

LCD Monitor

Interface Manual for Programmers

LMD-3251ST

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RS-232C

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Ethernet

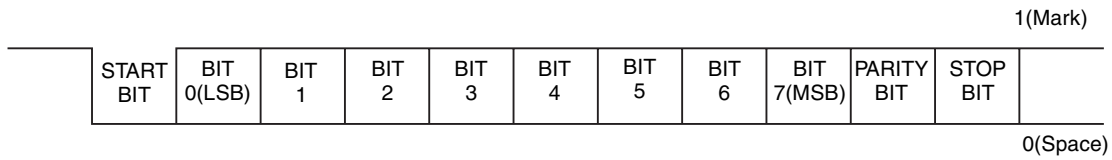
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Communication Format

Asynchronous, bit serial signal

- Based on RS-232C
- Data signaling rate: 38400 bit/sec
- Start bit: 1 bit
- Data bit: 8 bits
- Parity: Even
- Stop bit: 1 bit



Command Block Format

Data communication between the remote controller and the monitor is performed in accordance with the following format.

| STX | Byte Count | Destination Address | Source Address | Command Block | Checksum |
|--------|------------|---------------------|----------------|---------------|----------|
| 1 byte | 1 byte | 1 byte | 1 byte | n bytes | 1 byte |

- **STX:** start of text code value equals 02H.
- **Byte Count**
This indicates the number of data bytes (maximum 255 bytes) which have been inserted between this byte and the Checksum byte. Values 00H, 01H, 02H are illegal values.
- **Destination address:**
One byte address value which defines who receives the message. The value 01H should be specified.
- **Source address:**
One byte address value which defines who transmits the message. The destination to which the reply should be sent is shown with this value. A value from 41H to 7FH should be specified.
- **Command Block**
This designates a particular command. Refer to “Command Description” (on page 7) for the details.
- **Checksum**
This value is set so that the bottom eight bits of the sum of all bytes from the byte count to the checksum inclusive are zero.

Communication Protocol

The remote controller should take the initiative in communication between the remote controller and the monitors.

The monitor will carry out one of the following actions when receiving the message.

- When the received message is an undefined message, a communication error occurs or the automatic adjustment of APA or AUTO CHROMA/PHASE is working, a NAK (05H) is issued.
- When the received command is a question, the specific replay and data are issued.
- When the received command is anything else, an ACK is issued.

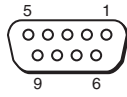
The next message can be received as soon as a NAK is issued from the monitor to the remote controller.

Notes

- If there are not enough or too many data bytes of data values then a NAK is issued and no values are specified.
- Bits which are not specified here are undefined bits and their values are always ignored.

Connections

Pin assignment for the RS-232C connector is as follows.



| Pin number | Signal |
|------------|--------|
| 1 | NC |
| 2 | RX |
| 3 | TX |
| 4 | NC |
| 5 | GND |
| 6 | NC |
| 7 | RTS |
| 8 | CTS |
| 9 | NC |

Features of the Command Protocol

This protocol provides the following features when individual monitors are controlled.

- Switch functions can be changed.
- The ability to remotely make settings and adjustments normally made with the monitor's menu.

Command Table

Using this protocol, the following commands can be executed by the monitors.

All values in the following table are hexadecimal.

| Command from Remote Controller | | | Return from Monitor | | |
|--------------------------------|-------------------------|------------|---------------------|---------------------|------------|
| Specific Command | Name | Data Bytes | Specific Command | Name | Data Bytes |
| 21 | Input Config | 2 | 04 | ACK | 0 |
| 23 | Control Data | × | 04 | ACK | 0 |
| 24 | Display Data | × | 04 | ACK | 0 |
| 25 | User Memory | 1 | 04 | ACK | 0 |
| 26 | Memory Name | × | 04 | ACK | 0 |
| 27 | I/P Mode | 1 | 04 | ACK | 0 |
| 28 | Selected Offset | 1 | 04 | ACK | 0 |
| 29 | On Switch Function | 1 | 04 | ACK | 0 |
| 2A | Off Switch Function | 1 | 04 | ACK | 0 |
| 2B | Select Display | 1 | 04 | ACK | 0 |
| 2C | Select Menu | 1 | 04 | ACK | 0 |
| 2D | Scan Aspect | 1 | 04 | ACK | 0 |
| 2F | Select Config Data | 2 | 04 | ACK | 0 |
| 30 | Picture Config | 1 | 04 | ACK | 0 |
| 31 | Multi Display | 3 | 04 | ACK | 0 |
| 3D | BKM-256DD | 2 | 04 | ACK | 0 |
| 3E | 3D Function 1 | 2 | 04 | ACK | 0 |
| 3F | 3D Function 2 | 2 | 04 | ACK | 0 |
| 40 | White Balance Data | × | 04 | ACK | 0 |
| 42 | White Balance Data Copy | 1 | 04 | ACK | 0 |
| 43 | User Memory Data | × | 04 | ACK | 0 |
| 49 | 3D Offset | 2 | 04 | ACK | 0 |
| 4A | Select 3D Offset | 1 | 04 | ACK | 0 |
| 60 | Status Sense | 1 | 70 | Status Reply | × |
| 61 | White Balance Sense | 1 | 71 | White Balance Reply | 7 |
| 63 | 3D Offset Sense | 1 | 73 | 3D Offset Reply | 7 |
| 65 | User Memory Sense | 1 | 75 | User Memory Reply | × |
| 6E | Status Remote | 0 | 7E | Status Remote Reply | 1 |

× : varies depending on the number of data items.

Command Description

Input Config (21H)

Used to control the current video signal being displayed on the monitor.

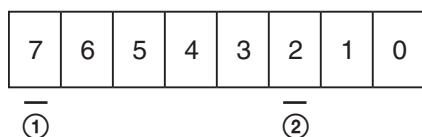
The switches effectively being controlled are Input Connector and Preset White Balance.

The command has two sections.

1. Information being changed
2. Values to be applied

1. Information being changed

The values are specified as follows:



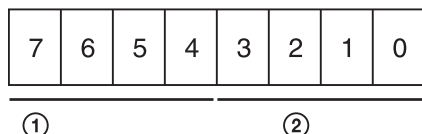
① Input connector information

② Preset white balance information

When 1 is set in the bit position, information for the bit is applied. When 0 is set, information for the bit is ignored. When 1 is set in the ① and ② bit positions, information on both items is applied.

2. Values to be applied

The values are specified as follows:



① Input connector

- COMPOSITE = 0000
- Y/C = 0010
- RGB = 0100
- COMPONENT = 0101
- DVI = 1000
- HD15 = 1001
- OPTION A-1 = 0110
- OPTION A-2 = 0111
- OPTION B-1 = 1010
- OPTION B-2 = 1011

The values which are specified here are applied to the current monitor state if the input setting is set to ON. If the input setting is set to OFF, the values are ignored.

② Preset white balance information

- D56 = 0001
- D65 = 0011
- D93 = 0000
- USER CONFIG 1 = 0010
- USER CONFIG 2 = 0100
- USER CONFIG 3 = 0110
- USER CONFIG 4 = 0111
- USER CONFIG 5 = 1000

The values specified here are applied to the current monitor state.

Control Data (23H)

Defines the keys on the front panel and data in the USER CONTROL menu.

The command has two sections.

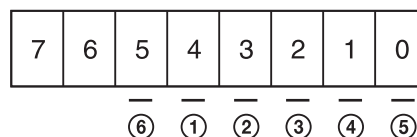
1. The element of CONTROL data being sent
2. CONTROL data value

1. The element of CONTROL data being sent

The element of CONTROL data being sent is the first byte of data contained within the command block of the message.

Several items of CONTROL data can be specified in one message stream. When the bit of an item is set to 1, the data value is changed, and it is set to 0, the data value is not changed. When the byte value is 0, no data are changed and an ACK is issued.

The values are specified as follows:



① CONTRAST

② APERTURE

③ BRIGHTNESS

④ PHASE

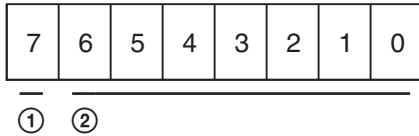
⑤ CHROMA

⑥ BACKLIGHT

2. CONTROL data value

Each value is one byte of data. APERTURE is specified as 0 to 6, BACKLIGHT is specified as 0 to 5 and others are 0 to 100 (8 bit data, MSB is a mark data. If the value is a negative number, it is represented as a complement of 2). The data is defined from the lower bit item to the higher one. For example, if the PHASE and CONTRAST data are defined, the PHASE data is specified in the first byte and the CONTRAST data is specified in the next byte.

The values are specified as follows:



① Mark data

- + = 0
- = 1

② Numerical value data

The values of the CONTROL data which is defined by this command are applied to the current monitor state.

Display Data (24H)

Defines PITCH, DOT PHASE, SIZE H, SIZE V, SHIFT H and SHIFT V data in the USER CONFIG menu. The command has two sections.

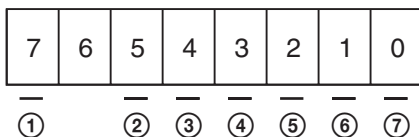
1. The element of USER CONFIG data being sent
2. USER CONFIG data value

1. The element of USER CONFIG data being sent

The element of USER CONFIG data being sent is the first byte of the command block of the message. Several items of USER CONFIG data can be specified in one message stream. If 1 is indicated in the bit position, the data is changed and 0 is indicated, no data is changed.

If the byte value is 0, no data are changed and an ACK is issued. If the RESET value is set to 1, all items are specified to the default setting.

The values are specified as follows:



- ① RESET
- ② PITCH
- ③ DOT PHASE
- ④ SIZE H
- ⑤ SIZE V
- ⑥ SHIFT H
- ⑦ SHIFT V

2. USER CONFIG data value

Each adjustment value is one byte of data (8 bit data, MSB is a mark data. If the value is a negative number, it is represented as a complement of 2). The data are defined from the subordinate bit element to the superordinate bit element in the data bytes. For

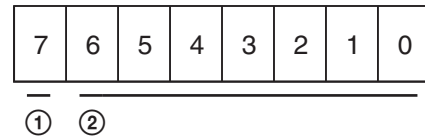
example, if the data to be adjusted are SIZE H and SHIFT H, then the first byte of data bytes is for SHIFT H and the next byte is for SIZE H.

Adjustment Item Max. Min.

| | | |
|-----------|------|------|
| PITCH | 0 | 32 |
| DOT PHASE | 0 | 63 |
| SIZE H | -100 | +100 |
| SIZE V | -100 | +100 |
| SHIFT H | * | * |
| SHIFT V | * | * |

* The maximum and minimum values vary according to the input signal (resolution). See "Maximum and minimum values of SHIFT H and SHIFT V" (page 34).

The values are specified as follows:



① Mark data

- + = 0
- = 1

② Numerical value data

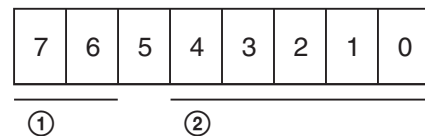
This is not the data to increase or decrease the setting. Enter the adjustment value.

The standard value (center value) of the PITCH data is not always 0 (zero). It differs depending on the input signals. The maximum and minimum values mentioned above are variable values to each standard value.

User Memory (25H)

Controls LOAD/SAVE of each data set in the USER MEMORY menu.

The values are specified as follows:



① Control data

- LOAD = 01
- SAVE = 10

② User memory number

Specifies the number 01 to 20.

If a number other than the above except 00 is specified, an ACK is issued.

When 00 is specified, the data is applied as follows:
If LOAD (01) is specified in ①, the default setting is applied.

If SAVE (10) is specified in ①, an ACK is issued.

Memory Name (26H)

Defines the name (ASCII) of each user memory in the USER MEMORY menu.

The command has two sections.

1. User memory number to change the name
2. Memory name setting data

1. User memory number to change the name

Defines the user memory number to change the name.

The values are specified as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|

①

① User memory number

Specifies the number 01 to 20. If a number other than 01 to 20 is specified, a NAK is issued.

2. Memory name setting data

1. Specifies the length of the name

Specifies 1 to 18 characters.

2. Specifies the name data (ASCII code)

Usable characters are as follows (42 characters):

| | | | | | | | | | | | |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| ASCII | 0x20 | 0x2C | 0x2D | 0x2E | 0x2F | 0x30 | 0x31 | 0x32 | 0x33 | 0x34 | 0x35 |
| Character | Space | , | - | . | / | 0 | 1 | 2 | 3 | 4 | 5 |
| ASCII | 0x36 | 0x37 | 0x38 | 0x39 | 0x41 | 0x42 | 0x43 | 0x44 | 0x45 | 0x46 | 0x47 |
| Character | 6 | 7 | 8 | 9 | A | B | C | D | E | F | G |
| ASCII | 0x48 | 0x49 | 0x4A | 0x4B | 0x4C | 0x4D | 0x4E | 0x4F | 0x50 | 0x51 | 0x52 |
| Character | H | I | J | K | L | M | N | O | P | Q | R |
| ASCII | 0x53 | 0x54 | 0x55 | 0x56 | 0x57 | 0x58 | 0x59 | 0x5A | 0x5F | | |
| Character | S | T | U | V | W | X | Y | Z | _ | | |

If data other than the data listed above is specified, the message is ignored and a NAK is issued.

I/P Mode (27H)

Controls the MODE select of I/P MODE.
The values are specified as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ① | | | | ② | | | |

① ② Mode select

01 00 INTER-FIELD

01 01 FIELD MERGE

01 10 LINE DOUBLER

The values are applied to the current monitor state.

Selected Offset (28H)

Defines the offset to be applied to COMPONENT or NTSC signal which is selected to be displayed on the monitor.

The values are specified as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ① | | | | ② | | | |

① **COMPONENT signal offset**

SMPTE = 01

BETA 0 = 10

BETA 7.5 = 11

② **NTSC signal offset**

NTSC 0 = 01

NTSC 7.5 = 10

The values are applied to the current monitor state.

On Switch Function (29H)

This command is used to set the offset value of APA, POWER SAVING, KEY INHIBIT, Tally Lamp (green), BLUE ONLY, MONO, MIRROR IMAGE, BACKGROUND and SPLASH LOGO to ON.

The values are specified as follows:

| | | | | | | | |
|---|---|---|---|---|---|-----|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ① | | ④ | | ② | | ④ ③ | |

① ② ③ ④ Action taken

11 001 APA applied

11 010 POWER SAVING applied

11 100 KEY INHIBIT applied

11 101 Tally Lamp (green) applied

1 11 011 BLUE ONLY applied

1 11 100 MONO applied

1 11 101 MIRROR IMAGE applied

1 11 000 BACKGROUND applied

1 00 000 10 SPLASH LOGO applied (5 seconds)

1 00 010 10 SPLASH LOGO applied (10 seconds)

Off Switch Function (2AH)

This command is used to set the offset value of APA, POWER SAVING, KEY INHIBIT, Tally Lamp (green), BLUE ONLY, MONO, MIRROR IMAGE, BACKGROUND and SPLASH LOGO to OFF.

The values are specified as follows:

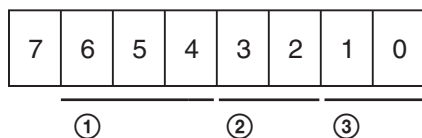
| | | | | | | | |
|---|---|---|---|---|---|-----|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ① | | ④ | | ② | | ④ ③ | |

| ① | ② | ③ | ④ | Action taken |
|---|----|-----|----|----------------------------------|
| | 11 | 001 | | APA removed |
| | 11 | 010 | | POWER SAVING removed |
| | 11 | 100 | | KEY INHIBIT removed |
| | 11 | 101 | | Tally Lamp (green) removed |
| 1 | 11 | 011 | | BLUE ONLY removed |
| 1 | 11 | 100 | | MONO removed |
| 1 | 11 | 101 | | MIRROR IMAGE removed |
| 1 | 11 | 000 | | BACKGROUND removed |
| 1 | 00 | 000 | 10 | SPLASH LOGO removed (5 seconds) |
| 1 | 00 | 010 | 10 | SPLASH LOGO removed (10 seconds) |

Select Display (2BH)

Defines the offset values of LANGUAGE and FORMAT DISP in the menu.

The values are specified as follows:



① LANGUAGE

ENGLISH = 001
 GERMAN = 010
 FRENCH = 011
 ITALIAN = 100
 SPANISH = 101
 JAPANESE = 110
 CHINESE = 111

② 3D FORMAT DISP

AUTO = 01
 ON = 10
 OFF = 11

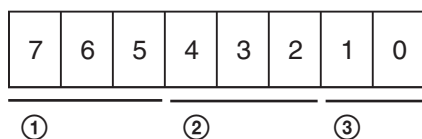
③ FORMAT DISP

AUTO = 01
 ON = 10
 OFF = 11

Select Menu (2CH)

Defines the offset value of GAMMA, COLOR SPACE and CHROMA in the menu.

The values are specified as follows:



① GAMMA offset

GAMMA3 (2.2) = 011
 GAMMA5 (DICOM) = 101

② COLOR SPACE offset

OFF = 001
 ITU-709 = 111

③ CHROMA offset

OFF = 01
 ON = 10
 AUTO ADJUST = 11

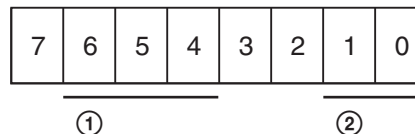
The values are applied to the current monitor state.

If a correct signal is not input or the adjustment is in failure, an error message is issued for AUTO ADJUST definition.

Scan Aspect (2DH)

Defines SCAN and ASPECT in the menu.

The values are specified as follows:



① SCAN

NORMAL = 000
 OVER = 001
 FULL = 011
 NATIVE = 101

② ASPECT

4:3 = 00
 16:9 = 01

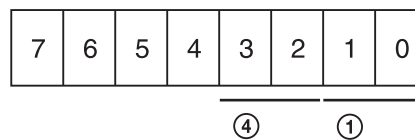
The values are applied to the current monitor state.

Select Config Data (2FH)

Defines SYNC and COMPUTER DETECT in the menu.

Define one byte each.

The values are specified as follows:



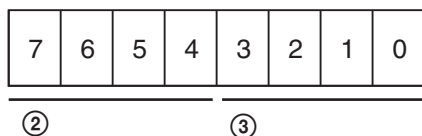
① SYNC

The sync signal is the internal one = 01
 The sync signal is the external one = 10

④ AUTO SYNC DETECT

The sync signal is detected manually = 01

The sync signal is detected automatically = 10



② COMPUTER DETECT (DVI)

PRESET1 = 0001
 PRESET2 = 0010
 PRESET3 = 0011
 PRESET4 = 0100
 PRESET5 = 0101
 PRESET6 = 0110
 PRESET7 = 0111
 PRESET8 = 1000

③ COMPUTER DETECT (HD15)

PRESET1 = 0001
 PRESET2 = 0010
 PRESET3 = 0011
 PRESET4 = 0100
 PRESET5 = 0101
 PRESET6 = 0110

The values are applied to the current monitor state.
 SYNC data is applied when the COMPONENT or RGB signal is input.

COMPUTER DETECT data is applied when the DVI or HD15 signal is input.

If the correct value is specified, an ACK is issued.

The values of SYNC data or COMPUTER DETECT data can only be set one at a time.

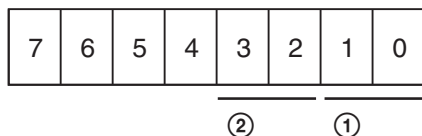
Before setting the values of SYNC data, set the byte values of the COMPUTER DETECT data to 00.

Before setting the values of COMPUTER DETECT data, set the byte values of the SYNC data to 00.

Picture Config (30H)

This command is used to set the SD PIXEL MAPPING.

The values are specified as follows:



① COMPOSITE&Y/C

712×483/702×576 = 01
 720×487/720×576 = 10

② RGB/COMPONENT

712×483/702×576 = 01
 720×487/720×576 = 10

Multi Display (31H)

This command is used to set the multi display.

Send the following commands to execute this function:

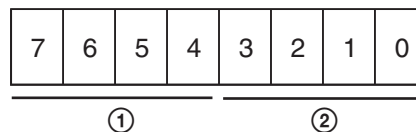
1. Set the input signal of the sub display
2. Set the multi display (PIP/POP/SIDE BY SIDE)
3. Set the multi display to ON/OFF
- 4-1. Set the size of the sub display (when PIP is selected)
- 4-2. Set the position of the frame (when POP is selected)
5. Set the position of the sub display

The setting of the multi display consists of three bytes. The first data byte refers to the input signal setting of the sub display and the setting of the multi display. The second data byte refers to the setting of the display position.

The third data byte is set to "0x00".

The values are specified as follows.

Input Signal and Multi Display



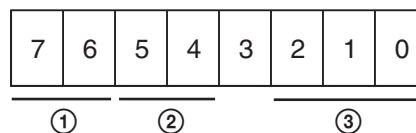
① Input signal

COMPOSITE = 0000
 Y/C = 0010
 RGB = 0100
 COMPONENT = 0101
 DVI = 1000
 HD15 = 1001
 OPTION A-1 = 0110
 OPTION A-2 = 0111
 OPTION B-1 = 1010
 OPTION B-2 = 1011
 WAVE FORM = 1100
 OFF = 1110

② Multi Display

PIP = 0010
 POP = 0100
 SIDE BY SIDE = 0011
 MULTI DISPLAY ENABLE OFF = 0111
 MULTI DISPLAY ENABLE ON = 1111

Position



① **Sub picture size¹⁾**

- 1 = 01
- 2 = 10

② **Frame²⁾**

- FRAME RIGHT = 01
- FRAME LEFT = 10

③ **Display**

- POSITION 1 = 001
- POSITION 2 = 010
- POSITION 3 = 011
- POSITION 4 = 100¹⁾

1) This setting is available when PIP is selected.
 2) This setting is available when POP is selected.

1. Set the input signal of the sub display

1. Use the upper 4 bits of the first data byte to set the "Input signal".
2. Set the lower 4 bits of the first data byte to "0x0".
3. Set the second data byte and the third data byte to "0x00".

2. Set the multi display (PIP/POP/SIDE BY SIDE)

1. Set the upper 4 bits of the first data byte to "0xf".
2. Use the lower 4 bits of the first data byte to set the "Multi Display".
3. Set the second data byte and the third data byte to "0x00".

3. Set the multi display to ON/OFF

1. Set the upper 4 bits of the first data byte to "0xf".
2. Use the lower 4 bits of the first data byte to set the multi display to ON/OFF.
3. Set the second data byte and the third data byte to "0x00".

4-1. Set the size of the sub display (when PIP is selected)

1. Set the first data byte to "0xf0".
2. Use bit 7 and 6 of the second data byte to set the size of the sub display.
3. Set bit 5, 4, 2, 1 and 0 of the second data byte to "0x0".
4. Set the third data byte to "0x00".

4-2. Set the position of the frame (when POP is selected)

1. Set the first data byte to "0xf0".
2. Set bit 7 and 6 of the second data byte to "0x0".
3. Use bit 5 and 4 of the second data byte to set the frame position.
4. Set bit 2, 1 and 0 of the second data byte to "0x0".
5. Set the third data byte to "0x00".

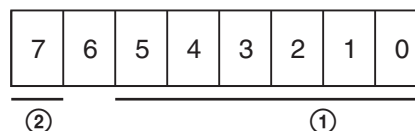
5. Set the position of the sub display

1. Set the first data byte to "0xf0".
2. Set bit 7, 6, 5 and 4 of the second data byte to "0x0".

3. Use bit 2, 1 and 0 to set the picture position of the sub display.
4. Set the third data byte to "0x00".

BKM-256DD (3DH)

This command is used to control ON/OFF of external output and EDID UPDATE function of BKM-256DD. The values are specified as follows.



① **External 5 V power output**

- EXT 5V DVI-IN ON = 000001
- EXT 5V DVI-IN OFF = 000010
- EXT 5V DVI-OUT ON = 000100
- EXT 5V DVI-OUT OFF = 001000

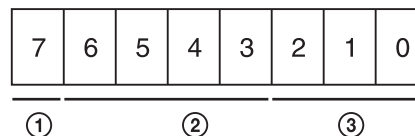
② **EDID UPDATE**

- EDID UPDATE START = 1

3D Function 1 (3EH)

This command is used to adjust the 3D settings for BKM-250TG and 3D settings when DVI signal is input. The values are specified as follows:

2D/3D settings



① **2D/3D SELECT**

- 2D = 1
- 3D = 0

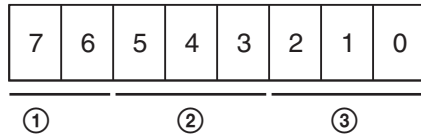
② **SIGNAL FORMAT**

- 3G-B = 0010
- DUAL = 0100
- SEQUENTIAL = 0110
- SIDE BY SIDE = 1000
- LINE BY LINE = 1010
- AUTO 1 = 1110
- AUTO 2 = 1111

③ **DISPLAY**

- INTER = 001
- PROG = 010
- PSF = 011

Horopter settings



① HOROPTER CHECK

OFF = 10
ON = 01

② LEFT

NORMAL = 001
BLACK = 010
MONO = 011
RED = 100
BLUE = 101

③ RIGHT

NORMAL = 001
BLACK = 010
MONO = 011
RED = 100
BLUE = 101

3D Function 2 (3FH)

This command is used to adjust the 3D display settings for BKM-250TG and 3D display settings when DVI signal is input.

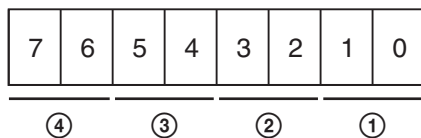
The command has two sections.

1. The element of CONTROL data being sent
2. CONTROL data value

1. The element of CONTROL data being sent

This command is used to display the following functions on the screen; checkerboard, L/R switch and disparity simulation. This is also used to make the channel settings of disparity simulation.

The values are specified as follows:



① CHECKERBOARD

ON = 01
OFF = 10

② L/R SWITCH

ON = 01
OFF = 10

③ DISPARITY SIM.

LR = 01

L = 10

R = 11

④ DISPARTY

OFF = 10

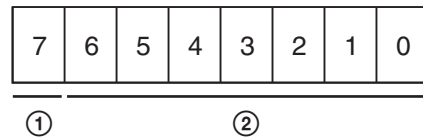
ON = 11

The values set in the CONTROL are applied.

2. CONTROL data value

Values for disparity simulation is specified as -50 to +50, and each value is one byte of data. (8 bit data, MSB is a mark data. If the value is a negative number, it is represented as a complement of 2). The data is defined from the lower bit item to the higher one.

The values are specified as follows:



① Mark data

+ = 0

- = 1

② Numerical value data

White Balance Data (40H)

This command is used to save the values for USER of the white balance data into the NVM of the monitor from the remote controller.

Color temperature values are applied when the values are set to "USER".

The preset white balance data are not changed by this command.

The command has two sections:

1. The elements of white balance data being sent (first data byte and 14th data byte¹⁾)
2. The white balance values to be saved (second data byte to 13th data byte)

Data bytes depend on the data items specified in the first data byte and 14th data byte¹⁾.

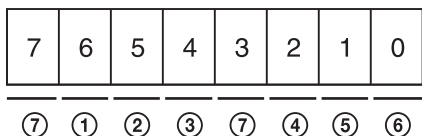
1. The elements of white balance data being sent

The element of white balance data being sent is judged by the first data byte and 14th data byte¹⁾ of the command block of the message.

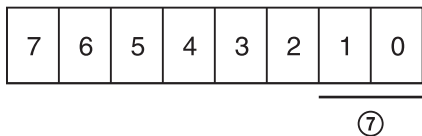
Several elements of white balance data can be specified in one message stream. When the bit of an item is set to 1, the data value is changed, and it is set to 0, the data value is not changed.

The values are specified as follows:

First data byte:



14th data byte¹⁾:



- ① B Bias
- ② G Bias
- ③ R Bias
- ④ B Gain
- ⑤ G Gain
- ⑥ R Gain
- ⑦ USER

| USER | 14th Data Byte ¹⁾ | | First Data Byte | |
|-------|------------------------------|-------|-----------------|-------|
| | bit 1 | bit 0 | bit 7 | bit 3 |
| USER1 | - | - | 0 | 1 |
| USER2 | - | - | 1 | 0 |
| USER3 | - | - | 1 | 1 |
| USER4 | 0 | 1 | * | * |
| USER5 | 1 | 0 | * | * |

*: indefinite

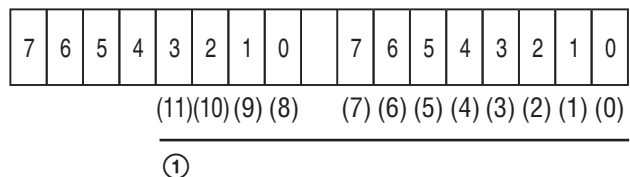
1) Necessary when setting "USER4" and "USER5". Adjustment values from the second to the 14th data byte are necessary. However, only data items set to "1" in the first data byte will be changed.

2. The white balance values to be saved

The elements of white balance data mentioned above contained in the bit are accepted in the order from the lower to upper bit elements. For example, when the bits specified as B Bias and R Gain are set to 1, R Gain data value is changed first, then B Bias value. The adjustment values, which consist of two bytes, are sent in the order from lower to upper byte elements.

Gain data consist of 12 bits and the setting values are in the range between 0 and 4095.

The values are specified as follows:



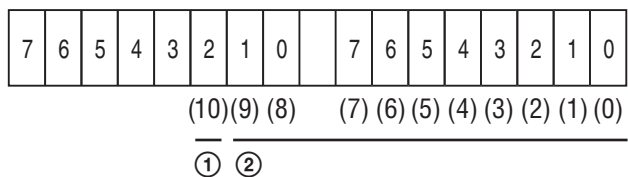
① Numerical value data

This is not the data to increase or decrease the current setting value.

Enter the adjustment value.

Bias data consist of 11-bit. MSB is a Mark data and is represented as a complement of 2. The setting values are in the range between -1024 and 1023.

The values are specified as follows:



① Mark data

+ = 0

- = 1

② Numerical value data

This is not the data to increase or decrease the current setting value.

Enter the adjustment value.

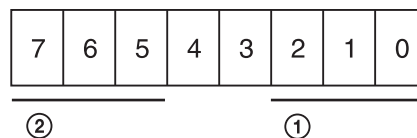
If the subcommand is not defined, NAK and an undefined message error are issued. If the subcommand is properly defined, ACK is issued.

White Balance Data Copy (42H)

This command is used to copy the values for USER of the preset white balance data from the color temperature data and save them into the NVM of the monitor. The values are applied to the current monitor state.

The color temperature values of the source data are specified at the first byte.

The values are specified as follows:



Bits which are not specified here are undefined bits.

① Preset white balance

D56 = 001

D65 = 011

D93 = 000

② USER CONFIG

USER CONFIG 1 = 010

USER CONFIG 2 = 100

USER CONFIG 3 = 110

USER CONFIG 4 = 001

User Memory Data (43H)

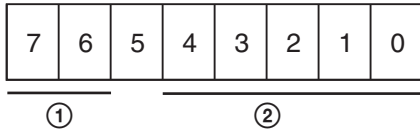
The memory data 01 to 20 are stored in the NVM of the monitor by using the remote controller.

The user memory data cannot be loaded by this command.

This command consists of the following data. A number of the byte differs according to the setting of the user memory name.

First data byte: Specifies the user memory number in one data byte.

The values are specified as follows:



① **User memory control**

SAVE = 10

② **User memory number**

Specifies the numbers 01 to 20.

Second data byte: Specifies the CONTRAST in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

Third data byte: Specifies the APERTURE (except 15k) in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

4th data byte: Specifies the APERTURE (15k) in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

5th data byte: Specifies the BRIGHTNESS in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

6th data byte: Specifies the PHASE in one data byte.

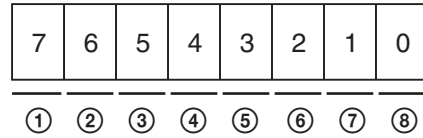
The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

7th data byte: Specifies the CHROMA in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

8th data byte: Specifies the ASPECT in one data byte. Specifies for each input signal. If bit 1 is specified, the aspect is set to 16:9 and bit 0 is specified, the aspect is set to 4:3.

The values are specified as follows:



- ① **OPTION B-2**
- ② **OPTION B-1**
- ③ **OPTION A-2**
- ④ **OPTION A-1**
- ⑤ **COMPONENT**
- ⑥ **RGB**
- ⑦ **Y/C**
- ⑧ **COMPOSITE**

9th/10th data bytes: Specifies the white balance (R Gain) in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

11th/12th data bytes: Specifies the white balance (G Gain) in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

13th/14th data bytes: Specifies the white balance (B Gain) in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

15th/16th data bytes: Specifies the white balance (R Bias) in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

17th/18th data bytes: Specifies the white balance (G Bias) in two data bytes.

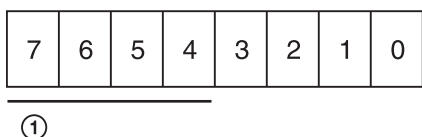
For details on the specified values, see “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

19th/20th data bytes: Specifies the white balance (B Bias) in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

21st data byte: Specifies the color temp in one data byte.

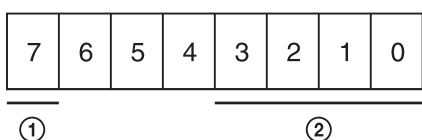
The values are specified as follows:



The data (four bits) specified in ① is the same as those specified in “2-② Preset white balance information” of “Input Config (21H)” on page 7.

22nd data byte: Specifies the COMPUTER DETECT and the PRESET in one data byte.

The values are specified as follows:



① COMPUTER DETECT

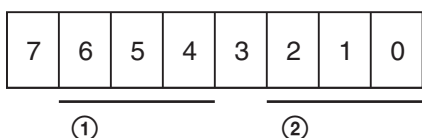
HD15 = 0
DVI = 1

② PRESET

PRESET1 = 0001
PRESET2 = 0010
PRESET3 = 0011
PRESET4 = 0100
PRESET5 = 0101
PRESET6 = 0110
PRESET7 = 0111
PRESET8 = 1000

23rd data byte: Specifies the gamma and scan mode in one data byte.

The values are specified as follows:



The bits other than those explained here are undefined bits.

① Gamma offset

GAMMA3 (2.2) = 011
GAMMA5 (DICOM) = 101

② Scan mode offset

NORMAL = 000
OVER = 001
FULL SCREEN = 011
NATIVE = 101

If the value other than the above values is specified, a NAK is issued.

24th data byte: Specifies the I/P Mode in one data byte. The byte order is the same as that specified in “I/P Mode (27H)” on page 10.

25th data byte: Specifies the source data from which the values for USER of the white balance data is copied. The byte order is the same as that specified in “White Balance Data Copy (42H)” on page 15.

26th data byte: Specifies the user memory name length in one data byte.

The byte order is the same as that specified in “2-1 Specifies the length of the name” of “Memory Name (26H)” on page 9.

27th data byte: Specifies the user memory name (maximum 44 data bytes).

The byte order is the same as that specified in “2-2 Specifies the name data” of “Memory Name (26H)” on page 9.

3D Offset (49H)

This command is used to save the 3D offset data into the NVM of the monitor from the remote controller.

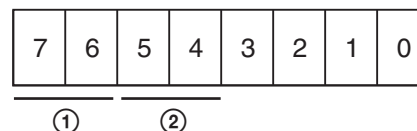
The command has two sections:

1. The elements of 3D offset data being sent
2. The 3D offset values to be saved

1. The elements of 3D offset data being sent

The element of 3D offset data being sent is judged by the first byte of the command block of the message. One element of 3D offset data can be specified in one message stream.

The values are specified as follows:



① R/G/B select

R = 10
G = 01
B = 11

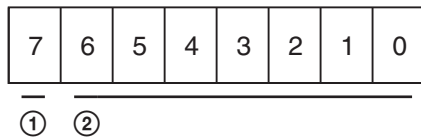
② GAIN/BIAS select

GAIN = 10
BIAS = 01

2. The 3D offset values to be saved

This command is used to set the element of 3D offset data specified. The data consists of 8-bit. MSB is a Mark

data and is represented as a complement of 2. The setting values are in the range between -100 and +100. The values are specified as follows:



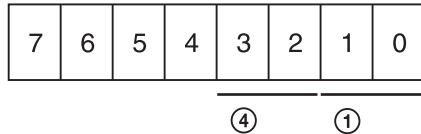
① Mark data

+ = 0
- = 1

② Numerical value data

Select 3D Offset (4AH)

This command is used to set the 3D offset mode. The values are specified as follows.



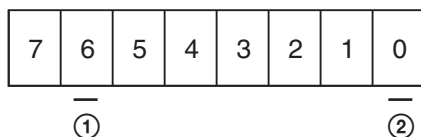
① 3D offset

AUTO = 01
ON = 10
OFF = 11

Status Sense (60H)

This command is used to sense the status of the monitor's current operation. The remote controller can specify which items of data should be replied. Specify them in one data byte.

The values are specified as follows:



The bit to request the reply must be set to 1.

① Selected offset

② Current Input Configuration

If there is no reply, a NAK is issued.

The monitor will send Status Reply (70H) to the remote controller.

White Balance Sense (61H)

This command is used to obtain the values for USER of the white balance data stored in the NVM of the monitor. The preset white balance data are not changed by this command.

The values are specified as follows:



Bits required for the white balance data

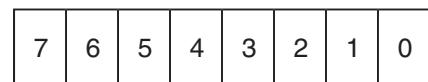
The bit to request the white balance data must be set to 1. If there is no reply, a NAK is issued.

The monitor will send White Balance Reply (71H) to the remote controller.

3D Offset Sense (63H)

This command is used to obtain the 3D offset data stored in the NVM of the monitor.

The values are specified as follows:



Bits required for the 3D offset data

The bit to request the 3D offset data must be set to 1. If there is no reply, a NAK is issued.

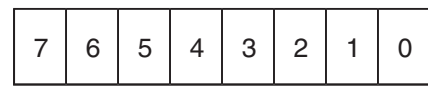
The monitor will send 3D Offset Reply (73H) to the remote controller.

User Memory Sense (65H)

This command is used to obtain the values for user memory data stored in the NVM of the monitor.

The user memory data is not loaded by this command.

The values are specified as follows:



① User memory control

Data send for user memory = 11

② User memory number

Specifies the numbers 01 to 20.

If there is no reply, a NAK is issued.

The monitor will send User Memory Reply (75H) to the remote controller.

Status Remote (6EH)

This command is used to obtain the current remote control status for the monitor.
The monitor will reply with the Status Remote Reply (7EH).

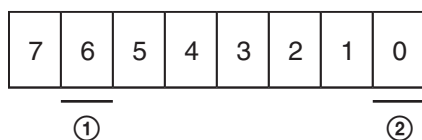
Status Reply (70H)

This command is used to send back the required status data to the remote controller.
The [0x70] command data is specified as the first data byte of the command block.
The reply consists of two sections.

- 1 Element of reply data
- 2 Reply data

1. Element of reply data

The values are specified as follows:



The bit for the reply data must be set to 1.

- ① Selected offset
- ② Input Configuration data

2. Reply data

The Reply data consists of two bytes. The Reply data starts at the LSB of the specified data byte.
Each section of the data reply requires the following details.

Input Configuration data: One byte. The byte order is the same as that specified in “2. Values to be applied” of “Input Config (21H)” on page 7.

Selected offset: One byte. The byte order is the same as that specified in “Selected Offset (28H)” on page 10.

White Balance Reply (71H)

This command is used to send the white balance data to the remote controller.
The [0x71] command data is specified as the first data byte of the command block.
The [0x04] command data is sent back as the second data byte in one data byte.
The two-byte data of the following adjustment values are sent back in the order of the lower to upper bytes as the third data byte.

R gain

G gain
B gain
R bias
G bias
B bias

3D Offset Reply (73H)

This command is used to send the 3D offset data to the remote controller.

First data byte: The [0x73] command data is specified.

Second data byte: Sends the R gain data in one data byte.

Third data byte: Sends the G gain data in one data byte.

4th data byte: Sends the B gain data in one data byte.

5th data byte: Sends the R bias data in one data byte.

6th data byte: Sends the G bias data in one data byte.

7th data byte: Sends the B bias data in one data byte. The byte order is the same as that specified in “2. The 3D offset values to be saved” of “3D Offset (49H)” on page 17.

User Memory Reply (75H)

This command is used to send the values for the User Memory data stored in the NVM of the monitor to the remote controller.

First data byte: The [0x75] command data is specified.

Second data byte: Sends the User Memory Number data in one data byte.

The byte order is the same as that specified in “User Memory Sense (65H)” on page 18.

Third data byte: Sends the CONTRAST data in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

4th data byte: Sends the APERTURE (except 15k) data in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

5th data byte: Sends the APERTURE (15k) data in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

6th data byte: Sends the BRIGHTNESS data in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

7th data byte: Sends the PHASE data in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

8th data byte: Sends the CHROMA data in one data byte.

The byte order is the same as that specified in “2. CONTROL data value” of “Control Data (23H)” on page 7.

9th data byte: Sends the ASPECT data in one data byte.

The byte order is the same as that of the 8th data byte of “User Memory Data (43H)” on page 16.

10th/11th data bytes: Sends the White Balance (R gain) data in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

12th/13th data bytes: Sends the White Balance (G gain) data in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

14th/15th data bytes: Sends the White Balance (B gain) data in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

16th/17th data bytes: Sends the White Balance (R bias) data in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

18th/19th data bytes: Sends the White Balance (G bias) data in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

20th/21st data bytes: Sends the White Balance (B bias) data in two data bytes.

The byte order is the same as that specified in “2. The white balance values to be saved” of “White Balance Data (40H)” on page 14.

22nd data byte: Sends the Color Temp data in one data byte.

The byte order is the same as that of the 21st data byte of “User Memory Data (43H)” on page 16.

23rd data byte: Sends the Computer Detect and Preset data in one data byte.

The byte order is the same as that of the 22nd data byte of “User Memory Data (43H)” on page 16.

24th data byte: Sends the Gamma and Scan Mode data in one data byte.

The byte order is the same as that of the 23rd data byte of “User Memory Data (43H)” on page 16.

25th data byte: Sends the I/P Mode data in one data byte.

The byte order is the same as that specified in “I/P Mode (27H)” on page 10.

26th data byte: Sends the source data to copy the values for USER of the white balance data in one data byte.

The byte order is the same as that specified in “White Balance Data Copy (42H)” on page 15.

27th data byte: Sends the User Memory Length data in one data byte.

The byte order is the same as that specified in “2-1. Specifies the length of the name” of “Memory Name (26H)” on page 9.

28th data byte: Sends the User Memory Name data in one data byte (maximum 45 data bytes).

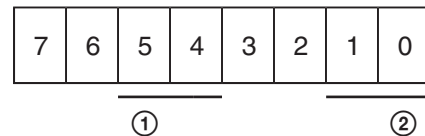
The byte order is the same as that specified in “2-2. Specifies the name data” of “Memory Name (26H)” on page 9.

Status Remote Reply (7EH)

This reply informs the remote controller of the current remote status of the monitor. The monitor always reply to questions in REMOTE ON and REMOTE OFF mode. The [0x7E] command data is specified as the first data byte of this command.

The status of the remote control is sent as the second data byte in one data byte.

The values are specified as follows:



① **Control applied**

REMOTE ON = 01

REMOTE OFF = 10

② **Type of remote control ready to apply**

This value should always be 10.

ACK Reply (04H)

The monitor sends this command when all the commands were correctly received and executed.

NAK Reply (05H)

The monitor sends this command when an error has occurred after reception of the command.

The [0x05] command data is specified as the first data byte of the command block.

An error which is found in the serial communication port is sent in one data byte as the second byte data.

The errors are as follows:

| Error Code | Error Type | Explanation |
|-------------------|-------------------|--|
| 0x04 | Checksum error | The received command data is not recognized as the data is different from the checksum. |
| 0x01 | Command error | The received message is an undefined message. A communication error occurs. The automatic adjustment such as APA, AUTO CHROMA/ PHASE is working or the automatic adjustment failed. |

Overview

The unit can control the monitor using the commands described in this manual via the network (Ethernet). For example, the Input Select, etc. can control from the external controller such as the PC.

On notation

This document uses the following notations:

- A hexadecimal number is indicated by an **h** after the number (10h = 0x10 = 16.) Otherwise, the number is a decimal.
- Character strings are enclosed by quotation marks (“ ”).

Connections

When you connect the unit to the network that uses the Ethernet, use the straight cable. When using a hub for network connection, use a hub with automatic cable type (straight or cross) detection feature (AUTO MDIX).

Network ports used by the monitor (the FTP data port is not shown)

| Service | Port number | Factory setting | Change | |
|---------|-------------|-----------------|---------------|-------------|
| | | | Service usage | Port number |
| SDAP | 53862 | Auto start | No | No |
| SDCP | 53484 | Auto start | No | No |
| FTP | 21 | Auto start | No | No |

Communication Protocol

You can control the monitor using the Simple Display Control Protocol (SDCP) and the Simple Display Advertisement Protocol (SDAP), which define the packet conventions and communication procedures for the commands.

SDCP is used to exchange monitor commands and statuses. You can obtain video settings and information, modify system settings including networking settings and obtain information using Video Monitor Control (VMC) packets superimposed on the SDCP protocol. The SDAP protocol periodically broadcasts the status of devices using UDP to check the connections.

For more information on the SDCP protocol, refer to section SDCP on page 23.

SDAP

The monitor provides the Status Advertisement Service. This service allows for the development of host applications that automatically find devices on the network. Monitors and controllers periodically broadcast device information over the network.

Function

The following table shows the device information that is periodically (at regular intervals) sent out to the network as broadcast packets:

Advertised information

| Information | Description |
|---------------|-----------------------------------|
| Category | Category of the device (0Bh) |
| Device name | Name of the device |
| Serial number | Serial number of the device |
| Location | Location of the device |
| Community | Community name of the device |
| Power status | Power on/off status of the device |

Protocol definition

The following table defines the SDAP protocol used to implement this advertisement service:

Definition of the SDAP protocol

| Category | Description |
|--------------------|---|
| Protocol name | SDAP (Simple Display Advertisement Protocol) |
| Transport type | UDP |
| Port number | 53862 |
| Broadcast interval | Monitor: 15 seconds Controller: 30 seconds |

SDCP

This protocol provides a service for remotely controlling the monitor.

Function

This service responds to the control commands and requests for status and information sent from the host controller.

The unit provides four connection modes: Single connection, Peer to Peer connection, Group connection, and All connection. The Single connection and Peer to Peer connection modes send SDCP packets using TCP to identify a single monitor. The Group connection and All connection modes send SDCP packets using UDP broadcast function within the area network to identify more than one monitor. The controller can obtain status information from the monitor only if they are connected via TCP. Do not perform status sensing when connecting via UDP.

Protocol definition

The following table defines the SDCP protocol used to implement this service:

Definition of the SDCP protocol

| Category | Description |
|------------------------|--|
| Protocol name | SDCP (Simple Display Control Protocol) |
| Transport type | TCP and UDP |
| Port number | 53484 |
| TCP connection timeout | 30 seconds |

Considerations on communication

- Do not issue the next command from the controller until you receive the return data for the previous command from the monitor. Otherwise, the monitor cannot receive the next command and thus cannot respond to the controller nor issue an error code. Refer to “Wait time for return data” (on page 24) for information on the wait time between the controller issuing a command and the monitor responding with the return data.

- When a communication error occurs, the monitor discards the data it has received up to that point and waits for a new command.
- When an SDCP packet has a problem: Monitors are response-oriented. Sending return data after the communication takes place inside the monitor results in an error that delays the response. Therefore, the monitor returns an SDCP packet indicating that the command was successfully processed as soon as it receives a command, even if the data area of the SDCP packet has a problem. If the SDCP packet has a problem in areas other than the data area, an appropriate SDCP packet is returned. For status sensing, normal operations are also implemented as response-oriented operations. Therefore, the monitor returns some data even if non-existent data are status-sensed.
- When broadcasting cursor or knob operations are performed from the menu using UDP, make sure to have an interval of 50 milliseconds between each command (BKM-15R issues a command every 100 milliseconds.) Time-consuming operations such as the white balance adjustment require longer intervals. Commands received before the previous process finishes are placed in a queue, but subsequent commands are discarded once the queued commands reach a certain number.

Wait time for return data

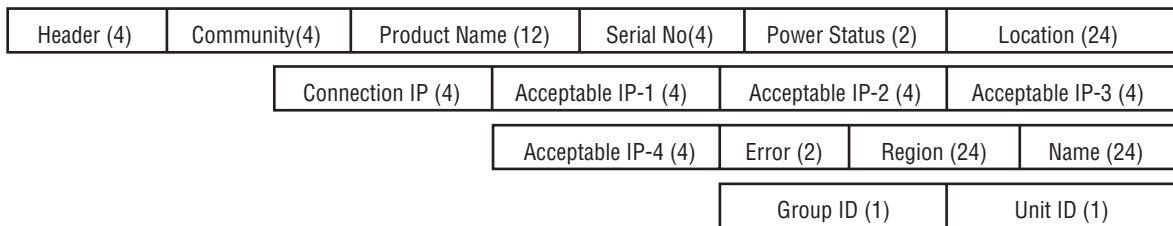
The wait time for the host to receive return data from the monitor after it issued an SDCP packet is in the range of 4 to 8 milliseconds when using a 10base-T connection, assuming that no communication failure occurs.

Command Block Format

SDAP Packets

This section describes the structure of SDAP packets. As shown in the following diagram, various information is bundled into a packet starting from the header. Each field is described in the subsequent paragraphs.

Structure of an SDAP packet



Format

SDAP packet version 4 includes all of the fields comprising version 3, which is used for the SONY SRX projector, plus Group ID and Unit ID.

Header

The Header uses four bytes: two bytes for the 16-bit ID and a byte each for the 8-bit Version and Category.

Structure of the SDAP header

| Byte 0, 1 | Byte 2 | Byte 3 |
|--------------|------------------|-------------------|
| ID (2 bytes) | Version (1 byte) | Category (1 byte) |
| “DA” | 04h | 0Bh / 0Ch |

ID: Fixed to “DA”.

Version: Indicates the version number of the protocol. It is fixed to 04h (version 4.)

Category: Indicates the category number of the display device. For a monitor, it is fixed to 0Bh. For a monitor controller, it is fixed to 0Ch.

Community

Contains a 4-byte string indicating the community name specified for the device. It is set to “SONY”.

Device information

Product Name : Name of the device (up to 12 characters.)

If the name is shorter than 12 characters, 00h is inserted to fill in the space.

Serial No.: Serial number of the device (hexadecimal value.)

Location: Location information for the device (up to 24 characters.)

If it is shorter than 24 characters, 00h is inserted to fill in the space.

Connection IP (SDAP Ver2.00): Indicates the IP address of the host to which the device is currently connected and from which the menu is operated (hexadecimal value). A value of 00h indicates that the device is not connected to any host.

Acceptable IP (SDAP Ver2.00): Contains the registered information for the host IP address that accepts a connection via SDCP (hexadecimal value). Information for four hosts is sent in a packet. A value of 00h indicates that no host is specified.

Error (SDAP Ver3.00): Indicates whether an error occurred: 0 if no error occurred, 1 if an error occurred.

Region (SDAP Ver3.00): Contains regional information. If it is shorter than 24 characters, 00h is inserted to fill in the space.

Name (SDAP Ver3.00): Indicates the name of the projector. If it is shorter than 24 characters, 00h is inserted to fill in the space.

Group ID (SDAP Ver4.00): Indicates the group ID assigned to the monitor (1-byte hexadecimal value.)

Unit ID (SDAP Ver4.00): Indicates the unit ID assigned to the monitor (1-byte hexadecimal value.)

SDCP Packets

This section describes the structure of version 3 SDCP packets about only the fields used by the unit.

Structure of an SDCP packet

| | | | | | |
|------------|---------------|--------------|-------------|-------------|----------|
| Header (2) | Community (4) | Group ID (1) | Unit ID (1) | Command (5) | Data (n) |
|------------|---------------|--------------|-------------|-------------|----------|

Format

Version 3 includes all of the fields comprising version 2, which is used for SONY SRX projector, plus Group ID and Unit ID, with the Data length field changed to two bytes.

Header

The Header uses two bytes: a byte each for the 8-bit Version and Category.

Structure of the SDCP header

| Byte 0 | Byte 1 |
|---------|----------|
| Version | Category |
| 03h | 0Bh |

Version: Indicates the version number of the protocol. It is fixed to 03h (version 3.)

Category: Contains the category number for the monitor (0Bh). The unit checks the category number

and ignore the request if it is set to a number other than 0Bh.

Community

Contains a 4-byte case-sensitive alpha-numerical string indicating the community name. For the unit, it is set to "SONY". Community name must be four characters long. You can not specify a name shorter than four characters. Requests are processed only when this field matches the community name specified for the display device.

Group ID

Indicates the ID of the group with which the unit is registered. It is set to 0 for Single and Peer to Peer network connections and to 0xFF for All connections. If a number other than 0x00 or 0xFF is specified as the Group ID, the monitor with the specified Group ID accepts the command (the range of values for the Group ID is 1 to 99 depending on 7SEG for BKM-15R). The ID is a 1-byte hexadecimal value. When a Group ID is specified, broadcast communication with UDP is used. In this case, monitors do not return any response to the command.

Unit ID

Indicates a device-specific ID that is registered with the unit. It is set to 0 for Peer to Peer Network and Group connections and to 0xFF for All connections.

The ID is a 1-byte hexadecimal value. When a monitor receives an SDCP packet via TCP, it accepts the command only if the Unit ID specified in the packet (if specified) matches its Unit ID.

The Unit IDs for the monitors in the same subnet should be unique. The behavior of the monitors that have the same Unit ID depends on the configuration of the controller.

ID settings for various connection modes

| Mode | Group ID | Unit ID |
|--------------|----------|---------|
| Peer to Peer | 0 | 0 |
| Single | 0 | 1 to 99 |
| Group | 1 to 99 | 0 |
| All | 0xFF | 0xFF |

Command

The following table shows the format of request and response commands:

Format of the SDCP Command field

| Byte 6 | Byte 7, 8 | Byte 9, 10 |
|------------------|-----------|-------------|
| Request/response | Item No. | Data Length |

Request

Specifies the command request from the host to the monitor.

SDCP request

| Request | Description |
|-----------|---|
| SET (00h) | Specifies the command request. Status requests are also considered as commands. |

Response

Returns the result to the request sent from the host.

SDCP response

| Response | Description |
|----------|---|
| NG (00h) | Indicates that the request was invalid or could not be completed. |
| OK (01h) | Indicates that the request was successfully completed. |

Item no.

Defines the format of the information included in the Data field.

Item no.

| Value | Description |
|-------|---|
| B000h | Indicates a monitor command. |
| B001h | Indicates a monitor command for monitors with built-in controllers. |

Data length

Specifies the length (n) of the subsequent Data field (a 2-byte hexadecimal value).

The maximum value that can be specified is 499 (01F3h).

Example of normal communication

| Request | Item No. | Data Length | Data |
|---------|----------|-------------|-------------------|
| 00h | Item No. | n | Set Data (n byte) |

Example of response

SDCP SET

| | | | |
|----------|----------|---|-------------------|
| OK (01h) | Item No. | n | Get Data (n byte) |
|----------|----------|---|-------------------|

Example of error communication

If there is an error in the request, or if the request results in an error, "NG" is returned as the response.

In this case, the Item no. field contains the item number of the original request packet and the Error Code field contains a 1-byte category and a 1-byte error code.

Refer to "SDCP error codes" (page 26) for the list of categories and error codes.

Error response

| | | | |
|----------|----------|---|-----------------|
| NG (00h) | Item No. | 2 | Error Code (16) |
|----------|----------|---|-----------------|

Support for broadcast communication

The broadcast communication via UDP is supported for controlling more than one monitor from a single controller. In this configuration, monitors do not return any response to commands.

SDCP error codes

The following table lists the SDCP error codes (not all of the error codes are implemented.) For description of the errors, refer to the subsequent paragraphs.

SDCP error codes

| Category | Error | Error Code |
|-----------------------------|---------------------------|------------|
| Communication Error (F0**h) | Check Sum Error | 10h |
| | Other Communication Error | 50h |

Communication Error

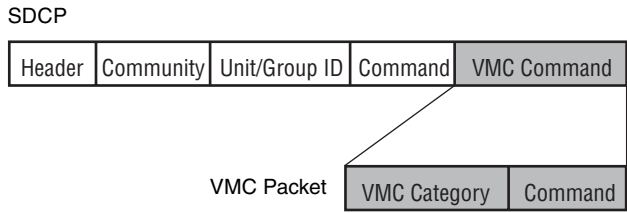
This type of error indicates a communication error between the controller and the main control microcomputer of the display.

Check Sum Error: A check sum error occurred at the main control microcomputer.

Other Communication Error: Another type of communication error occurred.

VMC Command Description

You can control the monitor settings using VMC packets superimposed on SDCP. A VMC packet is applied to the Data field of an SDCP packet to send commands to the monitor and receive its status.



Format of VMC Packets

A VMC packet is comprised of combinations of strings. The Category field specifies the category of the command and the Command field contains the command string and its parameters. Both fields have variable length. A space is used as the separator between them:

“Category Command Parameter1 Parameter2”

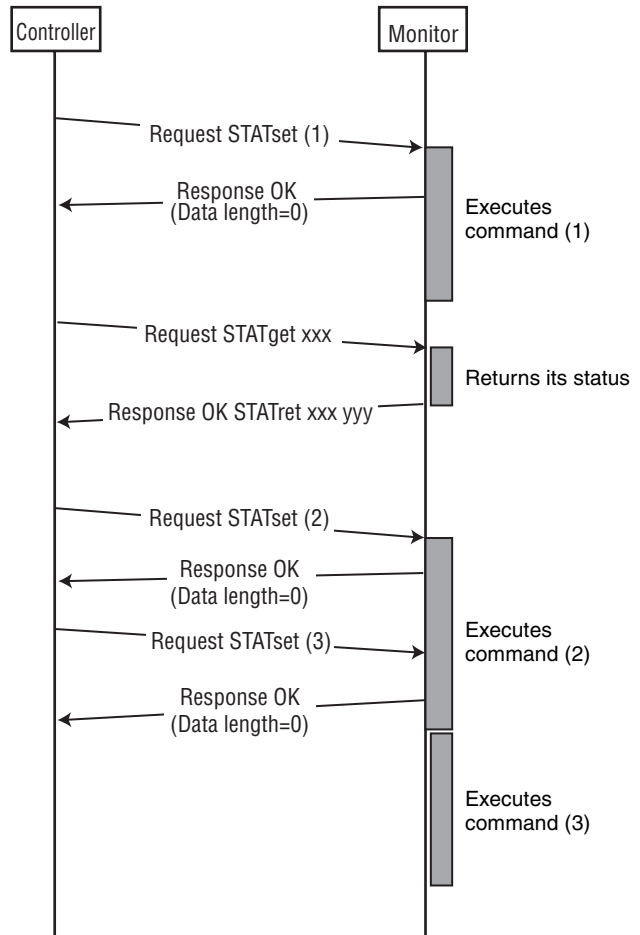
The termination code (0x00) for the strings is not sent. The command may not be correctly interpreted if a space is appended after a string. (You must configure the receiving device to accept strings with termination codes or spaces.)

Communication sequence for the VMC packets

SDCP (TCP) communication sequence

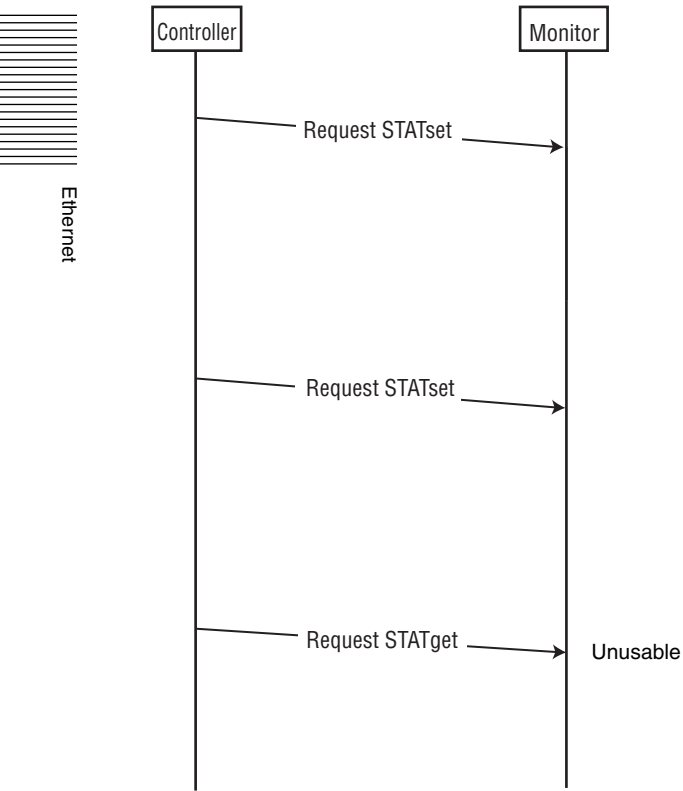
The following diagram shows the SDCP (TCP) communication sequence.

The monitor returns the response to a command upon its reception. For a command that takes time to process, the execution continues even after the response is sent out. If the monitor receives the next command while executing the previous command, it places the next command in the queue. For a status request, the monitor returns the response only after the command result becomes ready to be sent and the status value is set.



SDCP (UDP) communication sequence

The following diagram shows the communication sequence for ALL and Group-mode SDCP (UDP) communication:



Details of VMC Commands

VMC category

The following table lists the VMC command categories:

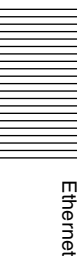
List of command categories

| Category | Communication direction | Description |
|--------------|-------------------------|--|
| “STATset” | Controller to monitor | Sets the status of the monitor. |
| “STATget” | Controller to monitor | Requests the monitor to send its status back to the controller. |
| “STATret” | Monitor to controller | Response to “STATget”. |
| “INFOknob” | Controller to monitor | Notifies the monitor the status of the rotary switch. |
| “INFObutton” | Controller to monitor | Transmits inputs from multipurpose buttons such as the numeric keypad and the cursor to the monitor. |

Command

Enter the setting value in [Value] (do not enter []).

| Function | Command Name | Command | Send (Ethernet → Monitor) |
|------------------------------|----------------------|----------------------------|---|
| SDCP (Ethernet Command) V0.2 | Button CONTROL (20H) | INFObutton MENU | Displays the menu. |
| | | INFObutton MENUUP | Moves the menu item upward. |
| | | INFObutton MENUDOWN | Moves the menu item downward. |
| | | INFObutton MENUENT | Confirms the menu item. |
| | Input Config (21H) | STATset INPUTSEL CVBS | Selects the composite input. |
| | | STATset INPUTSEL YC | Selects the Y/C input. |
| | | STATset INPUTSEL RGB | Selects the RGB input. |
| | | STATset INPUTSEL COMP | Selects the component input. |
| | | STATset INPUTSEL DVI | Selects the DVI input. |
| | | STATset INPUTSEL HD15 | Selects the HD15 input. |
| | | STATset INPUTSEL OPA1 | Selects the option A-1 input. |
| | | STATset INPUTSEL OPA2 | Selects the option A-2 input. |
| | | STATset INPUTSEL OPB1 | Selects the option B-1 input. |
| | | STATset INPUTSEL OPB2 | Selects t the option B-2 input. |
| | | STATset WBSEL LOW2 | Selects COLOR TEMP D56. |
| | | STATset WBSEL LOW | Selects COLOR TEMP D65. |
| | | STATset WBSEL HIGH | Selects COLOR TEMP D93. |
| | | STATset WBSEL USER | Selects COLOR TEMP USER1. |
| | | STATset WBSEL USER2 | Selects COLOR TEMP USER2. |
| | | STATset WBSEL USER3 | Selects COLOR TEMP USER3. |
| | STATset WBSEL USER4 | Selects COLOR TEMP USER4. | |
| | STATset WBSEL USER5 | Selects COLOR TEMP USER5. | |
| | Control Data (23H) | STATset CONTRAST [Value] | Sets the contrast level. Adjustable range is 0 to 100. |
| | | STATset APERTURE [Value] | Sets the aperture level. Adjustable range is 0 to 6. |
| | | STATset BRIGHTNESS [Value] | Sets the brightness level. Adjustable range is 0 to 100. |
| | | STATset PHASE [Value] | Sets the phase level. Adjustable range is 0 to 100. |
| | | STATset CHROMA [Value] | Sets the chroma level. Adjustable range is 0 to 100. |
| | | STATset BACKLIGHT [Value] | Sets the backlight level. Adjustable range is 0 to 5. |
| | Display Data (24H) | STATset RESET | Resets the setting to the factory setting. |
| | | STATset PITCH [value] | Sets the pitch. Adjustable range is 0 to 32. |
| | | STATset DOTPHASE [value] | Sets the dot phase. Adjustable range is 0 to 63. |
| | | STATset SIZEH [value] | Sets the H size. Adjustable range is -100 to +100. |
| | | STATset SIZEV [value] | Sets the V size. Adjustable range is -100 to +100. |
| | | STATset SHIFTH [value] | Sets the H shift. Adjustable range varies according to the input signal (see page 34). |
| | | STATset SHIFTV [value] | Sets the V shift. Adjustable range varies according to the input signal (see page 34). |
| | I/P Mode (27H) | STATset MODE0 | Sets I/P MODE to INTER-FIELD. |
| | | STATset MODE1 | Sets I/P MODE to FIELD MERGE. |
| | | STATset MODE2 | Sets I/P MODE to LINE DOUBLER. |



Ethernet

| Function | Command Name | Command | Send (Ethernet → Monitor) |
|-------------------|---------------------------|--|--|
| | Select Offset (28H) | STATset SMPTE | Sets COMPONENT LEVEL to SMPTE. |
| | | STATset BETA0 | Sets COMPONENT LEVEL to BETA 0. |
| | | STATset BETA75 | Sets COMPONENT LEVEL to BETA 7.5. |
| | | STATset NTSC0 | Sets the NTSC setup level to 0. |
| | | STATset NTSC75 | Sets the NTSC setup level to 7.5. |
| | On Switch Function (29H) | STATset REMOTE ON | Sets the remote to ON. |
| | | STATset APA ON | Sets APA to ON. |
| | | STATset POWERSAVING ON | Sets POWER SAVING to ON. |
| | | STATset KEYINHIBIT ON | Sets KEY INHIBIT to ON. |
| | | STATset TALLYGREEN ON | Sets the tally green to ON. |
| | | STATset BLUEONLY ON | Sets BLUE ONLY to ON. |
| | | STATset MONOCHR ON | Sets MONO to ON. |
| | | STATset PICMIRROR ON | Sets MIRROR IMAGE to ON. |
| | | STATset BACKGROUND ON | Sets BACKGROUND to ON. |
| | | STATset SPLASHLOGO ON | Sets SPLASHLOGO to ON (5 seconds). |
| | STATset SPLASHLOGO2 ON | Sets SPLASHLOGO to ON (10 seconds). | |
| | Off Switch Function (2AH) | STATset REMOTE OFF | Sets the remote to OFF. |
| | | STATset APA OFF | Sets APA to OFF. |
| | | STATset POWERSAVING OFF | Sets POWER SAVING to OFF. |
| | | STATset KEYINHIBIT OFF | Sets KEY INHIBIT to OFF. |
| | | STATset TALLYGREEN OFF | Sets the tally green to OFF. |
| | | STATset BLUEONLY OFF | Sets BLUE ONLY to OFF. |
| | | STATset MONOCHR OFF | Sets MONO to OFF. |
| | | STATset PICMIRROR OFF | Sets MIRROR IMAGE to OFF. |
| | | STATset BACKGROUND OFF | Sets BACKGROUND to OFF. |
| | | STATset SPLASHLOGO OFF | Sets SPLASHLOGO to OFF (5 seconds). |
| | STATset SPLASHLOGO2 OFF | Sets SPLASHLOGO to OFF (10 seconds). | |
| | Select Display (2BH) | STATset ENGLISH | Sets the menu language to English. |
| | | STATset GERMAN | Sets the menu language to German. |
| | | STATset FRENCH | Sets the menu language to French. |
| | | STATset ITALIAN | Sets the menu language to Italian. |
| | | STATset SPANISH | Sets the menu language to Spanish. |
| | | STATset JAPANESE | Sets the menu language to Japanese. |
| | | STATset CHINESE | Sets the menu language to Chinese. |
| | | STATset FMTDISPAUTO | Sets FORMAT DISPLAY to AUTO. |
| | | STATset FMTDISPON | Sets FORMAT DISPLAY to ON. |
| | | STATset FMTDISPOFF | Sets FORMAT DISPLAY to OFF. |
| | | STATset 3DFMTDISPAUTO | Sets 2D/3D DISPLAY to AUTO. |
| | | STATset 3DFMTDISPON | Sets 2D/3D DISPLAY to ON. |
| | | STATset 3DFMTDISPOFF | Sets 2D/3D DISPLAY to OFF. |
| | Select Menu (2CH) | STATset GAMMA3 | Sets the gamma “2.2”. |
| | | STATset GAMMA5 | Sets the gamma “DICOM”. |
| | | STATset CSCOFF | Sets COLOR SPACE (ChromaTru) to OFF. |
| | | STATset CSCITU | Sets COLOR SPACE (ChromaTru) to ITU-709. |
| | | STATset AUTOCHOFF | Sets AUTO CHROMA/PHASE to OFF. |
| STATset AUTOCHON | | Sets AUTO CHROMA/PHASE to ON. | |
| STATset AUTOADJ | | Starts the auto adjustment of AUTO CHROMA/PHASE. | |
| Scan Aspect (2DH) | STATset SCANMODE NORMAL | Sets the SCAN size to NORMAL. | |
| | STATset SCANMODE OVER | Sets the SCAN size to OVER. | |
| | STATset SCANMODE FULL | Sets the SCAN size to FULL. | |

| Function | Command Name | Command | Send (Ethernet → Monitor) | |
|--------------------------|-------------------------|--|--|---|
| Select Config Data (2FH) | | STATset SCANMODE NATIVE | Sets the SCAN size to NATIVE. | |
| | | STATset ASPECT 4BY3 | Sets the aspect ratio to 4:3. | |
| | | STATset ASPECT 16BY9 | Sets the aspect ratio to 16:9. | |
| | | STATset EXTSYNC OFF | Sets the external sync to OFF. | |
| | | STATset EXTSYNC ON | Sets the external sync to ON. | |
| | | STATset AUTOSYNCDDET OFF | Sets AUTOSYNCDDET to OFF. | |
| | | STATset AUTOSYNCDDET ON | Sets AUTOSYNCDDET to ON. | |
| | Picture Config (30H) | | STATset SDPIXEL CVBSYC712702 | Sets SD PIXEL MAPPING COMPOSITE&Y/C to 712 × 483/702 × 576. |
| | | | STATset SDPIXEL CVBSYC720720 | Sets SD PIXEL MAPPING COMPOSITE&Y/C to 720 × 487/720 × 576. |
| | | | STATset SDPIXEL RGBCOMP712702 | Sets SD PIXEL MAPPING RGB/COMPONENT to 712 × 483/702 × 576. |
| | | | STATset SDPIXEL RGBCOMP720720 | Sets SD PIXEL MAPPING RGB/COMPONENT to 720 × 487/720 × 576. |
| | Multi Display (31H) | | STATset MULTIDISP DISABLE | Sets the multi display to OFF. |
| | | | STATset MULTIDISP ENABLE | Sets the multi display to ON. |
| | | | STATset MULTIDISP PIP | Sets to PIP mode. |
| | | | STATset MULTIDISP SBS | Sets to SIDE BY SIDE mode. |
| | | | STATset MULTIDISP POP | Sets to POP mode. |
| | | | STATset MULTIDISP CVBS | Sets SUB INPUT DISPLAY to COMPOSITE. |
| | | | STATset MULTIDISP YC | Sets SUB INPUT DISPLAY to Y/C. |
| | | | STATset MULTIDISP RGB | Sets SUB INPUT DISPLAY to RGB. |
| | | STATset MULTIDISP COMP | Sets SUB INPUT DISPLAY to COMPONENT. | |
| | | STATset MULTIDISP DVI | Sets SUB INPUT DISPLAY to DVI. | |
| | | STATset MULTIDISP HD15 | Sets SUB INPUT DISPLAY to HD15. | |
| | | STATset MULTIDISP OPA1 | Sets SUB INPUT DISPLAY to OPTION A-1. | |
| | | STATset MULTIDISP OPA2 | Sets SUB INPUT DISPLAY to OPTION A-2. | |
| | | STATset MULTIDISP OPB1 | Sets SUB INPUT DISPLAY to OPTION B-1. | |
| | | STATset MULTIDISP OPB2 | Sets SUB INPUT DISPLAY to OPTION B-2. | |
| | | STATset MULTIDISP VIDEO_WAVE | Sets SUB INPUT DISPLAY to VIDEO WAVE. | |
| | | STATset MULTIDISP POSITION1 | Sets the position of the sub display to 1. | |
| | | STATset MULTIDISP POSITION2 | Sets the position of the sub display to 2. | |
| | | STATset MULTIDISP POSITION3 | Sets the position of the sub display to 3. | |
| | | STATset MULTIDISP POSITION4 | Sets the position of the sub display to 4. | |
| | STATset MULTIDISP RIGHT | Sets the position of the frame to RIGHT. | | |
| | STATset MULTIDISP LEFT | Sets the position of the frame to LEFT. | | |
| | STATset MULTIDISP SIZE1 | Sets SUB PICTURE SIZE to 1. | | |
| | STATset MULTIDISP SIZE2 | Sets SUB PICTURE SIZE to 2. | | |
| BKMDVI SET (3DH) | | STATset EXT5VINON | Sets external 5 V(DVI-IN) to ON. | |
| | | STATset EXT5VINOFF | Sets external 5 V(DVI-IN) to OFF. | |
| | | STATset EXT5VOUTON | Sets external 5 V(DVI-OUT) to ON. | |
| | | STATset EXT5VOUTOFF | Sets external 5 V(DVI-OUT) to OFF. | |
| | | STATset EDIDUPDATESTART | Starts EDID UPDATE. | |
| 3D Function (3EH) | | STATset 3DSEL 2D | Selects 2D display. | |
| | | STATset 3DSEL 3D | Selects 3D display. | |

| Function | Command Name | Command | Send (Ethernet → Monitor) | |
|----------------------------------|--|--|--|---------------------------|
| | | STATset 3DFMT 3GLVLB | Selects 3G level B format. | |
| | | STATset 3DFMT DUAL | Selects dual stream format. | |
| | | STATset 3DFMT SEQ | Selects either field sequential or frame sequential HD-SDI signal. | |
| | | STATset 3DFMT SBS | Selects side-by-side format. | |
| | | STATset 3DFMT LBL | Selects line-by-line format. | |
| | | STATset 3DFMT AUTO | Selects AUTO1 display. | |
| | | STATset 3DFMT AUTO2 | Selects AUTO2 display. | |
| | | STATset 3DDISP INTER | Selects interlace signal. | |
| | | STATset 3DDISP PROG | Selects progressive signal. | |
| | | STATset 3DDISP PSF | Selects PsF signal. | |
| | | STATset HOROPTER OFF | Sets horopter check to OFF. | |
| | | STATset HOROPTER ON | Sets horopter check to ON. | |
| | | STATset HOROPTERL NORMAL | Displays the left channel signal on the standard screen. | |
| | | STATset HOROPTERL BLACK | Displays the left channel signal as black signal. | |
| | | STATset HOROPTERL MONO | Displays the left channel signal as black and white signal. | |
| | | STATset HOROPTERL RED | Displays the left channel signal as RGB red color component. | |
| | | STATset HOROPTERL BLUE | Displays the left channel signal as RGB blue color component. | |
| | | STATset HOROPTERR NORMAL | Displays the right channel signal on the standard screen. | |
| | | STATset HOROPTERR BLACK | Displays the right channel signal as black signal. | |
| | | STATset HOROPTERR MONO | Displays the right channel signal as black and white signal. | |
| | | STATset HOROPTERR RED | Displays the right channel signal as RGB red color component. | |
| | | STATset HOROPTERR BLUE | Displays the right channel signal as RGB blue color component. | |
| | | 3D Function (3FH) | STATset CHECKER ON | Sets checkerboard to ON. |
| | | | STATset CHECKER OFF | Sets checkerboard to OFF. |
| STATset LRSWITCH ON | Sets L/R switch to ON. | | | |
| STATset LRSWITCH OFF | Sets L/R switch to OFF. | | | |
| STATset DISPARITYSEL LR | Sets disparity simulation for the left and right channels to ON. | | | |
| STATset DISPARITYSEL LEFT | Sets disparity simulation for the left channels to ON. | | | |
| STATset DISPARITYSEL RIGHT | Sets disparity simulation for the right channels to ON. | | | |
| STATset DISPARITYSEL MENUOFF | Sets disparity simulation to OFF. | | | |
| STATset DISPARITYSEL SET [Value] | Sets the phase of left/right signal in disparity simulation. | | | |
| 3D Offset (49H) | STATset 3DOFFSETRGAIN [Value] | Sets the 3D offset R gain. Adjustable range is -100 to +100. | | |
| | STATset 3DOFFSETGGAIN [Value] | Sets the 3D offset G gain. Adjustable range is -100 to +100. | | |
| | STATset 3DOFFSETBGAIN [Value] | Sets the 3D offset B gain. Adjustable range is -100 to +100. | | |
| | STATset 3DOFFSETRBIAS [Value] | Sets the 3D offset R bias. Adjustable range is -100 to +100. | | |
| | STATset 3DOFFSETGBIAS [Value] | Sets the 3D offset G bias. Adjustable range is -100 to +100. | | |

| Function | Command Name | Command | Send (Ethernet → Monitor) |
|----------|---------------------------|-------------------------------|---|
| | | STATset 3DOFFSETBBIAS [Value] | Sets the 3D offset B bias. Adjustable range is -100 to +100. |
| | | STATget 3DOFFSETRGAIN | Loads the values for 3D offset R gain. |
| | | STATget 3DOFFSETGGAIN | Loads the values for 3D offset G gain. |
| | | STATget 3DOFFSETBGAIN | Loads the values for 3D offset B gain. |
| | | STATget 3DOFFSETRBIAS | Loads the values for 3D offset R bias. |
| | | STATget 3DOFFSETGBIAS | Loads the values for 3D offset G bias. |
| | | STATget 3DOFFSETBBIAS | Loads the values for 3D offset B bias. |
| | Select 3D Offset (4AH) | STATset 3D OFFSET AUTO | Sets the 3D offset to AUTO. |
| | | STATset 3D OFFSET OFF | Sets the 3D offset to OFF. |
| | | STATset 3D OFFSET ON | Sets the 3D offset to ON. |

Maximum and minimum values of SHIFT H and SHIFT V

VESA DMT

| Resolution | H | V |
|-------------------|------------|----------|
| 640 × 480 60 Hz | -24 to +24 | -6 to +6 |
| 800 × 600 56 Hz | -33 to +33 | -3 to +3 |
| 800 × 600 60 Hz | -38 to +38 | -4 to +4 |
| 800 × 600 72 Hz | -36 to +36 | -9 to +9 |
| 800 × 600 75 Hz | -38 to +38 | -3 to +3 |
| 800 × 600 85 Hz | -37 to +37 | -4 to +4 |
| 1024 × 768 60 Hz | -48 to +48 | -5 to +5 |
| 1024 × 768 70 Hz | -45 to +45 | -5 to +5 |
| 1024 × 768 75 Hz | -43 to +43 | -4 to +4 |
| 1024 × 768 85 Hz | -52 to +52 | -6 to +6 |
| 1152 × 864 75 Hz | -67 to +67 | -5 to +5 |
| 1280 × 960 60 Hz | -78 to +78 | -6 to +6 |
| 1280 × 1024 60 Hz | -61 to +61 | -6 to +6 |

VESA CVT

| Resolution | H | V |
|-------------------------|------------|----------|
| 640 × 480 60 Hz | -24 to +24 | -2 to +2 |
| 800 × 600 60 Hz | -24 to +24 | -2 to +2 |
| 1024 × 768 60 Hz | -24 to +24 | -3 to +3 |
| 1280 × 960 60 Hz | -24 to +24 | -4 to +4 |
| 1360 × 768 50 Hz | -60 to +60 | -3 to +3 |
| 1360 × 768 60 Hz | -62 to +62 | -4 to +4 |
| 1360 × 768 60 Hz (WXGA) | -24 to +24 | -3 to +3 |
| 1920 × 1080 50 Hz | -93 to +93 | -4 to +4 |
| 1920 × 1080 60 Hz | -24 to +24 | -4 to +4 |
| 1280 × 1024 60 Hz | -24 to +24 | -4 to +4 |
| 1280 × 768 50 Hz | -55 to +55 | -3 to +3 |
| 1280 × 768 60 Hz | -60 to +60 | -4 to +4 |
| 1280 × 768 75 Hz | -64 to +64 | -5 to +5 |
| 1280 × 768 60 Hz | -24 to +24 | -3 to +3 |

Others

| Resolution | H | V |
|------------------|------------|----------|
| 720 × 400 70 Hz | -27 to +27 | -7 to +7 |
| 1280 × 800 60 Hz | -19 to +19 | -2 to +2 |

- : Not available

