The top half of the page features a complex, abstract background of overlapping, semi-transparent blue triangles and polygons, creating a dynamic, crystalline effect. The colors range from light sky blue to deep navy blue.

Technical Reference
020-102499-04

Extreme Series LCD Panels

External Controls

CHRISTIE®

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About external controls

In addition to using the display keypad or the remote control, you can control a display panel by using a serial (RS232/RS485) link to send ASCII commands and receive responses to those commands.

You can also use discrete infrared (IR) control codes to program a third-party remote control unit. For more information, see *Using discrete IR codes* (on page 22).

Sending communications over an RS232 or an Ethernet connection

Learn how to send messages from a control computer to a display panel over an RS232 or an Ethernet link.

The control computer or device must be running one of the following applications:

- An audio/video control system such as those manufactured by AMX, Extron, or Crestron
- The Video Wall Toolbox application

For more information on the Video Wall Toolbox application, see *Using the Video Wall Toolbox application* (on page 13).

Configuring the RS232 port

Learn how to configure the RS232 port.

1. Connect the control computer to the RS232 input on the display panel.
2. Do one of the following.
 - If you are using the Video Wall Toolbox application, to connect the control computer to the display panel, select the **COM: port**.
For more information, see *Using the Video Wall Toolbox application* (on page 13).
 - If you are using an audio/video control system, complete the following to configure the RS232 port on the system.
 - a. Select **no parity, 8 data bits, 1 stop bit, and no flow control**.
 - b. Set the baud rate to 115200, so that it matches the RS232 port on the display panel.

Ethernet connection command and response format

If you are using the Video Wall Toolbox application, select the IP address of the display panel. If you are using an audio/video control system, configure the control system to the IP address of the display panel and send commands using the Telnet protocol.

Commands sent from an automation/control system or a control computer to the display panel must be sent in this format:

[STX] [IDT] [TYPE] [CMD] ([VALUE] or [REPLY]) [ETX] [CR]

Where:

- [STX] indicates the start of the data command (always 07).
- [IDT] is the display ID. Use hexadecimal values 01 to 19 inclusive to address a single display panel. Use 00 to broadcast a command to all display panels in a video wall.
- [TYPE] is the command type:
 - 00 = return to host (response from the LCD panel)
 - 01 = read/action
 - 02 = write
- [VALUE] is the parameter setting for the command.
- [REPLY] is the parameter setting for the command, acknowledged by the display panel in its response to a command.
- [ETX] indicates the end of the command data (always 08).
- [CR] is the ASCII carriage return key (0x0D).

Examples: Serial commands and responses

The following are some examples of serial commands and their responses.

Description	Command sent to the display panel	Response received from the display panel
Turn off the display panel.	07 01 02 50 4F 57 00 08	07 01 00 50 4F 57 00 08
Turn on the display panel.	07 01 02 50 4F 57 01 08	07 01 00 50 4F 57 01 08
Request the display panel status.	07 01 01 50 4F 57 08	07 01 00 50 4F 57 XX 08 (XX = 0 when off, or 1 when on)
Set the display panel contrast to 30 (1E hex).	07 01 02 43 4F 4E 1E 08	07 01 00 43 4F 4E 1E 08
Request the display panel use large PIP.	07 01 02 50 53 43 03 08	07 01 00 50 53 43 03 08
Reset the display settings on the display panel.	07 01 02 41 4C 4C 00 08	07 01 00 41 4C 4C 00 08
Request the serial number of the display panel.	07 01 01 53 45 52 08	07 01 00 53 45 52 S(0)...S(12) 08
Request the firmware version of the display panel.	07 01 01 47 56 45 08	07 01 00 47 56 45 S(0)...S(5) 08 (S(0)...S(5) = firmware version in ASCII)

Serial command list

Learn the serial commands that work with a display panel.

Power control and input sources

Learn the commands for power control and input sources.

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)
Power control and input source	Power control	POW	W/R	0	0	Off (soft power)	50 4F 57
				1	1	On (soft power)	
	Input source	MIN	W/R	0	0	VGA	4D 49 4E
				1	1	Digital DVI	
				9	9	HDMI 1	4D 49 4E
				10	10	HDMI 2	
				13	13	DisplayPort	
				14	14	OPS	

Display adjustment

Learn the commands for making adjustments to the display.

The 25 Reply Bytes are defined: bD1, bD2, bD3, ..., bD25, where:

- bD1 = High byte of RY*16, bD2 = Low byte of RY*16.
- bD3 = High byte of Rx*10000, bD4 = Low byte of Rx*10000.
- bD5 = High byte of Ry*10000, bD6 = Low byte of Ry*10000.
- bD7 = High byte of GY*16, bD8 = Low byte of GY*16.
- bD9 = High byte of Gx*10000, bD10 = Low byte of Gx*10000.
- bD11 = High byte of Gy*10000, bD12 = Low byte of Gy*10000.
- bD13 = High byte of BY*16, bD14 = Low byte of BY*16.
- bD15 = High byte of Bx*10000, bD16 = Low byte of Bx*10000.
- bD17 = High byte of By*10000, bD18 = Low byte of By*10000.
- bD19 = High byte of WY*16, bD20 = Low byte of WY*16.

- bD21 = High byte of Wx*10000, bD22 = Low byte of Wx*10000.
- bD23 = High byte of Wy*10000, bD24 = Low byte of Wy*10000.
- bD25 = checksum (bD1+bD2+...+bD25=0x00).

RY, GY, BY, and WY are the Luminance (cd/m2) of all pixel red, green, blue, and white respectively. (Rx, Ry), (Gx, Gy), (Bx, By), and (Wx, Wy) are the Color Chromaticity of all pixel red, green, blue, and white respectively.

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)
Display adjustment	Display adjustment	BRI	W/R	0~100	Current value	Backlight	42 52 49
		BRL	W/R	0~100	Current value	Brightness	42 52 4C
		BLC	W/R	0	0	Off (Backlight)	42 4C 43
				1	1	On (Backlight)	
		CON	W/R	0~100	Current value	Contrast	43 4F 4E
		SHA	W/R	0~24	Current value	Sharpness	53 48 41
		HUE	W/R	0~100	Current value	Hue	48 55 45
		SAT	W/R	0~100	Current value	Saturation	53 41 54
		CCT	W/R	0~64	Current value	Color temperature (3200K~9600K)	43 43 54
		GAC	W/R	0	0	Off (Gamma)	47 41 43
				1	1	2.2 (Gamma)	
		USR	W/R	0~255	Current value	Red Gain (128~383)	55 53 52
		USG	W/R	0~255	Current value	Green Gain (128~383)	55 53 47
		USB	W/R	0~255	Current value	Blue Gain (128~383)	55 53 42
		UOR	W/R	0~100	Current value	Red Offset (-50~50)	55 4F 52
UOG	W/R	0~100	Current value	Green Offset (-50~50)	55 4F 47		

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)
		UOB	W/R	0~100	Current value	Blue Offset (-50~50)	55 4F 42
		RXY	R		25 bytes	Read Luminance & Color Chromaticity for 9300K	42 58 59
	VGA adjustment	PHA	W/R	0~63	Current value	Phase	50 48 41
		CLO	W/R	0~100	Current value	Clock	43 4C 4F
		HOR	R		Current value	Horizontal Position	48 4F 52
		VER	R		Current value	Vertical Position	56 45 52
		ADJ	W	0	0	Auto Adjust	41 44 4A

Other controls

Learn the commands for other controls.

In broadcast mode, the command that is used to auto sort the Monitor ID sequentially must have a Value Byte of 0x01.

In broadcast mode, the command that is used to auto arrange the Division X/Y must have a Value Byte of 0x11.

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)
Other control	PIP adjust	PSC	W/R	0	0	PIP OFF	50 53 43
				1	1	PIP small	
				2	2	PIP medium	
				3	3	PIP large	
				4	4	PIP side-by-side	
	PIP source selection	PIN	W/R	0	0	VGA	50 49 4E
				1	1	Digital DVI	
				9	9	HDMI 1	
				10	10	HDMI 2	
				13	13	DisplayPort	
				14	14	OPS	

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)
	PIP position	PPO	W/R	0	0	PIP position bottom-left	50 50 4F
				1	1	PIP position bottom-right	
				2	2	PIP position top-left	
				3	3	PIP position top-right	
	PIP/Main swap	SWA	W	0	0	Swap main and PIP	53 57 41
	Scaling	ASP	W/R	0	0	Native	41 53 50
				1	1	Full screen	
				2	2	4:3	
				3	3	Letterbox	
		ZOM	W	0	0	Zoom in	5A 4F 4D
				1	1	Zoom out	
	Baud rate adjustment	BRA	W/R	0	0	115200	42 52 41
				1	1	38400	
				2	2	19200	
				3	3	9600	
	Other control	RCU	W	0	0	MENU key	52 43 55
				1	1	INFO key	
				2	2	UP key	
				3	3	DOWN key	
				4	4	LEFT key	
5				5	RIGHT key		
6				6	ENTER key		
7				7	EXIT key		
8				8	VGA key		
9				9	DVI key		
10				10	HDMI 1 key		
11				11	HDMI 2 key		
12				12	DISPLAYPORT key		
18	18	SOURCE key					
19	19	P-SOURCE key					

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)
				20	20	PIP key	
				21	21	P-POSITION key	
				22	22	SWAP key	
				23	23	SCALING key	
				26	26	BRIGHT key	
				27	27	CONTRAST key	
				28	28	AUTO key	
		ALL	W	0	0	Reset all	41 4C 4C
		KLC	W/R	0	0	Unlock keys	4B 4C 43
				1	1	Lock keys	
		SER	R		13 Bytes	Read serial number	53 45 52
		MNA	R		13 Bytes	Read model name	4D 4E 41
		GVE	R		6 Bytes	Read firmware version	47 56 45
		RTV	R		Current Value	Read RS232 table version	52 54 56
		RTT	R		Current Value	Read the temperature of the internal thermal sensor (-128 ~ +12&°C).	52 54 54
		RSF	R		Current Value	Read the Fan 1 speed (RPM=30xReply Value).	52 53 46
			W	0	0~255	Read the Fan 1 speed (RPM=30xReply Value).	
			1	0~255	Read the Fan 2 speed (RPM=30xReply Value).		
	Wake up from sleep selection	WFS	W/R	0	0	VGA only	57 46 53
				1	1	VGA, Digital, RS232	
				2	2	Never sleep	
	Scheme selection	SCM	W/R	0	0	User	53 43 4D

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)	
				1	1	Sport		
				2	2	Game		
				3	3	Cinema		
				4	4	Vivid		
	Multi-display	SID	W		0	0	Show Monitor ID	53 49 44
		CID	W		0~100*	0	Change Monitor ID	43 49 44
		VWS	W/R		0	0	Video wall switch off	56 57 53
					1	1	Video wall switch on	
		VWF	W/R		0	0	Video wall frameless off	56 57 46
					1	1	Video wall frameless on	
		MAT	W/R		X: 1~10 Y: 1~10	Current value	Matrix X, Y value High quarter is X: 7 ~ 4 bit Low quarter is Y: 3 ~ 0 bit	4D 41 54
		DIV	W/R					
		ATT	W/R		0	0	Anti-tearing: Off	41 54 54
					1	1	Anti-tearing: Auto	
					2	2	Anti-tearing: Odd	
					3	3	Anti-tearing: Even	
	POD	W/R		0~30	Current Value	Integral part of Power On Delay (0, 1, 2 ..., 30 sec).	50 4F 44	
	POE	W/R		0~19	Current Value	Fractional part of Power On Delay (0, 0.05, 0.10, ..., 0.95 sec).	50 4F 45	
	Self diagnosis	OTT	R			4 Bytes	Accumulated operation time (minutes)	4F 54 54
		OTS	R			4 Bytes	Operation time (minutes)	4F 54 53
ERR		R			4 Bytes	Error code	45 52 52	

Main item	Control item	CMD	Type	Value (DEC)	Reply (DEC)	Content	CMD (HEX)
		LMT	R		8 Bytes	The maximum temperature and the corresponding accumulated operation time (minutes).	4C 4D 54
		LM1	R		8 Bytes	The 1st error log	4C 4D 31
		LM2	R		8 Bytes	The 2nd error log	4C 4D 32
		LM3	R		8 Bytes	The 3rd error log	4C 4D 33
		LM4	R		8 Bytes	The 4th error log	4C 4D 34
		LM5	R		8 Bytes	The 5th error log	4C 4D 35
		LM6	R		8 Bytes	The 6th error log	4C 4D 36
		LM7	R		8 Bytes	The 7th error log	4C 4D 37
		LM8	R		8 Bytes	The 8th error log	4C 4D 38
		LM9	R		8 Bytes	The 9th error log	4C 4D 39
		LMA	R		8 Bytes	The 10th error log	4C 4D 41

*If a value of 0 is entered, the command is broadcast to all panels in the array.

Using the Video Wall Toolbox application

The Video Wall Toolbox application can be used to configure and control a single display panel or a video wall.

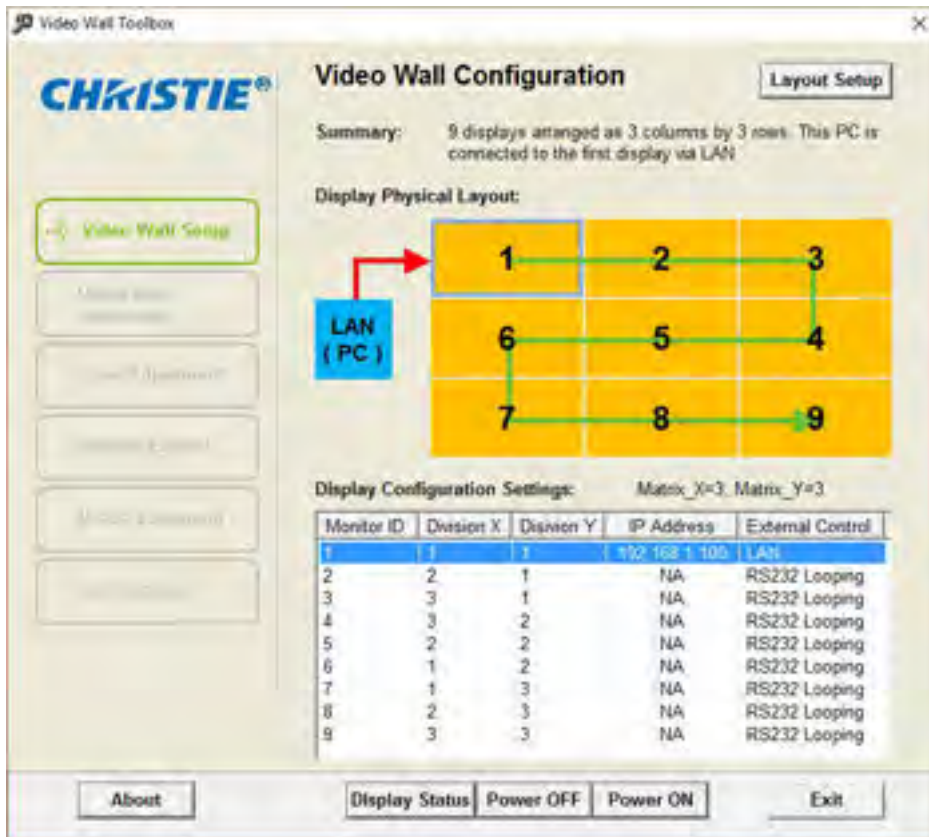
The application provides an alternative to using the remote control unit or built-in keypad. It presents all of the controls in the on-screen display (OSD) menus as a graphical user interface.

To use the Video Wall Toolbox application, the control computer must be running Windows 7 or later.

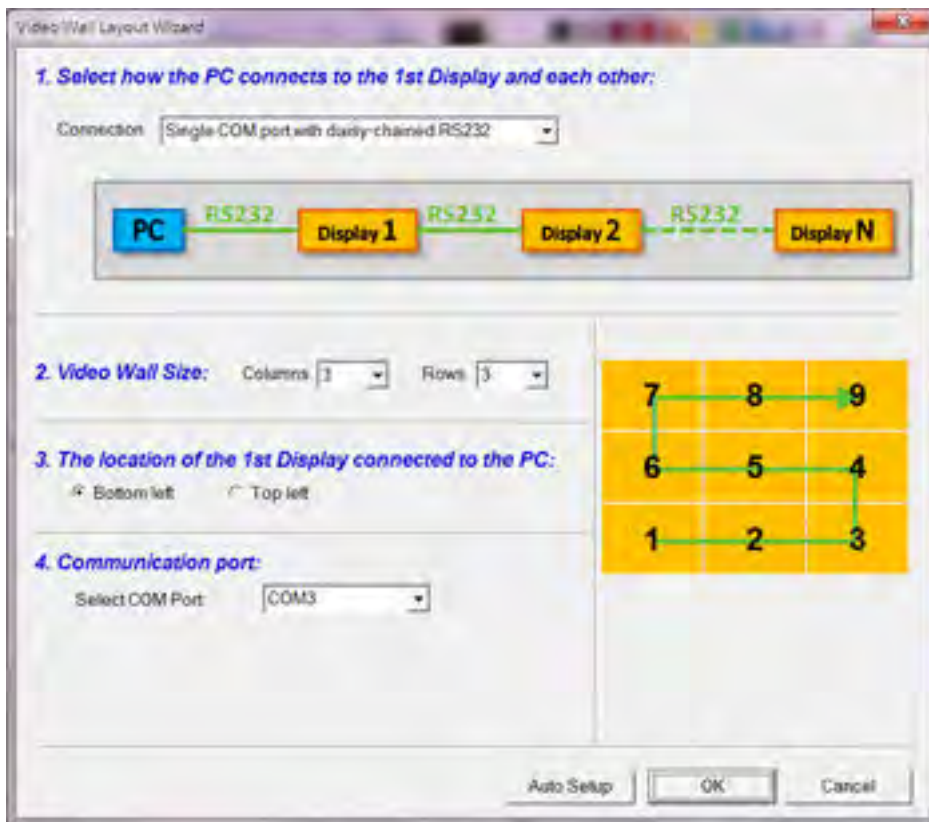
Installing the Video Wall Toolbox application

Learn how to install and set up the Video Wall Toolbox application on the control computer.

1. Download the Video Wall Toolbox application from <https://www.christiedigital.com/>.
2. Connect the control computer to a display panel or video wall.
For detailed instructions on connecting a control computer to a video wall using an RS232 or an Ethernet connection, refer to the user manual for the product.
3. Verify that the baud rate for the RS232 connection on the control computer matches the baud rate of the display panel.
The default baud rate is 115200.
4. Launch The Video Wall Toolbox application.



- To specify the size of the video wall, in the **Video Wall Size** fields, enter the number of columns and rows in your video wall.



6. Specify the location of the first display panel that is connected to the display computer.
7. To connect the display panel or video wall to the control computer, in the **Select COM Port** list, select an option.
8. To automatically assign Monitor IDs to all the display panels in a video wall, select **Auto Setup**.

Understanding functions of the Video Wall Toolbox application

Learn the differences between the functions of the Video Wall Adjustment screen, the Color Adjustment screen, and the Remote Control screen.

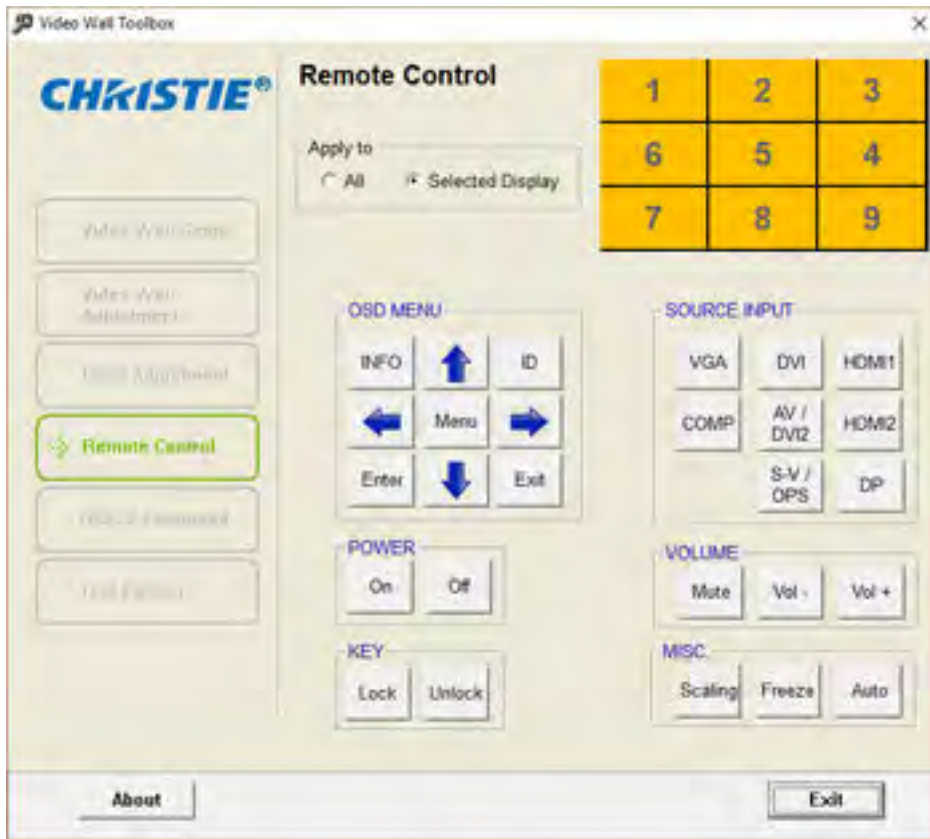
- The Video Wall Adjustment screen provides the same controls as the Multi-Display Control menu on a display panel.



- The Color Adjustment screen provides the same image quality controls as the Image Settings menu on a display panel.

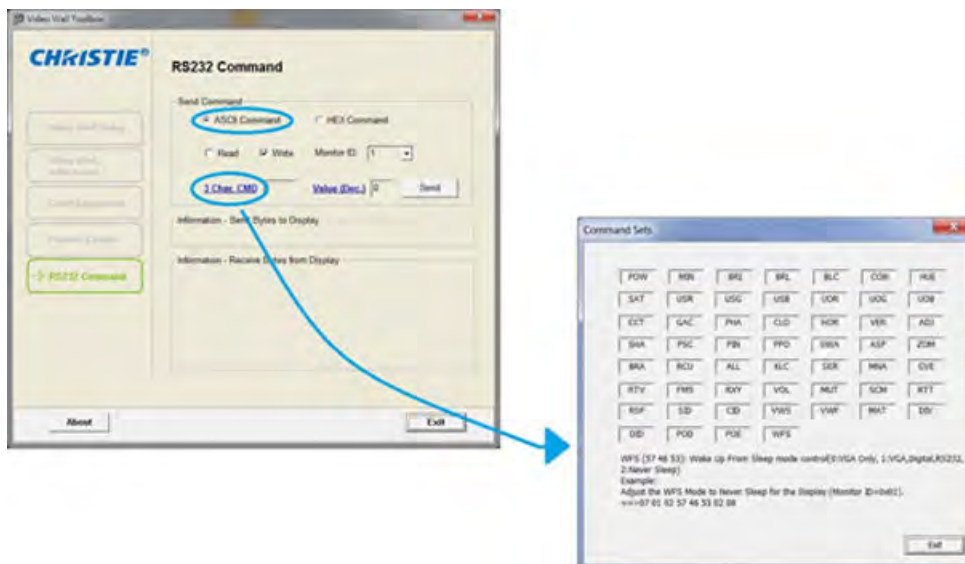


- The Remote Control screen provides the same functionality as the hand-held remote control.



Entering RS232 commands in ASCII format

Learn how to send and receive RS232 commands using the Video Wall Toolbox application. Use the RS232 Command screen to manually enter supported RS232 commands in ASCII format.

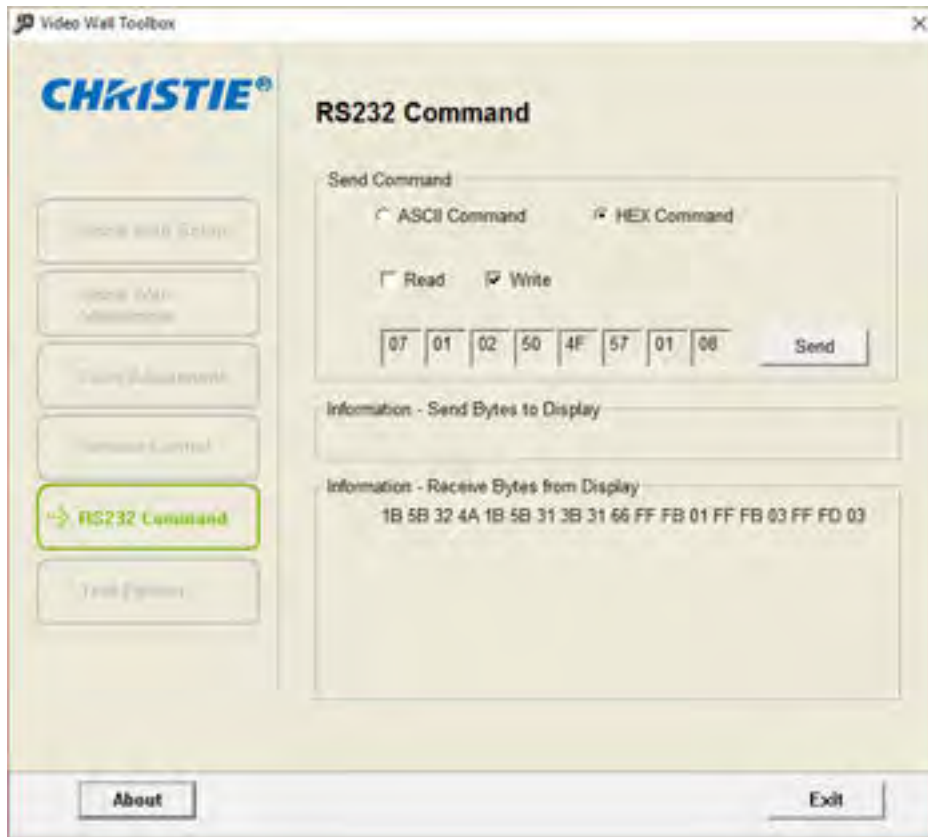


1. On the RS232 Command screen, under Send Command, select **ASCII Command**.
2. To select a command type, select **Read** or **Write**.
3. To select a command destination, from the **Monitor ID** list, select a display panel.
4. If you are entering a Read command, do one of the following.
 - To manually enter a valid three-character command from the *Serial Command List* (on page 6), in the **3 Char CMD** field, type a command.
 - To choose a three-character command from a list of commands, click **3 Char CMD**. When you hover your mouse pointer over a command, a brief description of the command and an example in hexadecimal format appear at the bottom of the window. Click a command to select it.
5. If you are entering a Write command, do one of the following.
 - To enter a decimal parameter value to send with the command, in the **Value (Dec.)** field, enter a value.
 - To change the parameter entry mode to Value (Hex) and enter a hexadecimal value, click **Value (Dec.)**.
6. Click **Send**.

If the command is successfully executed, the command and the response from the target display panel appear in the window.

Entering RS232 commands in hexadecimal format

Learn how to enter RS232 commands in hexadecimal format using the Video Wall Toolbox application.



1. On the RS232 Command screen, under Send Command, select **HEX Command**.
2. To select a command type, select **Read** or **Write**.
3. Click the far-left text box then enter 07.
4. In the second text box, enter the Monitor ID.
5. In the third text box, enter 01 for a Read command, or 02 for a Write command.
6. In the next three text boxes, enter the command.
If you are entering a Write command, enter a parameter value to send with the command.
7. In the far-right text box, enter 08.
8. Click **Send**.
If the command is successfully executed, the command and the response from the target display panel appear in the window.

Generating a test pattern

Learn how to generate a test pattern on a display panel or a video wall using the Video Wall Toolbox application.



1. To select whether to display a test pattern across a video wall or on just one display panel, under Apply To, select **All** or **Selected Display**.
If you chose **Selected Display**, select the Monitor ID for the target display panel.
2. Do one of the following.
 - To generate an internal test pattern from a display panel, under Test Pattern from Display, select a test pattern.
 - To generate an external test pattern from the control computer, under Test Pattern from Computer, select a test pattern.

Using discrete IR codes

A display panel can accept commands in the form of infrared (IR) signals that conform to NEC protocol.

Each button on a display panel remote control has an IR control code associated with it. You can use these codes to program a third-party, universal, remote control unit that can work with the display panel. Generally, these third-party products come with a computer software application that supports this. For more information, see the documentation provided with the third-party remote control unit.

IR command protocol

The following are characteristics that IR control codes possess.

- Each code consists of the following.
 - **A leader pulse**—A modulated pulse of 9 ms followed by a non-modulated pulse of 4.5 ms.
 - **16 address bits (custom code)**—Eight bits for the address followed by the logical inverse of the address. The custom code for the display is 16559 decimal (0x40AF, binary 01000000 10101111).
 - **16 data bits**—Eight bits for the command followed by the logical inverse of the command.
 - **An end pulse**—A modulated pulse of 0.56 ms, similar to the modulated pulse in the 0 and 1 bits. The end of the modulated pulse constitutes the end of the data transmission.
- The carrier frequency is 38 kHz, with the modulated pulses having a 33% duty cycle.
- Commands are sent at a maximum rate of 9 Hz.

To illustrate, below is the NEC control code for the POWER button on the display panel remote control unit.

Hex	40	AF	1C	E3
Binary	01000000	10101111	00011100	11100011
Function	Cust. Code Byte 1	Cust. Code Byte 2	Command	Command (logical inverse)

IR control code list

Learn the IR control codes.

Customer code	Data code	Function
40AF	04FB	INFO
40AF	1CE3	POWER
40AF	07F8	VGA

Customer code	Data code	Function
40AF	08F7	DVI
40AF	09F6	HDMI1
40AF	0CF3	HDMI2
40AF	1AE5	PIP POSITION
40AF	15EA	DISPLAY PORT
40AF	11EE	PIP
40AF	0DF2	OPS
40AF	06F9	SWAP
40AF	13EC	PIP SOURCE
40AF	02FD	UP ARROW
40AF	01FE	LEFT ARROW
40AF	0EF1	MENU
40AF	03FC	RIGHT ARROW
40AF	19E6	DOWN ARROW
40AF	12ED	ENTER
40AF	05FA	EXIT
40AF	14EB	SCALING
40AF	17E8	BRIGHT
40AF	18E7	CONTRAST
40AF	1EE1	AUTO
40AF	0FF0	SOURCE

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