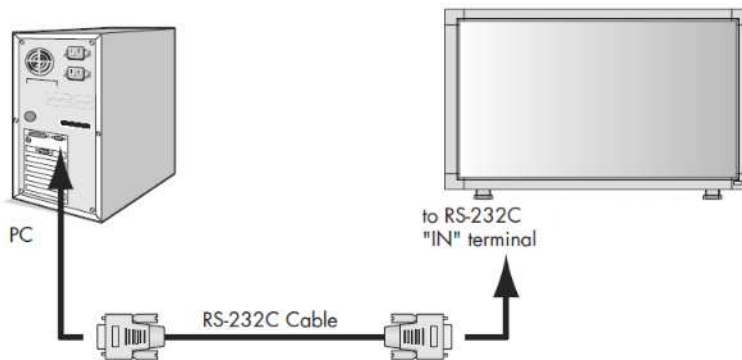## 1. Application

 This document defines the communications method for control of the LCD3215/LCD4215 when using an external controller.

2. Connectors and wiring

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

3. Communication Parameter

  (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

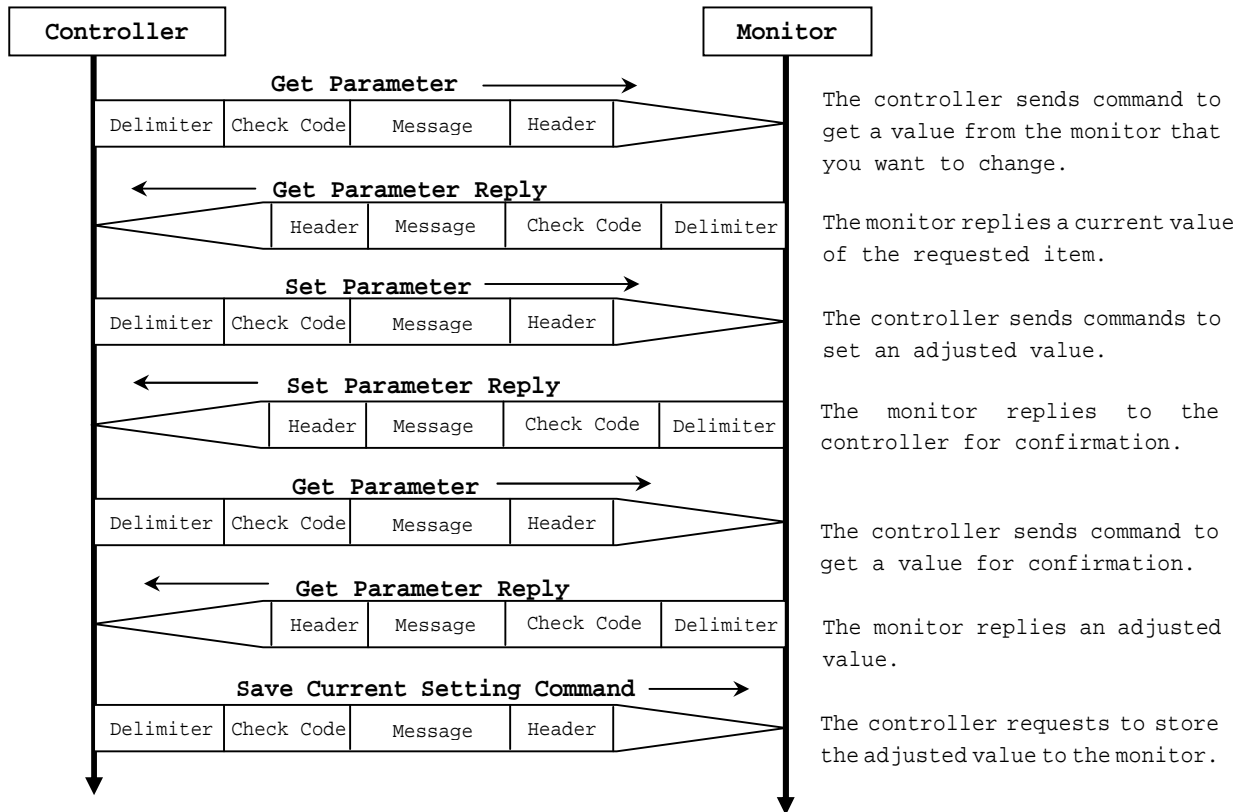### 3.1 Communication timing

  The controller should wait for a packet interval before next command is sent.
  The packet interval needs to be longer than 600msec for the LCD3215/LCD4215.

4. Communication Format

Header	Message	Check Code	Delimiter

The command packet consists of four parts, Header, Message, Check code and Delimiter.

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

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

The monitor replies a current value of the requested item.

The controller sends commands to set an adjusted value.

The monitor replies to the controller for confirmation.

The controller sends command to get a value for confirmation.

The monitor replies an adjusted value.

The controller requests to store the adjusted value to the monitor.

4.1 Header block format (fixed length)

Header	Message	Check code	Delimiter

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

1st byte) SOH: Start of Header
    ASCII SOH (01h)

2nd byte) Reserved: Reserved for future extensions.

    LCD3215/LCD4215 must be ASCII '0'(30h)

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

    Specify a commands receiver's address.

    LCD3215/LCD4215 must be ASCII 'A' (41h).

4thbyte) Source: Source equipment ID. (Sender)

Specify a sender address.

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

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 6 "Message 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 "Appendix A. Operation code table".

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

STX	OP code page		OP code		ETX
	Hi	Lo	Hi	Lo	

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

2 Get Parameter reply

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

in the "Get parameter message".

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

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

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

3 Set parameter

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

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

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

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

4 Set Parameter reply

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

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

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

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

5 Command

"Command message" format depends on each command.

Usually, this "command message" is used for some non-slider controls and some special operations, such as "Save current settings", "Get timing report", "power control", "Schedule", 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.

4.5 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	D_5								
STX	D_6								
Data	D_7								
|	|								
|	|								
ETX	D_n								
Check code	D_{n+1}	P	P	P	P	P	P	P	P

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

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}

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

$$= 30h \text{ xor } 41h \text{ xor } 30h \text{ xor } 45h \text{ xor } 30h \text{ xor } 41h$$

$$\text{xor } 02h \text{ xor } 30h \text{ xor } 30h \text{ xor } 31h \text{ xor } 30h \text{ xor } 30h$$

$$\text{xor } 30h \text{ xor } 36h \text{ xor } 34h \text{ xor } 03h$$

$$= 77h$$

4.6 Delimiter

Header	Message	Check code	**Delimiter**

Packet delimiter code; ASCII CR(0Dh).

5. Message type

5.1 Get current Parameter from a monitor.

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

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

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

A. Operation code table".

1^{st}byte) STX: Start of Message

  ASCII STX (02h)

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

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

  Refer to "Appendix A 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. (Appendix A)

4th-5^{th}bytes) OP code: Operation code

  Refer to "Appendix A 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.

6^{th}byte) ETX: End of Message

  ASCII ETX (03h)

5.2 "Get parameter" reply

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

LCD3215/LCD4215 replies with a current value and the status of the requested item (operation code).

 1^{st}byte) STX: Start of Message

  ASCII STX (02h)

2nd-3^{rd}bytes) Result code.

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

00h: No Error.

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

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

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

$4^{th}-5^{th}$bytes) OP code page: Operation code page.

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

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

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

Refer to the operation codes table.

$6^{th}-7^{th}$bytes) OP code: Operation code

These bytes indicate a replying item's OP code.

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

Refer to the operation code table.

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

$8^{th}-9^{th}$bytes) Type: Operation type code

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).

00h: Set parameter

01h: Momentary

Like the AutoSetup function which automatically changes the parameter.

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

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

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

$14^{th}-17^{th}$bytes) Current Value: (16bits)

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

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

18^{th}byte) ETX: End of Message

ASCII ETX (03h)

5.3 Set parameter

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

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

The controller requests a monitor to change value.

1^{st}byte) STX: Start of Message

ASCII STX (02h)

$2^{nd}-3^{rd}$bytes) OP code page: Operation code page

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

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

Refer to the Operation code table.

4th-5thbytes) OP code: Operation code

This OP code data must be encoded to ASCII characters.

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)

10thbyte) ETX: End of Message

ASCII ETX (03h)

5.4 "Set parameter" reply

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

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

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 Commands

"Command message format" depends on each command. Some commands are shown with usage. Refer to section 7 to 10.

5.5.1 Save Current Settings.

The controller requests for the monitor to store the adjusted value.

STX	Command code		ETX
	'0'	'C'	

➢ Send "OC"(30h, 43h) as Save current settings command.

➢ Complete "Save Current setting" command packet as follows;

ASCII: 01h-30h-41h-30h-41h-30h-34h-02h-30h-43h-03h-CHK-0Dh

SOH-'0'-'A'-'0'-'A'-'0'-'4'-STX-'0'-'C'-ETX-CHK- CR

The monitor replies the packet for confirmation as follows;

SOH-'0'-'0'-'A'-'B'-'0'-'6'-STX-'0'-'0'-'0'-'C'-ETX-CHK- CR

5.5.2 Get Timing Report and Timing reply.

The controller requests the monitor to report the displayed image timing.

STX	Command code		ETX
	'0'	'7'	

➢ Send "07"(30h, 37h) as Get Timing Report command.

➢ Complete "Get Timing Report" command packet as follows;

ASCII: 01h-30h-41h-30h-41h-30h-34h-02h-30h-37h-03h-CHK-0Dh

SOH-'0'-'A'-'0'-'A'-'0'-'4'-STX-'0'-'7'-ETX-CHK- CR

The monitor replies status as the following format;

STX	Command		SS		H Freq.				V Freq.				ETX
	'4'	'E'	Hi	Lo	MSB			LSB	MSB			LSB	

➢ SS: Timing status byte

Bit 7 = 1: Sync Frequency is out of range.
Bit 6 = 1: Unstable count

```
         Bit 5-2     Reserved (Don't care)
         Bit 1       1:Positive Horizontal sync polarity.
                     0:Negative Horizontal sync polarity.
         Bit 0       1:Positive Vertical sync polarity.
                     0:Negative Vertical sync polarity.
```

➢   H Freq: Horizontal Frequency in unit 0.01kHz

➢   V Freq: Vertical Frequency in unit 0.01Hz

       Ex.) When H Freq is '1''2''A''9' (31h, 32h, 41h, 39h), it means 47.77kHz.

5.5.3 NULL Message

STX	Command code		ETX
	'B'	'E'	

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

➢   A timeout error has occurred. (The default timeout is 10sec.)

➢   The monitor receives an unsupported message type.

➢   The monitor detects a packet BCC (Block Check Code) error.

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

       ready or not expected)

➢   Complete "NULL Message" command packet as follows;

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

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

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 "Brightness" 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'-'A'-'0'-'C'-'0'-'6'	STX-'0'-'0'-'1'-'0'-ETX	BCC	CR

```
Header
  SOH (01h): Start Of Header
  '0' (30h): Reserved
  'A' (41h): Monitor ID
          LCD3215/LCD4215 must be ASCII 'A' (41h).
  '0' (30h): Message sender is the controller
  'C' (43h): Message 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
  '1'-'0' (31h, 30h): Operation code is 10h (in the OP code page 0)
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
       Refer to the section 4.5 "Check code" for a BCC calculation.
```

Delimiter
  CR (0Dh): End of packet

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

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'D'-'1'-'2'	STX-'0'-'0'-'0'-'0'-'1'-'0'-'0'-'0' -'0'-'0'-'6'-'4'-'0'-'0'-'3'-'2'-ETX	BCC	CR

Header
  SOH (01h): Start Of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller
  'A' (41h): Monitor ID
            LCD3215/LCD4215 must be ASCII 'A' (41h).
  '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
  '1'-'0' (31h, 30h): Operation code is 10h (in the page 0)
  '0'-'0' (30h, 30h): This operation is "Set parameter" type
  '0'-'0'-'6'-'4' (30h, 30h, 36h, 34h): Brightness max value is 100(0064h)
  '0'-'0'-'3'-'2' (30h, 30h, 33h, 32h): Current Brightness setting is 50(0032h) as 50%
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

Step 3. The controller request the monitor to change the Brightness setting

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'E'-'0'-'A'	STX-'0'-'0'-'1'-'0'-'0'-'0'-'5'-'0'-ETX	BCC	CR

  Header
  SOH (01h): Start Of Header
  '0' (30h): Reserved
  'A' (41h): Monitor ID
            LCD3215/LCD4215 must be ASCII 'A' (41h).
  '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
  '1'-'0' (31h, 30h): Operation code is 10h (in the page 0)
  '0'-'0'-'5'-'0' (30h, 30h, 35h, 30h): Set Brightness setting 80(0050h) as 80%
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.5 "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'-'A'-'F'-'1'-'2'	STX-'0'-'0'-'0'-'0'-'1'-'0'—'0'-'0'-'0' -'0'-'6'-'4'-'0'-'0'-'5'-'0'-ETX	BCC	CR

```
    Header
     SOH (01h): Start Of Header
     '0' (30h): Reserved
     '0' (30h): Message receiver is the controller
     'A' (41h): Monitor ID
               LCD3215/LCD4215 must be ASCII 'A' (41h).
     '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'-'6'-'4' (30h, 30h, 36h, 34h): Brightness max value is 100(0064h)
     '0'-'0'-'5'-'0' (30h, 30h, 35h, 30h): Received a Brightness setting was 80(0050h) as 80%
     ETX (03h): End of Message

   Check code
     BCC: Block Check Code
          Refer to the section 4.5 "Check code" for a BCC calculation.

   Delimiter
     CR (0Dh): End of packet

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

  Step 5. Request the monitor to store the Brightness setting. (Save Current Settings Command)
```

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

```
    Header
     SOH (01h): Start Of Header
     '0' (30h): Reserved
     'A' (41h): Monitor ID
             LCD3215/LCD4215 must be ASCII 'A' (41h).
     '0' (30h): Message sender is the controller
     'A' (41h): Message type is "Command"
     '0'-'4' (30h, 34h): Message length is 4 bytes

   Message
     STX (02h): Start of Message
     '0'-'C' (30h, 43h): Command code is 0Ch as "Save current settings"
     ETX (03h): End of Message

   Check code
     BCC: Block Check Code
          Refer to the section 4.5 "Check code" for a BCC calculation.

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

6.2. How to read the measurement value of the built-in temperature sensors.

```
LCD3215/LCD4215 has two built-in temperature sensors.
The controller can monitor inside temperatures by using those sensors through RS-232C.

The following shows the procedure for reading the temperatures from the sensors.


Step 1. Select a temperature sensor which you want to read.
```

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'E'-'0'-'A'	STX-'0'-'2'-'7'-'8'-'0'-'0'-'0'-'1'-ETX	BCC	CR

```
   Header
   SOH (01h): Start of Header
   '0' (30h): Reserved
   'A' (41h): Monitor ID
           LCD3215/LCD4215 must be ASCII 'A' (41h).
   '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'-'2' (30h, 32h): Operation code page number is 0
   '7'-'8' (37h, 38h): Operation code is 78h (on page 2)
   '0'-'0'-'0'-'1' (30h, 30h, 30h, 31h): Select the temperature sensor #1 (01h).
           00h: No meaning
           01h: Sensor #1
           02h: Sensor #2
   ETX (03h): End of Message

 Check code
   BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.

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

Step 2. The monitor replies for confirmation.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'F'-'1'-'2'	STX-'0'-'0'-'0'-'2'-'7'-'8'-'0'-'0'-'0'-'0' -'0'-'2'-'0'-'0'-'0'-'1'-ETX	BCC	CR

```
   Header
   SOH (01h): Start of Header
   '0' (30h): Reserved
   '0' (30h): Message receiver is the controller
   'A' (41h): Monitor ID
             LCD3215/LCD4215 must be ASCII 'A' (41h).
   'F' (46h): Message Type is "Set parameter reply"
   '1'-'2' (30h, 32h): Message length is 18 bytes

 Message
   STX (02h): Start of Message
   '0'-'0' (30h, 30h): Result code.  No error
   '0'-'2' (30h, 32h): Operation code page number is 0
   '7'-'8' (37h, 38h): Operation code is 78h (in the page 2)
   '0'-'0' (30h, 30h): This operation is "Set parameter" type
   '0'-'0'-'0'-'2' (30h, 30h, 30h, 32h): Number of temperature sensors 2 (0002h).
   '0'-'0'-'0'-'1' (30h, 30h, 30h, 31h): temperature sensor is #1.
   ETX (03h): End of Message

 Check code
   BCC: Block Check Code
      Refer to the section 4.5 "Check code" for a BCC calculation.

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

Step 3. The controller requests the monitor to send the temperature from the selected sensor.

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'C'-'0'-'6'	STX-'0'-'2'-'7'-'9'-ETX	BCC	CR

Header
 SOH (01h): Start of Header
 '0' (30h): Reserved
 'A' (41h): Monitor ID
          LCD3215/LCD4215 must be ASCII 'A' (41h).
 '0' (30h): Message sender is the controller
 'C' (43h): Message Type is "Get parameter "
 '0'-'6' (30h, 36h): Message length is 6 bytes

Message
 STX (02h): Start of Message
 '0'-'2' (30h, 32h): Operation code page number is 02h.
 '7'-'9' (37h, 39h): Operation code is 79h (in the page 2)
 ETX (03h): End of Message

Check code
 BCC: Block Check Code
      Refer to the section 4.5 "Check code" for a BCC calculation.

Delimiter
 CR (0Dh): End of packet

Step 4. The monitor replies a temperature of selected sensor.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'D'-'1'-'2'	STX-'0'-'0'-'0'-'2'-'7'-'9'-'0'-'0'-'0'-'0'-'F'-'F'-'0'-'0'-'3'-'2'-ETX	BCC	CR

Header
 SOH (01h): Start of Header
 '0' (30h): Reserved
 '0' (30h): Message receiver is the controller
 'A' (41h): Monitor ID
          LCD3215/LCD4215 must be ASCII 'A' (41h).
 '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'-'2' (30h, 32h): Operation code page number is 2
 '7'-'9' (37h, 39h): Operation code is 79h (in the page 2)
 '0'-'0' (30h, 30h): This operation is "Set parameter" type
 '0'-'0'-'F'-'F' (30h, 30h, 46h, 46h): Maximum value.
 '0'-'0'-'3'-'2' (30h, 30h, 33h, 32h): The temperature is 25 degrees Celsius.

                    Readout value is 2's complement.

Temperature[Celsius]	Readout value	
	Binary	Hexadecimal
+125.0	0000 0000 1111 1010	00FAh
+ 25.0	0000 0000 0011 0010	0032h
+ 0.5	0000 0000 0000 0001	0001h
0	0000 0000 0000 0000	0000h
- 0.5	1111 1111 1111 1111	FFFFh
- 25.0	1111 1111 1100 1110	FFCEh
- 55.0	1111 1111 1001 0010	FF92h

 ETX (03h): End of Message

Check code
 BCC: Block Check Code
      Refer to the section 4.5 "Check code" for a BCC calculation.

Delimiter
 CR (0Dh): End of packet

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'-'A'-'0'-'A'-'0'-'6'	STX-'0'-'1'-'D'-'6'-ETX	BCC	CR

```
    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    'A' (41h): Monitor ID
               LCD3215/LCD4215 must be ASCII 'A' (41h).
    '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 4.5 "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'-'A'-'B'-'1'-'2'	STX-'0'-'2'-'0'-'0'-'D'-'6'-'0'-'0'-'0'-'0'-'0'-'4'-'0'-'0'-'0'-'1'-ETX	BCC	CR

```
    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    '0' (30h): Message receiver is the controller
    'A' (41h): Monitor ID
               LCD3215/LCD4215 must be ASCII 'A' (41h).
    '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
                                 <Status>
                                   0001: ON
                                   0002: Stand-by (power save)
                                   0003: Suspend (power save)
                                   0004: OFF (same as IR power off)
    ETX (03h): End of Message

   Check code
    BCC: Block Check Code
        Refer to the section 4.5 "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'-'A'-'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
  'A' (41h): Monitor ID
            LCD3215/LCD4215 must be ASCII 'A' (41h).
  '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
                                 0001: ON
                                 0002, 0003: Do not set.
                                 0004: OFF (same as the power off by IR)
  ETX (03h): End of Message


 Check code
  BCC: Block Check Code
       Refer to the section 4.5 "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'-'A'-'B'-'0'-'C'	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 sender is the controller
  'A' (41h): Monitor ID
            LCD3215/LCD4215 must be ASCII 'A' (41h).
  '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
                                 0001: ON
                                 0002, 0003: Do not set.
                                 0004: OFF (same as the power off by IR)
  ETX (03h): End of Message

 Check code
  BCC: Block Check Code
       Refer to the section 4.5 "Check code" for a BCC calculation.

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

8. Asset Data read and write

8.1 Asset Data Read Request and reply

This command is used in order to read Asset Data.

1) The controller requests the monitor to reply with Asset data.

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

```
   Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    '0' (30h): Message sender is the controller
    'A' (41h): Message type is "Command"
    '0'-'A' (30h, 41h): Message length is 10 bytes

  Message
    STX (02h): Start of Message
    'C'-'0'-'0'-'B'  (43h, 30h, 30, 42h): Asset read request command
    '0'-'0' (30h, 30h): Offset data from top of the Asset data.
     At first set 00h: Read data from the top of Asset data area.
     Secondly set 20h: Read data from the 32bytes offset point in the Asset data area.
    '2'-'0' (32h, 30h): Read out data length is 32bytes.
                      Maximum readout length is 32bytes at a time.
    ETX (03h): End of Message

  Check code
    BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.

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

2) The monitor replies Asset data to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'B'-N-N	STX-'C'-'1'-'0'-'B'- 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
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    'B' (42h): Message type is "Command reply"
    N-N: Message length
            Ex.) The byte data 20h is encoded to ASCII characters '2' and '0' (32h and 30h).
            Note.) This length is includes STX and ETX.

  Message
    STX (02h): Start of Message
    'C'-'1'-'0'-'B'  (43h, 31h, 30, 42h): Asset read reply command
    Data(0) – Data(N): Retuned Asset data.
    ETX (03h): End of Message

  Check code
    BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.

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

8.2 Asset Data write

This command is used in order to write Asset Data.

1) The controller requests the monitor to write Asset data.

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'A'-N-N	STX-'C'-'0'-'0'-'E'-'0'-'0'- Data(0)-Data(1)---Data(N)-ETX	BCC	CR

```
  Header
   SOH (01h): Start Of Header
   '0' (30h): Reserved
   'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
   '0' (30h): Message sender is the controller
   'A' (41h): Message type is "Command"
   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
   'C'-'0'-'0'-'E'  (43h, 30h, 30, 45h): Asset Data writes command
   '0'-'0': Offset address from top of Asset data.
      00h : Write data from top of the Asset data area.
      20h : Write data from the 32bytes offset point in the Asset data area.
   Data0 - DataN: Asset data. The data must be ASCII characters strings.
   ETX (03h): End of Message

 Check code
   BCC: Block Check Code
        Refer to the section 4.5 "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'-'A'-'B'-N-N	STX-'0'-'0'-'C'-'0'-'0'-'E'-'0'-'0'- 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
   'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
   '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' (34h and 30h).

 Message
   STX (02h): Start of Message
   '0'-'0': Result code. No error
   'C'-'0'-'0'-'E'  (43h, 30h, 30h, 45h): Asset Data write command
   '0'-'0': Offset address from top of Asset data.
      00h : Write data into from top of the Asset data area.
      20h : Write data into from the 32bytes offset point in the Asset data area.
   Data(0) -- Data(N): Asset data. The data must be ASCII characters strings.
   ETX (03h): End of Message

 Check code
   BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.
```

Delimiter
  CR (0Dh): End of packet

9. Date & Time read and write

9.1 Date & Time Read

This command is used in order to read the setting of Date & Time.
1) The controller requests the monitor to reply with the Date & Time.

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

    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    '0' (30h): Message sender is the controller
    'A' (41h): Message type is "Command"
    '0'-'6'(30h, 36h): length.

  Message
    STX (02h): Start of Message
    'C'-'2'-'1'-'1' (43h, 32h, 31h, 31h): Date & time read request command
    ETX (03h): End of Message

  Check code
    BCC: Block Check Code
         Refer to the section 4.5 "Check code" for a BCC calculation.

  Delimiter
    CR (0Dh): End of packet

  2) The monitor replies Date & Time to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'B'-'1'-'4'	STX-'C'-'3'-'1'-'1'-YY-MM-DD-WW-HH-MM -DS-ETX	BCC	CR

    Header
    SOH (01h): Start of Header
    '0' (30h): Reserved
    '0' (30h): Message receiver is the controller
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    'B' (42h): Message type is "Command reply"
    '1'-'4'(31h, 34h): Message length

  Message
    STX (02h): Start of Message
    'C'-'3'-'1'-'1' (43h, 33h, 31h, 31h): Date & Time read reply command
    'YY'-'MM'-'DD'-'WW'-'HH'-'MN'-'DS': Date & Time data
        YY: Year (offset 2000)
            '0'-'0'(30h, 30h): 2000
                |
            '6'-'3'(36h, 33h): 2099 (99 = 63h)

        MM: Month
            '0'-'1'(30h, 31h): January
                |
            '0'-'C'(30h, 43h): December
        DD: Day
            '0'-'1'(30h, 31h): 1
                |
            '1'-'E'(31h, 45h): 30(=1Eh)
            '1'-'F'(31h, 46h): 31(=1Fh)

```
        WW: weekdays
            '0'-'0'(30h, 30h): Sunday
            '0'-'1'(30h, 31h): Monday
            '0'-'2'(30h, 32h): Tuesday
            '0'-'3'(30h, 33h): Wednesday
            '0'-'4'(30h, 34h): Thursday
            '0'-'5'(30h, 35h): Friday
            '0'-'6'(30h, 36h): Saturday


        HH: Hours
            '0'-'0'(30h, 30h): 0
                 |
            '1'-'7'(31h, 37h): 23 (=17h)


        MN: Minutes
            '0'-'0'(30h, 30h): 0
                 |
            '3'-'B' (33h, 42h): 59 (=3Bh)


        DS: Daylight saving (Summer time)
            '0'-'0'(30h, 30h): NO
            '0'-'1'(30hm 31h): YES


    ETX (03h): End of Message

  Check code
    BCC: Block Check Code
          Refer to the section 4.5 "Check code" for a BCC calculation.


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

9.2 Date & Time Write

This command is used in order to write the setting of the Date & Time.

1) The controller requests the monitor to write Date & Time.

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'A'-'1'-'2'	STX-'C'-'2'-'1'-'2'-YY-MM-DD-WW-HH-MN -DS-ETX	BCC	CR

```
    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    'A' (41h): Monitor ID
            LCD3215/LCD4215 must be ASCII 'A' (41h).
    '0' (30h): Message sender is the controller
    'A' (41h): Message type is "Command"
    '1'-'2'(31h, 32h): Message length.

  Message
    STX (02h): Start of Message
    'C'-'2'-'1'-'2'  (43h, 32h, 31h, 32h): Date & Time write command
    'YY'-'MM'-'DD'-'WW'-'HH'-'MN'-'DS': Date & Time data
        YY: Year (offset 2000)
            '0'-'0'(30h, 30h): 2000
                 |
            '6'-'3'(36h, 33h): 2099 (99 = 63h)


        MM: Month
            '0'-'1'(30h, 31h): January
                  |
            '0'-'C'(30h, 43h): December


        DD: Day
            '0'-'1'(30h, 31h): 1
                  |
            '1'-'E'(31h, 45h): 30(=1Eh)
```

```
    WW: weekdays
          '0'-'0'(30h, 30h): Sunday
          '0'-'1'(30h, 31h): Monday
          '0'-'2'(30h, 32h): Tuesday
          '0'-'3'(30h, 33h): Wednesday
          '0'-'4'(30h, 34h): Thursday
          '0'-'5'(30h, 35h): Friday
          '0'-'6'(30h, 36h): Saturday

    HH: Hours
          '0'-'0'(30h, 30h): 0
                |
          '1'-'7'(31h, 37h): 23 (=17h)

    MN: Minutes
          '0'-'0'(30h, 30h): 0
                |
          '3'-'B' (33h, 42h): 59 (=3Bh)

    DS: Daylight saving (Summer time)
          '0'-'0'(30h, 30h): NO
          '0'-'1'(30h, 30h): YES

  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.5 "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'-'A'-'B'-'1'-'6'	STX-'C'-'3'-'1'-'2'-ST-YY-MM-DD-WW-HH-MN -DS-ETX	BCC	CR

```
    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    '0' (30h): Message receiver is the controller
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    '1'-'6'(31h, 36h): Message length.

    Message
    STX (02h): Start of Message
    'C'-'3'-'1'-'2'  (43h, 33h, 31h, 32h): Date & Time write reply command
    ST: Date & Time Status command
          '0'-'0'(30h, 30h):No error
          '0'-'1'(30h, 31h):Error
    'YY'-'MM'-'DD'-'WW'-'HH'-'MN'-'DS': Date & Time data
          YY: Year (offset 2000)
              '0'-'0'(30h, 30h): 2000
                  |
              '6'-'3'(36h, 33h): 2099 (99 = 63h)

          MM: Month
              '0'-'1'(30h, 31h): January
                  |
              '0'-'C'(30h, 43h): December

          DD: Day
              '0'-'1'(30h, 31h): 1
                  |
              '1'-'E'(31h, 45h): 30(=1Eh)
              '1'-'F'(31h, 46h): 31(=1Fh)

          WW: weekdays
```

```
                    '0'-'0'(30h, 30h): Sunday
                    '0'-'1'(30h, 31h): Monday
                    '0'-'2'(30h, 32h): Tuesday
                    '0'-'3'(30h, 33h): Wednesday
                    '0'-'4'(30h, 34h): Thursday
                    '0'-'5'(30h, 35h): Friday
                    '0'-'6'(30h, 36h): Saturday

            HH: Hours
                    '0'-'0'(30h, 30h): 0
                         |
                    '1'-'7'(31h, 37h): 23 (=17h)

            MN: Minutes
                    '0'-'0'(30h, 30h): 0
                         |
                    '3'-'B' (33h, 42h): 59 (=3Bh)

            DS: Daylight saving (Summer time)
                    '0'-'0'(30h, 30h): NO
                    '0'-'1'(30h, 31h): YES

    ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.

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

10.Schedule read and write

10.1 Schedule Read

This command is used in order to read the setting of the Schedule.
1) The controller requests the monitor to read Schedule

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'A'-'0'-'8'	STX-'C'-'2'-'1'-'3'-PG-ETX	BCC	CR

```
   Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    '0' (30h): Message sender is the controller
    'A' (41h): Message type is "Command"
    '0'-'8'(30h, 38h): Message length.

  Message
    STX (02h): Start of Message
    'C'-'2'-'1'-'3'  (43h, 32h, 31h, 33h): Schedule read request command
        PG: Program No.
        ➢   The data must be ASCII characters strings.
    ETX (03h): End of Message

  Check code
    BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.

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

2) The monitor replies Schedule to the controller.

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'B'-'1'-'6'	STX-'C'-'3'-'1'-'3'-PG-ON HOURS-ON MIN-OFF HOURS-OFF Min-INPUT-WD-FL-ETX	BCC	CR

```
   Header
    SOH (01h): Start of Header
    '0' (30h): Reserved
    '0' (30h): Message receiver is the controller
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    'B' (42h): Message type is "Command reply"
    '1'-'6'(31h, 36h): Message length

  Message
    STX (02h): Start of Message
    'C'-'3'-'1'-'3'  (43h, 33h, 31h, 33h): Schedule read reply command
    PG-ON HOURS-ON MIN-OFF HOURS-OFF MIN-INPUT-WD-FL: Schedule data
        PG: Program No.
            '0'-'0'(30h, 30h): Program No.1
               |
            '0'-'6'(30h, 36h): Program No.7

        ON_HOUR: Turn on time (hour)
            '0'-'0'(30h, 30h): 00
               |
            '1'-'7'(31h, 37h): 23 (=17h)
            '1'-'8'(31h, 38h): ON timer isn't set.

        ON_MIN:  Turn on time (minute)
            '0'-'0'(30h, 30h): 0
               |
            '3'-'B'(33h, 42h): 59
            '3'-'C'(33h, 43h): On timer isn't set.
```

```
       OFF_HOUR: Turn off time (hour)
             '0'-'0'(30h, 30h): 00
                 |
             '1'-'7'(31h, 37h): 23 (=17h)
             '1'-'8'(31h, 38h): Off timer isn't set.

       OFF_MIN:  Turn off time (minute)
             '0'-'0'(30h, 30h): 0
                 |
             '3'-'B'(33h, 42h): 59 (=3Bh)
             '3'-'C'(33h, 43h): Off timer isn't set.

       INPUT: Timer input
             '0'-'0'(30h, 30h): RGB1(DVI-D)
             '0'-'1'(30h, 31h): RGB2(D-SUB)
             '0'-'2'(30h, 32h): RGB3(BNC)
             '0'-'3'(30h, 33h): DVD/HD
             '0'-'4'(30h, 34h): VIDEO
             '0'-'5'(30h, 35h): VIDEO(S)
             '0'-'7'(30h, 37h): It is operates by last memory input

       WD: Week setting
             bit 0: Monday
             bit 1: Tuesday
             bit 2: Wednesday
             bit 3: Thursday
             bit 4: Friday
             bit 5: Saturday
             bit 6: Sunday

             EX.
             '0'-'1'(30h, 31h): Monday
             '0'-'4'(30h, 34h): Wednesday
             '0'-'F'(30h, 46h): Monday, Tuesday, Wednesday and Thursday
             '7'-'F'(37h, 46h): Monday to Sunday

       FL: Option
             bit 0: 0(30h):once 1(31h):Everyday
             bit 1: 0(30h):once 1(31h):Every week
             bit 2: 0:Disable 1:Enable


   ETX (03h): End of Message

 Check code
   BCC: Block Check Code
         Refer to the section 4.5 "Check code" for a BCC calculation.

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

10.2 Schedule Write

This command is used in order to write the setting of the Schedule.

1) The controller requests the monitor to write Schedule.

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'A'-'1'-'6'	STX-'C'-'2'-'1'-'4'-PG-ON HOURS-ON MIN-OFF HOURS-OFF Min-INPUT-WD-FL-ETX	BCC	CR

```
   Header
   SOH (01h): Start Of Header
   '0' (30h): Reserved
   'A' (41h): Monitor ID
             LCD3215/LCD4215 must be ASCII 'A' (41h).
   '0' (30h): Message sender is the controller
   'A' (41h): Message type is "Command"
   '1'-'6'(31h, 36h): Message length.
```

```
Message
  STX (02h): Start of Message
  'C'-'2'-'1'-'4'  (43h, 32h, 31h, 34h): Schedule writes command
  PG-ON HOURS-ON MIN-OFF HOURS-OFF Min-INPUT-WD-FL: Schedule data
        PG: Program No.
            '0'-'0'(30h, 30h): Program No.1
               |
            '0'-'6'(30h, 36h): Program No.7

        ON_HOUR: Turn on time (hour)
            '0'-'0'(30h, 30h): 00
               |
            '1'-'7'(31h, 37h): 23 (=17h)
            '1'-'8'(31h, 38h): ON timer isn't set.

        ON_MIN:  Turn on time (minute)
            '0'-'0'(30h, 30h): 0
               |
            '3'-'B'(33h, 42h): 59
            '3'-'C'(33h, 43h): On timer isn't set.

        OFF_HOUR: Turn off time (hour)
            '0'-'0'(30h, 30h): 00
               |
            '1'-'7'(31h, 37h): 23 (=17h)
            '1'-'8'(31h, 38h): Off timer isn't set.

        OFF_MIN:  Turn off time (minute)
            '0'-'0'(30h, 30h):0min
               |
            '3'-'B'(33h, 42h):59 (=3Bh)
            '3'-'C'(33h, 43h): Off timer isn't set.

        INPUT: Timer input
            '0'-'0'(30h, 30h): RGB1(DVI-D)
            '0'-'1'(30h, 31h): RGB2(D-SUB)
            '0'-'2'(30h, 32h): RGB3(BNC)
            '0'-'3'(30h, 33h): DVD/HD
            '0'-'4'(30h, 34h): VIDEO
            '0'-'5'(30h, 35h): VIDEO(S)
            '0'-'7'(30h, 37h): It is operates by last memory input

        WD: Week setting
            bit 0: Monday
            bit 1: Tuesday
            bit 2: Wednesday
            bit 3: Thursday
            bit 4: Friday
            bit 5: Saturday
            bit 6: Sunday

            EX.
            '0'-'1'(30h, 31h): Monday
            '0'-'4'(30h, 34h): Wednesday
            '0'-'F'(30h, 46h): Monday, Tuesday, Wednesday and Thursday
            '7'-'F'(37h, 46h): Monday to Sunday

         FL: Option
            bit 0: 0(30h):once 1(31h):Everyday
            bit 1: 0(30h):once 1(31h):Every week
            bit 2: 0:Disable 1:Enable
             * When bit0 and bit1 are '1', it behaves as Everyday.

  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.5 "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'-'A'-'B'-'1'-'8'	STX-'C'-'3'-'1'-'4'-ST-PG-ON　HOURS-ON MIN-OFF HOURS-OFF Min-NPUT-WD-FL-ETX	BCC	CR

    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    '0' (30h): Message receiver is the controller
    'A' (41h): Monitor ID
               LCD3215/LCD4215 must be ASCII 'A' (41h).
    'B' (42h): Message type is "Command reply"
    '1'-'8'(31h, 38h): Message length.

  Message
    STX (02h): Start of Message
    'C'-'3'-'1'-'4' (43h, 33h, 31h, 34h): Schedule writes reply command
    ST: Schedule Status command
         0(30h):No error
         1(31h):Error
    PG-ON HOURS-ON MIN-OFF HOURS-OFF Min-NPUT-WD-FL: Schedule data
         PG: Program No.
              '0'-'0'(30h, 30h): Program No.1
                 |
              '0'-'6'(30h, 36h): Program No.7

         ON_HOUR: Turn on time (hour)
              '0'-'0'(30h, 30h): 00
                 |
              '1'-'7'(31h, 37h): 23 (=17h)
              '1'-'8'(31h, 38h): ON timer isn't set.

         ON_MIN: Turn on time (minute)
              '0'-'0'(30h, 30h): 0
                 |
              '3'-'B'(33h, 42h): 59
              '3'-'C'(33h, 43h): On timer isn't set.

         OFF_HOUR: Turn off time (hour)
              '0'-'0'(30h, 30h): 00
                 |
              '1'-'7'(31h, 37h): 23 (=17h)
              '1'-'8'(31h, 38h): Off timer isn't set.

         OFF_MIN: Turn off time (minute)
              '0'-'0'(30h, 30h): 0
                 |
              '3'-'B'(33h, 42h): 59 (=3Bh)
              '3'-'C'(33h, 43h): Off timer isn't set.

         INPUT: Timer input
              '0'-'0'(30h, 30h): RGB1(DVI-D)
              '0'-'1'(30h, 31h): RGB2(D-SUB)
              '0'-'2'(30h, 32h): RGB3(BNC)
              '0'-'3'(30h, 33h): DVD/HD
              '0'-'4'(30h, 34h): VIDEO
              '0'-'5'(30h, 35h): VIDEO(S)
              '0'-'7'(30h, 37h): It is operates by last memory input

         WD: Week setting
              bit 0: Monday
              bit 1: Tuesday
              bit 2: Wednesday
              bit 3: Thursday
              bit 4: Friday

```
                      bit 5: Saturday
                      bit 6: Sunday

                      EX.
                      '0'-'1'(30h, 31h): Monday
                      '0'-'4'(30h, 34h): Wednesday
                      '0'-'F'(30h, 46h): Monday, Tuesday, Wednesday and Thursday
                      '7'-'F'(37h, 46h): Monday to Sunday

              FL: Option
                      bit 0: 0(30h):once 1(31h):Everyday
                      bit 1: 0(30h):once 1(31h):Every week
                      bit 2: 0:Disable 1:Enable
                      * When bit0 and bit1 are '1', it behaves as Everyday.

      ETX (03h): End of Message

   Check code
     BCC: Block Check Code
           Refer to the section 4.5 "Check code" for a BCC calculation.

   Delimiter
     CR (0Dh): End of packet

   3) The controller requests the monitor to write Enable/Disable Schedule.
```

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'A'-'0'-'A'	STX-'C'-'2'-'1'-'5'-PG-EN-ETX	BCC	CR

```
      Header
      SOH (01h): Start Of Header
      '0' (30h): Reserved
      'A' (41h): Monitor ID
                 LCD3215/LCD4215 must be ASCII 'A' (41h).
      '0' (30h): Message sender is the controller
      'A' (41h): Message type is "Command"
      '0'-'A'(30h, 41h): Message length.

   Message
      STX (02h): Start of Message
      'C'-'2'-'1'-'5'  (43h, 32h, 31h, 35h): Enable/Disable Schedule writes reply command
      PG-EN: Schedule data
            PG: Program No.
                 '0'-'0'(30h, 30h): Program No.1
                   |
                 '0'-'6'(30h, 36h): Program No.7

            EN: Enable /Disable
                 '0'-'0'(30h, 30h): Disable
                 '0'-'1'(30h, 31h): Enable

      ETX (03h): End of Message

   Check code
     BCC: Block Check Code
           Refer to the section 4.5 "Check code" for a BCC calculation.

   Delimiter
     CR (0Dh): End of packet

   4) The monitor replies a data for confirmation.
```

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'B'-'0'-'C'	STX-'C'-'2'-'1'-'5'-ST-PG-EN-ETX	BCC	CR

```
      Header
      SOH (01h): Start Of Header
      '0' (30h): Reserved
      '0' (30h): Message receiver is the controller
      'A' (41h): Monitor ID
                 LCD3215/LCD4215 must be ASCII 'A' (41h).
```

```
   'B' (42h): Message type is "Command reply"
   '0'-'C' (30h, 43h): Message length.

Message
  STX (02h): Start of Message
  'C'-'2'-'1'-'5'  (43h, 32h, 31h, 35h): Schedule writes command
  ST: Schedule Status command
        0(30h):No error
        1(31h):Error
  PG-EN: Schedule data
        PG: Program No.
            '0'-'0'(30h, 30h): Program No.1
               |
            '0'-'6'(30h, 36h): Program No.7

  EN: Enable /Disable
            '0'-'0'(30h, 30h): Disable
            '0'-'1'(30h, 31h): Enable

  ETX (03h): End of Message

Check code
  BCC: Block Check Code
       Refer to the section 4.5 "Check code" for a BCC calculation.

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

11. Self diagnosis

11.1 Self-diagnosis status read

```
This command is used in order to read the Self-diagnosis status.
1) The controller requests the monitor to read Self-diagnosis status.
```

Header	Message	Check code	Delimiter
SOH-'0'-'A'-'0'-'A'-'0'-'4'	STX-'B'-'1'-ETX	BCC	CR

```
  Header
  SOH (01h): Start of Header
  '0' (30h): Reserved
  'A' (41h): Monitor ID
            LCD3215/LCD4215 must be ASCII 'A' (41h).
  '0' (30h): Message sender is the controller
  'A' (41h): Message type is "Command"
  '0'-'4'(30h, 34h): Message length.

Message
  STX (02h): Start of Message
  'B'-'1' (42h, 31h): Self-diagnosis command
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
       Refer to the section 4.5 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet


2) The monitor replies a result of the self-diagnosis.
```

Header	Message	Check code	Delimiter
SOH-'0'-'0'-'A'-'B'-N-N	STX-'A'-'1'- ST(0)-ST(1) --------ST(n)-ETX	BCC	CR

```
  Header
  SOH (01h): Start Of Header
  '0' (30h): Reserved
  '0' (30h): Message receiver is the controller
```

'A' (41h): Monitor ID
        LCD3215/LCD4215 must be ASCII 'A' (41h).
'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' (34h and 30h).

Message
  STX (02h): Start of Message
  'A'-'1' (41h, 31h): Application Test Report reply command
  ST: Result of self-tests
        00:Normal
        70:Analog 3.3V abnormality
        71:Analog 12V abnormality
        72:Analog 5V abnormality
        73:Audio amplifier +12V abnormality
        80:Cooling fan-1 abnormality
        81:Cooling fan-2 abnormality
        ➢   The byte data 70 is encoded as ASCII characters '7' and '0' (37h and 30h).
  ETX (03h): End of Message

Check code
  BCC: Block Check Code
        Refer to the section 4.5 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

12. Serial No. & Model Name Read
12.1 Serial No. Read
 This command is used in order to read a serial No..
 1) The controller requests the monitor to read a serial No.

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

    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    'A' (41h): Monitor ID
                LCD3215/LCD4215 must be ASCII 'A' (41h).
    '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 4.5 "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'-'A'-'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

'A' (41h): Monitor ID
               LCD3215/LCD4215 must be ASCII 'A' (41h).
'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
    'C'-'3'-'1'-'6' (41h, 33h, 31h, 36h): Serial No. reply command
    Data(0)-Data(1)----Data(n):Serial Number
    ➤   The data must be ASCII characters strings.
  ETX (03h): End of Message

  Check code
    BCC: Block Check Code
       Refer to the section 4.5 "Check code" for a BCC calculation.

  Delimiter
    CR (0Dh): End of packet

12.2 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'-'A'-'0'-'A'-'0'-'6'	STX-'C'-'2'-'1'-'7'-ETX	BCC	CR

    Header
    SOH (01h): Start Of Header
    '0' (30h): Reserved
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    '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 4.5 "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'-'A'-'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
    'A' (41h): Monitor ID
              LCD3215/LCD4215 must be ASCII 'A' (41h).
    '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
    'C'-'3'-'1'-'7' (43h, 33h, 31h, 37h): Model Name reply Command

Data(0) -Data(1)----Data(n):Model name
  ➢   The data must be ASCII characters strings.
ETX (03h): End of Message

Check code
  BCC: Block Check Code
      Refer to the section 4.5 "Check code" for a BCC calculation.

Delimiter
  CR (0Dh): End of packet

Data(0) -Data(1)----Data(n):Model name
  ➢   The data must be ASCII characters strings.
ETX (03h): End of Message

Appendix

A. Operation Code (OP code) Table

	Item	OP code page	OP code	Parameter	Remarks
PICTURE	Brightness	00h	10h	0: dark | MAX.: bright	
	Contrast	00h	12h	0: low | MAX.: high	
	Sharpness	00h	8Ch	0: dull | MAX: sharp	
	Tint	00h	90h	0: | MAX:	
	Color	02h	1Fh	0: pale | MAX: deep	
	Black Level	00h	92h	0: dark | MAX: bright	
	Noise Reduction	02h	20h	0: Off | MAX.	
	Color control	00h	Red: 16h Green: 18h Blue: 1Ah	0: | MAX:	
	Color Temperature	00h	14h	04h:5000K 05h:6500K 08h:9300K 0Bh:USER 02h:10000K(NATIVE)	
	Picture reset	00h	08h	1: Reset	Momentary
SCREEN	H Position	00h	20h	0: Left side | Max.: Right side	Depends on a display timing
	V Position	00h	30h	0: Bottom side | Max.: Top side	Depends on a display timing
	Clock	00h	0Eh	0: | Max.	
	Clock phase	00h	3Eh	0: | Max.	
	H Resolution	02h	50h	0: | Max.	
	V Resolution	02h	51h	0: | Max.:	
	Zoom Mode	02h	CEh	1:off 2:custom 3:16:9-ZOOM 4:14:9-ZOOM 5:Dynamic	

	Item	OP code page	OP code	Parameter	Remarks
	Zoom H-Expansion	02h	6Ch	1:100 2:101 | 201:300	
	Zoom V- Expansion	02h	6Dh	1:100 2:101 | 201:300	
	Zoom H-Position	02h	CCh	0: Left side | Max.: Right side	
	Zoom V-Position	02h	CDh	0: Down side | Max.: Up side	
	Screen reset	00h	06h	1: Reset	Momentary
AUDIO	Balance	00h	93h	O: Left | 50:(Center) | 100: Right	
	Treble	00h	8Fh	O: Min. | 50:(Center) | 100: Max.	
	Bass	00h	91h	0: Min. | 50:(Center) | 100: Max.	
	Audio reset	02h	31h	1: Reset	Momentary
PIP	PIP Size	02h	71h	1: Small 2: Middle 3: Large	
	PIP Audio			N/A	
	PIP Reset			N/A	Momentary
Configuration 1	Auto Setup	00	1Eh	1: Execute	Momentary
	Auto Adjust			N/A	
	Power Save	00h	E1h	0: OFF 1: ON	
	Language	00h	68h	1:English 2:German 3:French 4:Spanish 5:Japanese 6:Italian 7:Swedish	OSM Language
	Screen Saver	Gamma	02h	DBh	1: normal 2:screen saving gamma	
		Brightness	02h	DCh	1:normal 2:decrease brightness
		Cooling Fan	02h	7Dh	1:Auto 2:Forced ON
		Motion	02h	DDh	0: 0s(Off) | 90: 900s	10s/step

	Item		OP code page	OP code	Parameter	Remarks
	Color System		02h	21h	1: NTSC 2: PAL 3: SECAM 4: Auto 5: 4.43NTSC 6: PAL-60	
	Side Border Color		02h	DFh	0:Black 1:Middle 2:White	
	Factory Reset		00h	04h	1: Reset	Momentary
	Configuration Reset				N/A	
Configuration 2						
	OSM Turn Off		00h	FCh	0-9:Do not set. 10:10s 11:11s | 60:60s	5sec/step
	Information OSM		02h	3Dh	0:disable information OSD 3-10: OSM timer [seconds]	
	Off Timer		02h	2Bh	0: OFF 1: 1 hour | 24: 24 hours	1 hour/step
	DVI Mode		02h	CFh	1: DVI-PC 2: DVI-HD	
	OSD Position	H Position	02h	38h	0: | MAX.:	
		V Position	02h	39h	0: | MAX.:	
Advanced Option						
	Input Resolution		02h	DAh	1: Auto 2: 1024x768 3: 1280x768 4: 1360x768	
	Black Level Expansion		02h	22h	1: OFF 2: MIDDLE 3: HIGHT	

	Item		OP code page	OP code	Parameter	Remarks
	Gamma Selection		02h	68h	Gamma Table Selection 1: Native Gamma 4: Gamma=2.2 8: Gamma=2.4 7: S Gamma	
	Scan Mode		02	E3h	1: UNDERSCAN 2: OVER SCAN	
	Scan Conversion		02h	25h	1: OFF(INTERLACE) 2: Enable (IP ON/PROGRESSIVE)	
	Film Mode		02h	23h	1: OFF 2: AUTO	
	IR Control		02h	3Fh	1: Normal 4: Lock (Off)	
	Tile Matrix	H monitor	02h	D0h	1 | 4	Number of H-division
		V monitor	02h	D1h	1 | 4	Number of V-division
		Position	02h	D2h	1: Upper left | MAX.: Lower right	
		Mode	02h	D3h	1: Disable (OFF) 2: Enable (ON)	
		Tile comp	02h	D5h	1: Disable (OFF) 2: Enable (ON)	
	Power On Delay		02h	D8h	0: OFF (0sec) 50:50sec	
	Advanced Option Reset		02h	E4h	1:RESET	Momentary
	Input		00h	60h	3: RGB1 (DVI-D) 1: RGB2 (D-SUB) 2: RGB3 (BNC) 12: DVD/HD 5:VIDEO(Composite) 7: S-VIDEO	
	Picture Mode		02h	1Ah	1: sRGB 3: Hi-Bright 4: Standard 5: Cinema	SRGB: PC mode only Cinema: A/V mode only
	Size		02h	70h	1: Normal 2: Full 3: Wide 4: Zoom	
	PIP ON/OFF Still ON/OFF		02h	72h	1: OFF 2: PIP 3: POP 4: Still	

	Item	OP code page	OP code	Parameter	Remarks
	PIP Input	02h	73h	0: No mean 1: RGB-2(D-SUB) 2: RGB-3(BNC) 3: RGB-1(DVI-D) 12:DVD/HD 5:VIDEO(Composite) 7: S-VIDEO	This operation has limitation of selection. Please refer to the monitor instruction manual.
	Still Capture	02h	76h	0: Off 1: Capture	Momentary
	Audio Input	02h	2Eh	1: Audio 1(PC) 2: Audio 2 3: Audio 3	
	Mute	00h	8Dh	0,2: UNMUTE 1: MUTE	
	Volume UP/Down	00h	62h	0: whisper | 100: loud	
	PIP H Position	02h	74h	0: left side | MAX: right side	
	PIP V Position	02h	75h	0: top side | MAX: bottom side	
Temperature sensor	Select Temperature sensor	02h	78h	1: Sensor #1 2: Sensor #2	
	Readout a temperature	02h	79h	Returned value is 2's complement. Refer to section 6.2	Read only

All data are subject to change without notice.