SIM2 BV INTERNATIONAL SRL

CRYSTAL4 SH

RS-232 communication protocol

Rev. 1.0 (21 December 2020)

Contents

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Revision History

Rev.	Date	Software Version	Description of Change
1.0	21 December 2020		Initial version.

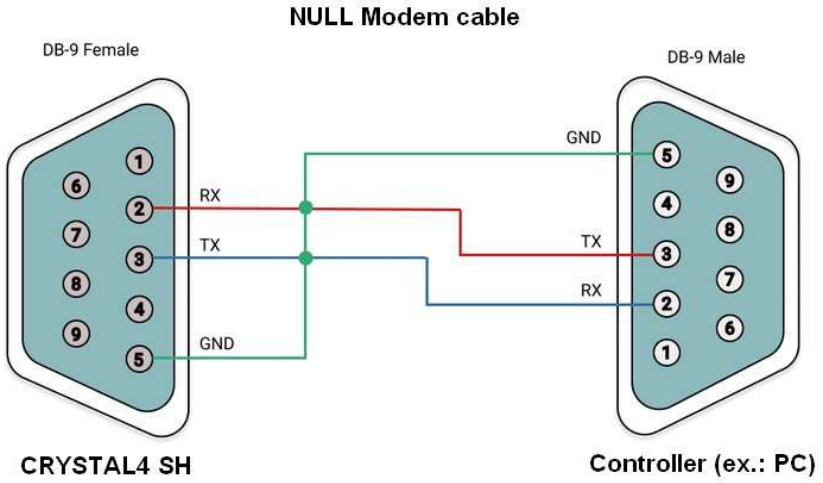
1. Introduction

This document describes how to interface the CRYSTAL4 SH projector with a Home Theatre control system (or a PC) over a direct serial connection or IR communication.

1.1 Setting up the RS-232 Serial connection

Follow these steps to configure the control system (or the PC) serial port.

- Switch off the control system (or the PC) and the projector.
- Use a NULL Modem serial cable with 9 pin male to the control system (or the PC) and 9 pin female to the Projector:



- Make sure the distances between equipment do not exceed the specifications of the interface (15 m or 50 feet).
- Switch on the control system (or the PC) and, after start up, switch on the projector.
- Set the Serial Port Parameters as shown below:

Communication Parameters

Parameter	Value
Transfer Rate	19200 bps
Data Bits	8
Parity Bit	None
Stop Bit	1
Flow Control	None

- Set the control system (or the PC program) Communication Mode to Binary (or Hex). ASCII mode is not supported.
- Set the control system interface (or the PC communication program) Display Mode to Hex.

1.2 Execution of the command

Command execution time may vary from 0.1 to 2.0 seconds, depending on the operation that have been requested.
If the projector is busy when a command is sent, the unit may not accept the command. When several commands are to be sent one after the other, sufficient time between them should be allowed.
When the unit is switched on from Standby wait 15 seconds before sending commands or reading messages sent by the projector.

In this section, serial commands (and respective responses) are listed. Commands (and responses) are series of bytes (numbers holding values from 0 to 255).
In the following, bytes are represented by couples of hexadecimal digits, shown in monospace (fixed-width) type (for example: EF[1]). Spaces between bytes (for example: E4 48) have been inserted just to make the command more readable and are not part of the command itself.
Commands do not require any termination character: do not add <LF>, <CR>, <EOT> or the like at the end of the given series of bytes.
[1]A variety of alternative conventions are used for representing hexadecimal digits, the most common being: Hex EF, EF_{16}, EFh, 0xEF.

1.3 Communication Protocol

The communication protocol is packet oriented. Packets consists of Header and Payload.
The packet header size is fixed (7 bytes), while the packet payload type and content varies based on the type of packet. The entire packet size is variable, being the sum of the fixed-size packet header and variable-sized packet payload. Event packet size is 13 bytes.

Header

All Packets use the same Packet Header format.
The Packet Header size is fixed at seven bytes.

0	1	2	3	4	5	6
BE	EF	Packet Type	Packet Payload Size		Packet Checksum (CRC)	

0xEFBE is a fixed value that is used to insure packet alignment if there are partial packets received or byte lost. The least-significant byte of the word (BE) is sent first, then the most-significant-byte (EF).

The **Packet Type** is a number (a byte in length) that defines the type of data in the packet.

The **Packet Payload Size** is a number (two bytes) that defines the size of the payload portion of the packet. For a given Packet Type, Packet Size is fixed.

The **Packet Checksum** (two bytes) is the CRC value for the entire packet (Header and Payload).

1.3.1 Response

There are two possible response type from the projector: Pass and “Fail”. The “Fail” type as a fix return response byte equal to value “15”.
When the projector successfully execute the command sent, it return a “Pass” packet. This one could be a fix byte, value “06”, if the command require only an acknowledge response, or three bytes if the command perform an action to “Set”, “Get”, “Increment” or “Decrement” to a value of a specific parameter or function.
The “Pass” packet, when the response has three bytes, starting with a fix byte “20” and follow two bytes that are the parameter or function value, as a word of 16 bits. In this “word” bits the least-significant byte is sent first, then the most-significant-byte

2. Commands

2.1 Remote Control Keys Codes

The following serial commands are meant to emulate button presses on the SUPERLUMIS IR Remote Control. Like remote button presses they interact with the OSD of the projector.

Key	Command	Response	
		Pass	Fail
Power On	BE EF 02 06 00 6B E6 52 01 00 00 00 00	06	15
Power Off	BE EF 02 06 00 51 E4 48 01 00 00 00 00	06	15
Function button (F1)	BE EF 02 06 00 F7 EA 0E 01 00 00 00 00	06	15
Function button (F2)	BE EF 02 06 00 26 EB 0F 01 00 00 00 00	06	15
Function button (F3)	BE EF 02 06 00 49 E9 10 01 00 00 00 00	06	15
Mode	BE EF 02 06 00 98 E8 11 01 00 00 00 00	06	15
Up	BE EF 02 06 00 DC E7 55 01 00 00 00 00	06	15
Down	BE EF 02 06 00 C1 E6 58 01 00 00 00 00	06	15
Left	BE EF 02 06 00 EF E7 56 01 00 00 00 00	06	15
Right	BE EF 02 06 00 3E E6 57 01 00 00 00 00	06	15
Enter	BE EF 02 06 00 BA E7 53 01 00 00 00 00	06	15
Source	BE EF 02 06 00 AB E8 12 01 00 00 00 00	06	15
Re-sync	BE EF 02 06 00 0D E6 54 01 00 00 00 00	06	15
Menu	BE EF 02 06 00 23 E7 5A 01 00 00 00 00	06	15
Freeze	BE EF 02 06 00 7A E9 13 01 00 00 00 00	06	15
Aspect Ratio	BE EF 02 06 00 CD E8 14 01 00 00 00 00	06	15
Information	BE EF 02 06 00 1C E9 15 01 00 00 00 00	06	15
AV Mute	BE EF 02 06 00 2F E9 16 01 00 00 00 00	06	15
Digital Zoom	BE EF 02 06 00 FE E8 17 01 00 00 00 00	06	15
VGA	BE EF 02 06 00 01 E8 18 01 00 00 00 00	06	15
HDMI2	BE EF 02 06 00 D0 E9 19 01 00 00 00 00	06	15
HDMI1	BE EF 02 06 00 E3 E9 1A 01 00 00 00 00	06	15
1	BE EF 02 06 00 67 E8 1E 01 00 00 00 00	06	15
2	BE EF 02 06 00 B6 E9 1F 01 00 00 00 00	06	15
3	BE EF 02 06 00 B9 EC 20 01 00 00 00 00	06	15
4	BE EF 02 06 00 68 ED 21 01 00 00 00 00	06	15
5	BE EF 02 06 00 5B ED 22 01 00 00 00 00	06	15
6	BE EF 02 06 00 8A EC 23 01 00 00 00 00	06	15
7	BE EF 02 06 00 3D ED 24 01 00 00 00 00	06	15
8	BE EF 02 06 00 EC EC 25 01 00 00 00 00	06	15
9	BE EF 02 06 00 DF EC 26 01 00 00 00 00	06	15
0	BE EF 02 06 00 0E ED 27 01 00 00 00 00	06	15

[1]A variety of alternative conventions are used for representing hexadecimal digits, the most common being: Hex EF, EF_{16}, EFh, 0xEF.

2.2 Operation Commands

2.2.1 Set action

The “Set” action is a command where is it necessary to write the parameter or function value. In the commands list below, is indicated with the label “Data” the value to send.
For this type of commands it is necessary to calculate the Packet Checksum (CRC): value for the entire packet, made of two bytes.
See the CRC Packet Checksum appendix, for more details.

2.2.2 List of commands

2.2.2.1 Direct source commands

				Response	
Function	**Range**	**Action**	**Command**	**Pass**	**Fail**
HDMI1		Set	BE EF 02 06 00 D5 E5 4C 01 00 00 00 00	06	15
HDMI2		Set	BE EF 02 06 00 04 E4 4D 01 00 00 00 00	06	15
VGA		Set	BE EF 02 06 00 62 E4 4B 01 00 00 00 00	06	15

2.2.2.2 Display menu

					Response	
Function		**Range**	**Action**	**Command**	**Pass**	**Fail**
Display Mode	Dynamic		Set	BE EF 02 06 00 EA EB 03 01 00 00 00 00	06	15
	Bright		Set	BE EF 02 06 00 9B F2 A2 01 00 00 00 00	06	15
	Cinema		Set	BE EF 02 06 00 A8 F2 A1 01 00 00 00 00	06	15
	Sport		Set	BE EF 02 06 00 5D EA 04 01 00 00 00 00	06	15
	Natural		Set	BE EF 02 06 00 8C EB 05 01 00 00 00 00	06	15
	HDR		Set	BE EF 02 06 00 BF EB 06 01 00 00 00 00	06	15
	User		Set	BE EF 02 06 00 4A F3 A3 01 00 00 00 00	06	15
	UserHDR		Set	BE EF 02 06 00 FD F2 A4 01 00 00 00 00	06	15
	HLG		Set	BE EF 02 06 00 29 EE 30 01 00 00 00 00	06	15
	UserHLG		Set	BE EF 02 06 00 F8 EF 31 01 00 00 00 00	06	15
Noise Reduction		n = 0 - 3	Inc	BE EF 1A 0C 00 B1 72 1C 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 74 23 1C 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 BE 82 1C 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
HDR	Auto		Set	BE EF 02 06 00 CE F2 A7 01 00 00 00 00	06	15

Settings	SDR		Set	BE EF 02 06 00 31 F2 A8 01 00 00 00 00	06	15
	HDR/HLG 1		Set	BE EF 02 06 00 E0 F3 A9 01 00 00 00 00	06	15
	HDR/HLG 2		Set	BE EF 02 06 00 D3 F3 AA 01 00 00 00 00	06	15
	HDR/HLG 3		Set	BE EF 02 06 00 02 F2 AB 01 00 00 00 00	06	15
	HDR/HLG 4		Set	BE EF 02 06 00 B5 F3 AC 01 00 00 00 00	06	15
Brightness		n= -50 - +50	Inc	BE EF 1A 0C 00 5E A3 00 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 9B F2 00 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Set	BE EF 1A 0C 00 crc crc 00 00 00 00 Data 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 51 53 00 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
Contrast		n= -50 - +50	Inc	BE EF 1A 0C 00 9D 5E 01 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 58 0F 01 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Set	BE EF 1A 0C 00 crc crc 01 00 00 00 Data 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 92 AE 01 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
Sharpness		n= 1 - 15	Inc	BE EF 1A 0C 00 91 52 04 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 54 03 04 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 9E A2 04 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
Color		n= -50 - +50	Inc	BE EF 1A 0C 00 5A A7 03 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 9F F6 03 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 55 57 03 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
Tint		n= -50 - +50	Inc	BE EF 1A 0C 00 99 5A 02 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 5C 0B 02 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 96 AA 02 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
Gamma	Film		Set	BE EF 1A 0C 00 4F E7 0B 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Video		Set	BE EF 1A 0C 00 83 26 0B 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Graphics		Set	BE EF 1A 0C 00 96 66 0B 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
	Standard (2.2)		Set	BE EF 1A 0C 00 A9 A6 0B 00 00 00 07 00 00 00 00 00 00 00	20 XX XX	15
	1,8		Set	BE EF 1A 0C 00 5A A7 0B 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
	2.0		Set	BE EF 1A 0C 00 70 27 0B 00 00 00 05 00 00 00 00 00 00 00	20 XX XX	15
	2,4		Set	BE EF 1A 0C 00 25 27 0B 00 00 00 09 00 00 00 00 00 00 00	20 XX XX	15
BrilliantColor™	Off		Set	BE EF 1A 0C 00 6F C7 13 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15

	On		Set	BE EF 1A 0C 00 A3 06 13 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
Color Temperature	D55		Set	BE EF 1A 0C 00 11 DF 39 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
	D65		Set	BE EF 1A 0C 00 7B 1F 39 00 00 00 0B 00 00 00 00 00 00 00	20 XX XX	15
	D75		Set	BE EF 1A 0C 00 44 DF 39 00 00 00 0E 00 00 00 00 00 00 00	20 XX XX	15
	D83		Set	BE EF 1A 0C 00 04 9F 39 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	D93		Set	BE EF 1A 0C 00 C8 5E 39 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Native		Set	BE EF 1A 0C 00 DD 1E 39 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
Color Gamut	Native		Set	BE EF 1A 0C 00 68 FE 41 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	HDTV		Set	BE EF 1A 0C 00 A4 3F 41 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	User		Set	BE EF 1A 0C 00 CE FF 41 00 00 00 08 00 00 00 00 00 00 00	20 XX XX	15
	Cinema		Set	BE EF 1A 0C 00 02 3E 41 00 00 00 09 00 00 00 00 00 00 00	20 XX XX	15
	LCC		Set	BE EF 1A 0C 00 17 7E 41 00 00 00 0A 00 00 00 00 00 00 00	20 XX XX	15
CMS	Red		Set	BE EF 1A 0C 00 1F B7 37 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Green		Set	BE EF 1A 0C 00 D3 76 37 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Blue		Set	BE EF 1A 0C 00 C6 36 37 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
	Cyan		Set	BE EF 1A 0C 00 0A F7 37 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
	Yellow		Set	BE EF 1A 0C 00 EC B6 37 00 00 00 04 00 00 00 00 00 00 00	20 XX XX	15
	Magenta		Set	BE EF 1A 0C 00 20 77 37 00 00 00 05 00 00 00 00 00 00 00	20 XX XX	15
	White		Set	BE EF 1A 0C 00 35 37 37 00 00 00 06 00 00 00 00 00 00 00	20 XX XX	15
	xOffset	n= -50 - +50	Inc	BE EF 1A 0C 00 06 FB 3A 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 C3 AA 3A 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 09 0B 3A 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Set	BE EF 1A 0C 00 CRC CRC 3A 00 00 00 XX XX 00 00 00 00 00 00	20 XX XX	15
	yOffset	n= -50 - +50	Inc	BE EF 1A 0C 00 C5 06 3B 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 00 57 3B 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 CA F6 3B 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Set	BE EF 1A 0C 00 CRC CRC 3B 00 00 00 XX XX 00 00 00 00 00 00	20 XX XX	15
	Brightness	n= -100 - +100	Inc	BE EF 1A 0C 00 0E F3 3C 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15

			Dec	BE EF 1A 0C 00 CB A2 3C 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 01 03 3C 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Set	BE EF 1A 0C 00 CRC CRC 3C 00 00 00 XX XX 00 00 00 00 00 00	20 XX XX	15
	Reset		Set	BE EF 02 06 00 A8 E3 61 01 00 00 00 00	06	15
RGB Gain/Bias	Red Gain	n= -50 - +50	Inc	BE EF 1A 0C 00 52 AF 05 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 97 FE 05 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 5D 5F 05 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Green Gain	n= -50 - +50	Inc	BE EF 1A 0C 00 56 AB 06 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 93 FA 06 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 59 5B 06 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Blue Gain	n= -50 - +50	Inc	BE EF 1A 0C 00 95 56 07 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 50 07 07 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 9A A6 07 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Red Bia	n= 0 - 100	Inc	BE EF 1A 0C 00 81 42 08 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 44 13 08 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 8E B2 08 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Green Bias	n= 0 - 100	Inc	BE EF 1A 0C 00 42 BF 09 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 87 EE 09 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 4D 4F 09 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Blue Bias	n= 0 - 100	Inc	BE EF 1A 0C 00 46 BB 0A 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 83 EA 0A 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 49 4B 0A 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Reset		Set	BE EF 02 06 00 79 E2 60 01 00 00 00 00	06	15
Color Space	Auto		Set	BE EF 02 06 00 E9 E0 70 01 00 00 00 00	06	15
	RGB (0-255)		Set	BE EF 02 06 00 38 E1 71 01 00 00 00 00	06	15
	RGB(16 - 235)		Set	BE EF 02 06 00 0B E1 72 01 00 00 00 00	06	15
	YUV		Set	BE EF 02 06 00 DA E0 73 01 00 00 00 00	06	15
Analog Signal	Automatic	Off	Set	BE EF 1A 0C 00 37 9F 29 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 FB 5E 29 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Frequency		Inc	BE EF 1A 0C 00 F9 3A 2A 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15

		n= -50 - +50 (depends on signal)	Dec	BE EF 1A 0C 00 3C 6B 2A 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 F6 CA 2A 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Phase	n= 0 - +31 (depends on signal)	Inc	BE EF 1A 0C 00 3A C7 2B 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 FF 96 2B 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 35 37 2B 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	H. Position	n= -50 - +50 (depends on signal)	Inc	BE EF 1A 0C 00 F1 32 2C 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 34 63 2C 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 FE C2 2C 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	V. Position	n= -50 - +50 (depends on signal)	Inc	BE EF 1A 0C 00 32 CF 2D 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 F7 9E 2D 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 3D 3F 2D 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
Auto Adaptive Contrast	On		Set	BE EF 1A 0C 00 AB 0E 15 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Off		Set	BE EF 1A 0C 00 67 CF 15 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
Super Hybrid Mode	Off		Set	BE EF 1A 0C 00 64 F2 44 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Standard		Set	BE EF 1A 0C 00 A8 33 44 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Enhanced		Set	BE EF 1A 0C 00 BD 73 44 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
	Deep Black		Set	BE EF 1A 0C 00 71 B2 44 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
Laser Modulation	100%		Set	BE EF 1A 0C 00 6C FA 42 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	95%		Set	BE EF 1A 0C 00 A0 3B 42 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	90%		Set	BE EF 1A 0C 00 B5 7B 42 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
	85%		Set	BE EF 1A 0C 00 79 BA 42 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
	80%		Set	BE EF 1A 0C 00 9F FB 42 00 00 00 04 00 00 00 00 00 00 00	20 XX XX	15
	75%		Set	BE EF 1A 0C 00 53 3A 42 00 00 00 05 00 00 00 00 00 00 00	20 XX XX	15
	70%		Set	BE EF 1A 0C 00 46 7A 42 00 00 00 06 00 00 00 00 00 00 00	20 XX XX	15
	65%		Set	BE EF 1A 0C 00 8A BB 42 00 00 00 07 00 00 00 00 00 00 00	20 XX XX	15
	60%		Set	BE EF 1A 0C 00 CA FB 42 00 00 00 08 00 00 00 00 00 00 00	20 XX XX	15
	55%		Set	BE EF 1A 0C 00 06 3A 42 00 00 00 09 00 00 00 00 00 00 00	20 XX XX	15
	50%		Set	BE EF 1A 0C 00 13 7A 42 00 00 00 0A 00 00 00 00 00 00 00	20 XX XX	15

Advanced Image Processing	Enhanced Details	OFF	Set	BE EF 1A 0C 00 97 3F 51 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		1	Set	BE EF 1A 0C 00 5B FE 51 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
		2	Set	BE EF 1A 0C 00 4E BE 51 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
		3	Set	BE EF 1A 0C 00 82 7F 51 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
	Enhanced Colors	OFF	Set	BE EF 1A 0C 00 93 3B 52 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		1	Set	BE EF 1A 0C 00 5F FA 52 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
		2	Set	BE EF 1A 0C 00 4A BA 52 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
		3	Set	BE EF 1A 0C 00 86 7B 52 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
		4	Set	BE EF 1A 0C 00 60 3A 52 00 00 00 04 00 00 00 00 00 00 00	20 XX XX	15
		5	Set	BE EF 1A 0C 00 AC FB 52 00 00 00 05 00 00 00 00 00 00 00	20 XX XX	15
	Motion Compensa-tion	OFF	Set	BE EF 1A 0C 00 83 2B 5E 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		1	Set	BE EF 1A 0C 00 4F EA 5E 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
		2	Set	BE EF 1A 0C 00 5A AA 5E 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
		3	Set	BE EF 1A 0C 00 96 6B 5E 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
	Reset		Set	BE EF 1A 0C 00 AF 07 43 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
Aspect Ratio	4:3		Set	BE EF 02 06 00 2A F4 83 01 00 00 00 00	06	15
	16:9		Set	BE EF 02 06 00 7F F4 86 01 00 00 00 00	06	15
	LBX		Set	BE EF 02 06 00 4C F4 85 01 00 00 00 00	06	15
	SuperWide		Set	BE EF 02 06 00 9D E4 44 01 00 00 00 00	06	15
	Native		Set	BE EF 02 06 00 AE F5 87 01 00 00 00 00	06	15
	Auto		Set	BE EF 02 06 00 4C E5 45 01 00 00 00 00	06	15
Edge mask		n = 0 - 10	Inc	BE EF 1A 0C 00 66 9B 12 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 A3 CA 12 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 69 6B 12 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
Digital Zoom		n = -27 - 27	Inc	BE EF 1A 0C 00 62 9F 11 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 A7 CE 11 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Set	BE EF 1A 0C 00 CRC CRC 11 00 00 00 data data 00 00 00 00 00 00	20 data data	15
			Get	BE EF 1A 0C 00 6D 6F 11 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
H Image Shift		n = -100 - +100	Inc	BE EF 1A 0C 00 A9 6A 16 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 6C 3B 16 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15

			Set	BE EF 1A 0C 00 CRC CRC 16 00 00 00 data data 00 00 00 00 00 00	20 data data	15
			Get	BE EF 1A 0C 00 A6 9A 16 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
V Image Shift		n = -100 - +100	Inc	BE EF 1A 0C 00 6A 97 17 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 AF C6 17 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Set	BE EF 1A 0C 00 CRC CRC 17 00 00 00 data data 00 00 00 00 00 00	20 data data	15
			Get	BE EF 1A 0C 00 65 67 17 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15

2.2.2.3 Setup menu

					Response	
Function		**Range**	**Action**	**Command**	**Pass**	**Fail**
Projection	Front-Desktop		Set	BE EF 1A 0C 00 01 CF 35 00 00 00 02 00 00 00 00 00 00 00	20 XX XX	15
	Rear-Desktop		Set	BE EF 1A 0C 00 D8 4E 35 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Front-Ceiling		Set	BE EF 1A 0C 00 14 8F 35 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Rear-Ceiling		Set	BE EF 1A 0C 00 CD 0E 35 00 00 00 03 00 00 00 00 00 00 00	20 XX XX	15
Power Settings	Direct Power On	On	Set	BE EF 1A 0C 00 7B DE 49 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
		Off	Set	BE EF 1A 0C 00 B7 1F 49 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Auto Power Off (min)	n = 0 - 180 (5 minutes for each step)	Inc	BE EF 1A 0C 00 3E C3 28 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 FB 92 28 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 31 33 28 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Sleep Timer (min)	n = 0 - 990 (30 minutes for each step)	Inc	BE EF 1A 0C 00 79 BA 4A 00 02 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 BC EB 4A 00 03 00 00 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 76 4A 4A 00 01 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Power Mode (Standby)	Active	Set	BE EF 1A 0C 00 70 E6 4B 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		Eco. (<0.5W)	Set	BE EF 1A 0C 00 BC 27 4B 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
Security	Security Timer	Month mm= 00 - 12 Day dd = 00 - 30 Hour hh= 00 - 24	Set	BE EF 1A 0C 00 crc crc 4C 00 00 00 mm dd hh 00 00 00 00 00	20 XX XX	15
	Security	On	Set	BE EF 1A 0C 00 E5 3C 81 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
		Off	Set	BE EF 1A 0C 00 29 FD 81 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
Test Pattern	Off		Set	BE EF 1A 0C 00 78 EE 4D 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15

	Grid(Green)		Set	BE EF 1A 0C 00 B4 2F 4D 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
	Grid (Magenta)		Set	BE EF 1A 0C 00 A1 6F 4D 00 00 00 02 00 00 00 00 00 00	20 XX XX	15
	Grid(White)		Set	BE EF 1A 0C 00 6D AE 4D 00 00 00 03 00 00 00 00 00 00	20 XX XX	15
	White		Set	BE EF 1A 0C 00 8B EF 4D 00 00 00 04 00 00 00 00 00 00	20 XX XX	15
Remote Settings [depends on remote]	IR Function	On	Set	BE EF 1A 0C 00 2B 83 20 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		Front	Set	BE EF 1A 0C 00 E7 42 20 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
		Top	Set	BE EF 1A 0C 00 F2 02 20 00 00 00 02 00 00 00 00 00 00	20 XX XX	15
		Off	Set	BE EF 1A 0C 00 3E C3 20 00 00 00 03 00 00 00 00 00 00	20 XX XX	15
	F1	Test Pattern / AV Mute / Freeze / Sleep Timer / CMS / Color Temperature / 12V Trigger / Auto Source / Aspect Ratio / Brightness / Contrast / Gamma / Projection / LAN	Set	BE EF 1A 0C 00 crc crc 82 00 00 00 xx 00 00 00 00 00 00 00	20 XX XX	15
	F2	Test Pattern / AV Mute / Freeze / Sleep Timer / CMS / Color Temperature / 12V Trigger / Auto Source / Aspect Ratio / Brightness / Contrast / Gamma / Projection / LAN	Set	BE EF 1A 0C 00 crc crc 83 00 00 00 xx 00 00 00 00 00 00 00	20 XX XX	15
	F3	Test Pattern / AV Mute / Freeze / Sleep Timer / CMS / Color Temperature / 12V Trigger / Auto Source / Aspect Ratio / Brightness / Contrast / Gamma / Projection / LAN	Set	BE EF 1A 0C 00 crc crc 84 00 00 00 xx 00 00 00 00 00 00 00	20 XX XX	15
12V Trigger	Off		Set	BE EF 1A 0C 00 54 C2 50 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	On		Set	BE EF 1A 0C 00 98 03 50 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
Language	English		Set	BE EF 1A 0C 00 2F 87 23 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Spanish		Set	BE EF 1A 0C 00 DC 86 23 00 00 00 04 00 00 00 00 00 00	20 XX XX	15

	French		Set	BE EF 1A 0C 00 F6 06 23 00 00 00 02 00 00 00 00 00 00	20 XX XX	15
	German		Set	BE EF 1A 0C 00 E3 46 23 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
	Portuguese		Set	BE EF 1A 0C 00 10 47 23 00 00 00 05 00 00 00 00 00 00	20 XX XX	15
	Simplified Chinese		Set	BE EF 1A 0C 00 A3 06 23 00 00 00 0E 00 00 00 00 00 00	20 XX XX	15
	Italian		Set	BE EF 1A 0C 00 3A C7 23 00 00 00 03 00 00 00 00 00 00	20 XX XX	15
	Russian		Set	BE EF 1A 0C 00 45 47 23 00 00 00 09 00 00 00 00 00 00	20 XX XX	15
Menu Settings	Menu Location	Top Left	Set	BE EF 1A 0C 00 C7 6F 6D 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		Top Right	Set	BE EF 1A 0C 00 0B AE 6D 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
		Centre	Set	BE EF 1A 0C 00 1E EE 6D 00 00 00 02 00 00 00 00 00 00	20 XX XX	15
		Bottom Left	Set	BE EF 1A 0C 00 D2 2F 6D 00 00 00 03 00 00 00 00 00 00	20 XX XX	15
		Bottom Right	Set	BE EF 1A 0C 00 34 6E 6D 00 00 00 04 00 00 00 00 00 00	20 XX XX	15
	Menu Timer	Off	Set	BE EF 1A 0C 00 C3 6B 6E 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		5sec	Set	BE EF 1A 0C 00 0F AA 6E 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
		10sec	Set	BE EF 1A 0C 00 1A EA 6E 00 00 00 02 00 00 00 00 00 00	20 XX XX	15
Auto Source	Auto Source Off		Set	BE EF 1A 0C 00 00 96 6F 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Auto Source On		Set	BE EF 1A 0C 00 CC 57 6F 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
Input Source	HDMI1		Set	BE EF 02 06 00 D5 E5 4C 01 00 00 00 00	06	15
	HDMI2		Set	BE EF 02 06 00 04 E4 4D 01 00 00 00 00	06	15
	VGA		Set	BE EF 02 06 00 62 E4 4B 01 00 00 00 00	06	15
High Altitude	Off		Set	BE EF 1A 0C 00 23 8B 26 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	On		Set	BE EF 1A 0C 00 EF 4A 26 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
Display Mode Lock	Off		Set	BE EF 1A 0C 00 24 B2 74 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	On		Set	BE EF 1A 0C 00 E8 73 74 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
Keypad Lock	Off		Set	BE EF 1A 0C 00 E7 4F 75 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	On		Set	BE EF 1A 0C 00 2B 8E 75 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
Information Hide	Off		Set	BE EF 1A 0C 00 E0 76 27 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	On		Set	BE EF 1A 0C 00 2C B7 27 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
Logo	Default		Set	BE EF 1A 0C 00 E3 4B 76 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Neutral		Set	BE EF 1A 0C 00 2F 8A 76 00 00 00 01 00 00 00 00 00 00	20 XX XX	15

Background Color	None		Set	BE EF 1A 0C 00 B3 16 1F 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
	Blue		Set	BE EF 1A 0C 00 7F D7 1F 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	Red		Set	BE EF 1A 0C 00 6A 97 1F 00 00 00 03 00 00 00 00 00 00	20 XX XX	15
	Green		Set	BE EF 1A 0C 00 8C D6 1F 00 00 00 04 00 00 00 00 00 00	20 XX XX	15
	Gray		Set	BE EF 1A 0C 00 A6 56 1F 00 00 00 02 00 00 00 00 00 00	20 XX XX	15
HDMI 2 Setting	EDID 1		Set	BE EF 1A 0C 00 20 B6 77 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
	EDID 2		Set	BE EF 1A 0C 00 EC 77 77 00 00 00 01 00 00 00 00 00 00	20 XX XX	15
HDMI1 EQ		1~7	Set	BE EF 1A 0C 00 crc crc 85 00 00 00 Data 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 23 5D 85 00 01 00 00 00 00 00 00 00 00	20 XX XX	15
			Inc	BE EF 1A 0C 00 2C AD 85 00 02 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 E9 FC 85 00 03 00 00 00 00 00 00 00 00	20 XX XX	15
HDMI2 EQ		1~7	Set	BE EF 1A 0C 00 crc crc 86 00 00 00 Data 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 27 59 86 00 01 00 00 00 00 00 00 00 00	20 XX XX	15
			Inc	BE EF 1A 0C 00 28 A9 86 00 02 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 ED F8 86 00 03 00 00 00 00 00 00 00 00	20 XX XX	15
Detail Filter		0~2	Set	BE EF 1A 0C 00 crc crc 88 00 00 00 Data 00 00 00 00 00 00 00	20 XX XX	15
			Get	BE EF 1A 0C 00 F0 B0 88 00 01 00 00 00 00 00 00 00 00	20 XX XX	15
			Inc	BE EF 1A 0C 00 FF 40 88 00 02 00 00 00 00 00 00 00 00	20 XX XX	15
			Dec	BE EF 1A 0C 00 3A 11 88 00 03 00 00 00 00 00 00 00 00	20 XX XX	15
Reset	Reset OSD		Set	BE EF 02 06 00 1F E2 66 01 00 00 00 00	06	15
	Reset to De-fault		Set	BE EF 02 06 00 A1 E1 78 01 00 00 00 00	06	15

2.2.2.4 Network menu

					Response	
Function		**Range**	**Action**	**Command**	**Pass**	**Fail**
LAN	DHCP	Off	Set	BE EF 1A 0C 00 F3 5B 7A 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 3F 9A 7A 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
Control	Crestron	Off	Set	BE EF 1A 0C 00 30 A6 7B 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 FC 67 7B 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Extron	Off	Set	BE EF 1A 0C 00 FB 53 7C 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 37 92 7C 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	PJ Link	Off	Set	BE EF 1A 0C 00 38 AE 7D 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 F4 6F 7D 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	AMX Device Discovery	Off	Set	BE EF 1A 0C 00 3C AA 7E 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 F0 6B 7E 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	HTTP	Off	Set	BE EF 1A 0C 00 EA 00 80 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 26 C1 80 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15
	Telnet	Off	Set	BE EF 1A 0C 00 31 E5 8B 00 00 00 00 00 00 00 00 00 00 00	20 XX XX	15
		On	Set	BE EF 1A 0C 00 FD 24 8B 00 00 00 01 00 00 00 00 00 00 00	20 XX XX	15

2.3 Status commands

Status Commands may be used to get the current value of the main projector parameters.
Sections below describe the responses when the unit is On. It is not possible to receive a significant response when the unit is in Standby state.

Status Commands

Parameter	Command
Projector Status	3E EF 10 0A 00 34 B7 01 01 00 01 01 15 01 00 00 02
Signal Status	3E EF 10 0A 00 33 37 01 01 00 01 01 15 01 00 00 08
Lamp Status	3E EF 10 0A 00 A9 36 01 01 00 01 01 15 01 00 01 10

Projector Status

When in Standby State, the projector does not respond to this command.
If the unit is On, the returned packet (27 byte long) is described in the following table:

1E	BE	EF	10	13	00	..	..	01	01	00	01	01	15	01	00	00	02	00	00	00	SS	..	..	..	..	..
0	1																17	18		20	21					

where bytes marked with .. are not relevant.

The response may be separated into 4 parts:

- 1 bytes (byte 0) that initiates the packet (1E)
- 17 bytes (bytes 1-17) that duplicate the sent command (apart from 2 of them for the CRC)
- 3 Error bytes (bytes 18{20) that signal errors in the processing of the command
- 1 Data byte (bytes 21) that contain the requested data

If the 3 Error bytes (bytes 18-20) are 00 00 00 then requested data are valid.

Byte 21 (labeled SS in the table above) contains Projector Status: On = 01

Signal Status

When then unit is On, the returned packet (25 byte long) is described in the following table:

1E	BE	EF	10	11	00	..	..	01	01	00	01	01	15	01	00	00	08	00	00	00	SS	..	..	II	..
0	1																17	18		20	21			24	

where bytes marked with .. are not relevant.

The response may be separated into 4 parts:

- 1 bytes (byte 0) that initiates the packet (1E)
- 17 bytes (bytes 1-17) that duplicate the sent command (apart from 2 of them | the CRC)
- 3 Error bytes (bytes 18-20) that signal errors in the processing of the command
- 2 Data bytes (bytes 21, 24) that contain the requested data

If the 3 Error bytes (bytes 18-20) are 00 00 00 then requested data are valid.
When in Standby State, the projector does not respond to this command.

The tables below explain the meaning of returned data.

- Byte 21 (labelled SS in the table above) contains current Input Status:

OK	00
No Signal	01

- Byte 24 (labelled II in the table above) contains Current Input:

VGA	05
HDMI 1	12
HDMI 2	13
HDMI 3	14
Display Port	15

Lamp Status

When then unit is On, the returned packet (27 byte long) is described in the following table:

1E	BE	EF	10	13	00	..	..	01	01	15	01	00	01	10	00	00	00	UU	UU	UU	SS	LL	LL	LL
0	1													17	18			21	22	23	24	25	26	27

where bytes marked with .. are not relevant.

The response may be separated into 4 parts:
- 1 bytes (byte 0) that initiates the packet (1E)
- 17 bytes (bytes 1-17) that duplicate the sent command (apart from 2 of them for the CRC)
- 3 Error bytes (bytes 18-20) that signal errors in the processing of the command
- 6 Data bytes (bytes 21-27) that contain the requested data

If the 3 Error Bytes (bytes 18-20) are 00 00 00 then requested data are valid.
The tables below explain the meaning of returned data.

- Bytes 21, 22 and 23 (labelled **UU UU UU** in the table above) contain **Unit Working Hours**. UU UU UU is the hex representation of the number of working hours. Therefore, if, for instance, UU UU UU= 09 D8 00 then Unit Working Hours is 2520.

- Byte 25 (labelled **SS** in the table above) contains the **Lamp Status**:

Off	00
On	02

- Bytes 25, 26 and 27 (labelled **LL LL LL** in the table above) contain **Lamp Working Hours**. LL LL LL is the hex representation of the number of working hours. Therefore, if, for instance, LL LL LL = 01 B6 00 then Unit Working Hours is 438.

2.3.1 Generic info

Command to send
BE EF 10 0A 00 9F 97 01 01 06 00 01 15 01 FF FF FF

Response
1E BE EF 10 4B 00 CRC_H CRC_L 01 01 47 00 01 15 01 FF FF FFA B C D E F SN AA AA AA BB BB BB CC CC CC DD DD DD Hfreq Hfreq Vfreq Vfreq Hres Hres Vres Vres Sync Sync aa bb cc dd ee ff gg hh ii jj kk ll mm xx xx xx ss ss ss

Where

1 bytes (byte 0) that initiates the packet (1E)
17 bytes (bytes 1-17) that duplicate the sent command (apart from 2 of them | the CRC)
1 byte A for input source (NoSignal=0x00, HDMI1=0x01, HDMI2=0x02, HDMI3=0x03, DispalyPort=0x04, VGA=0x05, YPrPb=0x06)
1 byte B for signal status (0x00: no signal, 0x01: signal present)
1 byte C Reserved
1 byte D Reserved
1 byte E for test pattern enabled(0x00:Off, Green Grid= 0x01, Magenta Grid =0x02, White Grid = 0x03, White = 0x04)
1 byte F for Lamp on/off (0x00:Off, 0x01:On)
18 bytes for SN.
3 bytes AA AA AA for MST FW version (ASCII code)
3 bytes BB BB BB for MCU FW version (ASCII code)
3 bytes CC CC CC for MST7410 FW version (ASCII code)
3 bytes DD DD DD for DDP4422 FW version (ASCII code)
2 byte Hfreq (xx.x KHz)
2 byte Vfreq (xx Hz)
2 bytes Hres
2 bytes Vres
2 byte Sync info (bit0:Vsync present, bit1:Hsync present, bit4:Composite sync, bit6:Interlace, bit8:SOG, other bit: Ignore)
1 byte aa display mode (0x0:Dynamic, 0x1:Bright, 0x2:Cinema, 0x3:Sport, 0x4:Natural, 0x5:HDR, 0x6:User, 0x7:UserHDR, 0x8:none, 0xD:HLG, 0xE:UserHLG)
1 byte bb color temperature (0:D55, 1:D65, 2:D75, 3:D83, 4:D93, 5:Native, 6:no signal)
1 byte cc Color Gamut (0:Native, 1:HDTV, 2:User, 3:Cinema, 4:LCC, 7:no siganl)
1 byte dd Brilliant Color
1 byte ee Aspect (0:4:3, 1:16:9, 2:LBX, 3: Superwide 4:Native, 5:Auto, 6:No signal)
1 byte ff Gamma (0:Film, 1:Video, 2:Graphic, 3:Standard, 4:1.8, 5: 2.0, 6:2.4, 9:No signal)
1 byte gg Color space (if input not HDMI: 0:Auto, 1:RGB, 2:YUV, if HDMI: 3:Auto, 4:0~255, 5:16~235, 6:YUV, 7:No Signal)
1 byte hh Ultra Detail (0: OFF)
1 byte ii Pure Color (0: OFF)
1 byte jj Pure Motion (0: OFF)
1 byte kk Dynamic Contrast 0: OFF, 1: On
1 byte ll Reserved
1 byte mm Spoke white 0x00:Off, 0x01:
3 bytes xx xx xx Lamp hours
3 bytes ss ss ss Projection hours

2.4 Appendix - Checksum CRC

Modbus CRC16 method
Calculation of the checksum is performed by the C code shown below.
SIM2 have a application for PC windows, to calculate the CRC, from an inserted hexadecimal string.
The application name is "CRC Calculator" ver. 1.3 or greater.
To perform the calculation correctly, first set to zero those fields (2 bytes) that contain the checksum.

```
// Using two 256 byte lookup tables, quickly calculate a 16-bit CRC on
// a block of data.
// Params:
// pcData : Pointer to data to calculate CRC on.
// nCount : Number of data bytes.
// Return: 16-bit CRC value.

WORD CalculateCRC16(BYTE *pcData, int nCount)    {
    BYTE cCRCHi = 0xFF;             // high byte of CRC initialised
    BYTE cCRCLo = 0xFF;             // low byte of CRC initialised
    BYTE cIndex;                    // will index into CRC lookup table
    while (nCount--)  {             // step through each byte of data

        cIndex = cCRCHi ^ *pcData++;          //calculate the CRC
        cCRCHi = cCRCLo ^ cCRCHiArray[cIndex];
        cCRCLo = cCRCLoArray[cIndex];
    }
    return (cCRCHi << 8) + cCRCLo;
}

// Lookup table used for high-byte of CRC
static const BYTE cCRCHiArray[] =  {
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40
 };
```

```
// Lookup table used for low-byte of CRC
static const BYTE cCRCLoArray[] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06,
0x07, 0xC7, 0x05, 0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D, 0xCD,
0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A,
0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC, 0x14, 0xD4,
0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3,
0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4,
0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29,
0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED,
0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60,
0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67,
0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,
0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68,
0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE, 0x7E,
0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71,
0x70, 0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92,
0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,
0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B,
0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B,
0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42,
0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};
```

Example
Set the brightness value to +20.
Command is BE EF 1A 0C 00 crc crc 00 00 00 00 Data 00 00 00 00 00 00 00

+20 in hexadecimal value is 0x14

The init string to send is BE EF 1A 0C 00 crc crc 00 00 00 00 14 00 00 00 00 00 00 00

To calculate the CRC, set the initial CRC values to zero:
BE EF 1A 0C 00 00 00 00 00 00 00 14 00 00 00 00 00 00 00

Buffer = [0xBE, 0xEF, 0x1A, 0x0C, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x14, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00]

CRC = CalculateCRC16(Buffer, 19)
the CalculateCRC16 return the value 0x026B
The string to send is BE EF 1A 0C 00 6B 02 00 00 00 00 14 00 00 00 00 00 00 00

Tx BE EF 1A 0C 00 6B 02 00 00 00 00 14 00 00 00 00 00 00 00
Rx 20 14 00

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