

Chroma Meter CL-200A

Communication Specifications



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<http://www.konicaminolta.com/selector/instruments.html>

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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- First issue of communication specifications for Chroma Meter CL-200A .

1. Introduction

This document explains how to communicate with the Chroma Meter CL-200A (hereafter referred to as “CL-200A”) via USB, and the procedures for controlling the instrument through such communication. Please read this manual thoroughly before using the CL-200A connected to a PC, and follow the instructions herein. Improper operation may result in unexpected results.

- For connecting the CL-200A with a PC, use the exclusive Communication Cable T-A15 (sold separately).
- The commands listed herein (with the exception of command 15) can also be used for communication with the CL-200 via RS-232C using the exclusive Communication Cable T-A11 (sold separately) for connection with a PC. However, operation of the CL-200 using the commands herein has not been thoroughly verified.

1.1. About the USB driver for CL-200A

Communication between a computer and a CL-200A is performed via a virtual COM port. In order to perform such control, it is necessary to install the USB device driver. For information on installing the USB device driver, refer to the section on installing the device driver in the CL-S10w Installation Guide.

The USB device driver for the CL-200A is located in the Drivers folder of the CD included with the CL-200A.

- The USB device driver is a device driver from Future Technology Devices International Ltd. (FTDI) and operation has been verified utilizing the device driver version included on the CD. However, if you would prefer to use the latest version of the device driver, please visit the FTDI homepage at: <http://www.ftdichip.com/> Please note however that operation with versions other than the version included on the CD has not been verified.

2. Main body control examples

How to perform communication is explained on p. 32, and the details of the communication commands are explained starting on p. 38.

2.1. Meaning of symbols:

→	Command sent from the PC to the CL-200A
←	Command sent from the CL-200A to the PC
+	Combination of characters
␣	Space (20h)
" "	Character string (ASCII code)
[STX]	STX [02h]
[ETX]	ETX [03h]
[BCC]	Block Check Character (See p. 36for details.)
[DELIMITER]	Delimiter code CR+LF [0Dh+0Ah]

2.2. Taking measurements with a single instrument and reading the measurement data into the PC

2.2.1. Procedure

This section will explain the procedures for using the PC to control a single receptor head for taking measurements and reading the measurement data.

- The receptor head number will be set to "00". However, when an extension cable is used, the receptor head number set using the rotary switch on the receptor adapter should be used. (See the CL-200A instruction manual for details.)
- When receiving a response from the CL-200A, be sure to check that the BCC is correct. If the BCC is incorrect, repeat the process which caused the error.

1 Connect the PC and CL-200A, and switch on the CL-200A.

- After the CL-200A starts up, it will automatically perform zero calibration.
- After "CAL" has disappeared from the CL-200A's display, proceed to step 2.

2 Switch the CL-200A to PC connection mode. (Command "54")

(See p. 57 for command details.)

PC	CL-200A
[STX]+"00541_ _ _ _"+[ETX]+[BCC ("13")]+[DELIMITER] →	
← [STX]+"0054_ _ _ _"+[ETX]+[BCC]+[DELIMITER]	

- In order to perform communication with a PC, this command must be used to set the CL-200A to PC connection mode.
- Check that the response from the CL-200A is correct.
- If no response is received, resend the command. If there is still no response, check that the cable is properly connected, and repeat the procedure from Step 1.
- Wait at least 500ms before proceeding to step 3.
- After waiting, clear the send and receive buffers.

3 Set the CL-200A to Hold status. (Command "55")

(See p. 58 for command details.)

PC	CL-200A
[STX]+"99551_ _ _ 0"+[ETX]+[BCC ("02")]+[DELIMITER] →	
← (No response)	

- This step is necessary in order to set the CL-200A to EXT mode in step 4. The following steps cannot be performed without first setting the CL-200A to Hold status.
- Wait at least 500ms before proceeding to step 4.
- EXT mode is the mode for taking measurements according to the timing commands from the PC.

4 Set the CL-200A to EXT mode. (Command "40")

(See p. 49 for command details.)

PC	CL-200A
[STX]+"004010_ _"+[ETX]+[BCC ("06")]+[DELIMITER] →	
← [STX]+"0040_ _■_ _"+[ETX]+[BCC]+[DELIMITER]	

- In order to control measurements from the PC, it is necessary to set the CL-200A to EXT mode.
- After receiving the response from the CL-200A, check that the ERR byte (indicated by "■" above) of STATUS is correct.
 - If an error occurred when setting EXT mode (ERR byte = "4"), step 3 was not completed correctly. Repeat step 3 and then set EXT mode again.
 - Depending on the results of the most recent measurement, the following errors may occur. However, they are not a problem for this step and can be ignored; proceed to the next step.
 - Measurement value over range error (ERR byte = "5")
 - Low luminance error (ERR byte = "6")
 - Outside of range error (ERR byte = "7")
- Wait at least 175ms before proceeding to step 5.

5 Perform measurement. (Command "40")

(See p. 49 for command details.)

PC	CL-200A
[STX]+"994021_ _"+[ETX]+[BCC ("04")]+[DELIMITER] →	
← (No response)	

- A measurement will be taken.
- Send this command with the timing at which you want to perform measurements.
- Wait at least 500ms before proceeding to step 6.

6 Read the colorimetric measurement value (Example: Read E_v , x, y values using the command "02")

(See p. 41 for command details.)

PC	CL-200A
[STX]+"00021200"+[ETX]+[BCC ("02")]+[DELIMITER] →	
← [STX]+"00021_20+32543+38560+40400"+ [ETX]+[BCC]+[DELIMITER]	

- The results of the measurement taken in step 5 will be read into the PC.
- Measurement data can also be read in other color systems (X, Y, Z; E_v , u' , v' ; E_v , T_{cp} , Δuv), or multiple commands can be used together to receive measurement results in several color systems can also be performed.
- The PARAMETER (lower 4 digits of the command) can be used to set the calibration mode and/or enable/disable the CF (correction factor) function. In the above example, the calibration mode is set to NORM and the CF function is disabled.

PARAMETER	Calibration mode		CF function	
"1200"	NORM		Disabled	
"1300"	NORM			Enabled

"1201"		MULTI	Disabled	
"1301"		MULTI		Enabled

- When performing measurements with the CF function enabled, since the measurement results will be calculated using the CF set on the CL-200A main body, it is necessary to set the CF values on the main body prior to measurements.
- Changing the calibration mode or CF enabled/disabled setting will cause the measurement results to change. Carefully select the settings according to your measurement purpose.
- After receiving the response from the CL-200A, check that the ERR, RNG, and BA bytes of STATUS are correct.
- Refer to p. 34 for details of the measurement values.
- When taking continuous measurements, perform the cycle of steps 5 and 6 repeatedly.
- To cancel PC connection mode on the CL-200A, set the CL-200A power switch to OFF.

2.2.2. Visual Basic 6.0 Program Example

Code

```

Option Explicit
Public strSndCommand As String           'command
Public strRcvCommand As String
Public strSendStr As String              'character
Public strReceiveStr As String

Public strSTX_Command As String          'STX & command
Public strCommand_ETX As String          'command & ETX
Public strCommand_ETX_BCC As String      'command & ETX & BCC

Public intErrNO As Integer                'Error No
                                         '0: Normal, 1-7: Error Code, 8: Time Out,
                                         '9:BCC Error, 10:Range Changing, 11:Battery Out

Public intErrflg As Integer

Public strData As String                  'measurement data Block

Public strData1 As String
Public strData2 As String
Public strData3 As String

Public sngData1 As Single                 'measurement data Ev
Public sngData2 As Single                 'measurement data x
Public sngData3 As Single                 'measurement data y

Public i As Integer                       'for LOOP

'*****
'*** Starting Measurement ***
'*****
Private Sub cmdStartButton_Click()

    intErrflg = 0
'-----
'Step 2 PC MODE
'-----
    strSndCommand = "00541  "
    Call CmdSend(1)
    Call ErrCheck
    If intErrflg = 1 Then
        GoTo SubEnd
    End If
    'Insert code to wait 500ms here
    DoEvents
'-----
'Step 3 HOLD ON
'-----

```

```

    strSndCommand = "99551 0"
    Call CmdSend(0)
    'Insert code to wait 500ms here
    DoEvents
'-----
'Step 4 EXT MODE
'-----
    strSndCommand = "004010 "
    Call CmdSend(1)
    Call ErrCheck
    If intErrflg = 1 Then
        Exit Sub
    End If
    'Insert code to wait 175ms here
    DoEvents
'-----
'Step 5 EXT MEASUREMENT
'-----
    strSndCommand = "994021 "
    Call CmdSend(0)
    'Insert code to wait 500ms here
    DoEvents
'-----
'Step 6 READ MEASUREMENT DATA
'-----
    strSndCommand = "00021200"
    Call CmdSend(1)
    Call ErrCheck
    If intErrflg = 1 Then
        Exit Sub
    End If

    strData = Right(strRcvCommand, 18)

    strData1 = Left(strData, 6)
    strData2 = Mid(strData, 7, 6)
    strData3 = Right(strData, 6)

    'Lv,x,y
    sngData1 = Val(Left(strData1, 5)) * 10 ^ (Val(Right(strData1, 1)) - 4)
    sngData2 = Val(Left(strData2, 5)) * 10 ^ (Val(Right(strData2, 1)) - 4)
    sngData3 = Val(Left(strData3, 5)) * 10 ^ (Val(Right(strData3, 1)) - 4)
End Sub

'*****
'*** Send command & Receive command ***
'*****
Public Sub CmdSend(FlgTimeoutCheck As Integer)
    Dim sngStartTime As Single
    Dim sngFinishTime As Single
    Dim varBuf As String

    intErrNO = 0
    strRcvCommand = ""

```

```

    strReceiveStr = ""
'-----
'Transmission
'-----
    Call BCC_Append(strSndCommand)
    strSendStr = Chr(2) & strCommand_ETX_BCC & vbCr & vbLf

    'Insert code for sending data here

'-----
'Reception & TimeOut Check
'-----

    'Insert code to handle data receiving within timeout limit here

'-----
'BCC Check
'-----
    strSTX_Command = Left(strReceiveStr, (InStr(1, strReceiveStr, Chr(3)) - 1))

    strRcvCommand = Mid(strSTX_Command, 2)
    Call BCC_Append(strRcvCommand)

    If (strReceiveStr) <> (Chr(2) & strCommand_ETX_BCC & vbCr & vbLf) Then
        intErrNO = 9                                'BCC Error
    Else
        intErrNO = 0
    End If
End Sub

'*****
'*** BCC Calculation ***
'*****

Public Sub BCC_Append(Command As String)
    Dim intBCC As Long
    Dim strBCC As String

    strCommand_ETX = Command & Chr(3)

    intBCC = 0
    For i = 1 To Len(strCommand_ETX)
        intBCC = intBCC Xor Asc(Mid(strCommand_ETX, i, 1))
    Next i

    strBCC = (Hex(intBCC))
    If Len(strBCC) = 1 Then
        strBCC = "0" & strBCC
    Else
        End If

    strCommand_ETX_BCC = strCommand_ETX & strBCC
End Sub

```

```

'*****
'***  Error Check  ***
'*****
Public Sub ErrCheck()
    If Mid(strRcvCommand, 8, 1) = "1" Then
        intErrNO = 11                'Battery Out
        Exit Sub
    ElseIf Mid(strRcvCommand, 7, 1) = "6" Then
        intErrNO = 10                'Changing Range
        Exit Sub
    ElseIf intErrNO = 0 Then
        If Mid(strRcvCommand, 6, 1) = " " Then
            intErrNO = 0
        Else
            intErrNO = Val(Mid(strRcvCommand, 6, 1))
        End If
    End If
End If

Select Case intErrNO
    Case 0: Exit Sub
    Case 1: MsgBox "POWER OF SENSOR WAS OFF.": lblInformation.Caption = "": intErrflg = 1
    Case 2: MsgBox "EE-PROM ERROR": lblInformation.Caption = "": intErrflg = 1
    Case 3: MsgBox "EE-PROM ERROR": lblInformation.Caption = "": intErrflg = 1
    Case 4: MsgBox "EXT ERROR": lblInformation.Caption = "": intErrflg = 1
    Case 5: Exit Sub
    Case 6: Exit Sub
    Case 7: Exit Sub
    Case 8: MsgBox "TIME OUT": lblInformation.Caption = "": intErrflg = 1
    Case 9: MsgBox "BCC ERROR": lblInformation.Caption = "": intErrflg = 1
    Case 10: Exit Sub
    Case 11: MsgBox "BATTERY OUT": lblInformation.Caption = "": intErrflg = 1
End Select
End Sub

```

2.3. Taking measurements with multiple instruments (receptor heads) and reading the measurement data into the PC

2.3.1. Procedure

- This section will explain the procedures for using the PC to control multiple receptor heads for taking measurements and reading the measurement data.
- Set the receptor head number for each head to different numbers using the rotary switch on each receptor adapter. Be sure that no duplicate receptor head numbers are set. (See the CL-200A instruction manual for details.)
- When receiving a response from the CL-200A, be sure to check that the BCC is correct. If the BCC is incorrect, repeat the process which caused the error.

1 Connect the PC, CL-200A, and each receptor head, and switch on the CL-200A.

- After the CL-200A starts up, it will automatically perform zero calibration.
- After "CAL" has disappeared from the CL-200A's display, proceed to step 2.

- If the connection status of the receptor heads change, the CL-200A power should be switched off momentarily and then switched back on, and this step repeated again.

2 Switch the CL-200A to PC connection mode. (Command "54")

(See p. 57 for command details.)

PC	CL-200A
[STX]+"00541_ _ _ _"+[ETX]+[BCC (= "13")]+[DELIMITER] →	
← [STX]+"0054_ _ _ _"+ [ETX]+[BCC]+[DELIMITER]	

- In order to perform communication with a PC, this command must be used to set the CL-200A to PC connection mode.
- Check that the response from the CL-200A is correct.
- If no response is received, resend the command. If there is still no response, check that the cable is properly connected, and repeat the procedure from Step 1.
- Wait at least 500ms before proceeding to step 3.
- After waiting, clear the send and receive buffers.

3 Set the CL-200A to Hold status. (Command "55")

(See p. 58 for command details.)

PC	CL-200A
[STX]+"99551_ _ _ 0"+[ETX]+[BCC (= "02")]+[DELIMITER] →	
← (No response)	

- This step is necessary in order to set the CL-200A to EXT mode in step 4. The following steps cannot be performed without first setting the CL-200A to Hold status.

- Wait at least 500ms before proceeding to step 4.
 - EXT mode is the mode for taking measurements according to the timing commands from the PC.
- 4 Set the CL-200A to EXT mode. (Command "40")

(See p. 49 for command details.)

PC	CL-200A
[STX]+"004010_ _"+[ETX]+[BCC (= "06")]+[DELIMITER] →	
	← [STX]+"0040_ _"+[ETX]+[BCC]+[DELIMITER]
[STX]+"014010_ _"+[ETX]+[BCC (= "07")]+[DELIMITER] →	
	← [STX]+"0140_ _"+[ETX]+[BCC]+[DELIMITER]
<i>(Repeat for each receptor head number.)</i>	
	•
	•

- In order to control measurements from the PC, it is necessary to set the CL-200A to EXT mode.
 - After receiving the response from the CL-200A, check that the ERR byte (indicated by "■" above) of STATUS is correct.
 - If an error occurred when setting EXT mode (ERR byte = "4"), step 3 was not completed correctly. Repeat step 3 and then set EXT mode again.
 - Depending on the results of the most recent measurement, the following errors may occur. However, they are not a problem for this step and can be ignored; proceed to the next step.
 - Measurement value over range error (ERR byte = "5")
 - Low luminance error (ERR byte = "6")
 - Outside of range error (ERR byte = "7")
 - Wait at least 175ms before proceeding to step 5.
- 5 Perform measurement. (Command "40")

(See p. 49 for command details.)

PC	CL-200A
[STX]+"994021_ _"+[ETX]+[BCC (= "04")]+[DELIMITER] →	
	← (No response)

- A measurement will be taken.
 - Send this command with the timing at which you want to perform measurements.
 - Wait at least 500ms before proceeding to step 6.
- 6 Read the colorimetric measurement values (Example: Read E_v, x, y values using the command "02")

(See p. 41 for command details.)

PC	CL-200A
[STX]+"00021200"+[ETX]+[BCC (= "02")]+[DELIMITER] →	
	← [STX]+"00021_20+32543+38560+40400"+ [ETX]+[BCC]+[DELIMITER]

[STX]+"01021200"+[ETX]+[BCC (= "03")]+[DELIMITER] →
← [STX]+"01021_20+32543+38560+40400"+ [ETX]+[BCC]+[DELIMITER]
<i>(Repeat for each receptor head number.)</i>
•
•

- The results of the measurement taken in step 5 will be read into the PC.
- Measurement data can also be read in other color systems (X, Y, Z; E_v, u', v'; E_v, T_{cp}, Δuv), or multiple commands can be used together to receive measurement results in several color systems can also be performed.
- The PARAMETER (lower 4 digits of the command) can be used to set the calibration mode and/or enable/disable the CF (correction factor) function. In the above example, the calibration mode is set to NORM and the CF function is disabled.

PARAMETER	Calibration mode		CF function	
"1200"	NORM		Disabled	
"1300"	NORM			Enabled
"1201"		MULTI	Disabled	
"1301"		MULTI		Enabled

- When performing measurements with the CF function enabled, since the measurement results will be calculated using the CF set on the CL-200A main body, it is necessary to set the CF values on the main body prior to measurements.
- Changing the calibration mode or CF enabled/disabled setting will cause the measurement results to change. Carefully select the settings according to your measurement purpose.
- After receiving the response from the CL-200A, check that the ERR, RNG, and BA bytes of STATUS is correct.
- Refer to p. 34 for details of the measurement values.
- When taking continuous measurements, perform the cycle of steps 5 and 6 repeatedly.
- To cancel PC connection mode on the CL-200A, set the CL-200A power switch to OFF.

2.3.2. Visual Basic 6.0 Program Example

Code

```

Option Explicit
Public strSndCommand As String           'command
Public strRcvCommand As String
Public strSendStr As String             'character
Public strReceiveStr As String

Public strSTX_Command As String         'STX & command
Public strCommand_ETX As String         'command & ETX
Public strCommand_ETX_BCC As String     'command & ETX & BCC

Public intErrNO As Integer              'Error No
                                         '0: Normal, 1-7: Error Code, 8: Time Out, 9:BCC
                                         'Error, 10: Range Changing, 11: Battery Out

Public intErrflg As Integer

Public strData As String                'measurement data Block

Public strData1 As String
Public strData2 As String
Public strData3 As String

Public sngData1 As Single               'measurement data Ev
Public sngData2 As Single               'measurement data x
Public sngData3 As Single               'measurement data y

Public SensorNo
Public m As Integer                    'number of sensor
Public n As Integer

Public i As Integer                    'for LOOP
Public j As Integer                    'for LOOP

'*****
'*** Starting Measurement ***
'*****
Private Sub cmdStartButton_Click()

    intErrflg = 0
'-----
'Step 2 PC MODE
'-----

    j = 0
    strSndCommand = "00541  "
    Call CmdSend(1)
    Call ErrCheck
    If intErrflg = 1 Then
        Exit Sub
    
```

```

End If
'Insert code to wait 500ms here
DoEvents
'-----
'Step 3 HOLD ON
'-----
    strSndCommand = "99551 0"
    Call CmdSend(0)
    'Insert code to wait 500ms here
    DoEvents
'-----
'Step 4 EXT MODE
'-----
    For j = 0 To n
        strSndCommand = SensorNo(j) & "4010 "
        Call CmdSend(1)
        Call ErrCheck
        If intErrflg = 1 Then
            Exit Sub
        End If
        DoEvents
    Next j
    'Insert code to wait 175ms here
'-----
'Step 5 EXT MEASUREMENT
'-----
    strSndCommand = "994021 "
    Call CmdSend(0)
    'Insert code to wait 500ms here
    DoEvents
'-----
'Step 6 READ MEASUREMENT DATA
'-----
    For j = 0 To n
        strSndCommand = SensorNo(j) & "021200"
        Call CmdSend(1)
        Call ErrCheck
        If intErrflg = 1 Then
            Exit Sub
        End If

        strData = Right(strRcvCommand, 18)

        strData1 = Left(strData, 6)
        strData2 = Mid(strData, 7, 6)
        strData3 = Right(strData, 6)

        'Lv,x,y
        sngData1 = Val(Left(strData1, 5)) * 10 ^ (Val(Right(strData1, 1)) - 4)
        sngData2 = Val(Left(strData2, 5)) * 10 ^ (Val(Right(strData2, 1)) - 4)
        sngData3 = Val(Left(strData3, 5)) * 10 ^ (Val(Right(strData3, 1)) - 4)
        'Data obtained from the receptor heads are then used.

        DoEvents
    Next j

```

End Sub

```

'*****
'***  Send command & Receive command  ***
'*****
Public Sub CmdSend(FlgTimeoutCheck As Integer)
    Dim sngStartTime As Single
    Dim sngFinishTime As Single
    Dim varBuf As String

    intErrNO = 0
    strRcvCommand = ""
    strReceiveStr = ""

'-----
'Transmission
'-----
    Call BCC_Append(strSndCommand)
    strSendStr = Chr(2) & strCommand_ETX_BCC & vbCr & vbLf

    'Insert code for sending data here

'-----
'Reception & TimeOut Check
'-----

    'Insert code to handle data receiving within timeout limit here

'-----
'BCC Check
'-----
    strSTX_Command = Left(strReceiveStr, (InStr(1, strReceiveStr, Chr(3)) - 1))

    strRcvCommand = Mid(strSTX_Command, 2)
    Call BCC_Append(strRcvCommand)

    If (strReceiveStr) <> (Chr(2) & strCommand_ETX_BCC & vbCr & vbLf) Then
        intErrNO = 9                'BCC Error
    Else
        intErrNO = 0
    End If
End Sub

'*****
'***  BCC Calculation  ***
'*****
Public Sub BCC_Append(Command As String)
    Dim intBCC As Long
    Dim strBCC As String

    strCommand_ETX = Command & Chr(3)

    intBCC = 0
    For i = 1 To Len(strCommand_ETX)

```

```

        intBCC = intBCC Xor Asc(Mid(strCommand_ETX, i, 1))
    Next i

    strBCC = (Hex(intBCC))
    If Len(strBCC) = 1 Then
        strBCC = "0" & strBCC
    Else
    End If

    strCommand_ETX_BCC = strCommand_ETX & strBCC
End Sub

'*****
'***  Error Check  ***
'*****

Public Sub ErrCheck()
    If Mid(strRcvCommand, 8, 1) = "1" Then
        intErrNO = 11                'Battery Out
        Exit Sub
    ElseIf Mid(strRcvCommand, 7, 1) = "6" Then
        intErrNO = 10                'Changing Range
        Exit Sub
    ElseIf intErrNO = 0 Then
        If Mid(strRcvCommand, 6, 1) = " " Then
            intErrNO = 0
        Else
            intErrNO = Val(Mid(strRcvCommand, 6, 1))
        End If
    End If

    Select Case intErrNO
        Case 0: Exit Sub
        Case 1: MsgBox "POWER OF SENSOR WAS OFF.(No." & SensorNo(j) & ")": intErrflg = 1
        Case 2: MsgBox "EE-PROM ERROR(No." & SensorNo(j) & ")": intErrflg = 1
        Case 3: MsgBox "EE-PROM ERROR(No." & SensorNo(j) & ")": intErrflg = 1
        Case 4: MsgBox "EXT ERROR(No." & SensorNo(j) & ")": intErrflg = 1
        Case 5: Exit Sub
        Case 6: Exit Sub
        Case 7: Exit Sub
        Case 8: MsgBox "TIME OUT(No." & SensorNo(j) & ")": intErrflg = 1
        Case 9: MsgBox "BCC ERROR(No." & SensorNo(j) & ")": intErrflg = 1
        Case 10: Exit Sub
        Case 11: MsgBox "BATTERY OUT(No." & SensorNo(j) & ")": intErrflg = 1
    End Select
End Sub

```

2.4. Performing user calibration with a single instrument

2.4.1. Procedure

This section will explain the procedures for using the PC to control a single receptor head for taking measurements and reading the measurement data.

- The receptor head number will be set to "00". However, when an extension cable is used, the receptor head number set using the rotary switch on the receptor adapter should be used. (See the CL-200A instruction manual for details.)
- When receiving a response from the CL-200A, be sure to check that the BCC is correct. If the BCC is incorrect, repeat the process which caused the error.

1 Connect the PC and CL-200A, and switch on the CL-200A.

- After the CL-200A starts up, it will automatically perform zero calibration.
- After "CAL" has disappeared from the CL-200A's display, proceed to step 2.

2 Switch the CL-200A to PC connection mode. (Command "54")

(See p. 57 for command details.)

PC	CL-200A
[STX]+"00541_ _ _ _"+[ETX]+[BCC ("13")]+[DELIMITER] →	
	← [STX]+"0054_ _ _ _"+[ETX]+[BCC]+[DELIMITER]

- In order to perform communication with a PC, this command must be used to set the CL-200A to PC connection mode.
- Check that the response from the CL-200A is correct.
- If no response is received, resend the command. If there is still no response, check that the cable is properly connected, and repeat the procedure from Step 1.
- Wait at least 500ms before proceeding to step 3.
- After waiting, clear the send and receive buffers.

3 Set the CL-200A to Hold status. (Command "55")

(See p. 58 for command details.)

PC	CL-200A
[STX]+"99551_ _ _ _"+[ETX]+[BCC ("02")]+[DELIMITER] →	
	← (No response)

- This step is necessary in order to set the CL-200A to EXT mode in step 4. The following steps cannot be performed without first setting the CL-200A to Hold status.
- Wait at least 500ms before proceeding to step 4.

- EXT mode is the mode for taking measurements according to the timing commands from the PC.

4 Set the CL-200A to EXT mode. (Command "40")

(See p. 49 for command details.)

PC	CL-200A
[STX]+"004010_ _"+[ETX]+[BCC (= "06")]+[DELIMITER] →	
← [STX]+"0040_ _■_ _"+[ETX]+[BCC]+[DELIMITER]	

- In order to control measurements from the PC, it is necessary to set the CL-200A to EXT mode.
- After receiving the response from the CL-200A, check that the ERR byte (indicated by "■" above) of STATUS is correct.
 - If an error occurred when setting EXT mode (ERR byte = "4"), step 3 was not completed correctly. Repeat step 3 and then set EXT mode again.
 - Depending on the results of the most recent measurement, the following errors may occur. However, they are not a problem for this step and can be ignored; proceed to the next step.
 - Measurement value over range error (ERR byte = "5")
 - Low luminance error (ERR byte = "6")
 - Outside of range error (ERR byte = "7")
- Wait at least 175ms before proceeding to step 5.

5 Perform measurement. (Command "40")

(See p. 49 for command details.)

PC	CL-200A
[STX]+"994021_ _"+[ETX]+[BCC (= "04")]+[DELIMITER] →	
← (No response)	

- A measurement will be taken.
- Send this command with the timing at which you want to perform measurements.
- Wait at least 500ms before proceeding to step 6.

6 Read the colorimetric measurement value (Example: Read X₂, Y, Z values using the command "45")

(See p. 51 for command details.)

PC	CL-200A
[STX]+"00451000"+[ETX]+[BCC (= "03")]+[DELIMITER] →	
←	
[STX]+"00451_20+4417D747442DD82943B3C6C2"+[ETX]+[BCC]+[DELIMITER]	

- The results of the measurement taken in step 5 will be read into the PC.
- After receiving the response from the CL-200A, check that the ERR, RNG, and BA bytes of STATUS are correct.
- Refer to p. 34 for details of the measurement values.

7 Determine the calibration coefficients.

7-1 Obtain the X_2YZ values.

Obtain the X_2YZ values from the values measured in Step 6:

$$\begin{cases} X_2(mes) = X_2 \\ Y(mes) = Y \\ Z(mes) = Z \end{cases}$$

7-2 Determine the calibration values (E_vxy) to be adjusted to.

Use the following conversion equations to determine the X_2YZ values from the luminance E_v and chromaticity xy calibration values:

$$\begin{cases} X_2(std) = \frac{(1.1672 * x + 0.1672 * y - 0.1672) * E_v}{y} \\ Y(std) = E_v \\ Z(std) = \frac{(1 - x - y) * E_v}{y} \end{cases}$$

7-3 Calculate the user calibration coefficients.

Calculate the user calibration coefficients from the results of Steps 7-1 and 7-2 above according to the following equations:

$$\begin{cases} \alpha = \frac{X_2(std)}{X_2(mes)} \\ \beta = \frac{Y(std)}{Y(mes)} \\ \gamma = \frac{Z(std)}{Z(mes)} \end{cases}$$

8 Write the calibration coefficients to the instrument (Command "48")

(See p. 55 for command details.)

PC	CL-200A
[STX]+"004811_ _ _ _"+"3F8000000000000003E2B367A"+[ETX]+[BCC (= "07")]+[DELIMITER] →	← [STX]+"0048_ _ _ _ _ _"+[ETX]+[BCC]+[DELIMITER]
[STX]+"004821_ _ _ _"+"0000000003F80000000000000000"+[ETX]+[BCC (= "71")]+[DELIMITER] →	← [STX]+"0048_ _ _ _ _ _"+[ETX]+[BCC]+[DELIMITER]
[STX]+"004831_ _ _ _"+"00000000000000000003F8000000"+[ETX]+[BCC (= "70")]+[DELIMITER] →	← [STX]+"0048_ _ _ _ _ _"+[ETX]+[BCC]+[DELIMITER]

- The coefficients calculated in Step 7 are used in the following matrix, which is sent in 3 lines to the instrument.

$$\begin{bmatrix} \alpha & 0 & \gamma * 0.1672 \\ 0 & \beta & 0 \\ 0 & 0 & \gamma \end{bmatrix}$$

In the example above, the coefficients are set as $\alpha=1.0$, $\beta=1.0$, and $\gamma=1.0$ in the example data.

- When the coefficients are stored in the instrument, measurement values calculated using these coefficients can be obtained by specifying CF=ON, CAL=Multi in the commands 01, 02, 03, 08, and 15.
- When using the CL-200A standalone (not connected to a computer), if the instrument's conditions are set to CFS (CF Multi), the coefficients will be used when determining the measurement values.

9 Confirm that the calibration coefficients were properly written to the instrument (Command "47")

(See p. 53 for command details.)

PC	CL-200A
[STX]+"004711_ _ _ _"+[ETX]+[BCC ("00")]+ [DELIMITER] →	
	← [STX]+"0047_ _ _ _ _ _"+ "3F8000000000000000000003E2B367A"+[ETX]+[BCC]+ [DELIMITER]
[STX]+"004721_ _ _ _"+ [ETX]+[BCC ("03")]+ [DELIMITER] →	
	← [STX]+"0047_ _ _ _ _ _"+ "0000000003F80000000000000000"+[ETX]+[BCC]+ [DELIMITER]
[STX]+"004731_ _ _ _"+[ETX]+[BCC ("02")]+ [DELIMITER] →	
	← [STX]+"0047_ _ _ _ _ _"+ "0000000000000000000003F8000000"+[ETX]+[BCC]+ [DELIMITER]

2.4.2. Visual Basic 6.0 Program Example

Code

```

Option Explicit

Public strSndCommand As String           'command
Public strRcvCommand As String
Public strSendStr As String              'character
Public strReceiveStr As String

Public strSTX_Command As String          'STX & command
Public strCommand_ETX As String          'command & ETX
Public strCommand_ETX_BCC As String      'command & ETX & BCC

Public intErrNO As Integer                'Error No
                                         '0:Normal, 1-7:Error Code, 8:Time Out, 9:BCC Error
                                         '10:Range Changing, 11:Battery Out

Public intErrflg As Integer

Public strData As String                  'measurement data Block

Public strData1 As String
Public strData2 As String
Public strData3 As String

Public sngData1 As Single                 'measurement data Ev
Public sngData2 As Single                 'measurement data x
Public sngData3 As Single                 'measurement data y
Public i As Integer                      'for LOOP
Public j As Integer                      'for LOOP

Private Type tagData
    Bytedata(3) As Byte
End Type

Private Type tagSngData
    SngData As Single
End Type

' *****
' ***   Starting Calibration   ***
' *****

Private Sub cmdCalButton_Click()

Dim X2YZ_mes(2) As Single
Dim X2YZ_std(2) As Single
Dim Evxy_std(2) As Single

Dim cfc(2) As Single

Dim StrSendString(2) As String

```

```

'For steps 1 to 5, refer to Section 2.2.2 or 2.3.2
'-----
'Step 6 READ MEASUREMENT DATA (X2/Y/Z)
'-----

    strSndCommand = "00451000"
    Call CmdSend(1)
    Call ErrCheck
    If intErrflg = 1 Then
        Exit Sub
    End If

    strData = Right(strRcvCommand, 24)

    strData1 = Left(strData, 8)
    strData2 = Mid(strData, 9, 8)
    strData3 = Right(strData, 8)
'-----
'Step 7 Calculate Calibration Coefficient
'-----
'1,Get X2YZ Value

    X2YZ_mes(0) = Convert_HexString_To_Single(strData1)
    X2YZ_mes(1) = Convert_HexString_To_Single(strData2)
    X2YZ_mes(2) = Convert_HexString_To_Single(strData3)

'2,Determine Calibration Standard

    'Insert code to input calibration standard values for Evxy_std here

    Call Convert_Evxy_To_X2YZ(Evxy_std, X2YZ_std)

'3,Calculate User Calibration Coefficient

    cfc(0) = X2YZ_std(0) / X2YZ_mes(0)
    cfc(1) = X2YZ_std(1) / X2YZ_mes(1)
    cfc(2) = X2YZ_std(2) / X2YZ_mes(2)

'-----
'Step 8 Writing Calibration Coefficient
'-----

    StrSendString(0) = Convert_Single_To_HexString(cfc(0)) & "00000000" &
    Convert_Single_To_HexString(cfc(2) * 0.1672)

    strSndCommand = "004811 " & StrSendString(0)
    Call CmdSend(1)
    Call ErrCheck
    If intErrflg = 1 Then
        Exit Sub
    End If

    StrSendString(1) = "00000000" & Convert_Single_To_HexString(cfc(1)) & "00000000"

```

```
strSndCommand = "004821  " & StrSendString(1)
Call CmdSend(1)
Call ErrCheck
If intErrflg = 1 Then
    Exit Sub
End If

StrSendString(2) = "00000000" & "00000000" & Convert_Single_To_HexString(cfc(2))

strSndCommand = "004831  " & StrSendString(2)
Call CmdSend(1)
Call ErrCheck
If intErrflg = 1 Then
    Exit Sub
End If

'-----
'Step 9 Check Calibration Coefficient
'-----

strSndCommand = "004711  "
Call CmdSend(1)
Call ErrCheck
If intErrflg = 1 Then
    Exit Sub
End If

strData = Right(strRcvCommand, 24)
If (StrComp(strData, StrSendString(0)) <> 0) Then
    lblInformation.Caption = "Calibration NG"
    Exit Sub
End If

strSndCommand = "004721  "
Call CmdSend(1)
Call ErrCheck
If intErrflg = 1 Then
    Exit Sub
End If

strData = Right(strRcvCommand, 24)
If (StrComp(strData, StrSendString(1)) <> 0) Then
    lblInformation.Caption = "Calibration NG"
    Exit Sub
End If

strSndCommand = "004731  "
Call CmdSend(1)
Call ErrCheck
If intErrflg = 1 Then
    Exit Sub
End If

strData = Right(strRcvCommand, 24)
If (StrComp(strData, StrSendString(2)) <> 0) Then
```

```

        lblInformation.Caption = "Calibration NG"
    Exit Sub
End If

    lblInformation.Caption = "Calibration OK"

End Sub

' *****
' ***   Convert Evxy To X2YZ           ***
' *****

Public Sub Convert_Evxy_To_X2YZ(Evxy() As Single, X2YZ() As Single)

    X2YZ(0) = ((1.1672 * Evxy(1) + 0.1672 * Evxy(2) - 0.1672) * Evxy(0)) / Evxy(2)
    X2YZ(1) = Evxy(0)
    X2YZ(2) = ((1 - Evxy(1) - Evxy(2)) * Evxy(0)) / Evxy(2)

End Sub

' *****
' ***   Convert HexString To Single   ***
' *****

Public Function Convert_HexString_To_Single(HexString As String) As Single

    Dim TmpData As tagData
    Dim TmpSngData As tagSngData

    For i = 0 To 3
        TmpData.Bytedata(3 - i) = Val("&H" & Mid(HexString, 1 + 2 * i, 2))
    Next i

    LSet TmpSngData = TmpData

    Convert_HexString_To_Single = TmpSngData.SngData

End Function

' *****
' ***   Convert Single To HexString   ***
' *****

Public Function Convert_Single_To_HexString(SingleData As Single) As String

    Dim TmpData As tagData
    Dim TmpSngData As tagSngData

    TmpSngData.SngData = SingleData
    LSet TmpData = TmpSngData

    For i = 0 To 3
        If (Len(Hex(TmpData.Bytedata(3 - i))) = 1) Then
            Convert_Single_To_HexString = Convert_Single_To_HexString & "0"
        End If
        Convert_Single_To_HexString = Convert_Single_To_HexString & (Hex(TmpData.Bytedata(3 -
i)))
    Next i

```

```

Next i

End Function

'*****
'***   Send command & Receive command   ***
'*****
Public Sub CmdSend(FlgTimeoutCheck As Integer)
    Dim sngStartTime As Single
    Dim sngFinishTime As Single
    Dim varBuf As String

    intErrNO = 0
    strRcvCommand = ""
    strReceiveStr = ""

'-----
'Transmission
'-----
    Call BCC_Append(strSndCommand)
    strSendStr = Chr(2) & strCommand_ETX_BCC & vbCr & vbLf

    'Insert code for sending data here

'-----
'Reception & TimeOut Check
'-----

    'Insert code to handle data receiving within timeout limit here

'-----
'BCC Check
'-----
    strSTX_Command = Left(strReceiveStr, (InStr(1, strReceiveStr, Chr(3)) - 1))

    strRcvCommand = Mid(strSTX_Command, 2)
    Call BCC_Append(strRcvCommand)

    If (strReceiveStr) <> (Chr(2) & strCommand_ETX_BCC & vbCr & vbLf) Then
        intErrNO = 9                                'BCC Error
    Else
        intErrNO = 0
    End If
End Sub

'*****
'***   BCC Calculation   ***
'*****
Public Sub BCC_Append(Command As String)
    Dim intBCC As Long
    Dim strBCC As String

    strCommand_ETX = Command & Chr(3)

    intBCC = 0
    For i = 1 To Len(strCommand_ETX)

```

```

        intBCC = intBCC Xor Asc(Mid(strCommand_ETX, i, 1))
    Next i

    strBCC = (Hex(intBCC))
    If Len(strBCC) = 1 Then
        strBCC = "0" & strBCC
    Else
    End If

    strCommand_ETX_BCC = strCommand_ETX & strBCC
End Sub

'*****
'***   Error Check   ***
'*****

Public Sub ErrCheck()
    If Mid(strRcvCommand, 8, 1) = "1" Then
        intErrNO = 11                                'Battery Out
        Exit Sub
    ElseIf Mid(strRcvCommand, 7, 1) = "6" Then
        intErrNO = 10                                'Changing Range
        Exit Sub
    ElseIf intErrNO = 0 Then
        If Mid(strRcvCommand, 6, 1) = " " Then
            intErrNO = 0
        Else
            intErrNO = Val(Mid(strRcvCommand, 6, 1))
        End If
    End If

    Select Case intErrNO
        Case 0: Exit Sub
        Case 1: MsgBox "POWER OF SENSOR WAS OFF.": lblInformation.Caption = "": intErrflg = 1
        Case 2: MsgBox "EE-PROM ERROR": lblInformation.Caption = "": intErrflg = 1
        Case 3: MsgBox "EE-PROM ERROR": lblInformation.Caption = "": intErrflg = 1
        Case 4: MsgBox "EXT ERROR": lblInformation.Caption = "": intErrflg = 1
        Case 5: Exit Sub
        Case 6: Exit Sub
        Case 7: Exit Sub
        Case 8: MsgBox "TIME OUT": lblInformation.Caption = "": intErrflg = 1
        Case 9: MsgBox "BCC ERROR": lblInformation.Caption = "": intErrflg = 1
        Case 10: Exit Sub
        Case 11: MsgBox "BATTERY OUT": lblInformation.Caption = "": intErrflg = 1
    End Select
End Sub

```

'Note: When using .NET, the above functions Convert_HexString_To_Single and Convert_Single_To_HexString cannot be used without modification. Refer to the following code and make modifications as necessary.

```

'*****
'***   Convert HexString To Single   ***
'*****

```

```
Public Function Convert_HexString_To_Single(ByVal StringData As String) As Single

    Dim bytedata(3) As Byte
    Dim i As Integer

    For i = 0 To 3
        bytedata(3 - i) = Val("&H" & Mid(StringData, 1 + 2 * i, 2))
    Next i

    Convert_HexString_To_Single = BitConverter.ToSingle(bytedata, 0)

End Function
' *****
' *** Convert Single To HexString ***
' *****

Public Function Convert_Single_To_HexString(ByVal SingledData As Single) As String

    Dim bytedata(3) As Byte
    Dim i As Integer

    bytedata = BitConverter.GetBytes(SingledData)

    For i = 0 To 3
        If (Len(Hex(bytedata(3 - i))) = 1) Then
            Convert_Single_To_HexString = Convert_Single_To_HexString & "0"
        End If
        Convert_Single_To_HexString = Convert_Single_To_HexString & (Hex(bytedata(3 - i)))
    Next i

End Function
```

3. Reference

3.1. Communication method

- The communication parameters for the CL-200A are as shown in the table below. Set the PC to these parameters.

Parameter	Details
Communication method	Start/stop synchronization; Half duplex
Baud rate	9600bps (fixed)
Character length	7 bits
Parity	Even
Stop bits	1 bit
Delimiter code	CR+LF

- Commands from the PC to the CL-200A and command responses from the CL-200A are fixed-length strings (ASCII code).
- Half-duplex communication is used. Because of this, when sending a series of commands, it is necessary to receive the command response (including the delimiter code) from the instrument for each command and wait the specified length of time before sending the next command. However, certain commands do not provide a command response.
- For connecting the CL-200A with a PC, use the exclusive Communication Cable T-A15 (sold separately).

3.2. Communication format

- The CL-200A uses three types of communication formats: Short, Long, and Special.
- The Long format is used only for the command responses (CL-200A → PC) for commands 01, 02, 03, and 08.
- The Special format is used only for sending data (PC → CL-200A) for commands 45 and 48, and for the command responses (CL-200A → PC) for command 47.
- All other commands and command responses use the Short communication format.

3.2.1. Short communication format

STX (1)	Receptor head # (2)	Command (2)	Status/Parameter (4)	ETX (1)	BCC (2)	CR (1)	LF (1)
02h				03h		0Dh	0Ah

- Numbers in parentheses indicate number of characters

STX	1 byte	Start of text (02h; fixed)
Receptor head number	2 bytes	
Command name	2 bytes	
PARAMETER/STATUS	4 bytes	Parameter data for commands; Status data for command responses.
ETX	1 byte	End of text (03h; fixed)
BCC	2 bytes	XOR (exclusive OR) of the data up to ETX (excluding STX). See p. 36 for details regarding BCC.
CR	1 byte	Carriage return (0Dh; fixed)
LF	1 byte	Line feed (0Ah; fixed)

- Delimiter code is fixed as CR+LF (0Dh+0Ah).

3.2.2. Long communication format

- The Long format is the same as the Short format, with the addition of Data bytes.
- Details of items other than Data are the same as those for the Short format.
- Data is used in determining the BCC.
- Data contains the measurement values (6 columns × 3 values) in the format shown below:

STX (1)	Receptor head # (2)	Command (2)	Status (4)				Data (6 × 3 blocks)	ETX (1)	BCC (2)	CR (1)	LF (1)
02h								03h		0Dh	0Ah

1 block of data					
Sign	Value	Value	Value	Value	Exp.

Repeated for remaining 2 blocks.

The meaning of each parameter for Data is shown below.

- Sign

Character	"+" (2Bh)	"-" (2Dh)	"=" (3Dh)
Meaning	+	-	±

- Numerical values: 4 significant digits

- Exponent

Character	"0"	"1"	"2"	"3"	"4"	"5"	"6"	"7"	"8"	"9"
Meaning	10^{-4}	10^{-3}	10^{-2}	10^{-1}	10^0	10^1	10^2	10^3	10^4	10^5

Measurement value examples

0.001

"+"	"0"	"0"	"0"	"1"	"1"
-----	-----	-----	-----	-----	-----

-0.0001

"-"	"0"	"0"	"0"	"1"	"0"
-----	-----	-----	-----	-----	-----

123

"+"	␣	"1"	"2"	"3"	"4"
-----	---	-----	-----	-----	-----

±0

"="	␣	␣	␣	"0"	"0"
-----	---	---	---	-----	-----

9876×10³

"+"	"9"	"8"	"7"	"6"	"7"
-----	-----	-----	-----	-----	-----

␣ indicates a space (20h).

3.2.3. Special communication format

- The Special format is the same as the Short format, with the addition of Data bytes.
- Details of items other than Data are the same as those for the Short format.
- Data is used in determining the BCC.
- Data contains the measurement values (8 columns × 3 values) in the format shown below.

STX (1)	Receptor head # (2)	Command (2)	Status (4)	Data (8 × 3 blocks)	ETX (1)	BCC (2)	CR (1)	LF (1)
02h					03h		0Dh	0Ah

1 block of data								Repeated for remaining 2 blocks.
Value	Value	Value	Value	Value	Value	Value	Value	

Values are hexadecimal numerical values using ASCII characters "0" to "F" (8 bytes)

- The meaning of each parameter in the data structure is as follows:

Memory image of float type (32-bit single-precision floating-point values) is converted into ASCII 8-byte data.

Data 8 bytes

Bit	31	30 - 23	22 - 0
Value	Sign	Exponent	Mantissa

3.2.4. BCC

The BCC (Block Check Character) of the CL-200A is obtained by successively XORing (taking the exclusive OR of) the message bytes starting from the first Head No. byte and ending with the final data byte (everything between STX and ETX, excluding STX and ETX), with the result expressed as a 2-byte ASCII value. The BCC can be checked to verify the reliability of the communication data. When sending a command from the PC to the CL-200A, be sure to set the BCC correctly. If the BCC is set incorrectly, the CL-200A will not respond. When receiving data from the CL-200A, the BCC should be checked, and if the value is incorrect, the response from the instrument is invalid and is not reliable.

About "Exclusive OR":

Exclusive OR is a boolean logic operation in which the result is 0 if the 2 bits are the same, and 1 if they are different. So, for example,

- 0 and 0 would be 0
- 1 and 0 would be 1
- 1 and 1 would be 0

BCC setting example

For this example, the following command will be sent:

Command 02 (read colorimetric measurement values) is being sent to receptor head 01. CF function is disabled, and calibration mode is set to NORM.

STX (1)	Receptor head # (2)		Command (2)		Parameter (4)				ETX (1)	BCC (2)		CR (1)	LF (1)
02h	"0"	"1"	"0"	"2"	"1"	"2"	"0"	"0"	03h			0Dh	0Ah

- 20h is used for space.

Contents	ASCII	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Receptor head # (10's)	30h	0	0	1	1	0	0	0	0
Receptor head # (1's)	31h	0	0	1	1	0	0	0	1
Command (10's)	30h	0	0	1	1	0	0	0	0
Command (1's)	32h	0	0	1	1	0	0	1	0
Parameter (byte 1)	31h	0	0	1	1	0	0	0	1
Parameter (byte 2)	32h	0	0	1	1	0	0	1	0
Parameter (byte 3)	30h	0	0	1	1	0	0	0	0
Parameter (byte 4)	30h	0	0	1	1	0	0	0	0
ETX	03h	0	0	0	0	0	0	1	1
Results									
XOR	03h	0	0	0	0	0	0	1	1

After conversion to ASCII, the following values would be set:

BCC upper character	BCC lower character
"0" (30h)	"3" (33h)

And the command would become:

STX (1)	Receptor head # (2)		Command (2)		Parameter (4)				ETX (1)	BCC (2)		CR (1)	LF (1)
02h	"0"	"1"	"0"	"2"	"1"	"2"	"0"	"0"	03h	"0"	"3"	0Dh	0Ah

3.3. Explanation of commands

The following are the commands which can be used.

Command type	Command	Reference page
Read measurement data (X, Y, Z)	01	39
Read measurement data (E_V , x, y)	02	41
Read measurement data (E_V , u' , v')	03	43
Read measurement data (E_V , T_{CP} , Δuv)	08	45
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Set PC connection mode	54	57
Set Hold status	55	58

Commands marked with * are available only on CL-200A.

3.3.1. Read Measurement Data (X, Y, Z): Command 01

Function

To read the most recent measurement data from the CL-200A to the PC in terms of X, Y, Z.

Command format/parameter explanation (PC->CL-200A)

Receptor head #		Command		Parameter			
		"0"	"1"	"1"	CF	"0"	MODE
①		②				③	

- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)
②	CF function	"2": CF disabled "3": CF enabled
③	Calibration mode	"0": NORM "1": MULTI

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command		Status				Data		
	"0"	"1"	"1" or "5"	ERR	RNG	BA	X	Y	Z
①			②	③	④	⑤	⑥		

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	(Fixed value)	"1" or "5"	Normal operation
③	ERR: Error information	┐	Normal operation
		"1"	Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"3"	EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"4"	Normal operation
		"5"	Measurement value over error Displayed when the measurement exceeds the CL-200A measurement range. If this error occurs, the measurement values should not be used as the values for the most recent measurement. If this error occurs repeatedly, reduce the luminance or increase the distance between the light source and measuring instrument. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"6"	Normal operation
		"7"	Normal operation
④	RNG: Range status	"0"	Range not determined Measurement could not be taken because the range could not be determined. The wait period for the prior command sent or command response received may have been incorrect. Set the correct wait time, and then perform the measurement again.
		"1" to "4"	Normal
		"6"	Out of range The measurement could not be taken in a suitable range. Perform EXT mode (command "40") again. This will cause the range to automatically be changed (the CL-200A is equipped with 4 measuring ranges, so it may be necessary to repeat this procedure a maximum of 3 times). If this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑤	BA: Battery level	"0"	Normal
		"1"	Low battery The battery should be changed immediately or the AC adapter should be used. Also, if this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑥	X, Y, Z	Measurement values in terms of X, Y, Z (For details of how to read the data, refer to p. 34.)	

3.3.2. Read Measurement Data (E_v , x, y): Command 02

Function

To read the most recent measurement data from the CL-200A to the PC in terms of E_v , x, y.

Command format/parameter explanation (PC->CL-200A)

Receptor head #	Command		Parameter			
	"0"	"2"	"1"	CF	"0"	MODE
①			②		③	

- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)
②	CF function	"2": CF disabled "3": CF enabled
③	Calibration mode	"0": NORM "1": MULTI

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command		Status				Data		
	"0"	"2"	"1" or "5"	ERR	RNG	BA	E_v	x	y
①			②	③	④	⑤	⑥		

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	(Fixed value)	"1" or "5"	Normal operation
③	ERR: Error information	␣	Normal operation
		"1"	Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"3"	EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.

		"4"	Normal operation
		"5"	Measurement value over error Displayed when the measurement exceed the CL-200A measurement range. If this error occurs, the measurement values should not be used as the values for the most recent measurement. If this error occurs repeatedly, reduce the luminance or increase the distance between the light source and measuring instrument. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"6"	Low luminance error Luminance is low, resulting in reduced calculation accuracy for determining chromaticity. If this error continues to occur, increase the luminance of the light source or move the receptor head closer to the light source. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"7"	Normal operation
④	RNG: Range status	"0"	Range not determined Measurement could not be taken because the range could not be determined. The wait period for the prior command sent or command response received may have been incorrect. Set the correct wait time, and then perform the measurement again.
		"1" to "4"	Normal
		"6"	Out of range The measurement could not be taken in a suitable range. Perform EXT mode (command "40") again. This will cause the range to automatically be changed (the CL-200A is equipped with 4 measuring ranges, so it may be necessary to repeat this procedure a maximum of 3 times). If this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑤	BA: Battery level	"0"	Normal
		"1"	Low battery The battery should be changed immediately or the AC adapter should be used. Also, if this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑥	E_v , x, y	Measurement values in terms of E_v , x, y (For details of how to read the data, refer to p. 34.)	

3.3.3. Read Measurement Data (E_v , u' , v'): Command 03

Function

To read the most recent measurement data from the CL-200A to the PC in terms of E_v , u' , v' .

Command format/parameter explanation (PC->CL-200A)

Receptor head #	Command		Parameter			
	"0"	"3"	"1"	CF	"0"	MODE
①			②	③		

- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)
②	CF function	"2": CF disabled "3": CF enabled
③	Calibration mode	"0": NORM "1": MULTI

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command		Status				Data		
	"0"	"3"	"1" or "5"	ERR	RNG	BA	E_v	u'	v'
①			②	③	④	⑤	⑥		

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	(Fixed value)	"1" or "5"	Normal operation
③	ERR: Error information	␣	Normal operation
		"1"	Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"3"	EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.

		"4"	Normal operation
		"5"	Measurement value over error Displayed when the measurement exceed the CL-200A measurement range. If this error occurs, the measurement values should not be used as the values for the most recent measurement. If this error occurs repeatedly, reduce the luminance or increase the distance between the light source and measuring instrument. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"6"	Low luminance error Luminance is low, resulting in reduced calculation accuracy for determining chromaticity. If this error continues to occur, increase the luminance of the light source or move the receptor head closer to the light source. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"7"	Normal operation
④	RNG: Range status	"0"	Range not determined Measurement could not be taken because the range could not be determined. The wait period for the prior command sent or command response received may have been incorrect. Set the correct wait time, and then perform the measurement again.
		"1" to "4"	Normal
		"6"	Out of range The measurement could not be taken in a suitable range. Perform EXT mode (command "40") again. This will cause the range to automatically be changed (the CL-200A is equipped with 4 measuring ranges, so it may be necessary to repeat this procedure a maximum of 3 times). If this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑤	BA: Battery level	"0"	Normal
		"1"	Low battery The battery should be changed immediately or the AC adapter should be used. Also, if this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑥	E_v, u', v'	Measurement values in terms of E_v, u', v' (For details of how to read the data, refer to p. 34.)	

3.3.4. Read Measurement Data (E_V , T_{CP} , Δuv): Command 08

Function

To read the most recent measurement data from the CL-200A to the PC in terms of E_V , T_{CP} , Δuv .

Command format/parameter explanation (PC->CL-200A)

Receptor head #	Command		Parameter			
	"0"	"8"	"1"	CF	"0"	MODE
①				②		③

- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)
②	CF function	"2": CF disabled "3": CF enabled
③	Calibration mode	"0": NORM "1": MULTI

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command		Status				Data		
	"0"	"8"	"1" or "5"	ERR	RNG	BA	E_V	T_{CP}	Δuv
①			②	③	④	⑤	⑥		

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	(Fixed value)	"1" or "5"	Normal operation
③	ERR: Error information	⏏	Normal operation
		"1"	Receptor head power is switched off. Switch off the instrument and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the instrument and then switch it back on, and repeat the procedure from the beginning.

		"3"	EEPROM error 2 Switch off the instrument and then switch it back on, and repeat the procedure from the beginning.
		"4"	Normal operation
		"5"	Measurement value over error Displayed when the measurement exceeds the instrument measurement range. If this error occurs, the measurement values should not be used as the values for the most recent measurement. If this error occurs repeatedly, reduce the luminance or increase the distance between the light source and measuring instrument. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"6"	Low luminance error Luminance is low, resulting in reduced calculation accuracy for determining chromaticity. If this error continues to occur, increase the luminance of the light source or move the receptor head closer to the light source. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"7"	Value out of range The T_{CP} , Δuv measurement is out of range. If this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
④	RNG: Range status	"0"	Range not determined Measurement could not be taken because the range could not be determined. The wait period for the prior command sent or command response received may have been incorrect. Set the correct wait time, and then perform the measurement again.
		"1" to "4"	Normal
		"6"	Out of range The measurement could not be taken in a suitable range. Perform EXT mode (command "40") again. This will cause the range to automatically be changed (the CL-200A is equipped with 4 measuring ranges, so it may be necessary to repeat this procedure a maximum of 3 times). If this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑤	BA: Battery level	"0"	Normal
		"1"	Low battery The battery should be changed immediately or the AC adapter should be used. Also, if this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑥	E_v , T_{CP} , Δuv	Measurement values in terms of E_v , T_{CP} , Δuv (For details of how to read the data, refer to p. 34.)	

3.3.5. Read Measurement Data (E_v , DW, P): Command 15

- This function is available only on the CL-200A.

Function

To read the most recent measurement data from the CL-200A to the PC in terms of E_v , DW (Dominant wavelength), P (Excitation purity).

Command format/parameter explanation (PC->CL-200A)

Receptor head #	Command		Parameter			
	"1"	"5"	"1"	CF	"0"	MODE
①				②		③

- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)
②	CF function	"2": CF disabled "3": CF enabled
③	Calibration mode	"0": NORM "1": MULTI

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command		Status				Data		
	"1"	"5"	"1" or "5"	ERR	RNG	BA	E_v	DW	P
①			②	③	④	⑤	⑥		

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	(Fixed value)	"1" or "5"	Normal operation
③	ERR: Error information	⌵	Normal operation
		"1"	Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.

④		"3"	EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"4"	Normal operation
		"5"	Measurement value over error Displayed when the measurement exceed the CL-200A measurement range. If this error occurs, the measurement values should not be used as the values for the most recent measurement. If this error occurs repeatedly, reduce the luminance or increase the distance between the light source and measuring instrument. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"6"	Normal operation
		"7"	Normal operation
	RNG: Range status	"0"	Range not determined Measurement could not be taken because the range could not be determined. The wait period for the prior command sent or command response received may have been incorrect. Set the correct wait time, and then perform the measurement again.
		"1" to "4"	Normal
		"6"	Out of range The measurement could not be taken in a suitable range. Perform EXT mode (command "40") again. This will cause the range to automatically be changed (the CL-200A is equipped with 4 measuring ranges, so it may be necessary to repeat this procedure a maximum of 3 times). If this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑤	BA: Battery level	"0"	Normal
		"1"	Low battery The battery should be changed immediately or the AC adapter should be used. Also, if this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑥	E_v , DW, P	Measurement values in terms of E_v , DW, P (For details of how to read the data, refer to p. 34.)	

3.3.6. Set EXT mode: Command 40

Function



Sets the CL-200A to the mode for controlling measurements from the PC, and takes measurements.

- Before sending this command, the CL-200A must be set to Hold status using command 55).

1 Set CL-200A to EXT mode

- Wait at least 500ms after receiving the command response before sending further commands.




Command format/parameter explanation (PC->CL-200A)

Receptor head #	Command	Parameter
	"4" "0"	"1" "0"  
①		


- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command	Status
	"4" "0"	 ERR  
①		②

- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29"
②	ERR: Error information	 Normal operation
		"1" Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2" EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"3" EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.

	"4"	EXT error Occurs when this command is sent to the CL-200A without first setting the CL-200A to Hold status. Send the command "55" to the CL-200A to set it to Hold status, and then send this command again.
	"5"	Normal operation (Indicates that the measurement immediately preceding the sending of this command returned a "Measurement value over" error. Does not affect subsequent measurements.)
	"6"	Normal operation (Indicates that the measurement immediately preceding the sending of this command returned a "Low luminance" error. Does not affect subsequent measurements.)
	"7"	Normal operation (Indicates that the measurement immediately preceding the sending of this command returned a "Value out of range" error. Does not affect subsequent measurements.)

2 Take an EXT measurement.

- Wait at least 500ms after receiving the command response before sending further commands.

Command format/parameter explanation (PC->CL-200A)

Receptor head #		Command		Parameter			
"9"	"9"	"4"	"0"	"2"	"1"	␣	␣

- All parameters are fixed.
- The receptor head number is fixed at "99".

Command response format/status explanation (CL-200A->PC)

No response will be sent.

3.3.7. Read Measurement Data (X₂, Y, Z): Command 45

Function

To read the most recent measurement data from the CL-200A to the PC in terms of X₂, Y, Z.

Command format/parameter explanation (PC->CL-200A)

Receptor head #	Command		Parameter			
	"4"	"5"	"1"	"0"	"0"	"0"

①

- Grayed parameters are fixed.

Number	Contents	Details/Range
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command		Status				Data		
	"4"	"5"	"1" or "5"	ERR	RNG	BA	E _v	DW	P

①

②

③

④

⑤

⑥

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	(Fixed value)	"1" or "5"	Normal operation
③	ERR: Error information	⏏	Normal operation
		"1"	Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"3"	EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"4"	Normal operation

		"5"	Measurement value over error Displayed when the measurement exceeds the CL-200A measurement range. If this error occurs, the measurement values should not be used as the values for the most recent measurement. If this error occurs repeatedly, reduce the luminance or increase the distance between the light source and measuring instrument. However, if this error occurs together with out-of-range error (RNG="6") then measures to resolve the over-range error should be given precedence.
		"6"	Normal operation
		"7"	Normal operation
④	RNG: Range status	"0"	Range not determined Measurement could not be taken because the range could not be determined. The wait period for the prior command sent or command response received may have been incorrect. Set the correct wait time, and then perform the measurement again.
		"1" to "4"	Normal
		"6"	Out of range The measurement could not be taken in a suitable range. Perform EXT mode (command "40") again. This will cause the range to automatically be changed (the CL-200A is equipped with 4 measuring ranges, so it may be necessary to repeat this procedure a maximum of 3 times). If this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑤	BA: Battery level	"0"	Normal
		"1"	Low battery The battery should be changed immediately or the AC adapter should be used. Also, if this error occurs, the measurement values should not be used as the values for the most recent measurement.
⑥	X ₂ , Y, Z	Measurement values in terms of X ₂ , Y, Z (For details of how to read the data, refer to Special format on p. 35.)	

3.3.8. Read User Calibration Coefficients: Command 47

Function

To read the user calibration coefficients currently set on the CL-200A. These coefficients are used when the CL-200A is set to CF Mode: On and Calibration Mode: Multi.

Command format/parameter explanation (PC->CL-200A)

Receptor head #	Command		Parameter			
	"4"	"7"	MCF	"1"		
①			②			

- Grayed parameters are fixed.

Number	Contents	Details/Range												
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)												
②	User calibration coefficient matrix row number	"1" to "3" The number of the user calibration coefficient matrix row to be read. <table><tr><td>A₁₁</td><td>A₁₂</td><td>A₁₃</td><td>Row 1</td></tr><tr><td>A₂₁</td><td>A₂₂</td><td>A₂₃</td><td>Row 2</td></tr><tr><td>A₃₁</td><td>A₃₂</td><td>A₃₃</td><td>Row 3</td></tr></table>	A ₁₁	A ₁₂	A ₁₃	Row 1	A ₂₁	A ₂₂	A ₂₃	Row 2	A ₃₁	A ₃₂	A ₃₃	Row 3
A ₁₁	A ₁₂	A ₁₃	Row 1											
A ₂₁	A ₂₂	A ₂₃	Row 2											
A ₃₁	A ₃₂	A ₃₃	Row 3											

Command response format/status explanation (CL-200A->PC)

Receptor head #	Command		Status				Data		
	"4"	"7"	"0" or "1"	ERR			A _{x1}	A _{x2}	A _{x3}
①			②	③			④		

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	(Fixed value)	"0" or "1"	Normal operation
③	ERR: Error information		Normal operation
		"1"	Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"3"	EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.

		"4"	Normal operation
		"5"	Normal operation
		"6"	Normal operation
		"7"	Normal operation
④	$A_{x1}, A_{x2}, A_{x3},$	User calibration coefficients $A_{x1}, A_{x2}, A_{x3},$ for the specified user calibration matrix row stored in the instrument (For details of how to read the data, refer to Special format on p. 35.)	

3.3.9. Write User Calibration Coefficients: Command 48

Function

To write the user calibration coefficients currently set on the CL-200A. These coefficients are used when the CL-200A is set to CF Mode: On and Calibration Mode: Multi.

Command format/parameter explanation (PC->CL-200A)

Receptor head #		Command		Status				Data		
		"4"	"8"	MCF	"1"	▬	▬	A _{x1}	A _{x2}	A _{x3}
①				②				③		

- Grayed parameters are fixed.

Number	Contents	Details/Range												
①	Receptor head #	"00" to "29": Receptor head number The number set using the rotary switches on each receptor head adapter prior to switching on the CL-200A (See the CL-200A Instruction Manual.)												
②	User calibration coefficient matrix row number	"1" to "3" The number of the user calibration coefficient matrix row to be read. <table><tr><td>A₁₁</td><td>A₁₂</td><td>A₁₃</td><td>Row 1</td></tr><tr><td>A₂₁</td><td>A₂₂</td><td>A₂₃</td><td>Row 2</td></tr><tr><td>A₃₁</td><td>A₃₂</td><td>A₃₃</td><td>Row 3</td></tr></table>	A ₁₁	A ₁₂	A ₁₃	Row 1	A ₂₁	A ₂₂	A ₂₃	Row 2	A ₃₁	A ₃₂	A ₃₃	Row 3
A ₁₁	A ₁₂	A ₁₃	Row 1											
A ₂₁	A ₂₂	A ₂₃	Row 2											
A ₃₁	A ₃₂	A ₃₃	Row 3											
④	Ax1, Ax2, Ax3,	User calibration coefficients Ax1, Ax2, Ax3, for the specified user calibration matrix row stored in the instrument (For details of how to read the data, refer to Special format on p. xx.)												

Command response format/status explanation (CL-200A->PC)

Receptor head #		Command		Status			
		"4"	"8"	▬	ERR	▬	▬
①				②			

- Grayed parameters are fixed.

Number	Contents	Details/Range	
①	Receptor head #	"00" to "29"	
②	ERR: Error information	▬	Normal operation
		"1"	Receptor head power is switched off. Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"2"	EEPROM error 1 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.

		"3"	EEPROM error 2 Switch off the CL-200A and then switch it back on, and repeat the procedure from the beginning.
		"4"	Outside setting range. The input coefficient values are outside the valid setting range
		"5"	Normal operation
		"6"	Normal operation
		"7"	Normal operation

3.3.10. Set PC connection mode: Command 54

Function

Switches CL-200A to PC connection mode.

- In normal mode, the CL-200A will not accept any commands other than this one.
- Wait at least 500ms after receiving the command response before sending further commands.
- Also, before sending the next command, be sure to clear the send/receive buffers.

Command format/parameter explanation (PC->CL-200A)

Receptor head #		Command		Parameter			
"0"	"0"	"5"	"4"	"1"	└	└	└

- All parameters are fixed.
- The receptor head number is fixed at "00".

Command response format/status explanation (CL-200A->PC)

Receptor head #		Command		Status			
"0"	"0"	"5"	"4"	└	└	└	└

- All parameters are fixed.

3.3.11. Set Hold status: Command 55

Function

Sets the CL-200A to Hold status.

- Wait at least 500ms after receiving the command response before sending further commands.

Command format/parameter explanation (PC->CL-200A)

Receptor head #		Command		Parameter			
"9"	"9"	"5"	"5"	"1"	␣	␣	"0"

- All parameters are fixed.
- The receptor head number is fixed at "99".

Command response format/status explanation (CL-200A->PC)

No response will be sent.

3.4. Error Codes

Code	Meaning	Details
␣ (space)	Normal	No error (normal)
"1"	POW-ON	Indicates that power to the head has been cut off. Turn the CL-200A off and then back on.
"2"	EEPROM error 1	An improper value has been written to the receptor head's EEPROM. Turn the CL-200A power off and then back on. If the problem recurs, the unit requires service.
"3"	EEPROM error 2	
"4"	EXT error	Occurs when command 40 (set EXT mode) was sent to the CL-200A without first setting the CL-200A to Hold status. Send the command "55" to the CL-200A to set it to Hold status, and then send command 40 again.
"5"	Measurement value over error	Displayed when the measurement exceeds the CL-200A measurement range.
		If this error occurs, the measurement values should not be used as the values for the most recent measurement. If this error occurs repeatedly, reduce the luminance or increase the distance between the light source and measuring instrument.
"6"	Low luminance error	Luminance is low, resulting in reduced calculation accuracy for determining chromaticity and correlated color temperature.
		Measurement was taken correctly, so there is no serious problem. However, if this error continues to occur, increase the luminance of the light source or move the receptor head closer to the light source.
"7"	Value out of range	The T_{CP} , Δuv measured values are out of range.