VX16s Control Protocol

Version 1.0

2020-04-21

Change History

Version	Modified By	Description	Date
V1.0	Chang Wenting	Initialized the VX16s control protocol.	2020-04-21

1. Privacy Statement

a) This protocol is strictly confidential, and shall not be distributed outside NovaStar or uploaded to the Internet. Anyone who breaks these rules and therefore causes any loss to the company shall be investigated according to law.

b) Developers must strictly follow the instructions in this document for related development.

2. Overview

The communication protocol format of this NovaStar video processor product includes request frames and response frames. Each request packet corresponds to only one response packet so as to form a closed-loop communication.

The VX16s supports USB, TCP/IP, and RS232 communication protocols. The Ethernet is based on the TCP/IP protocol where relevant control data frames should be added after the protocol frame and then sent to the device to realize related functions. For the RS232 communication, you only need to send the corresponding data frames to the device via RS232 to realize the functions.

3. Communication Settings

3.1 Network Port and Communication Format

3.1.1 UDP Searching

(1) UDP port: 3800
(2) UDP searching
The software sends the "rqProMI:" data in UDP message format for searching. When the data saved in the device is the same as the data sent by the software, the device will reply with the following data format, indicating that the UDP has identified the NovaStar device.
{0X72, 0x70, 0x50, 0x72, 0x6F, 0x4D, 0x49, 0x3A, 0x41, 0x70, 0x70, 0x2C, 0x30, 0x31, 0x36, 0x31}

3.1.2 TCP Communication

The communication between the software and the device uses the standard TCP protocol.

(1) TCP port: 5200

(2) Reconnecting device and reading the device ID

Command to read ModelD of the VX16s:

55 aa 00 00 fe 00 00 00 00 00 00 00 02 00 00 00 02 00 57 56

If the response packet is in the following format, the device is successfully connected.

aa 55 00 00 00 fe 00 00 00 00 00 00 02 00 00 00 02 00 0b 62 c4 56

3.2 RS232 Serial Communication Protocol

RS232 Serial Communication Protocol:

1) Baud rate: 115200

2) Data bits: 8

3) Parity: None

4) Stop bits: 1

5) Data stream: Hexadecimal data

Command to read ModelD of the VX16s:

55 aa 00 00 fe 00 00 00 00 00 00 00 02 00 00 00 02 00 57 56

If the response packet is in the following format, the device is successfully connected.

aa 55 00 00 00 fe 00 00 00 00 00 00 02 00 00 00 02 00 0b 62 c4 56

4. Function Control

4.1 System Parameters

4.1.1 Screen Brightness Control

(1) Command to adjust screen brightness

Set the brightness value to "XX":

55 aa 00 00 fe ff 01 ff ff ff 01 00 01 00 00 02 01 00 XX SUM_L SUM_H

The command data is in hexadecimal format and XX stands for the desired screen brightness. "SUM_L" and "SUM_H" constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xFE + 0xFF+ 0x01 + 0xFF + 0xFF + 0xFF + 0x01 + 0x00 + 0x01 + 0x00 + 0x00 + 0x02 + 0x01 + 0x00 + XX + 0x5555, SUM = SUM_H << 8 + SUM_L ("SUM_L" stands for the lower 8 bits of SUM, while "SUM_H" stands for the higher 8 bits of SUM.)

(2) Response packet

After the brightness adjustment command is sent, if the response packet is in the following format, it represents the screen brightness is successfully adjusted.

aa 55 00 00 ff fe 01 ff ff ff 01 00 01 00 00 02 00 00 54 5a

4.1.2 Switching Between Primary and Backup Modes

(1) Command to switch between primary and backup modes

① Set the device as primary device

55 aa 00 00 fe 00 00 00 00 00 01 00 18 00 00 02 04 00 00 00 00 00 72 56
55 aa 00 00 fe 00 00 00 00 00 01 00 98 00 00 02 04 00 00 00 00 00 f2 56
55 aa 00 00 fe 00 00 00 00 00 01 00 00 01 00 02 08 00 00 00 00 00 00 00 00 00 5f 56

① Set the device as backup device

55 aa 00 00 fe 00 00 00 00 00 01 00 18 00 00 02 04 00 80 80 80 80 72 58
55 aa 00 00 fe 00 00 00 00 00 01 00 98 00 00 02 04 00 80 80 80 80 f2 58
55 aa 00 00 fe 00 00 00 00 00 01 00 00 01 00 02 08 00 80 80 80 80 80 80 80 80 5f 5a

(2) Response packet

If the response packet is in the following format, the device mode is successfully switched.

aa 55 00 00 00 fe 00 00 00 00 01 00 18 00 00 02 00 00 6e 56
aa 55 00 00 00 fe 00 00 00 00 01 00 98 00 00 02 00 00 ee 56
aa 55 00 00 00 fe 00 00 00 00 01 00 00 01 00 02 00 00 57 56

Note: The primary and backup modes switching requires sending of three packets of data. The next packet of data will only be sent when the previous one gets a valid response packet. The data sending and responding order is the same with the order of the data package described above (from top to bottom).

4.1.3 Test Pattern

(1) Command to set the display mode

① Normal

55 aa 00 00 fe 00 00 00 00 00 01 00 04 00 00 13 02 00 03 00 70 56

② Freeze

55 aa 00 00 fe 00 00 00 00 00 01 00 04 00 00 13 02 00 04 00 71 56

③ Black out

55 aa 00 00 fe 00 00 00 00 00 01 00 04 00 00 13 02 00 05 00 72 56

④ Test Pattern

Set the test pattern type to XX:

55 aa 00 00 fe 00 00 00 00 00 01 00 04 00 00 13 02 00 06 XXSUM_L SUM_H

The command data is in hexadecimal format and XX stands for the desired test pattern type. For details of the test pattern types, see Appendix 1. "SUM_L" and "SUM_H" constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + 0x04 + 0x00 + 0x00 + 0x13 + 0x02 + 0x06 + 0x00 + XX + 0x5555, SUM = SUM_H<<8 + SUM_L ("SUM_L" stands for the lower 8 bits of SUM, while "SUM_H" stands for the higher 8 bits of SUM.)

(2) Response packet

aa 55 00 00 00 fe 00 00 00 00 01 00 04 00 00 13 00 00 6b 56

4.1.4 Factory Reset

(1) Command to do factory reset:

55 aa 00 00 fe 00 00 00 00 00 01 00 02 00 00 01 01 00 00 58 56

(2) Response packet

If the response packet is in the following format, the device is successfully factory reset.

aa 55 00 00 00 fe 00 00 00 00 01 00 02 00 00 01 00 00 57 56

4.2 Input Parameters

4.2.1 Setting Input Source Resolution

(1) Command to set input source resolution

Set the parameters of the input source resolution, including the input source number, card slot number, horizontal width, vertical height, frame rate which are represented by Source, CardNo, Width, Height and Frame respectively.

55 aa 00 00 fe 00 00 00 00 00 01 00 00 42 01 13 08 00 Source CardNo Width_L Width_H Height_L Height_H Frame_L Frame_H SUM_L SUM_H

The command data is hexadecimal. "Source" indicates the input source number (for details on definition of the source number values, see Appendix 2). "CardNo" indicates the card slot number (for details on the slot number values, see Appendix 3). "Width" indicates the horizontal width of resolution (Width = Width_H<<8 + Width_L). "Hight" indicates the vertical height of resolution (Hight = Hight_H<<8 + Hight_L). "Frame" indicates the frame rate (unit: 0.01 Hz, Frame = Frame_H<<8 + Frame_L). "SUM_L" and "SUM_H" constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + 0x00 + 0x42 + 0x01 + 0x13 + 0x08 + 0x00 + Source + CardNo + Width_L + Width_H + Height_L + Height_H + Frame_L + Frame_H + 0x5555, SUM = SUM_H<<8 + SUM_L ("SUM_L" stands for the lower 8 bits of SUM, while "SUM_H" stands for the higher 8 bits of SUM.)

Explanation of parameters:

For example, to set the resolution of HDMI 2.0 source to 1920*1080@60Hz, write the parameter values as follows.

a. Source: As described in Appendix 2, the code for DVI is 0x00 and the code for HDMI 2.0 is 0x10. In this example, write 0x10 for "Source".

b. CardNo: As described in Appendix 3, the slot number of HDMI 2.0 is 0x00. In this example, write 0x00 for "CardNo".

c. Width: The input source Width = 1920 = 0x780. Width_L stands for the lower 8 bits of Width and Width_H stands for the higher 8 bits of Width. Here, Width_L = 0x80 and Width_H = 0x07.

d. Height: The input source Height = 1080 = 0x438. Height_L stands for the lower 8 bits of Height and Height_H stands for the higher 8 bits of Height. Here, Height_L = 0x38 and Height_H = 0x04.

e. Frame: Frame rate of the input source (unit: 0.01 Hz) = 60 * 100 = 6000 = 0x1770. Frame_L stands for the lower 8 bits of Frame and Frame_H stands for the higher 8 bits of Frame. Here, Frame_L = 0x70 and Frame_H = 0x17.

Note: The VX16s supports input resolution settings of HDMI 2.0 and DVI only.

(2) Response packet

If the response packet is in the following data format, the input resolution is set successfully.

aa 55 00 00 00 fe 00 00 00 00 01 00 00 42 01 13 00 00 aa 56

4.2.2 Obtaining Input Source Resolution

(1) Command to obtain the input source resolution

55 aa 00 00 fe 00 00 00 00 00 00 00 01 00 01 13 00 01 69 56

(2) Response packet

Since the response packet of obtaining input source resolution is complex and has many parameters, the following table is used to describe the commands.

aa	55	00	00	00	fe	00	00
00	00	00	00	01	00	01	13
00	01	Reserved	Source1 Interlaced	Source1 State	Source1 Width_L	Source1 Width_H	Source1 Height_L
Source1 Height_H	Source1 Framerate count_L	Source1 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Source2 Interlaced	Source2 State	Source2 Width_L	Source2 Width_H	Source2 Height_L
Source2 Height_H	Source2 Framerate count_L	Source2 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Source3	Source3	Source3	Source3	Source3

			Interlaced	State	Width_L	Width_H	Height_L
Source3 Height_H	Source3 Framerate count_L	Source3 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Source4 Interlaced	Source4 State	Source4 Width_L	Source4 Width_H	Source4 Height_L
Source4 Height_H	Source4 Framerate count_L	Source4 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Source5 Interlaced	Source5 State	Source5 Width_L	Source5 Width_H	Source5 Height_L
Source5 Height_H	Source5 Framerate count_L	Source5 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Source6 Interlaced	Source6 State	Source6 Width_L	Source6 Width_H	Source6 Height_L
Source6 Height_H	Source6 Framerate count_L	Source6 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Source7 Interlaced	Source7 State	Source7 Width_L	Source7 Width_H	Source7 Height_L
Source7 Height_H	Source7 Framerate count_L	Source7 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Source8 Interlaced	Source8 State	Source8 Width_L	Source8 Width_H	Source8 Height_L
Source8 Height_H	Source8 Framerate count_L	Source8 Framerate count_H	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Reserved	Reserved	SUM_L	SUM_H				

The command data is hexadecimal. “Interlaced” indicates whether the input source is an interlaced signal or not (0: progressive; 1: interlaced). “State” indicates the input source availability

(0: The input source has no signal; 1: The input source has signal). “Width” indicates the horizontal width of resolution (Width = Width_H<<8 + Width_L). “Height” indicates the vertical height of resolution (Height = Height_H<<8 + Height_L). “Framerate count” indicates the frame rate count (unit: us; Frame rate count = Frame rate count _H<<8 + Frame rate count_L; The actual input source frame rate is calculated by the frame rate count, that is, Frame rate = 100000000 / Frame rate count; The unit of frame rate is 0.01 Hz). “SUM_L” and “SUM_H” constitute the checksum of this command frame, which is the sum of the data in red and 0x5555.

4.3 Layer Parameters

4.3.1 Switching Input Source of Layer

(2) Command to switch input source of layer

Switch the input source of layer to CardNo:

55 aa 00 00 fe 00 00 00 00 00 01 00 Addr0 Addr1 Addr2 Addr3 03 00 CardNo 00 00 SUM_L SUM_H

The command data is in hexadecimal format. The parameter descriptions are as follows.

a. CardNo stands for the slot number (refer to Appendix 3). For example, CardNo of HDMI 2.0 is 0x00.

b. SUM_L and SUM_H constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + Addr0 + Addr1 + Addr2 + Addr3 + 0x03 + 0x00 + CardNo + Priority + Source + 0x5555, SUM = SUM_H<<8 + SUM_L (SUM_L stands for the lower 8 bits of SUM, while SUM_H stands for the higher 8 bits of SUM).

c. Addr: Addr stands for the layer parameter address (Addr = Addr3<<24 + Addr2<<16 + Addr1<<8 + Addr0). Different layers have different parameter addresses. The calculation formula for Addr is Addr = 0x13020012 + WindowNo * 0x30. For example, if you want to adjust the parameters of MAIN layer, then Addr = 0x13020012 + 0 * 0x30 = 0x13020012, that is, Addr0 = 0x12, Addr1 = 0x00, Addr2 = 0x02, Addr3 = 0x13.

d. Addr: Addr stands for the layer parameter address (Addr = Addr3<<24 + Addr2<<16 + Addr1<<8 + Addr0). Different layers have different parameter addresses. The calculation formula for Addr is Addr = 0x13020012 + WindowNo * 0x30. For example, if you want to adjust the parameters of PIP1 layer, then Addr = 0x13020012 + 1 * 0x30 = 0x13020042 = Addr3<<24 + Addr2<<16 + Addr1<<8 + Addr0 = 0x13<<24 + 0x02<<16 + 0x00<<8 + 0x42, that is, Addr0 = 0x42, Addr1 = 0x00, Addr2 = 0x02, Addr3 = 0x13.

e. Addr: Addr stands for the layer parameter address (Addr = Addr3<<24 + Addr2<<16 + Addr1<<8 + Addr0). Different layers have different parameter addresses. The calculation formula for Addr is Addr = 0x13020012 + WindowNo * 0x30. For example, if you want to adjust the parameters of PIP2 layer, then Addr = 0x13020012 + 2 * 0x30 = 0x13020072 = Addr3<<24 + Addr2<<16 + Addr1<<8 + Addr0 = 0x13<<24 + 0x02<<16 + 0x00<<8 + 0x72, that is, Addr0 = 0x72, Addr1 = 0x00, Addr2 = 0x02, Addr3 = 0x13.

(2) Response packet

If the response packet is in the following format, the layer parameters are set successfully.

aa 55 00 00 00 fe 00 00 00 00 01 00 Addr0 Addr1 Addr2 Addr3 00 00 SUM_L SUM_H

"SUM_L" and "SUM_H" constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + Addr0 + Addr1 + Addr2 + Addr3 + 0x00 + 0x00 + 0x5555, SUM = SUM_H<<8 + SUM_L (SUM_L stands for the lower 8 bits of SUM, while SUM_H stands for the higher 8 bits of SUM).

4.3.2 Setting Layer Switch, Size, Position and Priority

(1) Command to set the layer parameters

Turn on or turn off the layer and adjust the layer parameters, including the layer number, card slot number, layer priority, input source number, layer H offset, V offset, H width and V height which are represented by Switch, WindowNo, CardNo, Priority, Source, StartX, StartY, Width and Height respectively.

55 aa 00 00 fe 00 00 00 00 00 01 00 Addr0 Addr1 Addr2 Addr3 30 00 Switch WindowNo CardNo Priority Source StartX0 StartX1 StartX2 StartX3 StartY0 StartY1 StartY2 StartY3 Width0 Width1 Width2 Width3 Height0 Height1 Height2 Height3 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 SUM_L SUM_H

When you send the layer parameters, all the properties parameters of the layer must be included. For example, when you open a layer, all the right parameters of the layer must be included, including "Addr", "Switch", "WindowNo", "CardNo", "Priority", "Source", "StartX", "StartY", "Width", "Hight". If you want to change the value of only one parameter, the values of other parameters must not be changed. The command data is in hexadecimal format. The parameter descriptions are as follows.

a. Switch stands for the layer switch. To turn on the layer, Switch = 0x01. To turn off the window, Switch = 0x00.

b. WindowNo stands for the layer number (for details on the layer number codes, see Appendix 4). For example, for Main layer, WindowNo = 0x00. For PIP 1 layer, WindowNo = 0x01.

c. CardNo stands for the slot number (for details on the slot number. values, see Appendix 3). For example, CardNo of HDMI 2.0 is 0x00.

d. Priority stands for layer priority (for details on layer priority codes, see Appendix 5). If the layer priority is 1, Priority = 0x00. If the window priority is 2, Priority = 0x01.

e. Source stands for the input source number (for details on the input source number values, see Appendix 2).

f. StartX stands for horizontal offset of layer (StartX= StartX3<<24 + StartX2<<16 + StartX1<<8 + StartX0). For example, StartX = 800 = 0x320 = StartX3<<24 + StartX2<<16 + StartX1<<8 + StartX0 = 0x00<<24 + 0x00<<16 + 0x03<<8 + 0x20, then StartX0 = 0x20, StartX1 = 0x03, StartX2 = 0x00, StartX3 = 0x00.

g. StartY stands for vertical offset of layer (StartY= StartY3<<24 + StartY2<<16 + StartY1<<8 + StartY0). For example, StartY = 600 = 0x258 = StartY3<<24 + StartY2<<16 + StartY1<<8 + StartY0 = 0x00<<24 + 0x00<<16 + 0x02<<8 + 0x58, then StartY0= 0x58, StartY1 = 0x02, StartY2 = 0x00, StartY3 = 0x00.

h. Width stands for layer width (Width= Width3<<24 + Width2<<16 + Width1<<8 + Width0). For example, Width = 1920 = 0x780 = Width3<<24 + Width2<<16 + Width1<<8 + Width0 = 0x00<<24 + 0x00<<16 + 0x07<<8 + 0x80, then Width0 = 0x80, Width1= 0x07, Width2= 0x00, Width3= 0x00.

i. Height stands for layer height (Height = Height3<<24 + Height2<<16 + Height1<<8 + Height0). For example, Height = 1080 = 0x438 = Height3<<24 + Height2<<16 + Height1<<8 + Height0 = 0x00<<24 + 0x00<<16 + 0x04<<8 + 0x38, then Height0= 0x38, Height1= 0x04, Height2= 0x00, Height3= 0x00.

j. SUM_L and SUM_H constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + Addr0 + Addr1 + Addr2 + Addr3 + 0x30 + 0x00 + Switch + WindowNo + CardNo + Priority + Source + StartX0 + StartX1 + StartX2 + StartX3 + StartY0 + StartY1 + StartY2 + StartY3 + Width0 + Width1 + Width2 + Width3 + Height0 + Height1 + Height2 + Height3 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00+ 0x00 + 0x00 + 0x5555, SUM = SUM_H<<8 + SUM_L (SUM_L stands for the lower 8 bits of SUM, while SUM_H stands for the higher 8 bits of SUM).

k. Addr: Addr stands for the layer parameter address (Addr = Addr3<<24 + Addr2<<16 + Addr1<<8 + Addr0). Different layers have different parameter addresses. The calculation formula for Addr is Addr = 0x13020010 + WindowNo * 0x30. For example, if you want to adjust the parameters of PIP1 layer, then Addr = 0x13020010 + 1 * 0x30 = 0x13020040 = Addr3<<24 + Addr2<<16 + Addr1<<8 + Addr0 = 0x13<<24 + 0x02<<16 + 0x00<<8 + 0x40, that is, Addr0 = 0x40, Addr1 = 0x00, Addr2 = 0x02, Addr3 = 0x13.

(2) Response packet

If the response packet is in the following format, the layer parameters are set successfully.

aa 55 00 00 00 fe 00 00 00 00 01 00 Addr0 Addr1 Addr2 Addr3 00 00 SUM_L SUM_H

"SUM_L" and "SUM_H" constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + Addr0 + Addr1 + Addr2 + Addr3 + 0x00 + 0x00 + 0x5555, SUM = SUM_H<<8 + SUM_L (SUM_L stands for the lower 8 bits of SUM, while SUM_H stands for the higher 8 bits of SUM).

4.4 Presets

4.4.1 Loading Presets

(1) Command to load a preset

Load Preset XX:

55 aa 00 00 fe 00 00 00 00 00 01 00 00 01 51 13 01 00 XX SUM_L SUM_H

The command data is in hexadecimal format and XX stands for the preset number. The number range is 0x00-0x09 which represent Preset 1-10. For the detailed preset numbers, see Appendix 6.

“SUM_L” and “SUM_H” constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + 0x00 + 0x01 + 0x51 + 0x13 + 0x01 + 0x00 + XX + 0x5555, SUM = SUM_H<<8 + SUM_L (SUM_L stands for the lower 8 bits of SUM, while SUM_H stands for the higher 8 bits of SUM).

(2) Response packet

If the response packet is in the following format, the preset is successfully loaded.

aa 55 00 00 00 fe 00 00 00 00 01 00 00 01 51 13 00 00 b9 56

4.4.2 Saving Presets

(1) Command to save a preset

Save Preset XX:

55 aa 00 00 fe 00 00 00 00 00 01 00 02 01 51 13 01 00 XX SUM_L SUM_H

The command data is in hexadecimal format and XX stands for the preset number. The number range is 0x00-0x09 which represent Preset 1-10. For the detailed preset numbers, see Appendix 6. “SUM_L” and “SUM_H” constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + 0x02 + 0x01 + 0x51 + 0x13 + 0x01 + 0x00 + XX + 0x5555, SUM = SUM_H<<8 + SUM_L (SUM_L stands for the lower 8 bits of SUM, while SUM_H stands for the higher 8 bits of SUM).

(2) Response packet

If the response packet is in the following format, the preset is successfully saved.

aa 55 00 00 00 fe 00 00 00 00 01 00 02 01 51 13 00 00 bb 56

4.4.3 Deleting Presets

(1) Command to delete a preset

Delete Preset XX:

55 aa 00 00 fe 00 00 00 00 00 01 00 04 01 51 13 02 00 00 XX SUM_L SUM_H

The command data is in hexadecimal format and XX stands for the preset number. The number range is 0x00-0x09 which represent Preset 1-10. For the detailed preset numbers, see Appendix 6. “SUM_L” and “SUM_H” constitute the checksum of this command frame, which is the sum of the underlined data and 0x5555. The calculation formula is as below.

SUM = 0x00 + 0x00 + 0xfe + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 + 0x01 + 0x00 + 0x04 + 0x01 + 0x51 + 0x13 + 0x02 + 0x00 + 0x00 + XX + 0x5555, SUM = SUM_H<<8 + SUM_L (SUM_L stands for the lower 8 bits of SUM, while SUM_H stands for the higher 8 bits of SUM).

(2) Response packet

If the response packet is in the following format, the preset is successfully deleted.

aa 55 00 00 00 fe 00 00 00 00 01 00 04 01 51 13 00 00 bd 56

4.5 Appendix

4.5.1 Appendix 1

Appendix 1: Test pattern types

Type	Value
Full Black	0x00
Full red	0x01
Full green	0x02
Full blue	0x03
Full white	0x04
Vertical Bars	0x05
Horizontal Bars	0x06
Chessboard	0x07
Horizontal Lines	0x10
Vertical Lines	0x11
Backward Slashes	0x12
Forward Slashes	0x13
Grid	0x14
Cross Hatch	0x15
Red Gradient (H)	0x20
Green Gradient (H)	0x21
Blue Gradient (H)	0x22
White Gradient (H)	0x23
Red Gradient (V)	0x24
Green Gradient (V)	0x25
Blue Gradient (V)	0x26
White Gradient (V)	0x27

4.5.2 Appendix 2

Appendix 2: Video interface codes

Interface Type	Interface Code
DVI	0x00
HDMI	0x10
VGA	0x20
3G-SDI	0x30
CVBS	0x40
Dual DVI	0x50
HDMI1.4	0x60
DP1.1	0x70

DP1.2	0x80
HDMI2.0	0x90
6G SDI	0xC0
12G SDI	0xD0
MOSAIC	0xE0

4.5.3 Appendix 3

Appendix 3: Card slot number codes

Type	Value
HDMI	0x00
SDI1	0x01
SDI2	0x02
DVI1	0x03
DVI2	0x04
DVI3	0x05
DVI4	0x06
DVI MOSAIC	0x07

4.5.4 Appendix 4

Appendix 4: Layer number codes

Layer Number	Code
Main Layer	0x00
PIP1	0x01
PIP2	0x02

4.5.5 Appendix 5

Appendix 5: Layer priority codes

Layer Priority	Code	Remarks
Layer priority: 1	0x00	The layer is at the back.
Layer priority: 2	0x01	The layer is in the middle.
Layer priority: 3	0x02	The layer is at the front.

4.5.6 Appendix 6

Appendix 6: Preset number codes

Preset Number	Code
Preset 1	0x00
Preset 2	0x01
Preset 3	0x02

Preset 4	0x03
Preset 5	0x04
Preset 6	0x05
Preset 7	0x06
Preset 8	0x07
Preset 9	0x08
Preset 10	0x09