KONICA MINOLTA

Display Color Analyzer
CA-310 [10]

Support for LED backlights

The next-generation model that surpasses the CA-210

For high-speed, high-accuracy measurements of LED-backlit LCD TVs

LED television

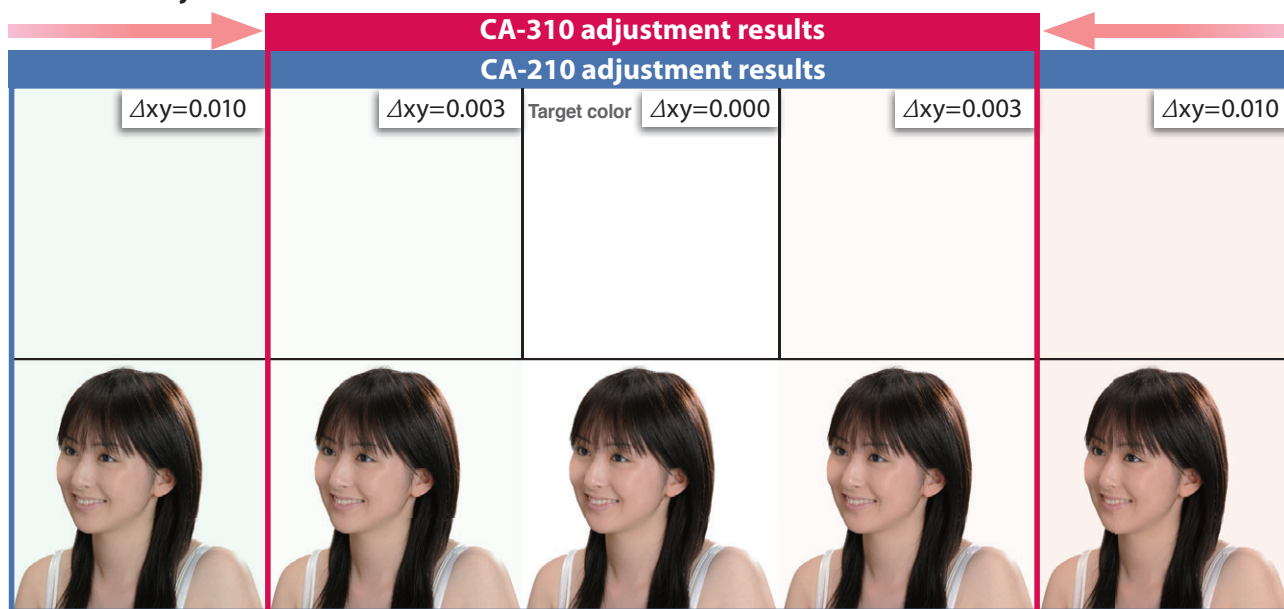**Smartphone**

Uniformity
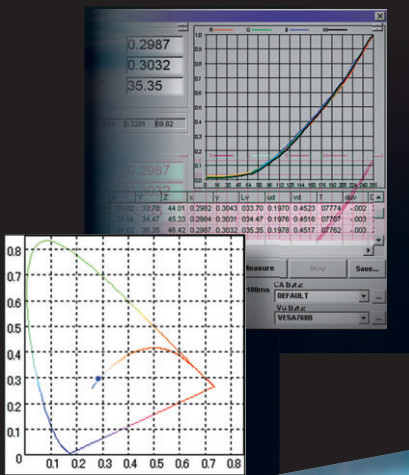
Giving Shape to Ideas

Enables high-accuracy adjustment of EL/LED-backlit LCD TV gamma/white balance to greatly improve efficiency.

White balance adjustment has advanced even further!

Our previous Display Color Analyzer CA-210 could adjust the white balance of LED-backlit LCD TVs to $\Delta xy=0.010$, but the new Display Color Analyzer CA-310 enables adjustment to $\Delta xy=0.003$ so colors are even more true, as can be seen below.

White balance adjustment of LED -backlit LCD TVs

	CA-310 adjustment results				
	CA-210 adjustment results				
$\Delta xy=0.010$	$\Delta xy=0.003$	Target color $\Delta xy=0.000$		$\Delta xy=0.003$	$\Delta xy=0.010$

Enables high-speed measurement of even extremely low luminances down to 0.005 cd/m²
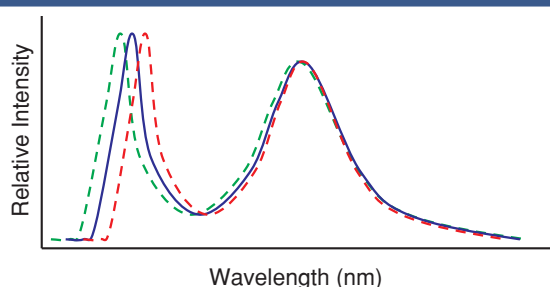
Sensor noise reduction technology has been used to enable measurements even in the extremely low luminance region around 0.005 cd/m² at speeds as fast as 4 times per second. This allows the high-speed high-accuracy measurement essential for manufacturing high-grade displays. In addition, at luminances higher than 2.0 cd/m², 20 measurements per second are possible.
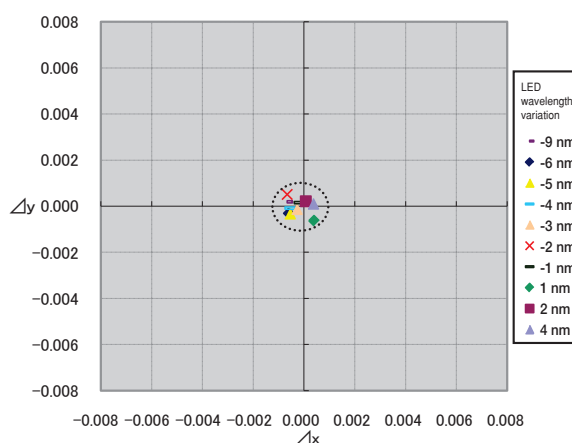
Reduces errors due to LED emission distribution variations to less than 1/3.

Variations in the emission distribution of LED backlights result in individual differences of about 10nm in peak intensity wavelength. If LED-backlit LCD TVs with such individual differences are adjusted using conventional color analyzers, color differences of close to 0.010 on the xy chromaticity diagram may occur. But the CA-310 has sensor sensitivities that more closely match the CIE 1931 color-matching functions, enabling the color difference in the same case to be reduced to around 0.003, suppressing errors to less than 1/3.

Variations in the emission distribution of LED backlights

Relative Intensity

Wavelength (nm)

Measurement errors for LED backlights

0.008
0.006
0.004
0.002
Δy 0.000
−0.002
−0.004
−0.006
−0.008

−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
Δx

LED wavelength variation
- ─ -9 nm
- ♦ -6 nm
- ▲ -5 nm
- ─ -4 nm
- ▲ -3 nm
- ✕ -2 nm
- ─ -1 nm
- ♦ 1 nm
- ■ 2 nm
- ▲ 4 nm

∗Errors (differences from true values) for white LEDs with different peak wavelengths when measured using CA-310. User calibration to standard LED performed.

PC Software for Color Analyzer
CA-SDK (Standard accessory)

Standard accessory SDK helps create software easily according to needs.
Sample software is bundled; you can start data collection easily.
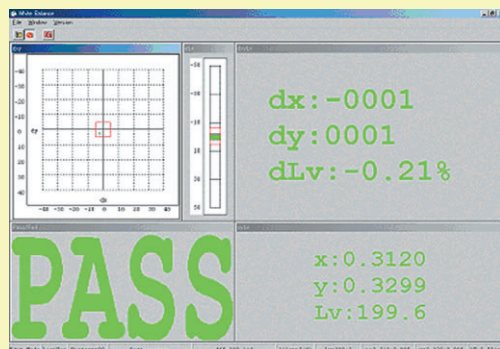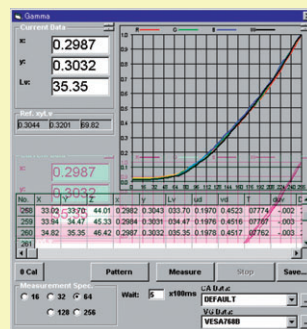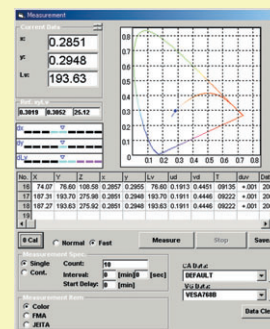
Example of White Balance Adjustment Software made by SDK

```
dx:-0001
dy:0001
dLv:-0.21%

PASS

x:0.3120
y:0.3299
Lv:199.6
```

Required system
OS : Windows® XP, Vista, 7

Windows® and Excel® are a trademark of Microsoft Corporation in the USA and other countries.

Sample software Gamma

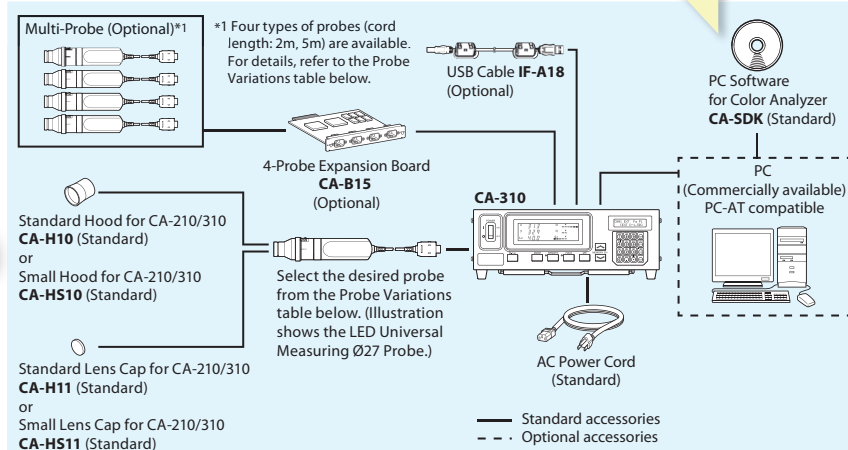Sample software Color

Sample software (Standard)	
Cal	CA-210 can be corrected in the matrix calibration method using Konica Minolta's spectroradiometer CS-1000A.
Color	The measurement data of CA-210 can be acquired into the PC. Drift tests, LCD stability test and so on can be performed easily. The acquired data can be read with Excel® or other spreadsheet software.
Contrast	Multi-point measurement (5, 9, or 25 points) can be made for white uniformity and contrast measurement.
Gamma	R, G, B, and W gamma measurements for gradations of 16, 32, 64, 128, and 256 steps.

Expandable up to 5 measuring probes. (Requires expansion board CA-B15)

Number of digits for luminance display increased, enabling display to 0.0001 cd/m².

System Diagram

Multi-Probe (Optional)*1

*1 Four types of probes (cord length: 2m, 5m) are available. For details, refer to the Probe Variations table below.

USB Cable **IF-A18** (Optional)

PC Software for Color Analyzer **CA-SDK** (Standard)

4-Probe Expansion Board **CA-B15** (Optional)

Standard Hood for CA-210/310 **CA-H10** (Standard)
or
Small Hood for CA-210/310 **CA-HS10** (Standard)

Select the desired probe from the Probe Variations table below. (Illustration shows the LED Universal Measuring Ø27 Probe.)

CA-310

PC (Commercially available) PC-AT compatible

Standard Lens Cap for CA-210/310 **CA-H11** (Standard)
or
Small Lens Cap for CA-210/310 **CA-HS11** (Standard)

AC Power Cord (Standard)

—— Standard accessories
— · — Optional accessories

Probe variations

This table is based on the most popular method for controlling emission intensity for each display type.
* Measurements of displays using certain control methods are not possible. For details of measurement compatibility, contact your nearest Konica Minolta representative.
  Examples for which measurement is not possible:
  • Displays which use PWM, etc. for control of emission intensity.
  • Displays with backlights which emit intermittently.
  • Displays which write black for each frame, etc.

○ Recommended

△ Measurement possible with restrictions, but probes marked with ○ are recommended

× Measurement not possible

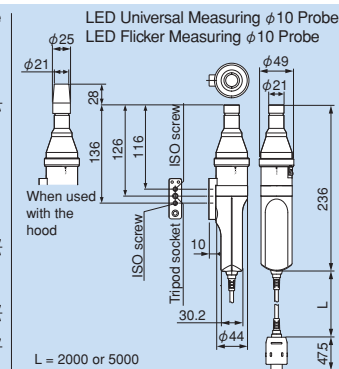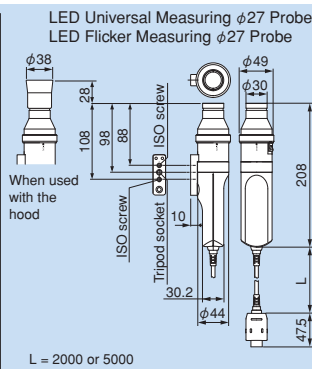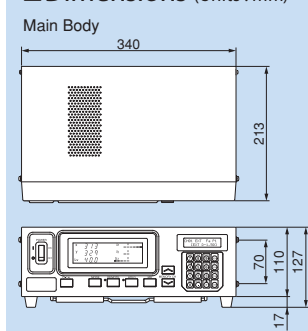|		CA-310 Probe			
		LED Universal Measuring Probe		LED Flicker Measuring Probe	
		Ø27 Probe CA-PU32 (2m) CA-PU35 (5m)	Ø10 Probe CA-PSU32 (2m) CA-PSU35 (5m)	Ø27 Probe CA-P32 (2m) CA-P35 (5m)	Ø10 Probe CA-PS32 (2m) CA-PS35 (5m)
Applicability for different display types					
Transmissive / semi-transmissive LCD	Active Matrix Driven	○	○	○*	○*
	Passive Matrix Driven	○	○	×	×
OLED	Active Matrix Driven	○	○	○*	○*
	Passive Matrix Driven	○	○	×	×
PDP		○	△	×	×
FED		○	○	×	×
Rear Screen Projector	LCD Active Matrix Driven	○	△	○*	△*
	LCD Passive Matrix Driven	○	△	×	×
	DLP	○	△	×	×
	CRT	○	△	×	×

(LED Flicker Measuring Probes are unsuitable for measurements of CRTs.)

Specifications

Model		CA-310 (LED Universal Measuring Ø27 Probe)		CA-310 (LED Universal Measuring Ø10 Probe)		CA-310 (LED Flicker Measuring Ø27 Probe)		CA-310 (LED Flicker Measuring Ø10 Probe)	
Receptor		Detector: Silicon photo cell							
Measurement area		Ø27 mm		Ø10 mm		Ø27 mm		Ø10 mm	
Acceptance angle		±2.5°		±5°		±2.5°		±5°	
Measurement distance		30±10 mm		30±5 mm		30±10 mm		30±5 mm	
Display range	Luminance	0.0001 to 1000 cd/m²		0.0001 to 3000 cd/m²		0.0001 to 1000 cd/m²		0.0001 to 3000 cd/m²	
	Chromaticity	Displayed in 4 or 3-digit value (Can be chosen)							
Luminance	Measurement range	0.0050 to 1000 cd/m²		0.0150 to 3000 cd/m²		0.0050 to 1000 cd/m²		0.0150 to 3000 cd/m²	
	Accuracy (for white)*1	0.0050 to 0.0999 cd/m²	±4%±0.0015 cd/m²	0.0150 to 0.2999 cd/m²	±4%±0.0045 cd/m²	0.0050 to 0.0999 cd/m²	±4%±0.0015 cd/m²	0.0150 to 0.2999 cd/m²	±4%±0.0045 cd/m²
		0.1000 to 9.999 cd/m²	±3%±0.0010 cd/m²	0.3000 to 29.99 cd/m²	±3%±0.0030 cd/m²	0.1000 to 9.999 cd/m²	±3%±0.0010 cd/m²	0.3000 to 29.99 cd/m²	±3%±0.0030 cd/m²
		10.00 to 1000 cd/m²	±2%±0.0010 cd/m²	30.00 to 3000 cd/m²	±2%±0.0030 cd/m²	10.00 to 1000 cd/m²	±2%±0.0010 cd/m²	30.00 to 3000 cd/m²	±2%±0.0030 cd/m²
	Repeatability(2σ) *1	0.0050 to 0.0999 cd/m²	1% + 0.0010 cd/m²	0.0150 to 0.2999 cd/m²	1% + 0.0030 cd/m²	0.0050 to 0.0999 cd/m²	1% + 0.0010 cd/m²	0.0150 to 0.2999 cd/m²	1% + 0.0030 cd/m²
		0.1000 to 0.9999 cd/m²	0.2% + 0.0010 cd/m²	0.3000 to 2.999 cd/m²	0.2% + 0.0030 cd/m²	0.1000 to 0.9999 cd/m²	0.2% + 0.0010 cd/m²	0.3000 to 2.999 cd/m²	0.2% + 0.0030 cd/m²
		1.000 to 1000 cd/m²	0.1%+0.0010 cd/m²	3.000 to 3000 cd/m²	0.1% + 0.0030 cd/m²	1.000 to 1000 cd/m²	0.1%+0.0010 cd/m²	3.000 to 3000 cd/m²	0.1% + 0.0030 cd/m²
Chromatcity	Measurement range	0.0500 to 1000 cd/m²		0.1500 to 3000 cd/m²		0.0500 to 1000 cd/m²		0.1500 to 3000 cd/m²	
	Accuracy *1 (temperature:23°±2°, relative humidity: (40±10)%))	0.0500 to 4.999 cd/m²	±0.005 for white	0.1500 to 14.99 cd/m²	±0.005 for white	0.0500 to 4.999 cd/m²	±0.005 for white	0.1500 to 14.99 cd/m²	±0.005 for white
		5.000 to 19.99 cd/m²	±0.004 for white	15.00 to 59.99 cd/m²	±0.004 for white	5.000 to 19.99 cd/m²	±0.004 for white	15.00 to 59.99 cd/m²	±0.004 for white
		20.00 to 1000 cd/m²	±0.003 for white	60.00 to 3000 cd/m²	±0.003 for white	20.00 to 1000 cd/m²	±0.003 for white	60.00 to 3000 cd/m²	±0.003 for white
		120 cd/m²	±0.002 for white	120 cd/m²	±0.002 for white	120 cd/m²	±0.002 for white	120 cd/m²	±0.002 for white
		(±0.004 for monochrome)*2		(±0.004 for monochrome)*2		(±0.004 for monochrome)*2		(±0.004 for monochrome)*2	
	Repeatability(2σ) *1	0.0500 to 0.0999 cd/m²	0.010	0.1500 to 0.2999 cd/m²	0.010	0.0500 to 0.0999 cd/m²	0.010	0.1500 to 0.2999 cd/m²	0.010
		0.1000 to 0.1999 cd/m²	0.004	0.3000 to 0.5999 cd/m²	0.004	0.1000 to 0.1999 cd/m²	0.004	0.3000 to 0.5999 cd/m²	0.004
		0.2000 to 0.4999 cd/m²	0.002	0.6000 to 1.499 cd/m²	0.002	0.2000 to 0.4999 cd/m²	0.002	0.6000 to 1.499 cd/m²	0.002
		0.5000 to 1000 cd/m²	0.001	1.500 to 3000 cd/m²	0.001	0.5000 to 1000 cd/m²	0.001	1.500 to 3000 cd/m²	0.001
Flicker Contrast method	Measurement range	-				5 cd/m² or higher		15 cd/m² or higher	
	Display range	-				0.0 ~ 999.9 %			
	Accuracy	-				±1 % (Flicker frequency: 30 Hz AC/DC 10% sine wave)			
						±2 % (Flicker frequency: 60 Hz AC/DC 10% sine wave)			
	Repeatability(2σ)	-				1 % (Flicker frequency: 20 to 65 Hz AC/DC 10% sine wave)			
Flicker JEITA method *3	Measurement range	-				5 cd/m² or higher		15 cd/m² or higher	
	Accuracy	-				±0.5 dB (Flicker frequency: 30 Hz AC/DC 4% (-40 dB) sine wave)			
						±1.0 dB (Flicker frequency: 30 Hz AC/DC 1.2% (-50 dB) sine wave)			
	Repeatability(2σ)	-				0.1 dB (Flicker frequency: 30 Hz AC/DC 4% (-40 dB) sine wave)			
						0.3 dB (Flicker frequency: 30 Hz AC/DC 1.2% (-50 dB) sine wave)			
Measurement speed*4	xyL_v	0.0050 to 0.0999 cd/m²	4(3.5) times/sec.	0.0150 to 0.2999 cd/m²	4(3.5) times/sec.	0.0050 to 0.0999 cd/m²	4(3.5) times/sec.	0.0150 to 0.2999 cd/m²	4(3.5) times/sec.
		0.1000 to 1.999 cd/m²	5(4.5) times/sec.	0.3000 to 5.999 cd/m²	5(4.5) times/sec.	0.1000 to 1.999 cd/m²	5(4.5) times/sec.	0.3000 to 5.999 cd/m²	5(4.5) times/sec.
		2.000 to 1000 cd/m²	20(17) times/sec.	6.000 to 3000 cd/m²	20(17) times/sec.	2.000 to 1000 cd/m²	20(17) times/sec.	6.000 to 3000 cd/m²	20(17) times/sec.
	Flicker Contrast	-				16(16) times/sec.			
	Flicker JEITA *3	-				0.5 (0.3)times/sec. *5			
Display	Digital	xyL_v, TΔuvL_v, RGB analyze, XYZ, u'v'L_v				xyL_v, TΔuvL_v, RGB analyze, XYZ, u'v'L_v, Flicker (Contrast method) *3			
	Analog	Δx Δy ΔL_v, R/G B/G ΔG, ΔR B/R G/R				Δx Δy ΔL_v, R/G B/G ΔG, ΔR B/R G/R, Flicker (Contrast method) *3			
	LCD	16 characters by 2 lines (with backlight)							
SYNC mode		NTSC, PAL, EXT, UNIV, INT							
Object under measurement		Vertical synchronization frequency: 40 to 200 Hz				Vertical synchronization frequency: 40 to 200 Hz (Luminance or chromaticity measurement), 40 to 130 Hz (Flicker measurement)			
Memory channel		100 channels							
Analyzer function		Standard function							
Interface		USB; RS-232C (38,400 bps or below)							
Multi-point Measurement		Max. 5 points (Use 4-Probe Expansion Board CA-B15)							
Operation temperature/humidity range		Temperature: 10 to 28°C; relative humidity 70% or less with no condensation Luminance change: ±2% of reading for white Chromaticity change ±0.002 for white, ±0.006 for monochrome from reading of Konica Minolta's standard LCD *1, 120 cd/m², with 23°C 40%							
Storage temperature/humidity range		0 to 28°C: relative humidity 70% or less with no condensation 28 to 40°C: relative humidity 40% or less with no condensation							
Input voltage range		100-240V∿, 50-60 Hz, 50 VA							
Size/weight	Main body	340(W)×127(H)×216(D) mm/3.58 kg							
	Probe	Ø49×208 mm / 530 g		Ø49×236 mm / 550 g		Ø49×208 mm / 530 g		Ø49×236 mm / 550 g	

*1 The chromaticity and luminance are measured under Konica Minolta's condition (standard LCD(6500K, 9300K) is used). *2 The luminance for monochrome is measured when the reading of luminance for white is 120 cd/m² .
*3 Measurement of flicker (JEITA method) is supported by SDK software. *4 Measuring probe connected to probe connector P1 only, used USB(used RS-232C Baud rate: 38400 bps) *5 Measured by Konica Minolta's PC (P3-600 MHz)

■Dimensions (Units : mm)

Main Body

LED Universal Measuring φ27 Probe
LED Flicker Measuring φ27 Probe

LED Universal Measuring φ10 Probe
LED Flicker Measuring φ10 Probe

L = 2000 or 5000

- Select the desired type of LED Universal Measuring type probe or LED Flicker Measuring type probe.
- Contains mercury in the backlighting of LCD used for display. Dispose of according to local, state or federal laws.
- KONICA MINOLTA and the Konica Minolta logo and the symbol mark, and "Giving Shape to Ideas" are registered trademarks or trademarks of KONICA MINOLTA, INC.
- Screens shown are for illustration purpose only.
- The specifications and appearance shown herein are subject to change without notice.
- Some lamp control methods may make accurate measurements difficult. For details, please contact your nearest Konica Minolta sales office or dealer.

SAFETY PRECAUTIONS

For correct use and for your safety, be sure to read the instruction manual before using the instrument.
- Always connect the instrument to the specified power supply voltage. Improper connection may cause a fire or electric shock.

Certificate No : LRQ 0960094/A
Registration Date : March 3, 1995

Certificate No : JQA-E-80027
Registration Date : March 12, 1997