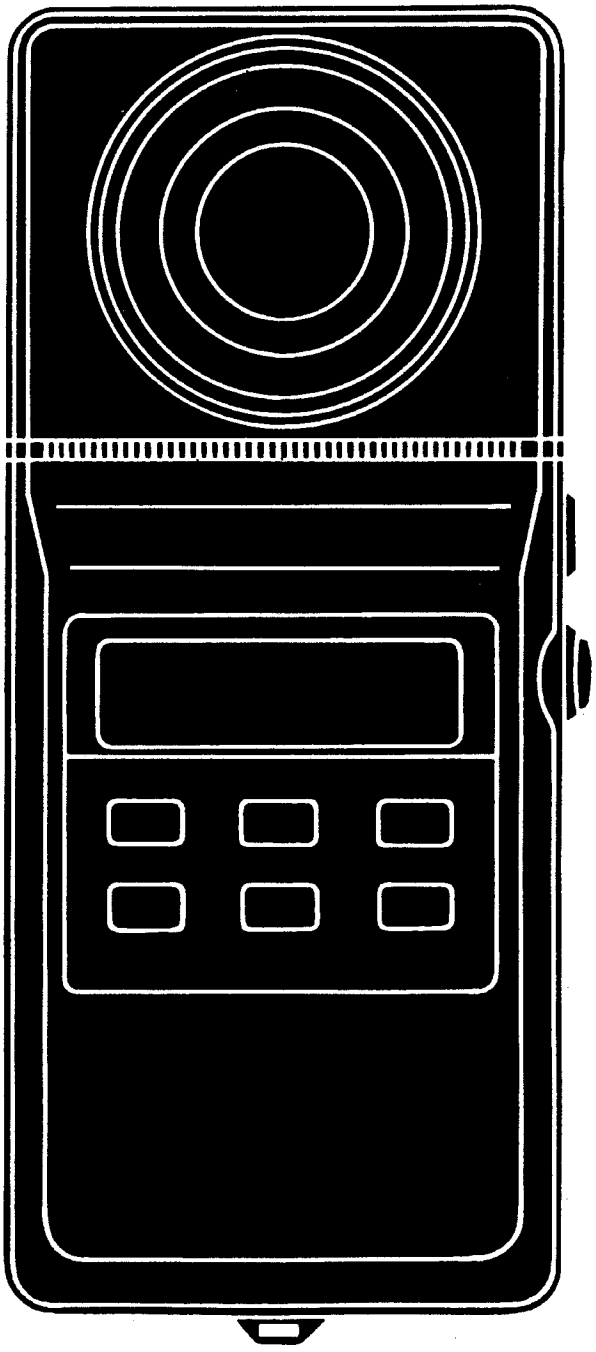
MINOLTA

CHROMA METER
xy-1

INSTRUCTION MANUAL E

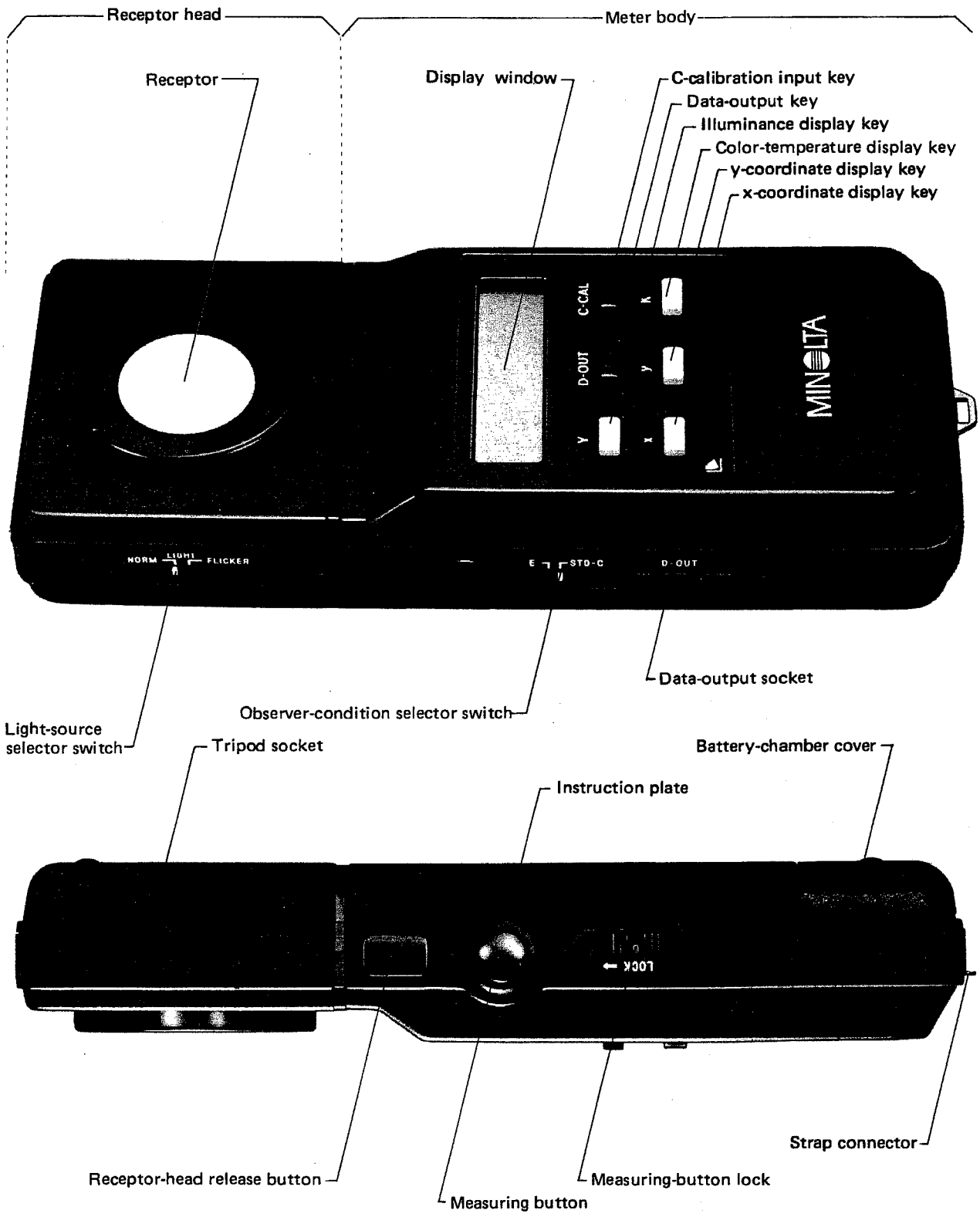


The Minolta Chroma Meter xy-1 is the lightest and most compact tristimulus color analyzer ever produced. It utilizes three high-sensitivity silicon photo cells which are filtered to match CIE (Commission International de l'Eclairage) Standard Observer response. By simply pressing a button, these cells make simultaneous readings of light source or subject color through an integrating diffuser. Chromaticity coordinates (x,y) and illuminance (Y) as well as color temperature in Kelvin (K) are calculated by the meter's microprocessor. Measurements are indicated digitally on a custom-designed liquid-crystal display by pressing appropriate keys below the readout window. Readings can also be transfered to a separate data processor through an output jack by means of a connecting cord included with the unit. Power is provided by a single nine-volt battery which is sufficient for more than 30,000 separate readings or over 24 hours of continuous monitoring. As measurements require only 1-1/2 seconds, the Chroma Meter xy-1 is ideally suited for high-volume applications in both production and laboratory use.

Before using the Minolta chroma Meter xy-1 for the first time, please read this manual carefully while installing the battery and handling and acquainting yourself with its attachments and features. In this way, you can obtain accurate results right from the start.

CONTENTS

NAMES OF PARTS



BATTERY

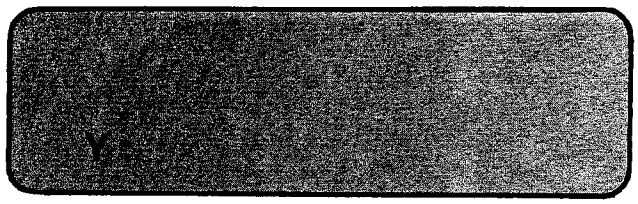
Installing the battery

The Minolta Chroma Meter xy-1 is powered by a single 9-volt "transistor-type" battery, Eveready 216 or equivalent.

To install the battery:

1. Remove the battery-chamber cover by pressing down on it and sliding it in the direction of the arrow.
2. Insert the bottom of the battery into the chamber first, making sure the terminals are positioned as illustrated inside the chamber.
3. Replace the cover by carefully realigning and sliding it towards the meter body until it snaps securely into place.

After the battery has been installed, all display indications will appear. After a few seconds all indications will disappear except for the letter "Y".



NOTE

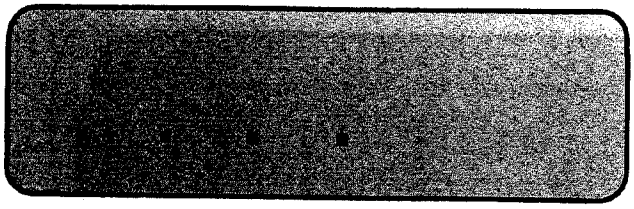
If the display becomes blank or letters other than "Y" are displayed, remove the battery and wait at least ten seconds before reinstalling it. If the battery is installed before ten seconds, the figures displayed will be incorrect, and measurements cannot be made.

Power consumption

Because the Chroma Meter's power consumption in non-measuring mode is minimal, a power switch is unnecessary. Instead, the meter employs an automatic cancelling feature that clears the display approximately four minutes after a measurement has been taken.

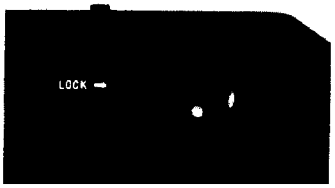
The meter's low power consumption permits a fresh battery under normal conditions to yield more than 30,000 three-second measurements, or continuous measurement for 24 or more hours.

When the battery's power level drops below minimum requirements, the display figures will be replaced by three decimal points as shown below. If the battery is totally exhausted, the display window will be blank.



NOTE

- If the meter is not to be used for two weeks or longer, it is recommendable to remove the battery and store it in a cool place.
- To avoid accidentally pressing the measuring button and draining the battery, use the measuring-button lock.



DISPLAY WINDOW

Over- and under-range warnings

If either the color temperature or illuminance level of the light being measured exceeds the meter's range, the display will blink on and off as a warning.

The meter's color-temperature range is from 1600 to 40,000K. Depending on whether the color-temperature goes below or above this range, either the 1600 or 40,000K figure will appear and begin to blink. Even if this happens, the x and y color coordinates and illuminance (Y) can still be obtained.

For all practical purposes, there is no over-range illuminance level; only low-light levels will affect the meter. If the light level drops below approx. 10 lx., the meter's display will begin to blink on and off as a warning that the light level is too low to measure.

NOTE

- In light levels below approx. 100 lx. the meter's display will take longer than normal to appear, and be fractionated until it has stabilized. In this case, be sure to hold the measuring button in until the display fully appears and stabilizes.
- To stop the display from blinking, increase the level of illumination and/or adjust the measuring set up and take another reading that is within the meter's range.

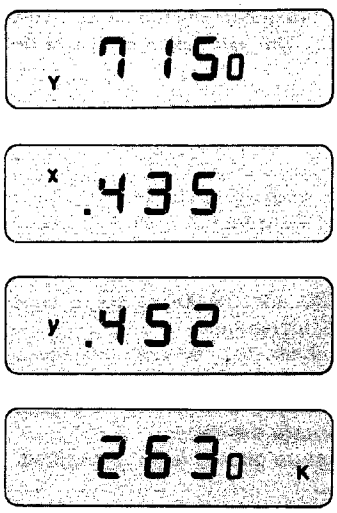
›ASIC OPERATION

Although the precise method for measuring light source ır subject color will differ, the basic operation of the Chroma Meter is the same for any subject. Following the steps below will enable you to obtain illuminance, color coordinates, and olor temperature of a subject.

. Install the battery. All indications will be displayed for a few seconds and disappear leaving only the figure "Y" in the display window.

:. Press the measuring button until a display appears. Release the button to input and hold the reading.
- If only decimal points are displayed, replace the battery with a fresh one and take another reading.
- If the display blinks on and off in "x", "y", or "Y" modes, increase the level of illuminance.
- If the display blinks on and off in the "K" mode, the color temperature of the subject exceeds the meter's range. Chromaticity readings can still be obtained by pressing the "x", "y", and "Y" keys.

:. Press the display keys to obtain illuminance (Y), chromaticity coordinates (x, y), and color temperature (K).



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› Pressing either the "x" or "y" key before the measurement is made will automatically display that respective color coordinate data after the measuring button is released.

› The meter's display will take longer to stabilize in low illuminance levels or when reading subjects such as sharp cut filters which have sharply defined absorption characteristics.

MEASURING LIGHT-SOURCE COLOR

1. Set the light-source selector to either "NORM" for reading continuous light sources such as incandescent lamps, "FLICKER" for noncontinuous sources such as fluorescent lamps, TV screens, etc.
2. Slide the observer-condition selector switch to "E".
3. Position the meter's receptor directly under the light source and press and hold the measuring button until a display appears and stabilizes. Release the button to input and hold the reading.
4. Press the "x" and "y" keys to display the effective chromaticity coordinates of the light source. The displayed data is computed from the following equations:

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

Pressing the "Y" key will display illuminance. The color temperature of the source (Z/X_2) can be displayed by pressing the "K" key.

MEASURING COLOR TEMPERATURE

After taking a measurement of a light source, press the "K" key to display the color temperature in Kelvins. However, as color temperature only represents the relative spectral energy distribution of full radiators (i.e., black bodies), the Kelvin data displayed for measurements of all other sources should be regarded as approximations only.

Fig. 1. illustrates that color temperature data displayed by the Chroma Meter is equal to the point at which a line draw from y=1.0, x=0.0 through the indicated chromaticity point intersects the black body locus line. If the chromaticity point is not on the black body locus line, the indicated color temperature will be different from the actual correlated color temperature.

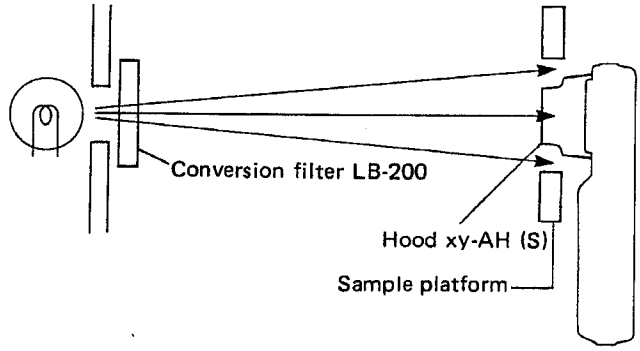
In this case, plot the chromaticity on Fig. 2. and read the correlated color temperature from the isotemperature line closest to the coordinate point.

MEASURING TRANSPARENT SUBJECT COLOR

Calibrating the meter for measuring chromaticity

Under Illuminant C

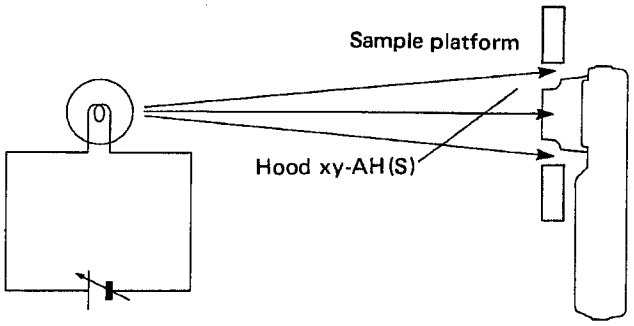
1. Attach the color conversion filter LB-200 and the short hood xy-AH(S) over the meter's light receptor.
2. Place the meter in the prepared measuring set up so that the light receptor is in the direct path of the light source.



3. Push the "K" key.
4. Slide the observer-condition selector switch to "E".
5. Press and hold the measuring button until a display appears and stabilizes. Release the button to input and hold the reading. For greatest accuracy the displayed color temperature should be between 6000° and 7500°K.
6. While pressing the "C-CAL" key, slide the observer-condition selector switch from "E" to "STD-C" (Luther condition). The chromaticity coordinates of the light source will then be memorized as Illuminant C conditions i.e., x = .310, y = .316, at 6774K and displayed as "x" = .310, "y" = .315.

Under Illuminant A

1. Attach the short hood xy-AH(S) over the meter's light receptor. (Do not attach the color conversion filter.)
2. Place the meter in the prepared measuring set up so that the light receptor is in the direct path of the light source.



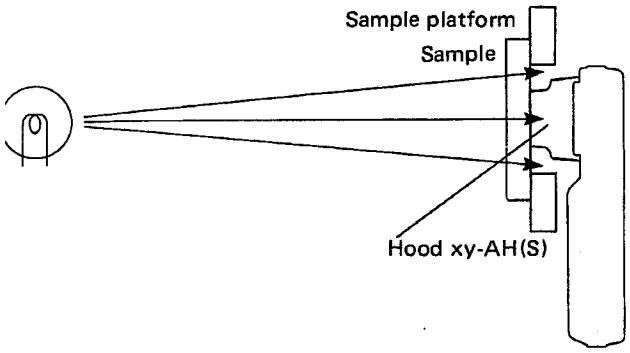
3. Press the "K" key.
4. Slide the observer-condition selector switch to "E".
5. Press and hold the measuring button until a display appears and stabilizes. If the color temperature is not 2850K, adjust the lamp voltage to obtain a reading of 2850K.

NOTE

- Due to the resolution limits of the meter's microprocessor, the y chromaticity coordinate will be displayed as "y" = .315 when the meter is set for Illuminar conditions.
- Between 4,000 and 10,000K, color temperature is displayed in 50K increments.
- It recommended to recheck the color temperatur periodically to assure proper readings. If the col temperature reading is different from that of the original setting, recalibrate the meter.
- Color temperature display is not calibrated.

Measuring effective subject color under actual viewing conditions

1. Attach the short hood xy-AH(S) over the meter's light receptor.
2. Slide the observation-condition selector switch to the appropriate position.
3. Place the meter in the prepared measuring set up with the sample between the light source and the light receptor.
4. Then press the measuring button until a display appears and stabilizes. Release the button to input the reading and hold the display.
5. Press the "x" and "y" display keys to obtain the effective color of the sample.



Obtaining the percentage of light transmitted through a subject

1. Attach the short hood xy-AH(S) over the meter's light receptor.
2. Press the "Y" key.
3. Place the meter in the prepared measuring set up so that the light receptor is in the direct path of the light source.
4. Press and hold the measuring button until a display appears and stabilizes. Enter the reading in the " Y_{OT} " position in the equation below.
5. Position the subject between the light source and the light receptor in the measuring set up and take a second reading. Enter the reading in the " Y_{ST} " position in the equation below.

Using the equation below, find the percentage of light transmitted through the subject.

$$Y \text{ (light transmission)} = \frac{Y_{ST} \text{ (subject transmission)}}{Y_{OT} \text{ (light source reading)}} \times 100\%$$

EXAMPLE:

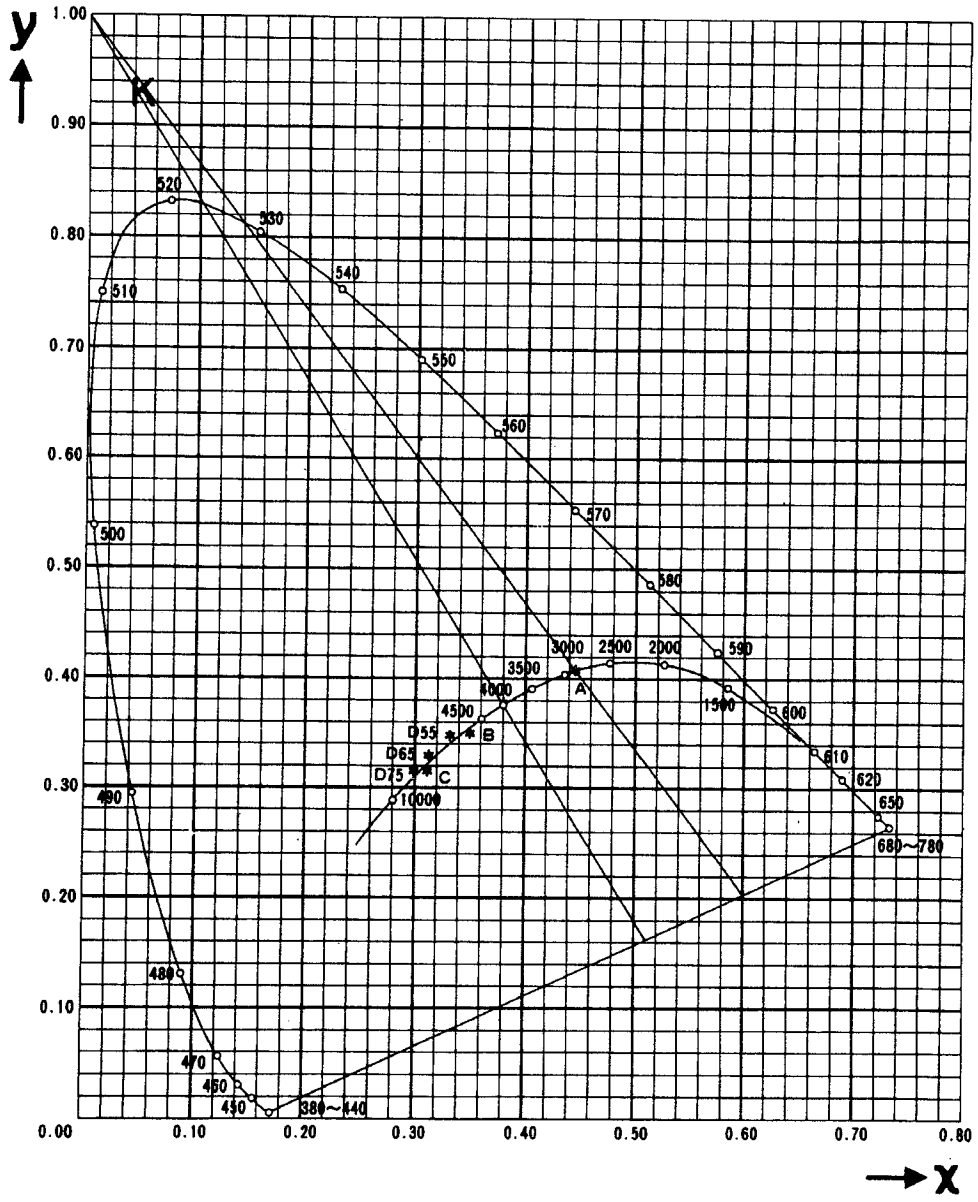
$$Y = \frac{Y_{ST}\ 200}{Y_{OT}\ 350} \times 100\%$$

$$Y = 57.1\%$$

NOTE

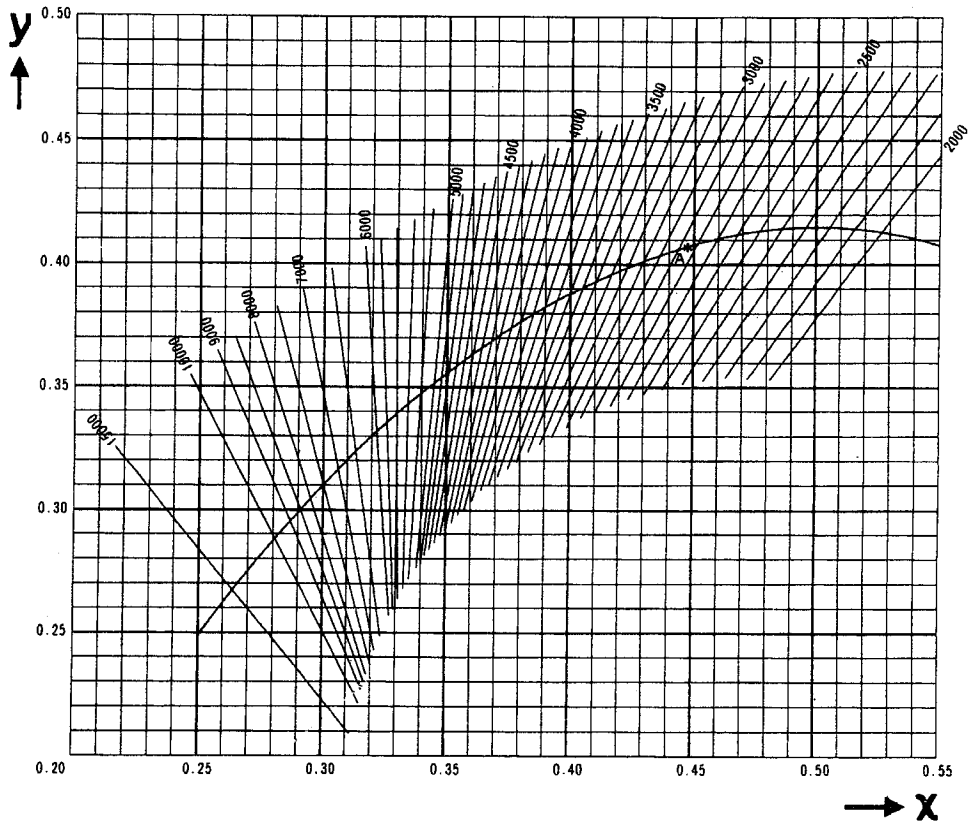
When measuring transparent subjects such as sharp cut filters which have sharply defined absorption characteristics, press the measuring button to start the reading cycle before inserting the sample into the measuring set up. Then after a display appears, position the sample between the receptor and light source. Release the measuring button when the display stabilizes. This method reduces the long measuring times required to stabilize the display when this type of material is measured normally.

Fig. 1



CIE 1931 (x,y) chromaticity diagram with the black-body locus.

Fig. 2



Portion of the CIE 1931 (x,y) chromaticity diagram with the black-body locus and isotemperature lines.

MEASURING CHROMATICITY DIFFERENCE

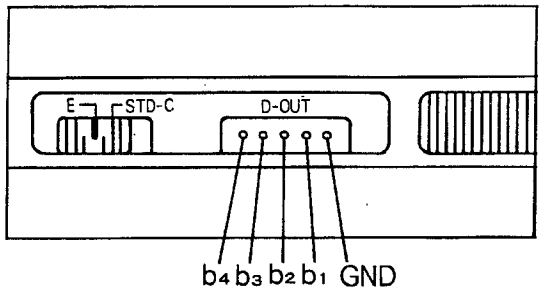
The Minolta Chroma Meter xy-1 can also be used to memorize a specific color (chromaticity coordinates) in order to detect the degree of color deviation between samples or color changes at different points in a particular sample.

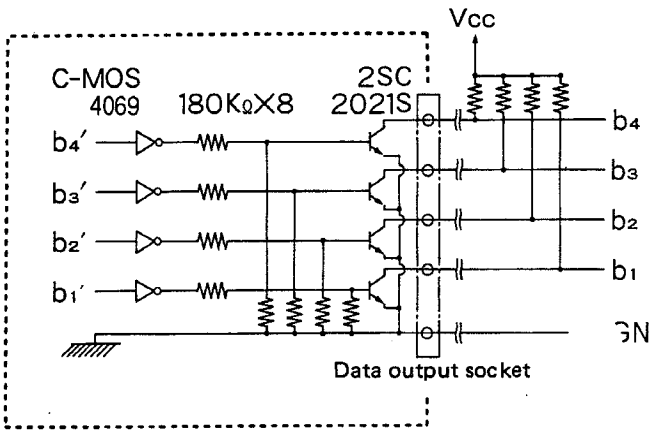
To calibrate the meter:

1. With the observer-condition selector at "E", place the meter in the prepared measuring set switch up so that the light receptor receives only color information from the sample. If necessary use one of the accessory hoods.
2. Press and hold the measuring button until a reading appears. Release the button to hold the reading.
3. Press the "C-CAL" key and at the same time slide the observer-condition selector switch from "E" to "STD-C". The chromaticity coordinates of the sample will then be memorized and indicated as "x" = .310, and "y" = .315. Changes in these display readings in subsequent measurements of other samples will indicate a deviation from the standard input to the meter.

DATA-OUTPUT SOCKET

The Chroma Meter's data-output socket permits inputting all meter data to a separate computer through a connector cord that is included with the unit. The socket's connecting pins are wired as shown in the diagrams below:





NOTE

- When connecting the cord to the meter, make sure the label on the plug is facing toward the front of the meter.

- Be sure the input levels of the computer in use are compatible with the meter output ratings listed below:

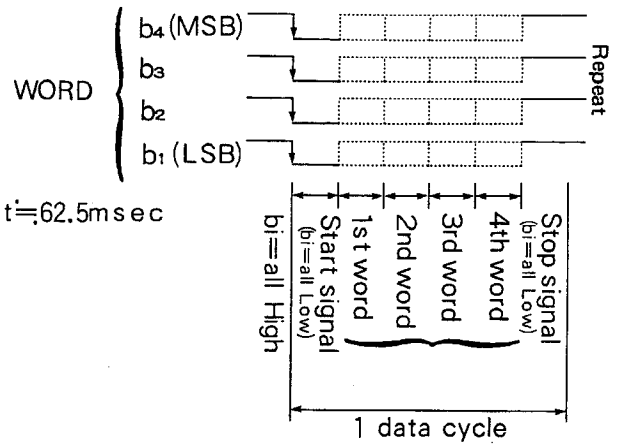
MAXIMUM OUTPUT (at 25°C)

Collector base voltage:	V_{CBO} : 50V
Collector emitter voltage:	V_{CEO} : 40V
Emitter base voltage:	V_{EBO} : 5V
Collector current:	I_C: 100mA
Collector loss:	PC: 300mW

Pressing the "D-OUT" key outputs the color data to ıe computer.

Each word in output requires 62.5msec. As indicated ɜlow, four bits equals one word. A complete data output ıcludes the start signal and four words vis. "y", "x", "K", Y".

This sequence will repeat as long as the "D-OUT" key is ɜpressed. Data will also be shown on the meter's digital ısplay.



)utput signal identification

1st word (information classification)	(SEE CHART)
ord (third digit)	BCD signal
3rd word (second digit)	(MSB = b_4
4th word (first digit)	LSB = b_1

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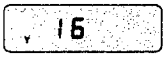
When there is no data in the first digit position, "E" will ɔe output to indicate the blank space.

Example: Y16



1st word = 0
2nd word = 6
3rd word = 1
4th word = E

A. Data output order
B. Display division
C. Data specification codes
D. Display example
E. Output signal

A	B	C	D	E							
				1st word					2nd word	3rd word	4th word
				Hexa-decimal Code	b_4	b_3	b_2	b_1			
1	Y	(E) .***	Y .384	A	H	L	H	L	4	8	3
		(STD-C) .***	Y .315	B	H	L	H	H	5	1	3
2	X	(E) .***	X .387	6	L	H	H	L	7	8	3
		(STD-C) .***	X .310	7	L	H	H	H	0	1	3
3	K	***0	3810 K	9	H	L	L	H	1	8	3
		***00	11500 K	D	H	H	L	H	5	1	1
4	Y	***	Y 265	0	L	L	L	L	5	6	2
		***0	Y 2650	8	H	L	L	L	5	6	2
		***00	Y 26500	C	H	H	L	L	5	6	2
		***000	Y 265000	E	H	H	H	L	5	6	2

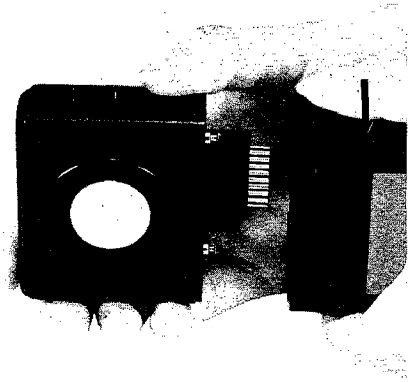
DETACHABLE RECEPTOR HEAD

The Chroma Meter's receptor head can be detached from the meter body for use with the Adapter Cord MA-2 included with the unit.

To detach the head, depress the receptor-head release button and pull the head straight out from the meter body as shown.

The adapter cord can now be installed between the meter body and receptor head. All operations and functions of the meter will remain the same as when the head and body are directly attached.

To replace the receptor head, align it with the meter body and press it all the way into the body until it clicks securely in place.



NOTE

- When the receptor head is separated from the body, be careful not to damage or touch the connecting pins.
- The receptor head can be installed in only one position; never force it into the meter body.
- When using the MA-2 cord, be sure to keep it away from electric motors or relays that could cause interference or noise.

CARE AND STORAGE

- Do not press on or damage the indication-display window.
- Do not subject the meter to shocks or vibration.
- The meter should never be placed or left in the glove compartment or their places in a motor vehicle, or elsewhere, where it may be subject to temperature higher than 55°C, or lower that −20°C. Do not store it in humid places, or near corrosive chemicals.
- The Chroma Meter xy-1 is designed for use at temperatures between 40° and 0°C. If the unit becomes hotter or colder than this, operation will be more or less unsatisfactory, and it may be permanently damaged. Particular care should be taken not to leave the meter in sunlight or near sources of heat such as strong lights, etc.
- If the meter is left or placed in direct lunlight for any long period, the display window will turn black. In this case, use the Adapter Cord MA-2 and place the meter body away from the light.
- When the meter is to be stored, place it in its original pachaging, and put it in an air-tight container with an appropriate amount of dehumidifying agent, such as silica gel.
- Never attempt to disassemble the unit. Any repairs necessary should be undertaken only by an authorized Minolta service facility.
- The meter body may be wiped with a silicone-treated cloth to clean it. Do not allow alcohol or chemicals of any other kind to touch its surface.
- If the meter is not to be used for two or more weeks, it is advisable to remove the battery.

DELTA CHROMA METER xy-1 TECHNICAL DETAILS

Type:	Hand-held light-source/object colorimeter with CIE-standard digital readout by liquid-crystal display and microprocessor; multiple uses and interfacing
Receptor:	3 silicon photo cells (respectively filtered to detect primary stimulus values for blue, green, and red light) under shielded integrating flat opal diffuser; receptor head detachable
Spectral response:	Closely approximates CIE (Commission Internationale de l'Eclairage) colorimetric Standard Observer curves ($\bar{x}_2\lambda$, $\bar{y}\lambda$, $\bar{z}\lambda$)
Calibration settings:	"E" for measuring effective chromaticity "STD-C" for measuring chromaticity under standard-illuminant condition "C"
Measuring functions:	Chromaticity and illuminance of light sources or objects by reflected or transmitted light, color temperature of tungsten sources
Measurement readouts:	1) Chromaticity coordinates (x, y) calculated automatically 2) Illuminance (Y) value in lx (lux) 3) Color temperature in K (Kelvins) calculated automatically
Ranges and x,y:	3 figures, 1.4% for stimulus ratio Y/X, Z/X
Reproducibility: Y:	Within 2.5% at maximum reading
Color temperature:	1,600 to 40,000K (black-body radiant emittance), ±2 mireds (micro-reciprocal degrees = $1/K \times 10^6$; Kelvin figure varies with color temperature; e.g., ±20K at 3,200K, ±50K at 5,000K, etc.)
Measuring range:	10 lx to 200,000 lx
Temperature range:	0 to 40°C (32 to 104°F)
Controls:	Measuring button with lock to prevent readings or read continuously; "NORM/FLICKER" light-source and "E/STD" observing-condition selectors; C-calibration/memory and data-output keys; "x," "y," "Y," and "K" display keys
Display:	LCD type; 6 digits with decimal and unit identifications as applicable; desired readout selectable by depressing appropriate key before/after reading made; display blinks as over-/under-range warning, cancels approx. 4 min. after measuring button released
Electronic components:	Hermetically sealed microprocessor chip; custom-designed liquid-crystal display; gold-plated data-out and receptor-head plug contacts
Power source:	One 9v battery (Eveready 216 or equivalent)
Other:	Body housing and head of reinforced molded ABS synthetic resin; table of CIE standard-illuminant values on back of body; tripod socket; strap eyelet
Standard accessories:	Detector for continuous light (xy-DC); Chromaticity chart (xy-AC); Case for meter
Optional accessories:	Hood xy-AH (S); Data-output connector plug (xy-AD); Adapter Cord MA-2 (length: 1m or 3 ft. 3-3/8 in.)
Dimensions:	170 x 72 x 33mm (6-11/16 x 2-13/16 x 1-5/16 in.)
Weight:	230g (8-1/8 oz.) without battery

Specifications subject to change without notice.

MEMO

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