# External Control                SHARP Touch Display

### Rev.1.0 (PN-L862B/L752B/L652B series)

## INDEX

# I. Application

 This document defines the communications method for control of the SHARP PN-L862B/L752B/L652B when using an external controller.

# II. Preparation

## 2. Connectors and wiring

### 2.1 RS-232C Remote control

  Connector: 9-pin D-Sub
  Cable: Straight cable
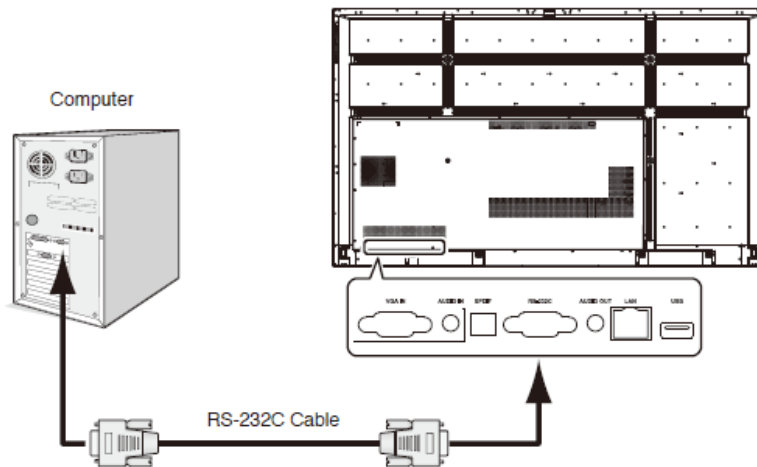


### 2.2 LAN control

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



NOTE: Use a category 5 or higher LAN cable.
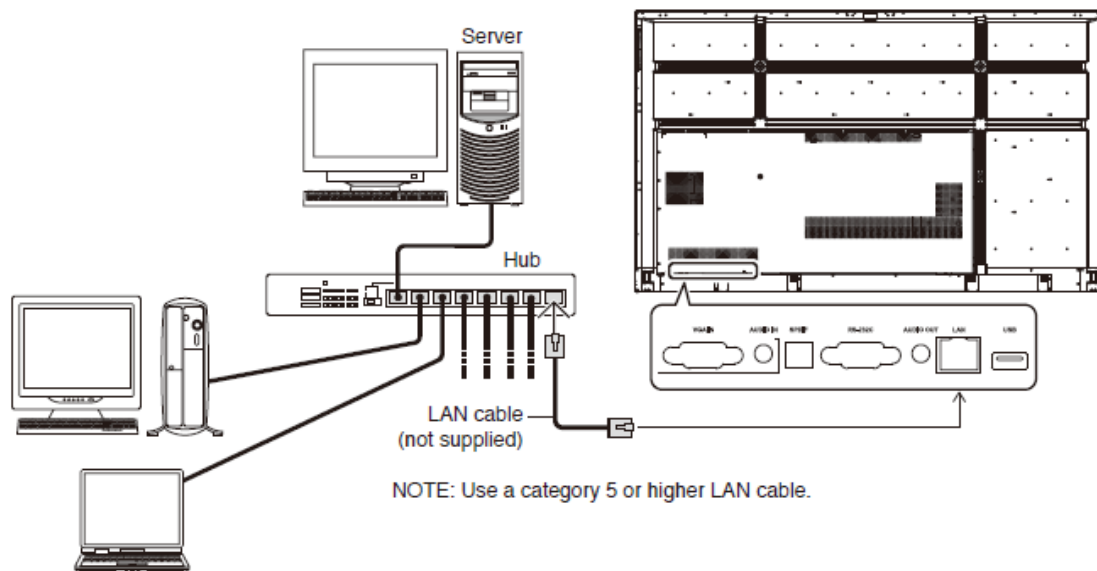
### 2.3 Monitor settings

    The following settings are required on the monitor side. Please check if communication fails.
    (1) Power Save Mode                off
    (2) Monitor Control via Network    on
    (3) Command format                 N-format
    (Please refer to "Administrator Settings Menu" in the operation manual.)

# 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)
```

## 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
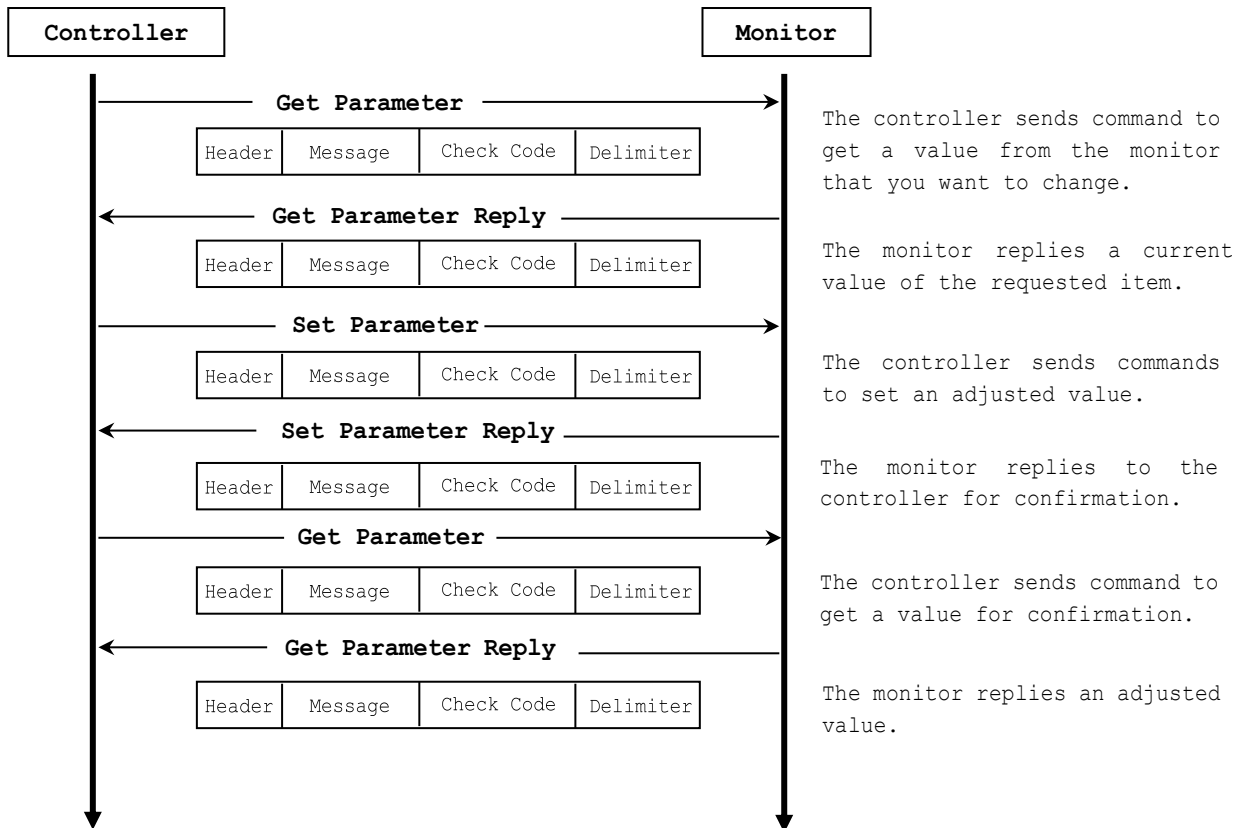- Input Change: 10 seconds

# 4. Communication Format

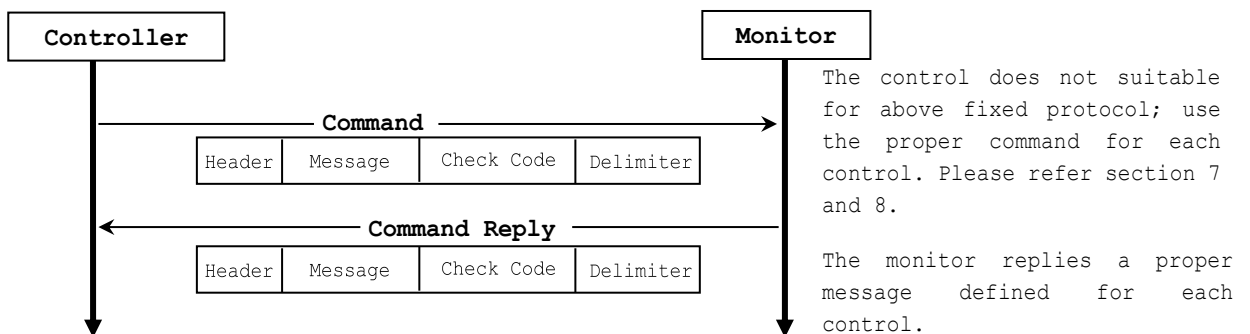| Header | Message | Check Code | Delimiter |
|---|---|---|---|

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")

| Controller | | Monitor |
|---|---|---|

Get Parameter →

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

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

← Get Parameter Reply

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

The monitor replies a current value of the requested item.

Set Parameter →

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

The controller sends commands to set an adjusted value.

← Set Parameter Reply

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

The monitor replies to the controller for confirmation.

Get Parameter →

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

The controller sends command to get a value for confirmation.

← Get Parameter Reply

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

The monitor replies an adjusted value.

■ For the special command (see the part 7, 8)

| Controller | | Monitor |
|---|---|---|

Command →

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

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

← Command Reply

| Header | Message | Check Code | Delimiter |
|---|---|---|---|

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 PN-L862B/L752B/L652B are "1" (Fixed).

Therefore PN-L862B/L752B/L652B should accept, only when 3rd Byte is 41h or 2Ah.


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

## 4.4 Delimiter

| Header | Message | Check code | **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 PN-L862B/L752B/L652B.

    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)


18thbyte) 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.

1stbyte) STX: Start of Message

   ASCII STX (02h)

2nd-3rdbytes) 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-5thbytes) 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-9thbytes) 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.

10thbyte) 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'-'9'-'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'-'9' (30h, 30h, 38h, 39h): Input source max value is 0089h (USB-C).
  '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, 35h, 30h): 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'-'9'-'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'-'9' (30h, 30h, 38h, 39h): Input source max value is 0089h (USB-C).
  '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.<br>　00h: No mean<br>　01h: VGA<br>　0Dh: OPTION<br>　11h: HDMI1<br>　12h: HDMI2<br>　82h: HDMI3<br>　87h: HOME<br>　89h: USB-C |
| 00h | 62h | Audio Speaker Volume Adjust | Audio Speaker Volume<br>Value : 00h – (max value: 0064h)<br>Set VCP data value :<br>　　00h < ----- > 100 (64h)<br>　　( whisper)　　( loud ) |
| 00h | 8Dh | TV Audio Mute | Mute the TV audio volume.<br>　00h : Unmute the audio (Set only)<br>　01h : Mute the audio<br>　02h : Unmute the audio<br>　>02h: Ignore |
| 02h | 3Eh | Monitor ID | Monitor ID number<br>　1 (fixed)<br>　　Read only |
| 02h | 50h | H Resolution | Get Horizontal Resolution<br>Value :<br>　0 ←------→ FFFFh)<br>　( small )　　( large )<br>* Depend on signal<br>* Read only |
| 02h | 51h | V Resolution | Get Vertical Resolution<br>Value :<br>　0 ←------→ FFFFh)<br>　( small )　　( large )<br>* Depend on signal<br>* Read only |
| 02h | 70H | ASPECT | Picture Size adjust<br>　00h : No mean<br>　01h : Normal<br>　02h : Wide<br>　07h : Dot by Dot |
| 10h | C2h | START UP PC | Internal PC power on<br>　00h: Not operate,<br>　01h: Execute |
| 10h | C3h | FORCE QUIT | Internal PC force off<br>　00h: Not operate<br>　01h: Execute |

# 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: Power on
                                0002: Sleep state
                                0004: Power off
  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

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: Power on
                                0002, 0003: Do not set.
                                0004: Power off
  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: Power on
                                0002, 0003: Do not set.
                                0004: Power off
  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

# 8. Serial No. & Model Name Read

## 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-<br>'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-<br>'B'-N-N | STX-'C'-'3'-'1'-'6'-<br>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

## 8.2 Model Name Read

This command is used in order to read the Model Name.

1) The controller requests the monitor to read Model Name.

| Header | Message | Check code | Delimiter |
|---|---|---|---|
| SOH-'0'-Monitor ID-'0'-'A'-'0'-'6' | STX-'C'-'2'-'1'-'7'-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'-'6'(30h, 36h): Message length

Message
  STX (02h): Start of Message
    'C'-'2'-'1'-'7' (43h, 32h, 31h, 37h): Model Name 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 model name data to the controller.

| Header | Message | Check code | Delimiter |
|---|---|---|---|
| SOH-'0'-'0'-Monitor ID-'B'-N-N | STX-'C'-'3'-'1'-'7'-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'-'7' (43h, 33h, 31h, 37h): Model Name reply Command
  Data(0)-Data(1)----Data(n):Model name
  ➢      The byte data 20h is encoded as ASCII characters '2' and '0' (32h and 30h).
         Ex.) For example when receiving Model Name data
              -> 34h 33h 34h 32h 33h 36h 33h 35h 33h 31h 35h 31h
            Step1: Model Name data is encoded character string.
                  Example:
                    34h 33h 34h 32h 33h 36h 33h 35h 33h 31h 35h 31h
                    -> '4','3','4','2','3','6','3','5' '3','1','5','1'
            Step2: Decode pairs of ASCII characters to hexadecimal values.
                  Example:
                    '4','3','4','2','3','6','3','5' '3','1','5','1'
                    -> 43h 42h 36h 35h 31h 51h
            Step3: Byte data represents the ASCII string data.
                  Example:
                    43h 42h 36h 35h 31h 51h -> "CB651Q"

Result: Model Name is "CB651Q".
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

**All data are subject to change without notice.**