

RS232Serial Communication Control Specification

1. Application

This document defines the communication protocols for serial control

2.Connectors and wiring

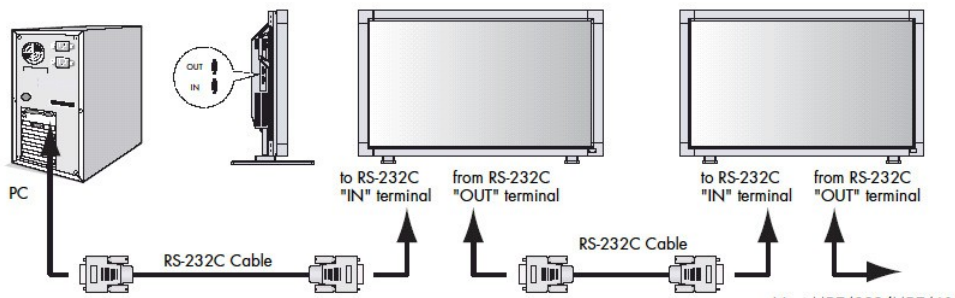
You connect the computer and the displays with serial cables for the display control.

You can use one of serial communication control ports with selecting whether RS-232C or LAN.

A: RS-232C connection

Connector: D-Sub 9-pin

Cable: Cross (reversed) cable or null modem cable



3. Communication Parameter

Set each communication parameters to the PC connected with each kind of cable.

A: RS-232C connection

(1) RS-232C direct connection between PC and Display

Interface	RS-232C (Asynchronous, Full-duplex)
Baud rate	9600bps
Data length	8bits
Parity	None
Stop bit	1 bit
Flow control	None
Communication code	ASCII
Communicationsignals	TXD, RXD

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.

[ImportantInformation]

HOSTsystemshallsendnextcommandafterreceivingareplycommandfromMonitor,ifitissequential commandscommunication.IfHostdoesn'twaitformonitor'sreply,monitoroperationerrormayhappen.

Time-outerrorhandlingoperationinController:HostControllershallwaitthereplyfromMonitor, after sending command as mentioned above. The time-out setting in Host Controller shall be more than 30sec after sending command to Monitor. (Using the maximum command interval "aMAX" is most safety.)

Communication disabled period after power on/off: After Monitor Power on, either by AC switch, Remote Controller or Serial communication command, Monitor goes initialize mode of controller and can not handle the remote control commands correctly during the mode. So do NOT send any command at least 14sec after monitor power on/off. If you make the code which sends any command after POWER ON/OFF command, please put a wait at least 14sec after sending the command.

About the other commands, please wait the each periods of command interval from PC. (See below example.)

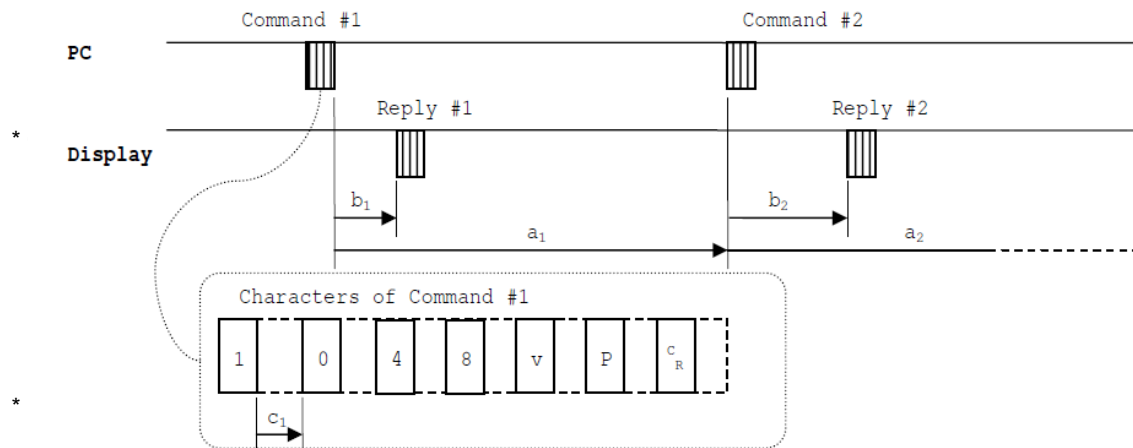
When your system may output no signal, you have to set the menu "POWER SAVE (PC)" to OFF because of 14sec waiting.

[Available Command list at DC power off status]

Monitor can't accept and reply any command except for the following commands when it is in DC power off or power saving.

Power status Read / Read Model name Read / Serial number Read /Power on / Power off

Example of communication timing



* Command interval from PC (Wait sending next command for processing in display.)

$a > 14\text{sec}$: When Command #1 is power command "POWER ON", "POWER OFF".

$a > 5\text{sec}$: When Command #1 is video input command "INPUT D-SUB", "INPUT VIDEO", etc.

$a > 1.8\text{sec}$: When Command #1 is store the adjusted value command "SAVE CURRENT SETTINGS", "SAVE CURRENT SETTINGS QUICK".

$a > 6\text{sec}$: When Command #1 is "AUTO SETUP".

$a > 30\text{sec}$: When Command #1 is "FACTORY RESET", "SCREEN RESET". (This results in a_{MAX})

$a > 15\text{sec}$: When Command #1 is "Force powered off".

$a > 600\text{msec}$: When Command #1 is the others.

* Minimum reply time from display (Additional time depends on command processing in display)

$b = 10\text{msec}$ (Typ.): On RS-232C connection (The time depends on models as 10 to 20msec.)

$b = 30\text{sec}$ (max): When Command #1 is "FACTORY RESET", "SCREEN RESET".

$b = 3\text{sec}$ (max): When Command #1 is video input command "INPUT D-SUB", "INPUT VIDEO", etc.

$b < 200\text{msec}$ (max): When Command #1 is the others.

* Command internal gap (Don't make a longer interval gap between characters.)

[Following 3 steps of time out period is selectable by OSD menu "CONTROL TIMEOUT" in CONFIGURATION2 menu on POWER ON mode. Although c is 5sec on POWER OFF mode and sleep mode.]

$c < 10\text{msec}$: Normal communication mode for time-out error of each character gap.

$c < 2\text{sec}$: Hand typing mode on teletype application.

$c < 30\text{sec}$: Hand typing mode with longer time-out.

(Infinity waiting isn't supported because of processing freeze.)


4. Communication Format

4.1. Basic command

This command set supports only the basic control of monitor and does NOT support multi monitor control by daisy chained connection. This command set will be written in the user's manual.

1) Control command diagram


The command is structured by the address code, function code, data code and end code. The length of the command is different for each function.

	Address code	Function code	Data code	End code
HEX	31h 30h 34h 38h	Function	Data	0DH
ASCII	'1' '0' '4' '8'	Function	Data	

[Address code] 31h 30h 34h 38h (In ASCII code, '1' '0' '4' '8') fixed.

[Function code] A code of each fixed control move.



[Data code] A code of each control data(number) and not always indicated.

[End code] 0Dh(in ASCII code, ')Fixed

2) Control sequence

- (1) The command from a computer to the LCD monitor will be sent in 600ms.
- (2) The LCD monitor will send a return command 600ms* after it has received and encoded. If the command isn't received correctly, the LCD monitor will not send the return command.
- (3) The personal computer checks the command and confirms if the command, which has been sent, has been executed or not.
- (4) This LCD monitor sends various codes other than return code. When having a control sequence by RS-232C, reject other codes from personal computers side.

Example: Turn the power ON (' ' is for ASCII code)

Sending commands from PC	Status code from LCD monitor	Meaning
31 30 34 38 21 0D '1' '0' '4' '8' '!' 		Command for POWER ON
	31 30 34 38 21 0D '1' '0' '4' '8' '!' 	Command received (Command echoed back)

Note: The replied status is for communication confirmation. When you want to know the display condition, please use the 'Read command'.

3) Operation commands

The operation commands execute the basic operation setting of this LCD monitor.

It may not operate when changing the signal:

Operation	ASCII	HEX
Power ON	!	21h
Power OFF	"	22h
FORCE POWER OFF WITH OPS	""	22h 22h
INPUT HDMI	_r1	5Fh 72h 31h
INPUT HDM2	_r7	5Fh 72h 37h
INPUT DVI-D	_r2	5Fh 72h 32h
INPUT D-SUB	_r3	5Fh 72h 33h
INPUT OPTION(OPS)	_r5	5Fh 72h 35h
INPUT DisplayPort	_r6	5Fh 72h 36h
INPUT VIDEO	_v1	5Fh 76h 31h
INPUT YPbPr(DVD/HD)	_v2	5Fh 76h 32h
INPUT S-VIDEO*	_v3	5Fh 76h 33h
Backlight luminance control	_b050	5Fh 62h 30h 35h 30h
IR control ON	_i1	5Fh 69h 31h
IR control OFF	_i0	5Fh 69h 30h
Local-key control ON	_k1	5Fh 6Bh 31h
Local-key control OFF	_k0	5Fh 6Bh 30h

*S-VIDEO is SEPARATE only



*_b050 set the backlight luminance to 50% of OSD brightness value.

4) Read command

Host computer sends the command without Data-code to monitor.

After receiving this command, the monitor returns the command with Data-code of current status to host computer.

<ex.> When Host computer ask Power status of monitor, the status of monitor is powered-on.

Sending commands from PC	Status code from LCD monitor	Meaning
31 30 34 38 76 50 0D '1' '0' '4' '8' 'v' 'P' ' ' 		Ask about the power status of monitor.
	31 30 34 38 76 50 31 0D '1' '0' '4' '8' 'v' 'P' '1' ' ' 	Monitor is powered-on

Structure of the Read-command

			ASCII		HEX	
			Function	Data (Receive)	Function	Data (Receive)
POWER	ON		vP	1	76 50	31
	OFF(sleep/stand by)		vP	0	76 50	30
Input	HDMI1		vl	r1	76 49	72 31
	HDMI2		vl	r7	76 49	72 37
	DVI-D		vl	r2	76 49	72 32
	D-SUB		vl	r3	76 49	72 33
	OPTION		vl	r5	76 49	72 35
	DisplayPort		vl	r6	76 49	72 36
	Video		vl	v1	76 49	76 31
	YPbPr(DVD/HD)		vl	v2	76 49	76 32
	S-VIDEO		vl	v3	76 49	76 33
Picture mode	HIGHBRIGHT		vM	p1	76 4D	70 31
	STANDARD		vM	p2	76 4D	70 32
Temperature of Internal monitor	Around Main board	resolution 1°C	tc1	(ex.) +25	74 63 31	2B 20 32 35

	Around Power PCB	resolution 1°C	tc2	(ex.) +31	74 63 32	2B 20 33 31
Read Backlight Luminance	Set and read		vB	(ex) 099	76 42	30 39 39
Read IR control	ON		vR	1	76 52	31
	OFF		vR	0	76 52	30

Read Local-key control	ON	vL	1	76 4C	31
	OFF	vL	0	76 4C	30



5) Remote command

(Not executable in sleep/standby mode. When the remote commands are sent while sleep/standby mode, the sleep/stand-by mode is only canceled.)

Some remote control operations can be achieved by the remote command codes. The remote commands have no data codes.

Button's name on remote	Function	
	Character	ASCII
+/VOLUME	r06	72h 30h 36h
-/VOLUME	r07	72h 30h 37h
AV MUTE	ra6	72h 61h 36h
AUTO SETUP	r09	72h 30h 39h

[Example] When executing the AUTO SETUP. (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'31' '30' '34' '38' '72' '30' '39' '0D' 1048r09 		Command operating the same as the MENU button
	'31' '30' '34' '38' '72' '30' '39' '0D' 1048r09 	Command receipt confirmation (Command echo back)

Note:

When you use a terminal application with typing the codes by hands, DO NOT type BS (Back Space) key or the other control keys. The behavior may send unexpected codes in Sending command to the monitor. The communication may be rejected by the monitor, or the monitor may result in unexpected operation in the worst case.

4.2 Extended command

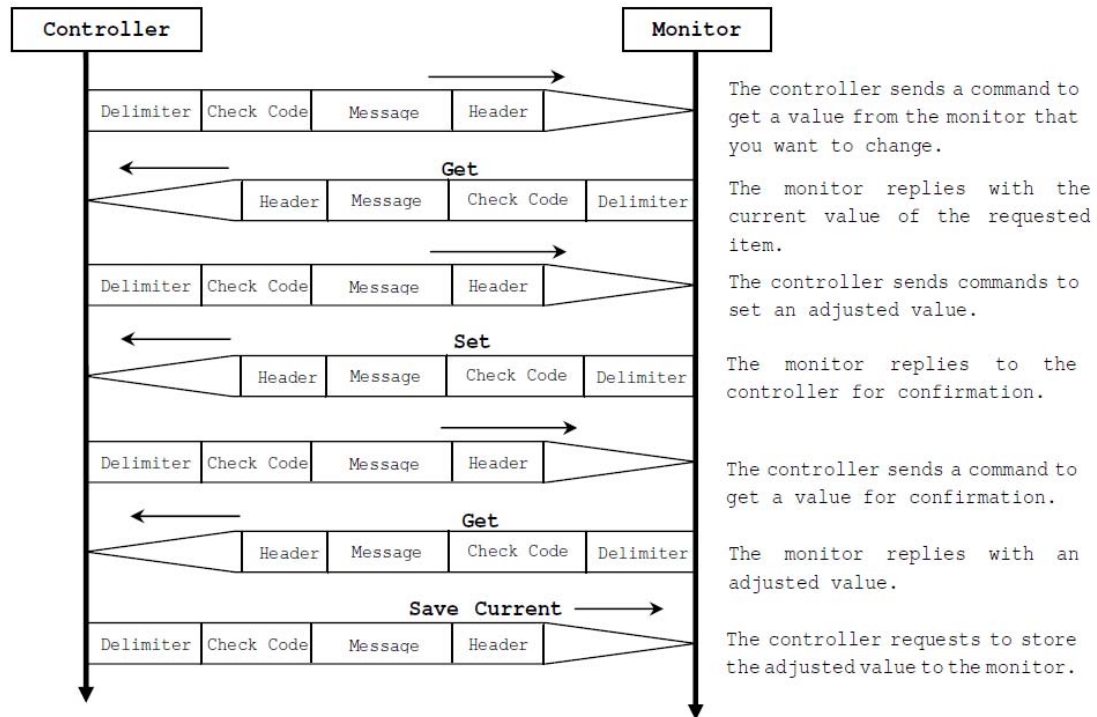
This command set supports only the basic control of monitor and does NOT support multi monitor control by daisy chained connection. This command set will be written in the user's manual.

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

Header	Message	Check Code	Delimiter
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Sequence of a typical procedure to control a monitor is as follows,

[A controller and a monitor, two-way communication composition figure]



4.3. Header block format (fixed length)

Header	Message	Check code	Delimiter
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STX	Vendor ID			Destination 'A'	Source	Message Type	Message Length
1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th - 9 th

1st byte) STX: Start of Header

STX(0x02)

2nd-4th byte) EISA Vendor ID in ASCII format

(EISA ID is used in EDID as a Vendor ID)

Currently it is "IYA"

2nd=0x49

3rd=0x59

4th=0x41

Each brand should provide their specific VID, in a same manner as EDID.

5th byte) Destination: Destination equipment ID. (Receiver)

Specify a command's receiver's address.

If the command should be sent to certain monitor only, the either of character 'A' (41h) to 'Z' (5Ah) which is corresponding to monitor ID from No.1 to No.26 should be set to this portion. If it is a broad cast command (only "set command" is available), then the '*' (2Ah) should be applied.

6th byte) Source: Source equipment ID. (Sender)

Specify a sender address.

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

7th byte) Message Type: (Case sensitive.)

Refer to section 4.2 "Message block format" for more details.

ASCII 'A' (41h): Command

ASCII 'B' (42h): Command reply.

ASCII 'C' (43h): Get current parameter from a monitor.

ASCII 'D' (44h): "Get parameter" reply.

ASCII 'E' (45h): Set parameter.

ASCII 'F' (46h): "Set parameter" reply.

8th - 9th 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).

4.4. Message block format

Header	Message	Check code	Delimiter
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“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 Setparameter

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”, “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
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Check code is the Block Check Code (BCC) between the Header and the End of Message except STX.

		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
STX	D_0								
VID	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

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

XOR: Exclusive OR

$$\text{VID} = \text{VID1 XOR VID2 XOR VID3}$$

Following is an example of a Check code (BCC) calculation.

Header							Message										Check code (BCC)	Delimiter
STX	VID	Destination Address	Source Address	Message type	Message length		STX	OP code page		OP code		Set Value				ETX		
02	VID1 xor VID2 xor VID3	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}

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

$$\begin{aligned}
 &= 30\text{h} \text{ xor } 41\text{h} \text{ xor } 30\text{h} \text{ xor } 45\text{h} \text{ xor } 30\text{h} \text{ xor } 41\text{h} \\
 &\quad \text{xor } 02\text{h} \text{ xor } 30\text{h} \text{ xor } 30\text{h} \text{ xor } 31\text{h} \text{ xor } 30\text{h} \\
 &\quad \text{xor } 30\text{h} \text{ xor } 30\text{h} \text{ xor } 36\text{h} \text{ xor } 34\text{h} \text{ xor } 03\text{h} \\
 &= 77\text{h}
 \end{aligned}$$

4.6. Delimiter

Header	Message	Check code	Delimiter
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Packet delimiter code; ASCII CR(0Dh).

5.Message type

5.1. Get current Parameter from a monitor.

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

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

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

A. Operation code table”.

1stbyte) STX: Start of Message

ASCII STX (02h)

2nd-3rdbytes) OP code page: Operation code page.

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

Refer to “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-5thbytes) 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.

6thbyte) ETX: End of Message

ASCII ETX (03h)

5.2. “Get Parameter” replay

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

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

1stbyte) STX: Start of Message

ASCII STX (02h)

2nd-3rdbytes) Result code.

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

00h: No Error.

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

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

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

4th-5thbytes) OP code page: Operation code page.

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

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

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

Refer to the operation codes table.

6th-7thbytes) OP code: Operation code

These bytes indicate a replying item's OP code.

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

Refer to the operation code table.

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

8th-9thbytes) Type: Operation type code

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 Auto Setup function which automatically changes the parameter.
 10th-13thbytes) Max. value: Maximum value which monitor can accept. (16bits)
 This returned value from the monitor is encoded to ASCII characters.
 Ex.) '0','1','2' and '3' means 0123h (291)
 14th -17thbytes) Current Value: (16bits)
 This returned value from the monitor is encoded to ASCII characters.
 Ex.) '0','1','2' and '3' means 0123h (291)
 18thbyte) ETX: End of Message
 ASCII ETX (03h)

5.3. Set parameter

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

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

The controller requests a monitor to change value.

1stbyte) STX: Start of Message

ASCII STX (02h)

2nd-3rdbytes) OP code page: Operation code page

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

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

Refer to the Operation code table.

4th-5thbytes) OP code: Operation code

This OP code data must be encoded to ASCII characters.

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

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

(If command is sent as "Broadcast" then no reply should be sent back.)

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;

(The destination "A" (monitor ID of 1) is only an example. It should be changed according to the target monitor ID)

ASCII: 01h-49h-59h-41h-41h-30h-41h-30h-34h-02h-30h-43h-03h-CHK-0Dh

STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'4'-STX-'0'-'C'-ETX-CHK-CR

The monitor replies the packet for confirmation as follows;

STX-'V'-'I'-'D'-'A'-'B'-'0'-'6'-STX-'0'-'0'-'0'-'C'-ETX-CHK-CR

5.5.1a Save Current settings Quick

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

This command supports only following items, in order to shorten execute time in monitor inside.

CONTRAST, BRIGHT, Color Temperature, IR Control, Information OSD, H-Position, V-Position, Sharpness, Black Level, Tint, Color, OSD Turn Off, Off Timer, OSD H-Position, OSD V-Position, Power On Delay, Gamma Selection, Tiling, Monitor ID, Clock, Clock Phase, Zoom, H-Resolution, V-Resolution.

STX	Command Code		ETX
	'0'	'D'	

- Send "OD"(30h, 44h) as Save current settings quick command.
- Complete "Save Current setting" command packet as follows;

ASCII: 01h-49h-59h-41h-41h-30h-41h-30h-34h-02h-30h-44h-03h-CHK-0Dh

STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'4'-STX-'0'-'D'-ETX-CHK- CR

The monitor replies the packet for confirmation as follows;

STX-'V'-'I'-'D'-'A'-'B'-'0'-'6'-STX-'0'-'0'-'0'-'D'-ETX-CHK- CR

5.5.2 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 10msec for command internal gap.)
- 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;
- (The destination "A" (monitor ID of 1) is only an example. It should be changed according to the target monitor ID)

01h-49h-59h-41h-41h-30h-41h-30h-34h-02h-42h-45h-03h-CHK-0Dh

STX-'V'-'I'-'D'-'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
STX-'V'-'I'-'D'-'A'-'0'-'C'-'0'-'6'	STX-'0'-'0'-'1'-'0'-'ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah)

which is corresponding to monitor ID from No1 to No.26 should be set to this portion.

If it is a broad cast command (only "set command" is available), then the '*' (2Ah) should be applied.

'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.

(If command is sent as "Broadcast" then no reply should be sent back.)

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'A'-'D'-'1'-'2'	STX-'0'-'0'-'0'-'0'-'1'-'0'-'0'-'0'-'0'-'0'-'0'-'6'-'4'-'0'-'0'-'3'-'2'-'E TX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor. ('A'(41h)-'Z'(5Ah))

'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	Delimite
STX-'V'-'I'-'D'-'A'-'0'-'E'-'0'-'A'	STX-'0'-'0'-'1'-'0'-'0'-'0'-'5'-'0'-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No.1 to No.26 should be set to this portion. If it is a broad cast command(only "set command" is available), then the '*' (2Ah) should be applied.

'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.

(If command is sent as "Broadcast" then no reply should be sent back.)

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'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

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah))

'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

1. 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
STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'4'	STX-'0'-'C'-'ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion. If it is a broad cast command (only "set command" is available), then the '*' (2Ah) should be applied.

'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

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

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion.

'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
STX-'V'-'I'-'D'-'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

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah))

'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

0004: Sleep/Standby (power save), OFF (same as IR power off)

000F: Force Power OFF with OPS

ETX (03h): End of Message

Check code

BCC: Block Check Code

Refer to the section –“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
STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'C'	STX-'C'-'2'-'0'-'3'-'D'-'6'-'0'-'0'-'0'-'1'-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion. If it is a broad cast command(only “set command” is available), then the '**'(2Ah)should be applied.

'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: Sleep/Standby (power save),OFF (same as power off by IR)

000F: Force Power OFF with OPS

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. (If command is sent as “Broadcast” then no reply should be sent back.).

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'A'-'B'-'0'-'E'	STX-'0'-'0'-'0'-'C'-'2'-'0'-'3'-'D'-'6'-'0'-'0'-'0'-'1'-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah)).

'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

2. 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)

000F: Force Power OFF with OPS

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. Date & Time read and write

8.1. 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
STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'6'	STX-'C'-'2'-'1'-'1'-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion.

'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

STX (02h): Start of Header '0' (30h):

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah)).

'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'(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

8.2. 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
STX-'V'-'I'-'D'-'A'-'0'-'A' -'1'-'4'	STX-'C'-'2'-'1'-'2'-YY-MM-DD-WW-HH-MN-DS-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion. If it is a broad cast command(only "set command" is available), then the '*' (2Ah) should be applied.

'0' (30h): Message sender is the controller

'A' (41h): Message type is "Command"

'1'-'4'(31h, 34h): 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

This parameter if no use, since the week is automatically calculated by Monitor based on the date data.

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.(If command is sent as "Broadcast" then no reply should be sent back.).

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'A'-'B'-'1'-'6'	STX-'C'-'3'-'1'-'2'-ST-YY-MM-DD-WW-HH-MN-DS-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah)).

'B' (42h): Message type is "Command reply"

'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

This parameter if no use, since the week is automatically calculated by Monitor based on the date data.

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

9. Schedule read and write

9.1. 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
STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'8'	STX-'C'-'2'-'1'-'3'-PG-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion.

'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

The monitor replies Schedule to the controller.

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'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

STX (02h): Start of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor. ('A'(41h)-'Z'(5Ah)).

'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): HDMI1
'0'-'A'(30h, 48h): HDMI2
'0'-'1'(30h, 31h): DVI-D
'0'-'2'(30h, 32h): D-SUB
'0'-'4'(30h, 34h): YPbPr(DVD/HD)
'0'-'5'(30h, 35h): VIDEO
'0'-'6'(30h, 36h): S-VIDEO
'0'-'7'(30h, 37h): It is operates by last memory input
'0'-'8'(30h, 38h): OPTION
'0'-'9'(30h, 39h): DisplayPort

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

Example)
'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: Everyday
bit 1: Every week
bit 2: Schedule Disable/Enable
* When bit0 and bit1 are '1', it behaves as Everyday

Example)

FL setting	Schedule	Everyweek	Everyday	Schedule behavior
'0'-'0' (30h, 30h)				Schedule Disable
'0'-'1' (30h, 31h)			0	Schedule Disable
'0'-'2' (30h, 32h)		0		Schedule Disable
'0'-'3' (30h, 33h)		0	0	Schedule Disable
'0'-'4' (30h, 34h)	0			Once *Follow WD (Week setting)
'0'-'5' (30h, 35h)	0		0	Everyday
'0'-'6' (30h, 36h)	0	0		Every week *Follow WD (Week setting)
'0'-'7' (30h, 37h)	0	0	0	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

9.2. 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
STX-'V'-'I'-'D'-'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

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No.1 to No.26 should be set to this portion. If it is a broad cast command (only "set command" is available), then the '*' (2Ah) should be applied.

'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): HDMI1

'0'-'A'(30h, 41h): HDMI2

'0'-'1'(30h, 31h): DVI-D

'0'-'2'(30h, 32h): D-SUB

'0'-'4'(30h, 34h): YpbPr(DVD/HD)

'0'-'5'(30h, 35h): VIDEO

'0'-'6'(30h, 36h): S-VIDEO
 '0'-'7'(30h, 37h): It is operates by last memory input
 '0'-'8'(30h, 38h): OPTION
 '0'-'9'(30h, 39h): DisplayPort

WD: Week setting

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

Example)

'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: Everyday
 bit 1: Every week
 bit 2: Schedule Disable/Enable
 * When bit0 and bit1 are '1', it behaves as Everyday.

Example)

FL setting	Schedule	Everyweek	Everyday	Schedule behavior
'0'-'0'(30h, 30h)				Schedule Disable
'0'-'1'(30h, 31h)			0	Schedule Disable
'0'-'2'(30h, 32h)		0		Schedule Disable
'0'-'3'(30h, 33h)		0	0	Schedule Disable
'0'-'4'(30h, 34h)	0			Once *Follow WD (Week setting)
'0'-'5'(30h, 35h)	0		0	Everyday
'0'-'6'(30h, 36h)	0	0		Everyweek *Follow WD (Week setting)
'0'-'7'(30h, 37h)	0	0	0	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.(If command is sent as "Broadcast" then no reply should be sent back.).

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'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

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah)).

'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): HDMI1

'0'-A'(30h, 41h): HDMI2

'0'-1'(30h, 31h): DVI-D

'0'-2'(30h, 32h): D-SUB

'0'-4'(30h, 34h): YpbPr(DVD/HD)

'0'-5'(30h, 35h): VIDEO

'0'-6'(30h, 36h): S-VIDEO

'0'-7'(30h, 37h): It is operates by last memory input

'0'-8'(30h, 38h): OPTION

'0'-9'(30h, 39h): DisplayPort

WD: Week setting

bit 0: Monday

bit 1: Tuesday
bit 2: Wednesday
bit 3: Thursday
bit 4: Friday
bit 5: Saturday
bit 6: Sunday

Example)

'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: Everyday

bit 1: Every week

bit 2: Schedule Disable/Enable

* When bit0 and bit1 are '1', it behaves as Everyday.

Example)

FL setting	Schedule	Everyweek	Everyday	Schedule behavior
'0'-'0'(30h, 30h)				Schedule Disable
'0'-'1'(30h, 31h)			0	Schedule Disable
'0'-'2'(30h, 32h)		0		Schedule Disable
'0'-'3'(30h, 33h)		0	0	Schedule Disable
'0'-'4'(30h, 34h)	0			Once *Follow WD (Week setting)
'0'-'5'(30h, 35h)	0		0	Everyday

'0'-'6'(30h, 36h)	0	0		Everyweek *Follow WD (Week setting)
'0'-'7'(30h, 37h)	0	0	0	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

10. Self diagnosis

10.1. 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
STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'4'	STX-'B'-'1'-ETX	BCC	CR

Header

STX (02h): Start of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion.

'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
STX-'V'-'I'-'D'-'A'-'B'-N-N	STX-'A'-'1'- ST(0)-ST(1) -----ST(n)-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah)).

'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

80:Cooling fan-1 abnormality
81:Cooling fan-2 abnormality
90:PANEL Backlight Driver Error

The data must be ASCII characters strings.

Example) 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

11. Serial No. & Model Name Read

11.1. 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
STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-'6'	STX-'C'-'2'-'1'-'6'-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor or ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion.

'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.(If command is sent as "Broadcast" then no reply should be sent back.).

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'A'-'B'-N-N	STX-'C'-'3'-'1'-'6'- Data(0)-Data(1)---Data(n)-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah)).

'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

11.2. 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
STX-'V'-'I'-'D'-'A'-'0'-'A'-'0'-' 6'	STX-'C'-'2'-'1'-'7'-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

If the command should be sent to certain monitor only, the either of character 'A'(41h) to 'Z'(5Ah) which is corresponding to monitor ID from No1 to No.26 should be set to this portion.

'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.(If command is sent as "Broadcast" then no reply should be sent back.)

Header	Message	Check code	Delimiter
STX-'V'-'I'-'D'-'A'-'B'-N-N	STX-'C'-'3'-'1'-'7'-Data(0) -Data(1)---- -Data(n)-ETX	BCC	CR

Header

STX (02h): Start Of Header

'V'-'I'-'D': Vendor ID

'A' (41h): Monitor ID

This portion should depend on the monitor ID of Monitor.('A'(41h)-'Z'(5Ah)).

'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' (41h, 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

APPENDIX 2

A. Operation Code (OP code) Table

	Item	OP code page	OP code	Parameter
PICTURE	Brightness	00h	10h	0: dark MAX.: bright
	Contrast	00h	12h	0: low MAX.: high
	Sharpness	00h	8Ch	0: dull MAX.: sharp
	Black Level	00h	92h	0: dark MAX.: bright
	Noise Reduction	02h	21h	0: Off MAX.
	Color control	00h	Red: 16h Green: 18h Blue: 1Ah	0: MAX.
	Gamma Selection	02h	69h	Gamma Table Selection 1: Native Gamma 4: Gamma=2.2 8: Gamma=2.4 7: S Gamma 5: Option
	Reserved	00h	14h	
	Color Temperature(2)	00h	0ch	0:2600K 74:10000K
	Picture reset	00h	08h	1: Reset
SCREEN	H Position	00h	20h	0: Left side Max.: Right side
	V Position	00h	30h	0: Down side Max.: Up side
	Clock	00h	0Eh	0: Max.
	Clock phase	00h	3Eh	0: Max.

	Item	OP code page	OP code	Parameter	Remarks
PIP	Zoom Mode	02h	CFh	1:REAL 2:custom 5:Dynamic 6:Normal 7:FULL	
	Screen reset	00h	06h	1: Reset	Momentary
	PIP Size	02h	72h	1: Small 2: Middle 3: Large	
	PIP Audio			N/A	
	PIP Reset			N/A	Momentary
	Language	00h	68h	1:English 2:German 3:French 4:Spanish 5:Japanese 6:Italian 7:Swedish 8:Chinese	OSD Language

	Item	OP code page	OP code	Parameter	Remarks
	Motion	02h	DEh	0: 0s(Off) 90: 900s	10s/step
	Color System	02h	22h	1: NTSC 2: PAL 3: SECAM 4: Auto 5: 4.43NTSC 6: PAL-60	
	Side Border Color	02h	E0h	0:Black 1: Middle 2: White	
	Factory Reset	00h	04h	1: Reset	Momentary
	Configuration Reset			N/A	

Configuration 2					
	OSD Turn Off	00h	FCh	0-4:Do not set. 5:5sec 120:120sec	
	OSD Position	H Position	02h	39h	0: MAX.:
		V Position	02h	3Ah	0: MAX.:
	OSD Rotation	02h	42h	0: OFF 1: 90degree Rotation 2: H MIRROR 3: V MIRROR 4: 180degree Rotation 5: 270degree Rotation	OSD Rotation

	Item	OP code page	OP code	Parameter	Remarks
	Monitor ID	02h	3Fh	1-26:ID	
	IR Control	02h	40h	1: Lock (Off) 3: Primary 2: Normal 4: Secondary	
	Advanced Option Reset	02h	E5h	1: RESET	Momentary
	Input	00h	60h	0: No mean 1: D-SUB 2: Reserved 3: HDMI1 18 HDMI2 4: DVI-D 12: YPbPr 5: VIDEO (Composite) 7: S-VIDEO 8: OPTION 9: DisplayPort	
	PIP ON/OFF Still ON/OFF	02h	73h	1: OFF 2: PIP 4: Still	

	Item	OP code page	OP code	Parameter	Remarks
	Mute	00h	8Dh	0, 2: UNMUTE 1: MUTE	
	Volume UP/Down	00h	62h	0: whisper 100: loud	
CONTROL LOCK	CONTROL LOCK of Front button and IR control (ON/OFF)	00h	E3h	0: UN LOCK (Off) 1: LOCK (ON)	This LOCK is unlocked in the same manner as LOCK status of IR CONTROL.