GraphXMASTER™ RPMS/CS50/CS70

Serial Communications

Section Contents

NOTE: 1) The following document explains external serial communication (RS-232 or RS-422) and commands for programming and controller applications. It applies to all GraphXMASTER™ RPMS/CS50/CS70 products, unless otherwise noted. 2) For applications beyond simple projector control, contact CHRISTIE for technical assistance. – Software version 2.4c at time of publication. –

Overview

RS-232 serial communications allow simultaneous interfacing and control of one or more projectors and accessories by an external controller, such as an AMX or Creston controller or a simple ASCII terminal. Once connected to the RS-232 (or RS-422, if supported by your external equipment) port of the projector, controllers can access projector controls and setups, issuing commands or queries and receiving replies.

This bi-directional communication is useful for:

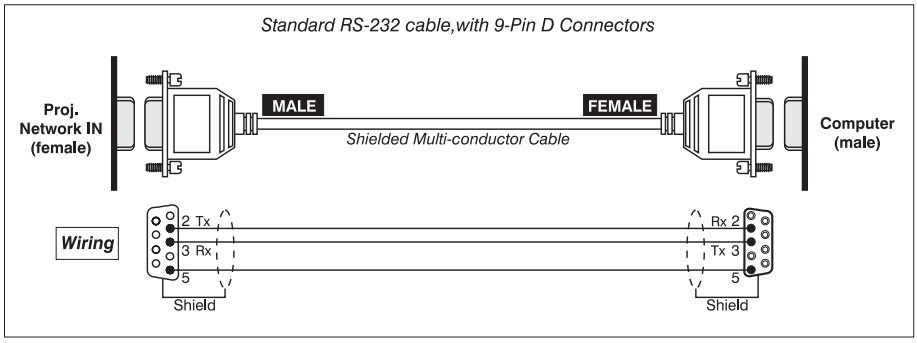
- downloading projector software upgrades through *CoRE Librarian*
- controlling multiple projectors
- obtaining a projector status report
- automating events on the projector (source switching, adjustments, etc.)
- monitoring sequences of events
- diagnosing certain performance problems

1. Connection

When connecting a projector to a computer another projector use the appropriate serial communication cabling as illustrated.

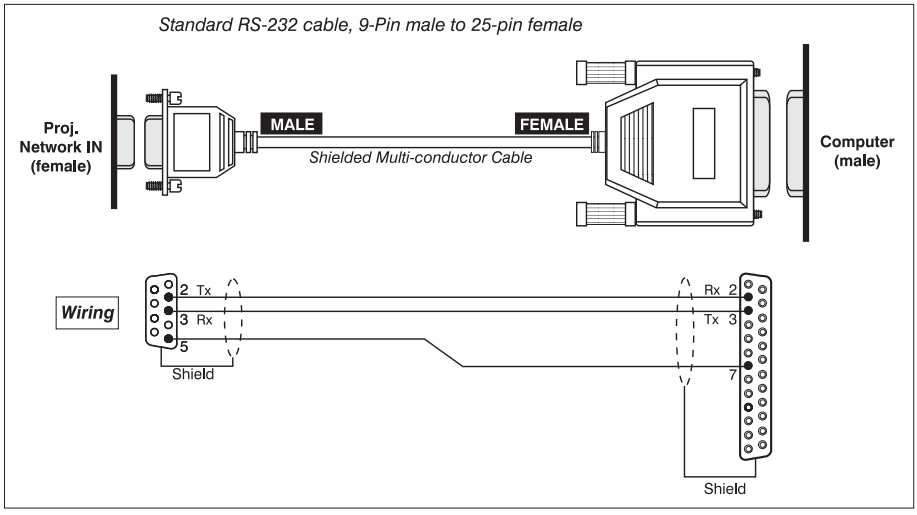
❑ ***From projector to computer (RS-232)***

For computers having a 9-pin "AT" type serial port

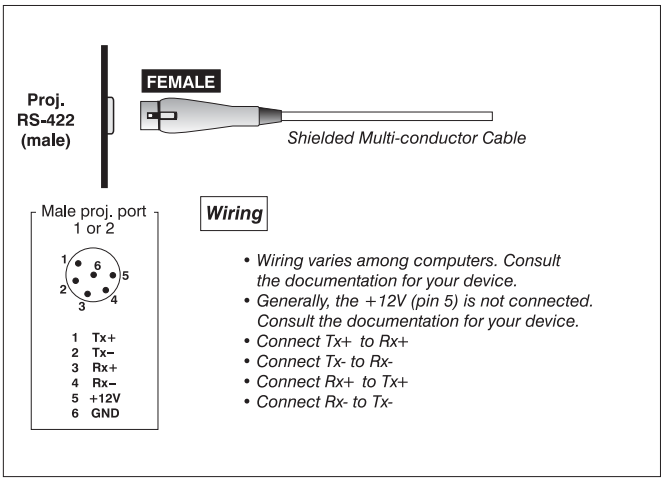


❑ ***From projector to computer (RS-232)***

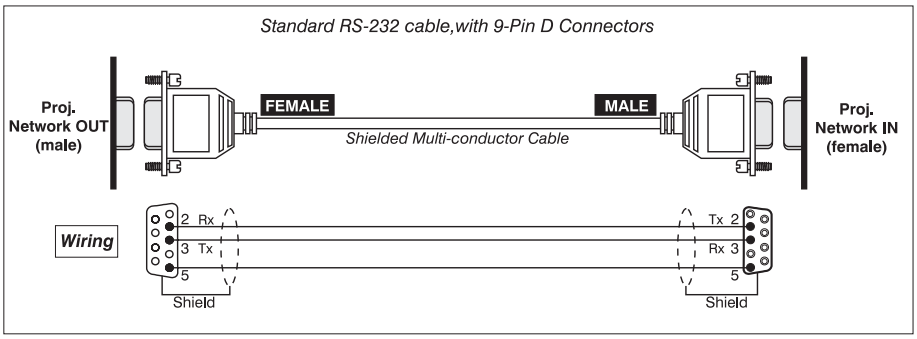
For computers having a 25-pin serial port



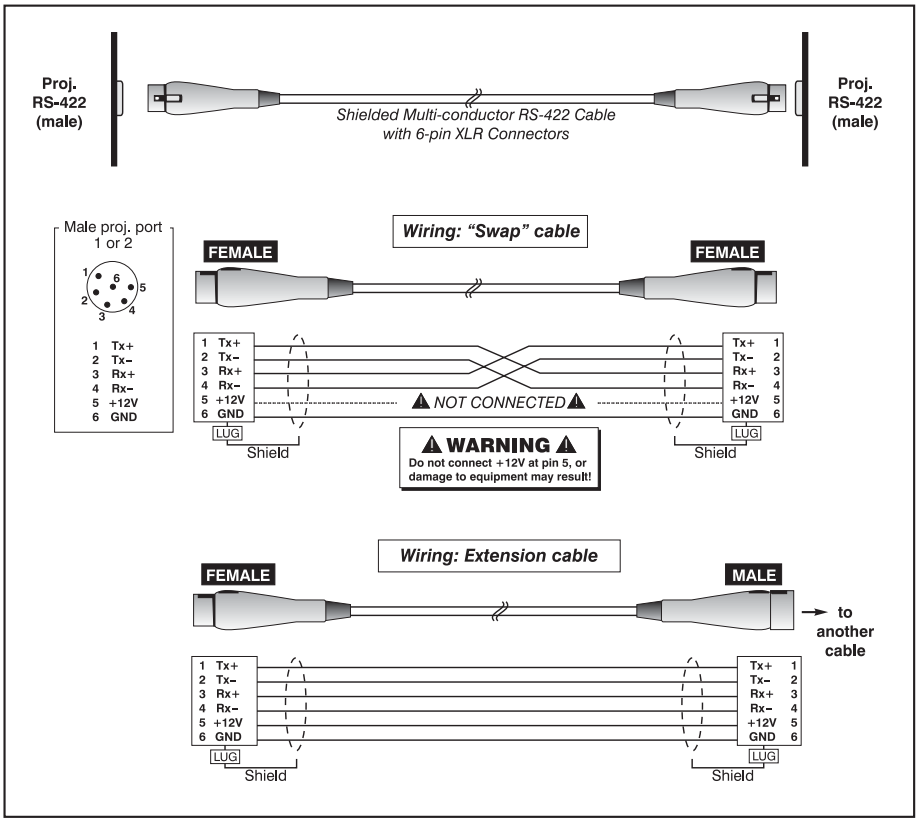
❑ *From projector to RS-422 compatible computer*



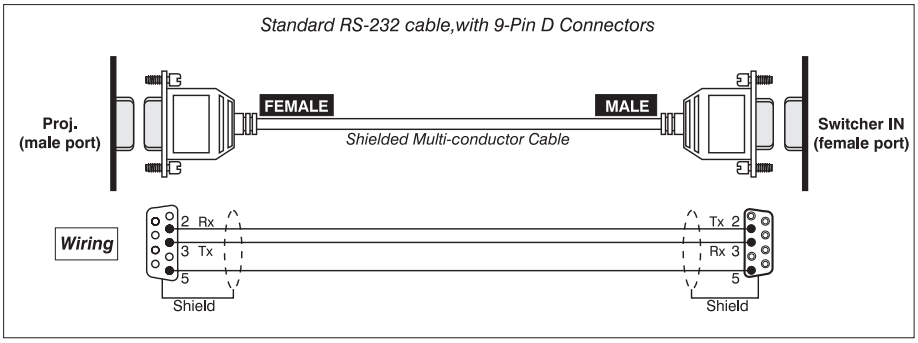
❑ *From projector to projector (RS-232)*



❑ *From projector to projector (RS-422)*

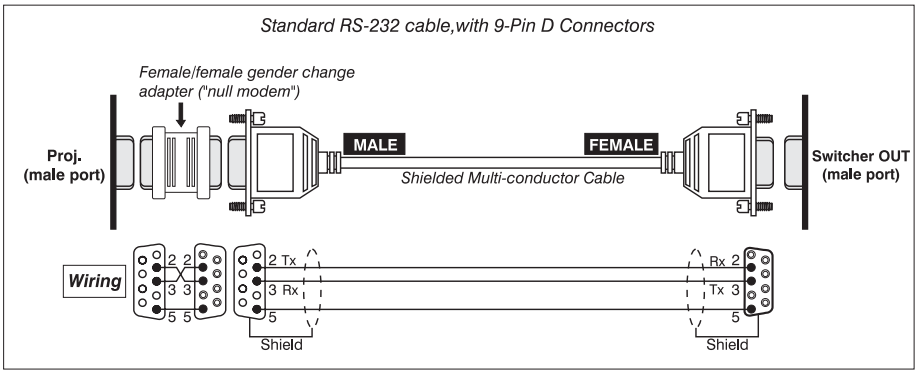


❑ ***From projector to switcher, new installation***



❑ ***From projector to switcher, in existing Marquee™ installation***

For adding a projector to an existing installation in which the switcher OUT port is used (such as with Marquee™ installations), add a gender-changing adapter at the projector port as shown:



2. Message Format

All serial communication passes in and out of the projector in messages. For example, to set the Contrast level to a specific value the controller sends a “set” message to the projector. To read the current value of a parameter the controller sends a “***request***” message asking for the information—the projector then returns the data in a “***reply***” message.

These messages use simple ASCII characters—normal letters, numbers and punctuation—and consist of a three-letter command code and any accompanying data. Opening and closing round brackets (parentheses) indicate the beginning and the end of a message as shown below.

(cmd data)

Three-letter commands sent ***to*** the projector can be uppercase, lowercase, or a mixture. For example, the contrast commands 'CON', 'con' and 'cON' are all the same. Replies ***from*** the projector are always uppercase.

This simple protocol can be used with a straightforward connection between a single projector and controller. It can also be used when several projectors are connected together in a network, however all projectors will respond to all messages. See Figure 2. for an explanation of how to send messages to specific projectors within a network.

When required, the basic protocol can be expanded to include additional information, such as when there are multiple parameters involved, or it can include options such as message acknowledgments, checksums, and network addressing.

Messages to The Projector

Commands can "***set"*** a projector control or preference to a specific value or "***request"*** the current setting from the projector.

Set Contrast to a value of 75: (CON75)

Request the current Contrast setting: (CON?)

Messages From The Projector

After a "***request***" message is sent to the projector (see above example) a reply comes back.

The projector ***Replies*** with data: (CON!075)

Replies are always:

- in upper case.
- identified with an exclamation mark.
- padded with leading zeros before the value.

Parameter values returned by the projector (such as contrast level) are always either 3 or 5 characters in length regardless of their actual value—the value is padded with leading zeros as needed. The length of a specific parameter will always be the same (for example, contrast is always returned as 3 characters, projector number is always returned as 5 characters). In the three-digit Contrast reply shown above, 075 shows that the contrast level is set at 75.

Optional Message Components

If desired, basic messages can be expanded in function with the insertion of one or two special characters.

Acknowledging Messages

If you want the projector to acknowledge that a message has been processed, request this acknowledgment by inserting a "$" just after the start code "(", as shown.

(**$**CON75)

The projector will then return a "$" when processing of the message is complete:

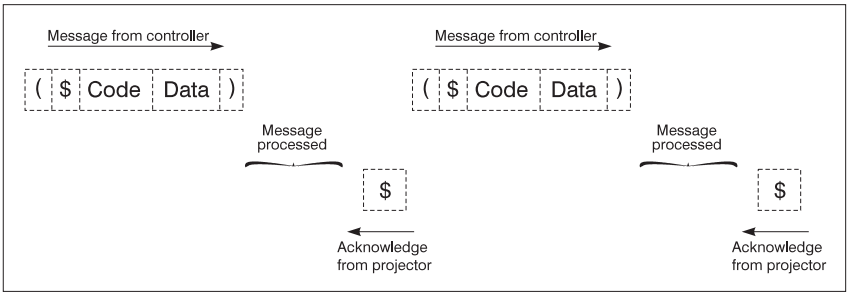


Figure 1.

Note that the "$" character is not accompanied by start and end characters—it is the complete acknowledgment (it can be part of a message such as dealer message command). If the request for an acknowledgment was sent to all projectors on a network (broadcast), each projector will return a "$" reply.

NOTE: Requesting an acknowledgment of a "request" is redundant, however the acknowledge character will still be returned after the usual reply.

Except when sending large data blocks such as source data, message acknowledgment can be used instead of Xon/Xoff for flow control. (Wait for the projector to acknowledge that the previously sent message has been processed before sending the next message – this way, the projector will never have to store any messages in a buffer.)

Checksums

If desired, you can add a character "&" to an RS-232 message for increased message integrity. Insert this character just after the start code. You must then also include the correct checksum total (0-255) just before the end code. Make sure to add a space before the calculated checksum to separate it from the last data parameter as shown:

(**&**con64 240)

The checksum is the low byte of the sum of the ASCII values of all characters *between* the first character of the checksum, including the space after the last data parameter. Calculate the checksum for the above "set contrast" command as follows:

CHECKSUM = & + c + o + n + 6 + 4 + 'space'
= 26*h*+63*h* +6F*h* +6E *h* +36*h* +$34*h* +$20*h*
= 01F0*h*
= F0*h* when only the low byte is used
= 240

The projector collects all of the message bytes as defined in the first byte of the message, then creates its own checksum value for comparison with the checksum included in the controller's message. If the values match, the message is considered to be correctly received—otherwise the message is discarded.

NOTES: 1) 'h' indicates a hex number 2) If a "request" message has a checksum so will the reply. 3) If using "acknowledge" and "checksum", either character can occur first.

Sample Formats and Messages ➤

The following figure shows how to construct and interpret some specific sample messages (ASCII) commonly used for one or more projectors.

• For Single Projector
• For Broadcasting

Message Format	Function	Examples
(Code Data)	**SET** *(set contrast to 64)*	(con64)
(Code ?)	**REQUEST** *(what's current contrast?)*	(Con?)
(Code ! Data)	**REPLY** *(contrast is 64)*	(CON!064)
($ Code Data)	**SET AND ACKNOWLEDGE MESSAGE** *(message processed?)*	($con64)
(& Code Data space Checksum)	**SET WITH CHECKSUM**	(&CON64 240)

• For Specific Projector Within a Network
• 1 Controller Present

Message Format	Function	Examples
(Dest. Addr. Code Data)	**SET** *(turn proj.#5 on)*	(5pwr1)
($ Dest. Addr. Code Data)	**SET AND ACKNOWLEDGE MESSAGE** *(message processed?)*	($5pwr1)

• For Specific Projector Within a Network
• Multiple Controllers Present

Message Format	Function	Examples
(Dest. Addr. space Src. Code ?)	**REQUEST** *(get contrast from proj. #5 to controller #2)*	(5 2con?)
($ Dest. Addr. space Src. Code Data)	**SET AND ACKNOWLEDGE MESSAGE** *(is message from controller #2 processed by proj. #5?)*	($5 2con64)
($ Dest. Addr. space Src. Code ! Data)	**REPLY** *(from proj. #5 to controller #2: contrast is 64)*	(002 005CON!064)

Figure 2. Formats and Sample Messages

Flow Control ➤

Normally messages can be sent to the projector before processing of earlier messages is complete—the projector will just store messages in a buffer until ready to process. However, if a series of messages is sent it is possible that the projector will not be able to process them as fast as they arrive and the buffer will become full. If this happens, the projector will immediately send the 13*h* (Xoff) code to instruct the controller (or any devices preparing to transmit) to cease transmission. The controller must stop sending ASAP and at maximum before it sends 10 characters (approximately 10 milliseconds @ 9600 baud). The projector is able to accommodate the receipt of up to 10 more bytes after it sends 13*h* (Xoff) — additional bytes may be lost. When the buffer is once again available, the projector will send a 11*h* (Xon) command to resume transmission.

NOTE: Xon and Xoff controls apply to both directions of communication. The projector will not send more than 3 characters after it has received a 13h (Xoff) code.

Flow Control with "Acknowledge"

If the projector has not received a *Xon* one-minute after receiving a *Xoff* code it will assume that the *Xon* was lost and will resume transmissions. If the controller has received a *Xoff* and no *Xon* after one minute, it can assume that the *Xon* was lost.

If the controller waits for an acknowledgment before sending the next message and does not upload a complete source setup (the only message that is longer than 20 characters), the projector will never send a 13*h (Xoff)* code and the controller does not have to handle flow control codes.

3. Messages

The following Table of Messages (Table 1) lists RS-232 messages used for communicating with the projector. When referring to the table, keep in mind the following guidelines:

- ***Set*** and ***Reply*** messages usually have the same parameters in the same format
- ***Request*** messages are requests for information and usually have no data
- ***Request*** and ***Reply*** messages use the same code as ***Set*** messages except that bit#7 is set. *(Binary format only.)*
- Data is described using one or more parameters (P1, P2, etc.), each having a specific value representing the state of that parameter.
- Parameters can have spaces between them. For example, (5pwr1) is the same as (5 pwr 1)
- Out-of-range values sent to the projector will be converted to the maximum or minimum value, whichever is closest. This function can be used to determine the range of control. For simple commands, the min/max request can also be used. (con?m) =>(con!m 001 255)
- For those controls in which the projector normally displays a percentage (such as contrast is set to 72%), the RS-232 value represents the 0-254 setting, not the percentage. For example, an RS-232 contrast setting of 127 = 50%.

Messages involving multiple parameters or other details are further explained in *4. Messages with Multiple Parameters*.

Table 1. Table of Messages

NOTE: *1) Commands and parameters apply to all GraphXMASTER™ RPMS/CS50/CS70 products, unless otherwise noted. 2) The parameters indicated in this chart are current at time of publishing for Software version 2.4c. To verify the parameter range for a command (for source type), use (ASCII code?m). 3) Some commands have multiple parameters - they are described in detail with examples in* ***4. Messages with Multiple Parameters****.*

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Projector Number	ADR	P1: 0-999	Changes the address of projector Example: (5ADR 25) from #5 to #25	(ADR ?) (ADR 0) (ADR 999)	(0 ADR ?) (0 ADR 0) (0 ADR 999)	(1 ADR ?) (1 ADR 0) (1 ADR 999)
Auto Gain Control	AGC		When enabled, allows the decoder in the projector to automatically track the sync amplitude of the incoming signal. Control is typically enabled.	(AGC ?)	(0 AGC?)	(1 AGC?)
Advanced Horizontal Filter	AHF	P1: 0 - 10	Adjust horizontal filter cutoffs. The higher the value the lower the cutoff. Requires 10-bit ADP module. Set to 0, ADP will determine horizontal filter cutoffs.	(AHF ?) (AHF 0) (AHF 1)	(0 AHF?) (0 AHF 0) (0 AHF 1)	(1 AHF?) (1 AHF 0) (1 AHF 1)
Auto Input Level	AIL	P1: 0 = Off 1 = On	Monitors input signal levels and adjusts input offset or gain when the white and black levels become crushed.	(AIL ?) (AIL 0)	(0 AIL ?) (0 AIL 0)	(1 AIL ?) (1 AIL 0)
Adjust Primary Colors	APC		Adjust primary colors. See APC in *4. Messages with Multiple Parameters.*			
Active Projector	APJ	P1: 0 = keypad inactive 1 = keypad active	Enables or disables the IR and wired keypad inputs to a specific projector in a network of projectors. Same function as the "PROJ" key.	(APJ 0) (APJ 1)	(0 APJ 0) (0 APJ 1)	(1 APJ 0) (1 APJ 1)
Auto Power Up	APW	P1: 0 = Off 1 = On	The projector will automatically power up after a power failure when this feature is enabled (ON).	(APW ?) (APW 0) (APW 1)	(0 APW ?) (0 APW 0) (0 APW 1)	(1 APW ?) (1 APW 0) (1 APW 1)
Auto Source	ASR	P1: S{source #) *(S0 = all sources)* P2: 0 = Off 1 = On	ASR can be "ON" or "OFF" for different sources. See ASR in *5. Multiple Sources*.			
Auto Setup	ASU		The projector will automatically adjust as many parameters as possible for optimal setup (of the current source)	(ASU)	(0 ASU)	(1 ASU)
Advanced Vertical Filter	AVF	P1: 0-10	Adjust vertical filter cutoffs. The higher the value the lower the cutoff. Requires 10-bit ADP module. Set to 0, ADP will determine horizontal filter cutoffs.	(AVF 0) (AVF 10)	(0 AVF 0) (0 AVF 10)	(1 AVF 0) (1 AVF 10)
Bottom Blanking	BBL	First, use manual adjustments to find optimal setting. Then use (ASCII CODE?m) to find parameter value for RS-232 code.	Sets the amount to blank at bottom of image. NOTE: The maximum amount of blanking is 25% of the picture.	(BBL?)	(0 BBL ?)	(1 BBL ?)
Baud Rate	BDR	P1: 1200 2400 9600 19200 38400 57600 115200	NOTE: The controller should wait at least 2s after setting the baud rate before sending the next message at the new rate.	(BDR?) (BDR 1200) (BDR 38400)	(0 BDR?) (0 BDR 1200) (0 BDR 38400)	(1 BDR?) (1 BDR 1200) (1 BDR 38400)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Broadcast Keys	BKY	P1: 0 = Off 1 = On	Broadcasts all keys received by a projector to all other projectors on the network.	(BKY ?) (BKY 1) (BKY 0)	(0 BKY ?) (0 BKY 1) (0 BKY 0)	(1 BKY ?) (1 BKY 1) (1 BKY 0)
Blue Blacklevel	BLB	P1: 0 – 255	Adjusts Blue BlackLevel for a specific source.	(BLB ?) (BLB 144)	(0 BLB ?) (0 BLB 144)	(1 BLB ?) (1 BLB 144)
Blue Drive	BLD	P1: 0 – 255	Adjusts Blue Drive Level for a specific source.	(BLD ?) (BLD 144)	(0 BLD ?) (0 BLD 144)	(1 BLD ?) (1 BLD 144)
Blue White Level	BLW	P1: 0 – 255	Adjusts the Blue White Level for the current color temperature. See also CTM.			
Blue Odd Gain	BOG	P1: 0 – 255	Sets the gain for the blue odd pixels relative to the blue even pixels.	(BOG ?) (BOG 0)	(0 BOG ?) (0 BOG 0)	(1 BOG ?) (1 BOG 0)
Blue Odd Offset	BOO	P1: 97-160	Sets the offset for the blue odd pixels relative to the blue even pixels.	(BOO ?) (BOO 97)	(0 BOO ?) (0 BOO 97)	(1 BOO ?) (1 BOO 97)
Brightness	BRT	P1: 0 – 255	Sets image brightness.	(BRT ?) (BRT 0) (BRT 62)	(0 BRT ?) (0 BRT 0) (0 BRT 62)	(1 BRT ?) (1 BRT 0) (1 BRT 62)
Brightness Uniformity	BRU		Enable/disable Brightness Uniformity flag, set brightness uniformity parameters. See BRU in subsection *4. Messages with Multiple Parameters.*			
Copy Color Temp.	CCT	P1: (Color Temp) 0 = 3200 1 = 5400 2 = 6500 3 = 9300 4 = User 1 5 = User 2 6 = User 3 7 = User 4 8 = Interpolated 9 = Factory 3200 10 = Factory 5400 11 = Factory 6500 12 = Factory 9300	Allows you to copy color temperature (P1) to the currently selected color temperature.	(CCT 0) (CCT 4) (CCT 10)	(0 CCT 0) (0 CCT 4) (0 CCT 10)	(1 CCT 0) (1 CCT 4) (1 CCT 10)
Channel Select	CHA	P1: 1 – 99	Select a channel or source. See also SRC command.	(CHA ?) (CHA 1) (CHA 99)	(0 CHA ?) (0 CHA 1) (0 CHA 99)	(1 CHA ?) (1 CHA 1) (1 CHA 99)
Color Enable	CLE	P1: 1 = red 2 = green 3 = blue 4 = yellow 5 = cyan 6 = magenta 7 = white 8 = black	Enables specific color for setting up a projector.	(CLE?) (CLE 1) (CLE 6)	(0 CLE ?) (0 CLE 1) (0 CLE 6)	(1 CLE ?) (1 CLE 1) (1 CLE 6)
Sync Tip Clamping	CLP	P1: 0 = Off 1 = On	Enables / disables sync tip clamping. Clamping at the tip of the sync pulse is only used if the back porch is too small.	(CLP ?) (CLP 0) (CLP 1)	(0 CLP ?) (0 CLP 0) (0 CLP 1)	(1 CLP ?) (1 CLP 0) (1 CLP 1)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Color	CLR	P1: 1 – 255	Sets color intensity for video images	(CLR ?) (CLR 0) (CLR 255)	(0 CLR ?) (0 CLR 0) (0 CLR 255)	(1 CLR ?) (1 CLR 0) (1 CLR 255)
Contrast	CON	P1: 1 – 255	Sets the contrast	(CON ?) (CON 1) (CON 254)	(0 CON ?) (0 CON 1) (0 CON 254)	(1 CON ?) (1 CON 1) (1 CON 254)
Chroma/Luma Delay	CRM	P1: 0 – 16	Adjusts the time delay between the chroma and the luminance in a decoded signal.	(CRM ?) (CRM 16)	(0 CRM ?) (0 CRM 16)	(1 CRM ?) (1 CRM 16)
Color Space	CSP	P1: 0 = RGB 1 = YprPb 2 = YprPb (HDTV)	Specifies which color space the input signal uses.	(CSP ?) (CSP 2)	(0 CSP ?) (0 CSP 2)	(1 CSP ?) (1 CSP 2)
Color Temperature Interpolate	CTI	P1: 3200 – 9300	Sets color Temperature to any value in the specified range. The projector interpolates between the two closest standard values.	(CTI ?) (CTI 3250)	(0 CTI ?) (0 CTI 3250)	(1 CTI ?) (1 CTI 3250)
Color Temperature	CTM		Adjusts color temperature See CTM in *4. Messages with Multiple Parameters*.			
Color Wheel Delay	CWD	P: -100 to 100 (default = 0)	Control used to calibrate the color wheel delay.	(CWD ?) (CWD 0)	(0 CED ?) (0 CWD 0)	(1 CWD ?) (1 CWD 0)
Factory Defaults	DEF	P1: 111 (fixed parameter)	All projector parameters will be set to factory defaults. All sources are deleted and user preferences set back to default values.	(DEF 111)	(0 DEF 111)	(1 DEF 111)
Delete Source	DLS	P1: 0 – 99	Will delete specified source (locked or unlocked).	(DLS ?) (DLS 55)	(0 DLS ?) (0 DLS 55)	(1 DLS ?) (1 DLS 55)
Digital Noise Margin	DNM	P1: 1 – 48	Set the sensitivity of the DVI input to noise, cable length and slight incompatibilities between the transmitter and receiver. *Applicable to XeF models only.*	(DNM ?) (DNM 48)	(0 DNM ?) (0 DNM 48)	(1 DNM ?) (1 DNM 48)
Source Data	DTA		Use to load or read all parameters for a source or projector's preferences. See DTA in *4. Messages with Multiple Parameters*.			
Detail	DTL	P1: 0 – 7 (video) 0 – 3 (graphics) 0 – 6 (10 bit processing – *requires ADP module)*	Use to set the detail for video images.	(DTL ?) (DTL 0) (DTL 7)	(0 DTL ?) (0 DTL 0) (0 DTL 7)	(1 DTL ?) (1 DTL 0) (1 DTL 7)
Enable Err. Msg.	EME	P1: 0 = Off 1 = On screen only 2 = RS232 only 3 = All	Enables/disables error messages on the screen.	(EME ?) (EME 0) (EME 1)	(0 EME ?) (0 EME 0) (0 EME 1)	(1 EME ?) (1 EME 0) (1 EME 1)
Error Message	ERR		Message generated when an error is detected. See ERR in *4. Messages with Multiple Parameters*.			
Input Filter	FIL	P1: 0 – 255	Adjust an internal low pass filter before A/D conversion.	(FIL ?) (FIL 152)	(0 FIL ?) (0 FIL 152)	(1 FIL ?) (1 FIL 152)
Freeze Image	FRZ	P1: 0 = unfreeze the image 1 = freeze the image	Use the control to freeze/unfreeze the image.			

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Fan Sensor Enable	FSE	P1: 0 = Off 1 = On	If enabled, failure of one of the cooling fans will result in the projector shutting down after 3 minutes.	(FSE ?) (FSE 0)	(0 FSE ?) (0 FSE 0)	(1 FSE ?) (1 FSE 0)
For Your Information	FYI		The projector generates a "FYI" message when a change in status is detected. See FYI in *4. Messages with Multiple Parameters,*			
Gamma	GAM	P1: 0 – 6	Use this option to select a gamma curve to improve performance for different applications and with different kinds of source input. See GAM in *4. Messages with Multiple Parameters*.	(GAM ?) (GAM 0)	(0 GAM ?) (0 GAM 0)	(1 GAM ?) (1 GAM 1)
Green Blacklevel	GNB	P1: 0 – 255	Adjusts Green Blacklevel for a specific source.	(GNB ?) (GNB 125)	(0 GNB ?) (0 GNB 125)	(1 GNB ?) (1 GNB 125)
Green Drive	GND	P1: 0 – 255	Adjusts Green Drive Level for a specific source.	(GND ?) (GND 125)	(0 GND ?) (0 GND 125)	(1 GND ?) (1 GND 125)
Green White Level	GNW	P1: 0-255	Adjusts the green white level for the selected color temperature. See also CTM.			
Green Odd Gain	GOG	P1: 0 – 255	Sets the gain for green odd pixels relative to green even pixels.	(GOG ?) (GOG 0)	(0 GOG ?) (0 GOG 0)	(1 GOG ?) (1 GOG 0
Green Odd Offset	GOO	P1: 97 – 160	Sets the offset for green odd pixels relative to green even pixels	(GOO ?) (GOO 97)	(0 GOO ?) (0 GOO 97)	(1 GOO ?) (1 GOO 97)
Help	HLP		Returns a list of all serial commands supported by the projector and the menu label associated with them. Short descriptive text is returned for those commands for which there are no equivalent menu items. See HLP in *4. Messages with Multiple Parameters*.	(HLP ?)	(0 HLP ?)	(1 HLP ?)
History	HIS		Used to read the projectors lamp history. See HIS in *4. Messages with Multiple Parameters*.			
Horizontal Position	HOR	Use (ASCII CODE?m) for range	Adjusts the horizontal position of the image.	(HOR ?) (HOR 0) (HOR 847)	(0 HOR ?) (0 HOR 0) (0 HOR 847)	(1 HOR ?) (1 HOR 0) (1 HOR 847)
In Menu	INM	P1: S{source #) (S0 = all sources) P2: 0 = Off 1 = On	Specifies which sources are to be included in the sources selection menu.	(INM? S5) (INM S0 0)	(0 INM? S5) (0 INM S0 0)	(1 INM? S5) (1 INM S0 0)
Internal Test Pattern	ITP	P1: 0 – 10	Displays a test pattern See ITP in *4. Messages with Multiple Parameters.*	(ITP ?) (ITP 0) (ITP 5)	(0 ITP ?) (0 ITP 0) (0 ITP 5)	(1 ITP ?) (1 ITP 0) (0 ITP 5)
Keypad Enable	KEN		Enables or disables the keypad See KEN in *4. Messages with Multiple Parameters.*			
Key Code	KEY		Emulates the function of a key on the keypad See KEY in *4. Messages with Multiple Parameters.*	(KEY 44)	(0 KEY 44)	(1 KEY 44)
Left Blanking	LBL	First, use manual adjustments to find optimal setting. Then use (ASCII CODE?m) to find parameter value for RS-232 code.	Blanks left side of image			
Lamp Conditioning	LCO	0 = off 1 = on	*For Dual Lamp products only* - use LCO to pulse modulate the lamp to reduce flicker affects generated by the lamp.	(LCO ?) (LCO 0)	(0 LCO 0)	(1 LCO 0)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Lamp Message Enable	LME	P1: 0 = Off 1 = On	If enabled, a lamp timer message displays on screen when lamp life has exceeded its expected life. If disabled, no lamp timer message displayed.	(LME ?) (LME 0) (LME 1)	(0 LME ?) (0 LME 0) (0 LME 1)	(1 LME ?) (1 LME 0) (1 LME 1)
Language	LNG	P1: 1 = English 2 = French 3 = Spanish 4 = German 5 = Italian	Selects desired menu language.	(LNG ?) (LNG 0) (LNG 4)	(0 LNG ?) (0 LNG 0) (0 LNG 4)	(1 LNG ?) (1 LNG 0) (1 LNG 4)
Lamp Operation	LOP	P1: 0 = Single, Lamp 1 1 = Single, Lamp 2 2 = Dual Lamp	*For Dual Lamp products only* – use LOP to select the lamp operation mode (determines which lamp is on).	(LOP ?) (LOP 0) (LOP 2)	(0 LOP ?) (0 LOP 0) (0 LOP 2)	(1 LOP ?) (1 LOP 0) (1 LOP 2)
Lamp Changed	LPC	P1: “serial #” (text, max length =8)) *For Dual Lamp products:* P1: 1 = Lamp 1 2 = Lamp 2 P2: “serial # (text, max length = 9)	Tells the projector the lamp has been changed, the parameter is the lamp’s serial number. *For Dual Lamp products* – when a new serial number is entered the lamp status is changed to Good. *NOTE: (LPC?) returns serial number for both lamps.*	(LPC “abcdefgh”)	(0 LPC “abcdefg”) (0 LPC 1 “abc123”)	(1 LPC “abcdefg”)
Lamp Hours of Use	LPH	P1: 0 – 9999 *For Dual Lamp products:* P1: 1 = Lamp 1 2 = Lamp 2 P2: 0-20000	Returns the numbers of hours the requested lamp has been in use. *NOTE: For Dual Lamp products (LPH?) returns a reply for both lamps.*	(LPH ?) *(LPH? 1)*	(0 LPH ?) *(0 LPH? 1)*	(1 LPH ?) *(1 LPH? 2)*
Lamp Intensity	LPI	P1: 0 – 9999	Specifies the light intensity setting for the lamp.	(LPI ?) (LPI 500)	(0 LPI ?) (0 LPI 500)	(1 LPI ?) (1 LPI 500)
Lamp Limit	LPL	P1: 0 – 5000 (prior to v2.3) 2 – 20000 (v2.3 or higher)	Specifies the amount of time a lamp can be on before a warning message appears.	(LPL ?) (LPL 1000)	(0 LPL ?) (0 LPL 1000)	(1 LPL ?) (1 LPL 1000)
Lamp Mode	LPM	P1: (v2.2c or earlier) 0 = Max. Brightness 1 = Not supported 2 = Constant Light Intensity 3 = Constant Power (v2.3 or higher) 0 = Max. Brightness 1 = Constant Light Intensity 2 = Constant Power	Specifies the way the lamp is to be controlled.	(LPM ?) (LPM 0)	(0 LPM ?) (0 LPM 0)	(1 LPM ?) (1 LPM 0)
Lamp Power	LPP	Use (ASCII CODE?m) for range	Specifies the power setting for the lamp in watts.	(LPP ?)	(0 LPP ?)	(1 LPP ?)
Lamp Status	LPS	P1 : 1 = lamp 1 2 = lamp 2 P2 : 0 = good 1 = associated fan failure 2 = lamp failed to strike 3 = lamp turned off unexpectedly 4 = lamp interlock tripped	*For Dual Lamp only* – use LPS to see the status of the lamp requested. On power up, the status of both lamps is set to “good”. When “Shutdown if Fan Fails” flag is set, a fan 3 failure results in lamp 1 being turned off. Similarly, a fan 5 failure results in lamp 2 being turned off.		(0 LPS? 1) (0 LPS? 2)	(1 LPS? 1) (1 LPS? 2)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Menu Font	MFT	P1: 0= regular font 1 = large font	Use MFT to choose the active menu font.	(MFT 0) (MFT 1)	(0 MFT 0) (0 MFT 1)	(1 MFT 0) (1 MFT 1)
Source Memory Lock	MLK	P1: S{Source#} (S0 = all sources) P2: 0 = Off 1 = On	Use control to lock or unlock specific sources. See also *5. Multiple Sources*			
Mosquito Noise Reduction	MNR	P1: 0= disable 1= enable	Control used to reduce the high frequency noise when Mosquito Noise Reduction option is installed on the ADP module and 10-bit processing is active.	(MNR 0) (MNR 1)	(0 MNR 0) (0 MNR 1)	(1 MNR 0) (1 MNR 1)
Menu Status	MNU	P1: 0 = Presentation level 1 = Main menu 2 = Sub menu	Enables the status of the menu to be determined or set. When using MNU to set the menu status, only Presentation Level (0) and Main Menu (1) are valid.			
Motion Filter	MOT	P1: 0 = Auto 1 = Still 2 = Motion 3 = Film	Controls how de-interlacing is handled.	(MOT ?) (MOT 0)	(0 MOT ?) (0 MOT 0)	(1 MOT ?) (1 MOT 0)
Menu Shift Horizontal	MSH	P1: 0 – 112	Moves horizontal position of menu.	(MSH 0)	(0 MSH 50)	(1 MSH 112)
Menu Shift Preset	MSP	P1: 0 = 4:3 Top/Left 1 = 4:3 Inset 1 2 = 4:3 Inset 2 3 = 16:9 Top/Left 4 = 16:9 Inset 1 5 = 16:9 Inset 2	Moves menu to a preset location.	(MSP ?) (MSP 0)	(0 MSP ?) (0 MSP 0)	(1 MSP ?) (1 MSP 0)
Menu Shift Vertical	MSV	P1: 0 – 50 (0 = top)	Moves vertical position of the menu.	(MSV ?) (MSV 0)	(0 MSV ?) (0 MSV 0)	(1 MSV ?) (1 MSV 0)
Source Name	NAM	P1: Name in double quotes *(text = the name of the source)*	Use to set or get a source name Examples: (nam “Bobs PC”) Set the name of the current source to “Bobs PC” (nam s5 “Sun1”) Set the name of source#5 to “Sun1” (nam s0 “Test”) Set all the sources to “Test”			
Noise Reduction	NRD	P1: 0 – 63	Use to reduce high frequency noise. Requires ADP module.	(NRD ?) (NRD 0) (NRD 63)	(0 NRD ?) (0 NRD 0) (0 NRD 63)	(1 NRD ?) (1 NRD 0) (1 NRD 63)
Options Installed	OPT		Receive message about which optional modules are installed in the projector. See OPT in *4. Messages with Multiple Parameters*.			
On Screen Display	OSD	P1: 0 = disabled (display off) 1 = enabled (display on)	Enables or disables the on screen display	(OSD ?) (OSD 0) (OSD 1)	(0 OSD ?) (0 OSD 0) (0 OSD 1)	(1 OSD ?) (1 OSD 0) (1 OSD 1)
Peak Detector	PDT	P1: 0 = disabled 1 = enabled	Use to enable or disable Peak Detector, which helps in the setup of input levels. (display black pixels as black and pixels near peak level full on) Disable Peak Detector when adjustment is complete to allow display of all gray levels.	(PDT ?) (PDT 0) (PDT 1)	(0 PDT ?) (0 PDT 0) (0 PDT 1)	(1 PDT ?) (1 PDT 0) (1 PDT 1)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Projector Hours of Use	PJH	P1: 0 - 16,777,215	Returns the number of hours a projector has been operated.	(PJH ?)	(0 PJH ?)	(1 PJH ?)
PLL Loop Gain	PLG	P1: 0 – 20	Use to add offset to PLL gain. Default = 10 (no offset added) Values less than 10 reduce gain, whereas values greater than 10 increase gain.	(PLG ?) (PLG 0) (PLG 18)	(0 PLG ?) (0 PLG 0) (0 PLG 18)	(1 PLG ?) (1 PLG 0) (1 PLG 18)
Parameter Lockout	PLK	P1: ASCII code for the parameter (i.e. CNT, CTM, etc.)	Specifies which controls to lockout from the user.			
Picture Mute	PMT	P1: 0 = Off 1 = On	Screen image is blanked.	(PMT ?) (PMT 0)	(0 PMT ?) (0 PMT 0)	(1 PMT ?) (1 PMT 0)
Plug & Display Modes	PND	P1: 0 = XGA 60Hz 1 = SXGA 60Hz 2 = UXGA 45Hz 3 = kSXGA 105Hz 4 = kXGA 120Hz	Use to specify the requested Display Mode of the video card attached to the DVI Input Module (DIM). *DIM applicable to Xe models only.*	(PND ?) (PND 0) (PND 4)	(0 PND ?) (0 PND 0) (0 PND 4)	(1 PND ?) (1 PND 0) (1 PND 4)
Ping	PNG	Parameters: proj. type, major, minor, maintenance and beta version numbers.	Returns basic projector information to the user. See "Ping" subsection	(PNG ?)	(0 PNG ?)	(1 PNG ?)
Proj. Rental Hours of Use	PRH	P1: 0 – 16,777,215	Use PRH? to return the number of rental hours (lamp counter) a projector has been operated during the rental period.	(PRH ?)	(0 PRH ?)	(1 PRH ?)
Processing Mode	PRM	P1: 0 = Auto 1 = Video 2 = Graphics/HDTV 3 = Minimum Delay 4 = Advanced 10-bit (requires ADP module)	Controls how the signal is processed by projector electronics.			
Service Password	PSW	P1: 0 – 32768	Sets service password to new value. User can enter service menu with the password defined using this command or the standard password defined in the Service Manual.	(PSW 4321)	(0 PSW 4321)	(1 PSW 4321)
Password Enable	PWE	P1: 0 = disable 1 = enable	Use to enable/disable the service password.	(PWE 0) (PWE 1)	(0 PWE 0) (0 PWE 1)	(1 PWE 0) (1 PWE 1)
Power	PWR	P1: as a setting 0 = Off 1 = On 2 = boot 3 = no lamp P1: as a reading 0 = Off 1 = On 2 = boot 3 = no lamp 10 = cool down 11 = warm up	The “boot” function is used to put the projector in a special mode & is only used to download new code. The “cool down” and “warm up” states are returned when the projector is in the process of changing between power up and power down.	(PWR ?) (PWR 0) (PWR 1)	(0 PWR ?) (0 PWR 0) (0 PWR 1)	(1 PWR ?) (1 PWR 0) (1 PWR 1)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Pixel Phase	PXP	Use (ASCII CODE?m) for range – it varies per source	Adjust the position of the sampling clock relative to the video data.	(PXP ?) (PXP 0) (PXP 255)	(0 PXP ?) (0 PXP 0) (0 PXP 255)	(1 PXP ?) (1 PXP 0) (1 PXP 255)
Pixel Tracking	PXT	P1: Depends on horizontal sync frequency of the input signal.	Number of pixels/line in the image	(PXT ?) (PXT 0) (PXT 31)	(0 PXT ?) (0 PXT 0) (0 PXT 31)	(1 PXT ?) (1 PXT 0) (1 PXT 31)
Right Blanking	RBL	First, use manual adjustments to find optimal setting. Then use (ASCII CODE?m) to find parameter value for RS-232 code. Range will vary per source.	Blanks right side of image	(RBL ?) (RBL 3000)	(0 RBL ?) (0 RBL 3000)	(1 RBL ?) (1 RBL 3000)
Red Blacklevel	RDB	P1: 0 – 255	Adjusts Red Blacklevel for a Specific Source	(RDB ?) (RDB 125)	(RDB ?) (0 RDB 125)	(1 RDB ?) (1 RDB 125)
Red Drive	RDD	P1: 0 – 255	Adjusts Red Drive Level for a Specific Source	(RDD ?) (RDD 125)	(0 RDD ?) (0 RDD 125)	(1 RDD ?) (1 RDD 125)
Red White Level	RDW	P1: 0 – 255	Adjusts the red drive level for a specific source and is used to compensate for relative variations in the drive levels between Red, Green, Blue.	(RDW ?) (RDW 100)	(0 RDW ?) (0 RDW 100)	(1 RDW ?) (1 RDW 100)
Red Odd Gain	ROG	P1: 0 – 255	Sets the gain for the red odd pixels relative to the red even pixels.	(ROG ?) (ROG 0)	(0 ROG ?) (0 ROG 0)	(1 ROG ?) (1 ROG 0)
Red Odd Offset	ROO	P1: 97 – 160	Sets the offset for the red odd pixels relative to the red even pixels.	(ROO ?) (ROO 97)	(0 ROO ?) (0 ROO 97)	(1 ROO ?) (1 ROO 97)
Save Changes	SAV		Projector will save all outstanding changes into flash memory	(SAV 0)	(0 SAV)	(1 SAV)
Slidebar Enable	SBE	P1: 0 = Off 1 = On	Displays or hides adjustment slidebars	(SBE ?) (SBE 0) (SBE 1)	(0 SBE ?) (0 SBE 0) (0 SBE 1)	(1 SBE ?) (1 SBE 0) (1 SBE 1)
Standby	SBY	P1: 0 = Off 1 = On	Puts the projector in standby mode.	(SBY ?) (SBY 0) (SBY 1)	(0 SBY ?) (0 SBY 0) (0 SBY 1)	(1 SBY ?) (1 SBY 0) (1 SBY 1)
Select Color Temperature	SCT	P1: 0 = 3200 1 = 5400 2 = 6500 3 = 9300 4 = user1 5 = user2 6 = user3 7 = user4 8 = INTERPOLATED	Use SCT to set or get the color temperature. You can set the color temperature by selecting a value from the list P1: or by specifying the color temperature directly – when set directly the temperature is set as close to the desired value as the hardware would allow.	(SCT ?) (SCT 0) (SCT 5)	(0 SCT ?) (0 SCT 0) (0 SCT 5)	(1 SCT ?) (1 SCT 0) (1 SCT 5)
Source Dialog Enable	SDE	P1: 0 = disabled 1 = enabled	Enables the display of on screen dialogs when the SRC key is used to select a source numerically.	(SDE ?) (SDE 0)	(0 SDE ?) (0 SDE 0)	(1 SDE ?) (1 SDE 0)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Stereo3D™ Interface Module	SIM	P1: 0 = Off 1 = On	Use to enable or disable Stereo3D™ Interface Module signal inverter. The default is enabled for front viewing. The invert state is automatically changed when the orientation is changed from front to rear. (SIM 0) Turns the invert bit flag to 0 (off for rear projection (SIM 1) Turns the invert bit flag to 1 (on for front projection)	(SIM 0) (SIM 1)	(0 SIM 0) (0 SIM 1)	(1 SIM 0) (1 SIM 1)
Select Input	SIN		Tells the projector to look at a specific input for the source to be displayed. See SIN in *4. Messages with Multiple Parameters*.	(SIN?) (SIN 0 2) (SIN 1 4)	(0 SIN ?) (0 SIN 0 2) (0 SIN 1 4)	(1 SIN ?) (1 SIN 0 2) (1 SIN 1 4)
Size	SIZ	P1: 400 – 4000	Controls how the projector will electronically expand or shrink the image. The aspect ratio will not change. Scale = Value / 1000	(SIZ ?) (SIZ 1000)	(0 SIZ ?) (0 SIZ 1000)	(1 SIZ ?) (1 SIZ 1000)
Sync Noise Margin	SNM	P1: 0 – 255	Use to adjust the noise margin for V and HC sync inputs. *For fixed frequency models only(XeF/F).*	(SNM ?) (SNM 0) (SNM 200)	(0 SNM ?) (0 SNM 0) (0 SNM 200)	(1 SNM ?) (1 SNM 0) (1 SNM 1)
Split Network	SNT	P1: 0 = full network 1 = split network	Use to limit the re-broadcasting of messages to half the output ports. RS232 input messages are only sent out the other RS232 port & RS422 input messages are sent to other RS422 port.			
Screen Orientation	SOR	P1: 0 = front 1 = rear 2 = inverted front 3 = inverted rear	Specifies screen orientation	(SOR ?) (SOR 2) (SOR 3)	(0 SOR ?) (0 SOR 2) (0 SOR 3)	(1 SOR ?) (1 SOR 2) (1 SOR 3)
Select Source #	SRC	P1: 1 – 99	Select a source See also CHA command.	(SRC ?) (SRC 2) (SRC 99)	(0 SRC ?) (0 SRC 2) (0 SRC 99)	(1 SRC ?) (1 SRC 2) (1 SRC 99)
System Status	SST		Method of reading projector status information See SST in *4. Messages with Multiple Parameters*			
Video Standard	STD	P1: 0 = unknown 1 = NTSC 2 = NTSC4-43 3 = PAL 4 = PAL-M 5 = PAL-NC 6 = SECAM 7 = PAL-60 255 = auto	Select the video standard to use for the video input. If "auto" is selected (P1 = 255) the projector will automatically find the correct standard.	(STD ?) (STD 0) (STD 255)	(0 STD ?) (0 STD 0) (0 STD 255)	(1 STD ?) (1 STD 0) (1 STD 255)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Switcher Information	SWI	P1 = Switcher # P2 = Major Switcher software version P3 = Minor Switcher software version P4 – P12 = which cards are in each slot as defined: 0 = empty 1 = loop through 2 = RGB 3 = Analog 4 = TTL 5 = Composite 6 = SVHS 7 = HDTV 255 = Unknown	Returns list of switchers currently attached to the projector and what each has in each slot.	(SWI)	(0 SWI)	(1 SWI)
Size & Position Presets	SZP	P1: 0 = default 1 = none 2 = full screen 3 = full width 4 = full height 5 = anamorphic 6 = tiling full screen 7 = tiling full width 8 = tiling full height 9 = tiling anamorphic 10 = custom (read only)	Sets the image to one of several preset size/position presets.	(SZP ?) (SZP 1)	(0 SZP ?) (0 SZP 1)	(1 SZP ?) (1 SZP 1)
Top Blanking	TBL	First, use manual adjustments to find optimal setting. Then use (ASCII CODE?m) to find parameter value for RS-232 code. Range varies per source.	Blanks top of image.	(TBL ?)	(0 TBL ?)	(1 TBL ?)
Tiling, Column Number	TCL	P1: 1 – 4	Set the column number of the projector as it is positioned in a tiled array. Columns are numbered from left to right.		(0 TCL 1)	(1 TCL 2)
Tiling, Number of Columns	TNC	P1: 1 – 4	Number of columns in a tiled array. Columns are numbered from left to right. *NOTE: To define an array larger than 4 x 4, use an external device with resizing abilities.*	(TNC 4)	(0 TNC 4)	(1 TNC 4)
Tiling, Number of Rows	TNR	P1: 1 – 4	Number of rows in a tiled array. Rows are numbered from top to bottom. *NOTE: To define an array larger than 4 x 4, use an external device with resizing abilities.*	(TNR 4)	(0 TNR 4)	(1 TNR 4)
Tint	TNT	P1: 1-255	Sets tint for video images	(TNT ?) (TNT 1) (TNT 62)	(0 TNT ?) (0 TNT 1) (0 TNT 62)	(1 TNT ?) (1 TNT 1) (1 TNT 62)
Tiling, Row Number	TRW	P1: 1 – 4	Set the row number of the projector as it is positioned in a tiled array. Rows are numbered from top to bottom.		(0 TRW 1)	(1 TRW 2)

FUNCTION	ASCII CODE	PARAMETERS	DESCRIPTION / NOTES	Broadcast	Projector #0	Projector #1
Two Way Controller	TWC	P1: 0 = 422 port enable mode 1 = spontaneous messaging mode P2: 0 = disable, 1 = enable	Use to enable/disable the spare port routing to the in/out ports. This makes the spare port act like another network port – used with a two-way controller.			
Video Black Level	VBL	P1: 0 = 0 IRE 1 = 7.5 IRE	Affects black level for video signals.	(VBL 0) (VBL 1)	(0VBL 0) (0 VBL 1)	(1 VBL 0) (1 VBL 1)
VCR	VCR	P1: 0 = Off 1 = On	Enable or disable VCR settings	(VCR ?) (VCR 0) (VCR 1)	(0 VCR ?) (0 VCR 0) (0 VCR 1)	(1 VCR ?) (1 VCR 0) (1 VCR 1)
Vertical Position	VRT	Use (ASCIIcode?m) for range	Adjusts the vertical position of the image.	(VRT ?) (VRT 0) (VRT 599)	(0 VRT ?) (0 VRT 0) (0 VRT 599)	(1 VRT ?) (1 VRT 0) (1 VRT 599)
Vertical Stretch	VST	P1: 200 – 4000 (1000 = no vertical stretching)	Controls how much the image will be stretched vertically – does not affect horizontal Vertical Scale = Value / 1000	(VST ?) (VST 1000)	(0 VST ?) (0 VST 1000)	(1 VST ?) (1 VST 1000)
Video Termination	VTM	P1: 0 = Off 1 = On	Enable/disable 75ohm termination resistors Always disable if loop through is used. Works only on VID1 and VID2 inputs.	(VTM ?) (VTM 0) (VTM 1)	(0 VTM ?) (0 VTM 0) (0 VTM 1)	(1 VTM ?) (1 VTM 0) (1 VTM 1)
White Boost	WBT	P1: 0 = Off 1 – 10 = White Boost Level *(default 2 for video & 10 for graphics)*	Set value for white boost. Whites that are near full white are boosted to full white.	(WBT ?) (WBT 0) (WBT 10)	(0 WBT ?) (0 WBT 0) (0 WBT 10)	(1 WBT ?) (1 WBT 0) (1 WBT 10)

NOTES:

4. Messages With Multiple Parameters

Certain messages are more complex and require multiple parameters in order to relay complete information. These messages are described in detail below.

APC ➤ (Adjust Primary Colors)

Use APC to adjust primary colors and intensity when trying to match multiple screens to achieve a seamless image in display wall applications.

Message = Adjust Primary Colors

Parameter	Name	Description
P1	"In use"flag. 0 = false 1 = true	If there is only one parameter, it has this meaning. Flag to indicate if primary color adjustment is "in use".
P1	Which color, 0 or 'R' = red 1 or 'G' = green 2 or 'B' = blue	Identifies which primary color will be controlled/read.
P2	Which part of primary, 0 or 'R' = red 1 or 'G' = green 2 or 'B' = blue	Identifies which part of the primary color will be controlled.
P3	Value, 0 - 255	Identifies the value to be adjusted

Message = Read Primary Color Adjust

Parameter	Name	Description
P1	Status of "In Use" flag.	See above. If only 1 parameter specified.
P1	Which primary color	See above, if 2 parameters specified.
P2	Which part of primary	See above.

Reply to Read Primary Color Adjust Message

Parameter	Name	Description
P1	Status of "In Use" flag.	See above. If only 1 parameter specified.
P1	Which primary color Which part of primary	See above, if 2 parameters specified.
P2	Value 0-255	See above.
P3		The resulting value.

Adjust Primary Colors: Examples

(APC 1) = set primary Color Adjust "In Use" flag to true.
(APC 1 0 20) = set green primary color, red part to 20.
(APC G R 30) = set green primary color, red to 30.
(APC? 2 G) = request blue primary, green part
(APC! 2 1 012) = reply that blue primary, green part is 12.
(APC? G 2) = request of green primary, blue part.
(APC! 1 2 075) = reply that green primary color, blue part is 75

BRU ➤ (Brightness Uniformity)

Use BRU to enable/disable the *Brightness Uniformity* feature and to adjust parameters, which affect the overall brightness of an image.

Message = Adjust Brightness Uniformity

Parameter	Name	Description
P1	0 = overall 1 = left 2 = right 3 = top 4 = bottom 5 = top left 6 = top right 7 = bottom left 8 = bottom right	P1 is made up of 2 characters – the first specifies the zone and the second specifies red, green, or blue. *Example: 02 specifies adjustment of blue left zone.* P2 specifies the color
P2	0 = red 1 = green 2 = blue	P3 specifies the value
P3	0 – 127 (overall 0 - 255)	

Message = Set Brightness Uniformity Enable flag

Parameter	Name	Description
P1	0 = false 1 = true, enabled	Enable or disable brightness uniformity

Reply to Read Brightness Uniformity Enable flag

Parameter	Name	Description
P1	0 = false 1 = true, enabled	Set or clear brightness uniformity enabled flag.

Message = Read Brightness Uniformity

Parameter	Name	Description
P1	Which adjustment	Specifies which zone of brightness uniformity to return.
P2	Which color	Specifies which color or brightness uniformity to return.

Reply to Read Brightness Uniformity Message

Parameter	Name	Description
P1	Which adjustment	Specifies which zone of brightness uniformity to return.
P2	Which color	Specifies which color or brightness uniformity to return.
P3	value	The value of the specified adjustment

Examples of BRU command:

(BRU 2 0 65) = set right zone to 65
(BRU 5 G 24) = set top left green zone to 24
(bru? 0 B) = request overall brightness of blue
(bru! 0 B 039) = reply overall brightness of blue is 39
(BRU 1) = enable Brightness Uniformity feature (if available)
(bru?) = request Uniformity Enable checkbox status
(bru! 1) = reply Brightness Uniformity is enabled

CTM (Color Temperature) ➤ Use CTM to adjust the red, green and blue levels for one of the defined color temperatures. The lower the color temperature, the more reddish the image.

*NOTE: 1) The value for P2 varies depending on the method used for creating a custom color temperature. When creating a new color temperature through the **Image Setting menu** for the current source, ensure **all** blacklevels are set at 30, and **at least** one drive is set at 73. When creating a new color temperature through the **RS-232 software**, ensure **all** blacklevels are set at 76 and **at least** one drive is set at 194. 2) To adjust the user color temperature found in the image menu use the SCT command.*

Message = Adjust Color Temperature

Parameter	Name	Description
P1	Which color 0 = red, 1 = green, 2 = blue	Identifies which primary is to be controlled/read.
P2	Which Level 0 = reserved 1 = White Level	Identifies which level is to be controlled, currently only allow control of white level.
P3	Which Setup 0 = 3400K, 1 = 5400K, 2 = 6500K, 3 = 9300K, 4 = User 1, 5 = User 2, 6 = User 3, 7 = User 4	Identifies which setup is to be controlled.
P4	Value	0 – 255 : The value to be adjusted.

Message = Read Color Temperature

Parameter	Name	Description
P1	Which Color	See above
P2	Which Level	See above
P3	Which Setup	See above

Reply to Read Color Temperature Message

Parameter	Name	Description
P1	Which Color	See above
P2	Which Level	See above
P3	Which Setup	See above
P4	Value	The resulting value : See above

Examples of CTM command

(CTM 0 1 0 65) = set 3200K red contrast to 65
(CTM? 1 1 2) = request 6500K green contrast
(CTM! 1 1 2 175) = reply that 6500K green contrast is 175

DTA (Source Data) ➤ The *DTA* message is used to request the data for a source(s), or system preferences. It is also used to define a new source and its settings. When requesting data the *DTA* message causes the projector to generate reply messages for each setting. These messages can be sent back to the projector at any time without the need for the *DTA* message to be used. However, the *DTA* message must be sent to define a new source if that source does not exist. In general, when requesting settings acknowledge ($) protocol should be used to determine when the last parameter has been received, but this is not required.

Reading Settings for a Specific Source

Description	
Message	P1 = the number of the source to read – must have leading 'S'

Reply	P1 = the number of the source being read
	P2 = switcher number (0=projector)
	P3 = slot number
	P4 = the vertical frequency (cHz)
	P5 = the horizontal frequency (10's of Hz)
	P6 = input polarity & routing
	Bits 2-0 // horizontal sync source
	0 = no sync
	1 = horizontal on vertical input
	2 = horizontal on horizontal input
	3 = horizontal on green input
	4 = horizontal on red input
	5 = horizontal from Vid1 input
	6 = horizontal from Vid2 input
	Bit 3 // set if composite sync (H&V) on same wire
	Bit 4 // set if horizontal sync has negative polarity
	Bit 5 //set if vertical sync has negative polarity

Setting 1 Setting 2 Setting 3	Reply message for first source setting Reply message for second source setting Reply message for third source setting
Setting n $	Reply message for last source setting Acknowledge of *DTA* message (if requested)

Examples:

($DTA? S5)
(DTA! S005 000 001 05996 03150 059)
(CON! S005 045)
(BRT! S005 167)
…
$

Reading Settings for All Sources

To read the settings for all sources the format is the same as for a single source except that the source number to use is 0. The reply will be the same as for a single source except that it will be repeated for as many times as there are sources.

Examples:

($DTA? S0)
(DTA! S005 000 001 05996 03150 059)
(CON! S005 045)
(BRT! S005 167)
…
(DTA! S034 000 001 05996 03150 059)
(CON! S034 022)
(BRT! S034 137)
…
$

Downloading Source Settings to a projector

To download the source settings to a projector the *DTA* message is sent first, which defines a new source, or redefines an existing source with the specified

parameters. The various settings are then sent. The parameter format for the *DTA* command is identical to the parameter for the *DTA!* reply to a request.

Examples:

(DTA S005 000 001 05996 03150 085)
(CON S005 045)
(BRT S005 167)
…
(DTA S034 000 001 05996 03150 085)
(CON S034 022)
(BRT S034 137)
…

Reading Preference Settings

The projectors preferences are divided into 2 groups, transferable and projector specific. The transferable settings are those settings that are valid for any projector or the same type such as orientation. Projector specific settings are settings that are unique to each projector such as color temperature setup (exactly the same numeric values will produce different color temps on different projectors.

To specify transferable settings the DTA parameter =T and to specify projector specific settings the parameter =P.

Special care must be taken when using the BDR and ADR messages. These are returned like any other setting when the preferences are being read however if they are sent to a projector they may change the way the network operates (i.e. the BDR message should always be broadcast to all projectors or you will be unable to talk to some projectors).

Examples:

($DTA T)
(BDR! 09600)
(LPI! 00345)
…
$
($DTA P)
(CTM! 001 002 00000 000 01187)
(CTM! 002 007 05400 012 043)
…
$

Downloading Preferences to a projector

To download preference settings to a projector just send the various setting as separate commands. Take care before sending *BDR* (baud rate) and *ADR* (projector number) messages because they may affect network operation.

ERR (Error Messages) ➤

The projector generates an error message whenever an error is detected. This message will contain an error code, message specifier and a text parameter explaining the error code.

NOTE: The message specifier and text parameter are enclosed in quotation marks, separated by a colon and space. Error messages include the source address of the projector.

Error Code	Associated Text	Description/Notes
001	"System Error:……."	System crash.
002	"System Warning:……."	System error.
003	"Invalid parameter—"	Invalid parameter number.
004	"Too many parameters"	
005	"Too few parameters"	
006	"Source does not exist"	
007	"Could not be executed"	Current content prevented the command from executing..
008	"Checksum error"	
009	"Unknown request"	Message code undefined. If the message sent as a command it is ignored and no error is returned.
010	"Communication error"	Error receiving serial data on one of the RS-232 ports.

Examples:

Error Generated	Message Sent/Circumstance
(65535 00030ERR 001 "System Error: SYNC no longer responding")	SYNC no longer responding
(65535 00030ERR 002 "System Warning: The current source cannot be deleted")	Attempt to delete the current source
(65535 00030ERR 003 "BDR: Invalid parameter 1")	(BDR38900)
(65535 00030ERR 004 "BLB: Too many parameters")	(BLB 25 25)
(65535 00030ERR 005 "ASR: Too few parameters")	(ASR S10)
(65535 00030ERR 006 "ASR: Source does not exist")	(ASR S10 1)
(65535 00030ERR 007 "CON: Could not be executed")	(CON 45) with no source
(65535 00030ERR 008 "CON: Checksum Error")	(&con 64 250)
(65535 00030ERR 009 "ABC: Unknown request")	(ABC?)

FYI (For Your Information)➤ This is a message that is generated when a change in the projector's status is detected. The message contains a code that indicates what has changed followed by one or more parameters giving details about the change. A text string (in English) is the last parameter and describes what has changed. FYI messages include the source address of the projector generating the FYI and are broadcast. *NOTE: FYI messages are gated by the Error Message Enable (EME) control. If serial error messages are disabled then there will be no FYI messages.*

FYI Defined Codes and Parameters

Type	Code	Parameter(s)	Description
Power	001	0=off 1=on 2=boot 10=cool down 11=warm up	Messages sent whenever the projector changes from one power state to another and indicates the new state the projector has gone into.
Projector Address	002	New address	The projector address is being changed to the new value specified. The source address for this message will still use the projectors old address – the last message sent by the projector to do so.
Projector Selected	003	0 = RS232 inactive 1 = RS232 Inactive 2 = RS232 Active 3 = RS232 Active	The projector has been made active or inactive, by the user, via the "Proj" key or the APJ serial message.
Baud Rate Change	004	New baud rate	The user has changed the baud rate to the one indicated in the message. This message is snet at the old baud rate.
Standby	005	0 = Off 1 = On	The projector has been put in or out of standby.

Type	Code	Parameter(s)	Description
Signal Status	006	P1: 0 = good signal 1 = 1 signal missing 2 = bad sync P2: Horizontal Frequency P3: Vertical Frequency	Indicates a change in state of the signal attached to the projector. When the sync is bad, the text parameter may contain additional information.
OSD	007	0 = Off 1 = On	Indicates whether the on screen display is on or off.
Channel Changed	010	P1: Channel # P2: Switcher # P3: Slot#	Indicates the new channel and pysical input (switcher# and slot#)

Examples:
(65535 00030FYI 001 000 “Powered Off”)
(65535 00030FYI 002 00057 “Projector address changed to 57”)
(65535 00057FYI 003 001 “Projector UI active, RS-232 Inactive”)
(65535 00057FYI 004 38400 “Baud rate changed to 38400”)
(65535 00057FYI 005 001 “Standby On”)
(65535 00057FYI 006 000 01573 05994 “Good Signal”)
(65535 00057FYI 006 002 “Bad Sync: HSync is too High”)
(65535 00057FYI 007 000 “OSD Off”)
(65535 00057FYI 010 034 000 003 “Switched to channel 34,projector input 03”)
(65535 00057FYI 010 035 002 004 “Switched to channel35, switcher 2, slot 4”)

GAM (Gamma) ➤ Use the GAM command to control the shape of the gray scale output as the input signal changes from minimum (black) to maximum (white) intensity. Different curves are provided to improve the performance for different applications and different kinds of source input.

GAM Parameters

Parameter	Description
0	Normal – this is the default setting. It is designed to provide good black levels and high contrast under optimum viewing conditions for almost all types of images, including video, HDTV, and computer graphics.
1	Enhanced – This setting elevates middle gray levels compared to the Normal setting and provides a more gradual, rolled-off transition to maximum white.
2	High Ambient – This setting elevates low gray levels compared to the Normal and Enhanced settings. In high ambient light conditions, it allows details to be seen in the dark parts of an image that would otherwise be difficult to perceive.
3	PAL/SECAM – this setting results in a darker image with higher contrast. The gamma curve more closely matches the official standard for PAL and DECAM video signals.
4	Reserved
5	NTSC Enhanced – this setting is similar to Enhanced. The middle grays are less elevated, resulting in a darker image with higher apparent contrast.
6	Linear – this setting is a straight, linear transition from black to white. For normal source signals, it results in a picture of low contrast with highly elevated low and mid level grays. It should only be used with sources that have their own pre-applied gamma.

HIS (History) ➤ Includes a list of the lamps used, identified by serial number and the number of hours each had been turned on. The oldest history will be deleted as space is limited. The last history returned is for the current lamp.

Example:
($HIS?)
(HIS!003 01258 "abc-1") // sn. = "abc-1", third lamp used, on for 1,258 hrs
(HIS!003 00700 "ab-2") // sn. = "ab-2", fourth lamp used, on for 700 hrs

ITP (Internal Test Pattern) ➤ Use the ITP command to view a test pattern on the screen.

Pattern #	Description
0	User image – a test pattern is not displayed.
1	Checker
2	Gray Scale 16
3	Gray Scale 256
4	White
5	50% Gray
6	Black
7	Convergence
8	13 point
9	Color Bars
10	Geometry Pattern

KEN (Keypad Enable) ➤ Use the KEN command to enable or disable the keypad.

Command	Request	Reply	
P1		P1	Wired keypad protocol : 0=off 1=Protocol A 2=Protocol B 3=Protocol A &B
P2		P2	IR Front protocol 0=off 1=Protocol A 2=Protocol B 3=Protocol A &B Note: It is possible to disable the two IR sensors independently, but if they are both enabled they will be forced to the same protocol, which will be the P3 parameter.

KEY (Key Code) ➤ Use the KEY command to emulate the function of a key on the keypad.

Keypad Function	HEX Code
0	00
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
Pixel	0A
Position	0B
Lens	0C
Enter	0D
Func	0E
JOYSTART	0F
Cont +	10
Cont -	11
Bright +	12
Bright -	13
Vol +	14
Vol -	15
Proj	16

Keypad Function	HEX Code
Stby	20
Dat1	21
Dat2	22
Src	23
Vid1	24
Vid2	25
Pan	26
Mute	27
Vol	28
Cont	29
Asterisk	2A
Plus sign	2B
Menu	2C
Minus sign	2D
Power	2E
OSD	2F
0	30
1	31
2	32
3	33
4	34
5	35
6	36

Keypad Function	HEX Code
Pixel Track +	17
Pixel Track -	18
Pixel Phase +	19
Pixel Phase -	1A
Exit	1B
Color	1C
Tint	1D
Detail	1E
START	1F
Input	40
Input 1	41
Input 2	42
Input 3	43
Input 4	44
	45
	46
	47
	48
	49
	4A
	4B
	4C
.	4D
	4E
	4F
Bright	50
Chan	51
Test	52
Shutter	53
	54
	55
	56
	57
	58
	59
	5A
	5B
	5C
	5D
	5E
	5F

Keypad Function	HEX Code
7	37
8	38
9	39
UpArrow	3A
DownArrow	3B
LeftArrow	3C
Lamp	3D
RightArrow	3E
Help	3F
	60
	61
	62
	63
	64
	65
	66
	67
	68
	69
	6A
	6B
	6C
	6D
	6E
	6F
	70
	71
	72
	73
	74
	75
	76
	77
	78
	79
	7A
	7B
	7C
	7D
	7E
	7F
Available but not shown	80 - FF

OPT (Options Installed) ➤ Read what optional modules are installed in the projector.

Reply

P1	0 = <empty> 1 = loop through 2 = RGB 3 = Analog 4 = TTL 5 = Composite 6 = SVHS 7 = HDTV -----digital cards------ 10 = SDI 11 = HDSDI 12 = DVI 255 = unknown
P2-Pn	Text strings that indicate what options are installed. These may be in any order and can include: "Decoder" "Audio"

PLK (Parameter Lockout) ➤ Specifies which control parameters should be locked out from the user. These lockouts only apply to the on screen user interface – serial messages will still work. Some parameters, such as the various blanking commands, share a single lockout. This lockout can be set or cleared by referencing any one of the parameters that share the lockout.

Examples:

(PLK "CON" 1) Lockout the contrast control only
(PLK 1) Enable all possible lockouts

PNG (Ping) ➤ Use the PNG command to request and obtain basic projector information, such as projector type (model) and current software version. Like most RS-232 requests, a ping request contains no data (parameters).

NOTE: 1) Ping's P1 is recognized by all Christie Digital projectors (Vista, Marquee, Roadster). This parameter will identify which projector model is present. 2) There is no "set" command for ping — you can issue requests and receive replies only.

The Ping reply contains data for the six parameters necessary to fully answer the ping request.

Parameter	Name	Values	Description/Notes
P1	Model / Family ID	30 = Vista X and Roaster X Series	Indicates the family/model of the projector
P2	Major Version #	0-99	Major Software ID
P3	Minor Version #	0-99	Minor Software ID
P4 (optional)	Maintenance Version #	a-z	No functional changes in software
P5 (optional)	Beta Version #	1-999	Beta software ID (only if a beta version present)
P6 (optional)	Type	T1-T63	Variation ID (example: Korean version)

Examples:

Ping Request ("GET")	Ping Reply	Name
(png?)	(PNG! 009 001 000)	// Vista version 1.0
(png?)	(PNG! 009 002 005 b)	// Vista version 2.5b
(png?)	(PNG! 009 003 001 T005)	// Vista version 3.1 T5
(png?)	(PNG! 009 001 000 c 045 T002)	// Vista version 1.0c.045 T2

SIN (Select Input) ➤ This command tells the projector to look at a specific input for the source to display. After the projector switches to the specified input, it will look through its memory for a source and then load that source.

NOTE: (SIN 1) is equal to (SIN 01)

Command	Request	Reply	
P1 = S#	P1 = S#	P1 = S#	S = Source number
		P2	Returns "0" source exists "1" error, source does not exist
P2		P3	The number of the switcher
P3		P4	The number of the slot

If the switcher is #0 (projector) then:

Slot 1 = Input 0, 1 = Dat1
Slot 2 = Input 0, 2 = Dat2
Slot 3 = Input 0, 3 = Vid1 (on decoder)
Slot 4 = Input 0, 4 = Vid2 (on decoder)

SST (Signal Status) ➤ Use the SST command to read projector status information. The SST command causes the projector to return all values in a series of replies (as if multiple requests had been sent).

Message = Read Signal Status

Parameter	Value	Description
P1	<u>Signal Information</u> 0 = H, V Frequency 1 = State 2 = Sync Routing 3 = H, V Polarity 5 = Other Signal Info. 6 = Current Sampling Rate 7 = Channel <u>System Information</u> 10 = SW Version 11 = SW Boot Version 12 = Model 13 = Lamp Power 14 = Native Resolution 15 = Build Date 16 = Serial Number 17 = Lamp hours of use 18 = Projector Hours 19 = Factory Set software configuration 20 = Fan Sense 21 = Lamp, Low Power, Hours of Use <u>Detailed configuration</u>	 Main SW version Boot SW version Projector Model & Sub-Model Maximum power output from Ballast Light engine native resolution Date of manufacture Projector serial number Hours of use on current lamp Hours of use on projector Which fans are being monitored <u>Dual Lamp products only</u> **NOTE: The detailed configuration is subject to change from model to model.**

Parameter	Value	Description
P1 con't	30 = Image processor HW version 31 = Panel driver HW Version 32 = Interconnect HW version 33 = Status display SW version 34 = Status display HW version 35 = Decoder HW version 36 = Option card type & HW version 37 = Audio module installed 38 = MCM:N/A 39 = MCM PIC:N/A 40 = PHM module HW version 41 = Light engine HW version 42 = Light engine SW version 44 = TECs installed 45 = ADP card SW 46 = ADP card HW 47 = ADP card Bios 48 = ADP card Firmware 49 = Stereo3D™ Interface Module HW 50 = Optional fans 51 = Projector Head Flash SW version 52 = Projector Head Bit Sequence version <u>IC mask info</u> 60 = ICS1523 IC (PLL) 61 = Decoder IC 62 = FCI frame buffer controller Ics 63 = ZXI resizer IC 64 = A to D converter IC 65 = Projector Head ASIC version <u>Serial Number & Temp</u> 70 = IPM serial number 71 = IPM temperature (°C) 72 = Panel Driver 73 = Panel Driver Temperature (°C) 74 = Projector Head Serial Number 75 = Projector Head Temperature (°C) 90 = Projector Power Status 91 = On Screen Display Status 92 = Standby Status 93 = Menu Status 94 = Test Patterns On/Off 95 = Shutter is Open 96 = Lamp 1 / 2 Expiry Status 97 = Lamp Operation Mode 98 = Lamp Temperature Level 99 = Lamp Status	**HW Version N/A** **PIC Version N/A** **The IC revision information is subject to change from HW revision to HW revision** XeF or D100UF models **The serial number hardware and temperature sensors are not present on all versions of PCBs. "n/a" is returned when the information is not available.** **0 is off** **97-99 For Dual Lamp only** **192 = On and Okay, 65535 = off**

5. Multiple Sources

In setups with more than one channel, it is often necessary that messages specify to which channel a parameter value applies. Adjustments and parameters found in the *Image Settings, Size and Position* and *Channel Setup* menus are those that can be sent as RS-232 messages containing specific source identification.

When information about a specific source is requested, three parameters are returned by the projector: the source number, status (0=OK, 1=source doesn't exist), and the value of the parameter in question.

Examples:

COMMAND	*FUNCTION*
(ASR S25 1)	Turn on ASR for source #25
(ASR 1)	Turn ASR on for the current source
(ASR? S5)	Request for ASR status for source #5
(ASR! S005 000 001)	ASR is on and source is OK for source #5
(ASR?)	Request for ASR status for current source
(ASR! 000)	ASR is off for the current source