Professional Video Monitor

Interface Manual for Programmers

PVM-740

HDMI™
HIGH-DEFINITION MULTIMEDIA INTERFACE

Table of Contents

Ethernet

Overview

This unit can control the monitor using the commands described in this manual via the network (Ethernet). For example, the Input Select, Power On/Off, 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 4.

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 5) 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.
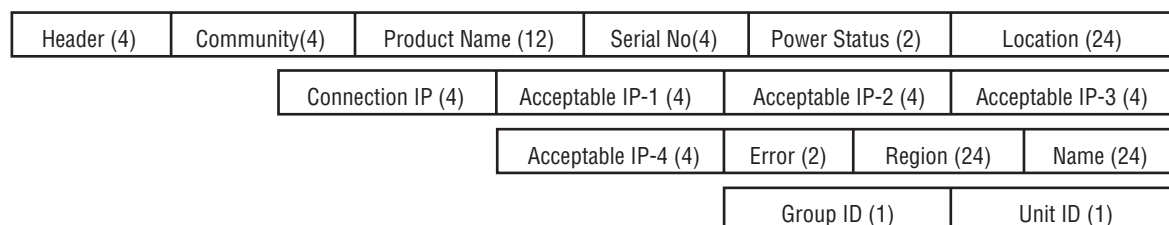
Wait time for return data

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

Header (4)	Community(4)	Product Name (12)	Serial No(4)	Power Status (2)	Location (24)

Connection IP (4)	Acceptable IP-1 (4)	Acceptable IP-2 (4)	Acceptable IP-3 (4)

Acceptable IP-4 (4)	Error (2)	Region (24)	Name (24)

Group ID (1)	Unit ID (1)

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 s 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 7) 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.

SDCP

Header	Community	Unit/Group ID	Command	VMC Command

VMC Packet

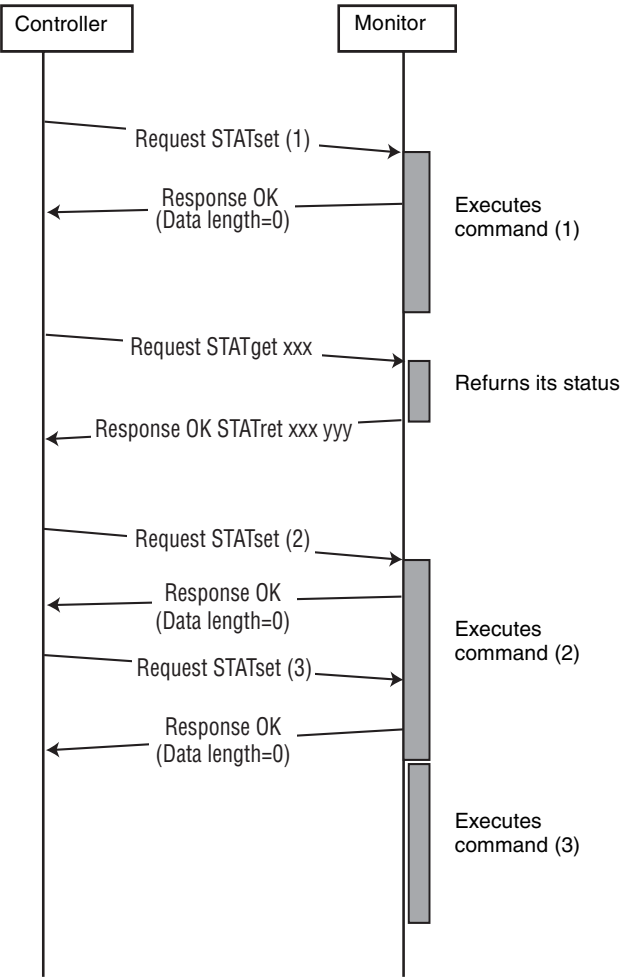| VMC Category	Command
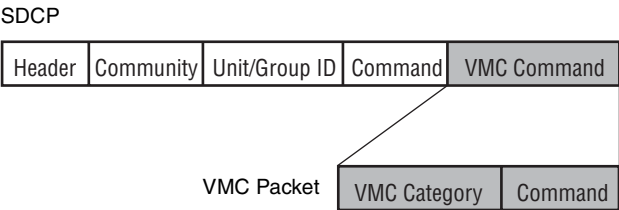
Format of VMC Packets

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.

Controller — Monitor

Request STATset (1)
Response OK (Data length=0)
Executes command (1)

Request STATget xxx
Returns its status
Response OK STATret xxx yyy

Request STATset (2)
Response OK (Data length=0)
Executes command (2)

Request STATset (3)
Response OK (Data length=0)

Executes command (3)

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

```
Controller                        Monitor

   │                                 │
   │──── Request STATset ───────────▶│
   │                                 │
   │                                 │
   │                                 │
   │──── Request STATset ───────────▶│
   │                                 │
   │                                 │
   │                                 │
   │──── Request STATget ───────────▶│  Unusable
   │                                 │
   │                                 │
```
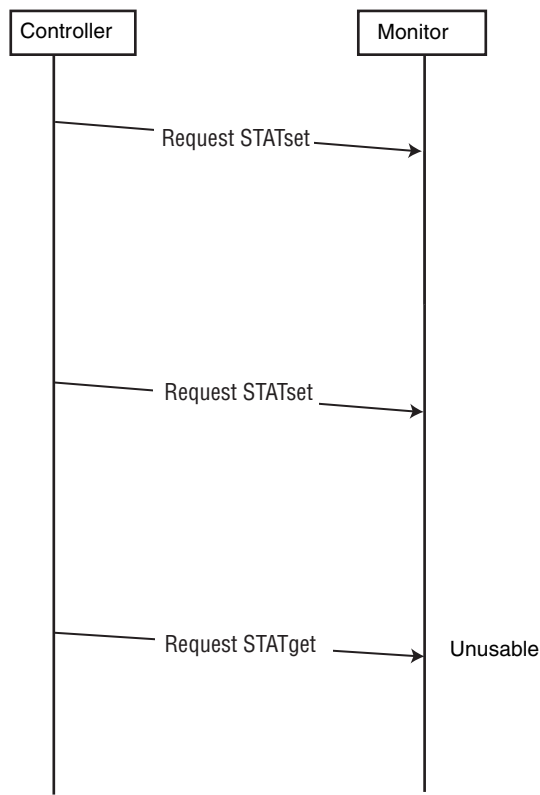
Details of VMC Commands

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	INFObutton MENU	Display/non-display the menu.
		INFObutton MENUUP	Moves the menu item upward.
		INFObutton MENUDOWN	Moves the menu item downward.
		INFObutton MENUENT	Confirms the menu item.
	Input Config	STATset INPUTSEL CVBS	Selects the composite input.
		STATset INPUTSEL SDI	Selects the SDI input.
		STATset INPUTSEL HDMI	Selects the HDMI input.
		STATset WBSEL LOW	Selects COLOR TEMP D65.
		STATset WBSEL HIGH	Selects COLOR TEMP D93.
		STATset WBSEL USER	Selects COLOR TEMP USER.
	Control Data	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 VOLUME [Value]	Sets the volume level. Adjustable range is 0 to 100.
	Display Data	STATset RESET	Resets the setting to the factory setting.
		STATset SHIFTH [Value]	Sets the H shift. Adjustable range is +30 to -30.
		STATset SHIFTV [Value]	Sets the V shift. Adjustable range is +30 to -30.
	I/P Mode	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.
	Select Offset	STATset NTSC0	Sets the NTSC setup level to 0.
		STATset NTSC75	Sets the NTSC setup level to 7.5.
		STATset RGB RANGE FULL	Sets RGB RANGE to FULL.
		STATset RGB RANGE LIMITED	Sets RGB RANGE to LIMITED.
	On Switch Function	STATset REMOTE ON	Sets the remote 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 TALLYRED ON	Sets the tally red to ON.
		STATset HVDELAY ON	Sets the H/V delay function to ON.
		STATset BLUEONLY ON	Sets BLUE ONLY to ON.
		STATset MONOCHR ON	Sets MONO to ON.
		STATset CAMERA FOCUS ON	Sets the camera focus function to ON.
		STATset LED ON	Sets the front panel LED to ON.
		STATset SCREENSAVER ON	Sets SCREEN SAVER to ON.
		STATset SILENTMODE ON	Sets SILENT MODE to ON.
		STATset FLIPH ON	Sets FLIP H to ON.
		STATset FLIPV ON	Sets FLIP V to ON.
		STATset FLIPHV ON	Sets FLIP HV to ON.
	Off Switch Function	STATset REMOTE OFF	Sets the remote to OFF.
		STATset POWERSAVING OFF	Sets POWER SAVING to OFF.

Function	Command Name	Command	Send (Ethernet → Monitor)
		STATset KEYINHIBIT OFF	Sets KEY INHIBIT to OFF.
		STATset TALLYGREEN OFF	Sets the tally green to OFF.
		STATset TALLYRED OFF	Sets the tally red to OFF.
		STATset HVDELAY OFF	Sets the H/V delay function to OFF.
		STATset BLUEONLY OFF	Sets BLUE ONLY to OFF.
		STATset MONOCHR OFF	Sets MONO to OFF.
		STATset CAMERA FOCUS OFF	Sets the camera focus function to OFF.
		STATset LED OFF	Sets the front panel LED to OFF.
		STATset SCREENSAVER OFF	Sets SCREEN SAVER to OFF.
		STATset SILENTMODE OFF	Sets SILENT MODE to OFF.
		STATset FLIPH OFF	Sets FLIP H to OFF.
		STATset FLIPV OFF	Sets FLIP V to OFF.
		STATset FLIPHV OFF	Sets FLIP HV to OFF.
	Select Display	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 FMTDISPOFF	Sets FORMAT DISPLAY to OFF.
	Select Menu	STATset CSCOFF	Sets COLOR SPACE (ChromaTru) to OFF.
		STATset CSCEBU	Sets COLOR SPACE (ChromaTru) to EBU.
		STATset CSCSMPTE	Sets COLOR SPACE (ChromaTru) to SMPTE-C.
		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	STATset SCANMODE NORMAL	Sets the SCAN size to NORMAL.
		STATset SCANMODE OVER	Sets the SCAN size to OVER.
		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.
	Multi Display	STATset MULTIDISP DISABLE	Sets the WFM/ALM (waveform monitor and audio level meter) display to OFF.
		STATset MULTIDISP ENABLE	Sets the WFM/ALM (waveform monitor and audio level meter) display to ON.
		STATset MULTIDISP VIDEO_WAVE	Sets WFM/ALM SELECT to WFM (waveform monitor).
		STATset MULTIDISP AUDIO_WAVE	Sets WFM/ALM SELECT to ALM (audio level meter).
		STATset MULTIDISP POSITION1	Sets the position of the WFM/ALM display to 1.
		STATset MULTIDISP POSITION2	Sets the position of the WFM/ALM display to 2.
		STATset MULTIDISP POSITION3	Sets the position of the WFM/ALM display to 3.
		STATset MULTIDISP POSITION4	Sets the position of the WFM/ALM display to 4.

Ethernet

Function	Command Name	Command	Send (Ethernet → Monitor)
	Marker	STATset MARKER OFF	Sets the marker to OFF.
		STATset MARKER ON	Sets the marker to ON.
		STATset MARKERSEL OFF	Sets the ASPECT marker to OFF.
		STATset MARKERSEL 4B3	Sets the 4:3 marker.
		STATset MARKERSEL 16B9	Sets the 16:9 marker.
		STATset MARKERSEL 15B9	Sets the 15:9 marker.
		STATset MARKERSEL 14B9	Sets the 14:9 marker.
		STATset MARKERSEL 13B9	Sets the 13:9 marker.
		STATset MARKERSEL 185B1	Sets the 1.85:1 marker.
		STATset MARKERSEL 235B1	Sets the 2.35:1 marker.
		STATset MARKERSEL 185A4B3	Sets the 1.85:1&4:3 marker.
		STATset MARKERMAT OFF	Sets MARKER MAT to OFF.
		STATset MARKERMAT HALF	Sets MARKER MAT to HALF.
		STATset MARKERLEVEL 1	Sets MARKER LEVEL to 1.
		STATset MARKERLEVEL 2	Sets MARKER LEVEL to 2.
		STATset CENTMARKER OFF	Sets CENTER MARKER to OFF.
		STATset CENTMARKER ON	Sets CENTER MARKER to ON.
	Audio Select	STATset BKMAUDIOSEL OFF	Sets SDI AUDIO SETTING to OFF.
		STATset BKMAUDIOSEL CH1	Sets SDI AUDIO SETTING to CH1.
		STATset BKMAUDIOSEL CH2	Sets SDI AUDIO SETTING to CH2.
		STATset BKMAUDIOSEL CH3	Sets SDI AUDIO SETTING to CH3.
		STATset BKMAUDIOSEL CH4	Sets SDI AUDIO SETTING to CH4.
		STATset BKMAUDIOSEL CH5	Sets SDI AUDIO SETTING to CH5.
		STATset BKMAUDIOSEL CH6	Sets SDI AUDIO SETTING to CH6.
		STATset BKMAUDIOSEL CH7	Sets SDI AUDIO SETTING to CH7.
		STATset BKMAUDIOSEL CH8	Sets SDI AUDIO SETTING to CH8.
		STATset BKMAUDIOSEL CH9	Sets SDI AUDIO SETTING to CH9.
		STATset BKMAUDIOSEL CH10	Sets SDI AUDIO SETTING to CH10.
		STATset BKMAUDIOSEL CH11	Sets SDI AUDIO SETTING to CH11.
		STATset BKMAUDIOSEL CH12	Sets SDI AUDIO SETTING to CH12.
		STATset BKMAUDIOSEL CH13	Sets SDI AUDIO SETTING to CH13.
		STATset BKMAUDIOSEL CH14	Sets SDI AUDIO SETTING to CH14.
		STATset BKMAUDIOSEL CH15	Sets SDI AUDIO SETTING to CH15.
		STATset BKMAUDIOSEL CH16	Sets SDI AUDIO SETTING to CH16.
		STATset BKMAUDIOSEL CH1CH2	Sets SDI AUDIO SETTING to CH1+CH2.
		STATset BKMAUDIOSEL CH3CH4	Sets SDI AUDIO SETTING to CH3+CH4.
		STATset BKMAUDIOSEL CH5CH6	Sets SDI AUDIO SETTING to CH5+CH6.
		STATset BKMAUDIOSEL CH7CH8	Sets SDI AUDIO SETTING to CH7+CH8.
		STATset BKMAUDIOSEL CH9CH10	Sets SDI AUDIO SETTING to CH9+CH10.
		STATset BKMAUDIOSEL CH11CH12	Sets SDI AUDIO SETTING to CH11+CH12.
		STATset BKMAUDIOSEL CH13CH14	Sets SDI AUDIO SETTING to CH13+CH14.
		STATset BKMAUDIOSEL CH15CH16	Sets SDI AUDIO SETTING to CH15+CH16.