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I. Application

This document defines the communications method for control of the NEC LCD monitor, CB651Q/ CB751Q/ CB861Q when using an external controller.

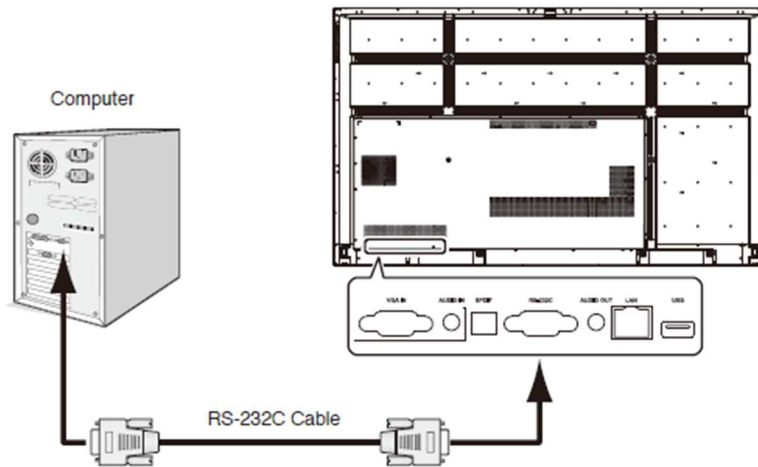
II. Preparation

2. Connectors and wiring

2.1 RS-232C Remote control

Connector: 9-pin D-Sub

Cable: Straight cable

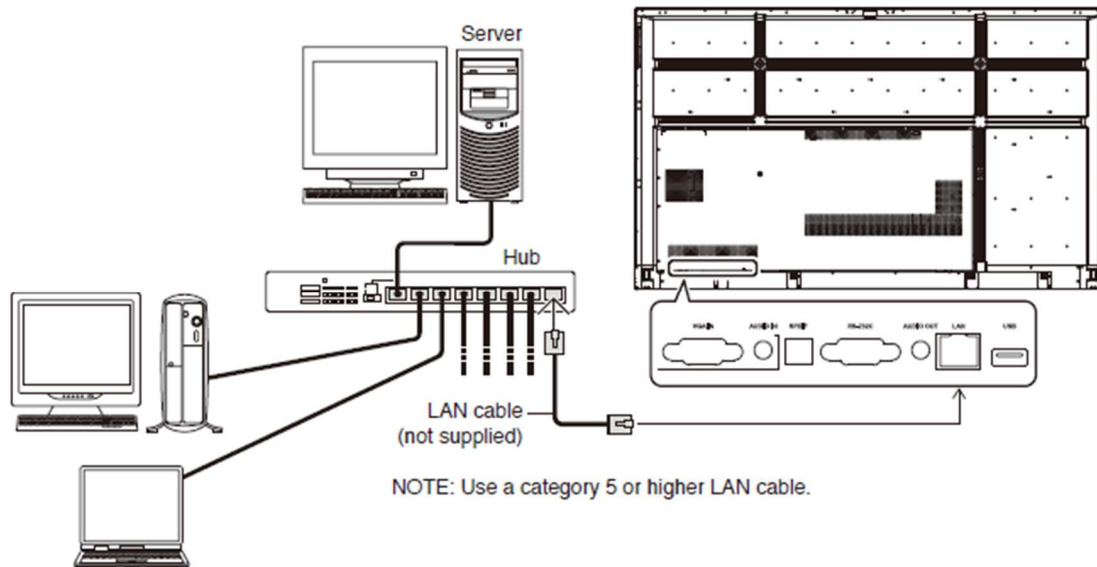


(Please refer "Controlling the LCD monitor via RS-232C Remote control" on User's manual.)

2.2 LAN control

Connector: RJ-45 10/100 BASE-T

Cable: Category 5 or higher LAN cable



(Please refer "Controlling the LCD monitor via LAN control" on User's manual.)

III. Communication specification

3. Communication Parameter

3.1 Monitor condition

When the machine status of this monitor is Running or Energy saving.
The machine status is the below Power Indicator table.

Power indicator

LED Indicator status	Machine status
Glowing blue	Running or booting.
Glowing red	Standby.
Blinking between blue and red slowly	Energy saving (Turn off the backlight). Note: Audio is output.
Blinking between blue and red fastly	Shutting down or received remote control signal.

3.2 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 |

3.3 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) |

3.4 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

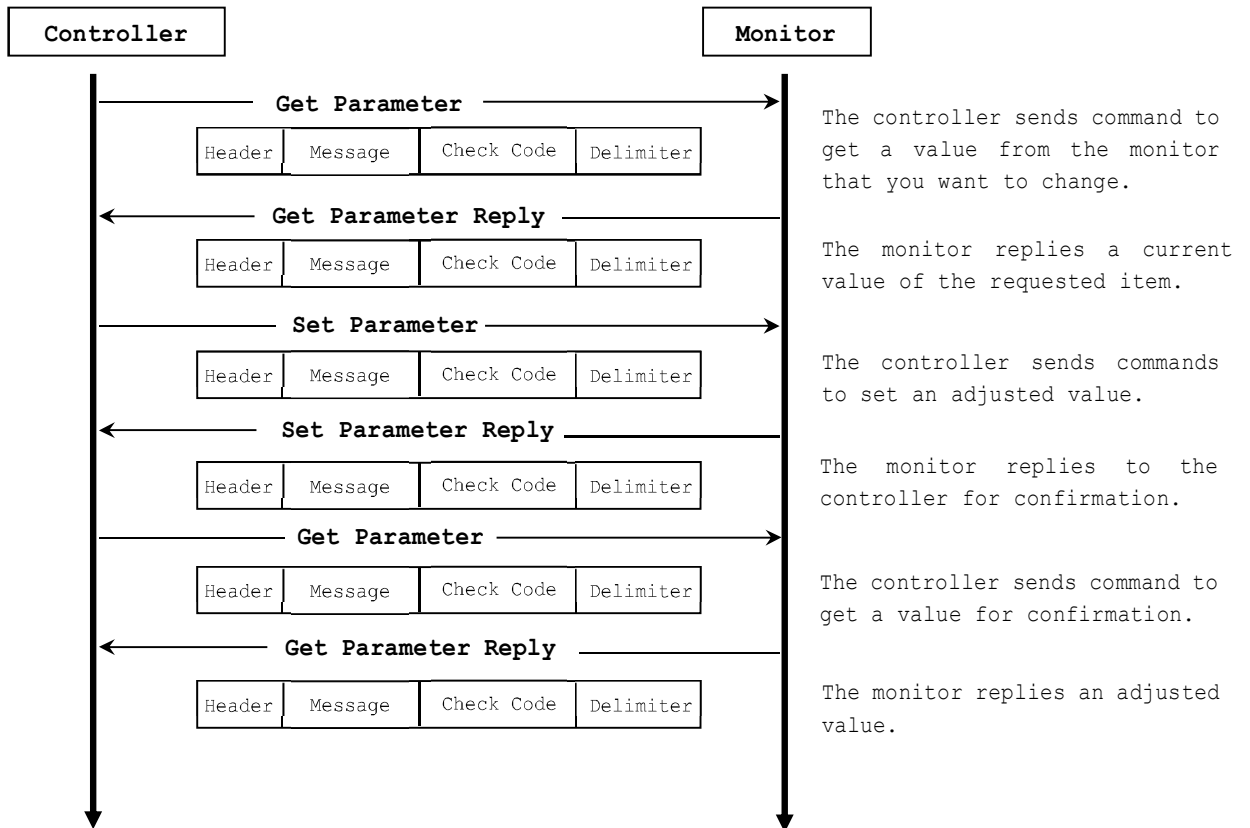
4. Communication Format

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

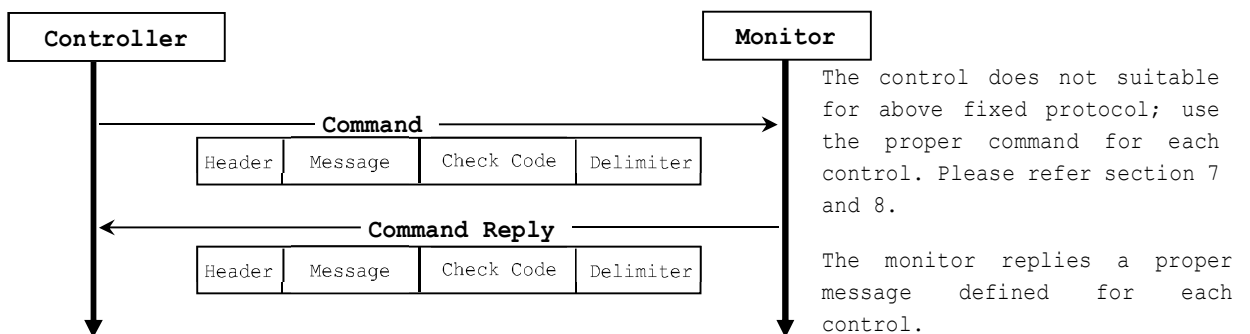
The command packet consists of four parts, Header, Message, Check code and Delimiter.
 Note: Don't add extra data (Example: padding data) after Delimiter.

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")



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



4.1 Header block format (fixed length)

Header	Message	Check code	Delimiter
--------	---------	------------	-----------

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

1stbyte) SOH: Start of Header

ASCII SOH (01h)

2ndbyte) Reserved: Reserved for future extensions.

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

3rdbyte) 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 CBxx1 is "1" (Fixed).

Therefore CBxx1 should accept, only when 3rd Byte is 41h or 2Ah.

4thbyte) 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.

5thbyte) 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		

➤ 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		

➤ 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

$$D_{n+1} = D_1 \text{ XOR } D_2 \text{ XOR } D_3 \text{ XOR } \dots \text{ XOR } D_n$$

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

$$\begin{aligned}
 \text{Check code (BCC) } D_{17} &= D_1 \text{ xor } D_2 \text{ xor } D_3 \text{ xor } \dots \text{ xor } D_{14} \text{ xor } D_{15} \text{ xor } D_{16} \\
 &= 30\text{h} \text{ xor } 41\text{h} \text{ xor } 30\text{h} \text{ xor } 45\text{h} \text{ xor } 30\text{h} \text{ xor } 41\text{h} \\
 &\quad \text{xor } 02\text{h} \text{ xor } 30\text{h} \text{ xor } 30\text{h} \text{ xor } 31\text{h} \text{ xor } 30\text{h} \text{ xor } 30\text{h} \\
 &\quad \text{xor } 30\text{h} \text{ xor } 36\text{h} \text{ xor } 34\text{h} \text{ xor } 03\text{h} \\
 &= 77\text{h}
 \end{aligned}$$

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	
1 st	2 nd -3 rd		4 th -5 th		6 th

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".

1stbyte) STX: Start of Message

ASCII STX (02h)

2nd-3rdbytes) 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-5thbytes) 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.

6thbyte) 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	
1 st	2 nd -3 rd		4 th -5 th		6 th -7 th		8 th -9 th		10 th -13 th			14 th -17 th			18 th

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

1stbyte) STX: Start of Message

ASCII STX (02h)

2nd-3rdbytes) 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-5thbytes) 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-7thbytes) 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-9thbytes) 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-13thbytes) 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-17thbytes) 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	
1 st	2 nd -3 rd		4 th -5 th		6 th -9 th				10 th

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	
1 st	2 nd -3 rd		4 th -5 th		6 th -7 th		8 th -9 th		10 th -13 th			14 th -17 th			18 th

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

1stbyte) STX: Start of Message

ASCII STX (02h)

2nd-3rdbytes) 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-5thbytes) 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-7thbytes) 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-9thbytes) 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-13thbytes) 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 -17thbytes) 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)

18thbyte) 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'-'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, 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'-'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, 37h): Input source max value is 0087h (Android).

'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 01h: VGA 0Dh: OPTION 11h: HDMI1 12h: HDMI2 82h: HDMI3 87h: HOME
00h	62h	Audio Speaker Volume Adjust	Audio Speaker Volume Value : 00h – (max value: 0064h) Set VCP data value : 00h < ----- > 100 (64h) (whisper) (loud)
00h	8Dh	TV Audio Mute	Mute the TV audio volume. 00h : Unmute the audio (Set only) 01h : Mute the audio 02h : Unmute the audio >02h: Ignore
02h	3Eh	Monitor ID	Monitor ID number 1 (fixed) Read only
02h	50h	H Resolution	Get Horizontal Resolution Value : 0 ←-----→ FFFFh) (small) (large) * Depend on signal * Read only
02h	51h	V Resolution	Get Vertical Resolution Value : 0 ←-----→ FFFFh) (small) (large) * Depend on signal * Read only
02h	70H	ASPECT	Picture Size adjust 00h : No mean 01h : Normal (4:3) 02h : Full (16:9) 07h : Point by Point (Dot by Dot)
10h	C2h	START UP PC	Internal PC power on 00h: Not operate, 01h: Execute
10h	C3h	FORCE QUIT	Internal PC force off 00h: Not operate 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'-'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: No mean
 0004: Energy saving
 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: Running
 0002, 0003: Do not set.
 0004: Energy saving

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: Energy saving

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-'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.) For example when receiving 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.

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