External Control   NEC LCD Monitor

Rev.3.0 (WD series)

INDEX

I. Application

This document defines the communications method for control of the NEC LCD monitor, WD551 when using an external controller.
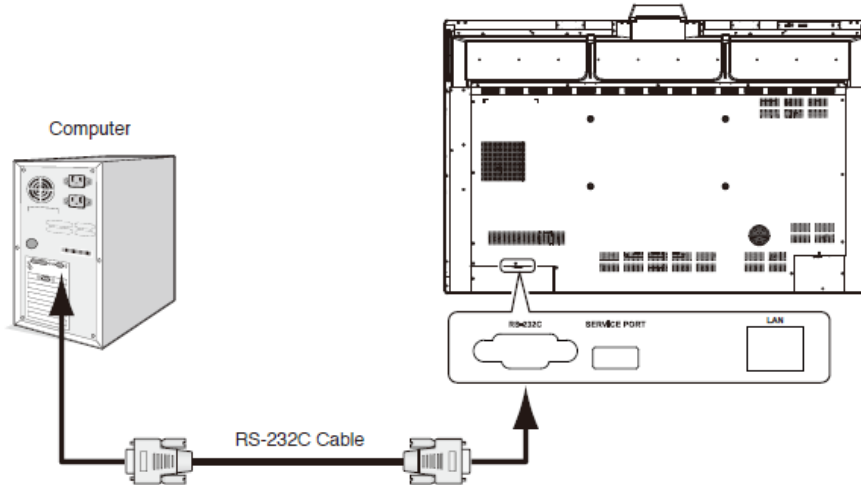
II. Preparation

2. Connectors and wiring

2.1 RS-232C Remote control

Connector: 9-pin D-Sub
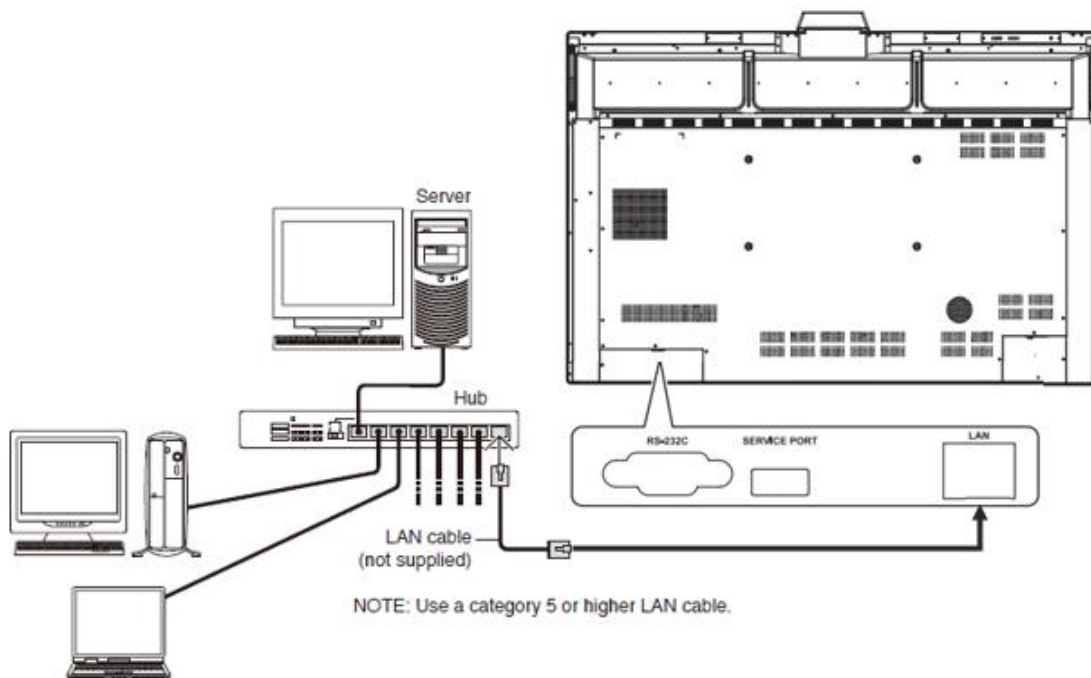Cable: Cross (reversed) cable or null modem cable

(Please refer "Controlling the Monitor via RS-232C" on User's manual.)

2.2 LAN control

Connector: RJ-45 10/100 BASE-T
Cable: Category 5 or higher LAN cable

Note) It is supported by firmware version "20220601_172206" or later.

III. Communication specification

3. Communication Parameter

3.1 RS-232C Remote control

```
(1) Communication system    Asynchronous
(2) Interface               RS-232C
(3) Baud rate               9600bps
(4) Data length             8bits
(5) Parity                  None
(6) Stop bit                1 bit
(7) Communication code      ASCII
```

3.2 LAN control

```
(1) Communication system    TCP/IP (Internet protocol suite)
(2) Interface               Ethernet (CSMA/CD)
(3) Communication layer     Transport layer (TCP)
                            * Using the payload of TCP segment.
(4) IP address              (Default) Automatic setup
                            * If you need to change,
                            Please refer "Network settings" on User's manual.
(5) Port No.                7142 (Fixed)
```

(Note)
It is supported by firmware version "20220601_172206" or later.
When communication is interrupted for about 2 hours, the monitor sends a Keep-Alive packet to the connected device.
At this time, if there is no response from the connected device, disconnect the connection with the device.
When communicating at intervals of more than 2 hours, perform a reconnection operation each time.

3.3 Communication timing

The controller should wait for a reply packet before the next command is sent.
(Note)
When the following commands are sent, a controller should wait for specified period after receiving the reply command before sending the next command.

- Power On, Power Off: 15 seconds
- Input Change: 10 seconds

4. Communication Format

Header	Message	Check Code	Delimiter

The command packet consists of four parts, Header, Message, Check code and Delimiter.
Note: Don't add extra data (Example: padding data) after Delimiter.

Recommended sequence of a typical procedure to control a monitor is as follows,
  [A controller and a monitor, two-way communication composition figure]

■ For the general command (see the part "6.2. Operation Code (OP code) Table")

The controller sends command to get a value from the monitor that you want to change.

The monitor replies a current value of the requested item.

The controller sends commands to set an adjusted value.

The monitor replies to the controller for confirmation.

The controller sends command to get a value for confirmation.

The monitor replies an adjusted value.
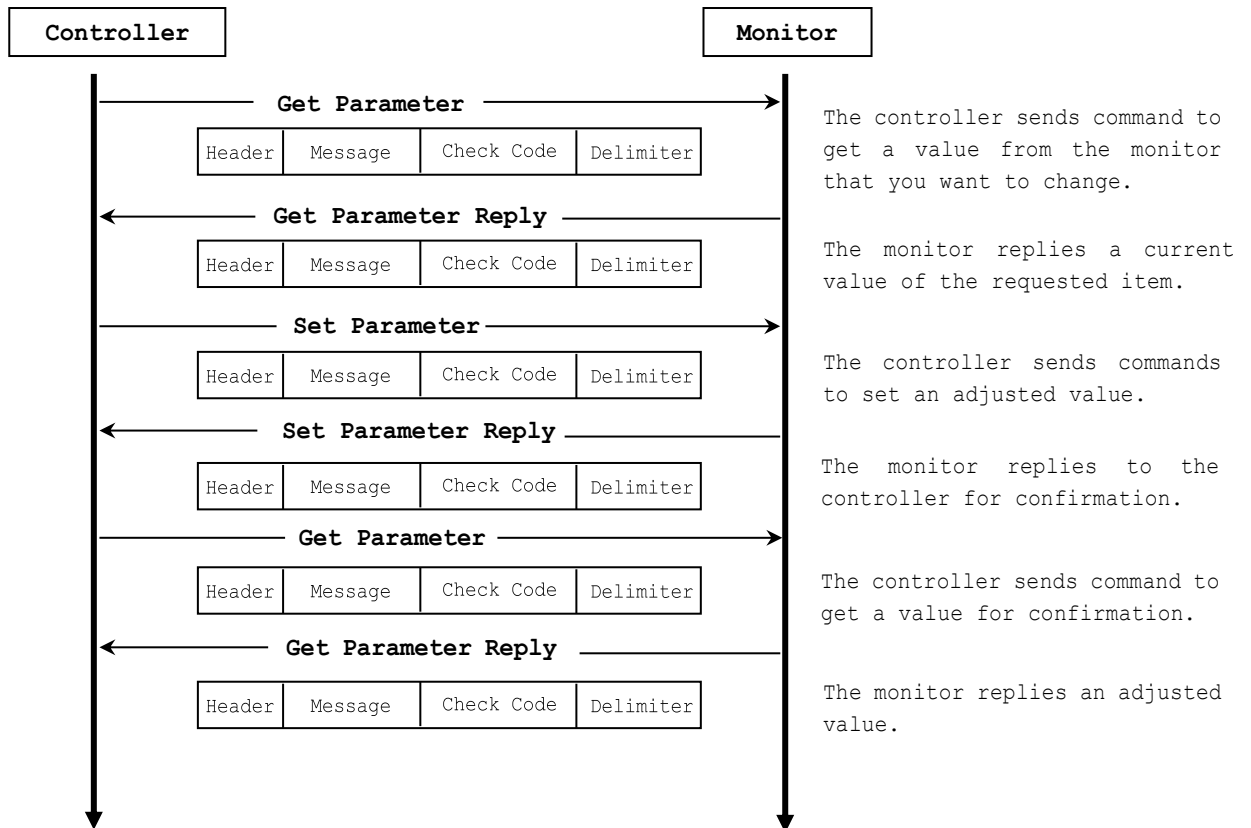
■ For the special command (see the part 7, 8)

The control does not suitable for above fixed protocol; use the proper command for each control. Please refer section 7 and 8.

The monitor replies a proper message defined for each control.
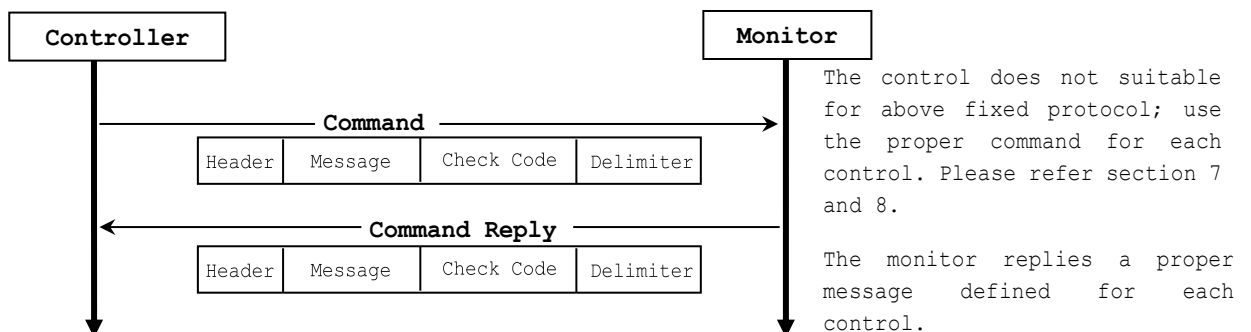
4.1 Header block format (fixed length)

Header	Message	Check code	Delimiter

SOH	Reserved '0'	Destination	Source	Message Type	Message Length
1st	2nd	3rd	4th	5th	6th –7th

1st byte) SOH: Start of Header

   ASCII SOH (01h)

2nd byte) Reserved: Reserved for future extensions.

   On this monitor, it must be ASCII '0'(30h).

3rd byte) Destination: Destination equipment ID. (Receiver)

   Specify a commands receiver's address.

   The controller sets the "MONITOR ID" of the monitor controlled in here.

   On the reply, the monitor sets '0' (30h), always.

 "MONITOR ID" to "Destination Address" conversion table is as follows,

Monitor ID	Destination Address
1	41h('A')
ALL	2Ah('*')

MONITOR ID of WDxx1 is "1" (Fixed).

4th byte) Source: Source equipment ID. (Sender)

   Specify a sender address.

   The controller must be '0' (30h).

   On the reply, the monitor sets the own MONITOR ID in here.

5th byte) Message Type: (Case sensitive.)

   Refer to section 4.2 "Message block format" for more details.

      ASCII 'A' (41h): Command.

      ASCII 'B' (42h): Command reply.

      ASCII 'C' (43h): Get current parameter from a monitor.

      ASCII 'D' (44h): "Get parameter" reply.

      ASCII 'E' (45h): Set parameter.

      ASCII 'F' (46h): "Set parameter" reply.

6th –7th bytes) Message Length:

Specify the length of the message (that follows the header) from STX to ETX.

This length includes STX and ETX.

The byte data must be encoded to ASCII characters.

Ex.) The byte data 3Ah must be encoded to ASCII characters '3' and 'A' (33h and 41h).

The byte data 0Bh must be encoded to ASCII characters '0' and 'B' (30h and 42h).

4.2 Message block format

Header	**Message**	Check code	Delimiter

"Message block format" is allied to the "Message Type" in the "Header".

Refer to the section 4.1 "Header block format" for more detail.

1) Get current parameter

 The controller sends this message when you want to get the status of the monitor.

For the status that you want to get, specify the "OP code page" and "OP code",

refer to "6.2 Operation code table".

   "Message format" of the "Get current parameter" is as follows,

STX	OP code page		OP code		ETX
	Hi	Lo	Hi	Lo	

➢   Refer to section 5.1 "Get current parameter from a monitor." for more details.

2) Get Parameter reply

 The monitor will reply with the status of the requested item specified by the controller

 in the "Get parameter message".

   "Message format" of the "Get parameter reply" is as follows,

STX	Result		OP code page		OP code		Type		Max value			Current Value			ETX
	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	MSB		LSB	MSB		LSB	

➢   Refer to section 5.2 "Get parameter reply" for more details.

3) Set parameter

 The controller sends this message to change a setting of the monitor.

   Message format of the "Set parameter" is as follows,

STX	OP code page		OP code		Set Value			ETX
	Hi	Lo	Hi	Lo	MSB		LSB	

➢   Refer to section 5.3 "Set parameter" for more details.

4) Set Parameter reply

 The monitor replies with this message for a confirmation of the "Set parameter message".

   Message format of the "Set parameter reply" is as follows,

STX	Result		OP code page		OP code		Type		Max value			Requested setting Value			ETX
	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	MSB		LSB	MSB		LSB	

➢   Refer to section 5.4 "Set parameter reply" for more details.

5) Command

 "Command message" format depends on each command.

 Usually, this "command message" is used for some non-slider controls and some special operations,

 such as "Save current settings", "Get timing report", "power control", etc. Refer to section

 5.5 "Commands message" for more details.

6) Command reply

 The monitor replies to a query from the controller.

 "Command reply message" format depends on each command.

 Refer to section 5.5 "Commands message" for more details.

4.3 Check code

| Header | Message | **Check code** | Delimiter |

Check code is the Block Check Code (BCC) between the Header and the End of Message except SOH.

		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
SOH	D_0								
Reserved	D_1								
Destination	D_2								
Source	D_3								
Type	D_4								
Length(H)	D_5								
Length(L)	D_6								
STX	D_7								
Data	D_8								
ETX	D_n								
Check code	D_{n+1}	P	P	P	P	P	P	P	P

$D_{n+1} = D_1$ XOR D_2 XOR D_3 XOR ,,, D_n

XOR: Exclusive OR

Following is an example of a Check code (BCC) calculation.

Header							Message										Check code (BCC)	Delimiter
SOH	Reserved	Destination Address	Source Address	Message type	Message length		STX	OP code page		OP code		Set Value				ETX		
01	30	41	30	45	30	41	02	30	30	31	30	30	30	36	34	03	77	0D
D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}	D_{11}	D_{12}	D_{13}	D_{14}	D_{15}	D_{16}	D_{17}	D_{18}

Check code (BCC) $D_{17} = D_1$ xor D_2 xor D_3 xor … xor D_{14} xor D_{15} xor D_{16}

= 30h xor 41h xor 30h xor 45h xor 30h xor 41h

xor 02h xor 30h xor 30h xor 31h xor 30h xor 30h

xor 30h xor 36h xor 34h xor 03h

= 77h

| Header | Message | Check code | **Delimiter** |

4.4 Delimiter

Packet delimiter code; ASCII CR(0Dh).

5. Message type

5.1 Get current Parameter from a monitor.

STX	OP code page		OP code		ETX
	Hi	Lo	Hi	Lo	
1st	2nd–3rd		4th–5th		6th

Send this message when you want to get the status of a monitor.

For the status that you want to get, specify the "OP code page" the "OP code", refer to "6.2 Operation code table".

1st byte) STX: Start of Message

    ASCII STX (02h)

2nd-3rd bytes) OP code page: Operation code page.

    Specify the "OP code page" for the control which you want to get the status.

    Refer to "Operation code table" for each item.

    OP code page data must be encoded to ASCII characters.

    Ex.) The byte data 02h must be encoded to ASCII characters '0' and '2' (30h and 32h).

    OP code page 02h -> OP code page (Hi) = ASCII '0' (30h)

                    OP code page (Lo) = ASCII '2' (32h)

    Refer to Operation code table.

4th-5th bytes) OP code: Operation code

    Refer to "6.2 Operation code table" for each item.

    OP code data must be encoded to ASCII characters.

    Ex.) The byte data 3Ah must be encoded to ASCII characters '3' and 'A' (33h and 41h).

    OP code 3Ah -> OP code (Hi) = ASCII '3' (33h)

              OP code (Lo) = ASCII 'A' (41h)

    Refer to Operation code table.

6th byte) ETX: End of Message

    ASCII ETX (03h)

5.2 "Get parameter" reply

STX	Result		OP code page		OP code		Type		Max value			Current Value			ETX
	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	MSB		LSB	MSB		LSB	
1st	2nd–3rd		4th–5th		6th –7th		8th –9th		10th –13th			14th –17th			18th

The monitor replies with a current value and the status of the requested item (operation code).

1st byte) STX: Start of Message

    ASCII STX (02h)

2nd-3rd bytes) Result code.

    These bytes indicate a result of the requested commands as follows,

        00h: No Error.

        01h: Unsupported operation with this monitor or unsupported operation under current condition.

    This result code from the monitor is encoded to ASCII characters.

    Result code is always 00h(No Error). Because monitor does not reply any command to the controller when monitor gets an unsupported command on CBxx1.

    Ex.) The byte data 00h is encoded to ASCII character '0' and '0' (30h and 30h).

4th-5th bytes) OP code page: Operation code page.

    These bytes indicate a replying item's OP code page.

    This returned value from the monitor is encoded to ASCII characters.

    Ex.) The byte data 02h is encoded to ASCII character '0' and '2' (30h and 32h).

    Refer to the operation code table.

6th-7th bytes) OP code: Operation code

    These bytes indicate a replying item's OP code.

    This returned value from the monitor is encoded to ASCII characters.

    Refer to the operation code table.

    Ex.) The byte data 1Ah is encoded to ASCII character '1' and 'A' (31h and 41h).

8th-9th bytes) Type: Operation type code

        00h: Set parameter

        01h: Momentary

        Like the Auto Setup function which automatically changes the parameter.

    This returned value from the monitor is encoded to ASCII characters.

    Ex.) The byte data 01h is encoded to ASCII character '0' and '1' (30h and 31h).

10th-13th bytes) Max. value: Maximum value which monitor can accept. (16bits)

    This returned value from the monitor is encoded to ASCII characters.

    Ex.) '0','1','2' and '3' means 0123h (291)

14th-17th bytes) Current Value: (16bits)

    This returned value from the monitor is encoded to ASCII characters.

Ex.) '0','1','2' and '3' means 0123h (291)

18th byte) ETX: End of Message

ASCII ETX (03h)

5.3 Set parameter

STX	OP code page		OP code		Set Value				ETX
	Hi	Lo	Hi	Lo	MSB			LSB	
1st	2nd-3rd		4th-5th		6th-9th				10th

Send this message to change monitor's adjustment and so on.

The controller requests a monitor to change value.

1st byte) STX: Start of Message

    ASCII STX (02h)

2nd-3rd bytes) OP code page: Operation code page

    This OP code page data must be encoded to ASCII characters.

    Ex.) The byte data 02h must be encoded to ASCII '0' and '2' (30h and 32h).

    Refer to the Operation code table.

4th-5th bytes) OP code: Operation code

    This OP code data must be encoded to ASCII characters.

    Ex.) OP code 1Ah -> OP code (Hi) = ASCII '1' (31h)

                         OP code (Lo) = ASCII 'A' (41h)

    Refer to the Operation code table.

6th-9th bytes) Set value: (16bit)

    This data must be encoded to ASCII characters.

    Ex.) 0123h -> 1st (MSB) = ASCII '0' (30h)

                 2nd = ASCII '1' (31h)

                 3rd = ASCII '2' (32h)

                 4th (LSB) = ASCII '3' (33h)

➢ ASCII '0'-'9' and 'A'-'F' should be used for Set value.

10th byte) ETX: End of Message

    ASCII ETX (03h)

5.4 "Set parameter" reply

STX	Result		OP code page		OP code		Type		Max value				Requested setting Value				ETX
	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	MSB			LSB	MSB			LSB	
1st	2nd–3rd		4th–5th		6th–7th		8th–9th		10th–13th				14th –17th				18th

The Monitor echoes back the parameter and status of the requested operation code.

1st byte) STX: Start of Message

    ASCII STX (02h)

2nd–3rd bytes) Result code

    ASCII '0''0' (30h, 30h): No Error.

    ASCII '0''1' (30h, 31h): Unsupported operation with this monitor or unsupported operation

    under current condition.

4th–5th bytes) OP code page: Echoes back the Operation code page for confirmation.

    Reply data from the monitor is encoded to ASCII characters.

    Ex.) OP code page 02h ->   OP code page = ASCII '0' and '2' (30h and 32h)

    Refer to Operation code table.

6th–7th bytes) OP code: Echoes back the Operation code for confirmation.

    Reply data from the monitor is encoded to ASCII characters.

    Ex.) OP code 1Ah -> OP code (Hi) = ASCII '1' (31h)

                        OP code (Lo) = ASCII 'A' (41h)

    Refer to Operation code table

8th–9th bytes) Type: Operation type code

    ASCII '0''0' (30h, 30h): Set parameter

    ASCII '0''1' (30h, 31h): Momentary

    Like Auto Setup function, that automatically changes the parameter.

10th–13th bytes) Max. value: Maximum value that monitor can accept. (16bits)

    Reply data from the monitor is encoded to ASCII characters.

    Ex.) '0''1''2''3' means 0123h (291)

14th –17th bytes) Requested setting Value: Echoes back the parameter for confirmation. (16bits)

    Reply data from the monitor is encoded to ASCII characters.

    Ex.) '0''1''2''3' means 0123h (291)

18th byte) ETX: End of Message

    ASCII ETX (03h)

5.5 NULL Message

The NULL message returned from the monitor is used in the following cases;

➢ To tell the controller that the monitor does not have any answer to give to the host (not ready or not expected)

➢ To tell the controller that the monitor received the command which isn't supported

➢ Complete "NULL Message" command packet as follows;

01h-30h-30h-41h-42h-30h-34h-02h-42h-45h-03h-CHK-0Dh

SOH-'0'-'0'-'A'-'B'-'0'-'4'-STX-'B'-'E'-ETX-CHK- CR

IV. Control Commands

6. Typical procedure example

The following is a sample of procedures to control the monitor, these are examples of "Get parameter", "Set parameter" and "Save current settings".

6.1. How to change the "Input source" setting.

Step 1. The controller requests the Monitor to reply with the current brightness setting and capability to support this operation. (Get parameter)

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'C'-'0'-'6'	STX-'0'-'0'-'6'-'0'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  Monitor ID: Specify the Monitor ID from which you want to get a value.
           Ex.) If Monitor ID is '1', specify 'A'.
  '0' (30h): Message sender is the controller.
  'C' (43h): Message type is "Get parameter command".
  '0'-'6' (30h, 36h): Message length is 6 bytes.

Message
  STX (02h): Start of Message
  '0'-'0' (30h, 30h): Operation code page number is 0.
  '6'-'0' (31h, 30h): Operation code is 60h (in the OP code page 0).
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

Step 2. The monitor replies with current Backlight setting and capability to support this operation.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'D'-'1'-'2'	STX-'0'-'0'-'0'-'0'-'6'-'0'-'0'-'0'-'0'-'0'-'8'-'7'-'0'-'0'-'0'-'1'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
           Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
  'D' (44h): Message Type is "Get parameter reply".
  '1'-'2' (31h, 32h): Message length is 18 bytes.

Message
  STX (02h): Start of Message
  '0'-'0' (30h, 30h): Result code. No error.
  '0'-'0' (30h, 30h): Operation code page number is 0.
  '6'-'0' (31h, 30h): Operation code is 60h (in the page 0).
  '0'-'0' (30h, 30h): This operation is "Set parameter" type.
  '0'-'0'-'8'-'7' (30h, 30h, 38h, 37h): Input source max value is 0087h (Android).
  '0'-'0'-'0'-'1' (30h, 30h, 30h, 31h): Current Input source setting is 0001h (VGA).
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

Step 3. The controller request the monitor to change the Input source setting

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID- '0'-'E'-'0'-'A'	STX-'0'-'0'-'6'-'0'- '0'-'0'-'1'-'1'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  Monitor ID: Specify the Monitor ID of which you want to change a setting.
            Ex.) If Monitor ID is '1', specify 'A'.
  '0' (30h): Message sender is the controller.
  'E' (45h): Message Type is "Set parameter command".
  '0'-'A' (30h, 41h): Message length is 10 bytes.

Message
  STX (02h): Start of Message
  '0'-'0' (30h, 30h): Operation code page number is 0.
  '6'-'0' (36h, 30h): Operation code is 60h (in the page 0).
  '0'-'0'-'1'-'1' (30h, 30h, 31h, 31h): Set Input source setting 0011h (HDMI1).
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

Step 4. The monitor replies with a message for confirmation.

Header	Message	Check code	Delimiter
SOH-'0'-'0'- Monitor ID – 'F'-'1'-'2'	STX-'0'-'0'-'0'-'0'-'6'-'0'—'0'-'0'- '0'-'0'-'8'-'7'-'0'-'0'-'1'-'1'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
            Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
  'F' (46h): Message Type is "Set parameter reply".
  '1'-'2' (31h, 32h): Message length is 18 bytes.

Message
  STX (02h): Start of Message
  '0'-'0' (30h, 30h): Result code. No error.
  '0'-'0' (30h, 30h): Operation code page number is 0.
  '1'-'0' (31h, 30h): Operation code is 10h (in the page 0).
  '0'-'0' (30h, 30h): This operation is "Set parameter" type.
  '0'-'0'-'8'-'7' (30h, 30h, 38h, 41h): Input source max value is 008Ah (USB-C 2).
  '0'-'0'-'1'-'1' (30h, 30h, 31h, 31h): Received an Input source setting was 0011h (HDMI1).
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

➢   Repeat Step 1 and Step 2, if you need to check Input source setting. (Recommended)

6.2. Operation Code (OP code) Table

OP code page	OP code	OP code name	Parameters
00h	60h	Input Source	Input source select. 00h: No mean 11h: HDMI 89h: USB-C 1 8Ah: USB-C 2
02h	10h	Backlight	Value : 00h – (max value: 0064h) 00h < ----- > 100 (64h) (dark) (bright)
02h	1Ah	Picture Mode	00h : No mean 03h : BRIGHT 04h : STANDARD 1Fh : SOFT
00h	54h	Color Temperature	00h: No mean 31h: WARM 43h: STANDARD 5Eh: COLD
00h	62h	Audio Speaker Volume Adjust	Audio Speaker Volume Value : 00h – (max value: 0064h) 00h < ----- > 100 (64h) (whisper) (loud)
00h	8Dh	Audio Mute	Mute the audio volume. 00h : Unmute the audio (Set only) 01h : Mute the audio 02h : Unmute the audio
02h	70H	Aspect	Picture Size adjust 00h : No mean 01h : STANDARD 07h : 1 : 1 (Dot by Dot)
02h	3Eh	Monitor ID	Monitor ID number 1 (fixed) Read only

7. Power control procedure

7.1 Power status read

1) The controller requests the monitor to reply a current power status.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'6'	STX-'0'-'1'-'D'-'6'-ETX	BCC	CR

```
Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  Monitor ID: Specify the Monitor ID from which you want to get status.
            Ex.) If Monitor ID is '1', specify 'A'.
  '0' (30h): Message sender is the controller.
  'A' (41h): Message Type is "Command".
  '0'-'6' (30h, 36h): Message length is 6 bytes.

Message
  STX (02h): Start of Message
  '0'-'1'-'D'-'6': Get power status command.
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
       Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet
```

2) The monitor returns with the current power status.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'1'-'2'	STX-'0'-'2'-'0'-'0'-'D'-'6'-'0'-'0'-'0'-'0'-'0'-'4'-'0'-'0'-'0'-'1'-ETX	BCC	CR

```
Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
            Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
  'B' (42h): Message Type is "Command reply".
  '1'-'2' (31h, 32h): Message length is 18 bytes.

Message
  STX (02h):Start of Message
  '0'-'2' (30h, 32h): Reserved data
  '0'-'0' (30h, 30h): Result code
               00: No Error.
               01: Unsupported.
  'D'-'6'(44h, 36h): Display power mode code
  '0'-'0' (30h, 30h): Parameter type code is "Set parameter".
  '0'-'0'-'0'-'4' (30h, 30h, 30h, 34h): Power mode is 4 types.
  '0'-'0'-'0'-'1' (30h, 30h, 30h, 31h): Current power mode (Machine status)
                                <Status>
                                 0001: Running
                                 0002: Screen off *1
                                 0004: Standby *1
      *1:As of December 2021, the power status values for "Screen off" and "Standby" are
      reversed. We will be respond correctly in the future. (Improved in firmware version
      "20220601_172206".)
  ETX (03h): End of Message
```

Check code
  BCC: Block Check Code
       Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

7.2 Power control

Note) This command is not supported for LAN.

1) The controller requests the monitor to control monitor power.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID- '0'-'A'-'0'-'C'	STX-'C'-'2'-'0'-'3'-'D'-'6'- '0'-'0'-'0'-'1'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  Monitor ID: Specify the Monitor ID which you want to change a setting.
            Ex.) If Monitor ID is '1', specify 'A'.
  '0' (30h): Message sender is the controller.
  'A' (41h): Message type is "Command".
  '0'-'C (30h, 43h): Message length is 12 bytes.

Message
  STX (02h): Start of Message
  'C'-'2'-'0'-'3'-'D'-'6' (43h, 32h, 30h, 33h, 44h, 36h): power control command
  '0'-'0'-'0'-'1' (30h, 30h, 30h, 31h): Power mode (Machine status)
                                0001: Running
                                0002, 0003: Do not set.
                                0004: Standby
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
       Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

2) The monitor replies a data for confirmation.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID- 'B'-'0'-'E'	STX-'0'-'0'-'C'-'2'-'0'-'3'-'D'-'6'- '0'-'0'-'0'-'1'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
            Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
  'B' (42h): Message type is "Command reply".
  'N'-'N': Message length
            Note.) The maximum data length that can be written to the monitor at a time is
            32bytes.
            Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

Message
  STX (02h): Start of Message
  '0'-'0' (30h, 30h): Result code. No error.
  'C'-'2','0'-'3'-'D'-'6' (43h, 32h, 30h, 33h, 44h, 36h): power control reply command
        ➢ The monitor replies same as power control command to the controller.
  '0'-'0'-'0'-'1' (30h, 30h, 30h, 31h): Power mode (Machine status)
                                0001: Running
                                0002, 0003: Do not set.
                                0004: Standby

ETX (03h): End of Message

Check code
  BCC: Block Check Code *1
        Refer to the section 4.3 "Check code" for a BCC calculation.
      *1:As of August 2022, the reply of the "Running" command is incorrect.
      Response example: 01 30 30 41 42 30 45 02 30 30 43 32 30 33 44 36 30 30 30 31 **56** 0d
      We will respond correctly in the future.

Delimiter
  CR (0Dh): End of packet

ETX (03h): End of Message

Check code
  BCC: Block Check Code *1
        Refer to the section 4.3 "Check code" for a BCC calculation.
      *1:As of August 2022, the reply of the "Running" command is incorrect.
      Response example: 01 30 30 41 42 30 45 02 30 30 43 32 30 33 44 36 30 30 30 31 **56** 0d
      We will respond correctly in the future.

Delimiter
  CR (0Dh): End of packet

8. Serial No.

8.1 Serial No. Read

This command is used in order to read a serial number.

1) The controller requests the monitor to read a serial number.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID- '0'-'A'-'0'-'6'	STX-'C'-'2'-'1'-'6'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  Monitor ID: Specify the Monitor ID which you want to get serial number.
            Ex.) If Monitor ID is '1', specify 'A'.
  '0' (30h): Message sender is the controller.
  'A' (41h): Message type is "Command".
  '0'-'6'(30h, 36h): Message length

Message
  STX (02h): Start of Message
    'C'-'2'-'1'-'6' (43h, 32h, 31h, 36h): Serial No. command
 ETX (03h): End of Message

Check code
  BCC: Block Check Code
       Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

2) The monitor replies the serial No. data to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID- 'B'-N-N	STX-'C'-'3'-'1'-'6'- Data(0)-Data(1)---Data(n)-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
            Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
'B' (42h): Message type is "Command reply".
N-N: Message length
            Note.) The maximum data length that can be returned from the monitor at a time is
                  32bytes.
            Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).
Message
  STX (02h): Start of Message
  'C'-'3'-'1'-'6' (43h, 33h, 31h, 36h): Serial No. reply command
  Data(0)-Data(1)----Data(n):Serial Number
  ➢   The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).
          Ex.) Foe example when receiveing Serial Number data 33h 31h 33h 32h 33h 33h 33h 34h
              Step1: Serial Number data is encoded as character string.
                    Example:
                      33h 31h 33h 32h 33h 33h 33h 34h -> '3','1','3','2','3','3','3','4'
              Step2: Decode pairs of ASCII characters to hexadecimal values.
                    Example:
                      '3','1','3','2','3','3','3','4' -> 31h 32h 33h 34h
              Step3: Byte data represents the ASCII string data.
                    Example:
                      31h 32h 33h 34h -> "1234"
              Result: Serial Number is "1234".

Note: No null termination character is sent.
ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

9. LAN MAC Address

9.1 LAN MAC Address Read

This command is used in order to read the MAC Address.

1) The controller requests the monitor to read MAC Address.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'8'	STX-'C'-'2'-'2'-'A'-'0'-'2'-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  Monitor ID: Specify the Monitor ID which you want to get Model Name.
            Ex.) If Monitor ID is '1', specify 'A'.
  '0' (30h): Message sender is the controller.
  'A' (41h): Message type is "Command".
  '0'-'8'(30h, 38h): Message length is 8 bytes.

Message
  STX (02h): Start of Message
    'C'-'2'-'2'-'A' (43h, 32h, 32h, 41h): LAN read command
    '0'-'2'   (30h, 32h) : MAC Address
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

2) The monitor replies the model name data to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-N-N	STX-'C'-'3'-'2'-'A'-'RC'-'0'-'2'-IPV-MAC(0)-MAC(1)-----MAC(n)-ETX	BCC	CR

Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
            Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
  'B' (42h): Message type is "Command reply".
  N-N: Message length
            Note.) The maximum data length that can be returned from the monitor at a time is
                    32bytes.
            Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).
Message
  STX (02h): Start of Message
  'C'-'3'-'2'-'A' (43h, 33h, 32h, 41h): LAN read reply Command
  RC: Reply result Code
    '0'-'0' (30h, 30h): Normal
    'F'-'F' (46h, 46h) or '0'-'1' (30h, 31h): Abnormal
  '0'-'2' (30h, 32h): MAC Address
  IPV: IPv4 or IPv6
    '0'-'4' (30h, 34h): IPv4
    '0'-'6' (30h, 36h): IPv6
  MAC (0-n): MAC Address
  In the case of IPv4 -> n = 12
    Ex.) 12:34:56:78:90:AB
          -> '1'-'2'-'3'-'4'-'5'-'6'-'7'-'8'-'9'-'0'-'A'-'B'
              (31h, 32h, 33h, 34h, 35h, 36h, 37h, 38h, 39h, 30h, 41h, 42h)

ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.3 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

10. Cloud connection (Microsoft Azure)

Note) "10. Cloud connection" commands are supported by firmware version "20220601_172206" or

later.

10.1 Write Cloud Connection Config

Use this command to write configuration information for Cloud connections.

1) The controller requests that the monitor write configuration information.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'F'-'F'	STX-'C'-'A'-'3'-'B'-SN-DI-IT-CD-ETX	BCC	CR

```
Header
  SOH (01h) : Start of Header
  '0' (30h) : Reserved
  Monitor ID: Specify the Monitor ID which you want to get Model Name.
              例) If Monitor ID is '1', specify 'A'.
  '0' (30h) : Message sender is the controller.
  'A' (41h) : Message type is "Command".
  'F'-'F' (46h, 46h) : The maximum message length is 255 bytes.

Message
  STX (02h) : Start of Message
  'C'-'A'-'3'-'B': "Write Cloud Connection Config Settings" command

  SN                 : Sequence Number
    The "sequence number" is a parameter for splitting large amounts of configuration
    information. Message Length is 2 bytes. If the sequence number is '1', it means the
    start of the split transmission of configuration information, If the sequence number is
    '0', it means the end of the split transmission of configuration information.

    [When sending configuration information without splitting]
      sequence number = '00'(30H 30H)

      To send the configuration information without splitting it, set the value of the
      sequence number to '00'(30H 30H),
      Send a command containing configuration information to the data section.

    [When sending configuration information in parts]
      sequence number = '01'(30H 31H)

      When sending configuration information in parts, set '1' to the value of the sequence
      number, and send a command containing fixed byte length in the data section from the
      beginning of the configuration information.
      And each time you send a command, it increments the sequence number and sends it.
      If you repeat the above steps and the configuration information after the split is
      less than a fixed byte length, Set the sequence number to '0' and send a command to
      include the rest of the configuration information in the data section.

      The above fixed byte length refers to the remaining data capacity obtained by
      subtracting data other than configuration information from Message (255 bytes).

  DI                 : Device ID
    Specifies the device ID of the monitor to which the command is sent.
    If the device IDs do not match, the command cannot be sent.
    The length is fixed at 32 Bytes.

  IT                 : Write Item
    "00"{30H 30H} : "configType"
    "01"{30H 31H} : "securityType"
    "02"{30H 32H} : "provisioningIdScope"
    "03"{30H 33H} : "certificate"
    "04"{30H 34H} : "privateKey"
```

```
   "05"{30H 35H} : "symmetricKey"
   "06"{30H 36H} : "connectionString"
   "07"{30H 37H} : "rootCertificate"

 CD                 : Configuration Data
   This is the configuration information to be written by this command.
   If the size of the configuration information is less than the maximum, it is putted at
   00H.
   Also, the newline code for the certificate is 0DH 0AH.
   The length is always 213 Bytes.

 ETX (03h)          : End of Message


Check code

 BCC                : Block Check Code
 Refer to the section 4.3 "Check code" for a BCC calculation.


Delimiter

 CR (0Dh)           : End of packet
```

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'2'-'A'	STX-'C'-'B'-'3'-'B'-RC-SN-DI-ETX	BCC	CR

```
Header

 SOH (01h): Start of Header
 '0' (30h): Reserved
 '0' (30h): Message receiver is the controller.
 Monitor ID: Indicate a replying Monitor ID.
        Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
 'B' (42h): Message type is "Command reply"。
 '2'-'A' (32h 41h): Message length
        Note.) The maximum data length that can be returned from the monitor at a time is
                32bytes.
        Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).


Message

 STX(02h)  :Start of Message
 'C'-'B'-'3'-'B'{43H 42H 33H 42H} : Write Cloud Connection Config reply command
 RC        : Reply result code
   '0'-'0' (30h, 30h): Normal
   '0'-'1' (30h, 31h): Abnormal
   '0'-'2' (30h, 32h): Abnormal(Cloud Service is enabled)

 SN        : Sequence Number
   Echoes back the sequence number received from the controller.

 DI        : Device ID
   Indicates the device ID of the monitor to which it responded.
   The length is fixed at 32 Bytes.

 ETX (03h) : End of Message


Check code

 BCC: Block Check Code *1
 Refer to the section 4.3 "Check code" for a BCC calculation.
 *1:As of August 2022, the check code of reply command is incorrect.
 We will respond correctly in the future.
```

```
Delimiter
  CR (0Dh): End of packet
```

Note)

```
    * When writing the setting value with this command, Cloud service must be disabled.
```

10.2 Verify Cloud Connection Config

```
As of August 2022, this command is not supported.
```

10.3 Delete Cloud Connection Config

Use this command to clear the data written in Write Cloud Connection Config.

1) The controller asks the monitor to erase the configuration information.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'2'-'6'	STX-'C'-'A'-'3'-'D'-DI-ETX	BCC	CR

Header

  SOH (01h) : Start of Header
  '0' (30h) : Reserved
  Monitor ID: Specify the Monitor ID which you want to get Model Name.
           例) If Monitor ID is '1', specify 'A'.
  '0' (30h) : Message sender is the controller.
  'A' (41h) : Message type is "Command".
  '2'-'6' (32h, 36h): The maximum data length is 38 bytes.

Message

  STX (02h) : Start of Message
  'C'-'A'-'3'-'D'{43H 41H 33H 44H}: Delete Cloud Connection Config Settings command

  DI   : Device ID
    Specifies the device ID of the monitor to which the command is sent.
    If the device IDs do not match, the command cannot be sent.
    The length is fixed at 32 Bytes.

  ETX (03h)   : End of Message

Check code

  BCC   : Block Check Code
    For information on calculating BCC, see 4.3 "Check code".

Delimiter

  CR (0Dh)   : End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'2'-'8'	STX-'C'-'B'-'3'-'D'-RC-DI-ETX	BCC	CR

Header

  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
        Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
  'B' (42h): Message type is "Command reply"。
  '2'-'8' (32h 38h): Message length
        Note.) The maximum data length that can be returned from the monitor at a time is
           32bytes.
        Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

Message

  STX(02h)   :Start of Message
  'C'-'B'-'3'-'D'{43H 42H 33H 44H}: "Delete Cloud Connection Config reply" command

  RC   : Reply result code
    '0'-'0' (30h, 30h): Normal
    '0'-'1' (30h, 31h): Abnormal

'0'-'2' (30h, 32h): Abnormal(Cloud Service is enabled)

  DI   : Device ID
    Indicates the device ID of the monitor to which it responded.
    The length is fixed at 32 Bytes.

  ETX (03h)   : End of Message

Check code
  BCC: Block Check Code *1
    For information on calculating BCC, see 4.3 "Check code".
 *1:As of August 2022, the check code of reply command is incorrect.
 We will respond correctly in the future.

Delimiter
  CR (0Dh): End of Packet

10.4 Get Deveice ID

Use this command to get the device ID stored on the device.

1) The controller asks the monitor to respond with the device ID.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'6'	STX-'C'-'A'-'3'-'F'-ETX	BCC	CR

    Header

      SOH (01h) : Start of Header
      '0' (30h) : Reserved
      Monitor ID: Specify the Monitor ID which you want to get Model Name.
               例) If Monitor ID is '1', specify 'A'.
      '0' (30h) : Message sender is the controller.
      'A' (41h) : Message type is "Command".
      '0'-'6' (30h, 36h) : Message length is 6 bytes.

    Message

      STX (02h) : Start of Message
      'C'-'A'-'3'-'F'{43H 41H 33H 46H}: Get Device ID command

      ETX (03h): End of Message

    Check code

      BCC: Block Check Code
        For information on calculating BCC, see 4.3 "Check code".

    Delimiter

      CR (0Dh): End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'2'-'8'	STX-'C'-'B'-'3'-'F'-RC-DI-ETX	BCC	CR

    Header

      SOH (01h): Start of Header
      '0' (30h): Reserved
      '0' (30h): Message receiver is the controller.
      Monitor ID: Indicate a replying Monitor ID.
            Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
      'B' (42h): Message type is "Command reply"。
      '2'-'8' (32h 38h): Message length
            Note.) The maximum data length that can be returned from the monitor at a time is
                32bytes.
            Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

    Message

      STX(02h):Start of Message
      'C'-'B'-'3'-'F'{43H 42H 33H 46H}: "Get Device ID reply" command

      RC   : Reply result code
        '0'-'0' (30h, 30h): Normal
        '0'-'1' (30h, 31h): Abnormal

      DI   : Device ID
        Indicates the device ID of the monitor to which it responded.

The length is fixed at 32 Bytes.

ETX (03h)   : End of Message

Check code
  BCC: Block Check Code *1
    For information on calculating BCC, see 4.3 "Check code".
 *1:As of August 2022, the check code of reply command is incorrect.
 We will respond correctly in the future.

Delimiter
  CR (0Dh): End of Packet

10.5 Set Transmission Interval

Use this command to set the time interval for sending IoT device information.

1) The controller requests the setting of the time interval to send IoT device information to
   the monitor.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'E'	STX-'C'-'A'-'4'-'0'-Index-SI-ST-ETX	BCC	CR

Header

  SOH (01h) : Start of Header
  '0' (30h) : Reserved
  Monitor ID: Specify the Monitor ID which you want to get Model Name.
            例) If Monitor ID is '1', specify 'A'.
  '0' (30h) : Message sender is the controller.
  'A' (41h) : Message type is "Command".
  '0'-'E' (30h, 45h): Message length is 14 bytes.

Message

  STX (02h)   : Start of Message
   'C'-'A'-'4'-'0'{43H 41H 34H 30H}: "Transmission Interval" command

  Index   : Identifier to determine set/get
   '0'-'0'{30H 30H}: Set

  SI   : Set Item
   'F'-'F'{46H 46H}: All Sensor

  ST   : Setting Time(min)
   It can be set in the range of 10 to 120 minutes.

   '0'-'0'-'0'-'A'{30H 30H 30H 41H}: "10 minute"
    ~
   '0'-'0'-'7'-'8'{30H 30H 37H 38H}: "120 minute"

  ETX (03h): End of Message

Check code

  BCC: Block Check Code
   For information on calculating BCC, see 4.3 "Check code".

Delimiter

  CR (0Dh): End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'1'-'0'	STX-'C'-'B'-'4'-'0'-RC-Index-SI-ST-ETX	BCC	CR

Header

  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.

Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
'B' (42h): Message type is "Command reply"。
'1'-'0' (31h 30h): Message length
Note.) The maximum data length that can be returned from the monitor at a time is 32bytes.
Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

Message
STX(02h):Start of Message
'C'-'B'-'4'-'0'{43H 42H 34H 30H}: "Transmission Interval reply" command

RC   : Reply result code
'0'-'0' (30h, 30h): Normal
'0'-'1' (30h, 31h): Abnormal

Index   : Identifier to determine set/get
'0'-'0'{30H 30H}: Set

SI   : Set Item
'F'-'F'{46H 46H}: All Sensor

ST   : Setting Time
The monitor responds with a successful time setting.
'0'-'0'-'0'-'A'{30H 30H 30H 41H}: "10 minute"
~
'0'-'0'-'7'-'8'{30H 30H 37H 38H}: "120 minute"

ETX (03h): End of Message

Check code
BCC: Block Check Code *1
For information on calculating BCC, see 4.3 "Check code".
*1:As of August 2022, the check code of reply command is incorrect.
We will respond correctly in the future.

Delimiter
CR (0Dh): End of Packet

Note)

Please specify the setting time in units of 10 minutes.

10.6 Get Transmission Interval

Use this command to get a set value for the time interval for which IoT device information is sent.

1) The controller requests a response of the set value of the time interval to send IoT device information to the monitor.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'A'	STX-'C'-'A'-'4'-'0'-Index-GI-ETX	BCC	CR

    Header
      SOH (01h) : Start of Header
      '0' (30h) : Reserved
      Monitor ID: Specify the Monitor ID which you want to get Model Name.
              例) If Monitor ID is '1', specify 'A'.
      '0' (30h) : Message sender is the controller.
      'A' (41h) : Message type is "Command".
      '0'-'A' (30h, 41h) : Message length is 10 bytes.

    Message
      STX (02h) : Start of Message
      'C'-'A'-'4'-'0'{43H 41H 34H 30H}: Transmission Interval command

      Index   : Identifier to determine set/get
      '0'-'1'{30H 31H}: Get

      GI   : Get Item
      'F'-'F'{46H 46H}: All Sensor

      ETX (03h): End of Message

    Check code
      BCC   : Block Check Code
        For information on calculating BCC, see 4.3 "Check code".

    Delimiter
      CR (0Dh): End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'1'-'0'	STX-'C'-'B'-'4'-'0'-RC-Index-GI-GT-ETX	BCC	CR

    Header
      SOH (01h): Start of Header
      '0' (30h): Reserved
      '0' (30h): Message receiver is the controller.
      Monitor ID: Indicate a replying Monitor ID.
          Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
      'B' (42h): Message type is "Command reply"。
      '1'-'0' (31h 30h): Message length
          Note.) The maximum data length that can be returned from the monitor at a time is
              32bytes.
          Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

    Message

```
STX(02h):Start of Message
'C'-'B'-'4'-'0'{43H 42H 34H 30H}: Transmission Interval reply command


 RC                : Reply result code
   '0'-'0' (30h, 30h): Normal
   '0'-'1' (30h, 31h): Abnormal



 Index             : Identifier to determine set/get
 '0'-'1'{30H 31H}: Get



 GI                : Get Item
   'F'-'F'{46H 46H}: All Sensor


 GT                : Setting Time(min)
   The monitor responds with the current set time.
   '0'-'0'-'0'-'A'{30H 30H 30H 41H}: "10 minute"
   ~
   '0'-'0'-'7'-'8'{30H 30H 37H 38H}: "120 minute"



 ETX (03h)         : End of Message


Check code
 BCC               : Block Check Code *1
   For information on calculating BCC, see 4.3 "Check code".
 *1:As of August 2022, the check code of reply command is incorrect.
 We will respond correctly in the future.


Delimiter
 CR (0Dh)          : End of Packet
```

10.7 Get Sensor Data

Use this command to retrieve sensor data for IoT devices.

1) The controller requests a response of the set value of the time interval to send IoT device

   information to the monitor.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'8'	STX-'C'-'A'-'4'-'1'-GI-ETX	BCC	CR

   Header

    SOH (01h) : Start of Header
    '0' (30h) : Reserved
    Monitor ID: Specify the Monitor ID which you want to get Model Name.
              例) If Monitor ID is '1', specify 'A'.
    '0' (30h) : Message sender is the controller.
    'A' (41h) : Message type is "Command".
    '0'-'8' (30h, 38h) : Message length is 8 bytes.

   Message

    STX (02h) : Start of Message
    'C'-'A'-'4'-'1'{43H 41H 34H 31H}: Get Seonsor Data command

    GI   : Get Item
    '0'-'0'{30H 30H}: Presence
    '0'-'1'{30H 31H}: Ambient Light
    '0'-'2'{30H 32H}: Ambient Temperature
    '0'-'3'{30H 33H}: Ambient Humidity
    '0'-'4'{30H 34H}: Ambient Air Quality

    ETX (03h): End of Message

   Check code

    BCC: Block Check Code
      For information on calculating BCC, see 4.3 "Check code".

   Delimiter

    CR (0Dh): End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'1'-'6'	STX-'C'-'B'-'4'-'1'-RC-GI-SV-ETX	BCC	CR

   Header

    SOH (01h): Start of Header
    '0' (30h): Reserved
    '0' (30h): Message receiver is the controller.
    Monitor ID: Indicate a replying Monitor ID.
          Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
    'B' (42h): Message type is "Command reply"。
    '1'-'6' (31h 36h): Message length
          Note.) The maximum data length that can be returned from the monitor at a time is
              32bytes.
          Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

   Message

```
  STX(02h)              :Start of Message
  'C'-'B'-'4'-'1'{43H 42H 34H 31H}: Get Sensor Data reply command

  RC                   : Reply result code
    '0'-'0' (30h, 30h): Normal
    '0'-'1' (30h, 31h): Abnormal


  GI                   : Get Item
  '0'-'0'{30H 30H}: Presence
  '0'-'1'{30H 31H}: Ambient Light
  '0'-'2'{30H 32H}: Ambient Temperature
  '0'-'3'{30H 33H}: Ambient Humidity
  '0'-'4'{30H 34H}: Ambient Air Quality

  SV                   : Sensor Value
  The monitor responds with the sensor value it obtained.
  The sensor value has a byte length of 12 and is constructed from the beginning as follows:

    Sign(2 byte)
    '0'-'0'{30H 30H}: "No Sign"
    '0'-'1'{30H 31H}: "-" (Minus)
    '0'-'2'{30H 32H}: "+" (Plus)

    Integer Part(6 byte)
    '0'-'0'-'0'-'0'-'0'-'0'{30H 30H 30H 30H 30H 30H}: "0"
    ~
    '0'-'1'-'8'-'6'-'A'-'0'{30H 31H 38H 36H 41H 30H}: "100000"

    Fractional Part(4 byte)
    '0'-'0'-'0'-'0'{30H 30H 30H 30H}: "0"
    ~
    '0'-'3'-'E'-'7'{30H 33H 45H 37H}: "999"


  ETX (03h): End of Message

Check code
  BCC: Block Check Code *1
    For information on calculating BCC, see 4.3 "Check code".
 *1:As of August 2022, the check code of reply command is incorrect.
  We will respond correctly in the future.

Delimiter
  CR (0Dh): End of Packet
```

Note)

The values indicating abnormalities in each acquired item and the range of sensor values are

described below.

Presence

  [Ex. Error]

  "010000010000"(30H 31H 30H 30H 30H 30H 30H 31H 30H 30H 30H 30H) : -1

  [Ex. Not Detect]

  "000000000000"(30H 30H 30H 30H 30H 30H 30H 30H 30H 30H 30H 30H) : 0

  [Ex. Detect]

"000000010000"(30H 30H 30H 30H 30H 30H 30H 31H 30H 30H 30H 30H) : 1

Ambient Light
  [Sensor value range]
   0.0 ～ 100000.0
  [Ex. Error]
   "010000010000"(30H 31H 30H 30H 30H 30H 30H 31H 30H 30H 30H 30H) : -1.0
  [Ex. "398 lux"]
   "0000018E0000"(30H 30H 30H 30H 30H 31H 38H 45H 30H 30H 30H 30H) : 398.0

Ambient Temperature
  [Sensor value range]
   -100.0 ～ +100.0
  [Ex. Error]
   "010003E80000"(30H 31H 30H 30H 30H 33H 45H 38H 30H 30H 30H 30H) : -1000.0
  [Ex. "25.8 ° C"]
   "020000190008"(30H 32H 30H 30H 30H 30H 31H 39H 30H 30H 30H 38H) : +25.8

Ambient Humidity
  [Sensor value range]
   0.0 ～ +100.0
  [Ex. Error]
   "010000010000"(30H 31H 30H 30H 30H 30H 30H 31H 30H 30H 30H 30H) : -1.0
  [Ex. "42.7 %"]
   "0200002A00007"(30H 32H 30H 30H 30H 30H 32H 41H 30H 30H 30H 37H) : +42.7

Ambient Air Quality
  [Sensor value range]
   0.0 ～ 10000.0
  [Ex. Error]
   "010000010000"(30H 31H 30H 30H 30H 30H 30H 31H 30H 30H 30H 30H) : -1.0
  [Ex. "476 ppm"]
   "000001DC00000"(30H 30H 30H 30H 30H 31H 44H 43H 30H 30H 30H 30H) : 476.0

10.8 Set Cloud Service

Use this command to configure (enable/disable) Cloud service.

1) The controller asks the monitor to configure Cloud service.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'A'	STX-'C'-'A'-'4'-'3'-Index-ED-ETX	BCC	CR

   Header

    SOH (01h) : Start of Header
    '0' (30h) : Reserved
    Monitor ID: Specify the Monitor ID which you want to get Model Name.
            例) If Monitor ID is '1', specify 'A'.
    '0' (30h) : Message sender is the controller.
    'A' (41h) : Message type is "Command".
    '0'-'A' (30h, 41h): Message length is 10 bytes.

   Message

    STX (02h) : Start of Message
    'C'-'A'-'4'-'3'{43H 41H 34H 33H}: Cloud Service command

    Index   : Identifier to determine set/get
    '0'-'0'{30H 30H}: Set

    ED   : Disable/Enable
    '0'-'0'{30H 30H}: Disable
    '0'-'1'{30H 31H}: Enable

    ETX (03h): End of Message

  Check code

    BCC: Block Check Code
      For information on calculating BCC, see 4.3 "Check code".

  Delimiter

    CR (0Dh): End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'0'-'A'	STX-'C'-'B'-'4'-'3'-RC-Index-ETX	BCC	CR

   Header

    SOH (01h): Start of Header
    '0' (30h): Reserved
    '0' (30h): Message receiver is the controller.
    Monitor ID: Indicate a replying Monitor ID.
       Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
    'B' (42h): Message type is "Command reply"。
    '0'-'A' (30h 41h): Message length
       Note.) The maximum data length that can be returned from the monitor at a time is
         32bytes.
       Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

   Message

    STX(02h):Start of Message
    'C'-'B'-'4'-'3'{43H 42H 34H 33H}: "Cloud Service reply" command

```
  RC                  : Reply result code
    '0'-'0' (30h, 30h): Normal
    '0'-'1' (30h, 31h): Abnormal


  Index     : Identifier to determine set/get
    '0'-'0'{30H 30H}: Set


  ETX (03h): End of Message

Check code
  BCC: Block Check Code *1
    For information on calculating BCC, see 4.3 "Check code".
  *1:As of August 2022, the check code of reply command is incorrect.
  We will respond correctly in the future.


Delimiter
  CR (0Dh): End of Packet
```

10.9 Get Cloud Service

Use this command to get the Cloud service settings (enabled/disabled).

1) The controller asks the monitor to respond to Cloud service settings.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'A'-'0'-'8'	STX-'C'-'A'-'4'-'3'-Index-ETX	BCC	CR

    Header

      SOH (01h) : Start of Header
      '0' (30h) : Reserved
      Monitor ID: Specify the Monitor ID which you want to get Model Name.
              例) If Monitor ID is '1', specify 'A'.
      '0' (30h) : Message sender is the controller.
      'A' (41h) : Message type is "Command".
      '0'-'8' (30h, 38h) : Message length is 8 bytes.

    Message

      STX (02h) : Start of Message
      'C'-'A'-'4'-'3'{43H 41H 34H 33H}: Cloud Service command

      Index   : Identifier to determine set/get
      '0'-'1'{30H 31H}: Get

      ETX (03h): End of Message

    Check code

      BCC: Block Check Code
        For information on calculating BCC, see 4.3 "Check code".

    Delimiter

      CR (0Dh): End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'B'-'0'-'C'	STX-'C'-'B'-'4'-'3'-RC-Index-ED-ETX	BCC	CR

    Header

      SOH (01h): Start of Header
      '0' (30h): Reserved
      '0' (30h): Message receiver is the controller.
      Monitor ID: Indicate a replying Monitor ID.
          Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
      'B' (42h): Message type is "Command reply"。
      '0'-'C' (30h 43h): Message length
          Note.) The maximum data length that can be returned from the monitor at a time is
              32bytes.
          Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

    Message

      STX(02h)   : Start of Message
      'C'-'B'-'4'-'3'{43H 42H 34H 33H}: "Cloud Service reply" command

      RC   : Reply result code
        '0'-'0' (30h, 30h): Normal
        '0'-'1' (30h, 31h): Abnormal

```
Index      : Identifier to determine set/get
 '0'-'1'{30H 31H}: Get

ED                 : Disable/Enable
 '0'-'0'{30H 30H}: Disable
 '0'-'1'{30H 31H}: Enable


ETX (03h): End of Message
```

Check code

```
 BCC: Block Check Code *1
    For information on calculating BCC, see 4.3 "Check code".
 *1:As of August 2022, the check code of reply command is incorrect.
 We will respond correctly in the future.
```

Delimiter

```
 CR (0Dh): End of Packet
```

10.10 Get Expiration Date Of Certificate

Use this command to get the expiration date of the specified certificate.

1) The controller asks the monitor to respond with the expiration date of the certificate.

Header	Message	Check code	Delimiter
SOH-'0'-Monitor ID-'0'-'C'-'0'-'8'	STX-'C'-'A'-'4'-'4'-CER-ETX	BCC	CR

Header

  SOH (01h) : Start of Header
  '0' (30h) : Reserved
  Monitor ID: Specify the Monitor ID which you want to get Model Name.
            例) If Monitor ID is '1', specify 'A'.
  '0' (30h) : Message sender is the controller.
  'C' (43h) : Message type is "Get Current Parameter".
  '0'-'8' (30h, 38h): Message length is 8 bytes.

Message

  STX (02h) : Start of Message
  'C'-'A'-'4'-'4'{43H 41H 34H 34H}: Expiration Date Of Certificate command

  CER   : Certificate
  '0'-'0'{30H 30H}: "Client"
  '0'-'1'{30H 31H}: "Root"

  ETX (03h): End of Message

Check code

  BCC: Block Check Code
    For information on calculating BCC, see 4.3 "Check code".

Delimiter

  CR (0Dh): End of Packet

2) The monitor returns an acknowledgment to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-Monitor ID-'D'-'2'-'4'	STX-'C'-'B'-'4'-'4'-RC-CER-ExD-ETX	BCC	CR

Header

  SOH (01h): Start of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller.
  Monitor ID: Indicate a replying Monitor ID.
        Ex.) When this byte is set to 'A', the replying Monitor ID is '1'.
  'D' (44h): Message type is "Command reply"。
  '2'-'4' (32h 34h): Message length
        Note.) The maximum data length that can be returned from the monitor at a time is
              32bytes.
        Ex.) The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).

Message

  STX(02h)   :Start of Message
    'C'-'B'-'4'-'4'{43H 42H 34H 34H}: Expiration Date Of Certificate reply command

  RC   : Reply result code
    '0'-'0' (30h, 30h): Normal

```
        '0'-'1' (30h, 31h): Abnormal

    CER      : Certificate
      '0'-'0'{30H 30H}: "Client"
      '0'-'1'{30H 31H}: "Root"


    ExD      : Expiration date of Certificate
      Reply with 26 bytes to the expiration date of the certificate.


    ETX (03h): End of Message

  Check code
    BCC: Block Check Code *1
      For information on calculating BCC, see 4.3 "Check code".
    *1:As of August 2022, the check code of reply command is incorrect.
    We will respond correctly in the future.

  Delimiter
    CR (0Dh): End of Packet
```

Note)

   If the certificate expires on 2045-09-30 23:59:59, the "ExD" is the following data:

   Also, the last two bytes contain 00H.

   "Sat Sep 30 23:59:59 2045"

    -> 53H 61H 74H 20H 53H 65H 70H 20H 33H 30H 20H 32H 33H 3AH 35H 39H 3AH 35H 39H 20H 32H 30H 34H 35H 00H 00H

In addition, "CTL-CA3B. Write Cloud Connection Config", the expiration date of the root certificate will be updated from the next boot.

All data are subject to change without notice.