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Spectrophotometer CM-700d/CM-600d

Communication Specifications



KONICA MINOLTA

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Notes regarding these specifications:

- An understanding of the fundamentals of PC communication is assumed in the preparation of this document. This document was prepared to explain communication procedures specific to the stated product.
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Revision (Date)	Modifications
Rev. 1.23 (February 4, 2008)	Original English revision
Rev. 1.32 (May 9, 2009)	To correspond to ROM Ver. 1.10 <ul style="list-style-type: none">• Additional response parameters for STR command.• Additional error message for data protection (Commands: TDS, TTD, TTS, TDD, TAD)
Rev. 1.33 (July 19, 2013)	To correspond to ROM Ver. 1.20 <ul style="list-style-type: none">• Addition of COR and RCR commands

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1 Communication Specifications

1.1 Communication method

Communication with the instrument can be performed using either USB or Bluetooth. Specifications for communication via each method are described below.

1.1.1 USB

USB communication is performed according to a CDC class that can use a Windows standard device driver. Therefore, communication with a PC can be performed with the instrument configured as using a COM port. The specifications of USB communication are stated below. For baud rate, communication can be performed regardless of the setting (default is 115,200).

Specifications	USB 1.1 Full Speed (Bulk transfer)	
Files used	<ul style="list-style-type: none"> • kmsecm700.inf • usbser.sys, serenum.sys Windows standard drivers. Separate installation is not necessary.	
Communication specifications	Baud rate	9,600/ 19,200/ 38,400/ 57,600/ 115,200 (default)/ 230,400/ 460,800/ 921,600
	Data length	8 bits
	Parity	None
	Stop bits	1
	Flow control	None

Installing the kmsecm700.inf file

- 1) Copy the kmsecm700.inf file to a folder on your computer.
- 2) Switch on the CM-700d/CM-600d and connect the instrument to the PC with the USB cable.
- 3) When the Found New Hardware Wizard appears, specify the folder used in 1) above as the driver location.
- 4) The OS will install the driver and allot a COM port for the instrument.
 - * When 4) has been completed, the COM port allotted to the instrument can be checked by looking at Ports (COM & LPT) in the Device Manager of the OS.

1.1.2 Bluetooth

For Bluetooth communication, the SPP (Serial Port Profile) is used, and communication with a PC can be performed with the instrument configured as using a COM port. The specifications of Bluetooth communication are stated below. For baud rate, communication can be performed regardless of the setting (default is 57,600).

Specifications	Bluetooth 1.2	
Communication specifications	Baud rate	9,600/ 19,200/ 38,400/ 57,600 (default)/ 115,200/ 230,400/ 460,800/ 921,600
	Data length	8 bits
	Parity	None
	Stop bits	1
	Flow control	None

1.2 Communication mode

The instrument is equipped with standalone and communication modes. In standalone mode, various operations are performed by pressing the appropriate buttons on the instrument. In communication mode, operations can be performed only via communication with a PC.

When performing communication with a PC, the instrument must be in communication mode. When the instrument is in communication mode, the instrument can receive all commands; if the unit is in standalone mode, the following procedure must be performed according to the communication method.

USB	When the instrument is connected to a PC using a USB cable, the instrument is automatically switched to communication mode. When the cable is disconnected, the instrument automatically returns to standalone mode.
Bluetooth	When the instrument receives an SPP connection request from a PC, the instrument is automatically set to communication mode. When a disconnection request is received from the PC, or when communication conditions become poor, the instrument automatically returns to standalone mode.

1.3 Delimiter

When sending commands from a PC to the instrument, it is necessary to add a delimiter at the end of the command. In the case of the CM-700d/CM-600d, the delimiter that should be used is CR (carriage return) + LF (line feed).

When the instrument responds to a command from the PC, the delimiter it adds at the end of its response will be the same delimiter that it received from the instrument. If no delimiter code is added to the command, the command will not be properly recognized. In such case, when more than 30 seconds has passed after receiving the last character of the command, the instrument will automatically clear its receive buffer and the command will be ignored.

1.4 Format for sent/received character string

Sent character strings must have the format and number of characters stated in this document. If the number of characters for data is less than the required number of characters, " " (space) should be added to fulfill the required number. However, for commands containing certain data items such as name (comment) that may contain " " (space) as desired, they will be accepted even if they do not contain the stated number of characters.

In the same way, for received strings commands containing certain data items such as name (comment) may not return the stated number of characters.

1.5 Timeout setting

In general, the timeout time should be set to at least 5 seconds. If the command requires a longer timeout time, it will be stated in the command description in this document.

1.6 Storage of settings and data

Settings and data set using commands can also be used when the instrument is in standalone mode. The settings and data are stored in the instruments internal memory.

1.7 Handling of commands during measurement

Once a measurement has been started using the "MES" command, the instrument will not accept any command other than "STR" until the measurement has been completed. If a command other than "STR" is sent, the response from the instrument will be "ER00" (Input of invalid command). Also, when "STR" is sent to the instrument during this period, the response will be "ER35" (Measurement in progress).

2 Product commands

2.1 Command table

Command	Description	Page
Instrument / Status		
IDR	Reads instrument information: Product code, ROM version, serial number, geometry, wavelength information	12
STR	Reads instrument status information: Ready to measure, battery condition, calibration condition, number of stored targets, maximum number of stored targets, number of stored measurements, maximum number of stored measurements	13
Condition settings		
CPR	Reads measurement conditions: Measurement area, SCI/SCE mode, delay time, number of measurements for automatic averaging, number of measurements for manual averaging	15
CPS	Sets measurement conditions: Measurement area, SCI/SCE mode, delay time, number of measurements for automatic averaging, number of measurements for manual averaging	16
CRR	Reads colorimetric and display parameters: Observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index	17
CRS	Sets colorimetric and display parameters: Observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index	19
ECR	Reads instrument environment parameter conditions: SCI/SCE mode, observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index, delay time, number of measurements for automatic averaging, number of measurements for manual averaging	21
ECS	Sets instrument environment parameter conditions: SCI/SCE mode, observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index, delay time, number of measurements for automatic averaging, number of measurements for manual averaging	23
ENR	Reads number of currently set instrument environment.	25
ENS	Selects instrument environment number.	26
EIR	Reads identification name of instrument environment.	27
EIS	Sets identification name of instrument environment.	28
Calibration settings		
CIR	Reads calibration plate ID number.	29
CIS	Sets calibration plate ID number.	30
CDR	Reads calibration data.	31
CDS	Sets calibration data.	32
UCR	Reads user calibration data.	33
UCS	Sets user calibration data.	34
USR	Reads user calibration on/off status.	35
USS	Sets user calibration on/off status.	36

Calibration Operations		
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CAL	Performs white calibration.	38
USC	Performs user calibration.	39
Measurement		
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COR		
SWS	Enables/disables instrument's measuring button.	45
RDR	Reads measurement data taken using instrument's measuring button.	46
RCR		
Measurement values		
SPR	Reads properties (measurement area, SCI/SCE mode, date, time, target number, condition on/off, and comment) for the specified measurement data.	50
SDR	Reads the specified measurement data (spectral reflectance data)	52
SDD	Deletes the specified measurement.	53
SAD	Deletes all measurements.	54
Target color		
TNR	Reads the active target number.	55
TNS	Sets the active target number.	56
TPR	Reads the properties of the specified target color: Measurement area, SCI/SCE mode, date, time, target color type, Cond. on/off, comment)	57
TDR	Reads the target color data (spectral reflectance or colorimetric data) for the specified target number.	58
TDS	Sets the target color data (spectral reflectance or colorimetric data) for the specified target number.	60
TTD	Returns the tolerance values set for the specified target number to the default tolerance values.	63
TTR	Reads the tolerance values set for the specified target color: Color space, color difference equation, index, tolerances, parametric coefficients	64
TTS	Sets the tolerance values set for the specified target color: Color space, color difference equation, index, tolerances, parametric coefficients	67
TDD	Deletes the specified target color.	71
TAD	Deletes all target colors.	72
TOR	Reads the default tolerance settings for the specified registration number.	73
TOS	Sets the default tolerance settings for the specified registration number.	76
TOD	Deletes the default tolerance settings for the specified registration number.	80
TIR	Reads the name for the default tolerance settings for the specified registration number.	81
TIS	Sets the name for the default tolerance settings for the specified registration number.	82
Settings; Other items		
APR	Reads the automatic printing setting.	83

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APS	Sets the automatic printing setting.	84
DFR	Reads the date format.	85
DFS	Sets the date format.	86
DPR	Reads the data properties: Data protection, list setting, measurement screen setting, target color screen setting	87
DPS	Sets the data properties: Data protection, list setting, measurement screen setting, target color screen setting	88
DTR	Reads the current date and time.	89
DTS	Sets the date and time.	90
LAR	Reads the language setting.	91
LAS	Sets the language setting.	92
LPR	Reads the power save setting (time until power save is activated).	93
LPS	Sets the power save setting (time until power save is activated).	94
OVR	Reads the enabled/disabled status of overwrite warning message.	95
OVS	Enables/disables display of overwrite warning message.	96
DSP	Stores character strings to show in display.	97
DSC	Deletes character strings to show in display.	98
DSF	Enables/disables display of stored character string in display.	99
ATR	Reads the enabled/disabled status of auto target function.	100
ATS	Enables/disables auto target function.	101

2.2.1 Instrument / Status

Function

Reads instrument information.

“IDR” + Delimiter code ⇨

⇧ “Error-check code 1, 2, 3, 4, 5, 6,
7” + Delimiter code

	Meaning	Type; No. of characters	Details/range

	Meaning	Type; No. of characters	Details/range
[1]	Model identification	Integer; 4	0100: CM-700d 0110: CM-600d
[2]	ROM version	Integer; 7	xxxxxxx: Indicates version is x.xx.xxxx.
[3]	Body serial number	Integer; 8	xxxxxxxx
[4]	Geometry identification	Integer; 2	00: di:8°/de:8°
[5]	Minimum wavelength	Integer; 3	400
[6]	Maximum wavelength	Integer; 3	700
[7]	Wavelength pitch	Integer; 2	10

Reads the instrument's ID information: Product code, ROM version, serial number, geometry, wavelength information.

Code	Meaning
OK00	Command was processed normally
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.

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STR (Status Read)			
Function			
Reads instrument status information.			
Input/Output Format			
[Instrument ROM ver. less than 1.10]			
"STR" + Delimiter code		⇒	
		⇐	" Error-check code 1 , 2 , 3 , 4 , 5 , 6 , 7 " + Delimiter code
[Instrument ROM ver. 1.10 or later]			
"STR" + Delimiter code		⇒	
		⇐	" Error-check code 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 " + Delimiter code
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Flash ready status	Integer; 1	0: Not ready to flash 1: Ready to flash
2	Voltage status	Integer; 1	0: Normal level 1: Warning level 2: Error level
3	Calibration status (for current SCI/SCE and measurement area settings)	Integer; 1	0: Zero calibration not performed, white calibration not performed, user calibration not performed 1: Zero calibration completed, white calibration not performed 2: Zero calibration completed, user calibration not performed 3: Ready to take measurement
4	Total data capacity	Integer; 5	05000 (fixed)
5	Sample data count	Integer; 5	00000 to 04000
6	Target data count	Integer; 5	00001 to 01000
7	Standard/Custom	Integer; 1	0: Standard 1: Custom
8	Calibration status warning	Integer; 1	0: Not in calibration warning status 1: In calibration warning status (calibration is recommended) • <u>Not output when instrument ROM version is less than 1.10.</u>

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9	Number of storable target data	Integer; 5	01000 (fixed) • <u>Not output when instrument ROM version is less than 1.10.</u>
Explanation			
<p>Reads instrument status information: Ready to measure, battery condition, calibration condition, number of stored targets, maximum number of stored targets, number of stored measurements, maximum number of stored measurements, calibration warning status, and maximum storable number of targets.</p> <p>8 <i>Calibration warning status</i> indicates whether or not white or user calibration has been performed since the instrument was most recently switched on. It corresponds to the "WR121 CALIBRATION RECOMMENDED" warning message for standalone use of the instrument. "1" will be output when white or user calibration was performed previously, but has not been performed since most recent switching on of instrument. Measurement can still be performed, but in general to ensure best accuracy white or user calibration should be performed whenever the instrument has been switched off and on again.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER35	Measurement in process		

Function

Reads measurement conditions.

“CPR” + Delimiter code ⇨

⇩ “Error-check code, 1, 2, 3, 4, 5”

 + Delimiter code ⇧

	Meaning	Type; No. of characters	Details/range

	Meaning	Type; No. of characters	Details/range
1	Measurement area	Integer; 1	1: SAV (CM-700d only) 2: MAV
2	SCI/SCE mode	Integer; 1	1: SCI 2: SCE 3: SCI + SCE
3	Delay time (from pressing measuring button to taking measurement)	Integer; 2	00 to 30 (10x actual time in seconds: 0.0 to 3.0)
4	Number of measurements for automatic averaging	Integer; 2	01 to 10
5	Number of measurements for manual averaging	Integer; 2	01 to 30

Reads measurement conditions: Measurement area, SCI/SCE mode, delay time, number of measurements for automatic averaging, number of measurements for manual averaging. These conditions are used when the instrument is used standalone (not connected to the computer) with COND. set to off, or in communication mode (connected to PC). However, the number of measurements for manual averaging setting is not used in communication mode. This command is treated in the same way as ECR with command parameter set to "0" (COND not used).

Code	Meaning
OK00	Command was processed normally
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.


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CPS (Condition Parameter Set)			
Function			
Sets measurement conditions.			
Input/Output Format			
"CPS, [1], [2], [3], [4], [5]" + [Delimiter code] ⇒ ⇐ "[Error-check code]" + [Delimiter code]			
Command Parameters			
	Meaning	Type; no. of char.	Details/range
[1]	Measurement area	Integer; 1	1: SAV (CM-700d only) 2: MAV
[2]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE 3: SCI + SCE
[3]	Delay time (from pressing measuring button to taking measurement)	Integer; 2	00 to 30 (10x actual time in seconds: 0.0 to 3.0)
[4]	Number of measurements for automatic averaging	Integer; 2	01 to 10
[5]	Number of measurements for manual averaging	Integer; 2	01 to 30
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets measurement conditions: Measurement area, SCI/SCE mode, delay time, number of measurements for automatic averaging, number of measurements for manual averaging. These conditions are used when the instrument is used standalone (not connected to the computer) with COND. set to off, or in communication mode (connected to PC). For measurement area, the setting value is compared with the current instrument lens setting, and if they are not matched, "ER25" is returned. The number of measurements for manual averaging setting is not used in communication mode. This command is treated in the same way as ECS with command parameter set to "0" (COND not used).			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		
ER25	Input measurement area and instrument lens position do not match.		

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CRR (Colorimetric Parameter Read)			
Function			
Reads colorimetric and display parameters.			
Input/Output Format			
"CRR" + Delimiter code ↗ ↖ " Error-check code , 1 , 2 , 3 , 4 , 5 , 6 , 7 " + Delimiter code			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Observer	Integer; 1	1: 2° 2: 10°
2	Illuminant 1	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12
3	Illuminant 2	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12 00: None
4	Display format	Integer; 10	0000000001: Absolute values 0000000010: Color difference values 0000000100: Absolute and difference 0000001000: Judgment 0000010000: Graph (Spectral) 0000100000: Graph (Color difference) 0001000000: Pseudocolor patches 0010000000: Assessment Each display format is enabled by setting a "1" in the appropriate column. Selection of multiple display formats is possible (switching between formats can then be performed using the < or > buttons on the instrument). For example, setting "0001000010" would enable both Color difference values and Pseudocolor patches displays, which could be switched between using the < or > buttons.
5	Color space	Integer; 2	01: L*a*b* 02: L*C*h 03: Hunter Lab 04: Yxy 05: XYZ 06: Munsell
6	Color-difference equation	Integer; 2	01: ΔE* (1976) 02: CMC (l:c) 03: ΔE* (1994) 04: ΔE* (2000)

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	Index	Integer; 2	00: None 01: WI (ASTM E313-73) 02: WI (ASTM E313-96) 03: YI (ASTM E313-73) 04: YI (ASTM D1925) 05: ISO Brightness 06: 8° gloss
Explanation			
<p>Reads colorimetric and display parameters: Observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index measurement conditions.</p> <p>These conditions are used when the instrument is used standalone (not connected to the computer) with COND. set to off.</p> <p>The font size used for display formats "Absolute values" and "Color difference values" is larger than the font size used for "Absolute and difference values".</p> <p>This command is treated in the same way as ECR with command parameter set to "0" (COND not used).</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

CRS (Colorimetric Parameter Set)			
Function			
Sets colorimetric and display parameters.			
Input/Output Format			
<p>"CRS, [1], [2], [3], [4], [5], [6], [7]" + Delimiter code ⇒</p> <p>← " Error-check code " + Delimiter code</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Observer	Integer; 1	1: 2° 2: 10°
[2]	Illuminant 1	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12
[3]	Illuminant 2	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12 00: None
[4]	Display format	Integer; 10	<p>0000000001: Absolute values 0000000010: Color difference values 0000000100: Absolute and difference 0000001000: Judgment 0000010000: Graph (Spectral) 0000100000: Graph (Color difference) 0001000000: Pseudocolor patches 0010000000: Assessment</p> <p>Each display format is enabled by setting a "1" in the appropriate column. Selection of multiple display formats is possible. For example, setting "0001000010" means both Color difference values and Pseudocolor patches displays are enabled.</p>
[5]	Color space	Integer; 2	01: L*a*b* 02: L*C*h 03: Hunter Lab 04: Yxy 05: XYZ 06: Munsell
[6]	Color-difference equation	Integer; 2	01: ΔE* (1976) 02: CMC (l:c) 03: ΔE* (1994) 04: ΔE* (2000)
[7]	Index	Integer; 2	00: None 01: WI (ASTM E313-73) 02: WI (ASTM E313-96) 03: YI (ASTM E313-73) 04: YI (ASTM D1925) 05: ISO Brightness 06: 8° gloss
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			

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Sets colorimetric and display parameters: Observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index measurement conditions.

These conditions are used when the instrument is used standalone (not connected to the computer) with COND. set to off.

The font size used for display formats "Absolute values" and "Color difference values" is larger than the font size used for "Absolute and difference values".

This command is treated in the same way as ECS with command parameter set to "0" (COND not used).

Error-check codes

Code	Meaning
OK00	Command was processed normally
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error.

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ECR (Environment Condition Parameter Read)			
Function			
Reads parameter conditions for the specified instrument environment number			
Input/Output Format			
"ECR, [1]" + Delimiter code <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> ↗ ↖ </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> "Error-check code, [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11]" + Delimiter code </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Instrument environment number	Integer; 1	0: No environment. Results are a combination of those that would be obtained using CPR and CRR. 1 to 8: Instrument environment
Response Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE 3: SCI + SCE
[2]	Delay time (from pressing measuring button to taking measurement)	Integer; 2	00 to 30 (10x actual time in seconds: 0.0 to 3.0)
[3]	Number of measurements for automatic averaging	Integer; 2	01 to 10
[4]	Number of measurements for manual averaging	Integer; 2	01 to 30
[5]	Observer	Integer; 1	1: 2° 2: 10°
[6]	Illuminant 1	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12
[7]	Illuminant 2	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12 00: None
[8]	Display format	Integer; 10	0000000001: Absolute values 0000000010: Color difference values 0000000100: Absolute and difference 0000001000: Judgment 0000010000: Graph (Spectral) 0000100000: Graph (Color difference) 0001000000: Pseudocolor patches 0010000000: Assessment Each display format is enabled by setting a "1" in the appropriate column. Selection of multiple display formats is possible (switching between formats can then be performed using the < or > buttons on the instrument). For example, setting "0001000010" would enable both Color difference values and

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			Pseudocolor patches displays, which could be switched between using the < or > buttons.	
9	Color space	Integer; 2	01: L*a*b* 03: Hunter Lab 05: XYZ	02: L*C*h 04: Yxy 06: Munsell
10	Color-difference equation	Integer; 2	01: ΔE^* (1976) 03: ΔE^* (1994)	02: CMC (l:c) 04: ΔE^* (2000)
11	Index	Integer; 2	00: None 01: WI (ASTM E313-73) 03: YI (ASTM E313-73) 05: ISO Brightness	02: WI (ASTM E313-96) 04: YI (ASTM D1925) 06: 8° gloss
Explanation				
<p>Reads parameter conditions for the specified instrument environment number: SCI/SCE mode, observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index, delay time, number of measurements for automatic averaging, number of measurements for manual averaging.</p> <p>When Instrument Environment Number is set to "0", results are a combination of those that would be obtained using CPR and CRR.</p>				
Error-check codes				
Code	Meaning			
OK00	Command was processed normally			
OK03	Battery power of instrument is getting low.			
ER00	Invalid command string received.			
ER02	Battery power is too low for measurements.			
ER03	Input parameter error.			

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ECS (Environment Condition Parameter Set)			
Function			
Sets parameter conditions for the specified instrument environment number			
Input/Output Format			
<p>"ECS, [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12]" + [Delimiter code] ⇒</p> <p>← " [Error-check code] " + [Delimiter code]</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Instrument environment number	Integer; 1	0: No environment. Effect is the same as a combination of those that would result from using CPS and CRS. 1 to 8: Instrument environment
[2]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE 3: SCI + SCE
[3]	Delay time (from pressing measuring button to taking measurement)	Integer; 2	00 to 30 (10x actual time in seconds: 0.0 to 3.0)
[4]	Number of measurements for automatic averaging	Integer; 2	01 to 10
[5]	Number of measurements for manual averaging	Integer; 2	01 to 30
[6]	Observer	Integer; 1	1: 2° 2: 10°
[7]	Illuminant 1	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12
[8]	Illuminant 2	Integer; 2	01: A 02: C 03: D50 04: D65 05: F2 06: F6 07: F7 08: F8 09: F10 10: F11 11: F12 00: None
[9]	Display format	Integer; 10	0000000001: Absolute values 0000000010: Color difference values 0000000100: Absolute and difference 0000001000: Judgment 0000010000: Graph (Spectral) 0000100000: Graph (Color difference) 0001000000: Pseudocolor patches 0010000000: Assessment Each display format is enabled by setting a "1" in the appropriate column. Selection of multiple display formats is possible (switching between formats can then be performed using the < or > buttons on the instrument). For example, setting "0001000010" would enable both Color difference values and Pseudocolor patches displays, which could be switched between using the < or > buttons.

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10	Color space	Integer; 2	01: L*a*b* 03: Hunter Lab 05: XYZ	02: L*C*h 04: Yxy 06: Munsell
11	Color-difference equation	Integer; 2	01: ΔE* (1976) 03: ΔE* (1994)	02: CMC (l:c) 04: ΔE* (2000)
12	Index	Integer; 2	00: None 01: WI (ASTM E313-73) 03: YI (ASTM E313-73) 05: ISO Brightness	02: WI (ASTM E313-96) 04: YI (ASTM D1925) 06: 8° gloss

Response Parameters			
	Meaning	Type; No. of characters	Details/range

Explanation	
<p>Sets parameter conditions for the specified instrument environment number: SCI/SCE mode, observer, illuminant 1, illuminant 2, display format, color space, color-difference equation, index, delay time, number of measurements for automatic averaging, number of measurements for manual averaging.</p> <p>When Instrument Environment Number is set to “0”, effect is the same as a combination of those that would result from using CPS and CRS.</p>	

Error-check codes	
Code	Meaning
OK00	Command was processed normally
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error.

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ENR (Environment Number Read)			
Function			
Reads current active instrument environment number			
Input/Output Format			
<div> <div>"ENR" + Delimiter code</div> <div>↗</div> <div>↖</div> <div>"Error-check code,[1]"</div> <div>+ Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Instrument environment number	Integer; 1	0: No environment. 1 to 8: Instrument environment
Explanation			
Reads current active instrument environment number. When Instrument Environment Number is set to "0", no environment is active.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

ENS (Environment Number Set)			
Function			
Sets active instrument environment number			
Input/Output Format			
<div> <div>"ENS," + <i>Delimiter code</i></div> <div>⇒</div> <div>"<i>Error-check code</i>" + <i>Delimiter code</i></div> <div>⇐</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
<i>i</i>	Instrument environment number	Integer; 1	0: No environment. 1 to 8: Instrument environment
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets active instrument environment number. When Instrument Environment Number is set to "0", no environment number is active and the conditions set using CPS and CRS are used.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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EIR (<u>E</u> nvironment <u>I</u> dentification <u>R</u> ead)			
Function			
Reads the identification name set for the specified instrument environment number.			
Input/Output Format			
<div> <div>"EIR," + <i>Delimiter code</i></div> <div>↗</div> <div>↖</div> <div>"<i>Error-check code</i>,"</div> <div>+ <i>Delimiter code</i></div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Instrument environment number	Integer; 1	1 to 8: Instrument environment
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Identification name	Character; 11	
Explanation			
Reads the identification name for the specified instrument environment number.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

EIS (Environment Identification Set)			
Function			
Sets the identification name set for the specified instrument environment number.			
Input/Output Format			
<div> <div>"EIS," + 1 + 2 + Delimiter code</div> <div> <div>↗</div> <div>↖</div> <div>"Error-check code" + Delimiter code</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Instrument environment number	Integer; 1	1 to 8: Instrument environment
2	Identification name	Character; 11	(See 4. Character codes.)
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets the identification name for the specified instrument environment number.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

Function

Reads the white calibration plate identification number currently set on the instrument.

“CIR” + Delimiter code ⇨

⇧ “Error-check code,1”

+ Delimiter code ⇨

	Meaning	Type; No. of characters	Details/range

	Meaning	Type; No. of characters	Details/range
[1]	White calibration plate identification number	Integer; 7	

Reads the white calibration plate identification number currently set on the instrument.

Code	Meaning
OK00	Command was processed normally
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.

CIS (White Calibration Plate Identification Set)			
Function			
Sets the white calibration plate identification number on the instrument.			
Input/Output Format			
<div> <div>"CIS," + Delimiter code</div> <div>↗</div> <div>↖ Error-check code + Delimiter</div> <div>code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
7	White calibration plate identification number	Integer; 7	
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets the white calibration plate identification number on the instrument.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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CDR (White Calibration Data Read)			
Function			
Reads the white calibration data currently set on the instrument.			
Input/Output Format			
<p>"CDR,"1,"2" + Delimiter code ↗</p> <p style="text-align: right;">↖ Error-check code,"1,"2,"3"... 29,"30,"31" + Delimiter code</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Measurement area	Integer; 1	1: SAV (CM-700d only) 2: MAV
2	SCI/SCE mode	Integer; 1	1: SCI 2: SCE
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	White calibration value (400nm)	Integer; 6	080000 to 110000 (1000× actual value: 80.000 to 110.000)
...			
31	White calibration value (700nm)	Integer; 6	080000 to 110000 (1000× actual value: 80.000 to 110.000)
Explanation			
Reads the white calibration data currently set on the instrument for the specified measurement area and SCI/SCE setting.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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UCR (<u>U</u> ser <u>C</u> alibration <u>D</u> ata <u>R</u> ead)			
Function			
Reads the user calibration data currently set on the instrument.			
Input/Output Format			
<p>"UCR,"1,"2" + Delimiter code ↗</p> <p style="text-align: right;">↖ Error-check code,"1,"2,"3"... 29,"30,"31" + Delimiter code</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Measurement area	Integer; 1	1: SAV (CM-700d only) 2: MAV
2	SCI/SCE mode	Integer; 1	1: SCI 2: SCE
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	User calibration value (400nm)	Integer; 6	050000 to 150000 (1000× actual value: 50.000 to 150.000)
...			
31	White calibration value (700nm)	Integer; 6	050000 to 150000 (1000× actual value: 50.000 to 150.000)
Explanation			
Reads the user calibration data currently set on the instrument for the specified measurement area and SCI/SCE setting.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		
ER10	No data present.		

USR (User Calibration Status Read)			
Function			
Reads user calibration enabled/disabled status.			
Input/Output Format			
"USR" + Delimiter code		⇨	
		⇧	" Error-check code , i "
			+ Delimiter code
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
i	User calibration enabled/disabled status	Integer; 1	0: Disabled 1: Enabled
Explanation			
Reads enabled/disabled status of user calibration.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

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USS (User Calibration Status Set)			
Function			
Sets user calibration enabled/disabled status.			
Input/Output Format			
<div> <div>"USS," + <i>Delimiter code</i></div> <div>⇒</div> </div> <div> <div> <div> <div>"<i>Error-check code</i>" + <i>Delimiter</i></div> <div>code</div> </div> <div>⇐</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	User calibration enabled/disabled status	Integer; 1	0: Disabled 1: Enabled
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Sets enabled/disabled status of user calibration.</p> <p>When user calibration is enabled and user calibration has been performed, measurements can be taken (regardless of whether or not white calibration has been performed).</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

2.2.4 Calibration Operations

ZRC (Zero Calibration)

Function

Performs zero calibration.

Input/Output Format

"ZRC" + Delimiter code ⇒
 ⇐ " Error-check code" + Delimiter code

Command Parameters

	Meaning	Type; No. of characters	Details/range

Response Parameters

	Meaning	Type; No. of characters	Details/range

Explanation

Performs zero calibration at the conditions (measurement area and SCI/SCE setting) set using CPS. When conditions are changed, it may be necessary to recalibrate at the new conditions. Timeout time should be set to 30 seconds or longer.

Error-check codes

Code	Meaning
OK00	Command was processed normally.
OK02	Low xenon lamp illumination
OK03	Battery power of instrument is getting low.
OK04	Low xenon lamp illumination/low battery power
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER05	Xenon lamp flash error
ER11	Calibration not performed correctly.
ER13	A/D conversion error
ER27	Charge circuit error

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CAL (White Calibration)			
Function			
Performs white calibration.			
Input/Output Format			
<div> <div>"CAL" + Delimiter code</div> <div>↗</div> <div>↖</div> <div>"Error-check code" + Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Performs white calibration. White calibration is performed at the conditions (measurement area and SCI/SCE setting) set using CPS. When conditions are changed, it may be necessary to recalibrate at the new conditions.</p> <p>Timeout time should be set to 30 seconds or longer.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK02	Low xenon lamp illumination		
OK03	Battery power of instrument is getting low.		
OK04	Low xenon lamp illumination/low battery power		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER05	Xenon lamp flash error		
ER07	Zero calibration and white calibration have not been performed.		
ER11	Calibration not performed correctly.		
ER13	A/D conversion error		
ER27	Charge circuit error		

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USC (User Calibration)			
Function			
Performs user calibration.			
Input/Output Format			
<div> <div>"USC" + Delimiter code</div> <div>↗</div> <div>↖</div> <div>"Error-check code" + Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Performs user calibration. User calibration is performed at the conditions (measurement area and SCI/SCE setting) set using CPS. When conditions are changed, it may be necessary to recalibrate at the new conditions.</p> <p>Timeout time should be set to 30 seconds or longer.</p> <p>If no user calibration data have been set in the instrument, ER22 will be returned.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK02	Low xenon lamp illumination		
OK03	Battery power of instrument is getting low.		
OK04	Low xenon lamp illumination/low battery power		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER05	Xenon lamp flash error		
ER07	Zero calibration and white calibration have not been performed		
ER11	Calibration not performed correctly.		
ER13	A/D conversion error		
ER22	No user calibration data stored in instrument.		
ER24	White calibration has not been performed.		
ER27	Charge circuit error		

2.2.5 Measurement Operations

MES (Measurement)

Function

Starts/interrupts measurement.

Input/Output Format

"MES," + *Delimiter code* ⇒
 ⇐ "Error-check code" + *Delimiter code*

Command Parameters

	Meaning	Type; No. of characters	Details/range
[1]	Measurement operation	Integer; 1	0: Interrupt measurements (automatic averaging) 1: Take measurement (single measurement)/start measurements (automatic averaging)

Response Parameters

	Meaning	Type; No. of characters	Details/range

Explanation

When number of measurements for automatic averaging = 1: Takes a measurement.
 When number of measurements for automatic averaging > 1: Starts a series of measurements for automatic averaging; can also be used to interrupt the series of measurements.
 Measurements are taken according to the conditions set using CPS. Since calibration status are stored for each set of conditions, if conditions are changed it may be necessary to perform calibration again.
 After a measurement (or measurement series for automatic averaging) has been successfully completed, measurement results can then be read from the instrument using MDR (for spectral data) or COR (for colorimetric data).
 The instrument's buffer is cleared of data immediately before a measurement is taken; if a measurement error occurs, it is no longer possible to read the previous measured data using MDR or COR. This also applies when the measuring button is enabled and used for remote measurements.
 Measurements taken using MES are not stored in the instrument's measurement memory.
 From the time when this command is sent to the instrument until the completion of the measurement or measurement series, the instrument will not respond to any command other than STR. When STR is sent during this time, the response will be ER35 (Measurement in process).
 When auto averaging is being performed, this command can be used to interrupt the measurement series. Data measured as part of that series will be lost.

Error-check codes

Code	Meaning
OK00	Command was processed normally.
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error
ER05	Xenon lamp flash error
ER07	Zero calibration and white calibration not performed.

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ER24	White calibration not performed. (Not output if User Calibration is enabled.)
ER36	User calibration not performed. (Not output if User Calibration is disabled.)

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MDR (<u>M</u> easurement <u>D</u> ata <u>R</u> ead)			
Function			
Reads spectral measurement data in instrument buffer.			
Input/Output Format			
<div> <div>"MDR," + 1 + Delimiter code</div> <div> <div>↗</div> <div>↖</div> </div> <div> <div>"Error-check code,1,2,3..."</div> <div>29,30,31 + Delimiter code</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	SCI/SCE mode	Integer; 1	1: SCI 2: SCE
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Measured reflectance (400nm)	Integer; 6	000000 to 020000 (100x actual value: 0.00 to 200.00)
...			
31	Measured reflectance (700nm)	Integer; 6	000000 to 020000 (100x actual value: 0.00 to 200.00)
Explanation			
<p>Reads the spectral measurement data held in the instrument's buffer immediately after a measurement is taken using MES.</p> <p>If data for the requested SCI/SCE mode is not available (for example, if measurement was taken in SCI mode and SCE data is requested using this command), ER10 will be output.</p> <p>Please see Appendix A for the flow of operations for measurement.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		
ER05	Xenon lamp flash error		
ER10	No data present.		
ER13	A/D conversion error		
ER27	Charge circuit error		

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ER05	Xenon lamp flash error
ER10	No data present.
ER13	A/D conversion error
ER27	Charge circuit error

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SWS (Measuring <u>S</u> witch <u>S</u> tatus <u>S</u> et)			
Function			
Enables/disables instrument's measuring button when the instrument is in communication mode.			
Input/Output Format			
<div> <div>"SWS," + Delimiter code</div> <div>⇒</div> <div> <div>"Error-check code" + Delimiter</div> <div>code</div> <div>⇐</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Measuring enable/disable status	Integer; 1	0: Disable 1: Enable
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Enables/disables instrument's measuring button. Enabling the measuring button allows the measuring button to be used to take measurements while the instrument is in communication mode. To take measurements in communication mode using the measuring button, it is necessary to enable the measuring button.</p> <p>Once the measuring button has been enabled, taking a measurement with either the measuring button or by sending the command MES to the instrument from the PC will disable the measuring button. To take continued measurements, the measuring button must be enabled after each measurement has been completed.</p> <p>When the measuring button is pressed to take a measurement, the instrument's buffer is immediately cleared to prepare to receive the new measurement data.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		

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ER13	A/D conversion error
ER27	Charge circuit error
ER35	Measurement in process

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ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error
ER05	Xenon lamp flash error
ER10	No data present.
ER13	A/D conversion error
ER27	Charge circuit error
ER35	Measurement in process

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2.2.6 Measurement values**SPR (Sample Data Parameter Read)****Function**

Reads the measurement parameters of the specified data stored in the instrument.

Input/Output Format

"SPR," + *Delimiter code* ⇒

← " *Error-check code* , 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11" + *Delimiter code*

Command Parameters

	Meaning	Type; No. of characters	Details/range
1	Sample data number	Integer; 5	00001 to 04000

Response Parameters

	Meaning	Type; No. of characters	Details/range
1	Measurement area	Integer; 1	1: SAV (CM-700d only) 2: MAV
2	SCI/SCE mode	Integer; 1	1: SCI 2: SCE 3: SCI + SCE
3	Related target number	Integer; 5	00001 to 01000
4	Year of measurement	Integer; 4	2000 to 2050
5	Month of measurement	Integer; 2	01 to 12
6	Day of measurement	Integer; 2	01 to 31 (Depending on month)
7	Hour of measurement	Integer; 2	00 to 23 (24-hour clock)
8	Minute of measurement	Integer; 2	00 to 59
9	Second of measurement	Integer; 2	00 to 59
10	Standard/Custom	Integer; 1	0: Standard 1: Custom
11	Name (comment)	Character; 11	

Explanation

Reads the measurement parameters of the specified data number stored in the instrument: Measurement area, SCI/SCE mode, related target number, date/time of measurement, and name (comment).

The reflectance data for measurement are read using a different command: SDR.

Error-check codes

Code	Meaning
OK00	Command was processed normally
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.

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ER03	Input parameter error
ER10	No data present.

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SDR (<u>S</u> ample <u>D</u> ata <u>R</u> ead)			
Function			
Reads the measurement data of the specified data number stored in the instrument.			
Input/Output Format			
<p>"SDR, [1], [2]" + [Delimiter code] ↗</p> <p>↖ "[Error-check code], [1], [2], [3]... [29], [30], [31]" + [Delimiter code]</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Sample data number	Integer; 5	00001 to 04000
[2]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE
Response Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Measured reflectance (400nm)	Integer; 6	000000 to 020000 (100x actual value: 0.00 to 200.00)
...			
[31]	Measured reflectance (700nm)	Integer; 6	000000 to 020000 (100x actual value: 0.00 to 200.00)
Explanation			
<p>Reads the measurement data of the specified data number stored in the instrument.</p> <p>If data for the requested SCI/SCE mode is not available (for example, if measurement was taken in SCI mode and SCE data is requested using this command), ER10 will be output.</p> <p>The measurement parameters for the data are read using a different command: SPR.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		
ER10	No data present.		

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SDD (Sample Data Delete)			
Function			
Deletes the measurement data for the specified data number stored in the instrument.			
Input/Output Format			
<div> <div>"SDD," + Delimiter code</div> <div>↗</div> <div>↖ Error-check code + Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Sample data number	Integer; 5	00001 to 0XXXX (XXXX = Number of measurements in memory; Maximum: 4000)
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Deletes the measurement data for the specified data number stored in the instrument. The maximum sample data number that can be specified is equal to the sample data count obtained using STR.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		
ER10	No data present.		

SAD (Sample Data All Delete)			
Function			
Deletes all measurement data stored in the instrument.			
Input/Output Format			
<div> <div>"SAD" + Delimiter code</div> <div>↗</div> <div>↖</div> <div>"Error-check code" + Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Deletes all measurement data stored in the instrument.</p> <p>The time required to complete this procedure varies according to the number of stored data, but a timeout of 3 seconds or longer is sufficient.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

Function

Input/Output Format

“TNR” + Delimiter code ⇨

⇧ “Error-check code,1”
+ Delimiter code ⇧

	Meaning	Type; No. of characters	Details/range

	Meaning	Type; No. of characters	Details/range
[7]	Target number	Integer; 5	00001 to 01000

Reads the active target number set on the instrument.

Code	Meaning
OK00	Command was processed normally
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.

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TNS (Target Number Set)			
Function			
Sets the active target number on the instrument.			
Input/Output Format			
<div> <div>"TNS," + Delimiter code</div> <div>↗</div> <div>↖ Error-check code + Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
7	Target number	Integer; 5	00001 to 01000
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets the active target number on the instrument. Subsequent measurements taken with the instrument in standalone mode (not connected to a computer) will have this target number as the related target number.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		

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TPR (Target Data Parameter Read)			
Function			
Reads the measurement parameters of the specified target data stored in the instrument.			
Input/Output Format			
"TPR," + 1 + Delimiter code ↘ ↙ Error-check code , 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 , 10 , 11 " + Delimiter code			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Target data number	Integer; 5	00001 to 01000
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Measurement area	Integer; 1	1: SAV (CM-700d only) 2: MAV
2	SCI/SCE mode	Integer; 1	1: SCI 2: SCE 3: SCI + SCE
3	Data type	Integer; 1	0: Spectral reflectance 1: Colorimetric
4	Year of measurement	Integer; 4	2000 to 2050
5	Month of measurement	Integer; 2	01 to 12
6	Day of measurement	Integer; 2	01 to 31 (Depending on month)
7	Hour of measurement	Integer; 2	00 to 23 (24-hour clock)
8	Minute of measurement	Integer; 2	00 to 59
9	Second of measurement	Integer; 2	00 to 59
10	Standard/Custom	Integer; 1	0: Standard 1: Custom
11	Name (comment)	Character; 11	
Explanation			
Reads the measurement parameters of the specific target data number stored in the instrument: Measurement area, SCI/SCE mode, data type, date/time of measurement, and name (comment). The target data for measurement are read using a different command: TDR.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		
ER10	No data present.		

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TDR (<u>T</u> arget <u>D</u> ata <u>R</u> ead)			
Function			
Reads the target data of the specified target number stored in the instrument.			
Input/Output Format			
"TDR, [1], [2]" + Delimiter code		⇒	
(For spectral target data)	⇐	Error-check code , [1], [2], [3]... 29, 30, 31 " + Delimiter code	
(For colorimetric target data)	⇐	Error-check code , [1], [2], [3]... 9, 10 " + Delimiter code	
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Target data number	Integer; 5	00001 to 01000
[2]	SCI/SCE mode	Integer; 1	1: SCI

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10	Illuminant 2	Integer; 2	1: A 4: D65 7: F7 10: F11	2: C 5: F2 8: F8 11: F12	3: D50 6: F6 9: F10 00: None
Explanation					
<p>Reads the target data of the specified target data number stored in the instrument. Either spectral data or colorimetric data (not both for the same target number) can be set as the target data.</p> <p>If data for the requested SCI/SCE mode is not available (for example, if only SCI data are stored and SCE data is requested using this command), ER10 will be output.</p> <p>The measurement parameters for the data are read using a different command: TPR.</p>					
Error-check codes					
Code	Meaning				
OK00	Command was processed normally.				
OK03	Battery power of instrument is getting low.				
ER00	Invalid command string received.				
ER02	Battery power is too low for measurements.				
ER03	Input parameter error				
ER10	No data present.				

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[3]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE 3: SCI + SCE
[4]	Data type	Integer; 1	0: Spectral reflectance 1: Colorimetric
[5]	Year	Integer; 4	2000 to 2050
[6]	Month	Integer; 2	01 to 12
[7]	Day	Integer; 2	01 to 31 (Depending on month)
[8]	Hour	Integer; 2	00 to 23 (24-hour clock)
[9]	Minute	Integer; 2	00 to 59
[10]	Second	Integer; 2	00 to 59
[11]	Name (comment)	Character; 11	
(For spectral target data)			
[20]	Spectral reflectance (400nm)	Integer; 6	000000 to 020000 (100x actual value: 0.00 to 200.00)
...			
[51]	Spectral reflectance (700nm)	Integer; 6	000000 to 020000 (100x actual value: 0.00 to 200.00)
(For colorimetric target data)			
[20]	Color space setting	Integer; 1	1: L*a*b* 3: Hunter Lab 5: XYZ
[21]	First colorimetric value under Illuminant 1	Integer; 6	Range varies depending on color space (100x actual value)
[22]	Second colorimetric value under Illuminant 1	Integer; 6	Range varies depending on color space (100x actual value)
[23]	Third colorimetric value under Illuminant 1	Integer; 6	Range varies depending on color space (100x actual value)
[24]	First colorimetric value under Illuminant 2	Integer; 6	Range varies depending on color space (100x actual value)
[25]	Second colorimetric value under Illuminant 2	Integer; 6	Range varies depending on color space (100x actual value)
[26]	Third colorimetric value under Illuminant 2	Integer; 6	Range varies depending on color space (100x actual value)
[27]	Observer	Integer; 1	1: 2° 2: 10°
[28]	Illuminant 1	Integer; 2	1: A 2: C 3: D50 4: D65 5: F2 6: F6 7: F7 8: F8 9: F10 10: F11 11: F12
[29]	Illuminant 2	Integer; 2	1: A 2: C 3: D50 4: D65 5: F2 6: F6 7: F7 8: F8 9: F10 10: F11 11: F12 00: None
Response Parameters			
	Meaning	Type; No. of characters	Details/range

Explanation	
<p>Sets the target data of the specified target data number in the instrument.</p> <p>To set data for a target, at a minimum "TDS,1" (target parameters) and "TDS,2" (target data) sets of data must be set. To set both SCI and SCE target data, "TDS,1" (target parameters), "TDS,2" (SCI target data), and "TDS,3" (SCE target data) must be set.</p> <p>The sets of data ("TDS,1" + "TDS,2" or "TDS,1" + "TDS,2" + "TDS,3") for this command must be set in sequence without interruption. If a different command is input before the sequence has been completed (for example, if a different command is input between the sets of data for "TDS,1" and "TDS,2"), the input data will be invalid and the target will not be stored.</p> <p>When inputting colorimetric data, if no data will be set for Illuminant 2, set the values to "0". In addition, when inputting colorimetric data for SCI and SCE, the Color space, Observer, Illuminant 1, and Illuminant 2 must be set to the same setting for both SCI and SCE. If different settings are set, the last setting will overwrite the earlier setting.</p>	
Error-check codes	
Code	Meaning
OK00	Command was processed normally.
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error
ER69	Target data protection status is on.

TTD (Use <u>T</u> arget <u>T</u> olerance <u>D</u> efault Values)			
Function			
Sets the tolerance values for the specified target data stored in the instrument to the values of the specified default registration.			
Input/Output Format			
<div> <div>"TTD," + [1] + [2] + [Delimiter code]</div> <div>⇒</div> <div>"[Error-check code]" + [Delimiter code]</div> <div>⇐</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Target data number	Integer; 5	00001 to 01000
[2]	Default tolerance registration number	Integer; 2	00: No registration (no tolerance data) 01 to 08: Default tolerance registration to copy from
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Sets the tolerance values for the specified target data number to the tolerance values stored in the specified default tolerance registration number.</p> <p>If 00 is set as the default tolerance registration number, the tolerance values for the specified target data number are set to "None".</p> <p>If 01 to 08 is set as the default tolerance registration number, the tolerance values stored in that default tolerance registration number are copied and set as the tolerances for the specified target number.</p> <p>If there are no data in the specified target data number, the response will be ER10.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		
ER10	No data present.		
ER69	Target data protection status is on.		

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TTR (Target Tolerance Values Read)			
Function			
Reads the tolerance values of the specified target number stored in the instrument.			
Input/Output Format			
<p>"TTR, [1], [2]" + <i>Delimiter code</i> ↗</p> <p>↖ " <i>Error-check code</i>, [1]...[9], [10]...[47], [48]" + <i>Delimiter code</i></p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Target data number	Integer; 5	00001 to 01000
[2]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE
Response Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Tolerance type	Integer; 1	0 (Standard value)
(Parametric coefficients)			
[2]	(CMC) l	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
[3]	(CMC) c	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
[4]	(ΔE*94) l	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
[5]	(ΔE*94) c	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
[6]	(ΔE*94) h	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
[7]	(ΔE2000) l	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
[8]	(ΔE2000) c	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
[9]	(ΔE2000) h	Integer; 3	001 to 999 (100x actual value: 0.01 to 9.99)
(Tolerance values)			
[10]	Color space	Integer; 2	01: L*a*b* 02: L*C*h 03: Hunter Lab 04: Yxy 05: XYZ 06: Munsell
[11]	Color-difference equation	Integer; 2	01: ΔE* (1976) 02: CMC (l:c) 03: ΔE* (1994) 04: ΔE* (2000)
[12]	Index	Integer; 2	00: None 01: WI (ASTM E313-73) 02: WI (ASTM E313-96) 03: YI (ASTM E313-73) 04: YI (ASTM D1925) 05: ISO Brightness 06: 8° gloss
[13]	Enable/disable +ΔA tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
[14]	+ ΔA tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)

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15	Enable/disable $-\Delta A$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
16	$-\Delta A$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
17	Enable/disable $+\Delta B$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
18	$+\Delta B$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
19	Enable/disable $-\Delta B$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
20	$-\Delta B$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
21	Enable/disable $+\Delta C$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
22	$+\Delta C$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
23	Enable/disable $-\Delta C$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
24	$-\Delta C$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
25	Enable/disable ΔE tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
26	ΔE tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
27	Enable/disable $+\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
28	$+\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
29	Enable/disable $-\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
30	$-\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
31	Enable/disable $+\Delta A$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
32	$+\Delta A$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
33	Enable/disable $-\Delta A$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
34	$-\Delta A$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
35	Enable/disable $+\Delta B$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
36	$+\Delta B$ tolerance value	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)

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	under Illuminant 2		
[37]	Enable/disable $-\Delta B$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[38]	$-\Delta B$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[39]	Enable/disable $+\Delta C$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[40]	$+\Delta C$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[41]	Enable/disable $-\Delta C$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[42]	$-\Delta C$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[43]	Enable/disable ΔE tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[44]	ΔE tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[45]	Enable/disable $+\Delta \text{Index}$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[46]	$+\Delta \text{Index}$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[47]	Enable/disable $-\Delta \text{Index}$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[48]	$-\Delta \text{Index}$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)

Explanation

Reads the tolerance parameters and values set for the specified target number. [10] above (Color space) determines the meanings of A, B, and C in [13] through [24] and [31] through [42]: A is the first variable of the color space, B is the second, and C is the third. For example, if [10] is set to "1" (L*a*b*), then A=L*, B=a*, and C=b*. If [10] is set to "6" (Munsell), tolerances for A, B, and C are ignored. [11] determines the meaning of E in [25], [26], [43] and [44]. [12] determines the meaning of Index in [27] to [30] and [45] to [48].

Error-check codes

Code	Meaning
OK00	Command was processed normally.
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error
ER10	No data present.

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TTS (Target Tolerance Values Set)			
Function			
Sets the tolerance values of the specified target number stored in the instrument.			
Input/Output Format			
"TTS, [1], [2]... [11], [12]... [49], [50]" + [Delimiter code]			
⇨			
⇩ " [Error-check code] " + [Delimiter code]			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Target data number	Integer; 5	00001 to 01000
[2]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE
[3]	Tolerance type	Integer; 1	0 (Standard value)
(Parametric coefficients)			
[4]	(CMC) l	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[5]	(CMC) c	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[6]	(ΔE*94) l	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[7]	(ΔE*94) c	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[8]	(ΔE*94) h	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[9]	(ΔE2000) l	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[10]	(ΔE2000) c	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[11]	(ΔE2000) h	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
(Tolerance values)			
[12]	Color space	Integer; 2	01: L*a*b* 02: L*C*h 03: Hunter Lab 04: Yxy 05: XYZ 06: Munsell
[13]	Color-difference equation	Integer; 2	01: ΔE* (1976) 02: CMC (l:c) 03: ΔE* (1994) 04: ΔE* (2000)
[14]	Index	Integer; 2	00: None 01: WI (ASTM E313-73) 02: WI (ASTM E313-96) 03: YI (ASTM E313-73) 04: YI (ASTM D1925) 05: ISO Brightness 06: 8° gloss
[15]	Enable/disable +ΔA tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
[16]	+ ΔA tolerance value under Illuminant 1	Integer; 3	001 to 200 (10× actual value: 0.1 to 20.0)
[17]	Enable/disable -ΔA tolerance value under	Integer; 1	0: Disable 1: Enable

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	Illuminant 1		
18	-ΔA tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
19	Enable/disable +ΔB tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
20	+ ΔB tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
21	Enable/disable -ΔB tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
22	-ΔB tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
23	Enable/disable +ΔC tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
24	+ ΔC tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
25	Enable/disable -ΔC tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
26	-ΔC tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
27	Enable/disable ΔE tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
28	ΔE tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
29	Enable/disable +ΔIndex tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
30	+ ΔIndex tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
31	Enable/disable -ΔIndex tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
32	-ΔIndex tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
33	Enable/disable +ΔA tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
34	+ ΔA tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
35	Enable/disable -ΔA tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
36	-ΔA tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
37	Enable/disable +ΔB tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
38	+ ΔB tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)

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[39]	Enable/disable ΔB tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[40]	ΔB tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[41]	Enable/disable ΔC tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[42]	ΔC tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[43]	Enable/disable ΔE tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[44]	ΔE tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[45]	Enable/disable ΔI tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[46]	ΔI tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[47]	Enable/disable $\Delta Index$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[48]	$\Delta Index$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[49]	Enable/disable $\Delta Index$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[50]	$\Delta Index$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)

Response Parameters

	Meaning	Type; No. of characters	Details/range

Explanation

Sets the tolerance parameters and values set for the specified target number. [12] above (Color space) determines the meanings of A, B, and C in [15] through [26] and [33] through [44]: A is the first variable of the color space, B is the second, and C is the third. For example, if [12] is set to "1" ($L^*a^*b^*$), then $A=L^*$, $B=a^*$, and $C=b^*$. If [12] is set to "6" (Munsell), tolerances for A, B, and C should be disabled. [13] determines the meaning of E in [27], [28], [45] and [46]. [14] determines the meaning of Index in [29] to [32] and [47] to [50]. Tolerance data can be set for any target number for which target data exists. Settings for [12] Color Space, [13] Color difference equation, and [14] Index should be set to the same setting for SCI and SCE. If different settings are set, the SCE setting will take priority and be used for SCI also.

Error-check codes

Code	Meaning
OK00	Command was processed normally.
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error

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ER69

Target data protection status is on.

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TDD (Target Data Delete)			
Function			
Deletes the data for the specified target data number stored in the instrument.			
Input/Output Format			
<div> <div>"TDD," + Delimiter code</div> <div>↗</div> <div>↖ Error-check code + Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Target data number	Integer; 5	00001 to 1000
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Deletes the data for the specific target data number stored in the instrument. If data does not exist for the specified target data number, ER10 will be output.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		
ER10	No data present.		
ER69	Target data protection status is on.		

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TAD (Target Data All Delete)			
Function			
Deletes all target data stored in the instrument.			
Input/Output Format			
"TAD" + Delimiter code		⇒	
		⇐	" Error-check code " + Delimiter code
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Deletes all target data stored in the instrument. The time required to complete this procedure varies according to the number of stored data, but a timeout of 3 seconds or longer is sufficient.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER69	Target data protection status is on.		

TOR (Default <u>Tolerance Values Read</u>)			
Function			
Reads the tolerance values of the specified default tolerance registration number stored in the instrument.			
Input/Output Format			
"TOR, [1], [2]" + [Delimiter code]		⇒	
		⇐ "[Error-check code], [1]...[9], [10]...[47], [48]" + [Delimiter code]	
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Default tolerance registration number	Integer; 2	01 to 08
[2]	SCI/SCE mode	Integer; 1	1: SCI 2: SCE
Response Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Tolerance type	Integer; 1	0 (Standard value)
(Parametric coefficients)			
[2]	(CMC) l	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[3]	(CMC) c	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[4]	(ΔE*94) l	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[5]	(ΔE*94) c	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[6]	(ΔE*94) h	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[7]	(ΔE2000) l	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[8]	(ΔE2000) c	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
[9]	(ΔE2000) h	Integer; 3	001 to 999 (100× actual value: 0.01 to 9.99)
(Tolerance values)			
[10]	Color space	Integer; 2	01: L*a*b* 02: L*C*h 03: Hunter Lab 04: Yxy 05: XYZ 06: Munsell
[11]	Color-difference equation	Integer; 2	01: ΔE* (1976) 02: CMC (l:c) 03: ΔE* (1994) 04: ΔE* (2000)
[12]	Index	Integer; 2	00: None 01: WI (ASTM E313-73) 02: WI (ASTM E313-96) 03: YI (ASTM E313-73) 04: YI (ASTM D1925) 05: ISO Brightness 06: 8° gloss
[13]	Enable/disable +ΔA tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable

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14	+ ΔA tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
15	Enable/disable - ΔA tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
16	- ΔA tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
17	Enable/disable + ΔB tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
18	+ ΔB tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
19	Enable/disable - ΔB tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
20	- ΔB tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
21	Enable/disable + ΔC tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
22	+ ΔC tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
23	Enable/disable - ΔC tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
24	- ΔC tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
25	Enable/disable ΔE tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
26	ΔE tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
27	Enable/disable + Δ Index tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
28	+ Δ Index tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
29	Enable/disable - Δ Index tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
30	- Δ Index tolerance value under Illuminant 1	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
31	Enable/disable + ΔA tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
32	+ ΔA tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
33	Enable/disable - ΔA tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
34	- ΔA tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
35	Enable/disable + ΔB tolerance value under	Integer; 1	0: Disable 1: Enable

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	Illuminant 2		
[36]	+ ΔB tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[37]	Enable/disable - ΔB tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[38]	- ΔB tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[39]	Enable/disable + ΔC tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[40]	+ ΔC tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[41]	Enable/disable - ΔC tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[42]	- ΔC tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[43]	Enable/disable ΔE tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[44]	ΔE tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[45]	Enable/disable + Δ Index tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[46]	+ Δ Index tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)
[47]	Enable/disable - Δ Index tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[48]	- Δ Index tolerance value under Illuminant 2	Integer; 3	001 to 200 (10 \times actual value: 0.1 to 20.0)

Explanation

Reads the tolerance parameters and values set for the specified default tolerance registration number.

[10] above (Color space) determines the meanings of A, B, and C in [13] through [24] and [31] through [42]: A is the first variable of the color space, B is the second, and C is the third. For example, if [10] is set to "1" (L*a*b*), then A=L*, B=a*, and C=b*. If [10] is set to "6" (Munsell), tolerances for A, B, and C are ignored.

[11] determines the meaning of E in [25], [26], [43] and [44].

[12] determines the meaning of Index in [27] to [30] and [45] to [48].

Error-check codes

Code	Meaning
OK00	Command was processed normally.
OK03	Battery power of instrument is getting low.
ER00	Invalid command string received.
ER02	Battery power is too low for measurements.
ER03	Input parameter error
ER10	No data present.

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17	Enable/disable $-\Delta A$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
18	$-\Delta A$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
19	Enable/disable $+\Delta B$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
20	$+\Delta B$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
21	Enable/disable $-\Delta B$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
22	$-\Delta B$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
23	Enable/disable $+\Delta C$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
24	$+\Delta C$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
25	Enable/disable $-\Delta C$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
26	$-\Delta C$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
27	Enable/disable ΔE tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
28	ΔE tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
29	Enable/disable $+\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
30	$+\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
31	Enable/disable $-\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 1	0: Disable 1: Enable
32	$-\Delta \text{Index}$ tolerance value under Illuminant 1	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
33	Enable/disable $+\Delta A$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
34	$+\Delta A$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
35	Enable/disable $-\Delta A$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
36	$-\Delta A$ tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
37	Enable/disable $+\Delta B$ tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
38	$+\Delta B$ tolerance value	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)

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	under Illuminant 2		
[39]	Enable/disable -ΔB tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[40]	-ΔB tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
[41]	Enable/disable +ΔC tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[42]	+ ΔC tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
[43]	Enable/disable -ΔC tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[44]	-ΔC tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
[45]	Enable/disable ΔE tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[46]	ΔE tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
[47]	Enable/disable +ΔIndex tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[48]	+ ΔIndex tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
[49]	Enable/disable -ΔIndex tolerance value under Illuminant 2	Integer; 1	0: Disable 1: Enable
[50]	-ΔIndex tolerance value under Illuminant 2	Integer; 3	001 to 200 (10x actual value: 0.1 to 20.0)
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Sets the tolerance parameters and values set for the specified default tolerance registration number. [12] (Color space) determines the meanings of A, B, and C in [15] through [26] and [33] through [44]: A is the first variable of the color space, B is the second, and C is the third. For example, if [12] is set to "1" ($L^*a^*b^*$), then $A=L^*$, $B=a^*$, and $C=b^*$. If [12] is set to "6" (Munsell), tolerances for A, B, and C should be disabled.</p> <p>[13] determines the meaning of E in [27], [28], [45] and [46].</p> <p>[14] determines the meaning of Index in [29] to [32] and [47] to [50].</p> <p>Tolerance data can be set for any target number for which target data exists.</p> <p>Settings for [12] Color Space, [13] Color difference equation, and [14] Index should be set to the same setting for SCI and SCE. If different settings are set, the SCE setting will take priority and be used for SCI also.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

ER03	Input parameter error
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TOD (Default <u>T</u> olerance Values <u>D</u> elete)			
Function			
Deletes the data for the specified default tolerance registration number stored in the instrument.			
Input/Output Format			
<div> <div>"TOD," + 1 + Delimiter code</div> <div>↗</div> <div>↖ Error-check code + Delimiter code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Default tolerance registration number	Integer; 2	01 to 08
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Deletes the data for the specific default tolerance registration number stored in the instrument. If data does not exist for the specified default tolerance registration number, ER10 will be output.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error		
ER10	No data present.		

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TIR (Default <u>T</u> olerance <u>I</u> dentification <u>R</u> ead)			
Function			
Reads the identification name set for the specified default tolerance registration number.			
Input/Output Format			
<p>"TIR," + <i>Delimiter code</i> ↗</p> <p>↖ " <i>Error-check code</i> ," + <i>Delimiter code</i> "</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Default tolerance registration number	Integer; 2	01 to 08
Response Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Identification name	Character; 11	
Explanation			
Reads the identification name for the specified default tolerance registration number.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

TIS (Default <u>T</u> olerance <u>I</u> dentification <u>S</u> et)			
Function			
Sets the identification name set for the specified default tolerance registration number.			
Input/Output Format			
<div> <div>"TIS," + [1] + [2] + [Delimiter code]</div> <div>↗</div> <div>↖ [Error-check code] + [Delimiter code]</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Default tolerance registration number	Integer; 2	01 to 08
[2]	Identification name	Character; 11	(See 4. Character codes.)
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets the identification name for the specified default tolerance registration number.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

2.2.8 Settings; Other items

APR (Auto Print Status Read)			
Function			
Reads current automatic print status of instrument.			
Input/Output Format			
<div> <div>"APR" + Delimiter code</div> <div>⇒</div> <div> <div>"Error-check code,1"</div> <div>⇐</div> <div>+ Delimiter code</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Auto print status	Integer; 1	0: Disabled 1: Enabled
Explanation			
Reads current automatic print status of instrument.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally.		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

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APS (Auto Print Status Set)			
Function			
Sets automatic print status of instrument.			
Input/Output Format			
<div> <div>"APS, [1]" + Delimiter code</div> <div>⇒</div> <div> <div>"Error-check code" + Delimiter</div> <div>⇐</div> <div>code</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Auto print status	Integer; 1	0: Disabled 1: Enabled
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Sets automatic print status of instrument.</p> <p>When [1] is set to "1" (enabled) with the instrument in standalone mode and connected to a printer, measurement results will be automatically sent to the printer after each measurement. Printed results will vary according to the instrument's screen display setting.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

DFR (<u>D</u> ate <u>F</u> ormat <u>R</u> ead)			
Function			
Reads date format of instrument.			
Input/Output Format			
<p>"DFR" + Delimiter code ⇒</p> <p style="text-align: right;">⇐ " Error-check code , 1 "</p> <p style="text-align: right;">+ Delimiter code</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Date format	Integer; 1	0: YYYY/MM/DD 1: MM/DD/YYYY
Explanation			
Reads date format of instrument.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

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DFS (Date Format Set)			
Function			
Sets date format of instrument.			
Input/Output Format			
<div> <div>"DFS," + Delimiter code</div> <div>⇒</div> <div>"Error-check code" + Delimiter</div> <div>⇐</div> <div>code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Date format	Integer; 1	0: YYYY/MM/DD 1: MM/DD/YYYY
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets date format of instrument. The date format affects only how dates are shown in the instrument's screen display. The date format used for setting/reading data for communication commands is fixed and is not affected by this setting.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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DPR (<u>D</u> ata <u>P</u> roperty <u>R</u> ead)			
Function			
Reads data properties of instrument.			
Input/Output Format			
"DPR" + Delimiter code <div style="display: inline-block; vertical-align: middle; margin-left: 10px;">⇒</div> <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> ⇐ " Error-check code , 1 , 2 , 3 , 4 " </div> <div style="display: inline-block; vertical-align: middle; margin-left: 10px;">+ Delimiter code</div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Target data protection status	Integer; 1	0: Disabled 1: Enabled
2	Data list display format	Integer; 1	1: Name 2: Date/time 3: Pseudocolor patch
3	Measurement screen display setting	Integer; 1	0: List display 1: Detail display
4	Target screen display setting	Integer; 1	0: List display 1: Detail display
Explanation			
Reads data properties of instrument: Target data protection status, data list display format, measurement screen display setting, target screen display setting.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

DPS (Data Property Set)			
Function			
Sets data properties of instrument.			
Input/Output Format			
"DPS, [1], [2], [3], [4]" + Delimiter code ⇒ ⇐ " Error-check code " + Delimiter code			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Target data protection status	Integer; 1	0: Disabled 1: Enabled
[2]	Data list display format	Integer; 1	1: Name 2: Date/time 3: Pseudocolor patch
[3]	Measurement screen display setting	Integer; 1	0: List display 1: Detail display
[4]	Target screen display setting	Integer; 1	0: List display 1: Detail display
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets data properties of instrument: Data protection status, data list display format, measurement screen display setting, target screen display setting. [1] (Target data protection status) applies to all target data. When [1] is set to "1" (enabled), creation of new targets is possible but overwriting existing target data cannot be performed.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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DTR (<u>D</u> ate and <u>T</u> ime <u>R</u> ead)			
Function			
Reads the current date and time set on the instrument.			
Input/Output Format			
"DTR" + Delimiter code <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> ↗ ↖ </div> <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> " Error-check code , 1 , 2 , 3 , 4 , 5 , 6 " </div> <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> + Delimiter code </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Year	Integer; 4	2000 to 2050
2	Month	Integer; 2	01 to 12
3	Day	Integer; 2	01 to 31 (Depending on month)
4	Hour	Integer; 2	00 to 23 (24-hour clock)
5	Minute	Integer; 2	00 to 59
6	Second	Integer; 2	00 to 59
Explanation			
Reads the current date and time set on the instrument. Output format is fixed and does not depend on the date/time format set using DFS.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

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DTS (<u>D</u> ate and <u>T</u> ime <u>S</u> et)			
Function			
Sets the date and time on the instrument.			
Input/Output Format			
"DTS, [1], [2], [3], [4], [5], [6]" + <i>Delimiter</i> <div style="display: flex; justify-content: space-around; align-items: center;"> <div> \Rightarrow <code>code</code> </div> <div> \Leftarrow <code>"Error-check code" + Delimiter</code> <code>code</code> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Year	Integer; 4	2000 to 2050
[2]	Month	Integer; 2	01 to 12
[3]	Day	Integer; 2	01 to 31 (Depending on month)
[4]	Hour	Integer; 2	00 to 23 (24-hour clock)
[5]	Minute	Integer; 2	00 to 59
[6]	Second	Integer; 2	00 to 59
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets the current date and time set on the instrument. Format is fixed and does not depend on the date/time format set using DFS.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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LAS (Language Set)			
Function			
Sets the display language of the instrument.			
Input/Output Format			
<div> <div>"LAS," + Delimiter code</div> <div>⇒</div> <div>"Error-check code" + Delimiter</div> <div>⇐</div> <div>code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
7	Language	Integer; 1	1: English 2: Japanese 3: German 4: French 5: Spanish 6: Italian 7: Chinese
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets the display language of the instrument.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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LPR (Low Power Attribute Read)			
Function			
Reads the low power attribute (time before activation of power save function) of the instrument.			
Input/Output Format			
<p>"LPR" + Delimiter code ⇒</p> <p style="text-align: right;">⇐ Error-check code, 1"</p> <p style="text-align: right;">+ Delimiter code</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Time before activation of power save function	Integer; 2	00 to 60 (seconds)
Explanation			
<p>Reads the low power attribute (time before activation of power save function) of the instrument.</p> <p>When set to "00", the power save function is disabled and the instrument never enters standby.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

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LPS (Low Power Attribute Set)			
Function			
Sets the low power attribute (time before activation of power save function) of the instrument.			
Input/Output Format			
<div> <div>"LPS," + Delimiter code</div> <div>⇒</div> <div>"Error-check code" + Delimiter</div> <div>⇐</div> <div>code</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
7	Time before activation of power save function	Integer; 2	00 to 60 (seconds)
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets the low power attribute (time before activation of power save function) of the instrument. When set to "00", the power save function is disabled and the instrument never enters standby.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

OVR (<u>O</u> verwrite Message Status <u>R</u> ead)			
Function			
Reads current overwrite message display enabled/disabled status of instrument.			
Input/Output Format			
<div> <div>"OVR" + Delimiter code</div> <div>⇒</div> <div> <div>"Error-check code,1"</div> <div>⇐</div> <div>+ Delimiter code</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Overwrite message status	Integer; 1	0: Disabled (Overwrite warning not shown.) 1: Enabled (Overwrite warning shown when applicable)
Explanation			
Reads current overwrite message display enabled/disabled status of instrument.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

OVS (<u>O</u> verwrite Message Status <u>S</u> et)			
Function			
Sets overwrite message display enabled/disabled status of instrument.			
Input/Output Format			
<div> <div>"OVS," + 1 + Delimiter code</div> <div>⇒</div> <div>"Error-check code" + Delimiter code</div> <div>⇐</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
1	Overwrite message status	Integer; 1	0: Disabled (Overwrite warning not shown.) 1: Enabled (Overwrite warning shown when applicable)
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets overwrite message display enabled/disabled status of instrument. When [1] is set to "0" (disabled), no warning message is displayed before overwriting an existing target.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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DSP (Display String Register)			
Function			
Registers character string for later display on instrument LCD.			
Input/Output Format			
<p>"DSP, [1], [2], [3], [4]" + Delimiter code ⇒</p> <p style="text-align: right;">⇐ Error-check code" + Delimiter code</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Screen line number	Integer; 1	1 to 9
[2]	Character color	Character; 6	Hexadecimal values 2 characters (8 bit) each for R, G, and B
[3]	Background color	Character; 6	Hexadecimal values 2 characters (8 bit) each for R, G, and B
[4]	Character string to be displayed	Character; 20	ASCII characters. (See Table 4.)
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
<p>Stores character strings for display in the instrument's LCD. To actually update the LCD with the character string, use the command DSF.</p> <p>The character color and background color can be set individually for each string, as well as the character string to be displayed. Only ASCII characters shown in Table 4 should be used.</p>			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

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DSC (Display String Clear)			
Function			
Deletes all character strings for display stored in the instrument.			
Input/Output Format			
"DSC" + Delimiter code \Rightarrow \Leftarrow Error-check code + Delimiter code			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Deletes all character strings for display stored in the instrument. To actually update the LCD, use the command DSF.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

DSF (Display Refresh)			
Function			
Refreshes the instrument LCD to show the character strings for display stored in the instrument.			
Input/Output Format			
<div> <div>"DSF" + Delimiter code</div> <div>⇒</div> <div> <div>"Error-check code" + Delimiter</div> <div>⇐</div> <div>code</div> </div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Refreshes the instrument LCD to show the character strings for display stored in the instrument.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		

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ATR (Auto Target Status Read)			
Function			
Reads current automatic target status of instrument.			
Input/Output Format			
<p>"ATR" + Delimiter code ⇒</p> <p style="text-align: right;">⇐ Error-check code, 1"</p> <p style="text-align: right;">+ Delimiter code</p>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
Response Parameters			
	Meaning	Type; No. of characters	Details/range
1	Auto target status	Integer; 1	0: Disabled 1: Enabled
Explanation			
Reads current automatic target status of instrument.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

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ATS (Auto Target Status Set)			
Function			
Sets automatic target status of instrument.			
Input/Output Format			
<div> <div>"ATS," + Delimiter code</div> <div>⇒</div> <div>"Error-check code" + Delimiter code</div> <div>⇐</div> </div>			
Command Parameters			
	Meaning	Type; No. of characters	Details/range
[1]	Auto target status	Integer; 1	0: Disabled 1: Enabled
Response Parameters			
	Meaning	Type; No. of characters	Details/range
Explanation			
Sets automatic target status of instrument. When [1] is set to "1" (enabled), the time required to create the list for automatic target selection depends on the number of data stored. Timeout time should be set to at least 10 seconds.			
Error-check codes			
Code	Meaning		
OK00	Command was processed normally		
OK03	Battery power of instrument is getting low.		
ER00	Invalid command string received.		
ER02	Battery power is too low for measurements.		
ER03	Input parameter error.		

3 Error-check codes

Code	Meaning	Details
OK00	Command was processed normally	
OK02	Low xenon lamp illumination	The brightness of the light source has decreased due to lamp aging, staining of the integrating sphere surface, etc.
OK03	Battery power of instrument is getting low.	
OK04	Low xenon lamp illumination/low battery power	
OK09	Spectral reflectance exceeds the measurement range.	Spectral reflectance is higher than 175%, the upper limit of the specified measurement range.
ER00	Invalid command string received.	The input command or parameter is invalid.
ER02	Battery power is too low for measurements.	Battery power is low and the flash charging circuit cannot function. Further measurements cannot be performed.
ER03	Input parameter error.	The input parameter is outside the specified range.
ER05	Xenon lamp flash error	Xenon lamp did not flash during calibration or measurement.
ER07	Zero calibration and white calibration have not been performed.	Zero calibration was not performed at the current instrument settings (SCI/SCE and measurement area).
ER08	Communication error	During receipt of a command by the instrument, a communication error such as an overrun occurred.
ER10	No data present.	No data are available for the requested item (measurement, target, or calibration data) at the specified settings (measurement area, SCI/SCE).
ER11	Calibration not performed correctly.	The count values obtained during zero calibration or white calibration are not within the normal range.
ER13	A/D conversion error	A/D conversion could not be performed properly during measurement.
ER17	Clock error	Clock IC is not operating properly.
ER20	Data write error	When setting values, etc., an error occurred while writing to the instrument.
ER22	No user calibration data	No user calibration data stored in instrument.
ER24	White calibration not performed.	White calibration has not been performed at the current instrument settings (SCI/SCE, measurement area)
ER25	Input measurement area and instrument measuring area setting do not match.	The current measurement area (lens position) on the instrument is different than the input measurement area (lens position).
ER27	Charge circuit error	Charging of the capacitor for the xenon lamp flash was not completed correctly.
ER28	Preparations for next measurement have not been completed.	The capacitor for the xenon lamp flash is currently being charged and preparations for the next measurement have not been completed.
ER35	Measurement in process	Instrument is currently in the process of taking a measurement.
ER36	User calibration not completed.	User calibration is enabled but user calibration under the current instrument settings (SCI/SCE,

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		measurement area) has not been completed.
ER69	Target data protection status is on.	Color difference target data are protected and cannot be modified or deleted. To set target data protection status to off, use the DPS command.

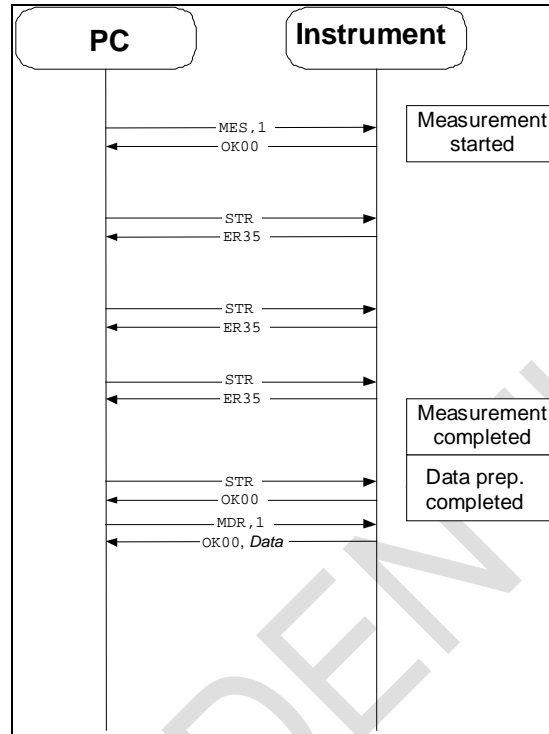
CONFIDENTIAL

4 Character table

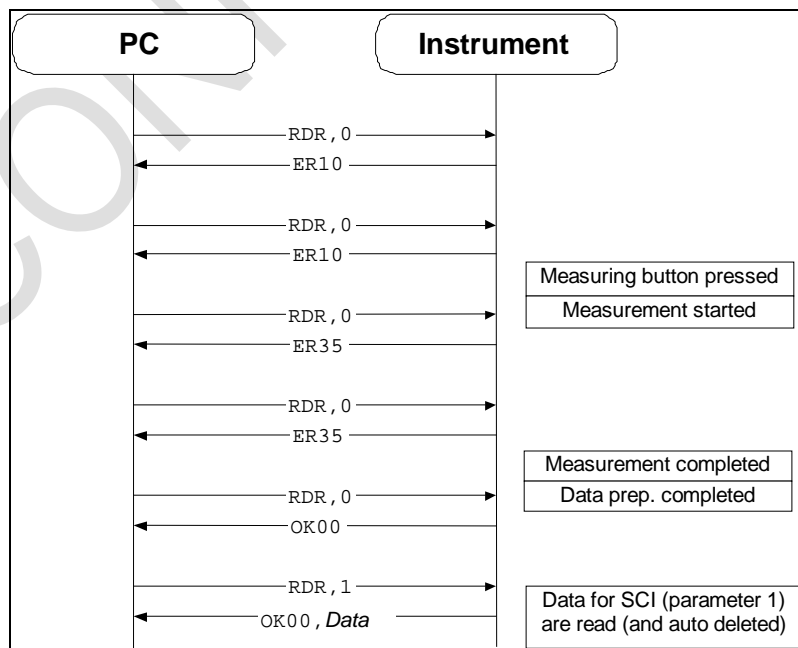
	20	30	40	50	60	70
0	sp	0	@	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	\$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
A	*	:	J	Z	j	z
B	+	;	K	[	k	{
C	,	<	L	¥	l	|
D	-	=	M	]	m	}
E	.	>	N	^	n	
F	/	?	O	_	o	

Appendix A: Measurement flow

Measurement controlled by PC



Measurement controlled by instrument measuring button



Appendix B: Communication command flow

The following command flows are for reference and show the general flow of how to use multiple commands to perform various functions.

B.1 From startup to measurement (Results read as spectral data)

Step	Process	Command
1	Set measurement parameters.	CPS , . . .
2	Read instrument status information.	STR
3	Perform zero calibration.	ZRC
4	Read white calibration data.	CDR , . . .
5	Perform white calibration	CAL
6	Perform measurement	MES , 1
7	Read status information	STR (Repeat until response is "OK00")
8	Read measurement data	MDR , . . .

- Before performing step 1, the current instrument measurement parameters can be checked using CPR, and if the parameters are the desired parameters, it is not necessary to set parameters as in step 1.
- In step 2, STR is used to check whether zero calibration at the current measurement parameters has been performed. If zero calibration at the measurement parameters has already been performed and the results are still present in the instrument, zero calibration in step 3 is not necessary.
- In step 4, the white calibration data are read to verify that white calibration data are present in the instrument.
- In step 7, whether or not measurement and data preparations have been completed is checked using STR repeatedly. When the response is OK00, measurement and data preparations have been completed and step 8 can be performed.

B.2 From startup to measurement (Results read as colorimetric data)

Step	Process	Command
1	Set measurement parameters.	CPS , ...
2	Read instrument status information.	STR
3	Perform zero calibration.	ZRC
4	Read white calibration data.	CDR , ...
5	Perform white calibration	CAL
6	Perform measurement	MES , 1
7	Read status information	STR (Repeat until response is "OK00")
8	Read measurement data	COR , ...

- Before performing step 1, the current instrument measurement parameters can be checked using CPR, and if the parameters are the desired parameters, it is not necessary to set parameters as in step 1.
- In step 2, STR is used to check whether zero calibration at the current measurement parameters has been performed. If zero calibration at the measurement parameters has already been performed and the results are still present in the instrument, zero calibration in step 3 is not necessary.
- In step 4, the white calibration data are read to verify that white calibration data are present in the instrument.
- In step 7, whether or not measurement and data preparations have been completed is checked using STR repeatedly. When the response is OK00, measurement and data preparations have been completed and step 8 can be performed.

B.3 Setting white calibration data

Step	Process	Command
1	Set white calibration data.	CDS , ...

- When this command is performed, white calibration data are written to non-volatile memory in the instrument.

B.4 Taking measurements using measuring button in communication mode (Results read as spectral data)

Step	Process	Command
1	Set measurement parameters.	CPS, . . .
2	Read instrument status information.	STR
3	Perform zero calibration.	ZRC
4	Read white calibration data.	CDR, . . .
5	Perform white calibration	CAL
6	Enable measuring button.	SWS, 1
7	Perform measurement.	(Press measuring button.)
8	Check whether data is available.	RDR, 0 (Repeat until response is "OK00")
9	Read measurement data.	RDR, . . .
(To continue with further measurements, repeat steps 6 through 9.)		

- In step 7, measurement is taken by pressing the instrument's measuring button.
- In step 8, whether or not measurement and data preparations have been completed is checked using RDR,0 repeatedly. When the response is OK00, measurement and data preparations have been completed and step 9 can be performed.
- In step 9, the measured data are read. When data are read at the SCI/SCE setting specified by the parameter input with RDR, the data for that setting are automatically deleted from the instrument's buffer. Attempting to read that data a second time will result in an error being returned.
- After the measuring button is pressed to take a measurement in step 7, the measuring button is automatically disabled. To continue taking measurements using the measuring button, it is necessary to re-enable the measuring button as in step 6 and repeat the remaining steps.

B.5 Taking measurements using measuring button in communication mode (Results read as colorimetric data)

Step	Process	Command
1	Set measurement parameters.	CPS , . . .
2	Read instrument status information.	STR
3	Perform zero calibration.	ZRC
4	Read white calibration data.	CDR , . . .
5	Perform white calibration	CAL
6	Enable measuring button.	SWS , 1
7	Perform measurement.	(Press measuring button.)
8	Check whether data is available.	RDR , 0 (Repeat until response is "OK00")
9	Read measurement data.	RCR , . . .
(To continue with further measurements, repeat steps 6 through 9.)		

- In step 7, measurement is taken by pressing the instrument's measuring button.
- In step 8, whether or not measurement and data preparations have been completed is checked using RDR,0 repeatedly. When the response is OK00, measurement and data preparations have been completed and step 9 can be performed.
- In step 9, the colorimetric data calculated from the measured data are read.
- After the measuring button is pressed to take a measurement in step 7, the measuring button is automatically disabled. To continue taking measurements using the measuring button, it is necessary to re-enable the measuring button as in step 6 and repeat the remaining steps.

B.6 Performing user calibration and taking measurement

Step	Process	Command
1	Set user calibration data.	UCS , . . .
2	Enable user calibration.	USS , 1
3	Set measurement parameters.	CPS , . . .
4	Read instrument status information.	STR
5	Perform zero calibration.	ZRC
6	Perform user calibration	USC
7	Perform measurement	MES , 1
8	Read status information	STR (Repeat until response is "OK00")
9	Read measurement data	MDR , . . .