SHARP

External Control

E series

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

Rev.1.03

Contents

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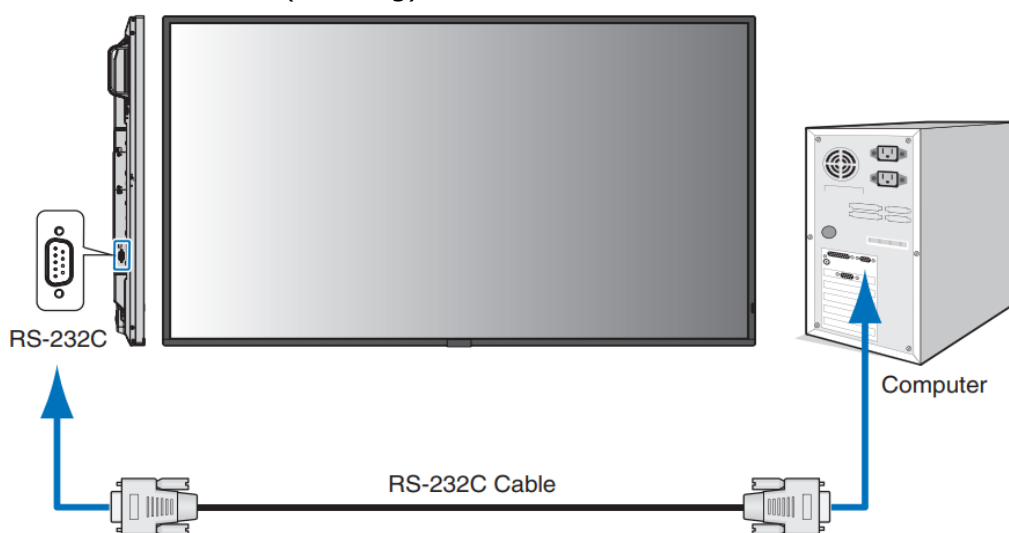
Note : See "RS-232C remote control" in the instruction manual.

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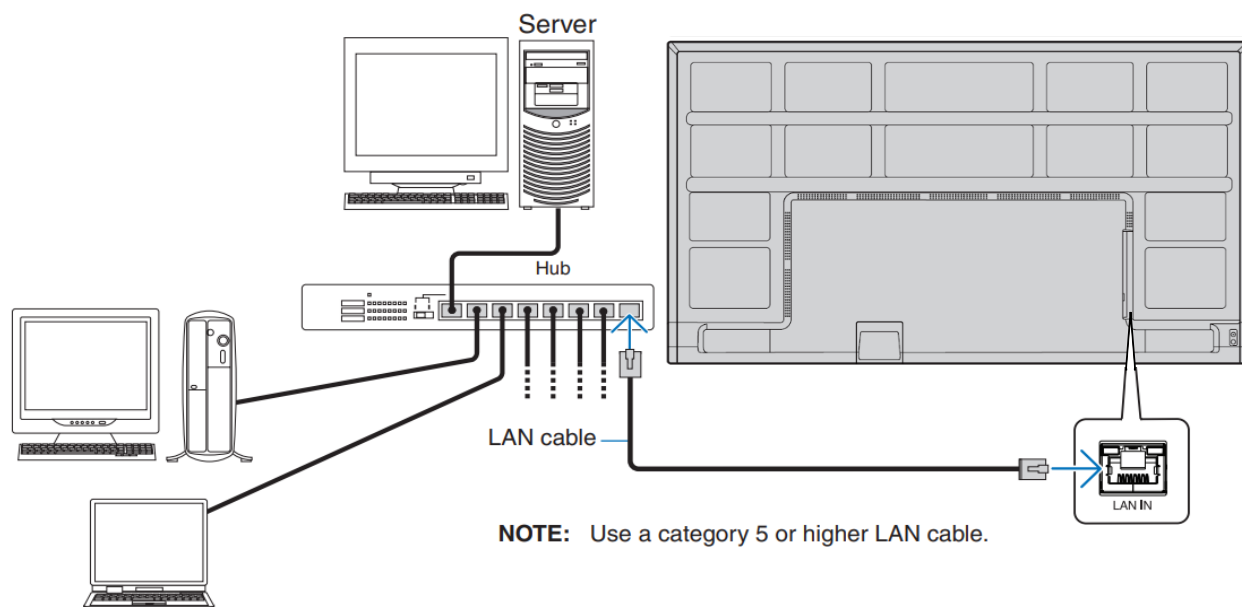
Note : See "LAN Control" in the Owner's Manual.

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	Monitor ID	Destination Address	Monitor ID	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	··· LSB	
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

Header	Message	**Check Code**	Delimiter

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	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

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

	Header							Message										Check	
								OP code											
SOH	Resv.	Dest	Src	Type	Length		STX	page		OP code		Set Value				ETX	Code	Delmiter
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

Check code (BCC) D17 = D1 xor D2 xor D3 xor ⋯ xor D14 xor D15 xor D16

= 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**

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】

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

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)】

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】

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

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)】

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

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)】

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

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】

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

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'	ASCII
02h	30h	32h	xxh	xxh	44h	36h	30h	30h	30h	30h	30h	34h	HEX
1st	2nd-3rd		4th-5th		6th-9th				10th-13th				

Message					
Power status				ETX	
'x'	'x'	'x'	'x'		ASCII
xxh	xxh	xxh	xxh	03h	HEX
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'		ASCII
02h	43h	32h	30h	33h	44h	36h	xxh	xxh	xxh	xxh	03h	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'	Data(0) - Data(N)		
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)　┐
　　　　　　 Data(1) : '0' (30h)　┘ '0'
　　　　　　 Data(2) : '3' (33h)　┐
　　　　　　 Data(3) : '1' (31h)　┘ '1'
　　　　　　 Data(4) : '3' (33h)　┐
　　　　　　 Data(5) : '2' (32h)　┘ '2'
　　　　　　 Data(6) : '3' (33h)　┐
　　　　　　 Data(7) : '3' (33h)　┘ '3'
　　　　　　 Data(8) : '3' (33h)　┐
　　　　　　 Data(9) : '4' (34h)　┘ '4'
　　　　　　 Data(10) : '3' (33h)　┐
　　　　　　 Data(11) : '5' (35h)　┘ '5'
　　　　 * 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】

STX	Command Code				ETX	
	'C'	'2'	'1'	'7'		ASCII
02h	43h	32h	31h	37h	03h	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)】

STX	Command Code				Model Name strings	ETX	
	'C'	'3'	'1'	'7'	Data(0) - Data(N)		ASCII
02h	43h	33h	31h	37h	xxh - xxh	03h	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】

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

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)】

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

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 CTL 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)".