Ai101 Spectral Irradiance Meter

User's Manual

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Version 1.3

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Revision History

Revision	Date	Description	Remark
1.0	7/14/2017	Official release	
1.1	8/6/2018	Official release	
1.2	3/11/2019	Official release	
1.3	5/20/2019	Official release	

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1. Introduction

Thank you for purchasing Apacer Ai101 Spectral Irradiance Meter! Apacer Ai101 Spectral Irradiance Meter is a portable and compact instrument designed to measure luminous flux from 1 to 600,000 Lux per unit area, including correlated color temperature (CCT), illuminance, dominant wavelength (λD), peak wavelength (λP), color rendering index (CRI), CIE 1931, and CIE 1976, Rf/Rg, and spectrogram (330-850 nm) of a light source emitted by a luminous object, such as COB (chip-on-board) and LED light bulbs.

In addition to using Apacer Ai101 Spectral Irradiance Meter as a stand-alone instrument, Apacer's ASI desktop application specifically designed for Apacer Ai101 Spectral Irradiance Meter also allows you to measure light level (illuminance) of a light source, view and save spectral data, and generate reports of measurement data.

In the following chapters, the instructions will guide you through the steps to take light measurements with Apacer Ai101 Spectral Irradiance Meter and ASI desktop application.

2. Before You Start

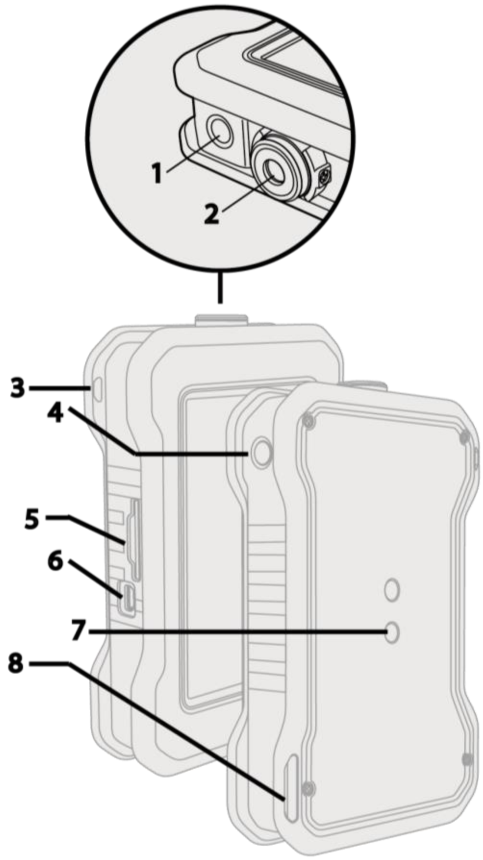
The following items are included with Ai101 Spectral Irradiance Meter. Please check the package contents before using the device. If anything is missing or damaged, contact the dealer from whom you purchased the instrument. Also, make sure you read the safety instructions thoroughly to avoid harming yourself or damaging the instrument before, during, and after using this product.

2.1 Package Contents

<table>
<tr><th>Main unit x 1</th><th colspan="2">Protective cap x 1</th></tr>
<tr><td rowspan="5"></td><td colspan="2"></td></tr>
<tr><th colspan="2">SD card x 1</th></tr>
<tr><td colspan="2"></td></tr>
<tr><th colspan="2">Adapter[1] x 1</th></tr>
<tr><td></td><td></td></tr>
<tr><th colspan="3">USB-Y cable x 1</th></tr>
<tr><td rowspan="6"></td><th colspan="2">A: Secondary connector</th></tr>
<tr><td colspan="2">Used to connect to the USB port of the supplied adapter for extra power supply.</td></tr>
<tr><th colspan="2">B: Primary connector</th></tr>
<tr><td colspan="2">Used to connect to computer USB port.</td></tr>
<tr><th colspan="2">C: Mini USB connector</th></tr>
<tr><td colspan="2">Used to plug into the USB port of the main unit.</td></tr>
</table>

[1] Either type of the AC adapters comes included in the package depending on your country or region.

2.2 Spectral Irradiance Meter at a Glance



No.	Item	Description
1.	Power	Long press to power on/off the device. If the device fails to power off caused by an unknown reason, please long press both Power and Measuring buttons on the unit to force shutdown.
2.	Cosine corrector	Used to measure light level of an illuminating source.
3.	Strap hole	Install a strap which allows you to carry the device with you.
4.	Measure button	Press to take lighting measurements of an illuminating source.
5.	SD card slot[2]	Insert the supplied SD card here.
6.	Mini USB port	Connect mini USB connector of the supplied USB cable to the device here, and plug the primary connector into an available port on your computer.
7.	Fixture mounting hole	Used to mount the device on a fixture.
8.	Strap hole	Install a strap which allows you to carry the device with you.

[2] For compatibility reasons, please use the SD card included in the package or others available on the market. Avoid using Micro SD adaptor because Apacer does not guarantee its compatibility with Ai101 Spectral Irradiance Meter.

2.3 Safety Instructions

To fully enjoy the benefits of this product, please read the important information and instructions carefully and keep it in an easily accessible place for future reference.

- **Power supply**: Power can be supplied to the instrument via an AC adaptor or a computer connected to the instrument via a USB cable. However, to make sure the unit runs smoothly, we recommend using the AC adaptor that comes with the package.
- **Environment**: Keep away from an area with a high dust or humidity level and corrosive gases. Make sure the environment does not experience abrupt changes in temperature; otherwise, measurement accuracy can be highly affected.
- **Vibration and collision**: The instrument is equipped with highly sophisticated optical components. To prevent it from falling or collision, do not place it near any moving objects while operating; keep it safe in a box while carrying it around.
- **Dust ingression**: Wipe off dust and dirt with towels or silica cloth. Do not use any chemicals, such as diluents, acetone, or volatile solvents which may damage the instrument.
- **Storage**: Place the instrument in a tool box under normal temperature. Do not put it in cars or expose it to environment with high temperature, humidity, or dust.
- **Calibration**: A measuring instrument like instrument may fail to produce valid data after being used for a period of time. To ensure optimum accuracy, we recommend you send the instrument back to the original manufacturer for calibration on a yearly basis. Please contact Apacer or your dealer for detailed information.
- **Maintenance**: Never dismantle the instrument by yourself. If encountering any breakdowns, please contact the original manufacturer or dealer to arrange a product inspection. Any attempt to dismantle the device may have an irrevocable impact on, or cause a loss of, the product's original efficacy, resulting in the immediate invalidation of Apacer's warranty and additional cost of replacement parts..
- **Protective cap**: After using the device, please cover the cosine corrector with the protective cap in case of unnecessary scratch or damage to influence the accuracy.

3. Getting Started with Spectral Irradiance Meter

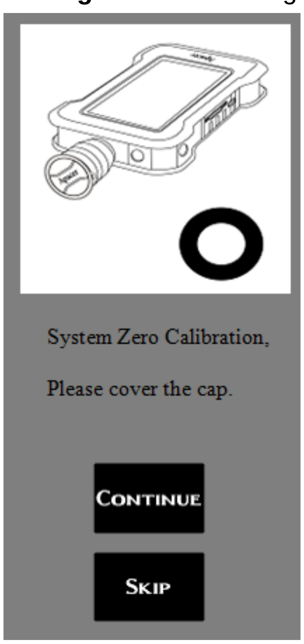
This chapter explains how to calibrate your stand-alone Ai101 Spectral Irradiance Meter without being connected to a computer via the supplied USB cable and ASI, desktop application designed for Ai101 Spectral Irradiance Meter, start up and zero calibrate the instrument, view system information, manage settings, measure light level of an illuminating source, and view measurement data.

3.1 Starting up and Calibrating Spectral Irradiance Meter

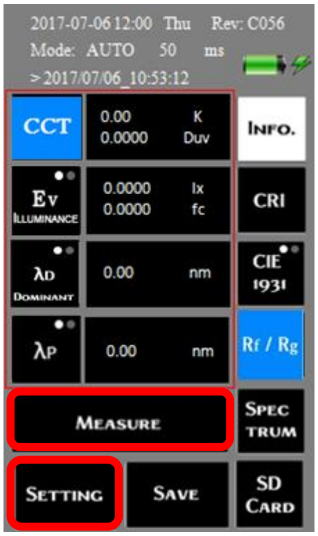
To ensure measurement accuracy, we suggest you calibrate the instrument at the first-timed system startup. Follow the steps below to start the calibration.

To start up and calibrate your instrument:

1. Long press the power button on the device to power on.
2. Cover the cosine corrector with the protective cap to start calibrating the device, and do either of the following:
   - Tap **Continue** to calibrate the unit.
   - Tap **Skip** if you do not want to perform calibration now. You may calibrate the unit later by going to **Setting**. See "3.3 Managing Settings" for more information.



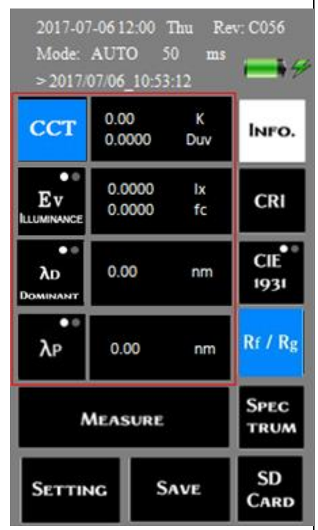
3. The gear icon  will appear when the system begins calibrating. Depending on the calibrating status, do either of the following:
   - **Successfully calibrated**: You can start taking measurements by tapping **Measure** on the device screen or press the physical Measure button on the side of the unit. However, in case you want to configure system settings before measuring in order to produce measurement data as accurately as possible, tap **Setting**. See "3.3 Managing Settings" for more information.



   - **Calibration failed**: The calibration results can be affected by potential error sources such as external lighting during a calibration. If ambient lighting is detected, the following error message will appear. Please make sure the cosine corrector is covered with the protective cap, and tap **Continue** to perform the calibration once again.

3.2 Viewing System Information

You can view the following system information on the home screen.

Information	Description	Display
2015-01-01 00:00 Thu	System date and time. Can be edited at **Settings** > **Date Time**.	
Rev: C043	Firmware version.	
Mode: AUTO	Integration mode. Can be set at **Settings** > **Auto Int. Time**. Options include manual integration (**Off**) and auto integration (**On**).	
50 ms	Integration time. Can be adjusted at **Settings** > **Auto Int. Time**.	
> 2015/01/01_00:00:37	Indicates the date and time a measurement is taken and is used as directory name of the measured data saved in the SD card. This can only appear when an .sps file is selected to display. See "3.4 Viewing Measurement Data" > **SD Card** for more information.	
	Power indicator.	

3.3 Managing Settings

Apacer's Ai101 Spectral Irradiance Meter provides a variety of settings that allow you to configure the instrument to measure light level from 1 to 600,000 Lux with more ease, effectiveness, and efficiency.

On the home screen, tap **Setting** to configure settings for the device. Manage and modify the settings options below with the three navigating buttons:

- **Done**: Tap to save the settings when finished.
- **Return**: Tap to exit the settings screen you are navigating and return to the previous page.
- : Tap to see more settings options available on other pages.

Auto Int. Time

This option allows you to obtain the best exposure by turning on/off the setting depending on your need:

- **On (Auto Integration)**: When set to on, the instrument will take measurements of a light source automatically at optimal timing when ambient environment provides appropriate lighting.
- **Off (Manual Integration)**: When set to off, you can take measurements whenever you want by tapping the **Measure** button. Select the integration time with the + and – buttons. Maximum time permitted can be up to 60,000 milliseconds.

Once finished, tap to return to the previous screen and tap **Done** to apply the setting.

Power Save

This option allows you to activate power saving mode by specifying the time for the screen to go off when the instrument is not in use. When the mode is set to on, the screen will be off in a standby mode if you have not used it for 120 seconds. After another 5 minutes, the device will be powered off automatically. If you want to go back to the screen you were on before the device is off, press the physical power button on the unit.

Screen Reverse 180°

Turn on the option to rotate the screen 180°. This allows you to adjust the orientation of the screen in response to the direction of the light source.

Language

Tap to select your display language among English, Traditional Chinese, and Simplified Chinese. Once finished, tap **Done** and the setting will come into effect immediately.

Date Time

Tap **Set** to set the date and time. Then tap the date or time field you want to change. The selected field will be highlighted. Tap + or – for changes, and tap **Set** when done. Once finished, tap to return to the previous screen and tap **Done** to apply the setting.

Illuminant

An illuminant is a set of numbers (relative power versus wavelength) that represents the spectral quality of a type of white light source. This option allows you to select one of the spectral power distributions, referred to as CIE standard illuminants as follows while taking measurements of a light source. Illuminant A is most commonly-used lighting for measuring light level.

<table>
<tr><th>Illuminant</th><th colspan="3">Description</th></tr>
<tr><td>A</td><td colspan="3">An incandescent or tungsten light source found in the home.</td></tr>
<tr><td>B</td><td colspan="3">Direct sunlight at noon.</td></tr>
<tr><td>C</td><td colspan="3">Average daylight.</td></tr>
<tr><td rowspan="5">D</td><td colspan="3">Represents phases of daylight.</td></tr>
<tr><td>D50</td><td colspan="2">Warm daylight at sunrise or sunset.</td></tr>
<tr><td>D55</td><td colspan="2">Mid-morning or mid-afternoon daylight.</td></tr>
<tr><td>D65</td><td colspan="2">Noon daylight.</td></tr>
<tr><td>D75</td><td colspan="2">Overcast daylight.</td></tr>
<tr><td>E</td><td colspan="3">Equal-energy illuminant.</td></tr>
<tr><td rowspan="9">F</td><td colspan="3">Represents fluorescent lamps of various composition.</td></tr>
<tr><td rowspan="6">Standard Fluorescent Illuminants</td><td>F1</td><td>Daylight fluorescent.</td></tr>
<tr><td>F2</td><td>Cool white fluorescent.</td></tr>
<tr><td>F3</td><td>White fluorescent.</td></tr>
<tr><td>F4</td><td>Warm white fluorescent.</td></tr>
<tr><td>F5</td><td>Daylight fluorescent.</td></tr>
<tr><td>F6</td><td>Lite white fluorescent.</td></tr>
<tr><td rowspan="2">Broadband Fluorescent Illuminants</td><td>F7</td><td>D65 simulator, daylight simulator.</td></tr>
<tr><td>F8</td><td>D50 simulator, Sylvania F40 Design 50.</td></tr>
</table>

Illuminant	Description		
		F9	Cool white deluxe fluorescent.
	Narrow Triband Fluorescent Illuminants	F10	Phillips TL85, Ultralume 50
		F11	Phillips TL84, Ultralume 40
		F12	Phillips TL83, Ultralume 30

Zero Calibration

Tap **Set** to calibrate the instrument. This option is the same function as system zero calibration which is available when the instrument is powered on.

Low Light Mode

Turn on the option to extend the measuring time. When the light source is too low for measurements to be taken with auto integration (3 seconds), you may need to consider allowing additional light to pass through the lens, in order to ensure that optimum spectral data can be generated.

Tap **On**/**Off** to trigger or to leave the **Low Light Mode**. When the **Low Light Mode** is on, it'll extend auto integration time to another 60 seconds. Once finished, tap **Off** to leave the mode.

Please note that the low light mode can only be activated when the light source is extremely low and when **Auto Int. Time** is set to on. Otherwise, measurements will be taken based on the time set for manual integration by default. To avoid overexposure, this mode remains off when the light source is already bright enough.

Backlight Adjust

Tap the number ranging from 1 to 5 to adjust screen brightness.

Average Times

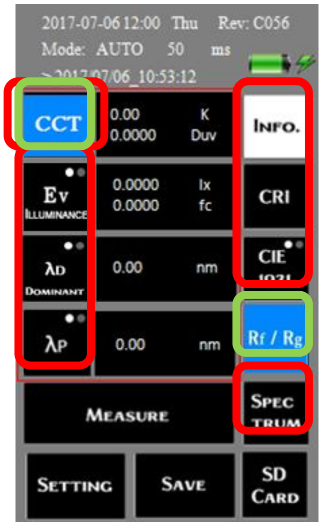
In order to prevent the measured data from being biased, you may configure the instrument to produce an average value of sets of data by taking multiple measurements of a light source. Options include 1, 4, 9, 16, and 25 times.

Please note that the measuring time increases with the number of average times.

Factory Default

Tap **Set** to restore to factory default settings, and tap **Done** to apply the setting.

3.4 Viewing Measurement Data



Once the settings described in "3.3 Managing Settings" are completed, you can do either of the following to take measurements:

- Press the physical Measure button on the side of the instrument.
- Tap **Measure** on the home screen.

While measuring, please position the cosine corrector directly under a distant light source. Afterwards, follow the instructions below by tapping **Info**, **CRI**, **CIE1931**/**CIE1976**, and **Spectrum** on the right to view the results which can be saved into the SD card that accompanies the package.

- Tap Rf / Rg, it will start the second calculation after finishing the process of tapping **Measure**. You'll get data and diagram of Color Fidelity (Rf) and Color Gamut (Rg).
- Tap CCT, it also can trigger second calculation after finishing the process of tapping **Measure**. Then the data of TLCI, CQS and Purity are revealed.

For the blue items in green frames, they both can do the second calculation after tapping **Measure** (Note: the first calculation, which is triggered by tapping **Measure**, should always be done before the second calculation. The measuring results of the first calculation can be viewed on the items in the red frame).

3.4.1 Info

Tap **Info** to display measurement data including the following:

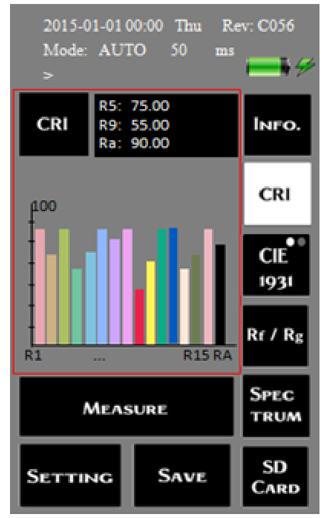
(There're two pages to be revealed for the items with the two dots at the upper-right side, such like CIE 1931).

Item	Description
Correlated Color Temperature (CCT)	Tap CCT or TLCI CQS PURITY to switch measured data between CCT and TLCI/CQS/Purity(Note: CCT can be viewed after the first calculation but other three items can only be viewed after finishing the second calculation).
Television Lighting Consistency Index (TLCI)/ Color Quality Scale (CQS)/ Purity	
Illuminance (Ev)/Irradiance (Ee)	Tap Ev ILLUMINANCE or EE IRRADIANCE to switch measured data between illuminance and irradiance. Tap 0.0000 lx 0.0000 fc under Ev ILLUMINANCE mode, it can switch measured data between general digits or scientific ones.
Dominant Wavelength (λD)/ XYZ Tristimulus Values	Tap λD DOMINANT or XYZ to switch measure data between dominant wavelength and tristimulus values.
Peak Wavelength (λP)/ Peak Wavelength Value (λPV)	Tap λP or λPV to switch measured data between peak wavelength and peak wavelength value.

3.4.2 CRI

Color Rendering Index (CRI) is a rating system that measures the accuracy of how well a light source reproduces the (total) color of an illuminated object (comparing to sunlight). General Color Rendering Index (Ra), which is an average value based on R1-R8 and it is ranked on a scale from 0 – 100. CRI indicates how accurately a given light source renders colors in the space it illuminates. The value 100 means that there is no difference in color rendition between the color of the illuminated object under certain light source and under sunlight.

Tap **CRI** to display color rendering index, in which R5, R9, and Ra values as well as R1-R15 bar chart along with Ra will be displayed.

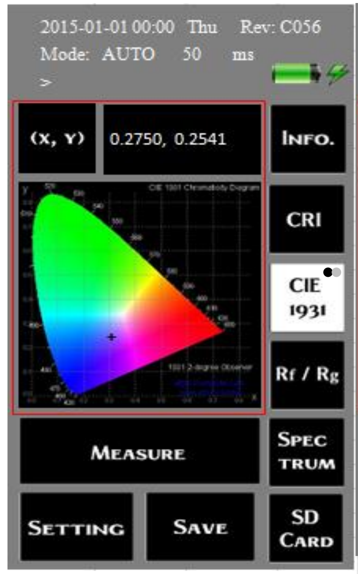


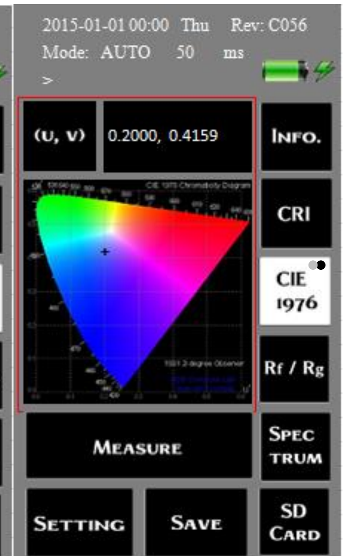
Ri	Appearance Color under Daylight	Note
R1	Light grayish red	
R2	Dark grayish yellow	
R3	Strong yellow green	
R4	Moderate yellowish green	
R5	Light bluish green	
R6	Light blue	
R7	Light violet	
R8	Light reddish purple	
R9	Strong red	The ability to accurately reproduce the color red is key for accurately rendering colors of displayed objects. Lamps with high R9 value produce the most vivid colors.
R10	Strong yellow	
R11	Strong green	
R12	Strong blue	
R13	Caucasian skin color	
R14	Moderate olive green (leaf)	
R15	Asian skin color	
Ra	General Color Rendering Index	Average value based on R1 – R8.

3.4.3 CIE 1931/CIE 1976

The Chromaticity diagrams CIE1931 and CIE1976 show chromaticity of an illuminating source which is an objective specification of the color quality regardless of its illuminance. The chromaticity of the illuminant is specified by a point which has two coordinates on the color spaces.

Tap **CIE1931**/**CIE1976** to switch between CIE 1931 and CIE 1976 chromaticity diagrams, in which (x, y) and (u', v') coordinates indicated by "+" on the color space will be displayed respectively.

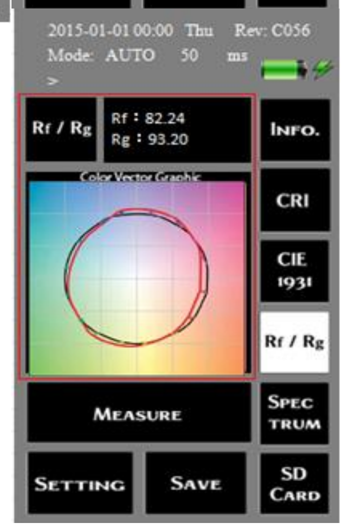




3.4.4 Rf/Rg

The new standard developed by the Illuminating Engineering Society of North America (IES) to replace CRI and is called IES-TM-30-15, or TM-30-15 for short. IES-TM30-15 is a new system of several related measures and graphics that can be used together to effectively evaluate and communicate a light source's color rendering properties. Two of the highest-level components of the system are fidelity index (Rf) and gamut index (Rg).

Tap **Rf/Rg** to view color vector graphic which illustrates average hue and saturation changes in each of 16 hue bins. The reference illuminant is indicated by the black circle, whereas the test source is represented by the red one.



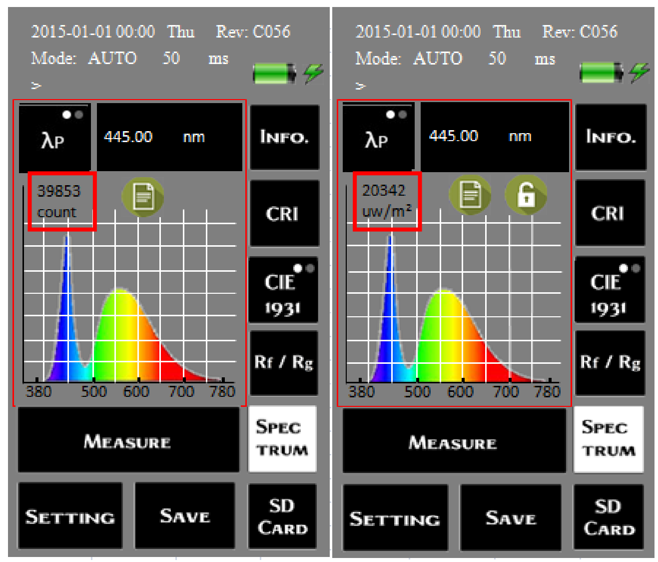
Measure	Abbreviation	Description
Fidelity Index	Rf	Analogous to CRI (Ra). Characterizes the average color shift of the 99 color evaluation samples to characterize the overall level of similarity between the test source and reference illuminant. Values range from 0 to 100.
Gamut Index	Rg	Compares the area enclosed by the average chromaticity coordinates in each of 16 hue bins to characterize the average saturation level of the test source compared to the reference illuminant. A neutral score is 100, with values greater than 100 indicating an increase in saturation and values less than 100 indicating a decrease in saturation. The range in values grows as fidelity decreases.

Measure	Abbreviation	Description
Color Vector Graphic	-	Provides a visual representation of hue and saturation changes based on the average rendering in each hue bin, relative to the reference. The graphic provides a quick understanding of how different hues are rendered in different ways.

3.4.5 Spectrum

Tap **Spectrum** to display spectrum diagram, in which peak wavelength will be displayed. The spectral response covers a wide wavelength range from 330 to 850 nm. Tap the value displayed on the upper-left corner to view the following spectral information:

- **Light Signal Intensity (count)**: When photons are captured during measurement, they are converted to electrons and via CCD, the signals in electrons are converted into voltage, which is then digitized by an Analogue to Digital Converter (ADC). Each Analogue to Digital Unit (ADU) is called count in the signal intensity scale. Each count corresponds to an exact number of electrons. For the spectrum diagram at right, the value of counts represents the highest point of the wavelength on the diagram.
- **Power Density (μw/m²)**: Power Density is calculated on light power per unit area. In the rightist diagram, the value (20342) represents the energy of light at the highest point in the spectrum diagram.



Tap the value displayed on the upper-left corner of the diagram in the red frame and it can switch from light signal intensity to power density or vice versa.

Tap  to display spectral data. You may view the data of different wavelengths by scrolling up or down.

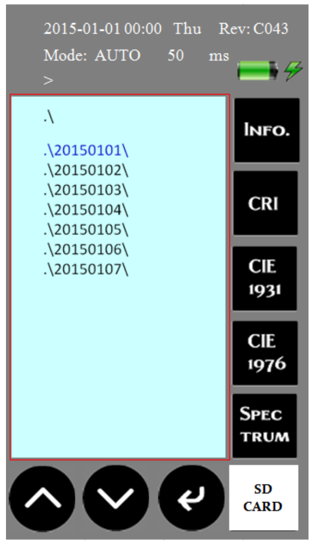
Tap  to lock the Y-axis. This function helps user to view the spectrum diagram from different light sources under the same condition. When the Y-axis is locked, the icon will change to a red lock.

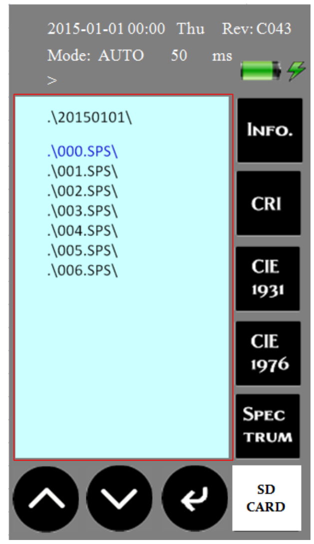
3.4.6 Save

Tap **Save** to save the measured data into the SD card inserted in the instrument as text files with .sps extension. The files can be opened with ASI, the desktop application designed for Ai101 Spectral Irradiance Meter, (see "4. Using Spectral Irradiance Meter with ASI") or software which can support txt file. By modifying file extension to .csv, the files also can be opened in the terms of excel files.

3.4.7 SD Card

Tap **SD Card** to view the measured data saved in the SD card. The root directory (indicated as .\) and subdirectory (categorized by date) can display up to 15 items per page. Tap / to navigate through items and tap for selection.





4. Using Spectral Irradiance Meter with ASI

In addition to taking measurements on the stand-alone Ai101 Spectral Irradiance Meter, Apacer's desktop application ASI allows you to operate the instrument with computer system by connecting it to your computer via the USB cable supplied. With ASI, you can measure light level of a light source, view and save spectrum data, and generate reports of measured results.

This chapter will guide you through the installation procedures of ASI and explains how to operate the instrument with the software features of the utility.

4.1 Installing ASI

Apacer's ASI is a software program specifically designed for spectral irradiance meters in general lighting measurement, such like Ai101 and Ai111 etc.. Before operating the instrument with the program, please contact Apacer for the setup.exe file. Afterwards, install the file on your computer and connect the instrument to your computer. Follow the steps below to install the utility.

To install ASI on your computer:

1. Extract the zipped setup file provided by Apacer.
2. Find and double click the ASI setup.exe file, then follow the onscreen instructions to install the utility.

   Once the installation is complete, the app icon  will appear on the desktop of your computer.

To connect Ai101 Spectral Irradiance Meter to your computer:

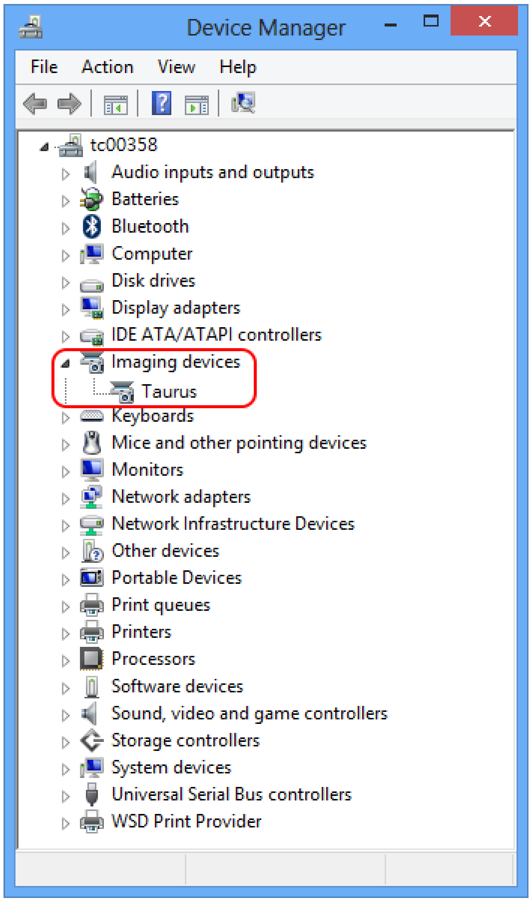
1. Power on your instrument.
2. Connect the mini USB connector of the supplied USB cable to the USB port of the instrument, and plug the primary connector (with thick cable) into an available USB port on your computer.

   > ***Note:*** In case the power drawing from the USB port on your computer is not enough, you can connect the secondary connector (thin cable) to the adaptor supplied and plug the adaptor to a power outlet to provide supplemental power.

3. Double click  to launch the ASI program.

   > ***Note:*** If you launch the ASI program without connecting the device to your computer, an error message "Cannot connect Ai101." will appear. Click **OK** and follow steps 1-3 to continue.

4. Depending on whether your instrument is successfully detected, do either of the following:
   - If the device is recognized, its serial number will appear on the upper-right corner of the ASI window; the connection status will show "Connect". You may start to take measurements with the program by following the instructions at "4.3 Measuring with ASI".
   - If the device is not recognized, either  will appear on the instrument or the connection status will show "Disconnect". Check if both ends of the USB cable are properly connected to the computer and device. Remove the connectors and connect once again if necessary. Then go to Control Panel > Device Manager in your Windows operating system. If the connection is established, the device name "Taurus" of the instrument should appear under the Imaging devices tab.

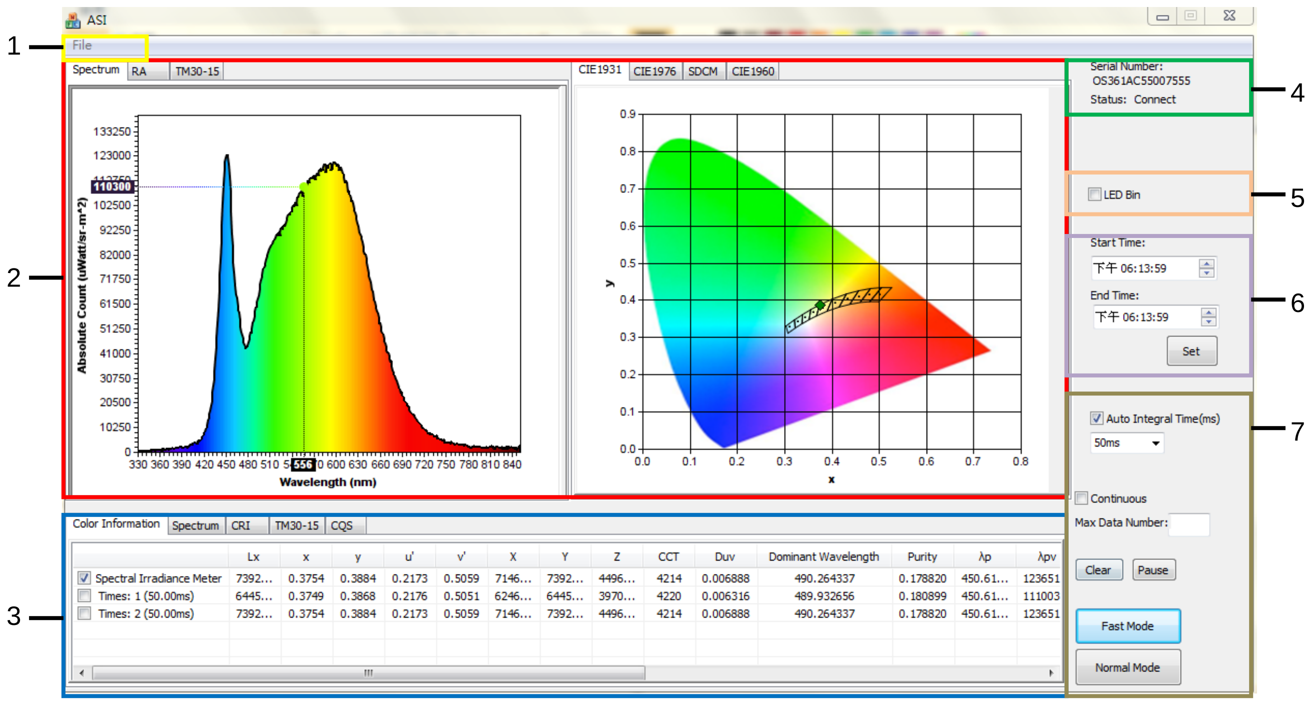


5. If you want to disconnect the instrument, simply remove the USB cable from the USB port of your computer.

4.2 ASI Interface

With the interface divided into two graphical display areas in the middle and tabular representation of measured values at the bottom, Apacer's desktop application ASI allows you to easily view measured results with category tabs and compare corresponding normalized values with diagrams.

When ASI is launched, you can see the interface divided into the following seven sections indicated by color.



No.	Item	Description
1.	File	Offline mode: ASI is able to work without connecting with the device to do file loading. However, for measurement, it should be in online mode (connection with the device). Click **Connect**, ASI software will connect with the device immediately via USB cable. For data saving, see "4.4 Saving Measurement Data".
2.	Main Area	Click the **Spectrum**, **RA**, **TM30-15**, **CIE 1931**, **CIE 1976**, **SDCM** or **CIE1960** tabs to display corresponding diagrams of the measured values.
3.	Color Information	Displays illuminance (Lx), CIE1931 (x,y) and CIE1976 (u',v') coordinates, XYZ tristimulus values, Correlated Color Temperature (CCT), duv, dominant wavelength, purity, peak wavelength (λp), peak wavelength value (λpv), Full Width Half Maximum (FWHM), Photosynthetic Photon Flux Density (PPFD), Photosynthetic Photon Flux (PPF), S/P ratio, R5, R9, and Standard Deviation Color Matching (SDCM).
	Spectrum	Displays the wavelength range between 330 to 850 nm.

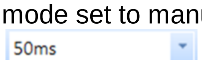
No.	Item	Description
	CRI	Displays values of color rendering index (R1-R15 and Ra).
	TM30-15	Displays Rf, Rg, and coordinates (a', b') of 16 hue bins.
	CQS	Displays values of color quality scale (Q1-Q15 and Qa).
4.	Serial Number	Displays serial number of the connected Ai101 Spectral Irradiance Meter.
	Status	Displays connection status.
5.	LED Bin	Check it to trigger LED binning measurement with selecting **Continuous** and filling in **Max Data Number** (default value is 100), e.g. to fill 10 in **Max Data Number** with selecting **Continuous** will start LED binning of 10 times continuously. Instead of it, single-time measurement of 10 times will start without selecting **Continuous**.
6.	Auto measurement	Select **Start Time** and **End Time**, and then the device will trigger and stop measurement automatically within the selected period.
7.	Measuring function	See "4.3 Measuring with ASI" for detailed information.

4.3 Measuring with ASI

Just as you can manage settings to measure with Apacer Ai101 Spectral Irradiance Meter, ASI also allows you to take light measurements with auto/manual integration in single/continuous mode.

While taking measurements, face the cosine corrector toward the source of light to be monitored. For overhead lighting, the cosine corrector can be placed on a desk or table top. The measured data will be displayed as "Times: [Number] (Integration Time)" at the rightest column of Color Information in the interface (See "4.2 ASI Interface").

Integration Mode

- **Auto Integration**: Tick the **Auto Integral Time** checkbox to enable auto integration. With the mode set to auto, measurements will be taken automatically at optimal timing when ambient environment provides appropriate lighting.
- **Manual Integration**: Untick the **Auto Integral Time** checkbox to disable auto integration. With the mode set to manual, measurements will be taken based on the integration time you select with the 

(1-60,000 miliseconds) drop-down menu.

Measuring Mode

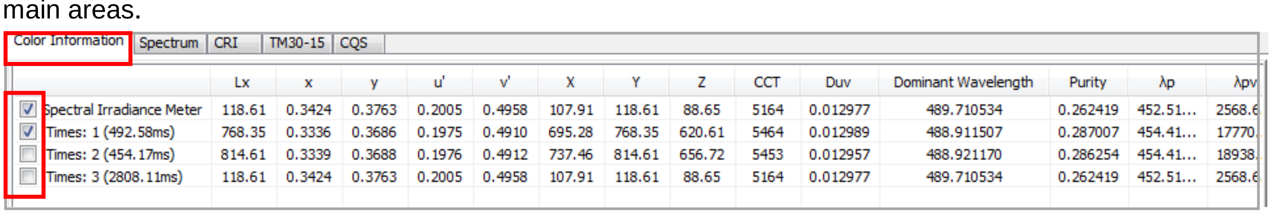
- **Single Measuring Mode**: Untick the **Continuous** checkbox to enable single measuring mode. When the single measuring mode is on, only one set of measured data will be recorded. You may choose fast or normal modes to take measurements:
- **Continuous Measuring Mode**: Tick the **Continuous** checkbox to enable continuous measuring mode. When the continuous measuring mode is on, spectral data will be recorded continuously until you click **Pause**. Fill the max data numbers you would like have in **Max Data Number**, and then the continuous measuring mode will be stopped automatically while the filled max data numbers is achieved. If you would like to remove previous measured data, just tick the **Clear** and all measured data showed at the item 2 (see "4.2 ASI Interface") will be eliminated immediately.

Fast/Normal Mode

- **Fast Mode**: Click to generate spectral data based on one-time measurement.
- **Normal Mode**: Click to generate an average value of spectral data based on ten-time measurements. This action will take some time to complete.

Multiple Measured Data Comparison

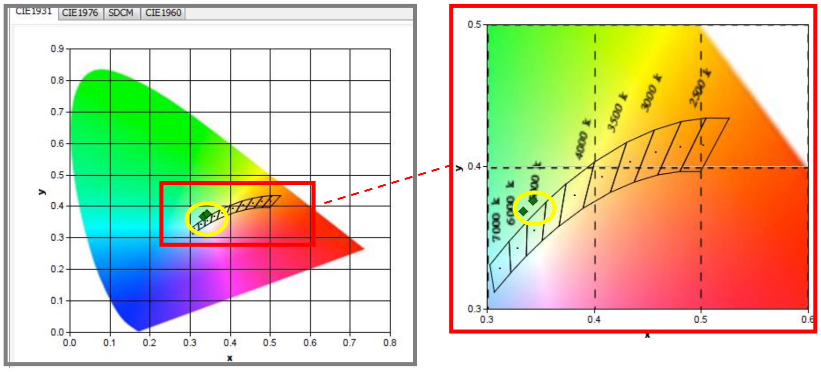
- **Multiple Chromaticity Coordinate Comparison**: Go to the tab **Color Information** and check the data which would like to be compared. Then the comparison diagram will be revealed in the following main areas.


Color Information | Spectrum | CRI | TM30-15 | CQS

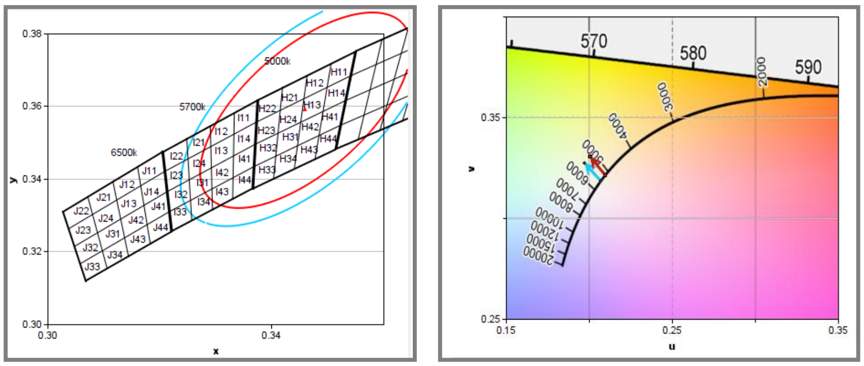
	Lx	x	y	u'	v'	X	Y	Z	CCT	Duv	Dominant Wavelength	Purity	λp	λpv
☑ Spectral Irradiance Meter	118.61	0.3424	0.3763	0.2005	0.4958	107.91	118.61	88.65	5164	0.012977	489.710534	0.262419	452.51...	2568.6
☑ Times: 1 (492.58ms)	768.35	0.3336	0.3686	0.1975	0.4910	695.28	768.35	620.61	5464	0.012989	488.911507	0.287007	454.41...	17770.
☐ Times: 2 (454.17ms)	814.61	0.3339	0.3688	0.1976	0.4912	737.46	814.61	656.72	5453	0.012957	488.921170	0.286254	454.41...	18938.
☐ Times: 3 (2808.11ms)	118.61	0.3424	0.3763	0.2005	0.4958	107.91	118.61	88.65	5164	0.012977	489.710534	0.262419	452.51...	2568.6

➢ **CIE1931/CIE1976**

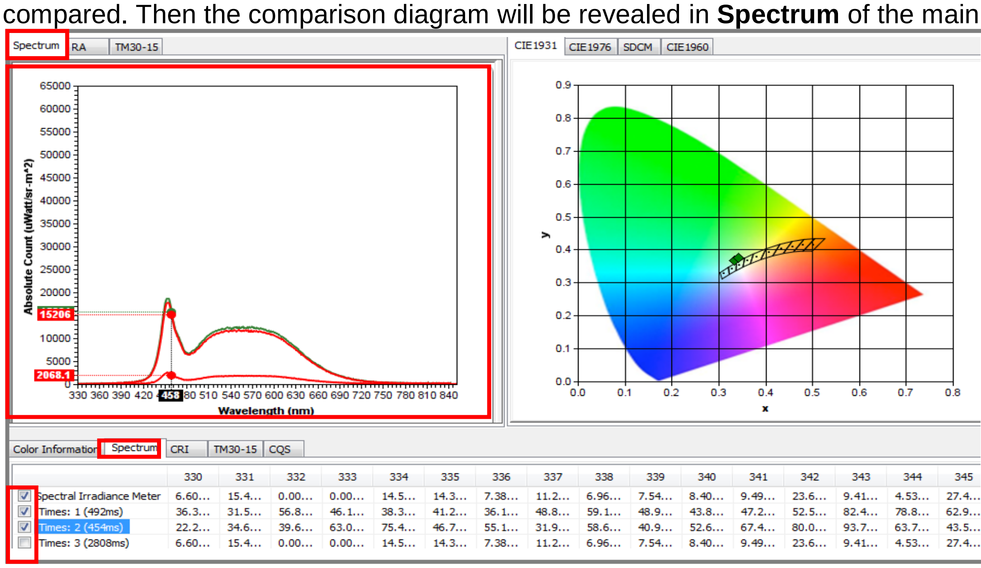
Click black body curve in red frame to enlarge the diagram.



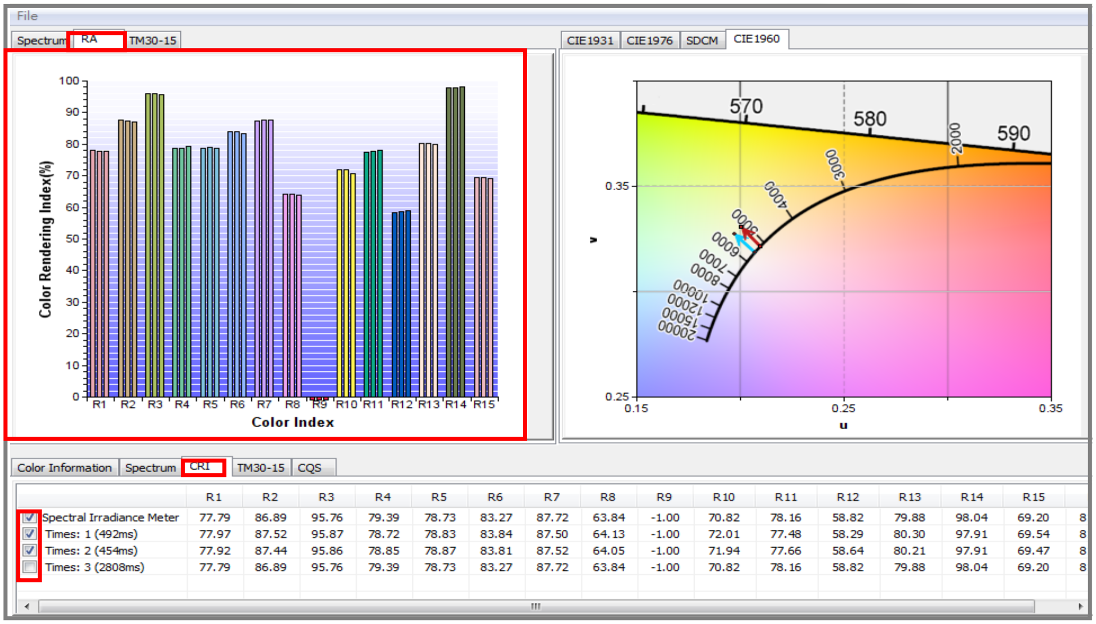
➢ **SDCM/CIE1960**



- **Multiple Spectrum Comparison**: Go to the tab **Spectrum** and check the data which would like to be compared. Then the comparison diagram will be revealed in **Spectrum** of the main area.



- **Multiple CRI Comparison**: Go to the tab **CRI** and check the data which would like to be compared. Then the comparison diagram will be revealed in **RA** of the main area.


File
Spectrum
RA
TM30-15
CIE1931
CIE1976
SDCM
CIE1960
Color Rendering Index(%)
Color Index
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15
570
580
590
0.35
0.25
0.15
0.25
0.35
v
u
Color Information
Spectrum
CRI
TM30-15
CQS
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15
Spectral Irradiance Meter 77.79 86.89 95.76 79.39 78.73 83.27 87.72 63.84 -1.00 70.82 78.16 58.82 79.88 98.04 69.20
Times: 1 (492ms) 77.97 87.52 95.87 78.72 78.83 83.84 87.50 64.13 -1.00 72.01 77.48 58.29 80.30 97.91 69.54
Times: 2 (454ms) 77.92 87.44 95.86 78.85 78.87 83.81 87.52 64.05 -1.00 71.94 77.66 58.64 80.21 97.91 69.47
Times: 3 (2808ms) 77.79 86.89 95.76 79.39 78.73 83.27 87.72 63.84 -1.00 70.82 78.16 58.82 79.88 98.04 69.20