibration Plate (10 mm) CM-A204	

## Attaching the Transmittance Specimen Holder to the instrument

### Notes

- Do not spill a specimen or other liquid on the instrument. Doing so may cause malfunction. If any liquid is spilled on the instrument, wipe it off immediately with a soft, dry cloth.
- Limit the thickness of a specimen to be set on the Transmittance Specimen Holder (optical path length) to 22.5 mm. (The total thickness of the Cell (20 mm) or Plastic Cell (20 mm) and the glass will be 22.5 mm.) Using a specimen or container exceeding this thickness may cause damage.
- To move the position of a specimen after it is set in the Transmittance Specimen Holder, open the specimen fixing plate beforehand to protect the surface of a specimen or the container of a specimen.

### 1. Open the Transmittance Specimen Chamber Cover.



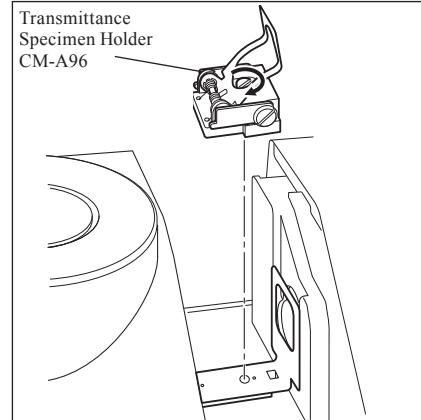
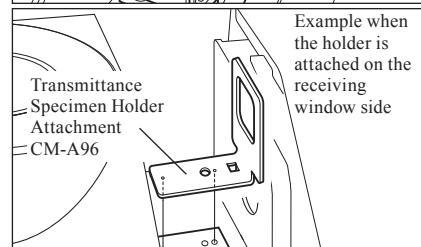
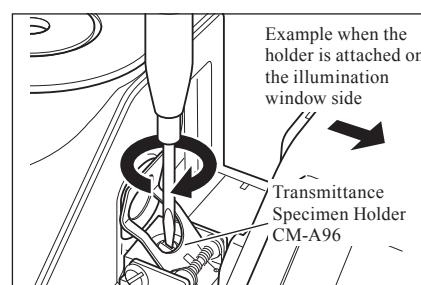
### 2. As shown in the figure, align the mounting screw of the Transmittance Specimen Holder with the screw hole on the instrument for mounting the holder and tighten the screw with a flat-blade screwdriver.

#### Memo

Although the Transmittance Specimen Holder can be attached on either the illumination window side or the receiving window side, attach it on the illumination window side for normal use. In this case, the geometry will be diffuse illumination and an 0° viewing angle (di: 0°, de: 0°).

#### Memo

To attach the holder on the receiving window side, attach the CM-A199 Transmittance Specimen Holder Attachment before the holder.

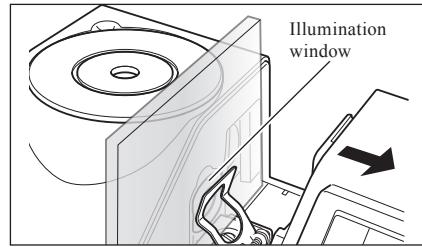


## Setting a film specimen

**Notes** Water drops formed on a specimen due to condensation or other causes prevent accurate measurement.

### 1. Open the specimen fixing plate and secure a specimen with the plate.

**Notes** When setting the specimen on the illumination window side, position it so that it fully covers the illumination window. When setting the specimen on the receiving window side, position it so that it fully covers the receiving window.



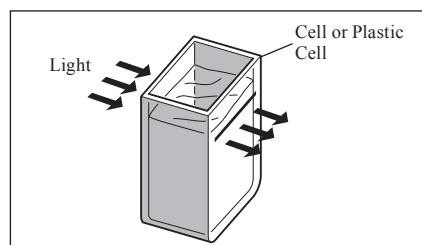
## Setting a liquid specimen

**Notes**

- As for the container for a liquid specimen, it is recommended to use the CM-A97 to 99 Cell or CM-A130 to 132 Plastic Cell provided as the optional accessory. To use other containers, use a colorless, transparent container with surfaces which make parallel with the illumination window and receiving window of the instrument.
- The Cell is fragile and it must be handled with care.
- Do not pour hot liquid in the Cell or Plastic Cell, and do not wash them with hot water.
- When cleaning the Cell or Plastic Cell with an ultrasonic cleaner, do not clean them for a long time to prevent damage.
- The measurement values obtained with attachments with different optical path lengths may not be compatible each other.
- Do not spill a specimen or other liquid on the instrument. Doing so may cause malfunction. If any liquid is spilled on the instrument, wipe it off immediately with a soft, dry cloth.
- Do not measure inflammable liquid.
- Ensure that there is no dust, stain or scratch on a specimen and the inner and outer surfaces of the container of a liquid specimen. Set a specimen by holding the section other than the measurement surface to avoid fingerprints.
- Bubbles in the container containing a liquid specimen prevent accurate measurement. Be sure to remove bubbles before measurement. (Sometimes bubbles may be generated when a specimen is left for a while.)
- Water drops formed on a specimen or the container containing a liquid specimen due to condensation or other causes prevent accurate measurement.
- The measurement accuracy for liquid containing fine particles may be unstable due to the deposition of the particles.

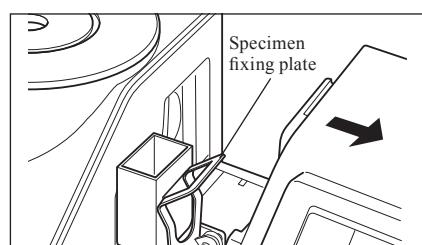
**Memo** When measuring transparent index, use a container wherein the optical path length is 10 mm.

### 1. Pour a specimen in a transparent container.



### 2. Open the specimen fixing plate and secure the container with the plate.

**Notes** When setting the specimen on the illumination window side, position it so that it fully covers the illumination window. When setting the specimen on the receiving window side, position it so that it fully covers the receiving window.



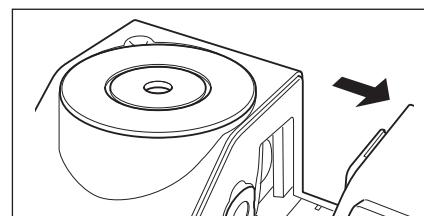
## Measuring a liquid specimen by using a commercially-available 10 mm-wide attachment

### Notes

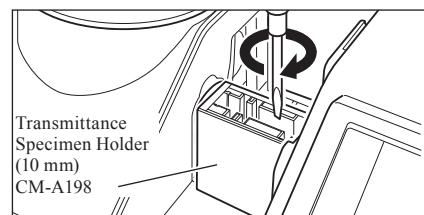
- As for the container for a liquid specimen, use a colorless, transparent container with surfaces which make parallel with the illumination window and receiving window of the instrument.
- To ensure an optical path length of 10 mm, use a 12.5 mm-wide attachment. Attachments that are 12 mm wide cannot be set securely.
- The measurement values obtained with attachments with different optical path lengths may not be compatible each other.
- Do not spill a specimen or other liquid on the instrument. Doing so may cause malfunction. If any liquid is spilled on the instrument, wipe it off immediately with a soft, dry cloth.
- Do not measure inflammable liquid.
- Ensure that there is no dust, stain or scratch on a specimen and the inner and outer surfaces of the container of a liquid specimen. Set a specimen by holding the section other than the measurement surface to avoid fingerprints.
- Bubbles in the container containing a liquid specimen prevent accurate measurement. Be sure to remove bubbles before measurement. (Sometimes bubbles may be generated when a specimen is left for a while.)
- Water drops formed on a specimen or the container containing a liquid specimen due to condensation or other causes prevent accurate measurement.
- The measurement accuracy for liquid containing fine particles may be unstable due to the deposition of the particles.

**Memo** When measuring transparent index, use a container wherein the optical path length is 10 mm.

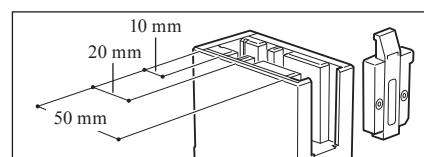
### 1. Open the Transmittance Specimen Chamber Cover.



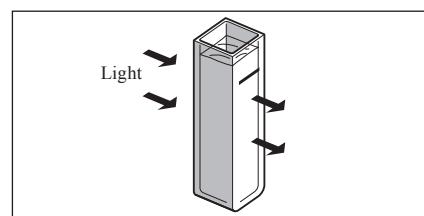
### 2. As shown in the figure, align the mounting screw of the Transmittance Specimen Holder (10 mm) with the screw hole on the instrument for mounting the holder and tighten the screw with a flat-blade screwdriver.



### 3. Change the position of the cell holding plate to one of the 10 mm, 20 mm or 50 mm groove on the Transmittance Specimen Holder (10 mm) according to the optical path length of the attachment to be used.



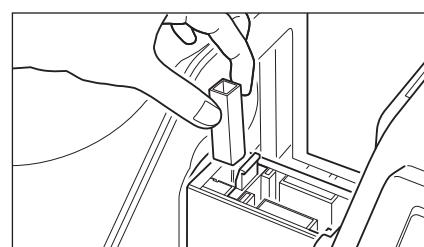
### 4. Pour a specimen in a transparent, 10 mm-wide container.



### 5. Set the container to the Transmittance Specimen Holder (10 mm).

#### Notes

Be sure to set the attachment so that the transparent surfaces of the attachment are oriented to the illumination and receiving windows.



# Calibration

## Zero Calibration (0% Calibration)

Since the CM-5 stores the data of the zero calibration (0% Calibration) performed at the factory, it is unnecessary to repeat the zero calibration (0% Calibration) every time you turn ON the instrument. If, however, the measurement conditions change greatly, or if the optional Target Mask ( $\varnothing 8$  mm or  $\varnothing 3$  mm), Petri Dish or Attachment is used, you need to perform zero calibration (0% Calibration) before white calibration (100% Calibration).

- Memo**
- The effects of stray light (i.e. light generated due to the flare characteristics of the optical system) will be compensated for automatically by the zero calibration (0% Calibration) data.
  - The amount of stray light may change because of dust or dirt which has collected in the optical system, humidity, repeated operation, or vibration and shock exerted on the instrument. In this case, performing zero calibration (0% Calibration) periodically is recommended.
- Notes**
- If the instrument is not used for long periods of time, the zero calibration (0% Calibration) data stored in the instrument may be lost. If the data is lost, zero calibration (0% Calibration) must be performed again.
  - If you performed zero calibration (0% Calibration) using the optional Target Mask ( $\varnothing 8$  mm or  $\varnothing 3$  mm), Petri Dish or Attachment, you must perform zero calibration (0% Calibration) again before conducting measurement using the standard Target Mask.

### [Procedure]

Start the procedure from the measurement screen.

Although zero calibration (0% Calibration) is included in the Easy Setup Wizard, the following explains the procedure to perform zero calibration (0% Calibration) from the measurement screen.

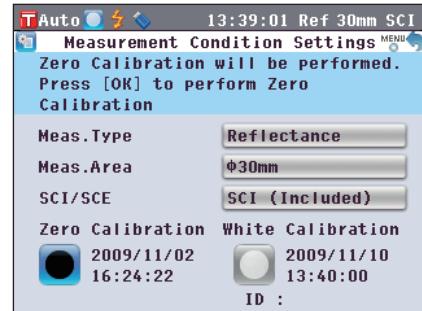
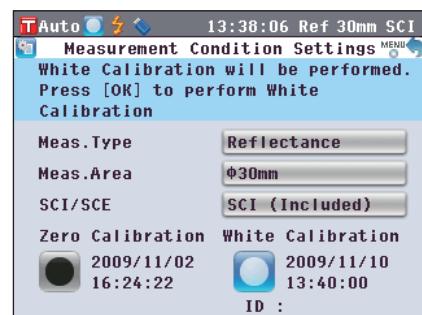
#### 1. Press the [CAL] button.

The <Measurement Condition Settings> screen is displayed.

**Notes** Confirm that the displayed measurement type, measurement area and specular component setting match with conditions of the measurement to be conducted.

**Memo** The bottom of the <Measurement Condition Settings> screen shows two items: Zero Calibration (0% Calibration) and White Calibration (100% Calibration). The date of the last calibration is displayed for each item. If no calibration has been performed yet, “--” is displayed.

#### 2. Use the or button and the or button of the cross key to move the cursor to Zero Calibration (0% Calibration).



#### 3. Go to the appropriate step according to the measurement type.

<Reflectance measurement> Refer to Steps 3 to 4 (Page 44).

<Reflectance measurement using Petri Dish> Refer to Steps 3 to 5 (Page 44).

<Transmittance measurement> Refer to Steps 3 to 4 (Page 45).

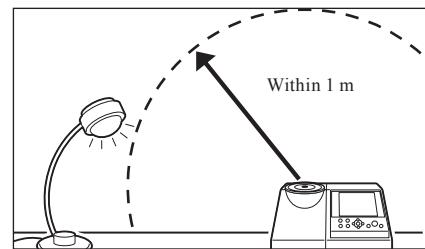
<Liquid transmittance measurement> Refer to Steps 3 to 4 (Page 45).

## <Reflectance measurement>

### 3. Clear an area of 1 m radius from the specimen measuring port of the instrument.

Keep everything including light sources (such as fluorescent lamps and other illumination) and reflective items (hands, desks, walls etc.) more than 1 m away from the specimen measuring port.

**Memo** Use of the optional Zero Calibration Box CM-A182 ensures proper zero calibration.

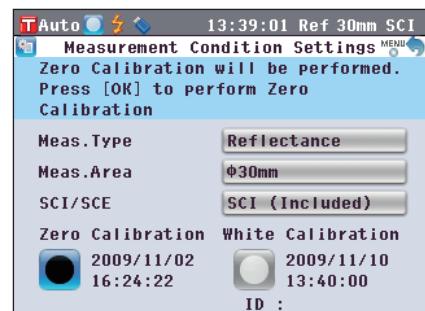


### 4. Press the [OK/Edit] button.

Zero calibration will be performed.

The Xe lamp flashes three times during the calibration. During zero calibration, the screen shows the number of flashes performed.

When the zero calibration is completed, the cursor moves to White Calibration.

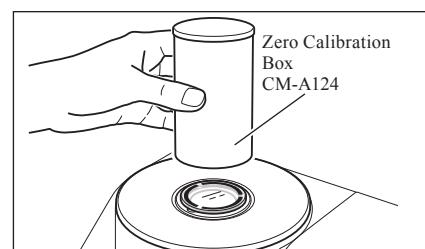


## <Reflectance measurement using Petri Dish>

### 3. Insert the Calibration Glass for Petri Dish into the recess in the Target Mask for Petri Dish.



### 4. Align the Zero Calibration Box with the positioning groove on the Target Mask for Petri Dish and push the box in.



### 5. Press the [OK/Edit] button.

Zero calibration will be performed.

The Xe lamp flashes three times during the calibration. During zero calibration, the screen shows the number of flashes performed.

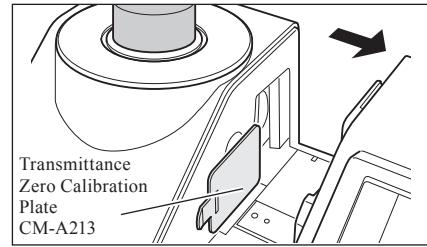
When the zero calibration is completed, the cursor moves to White Calibration.



## <Transmittance measurement>

- Open the Transmittance Specimen Chamber Cover and set the Transmittance Zero Calibration Plate so that it fully covers the illumination window.

**Notes** Set the Transmittance Zero Calibration Plate horizontally, as shown to the right. If the Transmittance Zero Calibration Plate is set vertically, the Transmittance Specimen Chamber Cover may not close.



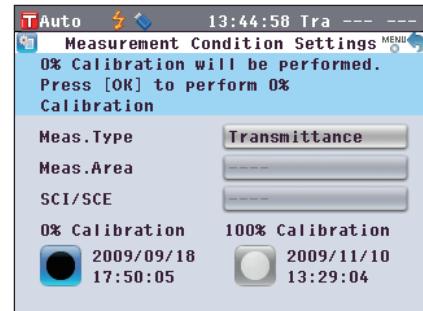
- Close the Transmittance Specimen Chamber Cover and press the [OK/Edit] button.

0% calibration will be performed.

The Xe lamp flashes three times during the calibration.

During 0% calibration, the screen shows the number of flashes performed.

When the 0% calibration is completed, the cursor moves to 100% Calibration.

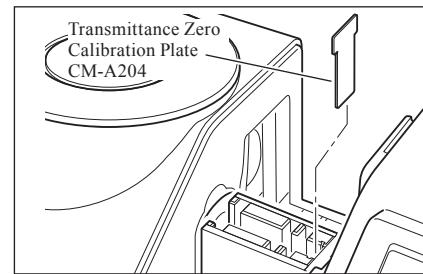


## <Liquid transmittance measurement>

- Open the Transmittance Specimen Chamber Cover and set the Transmittance Zero Calibration Plate so that it fully covers the receiving window. (Refer to the figure for the case of transmittance measurement.)

To use the 10 mm Cell Measurement Set, set the

Transmittance Zero Calibration Plate (10 mm) so that it fully covers the receiving window.



- Close the Transmittance Specimen Chamber Cover and press the [OK/Edit] button.

0% calibration will be performed.

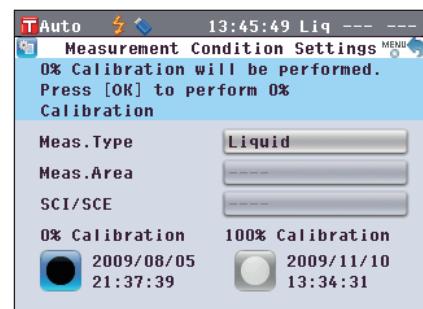
The Xe lamp flashes three times during the calibration.

During 0% calibration, the screen shows the number of flashes performed.

When the 0% calibration is completed, the cursor moves to 100% Calibration.

**Notes**

- After zero calibration (0% Calibration), you need to perform white calibration (100% Calibration). Go to step 3 of "White Calibration (100% Calibration)" on page 46.
- Even though you performed white calibration (100% Calibration) after turning ON the power, you need to perform it again if you performed zero calibration (0% Calibration) after the first white calibration.



# White Calibration (100% Calibration)

White calibration (100% Calibration) must be performed prior to start of measurement after the power is turned ON for the first time after purchase at the current settings.

- Memo**
- The built-in White Calibration Plate of the instrument is provided with its own calibration data.
  - When automatic white calibration (100% Calibration) is set to ON, white calibration (100% Calibration) will start automatically when the instrument is turned on. (Except for liquid measurement or user calibration)
  - The reading may fluctuate slightly due to changes in the ambient temperature or due to heat generation caused by repeated operation of the instrument. In this case, make sure to perform white calibration (100% Calibration) regularly.

- Notes**
- White calibration (100% Calibration) must be performed at the same temperature as the one at which measurement will be performed.
  - Before starting white calibration (100% Calibration), make sure that the instrument is sufficiently acclimatized to the ambient temperature.

## [Procedure]

Start the procedure from the measurement screen.

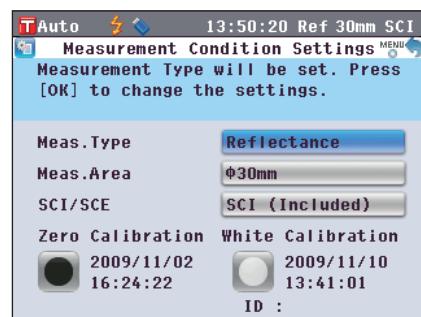
Although white calibration (100% Calibration) is included in the Easy Setup Wizard, the following explains the procedure to perform white calibration (100% Calibration) from the measurement screen.

### 1. Press the [CAL] button.

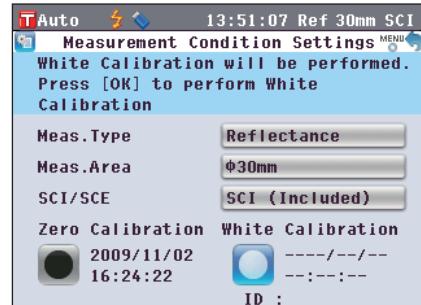
The <Measurement Condition Settings> screen is displayed.

**Notes** Confirm that the displayed measurement type, measurement area and specular component setting match with conditions of the measurement to be conducted.

**Memo** The bottom of the <Measurement Condition Settings> screen shows two items: Zero Calibration (0% Calibration) and White Calibration (100% Calibration). The date of the last calibration is displayed for each item. If no calibration has been performed yet, “--” is displayed.



### 2. Use the or button and or button of the cross key to move the cursor to White Calibration (100% calibration).



### 3. Go to the appropriate step according to the measurement type.

<Reflectance measurement>Refer to Step 3 (Page 47).

<Reflectance measurement using Petri Dish>Refer to Steps 3 to 5 (Page 47).

<Transmittance measurement>Refer to Steps 3 to 4 (Page 48).

<Liquid transmittance measurement>Refer to Steps 3 to 4 (Page 48).

## <Reflectance measurement>

### 3. Press the [OK/Edit] button.

White calibration is performed by using the built-in White Calibration Plate of the instrument.

The Xe lamp flashes three times during the calibration.

During white calibration, the screen shows the number of flashes performed.

When the white calibration is completed, the screen returns to the one displayed before the <Measurement Condition Settings> screen.



## <Reflectance measurement using Petri Dish (1)>

(Using the built-in White Calibration Plate to perform white calibration)

### 3. Press the [OK/Edit] button.

White calibration is performed by using the built-in White Calibration Plate of the instrument.

The Xe lamp flashes three times during the calibration.

During white calibration, the screen shows the number of flashes performed.

When the white calibration is completed, the screen returns to the one displayed before the <Measurement Condition Settings> screen.



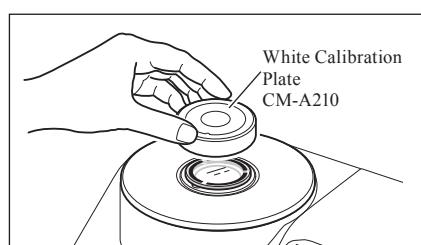
## <Reflectance measurement using Petri Dish (2)>

(Using the optional White Calibration Plate to perform white calibration as user calibration)

### 3. Insert the Calibration Glass for Petri Dish into the recess in the Target Mask for Petri Dish.



### 4. Align the White Calibration Plate with the positioning groove on the Target Mask for Petri Dish and push the plate in.



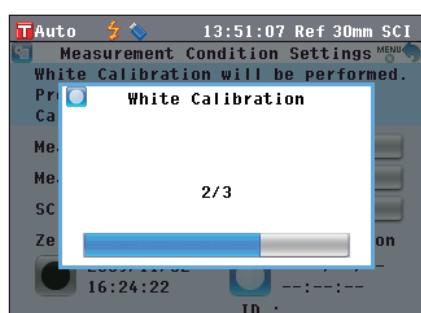
### 5. Press the [OK/Edit] button.

White calibration will be performed.

The Xe lamp flashes three times during the calibration.

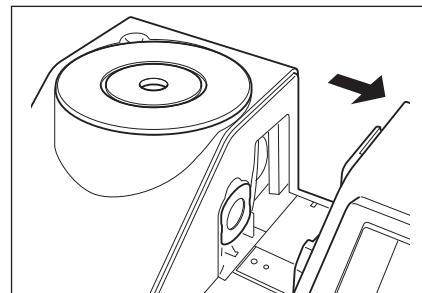
During white calibration, the screen shows the number of flashes performed.

When the white calibration is completed, the screen returns to the one displayed before the <Measurement Condition Settings> screen.



## <Transmittance measurement>

3. Open the Transmittance Specimen Chamber Cover and empty the space between the illumination and receiving windows. (No specimen, Attachment and Zero Calibration Plate being set)



4. Close the Transmittance Specimen Chamber Cover and press the [OK/Edit] button.

100% calibration (air calibration) is performed.

The Xe lamp flashes three times during the calibration.

During 100% calibration, the screen shows the number of flashes performed.

When the 100% calibration is completed, the screen returns to the one displayed before the <Measurement Condition Settings> screen.

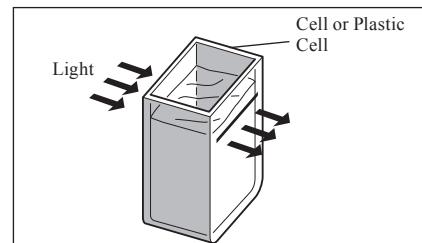


## <Liquid transmittance measurement>

3. Open the Transmittance Specimen Chamber Cover and set the attachment filled with distilled water to more than two-thirds of the capacity in the Transmittance Specimen Holder.

**Notes** Be sure to use the attachments with the same optical path length for the calibration and measurement.

Set the attachment so that its transparent surfaces are oriented to the illumination and receiving windows.



4. Close the Transmittance Specimen Chamber Cover and press the [OK/Edit] button.

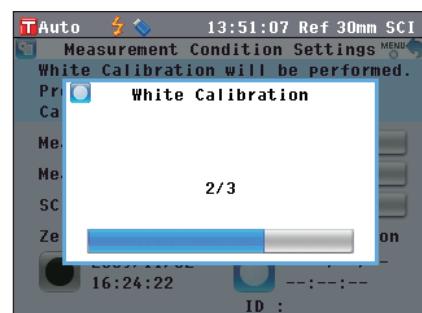
100% calibration (distilled water calibration) is performed.

The Xe lamp flashes three times during the calibration.

During 100% calibration, the screen shows the number of flashes performed.

When the 100% calibration is completed, the screen returns to the one displayed before the <Measurement Condition Settings> screen.

**Memo** If you change the measurement type or other measurement conditions after white calibration (100% Calibration), you need to perform white calibration (100% Calibration) again under the new conditions.



# User Calibration

You can perform calibration by using your own reference plate and calibration data instead of the white calibration (100% Calibration) data. The calibration data for user calibration can be specified by connecting the instrument to a PC and using the optional Color Management Software “SpectraMagic™ NX”.

You can select whether to use the user calibration data for measurement on the <Calibration Option Setting> screen of the instrument.

## [Procedure]

Start the procedure from the measurement screen.

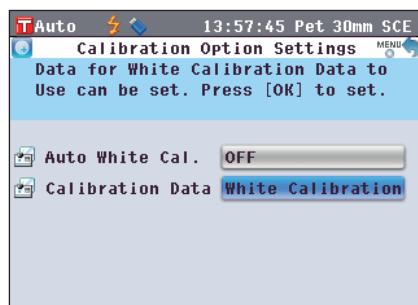
### 1. Press the [MENU] button.

The <Configuration> screen is displayed.



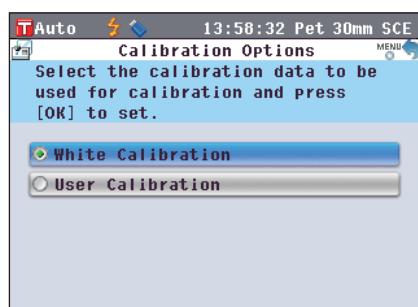
### 2. Use the ▲ or ▾ button of the cross key to move the cursor to ■ calibration options and then press the [OK/Edit] button.

The <Calibration Option Settings> screen is displayed.



### 3. Use the ▲ or ▾ button of the cross key to move the cursor to the desired calibration data and then press the [OK/Edit] button.

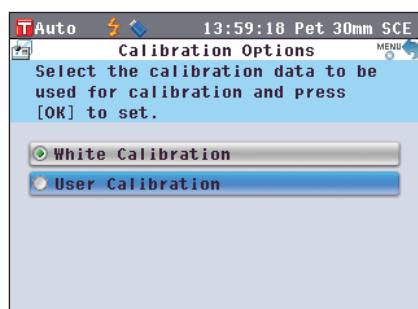
The <Calibration Options> screen is displayed.



### 4. Use the ▲ or ▾ button of the cross key to move the cursor to “User Calibration” and then press the [OK/Edit] button.

Now you can perform white calibration (100% Calibration) using your own calibration data.

**Notes** You need to prepare user calibration data and write it to the instrument memory before you can set user calibration to ON.



# Condition Setting

The CM-5 requires condition settings (measurement condition, measurement option, and color) before measurement can be started.

**Memo** To configure condition settings, select “Meas. Condition” (measurement conditions), “Meas. Option” (measurement options) or “Color” (display conditions) from the <Configuration> screen to open an appropriate screen.

## Setting the Measurement Conditions

To set measurement conditions, select “Meas. Condition” from the <Configuration> screen.

You can select or specify the following three items as the measurement conditions:

- Meas. Type: Select the measurement type such as reflectance measurement or transmittance measurement.
- Meas. Area: When the measurement type is reflectance measurement, select an measurement area.
- SCI/SCE: When the measurement type is reflectance measurement, select the specular component mode.

### [Setting Procedure]

#### 1. Press the [MENU] button.

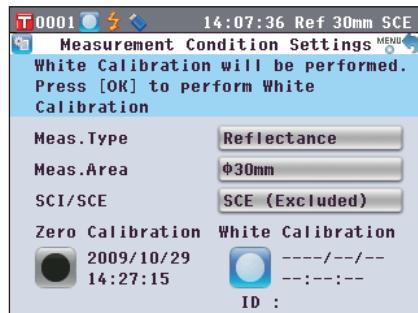
The <Configuration> screen is displayed.



#### 2. Use the ▲ or ▼ button of the cross key to move the cursor to “Meas. Condition” and then press the [OK/ Edit] button.

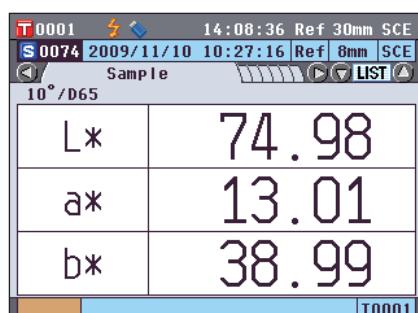
The <Measurement Condition Settings> screen is displayed.

- The <Measurement Condition Settings> screen shows the current settings.



#### 3. After you set the measurement conditions, you can press the [Back] button to return to the screen displayed before you press the [MENU] button in Step 1.

**Memo** To return to the <Configuration> screen, press the [MENU] button.



## Measurement Type

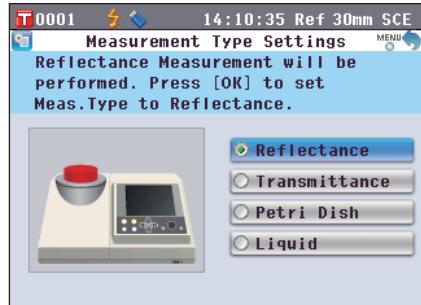
Select the measurement type such as reflectance measurement or transmittance measurement.

### [Setting Procedure]

Start the procedure from the <Measurement Condition Settings> screen.

1. Use the or button of the cross key to move the cursor to “Meas. Type” and then press the [OK/Edit] button.

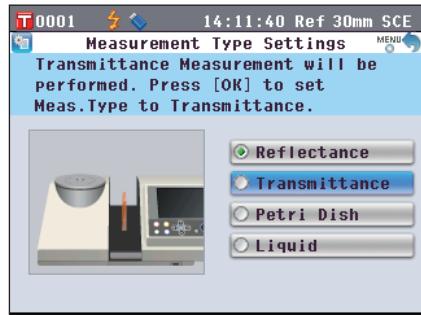
The <Measurement Type Settings> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

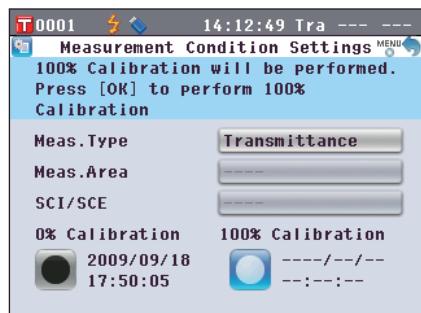
- Reflectance: Measure the reflectance of object colors.
- Transmittance: Measure the transmittance of specimens in the form of plate or film.
- Petri Dish: Measure the reflectance of powder or paste specimens by using a Petri Dish.
- Liquid: Measure the transmittance of liquid specimens.



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Measurement Condition Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Measurement Condition Settings> screen without changing the setting.



## Measurement Area

When the measurement type is reflectance measurement, select a measurement area.

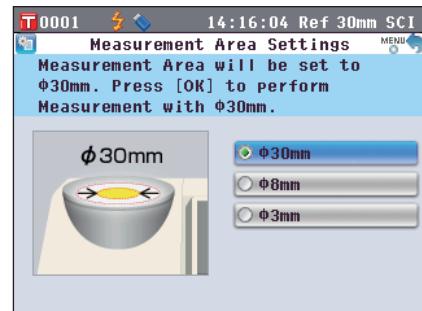
When the Petri Dish measurement is selected, “ø30 mm” is set automatically.

### [Setting Procedure]

Start the procedure from the <Measurement Condition Settings> screen.

1. Use the or button of the cross key to move the cursor to “Meas. Area” and then press the [OK/Edit] button.

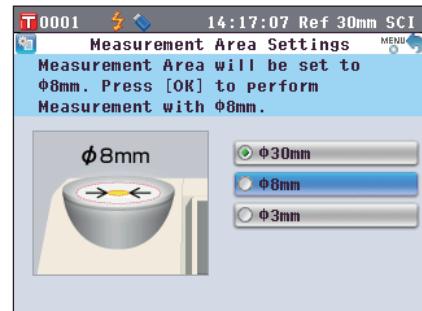
The <Measurement Area Settings> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

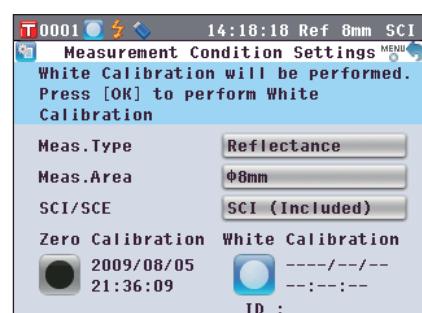
- ø30 mm: Measurement area of 30 mm(LAV)
- ø8 mm: Measurement area of 8 mm (MAV); using the optional ø8 mm Target Mask (CM-A195)
- ø3 mm: Measurement area of 3 mm (SAV); using the optional ø3 mm Target Mask (CM-A196)



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Measurement Condition Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Measurement Condition Settings> screen without changing the setting.



## Specular Component (SCI/SCE)

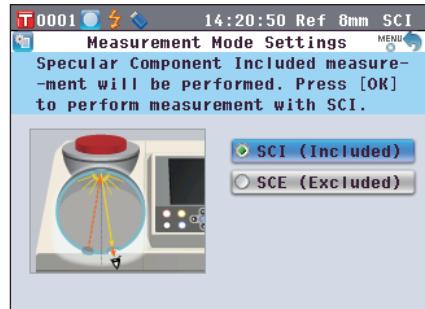
When the measurement type is reflectance measurement, select the specular component mode. When the Petri Dish measurement is selected, "SCE" is set automatically.

### [Setting Procedure]

Start the procedure from the <Measurement Condition Settings> screen.

1. Use the or button of the cross key to move the cursor to "SCI/SCE" and then press the [OK/Edit] button.

The <Measurement Mode Settings> screen is displayed.

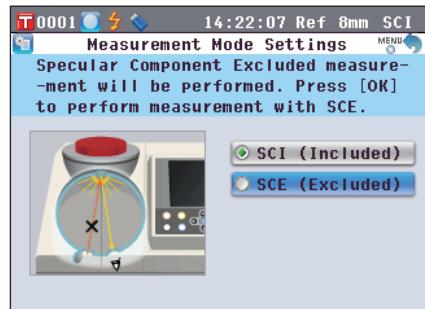


2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

SCI: Specular component included

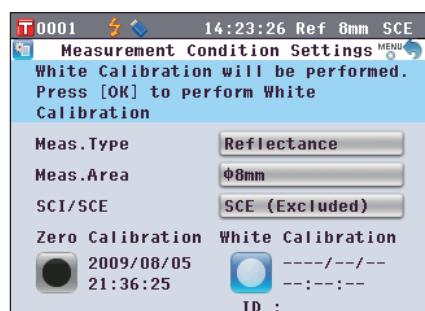
SCE: Specular component excluded



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Measurement Condition Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Measurement Condition Settings> screen without changing the setting.



# Measurement Option Settings

To set measurement options, select “Measurement Options” from the <Configuration> screen.

You can select or specify the following three items as the measurement options:

- Auto Measurement (1-10): Specify the number of measurements for auto averaging.
- Manual Measurement (1-30): Specify the number of measurements for manual averaging.
- Shutter Open/Close: Open or close the shutter of the specimen measuring port.

## [Setting Procedure]

### 1. Press the [MENU] button.

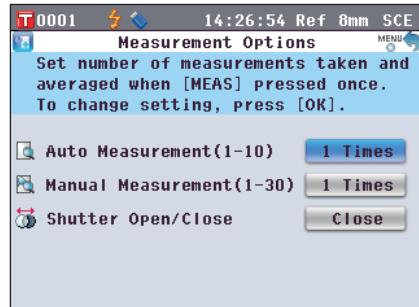
The <Configuration> screen is displayed.



### 2. Use the or button of the cross key to move the cursor to “Meas. Option” and then press the [OK/Edit] button.

The <Measurement Options> screen is displayed.

- The <Measurement Options> screen shows the current settings.



### 3. After you set the measurement conditions, press the [Back] button to return to the <Configuration> screen.



## Auto Measurement (1-10)

Specify the number of measurements for auto averaging.

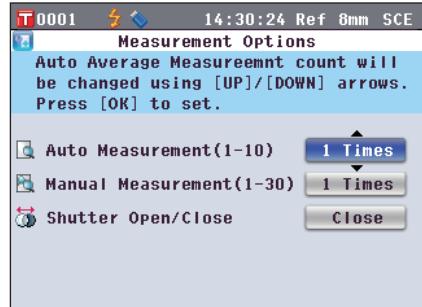
The average of the data obtained from the specified number of continuous measurements is determined as sample data.

### [Setting Procedure]

Start the procedure from the <Measurement Options> screen.

1. Use the or button of the cross key to move the cursor to “Auto Measurement (1-10)” and then press the [OK/Edit] button.

Above and below the cursor and are displayed.

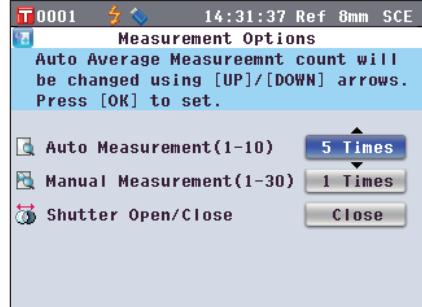


2. Use the or button of the cross key to specify a value.

#### Settings

1 to 10 times:

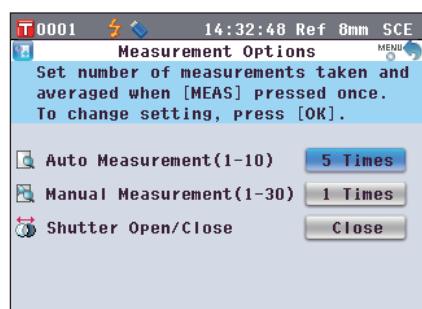
Specify the number of measurements, from 1 to 10 times, to perform when using auto averaging.



3. Press the [OK/Edit] button.

The selection is confirmed.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Measurement Options> screen without changing the setting.



## Manual Measurement (1-30)

Specify the number of measurements for manual averaging.

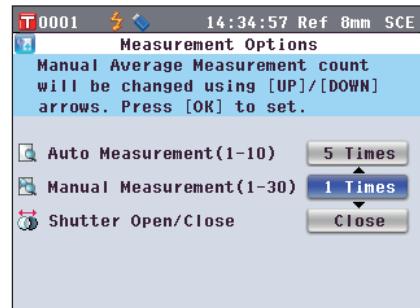
The average of the data obtained from the measurements conducted with the presses of the [MEAS] button for the specified number of times is determined as sample data.

### [Setting Procedure]

Start the procedure from the <Measurement Options> screen.

1. Use the or button of the cross key to move the cursor to “Manual Measurement (1-30)” and then press the [OK/Edit] button.

Above and below the cursor and are displayed.

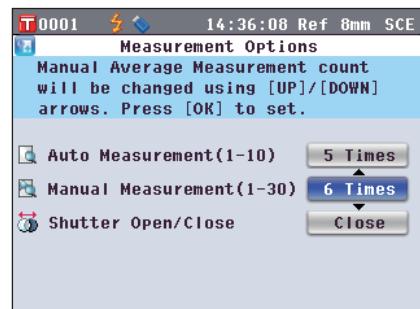


2. Use the or button of the cross key to specify a value.

#### Settings

○1 to 30 times:

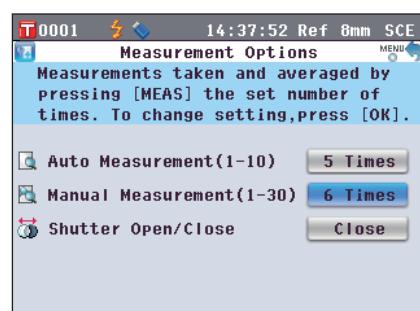
Specify the number of measurements, from 1 to 30 times, to perform when using manual averaging.



3. Press the [OK/Edit] button.

The selection is confirmed.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Measurement Options> screen without changing the setting.



## Shutter Open/Close

When cleaning the inside of the integrating sphere or to check the measurement points for a specimen using the Specimen Viewing Mirror (Optional), you need to open or close the shutter of the specimen measuring port. Use this option for the open/close operation.

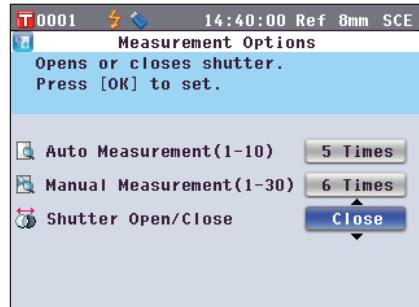
During measurement, the shutter is automatically opened or closed according to the measurement type.

### [Setting Procedure]

Start the procedure from the <Measurement Options> screen.

1. Use the or button of the cross key to move the cursor to "Shutter Open/Close" and then press the [OK/Edit] button.

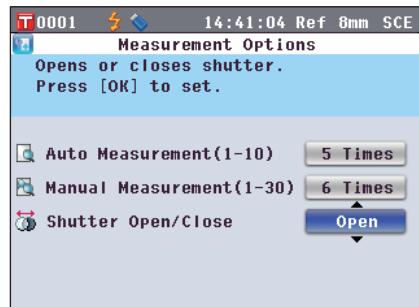
Above and below the cursor and are displayed.



2. Use the or button of the cross key to specify either to open or close the shutter.

#### Settings

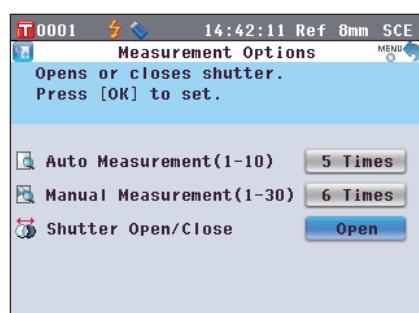
- Open: Opens the shutter
- Close: Closes the shutter



3. Press the [OK/Edit] button.

The shutter opens or closes according to the selection.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Measurement Options> screen without changing the setting.



**Memo** For the transmittance measurement, the geometry will be set to di:0° when the shutter is closed and will be set to de:0° when the shutter is open and the Zero Calibration Box is set.

In the haze measurement, the optional Color Management Software SpectraMagic™ NX (CM-S100w) allows haze calculation after automatic selection of the geometry (shutter open/close).

# Setting the Display Conditions

To set display conditions, select “Color” from the <Configuration> screen.

You can select or specify the following five items as the display conditions:

- Color Space: Select the color space to display.
- Color Index: Select the index (WI, YI, etc.) to display.
- Observer: Select the observer angle: 2° or 10°.
- Illuminant 1: Select the illuminant used to measure colorimetric data.
- Illuminant 2: Select the secondary illuminant used for MI (metamerism index) calculation, etc.

## [Setting Procedure]

### 1. Press the [MENU] button.

The <Configuration> screen is displayed.



### 2. Use the $\triangle$ or $\circlearrowright$ button of the cross key to move the cursor to “Color” and then press the [OK/Edit] button.

The <Color Settings> screen is displayed.

- The <Color Settings> screen shows the current settings.



### 3. After you set the display conditions, press the [Back] button to return to the <Configuration> screen.



## Color Space

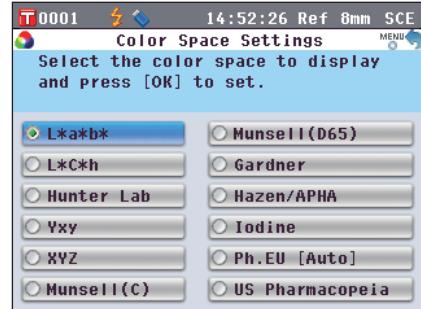
Select the color space to be used or the index used for transmittance measurement.

### [Setting Procedure]

Start the procedure from the <Color Settings> screen.

1. Use the or button of the cross key to move the cursor to the desired “Color Space” and then press the [OK/Edit] button.

The <Color Space Settings> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

- Use the or button of the cross key to move the cursor to the digit on the left or right.

#### Settings

- L\*a\*b\*: L\*a\*b\* color space
- L\*C\*h: L\*C\*h color space
- Hunter Lab: Hunter Lab color space
- Yxy: Yxy color space
- XYZ: XYZ color space
- Munsell (C): Munsell color space (illuminant “C”)
- Munsell (D65): Munsell color space (illuminant “D<sub>65</sub>”)
- Gardner: Transparent index, Gardner
- Hazen/APHA: Transparent index, Hazen(APHA) color scale
- Iodine Color Value: Transparent index, Iodine color scale
- Ph. EU: European Transparent index, Pharmacopeia
- US Pharmacopeia: Transparent index, US Pharmacopeia

#### Memo

- A value for Munsell (C) is displayed only when observer 2° and illuminant “C” are selected.
- A value for Munsell (D65) is displayed only when observer 2° and illuminant “D<sub>65</sub>” are selected.
- A value for Gardner is displayed only when observer 2° and illuminant “C” are selected.
- A value for Hazen/APHA is displayed only when observer 2° and illuminant “C” are selected.
- A value for Iodine is displayed only when observer 2° and illuminant “C” are selected.
- A value for Ph. EU is displayed only when observer 2° and illuminant “C” are selected.
- A value for US Pharmacopeia is displayed only when observer 2° and illuminant “C” are selected.



### 3. Press the [OK/Edit] button.

If you select L\*a\*b\* or L\*C\*h, <Difference Formula Settings> screen is displayed.

If you select Ph. EU, <Ph.EU Hue setting> screen is displayed.

If you select options other than above, the selection is confirmed and the screen returns to the <Color Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Color Settings> screen without changing the setting.

### 4. If you select L\*a\*b\*, L\*C\*h or Ph. EU, use the $\uparrow$ or $\downarrow$ button of the cross key to move the cursor to the desired item.

**Settings** (When L\*a\*b\* or L\*C\*h is selected)

- ΔE\*ab: ΔE\*ab (CIE1976) color difference formula
- CMC: CMC color difference formula; parameters can be changed.
- ΔE\*94: ΔE\*94 (CIE1994) color difference formula; parameters can be changed.
- ΔE00: ΔE00 (CIE2000) color difference formula; parameters can be changed.

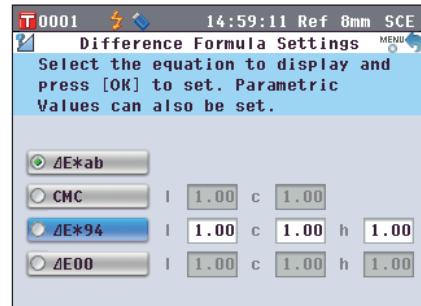
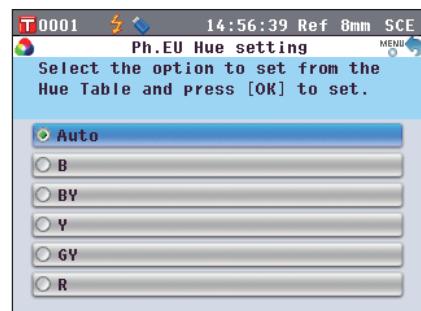
**Settings** (When Ph. EU is selected)

- Auto: Automatic
- B: Brown
- BY: Brownish-Yellow
- Y: Yellow
- GY: Greenish-Yellow
- R: Red

### 5. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Color Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Color Space> screen without changing the setting.



## Color Index

Select the index (WI, YI, etc.) to be used.

This screen is available when the user index has been set with the optional Color Management Software SpectraMagic™ NX (CM-S100w) in advance.

### [Setting Procedure]

Start the procedure from the <Color Settings> screen.

1. Use the or button of the cross key to move the cursor to “Color Index” and then press the [OK/Edit] button.

The <Color Index> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

- WI ASTM E313-73: Whiteness index (ASTM E313-73)
- WI ASTM E313-96: Whiteness index (ASTM E313-96)
- YI ASTM E313-73: Yellowness index (ASTM E313-73)
- YI ASTM E313-96: Yellowness index (ASTM E313-96)
- YI ASTM D1925: Yellowness index (ASTM D1925)
- B ASTM E313-73
- ISO Brightness
- None

#### **Memo**

- A value for WI ASTM E313-73 is displayed only when observer 2° and illuminant “C” are selected.
- A value for WI ASTM E313-96 is displayed only when illuminant “C”, “D50” or “D65” is selected.
- A value for YI ASTM E313-73 is displayed only when observer 2° and illuminant “C” are selected.
- A value for YI ASTM E313-96 is displayed only when illuminant “C”/“D65” are selected.
- A value for YI YI D1925 is displayed only when illuminant “C” are selected.
- A value for B ASTM E313-73 is displayed only when observer 2° and illuminant “C” are selected.



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Color Settings> screen.

#### **Notes**

If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Color Settings> screen without changing the setting.



## Observer

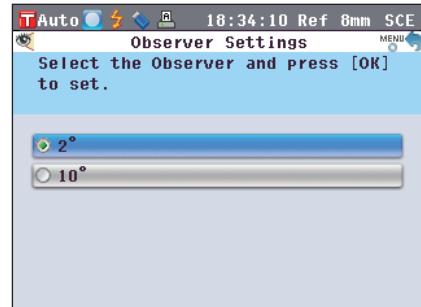
Select the observer angle: 2° or 10°.

### [Setting Procedure]

Start the procedure from the <Color Settings> screen.

1. Use the or button of the cross key to move the cursor to the desired “Observer” and then press the [OK/Edit] button.

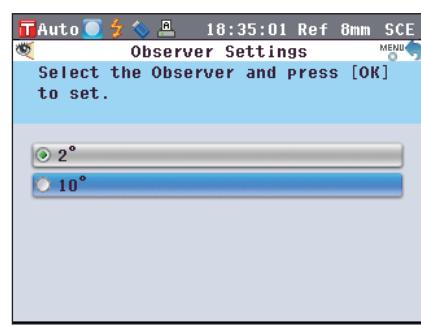
The <Observer Settings> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

- 2°: 2° observer (CIE1931)
- 10°: 10° observer (CIE1964)



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Color Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/EDIT] button, you return to the <Color Settings> screen without changing the setting.



## Illuminant 1

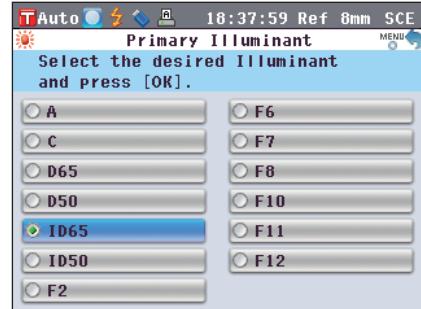
Select the illuminant used to measure colorimetric data.

### [Setting Procedure]

Start the procedure from the <Color Settings> screen.

1. Use the or button of the cross key to move the cursor to the desired "Illuminant 1" and then press the [OK/Edit] button.

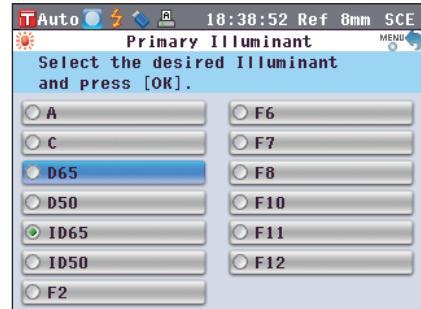
The <Primary Illuminant> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

- OA Standard illuminant A (Incandescent lamp, Color temperature: 2856K)
- OC Illuminant C; (Daylight, The relative value of the spectral distribution in the ultraviolet region is small; Color temperature: 6774K)
- OD65 Standard illuminant D65 (Daylight, Color temperature: 6504K)
- OD50 Standard illuminant D50 (Daylight, Color temperature: 5003K)
- OID65
- OID50
- OF2 Cool white (fluorescent lamp)
- OF6 Cool white (fluorescent lamp)
- OF7 Color rendering A daylight white (fluorescent lamp)
- OF8 Color rendering AAA natural white (fluorescent lamp)
- OF10 3-band type natural white (fluorescent lamp)
- OF11 3-band type cool white (fluorescent lamp)
- OF12 3-band type warm white (fluorescent lamp)



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Color Settings> screen.

#### Notes

If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Color Settings> screen without changing the setting.



## Illuminant 2

Select the secondary illuminant used for MI (metamerism index) calculation, etc.

### [Setting Procedure]

Start the procedure from the <Color Settings> screen.

1. Use the or button of the cross key to move the cursor to the desired "Illuminant 2" and then press the [OK/Edit] button.

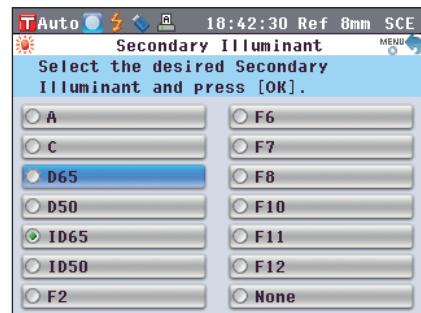
The <Secondary Illuminant> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

○ The setting values are the same as those for "Illuminant 1" and "None".



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Color Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/EDIT] button, you return to the <Color Settings> screen without changing the setting.



# Color Difference Target Color Data Operation

## Settings

To measure the color difference between two specimens, the color of one of the specimens must be set as the target color. The CM-5 can store up to 1,000 target colors.

When using the instrument alone, measure a target specimen by following the procedure below and set the result as the target color.

- Memo**
- Target colors are stored with setting numbers from 0001 to 1000 being assigned. Even when the data at some midpoint is deleted, these setting numbers do not change. It is useful to group data by assigning numbers of specific digits.
  - To set more accurate target color data, use averaging to measure the target specimen. For details, refer to “Average Measurement” on page 114.

- Notes**
- Be sure to perform white calibration before setting target colors.
  - To ensure measurement accuracy, make sure to keep ambient conditions (temperature, etc.) constant.

### [Setting Procedure]

- From the <Sample> screen, press the [Target/Sample] button.

The <Target> screen is displayed.

- Pressing the [Detail/List] button switches between the <Target> screen and <Target List> screen.

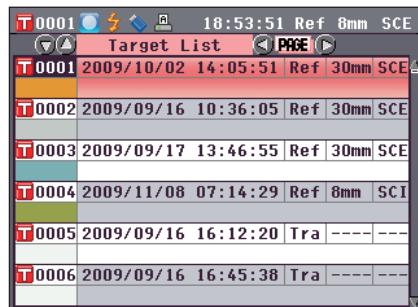


This screenshot shows the Target screen of the CM-5 software. At the top, it displays the date and time (2009/10/02 14:05:51), reference conditions (Ref 30mm SCE), and the current target number (T 0001). Below this, the text "Target" is centered. The main area shows color data for a target specimen measured at 10°/D65:

L*	73.95
C*	76.83
h	74.23

- Use the or button of the cross key to move to a desired target color No.

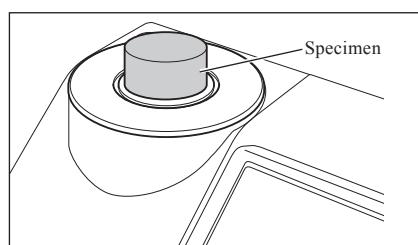
- Notes**
- Unlike measured data, the numbers assigned to target color data do not change automatically. When you measure colors continuously to set target colors, you need to move the cursor manually to set each data.



This screenshot shows the Target List screen of the CM-5 software. At the top, it displays the date and time (2009/10/02 14:05:51), reference conditions (Ref 30mm SCE), and the text "Target List". Below this, the text "PAGE" is centered. The main area lists six target entries:

	Date	Time	Ref	Condition
T 0001	2009/10/02	14:05:51	Ref	30mm SCE
T 0002	2009/09/16	10:36:05	Ref	30mm SCE
T 0003	2009/09/17	13:46:55	Ref	30mm SCE
T 0004	2009/11/08	07:14:29	Ref	8mm SCI
T 0005	2009/09/16	16:12:20	Tra	----
T 0006	2009/09/16	16:45:38	Tra	----

- Place a specimen on the Target Mask or Transmittance Specimen Chamber according to the measurement type.



4. Make sure that  (Ready to measure) is displayed or the Ready lamp is green, and then press the measuring button.

The specimen is measured and the result is displayed on the screen.

**Notes** If you selected a number to which target color data has already been set, a message is displayed to confirm overwriting.

5. To set more target colors, repeat steps 2 to 4.

T	0001	18:59:23	Ref	8mm	SCE
T	0001	2009/11/09 18:57:28	Ref	8mm	SCE
T	0002	2009/09/16 10:36:05	Ref	30mm	SCE
T	0003	2009/09/17 13:46:55	Ref	30mm	SCE
T	0004	2009/11/08 07:14:29	Ref	8mm	SCI
T	0005	2009/09/16 16:12:20	Tra	----	---
T	0006	2009/09/16 16:45:38	Tra	----	---



# Editing Target Color Data

The <Target Data Function> screen allows the following operations for target color data.

## “Current” tab

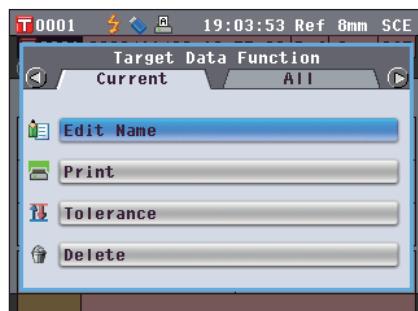
- Edit Name: Name the target color data.
- Print: Print the target color data.
- Tolerance: Specify the tolerance (box tolerance) used for pass/fail judgment of measured data.
- Delete: Delete the target color data.

## “All” tab

- Save: Save all target color data to the USB memory device. This option can be selected only when a USB memory device has been connected.
- Default Tolerance: Before setting tolerance for individual target color data, set default tolerance to be applied to all target color data in common.
- Data Protect: Disable the deletion or editing of the target color data. When the data protection is set, you cannot select “Edit Name”, “Tolerance”, “Delete” and “Delete All” on the <Target Data Function> screen.
- Delete All: Delete all target color data when the data protection is not set.

## [Setting Procedure]

1. On the <Target> screen, press the [OK/Edit] button.  
The <Target Data Function> screen is displayed.



2. Use the or button of the cross key to select the tab, use the or button to move the cursor to the desired item to set or start, and then press the [OK/Edit] button.

The setting screen for the selected item is displayed.  
For the setting procedure of each item, refer to the following sections.



3. On the <Target Data Function> screen, press the [Back] button to return to the <Target> screen.

L*	74.90
C*	40.62
h	71.80

## Edit Name

Name the target color data.

### [Procedure]

Start the procedure from the <Target Data Function> screen.

1. Use the **◀** or **▶** button of the cross key to select the “Selected Data” tab, use the **▲** or **▼** button to move the cursor to “Edit Name”, and then press the [OK/Edit] button.

The <Edit Name> screen is displayed.



2. Use **◀** and **▶** or **▲** and **▼** buttons of the cross key to move the cursor around the characters and then press the [OK/Edit] button.

- Up to 20 characters can be used.
- The selected character is displayed in the text box.



3. Repeat Step 2 until you have entered the necessary characters.

- You can use the **▲** or **▼** button of the cross key to move the blue box cursor on the text box.

In this status, you can move the character position and modify the character by pressing the **◀** or **▶** button of the cross key.



4. When you are finished entering characters, use **◀** and **▶** or **▲** and **▼** buttons of the cross key to move the cursor to “Save” and then press the [OK/Edit] button.

The setting is confirmed and the screen returns to the <Target> screen.



**[Memo]** If you press the [Back] button during the setting, “Save change?” is displayed. When you place the cursor on “OK” and press the [OK/Edit] button, the setting details are confirmed and the screen returns to the <Target> screen. When you place the cursor on “Cancel” and press the [OK/Edit] button, the setting details are not changed and the screen returns to the <Target Data Functions> screen.



## Print

Print the target color data.

You need to connect the instrument to a serial printer in advance. For the connection of the instrument and a serial printer, refer to “Printer Connection” (Page 124).

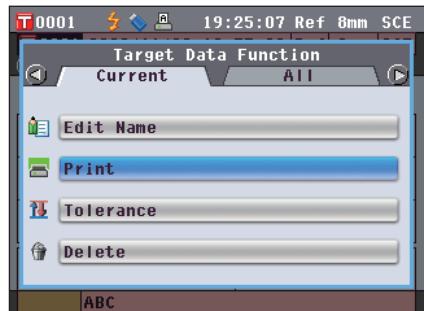
**Notes**

- If the connection is not established properly, printing is disabled.
- Even if the connection has been correctly established, printing may fail for reasons such as the printer is turned off when printing is attempted.

### [Procedure]

Start the procedure from the <Target Data Function> screen.

1. Use the or button of the cross key to select the “Current” tab, and use the or button to move the cursor to “Print”.



2. Press the [OK/Edit] button. The <Print Target Data> screen is displayed and the data is printed from the connected printer.

- When the printing is complete, the screen returns to the <Target> screen.

**Notes** The <Print Target Data> screen is also displayed for the case where printing will not be processed properly such as when the printer connection is incorrect.

## Tolerance Setting

Specify the tolerance used for pass/fail judgment of measured data for each target color.

- Memo**
- Before tolerance is specified for individual target colors, the instrument is set with default tolerance. For details, refer to page 74 “Default Tolerance Setting”.
  - The tolerance setting items are the same as those for the color space or index currently selected for the display conditions.
  - With the optional Color Management Software “SpectraMagic™ NX”, you can set or use the color difference tolerance easily.

### [Setting Procedure]

Start the procedure from the <Target Data Functions> screen.

- Use the  $\blacktriangleleft$  or  $\triangleright$  button of the cross key to select the “Current” tab, use the  $\blacktriangleup$  or  $\blacktriangledown$  button to move the cursor to “Tolerance”, and then press the [OK/Edit] button.

The <Tolerance> screen is displayed.



- Use  $\blacktriangleleft$  and  $\triangleright$  or the  $\blacktriangleup$  and  $\blacktriangledown$  button of the cross key to move the cursor to the desired item.



- Press the [OK/Edit] button to change the details.

- When the selected item is not currently checked, pressing the [OK/Edit] button causes the item to be checked, and you can change the setting value.
- When the selected item is not currently checked, pressing the [OK/Edit] button causes the item to be checked. Press the  $\blacktriangleright$  button of the cross key to move the blue box cursor to the setting value area. When you press the [OK/Edit] button, the cursor appears on the value. Press the  $\blacktriangleleft$  or  $\triangleright$  button of the cross key to change the value.

**Memo** You can move the cursor between the digits of the value by pressing the  $\blacktriangleleft$  or  $\triangleright$  button of the cross key.



### Settings

○0.1 to 20.0

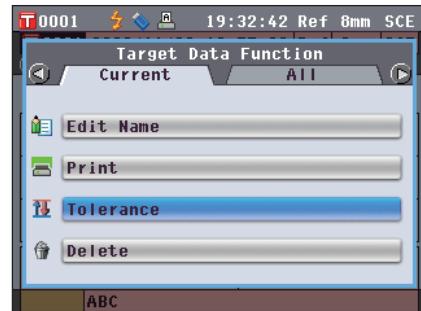
\* Settings of x and y are 0.001 to 0.200.

- You need to press the [OK/Edit] button to confirm the change every time you change the setting of an item.

4. When you finish all settings, press the **●** button or the [MENU] button of the cross key to move the cursor on “Save”, and then press the [OK/Edit] button.

The setting is confirmed and the screen returns to the <Target Data Function> screen.

**Memo** If you press the [Back] button during the setting, the <Save Confirmation> screen is displayed. When you place the cursor on “OK” and press the [OK/Edit] button, the setting details are confirmed. When you place the cursor on “Cancel” and press the [OK/Edit] button, the setting details are not changed. After that, the screen returns to the <Target Data Function> screen.



## Delete

Delete the target color data.

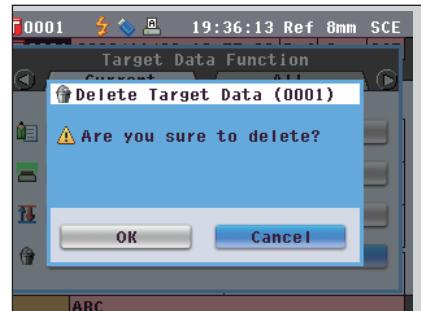
**Notes** When the data is protected, you cannot select “Delete” on the <Target Data Function> screen.

### [Procedure]

Start the procedure from the <Target Data Function> screen.

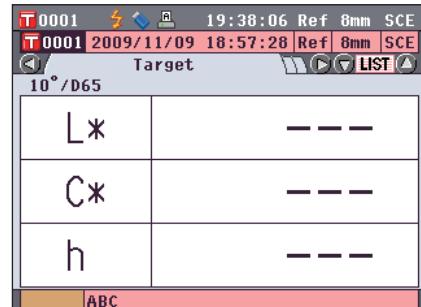
1. Use the **◀** or **▶** button of the cross key to select the “Selected Data” tab, use the **▲** or **▼** button to move the cursor to “Delete”, and then press the [OK/Edit] button.

The <Delete Target Data> screen is displayed.



2. Use the **◀** button of the cross key to move the cursor to “OK” and press the [OK/Edit] button. The data is deleted.

- When the deletion is complete, the screen returns to the <Target> screen.
- When you place the cursor on “Cancel” and press the [OK/Edit] button, the deletion is canceled and the screen returns to the <Target Data Function> screen.



## Save to USB memory device

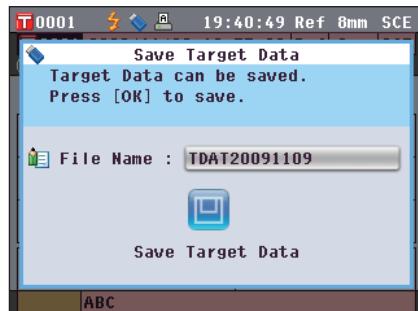
Save all target color data stored in the instrument to the USB memory device.

You need to connect a USB memory device to the instrument in advance. For the connection of a USB memory device, refer to page 121 “Connecting a USB Memory”.

### [Setting Procedure]

Start the procedure from the <Target Data Functions> screen.

1. Use the or button of the cross key to select the “All” tab, use the or button to move the cursor to “Save”, and then press the [OK/Edit] button.  
The <Save Target Data> screen is displayed with a suggested file name being entered.



2. To change the file name, use the or button of the cross key to move the cursor to “File Name” and then press the [OK/Edit] button.

The <File Name Functions> screen is displayed.



3. Use and or and buttons of the cross key to move the cursor around the characters and then press the [OK/Edit] button.

The selected character is displayed in the text box.



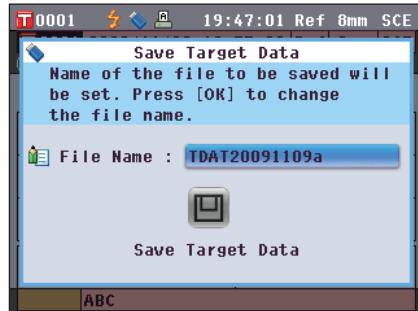
**4. Repeat Step 3 until you enter necessary characters.**

- You can use the or button of the cross key to move the blue box cursor on the text box. In this status, you can move the character position and modify the character by pressing the or button of the cross key.
- Up to 20 characters can be used.



**5. When you are finished entering characters, use and or and buttons of the cross key to move the cursor to "Save" and then press the [OK/Edit] button. The setting is confirmed and the screen returns to the <Save Target Data> screen.**

**[Memo]** If you press the [Back] button during the setting, "Do you want to save the changes?" is displayed. When you place the cursor on "OK" and press the [OK/Edit] button, the setting details are confirmed and the screen returns to the <Save Target Data> screen. When you place the cursor on "Cancel" and press the [OK/Edit] button, the setting details are not changed and the screen returns to the <Save Target Data> screen.



**6. To accept the displayed file name, use the or button of the cross key to move the cursor to "Save Target Data" and then press the [OK/Edit] button.**

- The <Saving...> screen is displayed.
- When the saving is complete, the screen returns to the <Target> screen.

Target	
10°/D65	
L*	74.90
C*	40.62
h	71.80

## Default Tolerance Setting

This instrument allows tolerance setting for individual target color data. Before setting such individual tolerance, the instrument is set with default tolerance. This section describes the procedure to set default tolerance.

- Memo**
- Before tolerance is specified for individual target colors, the instrument is set with default tolerance.
  - When you change default tolerance after tolerance has been set for individual target colors, the tolerance specified for these target colors will not be changed.
  - With the optional Color Management Software “SpectraMagic™ NX”, you can set or use the color difference tolerance easily.
  - The default tolerance setting items are the same as those of the color space or index currently selected for the display conditions.

### [Setting Procedure]

Start the procedure from the <Target Data Function> screen.

- Use the  $\blacktriangleleft$  or  $\triangleright$  button of the cross key to select the “All” tab, use the  $\blacktriangleup$  or  $\blacktriangledown$  button to move the cursor to “Tolerance (Def.)”, and then press the [OK/Edit] button.

The <Tolerance (Def.)> screen is displayed.



- Use the  $\blacktriangleup$  and  $\blacktriangledown$  button of the cross key  $\blacktriangleleft$  or  $\triangleright$  to move the cursor to the desired item.



- Press the [OK/Edit] button to change the details.

- When the selected item is not currently checked, pressing the [OK/Edit] button causes the item to be checked, and you can change the setting value.
- When the selected item is not currently checked, pressing the [OK/Edit] button makes the item be checked. Press the  $\blacktriangleright$  button of the cross key to move the blue box cursor to the setting value area. When you press the [OK/Edit] button, the cursor appears on the value. Press the  $\blacktriangleleft$  or  $\blacktriangleright$  button of the cross key to change the value.

**Memo** You can move the cursor between the digits of the value by pressing the  $\blacktriangleleft$  or  $\blacktriangleright$  button of the cross key.



### Settings

○0.1 to 20.0

\* Settings of x and y are 0.001 to 0.200.

- You need to press the [OK/Edit] button to confirm the change every time you change the setting of an item.

4. When you finish all settings, press the  button or the [MENU] button of the cross key to move the cursor on “Save”, and then press the [OK/Edit] button.

The setting is confirmed and the screen returns to the <Target Data Function> screen.

**Memo** If you press the [Back] button during the setting, the <Save Confirmation> screen is displayed. When you place the cursor on “OK” and press the [OK/Edit] button, the setting details are confirmed. When you place the cursor on “Cancel” and press the [OK/Edit] button, the setting details are not changed. After that, the screen returns to the <Target Data Function> screen.



## Data Protection

You can specify data protection so that the saved target color setting will not be deleted or changed by accident. When the data protection is set, you cannot select “Edit Name”, “Tolerance”, “Delete” and “Delete All” on the <Target Data Function> screen.

### [Setting Procedure]

Start the procedure from the <Target Data Function> screen.

1. Use the  or  button of the cross key to select the “All” tab, use the  or  button to move the cursor to “Data Protect”, and then press the [OK/Edit] button.  
The <Data Protect> screen is displayed.

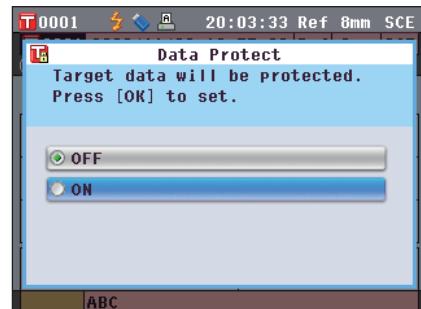


2. Use the  or  button of the cross key to move the cursor to the desired item.

#### Settings

ON: Protect the data.

OFF: Do not protect the data.



### 3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Target> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Target Data Function> screen without changing the setting.

This screenshot shows the Target Data Function screen. At the top, it displays the date and time (2009/11/09 18:57:28), refraction (8mm), and sclera (SCE). Below this, the word "Target" is centered. The main area shows three rows of target data: L\* (74.90), C\* (40.62), and h (71.80). The bottom of the screen has a pink bar labeled "ABC".

L*	74.90
C*	40.62
h	71.80

## Delete All

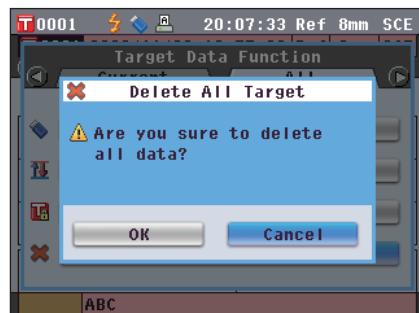
Delete all the target color data which have been set.

**Notes** When the data is protected, you cannot select “Delete All” on the <Target Data Function> screen.

### [Setting Procedure]

Start the procedure from the <Target Data Function> screen.

1. Use the or button of the cross key to select the “All” tab, use the or button to move the cursor to “Delete All”, and then press the [OK/Edit] button.  
The <Delete All Target> screen is displayed.



2. Use the button of the cross key to move the cursor to “OK” and press the [OK/Edit] button. The data is deleted.
  - When the all data is deleted, the screen returns to the <Target> screen.
  - When you place the cursor on “Cancel” and press the [OK/Edit] button, all data deletion is canceled and the screen returns to the <Target Data Function> screen.

This screenshot shows the Target Data Function screen after all data has been deleted. The target data rows for L\*, C\*, and h now show dashed lines instead of numerical values. The bottom of the screen has a pink bar labeled "ABC".

L*	---
C*	---
h	---

# Other Settings

## Setting Automatic White Calibration (100% Calibration) to ON/OFF

Set whether to perform white calibration (100% Calibration) automatically when the power switch of the instrument is set to ON.

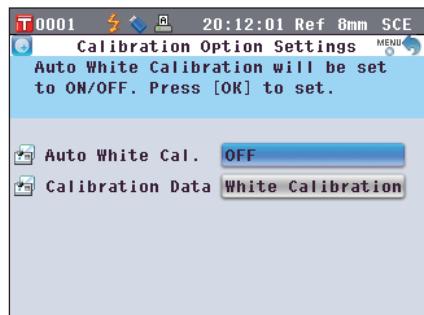
### [Setting Procedure]

1. Press the [MENU] button.  
The <Configuration> screen is displayed.



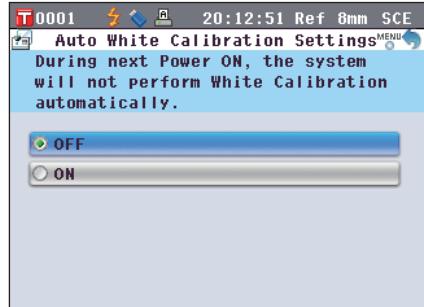
2. Use the **▲** or **▼** button of the cross key to move the cursor to “Calibration Options” and then press the [OK/Edit] button.

The <Calibration Option Settings> screen is displayed.  
The <Calibration Option Settings> screen shows the current setting of each item.



3. Use the **▲** or **▼** button of the cross key to move the cursor to “Automatic White Cal.” and then press the [OK/Edit] button.

The <Auto White Calibration Settings> screen is displayed.



4. Use the or button of the cross key to move the cursor to the desired item.

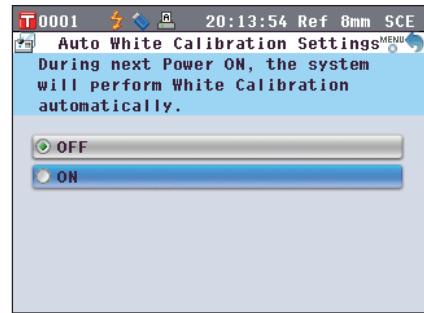
#### Settings

- OFF : Disable automatic white calibration (100% Calibration) the next time the instrument is turned ON (the power switch is set to ON).
- ON : Enable automatic white calibration (100% Calibration) the next time the instrument is turned ON (the power switch is set to ON).

#### Memo

When you set automatic white calibration to ON, white calibration (100% calibration) is automatically performed after the power switch of the instrument is set to ON before the <Welcome to Easy Setup Wizard!> screen appears. If you have disabled the display of the <Welcome to Easy Setup Wizard!> screen, the <Sample> screen is displayed immediately after the instrument is turned ON and white calibration (100% calibration) is performed. This allows you to start measurement quickly. This function is useful when you always perform measurement using the same condition settings.

For the procedure of disabling the display of the <Welcome to Easy Setup Wizard!> screen, refer to page 86.

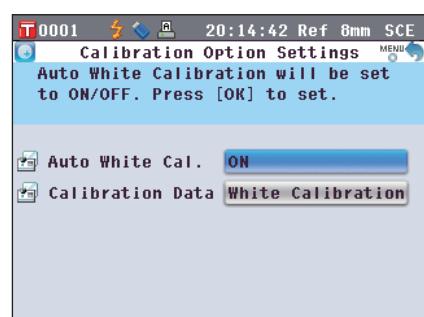


5. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Calibration Option Setting> screen.

#### Notes

If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Calibration Option Settings> screen without changing the setting.



6. After you set the calibration options, press the [Back] button to return to the <Configuration> screen.



# Setting the Measurement Result Display

To set details about the measurement result display, select “Graph” from the <Configuration> screen.

## [Setting Procedure]

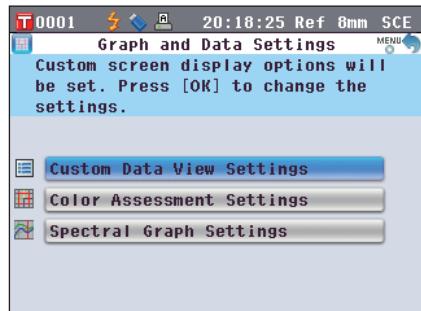
1. Press the [MENU] button.

The <Configuration> screen is displayed.

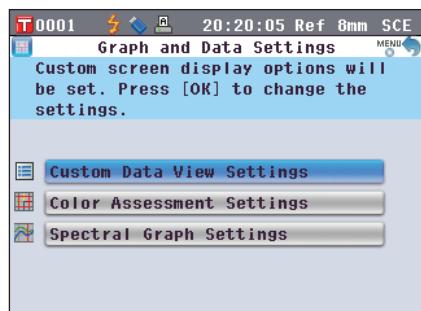


2. Use the or button of the cross key to move the cursor to “Graph” and then press the [OK/Edit] button.

The <Graph and Data Settings> screen is displayed.



3. After you set the graph display options, press the [Back] button to return to the <Graph and Data Settings> screen.



## Setting the Custom Data Screen to ON/OFF

The measurement result display function allows you to switch between various screens including “**Absolute**” or “**Difference**”. You can add the “**Custom Data**” screen showing your desired items to these screens. This section describes the procedure to set whether to display this “**Custom Data**” screen.

**Memo** / To set the items displayed on the “Custom” screen, you need to use the optional Color Management Software SpectraMagic™ NX. For details, refer to the instruction manual of SpectraMagic™ NX.

### [Setting Procedure]

Start the procedure from the <Graph and Data Settings> screen.

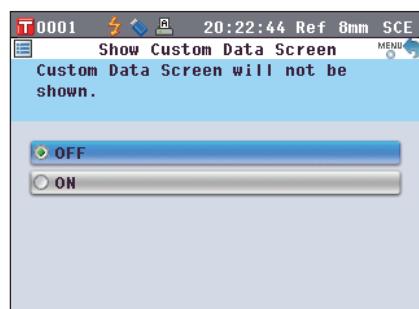
1. Use the or button of the cross key to move the cursor to “Custom Data View Settings” and then press the [OK/Edit] button.

The <Custom Data View Settings> screen is displayed.



2. Press the [OK/Edit] button.

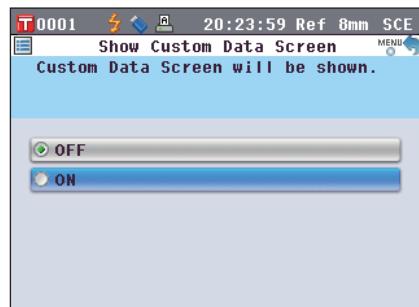
The <Show Custom Data Screen> screen is displayed.



3. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

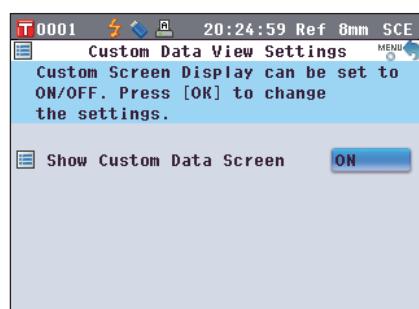
- OFF : The “Custom Data” screen is not displayed as the measurement result screen.
- ON : The “Custom Data” screen is displayed as one of the measurement result screens.



4. Press the [OK/Edit] button.

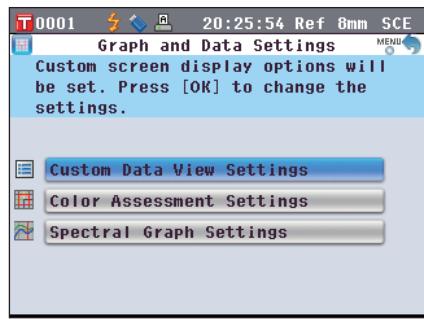
The selection is confirmed and the screen returns to the <Custom Data View Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Custom Data View Settings> screen without changing the setting.



**5. Press the [Back] button.**

The screen returns to the <Graph and Data Settings> screen.



## Setting the Assess. Graph Screen to ON/OFF

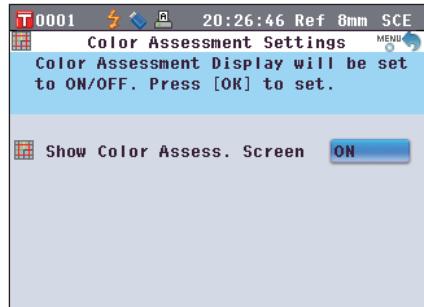
The measurement result display function allows you to switch between various screens including “**Absolute**” or “**Difference**”. You can add the “**Assess. Graph**” screen based on tone data to these screens. This section describes the procedure to set whether to display this “**Assess. Graph**” screen.

**[Setting Procedure]**

Start the procedure from the <Graph and Data Settings> screen.

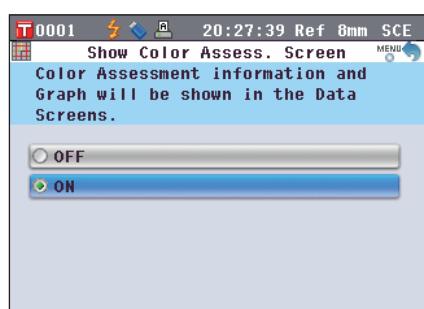
1. Use the or button of the cross key to move the cursor to “Color Assessment Settings” and then press the [OK/Edit] button.

The <Color Assessment Settings> screen is displayed.



2. Press the [OK/Edit] button.

The <Show Color Assess.> screen is displayed.



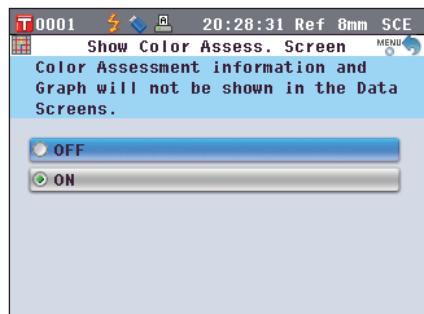
3. Use the or button of the cross key to move the cursor to the desired item.

**Settings**

- OFF : The <Assess. Graph> screen is not displayed as the measurement result screen.
- ON : The <Assess. Graph> screen is displayed as one of the measurement result screens.

**[Memo]**

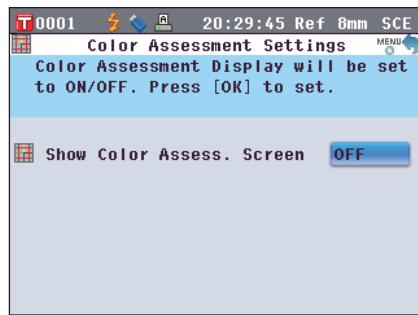
When the color assessment is set to ON, the <Assess. Graph> screen is displayed instead of the <Diff.Graph> screen. Moreover, color assessment is added to the <Difference> screen.



#### 4. Press the [OK/Edit] button.

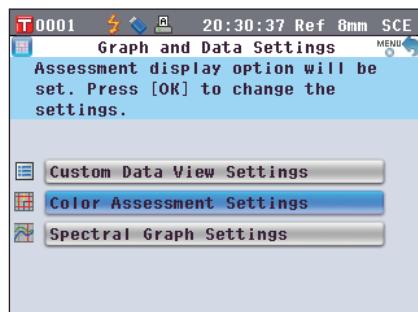
The selection is confirmed and the screen returns to the <Color Assessment Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Color Assessment Settings> screen without changing the setting.



#### 5. Press the [Back] button.

The screen returns to the <Graph and Data Settings> screen.



## Setting the Spectral Graph Data Display

The measurement result display function allows you to switch between various screens including "Absolute" and "Difference", and the "Spectral" screen which shows a spectral graph is one of them.

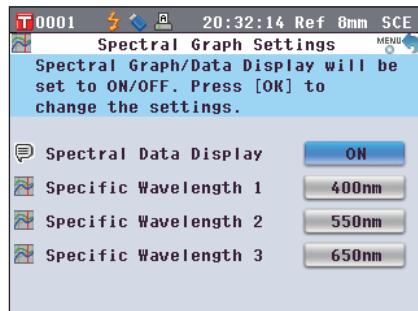
This section describes the procedure to set whether to show spectral data on this "Spectral" screen.

### [Setting Procedure]

Start the procedure from the <Graph and Data Settings> screen.

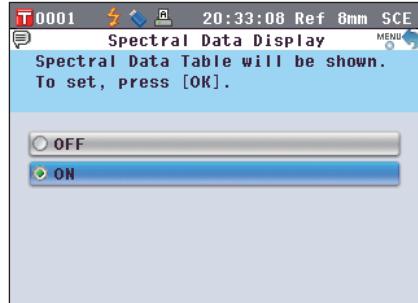
#### 1. Use the or button of the cross key to move the cursor to "Spectral Graph Settings" and then press the [OK/Edit] button.

The <Spectral Graph Settings> screen is displayed.



#### 2. Use the or button of the cross key to move the cursor to "Spectral Data Display" and then press the [OK/Edit] button.

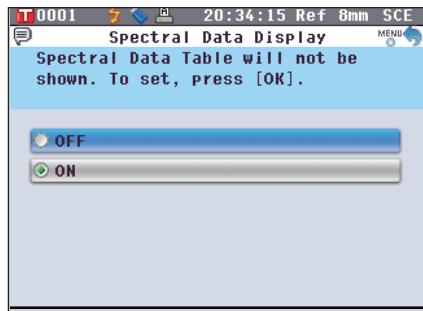
The <Spectral Data Display> screen is displayed.



3. Use the or button of the cross key to move the cursor to the desired item.

**Settings**

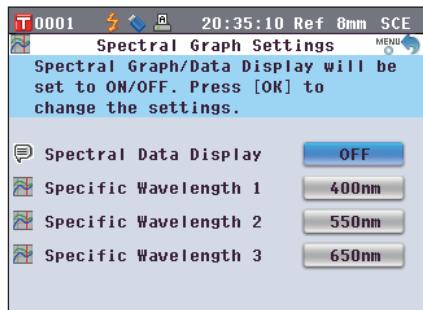
- OFF : Spectral data is not displayed on the “Spectral” screen.
- ON : Spectral data is displayed on the “Spectral” screen. The spectral data to be displayed can be selected for up to three wavelengths.



4. Press the [OK/Edit] button.

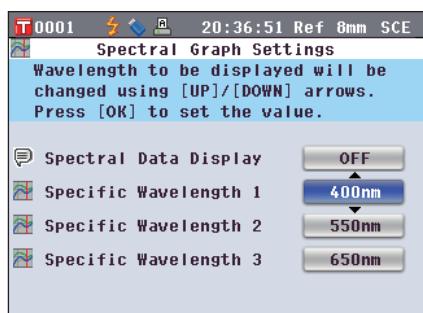
The selection is confirmed and the screen returns to the <Spectral Graph Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Spectral Graph Settings> screen without changing the setting.



5. To change the wavelength of the spectral data to be displayed, use the or button of the cross key to move the cursor to “Specific Wavelength 1” and then press the [OK/Edit] button.

The cursor color turns to blue and and are displayed above and below the cursor.



6. Use the or button of the cross key to change the wavelength.

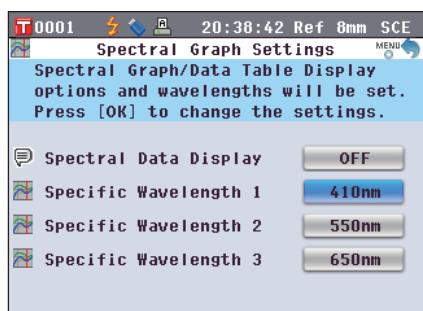
- The wavelength increases/decreases by 10 nm with each button press.
- Holding down the or button of the cross key increases/decreases the wavelengths by 10 nm continuously.



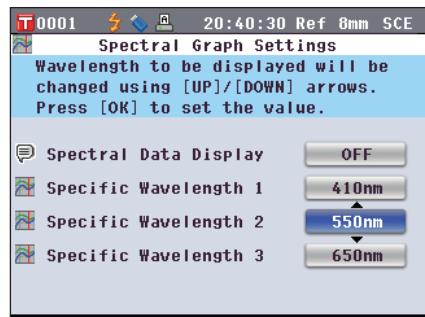
7. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Spectral Graph Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Spectral Graph Settings> screen without changing the setting.

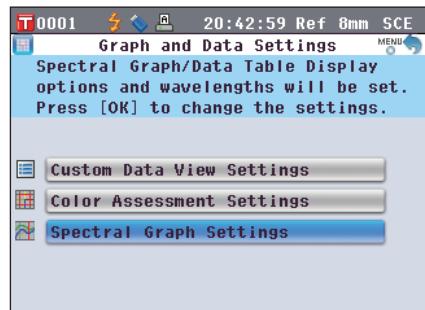


8. Repeat Steps 5 to 7 for “Specific Wavelength 2” and “Specific Wavelength 3”.



9. When all of the necessary changes have been made, press the [Back] button.

The screen returns to the <Graph and Data Settings> screen.



# Setting the Screen Options

To set screen options, select “Screen Option” from the <Configuration> screen.

## [Setting Procedure]

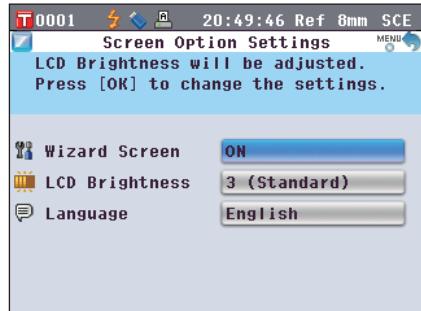
### 1. Press the [MENU] button.

The <Configuration> screen is displayed.



### 2. Use the or button of the cross key to move the cursor to “Screen Option” and then press the [OK/Edit] button.

The <Screen Option Settings> screen is displayed.



### 3. After you set the screen options, press the [Back] button to return to the <Configuration> screen.



## Setting the Quick Setting Wizard Display to ON/OFF

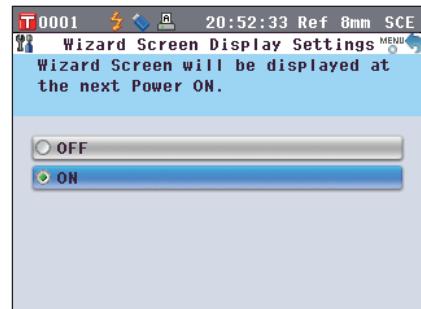
When the power switch of the instrument is set to ON, the <Welcome to Easy Setup Wizard!> screen is normally displayed and you can set the measurement conditions and calibrate the instrument step by step by following the instructions on the screen. This section describes the procedure to set whether to display this <Welcome to Easy Setup Wizard!> screen.

### [Setting Procedure]

Start the procedure from the <Screen Option Settings> screen.

1. Use the or button of the cross key to move the cursor to "Wizard Screen" and then press the [OK/Edit] button.

The <Wizard Screen Display Settings> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

- OFF : Do not display the <Welcome to Easy Setup Wizard!> screen the next time the instrument is turned ON (the power switch is set to ON).
- ON : Display the <Welcome to Easy Setup Wizard!> screen the next time the instrument is turned ON (the power switch is set to ON).

**Memo** When OFF is selected, the <Welcome to Easy Setup Wizard!> screen is not displayed after the power switch of the instrument is set to ON.

If you have set automatic white calibration to ON, white calibration (100% Calibration) is performed automatically after the instrument is turned ON, and then the <Sample> screen is displayed. This allows you to start measurement quickly. This function is useful when you always perform measurement using the same condition settings.

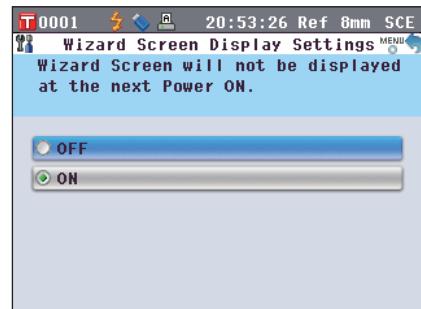
For the procedure to enable automatic white calibration, refer to page 77.

3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Screen Option Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Screen Option Settings> screen without changing the setting.

**Memo** Whether to display the wizard can also be set by selecting or unselecting "Yes" for "Show Quick Setting Wizard every time." on the <Welcome to Easy Setup Wizard!> screen.



## Setting the LCD Brightness

The brightness of the LCD can be set in five levels. Selecting a darker level is effective for power saving.

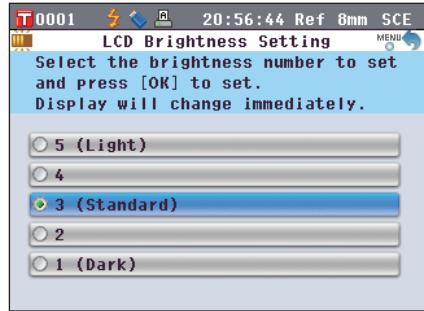
**Memo** / The brightness level is factory-set to “3 (Standard)”.

### [Setting Procedure]

Start the procedure from the <Screen Option Settings> screen.

1. Use the or button of the cross key to move the cursor to “LCD Brightness” and then press the [OK/Edit] button.

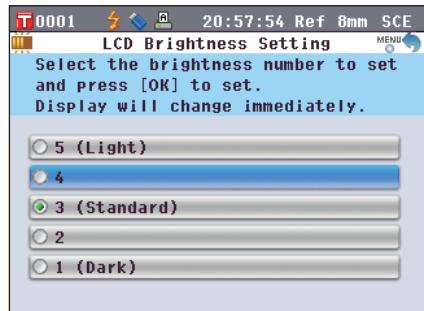
The <LCD Brightness Setting> screen is displayed.



2. Use the or button of the cross key to move the cursor to the desired item.

Settings

- 5 (Light)
- 4
- 3 (Standard)
- 2
- 1 (Dark)



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Screen Option Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Screen Option Settings> screen without changing the setting.



## Setting the Display Language

The display language can be changed from the factory-set language. Available languages are: English, Japanese, German, French, Spanish, Italian, and Chinese.

**Memo** / The language is factory-set to “English”.

**Notes** When the backup battery of the instrument has gone dead, the display language is reset to “English” regardless of the factory-set language.

### [Setting Procedure]

Start the procedure from the <Screen Option Settings> screen.

1. Use the or button of the cross key to move the cursor to “Language” and then press the [OK/Edit] button.

The <Language> screen is displayed.



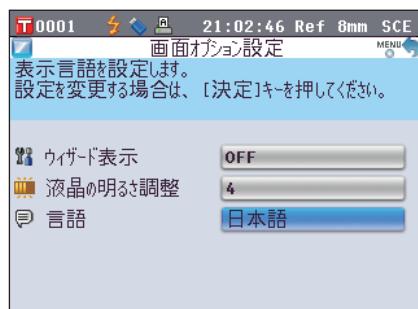
2. Use the or button of the cross key to move the cursor to the desired item.



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Screen Option Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Screen Option Settings> screen without changing the setting.



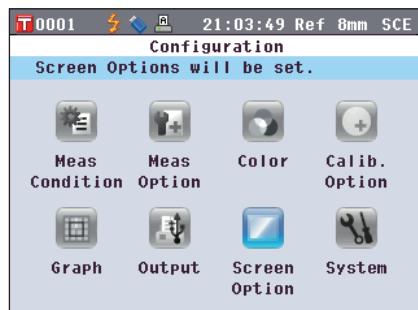
# Setting the Date and Time

To set date and time, select “System” from the <Configuration> screen.

## [Setting Procedure]

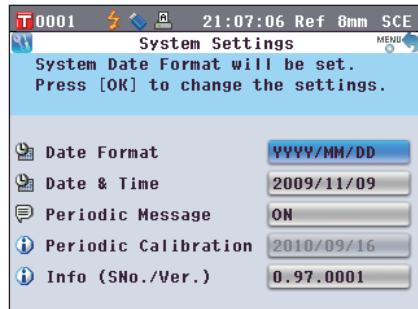
1. Press the [MENU] button.

The <Configuration> screen is displayed.



2. Use the ▲ or ▾ button of the cross key to move the cursor to “System” and then press the [OK/Edit] button.

The <System Settings> screen is displayed.



3. After you set the screen options, press the [Back] button to return to the <Configuration> screen.



# Setting the Clock

This instrument has a built-in clock to record the date and time of measurement. Since the date and time have been set at the factory, you do not need to change them under normal conditions. If necessary, you can change the date and time settings.

## [Setting Procedure]

Start the procedure from the <System Settings> screen.

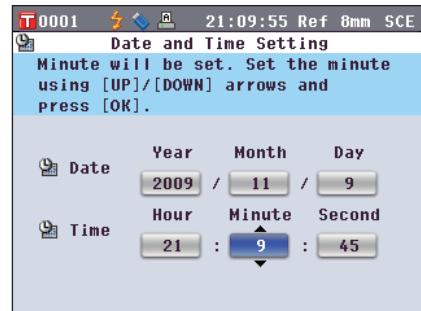
1. Use the ▲ or ▾ button of the cross key to move the cursor to “Date & Time” and then press the [OK/Edit] button.

The <Data and Time Setting> screen is displayed.



2. Use the or button of the cross key to move the cursor to a desired item and then press the [OK/Edit] button.

The cursor color turns to blue and and are displayed above and below the cursor.



3. Use the or button of the cross key to change the value.

#### Settings

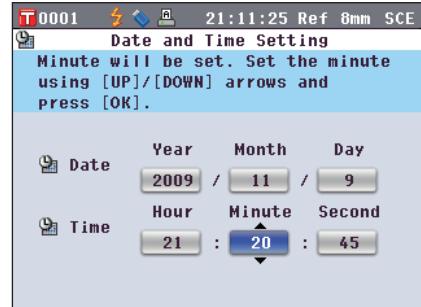
- Year : 2009 to 2050
- Month : 1 to 12
- Day : 1 to 28, 29, 30 and 31 (varies with the selected month/year)
- Hour : 0 to 23
- Minute : 0 to 59
- Second : 0 to 59

- The value increases/decreases by one with each button press.
- Holding down the or button of the cross key increases/decreases the value by one continuously.

4. Press the [OK/Edit] button.

The setting is confirmed.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, the setting is not changed.

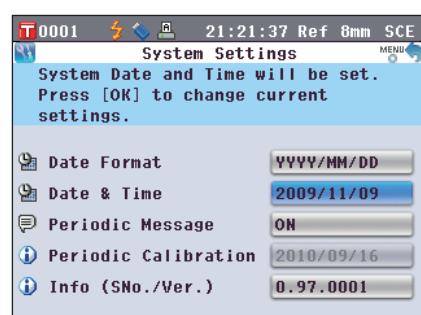


5. Repeat Steps 2 to 5 for each of the date (Year/Month/Day) and time (Hour:Minute:Second) parameters.



6. When all of the necessary changes have been made, press the [Back] button.

The screen returns to the <System Settings> screen.



## Setting the Date Format

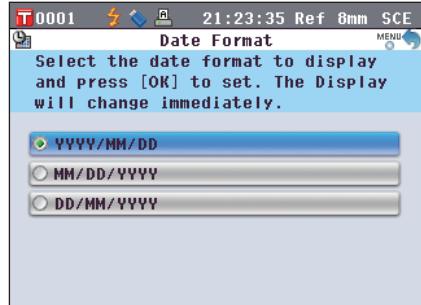
You can change the format of the date displayed on the screen.

### [Setting Procedure]

Start the procedure from the <System Settings> screen.

1. Use the **▲** or **▼** button of the cross key to move the cursor to “Date Format” and then press the [OK/Edit] button.

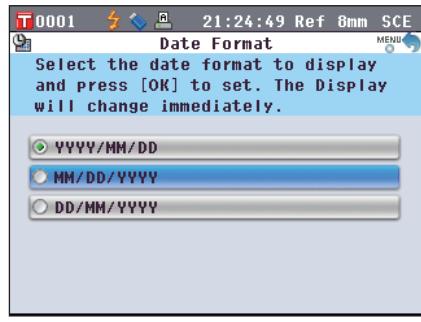
The <Date Format> screen is displayed.



2. Use the **▲** or **▼** button of the cross key to move the cursor to the desired item.

#### Settings

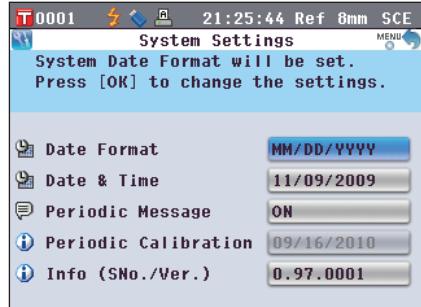
- YYYY/MM/DD : Display the date in the format of year/month/day.
- MM/DD/YYYY : Display the date in the format of month/day/year.
- DD/MM/YYYY : Display the date in the format of day/month/year.



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <System Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <System Settings> screen without changing the setting.



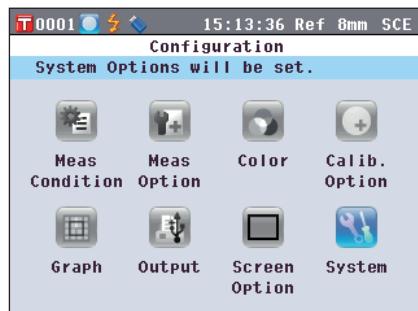
# Batch Setting of Conditions

You can save various conditions (display conditions, measurement conditions, etc.) as a file in advance and set the conditions of the instrument all at once by loading the file.

## [Preparation]

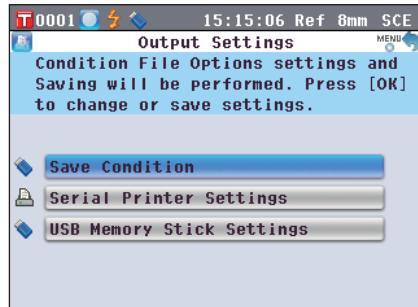
### 1. Press the [MENU] button.

The <Configuration> screen is displayed.



### 2. Use the or and or button of the cross key to move the cursor to “Output” and then press the [OK/Edit] button.

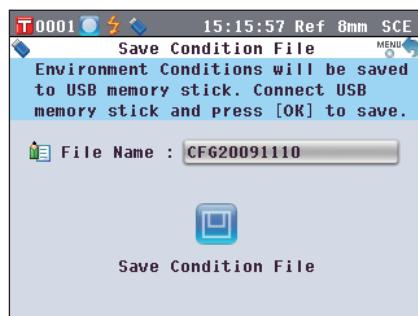
The <Output Settings> screen is displayed.



### 3. Connect a USB memory device to the USB connection terminal, use the or button of the cross key to move the cursor to “Save Condition” and then press the [OK/Edit] button.

The <Save Condition File> screen is displayed with a suggested file name being entered.

**Notes** The “Save Condition” option can be selected only when a USB memory device has been connected.



### 4. To change the file name, use the or button of the cross key to move the cursor to “File Name” and then press the [OK/Edit] button.

The <Edit Name> screen is displayed.



5. Use the or and or buttons of the cross key to move the cursor around the characters and then press the [OK/Edit] button.

The selected character is displayed in the text box.



6. Repeat Step 5 until you have entered the necessary characters.

- You can use the or button of the cross key to move the blue box cursor on the text box. In this status, you can move the character position and modify the character by pressing the or button of the cross key.
- Up to 20 characters can be used.



7. When you are finished entering characters, use the or and or buttons of the cross key to move the cursor to "Save" and then press the [OK/Edit] button.

The settings are confirmed and the screen returns to the <Save Condition File> screen.

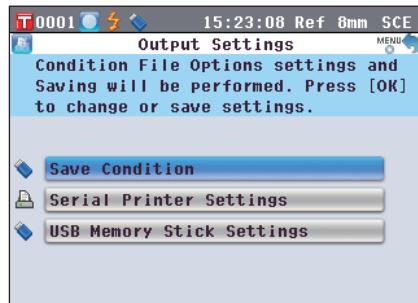
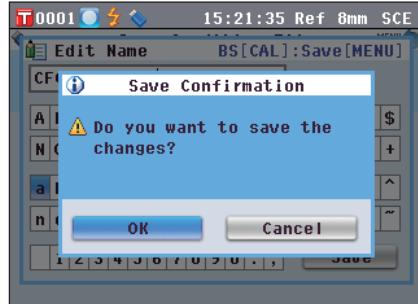
**Memo** If you press the [Back] button during the setting, "Do you want to save the changes?" is displayed. When you place the cursor on "OK" and press the [OK/Edit] button, the setting details are confirmed and the screen returns to the <Save Condition File> screen. When you place the cursor on "Cancel" and press the [OK/Edit] button, the settings are not changed and the screen returns to the <Save Condition File> screen.



8. To accept the displayed file name, use the or button of the cross key to move the cursor to "Save Condition" and then press the [OK/Edit] button.

- The <Saving...> screen is displayed.
- When the saving is complete, the screen returns to the <Output Settings> screen.

**Memo** A condition setting file stores the parameters of the following screens currently set in the instrument.

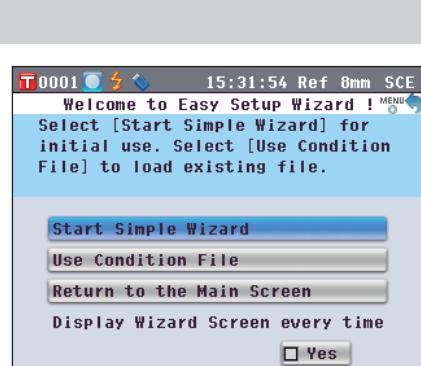


- <Measurement Condition Settings> screen “Meas. Type”, “Meas. Area”, “SCI/SCE”  
 <Measurement Options> screen “Auto Measurement (1-10)”, “Manual Measurement (1-30)”  
 <Color Settings> screen “Color Space”, “Color Index”, “Observer”, “Illuminant 1”, “Illuminant 2”  
 <Calibration Option Settings> screen “Calibration Data”  
 <Graph and Data Settings> screen “Custom Data View Settings”, “Color Assessment Settings”  
 <Output Settings> screen “Serial Printer Settings”, “USB Memory Stick Settings”  
 <Screen Option Settings> screen “LCD Brightness”
- The extension of the condition setting file is “.cdn”.
  - The condition setting file can also be created by using the optional Color Data Software SpectraMagic™ NX. When you create the condition setting file with SpectraMagic™ NX, you can set “User Index” as well as the items above. For details, refer to the instruction manual of SpectraMagic™ NX.

### [Setting Procedure]

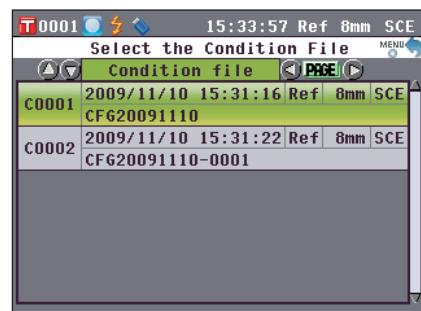
#### 1. Turn the instrument ON.

The <Welcome to Easy Setup Wizard!> screen appears after the initial screen.



#### 2. Connect the USB memory device containing the condition setting file (.cdn) to the USB connection terminal, use the or button of the cross key to move the cursor to “Use Condition File” and then press the [OK/Edit] button.

The <Select the Condition File> screen appears.



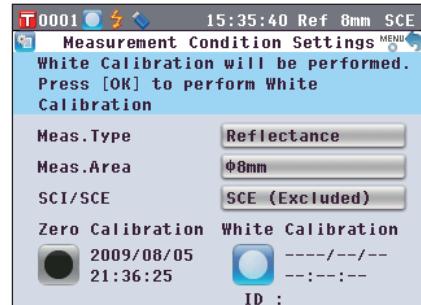
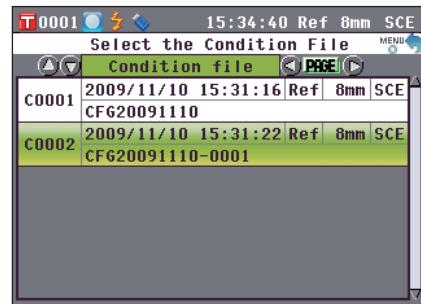
#### 3. Use the or button of the cross key to move the cursor to the desired condition setting file and then press the [OK/Edit] button.

**Memo** When there are six or more files, you can switch the page by using the or button of the cross key.

- The <Loading...> screen is displayed.
- When the condition setting file has been loaded, the <Measurement Condition Settings> screen is displayed.

**Notes**

- After setting the conditions, you need to perform zero calibration (0% Calibration) and white calibration (100% Calibration). Go to page 43 “Calibration”.
- If you change the conditions after the instrument is turned on, you need to perform zero calibration (0% Calibration) and white calibration (100% Calibration) again.



# Chapter 3

## Measurement

3

Measurement

# Measurement

## Notes

- Prior to the start of measurement, be sure to perform white calibration (100% calibration). For details, refer to page 43 "White Calibration (100% Calibration)".
- To display the color difference, it is necessary to set target colors before measurement.
- For accurate measurement, make sure to keep measurement conditions (ambient temperature, etc.) constant.

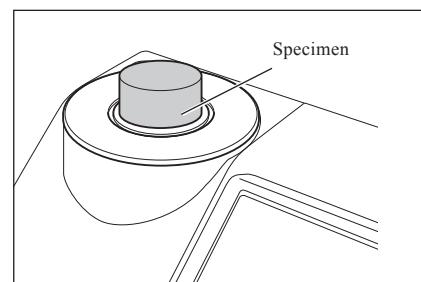
## [Operating Procedure]

- When a screen other than the <Sample> screen is displayed, press the [TARGET/SAMPLE] button.  
The <Sample> screen is displayed.
  - Every time the [Detail/List] button is pressed, the screen is switched between the <Sample> detail screen and <Sample> list screen.

**Memo** Measurement can be performed on either the <Sample> detail screen or <Sample> list screen.

T 0001	09:26:44	Ref	8mm	SCE
S 0072	2009/11/08	07:12:22	Ref	8mm SCI
C Sample LIST				
10°/D65	L*	68.03		
	C*	56.73		
	h	110.72		
			T0004	

- Set the specimen on the Target Mask or Transmittance Specimen Chamber according to the measurement type.



- Make sure that (Measurement possible) is displayed and then press the [MEAS] button.

The specimen is measured and the result is displayed on the screen.

- The sample data No. is automatically assigned sequentially in the order of measurements.

**Memo** When the number of sample data sets stored in the memory reaches 4000, the number assigned to the subsequent sample data will always be No. 4000, and the oldest data will be deleted one at a time.

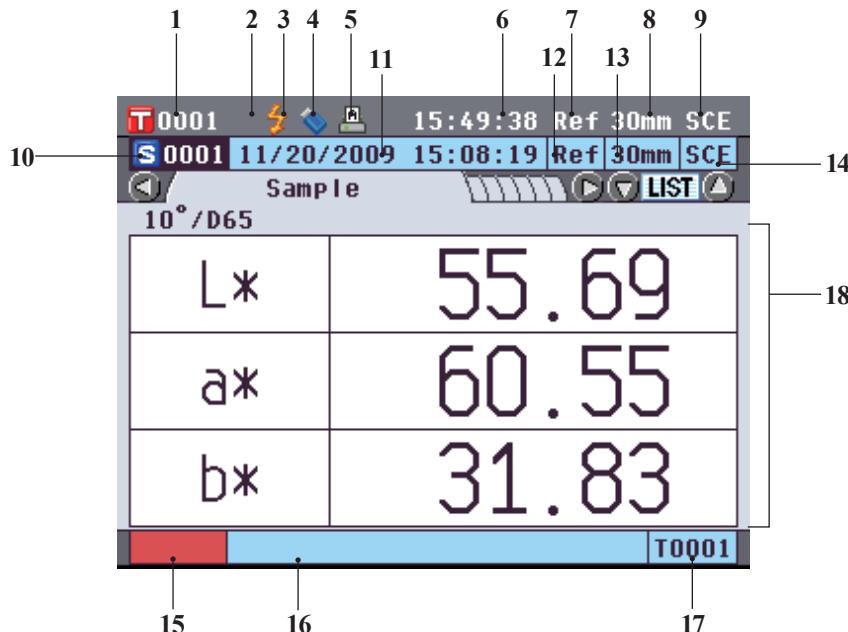
T 0001	09:27:50	Ref	8mm	SCE
S 0073	2009/11/10	09:27:32	Ref	8mm SCE
C Sample LIST				
10°/D65	L*	74.96		
	a*	41.19		
	b*	71.53		
			T0001	

# Displaying the Measurement Results

At the end of measurement, the measurement results will be displayed on the LCD according to the specified conditions. Typical measurement result screens are shown below.

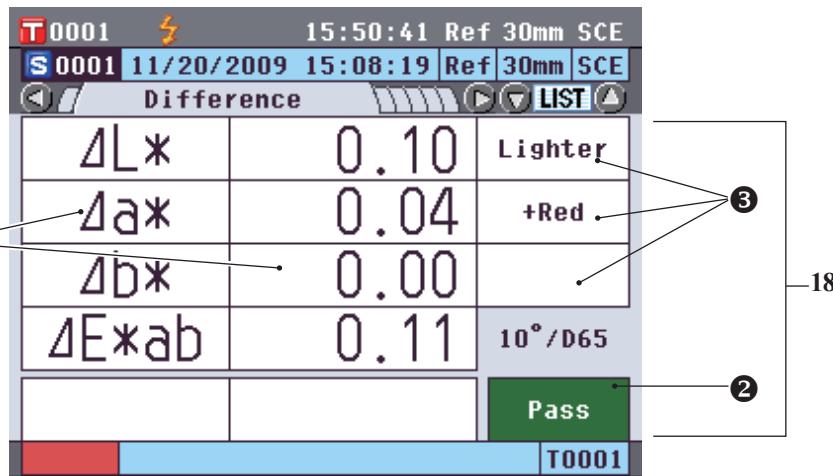
**Memo** You can switch the tab of the measurement screen with the  $\leftarrow$  or  $\rightarrow$  button of the cross key. For details of the screen switching, refer to page 104 "Switching the Display Contents of the Measurement Results".  
You can switch the sample data No. with the  $\uparrow$  or  $\downarrow$  button of the cross key.

## <Sample> Detail Screen: Absolute



- 1 Data No. of the currently selected target color data
- 2 White calibration completed
- 3 Measurement possible
- 4 USB memory device connection (No connection when the icon is not displayed)
- 5 Automatic printing from serial printer set to ON (OFF when the icon is not displayed)
- 6 Current time
- 7 Current measurement type (Ref: Reflectance measurement, Tra: Transmittance measurement, Pet: Petri Dish measurement, Liq: Liquid measurement)
- 8 Current measurement area
- 9 Current specular component mode  
For details of the status bar items 1 to 9, refer to page 21.
- 10 Sample data No.
- 11 Date and time of the measurement
- 12 Measurement type used for the measurement (Ref: Reflectance measurement, Tra: Transmittance measurement, Pet: Petri Dish measurement, Liq: Liquid measurement)
- 13 Measurement area used for the measurement
- 14 Specular component mode used for the measurement
- 15 Pseudocolor expressing the sample data
- 16 Name of the sample data
- 17 Data No. of the target color data used for the measurement
- 18 Sample data (The tab can be switched with the  $\leftarrow$  or  $\rightarrow$  button of the cross key.)

## <Sample> Detail Screen: “Difference” Tab



18 Sample data (The tab can be switched with the  $\leftarrow$  or  $\rightarrow$  button of the cross key.)

- ① Any color difference value which failed the pass/fail judgment based on the color difference tolerance will be highlighted in red.
- ② Pass/fail judgment: When the result was “Pass”, the background is shown in green. When the result was “Fail”, the background is shown in yellow.
- ③ When the color assessment settings is set to ON, the tones are displayed. For the procedure of setting the color assessment settings to ON/OFF, refer to page 81.

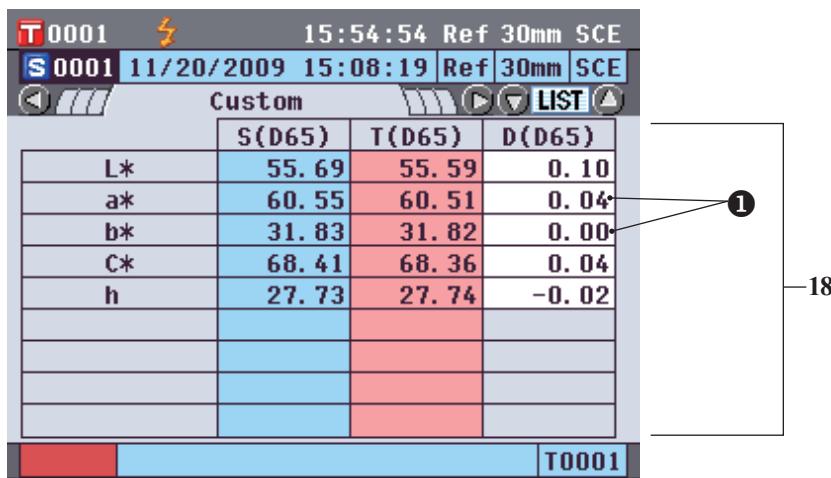
## <Sample> Detail Screen: “Abs. & Diff.” Tab



18 Sample data (The tab can be switched with the  $\leftarrow$  or  $\rightarrow$  button of the cross key.)

- This data is displayed when illuminant 2 is set. The upper section shows the sample data measured with illuminant 1, and the lower section shows the sample data measured with illuminant 2.
- ① Any color difference value which failed the pass/fail judgment based on the color difference tolerance will be highlighted in red.
- ② Pass/fail judgment: When the result was “Pass”, the background is shown in green. When the result was “Fail”, the background is shown in yellow.

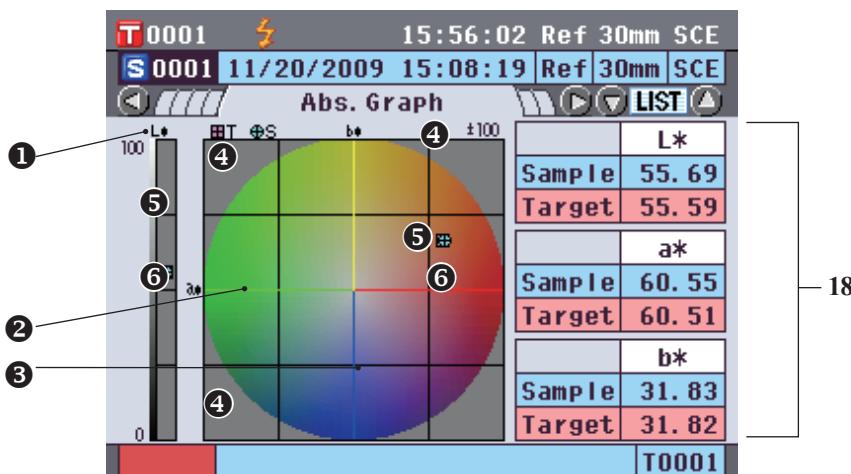
## <Sample> Detail Screen: “Custom” Tab



- 18 Sample data (The tab can be switched with the  $\leftarrow$  or  $\rightarrow$  button of the cross key.)
- This tab is displayed when the “Show Custom Data Screen” is set to ON. For the procedure of the “Show Custom Data Screen” to ON/OFF, refer to page 80.
  - ① Any color difference value which failed the pass/fail judgment based on the color difference tolerance will be highlighted in red.

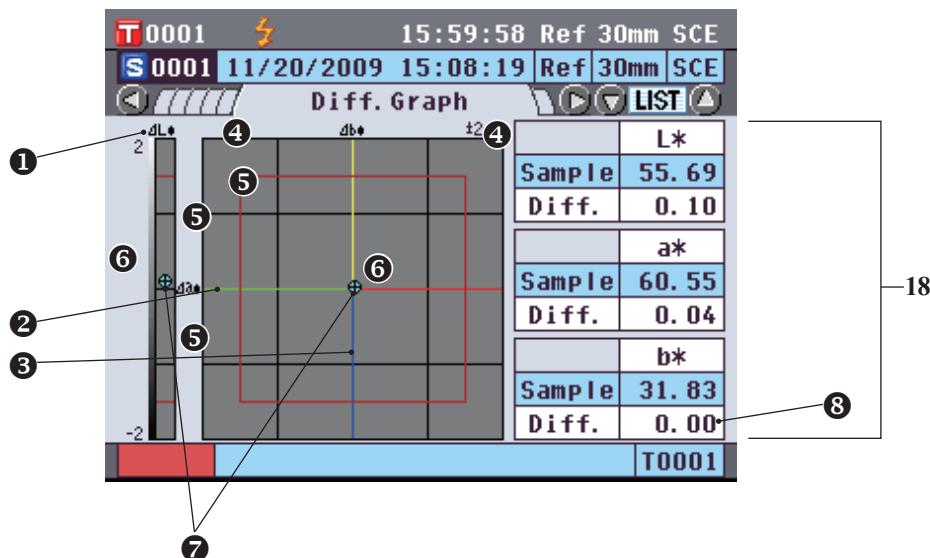
**[Memo]** The items shown on the custom data screen should be set by using the optional Color Management Software SpectraMagic™ NX. For details, refer to the instruction manual of SpectraMagic™ NX.

## <Sample> Detail Screen: “Abs.Graph” Tab



- 18 Sample data (The tab can be switched with the  $\leftarrow$  or  $\rightarrow$  button of the cross key.)
- ① L\* axis (color difference graph)
  - ② a\* axis (color difference graph)
  - ③ b\* axis (color difference graph)
  - ④ Scales for the axes
  - ⑤ Measuring point: Plotted with a light-blue circle (○).
  - ⑥ Position of target color: Plotted with a pink square (□).

## <Sample> Detail Screen: “Diff.Graph” Tab

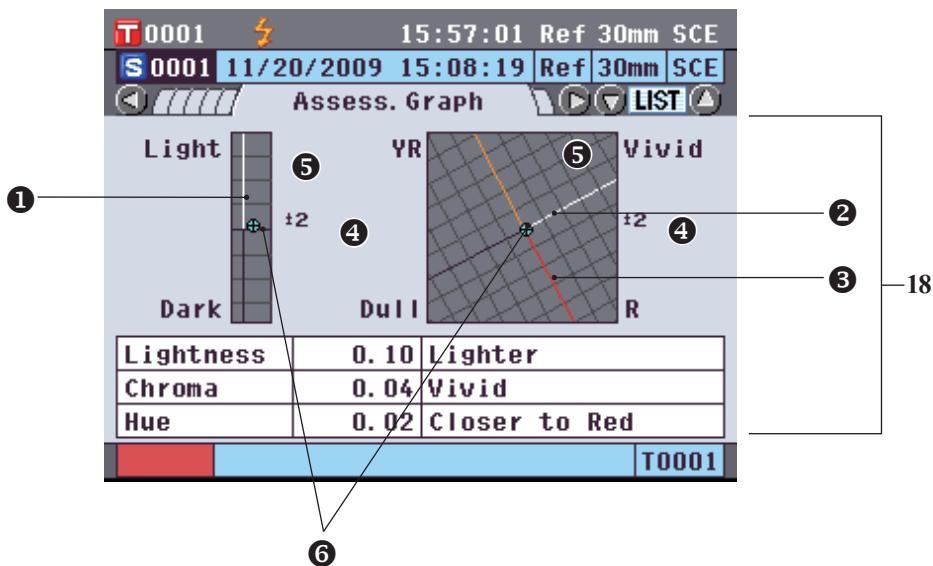


18 Sample data (The tab can be switched with the or button of the cross key.)

- ① ΔL\* axis (color difference graph)
- ② Δa\* axis (color difference graph)
- ③ Δb\* axis (color difference graph)
- ④ Scales for the axes
- ⑤ Color difference tolerance
- ⑥ Measuring point: Plotted with a light-blue circle (○).
- ⑦ Position of target color: This is the origin point of the graph.
- ⑧ The color difference value which failed the pass/fail judgment based on the color difference tolerance will be highlighted in red.

**Notes** The measuring point will not be shown on the graph when no target color is set for the sample data.

## <Sample> Detail Screen: “Assess.Graph” Tab

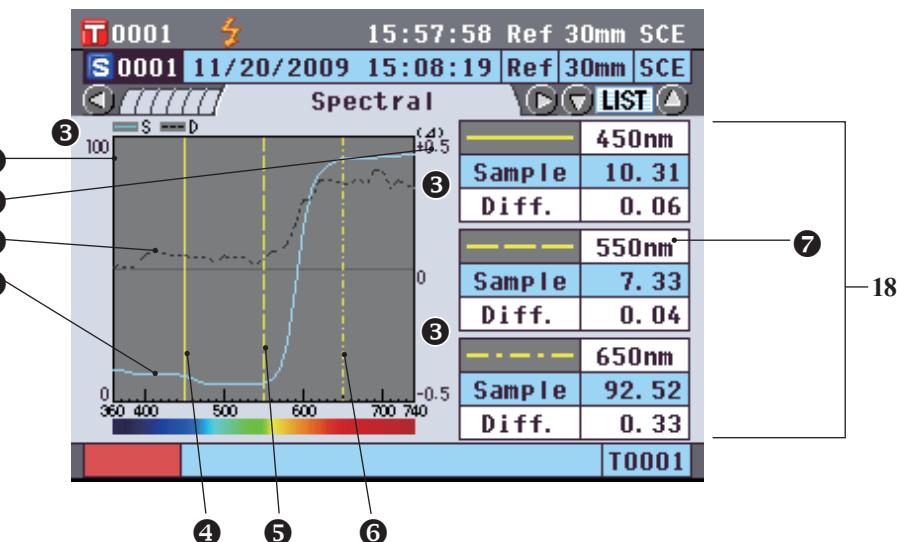


- 18 Sample data (The tab can be switched with the or button of the cross key.)

- ① Lightness axis
- ② Chroma axis
- ③ Hue axis
- ④ Scales for the axes
- ⑤ Measuring point: Plotted with a light-blue circle (○).
- ⑥ Position of target color: This is the origin point of the graph.

- Notes**
- The measuring point will not be shown on the graph when no target color is set for the sample data.
  - When color difference target is  $ab = 0.0$  or  $b^* = 0.00$ , no graph is displayed.

## <Sample> Detail Screen: “Spectral” Tab



- 18 Sample data (The tab can be switched with the or button of the cross key.)

- ① Axis of spectral reflectance
- ② Axis of spectral reflectance difference
- ③ Scales of the axes
- ④ Position of the wavelength specified for “Spectral Wavelength 1” in the spectral graph setting:  
Shown with a solid yellow line.
- ⑤ Position of the wavelength specified for “Spectral Wavelength 2” in the spectral graph setting:  
Shown with a dashed yellow line.
- ⑥ Position of the wavelength specified for “Spectral Wavelength 3” in the spectral graph setting:  
Shown with a dashed-dotted yellow line.
- ⑦ When “Spectral Data Display” is set to ON in the spectral graph setting, the spectral data for each selected wavelength is displayed. When “Spectral Data Display” is set to OFF, the spectral data is not displayed and the spectral graph is displayed on the full screen. For details of the spectral graph setting, refer to page 82.
- ⑧ Spectral graph of sample data: Shown with a solid light-blue line.
- ⑨ Spectral difference graph: Shown with a dashed black line.

## <Sample> List Screen

Every time the [Detail/List] button is pressed, the screen is switched between the <Sample> detail screen and <Sample> list screen.

**Memo** / Measurement can be performed on either the <Sample> detail screen or <Sample> list screen.

The screenshot shows a list of sample measurements. Each row contains the following information:

Sample data No.	Date and time of the measurement	Measurement type used for the measurement	Measurement area used for the measurement	Specular component mode used for the measurement	Pseudocolor expressing the sample data	Data No. of the target color data used for the measurement
LS0003	2008/08/27 09:33:23	Ref.	3 mm SCI			
LS0001	2008/08/27 09:32:12	Pet.	3 mm SCI		Matsu m o	T0023
LS0002	2008/08/27 09:33:32	Ful	3 mm SCE		Yam a m o	T0023
LS0003	2008/08/27 09:35:51	Tr a	3 mm SCI		Shi vare kha	T0023
LS0004	2008/08/27 09:36:06	Ref	30 mm SCI		Veer a vel	T0023
LS0005	2008/08/27 09:40:22	Ful	3 mm SCI		Kob a yashi	T0023
LS0006	2008/08/27 18:06:07	Ful	3 mm SCE		MMVVXXXXYYYYZZZZ	T0023

- 10 Sample data No.
- 11 Date and time of the measurement
- 12 Measurement type used for the measurement (Ref: Reflectance measurement, Tra: Transmittance measurement, Pet: Petri Dish measurement, Liq: Liquid measurement)
- 13 Measurement area used for the measurement
- 14 Specular component mode used for the measurement
- 15 Pseudocolor expressing the sample data
- 16 Name of the sample data
- 17 Data No. of the target color data used for the measurement

# Switching the Display Contents of the Measurement Results

The contents of the measurement result display can be changed by pressing the or button of the cross key on the <Sample> detail screen. The contents to be displayed will vary depending on the setting.

**Memo** When the number of sample data sets stored in the memory reaches 4000, the number assigned to the subsequent sample data will always be No. 4000, and the oldest data will be deleted one at a time.

Setting					1 Absolute	
Color Space	Illuminant 2	Custom Data View Settings	Color Assessment	Spectral Data Display		
L*a*b*, L*C*h	None (Initial setting)	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
		ON	OFF (Initial setting)	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			ON	OFF	<input type="radio"/>	
	Other than None	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
		ON	OFF (Initial setting)	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			ON	OFF	<input type="radio"/>	
Hunter Lab	None (Initial setting)	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
		ON	OFF (Initial setting)	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			ON	OFF	<input type="radio"/>	
	Other than None	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
		ON	OFF (Initial setting)	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			ON	OFF	<input type="radio"/>	
Yxy, XYZ	None (Initial setting)	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
		ON	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
	Other than None	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
		ON	OFF (Initial setting)	OFF	<input type="radio"/>	
			ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			ON	OFF	<input type="radio"/>	
Munsell (C), Munsell (D65), Gardner, Hazen/APHA, Iodine, Ph.EU, US Pharmacopeia	None (Initial setting)	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
		ON	ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
	Other than None	OFF (Initial setting)	OFF (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			OFF	OFF	<input type="radio"/>	
		ON	ON (Initial setting)	ON (Initial setting)	<input type="radio"/>	
			ON	OFF	<input type="radio"/>	

### Table legend

○ : The tab is displayed.

**x** : The tab is displayed, but no item will be displayed.

: The tab is not displayed.

# Sample Data Operation

On the <Sample Data Function> screen, the following operations are available for the sample data.

## “Current” tab

- Edit Name : Name the sample data.
- Print : Print the sample data.
- Delete : Delete the sample data.

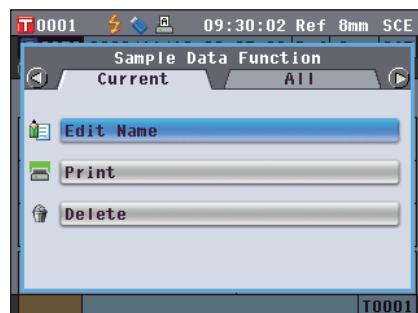
## “All” tab

- Save : Save all sample data onto a USB memory device. This option can be selected only when a USB memory device is connected.
- Auto Target : Automatically select a target color with the smallest color difference for measurement.
- Delete All : Delete all sample data.

## [Operating Procedure]

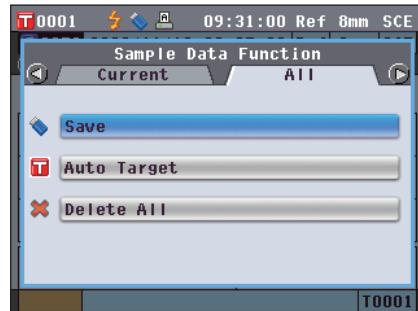
1. From the <Sample> detail screen, press the [OK/Edit] button.

The <Sample Data Function> screen is displayed.

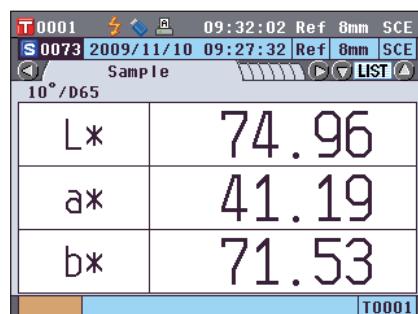


2. Use the or button of the cross key to change the tab, use the or button to move the cursor to an item to select or execute, and then press the [OK/Edit] button.

The setting screen for the selected item is displayed.  
For the operating procedure of each item, refer to the following sections.



3. To return to the <Sample> detail screen, press the [Back] button while the <Sample Data Function> screen is displayed.



# Edit Name

Name the sample data.

## [Operating Procedure]

Start the procedure from the <Sample Data Function> screen.

1. Use the **◀** or **▶** button of the cross key to select the “Selected Data” tab, use the **▲** or **▼** button to move the cursor to “Edit Name” and then press the [OK/Edit] button.

The <Edit Name> screen is displayed.



2. Use **◀** and **▶** or **▲** and **▼** buttons of the cross key to move the cursor around the characters and then press the [OK/Edit] button.

- Up to 20 characters can be used.
- The selected character is displayed in the text box.



3. Repeat Step 2 until you have entered the necessary characters.

- You can use the **▲** or **▼** button of the cross key to move the blue box cursor on the text box.

In this status, you can move the character position and modify the character by pressing the **◀** or **▶** button of the cross key.



4. When you finish entering characters, press [MENU] button, move the cursor to “Save”, and then press the [OK/Edit] button.

The setting is confirmed and the screen returns to the <Sample> detail screen.

**Memo** If you press the [Back] button during the setting, “Do you want to save the changes?” is displayed. When you place the cursor on “OK” and press the [OK/Edit] button, the setting details are confirmed and the screen returns to the <Sample> detail screen. When you place the cursor on “Cancel” and press the [OK/Edit] button, the setting details are not changed and the screen returns to the <Sample> detail screen.



# Print

Print the sample data.

You need to connect the instrument to a serial printer in advance. For instructions on how to connect the instrument and a serial printer, refer to page 124 “Printer Connection”.

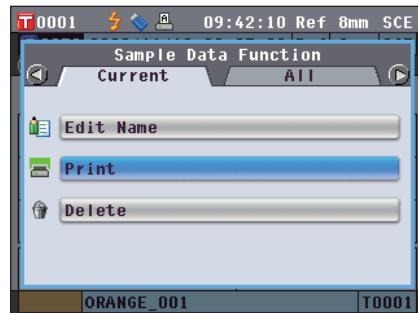
**Notes**

- If proper connection is not established, you cannot print data.
- Even if the connection has been correctly established, printing may fail for reasons such as the printer being turned off when printing is attempted.

**[Operating Procedure]**

Start the procedure from the <Sample Data Functions> screen.

1. Use the or button of the cross key to select the “Current” tab, and then use the or button to move the cursor to “Print”.

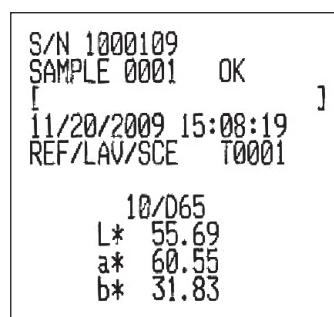


2. Press the [OK/Edit] button. The <Print Sample Data> screen is displayed and the data is printed out from the connected printer.

When the printing is complete, the screen returns to the <Sample> detail screen.

**Notes**

The <Print Sample Data> screen is displayed even when data will not be printed properly due to an improper printer connection or other problems.



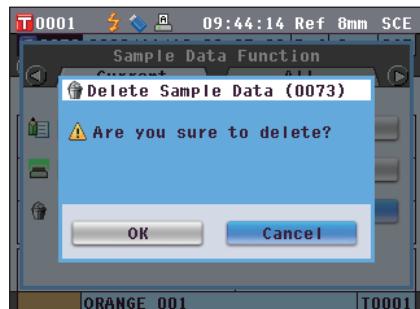
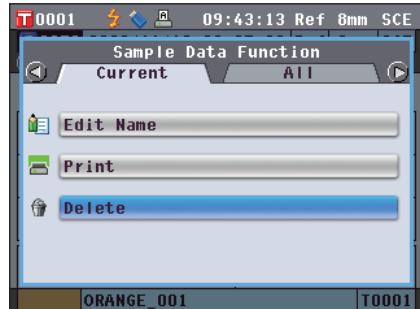
# Delete

Delete the sample data.

## [Operating Procedure]

Start the procedure from the <Sample Data Functions> screen.

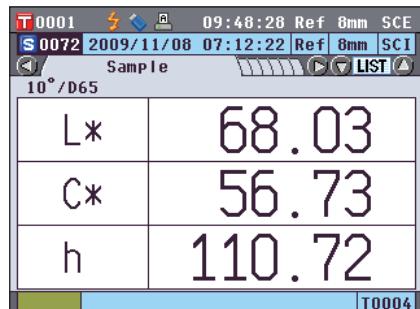
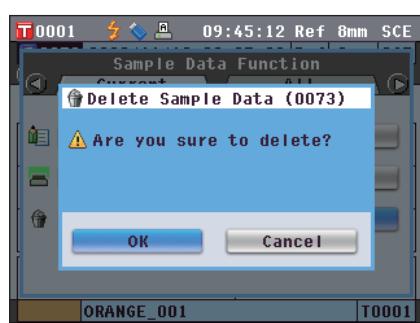
1. Use the **◀** or **▶** button of the cross key to select the “Current” tab, use the **▲** or **▼** or **○** button to move the cursor to “Delete” and then press the [OK/Edit] button. The <Delete Sample Data> screen is displayed.



2. Use the **◀** button of the cross key to move the cursor to “OK” and press the [OK/Edit] button. The data is deleted.

**Memo** When data is deleted, the subsequent sample data Nos. will be reassigned, reducing them by one.

- When the deletion is complete, the screen returns to the <Sample> detail screen.
- When you place the cursor on “Cancel” and press the [OK/Edit] button, the deletion is canceled and the screen returns to the <Sample> detail screen.



# Saving Data onto a USB Memory Device

Save all sample data stored in the instrument onto the USB memory device.

You need to connect a USB memory device to the instrument in advance. For the connection of a USB memory device, refer to page 121 “Connecting a USB Memory”.

## [Operating Procedure]

Start the procedure from the <Sample Data Function> screen.

1. Use the or button of the cross key to select the “All” tab, use the or button to move the cursor to “Save”, and then press the [OK/Edit] button.  
The <Save Sample Data> screen is displayed with a suggested file name being entered.



2. To change the file name, use the or button of the cross key to move the cursor to “File Name” and then press the [OK/Edit] button.  
The <Edit File Name> screen is displayed.



3. Use the or and or buttons of the cross key to move the cursor around the characters and then press the [OK/Edit] button.

The selected character is displayed in the text box.



4. Repeat Step 3 until you have entered the necessary characters.

- You can use the or button of the cross key to move the blue box cursor on the text box. In this status, you can move the character position and modify the character by pressing the or button of the cross key.
- Up to 20 characters can be used.



5. When you are finished entering characters, press [MENU] button, move the cursor to “Save” and then press the [OK/Edit] button.

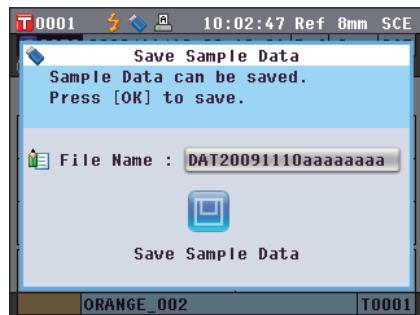
The settings are confirmed and the screen returns to the <Save Sample Data> screen.

**Memo** If you press the [Back] button during the setting, “Do you want to save the changes?” is displayed. When you place the cursor on “OK” and press the [OK/Edit] button, the setting details are confirmed and the screen returns to the <Save Sample Data> screen. When you place the cursor on “Cancel” and press the [OK/Edit] button, the setting details are not changed and the screen returns to the <Save Sample Data> screen.

6. To accept the displayed file name, use the or button of the cross key to move the cursor to “Save Sample Data” and then press the [OK/Edit] button.

- The <Saving...> screen is displayed.
- When the saving is complete, the screen returns to the <Sample> detail screen.

**Memo** When the file format is set to the CM-S100w format, measured color difference data is saved along with set values. For details regarding file format settings, refer to page 121.



# Auto Target

Use this function to automatically select the target color with the smallest color difference ( $\Delta E^*ab$ ) for measurement.

**Memo** / The target color will be selected from those with the same specular component mode and other measurement condition settings for the measurement.

**Notes** • Do not use this function if you want to control the color difference from a specific target color.  
• This setting will not be applied to the sample data obtained before this function was set to ON.

## [Setting Procedure]

Start the procedure from the <Sample Data Function> screen.

1. Use the or button of the cross key to select the "All" tab, use the or button to move the cursor to "Auto Target" and then press the [OK/Edit] button.

The <Auto Target> screen is displayed.

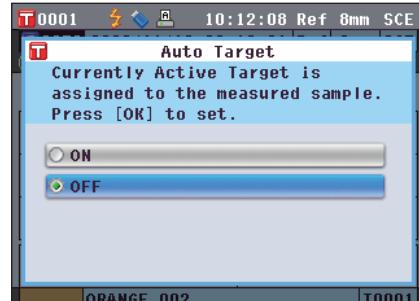


2. Use the or button of the cross key to move the cursor to "ON" or "OFF".

### Settings

○ON: Use the Auto Target function for measurement.

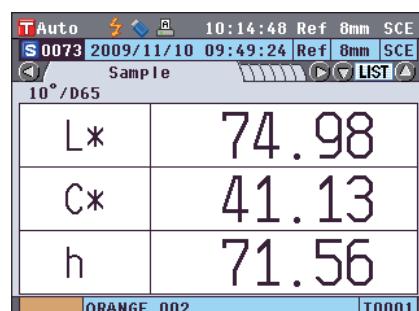
○OFF: Do not use the Auto Target function.



3. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Sample> detail screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Sample> detail screen without changing the setting.



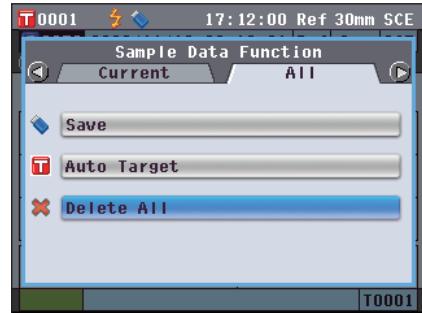
# Delete All

Delete all sample data.

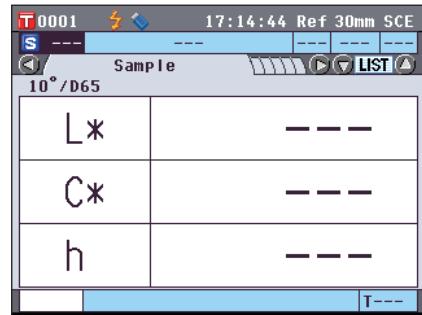
## [Operating Procedure]

Start the procedure from the <Sample Data Functions> screen.

1. Use the or button of the cross key to select the “All” tab, use the or button to move the cursor to “Delete All” and then press the [OK/Edit] button.  
The <Delete All Samples> screen is displayed.



2. Use the button of the cross key to move the cursor to “OK” and press the [OK/Edit] button. All data is deleted.
  - When the deletion is complete, the screen returns to the <Sample> detail screen.
  - When you place the cursor on “Cancel” and press the [OK/Edit] button, the deletion of all data is canceled and the screen returns to the <Sample> detail screen.



# Average Measurement

When taking measurements or setting target colors, more accurate data can be obtained if the averaging function is used.

With the CM5, the following two averaging functions are available.

- **Manual Measurement** : When the color of the specimen is not uniform, measurements are performed randomly at different positions on the specimen and then the average of the measured spectral reflectance/transmittance data is calculated. This gives the average data of the entire specimen.
- **Auto Measurement** : The specified number of measurements are repeated at the same position on the specimen and then the average of the measured spectral reflectance/transmittance data is calculated. This will improve the accuracy of the sample data.

These two averaging functions can also be used in combination. In this case, it is necessary to make settings for both auto and manual averaging. For details, refer to page 55 “Auto Measurement” and page 56 “Manual Measurement”.

**Notes** For average measurement, the average of the spectral reflectance/transmittance values of the sample data is calculated first, and then colorimetric value is calculated based on that calculated average. Thus, the result may not match the average of the colorimetric values of the sample data.

## Manual Measurement

This method is used when the color of the specimen is not uniform. Measurements are performed randomly at different positions on the specimen and then the average of the measured spectral reflectance/transmittance data is calculated, to obtain the average data of the entire specimen.

**Notes** Before using manual averaging, you must complete the settings for manual averaging.  
For details, refer to page 56 “Manual Measurement”.

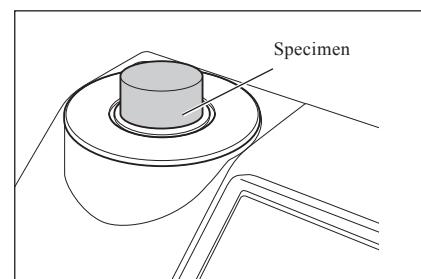
### [Operating Procedure]

1. When a screen other than the <Sample> screen is displayed, press the [Target/Sample] button.
  - The <Sample> screen is displayed.
  - Every time the [Detail/List] button is pressed, the screen is switched between the <Sample> detail screen and <Sample> list screen.

**Memo** Measurement can be performed on either the <Sample> detail screen or <Sample> list screen.

T	Auto	Auto	10:23:43	Ref	8mm	SCE
S	0073	2009/11/10	09:49:24	Ref	8mm	SCE
C	Sample					LIST
10°/D65						
L*	74.98					
C*	41.13					
h	71.56					
ORANGE_002						T0001

2. Set the specimen on the Target Mask or Transmittance Specimen Chamber according to the measurement type.



**3. Make sure that  (Ready to measure) is displayed and then press the measuring button.**

The specimen is measured and the <Manual Average Measurement> screen is displayed.

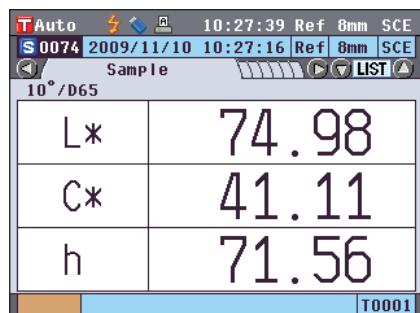
The <Manual Average Measurement> screen shows the result of the statistic calculation using the sample data of the measurements performed so far.

**[Memo]**

- If you use the  or  button of the cross key to select “Finish” and press the [OK/Edit] button, you can finish the manual averaging before the specified number of measurements is completed and the averaging result of the measurements performed so far is added to the <Sample> screen as new sample data.
- If you use the  or  button of the cross key to move the cursor to “Cancel” and press the [OK/Edit] button, you can cancel the manual averaging.

**4. Place the specimen at the next measuring position and repeat the steps from 1 to 3.**

When the specified number of measurements has been completed, the averaging result will be displayed on the <Sample> screen as new sample data.



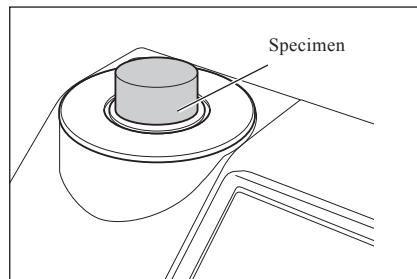
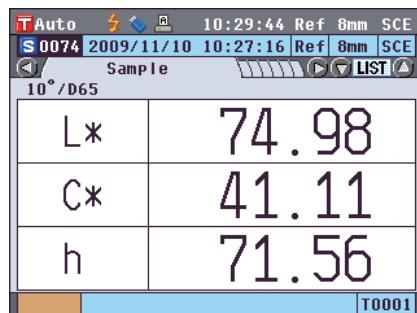
# Auto Measurement

Measurement is repeated the specified number of times at the same position on the specimen and then the average of the measured spectral reflectance/transmittance data is calculated. This will improve the accuracy of the sample data.

**Notes** Before starting auto averaging, you must complete the settings for auto averaging.  
For details, refer to page 55 “Auto Measurement”.

## [Operating Procedure]

- When a screen other than the <Sample> screen is displayed, press the [Target/Sample] button.  
The <Sample> screen is displayed.
  - Every time the [Detail/List] button is pressed, the screen is switched between the <Sample> detail screen and <Sample> list screen.
- Memo** Measurement can be performed on either the <Sample> detail screen or <Sample> list screen.
- Set the specimen on the Target Mask or Transmittance Specimen Chamber according to the measurement type.



- Make sure that (Ready to measure) is displayed and then press the [MEAS] button.

The number of completed measurements will be displayed during measurement.

**Notes** You cannot cancel the auto averaging in progress.

When the specified number of measurements has been completed, the averaging result will be displayed on the <Sample> screen as new sample data.

# Chapter 4

## Other Functions

4

Functions

# Pass/Fail Judgment for Color Difference

With the CM-5, you can set tolerances for the color difference of the sample data from the target color data to make pass/fail judgment.

For the procedure of setting tolerances, refer to page 70 “Tolerance Setting” and page 74 “Default Tolerance Setting”.

The pass/fail judgment will be based on the target color data of the number selected for measurement, and on the tolerance data specified for that target color data.

If target color data is deleted, neither the color difference display for the data nor the pass/fail judgment based on the tolerances set to the data will be performed. Even if other target color data is selected, recalculations and pass/fail judgments will not take place. If, however, another target color is assigned to the target color No. of the deleted data, recalculations and pass/fail judgments will be performed.

## Pass/Fail Judgment Based on Tolerances

If the measured color difference is outside the tolerances set for the target color, the value will be highlighted in red to indicate that the judgment result is “Fail”. Both + and - tolerances can be set for each target color.

To perform pass/fail judgment based on tolerances, follow the procedure given below.

**Notes** Before using this function, you must set color difference tolerances.

### [Operating Procedure]

#### 1. Press the [TARGET/SAMPLE] button on the <Sample> screen.

The <Target> screen is displayed.

- Every time the [Detail/List] button is pressed, the screen is switched between the <Target> detail screen and <Target> list screen.

10°/D65	
L*	74.90
C*	40.62
h	71.80

#### 2. Use the or button of the cross key to select the target color No.

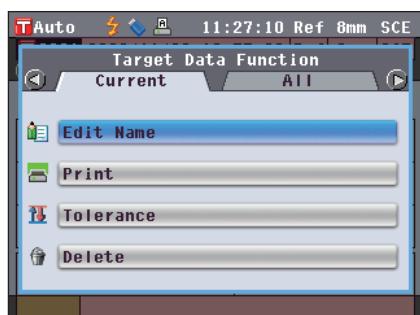
In the list, you can press the or button of the cross key to change the screen entirely to the next screen.

**Memo** The next step is to confirm the color difference tolerance settings. If this confirmation is unnecessary, go to step 6.

Target List	
T0001	2009/11/09 18:57:28 Ref 8mm SCE
T0002	2009/09/16 10:36:05 Ref 30mm SCE
T0003	2009/09/17 13:46:55 Ref 30mm SCE
T0004	2009/11/08 07:14:29 Ref 8mm SCI
T0005	2009/09/16 16:12:20 Tra -----
T0006	2009/09/16 16:45:38 Tra -----

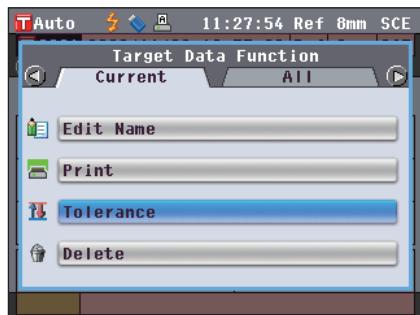
3. On the <Target> detail screen, press the [OK/Edit] button.

The <Target Data Function> screen is displayed.



4. Use the  $\blacktriangleleft$  or  $\triangleright$  button of the cross key to select the "Current" tab, use the  $\blacktriangledown$  or  $\blacktriangleright$  button to move the cursor to "Tolerance", and then press the [OK/Edit] button.

The <Tolerance> screen is displayed.



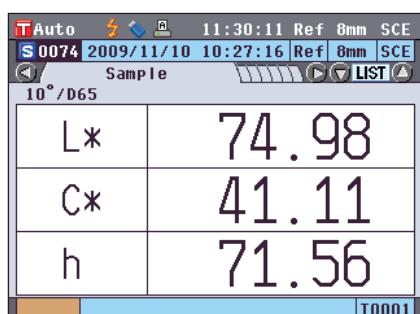
5. Make sure that the values are set properly, and then press the [Back] button twice.

The <Target> screen is displayed.



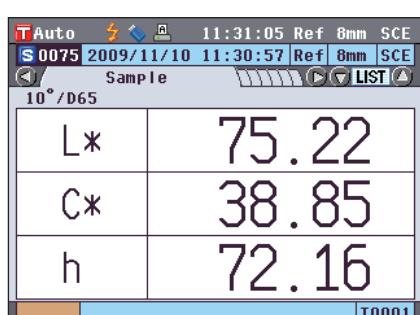
6. Press the [Target/Sample] button.

The <Sample> screen is displayed.



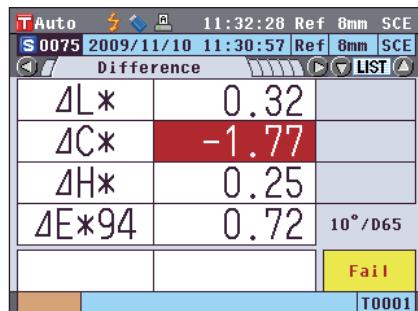
7. Set the specimen on the Target Mask or Transmittance Specimen Chamber according to the measurement type, and press the [MEAS] button.

The specimen is measured and the results are displayed on the screen.



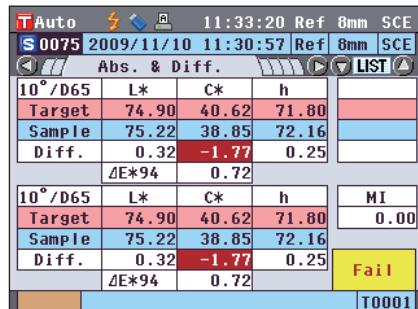
<Sample> detail screen: “Difference” tab or “Abs. & Diff.” tab

- The values which failed the judgment are highlighted in red.  
In the print output to the printer, “X” is appended after the failed item.



This screenshot shows the 'Difference' tab of a measurement software. The top header includes 'T Auto', date/time '2009/11/10 11:30:57', and 'Ref 8mm SCE'. The main table displays color differences for L\*, C\*, H\* and Delta E\*94. The 'Delta E\*94' row is highlighted in yellow, indicating a failure. The bottom right corner shows the word 'Fail'.

$\Delta L^*$	0.32	
$\Delta C^*$	-1.77	
$\Delta H^*$	0.25	
$\Delta E^*94$	0.72	10°/D65
		Fail
		T0001

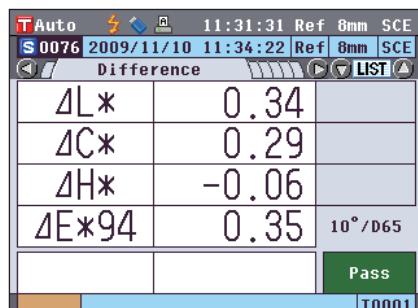


This screenshot shows the 'Abs. & Diff.' tab of a measurement software. The top header includes 'T Auto', date/time '2009/11/10 11:30:57', and 'Ref 8mm SCE'. The main table compares 'Target', 'Sample', and 'Diff.' values for L\*, C\*, H\* and Delta E\*94. The 'Delta E\*94' row under 'Diff.' is highlighted in yellow, indicating a failure. The bottom right corner shows the word 'Fail'.

10°/D65	L*	C*	H	
Target	74.90	40.62	71.80	
Sample	75.22	38.85	72.16	
Diff.	0.32	-1.77	0.25	
$\Delta E^*94$	0.72			
10°/D65	L*	C*	H	MI
Target	74.90	40.62	71.80	0.00
Sample	75.22	38.85	72.16	
Diff.	0.32	-1.77	0.25	
$\Delta E^*94$	0.72			Fail
				T0001

- When at least one item failed the judgment, “Fail” is displayed; when all items passed the judgment, “Pass” is displayed.

In the print output to the printer, “OK” is printed when the judgment result is “Pass”, and “NG” is printed when the judgment result is “Fail”.



This screenshot shows the 'Difference' tab of a measurement software. The top header includes 'T Auto', date/time '2009/11/10 11:34:22', and 'Ref 8mm SCE'. The main table displays color differences for L\*, C\*, H\* and Delta E\*94. All rows show green values. The bottom right corner shows the word 'Pass'.

$\Delta L^*$	0.34	
$\Delta C^*$	0.29	
$\Delta H^*$	-0.06	
$\Delta E^*94$	0.35	10°/D65
		Pass
		T0001

**Memo**

- “Pass” will be displayed only when all the items have passed the judgment.
- When no target color data has been set, when the target color data of the number selected for the measurement has been deleted, or when all tolerance settings are OFF, “None” will be displayed instead of the judgment results.

# Connecting to an External Device

The CM-5 features two USB connection terminals, one for connecting a USB memory and one for connecting a PC, and an RS-232C connector. When a USB memory is connected, you can save data and various conditions into it. Moreover, the supplied USB cable (IF-A19) can be used to connect the instrument to a PC to transmit data or to a printer to print data.

- Notes**
- Only use the prescribed equipment and cables with the two types of USB cables and RS-232C connector.
  - When the instrument is exposed to strong external static electricity or is affected by ambient interference during communication with an external device, the communication may be interrupted. In this case, turn the power OFF and then turn it ON again.

## Connecting a USB Memory

You can save the conditions, sample data, and target color data stored in the memory of the instrument into a USB memory as a file. You can load this condition file from the USB memory to the instrument and set the conditions all at once.

- Notes**
- Make sure that the USB memory is oriented correctly and connected securely.
  - To connect the USB memory, check the shape of the receptacle (connection terminal) and insert the connector fully until it is secured.

**Memo** The USB connection terminal of the instrument conforms to USB 1.1.

### [Operating Procedure]

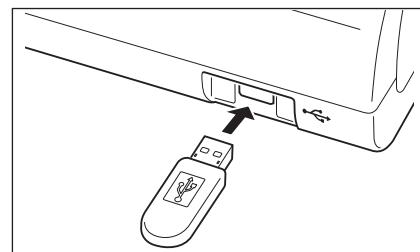
A USB memory can be connected or disconnected even while the instrument is turned ON.

#### 1. Connect the USB memory to the USB connection terminal

(A type).

Fully insert the connector and ensure that it is connected securely.

When the USB memory is properly connected,  (USB memory connected) is displayed on the screen.



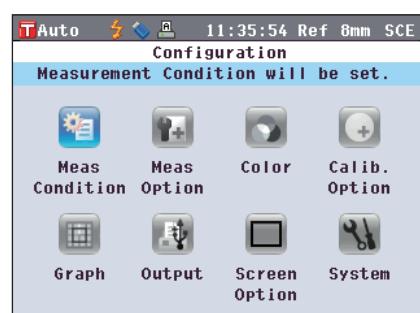
## Setting the File Format

Set the format of the sample data file or target color data file to be saved into the USB memory.

### [Operating Procedure]

#### 1. Press the [MENU] button.

The <Configuration> screen is displayed.



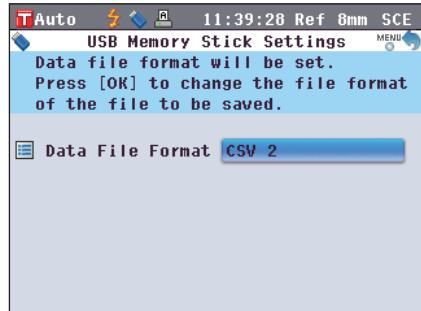
2. Use the or and or buttons of the cross key to move the cursor to "Output" and then press the [OK/Edit] button.

The <Output Settings> screen is displayed.

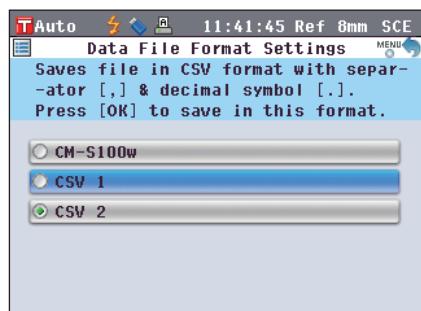


3. Use the or button of the cross key to move the cursor to "USB Memory Stick Settings" and then press the [OK/Edit] button.

The <USB Memory Stick Settings> screen is displayed with a currently-specified file format.



4. To change the file format, press the [OK/Edit] button.  
The <Data File Format Settings> screen is displayed.



5. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

CM-S100w:

Binary format which can be read with the optional Color Management Software SpectraMagic™ NX

CSV1:

CSV format using “,” for a separator and “.” for a decimal point.

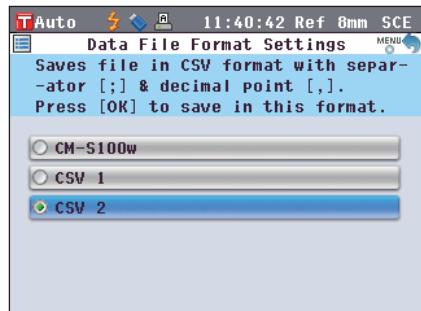
CSV2:

CSV format using “;” for a separator and “,” for a decimal point.

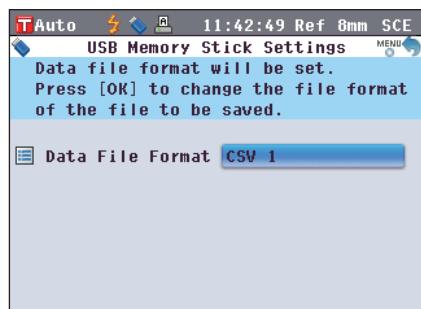
6. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <USB Memory Stick Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <USB Memory Stick Settings> screen without changing the setting.



7. Press the [Back] button twice to return to the <Sample> screen.



# Connecting a Personal Computer

Connect the instrument to a PC with the supplied USB cable IF-A19 (2 m).

## Memo

- When connected to a PC, the instrument enters the communication mode automatically. The LCD screen displays “Communicating” and the measuring and control buttons are disabled.
- If a command to enable the measuring button is sent from the PC to the instrument, you can use the measuring button to start measurement. Note, however, that, in this case, the sample data is not stored in the memory of the instrument, but is transferred to the PC.
- To connect the instrument with a PC, it is recommended that you use software that enables connection and operation of the instrument (such as the optional Color Management Software SpectraMagic™ NX).
- The USB communication port of the instrument conforms to USB 1.1.

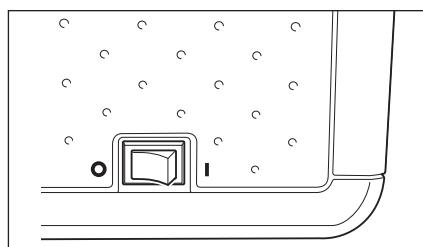
## Notes

- To connect the instrument to a PC, you need to install the USB driver dedicated to the CM-5. Install the USB driver supplied with the software that enables connection and operation of the instrument.
- The instrument is not designed to be powered via the USB cable. You need to connect the AC adapter.
- Make sure that the USB connector plug is oriented correctly and connected securely.
- When connecting/disconnecting the USB cable, be sure to hold the connector plug. Do not pull on or forcibly bend the cable. Otherwise, wire breakage may result.
- Make sure that the cable has sufficient length. Putting tension on the cable may cause connection failure or wire breakage.
- To connect the USB cable connector, check the shape of the receptacle (connection terminal) and insert the connector fully until it is secured.

## [Operating Procedure]

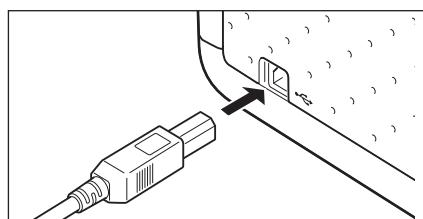
In general, a USB cable can be connected/disconnected while the instrument is turned ON, however, you need to turn OFF the instrument in the procedure below.

### 1. Turn OFF the instrument (Slide the Power switch to “○”).

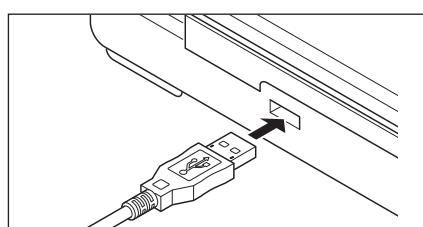


### 2. Connect the B connector of the USB cable to the USB connection terminal (B type) of the instrument.

- Fully insert the connector and ensure secure connection.

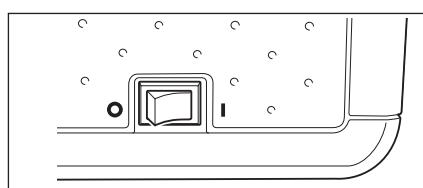


### 3. Connect the A connector of the USB cable to the USB port of the PC.



### 4. Turn ON the instrument (Slide the Power switch to “|”).

- When you are prompted to install the USB driver, specify the USB driver included with the software and complete the installation.



# Printer Connection

By connecting the instrument to a serial printer with a connecting cable, you can print out the sample data and target color data stored in the memory of the instrument. You can use the “Automatic output” which prints data automatically for each measurement, or can print out the sample data and target color data currently displayed.

**Memo** / Only text data can be output to a serial printer for printing. You cannot output the color difference graph or other graphs displayed on the instrument.

**Notes**

- Make sure that the connector is oriented correctly and connected securely. Using the screws to secure the connector prevents accidental disconnection.
- Be sure to turn OFF the power of both the instrument and printer before connecting them.
- To connect or disconnect the connecting cable, you must hold its plug or connector. Do not pull on or forcibly bend the cable.
- Do not touch the connector terminals, make them dirty or apply a strong force on them.
- Make sure that the cable has sufficient length. Putting tension on the cable may cause contact failure or wire breakage.
- Connect the instrument and printer with a printer cable conforming to “Pin No.-Signal Connection Diagram for Printer Cable”.

## ○Communication Parameters

Item	Communication condition
Baud rate	4800 bps, 9600 bps, 19200 bps
Character length	8 bits
Parity	None
Stop bit	1 bit
Flow control	RTS/CTS

## ○Applicable printer

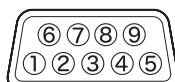
Any printers which conform to the following specifications can be used.

Item	Communication condition
No. of printing lines	27 digits or more, Data input: RS-232C
Data control	BUSY
Baud rate	4800 bps, 9600 bps, 19200 bps
Character length	8 bits
Parity	None
Stop bit	1 bit
Basic function	CR (0DH) carriage return

## ○Pin No.-Signal Connection Diagram for Printer Cable

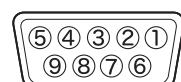
- For a D-sub 9-pin connector

Instrument side



Pin No.	Signal
3	TXD
5	GND
8	CTS

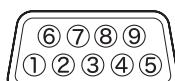
Printer side  
(D-sub 9-pin connector)



Signal	Pin No.
DATA	3
GND	5
BUSY	8

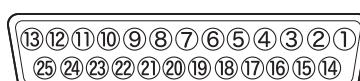
- For a D-sub 25-pin connector

Instrument side



Pin No.	Signal
3	TXD
5	GND
8	CTS

Printer side  
(D-sub 25-pin connector)



Signal	Pin No.
DATA	3
GND	5
BUSY	8

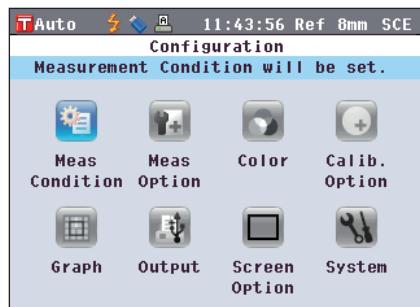
## Setting the Communication Parameters

Set the communication parameters between the instrument and serial printer.

### [Operating Procedure]

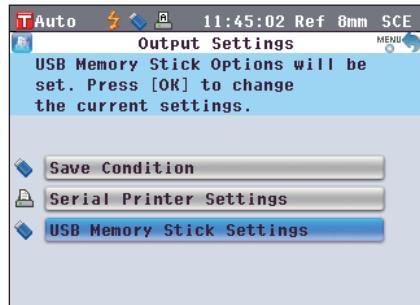
- Press the [MENU] button.

The <Configuration> screen is displayed.



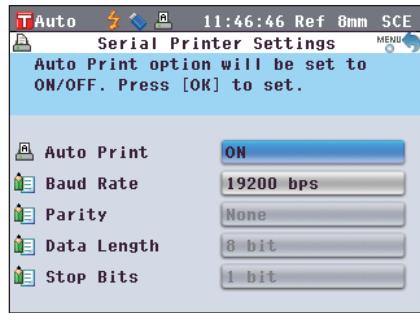
- Use the or and or buttons of the cross key to move the cursor to “Output” and then press the [OK]/[Edit] button.

The <Output Settings> screen is displayed.



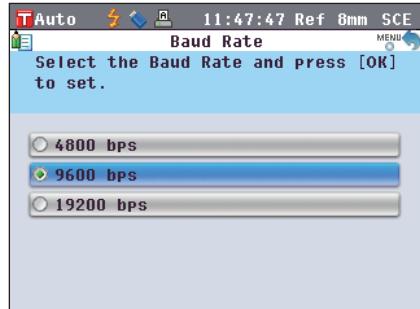
3. Use the or button of the cross key to move the cursor to “Serial Printer Settings” and then press the [OK/Edit] button.

The <Serial Printer Settings> screen is displayed with a currently-specified baud rate. Other communication parameters cannot be changed.



4. To change the baud rate, use the or button of the cross key to move the cursor to “Baud Rate” and then press the [OK/Edit] button.

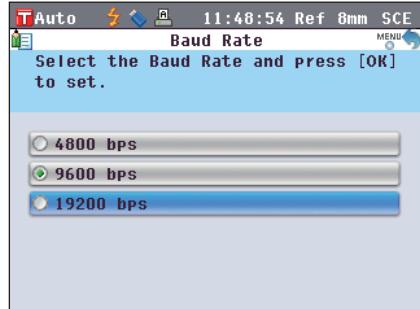
The <Baud Rate> screen is displayed.



5. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

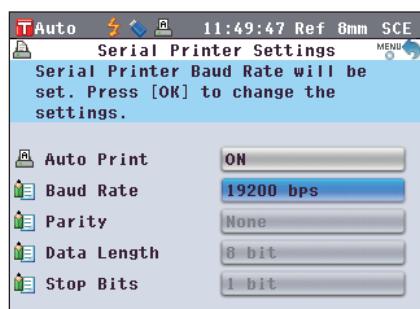
- 4800 bps
- 9600 bps
- 19200 bps



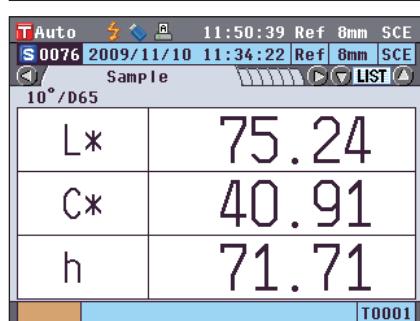
6. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Serial Printer Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Serial Printer Settings> screen without changing the setting.



7. Press the [Back] button three times to return to the <Sample> screen.



## Printing Out Sample Data/Target Color Data

Print the sample data or target color data with the printer.

You need to connect the instrument to a serial printer in advance.

**Memo** Only text data can be output to a serial printer for printing. You cannot output the color difference graph or other graphs displayed on the instrument.

### [Operating Procedure]

Start the procedure from the <Sample> detail screen or <Target> detail screen where a measurement result is displayed.

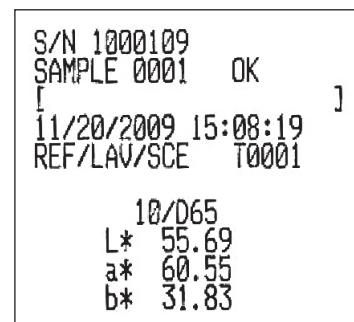
1. Press the [PRINT] button. The <Print Sample Data> or <Print Target Data> screen is displayed and the data is printed from the connected printer.

- When the printing is complete, the screen returns to the <Sample> detail screen or <Target> detail screen.

**Notes**

- The <Print Sample Data> or <Print Target Data> screen is displayed also for the case where printing will not be processed properly such as when the printer connection is incorrect.
- On the <Sample> list screen or <Target> list screen, printing is disabled even when the measurement result is displayed on the screen.

**Memo** In addition to the procedure above, printing can be started on the <Sample Data Function> screen or <Target Data Function> screen. For the procedure, refer to page 108 “Sample Data Operation: Print” or page 69 “Color Difference Target Color Data Operation: Print”.



## Setting the Auto Print

When the Auto Print is set to ON, sample data or target color data is automatically printed on the printer for every measurement.

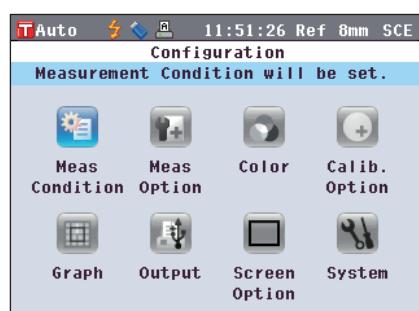
You need to connect the instrument to a serial printer in advance.

**Memo** Only text data can be output to a serial printer for printing. You cannot output the color difference graph or other graphs displayed on the instrument.

### [Operating Procedure]

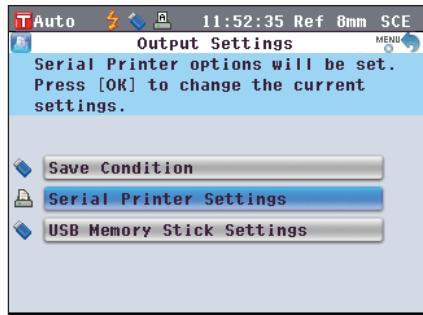
1. Press the [MENU] button.

The <Configuration> screen is displayed.



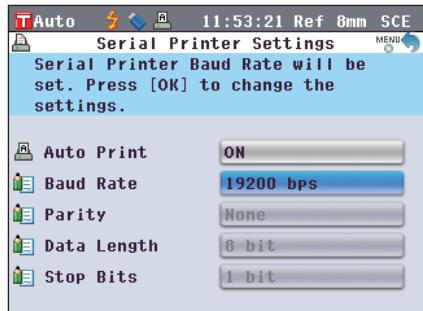
2. Use the or and or buttons of the cross key to move the cursor to “Output” and then press the [OK/Edit] button.

The <Output Settings> screen is displayed.



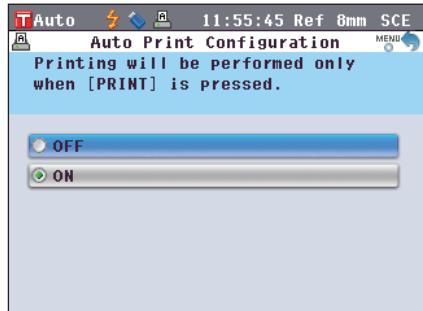
3. Use the or button of the cross key to move the cursor to “Serial Printer Settings” and then press the [OK/Edit] button.

The <Serial Printer Settings> screen is displayed.



4. Use the or button of the cross key to move the cursor to “Auto Print” and then press the [OK/Edit] button.

The <Auto Print Configuration> screen is displayed.

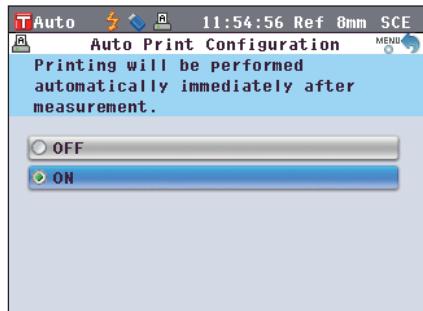


5. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

OFF: Disable Auto Print.

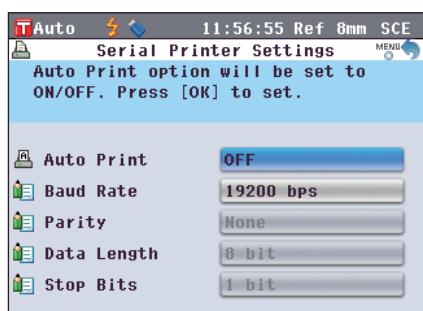
ON: Enable Auto Print. The (Auto Print ON) icon is displayed on the screen.



6. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <Serial Printer Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <Serial Printer Settings> screen without changing the setting.



7. Press the [Back] button three times to return to the <Sample> screen.

L*	75.24
C*	40.91
b	71.71

T0001

After measurement is performed on either of the <Sample> detail screen or <Target> detail screen, the <Print Sample Data> or <Print Target Data> screen is displayed and the data is printed from the connected printer.

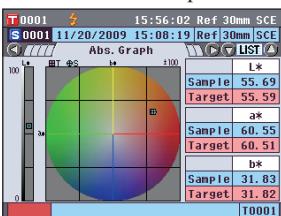
- Notes**
- The <Print Sample Data> or <Print Target Data> screen is displayed also for the case where printing will not be processed properly such as when the printer connection is incorrect.
  - On the <Sample> list screen or <Target> list screen, the data is not printed after measurement.

#### • Print Example 1

<Sample> detail screen: Absolute and Abs. Graph tab

L*	55.69
a*	60.55
b*	31.83

T0001



Absolute value and pass/fail Judgment result

S/N 1000109
SAMPLE 0001 OK
[
11/20/2009 15:08:19
REF/LAV/SCE T0001
10°/D65
L* 55.69
a* 60.55
b* 31.83

#### • Print Example 2

<Sample> detail screen: "Difference" tab

ΔL*	0.10	Lighter
Δa*	0.04	+Red
Δb*	0.00	
ΔE*ab	0.11	10°/D65
		Pass
		T0001

When the color assessment settings is set to ON, the tones are displayed.

Color difference and pass/fail judgment result (and tone indication)

S/N 1000109
SAMPLE 0001 OK
[
11/20/2009 15:08:19
REF/LAV/SCE T0001
10°/D65
dL* 0.10 Lighter
da* 0.04 +Red
db* 0.00
dE*ab 0.11

#### • Print Example 3

<Sample> detail screen: "Abs. & Diff." tab

10°/D65	L*	a*	b*	
Target	55.59	60.51	31.82	
Sample	55.69	60.55	31.83	
Diff.	0.10	0.04	0.00	
ΔE*ab	0.11			
10°/C	L*	a*	b*	MI
Target	55.82	58.52	32.09	0.00
Sample	55.92	58.56	32.09	
Diff.	0.11	0.04	0.00	
ΔE*ab	0.11			
				Pass
				T0001

Absolute value, color difference and pass/fail judgment result (colorimetric value measured with Illuminant 1 and Illuminant 2)

S/N 1000109
SAMPLE 0001 OK
[
11/20/2009 15:08:19
REF/LAV/SCE T0001
10°/D65 10°/C
L* 55.69 55.92
a* 60.55 58.56
b* 31.83 32.09
dL* 0.10 0.11
da* 0.04 0.04
db* 0.00 0.00
dE*ab 0.11 0.11
MI 0.00

- Print Example 4

<Sample> detail screen: “Custom” tab

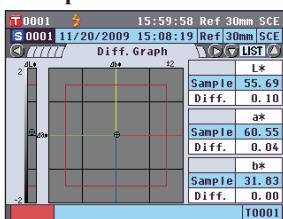


Absolute value, color difference and pass/fail judgment result specified for the custom screen

S/N 1000109	S(D65)	T(D65)
SAMPLE 0001	L*	55.69
[	a*	60.55
11/20/2009 15:08:19	b*	31.83
REF/LAV/SCE	C*	68.41
T0001	h	27.74
	D(D65)	
	L*	0.10
	a*	0.04
	b*	0.00
	C*	0.04
	h	-0.02

- Print Example 5

<Sample> detail screen: “Diff.Graph” tab



Absolute value, color difference and pass/fail judgment result

S/N 1000109	10/D65
SAMPLE 0001	L*
[	da*
11/20/2009 15:08:19	db*
REF/LAV/SCE	0.10
T0001	0.04
	0.00

- Print Example 6

<Sample> detail screen: “Assess.Graph” tab  
(When the tone indication is set to ON)

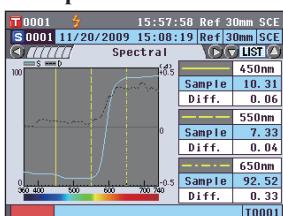


Color difference, pass/fail judgment result and tone indication

S/N 1000109	10/D65
SAMPLE 0001	L
[	C
11/20/2009 15:08:19	H
REF/LAV/SCE	0.10 Lighter
T0001	0.04 Vivid
	0.02 Red

- Print Example 7

<Sample> detail screen: “Spectral” tab



Spectral reflectance/transmittance and pass/fail judgment result

S/N 1000109	10/D65	
SAMPLE 0001	OK	
[	]	
11/20/2009 15:08:19	REF/LAV/SCE	
T0001	DIFF.	
360nm	12.74%	0.01%
370nm	12.56%	0.02%
380nm	12.00%	0.00%
390nm	11.26%	0.02%
400nm	10.82%	0.06%
410nm	10.81%	0.07%
420nm	11.00%	0.07%
430nm	11.02%	0.06%
440nm	10.81%	0.06%
450nm	10.31%	0.05%
460nm	9.19%	0.05%
470nm	9.21%	0.05%
480nm	9.51%	0.05%
490nm	7.13%	0.03%
500nm	6.92%	0.06%
510nm	6.85%	0.04%
520nm	6.81%	0.06%
530nm	6.80%	0.04%
540nm	6.92%	0.02%
550nm	7.33%	0.04%
560nm	8.68%	0.07%
570nm	12.21%	0.07%
580nm	22.75%	0.10%
590nm	44.22%	0.18%
600nm	66.85%	0.27%
610nm	80.58%	0.27%
620nm	87.05%	0.34%
630nm	89.88%	0.34%
640nm	91.95%	0.34%
650nm	92.04%	0.33%
660nm	93.04%	0.33%
670nm	93.10%	0.33%
680nm	93.12%	0.29%

The “\*\*” is print in the left of the wavelength specified for “Specific Wavelength” in the spectral graph setting.

# System-related Functions

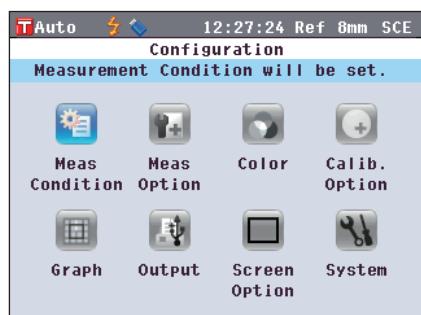
## Displaying the Instrument Information

Display the model name, version and serial number of the instrument.

### [Operating Procedure]

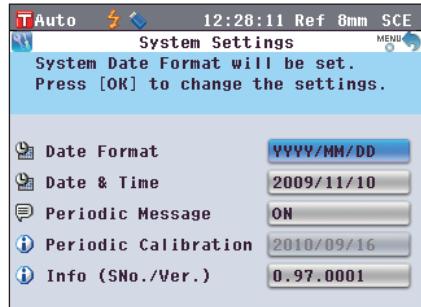
**1. Press the [MENU] button.**

The <Configuration> screen is displayed.



**2. Use the  $\blacktriangleleft$  or  $\triangleright$  and  $\blacktriangledown$  or  $\triangledown$  buttons of the cross key to move the cursor to "System" and then press the [OK/Edit] button.**

The <System Settings> screen is displayed.



**3. Use the  $\blacktriangleleft$  and  $\triangleright$  button of the cross key to move the cursor to "Info (SNo./Ver.)" and then press the [OK/Edit] button.**

The model name, version and serial number are displayed.



**4. Press the [Back] button to return to the <System Settings> screen**



**5. Press the [Back] button twice to return to the screen displayed before you press the [MENU] button in step 1.**

# Annual Service Recalibration Recommendation Message

When about one year passes after the factory shipment or the calibration service (or maintenance) conducted by KONICA MINOLTA SENSING-authorized service facility, the CM-5 shows a message "WR050 WE RECOMMEND RE-CALIBRATION SERVICE" at start-up to recommend annual service recalibration. You can set this message display to be shown, or to be hidden so that the message is not displayed even when the recommended recalibration time comes.

**Notes** Although the annual service recalibration recommendation message display can be hidden, it is recommended to accept our recalibration service.

**Memo** The message display is set to "Show" before the factory shipment.

## [Operating Procedure]

### 1. Press the [MENU] button.

The <Configuration> screen is displayed.

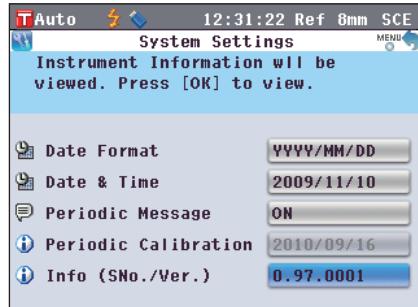


### 2. Use the or and or buttons of the cross key to move the cursor to "System" and then press the [OK/Edit] button.

The <System Settings> screen is displayed with "Periodic Calibration".

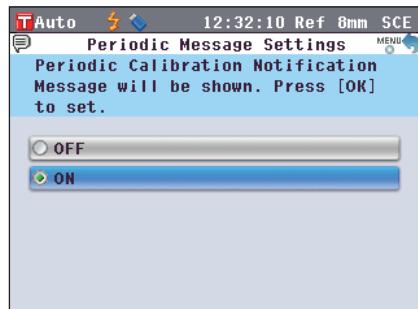
**Memo** When the periodic calibration notification message is set to ON, the message is displayed when the specified day comes.

The date of the annual recalibration service is specified before the factory shipment or during KONICA MINOLTA SENSING's calibration service (or maintenance) and you cannot change it.



### 3. Use the or button of the cross key to move the cursor to "Periodic Message Settings" and then press the [OK/Edit] button.

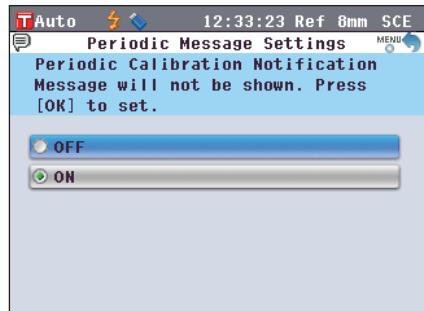
The <Periodic Message Settings> screen is displayed.



4. Use the or button of the cross key to move the cursor to the desired item.

#### Settings

- OFF: Do not show the annual service recommendation message when the specified day comes.
- ON: Show the annual service recommendation message when the specified day comes.



5. Press the [OK/Edit] button.

The selection is confirmed and the screen returns to the <System Settings> screen.

**Notes** If you press the [Back] button without pressing the [OK/Edit] button, you return to the <System Settings> screen without changing the setting.



6. Press the [Back] button twice to return to the screen displayed before you press the [MENU] button in step 1.

10°/D65	
L*	75.24
C*	40.91
h	71.71

# Initialization

Reset the settings of the instrument to the initial status.

- Notes**
- Do not initialize the instrument unless necessary.
  - The sample data, target color data, tolerances set to each target color and default tolerance settings will be protected and not be deleted by initialization.

**Memo** / The sample data and target color data which you saved will be stored even after initialization.  
For details of the initial setting values, refer to page 135 "Initial Settings".

## [Operating Procedure]

1. Turn ON the instrument while holding down the [Target/Sample] button.

The <Initialize> screen is displayed.



2. Use the **◀** or **▶** button of the cross key to move the cursor to "OK" and then press the [OK/Edit] button.

"WR123 Please reset power." is displayed.

**Memo** / If you place the cursor on "Cancel" on the <Initialize> screen and press the [OK/Edit] button, the initialization is canceled and the <Sample> screen is displayed.

3. Turn OFF the instrument once and then turn it ON again. The system starts with the initialized settings.

## Initial Settings

- \* Initialization of the instrument will reset the settings to the initial values shown in the table below. The sample data, target color data and the tolerances set for each target color are protected and not cleared by the initialization.
- \* The zero calibration data will be reset to the factory-set data. If you performed zero calibration due to a change in the measurement environment, you will need to perform zero calibration again after the initialization.
- \* In certain cases, the instrument is initialized due to another cause other than the initialization operation (e.g. when the built-in backup battery life expired). In this case, the sample data, target color data and tolerance settings will also be reset to the initial status (no sample data, no target color data, default tolerance settings).

Item		Initial setting	
Zero Calibration/0% Calibration		Completed (factory-set value)	
White Calibration/100% Calibration		Not performed	
User Calibration		Not performed	
Measurement condition	Measurement Type	Reflectance measurement (Ref)	
	Measurement Area	ø30 mm	
	SCI/SCE	SCE	
Measurement option	Auto Measurement	No. of measurements: 1	
	Manual Measurement	No. of measurements: 1	
	Shutter Open/Close	Close	
Color condition	Color Space	L*a*b*	
	Difference Formula Settings	ΔE*ab	
	Color Index	None	
	Observer	10°	
	Illuminant 1	D65	
	Illuminant 2	None	
Calibration option	Auto White Calibration	ON	
	Calibration Data	White Calibration	
Graph	Custom screen	Display	ON
		Line item	L*,a*,b*,C*,h
		Column item	Sample data, target color, and color difference measured with illuminant 1
	Color Assessment		OFF
	Spectral graph	Spectral data display	ON
		Selected wavelength	450 nm, 550 nm, 650 nm
Output	Serial printer	Auto Print	OFF
		Baud Rate	9600 bps
	USB memory	File Format	CSV1
Screen option	Wizard Screen		ON
	LCD Brightness		3 (Standard)
	Display language		English
System	Date Format	MM/DD/YYYY	
	Periodic Message	ON	

Item		Initial setting		
Tolerance  * These are the factory-set values.  Initialization of the instrument will not reset the settings to these initial values.	Color Space	$\Delta L^*$ , $\Delta a^*$ , $\Delta b^*$ , $\Delta C^*$ , $\Delta H^*$	Upper limit	+1.5, ON
			Lower limit	-1.5, ON
		$\Delta L$ , $\Delta a$ , $\Delta b$ , $\Delta X$ , $\Delta Y$ , $\Delta Z$	Upper limit	+1.5, OFF
			Lower limit	-1.5, OFF
		$\Delta x$ , $\Delta y$	Upper limit	+0.100, OFF
			Lower limit	-0.100, OFF
	Difference Formula Settings	$\Delta E00$ , $\Delta E$ hunter, CMC, $\Delta E^{*94}$	Upper limit	+1.5, OFF
		$\Delta E^{*ab}$	Upper limit	+1.5, ON
	Color Index	$\Delta WI$ (ASTM E313-73), $\Delta WI$ (ASTM E313-96), $\Delta YI$ (ASTM E313-73), $\Delta YI$ (ASTM E313-96), $\Delta YI$ (ASTM D1925), $\Delta WB$ (ASTM E313-73), $\Delta ISO$ Brightness	Upper limit	+1.5, OFF
			Lower limit	-1.5, OFF
Data Protect				OFF
Auto Target				OFF

# Chapter 5

## Troubleshooting

5

Troubleshooting

# Error Messages

The following messages may appear while you are using the instrument. If such messages appear, take the necessary actions shown in the table below. If the trouble does not go away in spite of taking the actions, contact a KONICA MINOLTA SENSING-authorized service facility.

**Notes** The table below shows messages that may be displayed on the LCD of the instrument. For communication error check codes, refer to the separate document.

Message	Symptom/Possible Cause	Corrective Action
Preparing to auto select target color	(When Auto Target is set to ON) • Instrument is preparing auto target color settings.	Wait for a moment. *This message will appear when the “Auto Target” function is set to ON or when power switch is turned ON with auto target set to ON. When preparations are completed, this message will disappear.
<b>ER005</b> ERROR IN FLASHING	Xenon lamp does not flash properly. • Xenon lamp has blown. • Faulty flash circuit. • Faulty sensor	If this message keeps appearing, contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER007</b> INCORRECT CLOCK OPERATION	Clock IC is not working correctly. • Since power voltage of backup battery is exhausted due to instrument not being used for a long time, data of calendar or clock has been lost. • Internal backup battery has reached the end of its life. • Breakdown of circuits relating to the clock IC.	Set date and time after charging the internal backup battery. If this message keeps appearing, the battery has reached the end of its life. Contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER010</b> NO DATA IN MEMORY	Data for performing white calibration or user calibration has not been input in the instrument’s memory.	To input user calibration data to the instrument, you need to connect the instrument with a computer and use the optional software. For details of the procedure, read the software manual. You cannot input the calibration data of the built-in White Calibration Plate to the instrument. For details, contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER011</b> FAILED IN CALIBRATION	Zero calibration (0% calibration) or white calibration (100% calibration) has not been performed correctly.	Read page 43 “Zero calibration (0% Calibration)” or page 46 “White Calibration (100% Calibration)” and perform the calibration properly such as by using the optional Zero Calibration Box.
	Target Mask is not correct.	Attach the correct Target Mask.
<b>ER013</b> ERROR IN A/D	Failed during A/D conversion. • Faulty A/D converter • Breakdown of circuits relating to the A/D converter	Turn the power OFF, and then turn it ON again. If this message keeps appearing, contact a KONICA MINOLTA SENSING-authorized service facility.

Message	Symptom/Possible Cause	Corrective Action
<b>ER024</b> WHITE CALIBRATION INCOMPLETE	White calibration (100% calibration) has not been completed.	The instrument requires white calibration (100% calibration) for specified measurement conditions when it is turned ON for the first time. (It is also recommended that white calibration (100% calibration) be performed whenever the instrument is turned ON or when the ambient environment changes.) White calibration (100% calibration) may also be required when the measurement area, specular component mode or other measurement conditions are changed.
<b>ER025</b> AREA SWITCH LENS ERROR	<ul style="list-style-type: none"> <li>Faulty drive motor</li> <li>Breakdown of drive circuit</li> <li>Faulty drive sensor</li> </ul>	Confirm the measurement area, and then try the measurement again. If this message keeps appearing, contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER026</b> SHUTTER ERROR	<ul style="list-style-type: none"> <li>Faulty drive motor</li> <li>Breakdown of drive circuit</li> <li>Faulty drive sensor</li> </ul>	Confirm the shutter behavior, and then try the measurement again. If this message keeps appearing, contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER027</b> ERROR IN CHARGING	<p>Charging for flashing of xenon lamp is not completed.</p> <ul style="list-style-type: none"> <li>Breakdown of charging circuit</li> </ul>	Confirm that  (Ready to measure) is displayed and then perform measurement. If this message keeps appearing, contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER030</b> MEMORY ERROR	Data has been lost since the memory's backup battery is exhausted.	Turn the power ON to charge the memory's backup battery. The backup battery can be fully charged in 72 hours when the power of this instrument is turned ON. After the battery is fully charged, data backup can be stored for approximate 5 months. If this message keeps appearing, the battery has reached the end of its life. Contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER031</b> TRAP ERROR	<ul style="list-style-type: none"> <li>Faulty drive motor</li> <li>Breakdown of drive circuit</li> <li>Faulty drive sensor</li> </ul>	Confirm the switching operation between SCI and SCE, and then try the measurement again. If this message keeps appearing, contact a KONICA MINOLTA SENSING-authorized service facility.
<b>ER036</b> USER CALIBRATION INCOMPLETE	User calibration has not been performed.	When user calibration is to be performed instead of white calibration (100% calibration), the instrument requires user calibration for specified measurement conditions when it is turned ON for the first time. (It is also recommended that user calibration be performed whenever the instrument is turned ON or when the ambient environment changes.) User calibration may also be required when the measurement area, specular component mode or other measurement conditions are changed.
<b>ER069</b> PROTECTED DATA	Target color data which you attempted to overwrite or delete is protected.	If it is necessary to overwrite or delete the protected target data, change the data protect setting of the data to OFF.

Message	Symptom/Possible Cause	Corrective Action
<b>ER082</b> USB MEMORY SAVE ERROR	The free space in the USB memory is insufficient.	Delete unnecessary data in the USB memory or use another USB memory.
	The USB memory is not connected properly.	Connect the USB memory properly and securely.
	The USB memory cannot be accessed due to security function.	Disable the security function or use a USB memory without security function.
<b>ER083</b> USB READ ERROR	The USB memory is not connected properly.	Connect the USB memory properly and securely.
	The USB memory cannot be accessed due to security function.	Disable the security function or use a USB memory without security function.
	The file was not saved in appropriate file format.	A condition file must be created with the optional software. For the procedure, refer to the software manual.
<b>WR002</b> LOW ILLUMINATION	Amount of light from the xenon lamp has dropped to 50% of its initial level. • Deterioration of xenon lamp • Dirt on integrating sphere	Clean the integrating sphere as explained in “Cleaning Parts” on page 16. If the problem still remains, contact a KONICA MINOLTA SENSING-authorized service facility.
<b>WR050</b> WE RECOMMEND RE-CALIBRATION SERVICE	Since a certain period of time has passed since the instrument was last calibrated, recalibration is recommended.	For recalibration service, contact a KONICA MINOLTA SENSING-authorized service facility. This message display can be set to be hidden. For the setting procedure, refer to page 132 “Annual Service Recalibration Recommendation Message”.
<b>WR112</b> USER CALIBRATION DATA NOT SET	It is necessary to input data for user calibration to the instrument before setting calibration data to user calibration data.	To perform user calibration, you need to input the user calibration data to the instrument’s memory by connecting the instrument with computer and using the optional software before setting calibration data to user calibration data. For details of the procedure, read the software manual.
<b>WR121</b> CALIBRATION RECOMMENDED	White calibration (100% calibration) or user calibration has not been performed yet after the power was switched on.	In order to ensure the reliability of white calibration (100% calibration), it is recommended to perform white calibration (100% calibration) or user calibration every time the instrument is turned ON or the measuring environment has changed.
<b>WR123</b> Please reset power.	It is necessary to restart the instrument. • Memory error or incorrect clock • Executing initialization	Turn the power OFF, and then turn it ON again.

# Troubleshooting

If an abnormality has occurred with the instrument, take necessary actions as given in the table below. If the instrument still does not work properly, turn the power OFF, and then turn it ON again. If the symptom remains, contact a KONICA MINOLTA SENSING-authorized service facility.

Symptom	Check Point	Action
LCD is blank.	Is the AC adapter connected?	Connect the AC adapter.
Measuring button is not effective.	Is measurement still in progress? Is a screen where measurement is possible displayed?	Wait until measurement is complete, and then press the button. Measuring button must be pressed while a screen that allows measurement (e.g. Calibration, Target, or Sample screen) is shown.
Abnormal measurement result	Is the specimen placed properly? Is proper calibration data used? Was white calibration (100% calibration) performed correctly? Was zero calibration (0% calibration) performed correctly?	Make sure that the specimen is securely placed in the instrument to prevent leakage of light. To perform user calibration or Petri Dish measurement, you need to input appropriate calibration data to the instrument by using the optional software. Check that the calibration plate is correct for the input calibration data before performing white calibration (100% calibration) or user calibration. Read page 43 "Zero calibration (0% Calibration)" and perform the calibration properly such as by using the optional Zero Calibration Box.
Measurement results fluctuate.	Is the instrument and specimen kept stationary during measurement?	Do not allow the instrument and specimen to move during measurement.
Not possible to input data to computer. No commands from computer are accepted. Commands cannot be accepted correctly.	Is the USB cable connected correctly? Is the USB cable supplied with the instrument used?	Connect the instrument's USB connecting terminal to the computer's USB port with the USB cable supplied with the instrument.
Files cannot be saved from the instrument to a USB memory. Files cannot be read from a USB memory to the instrument.	Is the USB memory connected properly? Is  (USB memory connected) shown on the LCD?	Connect the USB memory to the USB connection terminal of the instrument properly and securely. If the problem continues, turn OFF the instrument once and turn it ON again, and then connect the USB memory.
Not possible to print.	Is the printer cable connected properly?	Connect the RS-232C connector of the instrument and the connector of the printer with the optional connecting cable or the cable conforming to the requirements shown in the connection diagram on page 125.

Symptom	Check Point	Action
Measurement data or settings are not held in memory, and disappear immediately.	<p>The instrument's backup battery may be low immediately after purchase or following a period of prolonged non-use. Turn the instrument ON to charge the backup battery.</p> <p>Under this condition, the battery can be fully charged in 72 hours.</p>	<p>The backup battery has an expected service life of approximately ten years. If you find that the instrument fails to retain data in memory even after the battery has been fully charged, however, then it is likely that your battery has reached the end of its life and requires replacement.</p> <p>Note that you cannot replace the battery yourself. For information, please contact a KONICA MINOLTA SENSING-authorized service facility.</p>

# Chapter 6

## Appendix

6

Appendix

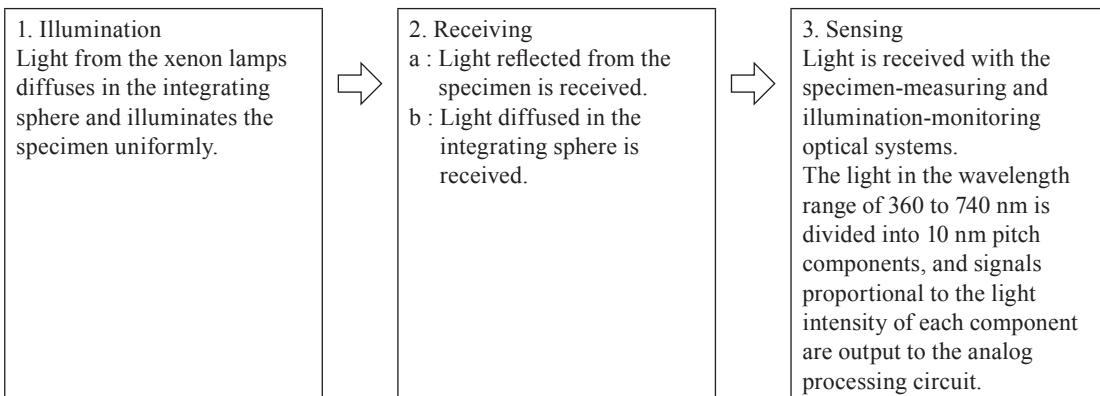
# Principles of Measurement

## Illuminating/Viewing System

### <Objective color reflectance measurement>

This instrument utilizes the di:8°/de:8° geometry conforming to CIE No. 15, ASTM E1164, DIN 5033 Teil 7, ISO 7724/1 and JIS Z 8722-1982 (diffused illumination, 8-degree viewing angle) standards, and offers measurement with automatic SCI (specular component included) and SCE (specular component excluded) switching.

The flow of measurement is shown below.



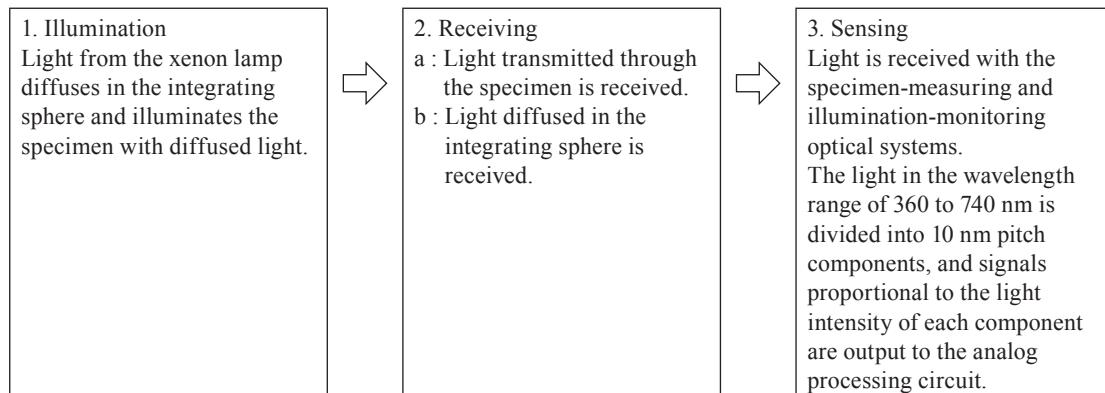
1. Light from the pulsed xenon lamp diffuses on the inner surface of the integrating sphere and illuminates the specimen uniformly.
2. a : The light reflected from the specimen surface at an angle of 8° to the normal of the surface is received by the specimen-measuring optical system.  
b : The light diffused in the integrating sphere is received by the illumination-monitoring optical system and guided to the sensor.
3. The light reflected from the specimen surface and the diffused light are divided into each wavelength component by the specimen-measuring optical system and illumination-monitoring optical sensor respectively, and then signals proportional to the light intensity of each component are output to the analog processing circuit.

By processing the outputs from the specimen-measuring optical system and the illumination-monitoring sensor with the calculation by the CPU, the instrument compensates for slight fluctuations in the spectral characteristics and intensity of the illumination light. (Double-beam system)

## <Object color transmittance measurement>

This instrument utilizes the di:0 °de:0 ° geometry conforming to CIE No. 15, ASTM E1164 and DIN 5033 Teil 7 standards, and offers measurement with SCI (specular component included) and SCE (specular component excluded) switching.

The flow of measurement is shown below.



- 1 Light from the pulsed xenon lamp diffuses on the inner surface of the integrating sphere and the built-in White Calibration Plate inside the specimen measuring port shutter and illuminates the specimen placed in the Transmittance Specimen Chamber with diffused light.
- 2 a : The light transmits through the specimen is received by the specimen-measuring optical system.  
b : The light diffused in the integrating sphere is received by the illumination-monitoring optical system and guided to the sensor.
- 3 The light transmitted through the specimen and the diffused light are divided into each wavelength component by the specimen-measuring optical system and illumination-monitoring optical sensor respectively, and then signals proportional to the light intensity of each component are output to the analog processing circuit.

By processing the outputs from the specimen-measuring optical system and the illumination-monitoring sensor with the calculation by the CPU, the instrument compensates for slight fluctuations in the spectral characteristics and intensity of the illumination light. (Double-beam system)

## Illumination Area and Measurement Area

This instrument allows the user to select from three types of measurement area: LAV (ø30 mm), MAV (ø8 mm) and (SAV) ø3 mm, depending on the specimen and application. Attach the target mask (illumination area) to match the measurement area.

### Target Mask (Illumination Area)

The instrument does not detect whether the currently attached target mask is for LAV, MAV, or SAV. Attach a target mask to match the selected measurement area.

As the condition of the edge of the target mask affects measurement, do not touch the edge of the target mask's specimen measuring port by hand, scratch it or make it dirty.

### Measurement Area

The measurement area is switched by adjusting settings on the <Measurement Area Settings> screen to operate the viewing system condenser lens, which is motor controlled.

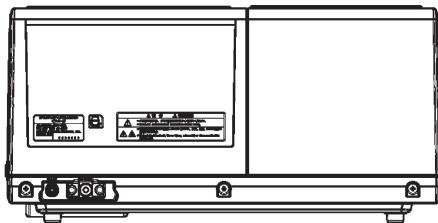
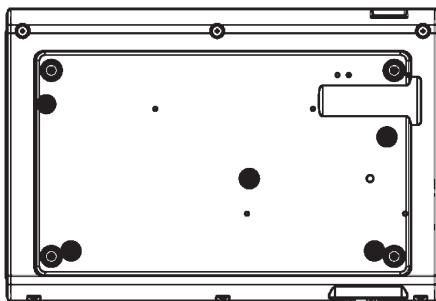
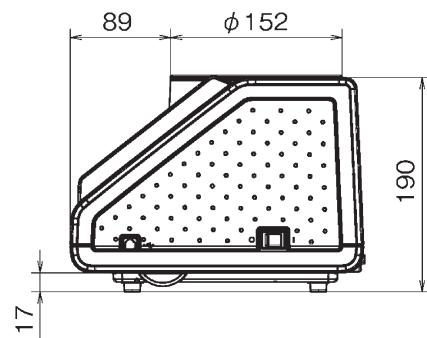
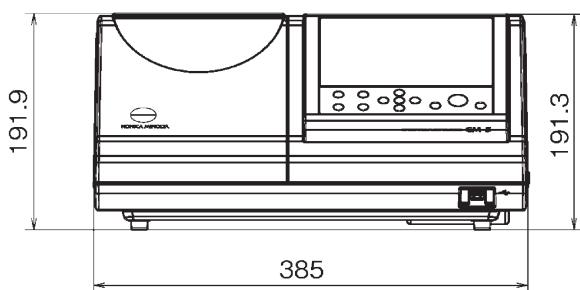
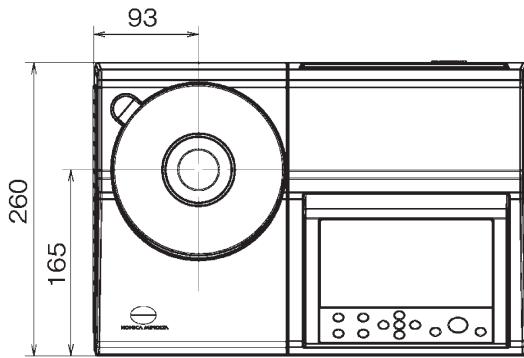
# Specifications

Model	CM-5 Spectrophotometer
Illuminating/viewing system	di:8°, de:8° (diffused illumination, 8-degree viewing angle) SCI (specular component included)/SCE (specular component excluded) selectable (with switching function) (Conforms to CIE No. 15, ISO7724/1, DIN5033 Teil7, ASTM E 1164, JIS Z 8722)
Size of integrating sphere	ø152 mm
Detector	Silicon photodiode array (dual 40-element)
Spectral separation device	Diffraction grating
Wavelength range	360 nm to 740 nm
Wavelength pitch	10 nm
Half bandwidth	Approx. 10 nm
Reflectance range	0 to 175%, Output resolution: 0.01%
Light source	Pulsed xenon lamp
Measurement time	Approx. 1 second (until data output). Shortest measurable interval: approx. 3 seconds
Measurement/illumination area	LAV: ø30 mm/ø36 mm, MAV: ø8 mm/ø11 mm (Optional accessories), SAV: ø3 mm/ø6 mm (Optional accessories)
Repeatability	Spectral reflectance: Standard deviation within 0.10% (400 nm to 740 nm), Colorimetric value: Standard deviation within ΔE*ab 0.04 * When the White Calibration Plate is measured 30 times at 10-second intervals after white calibration
Inter-instrument agreement	Average values of 12 BCRA Series II color tiles ΔE*ab 0.15 (Typical. LAV/SCI. Based on Konica Minolta master body with measurement conditions set by Konica Minolta.)
Transmittance	di: 0°, de: 0° (diffuse illumination/0° viewing angle)
Transmittance chamber	Width: Unlimited, Depth: 60 mm; Measurement diameter: 20 mm
Transmittance Specimen Holder (Optional accessories)	For use with both sheets/plates and liquid samples (removable)
Display	5.7-inch TFT color LCD
Languages	Japanese (kanji), English, German, French, Spanish, Italian, Chinese (simplified)
White calibration	Auto-calibration via integrated white calibration plate (except for measurement of liquid transmittance)
Interfaces	USB 1.1 (PC/USB memory device connection), Supports RS-232C (external printer connection)
Observation	2°/10°visual field
Illuminant	A, C, D50, ID65, D65, F2, F6, F7, F8, F10, F11, F12 (Simultaneous evaluation with two illuminants possible)
Displayed data	Spectral values/graph, colorimetric values, color difference values/graph, PASS/FAIL result, pseudocolor, color assessment
Color spaces	L*a*b*, L*C*h, Hunter Lab, Yxy, XYZ, Munsell, and color difference in these spaces (except for Munsell)
Index (Reflectance)	MI, WI (ASTM E313-73/E313-96), YI (ASTM E313-73/E313-96/ASTM D1925), WB (ASTM E313-73), ISO brightness
Index (Transmittance)	Gardner, Iodine Color Number, Hazen/APHA, European Pharmacopoeia, US Pharmacopeia
User Index	Yes (Requires Color Management Software SpectraMagic™ NX.)
Color difference formulas	ΔE*ab (CIE1976), ΔE*94 (CIE1994), ΔE00 (CIE2000), ΔE (Hunter), CMC (l:c)

Model	<b>CM-5 Spectrophotometer</b>
Pass/fail judgment	Tolerances can be set for colorimetric values (except for Munsell color spaces,) color difference values, and index values (except for transparent index values)
Storable data sets	Measured data: 4,000 sets/Target color data: 1,000 sets
Save data to USB memory device*	Measured data and color difference target color data can be saved to a USB memory device. Condition settings can be saved and loaded.
Power	Dedicated AC adapter (100-240 V $\sim$ , 50/60 Hz)
Size	With sliding cover closed: 385 (W) x 192 (H) x 261 (D) mm With sliding cover open: 475 (W) x 192 (H) x 261 (D) mm
Weight	Approx. 5.8 kg
Operating temperature/humidity range	13 to 33°C; relative humidity 80% or less (at 35°C); with no condensation
Storage temperature/humidity range	0 to 40°C; relative humidity 80% or less (at 35°C); with no condensation

\* USB devices with security settings are not supported.

# Dimensions







KONICA MINOLTA

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