



INSTRUCTION MANUAL
Spectroradiometer

SR-5
SR-5A

Introduction

Thank you for your purchasing Topcon Technohouse Corporation Spectroradiometer SR-5/SR-5A.

The spectroradiometer SR-5/SR-5A can measure the reflected light of the following machines with high precision, even if the luminance of the light is extremely low:

- LCD of smartphone, tablet, TV and others;
- Luminous bodies such as OLED panel, instrument panel of an automobile, switches and lamps, μ LED, MiniLED, LED illumination;
- The painted surface and printed substance.




This manual describes the outline, basic operation, and the specifications of the spectroradiometer SR-5/SR-5A.










Please keep this manual near you for operating this device.

Safety Precautions







The instruction panels on the device and this Instruction Manual describe important things to prevent the dangers to the operator or others and damages to your properties from occurring, and to secure your operating this device.

Be sure to understand the following indications and symbols. Then, read the precautions and the contents, and observe the written instructions fully.





Indication marks	Meaning of marks
 Danger	This “danger” mark indicates that ignoring this indication and mishandling the device can cause imminent dangerous situation that may cause death or severe injury to you or others.
 Warning	This “warning” mark indicates that ignoring this indication and mishandling the device may cause potential dangerous situation that may cause death or severe injury to you or others.
 Caution	The “Caution” mark indicates that ignoring this indication and mishandling the device may cause potential dangerous situation that may cause injury to you or others or only property damage.
<ul style="list-style-type: none"> • Injury stated here indicates the injury, burn, or electric shock that does not require hospitalization or visiting the hospital for a long time. • Property damage stated here indicates the damage widely spread to the building, properties, domestic animals, or pets. 	

Symbols	Meaning of symbols
	This mark indicates the caution. Detailed content of the caution is stated or indicated by the symbol  in or near the mark. (Example  : Be careful for electric shock.)
	This mark indicates the prohibited matter. Detailed content of the prohibited matter is stated or indicated by the symbol  in or near the mark. (Example  : Do not touch the operating units.)
	This mark indicates the obligatory matter. Detailed content of the obligatory matter is stated or indicated by the symbol  in or near the mark. (Example  : Perform grounding.)

⚠ Warning

Symbols	Preventive matters
 Prohibited	Never use the system in flammable or ignitable vapor-floated (gasoline, etc.) place. This may cause fire.
 Prohibited	Never disassemble or modify this instrument. This may cause fire or electric shock.
 Obligatory	Be sure to use the AC adapter which is the standard or optional accessory. The defective AC adapter may cause fire or electric shock.
 Prohibited	Never disassemble the AC adapter. This may cause fire or electric shock.
 Obligatory	Be sure to remove the dust or moisture around the plug and outlet of AC adapter. This may cause fire.
 Obligatory	If abnormal sound, unusual smell, or smoke are found in this instrument, turn off the power quickly and pull out the AC adapter cable from the outlet. Continuing to use the instrument may cause fire. Please contact the local retailer from which you purchased the instrument or TOPCON TECHNOHOUSE CORPORATION.

⚠ Caution

Symbols	Preventive matters
 Prohibited	Never watch the sun or the filament of an electric bulb directly. This may injure your eyes.
 Prohibited	Never put the instrument (or other objects) on the unstable places like wobbly table or inclined surface. Dropping or falling of the instrument (or other objects) may injure you.
 Prohibited	Never pull out or insert the plug by wet hands. This may cause electric shock.
 Obligatory	When using the tripod mounting screw hole and the jig mounting screw hole, use the specified screw. Do not tighten the screw excessively. The inside of the instrument may be broken.

Disclaimer

- We are not responsible for the damages caused by various problems such as fire, earthquake, behaviors by the third party, other accidents, intentional or negligent or wrong use of the device by the operator, and the use of the device under abnormal conditions.
- We are not responsible for incidental damages arising from the use or unavailability of the device (loss of business income, business interruption, etc.).
- We are not responsible for the damages caused by the uses other than specified in the Instruction Manual.
- We are not responsible for the damages caused by the malfunction due to the combination with the connecting devices.

Precautions for use

- Use the AC adapter, which is the standard or optional accessory. Any other AC adapter except the specified one may cause malfunction. For the power supply used for this instrument, the input voltage is AC100V to 240V and the frequency is 50Hz to 60Hz.
- For energy saving, when this instrument will not be used for an extended period of time, disconnect the power plug from the outlet.
- Keep this instrument away from water and liquid. It is not water-resistant.
- Never measure the light source exceeding the measurable range or the sunlight. Such behaviors may damage the photo detector and make it impossible to perform the stabilized measurement.
- When using this instrument, do not turn ON the power right after turning it OFF. Because the instrument inside is hot, the protective circuit works to indicate an error. In such a case, turn off the power and leave the instrument as it is for about thirty minutes under the usable condition (SR-5A: 5 - 30°C). Then, turn on the power.

 “5.1 Error Display of Instrument”

- Never use this instrument in the place which is dusty or humid or generates corrosive gas.
- Never use this instrument where the temperature tends to vary rapidly. Although a temperature compensating circuit is built in this instrument, it may not perform the stabilized measurement under the environment where the temperature tends to vary rapidly.
- Never use or store this instrument in a place which is subject to heavy shock like falling or tends to vibrate at any time. Using or storing in such a place may damage the instrument equipped with delicate optical components. When carrying this instrument, put it in the accessory carrying case to prevent it from direct vibration or shock.
- To store this instrument, be sure to put it in the exclusive carrying case and keep it under constant temperature and humidity. Never store the instrument under high temperature and high humidity condition (for example, in a car).
- To maintain the measurement precision, be sure to perform the calibration at least once a year. For the calibration, consult the local retailer from which you purchased the instrument or TOPCON TECHNOHOUSE CORPORATION.
- When the calibration is performed, **the measurement data stored in this instrument are completely erased.** Be sure to back up the necessary data in your personal computer, etc. before requesting the calibration.
- Never peel off the seal from the instrument. **If it is peeled off, all of warranty will be invalid.**
- When connecting a personal computer (PC) with this instrument, arrange the cables very carefully not to transmit noise from the surroundings. Connect GND correctly not to generate potential differences between PC and the instrument. If the instrument is used with potential differences, the internal electronic parts may be damaged.

User Maintenance

Maintenance works other than instructed in this manual must not be carried out by anybody other than our servicing staff in order to keep the safety and performance. However, the following matters can be performed by the user for maintenance. Please read the section relevant to the maintenance method in this manual.

Cleaning the instrument cover and lens

For the dirt of the instrument case and lens, please remove it with a soft cloth moistened with diluted neutral detergent. Then, wipe the case or lens with a dry soft cloth.

Never use solvent such as thinner, benzene and acetone. Such solvent may discolor the instrument surface.

CONTENTS

Introduction	
Safety Precautions	
Notation in This Manual	
1. Before Using the System	1
1.1 Checking the Instrument and Accessories	1
1.2 Names and Functions of Components	2
1.3 Preparation	7
1.3.1 Connecting AC adapter	7
1.3.2 Connecting PC	8
1.3.3 Alignment of Measurement Target	9
1.3.4 How to Turn On/Off the Power	11
1.3.5 Opening/Closing the Viewfinder Shutter	13
1.4 Replacing the Dust Filter	14
2. Measurement Operation	15
2.1 Single Measurement (Single)	15
2.2 Continuous Measurement (Auto Run)	17
2.3 Difference Measurement	18
2.4 Display of the Stored Measurement Data	20
2.5 Display of Chromaticity Diagram	22
2.6 Display of Graph	23
2.7 Measurement by Using This Instrument	24
2.7.1 Measuring a Target with Directivity	24
2.7.2 Measuring Small Surface	24
2.7.3 Measuring a Target Lighting by Frequency in Stabilized Condition	25
3. Operation for Various Settings	26
3.1 Selection Item Display	26
3.2 Function Mode	28
3.2.1 Setting Items	28
3.2.2 Shifting/Resetting to/from Function Mode	29
3.2.3 Setting of Numerical Value	34
3.2.4 Measurement Mode	36
3.2.4.1 Auto Mode	38
3.2.4.2 Manu (Manual) Mode	40
3.2.4.3 Freq (Frequency) Mode	42
3.2.4.4 Sync Mode	43
3.2.4.5 FixInteg Mode	44
3.2.4.6 FixFreq Mode	47
3.2.5 How to Measure	49
3.2.6 Action of "OVER-RANGE"	50
3.2.7 Automatic Control of Viewfinder Shutter	51





3.2.8	Integral Time Delay Function	52
3.2.8.1	Setting of Delay Time.....	53
3.2.9	Average Measurement	54
3.2.9.1	Averaging Times	55
3.2.10	Measuring Speed	56
3.2.10.1	“High Speed” Calibration.....	57
3.2.11	How to Connect PC	58
3.2.12	RS-232C Parameters	60
3.2.13	Data Communication Method	62
3.2.14	Environment Information Output	63
3.2.15	Terminal Code of Remote Command.....	64
3.2.16	Automatic Control of Touch Panel.....	65
3.2.17	Brightness of Touch Panel	66
3.2.18	Action When Touch Panel Is Not Operated	67
3.2.19	Beep Sound.....	68
3.2.20	Luminance Display Format.....	69
3.2.20.1	Luminance Display Digits.....	70
3.2.21	Correction Factor	71
3.2.22	CIE Color Matching Function (Visual Field)	73
3.2.23	CIE Color Matching Function (Type)	74
3.2.24	Initialization of Setting Data/ Measurement Data History/Diff Standard Data	75
4.	Communication with PC	77
4.1	Communication Command.....	77
4.1.1	RM/LM Command	81
4.1.2	WHO/SRL/VER Command.....	81
4.1.3	ST/STW Command	82
4.1.4	STB/STBW Command.....	84
4.1.5	SF Command	85
4.1.6	STCT_#Command.....	87
4.1.7	CXL Command	88
4.1.8	D[n] Command	89
4.1.9	A[n]/A1/A2 Command.....	89
4.1.10	KW[n]_# Command	90
4.1.11	KR[n] Command	90
4.1.12	K[n] Command.....	91
4.1.13	K[n] R Command	91
4.1.14	DR[n] Command.....	92
4.1.15	DRW[n] Command	92
4.1.16	K[n1][n2] Command.....	93
4.1.17	KOR[n] Command	93
4.1.18	CIE_# Command	93
4.1.19	CIER Command	94
4.1.20	CMF_# Command	94
4.1.21	CMFR Command.....	94

4.1.22 LDF# Command	95
4.1.23 LDFR Command.....	95
4.1.24 LDD_# Command.....	95
4.1.25 LDDR Command	96
4.1.26 FLD[n] Command	96
4.1.27 FLDR Command.....	96
4.1.28 NL_# Command	97
4.1.29 N[n] Command	97
4.1.30 [n]S Command.....	97
4.1.31 HCL Command.....	98
4.1.32 HSR Command	98
4.1.33 FO Command	98
4.1.34 FX Command	99
4.1.35 FG Command	99
4.1.36 FS_#1_#2 Command	100
4.1.37 FXQ_#1_#2 Command.....	100
4.1.38 IMD_# Command	100
4.1.39 IMDR Command.....	101
4.1.40 IMF_# Command.....	101
4.1.41 IMFR Command	101
4.1.42 EC/EO Command.....	102
4.1.43 ES_# Command	102
4.1.44 ESR Command.....	102
4.1.45 ALNS_# Command.....	103
4.1.46 ALHS_# Command.....	103
4.1.47 AVE_# Command.....	103
4.1.48 AVER Command	104
4.1.49 AVT_# Command	104
4.1.50 AVTR Command	104
4.2 Output Format	105
4.2.1 Output Format of Remote Measurement.....	105
4.2.1.1 ST Command.....	105
4.2.1.2 STW Command	106
4.2.1.3 SF Command.....	107
4.2.1.4 STB/STBW Command	108
4.2.1.5 STCT Command	110
4.2.2 Internal Stored Data Output Format	111
4.2.2.1 DR[n] Command	111
4.2.2.2 DRW[n] Command.....	112
4.3 Installing USB Driver	113
5. Error Display.....	114
5.1 Error Display of Instrument.....	114
5.2 Error Code in Communication	116
6. Appendices.....	117

Specifications and Performance	117
Block Diagram	125
Internal Calculation Processing	126
External Dimensional Diagram	128

Notation in This Manual

Description in this Manual is in accordance with the following notation.

Notation	Description
[Function]	This indicates the menu button displayed on the touch panel screen.
	This indicates the reference section in this manual.
	This indicates other manuals for reference.
 Note	This explains what you should know or consider before starting the operation.
 Memo	This explains the reference or convenient matters helpful for your operation.

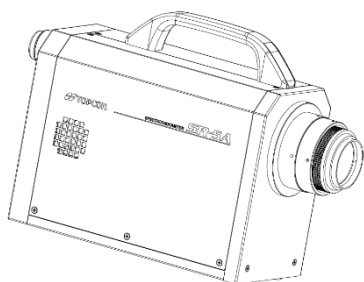
1. Before Using the System

1.1 Checking the Instrument and Accessories

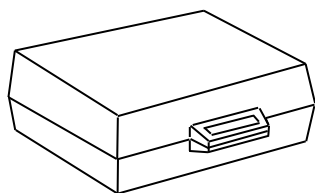
Please check that the instrument and all of the accessories are provided.

If any of them is not found, please contact the local retailer from which you purchased the instrument or TOPCON TECHNOHOUSE CORPORATION.

- Instrument (SR-5/SR-5A) 1



- Objective lens cap 1
- Eyepiece lens cap 1
- SR-5/SR-5A Quick manual 1
- Colorimetry program CS-900A/Instruction manual 1
- AC adapter 1
- USB cable 1
- Dust filter 10
- Inspection report 1
- Carrying case 1

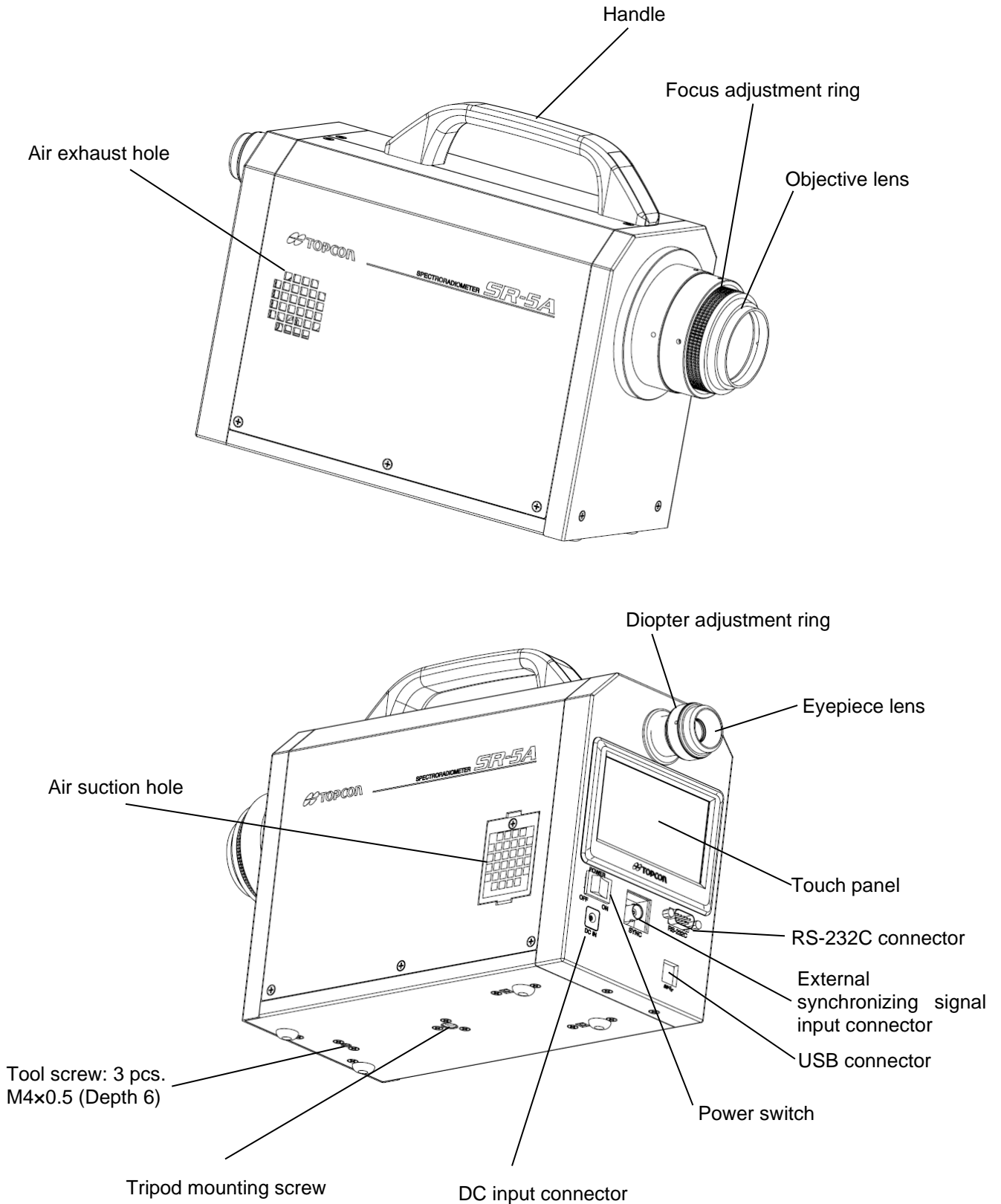






Note


When you use the colorimetry program CS-900A for the instrument, use the program of Ver.8.00 or higher.

1.2 Names and Functions of Components

Using the SR-5A instrument illustration, the names and functions of the components, which are common to SR-5/SR-5A, will be described.



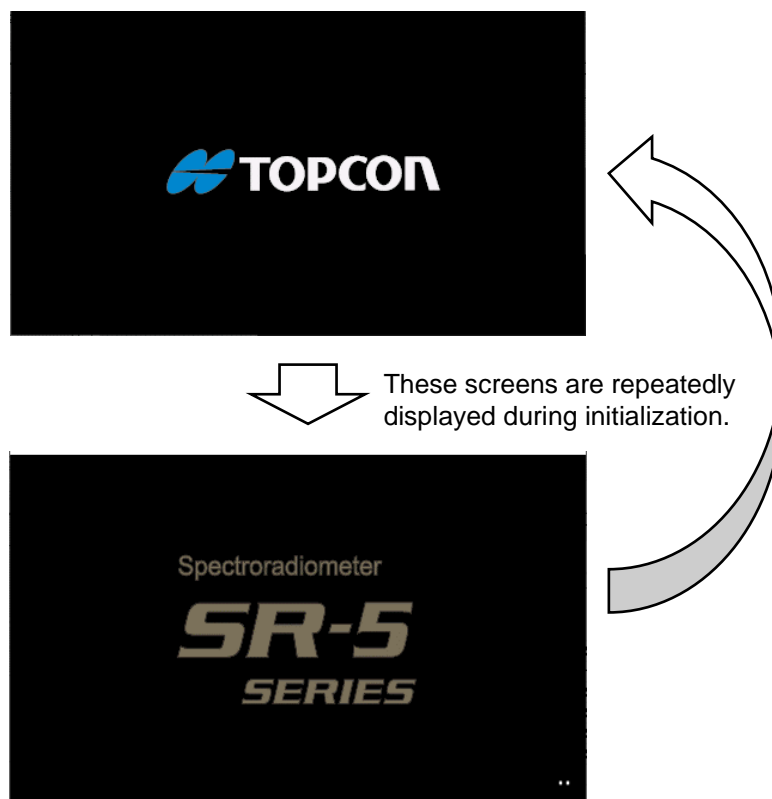
- Power switch: This is the power switch of the instrument.
- DC input connector: Insert the output plug of the AC adapter, which is the accessory of the instrument, into this connector.
- Touch panel: This indicates a variety of information such as the measurement data or the measurement conditions. The buttons to start/suspend measurement and perform settings are provided on this panel.
 “3.2.2 Shifting/Resetting to/from Function Mode”
- Diopter adjustment ring: Used to bring the viewfinder’s reticle mark into focus.
- Focus adjustment ring: Used to bring the measurement target into focus.
- USB connector: When carrying out remote mode measurement, the communication cable is connected to this connector.
 “1.3.2 Connecting PC”
- RS-232C connector: When carrying out remote mode measurement, the communication cable is connected to this connector.
 “1.3.2 Connecting PC”
- External synchronizing signal input connector:
 Input the synchronizing signal through this connector when measuring a flashing target.
- Tripod mounting screw: This screw is used to mount the instrument on a tripod. The 1/4-UNC camera mounting screw is adopted.
- Tool screw: This screw is used to mount the instrument on systems or others.
 The size is M4×0.5 (diameter: 3mm, Pitch: 0.5mm).
 “External Dimensional Diagram” of “6. Appendices”

 Note	<p>When using the tripod mounting screw hole and the jig mounting screw hole, use the specified screw. Do not tighten the screw excessively. The inside of the instrument may be broken.</p>
--	--

Display of touch panel

■ Initial screen

After turning ON the power, this screen appears during initialization.



■ Screen during measurement

Normally the whole screen is black. Press an optional position on the touch panel, and measurement information is displayed.



[Display]

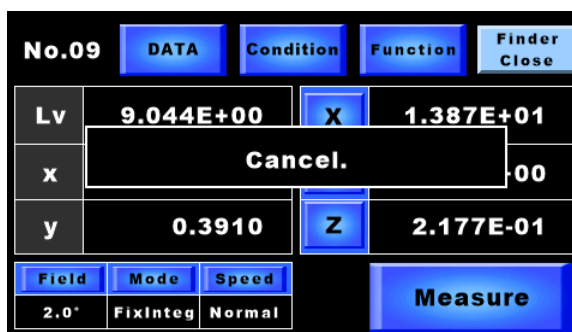
- IntegTime: Displays the integral time when measuring.
Field: Displays the measuring angle when measuring.
Meas.Speed: Displays the measuring speed when measuring.

[Button]

- Cancel: Cancels measurement.

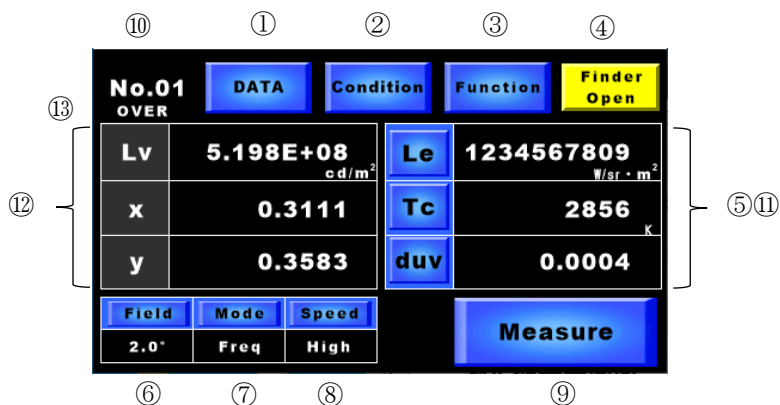
■ Cancel of measurement

Press the [Cancel] button during measurement. The following message is displayed and measurement is suspended.



■ Measurement result screen

This screen appears after finishing measurement.



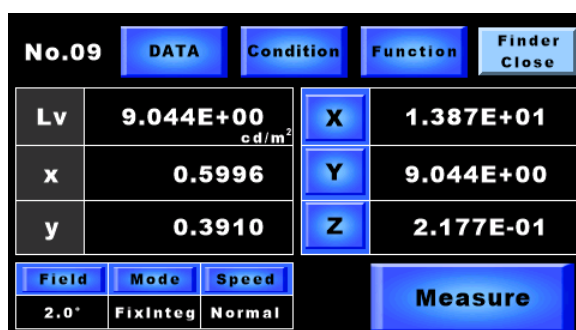
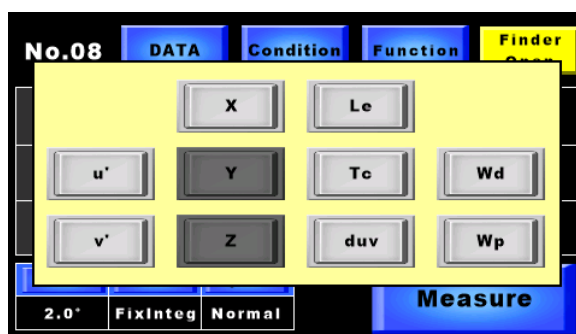
[Button]

- ① DATA: Shifts to the measurement data list screen.
- ② Condition: Shifts to the measurement conditions list screen of the displayed measurement number.
- ③ Function: Shifts to the function menu screen.
- ④ Finder: Opens/closes the viewfinder shutter.
This button is yellow for “Open” and light-blue for “Close”.
- ⑤ Selection items: Shifts to the item selection screen displayed optionally.
- ⑥ Field: Changes the measuring angle.
- ⑦ Mode: Changes the measurement mode.
- ⑧ Speed: Changes the measuring speed.
- ⑨ Measure: Starts measurement.

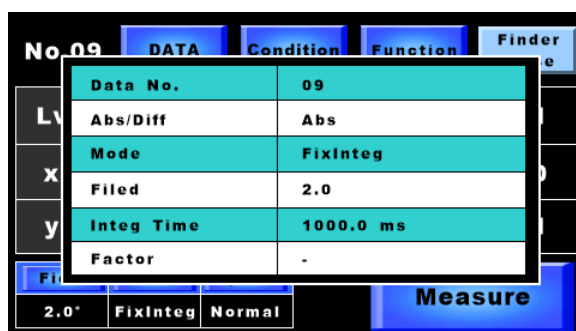
[Display]

- ⑩ Measurement number: Indicates the number of the measurement data being displayed.
- ⑪ Selection items: Indicates the optionally-selected items.
- ⑫ Fixed items: Indicates “Lv” (luminance), “x” (chromaticity “x”) and “y” (chromaticity “y”).
- ⑬ OVER: Displayed when the measurement data is beyond the range.

Press one of [Selection item] buttons, and the item selection screen appears. You can select the display items.



Press the [Condition] button. The measurement conditions of the measurement number being displayed are indicated.



[Display]

- Data No. : Indicates the measurement number.
- Abs/Diff: Indicates whether the measurement data is "Absolute value" or "Difference".
- Mode: Indicates the measurement mode.
- Filed: Indicates the measuring angle.
- Integ Time: Indicates the integral time.
- Factor: Indicates whether the correction factor is applied or not.

Memo

Press the outside of the display frame on the selection item screen and the measurement conditions screen. The screen disappears.

1.3 Preparation

1.3.1 Connecting AC adapter



Obligatory

**Be sure to use the AC adapter which is the standard or optional accessory.
The defective AC adapter may cause fire or electric shock.**



Obligatory

**Be sure to remove the dust or moisture around the plug and outlet of AC adapter.
This may cause fire.**

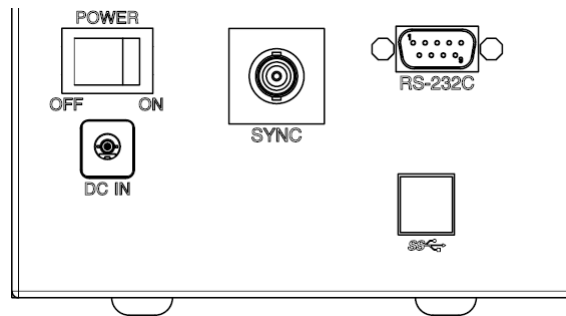


Prohibited

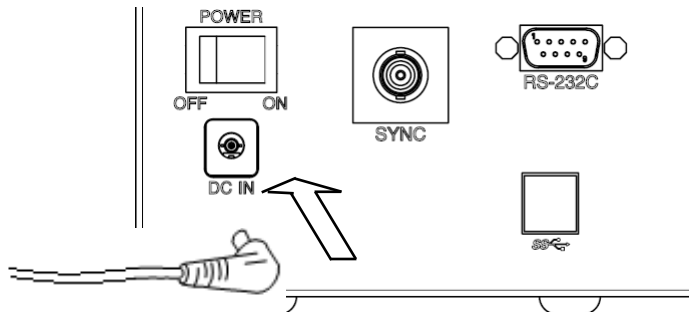
**Never pull out or insert the plug by wet hand.
This may cause electric shock.**

Connect the AC adapter to this instrument by the following procedures.

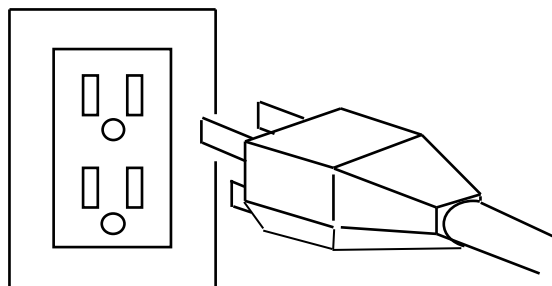
- 1 Make sure that the instrument is turned OFF.



- 2 Insert the output connector of the AC adapter into the DC input connector of the instrument.



- 3 Connect the AC adapter plug to the outlet.



1.3.2 Connecting PC

When using the instrument by connecting to PC, connect the instrument to PC with USB cable or RS-232C cable. Use the USB cable of standard 3.0. Use the RS-232C cable which is the interlink cable serial cross type applicable to personal computer.

The RS-232C signal line is arranged according to the 9-pin D-SUB connector specification that is used in personal computer or others. When connecting the instrument to a computer, carry out wiring as referring to the drawing below.

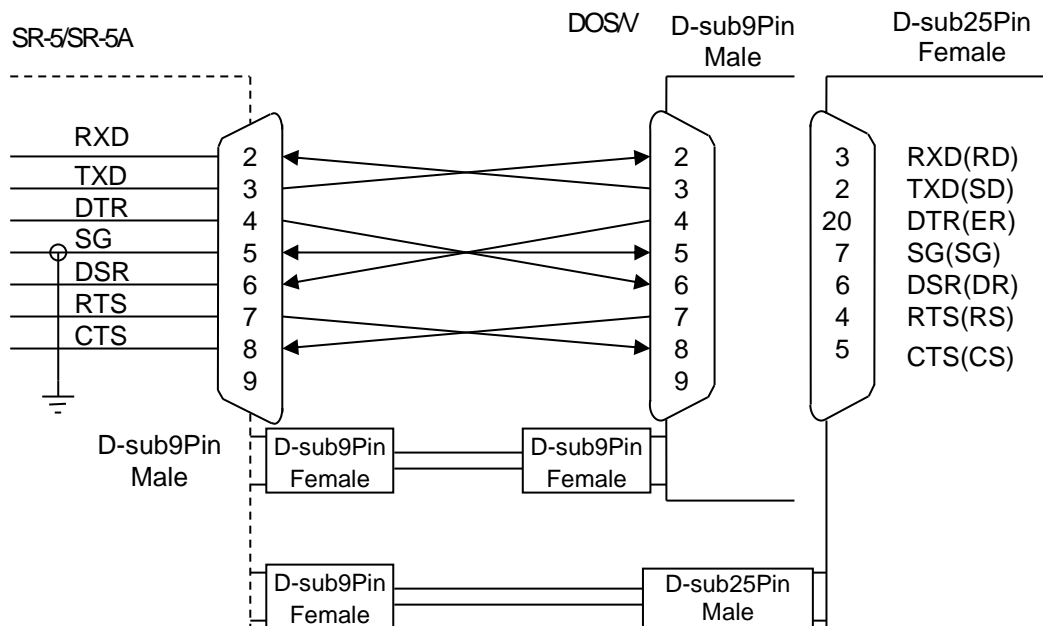
Memo

- The RS-232C cable is not an accessory of the instrument. Please purchase the RS-232C cable separately when you want to use it.
- When connecting to PC, refer to your PC manual in addition to the instrument's manual.
- When carrying out USB communication, it is necessary to install a proper driver.

☞ "4.3 Installing USB Driver"



Do not connect/disconnect the connectors while the instrument is powered.




The RS-232C specifications of the instrument are shown below.

- Communication method: Full duplex
- Synchronization: Asynchronous serial communication
- Communication speed: 4800/9600/19200/38400/57600/115200 bps (Bits Per second)
- Bit configuration: Data length: 7 bits/8 bits
Parity: Even number (EVEN)/Odd number (ODD)/None (NONE)
Stop bit: 1 bit/2 bits
- Communication type: ASCII
- Delimiter: When data is sent, "CR+LF" or "CR" is set at the end of data communication line.


☞ "3.2.15 Terminal Code of Remote Command"

1.3.3 Alignment of Measurement Target



Never watch the sun or the filament of an electric bulb directly.
This may injure your eyes.

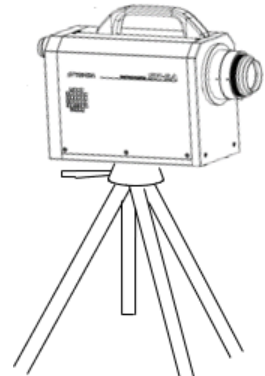
Prohibited



Note When using the tripod mounting screw hole or the jig mounting screw hole, use the specified screw. Do not tighten the screw excessively. The inside of the instrument may be broken.

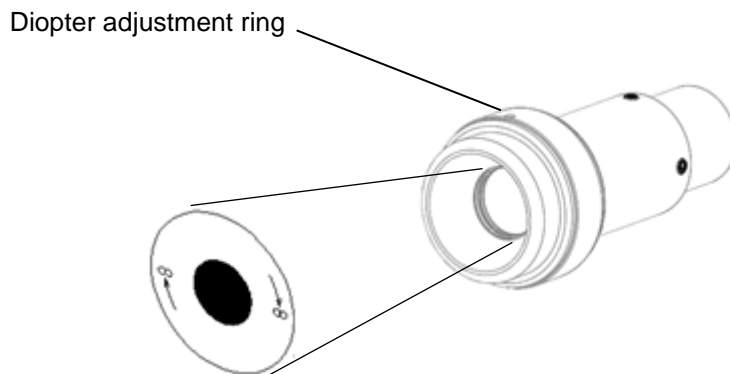
- 1 Fix the instrument by using the tripod mounting screw or the tool mounting screw.
- 2 Remove the objective lens cap.
- 3 Turn on the power switch to the right to open the viewfinder shutter.


☞ “1.3.4 How to Turn On/Off the Power”



No.01		DATA	Condition	Function	Finder Open
<small>OVER</small>					
Lv	5.198E+08		Le	1234567809	
	<small>cd/m²</small>			<small>W/sr · m²</small>	
x	0.3111		Tc	2856	
				<small>K</small>	
y	0.3583		duv	0.0004	
Field	Mode	Speed	Measure		
2.0°	Freq	High			


- 4 Look into the eyepiece lens. Adjust the focus by turning the diopter adjustment ring so that the reticle mark and the black circle, which shows the measurement area, can be seen clearly. The dioptric power (diopter) must be adjusted according to the visual acuity of the person who performs measurement.





Note Unless the dioptric power is adjusted before adjusting the focus of objective lens, sometimes a correct measured value cannot be obtained.

- 5 Perform alignment for the measurement target. Turn the focus adjustment ring of the objective lens to bring the measurement target into focus.

 Note	Adjust the focus adjustment ring of the objective lens in the same direction. If the adjusting direction is different, the measurement target position may be improperly moved.
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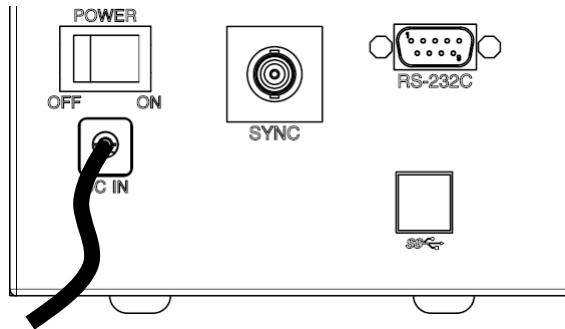
- 6 Change the measuring angle according to the size and brightness of the measurement target. Press the [Field] button, and the measuring angle selection screen appears. Select a desired measuring angle. The measuring angle is automatically changed. The current measuring angle is indicated at “Field” on the lower left corner of the screen.



☞ “1.2 Names and Functions of Components”

1.3.4 How to Turn On/Off the Power

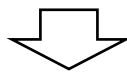
To turn ON the power, tilt the power switch rightward.



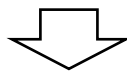
When the power is ON, the initial screen appears on the touch panel. After initialization is completed, the last measured data is indicated.



These screens are repeatedly displayed until initialization is completed.



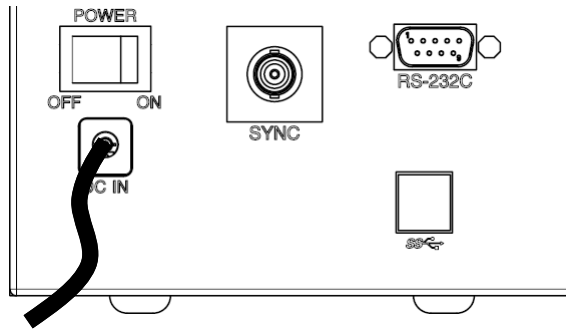
Screen during initialization



Screen when initialization is completed

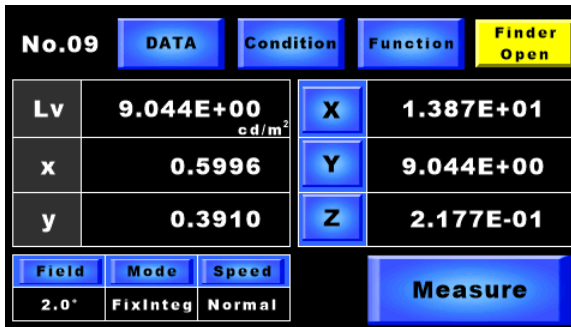
No.01 OVER		DATA	Condition	Function	Finder Open
Lv	5.198E+08 <small>cd/m²</small>	Le	1234567809 <small>W/sr · m²</small>		
x	0.3111	Tc	2856 <small>K</small>		
y	0.3583	duv	0.0004		
Field	Mode	Speed	Measure		
2.0°	Freq	High			

To turn OFF the power, tilt the power switch leftward.

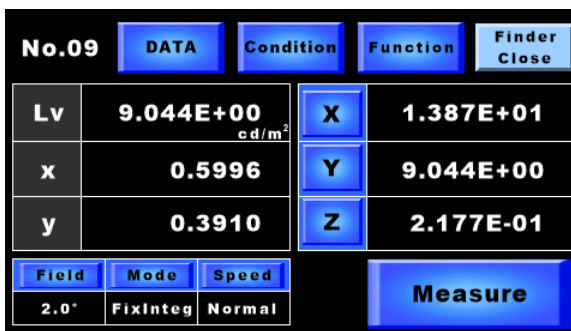


1.3.5 Opening/Closing the Viewfinder Shutter

When the brightness of the measurement target is extremely low or when there is a luminous body at the viewfinder side, set the viewfinder shutter to “Close” to block the stray light from the viewfinder.

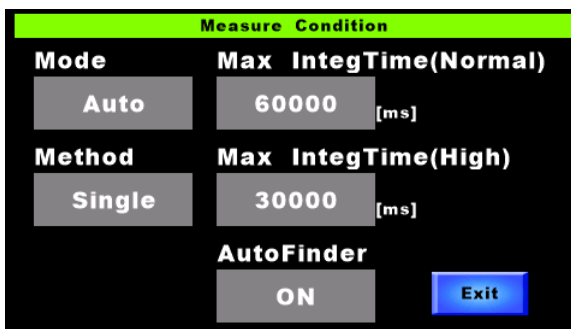


“Open” status
It is possible to observe an object through the viewfinder.



“Close” status
The light from the viewfinder is blocked.

When selecting [Function]-[Measure Condition] and setting [AutoFinder] to “ON” and then measurement is done, the viewfinder shutter is automatically closed. When it is set to “OFF” and measurement is done, the viewfinder shutter must be manually operated and the current position is kept.



☞ “3.2.7 Automatic Control of Viewfinder Shutter”

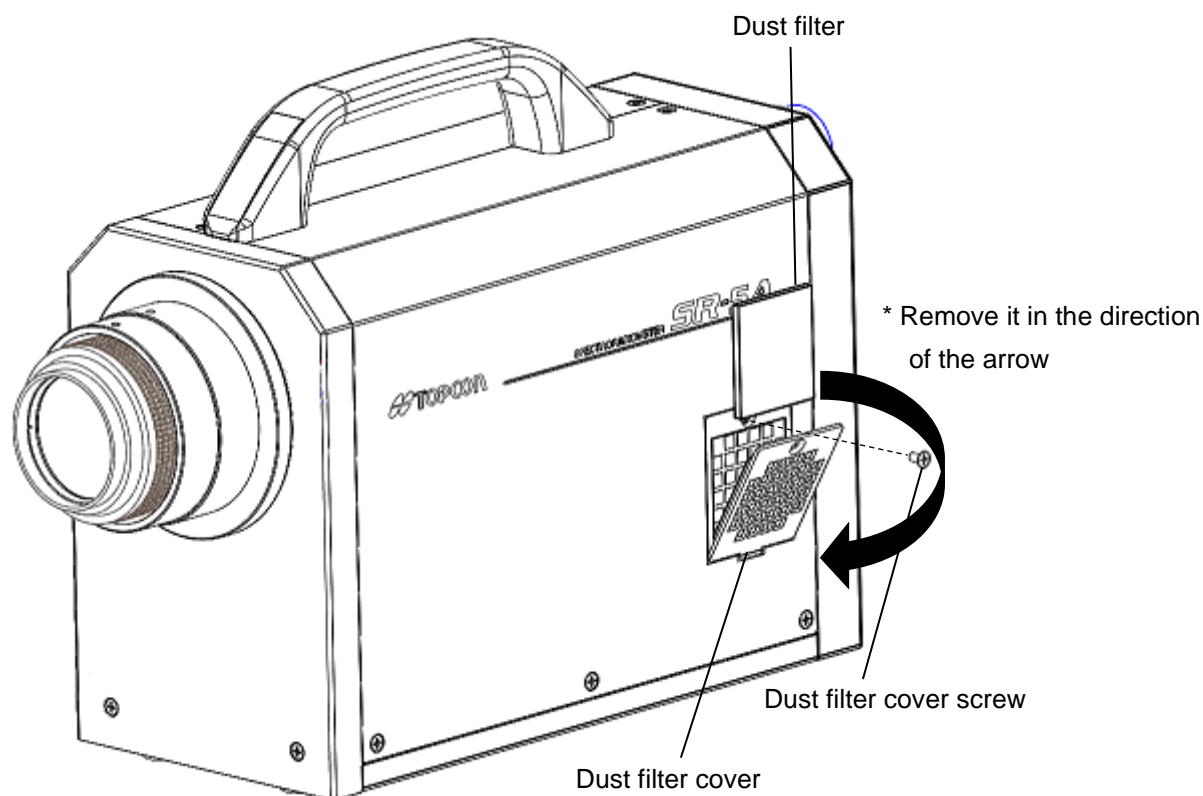
Memo

- “ON” is initially set. When “ON” is set, the viewfinder shutter is not in “Open” status after measurement is completed. To set it to “Open”, set “Open” on the measurement result screen.
- When you do not want to set the viewfinder shutter to “Close” each time measurement is done, set “OFF”.

1.4 Replacing the Dust Filter

Replace the dust filter with a new one by the following procedures.

- 1 Remove the dust filter cover.
- 2 Replace the dust filter with a new one.
- 3 Attach the dust filter cover.



Note


- It is recommended to replace the dust filter every six months. This replacing interval can be changed depending on the environment where the customer uses the instrument. The dirt of dust filter sometimes causes a malfunction of the instrument.
- Cleaning the dust filter periodically can reduce the replacing frequency. After the dust filter has been washed in water, do not attach it until it is fully dried. If the wet dust filter is installed, it may cause a malfunction of the instrument.
- Do not use the instrument without dust filter. If the dust filter is not attached, the instrument may malfunction.
- The quantity of dust filter as the accessory for replacing is ten.
When you want to purchase more dust filters, please give an order to the local retailer from which you purchased the instrument or TOPCON TECHNOHOSE CORPORATION.

☞ "1.1 Checking the Instrument and Accessories"

2. Measurement Operation

2.1 Single Measurement (Single)

The procedures to perform single measurement are described below.

 Note	The measurement data is stored at the number next to the measurement number being indicated on the screen. When there is the data registered with the same number, the existing data is overwritten.
--	--

 Memo

The measurement data can be stored up to 25.

- 1 Press the [Measure] button to start measurement.

No.09	DATA	Condition	Function	Finder Open
Lv	9.044E+00 <small>cd/m²</small>	X	1.387E+01	
x	0.5996	Y	9.044E+00	
y	0.3910	Z	2.177E-01	
Field	Mode	Speed	Measure	
2.0°	FixInteg	Normal		

- 2 When measurement starts, the whole screen is black.

Press an optional position on the screen. The measurement conditions are displayed.

Please wait...	
IntegTime	1000.0 [ms]
Field	2.0
Meas.Speed	Normal
Cancel	

3 When the measurement is finished, the measurement result is indicated.


The current set values are indicated on [Field], [Mode] and [Speed].

No.01		DATA	Condition	Function	Finder Close
Lv	8.331E+00 cd/m ²	X	8.071E+00		
x	0.3584	Y	8.331E+00		
y	0.3699	Z	6.119E+00		
Field	Mode	Speed	Measure		
2.0°	Auto	Normal			

Each time measurement is ended, the measurement number [No. **] is increased by 1.

2.2 Continuous Measurement (Auto Run)

The procedures to perform continuous measurement are described below.

 Note	<p>The measurement data is stored at the measurement number being indicated on the screen. The measurement data is stored up to 25. After the twenty-fifth data, the data is overwritten from No. 1 in order.</p>
--	---

1 Change the measuring method to continuous measurement.

☞ “3.2.5 How to Measure”

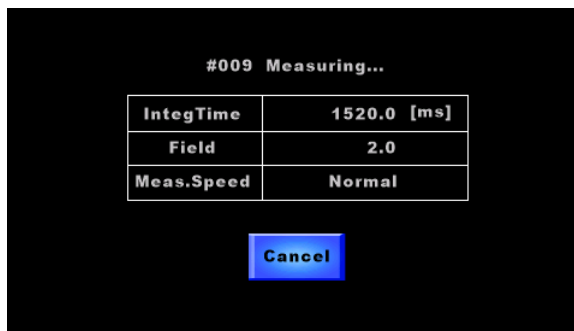
2 Press the [Measure] button to start measurement.

The whole screen is black.

Press an optional position on the screen. The measurement conditions are indicated.

 Memo

Each time measurement is ended, the measurement number [#***] is increased by 1.



3 To finish the measurement, press the [Cancel] button.

4 The measurement result screen appears again.



2.3 Difference Measurement

Using this instrument, you can measure the difference from the standard data.

The procedures to measure the difference are described below.

Change to the difference measurement.



Register or select the standard value.

The standard value can be registered up to 5 in the instrument.



Perform measurement.

- 1 Change from “Absolute value measurement” to “Difference measurement”.

Select [Function]-[Measure Option] and set [Abs/Diff] to “Diff”.



The screen is changed and the standard value registration screen is indicated.



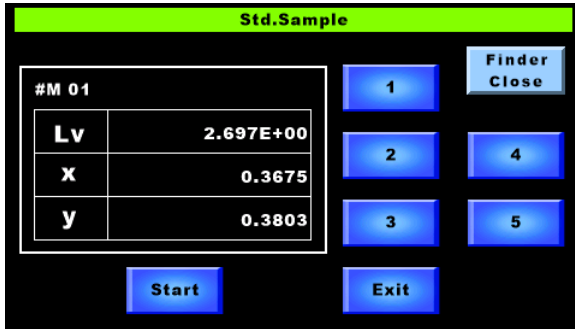
[Display]


- ① Standard value measurement result: The standard value measurement result is indicated.

[Button]

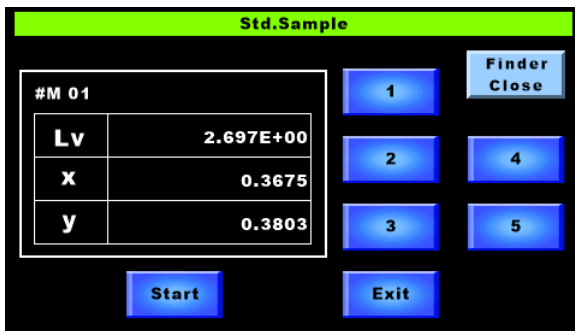
- ② Standard value number: Select the standard value number.
- ③ Finder: Set “Open/Close” for the viewfinder shutter.
- ④ Start: Start the standard value measurement.
- ⑤ Exit: Return to the “Measure Option” screen.

- 2 After specifying the standard value number, press the [Start] button to measure the standard value. After the measurement is finished, the measurement result is indicated and is registered at the specified standard value number.



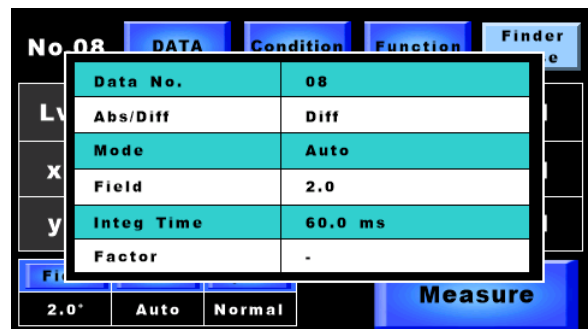
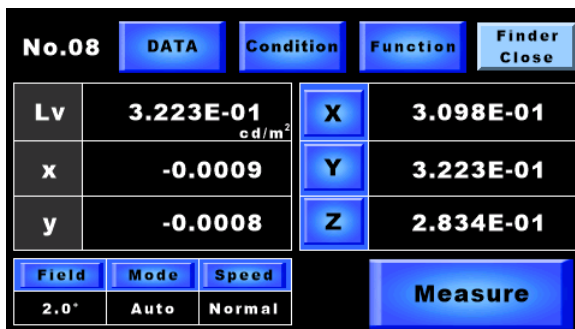
Note  The standard value is registered at the specified number. When there is the data registered with the same number, the existing data is overwritten.

- 3 Press the [Exit] button to return to the "Measure Option" screen.



- 4 Measure the difference.

Perform the measurement in the same way as absolute value measurement. After the measurement is finished, the difference from the standard value is indicated.



2.4 Display of the Stored Measurement Data

The measurement data is numbered and is stored in the internal memory up to 25.

You can refer to the stored data by the [DATA] button on the measurement result screen.

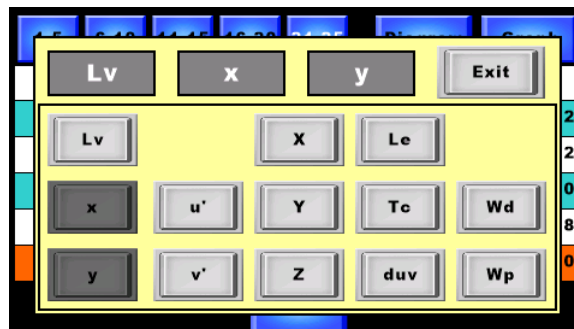
	Lv	X	y
16	4.662E+01	0.3654	0.3866
17	4.691E+01	0.3654	0.3865
18	4.683E+01	0.3655	0.3867
19	4.681E+01	0.3654	0.3866
20	4.693E+01	0.3654	0.3866

*3	6.595E+04	0.3256	0.3394
----	-----------	--------	--------


Five measurement data are indicated at a time. Five measurement data can be changed as a set.

[Button]


- ① Changing the measurement data: Change five data to be indicated at a time.
- ② Measurement number: Select the measurement data to be indicated on the measurement result screen.
The row being selected (measurement number) is indicated in orange.
- ③ Measurement data selection: Change three items to be indicated at a time.



- ④ Exit: The measurement result screen appears again.
- ⑤ Over range: When the ManuOver setting is OFF and the data measured in "OVER-RANGE" is saved, "*" will be added to the measurement number.

 Note	When measurement is done under the condition that twenty-five measurement data are stored, the data is overwritten from No. 1 in order.
--	---

 Memo

All measurement data can be deleted at a time.  “3.2.24 Batch Deletion of Measurement Data/Diff Standard Data”
--

2.5 Display of Chromaticity Diagram

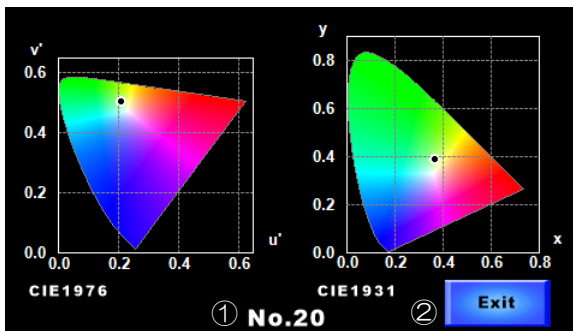
In this instrument, it is possible to indicate the chromaticity coordinate position of measurement data on a chromaticity diagram.

- 1 On the measurement data list screen of the [DATA] button, press the [Diagram] button.

1-5	6-10	11-15	16-20	21-25	Diagram	Graph
	Lv		x			y
16	4.662E+01		0.3654			0.3866
17	4.691E+01		0.3654			0.3865
18	4.683E+01		0.3655			0.3867
19	4.681E+01		0.3654			0.3866
20	4.693E+01		0.3654			0.3866

Exit

- 2 On the CIE1931 and CIE1976 chromaticity diagrams, the chromaticity coordinate position of the measurement data being selected is indicated with a black point.



[Display]

- ① Measurement number: Indicates the measurement number.

[Button]

- ② Exit: The measurement data list screen appears again.

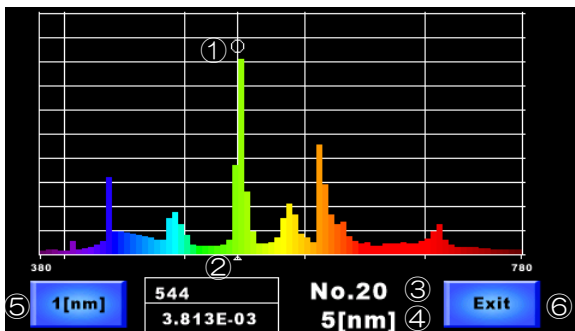
2.6 Display of Graph

The spectrum graph of measurement data is indicated.

- 1 On the measurement data list screen of the [DATA] button, press the [Graph] button.

1-5	6-10	11-15	16-20	21-25	Diagram	Graph
	Lv		x	y		
16	4.662E+01		0.3654	0.3866		
17	4.691E+01		0.3654	0.3865		
18	4.683E+01		0.3655	0.3867		
19	4.681E+01		0.3654	0.3866		
20	4.693E+01		0.3654	0.3866		
Exit						

- 2 The spectrum is indicated on a graph.

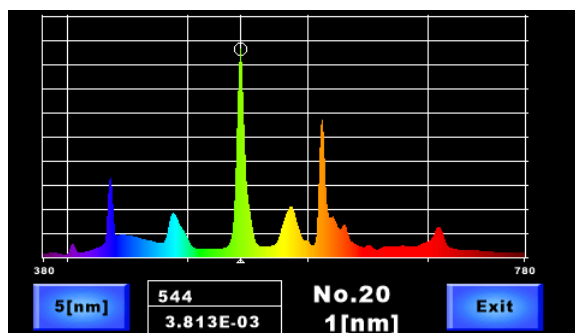


[Display]

- ① Peak wavelength marker: The marker "O" is indicated at the peak wavelength position.
- ② Peak wavelength position: The peak wavelength position and the spectral radiance at that position are indicated.
- ③ Measurement number: Indicates the measurement number.
- ④ Wavelength pitch: Indicates the wavelength pitch of the spectrum being displayed.

[Button]

- ⑤ Wavelength pitch: Changes the wavelength pitch of the displayed spectrum between 1nm and 5nm.



- ⑥ Exit: The measurement data list screen appears again.



Note

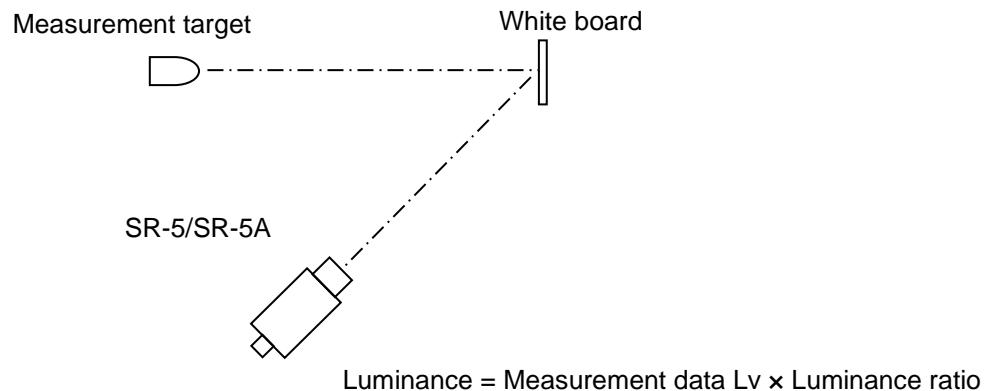
When the wavelength pitch is set to 1nm, the graph display is delayed.

2.7 Measurement by Using This Instrument

In this chapter, a measurement example will be described. Please use the example as a reference when you use this instrument.

2.7.1 Measuring a Target with Directivity

When measuring a target with directivity (for example, LED) or a target with unevenness, use a white board for measurement as shown in the figure. If you observe the target directly, sometimes you cannot obtain with good repeatability.



2.7.2 Measuring Small Surface

When measuring a smaller sample than the instrument's diameter, use the attachment lens, which is an optional accessory. There are three types of attachment lens, "AL-6", "AL-11" and "AL-12".

☞ "Specifications and Performance" of "6. Appendices"

Use the screw at the objective lens end of the instrument to connect the attachment lens.

When using the attachment lens, it is necessary to set the correction factor in the instrument.

☞ "3.2.21 Correction Factor"

The measuring diameter of each measuring angle is shown in the table below.

Measuring diameter (mm)	Measuring angle	AL-6	AL-11	AL-12
		(Measuring distance: 51.72 – 68.53mm)	(Measuring distance: 19.56 – 24.80mm)	(Measuring distance: 165 – 197mm)
	2°	2.00 - 2.88	1.18 - 1.53	3.23 - 4.00
	1°	1.00 - 1.44	0.59 - 0.76	1.62 - 2.00
	0.2°	0.20 - 0.29	0.15 - 0.19	0.32 - 0.40
	0.1°	0.10 - 0.14	0.06 - 0.08	0.16 - 0.20

*The definition of measuring distance is "Distance from the attachment lens hardware tip".

2.7.3 Measuring a Target Lighting by Frequency in Stabilized Condition

To measure a target lighting by frequency, follow the procedures described below.

■ When measuring with “Freq” and “Fix Freq” (frequency) mode

When the lighting frequency of the target is known, set the measurement mode to “Freq” or “Fix Freq” (frequency) mode. Set the frequency and measure the target.

☞ “3.2.4 Measurement Mode”

In “Freq”/ “Fix Freq” mode, the integral time is automatically set to the value obtained by multiplying one cycle by integers. So the discrepancy can be reduced in measurement.

■ When measuring with “Auto” mode

When measuring a target equipped with a high duty ratio and a high light intensity or a target with local dimming by using “Auto” mode, the sufficient flashing times cannot be obtained in the set integral time and so big discrepancy occurs in the measurement data. (Refer to the following example.) Setting the integral time longer than usual is useful to reduce discrepancy. By using the integral time delay function, the integral time is longer and measurement is done in stabilized condition.

☞ “3.2.8 Integral Time Delay Function”

Set the measurement mode to “Auto”, set the integral time delay function to “ON” and set the delay time.

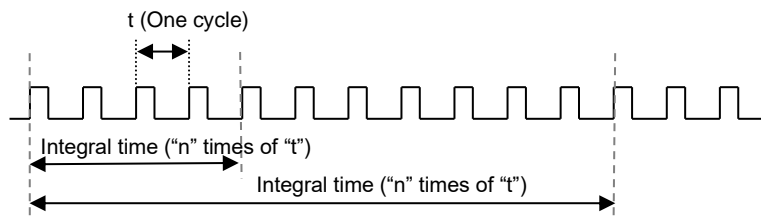
We recommend approx. 100 cycles or more as the delay time.

Example:

When discrepancy 10% of one cycle occurs (Refer to the following figure.)

- Measure with the integral time of 10 cycles (t : One cycle time)
Discrepancy = $0.1t/10t = 1\%$
- Measure with the integral time of 100 cycles
Discrepancy = $0.1t/100t = 0.1\%$

Setting the longer integral time reduces discrepancy.



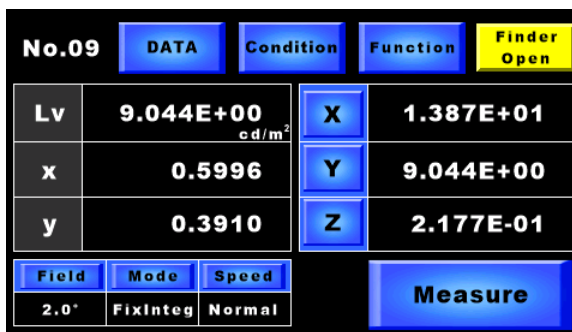
3. Operation for Various Settings

3.1 Selection Item Display

In this instrument, it is possible to set and display three items freely.

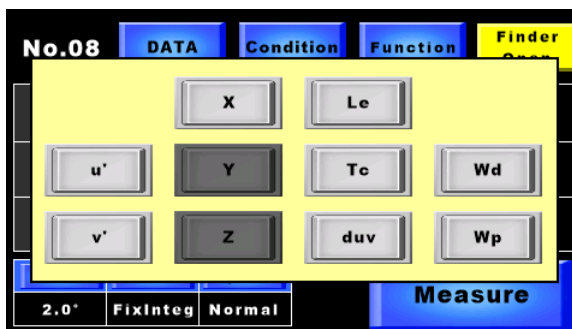
The item setting procedures are described below.

- 1 Press one of the three item buttons. The item selection screen appears.



The blue buttons [X], [Y] and [Z] are item buttons.

- 2 Select an item to be displayed.



You can select the following items.

u', v':	Chromaticity
X, Y, Z:	Tristimulus values
Le:	Radiance (W/sr·m ²)
Tc:	Color temperature (K)
duv:	Deviation
Wd:	Dominant wavelength (nm)
Wp:	Peak wavelength (nm)

 Memo

- The item which has already been selected is gray and cannot be selected.
- Press the outside of the item selection screen frame. The item selection screen disappears.
- “Wd: Dominant wavelength” is calculated by applying “CIE1931” and “white point x: 0.3333, y: 0.3333”.
- When “Wd: Dominant wavelength” cannot be calculated, “-1.0nm” are indicated
































3 The selected items are displayed.

No.20		DATA	Condition	Function	Finder Close
Lv	3.324E+01 <small>cd/m²</small>	Le	9.725E-02 <small>W/sr · m²</small>		
x	0.3602	Y	3.324E+01		
y	0.3747	Z	2.352E+01		
Field	Mode	Speed	Measure		
2.0°	Sync	Normal			

3.2 Function Mode

3.2.1 Setting Items

In this instrument, you can perform the following settings by function mode.

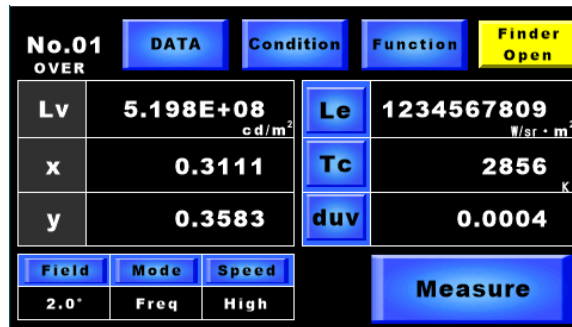
- Setting of measurement mode  "3.2.4 Measurement Mode"
- Setting of Auto Mode  "3.3.4.1 Auto Mode"
- Setting of Manu Mode  "3.3.4.2 Manu (Manual) Mode"
- Setting of Freq mode  "3.3.4.3 Freq (frequency) Mode"
- Setting of Sync mode  "3.3.4.4 Sync Mode"
- Setting of Fix Integ mode  "3.3.4.5 Fix Integ Mode"
- Setting of Fix Freq mode  "3.3.4.6 Fix Freq Mode"
- Setting of measurement method  "3.2.5 How to Measure"
- Setting of action for "OVER-RANGE"  "3.2.6 Action of OVER-RANGE"
- Setting for automatic control of viewfinder shutter  "3.2.7 Automatic Control of Viewfinder Shutter"
- Setting of integral time delay function  "3.2.8 Integral Time Delay Function"
- Setting of delay time  "3.2.8.1 Setting of Delay Time"
- Setting of average measurement  "3.2.9 Average Measurement"
- Setting of average times  "3.2.9.1 Average Times"
- Setting of measuring speed  "3.2.10 Measuring Speed"
- "High Speed" calibration  "3.2.10.1 "High Speed" Calibration"
- Setting of PC connection method  "3.2.11 How to Connect PC"
- Setting of RS-232C parameters  "3.2.12 RS-232C Parameters"
- Setting of data communication method  "3.2.13 Data Communication Method"
- Setting of environment information output  "3.2.14 Environment Information Output"
- Setting of the remote command terminal code  "3.2.15 Terminal Code of Remote Command"
- Setting for automatic control of touch panel  "3.2.16 Automatic Control of Touch Panel"
- Setting of touch panel brightness  "3.2.17 Brightness of Touch Panel"
- Setting of action when touch panel is not operated  "3.2.18 Action When Touch Panel Is Not Operated"
- Setting of beep sound  "3.2.19 Beep Sound"
- Setting of luminance display format  "3.2.20 Luminance Display Format"
- Setting of luminance display digits  "3.2.20.1 Luminance Display Digits"
- Setting of correction factor  "3.2.21 Correction Factor"
- Setting of CIE color matching function (visual field)  "3.2.22 CIE Color Matching Function (Visual Field)"
- Setting of CIE color matching function (type)  "3.2.23 CIE Color Matching Function (Type)"
- Initialization of setting data, measurement data and Diff standard data  "3.2.24 Initialization of Setting Data/Measurement Data History/Diff standard Data"

3.2.2 Shifting/Resetting to/from Function Mode

■ Function menu

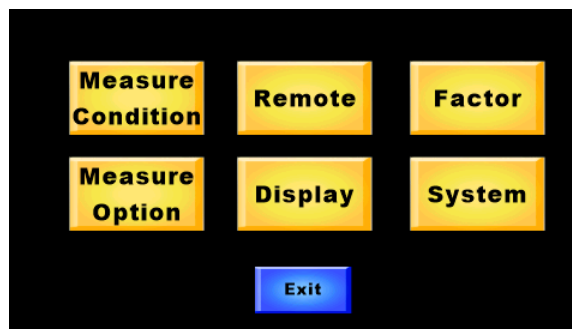
Using the function mode, perform a variety of setting.

Make sure that the instrument is in the standby condition. Then, press the [Function] button. The system shifts to the function mode.



Memo

Press the [Function] button for about two seconds, and the system is changed to the key lock condition. Under this condition, the system cannot shift to the function mode. Moreover, it is not possible to change the measuring angle, the measurement mode and the measuring speed on the measurement result screen. Press the [Function] button for about two seconds again, and the lock condition is canceled. Under the key lock condition, the [Function] button blinks.









Press each of menu buttons, and the settings screen appears.

Settings and display items of each menu are described below.









(1) Measure Condition

Name	Function
Mode	Set the measurement mode. ☞ “3.2.4 Measurement Mode”
ManuOver	Set ON/OFF of “OVER-RANGE” display in “Manu” mode and “FixInteg” mode. This is indicated only when “Manu” mode and “FixInteg” mode are selected.
Integ Time	Set the integral time for “Manu” mode and “FixInteg” mode. This is indicated only when “Manu” mode and “FixInteg” mode are selected. ☞ “3.2.4.2 Manu (Manual) Mode” ☞ “3.2.4.5 FixInteg Mode”
Frequency	Set the frequency for “Freq” mode and “FixFreq” mode. This is indicated only when “Freq” mode and “FixFreq” mode are selected. ☞ “3.2.4.3 Freq (Frequency) Mode” ☞ “3.2.4.6 FixFreq Mode”
Filter	Set the filter position for “FixInteg” mode and “FixFreq” mode. This is indicated only when “FixInteg” mode and “FixFreq” mode are selected. ☞ “3.2.4.5 FixInteg Mode” ☞ “3.2.4.6 FixFreq Mode”
Method	Set the measurement method. ☞ “3.2.5 How to Measure”
Conditioning	Used to perform measurement and activate the automatic setting of the integral time and the filter position for “FixInteg” mode. This is indicated only when “FixInteg” mode is selected. ☞ “3.2.4.5 FixInteg Mode”
Auto Finder	Set whether the viewfinder shutter is automatically set to “Close” or not when measuring. ON: Close OFF: Current position is kept.








(2) Measure Option

Name	Function
Abs/Diff	Set "Absolute value" or "Difference" for display.
Averaging	Set whether the average measurement function is used or not.  "3.2.9 Average Measurement"
Ave Count	Set the average times for average measurement. This is indicated only when the average measurement function is used.  "3.2.9.1 Average Times"
Integ Delay	Set whether the integral time delay function is used or not.  "3.2.8 Integral Time Delay Function"
Delay Time	Set the delay time for integral time. This is indicated only when the integral time delay function is used.  "3.2.8.1 Setting of Delay Time"
Speed	Set the measuring speed.  "3.2.10 Measuring Speed"
Calibration	Perform calibration of "High Speed" mode. This is indicated only when "High Speed" mode is selected.  "3.2.10 "High Speed" Calibration"






(3) Remote

Name	Function
I/F Type	Set the interface type.  "3.2.11 How to Connect PC"
BaudRate	Set the RS-232C communication speed. This is indicated only when "RS-232C" is selected as the interface type.  "3.2.12 RS-232C Parameters"
DataBits	Set the RS-232C data bit. This is indicated only when "RS-232C" is selected as the interface type.  "3.2.12 RS-232C Parameters"
Method	Set whether the RS-232C handshake function is used or not. This is indicated only when "RS-232C" is selected as the interface type.  "3.2.13 Data Communication Method"
Parity	Set the RS-232C parity bit. This is indicated only when "RS-232C" is selected as the interface type.  "3.2.12. RS-232C Parameters"
StopBits	Set the RS-232C stop bit. This is indicated only when "RS-232C" is selected as the interface type.  "3.2.12. RS-232C Parameters"
Format	Set whether the environment information output function is used or not.  "3.2.14 Environment Information Output"
Delimiter	Set the terminal code for communication.  "3.2.15 Terminal Code of Remote Command"


(4) Display

Name	Function
LightControl	Set whether the display OFF function when measuring is used or not.  "3.2.16 Automatic Control of Touch Panel"
Brightness	Set the display brightness.  "3.2.17 Brightness of Touch Panel"
TimeOut	Set whether the automatic display OFF function when the instrument is not in operation is used or not.  "3.2.18 Action When Touch Panel Is Not Operated"
Beep	Set ON/OFF of beep sound.  "3.2.19 Beep Sound"
LumiFormat	Set the luminance display method of the measurement result.  "3.2.20 Luminance Display Format"
Integer	Set the digits of integers for luminance display. This is indicated only when "Decimal" is set as the luminance display method.  "3.2.20.1 Luminance Display Digits"
Decimal	Set the digits of the decimal point number for luminance display. This is indicated only when "Decimal" is set as the luminance display method.  "3.2.20.1 Luminance Display Digits"

(5) Factor

Name	Function
XYZ	Set ON/OFF of X/Y/Z correction factors.  "3.2.21 Correction Factor"
X, Y, Z	Set the X, Y and Z correction factors. This is indicated only when the X/Y/Z correction factors are valid.  "3.2.21 Correction Factor"
Spectrum	Set ON/OFF of spectral correction factor per 1nm.  "3.2.21 Correction Factor"
CIE(Field)	Set the visual field of CIE color matching function.  "3.2.22 CIE Color Matching Function (Visual Field)"
CIE(Type)	Set the type of CIE color matching function.  "3.2.23 CIE Color Matching Function (Type)"

(6) System

Name	Function
MemoryInitialize	Initialize the setting data/measurement data history/Diff standard data.  "3.2.24 Initialization of Setting Data/Measurement Data History/Diff standard Data"
FirmwareVersion	The version and date of software are indicated.
DisplayVersion	The version and date of the touch panel software are indicated.
SerialNumber	The serial number of the instrument is indicated.

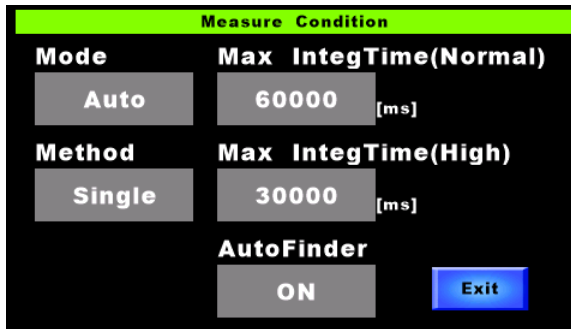
■ How to cancel the function mode

Press the [Exit] button on each of the menu item screens. The function menu screen appears again. Press the [Exit] button on the function menu screen. The function mode is finished and the measurement result screen appears again. The setting of measurement mode will be explained as an example.

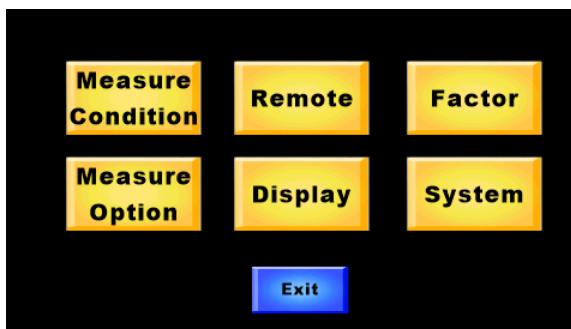
☞ “3.2.4 Measurement Mode”

Example: Setting of measurement mode

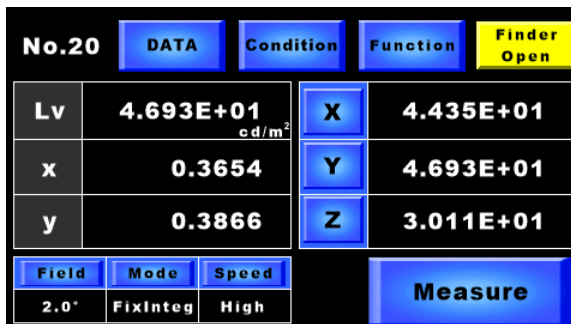
- 1 Press the [Exit] button, and the function menu screen appears again.



- 2 Press the [Exit] button, and the measurement result screen appears again.



- 3 The set items are stored and the function mode is finished.

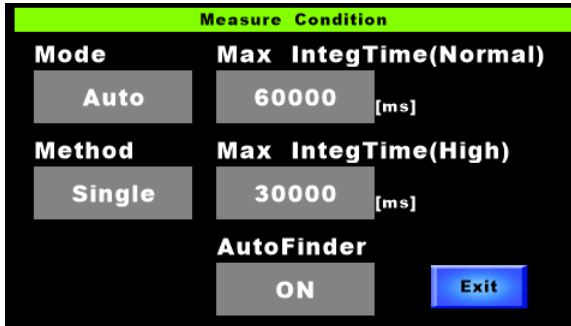


3.2.3 Setting of Numerical Value

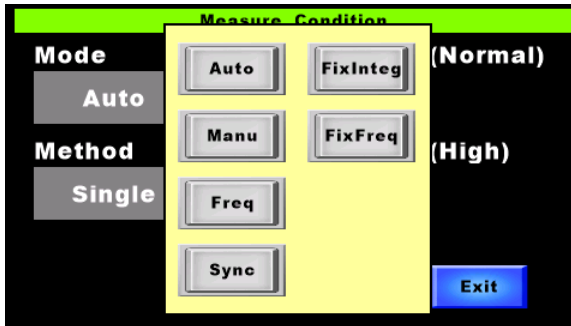
In this instrument, it is possible to set numerical values on a general numeric keypad screen. The numeric keypad operation in the function mode is common to all items.

The setting of integral time in “Manu” mode will be explained as an example.

- 1 Press the [Measure Condition] button on the function menu.

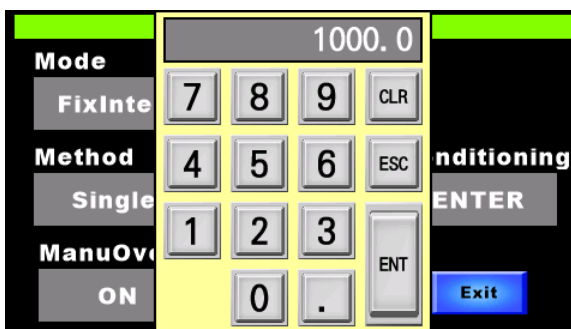


- 2 Select [Mode]. Select [Manu] on the mode selection screen.



☞ “3.2.4 Measurement Mode”

- 3 Select [Integ Time], and the numeric keypad screen appears.



4 Set numerical values.



[Button]

CLR: Clears the input numerical value to zero.

ESC: Invalidates the input and erases the numeric keypad screen.

ENT: Decides the input numerical value and erases the numeric keypad screen.

5 After the setting is completed, press the [ENT] button to decide the numerical value.

 Memo

- When the numeric keypad screen appears first, the current numerical value is indicated.
- Press the outside of the numeric keypad screen frame. The numeric keypad screen is erased. (Same action as "ESC")

3.2.4 Measurement Mode

Set the measurement mode.

In this instrument, there are six measurement modes. The integral time setting method is different between the modes.


Memo

Integral time is the time to expose the sensor in light. Within the integral time, the optical energy is accumulated in the sensor. The integral time is different from the measurement time. Measurement time is calculated by the following formula.


*When “Normal Speed” is set in “Manu” mode:

$$\text{Measurement time} = \text{Integral time} \times 2 + \text{Filter moving time} + \text{Calculation time}$$

(1) Auto: Used to measure general normal light, etc. The optimal integral time and filter position are automatically set according to the brightness of the measurement target.

 “3.2.4.1 Auto Mode”


(2) Manu : Used to perform measurement with the optionally-fixed integral time. The optimal filter position is set according to the brightness of the measurement target.

 “3.2.4.2 Manu (Manual) Mode”




When a shorter integral time is set in “Manu” mode than the integral time calculated in “Auto” mode, sometimes the measurement accuracy is lowered.

(3) Freq: Used to measure the target having the frequency characteristics such as the rays of lighting. The optimal integral time and filter position are set according to the set frequency and the brightness of the target.

 “3.2.4.3 Freq (Frequency) Mode”

(4) Sync: Used to carry out “Line input” of the vertical synchronizing signal into SR-5/SR-5A and perform measurement as synchronizing. The optimal integral time and filter position are set according to the input synchronizing signal and the brightness of the target.

 “3.2.4.4 Sync Mode”

(5) FixInteg: Used to shorten the measuring time (for example, when measuring the same target). Measurement is carried out under the condition that the set integral time and filter position are fixed. Select [Measure Condition] and then [Conditioning]. You can set the optimal integral time and filter position.

 “3.2.4.5 FixInteg Mode”

(6) FixFreq: When measuring the same target whose light frequency is known, use this mode to measure the frequency with the fixed filter position.

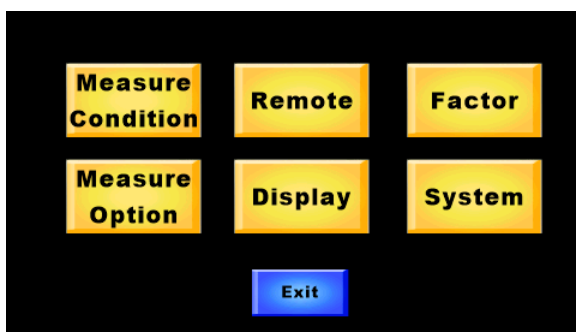
The optimal integral time is set according to the set frequency, filter position and the brightness of the target.

☞ “3.2.4.6 FixFreq Mode”

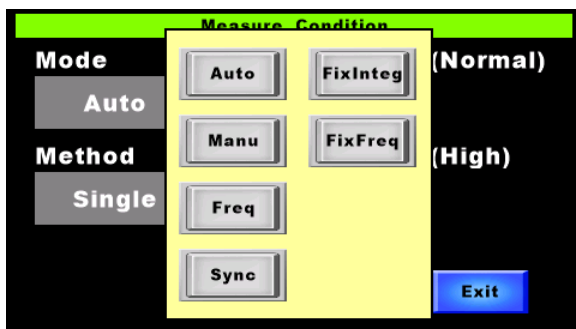
The procedures to set the measurement mode are described below.

☞ “3.2.2 Shifting/Resetting to/from Function Mode”

1 Press the [Measure Condition] button on the function menu.

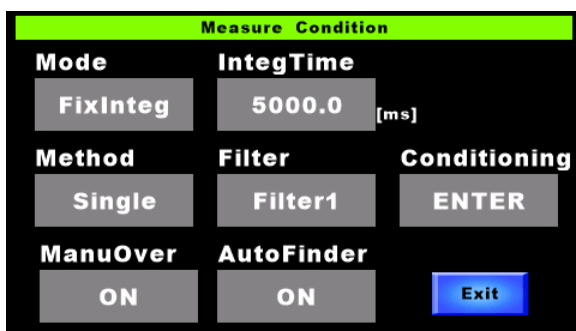


2 Select [Mode], and the measurement mode selection screen appears.



3 Select a measurement mode.

4 The measurement mode is changed and the relevant items are indicated.




☞ Memo You can also switch the measurement mode by the [Mode] button on measurement result screen.

3.2.4.1 Auto Mode

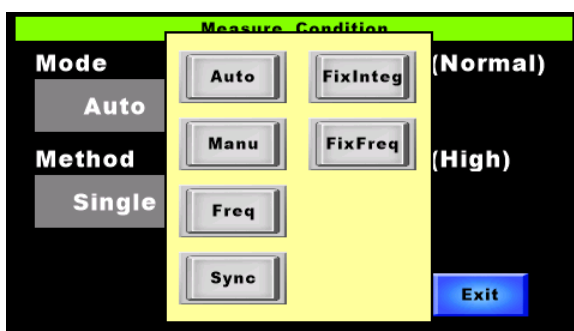
When “Auto” is set as the measurement mode, set the optimal integral time and filter position and perform measurement. In addition, the maximum integral time can be set. This mode is effective in order to set the upper limit of the integral time and shorten the measurement time when measuring in low luminance status.

The procedures to set the maximum integral time are described below.

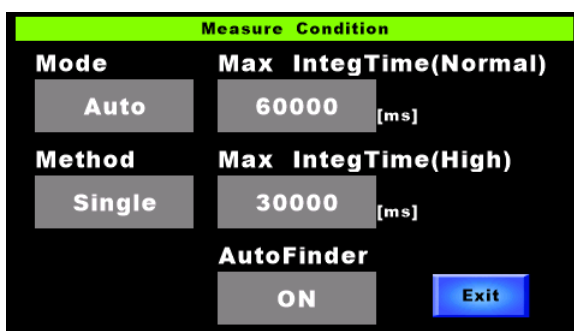
 Note	When the maximum integral time is shorter than the integral time calculated in “Auto” mode, sometimes the measurement accuracy is lowered.
--	--

☞ “3.2.3 Setting of Numerical Value”

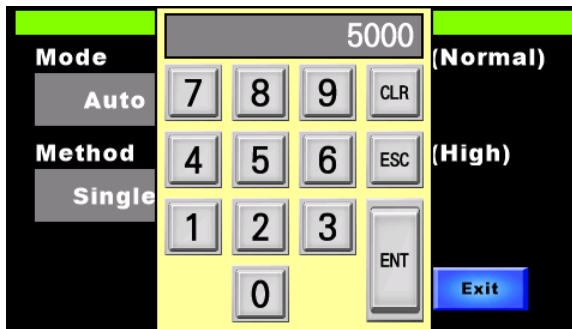
- 1 Select [Measure Condition] on the function menu. Then, select [Mode]. Select “Auto” on the mode selection screen.



- 2 Select [Max Integ Time (Normal)] or [Max Integ Time (High)].
The numeric keypad screen appears.



3 Set the maximum integral time.



Setting range

SR-5 : Normal 5000 - 60000ms、 High 5000 - 30000ms

SR-5A: Normal 5000 – 60000ms, High 5000 – 30000ms

4 Press the [ENT] button to decide the value.

 Memo

- When the numeric keypad screen appears first, the current numerical value is indicated.
- Press the outside of the numeric keypad screen frame. The numeric keypad screen is erased. (Same action as “ESC”)

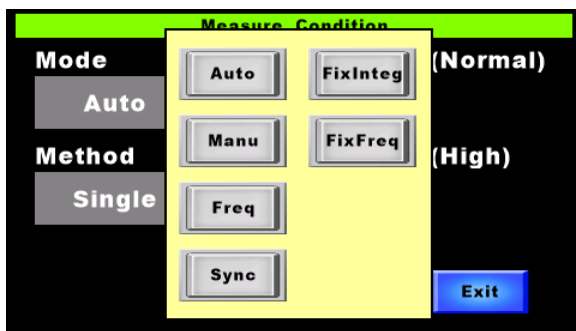
3.2.4.2 Manu (Manual) Mode

When “Manu” is set as the measurement mode, set the optimal filter position according to the set integral time and perform measurement. Use this mode to perform measurement with the fixed integral time.

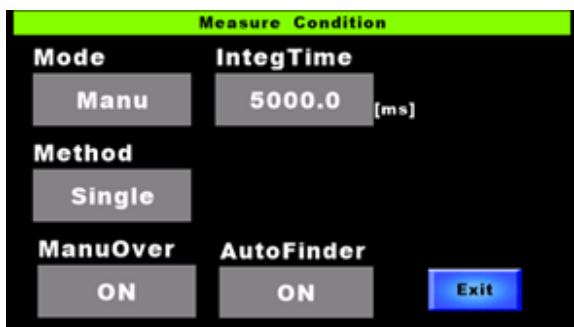
The procedures to set the integral time are described below.

☞ “3.2.3 Setting of Numerical Value”

- 1 Select [Measure Condition] on the function menu. Then, select [Mode]. Select “Manu” on the mode selection screen.



- 2 Select [IntegTime]. The numeric keypad screen appears.




- 3 Set the integral time.



Setting range

SR-5 : 20 - 60000ms

SR-5A: 20 – 120000ms

 Note	When the measuring speed is set to “High Speed”, the following integration time ranges can be measured	
	model	integral time
	SR-5	20 - 30000ms
	SR-5A	20 - 60000ms

4 Press the [ENT] button to decide the value.

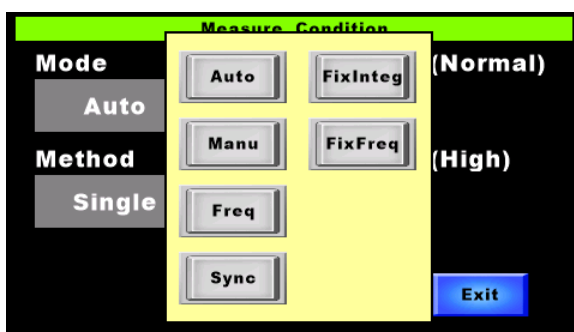
3.2.4.3 Freq (Frequency) Mode

When “Freq” is set as the measurement mode, the optimal integral time and filter position are set according to the set frequency and the brightness of the target. Then, perform measurement. This mode is effective when measuring a target having the frequency characteristics.

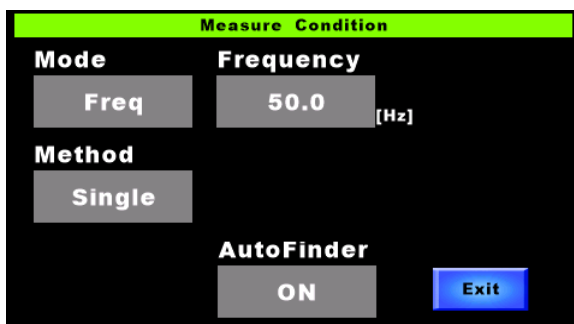
The procedures to set the frequency are described below.

How to set  “3.2.3 Setting of Numerical Value”

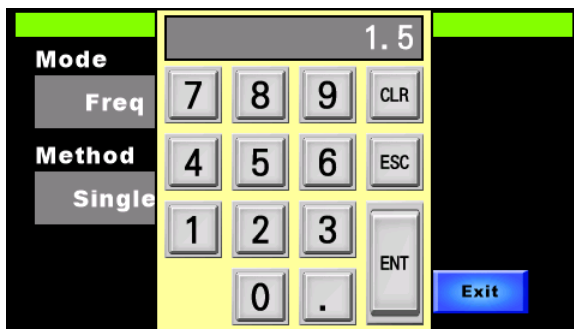
- 1 Select [Measure Condition] on the function menu. Then, select [Mode]. Select [Freq] on the mode selection screen.



- 2 Select [Frequency]. The numeric keypad screen appears.



- 3 Set frequency.



Setting range: 1.5 – 250Hz

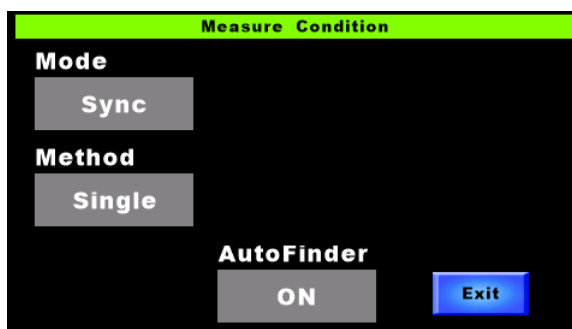
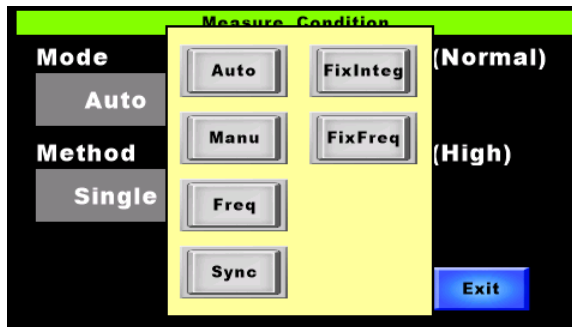
- 4 Press the [ENT] button to decide the value.

3.2.4.4 Sync Mode

When “Sync” is set as the measurement mode, the optimal integral time and filter position is set for each measurement according to the vertical synchronizing signal for which “Line Input” has been done into the instrument and the brightness of the target. Then, perform measurement.

The procedures to set “Sync” mode are described below.

- 1 Select [Measure Condition] on the function menu. Then, select [Mode]. Select [Sync] on the mode selection screen.



Synchronizing signal detection range: 12 – 750Hz

3.2.4.5 FixInteg Mode

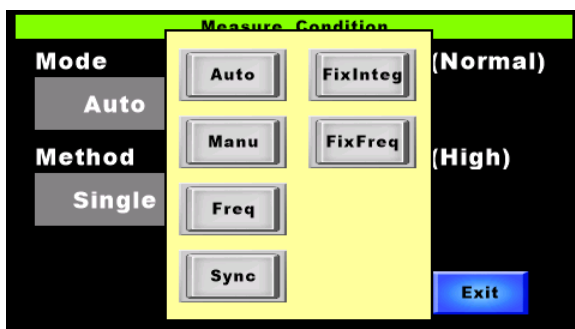
When “FixInteg” is set as the measurement mode, measurement is performed by the set integral time and filter position. It is possible to automatically set the optimal integral time and filter position.

By using this mode, you can shorten the measuring time when measuring a target which is seldom changed and the measurement conditions such as the production line are not changed.

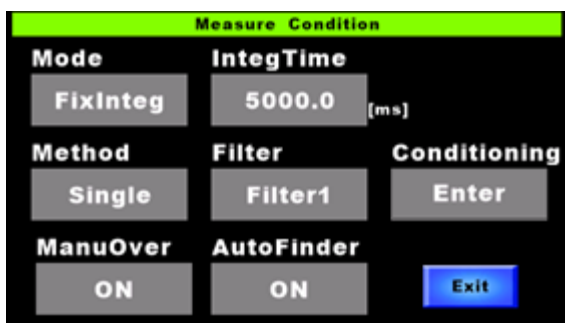
The procedures to manually set the integral time and filter position are described below.

☞ “3.2.3 Setting of Numerical Value”

- 1 Select [Measure Condition] on the function menu. Then, select [Mode]. Select [FixInteg] on the mode selection screen.



- 2 Select [IntegTime]. The numeric keypad screen appears.




- 3 Set the integral time.



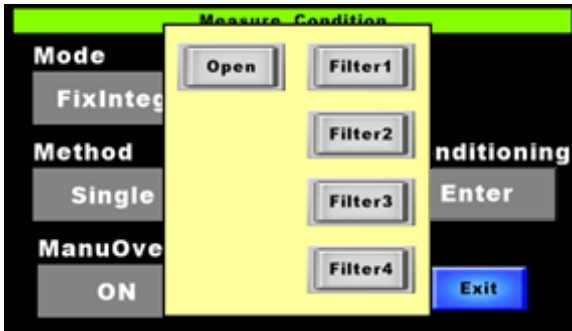
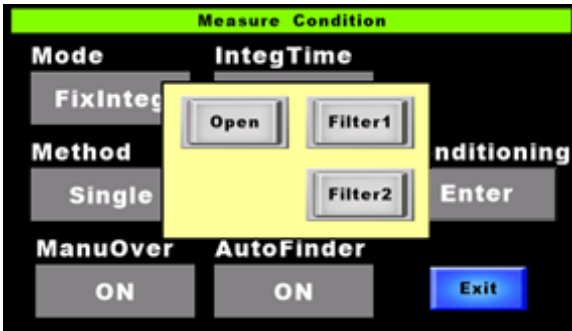
Setting range

SR-5 : 20 - 60000ms

SR-5A: 20 – 120000ms

 Note	When the measuring speed is set to “High Speed”, the following integration time ranges can be measured	
	model	integral time
	SR-5	20 - 30000ms
	SR-5A	20 - 60000ms

- 4 Press the [ENT] button to decide the value.
- 5 Select [Filter]. The filter selection screen appears.
- 6 Select a filter.



Setting range


SR-5 : Open/Filter1/Filter2


SR-5A: Open/Filter1/Filter2/Filter3/Filter4

- 7 When a filter is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

Press the outside of the selection screen frame. The selection screen is erased.

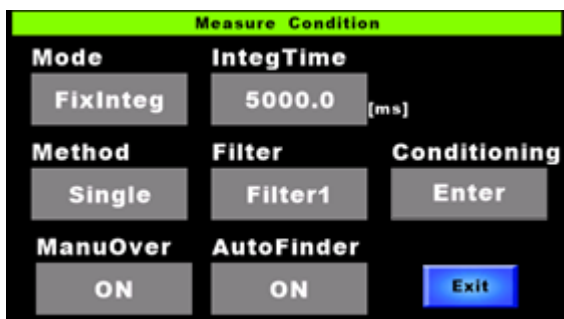
 Note	When the integral time and filter position, which have been optionally set, are not proper as the example below, sometimes the measurement accuracy is lowered.	
	- when the set time is shorter than the optimal integral time;	
	- when the set position is different from the optimal filter position.	

 Note	The SR-5 cannot measure the following combinations of measuring angle and filter position.	
	Measuring angle	Filter position
	0.2°	Filter2
	0.1°	Filter2


The automatic setting procedures for the integral time and filter position are described below.

☞ “1.3.3 Alignment of Measurement Target”

- 1 Align the measurement target.
- 2 Select [Conditioning] and then select [Enter].



- 3 After measuring, the optimal integral time and filter position are set at [IntegTime] and [Filter].

 Note	Carry out the setting procedures with the same measurement conditions (measuring angle, target, measuring distance, etc.) as real measurement. If the measurement conditions are not same, sometimes the measurement accuracy is lowered.
--	---

3.2.4.6 FixFreq Mode

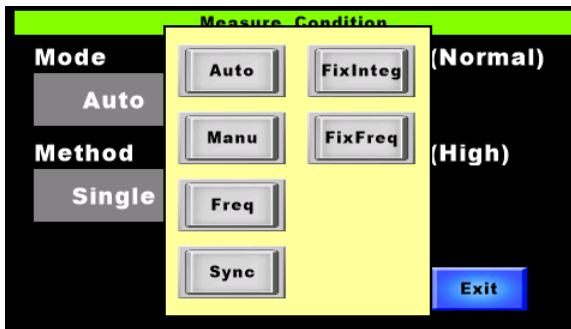
When “FixFreq” is set as the measurement mode, measurement is performed by the set frequency and filter position. Use this mode when measuring a target having the frequency characteristics with the fixed filter position.

The optimal integral time is calculated by the set frequency and the brightness of the target.

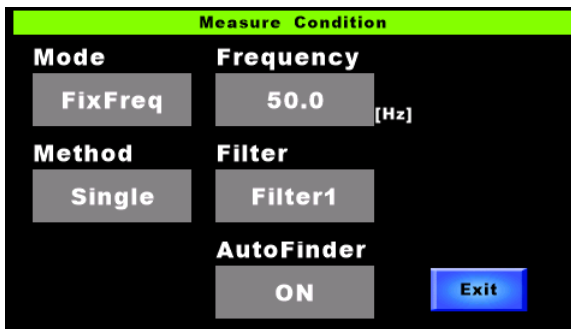
The procedures to set the frequency and filter position are described below.

☞ “3.2.3 Setting of Numerical Value”

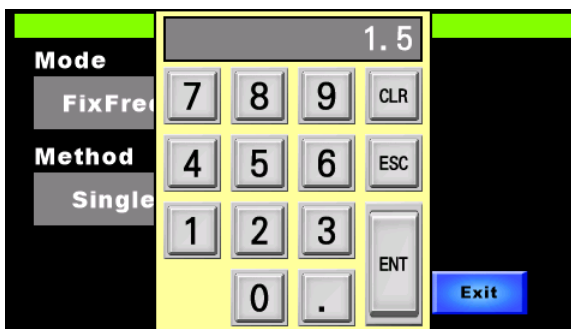
- 1 Select [Measure Condition] on the function menu. Then, select [Mode]. Select [FixFreq] on the mode selection screen.



- 2 Select [Frequency]. The numeric keypad screen appears.



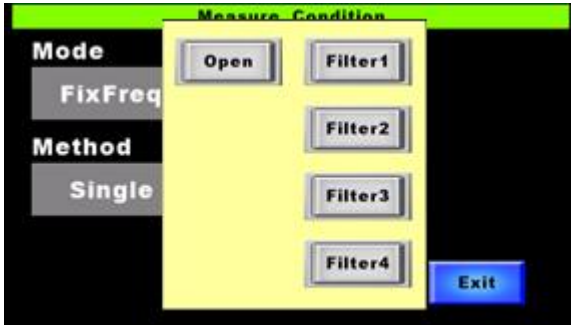
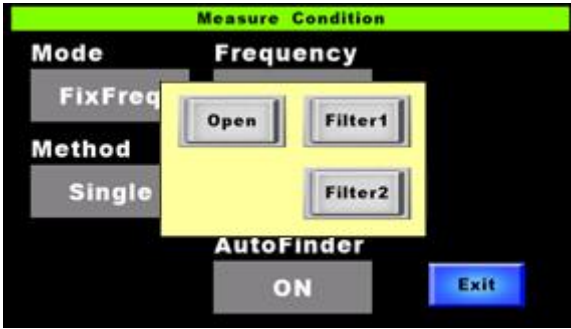
- 3 Set the frequency.



Setting range: 1.5 – 250Hz

- 4 Press the [ENT] button to decide the value.

- 5 Select [Filter]. The filter selection screen appears.
- 6 Select a filter.



Setting range


SR-5 : Open/Filter1/Filter2


SR-5A: Open/Filter1/Filter2/Filter3/Filter4

- 7 When a filter is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

Press the outside of the selection screen frame. The selection screen is erased.

 Note	When the optionally set filter position is not the same as the optimal filter position, sometimes the measurement accuracy is lowered.
--	--

 Note	<p>The SR-5 cannot measure the following combinations of measuring angle and filter position.</p> <table style="margin-left: 20px;"> <thead> <tr> <th>measuring angle</th> <th>Filter position</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0.2°</td> <td style="text-align: center;">Filter2</td> </tr> <tr> <td style="text-align: center;">0.1°</td> <td style="text-align: center;">Filter2</td> </tr> </tbody> </table>	measuring angle	Filter position	0.2°	Filter2	0.1°	Filter2
measuring angle	Filter position						
0.2°	Filter2						
0.1°	Filter2						

3.2.5 How to Measure

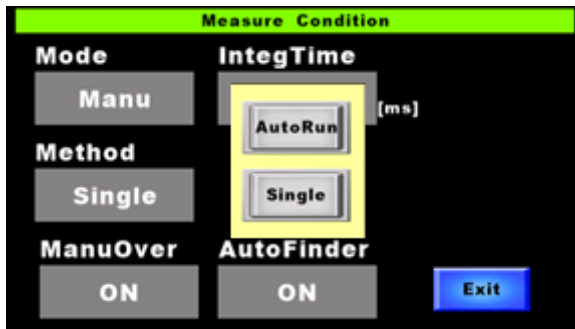
Set the measuring method.

There are two measuring methods, “Single” (single measurement) and “Auto Run” (continuous measurement).

Measuring method	
Single (single measurement)	Press the [Measure] button. The instrument performs measurement once and finishes the work.
Auto run (continuous measurement)	Press the [Measure] button. The instrument performs measurement continuously until the [Cancel] button is pressed.

The procedures to set the measuring method are described below.

- 1 Select [Measure Condition] on the function menu. Then, select [Method]. Select a measuring method on the measuring method selection screen.



- 2 When a measuring method is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

Press the outside of the selection screen frame. The selection screen is erased.

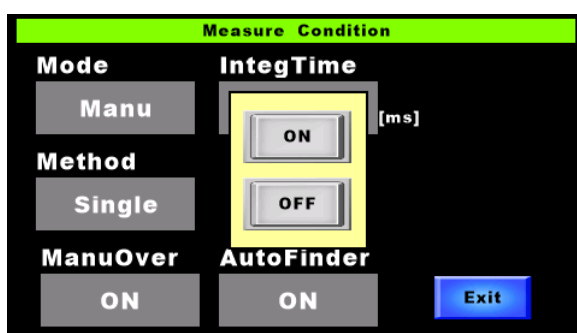
3.2.6 Action of “OVER-RANGE”

Set the action when “OVER-RANGE” occurs. “OVER-RANGE” means “Photo detector is saturated”. The data with unsaturated wavelength can be regarded as the normal measurement data. But the data with the saturated wavelength are unstable and cannot be regarded as the normal measurement data.

Action of “OVER-RANGE”	
ON	The instrument indicates the “OVER-RANGE” error and stops measurement. The measurement data are discarded.
OFF	The instrument does not indicate the “OVER-RANGE” error and continues measurement.

The procedures to set the action of “OVER-RANGE” are described below.

- 1 Select [Measure Condition] on the function menu. Then, select [ManuOver]. Select an action on the action selection screen.



- 2 When an action is selected, the setting is decided instantaneously and the selection screen is erased.

Memo

- Press the outside of the selection screen frame. The selection screen is erased.
- Only when one of “Manu” and “FixInteg” is set as the measurement mode, [ManuOver] is indicated.

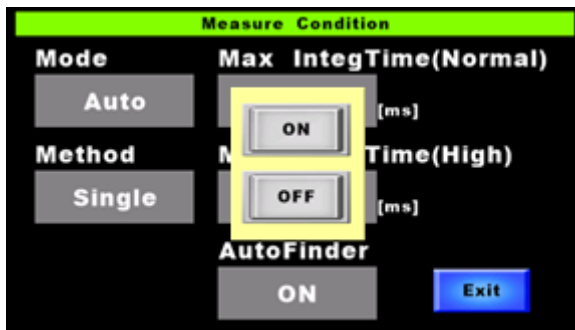
3.2.7 Automatic Control of Viewfinder Shutter

Set the viewfinder shutter action when measuring. By setting “Close” for the viewfinder shutter, the slight light from the eyepiece lens can be eliminated.

Action of viewfinder shutter	
ON	The viewfinder shutter is automatically closed when measuring.
OFF	The viewfinder shutter is kept at the current position when measuring.

The procedures to set the action of the viewfinder shutter are described below.

- 1 Select [Measure Condition] on the function menu. Then, select [AutoFinder]. Select an action on the action selection screen.



- 2 When an action is selected, the setting is decided instantaneously and the selection screen is erased.

Memo

- Press the outside of the selection screen frame. The selection screen is erased.
- “ON” is initially set. When “ON” is set, the viewfinder shutter is not in the “Open” status after measurement is finished. To set “Open”, carry out the procedures on the measurement result screen.
- When you do not want to set “Close” for the viewfinder shutter at each measurement, set “OFF”.

 “1.3.5 Opening/Closing the Viewfinder Shutter”

3.2.8 Integral Time Delay Function

Set whether the integral time delay function should be used or not. When measuring the following targets with “Auto” mode, the problem mentioned later occurs:

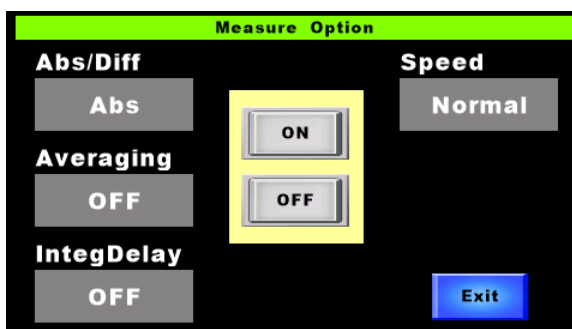
- A target equipped with a high duty ratio and a high light intensity when using the light source with PWM lighting method;
- A target with local dimming.

The problem is as follows:

The sufficient flashing times cannot be obtained in the set integral time and so big discrepancy occurs in the measurement data. Setting the integral time longer than usual is useful to reduce discrepancy. By using the integral time delay function, the integral time is longer and measurement is done in stabilized condition.

☞ “2.7.3 Measuring a Target Lighting by Frequency in Stabilized Condition”

- 1 Select [Measure Option] on the function menu. Then, select [IntegDelay]. Select “ON” on the ON/OFF selection screen.



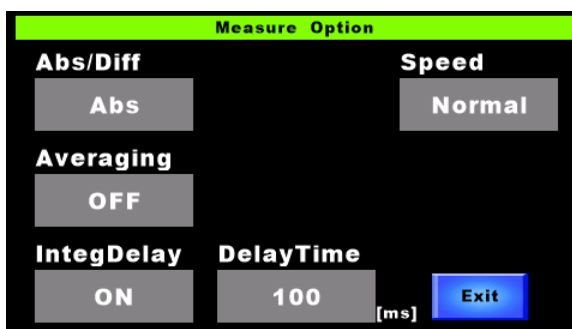
ON: Used

OFF: Not used

- 2 When “ON” or “OFF” is selected, the setting is decided instantaneously and the selection screen is erased.

📄Memo

Press the outside of the selection screen frame. The selection screen is erased.



3.2.8.1 Setting of Delay Time

When the integral time delay function is set to “ON”, set the integral time.

The procedures to set the integral time are described below.

☞ “3.2.3 Setting of Numerical Value”

Memo

It is recommended to set 100 cycles or more as the integral time.

[Example]

When measuring a target with the cycle discrepancy 10%:

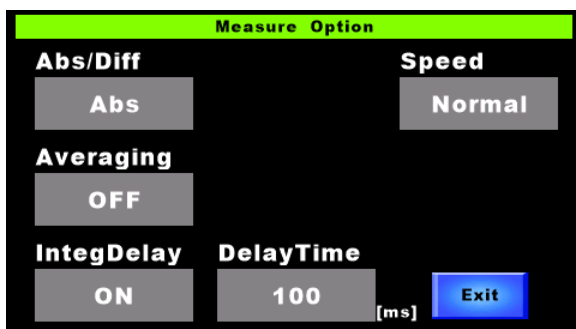
When measuring with the integral time of 10 cycles, the discrepancy is as follows.

$$0.1t/10t = 1\% \text{ (“t” is the cycle time.)}$$

When measuring with the integral time of 100 cycles, the discrepancy is as follows.

$$0.1t/100t = 0.1\%$$

- 1 Select [Measure Option] on the function menu. Then, select [DelayTime]. The numeric keypad screen appears.



Memo

When the integral time delay function is “OFF”, [DelayTime] is not indicated.

- 2 Set the integral time.



Setting range: 50 – 3000ms

- 3 Press the [ENT] button to decide the value.

3.2.9 Average Measurement

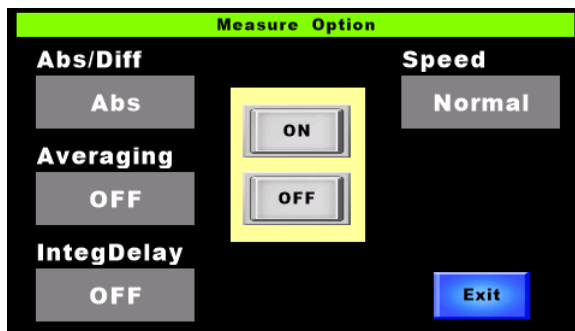
Set whether average measurement should be performed or not. In average measurement, the average value obtained by measuring two or more times is regarded as one piece of measurement data. The more times averaging is carried out, the longer the measuring time is.

Example: When averaging is carried out three times

Measurement data = (First measurement data + Second measurement data + Third measurement data) ÷ 3

The procedures to set ON/OFF of average measurement are described below.

- 1 Select [Measure Option] on the function menu. Then, select [Averaging]. Select ON/OFF on the ON/OFF selection screen.



ON: Performed

OFF: Not performed

- 2 When one option is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

Press the outside of the selection screen frame. The selection screen is erased.

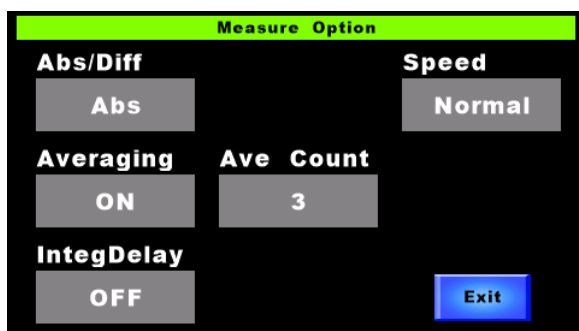
3.2.9.1 Averaging Times

When average measurement is performed, set the averaging times.

The procedures to set the averaging times are described below.

☞ “3.2.3 Setting of Numerical Value”

- 1 Select [Measure Option] on the function menu. Then, select [Ave Count]. The numeric keypad screen appears.



📄 Memo

When average measurement is “OFF”, [Ave Count] is not indicated.

- 2 Set the averaging times.



Setting range: 1 – 20

- 3 Press the [ENT] button to decide the value.

3.2.10 Measuring Speed

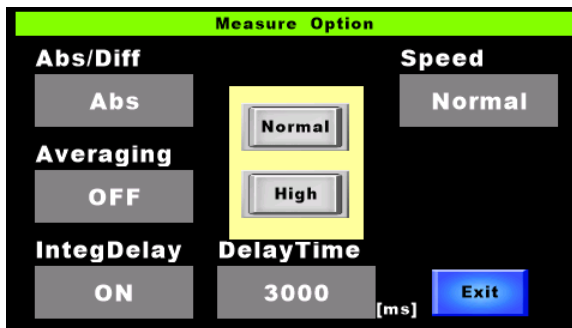
Set the measuring speed. "Normal Speed" and "High Speed" can be set as the measuring speed.

Measuring speed	
Normal Speed	Measurement is done with high accuracy by the standard measurement sequence.
High Speed	Measurement is done at high speed by applying a special sequence.

*The measuring time is sometimes changed due to the measurement target.

The procedures to set the measuring speed are described below.

- 1 Select [Measure Option] on the function menu. Then, select [Speed]. Select the measuring speed on the measuring speed selection screen.



Normal : Normal Speed High : High Speed

- 2 When one option is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

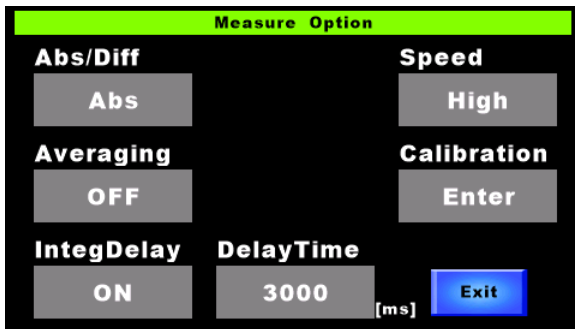
- Press the outside of the selection screen frame. The selection screen is erased.
- You can also switch the measuring speed by the [Speed] button on measurement result screen

3.2.10.1 “High Speed” Calibration

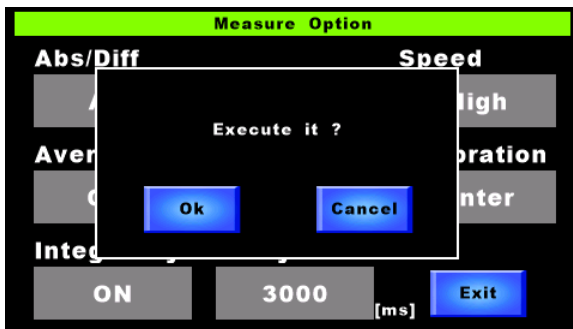
When “High” is set as the measuring speed, perform calibration.

The procedures to execute calibration are described below.


- 1 Select [Measure Option] on the function menu. Then, select [Calibration] and [Enter].




- 2 The check screen appears. Press the [OK] button to execute calibration.



- 3 It takes about ten minutes for SR-5 and, about fourteen minutes for SR-5A to complete calibration.


 Note	<ul style="list-style-type: none">• Set “Close” for the viewfinder shutter when calibration is done.• Do not turn OFF the power during calibration.• Perform calibration where the environmental temperature is stable. It is recommended to perform calibration once a day.
--	--

 Memo _____
Press the outside of the check screen frame. The check screen is erased.

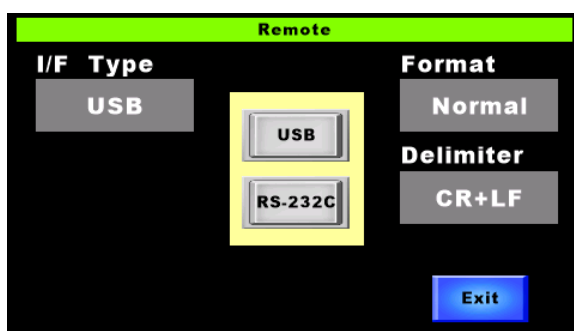
3.2.11 How to Connect PC

Set the connecting method for this instrument and PC. Set it according to the specification and application.

The procedures to set the connecting method are described below.

 Note	<p>When the communication setting is normal but communication cannot be done or is unstable, check the following points.</p> <ul style="list-style-type: none">• In the case of USB communication, check whether a USB driver applicable to the PC environment is installed or not. ☞ “4.3 Installing USB Driver”• In the case of USB communication, the driver is not recognized because of the PC condition from time to time. Check “Device Manager” of PC. If this instrument is not recognized, turn OFF/ON the instrument and PC to check whether the problem is solved or not.• In the case of RS-232C communication, check whether the cable applicable to the specification is used or not. ☞ “1.3.2 Connecting PC” <ul style="list-style-type: none">• When using many types of conversion adapter and HUB, check whether a driver applicable to the PC environment is installed or not.• When using many types of conversion adapter and HUB, check whether the problem is solved by connecting the adapter or HUB directly to PC.• Check whether the cable arrangement causes to transmit noise to the communication cable easily. If the communication cable is bundled together with the power cable and electric cables or is arranged in parallel with such cables, change the arrangement. Then, check whether the problem is solved.• Check whether the PC power supply is set to “Power Saving”. Change the setting and check whether the problem is solved.• Check whether measurement result screen is displayed. Communication cannot be done when the function mode screen is displayed.
--	---

- 1 Select [Remote] on the function menu. Then, select [I/F/Type]. Select the connecting method on the connecting method selection screen.



- 2 When a connecting method is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

Press the outside of the selection screen frame. The selection screen is erased.

3.2.12 RS-232C Parameters

Set the parameters for RS-232C connection. Set them according to the specification and application.

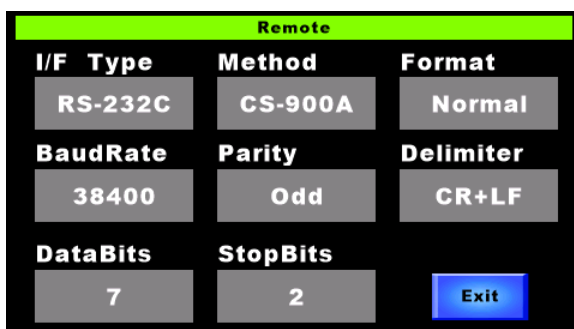
The procedures to set the RS-232C parameters are described below.

☞ “3.2.11 How to Connect PC”

 Memo

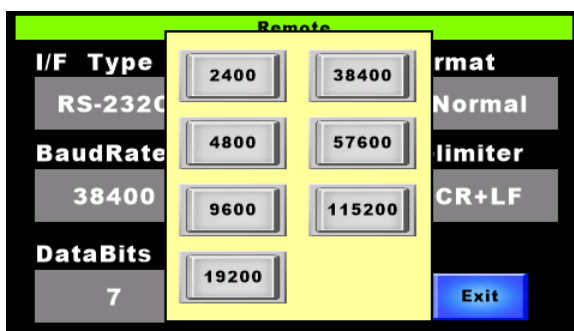
When “USB” is set as the connecting method, the RS-232C parameters are not indicated.

- 1 Select [Remote] on the function menu. Then, select [I/F Type] and [RS-232C].



- 2 Set the communication speed.

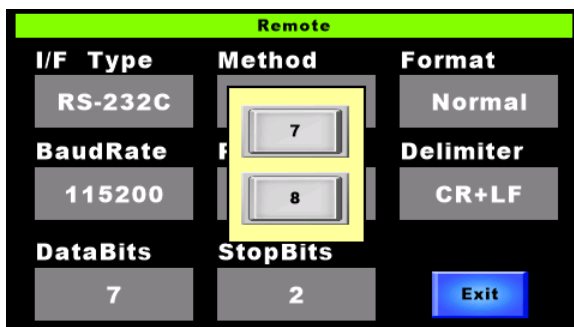
Select [BaudRate], and the communication speed selection screen appears. When a desired communication speed is selected, the setting is decided instantaneously and the selection screen is erased.



Setting range: 2400/4800/9600/19200/38400/57600/115200 bps

- 3 Set the data bit.

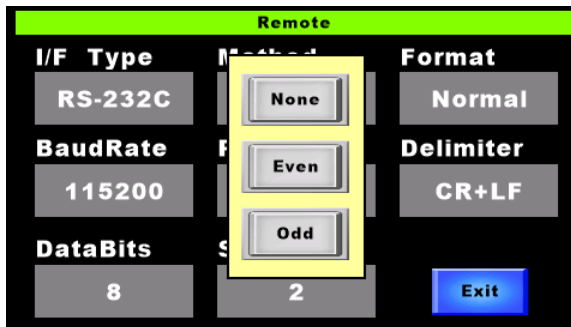
Select [DataBit], and the data bit selection screen appears. When a desired data bit is selected, the setting is decided instantaneously and the selection screen is erased.



Setting range: 7/8

4 Set the parity bit.

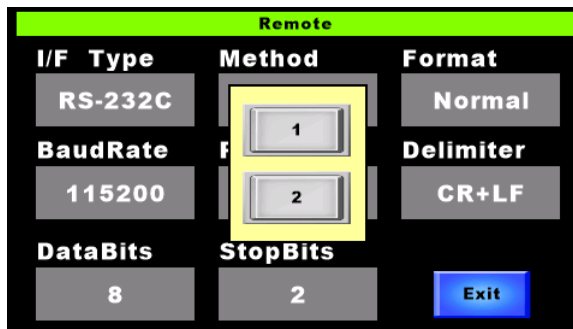
Select [Parity], and the parity bit selection screen appears. When a desired parity bit is selected, the setting is decided instantaneously and the selection screen is erased.



Setting range: None/Even/Odd

5 Set the stop bit.

Select [StopBit], and the stop bit selection screen appears. When a desired stop bit is selected, the setting is decided instantaneously and the selection screen is erased.



Setting range: 1/2

 Memo

- Press the outside of each selection screen frame. The selection screen is erased.
- An error will occur if the parity bit or data bit is different from that of the PC side when connected.

3.2.13 Data Communication Method

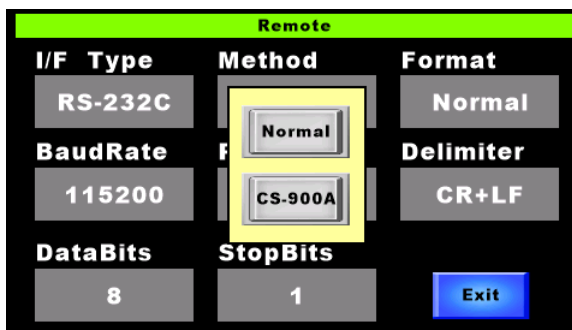
Set the communication method between this instrument and PC. In this instrument, there are two methods to output the measurement data. In the case of "Normal" method, the measurement data are sent continuously from the first to the last. In the case of "CS-900A" method, the measurement data are sent as handshaking is performed. The "CS-900A" method should be used for the communication of the colorimetry program "CS-900A", which is the standard accessory.

Set a proper method according to the specification and application.

For details of the communication flow, refer to "4.1.3 ST/STW Command".

 "4.1.3 ST/STW Command"

- 1 Select [Remote] on the function menu. Then, select [Method]. Select a communication method on the communication method selection screen.



 Memo

When "USB" is set as the connecting method, [Method] is not indicated.

- 2 When a communication method is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

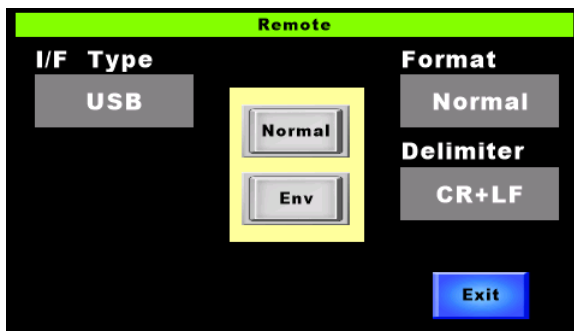
- Press the outside of the selection screen frame. The selection screen is erased.
- When using the colorimetry program "CS-900A", select "CS-900A".
- In the "CS-900A" setting, the communication speed is slower than "Normal" because of the handshake.

3.2.14 Environment Information Output

Set whether the environment information output should be used or not. In this instrument, it is possible to output the internal temperature, humidity and acceleration speed as the environment information when measuring.

The procedures to set whether the environment information output should be used or not are described below.

- 1 Select [Remote] on the function menu. Then, select [Format]. Select one option on the selection screen.



Normal: Not used

Env: Used

- 2 When one option is selected, the setting is decided instantaneously and the selection screen is erased.

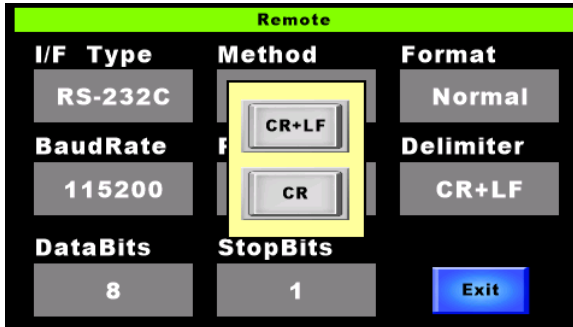
 Memo

Press the outside of the selection screen frame. The selection screen is erased.

3.2.15 Terminal Code of Remote Command

Set the terminal code of remote command. Set it according to the specification and application.
The procedures to set the terminal code are described below.

- 1 Select [Remote] on the function menu. Then, select [Delimiter]. Select a terminal code on the terminal code selection screen.



- 2 When a terminal code is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

Press the outside of the selection screen frame. The selection screen is erased.

3.2.16 Automatic Control of Touch Panel

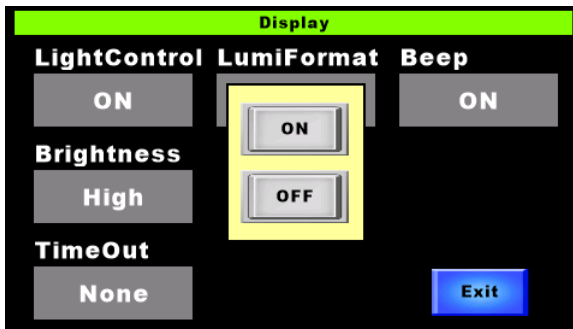
Set the action of touch panel when measuring. When measuring an object with low luminance, this function is effective to eliminate slight light from the touch panel.

Action of touch panel	
ON	When measuring, the whole touch panel screen is black.
OFF	When measuring, the screen indicating "Measurement is being performed" appears.

☞ "1.2 Names and Functions of Components"

The procedures to set the automatic control of touch panel are described below.

- 1 Select [Display] on the function menu. Then, select [LightControl]. Select an action on the action selection screen.



- 2 When an action is selected, the setting is decided instantaneously and the selection screen is erased.

☞ Memo

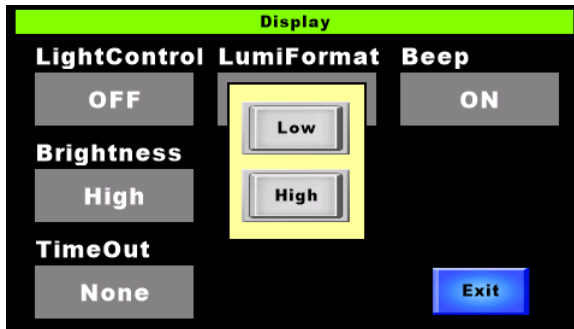
- Press the outside of the selection screen frame. The selection screen is erased.
- When "ON" is set for the automatic control of touch panel, it is possible to reduce the electric power consumption.

3.2.17 Brightness of Touch Panel

Set the brightness of touch panel.

The procedures to set the brightness are described below.

- 1 Select [Display] on the function menu. Then, select [Brightness]. Select a desired item on the brightness selection screen.



Low: Dark

High: Bright

- 2 When one item is selected, the setting is decided instantaneously and the selection screen is erased.

After three seconds, the brightness of touch panel is changed.

 Memo

Press the outside of the selection screen frame. The selection screen is erased.

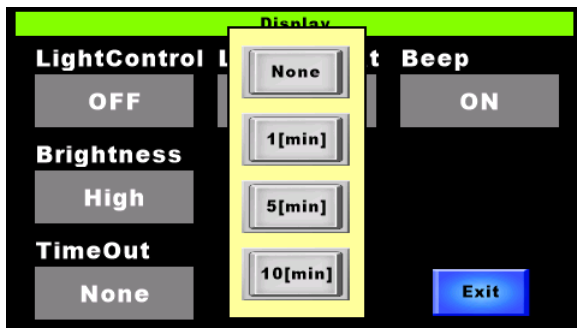
3.2.18 Action When Touch Panel Is Not Operated

Set the action of touch panel when it is not operated for the set time.

Action of touch panel	
None	No processing
1[min]/5[min]/10[min]	When the touch panel is not operated for 1 min./5 min./10 min., the whole screen of touch panel is black. Press an optional position of the touch panel, and it indicates the data again.

The procedures to set the action of touch panel are described below.

- 1 Select [Display] on the function menu. Then, select [TimeOut]. Select an action on the action selection screen.



- 2 When an item is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

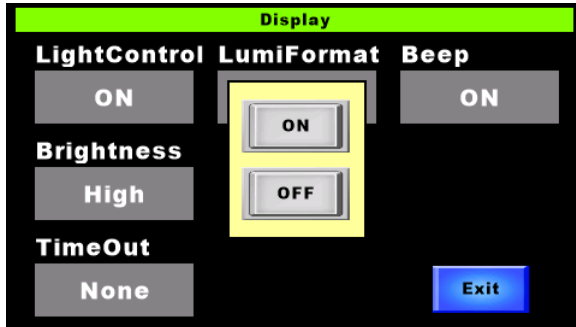
- Press the outside of the selection screen frame. The selection screen is erased.
- When others except “None” are set for the action of touch panel, it is possible to reduce the electric power consumption.

3.2.19 Beep Sound

Set whether the beep sound should be used or not.

The procedures to set ON/OFF of beep sound are described below.


- 1 Select [Display] on the function menu. Then, select [Beep]. Select ON/OFF on the selection screen.



ON: Used

OFF: Not used

- 2 When "ON" or "OFF" is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

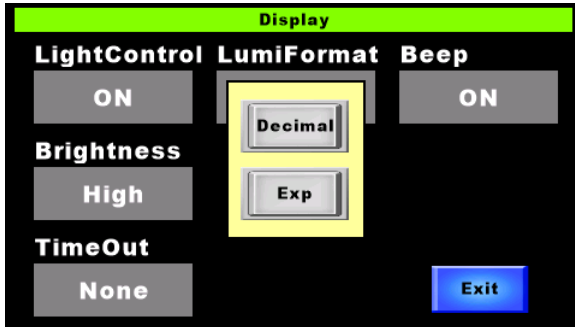
Press the outside of the selection screen frame. The selection screen is erased.

3.2.20 Luminance Display Format

Set the luminance display format.

The procedures to set the luminance display format are described below.

- 1 Select [Display] on the function menu. Then, select [LumiFormat]. Select a format on the format selection screen.



Decimal: Decimal point notation

Exp: Exponential notation

- 2 When one format is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

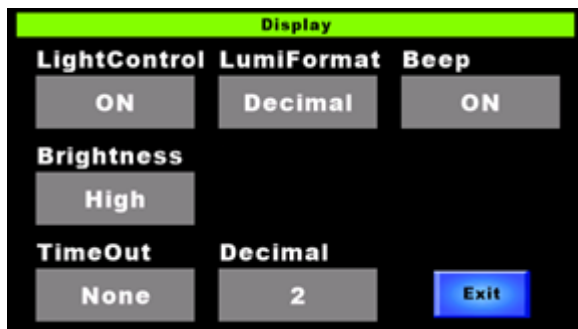
Press the outside of the selection screen frame. The selection screen is erased.

3.2.20.1 Luminance Display Digits

Set the luminance display digits.

The procedures to set the luminance display digits are described below.

- 1 Select [Display] on the function menu. Then, each time [Integer] or [Decimal] is selected, the numerical value is increased by 1. Decide a desired digit number.



Decimal: Digits after decimal point

Setting range

Setting range: 0 – 6

Memo

- When “Exp” is set as the luminance display format, [Decimal] is not indicated.
- The maximum display digits are ten (including the digits after decimal point). When the measured value is beyond the set digits, the digits after decimal point are reduced.

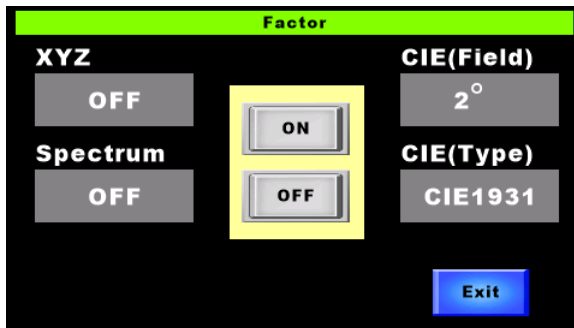
3.2.21 Correction Factor

Set whether the correction factor should be used or not. When the measured data is multiplied by the correction factor, the data is corrected. There are two types of correction factor as mentioned below.

Correction factor	
XYZ	Tristimulus values X/Y/Z are multiplied by correction factor.
Spectrum	Spectral radiance per 1nm is multiplied by correction factor.

The procedures to set "ON/OFF" of correction factor are described below.

- 1 Select [Factor] on the function menu. Then, select [XYZ] or [Spectrum]. Select an item on the "ON/OFF" selection screen.



ON: Used

OFF: Not used

- 2 When an item is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo _____

Press the outside of the selection screen frame. The selection screen is erased.

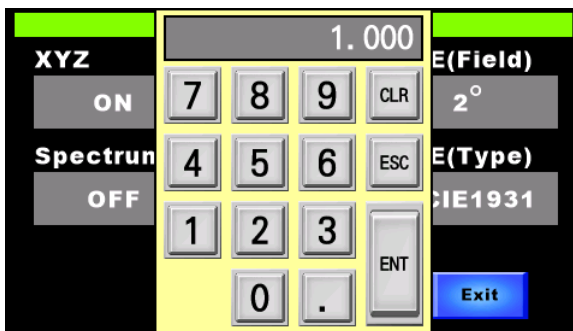
The procedures to set the X/Y/Z correction factors are described below.

☞ “3.2.3 Setting of Numerical Values”

1 Select [X], [Y] or [Z]. The numeric keypad screen appears.




2 Set the correction factor.



Setting range: 0 – 999.9

3 Press the [ENT] button to decide the value.

 Note	<p>You cannot set the correction factor relevant to spectral radiance through touch panel. When you want to set the correction factor, write it on the instrument by using the colorimetry program CS-900A or “KW[n]” command.</p> <p>☞ “4.1.10 KW[n]_#Command” ☞ “Colorimetry program CS-900A”</p>
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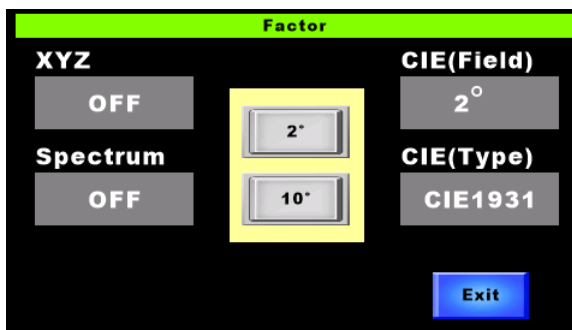
3.2.22 CIE Color Matching Function (Visual Field)

Set the visual field of CIE color matching function, which is applied to calculate the colorimetry value. There are two options mentioned below for the visual field of the CIE color matching function.

Visual field of CIE color matching function	
2° visual field XYZ color system	$\bar{x}(\lambda)$ $\bar{y}(\lambda)$ $\bar{z}(\lambda)$
10° visual field XYZ color system	$\bar{x}_{10}(\lambda)$ $\bar{y}_{10}(\lambda)$ $\bar{z}_{10}(\lambda)$

The procedures to set the visual field of the CIE color matching function are described below.

- 1 Select [Factor] on the function menu. Then, select [CIE (Field)]. Select a visual field on the 2°/10° selection screen.



- 2 When a visual field is selected, the setting is decided instantaneously and the selection screen is erased.

 Memo

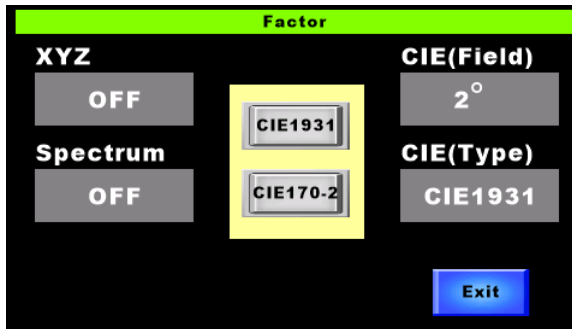
Press the outside of the selection screen frame. The selection screen is erased.

3.2.23 CIE Color Matching Function (Type)

Set the type of the color matching function, which is applied to calculate the colorimetry value.

The procedures to set the type of the CIE color matching function are described below.

- 1 Select [Factor] on the function menu. Then, select [CIE (Field)]. Select a type on the type selection screen.



* "CIE170-2" is the abbreviation of "CIE170: 2015".

- 2 When a type is selected, the setting is decided instantaneously and the selection screen is erased.

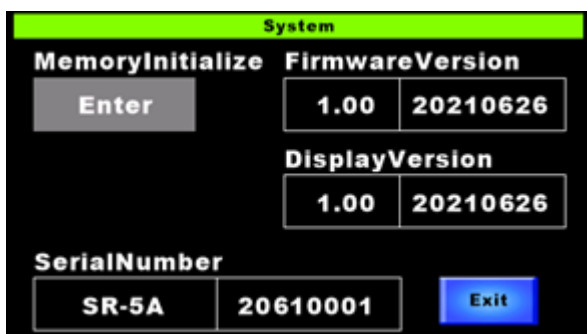
 Memo

Press the outside of the selection screen frame. The selection screen is erased.

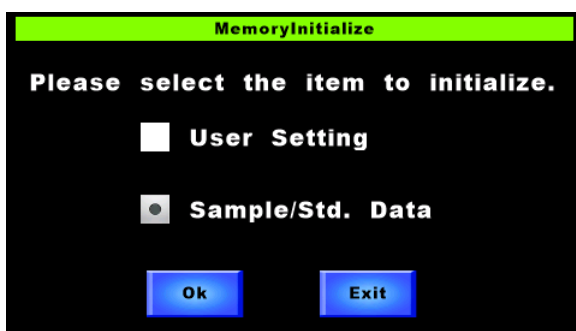
3.2.24 Initialization of Setting Data/ Measurement Data History/Diff Standard Data

Initialize the setting data, the twenty-five measurement data history and the Diff standard data.
The initialization procedures are described below.

- 1 Select [System] on the function menu. Then, select [MemoryInitialize] and [Enter].




- 2 Press to place a check mark for the data type to be initialized, [User Setting] or [Sample/Std. Data].



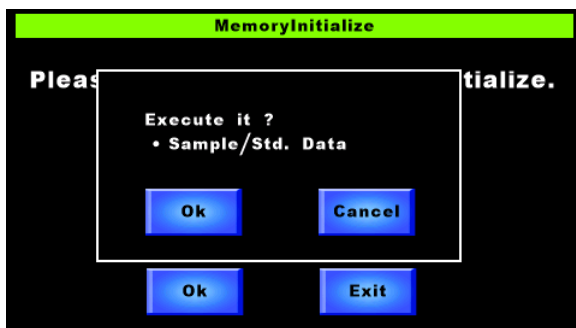
User Setting: Setting data

Sample/Std. Data: Measurement data history, Diff reference data


 Memo

- To remove the check mark, press the same item again.
- It is possible to place check marks for both [User Setting] and [Sample/Std. Data].

- 3 The check screen appears. Press the [OK] button to perform initialization.



- 4 Press the [Exit] button to return to the "System" screen.

 **Note** The initialized data cannot be restored. If necessary, back up the data before initializing.

■ Setting data initial value list

Item	Initial value
Measure Condition	
Mode	Auto
Max IntegTime (Normal)	SR-5 : 60000 SR-5A : 60000
Max IntegTime (High)	SR-5 : 30000 SR-5A : 30000
Method	Single
AutoFinder	ON
ManuOver	ON
IntegTime	1000
Frequency	50
Filter	Filter1
Measure Option	
Abs/Diff	Abs
Speed	Normal
Averaging	OFF
Ave Count	3
IntegDelay	OFF
DelayTime	100
Remote	
I/F Type	USB
Method	CS-900A
BaudRate	115200
Parity	Odd
DataBit	7
StopBit	1
Format	Normal
Delimiter	CR+LF
Display	
LightControl	ON
LumiFormat	Exp
Beep	ON
Brightness	High
TimeOut	None
Integer	7
Decimal	2
Factor	
XYZ	OFF
Spectrum	OFF
CIE(Field)	2°
CIE(Type)	CIE1931
X/Y/Z	1

4. Communication with PC

4.1 Communication Command

This instrument can communicate with PC. This chapter will explain the communication commands which will be used to communicate with the instrument.

Communication command list

Communication command	Function
RM	Enables the instrument to communicate with PC (remote mode).
LM	Sets the instrument in "Stand Alone" status (local mode). *Only "RM" command can be received.
WHO	Obtains the model name.
SRL	Obtains the serial number.
VER	Obtains the firmware version.
ST	Starts measurement. After finishing measurement, the measurement data are returned by text format.
STW	Starts measurement. After finishing measurement, the measurement data are returned by text format. Dominant wavelength and peak wavelength are added to the "ST" command measurement data.
STB	Starts measurement. After finishing measurement, the measurement data are returned by binary data format. High-speed communication can be done as compared with "ST" command. *This can be used only for USB communication.
STWB	Starts measurement. After finishing measurement, the measurement data are returned by binary data format. Dominant wavelength and peak wavelength are added to the "STB" command measurement data. *This can be used only for USB communication.
SF	Starts measurement. When the integral time is calculated, only the integral time is returned by text format earlier than other data. After finishing measurement, the measurement data are returned by text format.
STCT_#	Starts measurement. After finishing measurement, the specified data are returned by text format and comma-separated-value. #: Data type Setting range 1: Luminance, chromaticity xy 2: Luminance, chromaticity u'v' 3: Tristimulus values XYZ 4: Tristimulus values XYZ, chromaticity xy 5: Tristimulus values XYZ, chromaticity u'v' 6: Color temperature, deviation 7: Luminance, chromaticity xy, dominant wavelength, peak wavelength 8: Spectral radiance (380nm – 780nm) 9: Peak wavelength, maximum spectral radiance

CXL	<p>Cancels measurement.</p> <p>When this command is used during measurement, the instrument stops measurement immediately. The measurement data is not returned.</p> <p>When this command is used in other cases, the "OK" command is returned.</p>
D[n]	<p>Sets the output format.</p> <p>n: Type</p> <p>Setting range</p> <p>0: Colorimetry calculation value and spectral radiance</p> <p>1: Only colorimetry calculation value</p>
A[n]	<p>Sets the measurement mode.</p> <p>n: Type</p> <p>Setting range</p> <p>0: Auto, 3: Sync, 4: FixInteg, 5: FixFreq</p> <p>* "1: Freq" and "2: Manu" are explained below because it is necessary to set numerical values.</p>
A1_#	<p>Sets "Freq" as the measurement mode.</p> <p>#: Frequency</p> <p>Setting range: 1.5 -250Hz</p>
A2_#	<p>Sets "Manu" as the measurement mode.</p> <p>#: Integral time</p> <p>Setting range</p> <p>SR-5 : 20 – 60000ms SR-5A: 20 – 120000ms</p>
KW[n]_#	<p>Sets a correction factor for spectral radiance.</p> <p>n: Wavelength position</p> <p>Setting range: 0 – 400 (0: 380nm – 400: 780nm)</p> <p>#: Correction factor</p> <p>Setting range: 0 or higher</p> <p>Example: When setting the following values for "KW[n]_#";</p> <p>n: 555(Wavelength position);</p> <p>#: 100 (Correction factor).</p> <p>The set value is "KW175 100".</p>
KR[n]	<p>Obtains a correction factor for spectral radiance.</p> <p>n: Wavelength position</p> <p>Setting range: 0 – 400 (0: 380nm – 400: 780nm)</p>
K[n]_#	<p>Sets a correction factor for tristimulus values XYZ.</p> <p>n: Type XYZ</p> <p>Setting range: 'X': X, 'Y': Y, 'Z': Z</p> <p>#: Correction factor</p> <p>Setting range: 0 – 999.9</p> <p>Example: When setting "100" for "Y", the set value is "KY 100".</p>
K[n]R	<p>Obtains a correction factor for tristimulus values XYZ.</p> <p>n: Type XYZ</p> <p>Setting range: 'X': X, 'Y': Y, 'Z': Z</p> <p>Obtained value: 0 – 999.9</p>
DR[n]	<p>Obtains the measurement data stored in the instrument.</p> <p>n: Measurement number</p> <p>Setting range: 1 – 25</p>
DRW[n]	<p>Obtains the measurement data stored in the instrument.</p> <p>Dominant wavelength and peak wavelength are also output.</p> <p>n: Measurement number</p> <p>Setting range: 1 – 25</p>
K[n1][n2]	<p>Sets whether the correction factor should be used or not.</p> <p>n1: Used/Not used</p> <p>Setting range: 'O': Used, 'N': Not used</p> <p>n2: Type</p> <p>Setting range:</p> <p>1: For spectral radiance</p> <p>2: For tristimulus values XYZ</p> <p>Example: When the correction factor for tristimulus values XYZ should be used:</p> <p>The set value is "KO2".</p>

KOR[n]	Obtains the setting for using the correction factor. n: Type Setting range: 1: For spectral radiance 2: For tristimulus values XYZ Obtained value: 0: Not used, 1: Used
CIE_#	Sets the CIE color matching function (visual field). #: Visual field Setting range: 0: 2° visual field, 1: 10° visual field
CIER	Obtains the CIE color matching function (visual field). Obtained value: 0: 2° visual field, 1: 10° visual field
CMF_#	Sets the CIE color matching function (type). #: Type Setting range: 0: CIE1931, 1: CIE170 – 2: 2015
CMFR	Obtains the CIE color matching function (type). Obtained value: 0: CIE1931, 1: CIE170 – 2: 2015
LDF#	Sets the luminance display format. #: Format Setting range: 0: Decimal, 1: Exponential
LDFR	Obtains the luminance display format. Obtained value: 0: Decimal, 1: Exponential
LDD_#	Sets the digits after the decimal point when the luminance display format is “Decimal”. #: Digits after the decimal point Setting range: 0 – 6
LDDR	Obtains the digits after the decimal point when the luminance display format is “Decimal”. Obtained value: 0 – 6
FLD[n]	Sets the measuring angle position. n: Measuring angle position Setting range: 1: 2°, 2: 1°, 3: 0.2°, 4: 0.1°
FLDR	Obtains the current measuring angle position. Obtained value: 1: 2°, 2: 1°, 3: 0.2°, 4: 0.1°
NL_#	Sets the integral time delay function. #: Delay time Setting range: 50 – 3000ms
N[n]	Sets whether the integral time delay function should be used or not. n: Used/Not used Setting range: ‘D’: Used, ‘F’: Not used
[n]S	Sets the measuring speed. n: Measuring speed Setting range: ‘N’: Normal, ‘H’: HighSpeed
HCL	Executes “High Speed” calibration. When “High Speed” is set, execute the calibration.
HSR	Obtains the measuring speed. Obtained value: 0: HighSpeed, 1: Normal
FO	Sets “FixInteg” as the measurement mode. The processing is the same as “A4” command. This command has interchangeability with the old model.
FX	The integral time and filter position applied to “FixInteg” mode are automatically set. When the instrument receives the command, measurement starts. The optimal integral time and filter position are set by the measurement results. The integral time and filter position, which have just been set, are returned.
FG	Obtains the integral time and filter position set for “FixInteg” mode. Obtained value Integral time: SR-5 20 - 60000ms SR-5A 20 - 120000ms Filter position: SR-5 1 - 3 SR-5A 1 - 5

FS_#1_#2	Sets the integral time and filter position applied to "FixInteg" mode. #1: Integral time, #2: Filter position Setting range Integral time: SR-5 20 - 60000ms SR-5A 20 - 120000ms Filter position: SR-5 1 - 3 SR-5A 1 - 5
FXQ_#1_#2	Sets the frequency and filter position applied to "FixFreq" mode. #1: Frequency, #2: Filter position Setting range Frequency: 1, 5 - 250Hz Filter position: SR-5 1 - 3 SR-5A 1 - 5
IMD_#	Sets the data communication method. #: Format, 0: Normal, 1: CS-900A
IMDR	Obtains the data communication method. Obtained value: 0: Normal, 1: CS-900A
IMF_#	Sets whether the environment information output function should be used or not. #: Used/Not used, 0: Not used, 1: Used
IMFR	Obtains the value for the environment information output. Obtained value: 0: Not used, 1: Used
EC	Sets "Close" for viewfinder shutter.
EO	Sets "Open" for viewfinder shutter.
ES_#	Sets the automatic control of viewfinder shutter. #: Action 0: "Close" when measuring 1: The current position is kept when measuring.
ESR	Obtains the value for the automatic control of viewfinder shutter. Obtained value 0: "Close" when measuring 1: The current position is kept when measuring
ALNS_#	Sets the maximum integral time for "Normal" of "Auto" mode. Setting range: SR-5 5000 - 60000ms SR-5A 5000 - 60000ms
ALHS_#	Sets the maximum integral time for "HighSpeed" of "Auto" mode. Setting range: SR-5 5000 - 30000ms SR-5A 5000 - 30000ms
AVE_#	Sets the average measurement should be used or not #: Used/Not used, 0: Not used, 1: Used
AVER	Obtains the value for the average measurement Obtained value: 0: Not used, 1: Used
AVT_#	Sets the averaging time for the averaging measurement. #: averaging time Setting range: 1 - 20
AVTR	Obtains the averaging time for the averaging measurement. Obtained value: 1 - 20

* "_" means space. "#" means a numerical value. [n] means the added command letter.

Example: When setting the following values for "KW[n]_#":

n: 555 (Wavelength position);

#: 100 (Correction factor).

The set value is "KW175 100".

* When the instrument receives a communication command from PC, it returns "OK" as the reception check command.

If the instrument receives an irrelevant command, it returns "NO".

* In some cases, the return from this product is only an "OK" to confirm receipt, and in other cases, it returns measurement data and ends with an "END".

When communicating, please check the presence or absence of received data for each command.

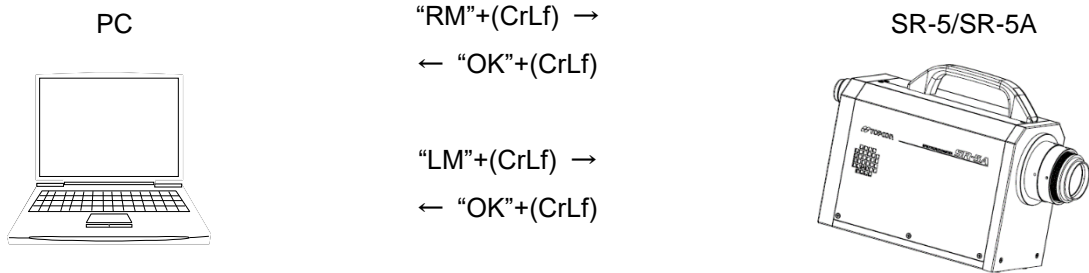
4.1.1 RM/LM Command

The instrument is set to the following conditions:

RM: Remote mode: The instrument can communicate with other systems;

LM: Local mode: The instrument is in "Stand Alone" status.

When turning ON the power, "Stand Alone" status (local mode) is set. In order to communicate with PC, send the "RM" command first so that the instrument can communicate with PC. (Remote mode)



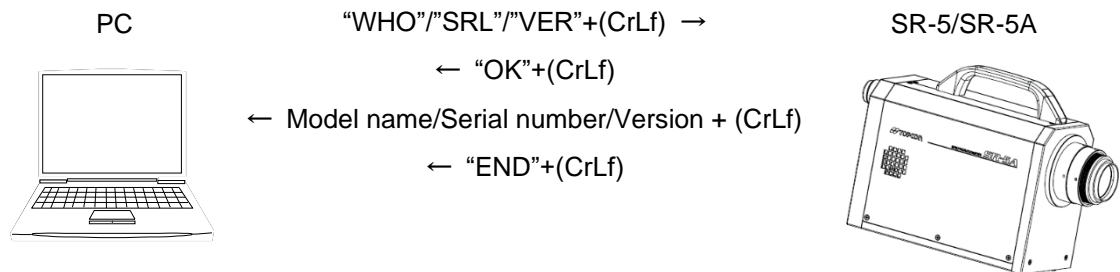
4.1.2 WHO/SRL/VER Command

These commands are used to obtain the model name, serial number and firmware version.

WHO: Model name

SRL: Serial number

VER: Firmware version



4.1.3 ST/STW Command

Measurement starts. After finishing measurement, the measurement data are returned as text format data.

ST: Standard output items

STW: Standard output items + Dominant wavelength + Peak wavelength

① Sending from PC to the instrument

“ST” + (CrLf) or “STW” + (CrLf) is sent.

② Returning the reception check from the instrument

When the instrument receives “ST” + (CrLf) or “STW” + (CrLf), it returns “OK” + (CrLf) as the reception check command. Then, measurement starts


 Memo

As an example, (CrLf) is used as a delimiter in the explanation. The delimiter can be changed to (Cr).

 “3.2.15 Terminal Code of Remote Command”

③ Returning the measurement data from the instrument

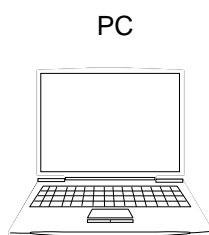
After finishing measurement, the measurement data are returned. When the data are sent, the delimiter (CrLf) is added to the end of one data line. After all the measurement data are sent, the finish code, “END” + (CrLf), is sent last.

 “4.2.1 Output Format of Remote Measurement”

 “3.2.13 Data Communication Method”

(1) Data communication method: Normal

“Handshake” for sending/receiving data is not done. The instrument keeps sending the data until the finish code, “END” + (CrLf), is sent.



“ST” or “STW”+(CrLf) →

← “OK”+(CrLf)

Measurement starts.

.

Measurement is finished.

← Measurement data 1 + (CrLf)

← Measurement data 2 + (CrLf)

← Measurement data 3 + (CrLf)

.

.

← Measurement data n + (CrLf)

← “END”+(CrLf)



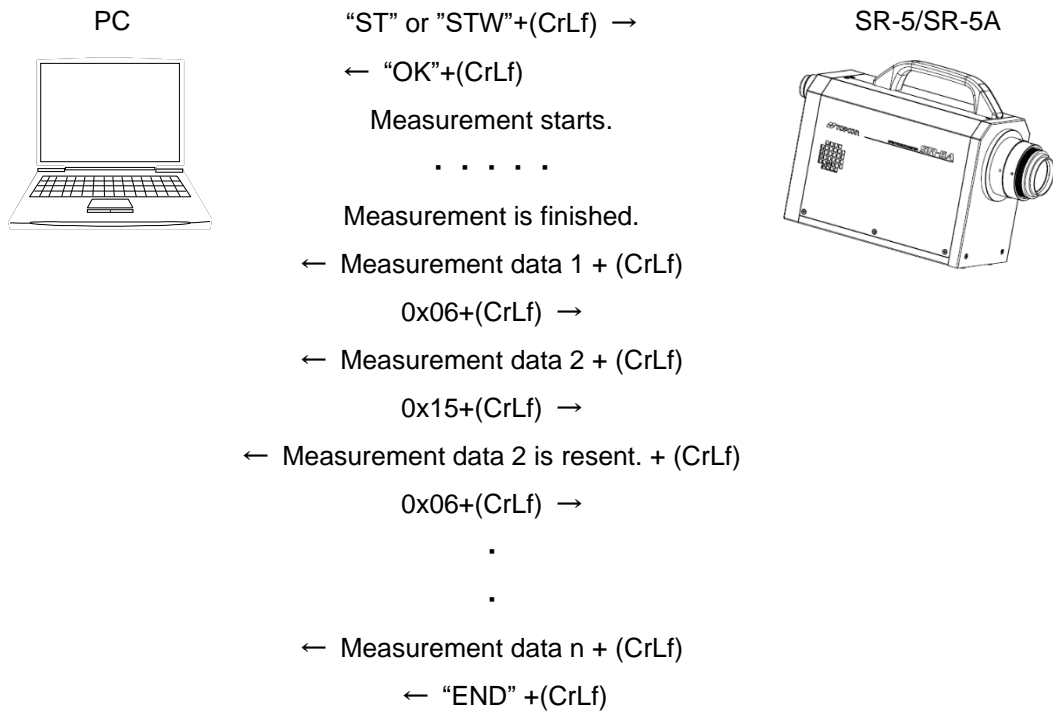
(2) Data communication method: CS-900A

“Handshake” for sending/receiving data is performed. Each time a piece of data is received by the PC, the PC must send the following matters:

- When the piece of data is correct, 0x06+(CrLf) should be sent;
- When the piece of data is incorrect, 0x15+(CrLf) should be sent.

Only when the instrument receives 0x15+(CrLf), it sends the same data again.

The same data is resent only once. If a piece of incorrect data is sent twice continuously, the finish code, “END”+(CrLf), is returned and the processing is finished.



When the piece of data which has been
resent is incorrect

- ← Measurement data 2 is resent. + (CrLf)
- 0x15+(CrLf) →
- ← “END” +(CrLf)

4.1.4 STB/STBW Command

Measurement starts. After finishing measurement, the instrument returns the measurement data as binary data (Big Endian).

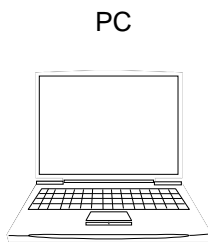
STB: Standard output items

STBW: Standard output items + Dominant wavelength + Peak wavelength

☞ “4.2.1 Output Format of Remote Measurement”

📄 Memo

As compared with “ST” command, communication can be done at high speed.



“STB” or “STBW”+(CrLf) →

← “OK”+(CrLf)

Measurement starts.

.

Measurement is finished.

← Header part

← Data part

← “END” +(CrLf)



4.1.5 SF Command

Measurement starts. After finishing measurement, the measurement data is returned as text format data.

- ① Sending from PC to the instrument

“SF”+(CrLf) is sent.

- ② Returning the reception check from the instrument

When the instrument receives “SF”+(CrLf), it returns “OK”+(CrLf) as the reception check command.

Then, measurement starts.

Memo

As an example, (CrLf) is used as a delimiter in the explanation. The delimiter can be changed to (Cr).


 “3.2.15 Terminal Code of Remote Command”

- ③ Returning the integral time from the instrument

After calculating the integral time, only the integral time is returned.

- ④ Returning the measurement data from the instrument

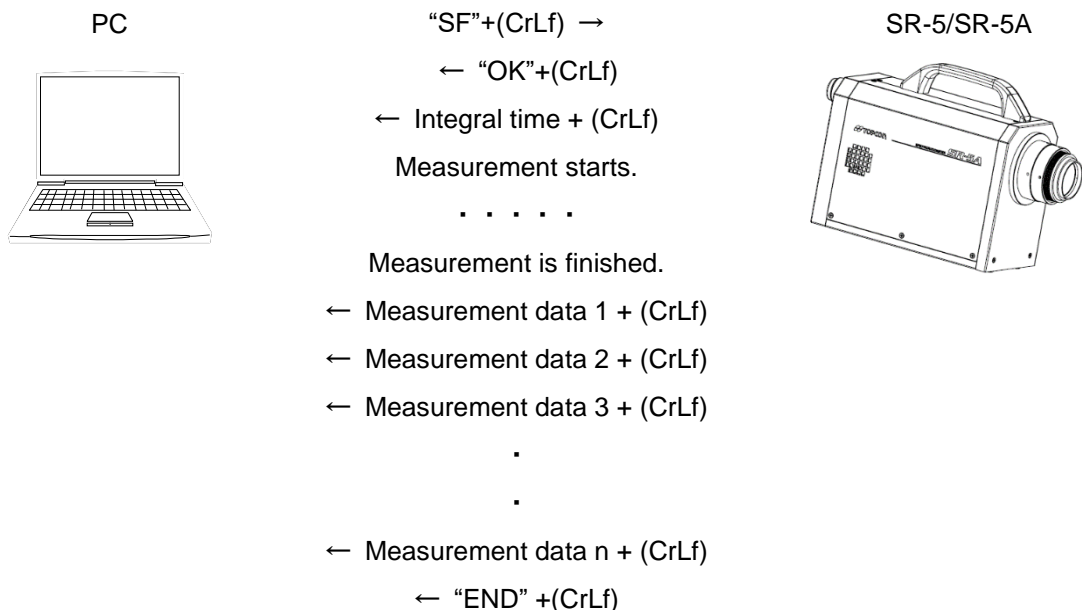
After finishing measurement, the measurement data are returned. When the data are sent, the delimiter (CrLf) is added to the end of one data line. When all the measurement data are sent, the finish code, “END”+(CrLf) is sent last.

 “4.2.1 Output Format of Remote Measurement”

 “3.2.13 Data Communication Method”

- (1) Data communication method: Normal

“Handshake” for sending/receiving data is not done. The instrument keeps sending the data until the finish code, “END”+(CrLf), is sent.



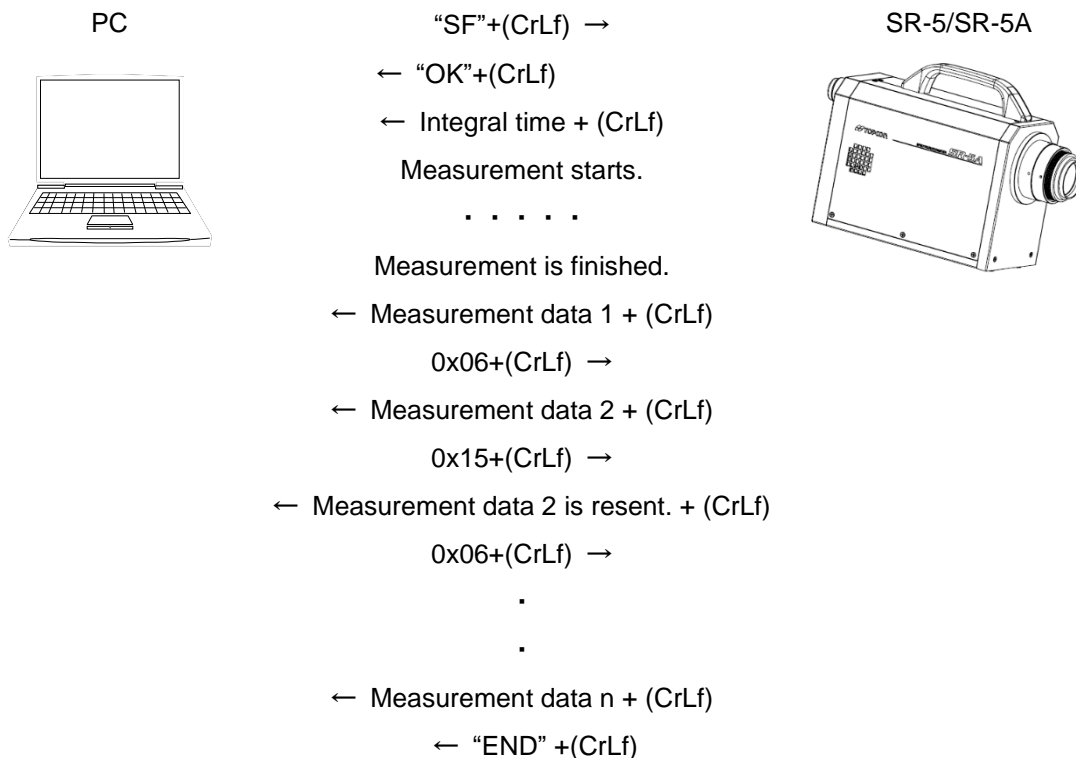
(2) Data communication method: CS-900A

“Handshake” for sending/receiving data is performed. Each time a piece of data is received by the PC, the PC must send the following matters:

- When the piece of data is correct, 0x06+(CrLf) should be sent;
- When the piece of data is incorrect, 0x15+(CrLf) should be sent.

Only when the instrument receives 0x15+(CrLf), it sends the same data again.

The same data is resent only once. If a piece of incorrect data is sent twice continuously, the finish code, “END”+(CrLf), is returned and the processing is finished.



When the piece of data which has been
resent is incorrect

- ```

 ← Measurement data 2 is resent. + (CrLf)
 0x15+(CrLf) →
 ← "END" +(CrLf)

```

## 4.1.6 STCT\_#Command

Measurement starts. After finishing measurement, the specified data are returned as text format data with comma separation.

### ① Sending from PC to the instrument

“STCT\_#”+(CrLf) is sent.

### ② Returning the reception check from the instrument

When the instrument receives “STCT\_#”+(CrLf), it returns “OK”+(CrLf) as the reception check command. Then, measurement starts.



Memo

As an example, (CrLf) is used as a delimiter in the explanation. The delimiter can be changed to (Cr).

☞ “3.2.15 Terminal Code of Remote Command”

### ③ Returning the measurement data from the instrument

After finishing measurement, the specified data are returned. When the data are sent, the delimiter (CrLf) is added to the end of one data line. When all the measurement data are sent, the finish code, “END”, is returned last.

☞ “4.2.1 Output Format of Remote Measurement”

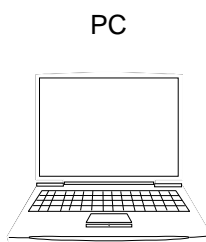
☞ “3.2.13 Data Communication Method”

Set the type of measurement data.

#: Data type

Setting range

- 1: Luminance, chromaticity xy,
- 2: Luminance, chromaticity u'v'
- 3: Tristimulus values XYZ,
- 4: Tristimulus values XYZ, chromaticity xy
- 5: Tristimulus values XYZ, chromaticity u'v',
- 6: Color temperature, deviation
- 7: Luminance, chromaticity xy, dominant wavelength, peak wavelength
- 8: Spectral radiance (380nm – 780nm)
- 9: Peak wavelength, maximum spectral radiance



PC

“STCT\_#”+(CrLf) →  
← “OK”+(CrLf)  
Measurement starts.  
.....  
Measurement is finished.  
← Measurement data + (CrLf)  
← “END” +(CrLf)

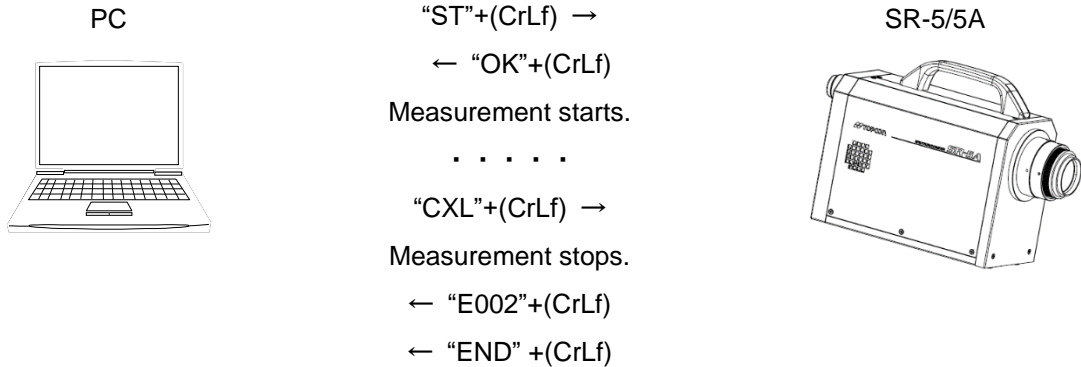


SR-5/SR-5A

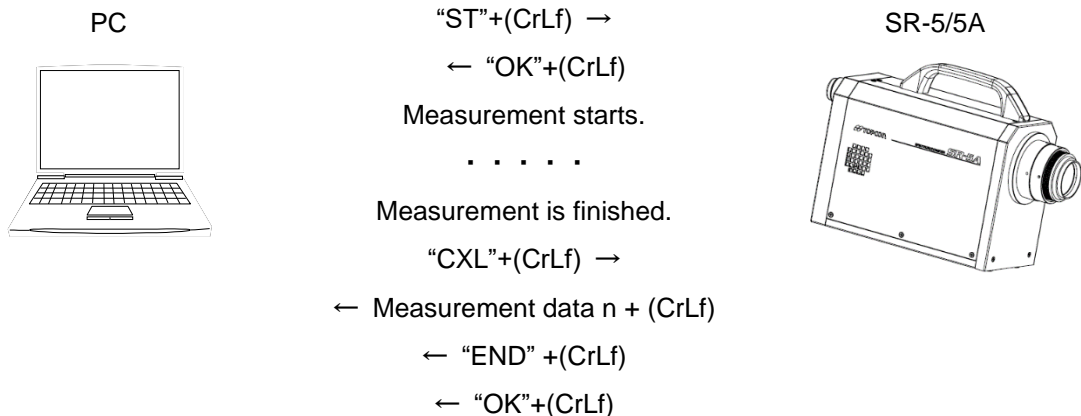
## 4.1.7 CXL Command

This command is used to stop measurement instantaneously and return an error code.  
The data that is being measured is not returned.

### ① When the instrument is measuring



### ② When the measurement data are being returned



#### Memo

- If the instrument receives this command while the measurement data are being returned, it returns the reception check command, “OK”+(CrLf), after returning the measurement data is completed. While the instrument is returning the measurement data, it does not receive a command.
- During any other operation except “When measuring”, the instrument returns only the reception check command, “OK”+(CrLf).
- Inside the instrument, this command is checked at intervals of one second. After this command is sent, delay time of maximum one second occurs from time to time.

## 4.1.8 D[n] Command

---

This command is used to set the output format.

n: type

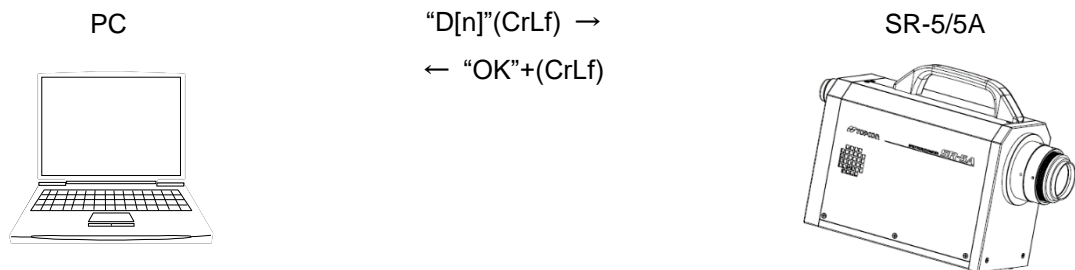
Setting range

0: Colorimetry calculation value and spectral radiance

1: Only colorimetry calculation value

Example: "D0" The colorimetry calculation value and spectral radiance are set.

☞ "4.2.1 Output Format of Remote Measurement"



📄 Memo

When the power is turned on, "D0: Colorimetry calculation value and spectral radiance" is set.

## 4.1.9 A[n]/A1/A2 Command

---

This command is used to set the measurement mode. Once the measurement mode is set, it is stored even after the power is OFF.

If measurement starts without setting the measurement mode, measurement is done by the mode set at the last measurement.

n: Type

Setting range

0: Auto 1: Freq 2: Manu 3: Sync 4: FixInteg 5: FixFreq

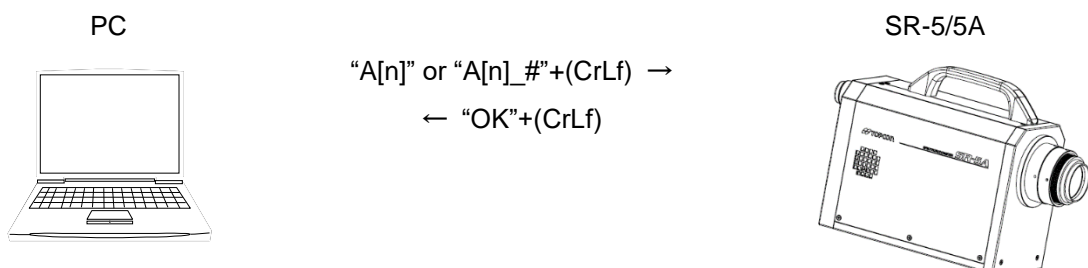
A1\_# #: Frequency

Setting range: 1.5 – 250Hz

A2\_# #: Integral time

Setting range SR-5 : 20 - 60000ms SR-5A : 20 - 120000ms

Example: A2\_100 "Manual mode" and "Integral time 100ms" are set.



#### 4.1.10 KW[n]\_# Command

---

This command is used to set the correction factor for the spectral radiance.

n: Wavelength position

Setting range: 0 – 400 (0: 380nm – 400: 780nm)

#: Correction factor

Setting range: 0 or higher

Example: "KW0 100": The correction factor 100 is set for "Wavelength position: 380nm".

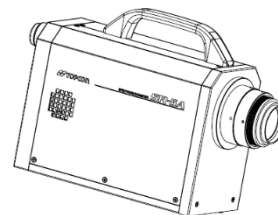
"KW400 1.234": The correction factor 1.234 is set for "Wavelength position: 780nm".

PC



"KW[n]\_#" + (CrLf) →  
← "OK" + (CrLf)

SR-5/5A



#### 4.1.11 KR[n] Command

---

This command is used to obtain the correction factor for the spectral radiance.

n: Wavelength position

Setting range: 0 – 400 (0: 380nm – 400: 780nm)

Example: "KR0": The correction factor for "Wavelength position: 380nm" is obtained.

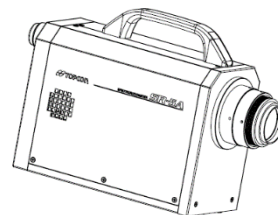
"KR400": The correction factor for "Wavelength position: 780nm" is obtained.

PC



"KR[n]" + (CrLf) →  
← "OK" + (CrLf)  
← Correction factor + (CrLf)  
← "OK" + (CrLf)

SR-5/5A



#### Memo

In order to keep the interchangeability with the old models, the finish code, not "END" + (CrLf) but "OK" + (CrLf) is returned.

## 4.1.12 K[n] Command

---

This command is used to set the correction factor for “Tristimulus values XYZ”.

n: Type of XYZ

Setting range: ‘X’: X ‘Y’: Y ‘Z’: Z

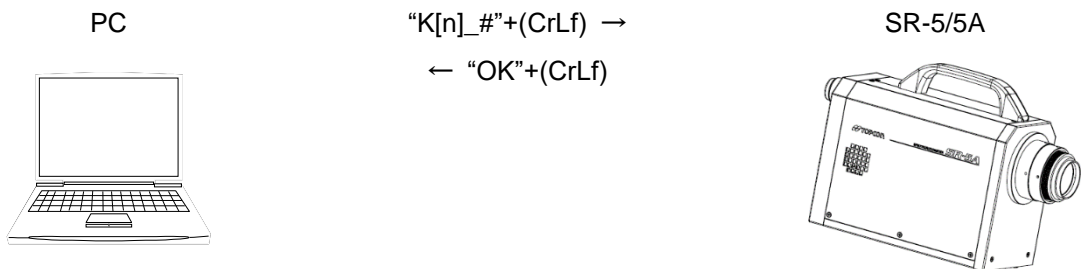
#: Correction factor

Setting range: 0 – 999.9

Example: “KX 100”: The correction factor 100 is set for “Tristimulus value X”.

“KY 10.3”: The correction factor 10.3 is set for “Tristimulus value Y”.

“KZ 999.9”: The correction factor 999.9 is set for “Tristimulus value Z”.



## 4.1.13 K[n] R Command

---

This command is used to obtain the correction factor for “Tristimulus values XYZ”.

n: Type of XYZ

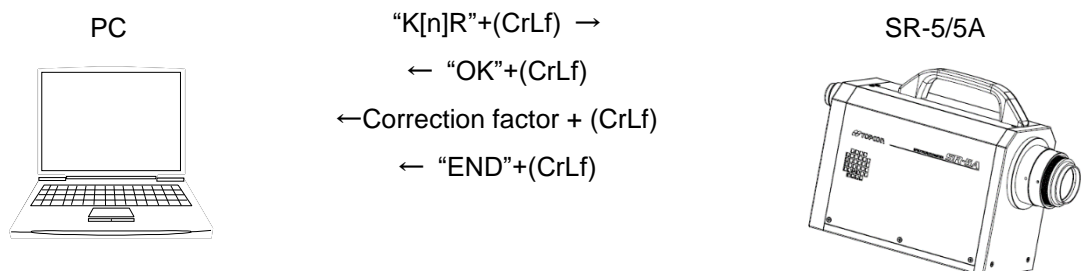
Setting range: ‘X’: X ‘Y’: Y ‘Z’: Z

Obtained value: 0 – 999.9

Example: “KXR”: The correction factor for “Tristimulus value X” is obtained.

“KYR”: The correction factor for “Tristimulus value Y” is obtained.

“KZR”: The correction factor for “Tristimulus value Z” is obtained.



#### 4.1.14 DR[n] Command

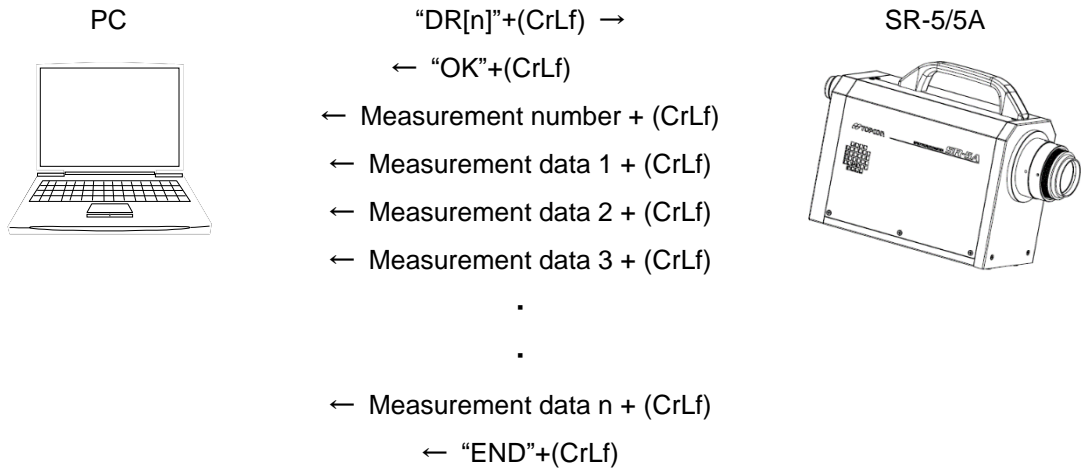
---

This command is used to obtain the measurement data stored in the instrument.

n: Measurement number

Setting range: 1 – 25

☞ “4.2.2.1 Output Format of DR [n] Command”



#### 4.1.15 DRW[n] Command

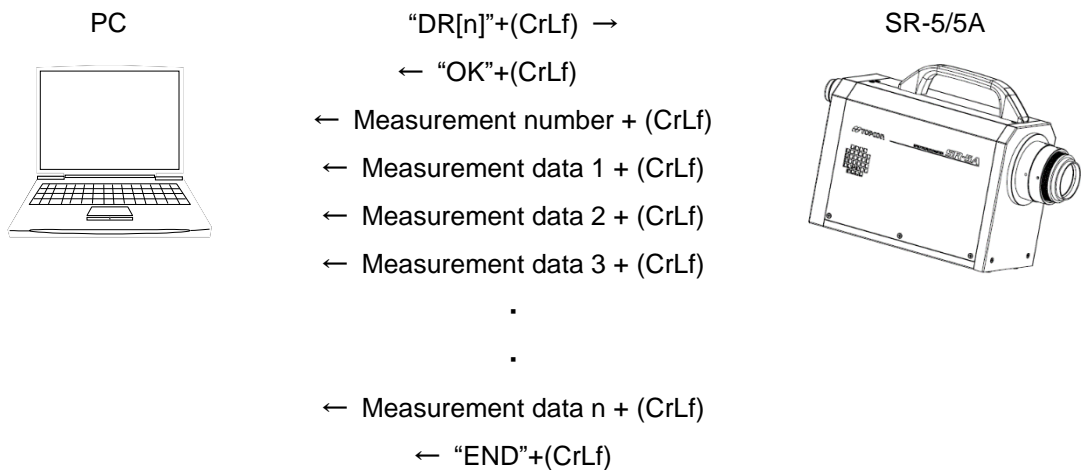
---

This command is used to obtain the measurement data stored in the instrument. The measurement data includes dominant wavelength and peak wavelength data.

n: Measurement number

Setting range: 1 – 25

☞ “4.2.2.2 Output Format of DRW [n] Command”





#### 4.1.16 K[n1][n2] Command

---

This command is used to validate/invalidate the correction factor.

n1: Validates/invalidates

Setting range: 'O': Validates 'N': Invalidates

n2: Type

Setting range: 1: For spectral radiance 2: For tristimulus values XYZ

Example: "KO2": Validates the correction factor for tristimulus values XYZ.

"KN1": Invalidates the correction factor for spectral radiance.

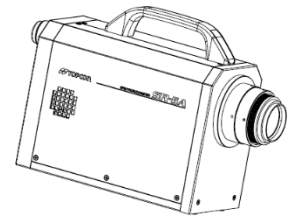
PC



"K[n1][n2]" + (CrLf) →

← "OK" + (CrLf)

SR-5/5A



#### 4.1.17 KOR[n] Command

---

This command is used to obtain the setting for validating/invalidating the correction factor.

n: Type

Setting range: 1: For spectral radiance 2: For tristimulus values XYZ

Obtained value: 0: Invalidates 1: Validates

Example: "KOR1": Obtains the setting for validating/invalidating the correction factor for spectral radiance.

"KOR2": Obtains the setting for validating/invalidating the correction factor for tristimulus values XYZ.

PC



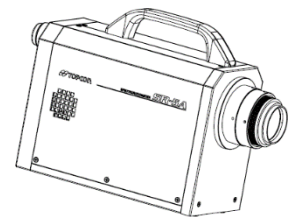
"KOR[n]" + (CrLf) →

← "OK" + (CrLf)

← Validating/invalidating + (CrLf)

← "END" + (CrLf)

SR-5/5A



#### 4.1.18 CIE\_# Command

---

This command is used to set the CIE color matching function (visual field).

#: Visual field

Setting range: 0: 2° visual field 1: 10° visual field

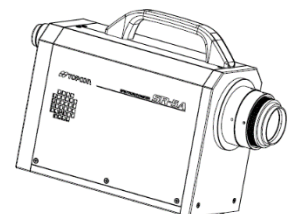
PC



"CIE\_#" + (CrLf) →

← "OK" + (CrLf)

SR-5/5A



### 4.1.19 CIER Command

---

This command is used to obtain the CIE color matching function (visual field).

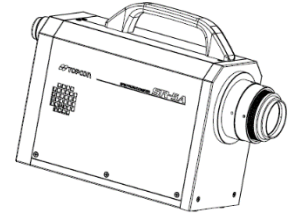
Obtained value: 0: 2° visual field 1: 10° visual field

PC



“CIER”+(CrLf) →  
← “OK”+(CrLf)  
← Visual field + (CrLf)  
← “END”+(CrLf)

SR-5/5A



### 4.1.20 CMF\_# Command

---

This command is used to set the CIE color matching function (type).

#: Type

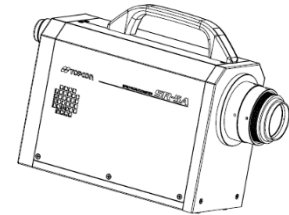
Setting range: 0: CIE1931 1: CIE170-2: 2015

PC



“CMF\_#”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A



### 4.1.21 CMFR Command

---

This command is used to obtain the CIE color matching function (type).

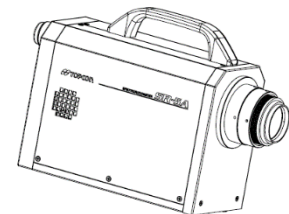
Obtained value: 0: CIE1931 1: CIE170-2:2015

PC



“CMFR”+(CrLf) →  
← “OK”+(CrLf)  
← Type + (CrLf)  
← “END”+(CrLf)

SR-5/5A



### 4.1.22 LDF# Command

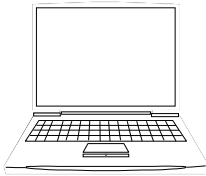
---

This command is used to set the luminance display format.

#: Format

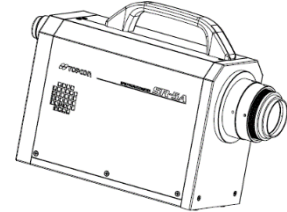
Setting range: 0: Decimal 1: Exponential

PC



“LDF#”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A



### 4.1.23 LDFR Command

---

This command is used to obtain the luminance display format.

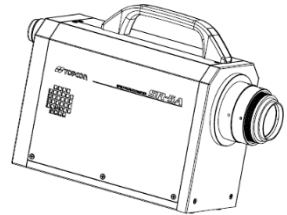
Obtained value: 0: Decimal 1: Exponential

PC



“LDFR”+(CrLf) →  
← “OK”+(CrLf)  
← Format + (CrLf)  
← “END”+(CrLf)

SR-5/5A



### 4.1.24 LDD\_# Command

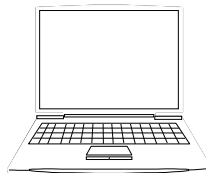
---

This command is used to set the digits after the decimal point for luminance.

#: Digits after the decimal point

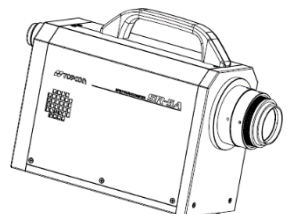
Setting range: 0 – 6

PC



“LDD\_#”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A

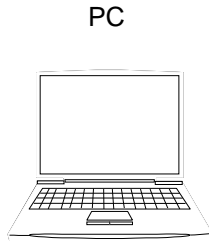


### 4.1.25 LDDR Command

---

This command is used to obtain the digits after the decimal point for luminance.

Obtained value: 0 – 6



“LDDR”+(CrLf) →  
← “OK”+(CrLf)  
← Digits after the decimal point + (CrLf)  
← “END”+(CrLf)



### 4.1.26 FLD[n] Command

---

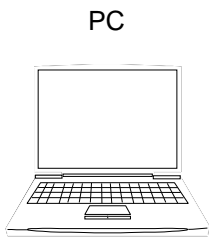
This command is used to set the measuring angle position.

n: Measuring angle position

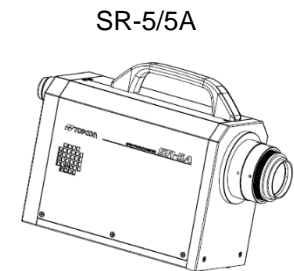
Setting range: 1: 2° 2: 1° 3: 0.2° 4: 0.1°

Example: “FLD1”: 2° is set as the measuring angle.

“FLD4”: 0.1° is set as the measuring angle.



“FLD[n]”+(CrLf) →  
← “OK”+(CrLf)

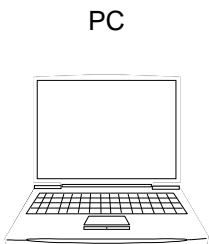


### 4.1.27 FLDR Command

---

This command is used to obtain the current measuring angle position.

Obtained value: 1: 2° 2: 1° 3: 0.2° 4: 0.1°



“FLDR”+(CrLf) →  
← “OK”+(CrLf)  
← Measuring angle + (CrLf)  
← “END”+(CrLf)



#### 4.1.28 NL\_# Command

---

This command is used to set the integral time delay function.

#: Delay time

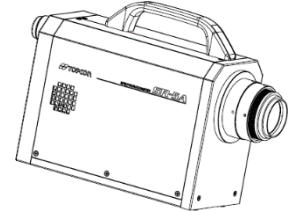
Setting range: 50 – 3000ms

PC



“NL\_#”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A



#### 4.1.29 N[n] Command

---

This command is used to validate/invalidate the integral time delay function.

n: Validates/invalidates

Setting range: ‘D’: Validates ‘F’: Invalidates

Example: “ND”: Validates the integral time delay function.

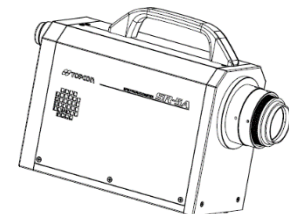
“NF”: Invalidates the integral time delay function.

PC



“N[n]”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A



#### 4.1.30 [n]S Command

---

This command is used to set the measuring speed.

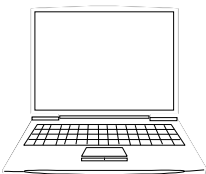
n: Measuring speed

Setting range: ‘N’: Normal ‘H’: HighSpeed

Example: “NS”: “Normal” is set as the measuring speed.

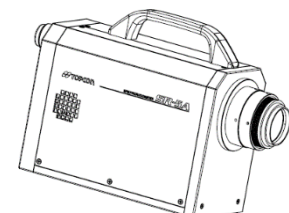
“HS”: “HighSpeed” is set as the measuring speed.

PC



“[n]S”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A

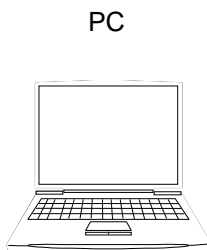


### 4.1.31 HCL Command

---

This command is used to execute "High Speed" calibration.

Execute it when "High Speed" is set.



"HCL"+(CrLf) →  
← "OK"+(CrLf)  
Execute calibration.  
(About fourteen minutes)  
← "END"+(CrLf)



**Note**

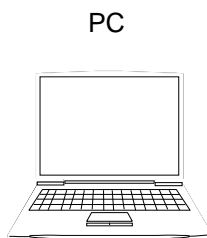
- When executing calibration, set the viewfinder shutter to "Close".
- Do not turn OFF the power during calibration.
- Execute calibration where the environmental temperature is stable.  
We recommend to execute calibration once a day.

### 4.1.32 HSR Command

---

This command is used to obtain the measuring speed.

Obtained value: 0: HighSpeed 1: Normal



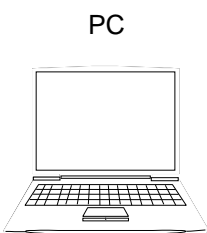
"HSR"+(CrLf) →  
← "OK"+(CrLf)  
← Measuring speed+(CrLf)  
← "END"+(CrLf)



### 4.1.33 FO Command

---

This command is used to set "FixInteg" as the measurement mode.



"FO"+(CrLf) →  
← "OK"+(CrLf)

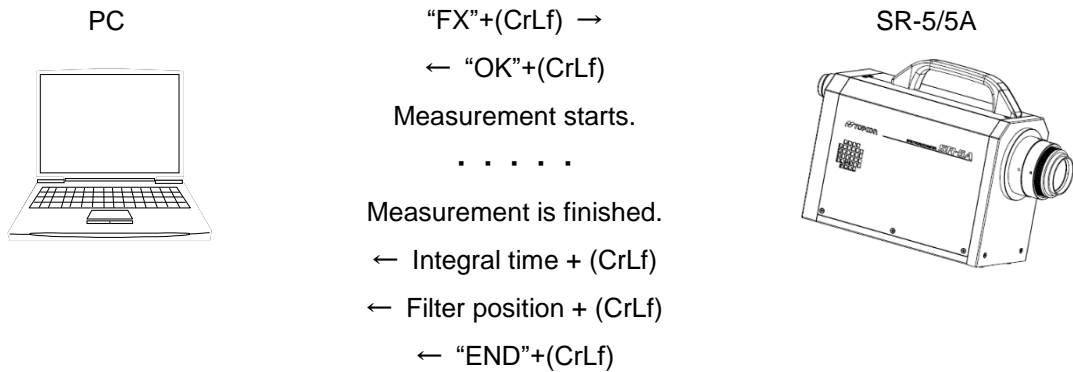



This command is used to keep the interchangeability with the old models. The processing is the same as "A4" command.

#### 4.1.34 FX Command

---

This command is used to set the integral time and filter position applied to “FixInteg” mode automatically. When the instrument receives this command, measurement starts. The optimal integral time and filter position are set according to the measurement result. The instrument returns the set integral time and filter position.



|                                                                                                  |                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Note</b> | Perform measurement under the same conditions (measuring angle, measurement target, measuring distance, etc.) as real measurement. If the measurement conditions are not same, the measuring accuracy is lowered from time to time. |
|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 4.1.35 FG Command

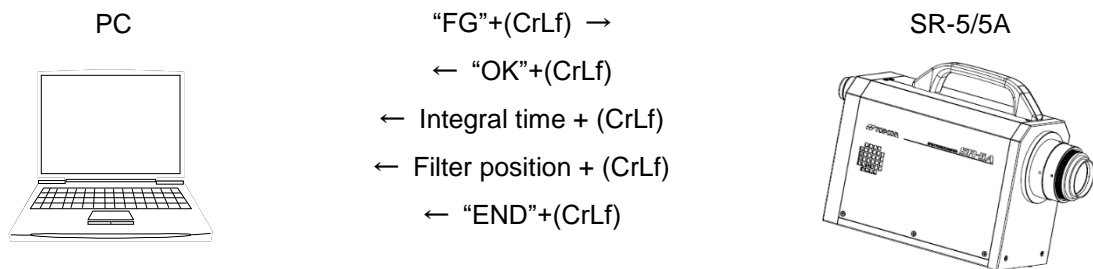
---

This command is used to obtain the integral time and filter position, which are set in “FixInteg” mode.

Obtained value:

Integral time: SR-5 20 - 60000ms SR-5A 20 - 120000ms

Filter position: SR-5 1 - 3 SR-5A 1 - 5



### 4.1.36 FS\_#1\_#2 Command

---

This command is used to set the integral time and filter position applied to “FixInteg” mode.

#1: Integral time #2: Filter position

Setting range:

Integral time: SR-5 20 - 60000ms SR-5A 20 - 120000ms

Filter position: SR-5 1 - 3 SR-5A 1 - 5

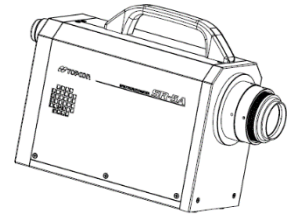
PC



“FS\_#1\_#2”+(CrLf) →

← “OK”+(CrLf)

SR-5/5A



### 4.1.37 FXQ\_#1\_#2 Command

---

This command is used to set the frequency and filter position applied to “FixFreq” mode.

#1: Frequency #2: Filter position

Setting range:

Frequency: 1, 5 – 250Hz

Filter position: SR-5 1 - 3 SR-5A 1 - 5

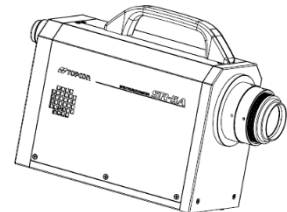
PC



“FXQ\_#1\_#2”+(CrLf) →

← “OK”+(CrLf)

SR-5/5A



### 4.1.38 IMD\_# Command

---

This command is used to set the data communication method.

#: Format

Setting range: 0: Normal 1: CS-900A

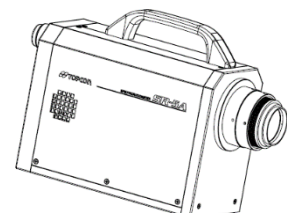
PC



“IMD\_#”+(CrLf) →

← “OK”+(CrLf)

SR-5/5A



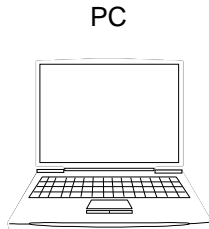


### 4.1.39 IMDR Command

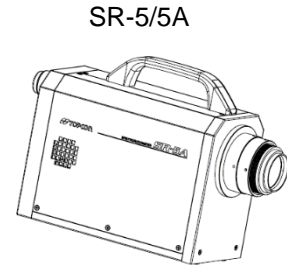
---

This command is used to obtain the data communication method.

Obtained value 0: Normal 1: CS-9000A



“IMDR”+(CrLf) →  
← “OK”+(CrLf)  
← Communication method + (CrLf)  
← “END”+(CrLf)



### 4.1.40 IMF\_# Command

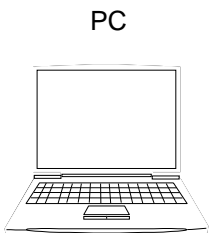
---

This command is used to validate/invalidate the environment information output. When validating it, the environment information is added to the measurement data.

#: Validates/invalidates

Setting range: 0: Invalidates 1: Validates

☞ “4.2.1 Output Format of Remote Measurement”



“IMF\_#”+(CrLf) →  
← “OK”+(CrLf)

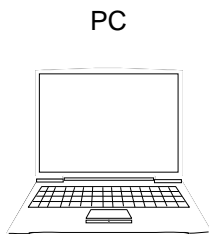


### 4.1.41 IMFR Command

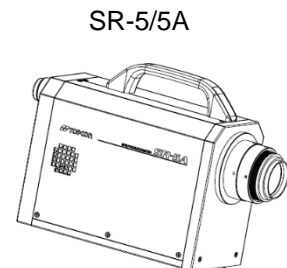
---

This command is used to obtain the setting for the environment information output.

Obtained value: 0: Invalidates 1: Validates



“IMFR”+(CrLf) →  
← “OK”+(CrLf)  
← Validates/Invalidates + (CrLf)  
← “END”+(CrLf)



#### 4.1.42 EC/EO Command

---

This command is used to set “Close/Open” for viewfinder shutter.

EC: “Close” is set for viewfinder shutter.

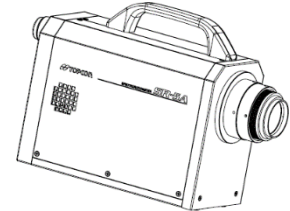
EO: “Open” is set for viewfinder shutter.

PC



“EC” or “EO”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A



#### 4.1.43 ES\_# Command

---

This command is used to set the automatic control of viewfinder shutter.

#: Action

Setting range: 0: “Close” when measuring

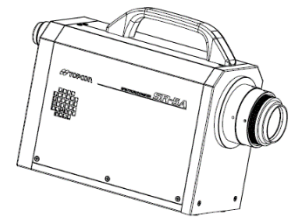
1: The current position is kept when measuring

PC



“ES\_#”+(CrLf) →  
← “OK”+(CrLf)

SR-5/5A



#### 4.1.44 ESR Command

---

This command is used to obtain the setting for the automatic control of viewfinder shutter.

Obtained value: 0: “Close” when measuring

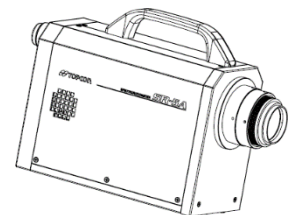
1: The current position is kept when measuring

PC



“ESR”+(CrLf) →  
← “OK”+(CrLf)  
← Control setting + (CrLf)  
← “END”+(CrLf)

SR-5/5A

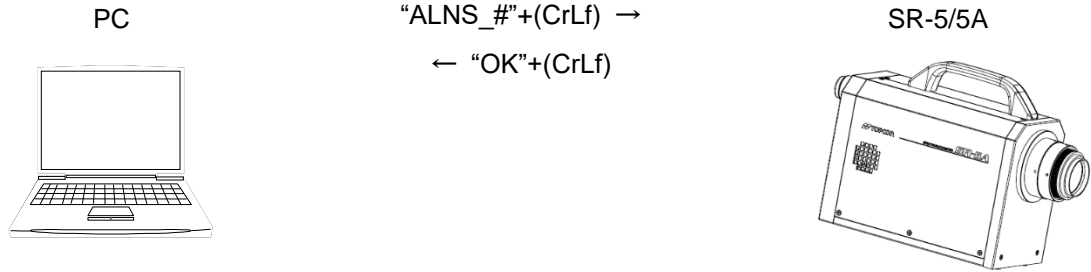


#### 4.1.45 ALNS\_# Command

---

This command is used to set the maximum integral time for “Normal” of “Auto” mode.

Setting range: SR-5 5000 - 60000ms SR-5A 5000 - 60000ms

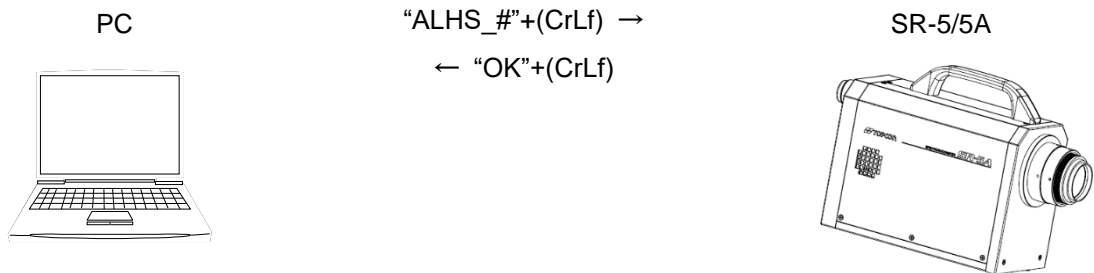


#### 4.1.46 ALHS\_# Command

---

This command is used to set the maximum integral time for “HighSpeed” of “Auto” mode.

Setting range: SR-5 5000 - 30000ms SR-5A 5000 - 30000ms



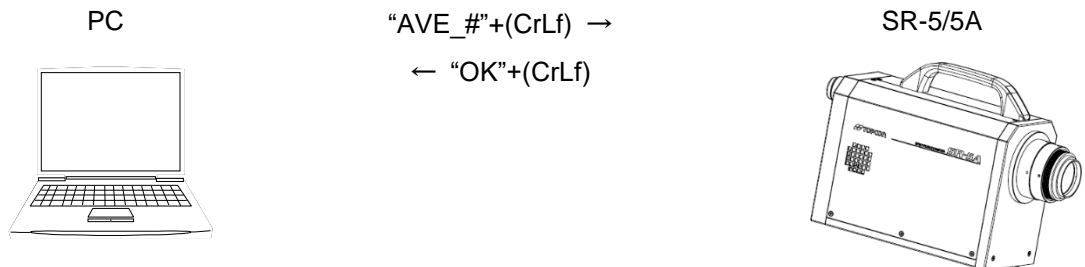
#### 4.1.47 AVE\_# Command

---

Sets the average measurement should be used or not

#: Validates/invalidates

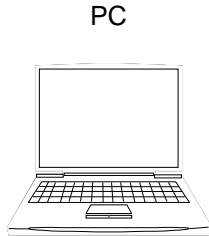
Setting range: 0: Invalidates 1: Validates



#### 4.1.48 AVER Command

---

Obtains the value for the average measurement  
Obtained value: 0: Invalidates 1: Validates



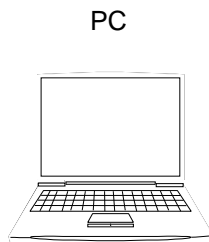
“AVER”+(CrLf) →  
← “OK”+(CrLf)  
← Validates/Invalidates+(CrLf)  
← ”END”+(CrLf)



#### 4.1.49 AVT\_# Command

---

Sets the averaging time for the averaging measurement.  
#: averaging time  
Setting range: 1 - 20



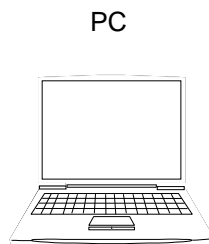
“AVT\_#”+(CrLf) →  
← “OK”+(CrLf)



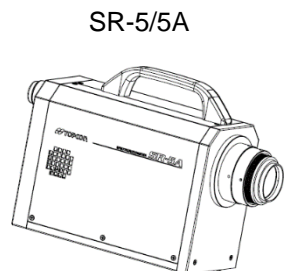
#### 4.1.50 AVTR Command

---

Obtains the averaging time for the averaging measurement.  
Obtained value: 1 - 20



“AVTR”+(CrLf) →  
← “OK”+(CrLf)  
← averaging time+(CrLf)  
← ”END”+(CrLf)



## 4.2 Output Format

### 4.2.1 Output Format of Remote Measurement

#### 4.2.1.1 ST Command

The measurement data output format for ST command is described below.

☞ “4.1.3 ST/STW Command”

| Line No. | Example of output | Data name                   |
|----------|-------------------|-----------------------------|
| 1        | 2                 | Observation measuring angle |
| 2        | 100               | Integral time               |
| 3        | 9.335E-01         | Radiance                    |
| 4        | 1.490E+02         | Luminance                   |
| 5        | 1.631E+02         | Tristimulus value X         |
| 6        | 1.490E+02         | Tristimulus value Y         |
| 7        | 5.374E+01         | Tristimulus value Z         |
| 8        | 0.4458            | Chromaticity x              |
| 9        | 0.4073            | Chromaticity y              |
| 10       | 0.2549            | Chromaticity u'             |
| 11       | 0.5241            | Chromaticity v'             |
| 12       | 2882              | Color temperature           |
| 13       | 0.0002            | Deviation                   |
| 14       | 380 2.141231E-04  | 380nm Spectral radiance     |
| 15       | 381 2.420037E-04  | 381nm Spectral radiance     |
| ↓        | ↓                 | ↓                           |
| 413      | 779 4.325765E-03  | 779nm Spectral radiance     |
| 414      | 780 4.294558E-03  | 780nm Spectral radiance     |
| 415      | 28.1099           | Internal temperature        |
| 416      | 46.6072           | Internal humidity           |
| 417      | 0.0000            | Acceleration X              |
| 418      | 0.0000            | Acceleration Y              |
| 419      | 9.8000            | Acceleration Z              |
| 420      | “END”             | Data terminal command       |

\* Measurement data are returned by text format (ASCII).

\* Only when the environment information output is valid, the data of No. 415 to No. 419 are returned.

\* When only the colorimetry calculation value is specified for the output format, the data of No. 1 to No. 13 and No. 420 are returned. When the environment information output is valid, the data of No. 1 to No. 13 and No. 415 to No. 420 are returned.

☞ “4.1.8 D[n] Command”

\* "AccelerationXYZ" indicates the device attitude. When the instrument is absolutely horizontal, acceleration X/Y is 0.0000 and Z is 9.8000.


#### 4.2.1.2 STW Command

The measurement data output format for STW command is described below.

 "4.1.3 ST/STW Command"

| Line No. | Example of output | Data name                   |
|----------|-------------------|-----------------------------|
| 1        | 2                 | Observation measuring angle |
| 2        | 100               | Integral time               |
| 3        | 9.335E-01         | Radiance                    |
| 4        | 1.490E+02         | Luminance                   |
| 5        | 1.631E+02         | Tristimulus value X         |
| 6        | 1.490E+02         | Tristimulus value Y         |
| 7        | 5.374E+01         | Tristimulus value Z         |
| 8        | 0.4458            | Chromaticity x              |
| 9        | 0.4073            | Chromaticity y              |
| 10       | 0.2549            | Chromaticity u'             |
| 11       | 0.5241            | Chromaticity v'             |
| 12       | 2882              | Color temperature           |
| 13       | 0.0002            | Deviation                   |
| 14       | 583.29            | Dominant wavelength         |
| 15       | 778               | Peak wavelength             |
| 16       | 380 2.141231E-04  | 380nm Spectral radiance     |
| 17       | 381 2.420037E-04  | 381nm Spectral radiance     |
| ↓        | ↓                 | ↓                           |
| 415      | 779 4.325765E-03  | 779nm Spectral radiance     |
| 416      | 780 4.294558E-03  | 780nm Spectral radiance     |
| 417      | 28.1099           | Internal temperature        |
| 418      | 46.6072           | Internal humidity           |
| 419      | 0.0000            | Acceleration X              |
| 420      | 0.0000            | Acceleration Y              |
| 421      | 9.8000            | Acceleration Z              |
| 422      | "END"             | Data terminal command       |

- \* Measurement data are returned by text format (ASCII).
- \* Only when the environment information output is valid, the data of No. 417 to No. 421 are returned.
- \* When only the colorimetry calculation value is specified for the output format, the data of No. 1 to No. 15 and No. 422 are returned. When the environment information output is valid, the data of No. 1 to No. 15 and No. 417 to No. 422 are returned.

 "4.1.8 D[n] Command"

- \* "AccelerationXYZ" indicates the device attitude. When the instrument is absolutely horizontal, acceleration X/Y is 0.0000 and Z is 9.8000.

### 4.2.1.3 SF Command

The measurement data output format for SF command is described below.

☞ “4.1.5 SF Command”

| Line No. | Example of output | Data name                   |
|----------|-------------------|-----------------------------|
| 1        | 100               | Integral time               |
| 2        | 2                 | Observation measuring angle |
| 3        | 100               | Integral time               |
| 4        | 9.335E-01         | Radiance                    |
| 5        | 1.490E+02         | Luminance                   |
| 6        | 1.631E+02         | Tristimulus value X         |
| 7        | 1.490E+02         | Tristimulus value Y         |
| 8        | 5.374E+01         | Tristimulus value Z         |
| 9        | 0.4458            | Chromaticity x              |
| 10       | 0.4073            | Chromaticity y              |
| 11       | 0.2549            | Chromaticity u'             |
| 12       | 0.5241            | Chromaticity v'             |
| 13       | 2882              | Color temperature           |
| 14       | 0.0002            | Deviation                   |
| 15       | 380 2.141231E-04  | 380nm Spectral radiance     |
| 16       | 381 2.420037E-04  | 381nm Spectral radiance     |
| ↓        | ↓                 | ↓                           |
| 414      | 779 4.325765E-03  | 779nm Spectral radiance     |
| 415      | 780 4.294558E-03  | 780nm Spectral radiance     |
| 416      | 28.1099           | Internal temperature        |
| 417      | 46.6072           | Internal humidity           |
| 418      | 0.0000            | Acceleration X              |
| 419      | 0.0000            | Acceleration Y              |
| 420      | 9.8000            | Acceleration Z              |
| 421      | “END”             | Data terminal command       |

- \* Measurement data are returned by text format (ASCII).
- \* Only when the environment information output is valid, the data of No. 416 to No. 420 are returned.
- \* When only the colorimetry calculation value is specified for the output format, the data of No. 1 to No. 14 and No. 421 are returned. When the environment information output is valid, the data of No. 1 to No. 14 and No. 416 to No. 421 are returned.

☞ “4.1.8 D[n] Command”

- \* "AccelerationXYZ" indicates the device attitude. When the instrument is absolutely horizontal, acceleration X/Y is 0.0000 and Z is 9.8000.
- \* After the data of one line are returned, measurement is performed. So the time for returning the data of two lines is changed according to the integral time.

#### 4.2.1.4 STB/STBW Command

The measurement data output format for STB/STBW command is described below.

☞ “4.1.4 STB/STBW Command”

##### Memo

- Only the colorimetry calculation value cannot be output. The spectral radiance is always output with other data.
- “(1) Header section” and “(4) Data section (when a measurement error occurs)” are common to STBW command.

#### (1) Header section

There is the information that is necessary to receive the data section.

| Start byte | Contents                  | Data type        | Size  | Element number |
|------------|---------------------------|------------------|-------|----------------|
| 1          | Size of data section      | Unsigned integer | 4     | 1              |
| 5          | Check sum of data section | Unsigned integer | 4     | 1              |
|            |                           | Data size        | 5byte |                |

\*Check sum of data section

Each data section is added by one byte from the first to the next in order and the lowest 1 byte of the total is extracted.

#### (2) STB command: Data section (when measurement is normally finished)

| Start byte | Contents            | Data type             | Size     | Element number | Remarks                                               |
|------------|---------------------|-----------------------|----------|----------------|-------------------------------------------------------|
| 1          | Measuring angle     | Unsigned integer      | 1        | 1              | 1 : 2°/2 : 1°/3 : 0.2°/4 : 0.1°                       |
| 2          | Integral time       | Floating point number | 4        | 1              |                                                       |
| 6          | Radiance            | Floating point number | 4        | 1              |                                                       |
| 10         | Luminance           | Floating point number | 4        | 1              |                                                       |
| 14         | Tristimulus value X | Floating point number | 4        | 1              |                                                       |
| 18         | Tristimulus value Y | Floating point number | 4        | 1              |                                                       |
| 22         | Tristimulus value Z | Floating point number | 4        | 1              |                                                       |
| 26         | Chromaticity x      | Floating point number | 4        | 1              |                                                       |
| 30         | Chromaticity y      | Floating point number | 4        | 1              |                                                       |
| 34         | Chromaticity u'     | Floating point number | 4        | 1              |                                                       |
| 38         | Chromaticity v'     | Floating point number | 4        | 1              |                                                       |
| 42         | Color temperature   | Floating point number | 4        | 1              | Fixed to -1 when it cannot be calculated.             |
| 46         | Deviation           | Floating point number | 4        | 1              | Fixed to -1 when it cannot be calculated.             |
| 50         | Wavelength position | Unsigned integer      | 2        | 1              | 380nm                                                 |
| 52         | Spectral radiance   | Floating point number | 4        | 1              | 380nm Spectral radiance                               |
| 56         | Wavelength position | Unsigned integer      | 2        | 1              | 381nm                                                 |
| 58         | Spectral radiance   | Floating point        | 4        | 1              | 381nm Spectral radiance                               |
| ↓          | ↓                   | ↓                     | ↓        | ↓              |                                                       |
| 2450       | Wavelength position | Unsigned integer      | 2        | 1              | 780nm                                                 |
| 2452       | Spectral radiance   | Floating point number | 4        | 1              | 780nm Spectral radiance                               |
| 2456       | Internal humidity   | Floating point number | 4        | 1              | Only when the environment information output is valid |
| 2460       | Internal humidity   | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2464       | Acceleration X      | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2468       | Acceleration Y      | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2472       | Acceleration Z      | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2476       | “END”+(CrLf)        | Character code        | 1        | 5              |                                                       |
|            |                     | Data size             | 2480byte |                | Environment information output is invalid: 2460 bytes |

\* Measurement data are returned by binary format.

\* When the environment information output is invalid, the data size is 2460 bytes.



\* "AccelerationXYZ" indicates the device attitude. When the instrument is absolutely horizontal, acceleration X/Y is 0.0000 and Z is 9.8000.

(3) STBW command: Data section (when measurement is normally finished)

| Start byte | Contents            | Data type             | Size     | Element number | Remarks                                               |
|------------|---------------------|-----------------------|----------|----------------|-------------------------------------------------------|
| 1          | Measuring angle     | Unsigned integer      | 1        | 1              | 1 : 2°/2 : 1°/3 : 0.2°/4 : 0.1°                       |
| 2          | Integral time       | Floating point number | 4        | 1              |                                                       |
| 6          | Radiance            | Floating point number | 4        | 1              |                                                       |
| 10         | Luminance           | Floating point number | 4        | 1              |                                                       |
| 14         | Tristimulus value X | Floating point number | 4        | 1              |                                                       |
| 18         | Tristimulus value Y | Floating point number | 4        | 1              |                                                       |
| 22         | Tristimulus value Z | Floating point number | 4        | 1              |                                                       |
| 26         | Chromaticity x      | Floating point number | 4        | 1              |                                                       |
| 30         | Chromaticity y      | Floating point number | 4        | 1              |                                                       |
| 34         | Chromaticity u'     | Floating point number | 4        | 1              |                                                       |
| 38         | Chromaticity v'     | Floating point number | 4        | 1              |                                                       |
| 42         | Color temperature   | Floating point number | 4        | 1              | Fixed to -1 when it cannot be calculated.             |
| 46         | Deviation           | Floating point number | 4        | 1              | Fixed to -1 when it cannot be calculated.             |
| 50         | Dominant wavelength | Floating point number | 4        | 1              |                                                       |
| 54         | Peak wavelength     | Floating point number | 4        | 1              |                                                       |
| 58         | Wavelength position | Unsigned integer      | 2        | 1              | 380nm                                                 |
| 62         | Spectral radiance   | Floating point number | 4        | 1              | 380nm Spectral radiance                               |
| 64         | Wavelength position | Unsigned integer      | 2        | 1              | 381nm                                                 |
| 66         | Spectral radiance   | Floating point number | 4        | 1              | 381nm Spectral radiance                               |
| ↓          | ↓                   | ↓                     | ↓        | ↓              |                                                       |
| 2458       | Wavelength position | Unsigned integer      | 2        | 1              | 780nm                                                 |
| 2460       | Spectral radiance   | Floating point number | 4        | 1              | 780nm Spectral radiance                               |
| 2464       | Internal humidity   | Floating point number | 4        | 1              | Only when the environment information output is valid |
| 2468       | Internal humidity   | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2472       | Acceleration X      | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2476       | Acceleration Y      | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2480       | Acceleration Z      | Floating point        | 4        | 1              | Only when the environment information output is valid |
| 2484       | "END"+(CrLf)        | Character code        | 1        | 5              |                                                       |
|            |                     | Data size             | 2488byte |                | Environment information output is invalid: 2468 bytes |

\* Measurement data are returned by binary format.

\* When the environment information output is invalid, the data size is 2468 bytes.

\* "AccelerationXYZ" indicates the device attitude. When the instrument is absolutely horizontal, acceleration X/Y is 0.0000 and Z is 9.8000.

(4) Data section (when a measurement error occurs)

| Start byte | Contents     | Data type      | Size | Element number |
|------------|--------------|----------------|------|----------------|
| 1          | Error code   | Character code | 1    | 4              |
| 5          | "END"+(CrLf) | Character code | 1    | 5              |
|            |              | Data size      | 9    |                |

☞ "5.2 Error Code in Communication"

#### 4.2.1.5 STCT Command

The measurement data output format for STCT command is described below.

☞ “4.1.6 STCT Command”

| Data type | Output data                                                                         | Remarks                                                                                                    |
|-----------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 1         | 1.490E+02,0.4458,0.4073+(CrLf)<br>“END”+(CrLf)                                      | Luminance, chromaticity x, chromaticity y<br>Data terminal command                                         |
| 2         | 1.490E+02,0.2549,0.5240+(CrLf)<br>“END”+(CrLf)                                      | Luminance, chromaticity u', chromaticity v'<br>Data terminal command                                       |
| 3         | 1.631E+02,1.490E+02,5.374E+01+(CrLf)<br>“END”+(CrLf)                                | Tristimulus values X, Y, Z<br>Data terminal command                                                        |
| 4         | 1.631E+02,1.490E+02,5.374E+01,<br>0.4458,0.4073+(CrLf)<br>“END”+(CrLf)              | Tristimulus values X, Y, Z<br>Chromaticity x, chromaticity y<br>Data terminal command                      |
| 5         | 1.631E+02,1.490E+02,5.374E+01,<br>0.2549,0.5240+(CrLf)<br>“END”+(CrLf)              | Tristimulus values X, Y, Z<br>Chromaticity u', chromaticity v'<br>Data terminal command                    |
| 6         | 2882,0.0002+(CrLf)<br>“END”+(CrLf)                                                  | Color temperature, deviation<br>Data terminal command                                                      |
| 7         | 4.718E+01,0.3655,0.3867,<br>564.82, 558+(CrLf)<br>“END”+(CrLf)                      | Luminance, chromaticity x, chromaticity y<br>Dominant wavelength, peak wavelength<br>Data terminal command |
| 8         | 2.141231E-04,2.420037E-04·····,<br>4.325765E-03,4.294558E-03+(CrLf)<br>“END”+(CrLf) | Spectral radiance (380nm – 780nm)<br>Data terminal command                                                 |
| 9         | 554, 2.141231E-03<br>“END”+(CrLf)                                                   | Peak wavelength, maximum spectral radiance<br>Data terminal command                                        |

\* When only the colorimetry calculation value is specified for the output format at “Data type 8, 9”, only the data terminal command “END” is returned.

☞ “4.1.8 D[n] Command”

## 4.2.2 Internal Stored Data Output Format

The commands described below are used to obtain the measurement data stored in the instrument.

### 4.2.2.1 DR[n] Command

The measurement data output format for DR[n] command is described below.

 "4.1.14 DR[n] Command"

| Line No. | Example of output | Data name                   |
|----------|-------------------|-----------------------------|
| 1        | 15                | Measurement number          |
| 2        | 2                 | Observation measuring angle |
| 3        | 100               | Integral time               |
| 4        | 9.335E-01         | Radiance                    |
| 5        | 1.490E+02         | Luminance                   |
| 6        | 1.631E+02         | Tristimulus value X         |
| 7        | 1.490E+02         | Tristimulus value Y         |
| 8        | 5.374E+01         | Tristimulus value Z         |
| 9        | 0.4458            | Chromaticity x              |
| 10       | 0.4073            | Chromaticity y              |
| 11       | 0.2549            | Chromaticity u'             |
| 12       | 0.5241            | Chromaticity v'             |
| 13       | 2882              | Color temperature           |
| 14       | 0.0002            | Deviation                   |
| 15       | 380 2.141231E-04  | 380nm Spectral radiance     |
| 16       | 381 2.420037E-04  | 381nm Spectral radiance     |
| ↓        | ↓                 | ↓                           |
| 414      | 779 4.325765E-03  | 779nm Spectral radiance     |
| 415      | 780 4.294558E-03  | 780nm Spectral radiance     |
| 416      | 28.1099           | Internal temperature        |
| 417      | 46.6072           | Internal humidity           |
| 418      | 0.0000            | Acceleration X              |
| 419      | 0.0000            | Acceleration Y              |
| 420      | 9.8000            | Acceleration Z              |
| 421      | "END"             | Data terminal command       |

- \* Only when the environment information output is valid, the data of No. 416 to No. 420 are returned.
- \* When only the colorimetry calculation value is specified for the output format, the data of No. 1 to No. 14 and No. 421 are returned. When the environment information output is valid, the data of No. 1 to No. 14 and No. 416 to No. 421 are returned.

 "4.1.8 D[n] Command"

#### 4.2.2.2 DRW[n] Command

The measurement data output format for DRW[n] command is described below.

☞ “4.1.15 DRW[n] Command”

| Line No. | Example of output | Data name                   |
|----------|-------------------|-----------------------------|
| 1        | 15                | Measurement number          |
| 2        | 2                 | Observation measuring angle |
| 3        | 100               | Integral time               |
| 4        | 9.335E-01         | Radiance                    |
| 5        | 1.490E+02         | Luminance                   |
| 6        | 1.631E+02         | Tristimulus value X         |
| 7        | 1.490E+02         | Tristimulus value Y         |
| 8        | 5.374E+01         | Tristimulus value Z         |
| 9        | 0.4458            | Chromaticity x              |
| 10       | 0.4073            | Chromaticity y              |
| 11       | 0.2549            | Chromaticity u'             |
| 12       | 0.5241            | Chromaticity v'             |
| 13       | 2882              | Color temperature           |
| 14       | 0.0002            | Deviation                   |
| 15       | 583.29            | Dominant wavelength         |
| 16       | 778               | Peak wavelength             |
| 17       | 380 2.141231E-04  | 380nm Spectral radiance     |
| 18       | 381 2.420037E-04  | 381nm Spectral radiance     |
| ↓        | ↓                 | ↓                           |
| 416      | 779 4.325765E-03  | 779nm Spectral radiance     |
| 417      | 780 4.294558E-03  | 780nm Spectral radiance     |
| 418      | 28.1099           | Internal temperature        |
| 419      | 46.6072           | Internal humidity           |
| 420      | 0.0000            | Acceleration X              |
| 421      | 0.0000            | Acceleration Y              |
| 422      | 9.8000            | Acceleration Z              |
| 423      | “END”             | Data terminal command       |

- \* Only when the environment information output is valid, the data of No. 418 to No. 422 are returned.
- \* When only the colorimetry calculation value is specified for the output format, the data of No. 1 to No. 16 and No. 423 are returned. When the environment information output is valid, the data of No. 1 to No. 16 and No. 418 to No. 423 are returned.

☞ “4.1.8 D[n] Command”

## 4.3 Installing USB Driver

---

The procedures to install USB driver are described below.

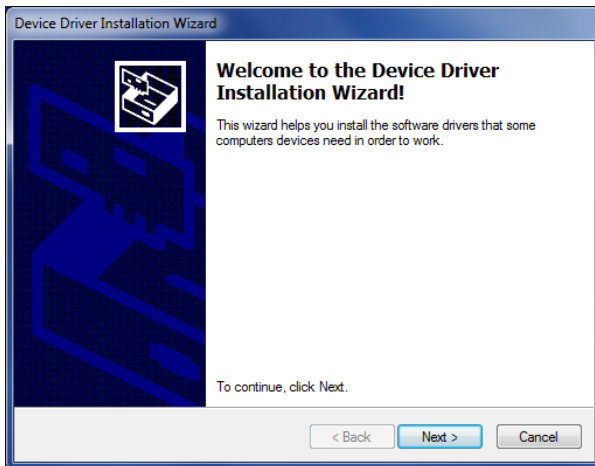
|               |                               |
|---------------|-------------------------------|
| Applicable OS | Windows® 10 Pro (32bit/64bit) |
|---------------|-------------------------------|

- 1 Set the CD-ROM “Colorimetry program CS-900A”, which is the accessory of the instrument, into the CD-ROM drive.
- 2 Open the CD-ROM drive from Explorer. Double-click the “dpinst.exe” file in the “[OS name]-[x64] or [x86]” folder within the [USB\_DRIVER] folder.

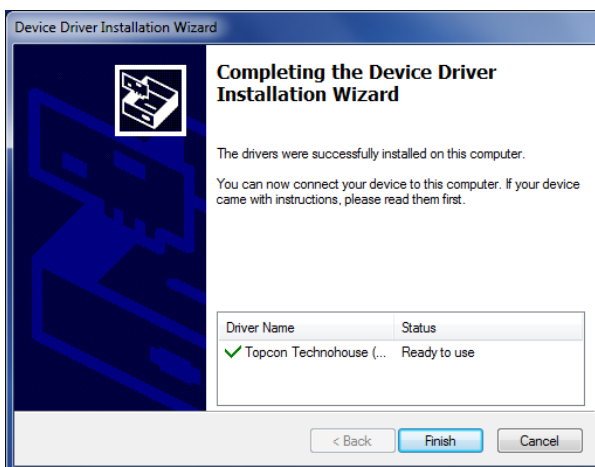
Example: When you use Windows10 (64 bits), double-click the following folder.

*USB\_DRIVER ¥Windows10¥x64*

- 3 The user account control dialog box is displayed. Click the [Yes] button.
- 4 The install wizard dialog box of Device Driver is displayed. Click the [Next] button.








- 5 When the driver installation is completed, the following screen appears. Click the [Finish] button.



# 5. Error Display

## 5.1 Error Display of Instrument

| Error display                                                                       | Contents                                                                             | Remedial measure                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | The instrument exceeds the measurable range. Press any of the buttons.               | Take the following remedial measures or others. <ul style="list-style-type: none"> <li>- Lower the brightness of the measurement target.</li> <li>- Select a smaller measuring angle.</li> <li>- Insert a neutral density filter.</li> </ul> |
|   | The measuring angle is set to be unmeasurable. Press any of the buttons.             | Set the measuring angle to 2.0° or 1.0°. Or set the Filter setting of Fix Integ, Fix Freq to Open or Filter1.                                                                                                                                |
|  | The external synchronizing signal capturing error occurs. Press any of the switches. | Check the synchronizing signal generating device and the connection of BNC cable.                                                                                                                                                            |
|  | 005 – 007<br>Communication error occurs.                                             | Check whether the communication conditions of the external communication device meet those of the instrument.<br>Check whether the data communication method is correct.                                                                     |
|  | The integral time is set to be unmeasurable. Press any of the buttons.               | Set the measuring speed to Normal Speed. Or set the integral time to less than 30000ms (SR-5) or less than 60000ms (SR-5A).                                                                                                                  |

| Error display                                            | Contents                                                                                                       | Remedial measure                                                                                                                                                     |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre> ERR = 811  Initialize FIELD </pre>                 | <p>The action of the measuring angle is not normal.</p>                                                        | <p>There is a problem in the measuring angle motor or the position check sensor. Contact our company or the retailer shop where you purchased the instrument.</p>    |
| <pre> ERR = 812  Initialize SHUTTER </pre>               | <p>The action of the filter is not normal.</p>                                                                 | <p>There is a problem in the filter motor or the position check sensor. Contact our company or the retailer shop where you purchased the instrument.</p>             |
| <pre> *** ERROR ***  ERR = 813  Initialize FINDER </pre> | <p>The action of the viewfinder shutter is not normal.</p>                                                     | <p>There is a problem in the viewfinder shutter motor or the position check sensor. Contact our company or the retailer shop where you purchased the instrument.</p> |
| <pre> *** ERROR ***  ERR = 915  TEMP COLD </pre>         | <p>The temperature inside the instrument is not normal. Turn OFF the power.</p>                                | <p>Turn OFF the power and leave the instrument as it is under the use condition (SR-5A: 5 - 30°C) for about 30 minutes. Then, turn on the power.</p>                 |
| <pre> *** ERROR ***  ERR = 916  CCD SENSE ERROR </pre>   | <p>Because the photo detector temperature is not normal, the protective circuit works. Turn OFF the power.</p> | <p>Turn OFF the power and leave the instrument as it is under the use condition (SR-5A: 5 - 30°C) for about 30 minutes. Then, turn on the power.</p>                 |
| <pre> *** ERROR ***  ERR = 999  OTHER </pre>             | <p>9** - 999<br/>There is a problem in the system. Press any of the switches.</p>                              | <p>Contact our company or the retailer shop you purchased the instrument.</p>                                                                                        |

- When the error is still displayed after you have taken the above-mentioned remedial measure, repair may be necessary. Contact our company or the retailer shop where you purchased the instrument.

## 5.2 Error Code in Communication

---

When errors occur in the instrument, which is measuring a target in combination with PC, the instrument sends the error codes mentioned in the table below to PC.

| Error code    | Contents                                                                                                                                                                                                                                                                                                                                                                 |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E001          | <p>OVER-RANGE</p> <p>When the brightness of the measurement target exceeds the instrument's measurable range, this code is returned. Take the following measures or others.</p> <ul style="list-style-type: none"><li>- Lower the brightness of the measurement target.</li><li>- Select a smaller measuring angle.</li><li>- Insert a neutral density filter.</li></ul> |
| E002          | <p>The [Cancel] button is pressed on the instrument during remote measurement or the measurement cancel command is received. So the measurement is stopped.</p>                                                                                                                                                                                                          |
| E004          | <p>The external synchronizing signal is not captured normally in the instrument. Check the synchronizing signal generating device and the connection of BNC cable.</p>                                                                                                                                                                                                   |
| E915          | <p>The temperature inside the instrument is not normal. Leave the instrument as it is under the use condition (SR-5A: 5 - 30°C) for about 30 minutes. Then, turn ON the power.</p>                                                                                                                                                                                       |
| E9 * * – E999 | <p>A system error occurs in the instrument, Contact our company or the retailer shop where you purchased the instrument.</p>                                                                                                                                                                                                                                             |



# 6. Appendices

## Specifications and Performance

### ■ SR-5 Specifications and Performance

#### Optical system

|                |                          |               |
|----------------|--------------------------|---------------|
| Objective lens | Focal length             | f = 82mm F2.5 |
| Eyepiece lens  | Viewfinder visual field  | 5°            |
|                | Diopter adjustment range | ±5diop        |

#### Spectroscope

|                      |                     |
|----------------------|---------------------|
| Spectral band width  | 5nm                 |
| Spectroscopic method | Polychromator       |
| Dispersion element   | Diffraction grating |

Photo detector      Electronic cooling linear array sensor

Measuring angle      2°/1°/0.2°/0.1° Electric changing type

Measuring distance      250nm - ∞ (Distance from the objective lens hardware tip)

Wavelength range      380nm - 780nm

Wavelength resolution      1nm

Measurement mode      Auto / Manu / Freq / Sync / FixInteg / FixFreq

Measuring diameter (mm φ)

| Measuring angle | Measuring distance (mm) |      |      |      |      |      |      |      |      |
|-----------------|-------------------------|------|------|------|------|------|------|------|------|
|                 | 250                     | 350  | 400  | 500  | 600  | 800  | 1000 | 2000 | 5000 |
| 2°              | 6.5                     | 10.0 | 11.7 | 15.1 | 18.6 | 25.4 | 32.2 | 66.4 | 169  |
| 1°              | 3.25                    | 4.99 | 5.84 | 7.55 | 9.26 | 12.7 | 16.1 | 33.2 | 84.4 |
| 0.2°            | 0.65                    | 1.0  | 1.17 | 1.51 | 1.86 | 2.54 | 3.22 | 6.64 | 16.9 |
| 0.1°            | 0.33                    | 0.5  | 0.59 | 0.76 | 0.93 | 1.27 | 1.61 | 3.32 | 8.44 |

\* The measuring distance is the distance from the objective lens hardware tip.

\* The values in the above table are design standard values and are different from the real diameters from time to time.

#### Measuring function

The following data can be displayed.

|          |                                 |
|----------|---------------------------------|
| Lv       | Luminance (cd/m <sup>2</sup> )  |
| xy, u'v' | Chromaticity                    |
| X, Y, Z  | Tristimulus values              |
| Le       | Radiance (W/sr·m <sup>2</sup> ) |
| Tc       | Color temperature (K)           |
| duv      | Deviation                       |
| Wd       | Dominant wavelength (nm)        |
| Wp       | Peak wavelength (nm)            |

\*The display accuracy is the accuracy when shipped.

Measurement mode: Auto Maximum integral time is set to the upper limit value.

|                                                  |                    | Measuring angle | Measuring speed                                                           |                                                                                                                      |  |
|--------------------------------------------------|--------------------|-----------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--|
|                                                  |                    |                 | Normal Speed Mode                                                         | High Speed Mode                                                                                                      |  |
| Measuring luminance range<br>(Standard light: A) |                    | 2°              | 0.001 – 15,000 cd/m <sup>2</sup>                                          |                                                                                                                      |  |
|                                                  |                    | 1°              | 0.003 – 45,000 cd/m <sup>2</sup>                                          |                                                                                                                      |  |
|                                                  |                    | 0.2°            | 0.075 – 125,000 cd/m <sup>2</sup>                                         |                                                                                                                      |  |
|                                                  |                    | 0.1°            | 0.3 – 500,000 cd/m <sup>2</sup>                                           |                                                                                                                      |  |
| Accuracy                                         | Wavelength         | —               | ±0.3nm (against the special bright line of mercury)                       |                                                                                                                      |  |
|                                                  | Luminance<br>*1    | 2°              | ±2%                                                                       | ±3% (0.001 – 0.5 cd/m <sup>2</sup> )<br>±2% (0.5 cd/m <sup>2</sup> – )                                               |  |
|                                                  |                    | 1°              |                                                                           | ±3% (0.003 – 1.5 cd/m <sup>2</sup> )<br>±2% (1.5 cd/m <sup>2</sup> – )                                               |  |
|                                                  |                    | 0.2°            |                                                                           | ±3% (0.075– 40 cd/m <sup>2</sup> )<br>±2% (40 cd/m <sup>2</sup> – )                                                  |  |
|                                                  |                    | 0.1°            |                                                                           | ±3% (0.3 – 150 cd/m <sup>2</sup> )<br>±2% (150 cd/m <sup>2</sup> – )                                                 |  |
|                                                  | Chromaticity<br>*1 | 2°              | xy ±0.002                                                                 | xy ±0.003<br>(0.001 – 0.5 cd/m <sup>2</sup> )<br>xy ±0.002<br>(0.5 cd/m <sup>2</sup> – )                             |  |
|                                                  |                    | 1°              |                                                                           | xy ±0.003<br>(0.003 – 1.5 cd/m <sup>2</sup> )<br>xy ±0.002<br>(1.5 cd/m <sup>2</sup> – )                             |  |
|                                                  |                    | 0.2°            |                                                                           | xy ±0.003<br>(0.075 – 40 cd/m <sup>2</sup> )<br>xy ±0.002<br>(40 cd/m <sup>2</sup> – )                               |  |
|                                                  |                    | 0.1°            |                                                                           | xy ±0.003<br>(0.5 – 150 cd/m <sup>2</sup> )<br>xy ±0.002<br>(150 cd/m <sup>2</sup> – )                               |  |
|                                                  | Repeat accuracy    | Luminance<br>*2 | 2°                                                                        | 1.5%(0.001 – 0.1 cd/m <sup>2</sup> )<br>0.3% (0.1 cd/m <sup>2</sup> – )                                              |  |
|                                                  |                    |                 | 1°                                                                        | 1.5%(0.003 – 0.3 cd/m <sup>2</sup> )<br>0.3% (0.3 cd/m <sup>2</sup> – )                                              |  |
|                                                  |                    |                 | 0.2°                                                                      | 1.5%(0.075 – 7.5 cd/m <sup>2</sup> )<br>0.3% (7.5 cd/m <sup>2</sup> – )                                              |  |
| 0.1°                                             |                    |                 | 1.5%(0.3 – 30 cd/m <sup>2</sup> )<br>0.3% (30 cd/m <sup>2</sup> – )       |                                                                                                                      |  |
| Chromaticity<br>*3                               |                    | 2°              | 0.005(0.001 – 0.1 cd/m <sup>2</sup> )<br>0.0005(0.1 cd/m <sup>2</sup> – ) | 0.005 (0.001 – 0.1 cd/m <sup>2</sup> )<br>0.0008 (0.1 – 0.5 cd/m <sup>2</sup> )<br>0.0005 (0.5 cd/m <sup>2</sup> – ) |  |
|                                                  |                    | 1°              | 0.005(0.003 – 0.3 cd/m <sup>2</sup> )<br>0.0005(0.3 cd/m <sup>2</sup> – ) | 0.005 (0.003 – 0.3 cd/m <sup>2</sup> )<br>0.0008 (0.3 – 1.5 cd/m <sup>2</sup> )<br>0.0005 (1.5 cd/m <sup>2</sup> – ) |  |
|                                                  |                    | 0.2°            | 0.005(0.075 – 7.5 cd/m <sup>2</sup> )<br>0.0005(7.5 cd/m <sup>2</sup> – ) | 0.005 (0.075 – 7.5 cd/m <sup>2</sup> )<br>0.0008 (7.5 – 40 cd/m <sup>2</sup> )<br>0.0005 (40 cd/m <sup>2</sup> – )   |  |
|                                                  |                    | 0.1°            | 0.005(0.3 – 30 cd/m <sup>2</sup> )<br>0.0005(30 cd/m <sup>2</sup> – )     | 0.005 (0.3 – 30 cd/m <sup>2</sup> )<br>0.0008 (30 – 150 cd/m <sup>2</sup> )<br>0.0005 (150 cd/m <sup>2</sup> – )     |  |

\*1: Color matching function type for CIE1931 against standard light "A":

The high luminance side is designed for standard light A up to 1000cd/m<sup>2</sup> , and beyond that, based on the linearity of the photo detector.

\*2: When measurement is done ten times continuously:

Two values of standard deviation/Average value

\*3: When measurement is done ten times continuously:

Maximum value – Minimum value

Measuring time (Example)

| Interface                          | Measuring time (second) |
|------------------------------------|-------------------------|
| Spectral radiance mode             |                         |
| USB (STB command)                  | 0.7                     |
| USB (ST command)                   | 1.2                     |
| RS-232C                            | 1.4                     |
| Colorimetry calculation value mode |                         |
| USB                                | 0.5                     |
| RS-232C                            | 0.5                     |

Measurement conditions

- (1) Integral time            20ms
- (2) Filter setting            Open
- (3) Measurement mode      FixInteg
- (4) Measuring speed        HighSpeed
- (5) RS-232C parameters    115200bps\_7bit\_ODD\_1bit

\* Measuring time is changed due to the PC operating environment or others.

|                              |                                                                                                                                                                                                                                        |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature characteristics  | ±3% against the luminance value<br>(Within 0°C - 35°C, the luminance of 20°C should be standard.)                                                                                                                                      |
| Polarization characteristics | Luminance: 1% or less, Spectral radiance: 2% or less (400nm – 780nm)                                                                                                                                                                   |
| Calibration standard         | TOPCON TECHNOHOUSE calibration standard<br>(Standard light "A", Temperature: 23°C±3°C, Humidity: 50%R.H ± 15%R.H)                                                                                                                      |
| Display                      | Touch panel LC (liquid crystal) display (LC size 4.3 type)                                                                                                                                                                             |
| Interface                    | USB3.0, RS-232C<br>RS-232C parameters<br>Communication speed: 4800 / 9600 / 19200 / 38400 / 57600 / 115200<br>Data length: 7bit / 8bit<br>Parity:        ODD (Odd number)/EVEN (Even number)/NONE (None)<br>Stop bit:      1bit / 2bit |
| Power supply                 | Exclusive AC adapter (standard accessory)                                                                                                                                                                                              |
| Power consumption            | Approx. 30W                                                                                                                                                                                                                            |
| Operating conditions         | Temperature: 0°C - 35°C<br>Humidity: 80%RH or less (without dew condensation)                                                                                                                                                          |
| Storage condition            | Temperature: -10°C - 50°C<br>Humidity: 80%RH or less                                                                                                                                                                                   |
| External dimensions          | Approx. 422mm (Length) × 130mm (Width) × 244mm (Height)                                                                                                                                                                                |
| Weight                       | Approx. 5.5kg (Only the instrument body)                                                                                                                                                                                               |

**FCC Compliance Information**

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

- (1) the device may not cause interference, and
- (2) the device must accept any interference, including interference that may cause undesired operation of this device.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

|                   |            |                                                                                                                                                                         |
|-------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Republic of Korea | KC:Class A | <p>해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다</p> <p>A급 기기 (업무용 방송통신기자재)</p> <p>이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다</p> |
|-------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**⚠ WARNING:**  
 This product can expose you to chemicals including Lead, which is known to the State of California to cause birth defects or other reproductive harm.  
 For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

(产品中有毒有害物质或元素的名称及含量)

| 部件名称  | 有毒有害物质或元素 |        |        |               |            |              |
|-------|-----------|--------|--------|---------------|------------|--------------|
|       | 铅 (Pb)    | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr (VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 表示部   | ×         | ○      | ×      | ○             | ○          | ○            |
| 电源部   | ×         | ○      | ×      | ○             | ○          | ○            |
| 机构部、箱 | ×         | ○      | ×      | ○             | ○          | ○            |
| 受光元件部 | ×         | ○      | ×      | ○             | ○          | ○            |
| 控制部   | ×         | ○      | ×      | ○             | ○          | ○            |

○: 表示该有毒有害物质在该部件所有均质材料中的含量均在电子信息产品中有毒有害物质的限量要求标准规定的限量要求 (GB/T 26572) 以下  
 ×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出电子信息产品中有毒有害物质的限量要求标准规定的限量要求 (GB/T 26572)  
 This information is applicable for People's Republic of China only.

**10** 环保使用期限标识是根据《电器电子产品有害物质限制使用管理办法》以及《电器电子产品有害物质限制使用标识要求》(SJ/T11364) 制定的, 适用于中国境内销售的电子信息产品的标识。只要按照安全及使用说明内容在正常使用电子信息产品情况下, 从生产日期算起, 在此期限内产品中含有的有毒有害物质不致发生外泄或突变, 不致对环境造成严重污染或对其人身、财产造成严重损害。产品正常使用后, 要废弃在环保使用年限内或者刚到年限的产品, 请根据国家标准采取适当的方法进行处置。另外, 此期限不同于质量/功能的保证期限。  
 The Mark and Information are applicable for People's Republic of China only.

## ■ SR-5A Specifications and Performance

### Optical system

|                |                          |               |
|----------------|--------------------------|---------------|
| Objective lens | Focal length             | f = 82mm F2.5 |
| Eyepiece lens  | Viewfinder visual field  | 5°            |
|                | Diopter adjustment range | ±5diop        |

### Spectroscope

|                       |                                                           |
|-----------------------|-----------------------------------------------------------|
| Spectral band width   | 5nm                                                       |
| Spectroscopic method  | Polychromator                                             |
| Dispersion element    | Diffraction grating                                       |
| Photo detector        | Electronic cooling linear array sensor                    |
| Measuring angle       | 2°/1°/0.2°/0.1° Electrical changing type                  |
| Measuring distance    | 250nm - ∞ (Distance from the objective lens hardware tip) |
| Wavelength range      | 380nm - 780nm                                             |
| Wavelength resolution | 1nm                                                       |
| Measurement mode      | Auto / Manu / Freq / Sync / FixInteg / FixFreq            |

### Measuring diameter

(mm  $\phi$ )

| Measuring angle | Measuring distance (mm) |      |      |      |      |      |      |      |      |
|-----------------|-------------------------|------|------|------|------|------|------|------|------|
|                 | 250                     | 350  | 400  | 500  | 600  | 800  | 1000 | 2000 | 5000 |
| 2°              | 6.5                     | 10.0 | 11.7 | 15.1 | 18.6 | 25.4 | 32.2 | 66.4 | 169  |
| 1°              | 3.25                    | 4.99 | 5.84 | 7.55 | 9.26 | 12.7 | 16.1 | 33.2 | 84.4 |
| 0.2°            | 0.65                    | 1.0  | 1.17 | 1.51 | 1.86 | 2.54 | 3.22 | 6.64 | 16.9 |
| 0.1°            | 0.33                    | 0.5  | 0.59 | 0.76 | 0.93 | 1.27 | 1.61 | 3.32 | 8.44 |

\* The measuring distance is the distance from the objective lens hardware tip.

\* The values in the above table are design standard values and are different from the real diameters from time to time.

### Measuring function

The following data can be displayed.

|          |                                 |
|----------|---------------------------------|
| Lv       | Luminance (cd/m <sup>2</sup> )  |
| xy, u'v' | Chromaticity                    |
| X, Y, Z  | Tristimulus values              |
| Le       | Radiance (W/sr·m <sup>2</sup> ) |
| Tc       | Color temperature (K)           |
| duv      | Deviation                       |
| Wd       | Dominant wavelength (nm)        |
| Wp       | Peak wavelength (nm)            |

\* The display accuracy is the accuracy when shipped.

Measurement mode: Auto Maximum integral time is set to the upper limit (excluding \*4).

|                                                  |                                                                                                          | Measuring angle                                  | Measuring speed                                                                                                           |                                                                                                                           |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|                                                  |                                                                                                          |                                                  | Normal Speed Mode                                                                                                         | High Speed Mode                                                                                                           |
| Measuring luminance range<br>(Standard light: A) |                                                                                                          | 2°                                               | 0.0005 – 1,500,000 cd/m <sup>2</sup>                                                                                      |                                                                                                                           |
|                                                  |                                                                                                          | 1°                                               | 0.0005 – 4,500,000 cd/m <sup>2</sup>                                                                                      |                                                                                                                           |
|                                                  |                                                                                                          | 0.2°                                             | 0.0125 – 100,000,000 cd/m <sup>2</sup>                                                                                    |                                                                                                                           |
|                                                  |                                                                                                          | 0.1°                                             | 0.05 – 500,000,000 cd/m <sup>2</sup>                                                                                      |                                                                                                                           |
| Accuracy                                         | Wavelength                                                                                               | —                                                | ±0.3nm (against the special bright line of mercury)                                                                       |                                                                                                                           |
|                                                  | Luminance<br>*1                                                                                          | 2°                                               | ±2%                                                                                                                       | ±2%                                                                                                                       |
|                                                  |                                                                                                          | 1°                                               |                                                                                                                           | ±3%                                                                                                                       |
|                                                  |                                                                                                          | ※4                                               |                                                                                                                           | (1° 0.0005 – 0.0015 cd/m <sup>2</sup> )                                                                                   |
|                                                  |                                                                                                          | ※4                                               |                                                                                                                           | (0.2° 0.0125 – 0.0375 cd/m <sup>2</sup> )                                                                                 |
|                                                  | ※4                                                                                                       | (0.1° 0.05 – 0.15 cd/m <sup>2</sup> )            |                                                                                                                           |                                                                                                                           |
|                                                  | Chromaticity<br>*1                                                                                       | 2°                                               | x ±0.0015<br>y ±0.0010                                                                                                    | xy ±0.003<br>(0.0005 – 0.005 cd/m <sup>2</sup> )                                                                          |
|                                                  |                                                                                                          | 1°                                               |                                                                                                                           | xy ±0.002<br>(0.005 cd/m <sup>2</sup> – )                                                                                 |
|                                                  |                                                                                                          | ※4                                               |                                                                                                                           | xy ±0.003<br>(0.0015 – 0.015 cd/m <sup>2</sup> )                                                                          |
|                                                  |                                                                                                          | ※4                                               |                                                                                                                           | xy ±0.002<br>(0.015 cd/m <sup>2</sup> – )                                                                                 |
| ※4                                               | (1° 0.0015cd/m <sup>2</sup> – )<br>(0.2° 0.0375cd/m <sup>2</sup> – )<br>(0.1° 0.15 cd/m <sup>2</sup> – ) | xy ±0.003<br>(0.0375 – 0.375 cd/m <sup>2</sup> ) |                                                                                                                           |                                                                                                                           |
| ※4                                               | (0.1° 0.15 cd/m <sup>2</sup> – )                                                                         | xy ±0.002<br>(0.375 cd/m <sup>2</sup> – )        |                                                                                                                           |                                                                                                                           |
| ※4                                               | (0.15 – 1.5 cd/m <sup>2</sup> )                                                                          | xy ±0.003<br>(0.15 – 1.5 cd/m <sup>2</sup> )     |                                                                                                                           |                                                                                                                           |
| ※4                                               | (1.5 cd/m <sup>2</sup> – )                                                                               | xy ±0.002<br>(1.5 cd/m <sup>2</sup> – )          |                                                                                                                           |                                                                                                                           |
| Repeat accuracy                                  | Luminance<br>*2                                                                                          | 2°                                               | 1.5% (0.0005 – 0.005 cd/m <sup>2</sup> )<br>0.4% (0.005 – 0.1 cd/m <sup>2</sup> )<br>0.3% (0.1 cd/m <sup>2</sup> – )      | 1.5% (0.0005 – 0.005 cd/m <sup>2</sup> )<br>0.4% (0.005 – 0.1 cd/m <sup>2</sup> )<br>0.3% (0.1 cd/m <sup>2</sup> – )      |
|                                                  |                                                                                                          | 1°                                               | 1.5% (0.0005 – 0.015 cd/m <sup>2</sup> )<br>0.4% (0.015 – 0.3 cd/m <sup>2</sup> )<br>0.3% (0.3 cd/m <sup>2</sup> – )      | 1.5% (0.0005 – 0.015 cd/m <sup>2</sup> )<br>0.4% (0.015 – 0.3 cd/m <sup>2</sup> )<br>0.3% (0.3 cd/m <sup>2</sup> – )      |
|                                                  |                                                                                                          | ※4                                               | 1.5% (0.0125 – 0.4 cd/m <sup>2</sup> )<br>0.4% (0.4 – 7.5 cd/m <sup>2</sup> )<br>0.3% (7.5 cd/m <sup>2</sup> – )          | 1.5% (0.0125 – 0.4 cd/m <sup>2</sup> )<br>0.4% (0.4 – 7.5 cd/m <sup>2</sup> )<br>0.3% (7.5 cd/m <sup>2</sup> – )          |
|                                                  |                                                                                                          | ※4                                               | 1.5% (0.05 – 1.5 cd/m <sup>2</sup> )<br>0.4% (1.5 – 30 cd/m <sup>2</sup> )<br>0.3% (30 cd/m <sup>2</sup> – )              | 1.5% (0.05 – 1.5 cd/m <sup>2</sup> )<br>0.4% (1.5 – 30 cd/m <sup>2</sup> )<br>0.3% (30 cd/m <sup>2</sup> – )              |
|                                                  | Chromaticity<br>*3                                                                                       | 2°                                               | 0.005 (0.0005 – 0.005 cd/m <sup>2</sup> )<br>0.0015 (0.005 – 0.1 cd/m <sup>2</sup> )<br>0.0005 (0.1 cd/m <sup>2</sup> – ) | 0.005 (0.0005 – 0.005 cd/m <sup>2</sup> )<br>0.0015 (0.005 – 0.1 cd/m <sup>2</sup> )<br>0.0005 (0.1 cd/m <sup>2</sup> – ) |
|                                                  |                                                                                                          | 1°                                               | 0.005 (0.0015 – 0.015 cd/m <sup>2</sup> )<br>0.0015 (0.015 – 0.3 cd/m <sup>2</sup> )<br>0.0005 (0.3 cd/m <sup>2</sup> – ) | 0.005 (0.0015 – 0.015 cd/m <sup>2</sup> )<br>0.0015 (0.015 – 0.3 cd/m <sup>2</sup> )<br>0.0005 (0.3 cd/m <sup>2</sup> – ) |
|                                                  |                                                                                                          | ※4                                               | 0.005 (0.0375 – 0.4 cd/m <sup>2</sup> )<br>0.0015 (0.4 – 7.5 cd/m <sup>2</sup> )<br>0.0005 (7.5 cd/m <sup>2</sup> – )     | 0.005 (0.0375 – 0.4 cd/m <sup>2</sup> )<br>0.0015 (0.4 – 7.5 cd/m <sup>2</sup> )<br>0.0005 (7.5 cd/m <sup>2</sup> – )     |
|                                                  |                                                                                                          | ※4                                               | 0.005 (0.15 – 1.5 cd/m <sup>2</sup> )<br>0.0015 (1.5 – 30 cd/m <sup>2</sup> )<br>0.0005 (30 cd/m <sup>2</sup> – )         | 0.005 (0.15 – 1.5 cd/m <sup>2</sup> )<br>0.0015 (1.5 – 30 cd/m <sup>2</sup> )<br>0.0005 (30 cd/m <sup>2</sup> – )         |

\*1 Color matching function type for CIE1931 against standard light “A”:

The high luminance side is designed for standard light A up to 1000cd/m<sup>2</sup> , and beyond that, based on the linearity of the photo detector.

\*2: When measurement is done ten times continuously:

Two values of standard deviation/Average value

\*3: When measurement is done ten times continuously:

Maximum value – Minimum value

\*4: High Speed Mode, Accuracy: Luminance  $\pm 3\%$ , Repeat accuracy: Luminance 1.5%:

“Measurement mode: Manu or FixInteg” + “Filter Open”, Integral time: 60 seconds

Measuring time (Example)

| Interface                          | Measuring time (second) |
|------------------------------------|-------------------------|
| Spectral radiance mode             |                         |
| USB (STB command)                  | 0.7                     |
| USB (ST command)                   | 1.2                     |
| RS-232C                            | 1.4                     |
| Colorimetry calculation value mode |                         |
| USB                                | 0.5                     |
| RS-232C                            | 0.5                     |

Measurement conditions

- (1) Integral time            20ms
- (2) Filter setting            Open
- (3) Measurement mode      FixInteg
- (4) Measuring speed        HighSpeed
- (5) RS-232C parameters    115200bps\_7bit\_ODD\_1bit

\* Measuring time is changed due to the PC operating environment or others.

|                              |                                                                                                                                                                                                                                                            |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature characteristics  | $\pm 3\%$ against the luminance value<br>(Within 5°C - 30°C, the luminance of 20°C should be the standard.)                                                                                                                                                |
| Warm-up time                 | 30 minutes or more<br>* Under the conditions equivalent to the following, warm-up is not necessary.<br>Measuring angle 2° or more, Luminance 1cd/m <sup>2</sup> or more, and Use temperature 23°C $\pm$ 3°C                                                |
| Polarization characteristics | Luminance: 1% or less, Spectral radiance: 2% or less (400nm – 780nm)                                                                                                                                                                                       |
| Calibration standard         | TOPCON TECHNOHOUSE calibration standard<br>(Standard light “A”, Temperature: 23°C $\pm$ 3°C, Humidity: 50%R.H $\pm$ 15%R.H)                                                                                                                                |
| Display                      | Touch panel LC (liquid crystal) display (LC size 4.3 type)                                                                                                                                                                                                 |
| Interface                    | USB3.0, RS-232C<br>RS-232C parameters<br>Communication speed:        4800 / 9600 / 19200 / 38400 / 57600 / 115200<br>Data length:                7bit / 8bit<br>Parity:        ODD (Odd number)/EVEN (Even number)/NONE (None)<br>Stop bit:    1bit / 2bit |
| Power supply                 | Exclusive AC adapter (standard accessory)                                                                                                                                                                                                                  |
| Power consumption            | Approx. 30W                                                                                                                                                                                                                                                |
| Operating conditions         | Temperature: 5°C - 30°C<br>Humidity: 80%RH or less (without dew condensation)                                                                                                                                                                              |
| Storage condition            | Temperature: -10°C - 50°C<br>Humidity: 80%RH or less                                                                                                                                                                                                       |
| External dimensions          | Approx. 422mm (Length) $\times$ 130mm (Width) $\times$ 244mm (Height)                                                                                                                                                                                      |
| Weight                       | Approx. 5.5kg (Only the instrument body)                                                                                                                                                                                                                   |

**FCC Compliance Information**

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

- (1) the device may not cause interference, and
- (2) the device must accept any interference, including interference that may cause undesired operation of this device.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

|                   |            |                                                                                                                                                                         |
|-------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Republic of Korea | KC:Class A | <p>해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다</p> <p>A급 기기 (업무용 방송통신기자재)</p> <p>이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다</p> |
|-------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**⚠ WARNING:**

This product can expose you to chemicals including Lead, which is known to the State of California to cause birth defects or other reproductive harm.

For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

(产品中有毒有害物质或元素的名称及含量)

| 部件名称  | 有毒有害物质或元素 |        |        |               |            |              |
|-------|-----------|--------|--------|---------------|------------|--------------|
|       | 铅 (Pb)    | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr (VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 表示部   | ×         | ○      | ×      | ○             | ○          | ○            |
| 电源部   | ×         | ○      | ×      | ○             | ○          | ○            |
| 机构部、箱 | ×         | ○      | ×      | ○             | ○          | ○            |
| 受光元件部 | ×         | ○      | ×      | ○             | ○          | ○            |
| 控制部   | ×         | ○      | ×      | ○             | ○          | ○            |

○: 表示该有毒有害物质在该部件所有均质材料中的含量均在电子信息产品中有毒有害物质的限量要求标准规定的限量要求 (GB/T 26572) 以下

×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出电子信息产品中有毒有害物质的限量要求标准规定的限量要求 (GB/T 26572)

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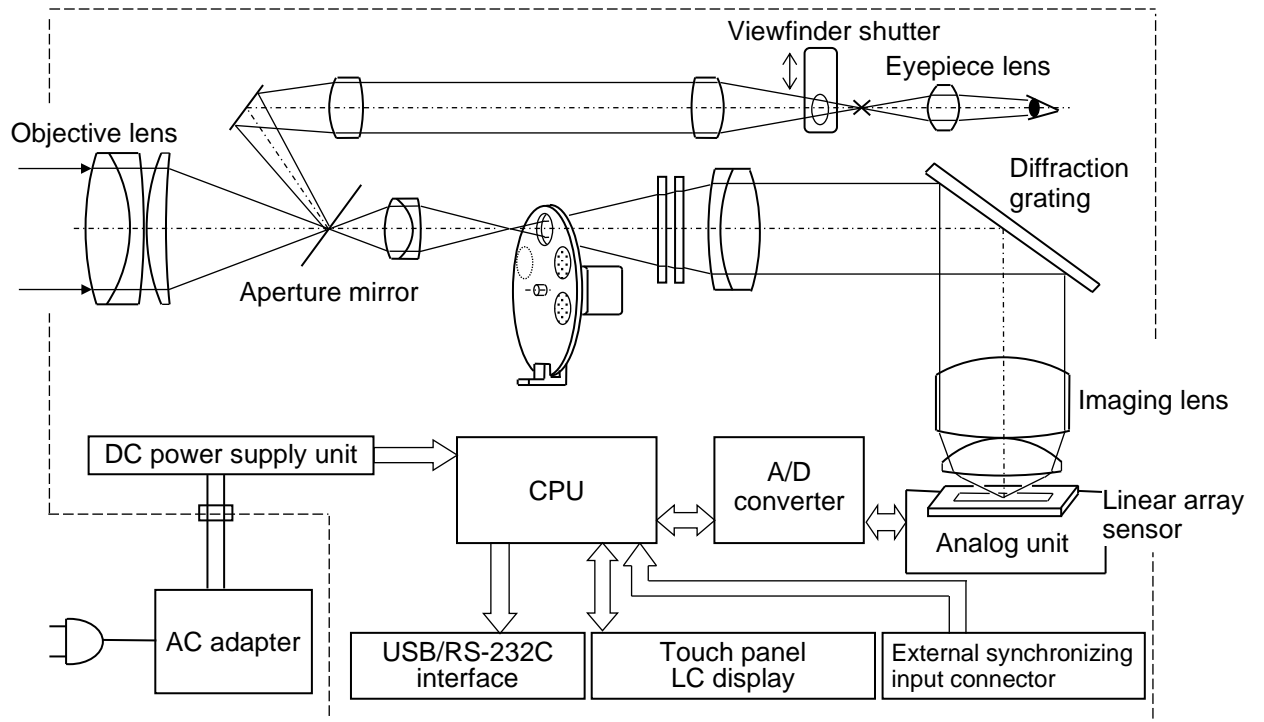


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The Mark and Information are applicable for People's Republic of China only.



# Block Diagram



## Internal Calculation Processing

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In this instrument, the calculation processing described below is performed for data.

### Spectral radiance $L_e(\lambda)$

$$L_{samp}(\lambda) = \frac{L_{ref}(\lambda)}{D_{ref}(\lambda)} \times D_{samp}(\lambda) \quad [W / sr \cdot m^2 \cdot nm]$$

The values to be inserted into the above formula are as follows.

$L_{samp}(\lambda)$  : Spectral radiance of the measurement target [W / sr·m<sup>2</sup>·nm]

$L_{ref}(\lambda)$  : Spectral radiance of the perfect reflecting diffuser under the standard light "A"  
100 π lux [W / sr·m<sup>2</sup>·nm]

$D_{ref}(\lambda)$  : Photoelectric element output when measuring the perfect reflecting diffuser  
under the standard light "A" 100 π lux

$D_{samp}(\lambda)$  : Photoelectric element output when measuring the target

### Radiance $L_e$

$$L_e = \sum_{\lambda_1}^{\lambda_2} L_{samp}(\lambda) \Delta\lambda$$

The values to be inserted into the above formula are as follows.

$\lambda_1$  : Measurement start wavelength 380nm

$\lambda_2$  : Measurement finish wavelength 780nm

$\Delta\lambda$  :  $\Delta\lambda = 1$

### Tristimulus values X, Y, Z/Luminance $L_v$

#### Observation visual field 2°

$$X = K \sum_{\lambda_1}^{\lambda_2} \bar{x}(\lambda) L_{samp}(\lambda) \Delta\lambda$$

$$L_v = Y = K \sum_{\lambda_1}^{\lambda_2} \bar{y}(\lambda) L_{samp}(\lambda) \Delta\lambda$$

$$Z = K \sum_{\lambda_1}^{\lambda_2} \bar{z}(\lambda) L_{samp}(\lambda) \Delta\lambda$$

The values to be inserted into the above formulas are as follows.

$\bar{x}(\lambda)$ ,  $\bar{y}(\lambda)$ ,  $\bar{z}(\lambda)$  : Color matching function in the CIE1931 standard color system

$K$  : Coefficient 683 lm/W

$\lambda_1$  : Measurement start wavelength 380nm

$\lambda_2$  : Measurement finish wavelength 780nm

$\Delta\lambda$  :  $\Delta\lambda = 1$

### Observation visual field 10°

$$X_{10} = K \sum_{\lambda_1}^{\lambda_2} \bar{x}_{10}(\lambda) L_{\text{samp}}(\lambda) \Delta\lambda$$

$$Y_{10} = K \sum_{\lambda_1}^{\lambda_2} \bar{y}_{10}(\lambda) L_{\text{samp}}(\lambda) \Delta\lambda$$

$$Z_{10} = K \sum_{\lambda_1}^{\lambda_2} \bar{z}_{10}(\lambda) L_{\text{samp}}(\lambda) \Delta\lambda$$

The values to be inserted into the above formulas are as follows.

$\bar{x}_{10}(\lambda)$ ,  $\bar{y}_{10}(\lambda)$ ,  $\bar{z}_{10}(\lambda)$  : Color matching function in the CIE1964 auxiliary standard color system

$K$  : Coefficient 683 lm/W

$\lambda_1$  : Measurement start wavelength 380nm

$\lambda_2$  : Measurement finish wavelength 780nm

$\Delta\lambda$  :  $\Delta\lambda = 1$

As the luminance (Lv) in "Observation visual field 10°", "Y" in "Observation visual field 2°" should be used.

### Chromaticity coordinates

#### Observation visual field 2°

x and y chromaticity coordinates in the XYZ color system

$$x = \frac{X}{X + Y + Z} \quad y = \frac{Y}{X + Y + Z}$$

u' and v' chromaticity coordinates in the UCS color system

$$u' = \frac{4X}{X + 15Y + 3Z} \quad v' = \frac{9Y}{X + 15Y + 3Z}$$

#### Observation visual field 10°

x<sub>10</sub> and y<sub>10</sub> chromaticity coordinates in the XYZ color system

$$x_{10} = \frac{X_{10}}{X_{10} + Y_{10} + Z_{10}} \quad y_{10} = \frac{Y_{10}}{X_{10} + Y_{10} + Z_{10}}$$

u'<sub>10</sub> and v'<sub>10</sub> chromaticity coordinates in the UCS color system

$$u'_{10} = \frac{4X_{10}}{X_{10} + 15Y_{10} + 3Z_{10}} \quad v'_{10} = \frac{9Y_{10}}{X_{10} + 15Y_{10} + 3Z_{10}}$$

### Color temperature/Deviation

Color temperature and deviation are obtained according to the spectral distribution of the JIS Z 8725 light source and the measuring method of color temperature/correlated color temperature.


Color temperature display range  $1563 \text{ K} \leq T_c \leq 100\,000 \text{ K}$

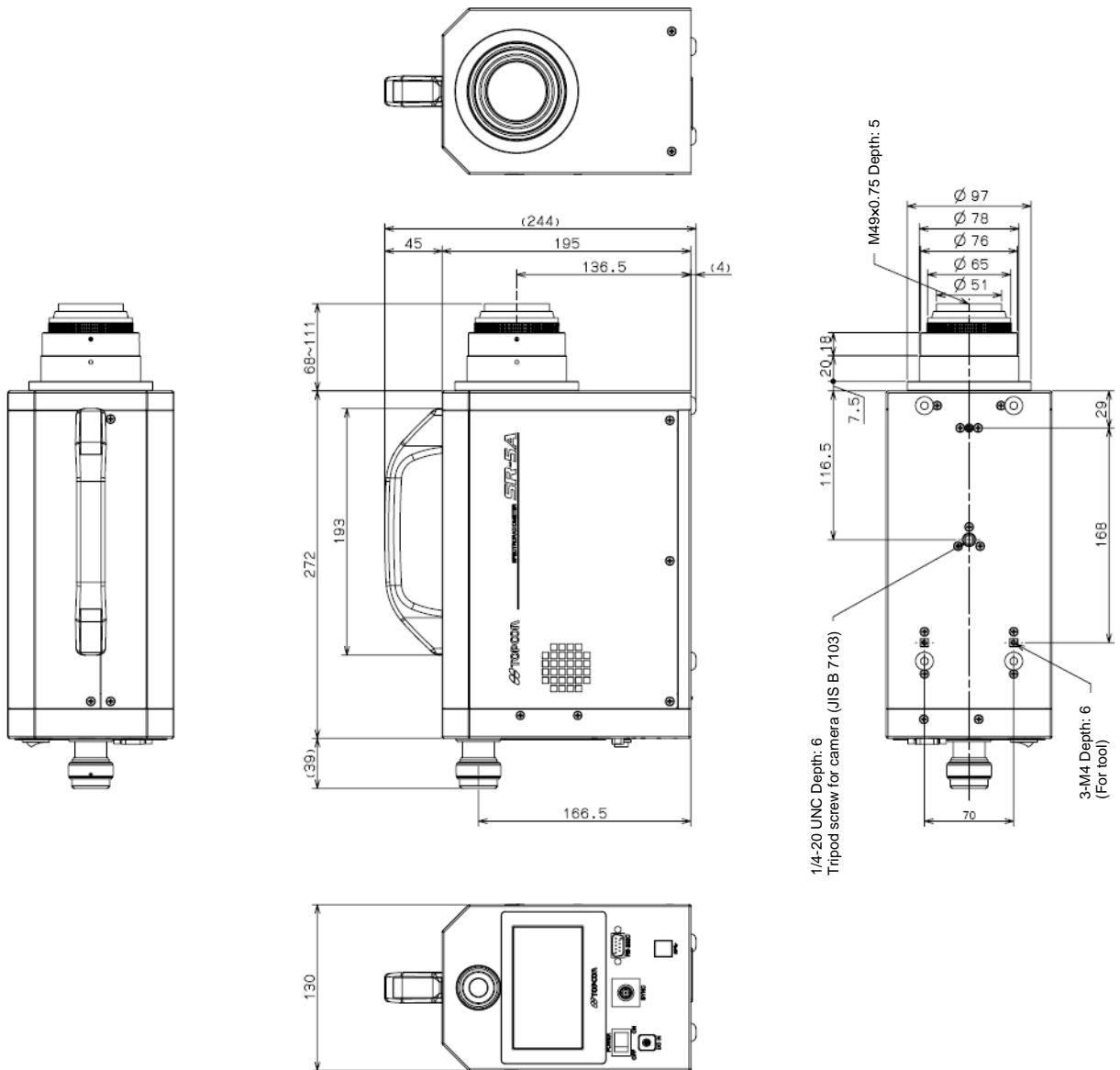
Deviation display range  $-0.02 \leq d_{uv} \leq 0.02$

"Deviation" means the distance from the blackbody radiation locus on the CIE1960 UCS chromaticity diagram.

# External Dimensional Diagram

## SR-5/SR-5A

**Note**  When using the tripod mounting screw hole and the jig mounting screw hole, use the specified screw. Do not tighten the screw excessively. The inside of the instrument may be broken.



## Warranty

### Warranty period

Our company warrants this instrument for 1 year from date of purchase.

### Repair during warranty period

When any trouble occurs in this instrument under the normal use conditions and it is judged that the trouble is caused by the design and production of our company, we will repair it without charge.

### Repair after warranty period

When the performance of this instrument can be kept by repair and the customer requests to repair, we will repair it for payment.

### Maintenance period

We will hold the functional parts (\*1) for repair for 8 years from date of purchase.

During the functional parts holding period, this instrument can be repaired.

Even after the holding period, we will meet the wishes if the instrument can be repaired. Please contact the retailer shop where you purchased the instrument or our service section.

(\*1) "Functional parts for repair" are the parts required to maintain the functions of the product.

(\*2) We will make efforts to keep the functional parts for repair so that they can be supplied sufficiently for a full maintenance period. But we will shorten this period from time to time because of unexpected circumstances. Please understand this.

### Disposal

When disposing of this instrument and its parts, follow the local regulations for disposal and recycling.

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### Please provide the following information when contacting us regarding questions about this instrument.

- Serial No.: You can check this by the rating nameplate of the instrument's back panel and the function mode.
- Period of use: Please inform us of the date of purchase and calibration about the instrument.
- Use condition: Please inform us of type of the measurement light source, setting of the instrument, measurement data, measuring status, etc.
- Defective condition: Please provide us with as much as detail as possible on the problem.

Contact information: Please refer to the back cover of this manual.

## **Spectroradiometer**

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***SR-5***  
***SR-5A***

### **Where to call:**

#### **TOPCON TECHNOHOUSE CORPORATION**

Hasunuma-cho 75-1, Itabashi-ku, Tokyo 174-8580, Japan

◆ **For inquiries about the product:**

Sales section: Phone: +81-3-3558-2666 Fax: +81-3-3558-4661

◆ **For inquiries about the after-care service including repairs:**

Maintenance service section: Phone: +81-3-3558-2710 Fax: +81-3-3558-3011

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Spectroradiometer SR-5/SR-5A Instruction Manual

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