COLOR READER

CR-10

OPERATION MANUAL

KONICA MINOLTA

Safety Symbols

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

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

🚫 Denotes a prohibited operation. The operation must never been performed.

❗ Denotes an instruction. The instruction must be strictly adhered to.

🔌 Denotes an instruction. Disconnect the AC power cord from the AC outlet.

🚫 Denotes a prohibited operation. The part must never be disassembled.

⚠ SAFETY PRECAUTIONS

• To ensure correct use of this Color Reader, read the following points carefully and adhere to them. After you have read this manual, keep it in a safe place where it can be referred to anytime a question arises.

	⚠ **WARING**
	(Failure to adhere to the following points may result in death or serious injury.)
⊘	Do not use the CR-10 in places where flammable or combustible gases (gasoline etc.) are present. Doing so may cause a fire.
❶	Always use the AC adapter supplied as a standard accessory or optional AC adapter with the CR-10, and connect it to an AC outlet (100 to 240 Vac, 50/60Hz). Failure to do so may damage the AC adapter, causing a fire or electric shock.
⬸	If the CR-10 will not be used for a long time, disconnect the AC adapter from the AC outlet. Accumulated dirt or water on the prongs of the AC adapter's plug may cause a fire and should be removed.
⊘	Do not insert or disconnect the AC adapter with wet hands. Doing so may cause electric shock.
⊗	Do not disassemble or modify the AC adapter. Doing so may cause a fire orelectric shock.
⊘	The CR-10 should not be operated if it is damaged, or smoke or odd smells occur. Doing so may result in a fire. In such situations, turn the power OFF immediately, disconnect the AC adapter from the AC outlet, and contact the nearest authorized service facility.
⊗	Do not disassemble or modify the CR-10. Doing so may cause a fire or electric shock.
⊘	Take special care not to allow liquid or metal objects to enter the CR-10. Doing so may cause a fire or electric shock. Should liquid or metal objects enter the CR-10, turn the power OFF immediately, disconnect the AC adapter from the AC outlet, and contact the nearest authorized service facility.
⊘	Do not dispose of batteries in fire, short their terminals, apply heat to them, or dissemble them. Also, do not recharge them. Doing so may cause explosion or heat generation, resulting in fire or injury.

	⚠ CAUTION
	(Failing to adhere to the following points may result in injury or damage to the CR-10 or other property.)
⊘	Do not perform measuerement with the measurement aperture directed towards your face. Doing so may cause damage to your eyes.
⊘	Do not place the CR-10 on an unstable or sloping surface. Doing so may result in its dropping or overturning, causing injury. Take care not to drop the CR-10 when carrying it.
⊘	Do not use batteries other than those specified . Also, do not mix new and old batteries, or mix batteries of different types. When installing batteries in the instrument, make sure that they are correctly oriented according to the (+) and (-) marks. Failure to adhere to these instructions may cause explosion of the batteries or leakage of electrolyte, resulting in fire, injury or air pollution.

Color Reader CR-10 is an extremely compact, extremely easy-to-use tristimulus colorimeter specifically designed for measuring the color difference between two colors. Measurements are performed by simply switching the instrument on, measuring one color (the target color), and then measuring the other color. Successive measurements can then be taken using the same target color or a different target color can be measured. Measurement results can be displayed in terms of $\Delta(L^*a^*b^*)/\Delta E^*ab$ or $\Delta(L^*C^*H^*)/\Delta E^*ab$. The Color Reader can be easily operated with one hand and is battery powered for complete portability.

Please read and study this manual before using the Color Reader for the first time and keep this manual handy for future reference.
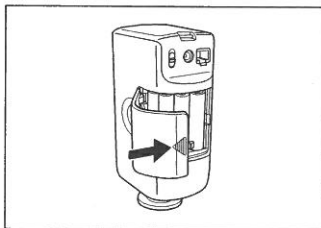
CONTENTS

TAKING MEASUREMENTS IMMEDIATELY

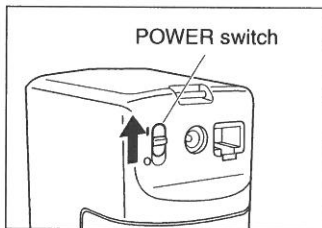To measure the color difference between two specimens, follow the steps below.

- For more information, refer to the corresponding section of this manual.
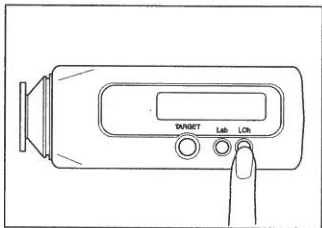
1 Install four AA-size batteries.
   - Check that the polarities are as shown in the battery chamber.
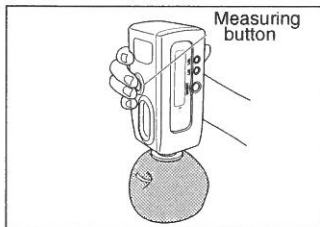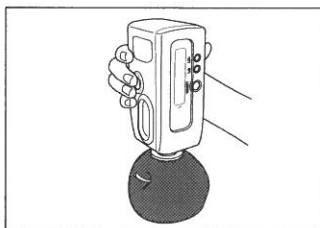

2 Switch on the instrument.

POWER switch

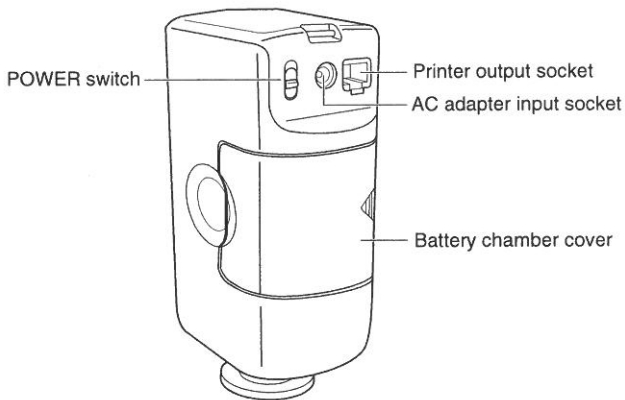3 Press **Lab** or **LCh** to select how color difference will be displayed.
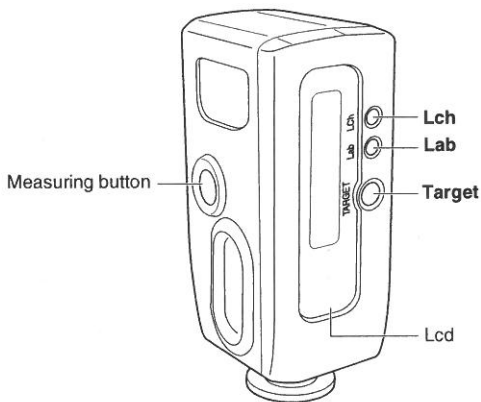
4 Place the tip of the Color Reader flat against one of the specimens and press the measuring button.

Measuring button

5 Place the tip of the Color Reader flat against the other specimen and press the measuring button.

NAMES OF PARTS

Measuring button

Lch
Lab
Target

Lcd

POWER switch

Printer output socket
AC adapter input socket

Battery chamber cover

FUNCTIONS OF CONTROLS

|	
POWER switch	Switches power on (I) and off (O).
TARGET	Deletes presently set target color and changes to display for measuring new target color.
Lab	Sets Color Reader to display target color in terms of L*a*b* and color difference in terms of ΔL^*, Δa^*, Δb^*, and ΔE^*ab.
LCh	Sets Color Reader to display target color in terms of L*C*h and color difference in terms of ΔL^*, ΔC^*, ΔH^*, and ΔE^*ab.
Measuring button	Takes measurement.
LCD	Displays measurement results, etc.
Battery chamber cover	Covers battery chamber which holds four AA-size batteries.
AC adapter input socket	Used for connecting AC adapter to supply power from an AC socket. Use only AC Adapter AC-A308
Printer output socket	Used for connecting a printer to print out data.

POWER

The Color Reader can be powered by either four AA-size batteries or optional AC Adapter AC-A308

Installing Batteries

- When installing or removing batteries, be sure the POWER switch of Color Reader is set to O (off).
- Do not mix battery types or ages. Mixing battery types or ages could result in battery leakage, reduced battery life, or damage to the Color Reader.
- Do not touch or short the battery terminals inside the battery chamber. Doing so may damage the Color Reader.
- The use of alkaline-manganese batteries is recommended.

1 Check that the POWER switch is set to O (off) and slide the battery chamber cover in the direction of the arrow while gently pressing it in.

Battery chamber cover
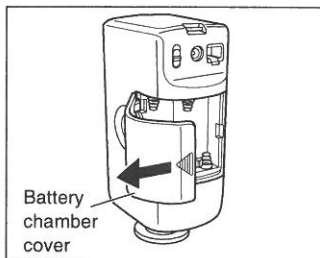
2 Install four AA-size batteries in the battery chamber with the polarities as shown inside the chamber.
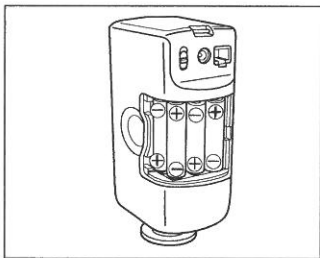
3 Close the battery chamber cover.
  • Be sure that both tabs on the battery chamber cover catch.

tab
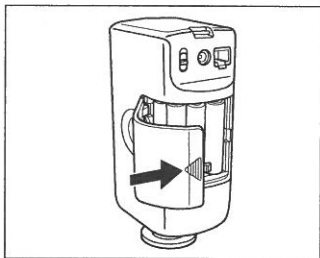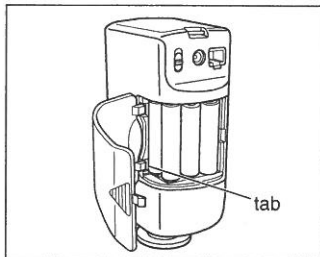
Using AC Adapter

- Use only AC Adapter AC-A308 (available as an optional accessory). Use of other AC adapters may damage the Color Reader.
- When connecting or disconnecting the AC adapter, be sure that the POWER switch of the Color Reader is set to O (off).

1 Check that the POWER switch of the Color Reader is set to O (off) and insert the output plug of the AC adapter into the AC adapter input socket of the Color Reader.

AC adapter input socket

output plug
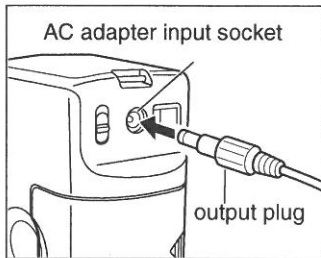
2 Insert the input plug of the AC adapter into an AC wall outlet.

DISPLAYS

Target Color Measurement Display

```
Target      L
a           b
```

The target color can be measured in this display. This automatically appears when the Color Reader is first switched on. To enter this display later to measure another target color, press **TARGET**.

Target Color Display

```
Target      L  65.7
a+  7.3     b+13.2
```

This display shows the numerical values for the measured color, and is shown immediately after the target color is measured. When this display is shown, the Color Reader is ready to measure color difference. If a mistake was made in measuring the target color, press **TARGET** to return to the target color measurement display.

Measurement Display

```
dE    1.7  dL-  1.1
da+  0.6   db+  1.0
```

This display shows the measurement results (the color difference between the target color and the other measured color). Additional measurements can be taken to determine the color difference between the target color and other colors without having to remeasure the target color.

TAKING MEASUREMENTS

The Color Reader measures the color difference between two colors. In order to do this, one of the two colors is measured first and stored in memory; in this manual, this color is referred to as the target color. The other color is then measured, and the color diffrence between the two is calculated and displayed.

1 Set the POWER switch of the Color Reader to I (on). The target color measurement display will appear.

POWER switch

```
Target    L
a         b
```
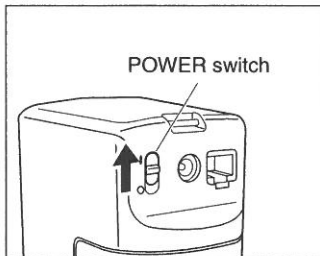
2 Select the desired color space by pressing either **Lab** (for L*a*b* color space) or **LCh** (for L*C*h color space). The display will change as shown below.
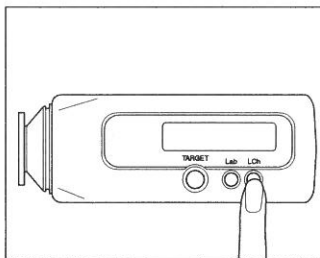

When **Lab** is pressed:

```
Target    L
a         b
```

When **LCh** is pressed:

```
Target    L
C         h
```

3 Place the tip of the Color Reader flat against the color chosen as the target color and press the measuring button. When measurement of the target color has been completed, a beep will sound and the display will change to the target color display, showing the results for the target color measurement.

Measuring button
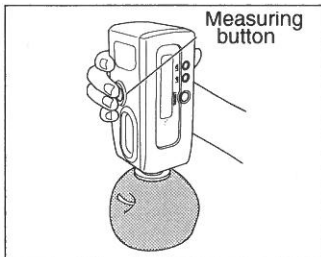
```
Target    L 65. 7
a+  7. 3  b+13. 2
```

• If a mistake was made in measuring the target color, press **TARGET** to return to the target color measurement display and repeat the above procedure from step 2.

4 Place the tip of the Color Reader flat against the color to be compared to the target color and press the measuring button.
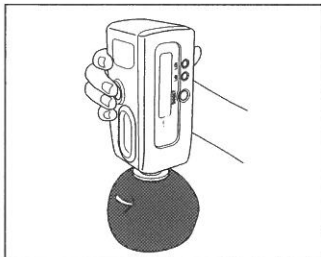
- When measurement has been completed, a beep will sound and the measurement results (the color difference from the target color) will appear in the display.
- The color space in which the results are displayed can be changed after measurement by pressing **Lab** (for L*a*b* color space) or **LCh** (for L*C*h color space).

When **Lab** is pressed:

```
d E    1. 7   d L −  1. 1
d a +  0. 6   d b +  1. 0
```

When **LCh** is pressed:

```
d E    1. 7   d L −  1. 1
d C +  1. 2   d H +  0. 5 Y
```

- The numerical value for dH (ΔH*) in the display when L*C*h color space has been selected by pressing **LCh** is followed by a letter which indicates the direction in which the measured color is shifted from the target color:

    R: Red   B: Blue   Y: Yellow
    P: Purple G: Green

However, if the chromaticity of the target color or the measured color is low, no letter will be displayed.
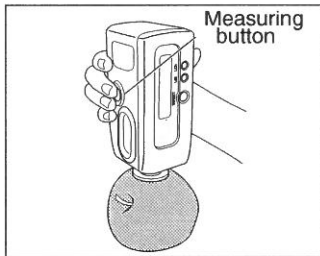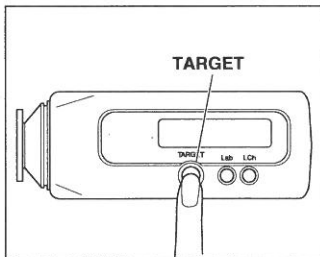
5 To take additional mea-
surements using the
same target color, repeat
step 4.

```
d E    1 . 5   d L —   0 . 9
d a +  0 . 4   d b +   0 . 8
```
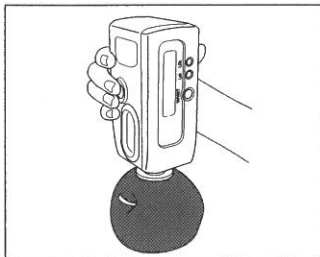
- To take measurements
using a different target
color, press **TARGET**
(the display will change
to the target color mea-
surement display) and
repeat the above pro-
cedure from step 2.

TARGET

```
T a r g e t     L
a               b
```

Measuring
button

PRINTING MEASUREMENT DATA

By connecting a printer to the Color Reader, target color data and measurement data can be printed out at the time of measurement.

Suitable Printers

Printers which have the following specifications can be used with the Color Reader:

Number of printed columns:	At least 27
Data input:	RS-232C standard
Data control:	BUSY
Baud rate:	9600
Character length:	7 bits
Parity:	Even
Number of stop bits:	2 bits
Basic operating codes:	Carriage return CR (0D hexadecimal)

Connections

When connecting a printer, the connections between the Color Reader and the printer should be as follows:

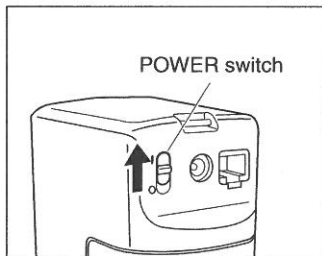| Color Reader		Printer	
Signal	Pin number	Pin number	Signal
TXD	3	3	DATA
GND	5	5	GND
CTS	8	8	BUSY
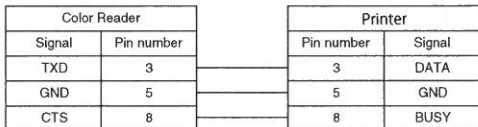
- The connections of Printer Cable CR-A75 (available as an optional accessory) correspond to the above diagram.
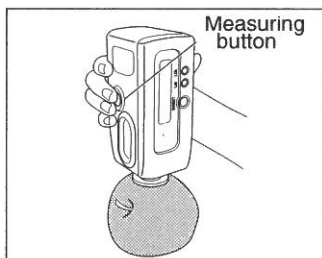
Procedure

- When connecting or disconnecting the Color Reader and the printer, be sure that both units are switched off.
- Always switch on the Color Reader before switching on the printer.

1 Check that the POWER switch of the Color Reader is set to O (off) and that the printer is switched off, and connect the Color Reader to the printer.
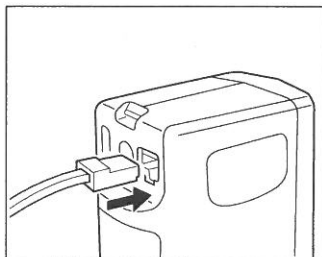

POWER switch

2 Set the POWER switch of the Color Reader to I (on) and then switch on the printer.

Measuring button

3 Measure target color and take measurements according to the procedure on p.15.
  - The measured data will be printed out each time a measurement is taken.

ERROR MESSAGES

- If any of the following messages continue to be displayed after the suggested corrective action has been taken, contact the nearest authorized service facility.

Error message	Cause	Corrective action
Measure Again	Measurement was not taken correctly (Color Reader was moved during measurement, ambient light entered measurement aperture, etc.)	Take measurement again, being sure tip of Color Reader is flat against the specimen and that the Color Reader is not moved until the beep indicating completion of measurement has sounded.
Sample Too Dark	Reflectance of specimen is low ($L^*<10$).	Specimens with low reflectance ($L^*<10$) cannot be measured.
Change Battery	Battery power is almost exhausted.	Replace batteries or use optional AC adapter.
Illumination Error	Lamp filament is broken or measurement circuit is malfunctioning.	Replace batteries or Contact the nearest authorized service facility.

CAUTION

- The Color Reader should be used at temperatures between 0 and 40°C (32 and 104°F). Do not use the Color Reader at temperatures outside this range. Also, do not subject the Color Reader to sudden changes in temperature.
- Do not leave the Color Reader in direct sunlight or near sources of heat, such as stoves, etc. The internal temperature of the Color Reader may become much higher than the ambient temperature in such cases.
- Do not use the Color Reader in extremely dusty areas or in areas filled with smoke or chemical fumes.
- Do not use the Color Reader near equipment which produces a strong magnetic field(such as speakers, large motors, etc.).
- When the Color Reader is not in use, be sure to set the POWER switch to O (off) and cover the measurement aperture with the protective cap.
- Use only optional AC Adapter AC-A308 to supply power to the Color Reader from an AC outlet. Use the AC Adapter AC-A308 only with the rated power source.
- Do not subject the Color Reader to strong impact or vibration.

CARE AND STORAGE

- If the Color Reader becomes dirty, it can be cleaned by wiping with a soft, dry cloth. Do not use benzene, paint thinner, or other chemicals to clean the Color Reader.
- The Color Reader should be stored at temperatures between -20 and 40°C (-4 and 104°F). Do not store the Color Reader in areas subject to high temperatures, high humidity, or where condensation may occur.
- Do not leave or store the Color Reader in direct sunlight, inside a closed motor vehicle, in the trunk of a motor vehicle, or in any other area subject to extremely high temperatures.
- Do not store the Color Reader in extremely dusty areas or in areas filled with smoke or chemical fumes.
- If the Color Reader will not be used for more than two weeks, remove the batteries to avoid the possibility of damage due to battery leakage or corrosion.
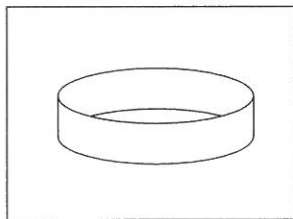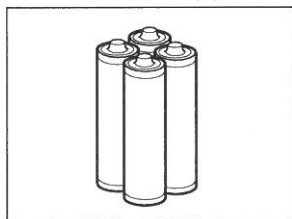
ACCESSORIES

Standard Accessories

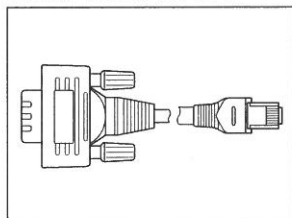Soft Case CR-A68

Wrist Strap CR-A73
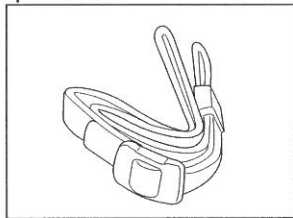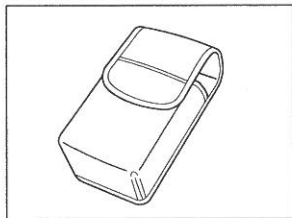
AA-size batteries (4)

Protective Cap CR-A72

Optional Accessories

Printer Cable CR-A75

AC Adapter AC-A308
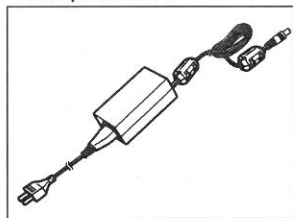
SPECIFICATIONS

Model	CR-10
Illuminating/viewing geometry	8° :di(8° illumination angle/diffuse viewing)
Measuring area	Approximately Ø8mm
Light source	Gas-filled tungsten lamp
Detector	6 silicon photocells
Display modes	Δ(L*a*b*)/ΔE*ab; Δ(L*C*H*)/ΔE*ab
Target color memory	1 channel; set by measurement
Measuring range	L*: 10 to 100
Measurement conditions	Observer: CIE 10° Standard Observer Illuminant: CIE Standard Illuminant D65

Repeatability	Standard deviation within ΔE*ab 0.1
	  (Measurement conditions:
	    Average of measurements of standard white plate)

Minimum interval between measurements	Approx. 1 sec
Power source	Four AA-size batteries or optional AC Adapter AC-A308
Battery life	Alkaline-manganese: Approx. 2000 measurements at 10-sec. intervals
Display	16-character x 2-row dot-matrix LCD
Dimensions (W x H x D)	59 x 158 x 85mm (2-5/16 x 6-1/4 x 3-3/8 in.)
Weight	360g (12.7 oz.) not including batteries
Operating environment conditions	Temperature: 0 to 40°C(32 to 104°F) (less than 85% relative humidity, no condensation) Maximum altitude: 2000m Installation category: I Pollution degree: II
Storage temperature	-20 to 40°C (-4 to 104°F)
Standard accessories	Soft Case CR-A68; Protective Cap CR-A72; Wrist Strap CR-A73; AA-size batteries (4)
Optional accessories	AC-Adapter AC-A308; Printer Cable CR-A75

- Specifications subject to change without notice.

KONICA MINOLTA