

External Control

E series

**PN-E329/PN-E439/PN-E509/
PN-E559/PN-E659/PN-E759/PN-E869**

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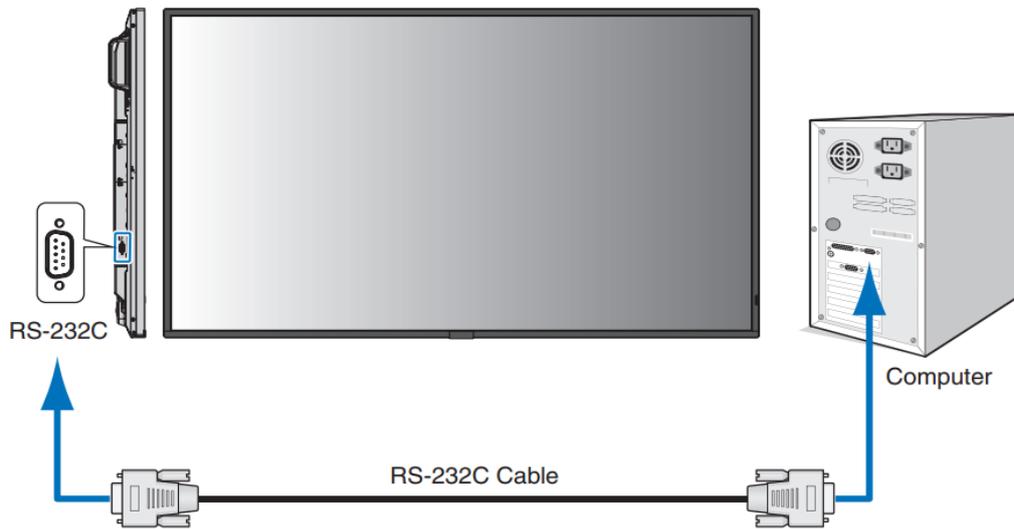
1. Overview

This document specifies the communication method when using the external control function of the SHARP LCD monitor.

2. Connection method

2.1 RS-232C

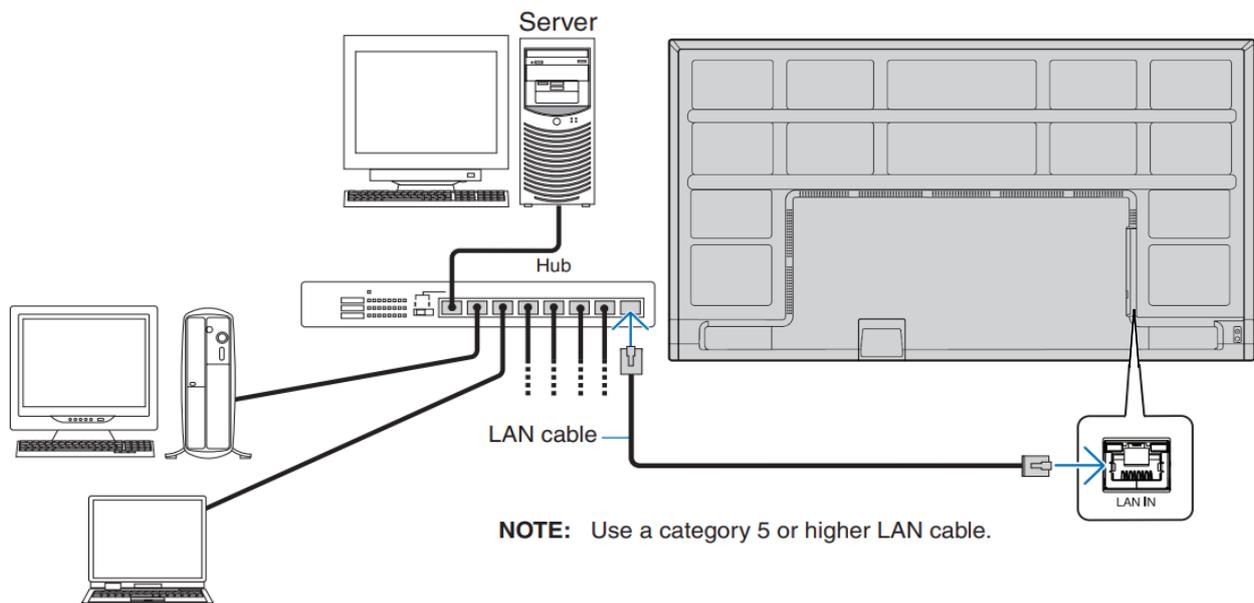
Connector : 9-pin D-sub
Cable : Reverse(Crossing) cable



Note : See "RS-232C remote control" in the instruction manual.

2.2 LAN

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



NOTE: Use a category 5 or higher LAN cable.

Note : See "LAN Control" in the Owner's Manual.

3. Communication conditions

3.1 RS-232C

| | |
|----------------------|--------------|
| Communication system | Asynchronous |
| Interface | RS-232C |
| Baud rate | 9600 (bps) |
| Data length | 8 (bit) |
| Parity | None |
| Stop bit | 1 (bit) |

Note:

- Keep the command byte interval within 100 ms.
- When sending commands continuously, send the next command after receiving the response command from the monitor.
- When sending the following commands, wait for the specified interval after receiving the response command, and then send the next command.
 - *Approximately 15 seconds after sending power ON and power OFF.
 - *Approximately 10 seconds after sending input switching, or all reset.
- When the monitor is "power off" or "power save", the commands that can be received are limited. See chapter 8.1 for details.

3.2 LAN

| | |
|----------------------|--------------|
| Communication system | 7142 (Fixed) |
| Communication layer | TCP |

For details on various settings, refer to "Network Settings" in the Operating Instructions.

Note:

- The monitor will disconnect after 15 minutes of communication loss. Please reconnect every time you communicate after an interval of 15 minutes or more.
- When sending commands continuously, send the next command after receiving the response command from the monitor.
- When sending the following commands, wait for the specified interval after receiving the response command, and then send the next command.
 - *Approximately 15 seconds after sending power ON and power OFF.
 - *Approximately 10 seconds after sending input switching, or all reset.
- When the monitor is "power off" or "power save", the commands that can be received are limited. See chapter 8.1 for details.

4. Command format

External control commands are roughly classified into two types: CTL and VCP. Each command consists of four parts, Header, Message, Check code, and Delimiter, as shown below.

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

The content of the message varies depending on the type of command (Header 5th: Message Type). The common components of CTL and VCP commands are explained in this chapter, but please refer to the following guidance for details of each.

- Detailed explanation of Message of CTL command
Refer to "5.CTL Command"
- Detailed explanation of Message of VCP command
Refer to "6.VCP Command"

4.1 Header (fixed length)

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

4.1.1 Header Format

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

1st) SOH: Start Header
means Start Header.

Specify the ASCII code 'SOH' (01h).

2nd) Reserved: Reserved area for function expansion
Specify ASCII '0' (30h) for this monitor.

3rd) Destination: ID of the device that receives the command
The transmitter side (controller) specifies the monitor ID or group ID of the display to be controlled here.
Specify '0' (30h) on the receiver side (monitor).

Notes : For details, refer to the
"Conversion table between monitor ID and group ID and Destination Address"

4th) Source: ID of the device sending the command
Specify '0' (30h) on the transmitter side (controller).
Specify the monitor ID on the receiver side (monitor).

5th) Message Type: Specify command type
ASCII 'A' (41h): CTL command
ASCII 'B' (42h): CTL command reply
ASCII 'C' (43h): Get VCP command
ASCII 'D' (44h): Get VCP command reply
ASCII 'E' (45h): Set VCP command
ASCII 'F' (46h): Set VCP command reply

6th-7th) Message Length:

Defines the command length of the Message, ranging from STX to ETX following the header. This length includes STX and ETX.

Byte data must be encoded in ASCII characters.

ex)

If the byte data is 3Ah, specify the ASCII characters '3' and 'A' (33h and 41h).

If the byte data is 0Bh, specify the ASCII characters '0' and 'B' (30h and 42h).

Conversion table between monitor ID and group ID and Destination Address

| Monitor ID | Destination Address |
|------------|---------------------|------------|---------------------|------------|---------------------|------------|---------------------|
| 1 | 41h('A') | 26 | 5Ah('Z') | 51 | 73h | 76 | 8Ch |
| 2 | 42h('B') | 27 | 5Bh | 52 | 74h | 77 | 8Dh |
| 3 | 43h('C') | 28 | 5Ch | 53 | 75h | 78 | 8Eh |
| 4 | 44h('D') | 29 | 5Dh | 54 | 76h | 79 | 8Fh |
| 5 | 45h('E') | 30 | 5Eh | 55 | 77h | 80 | 90h |
| 6 | 46h('F') | 31 | 5Fh | 56 | 78h | 81 | 91h |
| 7 | 47h('G') | 32 | 60h | 57 | 79h | 82 | 92h |
| 8 | 48h('H') | 33 | 61h | 58 | 7Ah | 83 | 93h |
| 9 | 49h('I') | 34 | 62h | 59 | 7Bh | 84 | 94h |
| 10 | 4Ah('J') | 35 | 63h | 60 | 7Ch | 85 | 95h |
| 11 | 4Bh('K') | 36 | 64h | 61 | 7Dh | 86 | 96h |
| 12 | 4Ch('L') | 37 | 65h | 62 | 7Eh | 87 | 97h |
| 13 | 4Dh('M') | 38 | 66h | 63 | 7Fh | 88 | 98h |
| 14 | 4Eh('N') | 39 | 67h | 64 | 80h | 89 | 99h |
| 15 | 4Fh('O') | 40 | 68h | 65 | 81h | 90 | 9Ah |
| 16 | 50h('P') | 41 | 69h | 66 | 82h | 91 | 9Bh |
| 17 | 51h('Q') | 42 | 6Ah | 67 | 83h | 92 | 9Ch |
| 18 | 52h('R') | 43 | 6Bh | 68 | 84h | 93 | 9Dh |
| 19 | 53h('S') | 44 | 6Ch | 69 | 85h | 94 | 9Eh |
| 20 | 54h('T') | 45 | 6Dh | 70 | 86h | 95 | 9Fh |
| 21 | 55h('U') | 46 | 6Eh | 71 | 87h | 96 | A0h |
| 22 | 56h('V') | 47 | 6Fh | 72 | 88h | 97 | A1h |
| 23 | 57h('W') | 48 | 70h | 73 | 89h | 98 | A2h |
| 24 | 58h('X') | 49 | 71h | 74 | 8Ah | 99 | A3h |
| 25 | 59h('Y') | 50 | 72h | 75 | 8Bh | 100 | A4h |
| ALL | 2Ah('*') | | | | | | |

| Group ID | Destination Address | Group ID | Destination Address | Group ID | Destination Address | Monito ID | Destination Address |
|----------|---------------------|----------|---------------------|----------|---------------------|-----------|---------------------|
| A | 31h('1') | D | 34h('4') | G | 37h('7') | J | 3Ah(':') |
| B | 32h('2') | E | 35h('5') | H | 38h('8') | | |
| C | 33h('3') | F | 36h('6') | I | 39h('9') | | |

ex) When controlling the monitor whose "ID No." is set to '1', set the destination address to 'A' (41h). To control all daisy chained displays, set the destination address to '*' (2Ah).

Note: ME series are not supported daisy-chained functions.

4.2 Message

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

The format of Message is determined by the 5th (Message type) of Header, and there are the following 6 types.

- CTL command
- CTL command reply
- Get VCP command
- Get VCP command reply
- Set VCP command
- Set VCP command reply

4.2.1. CTL command

The format of Message in Commands depends on each command.

Notes : Refer to "5.CTL Command" for detail.

4.2.2. CTL command replay

The monitor responds to commands received from the controller.
The format of Message in Commands depends on each command.

Notes : Refer to "5.CTL Command" for detail.

4.2.3 Get VCP command

Controller sends this Message with OP code page and OP code when it wants to get status of the monitor.

Notes : For each "OP code page" and "OP code", please refer to "6.VCP command".

4.2.3.1. Format and detail of Get VCP command.

| Message | | | | | |
|---------|--------------|----|---------|----|-----|
| STX | OP Code Page | | OP Code | | ETX |
| | Hi | Lo | Hi | Lo | |
| 1st | 2nd-3rd | | 4th-5th | | 6th |

1st) STX : Start of Message
Specify the ASCII code 'STC' (02h).

2nd-3rd) OP code page: Page of operation code
The data in the "OP code page" should be converted to ASCII characters.
ex) Byte data 02h must be converted 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)

4th-5th) OP code: Operation code
The data in the "OP code" should be converted to ASCII characters.
ex) Byte data 3Ah must be converted to ASCII characters '3' and 'A' (33h and 41h).
OP code 3Ah -> OP code (Hi) = ASCII '3' (33h)
OP code (Lo) = ASCII 'A' (41h)

4.2.4. Get VCP command reply

The monitor returns this Message in response to the Get VCP command specified on the OP code page and OP code.

Notes : For each "OP code page" and "OP code", please refer to "6.VCP command".

4.2.4.1. Format and detail fo Get VCP command reply

| Message | | | | | | | | | | | | | | | |
|---------|---------|----|--------------|----|---------|----|----------|----|-----------|-----|-----|---------------|-----|-----|------|
| STX | Result | | OP Code Page | | OP Code | | Reserved | | 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 |

1st) STX : Start of Message

Specify the ASCII code 'STC' (02h).

2nd-3rd) Result code:

Returns the execution result.

00h: No error

01h: Unsupported operation on this monitor, or unsupported operation in its current state.

This result code from the monitor has been converted to ASCII characters.

ex) Byte data 01h is converted to ASCII characters '0' and '1' (30h and 31h).

4th-5th) OP code page: Page of operation code

The data in the "OP code page" should be converted to ASCII characters.

ex) Byte data 02h must be converted 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)

6th-7th) OP code: Operation code

The data in the "OP code" should be converted to ASCII characters.

ex) Byte data 3Ah must be converted to ASCII characters '3' and 'A' (33h and 41h).

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

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

8th-9th) Reserved

Always specify '0'-'0' (30h, 30h).

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

This return value from the monitor is converted to ASCII characters.

ex) 0', '1', '2', '3' represent 0123h (291).

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

This return value from the monitor is converted to ASCII characters.

ex) 0', '1', '2', '3' represent 0123h (291).

18th) ETX: End of Message

Specify the ASCII code 'ETX' (03h).

4.2.5. Set VCP command

This Message is sent when the controller changes the monitor settings.

Notes : For each "OP code page" and "OP code", please refer to "6.VCP command".

4.2.5.1. Format and detail of Set VCP command

| Message | | | | | | | |
|---------|--------------|----|---------|----|-----------|-----|------|
| STX | OP Code Page | | OP Code | | Set value | | ETX |
| | Hi | Lo | Hi | Lo | MSB | ... | |
| 1st | 2nd-3rd | | 4th-5th | | 6th-9th | | 10th |

1st) STX : Start of Message

Specify the ASCII code 'STC' (02h).

2nd-3rd) OP code page: Page of operation code

The data in the "OP code page" should be converted to ASCII characters.

ex) Byte data 02h must be converted 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)

4th-5th) OP code: Operation code

The data in the "OP code" should be converted to ASCII characters.

ex) Byte data 3Ah must be converted to ASCII characters '3' and 'A' (33h and 41h).

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

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

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

This return value from the monitor is converted to ASCII characters.

ex) 0', '1', '2', '3' represent 0123h (291).

10th) ETX: End of Message

Specify the ASCII code 'ETX' (03h).

4.2.6. Set VCP command reply

The monitor will echo back this Message in response to the Set VCP command specified in the OP code page and OP code.

Notes : For each "OP code page" and "OP code", please refer to "6.VCP command".

4.2.6.1. Format and detail of Set VCP command reply.

| Message | | | | | | | | | | | | | | | |
|---------|---------|----|--------------|----|---------|----|----------|----|-----------|-----|-----|-------------------------|-----|-----|------|
| STX | Result | | OP Code Page | | OP Code | | Reserved | | 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 |

1st) STX : Start of Message

Specify the ASCII code 'STC' (02h).

2nd-3rd) Result code:

Returns the execution result.

00h: No error

01h: Unsupported operation on this monitor, or unsupported operation in its current state.

This result code from the monitor has been converted to ASCII characters.

ex) Byte data 01h is converted to ASCII characters '0' and '1' (30h and 31h).

4th-5th) OP code page: Page of operation code

The data in the "OP code page" should be converted to ASCII characters.

ex) Byte data 02h must be converted 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)

6th-7th) OP code: Operation code

The data in the "OP code" should be converted to ASCII characters.

ex) Byte data 3Ah must be converted to ASCII characters '3' and 'A' (33h and 41h).

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

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

8th-9th) Reserved

Always specify '0'-'0' (30h, 30h).

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

This return value from the monitor is converted to ASCII characters.

ex) 0', '1', '2', '3' represent 0123h (291).

14th-17th) Requested setting Value: Echo back the parameters for confirmation. (16bits)

This return value from the monitor is converted to ASCII characters.

ex) 0', '1', '2', '3' represent 0123h (291).

18th) ETX: End of Message

Specify the ASCII code 'ETX' (03h).

4.3. Check code



4.3.1. Check code format and calculation method

Check code is the Block Check Code (BCC) from Header to end of Message, excluding SOH. It is calculated by exclusive OR (XOR).

| | | | | | | | | | |
|-------------|------|------|------|------|------|------|------|------|------|
| | | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| SOH | D0 | | | | | | | | |
| Reserved | D1 | | | | | | | | |
| Destination | D2 | | | | | | | | |
| Source | D3 | | | | | | | | |
| Type | D4 | | | | | | | | |
| Length(H) | D5 | | | | | | | | |
| Length(L) | D6 | | | | | | | | |
| STX | D7 | | | | | | | | |
| Data | D8 | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| ETX | Dn | | | | | | | | |
| Check code | Dn+1 | P | P | P | P | P | P | P | P |

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

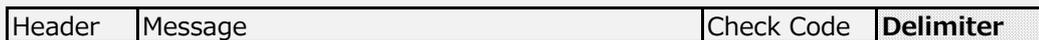
XOR : Exclusive OR

An example of Check code (BCC) calculation is shown below.

| Header | | | | | | | Message | | | | | | | | | | Check Code | Delimiter |
|--------|-------|------|-----|------|--------|-----|---------|-----|---------|-----|-----------|-----|-----|-----|-----|-----|------------|-----------|
| SOH | Resv. | Dest | Src | Type | Length | STX | OP code | | OP code | | Set Value | | | | ETX | | | |
| 01h | 30h | 41h | 30h | 45h | 30h | 41h | 02h | 30h | 30h | 31h | 30h | 30h | 30h | 36h | 34h | 03h | 77h | 0Dh |
| D0 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | D13 | D14 | D15 | D16 | D17 | D18 |

$$\begin{aligned} \text{Check code (BCC) D17} &= D_1 \text{ xor } D_2 \text{ xor } D_3 \text{ xor } \dots \text{ xor } D_{14} \text{ xor } D_{15} \text{ xor } D_{16} \\ &= 30\text{h} \text{ xor } 41\text{h} \text{ xor } 30\text{h} \text{ xor } 45\text{h} \text{ xor } 30\text{h} \text{ xor } 41\text{h} \text{ xor } 02\text{h} \text{ xor } 30\text{h} \text{ xor} \\ &\quad 30\text{h} \text{ xor } 31\text{h} \text{ xor } 30\text{h} \text{ xor } 30\text{h} \text{ xor } 30\text{h} \text{ xor } 36\text{h} \text{ xor } 34\text{h} \text{ xor } 03\text{h} \\ &= 77\text{h} \end{aligned}$$

4.4. Delimiter



Delimiter has no format or calculation as described so far. Specify 'CR'(0Dh) in ASCII for the Delimiter of the command.

5. CTL Command

5.1 CTL Command table

The CTL commands supported by this unit are as follows.

| CTL number | Explanation |
|-------------|------------------------------------|
| CTL-07 | Get Timing Report and Timing reply |
| CTL-0C | Save Current Settings |
| CTL-BE | NULL Message |
| CTL-01D6 | Power status read |
| CTL-C203-D6 | Power control |
| CTL-C216 | Serial No. Read |
| CTL-C217 | Model Name Read |
| CTL-C220 | MAC Address Read Request |

5.2 Detail of CTL command.

This chapter describes the details of the following Message parts for CTL commands.□

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

For Header/Check Code/ Delimiter, refer to "4.Command format".

5.2.1 CTL-07. Get Timing Report and Timing reply

This command is used to read the resolution information of the currently displayed image.

[Controller → Monitor]

| Message | | | |
|---------|--------------|-----|-----|
| STX | Command Code | | ETX |
| | '0' | '7' | |
| 02h | 30h | 37h | 03h |
| 1st | 2nd-3rd | | 4th |

ASCII
HEX

1st) STX : Start Message
Specify the ASCII code 'STX' (02h).

2nd-3rd) Command Code: '0'-'7' (30h, 37h)

4th) ETX: End of Message
Specify the ASCII code 'ETX' (03h).

[Monitor→Controller(ACK)]

| Message | | | | | | | | | | | | | |
|---------|--------------|-----|----------|-----|---------|-----|-----|-----|-----------|-----|-----|-----|------|
| STX | Command Code | | Reserved | | H Freq. | | | | V Freq. | | | | ETX |
| | '4' | 'E' | '0' | '0' | MSB | | | LSB | MSB | | | LSB | |
| 02h | 34h | 45h | 30h | 30h | xxh | xxh | xxh | xxh | xxh | xxh | xxh | xxh | 03h |
| 1st | 2nd-3rd | | 4th-5th | | 6th-9th | | | | 10th-13th | | | | 14th |

1st) STX : Start Message
Responds with the ASCII code 'STX' (02h).

2nd-3rd) Command Code: '4'-'E' (34h, 45h)

4th-5th) Reserved: '0'-'0' (30h, 30h)

6th-9th) H Freq: Horizontal sync frequency (0.01kHz unit)
ex) If "H Freq" is '1'-'2'-'A'-'9' (31h, 32h, 41h, 39h), it means 47.77kHz.

10th-13th) V Freq: Vertical sync frequency (0.01Hz unit)
ex) If "V Freq" is '1'-'7'-'6'-'F' (31h, 37h, 36h, 46h), it means 59.99kHz.

14th) ETX: End of Message
Responds with the ASCII code 'ETX' (03h).

5.2.2 CTL-0C. Save Current Settings

This command is used to save adjusted values.
When the monitor receives this command, save the current settings in non-volatile memory such as EEPROM.

【Controller → Monitor】

| Message | | | |
|---------|--------------|-----|-----|
| STX | Command Code | | ETX |
| | '0' | 'C' | |
| 02h | 30h | 43h | 03h |
| 1st | 2nd-3rd | | 4th |

ASCII
HEX

1st) STX : Start Message
Specify the ASCII code 'STX' (02h).

2nd-3rd) Command Code: '0'-'C' (30h, 43h)

4th) ETX: End of Message
Specify the ASCII code 'ETX' (03h).

【Monitor→Controller(ACK)】

| Message | | | | | |
|---------|--------------|-----|-----|-----|-----|
| STX | Command Code | | | | ETX |
| | '0' | '0' | '0' | 'C' | |
| 02h | 30h | 30h | 30h | 43h | 03h |
| 1st | 2nd-5th | | | | 6th |

ASCII
HEX

1st) STX : Start Message
Responds with the ASCII code 'STX' (02h).

2nd-5th) Command Code: '0'-'0'-'0'-'C' (30h, 30h, 30h, 43h)

6th) ETX: End of Message
Responds with the ASCII code 'ETX' (03h).

5.2.3 CTL-BE. NULL Message

The monitor notifies a NULL message to the controller under the following conditions.

- When an unsupported CTL command is received.
- When the CTL command is received while the monitor side is in the non-executable state.

Notes : refer to "8.Notes - 8.1 Regarding error reply." too.

【Monitor→Controller(ACK)】

| Message | | | |
|---------|--------------|-----|-----|
| STX | Command Code | | ETX |
| | 'B' | 'E' | |
| 02h | 42h | 45h | 03h |
| 1st | 2nd-3rd | | 4th |

ASCII
HEX

1st) STX : Start Message

Responds with the ASCII code 'STX' (02h).

2nd-3rd) Command Code: 'B'-'E' (42h, 45h)

4th) ETX: End of Message

Responds with the ASCII code 'ETX' (03h).

5.2.4 CTL-01D6. Power status read

This command is used to read the power status of the monitor.

【Controller → Monitor】

| Message | | | | | |
|---------|--------------|-----|-----|-----|-----|
| STX | Command Code | | | | ETX |
| | '0' | '1' | 'D' | '6' | |
| 02h | 30h | 31h | 44h | 36h | 03h |
| 1st | 2nd-5th | | | | 6th |

ASCII
HEX

1st) STX : Start Message

Specify the ASCII code 'STX' (02h).

2nd-5th) Command Code: '0'-'1'-'D'-'6' (30h, 31h, 44h, 36h)

6th) ETX: End of Message

Specify the ASCII code 'ETX' (03h).

[Monitor→Controller(ACK)]

| Message | | | | | | | | | | | | | |
|---------|----------|-----|-------------|-----|--------------|-----|-----|-----|-----------|-----|-----|-----|--------------|
| STX | Reserved | | Result Code | | Command Code | | | | Max | | | | |
| | '0' | '2' | 'x' | 'x' | 'D' | '6' | '0' | '0' | '0' | '0' | '0' | '4' | |
| 02h | 30h | 32h | xxh | xxh | 44h | 36h | 30h | 30h | 30h | 30h | 30h | 34h | ASCII HEX |
| 1st | 2nd-3rd | | 4th-5th | | 6th-9th | | | | 10th-13th | | | | |

| Message | | | | | |
|--------------|-----|-----|-----|------|--------------|
| Power status | | | | ETX | |
| 'x' | 'x' | 'x' | 'x' | 03h | ASCII HEX |
| xxh | xxh | xxh | xxh | 18th | |
| 14th-17th | | | | 18th | |

1st) STX : Start Message

Responds with the ASCII code 'STX' (02h).

2nd-3rd) Reserved

Responds with ASCII code '0'-'2' (30h, 32h).

4th-5th) Result Code

'0'-'0' (30h, 30h) : No error

'0'-'1' (30h, 31h) : Error

6th-9th) Command Code: 'D'-'6'-'0'-'0' (44h, 36h, 30h, 30h)

10th-13th) Power status Max value

Responds with ASCII code '0'-'0'-'0'-'4' (30h, 30h, 30h, 34h).

14th-17th) Current Power status

0'-'0'-'0'-'1' (30h, 30h, 30h, 31h) : Power on

0'-'0'-'0'-'2' (30h, 30h, 30h, 32h) : Power save

0'-'0'-'0'-'3' (30h, 30h, 30h, 33h) : No use(Reserved)

0'-'0'-'0'-'4' (30h, 30h, 30h, 34h) : Power off

18th) ETX: End of Message

Responds with the ASCII code 'ETX' (03h).

5.2.5 CTL-C203-D6. Power control

This command requests control of the monitor power.

【Controller → Monitor】

| Message | | | | | | | | | | | | |
|---------|--------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|------|--------------|
| STX | Command Code | | | | | | Power status | | | | ETX | |
| | 'C' | '2' | '0' | '3' | 'D' | '6' | 'x' | 'x' | 'x' | 'x' | | |
| 02h | 43h | 32h | 30h | 33h | 44h | 36h | xxh | xxh | xxh | xxh | 03h | ASCII HEX |
| 1st | 2nd-7th | | | | | | 8th-11th | | | | 12th | |

1st) STX : Start Message

Specify the ASCII code 'STX' (02h).

2nd-7th) Command Code: 'C'-'2'-'0'-'3'-'D'-'6' (43h, 32h, 30h, 33h, 44h, 36h)

8th-11th) Power status

0'-'0'-'0'-'1' (30h, 30h, 30h, 31h) : Power on

0'-'0'-'0'-'4' (30h, 30h, 30h, 34h) : Power off

12th) ETX: End of Message

Specify the ASCII code 'ETX' (03h).

【Monitor→Controller(ACK)】

| Message | | | | | | | | | | | | | |
|---------|-------------|-----|--------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|------|
| STX | Result Code | | Command Code | | | | | | Power status | | | | ETX |
| | 'x' | 'x' | 'C' | '2' | '0' | '3' | 'D' | '6' | 'x' | 'x' | 'x' | 'x' | |
| 02h | xxh | xxh | 43h | 32h | 30h | 33h | 44h | 36h | xxh | xxh | xxh | xxh | 03h |
| 1st | 2nd-3rd | | 4th-9th | | | | | | 10th-13th | | | | 14th |

1st) STX : Start Message

Responds with the ASCII code 'STX' (02h).

2nd-3rd) Result Code

'0'-'0' (30h, 30h) : No error

'0'-'1' (30h, 31h) : Error

4th-9th) Command Code: 'C'-'2'-'0'-'3'-'D'-'6' (43h, 32h, 30h, 33h, 44h, 36h)

10th-13th) Power status

Returns the same value as the Power status of the received command.

0'-'0'-'0'-'1' (30h, 30h, 30h, 31h) : Power on

0'-'0'-'0'-'4' (30h, 30h, 30h, 34h) : Power off

14th) ETX: End of Message

Responds with the ASCII code 'ETX' (03h).

5.2.6 CTL-C216. Serial No. Read

This command is used to read the serial number of the monitor.

[Controller → Monitor]

| Message | | | | | |
|---------|--------------|-----|-----|-----|-----|
| STX | Command Code | | | | ETX |
| | 'C' | '2' | '1' | '6' | |
| 02h | 43h | 32h | 31h | 36h | 03h |
| 1st | 2nd-5th | | | | 6th |

ASCII
HEX

1st) STX : Start Message
Specify the ASCII code 'STX' (02h).

2nd-5th) Command Code: 'C'-'2'-'1'-'6' (43h, 32h, 31h, 36h)

6th) ETX: End of Message
Specify the ASCII code 'ETX' (03h).

[Monitor→Controller(ACK)]

| Message | | | | | | |
|---------|--------------|-----|-----|-----|-----------------------|----------|
| STX | Command Code | | | | Serial Number strings | ETX |
| | 'C' | '3' | '1' | '6' | | |
| 02h | 43h | 33h | 31h | 36h | xxh - xxh | 03h |
| 1st | 2nd-5th | | | | 6th-xxth | (xx+1)th |

ASCII
HEX

1st) STX : Start Message
Responds with the ASCII code 'STX' (02h).

2nd-5th) Command Code: 'C'-'3'-'1'-'6' (43h, 33h, 31h, 36h)

6th-xxth) Serial Number Strings

Returns the serial number of the monitor according to the following conversion rules.

ex) Case of Serial Number : "012345"

"012345" = 33h, 30h, 33h, 31h, 33h, 32h, 33h, 33h, 33h, 34h, 33h, 35h

| | | |
|-----------------------|---|-----|
| = Data(0) : '3' (33h) | } | '0' |
| Data(1) : '0' (30h) | | |
| Data(2) : '3' (33h) | } | '1' |
| Data(3) : '1' (31h) | | |
| Data(4) : '3' (33h) | } | '2' |
| Data(5) : '2' (32h) | | |
| Data(6) : '3' (33h) | } | '3' |
| Data(7) : '3' (33h) | | |
| Data(8) : '3' (33h) | } | '4' |
| Data(9) : '4' (34h) | | |
| Data(10) : '3' (33h) | } | '5' |
| Data(11) : '5' (35h) | | |

* The following shows an example from STX to ETX.

STX-'C'-'3'-'1'-'6'-'3'-'0'-'3'-'1'-'3'-'2'-'3'-'3'-'3'-'4'-'3'-'5'-ETX

xx+1th) ETX: End of Message
Responds with the ASCII code 'ETX' (03h).

5.2.7 CTL-C217. Model Name Read

This command is used to read the model name of the monitor.

[Controller → Monitor]

| Message | | | | | | |
|---------|--------------|-----|-----|-----|-----|--------------|
| STX | Command Code | | | | ETX | |
| | 'C' | '2' | '1' | '7' | | |
| 02h | 43h | 32h | 31h | 37h | 03h | ASCII HEX |
| 1st | 2nd-5th | | | | 6th | |

1st) STX : Start Message
Specify the ASCII code 'STX' (02h).

2nd-5th) Command Code: 'C'-'2'-'1'-'7' (43h, 32h, 31h, 37h)

6th) ETX: End of Message
Specify the ASCII code 'ETX' (03h).

[Monitor→Controller(ACK)]

| Message | | | | | | | |
|---------|--------------|-----|-----|-----|--------------------------------|----------|--------------|
| STX | Command Code | | | | Model Name strings | ETX | |
| | 'C' | '3' | '1' | '7' | | | |
| 02h | 43h | 33h | 31h | 37h | Data(0) - Data(N) xxh - xxh | 03h | ASCII HEX |
| 1st | 2nd-5th | | | | 6th-xxth | (xx+1)th | |

1st) STX : Start Message
Responds with the ASCII code 'STX' (02h).

2nd-5th) Command Code: 'C'-'3'-'1'-'7' (43h, 33h, 31h, 37h)

6th-xxth) Model Name strings

Returns the model name of the monitor according to the following conversion rules.

ex) Case of Model Name : "PN-E329"

"PN-E329" = 35h, 30h, 34h, 45h, 32h, 44h, 34h, 35h, 33h, 33h, 33h, 32h, 33h, 39h

| | | |
|-----------------------|---|-----|
| = Data(0) : '5' (35h) | } | 'P' |
| Data(1) : '0' (30h) | | |
| Data(2) : '4' (34h) | } | 'N' |
| Data(3) : 'E' (45h) | | |
| Data(4) : '2' (32h) | } | - |
| Data(5) : 'D' (44h) | | |
| Data(6) : '4' (34h) | } | 'E' |
| Data(7) : '5' (35h) | | |
| Data(8) : '3' (33h) | } | '3' |
| Data(9) : '3' (33h) | | |
| Data(10) : '3' (33h) | } | '2' |
| Data(11) : '2' (32h) | | |
| Data(12) : '3' (33h) | } | '9' |
| Data(13) : '9' (39h) | | |

* The following shows an example from STX to ETX.

STX-'C'-'3'-'1'-'7'-'5'-'0'-'4'-'E'-'2'-'D'-'4'-'5'-'3'-'3'-'3'-'2'-'3'-'9'-ETX

xx+1th) ETX: End of Message
Responds with the ASCII code 'ETX' (03h).

5.2.8 CTL-C220. MAC Address Read Request

This command is used to read the MAC address.

[Controller → Monitor]

| Message | | | | | | | |
|---------|--------------|-----|-----|---------|----------|-----|-----|
| STX | Command Code | | | | Reserved | | ETX |
| | 'C' | '2' | '2' | '0' | '0' | '0' | |
| 02h | 43h | 32h | 32h | 30h | 30h | 30h | 03h |
| 1st | 2nd-5th | | | 6th-7th | | 8th | |

ASCII
HEX

1st) STX : Start Message
Specify the ASCII code 'STX' (02h).

2nd-5th) Command Code: 'C'-'2'-'2'-'0' (43h, 32h, 32h, 30h)

6th-7th) Reserved: '0'-'0' (30h, 30h)

8th) ETX: End of Message
Specify the ASCII code 'ETX' (03h).

[Monitor→Controller(ACK)]

| Message | | | | | | | | |
|---------|--------------|-----|-----|---------|---------------|----------|---|----------|
| STX | Command Code | | | | Select Device | | MAC Address strings Data(0) - Data(11) | ETX |
| | 'C' | '3' | '2' | '0' | '0' | '0' | | |
| 02h | 43h | 33h | 32h | 30h | 30h | 30h | xxh - xxh | 03h |
| 1st | 2nd-5th | | | 6th-7th | | 8th-xxth | | (xx+1)th |

ASCII
HEX

1st) STX : Start Message
Responds with the ASCII code 'STX' (02h).

2nd-5th) Command Code: 'C'-'3'-'2'-'0' (43h, 33h, 32h, 30h)

6th-7th) Select Device
This is the area used if the monitor is a model with multiple MAC Addresses.
If there is only one MAC Address, specify the ASCII code '0'-'0' (30h, 30h).

8th-xxth) MAC Address strings
Returns the MAC Address of the monitor according to the following conversion rules.
ex) Case of MAC Address : "11-22-33-44-55-66"

Data(0) : '1' (31h)
Data(1) : '1' (31h)
Data(2) : '2' (32h)
Data(3) : '2' (32h)
Data(4) : '3' (33h)
Data(5) : '3' (33h)
Data(6) : '4' (34h)
Data(7) : '4' (34h)
Data(8) : '5' (35h)
Data(9) : '5' (35h)
Data(10) : '6' (36h)
Data(11) : '6' (36h)

Maximum 12 bytes

*The following shows an example from STX to ETX.

STX-'C'-'3'-'2'-'0'-'1'-'1'-'2'-'2'-'3'-'3'-'4'-'4'-'5'-'5'-'6'-'6'-ETX

xx+1th) ETX: End of Message
Responds with the ASCII code 'ETX' (03h).

6. VCP Command

6.1 VCP Command table

The VCP commands supported by this unit are as follows.

| OP Code Page | OP Code | Parameter | Explanation |
|--------------|---------|---|--|
| 00h | 60h | 0011h : HDMI1 0012h : HDMI2 0089h : USB-C 0087h : Media Player | Input Source Select |
| 00h | 62h | 0000h - 0064h (Small) - (Big) | Audio volume |
| 00h | 8Dh | 0000h : Un mute (Set only) 0001h : Mute 0002h : Un mute | Audio mute |
| 02h | 3Eh | 0001h (MonitorID is 1(Fixed)) (1) | Monitor ID *Read only |
| 02h | 50h | 0000h - FFFFh | Input H Resolution *Read only *0780h(30h 37h 38h 30h) = 1920 |
| 02h | 51h | 0000h - FFFFh | Input V Resolution *Read only *0438h(30h 34h 33h 38h) = 1080 |
| 02h | 70h | 0001h : Normal 0002h : Full 0003h : Wide 0007h : Dot by Dot(1:1) | Aspect |

7. OSD Menu table

(Common menu)

| OSD itmes | Message Type | VCP | | CTL |
|-------------------|--------------|--------------|---------|------------|
| | | OP Code Page | OP Code | CTL number |
| PICTURE | | | | |
| PICTURE MODE | | | | |
| BACKLIGHT | | | | |
| VIDEO BLACK LEVEL | | | | |
| CONTRAST | | | | |
| COLOR TEMPERATURE | | | | |
| GAMMA | | | | |
| COLOR | | | | |
| TINT | | | | |
| SHARPNESS | | | | |
| ADVANCED | | | | |
| ASPECT | VCP | 02h | 70h | |
| NOISE REDUCTION | | | | |
| VIDEO RANGE | | | | |
| RESET | | | | |
| AUDIO | | | | |
| TREBLE | | | | |
| BASS | | | | |
| BALANCE | | | | |
| INTERNAL SPEAKER | | | | |
| LINE OUT | | | | |
| RESET | | | | |

(Administrator setting)

| OSD itmes | Message Type | VCP | | CTL |
|---------------------|--------------|--------------|---------|------------|
| | | OP Code Page | OP Code | CTL number |
| SYSTEM | | | | |
| LANGUAGE | | | | |
| DATE & TIME | | | | |
| SCHEDULE | | | | |
| CEC | | | | |
| AUTO INPUT CHANGE | | | | |
| HDMI MODE | | | | |
| CONTROL SETTINGS | | | | |
| POWER SAVE SETTINGS | | | | |
| AUTO PLAY | | | | |

| | | | | |
|-------------------------|-----|-----|-----|------|
| KEY LOCK SETTINGS | | | | |
| IR LOCK SETTINGS | | | | |
| MONITOR ID | VCP | 02h | 3Eh | |
| THERMAL SENSOR SETTINGS | | | | |
| OSD | | | | |
| 180°ROTATE | | | | |
| POWER INDICATOR | | | | |
| TILE MATRIX | | | | |
| SCREEN SAVER | | | | |
| MONITOR INFORMATION | | | | |
| INPUT | VCP | 00h | 60h | |
| ASPECT | VCP | 02h | 70h | |
| PICTURE MODE | | | | |
| BACKLIGHT | | | | |
| VOLUME | VCP | 00h | 62h | |
| MODEL | CTL | | | C217 |
| MAIN | | | | |
| LAN | | | | |
| S/N | CTL | | | C216 |
| SIGNAL | | | | |
| DATE & TIME | | | | |
| STATUS | | | | |
| CONTROL INTERFACE | | | | |
| IP SETTINGS | | | | |
| IP ADDRESS | | | | |
| SUBNET MASK | | | | |
| DEFAULT GATEWAY | | | | |
| MAC ADDRESS | CTL | | | C220 |
| UPDATE FIRMWARE | | | | |
| FACTORY RESET | | | | |

Notes : For details on each CTL command, refer to "5.CTL Command".
For details on each VCP command, refer to "6.VCP Command".

8. Notes

8.1 Command reception at power off and power save.

When the monitor is "power off" or "power save", the commands that can be received are limited to the following commands.

CTL Command

| CTL Number | Explanation |
|-------------|-------------------|
| CTL-01D6 | Power status read |
| CTL-C203-D6 | Power control |
| CTL-C216 | Serial No. Read |
| CTL-C217 | Model Name Read |

VCP Command

| OP Code Page | OP Code | Explanation |
|-----------------|---------|-------------|
| 02h | 3Eh | Monitor ID |

※In the case of RS-232C, received are limited to the following commands

CTL Command

| CTL Number | Explanation |
|-------------|-------------------|
| CTL-01D6 | Power status read |
| CTL-C203-D6 | Power control |

VCP Command

Not supported

8.2 Regarding error reply.

The monitor returns an error response according to the following divisions.

| | Divisions | VCP command reply | CTL Command reply |
|-------------------------|--|-------------------------------|-------------------------------|
| Command error | Undefined command | Result Code:01h (error) | Null Message (CTL-BE) |
| | Unsupported command | | |
| | The monitor side is in a non-executable state | | |
| Command parameter error | Specified by the controller Setting value is out of range | Result Code:00h (No error) | Result Code:00h (No error) |

Notes : If the controller sends a command to the monitor with settings out of range, the monitor does nothing and responds with "Result Code: 00h (no error)".

SHARP