KONICA MINOLTA

Chroma Meter CS-200

Communication Specifications

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KONICA MINOLTA SENSING, INC.

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1. Overview

- All commands from a PC to the CS-200 and the responses from the CS-200 are in fixed-length ASCII format. (Please refer to 4. Character Code Table.) All command sequences need to be followed by the delimiter code (CR+LF).
  Outbound Data (from PC to CS-200): Maximum 64 characters
  Inbound Data (from CS-200 to PC): Fixed at 250 characters
- A comma is used to separate a command, Error Check Code, and each associated parameter.
- When the Error Check Code is "ER**" (where ** is a number), parameters will not be returned.
- All commands and responses are case-sensitive. A space is processed as a character.

2. Communication Commands

BLR (Read current display backlight setting)

Command Name	BLR: Backlight Read
Function	Read current display backlight setting
Operating Procedure: [PC] [Unit] "BLR"+ delimiter---->` `<-----"*Error Check Code, Mode Setting*"+ delimiter	
Description: This function allows users to read the current display backlight setting.	
Format: - *Mode Setting* "*"	
Parameter Values: - *Mode Setting* "0": OFF "1": ON	

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BLS (Turn display backlight on/off)

Command Name	BLS: Backlight Set
Function	Turn display backlight on/off.
Operating Procedure: [PC] [Unit] "BLS, *Mode Setting*"+ delimiter ---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to turn the display backlight on/off.	
Format: - *Mode Setting* "*"	
Parameter Values: - *Mode Setting* "0": OFF "1": ON	

CAD (Delete all calibration channel data)

Command Name	CAD: Channel Data All Delete
Function	Delete all calibration channel data
Operating Procedure: [PC] [Unit] "CAD"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows users to delete the stored data for all calibration channels (ID, calibration coefficients, & target color).	
Format:	
Parameter Values:	

CDR (Read CH data)

Command Name	CDR: Channel Data Read
Function	Read CH data (to back up data)

Operating Procedure:

[PC] [Unit]

"CDR, *Calibration CH*"+ delimiter---->

<-----"*Error Check Code*, *CH data*, *Calibration coefficients*"+ delimiter

"CNT"+ delimiter---->

<-----"*Error Check Code*, *Target values*, *Calibration values*"+ delimiter

Description:

This function allows users to make a backup of CH data on a PC. The data can then be copied or used to restore CH data in the unit by using the CDS command.

CDR and CNT responses constitute one set of channel data. Therefore, the CNT command should follow immediately after receiving the response to the CDR command. If another command intervenes in the sequence, the command to read the calibration channel data will be canceled, and the process must be started again from the beginning.

Note:

Calibration CH00 is the calibration channel for the Konica Minolta preset calibration standard, and contains the compensation coefficients for the Konica Minolta calibration standard. These data cannot be changed. As a result, although data for CH00 can be read from the instrument using this command, the data for CH00 cannot be set on the instrument using the CDS command.

Format:

- *Calibration CH* "**"
- *CH data* "**, *, *, *********"
  (*Calibration CH*, *Mode*, *Observer*, *ID*)
- *Calibration coefficients* "**********, **********, ..., **********"
  (16 characters × 9 sets)
  (a_{11}, a_{12}, a_{13}, a_{21}, a_{22}, a_{23}, a_{31}, a_{32}, a_{33})
- *Target values* "**********, **********, **********"
  (*X*, *Y*, *Z*)
- *Calibration values* "**********, **********, **********, ..., **********"
  (11 characters × 12 sets)
  (X_W, Y_W, Z_W, X_R, Y_R, Z_R, X_G, Y_G, Z_G, X_B, Y_B, Z_B)

Parameter Values:

- *Calibration CH* "_0" to "20"

[CH data]

- *Calibration CH* "_0" to "20"
- *Mode* "0": Konica Minolta preset standard
  "1": Single-point calibration
  "2": Matrix calibration
- *Observer* "0": 2°
  "1": 10°
  "9": Same as Observer configuration set on unit
- *ID data* 9 single-byte characters
- *Calibration coefficient*s "0000000000000000" to "FFFFFFFFFFFFFFFF"
  (IEEE double precision)
- *Target values*
- *Calibration values*

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CDS (Set backed-up CH data on the unit)

Command Name	CDS: Channel Data Set
Function	Set backed-up CH data on the unit

Operating Procedure:

[PC] [Unit]

"CDS, *CH Data*" + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Calibration coefficients 1* " + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Calibration coefficients 2* " + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Calibration coefficients 3* " + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Target value*s" + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Calibration values 1* " + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Calibration values 2* " + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Calibration values 3* " + delimiter---->

<-----"*Error Check Code*" + delimiter

"CNT, *Calibration values 4* " + delimiter---->

<-----"*Error Check Code*" + delimiter

Description:

This function allows users to set previously backed up calibration channel data on the unit. The data should be sent via the CNT command immediately after executing the CDS command. If another command intervenes in the sequence, the command to set up the calibration channel data will be canceled.

Caution:

Calibration CH00 is the calibration channel for the Konica Minolta preset calibration standard, and contains the compensation coefficients for the Konica Minolta calibration standard. These data cannot be changed. As a result, although data for CH00 can be read from the instrument using the CDR command, the data for CH00 cannot be set on the instrument using the CDS command.

In addition, calibration data are crucial for computing measured values. The data

retrieved using the CDR command should be set again on the unit without alterations.

Format:

- *CH data* "**, *, *, *********"
  (*Calibration CH*, *Mode*, *Observer*, *ID*)
- *Calibration coefficients 1* "**********, **********, **********"
  (a_{11}, a_{12}, a_{13})
- *Calibration coefficients 2* "**********, **********, **********"
  (a_{21}, a_{22}, a_{23})
- *Calibration coefficients 3* "**********, **********, **********"
  (a_{31}, a_{32}, a_{33})
- *Target values* "**********, **********, **********"
  (*X*, *Y*, *Z*)
- *Calibration values 1* "**********, **********, **********"
  (X_W, Y_W, Z_W)
- *Calibration values 2* "**********, **********, **********"
  (X_R, Y_R, Z_R)
- *Calibration values 3* "**********, **********, **********"
  (X_G, Y_G, Z_G)
- *Calibration values 4* "**********, **********, **********"
  (X_B, Y_B, Z_B)

Parameter Values:

- *Calibration CH* "_1" to "20"

CHD (Delete specific calibration channel data)

Command Name	CHD: Channel Data Delete
Function	Delete specific calibration channel data
Operating Procedure: [PC] [Unit] "CHD, *Calibration CH*"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows users to delete the data stored for a specific calibration channel (ID, calibration coefficients, target color).	
Format: - *Calibration CH* "**"	
Parameter Values: - *Calibration CH* "_1" to "20"	

CHR (Read current calibration channel settings)

Command Name	CHR: Calibration Channel Read
Function	Read calibration channel settings

Operating Procedure:

[PC] [Unit]

"CHR, *Calibration CH1* "+ delimiter---->

<-----"*Error Check Code*, *Calibration CH2*, *Mode*, *Observer*, *ID* "+ delimiter

Description:

This function allows users to read the current calibration channel settings.

Format:

- *Calibration CH1* "**"
- *Calibration CH2* "**"
- *Mode* "*"
- *Observer* "*"
- *ID* "*********"

Parameter Values:

- *Calibration CH1* "_0" to "20" or "99": Active CH of the unit
- *Calibration CH2* "_0" to "20"
- *Mode* "0": Konica Minolta preset standard "1": Single-point calibration
  "2": Matrix calibration
- *Observer* "0": 2° "1": 10°
  "9": Same as the Observer configuration for the unit
- *ID data* 9 single-byte characters

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CHS (Set calibration channel)

Command Name	CHS: Calibration Channel Set
Function	Set calibration channel
Operating Procedure: [PC] [Unit] "CHS, *Calibration CH*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the calibration channel.	
Format: - *Calibration CH* "**"	
Parameter Values: - *Calibration CH* "_0" to "20"	

CIS (Set calibration channel ID)

Command Name	CIS: Calibration Channel Identification Set
Function	Set calibration channel ID
Operating Procedure: [PC] [Unit] "CIS, *Calibration CH, ID* "+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set a calibration channel ID consisting of 9 single-byte characters of fixed length. Refer to "4. Character Code Table" for the characters that can be used for entry.	
Format: - *Calibration CH* "**" - *ID* "*********"	
Parameter Values: - *Calibration CH* "_1" to "20" - *ID* 9 single-byte characters or less	

CSR (Read color space setting)

Command Name	CSR: Display Color Space Mode Read
Function	Read color space setting
Operating Procedure: [PC] [Unit] "CSR"+ delimiter---->` `<-----"*Error Check Code, Color space*"+ delimiter	
Description: This function allows users to read the color space setting on the display.	
Format: - *Color space* "*"	
Parameter Values: - *Color space* "0": Lvxy "1": Lvu'v' "2": LvTΔuv "3": XYZ "4": Dominant wavelength	

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CSS (Set color space)

Command Name	CSS: Display Color Space Mode Set
Function	Set color space
Operating Procedure: [PC] [Unit] "CSS, *Color space*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the color space. Caution: When 10° observer is selected, "LvTΔuv" cannot be selected. If the display mode is set to Ratio (%X%Y%Z) and the color space is changed to a space other than XYZ, the display mode will change to Color difference. In such case, even if the color space is changed back to XYZ, the display mode will remain as Color difference (ΔXΔYΔZ) and will not automatically change back to Ratio.	
Format: - *Color space* "*"	
Parameter Values: - *Color space* "0": Lvxy "1": Lvu'v' "2": LvTΔuv "3": XYZ "4": Dominant wavelength	

DMR (Read display mode setting)

Command Name	DMR: Display Mode Read
Function	Read display mode setting
Operating Procedure: [PC] [Unit] "DMR"+ delimiter---> <-----"*Error Check Code, Display mode*"+ delimiter	
Description: This function allows users to read the current display mode setting.	
Format: - *Display mode* "*"	
Parameter Values: - *Display mode* "0": Absolute value "1": Color difference value "2": Ratio	

DMS (Set display mode)

Command Name	DMS: Display Mode Set
Function	Set display mode
Operating Procedure: [PC] [Unit] "DMS, *Display mode*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the display mode. Prior to selecting the display mode "2", the color space of the unit needs to be configured to the XYZ system. Otherwise, the "2" command will result in responses with color-difference expressions.	
Format: - *Display mode* "*"	
Parameter Values: - *Display mode* "0": Absolute value "1": Color difference value "2": Ratio	

DPR (Read data protection mode)

Command Name	DPR: Data Protect Mode Read
Function	Read date protection mode
Operating Procedure: [PC] [Unit] "DPR"+ delimiter---->` `<-----"*Error Check Code, Data protection mode*"+ delimiter	
Description: This function allows users to read the data protection mode.	
Format: - *Data protection mode* "*"	
Parameter Values: - *Data protection mode* "0": Protection is OFF "1": Protection is ON	

DPS (Activate data protection)

Command Name	DPR: Data Protect Mode Set
Function	Activate data protection
Operating Procedure: [PC] [Unit] "DPS, *Data protection mode*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to activate data protection.	
Format: - *Data protection mode* "*"	
Parameter Values: - *Data protection mode* "0": Protection is OFF "1": Protection is ON	

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DTR (Read current date/time setting)

Command Name	DTR: Date/Time Read
Function	Read current date/time setting
Operating Procedure: [PC] [Unit] "DTR"+ delimiter---> <-----"*Error Check Code, Year/Month/Day, Hour/Minute/Second*"+ delimiter	
Description: This function allows users to read the current date/time setting.	
Format: - *Year/Month/Day* "******" - *Hour/Minute/Second* "******"	
Parameter Values: - *Year/Month/Day* "00_1_1" to "991231" (YY/MM/DD) - *Hour/Minute/Second* "_0_0_0" to "235959"	

DTS (Set current date/time setting)

Command Name	DTS: Date/Time Set
Function	Set current date/time setting
Operating Procedure: [PC] [Unit] "DTS, *Year/Month/Day, Hour/Minute/Second*" + delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the current date/time setting. Numerals between "00" (2000) and "99" (2099) can be entered for the year.	
Format: - *Year/Month/Day* "******" - *Hour/Minute/Second* "******"	
Parameter Values: - *Year/Month/Day* "00_1_1" to "991231" (YY/MM/DD) - *Hour/Minute/Second* "_0_0_0" to "235959"	

ETR (Calculate and apply calibration coefficient)

Command Name	ETR: Enter
Function	Calculate and apply calibration coefficient
Operating Procedure: [PC] [Unit] "ETR"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows for the calculation and application of the calibration coefficient. The coefficient takes effect when the unit is set to the calibration mode. The computation is made based on the values stored at this point and the result is registered in the unit. The command will fail if the calibration mode is released before executing this command. User calibration should be executed in the following order: UCS-UWT-ETR-UCS (release). The channel subject to calibration is read with the CHR ("CHR,99") command (and changed with the CHS command).	
Format:	
Parameter Values:	

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FSR (Read operation status of the finder shutter)

Command Name	FSR: Finder Shutter Mode Read
Function	Read operation status of the finder shutter
Operating Procedure: [PC] [Unit] "FSR"+ delimiter---->` `<-----"*Error Check Code, Operation status*"+ delimiter	
Description: This function allows users to read the operation status of the finder shutter.	
Format: - *Operation status* "*"	
Parameter Values: - *Operation status* "0": CLOSED "1": OPEN	

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FSS (Set current operation status of the finder shutter)

Command Name	FSS: Finder Shutter Mode Set
Function	Set current operation status of the finder shutter
Operating Procedure: [PC] [Unit] "FSS, *Operation status*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the current operation status of the finder shutter.	
Format: - *Operation status* "*"	
Parameter Values: - *Operation status* "0": CLOSED "1": OPEN	

IDR (Read ID data of the unit)

Command Name	IDR: Identification Read
Function	Read ID data of the unit
Operating Procedure: [PC] [Unit] "IDR"+ delimiter---> <-----"*Error Check Code, ID data*"+ delimiter	
Description: This function allows users to read the ID data of the unit (i.e. product type, ROM version number and product number).	
Format: – *ID data* ″********, ***, *******″ (Product type, ROM version number, Product number)	
Parameter Values: - *Product type* Fixed to "1892-100" - *ROM version number* "***": 3 characters (ver*.**) - *Product number* "*******": 7 characters	

LNR (Read lens type and angle of measurement)

Command Name	LNR: Measurement Lens Read
Function	Read lens type and angle of measurement

Operating Procedure:

[PC] [Unit]

"LNR"+ delimiter---->

<-----"*Error Check Code, Lens, Angle of measurement*"+ delimiter

Description:

This function allows users to read the angle of measurement and the type of lens used.

Format:

- *Lens* "*"
- *Angle of measurement* "*"

Parameter Values:

- *Lens*
  - "0": Standard lens
  - "1": Close-up lens 1 (No. 107)
  - "2": Close-up lens 2 (No. 122)
  - "3": User Lens 1 (When lens coefficient is set up by PC software.)
  - "4": User Lens 2 (When lens coefficient is set up by PC software.)
  - "5": User Lens 3 (When lens coefficient is set up by PC software.)
- *Angle of measurement* "0": 0.1° "1": 0.2° "2": 1°

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LNS (Set lens)

Command Name	LNS: Measurement Lens Set
Function	Set lens
Operating Procedure: [PC] [Unit] "LNS, *Lens*"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set a lens for measurement. Coefficients for the lenses, filters and others need to be registered in a PC software program before selecting any of the options from User Lens 1 to User Lens 3.	
Format: - *Lens* "*"	
Parameter Values: - *Lens* "0": Standard lens "1": Close-up lens 1 (No. 107) "2": Close-up lens 2 (No. 122) "3": User Lens 1 (When lens coefficient is set up by PC software.) "4": User Lens 2 (When lens coefficient is set up by PC software.) "5": User Lens 3 (When lens coefficient is set up by PC software.)	

MAD (Delete all measurement data from the memory)

Command Name	MAD: Measurement Data All Delete
Function	Delete all measurement data from the memory
Operating Procedure: [PC] [Unit] "MAD"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to delete all measurement data that have been stored in the memory.	
Format:	
Parameter Values:	

MDD (Delete specific measurement data from the memory)

Command Name	MDD: Measurement Data Delete
Function	Delete specific measurement data from the memory
Operating Procedure: [PC] [Unit] "MDD, *Data number*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to delete specific measurement data that has been stored in the memory.	
Format: - *Data number* "***"	
Parameter Values: - *Data number* "__0" to "100"	

MDR (Read measurement data setting)

Command Name	MDR: Measurement Data Read
Function	Read measurement data setting

Operating Procedure:

[PC] [Unit]

"MDR, *Color space*"+ delimiter---->

<-----"*Error Check Code, Measurement value data, Measured values*"+ delimiter

Description:

This function allows users to read the measurement data setting.

The value for Lv is expressed according to the unit of luminance selected for the device. (only when Observer is set to 2°)

Caution:

If the value for Lv, X, Y, or Z exceeds display range, error code of "OK12" or "OK13" is returned together with "-9999999999" as the corresponding measurement value parameter.

If the value for T or Δuv exceeds display range, the corresponding parameter will be blank.

When performing measurements using a computer equipped with an OHCI-standard USB host controller, attention should be paid to the following when controlling the CS-200.

When using the MDR command to obtain data after taking a measurement, the MDR command should be sent 0.5s before the end of the measurement. (For example, a wait time of [measurement time-0.5]s should be inserted between the MES and MDR commands.)

Then, if the response to the MDR command is “ER02”, the program should wait 0.3s before resending the MDR command.

For a sample program, refer to “Chroma Meter CS-200 DLL Reference”.

Format:

- *Color space* "*"
- *Measurement value data*

"*, *, *, **, *, *****, *, **"

(Lens, Angle of measurement, Measurement speed,

Duration of measurement, Synchronization, Frequency,

Observer, Calibration CH)

- *Measured values*

"**********, **********, **********"

Parameter Values:

- *Color space*

"0": Lvxy "1": Lvu’v’ "2": LvTΔuv

"3": XYZ "4": Dominant wavelength

[*Measurement Value Data*]

- Lens

"0": Standard lens

"1": Close-up lens 1 (No. 107)

"2": Close-up lens 2 (No. 122)

"3": User Lens 1 (When lens coefficient is set up by PC software.)

"4": User Lens 2 (When lens coefficient is set up by PC software.)

"5": User Lens 3 (When lens coefficient is set up by PC software.)

- Angle of measurement

"0": 0.1° "1": 0.2° "2": 1°

- Measurement speed

"0": LTD. AUTO "1": S-FAST "2": FAST "3": SLOW

"4": S-SLOW "5": MANU "6": AUTO

- Duration of measurement (seconds) "_1" to "60"
- Synchronization "0": No-Sync "1": Sync
- Frequency "____0" or "_4000" to "20000" (Frequency × 100)
- Observer "0": 2° "1": 10°
- Calibration channel "_0" to "20"

[*Measured values*]

Responses are expressed according to the color space specified in the command parameter.

(Ex) Lvxy

"_____80.003, _____0.3127, _____0.3293"

(Lv) (x) (y)

(Ex) Lvu'v'

"_____80.003, _____0.3333, _____0.3333"

(Lv) (u') (v')

(Ex) LvTΔuv (When Δuv is a positive value, the first character is left blank.)

"_____80.003, _____6500, ____-0.0050"

(Lv) (T) (Δuv)

(Ex) XYZ

"_____55.442, _____80.003, _____9.001"

(X) (Y) (Z)

(Ex) Dominant wavelength

"_____80.003, _____550.4, _____

(Lv) (Dominant wavelength) (Blank)

MEM (Save measurement data)

Command Name	MEM: MEMory
Function	Save measurement data
Operating Procedure: [PC] [Unit] "MEM, *Data number*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to save measurement data.	
Format: - *Data number* "***"	
Parameter Values: - *Data number* "__0" to "100"	

MES (Start/stop measurement)

Command Name	MES: Measure
Function	Start/stop measurement

Operating Procedure:

[PC] [Unit]

"MES, *Mode setting*"+ delimiter---->

<-----"*Error Check Codes, Duration of measurement*"+ delimiter

Description:

This function allows users to start/stop measurement. The MDR command should be used to retrieve the measurement data.

Caution:

If the value for Lv, X, Y, or Z exceeds display range, error code of "OK12" or "OK13" is returned together with "-9999999999" as the corresponding measurement value parameter. If the value for T or Δuv exceeds display range, the corresponding parameter will be blank.

When performing measurements using a computer equipped with an OHCI-standard USB host controller, attention should be paid to the following when controlling the CS-200.

When using the MDR command to obtain data after taking a measurement, the MDR command should be sent 0.5s before the end of the measurement. (For example, a wait time of [measurement time-0.5]s should be inserted between the MES and MDR commands.)

Then, if the response to the MDR command is “ER02”, the program should wait 0.3s before resending the MDR command.

For a sample program, refer to “Chroma Meter CS-200 DLL Reference”.

Format:

- *Mode setting* "*"
- *Duration of measurement* "**"

Parameter Values:

- *Mode setting* "1": Start measurement "0": Stop measurement
- *Duration of measurement* "_0" or "_1" to "60"

MMR (Read current save mode setting)

Command Name	MMR:
Function	Read current save mode setting
Operating Procedure: [PC] [Unit] "MMR"+ delimiter---> <-----"*Error Check Code, Save mode*"+ delimiter	
Description: This function allows users to read the current save mode setting when the unit is used as a freestanding device. The measurement data is saved when the MEMORY key is depressed.	
Format: - *Save mode* "*"	
Parameter Values: - *Save mode* "0": AUTO_NUM "1": MAN_NUM "2": AUTOSAVE	

MMS (Set save mode)

Command Name	MMS:
Function	Set save mode
Operating Procedure: [PC] [Unit] "MMS, *Save mode*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the save mode when the unit is used as a freestanding device. The measurement data is saved when the MEMORY key is depressed.	
Format: - *Save mode* "*"	
Parameter Values: - *Save mode* "0": AUTO_NUM "1": MAN_NUM "2": AUTOSAVE	

MSR (Read measurement mode setting)

Command Name	MSR: Meas Mode Read
Function	Read measurement mode setting
Operating Procedure: [PC] [Unit] "MSR" + delimiter---> <-----"*Error Check Code, Mode setting*"+ delimiter	
Description: This function allows users to read the measurement mode setting.	
Format: - *Mode setting* "*"	
Parameter Values: - *Mode setting* "0": Single measurement "1": Continuous measurement	

MSS (Set measurement mode)

Command Name	MSS: Meas Mode Set
Function	Set measurement mode
Operating Procedure: [PC] [Unit] "MSS, *Mode setting*" + delimiter----> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set up the measurement mode. The setting is only applicable to the unit when it is used as a freestanding device. The unit is only capable of taking single measurements when connected to a computer in remote mode.	
Format: - *Mode setting* "*"	
Parameter Values: - *Mode setting* "0": Single measurement "1": Continuous measurement	

OBR (Read current Observer setting)

Command Name	OBR: Observer Read
Function	Read current Observer setting
Operating Procedure: [PC] [Unit] "OBR"+ delimiter---->` `<-----"*Error Check Code, Observer*"+ delimiter	
Description: This function allows users to read the current Observer setting.	
Format: - *Observer* "*"	
Parameter Values: - *Observer* "0": 2° "1": 10°	

OBS (Set Observer setting)

Command Name	OBS: Observer Set
Function	Set Observer setting
Operating Procedure: [PC] [Unit] "OBS, *Observer*"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the Observer setting.	
Format: - *Observer* "*"	
Parameter Values: - *Observer* "0": 2° "1": 10°	

RMT (Enable/disable remote mode)

Command Name	RMT: Remote Mode Set
Function	Enable/disable remote mode

Operating Procedure:

[PC] [Unit]

"RMT, *Mode setting*"+ delimiter---->

<-----"*Error Check Code*"+ delimiter

Description:

This function allows users to enable/disable remote mode. When the remote mode is ON, various commands can be given via communication but not via the unit keys. When the remote mode is OFF, the unit is unable to communicate with other devices ("ER16" appears), but it can be controlled using the unit keys.

Format:

- *Mode setting* "*"

Parameter Values:

- *Mode setting*

"0": Remote mode is OFF. (Communication function OFF/Unit key control ON)

"1": Remote mode is ON. (Communication function ON/Unit key control OFF)

Chroma Meter CS-200 Communication Specifications

SCR (Read current synchronization mode setting)

Command Name	SCR: Synchronization Mode Read
Function	Read current synchronization mode setting
Operating Procedure: [PC] [Unit] "SCR"+ delimiter---->` `<-----"*Error Check Code, Synchronization, Frequency*"+ delimiter	
Description: This function allows users to read the current synchronization mode setting.	
Format: - *Synchronization* "*" - *Frequency* "*****"	
Parameter Values: - *Synchronization* "0": No-Sync "1": Sync - *Frequency (Hz)* "____0": No setting " 4000" to "20000": Frequency (40.0Hz to 200.0Hz) × 100	

SCS (Set synchronization mode)

Command Name	SCS: Synchronization Mode Set
Function	Set synchronization mode
Operating Procedure: [PC] [Unit] "SCS, *Synchronization, Frequency*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the synchronization mode. If No-Sync is selected, a measurement is completed within the timeframe apt for the speed of measurement. In the Sync mode, the duration of the measurement is determined based upon the frequency that has been selected. Caution: Frequency is automatically set to "0" if No-sync is selected. "0" cannot be set as the frequency if Sync is selected.	
Format: - *Synchronization* "*" - *Frequency* "*****"	
Parameter Values: - *Synchronization* "0": No-Sync "1": Sync - *Frequency (Hz)* "____0": No setting "_4000" to "20000": Frequency (40.0Hz to 200.0Hz) × 100	

Chroma Meter CS-200 Communication Specifications

SDR (Retrieve measurement data from the memory)

Command Name	SDR: Stored Data Request
Function	Retrieve measurement data from the memory

Operating Procedure:

[PC] [Unit]

"SDR, *Data number, Color space*"+ delimiter---->

<-----"*Error Check Code, Measurement value data, Measured values*"+ delimiter

Description:

This function allows users to download specific measurement data that have been stored in the unit to a PC.

The value for Lv is expressed according to the unit of luminance selected for the device (only when the Observer is set to 2°).

Caution:

If the value for Lv, X, Y, or Z exceeds display range, error code of "OK12" or "OK13" is returned together with "-9999999999" as the corresponding measurement value parameter.

If the value for T or Δuv exceeds display range, the corresponding measurement parameter will be blank.

Format:

- *Data number* "***"
- *Color space* "*"
- *Measurement value data* "*, *, *, **, *, *****, *, **, *********,******, ******"

(Lens, Angle of measurement, Measurement speed, Duration of measurement, Synchronization, Frequency, Observer, Calibration CH, Measurement Data ID, Date of measurement, Time of measurement)

- *Measured values*

"**********, **********, **********"

Parameter Values:

- *Data number* "__0" to "100"
- *Color space* ″0″: Lvxy ″1″: Lvu'v' ″2″: LvTΔuv

″3″: XYZ ″4″: Dominant wavelength

[*Measurement value data*]

- Lens

"0": Standard lens

"1": Close-up lens 1 (No. 107)

"2": Close-up lens 2 (No. 122)

"3": User Lens 1 (When lens coefficient is set up by PC software.)

"4": User Lens 2 (When lens coefficient is set up by PC software.)

"5": User Lens 3 (When lens coefficient is set up by PC software.)

- Angle of measurement

"0": 0.1° "1": 0.2° "2": 1°

- Measurement speed

"0": LTD. AUTO "1": S-FAST "2": FAST "3": SLOW

"4": S-SLOW "5": MANU "6": AUTO

- Duration of measurement (seconds) "_1" to "60"
- Synchronization "0": No-Sync "1": Sync
- Frequency "____0" No setting

"_4000" to "20000" (Frequency × 100)

- Observer "0": 2° "1": 10°
- Calibration CH "_0" to "20"
- Measurement data ID (Please refer to 4. Character Code Table.)
- Date of measurement "00_1_1" to "991231" (YY/MM/DD)
- Time of measurement "_0_0_0" to "235959"

[*Measured values*]

Responses are expressed according to the color space specified in the command parameter.

(Ex) Lvxy

"_____80.003, _____0.3127, _____0.3293"

(Lv) (x) (y)

(Ex) Lvu'v'

"_____80.003, _____0.3333, _____0.3333"

(Lv) (u') (v')

(Ex) LvTΔuv (When Δuv is a positive value, the first character is left blank.)

"_____80.003, _____6500, ____-0.0050"

(Lv) (T) (Δuv)

(Ex) XYZ

"_____55.442, _____80.003, _____9.001"

(X) (Y) (Z)

(Ex) Dominant wavelength

"_____80.003, _____550.4, _____"

(Lv) (Dominant wavelength) (Blank)

SFR (Read number of significant figures for chromaticity)

Command Name	SFR: Significant Figure Read
Function	Read number of significant figures for chromaticity
Operating Procedure: [PC] [Unit] "SFR"+ delimiter---->` `<-----"*Error Check Code, Number of significant figures*"+ delimiter	
Description: This function allows users to read the number of significant figures for chromaticity.	
Format: - *Number of significant figures* "*"	
Parameter Values: - *Number of significant figures* "0": 3 characters "1": 4 characters	

SFS (Set number of significant figures for chromaticity)

Command Name	SFS: Significant Figure Set
Function	Set number of significant figures for chromaticity
Operating Procedure: [PC] [Unit] "SFS, *Number of significant figures*"+ delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to set the number of significant figures for chromaticity.	
Format: - *Number of significant figures* "*"	
Parameter Values: - *Number of significant figures* "0": 3 characters "1": 4 characters	

SIS (Assign ID for measurement data in the memory)

Command Name	SIS: Stored Data Identification Set
Function	Assign ID for measurement data in the memory
Operating Procedure: [PC] [Unit] "SIS, *Data number, ID*"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows users to assign an ID for the measurement data stored in the memory. The ID should be entered with 9 single-byte fixed-length characters. Refer to "4. Character Code Table" for the characters that can be used for entry.	
Format: - *Data number* "***" - *ID* "*********"	
Parameter Values: - *Data number* "__0" to "100" - *ID* 9 single-byte characters	

SMR (Read sleep mode setting)

Command Name	SMR: Sleep Mode Read
Function	Read sleep mode setting
Operating Procedure: [PC] [Unit] "SMR + delimiter---->" <-----"*Error Check Code, Mode setting*"+ delimiter	
Description: This function allows users to read the sleep mode setting.	
Format: - *Mode setting* "*"	
Parameter Values: - *Mode setting* "0": OFF "1": ON	

SMS (Turn on/off sleep mode)

Command Name	SMS: Sleep Mode Set
Function	Turn on/off sleep mode
Operating Procedure: [PC] [Unit] "SMS, *Mode setting*" + delimiter---> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to turn the sleep mode on/off.	
Format: - *Mode setting* "*"	
Parameter Values: - *Mode setting* "0": OFF "1": ON	

Chroma Meter CS-200 Communication Specifications

SPR (Read current measurement speed setting)

Command Name	SPR: Measurement Speed Read
Function	Read current measurement speed setting

Operating Procedure:

[PC] [Unit]

"SPR"+ delimiter---->

<-----"*Error Check Code, Measurement speed, Duration of measurement*"+ delimiter

Description:

This function allows users to read the current measurement speed setting.

Format:

- *Measurement speed* "*"
- *Duration of measurement* "**"

Parameter Values:

- *Measurement speed*

"0": LTD. AUTO "1": S-FAST "2": FAST "3": SLOW

"4": S-SLOW "5": MANU "6": AUTO

- *Duration of measurement*

"_1" to "60": Duration of measurement

"_0": No setting

Chroma Meter CS-200 Communication Specifications

SPS (Set measurement speed)

Command Name	SPS: Measurement Speed Set
Function	Set measurement speed

Operating Procedure:

[PC] [Unit]

"SPS, *Measurement speed, Duration of measurement*"+ delimiter---->

<-----"*Error Check Code*"+ delimiter

Description:

This function allows users to set the measurement speed.

Caution:

Duration of measurement can be set up only when MANU is selected.

Format:

- *Measurement speed* "*"
- *Duration of measurement* "**"

Parameter Values:

- *Measurement speed*

"0": LTD. AUTO "1": S-FAST "2": FAST "3": SLOW

"4": S-SLOW "5": MANU "6": AUTO

- *Duration of measurement*

"_1" to "60": Duration of measurement

"_0": No setting

STR (Read current status of the unit)

Command Name	STR: Status Request
Function	Read current status of the unit
Operating Procedure: [PC] [Unit] "STR"+ delimiter---> <-----"*Error Check Code, Status*"+ delimiter	
Description: This function allows users to read the current status of the unit.	
Format: - *Status* "*, ***, ***" (Battery status, Number of measurement data in memory, Maximum number of measurement data)	
Parameter Values: - *Battery status* "0": Full "1": Close to exhausted - *Number of measurement data in memory* "__0" to "101" - *Maximum number of measurement data* "101"	

SWE (Enable/disable trigger mode in the unit)

Command Name	SWE: Measurement Switch Enable
Function	Enable/disable trigger mode in the unit

Operating Procedure:

[PC] [Unit]

"SWE, *Mode setting*"+ delimiter---->

<-----"*Error Check Code*"+ delimiter

Description:

This function allows users to enable/disable the trigger mode in the unit. When the trigger mode is ON, measurements can be taken only using the unit keys, overriding the remote mode. When the trigger mode is turned OFF, the unit returns to remote mode.

Caution:

When the trigger mode is changed from OFF to ON, hold data stored in the instrument will be deleted. Data measured while the trigger mode is ON can be read from the instrument using the MDR command. When the data is read using the MDR command, the hold data will be deleted after reading.

Format:

- *Mode setting* "*"

Parameter Values:

- *Mode setting*

"0": Trigger mode is OFF. (Remote mode)

"1": Trigger mode is ON. (Remote mode/Unit key control is ON)

TAD (Delete all target data)

Command Name	TAD: Target Data All Delete
Function	Delete all target data
Operating Procedure: [PC] [Unit] "TAD"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows users to delete all target data that have been stored in the memory.	
Format:	
Parameter Values:	

TDD (Delete specific target data)

Command Name	TDD: Target Data Delete
Function	Delete specific target data
Operating Procedure: [PC] [Unit] "TDD, *Data number*"+ delimiter----> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to delete specific target data that have been stored in the memory.	
Format: - *Data number* "**"	
Parameter Values: - *Data number* "_1" to "20"	

TDR (Retrieve target data from the memory)

Command Name	TDR: Target Data Request
Function	Retrieve target data from the memory

Operating Procedure:

[PC] [Unit]

"TDR, *Data number, Color space*"+ delimiter---->

<-----"*Error Check Code, Target value data, Target value*"+ delimiter

Description:

This function allows users to retrieve specific target data that has been stored in the unit and download the data to a PC.

The value for Lv is expressed according to the unit of luminance selected for the device. (only when Observer is set to 2°)

When the target value is manually entered, the data type is expressed as "1": Entered data, in which case, the entries for lens, angle of measurement, measurement speed, duration of measurement, synchronization and frequency are left blank.

Caution:

If value for Lv, X, Y, or Z exceeds display range, error code of "OK12" or "OK13" is returned together with "-9999999999" as the corresponding target value parameter.

If the value for T or Δuv exceeds the display range, the corresponding target value parameter will be blank.

Format:

- *Data number* "**"
- *Color space* "*"
- *Target value data*

"*, *, *, *, **, *, *****, *, **, *********, ******, ******"

(Data type, Lens, Angle of measurement, Measurement speed,
Duration of measurement, Synchronization, Frequency, Observer,
Calibration CH, Target value ID, Date of measurement, Time of measurement)

- *Target value*

"**********, **********, **********"

Parameter Values:

- *Data number* "_1" to "20"
- *Color space*

"0": Lvxy "1": Lvu'v' "2": LvTΔuv
"3": XYZ "4": Dominant wavelength

[*Target value data*]

- Data type

"0": Measured data "1": Entered data

- Lens

"0": Standard lens

"1": Close-up lens 1 (No. 107)

"2": Close-up lens 2 (No. 122)

"3": User Lens 1 (When lens coefficient is set up by PC software.)

"4": User Lens 2 (When lens coefficient is set up by PC software.)

"5": User Lens 3 (When lens coefficient is set up by PC software.)

- Angle of measurement

"_" or "0": 0.1° "1": 0.2° "2": 1°

- Measurement speed

"_" or "0": LTD. AUTO "1": S-FAST "2": FAST "3": SLOW

"4": S-SLOW "5": MANU "6": AUTO

- Duration of measurement (seconds) "__" or "_1" to "60"

- Synchronization

"_" or "0": No-Sync "1": Sync

- Frequency

"_____" or "____0": No setting

"_4000" to "20000": Frequency × 100

- Observer

"0": 2° "1": 10°

- Calibration CH "_0" to "20"

- Measurement data ID (Please refer to 4. Character Code Table.)

- Date of measurement "00_1_1" to "991231" (YY/MM/DD)

- Time of measurement "_0_0_0" to "235959"

[*Target value*]

Responses are expressed according to the color space specified in the command parameter.

(Ex) Lvxy

"_____80.003, _____0.3127, _____0.3293"

(Lv) (x) (y)

(Ex) Lvu'v'

"_____80.003, _____0.3333, _____0.3333"

(Lv) (u') (v')

(Ex) LvTΔuv (When Δuv is a positive value, the first character is left blank.)

"_____80.003, _____6500, ____-0.0050"

(Lv) (T) (Δuv)

(Ex) XYZ

"␣␣␣␣55.442, ␣␣␣␣80.003, ␣␣␣␣␣9.001"

(X) (Y) (Z)

(Ex) Dominant wavelength

"␣␣␣␣80.003, ␣␣␣␣␣550.4, ␣␣␣␣␣␣␣␣␣␣

(Lv) (Dominant wavelength) (Blank)

Chroma Meter CS-200 Communication Specifications

TDS (Set target data)

Command Name	TDS: Target Data Set
Function	Set target data

Operating Procedure:

[PC] [Unit]

"TDS, *Data number, Color space, Target data*"+ delimiter---->

<-----"*Error Check Code*"+ delimiter

Description:

This function allows users to set target data for the data number specified. This data is used to calculate color difference.

Format:

- *Data number* "**"
- *Color space* "*"
- *Target value* "**********, **********, **********"

Parameter Values:

- *Data number* "_1" to "20"
- *Color space* "0": Lvxy "1": Lvu'v' "3": XYZ
- *Target value* (Enter the parameter values specific to the color space)

(Ex) Lvxy

"____80.003, ____0.3127, ____0.3293"

(Lv) (x) (y)

(Ex) Lvu'v'

"____80.003, ____0.3333, ____0.3333"

(Lv) (u') (v')

(Ex) XYZ

"____55.442, ____80.003, _____9.001"

(X) (Y) (Z)

* Parameter values of color space (target or calibration value) should be set with the following range.

$0 < x < 1$ and

$0 < y < 1$ and

$0 < x+y \leq 1$ and

$0 < X \leq 99999000000$ and

$0 < Y \leq 99999000000$ and

$0 \leq Z \leq 99999000000$

UCS (Enable/disable calibration mode)

Command Name	UCS: User Calibration Setting
Function	Enable/disable calibration mode
Operating Procedure: [PC] [Unit] "UCS, *Mode*"+ delimiter----> <-----"*Error Check Code*"+ delimiter	
Description: This function allows users to enable/disable user calibration mode. This command is unavailable for CH00. User calibration should be executed in the following order: UCS-UWT-ETR-UCS (release). The channel subject to calibration is read with the CHR ("CHR,99") command (and changed with the CHS command).	
Format: - *Mode setting* "*"	
Parameter Values: - *Mode setting* "0": OFF "1": ON	

Chroma Meter CS-200 Communication Specifications

UWT (Perform user calibration)

Command Name	UWT: User Calibration White
Function	Perform single-point user calibration

Operating Procedure:

[PC] [Unit]

"UWT, *Data number, Color space, Calibration value*"+ delimiter---->

<-----"*Error Check Code*"+ delimiter

Description:

This function allows users to perform single-point user calibration. User calibration should be executed in the following order: UCS-UWT-ETR-UCS (release). The channel subject to calibration is read with the CHR ("CHR,99") command (and changed with the CHS command).

Format:

- *Data number* "***"
- *Color space* "*"
- *Calibration value* "**********, **********, **********"

Parameter Values:

- *Data number* "0" to "100" or "999": the value on hold
- *Color space* "0": Lvxy "1": Lvu'v' "3": XYZ
- *Calibration value* (Enter the parameter values specific to the color space)

(Ex) Lvxy

"_____80.003, _____0.3127, _____0.3293"

(Lv) (x) (y)

(Ex) Lvu'v'

"_____80.003, _____0.3333, _____0.3333"

(Lv) (u') (v')

(Ex) XYZ

"_____55.442, _____80.003, _____9.001"

(X) (Y) (Z)

* Parameter values of color space (target or calibration value) should be set with the following range.

$0 < x < 1$ and

$0 < y < 1$ and

$0 < x+y \leq 1$ and

$0 < X \leq 99999000000$ and

$0 < Y \leq 99999000000$ and

$0 \leq Z \leq 99999000000$

ZRC (Perform zero-calibration)

Command Name	ZRC: Zero Calibration
Function	Perform zero-calibration
Operating Procedure: [PC] [Unit] "ZRC"+ delimiter---->` `<-----"*Error Check Code*"+ delimiter	
Description: This function allows users to perform zero-calibration.	
Format:	
Parameter Values:	

3. Error Check Codes

Codes	Description
OK00	OK
OK03	Low battery voltage (The battery voltage is between 3.4V-3.6V)
OK12	Lv, X, Y, or Z exceeded display range
OK13	Low battery voltage (The battery voltage is between 3.4V-3.6V) and Lv, X, Y, or Z exceeded display range
ER01	Low battery voltage (The battery voltage is below 3.4V)
ER02	No command is accepted while taking measurements
ER03	Invalid entry for Lvxy or Lvu'y' during user calibration value or target value setup
ER05	Invalid entry for matrix calibration
ER06	Invalid matrix coefficient entry during matrix calibration (The elements on the main diagonal are below 0. The determinant is 0.)
ER07	CH00 does not accept user setup
ER08	Incorrect observer setting. Ex: Observer setting for the CH selected differs from observer setting of the instrument, the color space of "LvTΔuv" is selected when 10° observer was selected, etc.
ER09	Data protection is ON. MEM command to save the current data failed.
ER10	No command
ER11	Inbound data exceeds 64 characters
ER14	Incorrect parameter format
ER15	Incorrect parameter range or parameter error
ER16	Invalid operation of communication commands. For example: Instrument isn't in remote mode; user calibration procedure not completed correctly; sending CNT command with CDR or CDS isn't appropriate; etc.
ER20	No data
ER21	Low luminance
ER22	Beyond the range of measurement
ER23	Offset error (Shutter error)
ER27	Unstable range (due to excessive luminance variation)
ER30	Position of measuring angle selector isn't correct. The angle of measurement was changed during measurement.
ER31	FROM write error
ER34	Clock IC error
ER35	A/D conversion error

4. Character Code Table

The following characters can be used to assign IDs for measurement values and calibration channels.

Sp indicates a space code. Codes with blank entries are unavailable.

	20	30	40	50	60	70
0	sp	0	@	P	‘	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	’	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
A	*	:	J	Z	j	z
B	+	;	K	[	k	{
C	,	<	L	\	l	|
D	-	=	M	]	m	}
E	.	>	N	^	n	
F	/	?	O	_	o	