

**Application Note**  
**DS55MU01**  
**DS65MU01 / DS75MU01**

**RS232 SERIAL INTERFACE**  
**COMMUNICATION PROTOCOL**

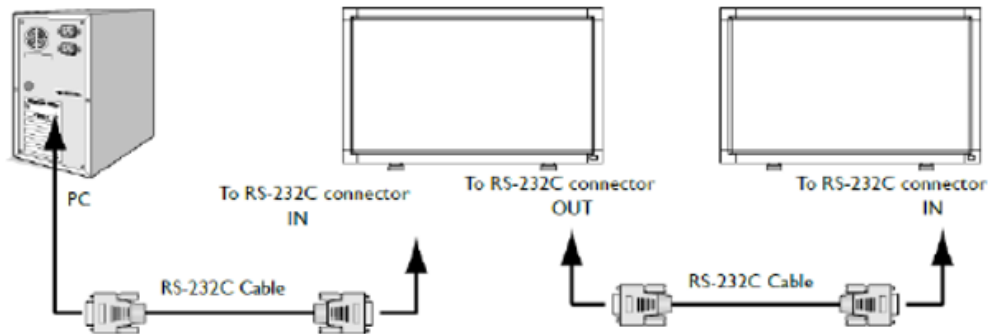
Version 3.1

2020.01/21

## RS232 Commands

Brand: HITACHI

Models: DSxxMU01 series



### 1.2 Definitions, Abbreviations and Acronyms

PBS	Professional Business Solutions
RC	Remote Control
ACK	Acknowledge
NACK	Not Acknowledge
NAV	Not Available
ID	Identification
0xXX	Hexadecimal notation

## 2. COMMAND PACKET FORMAT

### 2.1 Physical Specifications

1. Baud Rate : 9600
2. Data bits : 8
3. Parity : None
4. Stop Bit : 1
5. Flow Control : None
6. The Pin Assignments for DB9 male connector:  
Male D-Sub 9-Pin (outside view)



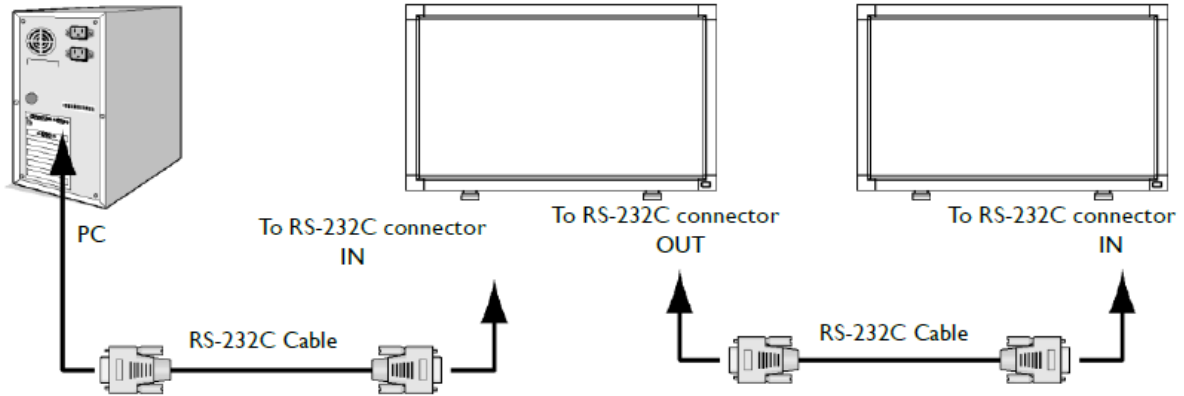
Pin #	Signal	Remark
1	NC	
2	RXD	Input to LCD Monitor
3	TXD	Output from LCD Monitor
4	NC	
5	GND	
6	NC	
7	NC	
8	NC	
9	NC	
frame	GND	

Function		Command	Feedback /Notes
Power	on	A6 01 00 00 00 04 01 18 02 B8	
	off	A6 01 00 00 00 04 01 18 01 BB	
	status	A6 01 00 00 00 03 01 19 00	DATA [1]: 01 = Power off, 02=ON
Input	HDMI 1	A6 01 00 00 00 07 01 AC 0D 00 00 00 00	
	HDMI 2	A6 01 00 00 00 07 01 AC 06 00 00 00 0B	
	HDMI 3	A6 01 00 00 00 07 01 AC 0F 00 00 00 02	
	HDMI 4	A6 01 00 00 00 07 01 AC 19 00 00 00 14	
	Media Player	A6 01 00 00 00 07 01 AC 16 00 00 00 1B	
	PDF Player	A6 01 00 00 00 07 01 AC 17 00 00 00 1A	
	DP	A6 01 00 00 00 07 01 AC 0A 00 00 00 07	
	VGA	A6 01 00 00 00 07 01 AC 05 00 00 00 08	
	Status	A6 01 00 00 00 03 01 AD 08	DATA [1]: 0D = HDMI 1, 06=HDMI 2, 0F=HDMI 3, 19=HDMI 4, 16=Media Player, 17=PDF Player, 05=VGA, DP=0A
Volume	Increment (+ 1)	A6 01 00 00 00 05 01 41 01 00 E3	
	Decrement (-1)	A6 01 00 00 00 05 01 41 00 00 E2	
	Mute (volume set to 0)	A6 01 00 00 00 05 01 44 00 00 E7	Mute sets the volume to 0%
	Status	A6 01 00 00 00 03 01 45 E0	DATA [1]: 0 to 64 in hex
	Set Volume 10 %	A6 01 00 00 00 05 01 44 0A 4D A0	Set volume to fix at 10%
	Set Volume 20%	A6 01 00 00 00 05 01 44 14 4D BE	Set volume to fix at 20%
	Set Volume 30%	A6 01 00 00 00 05 01 44 1E 4D B4	Set volume to fix at 30%
	Set Volume 40%	A6 01 00 00 00 05 01 44 28 4D 82	Set volume to fix at 04%
	Set Volume 50%	A6 01 00 00 00 05 01 44 32 4D 98	Set volume to fix at 50%
	Set Volume 60%	A6 01 00 00 00 05 01 44 3C 4D 96	Set volume to fix at 60%
	Set Volume 77%	A6 01 00 00 00 05 01 44 4D 4D E7	Set volume to fix at 77%
	Set Volume 100%	A6 01 00 00 00 05 01 44 64 4D CE	Set volume to fix at 100%
For comprehensive codes and details, please see the manual "RS232 SERIAL INTERFACE COMMUNICATION PROTOCOL."			

# 1. INTRODUCTION

## 1.1 Purpose

The purpose of this document is to explain in detail the commands and steps that can be used to control a Hitachi display via RS232C.



## 1.2 Definitions, Abbreviations and Acronyms

PBS	Professional Business Solutions
RC	Remote Control
ACK	Acknowledge
NACK	Not Acknowledge
NAV	Not Available
ID	Identification
0xXX	Hexadecimal notation

# 2. COMMAND PACKET FORMAT

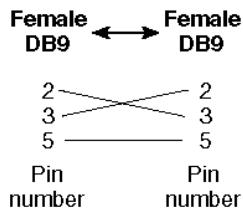
## 2.1 Physical Specifications

1. Baud Rate : 9600
2. Data bits: 8
3. Parity : None
4. Stop Bit : 1
5. Flow Control : None
6. The Pin Assignments for DB9 male connector:  
Male D-Sub 9-Pin (outside view)



Pin #	Signal	Remark
1	NC	
2	RXD	Input to LCD Monitor
3	TXD	Output from LCD Monitor
4	NC	
5	GND	
6	NC	
7	NC	
8	NC	
9	NC	
frame	GND	

Note: A crossover cable (null modem) is needed for connection to the host controller:



Digital Signage displays use RXD, TXD and GND pins for RS-232C control. For RS-232C cable, the reverse type cable should be used.

## 2.2 Communication Procedure

Control commands can be sent from a host controller via the RS232 connection. A new command should not be sent until the previous command is acknowledged. However, if a response is not received within 500 milliseconds a retry may be triggered. Every valid command receives an ACK. A command that is valid but not supported in the current implementation will be responded to with a NAV (Not Available). If the command buffer is corrupt (transmission errors) the command will be responded to with a NACK. The display operates according to the received command. If the command is a valid "Get" command, the display responds with the requested info. If the command is a valid "Set" command allowed, the display performs the requested operation.

Figure1 and Figure2 explain the mechanism of the Get and Set commands.

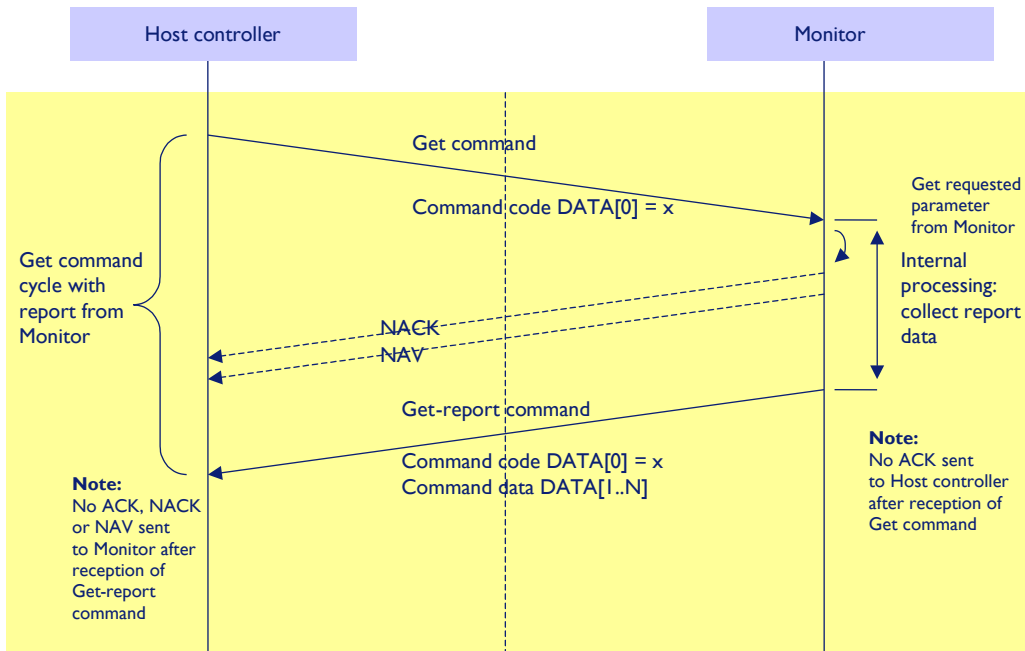


Figure 1: Explanation of mechanism of Get Command.

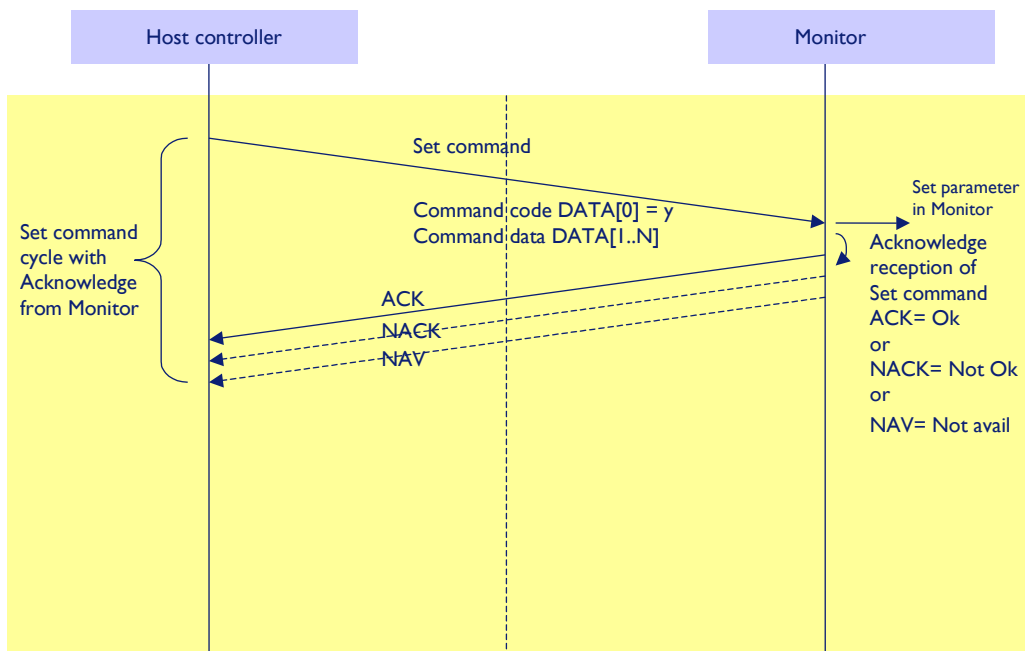


Figure 2: Explanation of mechanism of Set Command.

### 2.3 Command Format

The RS232 packet format:

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	...	Data[N]	Checksum
--------	------------	----------	-------	-------	--------	--------------	---------	-----	---------	----------

In detail:

Number of Field	Name of Field	Description
Byte 1	Header	Header = 0xA6
Byte 2	Monitor ID	Monitor ID Range : 1 ~ 255  Signal mode: Display Address range from 1 to 255 Broadcast mode: Display Address is 0 which indicates no ACK or Report is expected.
Byte 3	Category	Category = 0x00 (fixed)
Byte 4	Code0 (Page)	Page = 0x00 (fixed)
Byte 5	Code1 (Function)	
Byte 6	Length	Length has to be calculated in the following way: Length = N + 3
Byte 7	Data Control	Data Control = 0x01 (fixed)
Byte 8 ~ Byte 44	Data[0] ~ Data[N]	This field can be also empty. If not empty then the range of Data Size, N = 0 to 36.
Last Byte	Checksum	Checksum. Range = 0 to 255 (0xFF). Algorithm: The EXCLUSIVE-OR (XOR) of all bytes in the message except the checksum itself. Checksum = [Header] XOR [Monitor ID] XOR ... DATA[0] ... XOR DATA[N]

## **MESSAGES - SYSTEM**

### **2.4 Communication Control**

This defines the feedback command from monitor to host controller when it receives the display command from the host controller, depending on the commands availability, the command reported back to host controller can be one of the ACK, NACK or NAV.

**Note: there is no reply message when the wrong ID address is being used.**

#### **2.4.1 Message-Report**

<b>Number of Field</b>	<b>Name of Field</b>	<b>Description</b>
Byte 1	Header	Header = 0x21
Byte 2	Monitor ID	Monitor ID Range : 1 ~ 255
Byte 3	Category	Category = 0x00 (fixed)
Byte 4	Code0 (Page)	Page = 0x00 (fixed)
Byte 5	Length	Length = 0x04
Byte 6	Data Control	Data Control = 0x01 (fixed)
Byte 7	Command	0x00(Communication Control)
Byte 8	Status	0x00: Completed Normal response. 0x01: Limit Over The packets was received normally, but the data value was over the upper limit. 0x02: Limit Over The packets was received normally, but the data value was over the lower limit. 0x03: Command canceled The packet is received normally but either the value of data is incorrect or request is not permitted for the current host value. 0x04: Parse Error Received not defined format data or check sum Error.
Byte 9	Checksum	Check Sum The total from Byte1 to Byte8 calculated by XOR



### 3 Platform and Version Labels , Model Number, FW Version, Build date

#### 3.1 Platform and Version Labels

This command provides the SICP protocol version and the display Software version to the host controller.

##### 3.1.1 Message-Get

Bytes	Bytes Description	Bits	Description

Example: Get version (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0xA2	0x00	0x00

##### 3.1.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[1] to DATA[N]	Character[0] to Character[N-1]		36 (0x24) characters maximum. No. of characters, N = 1 to 36 (0x24). The actual size determines the value of the message size byte.

##### 3.1.3 Message-Get (Model Number, FW Version, Build date)

Bytes	Bytes Description	Bits	Description
DATA[1] to DATA[N]	Codes to request		0x00 = Model Number 0x01 = FW version 0x02 = Build Date

##### 3.1.4 Message-Report (Model Number, FW Version, Build date)

Bytes	Bytes Description	Bits	Description
DATA[1] to DATA[N]	Character[0] to Character[N-1]		36 (0x24) characters maximum. No. of characters, N = 1 to 36 (0x24). The actual size determines the value of the message size byte.

## 4 MESSAGES - GENERAL

### 4.1 Power state

This command is used to set/get the power state as it is defined as below.

#### 4.1.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x19 = Power state - Get</b>		Command requests the display to report its current power state

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x19	0xBC

#### 4.1.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x19 = Power State - Report</b>		Command reports Power state
DATA[1]	Power State		0x01 = Power Off 0x02 = On

Example: Power State On (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0x19	0x02	0x3E

#### 4.1.3 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x18 = Power state - Set</b>		Command to change the Power state of the display
DATA[1]	Power state		0x01 = Power Off 0x02 = On

Example: Power State Deep Sleep (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0x18	0x01	0xBB

## 4.2 Lock Functions for IR-Remote Control

The following commands separately are used to lock/unlock the Remote Control and Keypad.

### 4.2.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	0x1D = Get - Lock Status – IR – Remote Control		Get unlock all /lock all /lock all but power/lock all but volume/ Primary/Secondary status

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x1D	0xB8

### 4.2.2 Message-Report (IR-Remote Control)

Bytes	Bytes Description	Bits	Description
DATA[0]	0x1D = Report - Lock Status – IR – Remote Control		Report unlock all /lock all /lock all but power/lock all but volume/ Primary/Secondary status
DATA[1]	Status indicator byte for Remote Control		0x01 = Unlock all 0x02 = Lock all 0x03 = Lock all but Power 0x04 = Lock all but Volume 0x05 = Primary (Master) 0x06 = Secondary (Daisy chain PD) 0x07 = Lock all except Power & Volume

Example: Lock Keyboard and unlocked Remote Control (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0x1D	0x01	0x39

### 4.2.3 Message-Set (IR –Remote Control)

Bytes	Bytes Description	Bits	Description
DATA[0]	0x1C = Set - Lock State – IR – Remote Control		Set unlock all/lock all /lock all but power/lock all but volume/ Primary/Secondary status
DATA[1]	Status indicator byte for Remote Control		0x01 = Unlock all 0x02 = Lock all 0x03 = Lock all but Power 0x04 = Lock all but Volume 0x05 = Primary (Master) - Reply OTS_SET_IR_ACK(0x21 0x01 0x00 0x00 0x04 0x01 0x00 0x00 0x25) 0x06 = Secondary (Daisy chain PD) - Reply OTS_SET_IR_ACK(0x21 0x01 0x00 0x00 0x04 0x01 0x00 0x00 0x25) 0x07 = Lock all except Power & Volume

Example: Unlock local remote control (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0x1C	0x01	0xBF

#### 4.2.4 Message-Get (Keypad)

Bytes	Bytes Description	Bits	Description
DATA[0]	0x1B = Get - Keypad Lock Status		Set unlock all/lock all /lock all but power/lock all but volume/ Primary/Secondary status

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x1B	0xBE

#### 4.2.5 Message-Report (Keypad)

Bytes	Bytes Description	Bits	Description
DATA[0]	0x1B = Report - Keypad Status		Report unlock all /lock all/lock all but power/ lock all but Volume
DATA[1]	Status indicator byte for Keypad		0x01 = Unlock all 0x02 = Lock all 0x03 = Lock all but Power 0x04 = Lock all but Volume 0x07 = Lock all except Power & Volume

Example: Reporting status of Keypad indicating Lock all for (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0x1B	0x02	0x3C

#### 4.2.6 Message-Set (Keypad)

Bytes	Bytes Description	Bits	Description
DATA[0]	0x1A = Set – Keypad Lock Status		Report unlock all /lock all/lock all but power/ lock all but Volume
DATA[1]	Status indicator byte for Keypad		0x01 = Unlock all 0x02 = Lock all 0x03 = Lock all but Power 0x04 = Lock all but Volume 0x07 = Lock all except Power & Volume

Example: Set Lock all on Keypad for (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0x1A	0x01	0xB9

### 4.3 Power state at Cold Start

Command is used to set the cold start power state, the cold start power state are updated and stored by this command.

#### 4.3.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	0xA4 = Power at Cold Start - Get		Get Power state at Cold Start state

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0xA4	0x01

#### 4.3.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	0xA4 = Power at Cold Start – Report		Report from Power state at Cold Start state
DATA[1]	Power at Cold Start		0x00 = Power Off 0x01 = Forced On 0x02 = Last Status

Example: Report status of Forced On for power at cold start. (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0xA4	0x01	0x80

#### 4.3.3 Message-Set

Bytes	Bytes Description	Bits	Description

The value is stored and it is applied only when the display starts up from cold start power state the next time:  
Power Off:

The monitor will be automatically switched to Power Off mode (even if the last status was on) whenever the mains power is turned on or resumed after the power interruption.

Forced On:

The monitor will be automatically switched to ON mode whenever the mains power is turned on or resumed after the power interruption.

Last Status:

The monitor will be automatically switched to the last status (either Power Off or On) whenever the mains power is turned on or resumed after the power interruption.

Example: Set Power state at cold start to last status (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0xA3	0x02	0x03

## 5. MESSAGES - INPUT SOURCES

### 5.1 Input Source

This command is used to change the current input source.

#### 5.1.1 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0xAC = Input Source - Set</b>		Command requests the display to set the current input source
DATA[1]	Input Source Type		0x01 = VIDEO 0x02 = S-VIDEO 0x03 = COMPONENT 0x04 = CVI 2 (not applicable) 0x05 = VGA 0x06 = HDMI 2 0x07 = Display Port 2 0x08 = USB 2 0x09 = Card DVI-D 0x0A = Display Port 1 0x0B= Card OPS 0x0C = USB 1 0x0D= HDMI 0x0E= DVI-D 0x0F = HDMI3 0x10= BROWSER 0x11= SMARTCMS 0x12= DMS (Digital Media Server) 0x13= INTERNAL STORAGE 0x14= Reserved 0x15= Reserved 0x16= Media Player 0x17= PDF Player 0x18= Custom 0x19=HDMI 4
DATA[2]	Reserved		(Reserved, value is 0)
DATA[3]	Reserved		(Reserved, value is 0)
DATA[4]	Reserved		(Reserved, value is 0)

*Example: Set on DVI-D (Display address 01)*

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x07	0x01	0xAC	0x0E	0x00	0x00	0x00	0x03

## 5.2 Current Source

### 5.2.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0xAD = Current Source – Get</b>		Command requests the display to report the current input source in use.

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0xAD	0x08

### 5.2.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0xAD = Current Source – Report</b>		Command reports to the host controller the current input source in use by the display.
DATA[1]	<b>Input Source Type/Number</b>		0x01 = VIDEO 0x02 = S-VIDEO 0x03 = COMPONENT 0x04 = CVI 2 (not applicable) 0x05 = VGA 0x06 = HDMI 2 0x07 = Display Port 2 0x08 = USB 2 0x09 = Card DVI-D 0x0A = Display Port 1 0x0B= Card OPS 0x0C = USB 1 0x0D= HDMI 0x0E= DVI-D 0x0F = HDMI3 0x10= BROWSER 0x11= SMARTCMS 0x12= DMS (Digital Media Server) 0x13= INTERNAL STORAGE 0x14= Reserved 0x15= Reserved 0x16= Media Player 0x17= PDF Player 0x18= Custom 0x19=HDMI 4
DATA[2]	Reserved		(Reserved, value is 0)
DATA[3]	Reserved		(Reserved, value is 1)
DATA[4]	Reserved		(Reserved, value is 0)

Example: Current Input Source: DVI-D (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Checksum
0x21	0x01	0x00	0x00	0x07	0x01	0xAD	0x0E	0x00	0x01	0x00	0x84

## 6. MESSAGES - VIDEO

### 6.1 Video Parameters

The following commands are used to get/set video parameters as it is defined below.

#### 6.1.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x33 = Video Parameters – Get</b>		Command requests the display to report its current video parameters.

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x33	0x96

#### 6.1.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x33 = Video Parameters – Report</b>		Command reports to the host controller the current video parameters of the display.
DATA[1]	Brightness.		0 to 100 (%) of the user selectable range of the display.
DATA[2]	Color.		0 to 100 (%) of the user selectable range of the display.
DATA[3]	Contrast.		0 to 100 (%) of the user selectable range of the display.
DATA[4]	Sharpness.		0 to 100 (%) of the user selectable range of the display.
DATA[5]	Tint (Hue)		0 to 100 (%) of the user selectable range of the display.
DATA[6]	Black Level		0 to 100 (%) of the user selectable range of the display.
DATA[7]	Gamma Selection		0x01= Native, 0x02 = S gamma, 0x03 = 2.2, 0x04 = 2.4, <b>0x05 = D-image(DICOM gamma)</b>

Example: All video parameters are set to 55 % (0x37) and Gamma Curve is set to 2.2 (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]	Checksum
0x21	0x01	0x00	0x00	0x0A	0x01	0x33	0x37	0x37	0x37	0x37	0x37	0x37	0x03	0x1B

#### 6.1.3 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x32 = Video Parameters – Set</b>		Command to change the current video parameters
DATA[1]	Brightness.		0 to 100 (%) of the user selectable range of the display.
DATA[2]	Color.		0 to 100 (%) of the user selectable range of the display.
DATA[3]	Contrast.		0 to 100 (%) of the user selectable range of the display.
DATA[4]	Sharpness.		0 to 100 (%) of the user selectable range of the display.
DATA[5]	Tint (Hue)		0 to 100 (%) of the user selectable range of the display.
DATA[6]	Black Level		0 to 100 (%) of the user selectable range of the display.
DATA[7]	Gamma Selection		0x01= Native, 0x02 = S gamma, 0x03 = 2.2, 0x04 = 2.4, <b>0x05 = D-image(DICOM gamma)</b>



Example: Set all video parameters to 0x37 (55 %) (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]	Checksum	
0xA6	0x01	0x00	0x00	0x00	0x0A	0x01	0x32	0x37	0x37	0x37	0x37	0x37	0x37	0x37	0x03	0xAC

#### 6.1.4 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	0x35 = Color Temperature – Get		Command requests the display to report its current color temperature.

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x35	0x90

#### 6.1.5 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	0x35 = Color Temperature – Report		Command reports to the host controller the current color temperature of the display.
DATA[1]	Color temperature		0x00 = User 1 0x01 = Native 0x02 = 11000K(Not applicable) 0x03 = 10000K 0x04 = 9300K 0x05 = 7500K 0x06 = 6500K 0x07 = 5770K (Not applicable) 0x08 = 5500K(Not applicable) 0x09 = 5000K 0x0A = 4000K 0x0B = 3400K (Not applicable) 0x0C = 3350K (Not applicable) 0x0D = 3000K 0x0E = 2800K (Not applicable) 0x0F = 2600K (Not applicable) 0x10 = 1850K (Not applicable) 0x12 = User 2

Example: The current color temperature is set to Nature (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0x35	0x01	0x10



### 6.1.8 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x36 = Color Parameters – Report</b>		Command reports to the host controller the current video parameters of the display.
DATA[1]	Red color gain value		0 to 255 of the user selectable range of the display.
DATA[2]	Green color gain value		0 to 255 of the user selectable range of the display.
DATA[3]	Blue color gain value		0 to 255 of the user selectable range of the display.
DATA[4]	Red color offset value		0 to 255 of the user selectable range of the display.
DATA[5]	Green color offset value		0 to 255 of the user selectable range of the display.
DATA[6]	Blue color offset value		0 to 255 of the user selectable range of the display.

Example: All color parameters are set to 255 (0xFF) (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[4]	Data[5]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x09	0x01	0x36	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x99

## 6.2 Picture Format

This command is used to control the display screen format.

### 6.2.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x3B = Picture Format – Get</b>		Command requests the display to report its current picture format

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x3B	0x9E

### 6.2.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x3B = Picture Format – Report</b>		Command report to the host controller the current picture format of the display.
DATA[1]	Picture Format*	Bit 7..4	Not used.
		Bit 3..0	Picture Format. 0x00 = Normal (4:3) 0x01 = Custom 0x02 = Real (1:1) 0x03 = Full 0x04 = 21:9 0x05 = Dynamic (DSXX6QBK not support) 0x06 = 16:9

\* For further explanations, please see section 6.2.3 – Message-Set.

Example: Current Picture Format is Widescreen on Full Display (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0x3B	0x03	0x1D

### 6.2.3 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x3A = Picture Format – Set</b>		Command requests the display to set the specified picture format
DATA[1]	Picture Format	Bit 7..4	Not used.
		Bit 3..0	Picture Format. 0x00 = Normal (4:3) 0x01 = Custom 0x02 = Real (1:1) 0x03 = Full 0x04 = 21:9 0x05 = Dynamic (DSXX6QBK not support) 0x06 = 16:9

\* For further explanations, please see section 6.2.3 – Message-Set.

*Example: Set Picture Format to Widescreen on Full Display (Display address 01)*

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0x3A	0x03	0x9B

## 7. MESSAGES - AUDIO

### 7.1 Volume

This command is used to set/get the Volume as it is defined as below.

#### 7.1.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x45 = Volume – Get</b>		Command requests the display to report its current Volume level

The interface to set Software must be such that they also modify the variables representing these current parameters.

To mute the display, send Volume = 0. This command does not overwrite the system mute status of the display.

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x45	0xE0

#### 7.1.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x45 = Volume – Report</b>		Command reports current Volume level
DATA[1]	Volume.		0 to 100 (%) of the user selectable range of the display.
DATA[2]	Audio Out Volume level		0 to 100 (%) of the user selectable range of the display.

Example: Current Display settings: Volume:77% (0x4D), Audio Out:77%(0x4D) (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Data[2]	Checksum
0x21	0x01	0x00	0x00	0x05	0x01	0x45	0x4D	0x4D	0x61

#### 7.1.3 Message-Set

This command can set volume level for speaker & audio out individually.

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x44 = Volume – Set</b>		
DATA[1]	Volume.		0 to 100 (%) of the user selectable range of the display.
DATA[2]	Audio Out Volume level		0 to 100 (%) of the user selectable range of the display.

Example: Set the Display Volume to 77% (0x4D) (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x05	0x01	0x44	0x4D	0x4D	0xE7

### 7.2 Volume Limits

This command is used to set the volume limit (minimum, maximum and switch on volume).

#### 7.2.1 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0xB8 = Volume Limits– Set</b>		The 3 values must conform to the rule :

			Min <= Switch On <= Max
DATA[1]	Minimum Volume		0 to 100 (%) of the user selectable range of the display.
DATA[2]	Maximum Volume		0 to 100 (%) of the user selectable range of the display.
DATA[3]	Switch On Volume		0 to 100 (%) of the user selectable range of the display.

Example: Set the Display to the following: 10% (0x0A), 77% (0x4D), 50% (0x32) (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Data[2]	Data[3]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x06	0x01	0xB8	0x0A	0x4D	0x32	0x6D

### 7.3 Audio Parameters

This command is used to set/get the audio parameters as it is defined as below.

#### 7.3.1 Message-Get

Bytes	Bytes Description	Bits	Description

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0x43	0xE6

#### 7.3.2 Message-Report

Bytes	Bytes Description	Bits	Description

Example: Current Display settings: Treble:80% (0x50) , Bass:93% (0x5D) (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Data[2]	Checksum
0x21	0x01	0x00	0x00	0x05	0x01	0x43	0x50	0x50	0x67

#### 7.3.3 Message-Set

Bytes	Bytes Description	Bits	Description

The interface to set Software must be such that they modify the variables representing these current parameters

Example: Set the Display to the following: Treble:77% (0x4D) , Bass:77% (0x4D) (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Data[2]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x05	0x01	0x42	0x4D	0x4D	0xE1

## 8. MISCELLANEOUS

### 8.1 Operating Hours

The command is used to record the working hours of the display.

#### 8.1.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x0F = Misc Info - Get</b>		Command requests the display to report from miscellaneous information parameters
DATA[1]	Item		0x02 = Operating Hours (All other values are reserved)

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0x0F	0x02	0xAF

#### 8.1.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x0F = Misc Info – Report</b>		Command reports current Operating Hours
DATA[1] to DATA[2]	Operating Hours		DATA[1] and DATA[2] form the MSByte and LSByte, respectively, of the 16-bit-wide Operational Hours value.

Example: Current Display Operation Hours counter value (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Data[2]	Checksum
0x21	0x01	0x00	0x00	0x05	0x01	0x0F	0x4D	0x00	0x66

### 8.2 Auto Adjust

This command works for VGA (host controller) video auto adjust.

#### 8.2.1 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x70 = Video Alignment – Set</b>		Command requests the display to make auto adjustment on VGA Input source.
DATA[1]	Item		0x40 = Auto Adjust (* All other values are reserved *)
DATA[2]			( reserved, default 0 )

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Data[2]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x05	0x01	0x70	0x40	0x00	0x93





## 9. Scheduling

### 9.1 Scheduling Parameters

The following commands are used to get/set scheduling parameters as it is defined below.

#### 9.1.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x5B = Scheduling Parameters - Get</b>		Command requests the display to report its current Scheduling parameters
DATA[1]	<b>Page</b>		1 to 7 of the scheduling pages

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
X		X	X	X		X			
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0x5B	0x01	0xF8

#### 9.1.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x5B = Scheduling Parameters – Report</b>		Command reports to the host controller the current Scheduling parameters of the display.
DATA[1]	Page		0: Page disable 1: Page enable
DATA[2]	Start time hour		0 to 23 of the start time hour 24: NULL
DATA[3]	Start time minute		0 to 59 of the start time minute 60: NULL
DATA[4]	End time hour		0 to 23 of the end time hour 24: NULL
DATA[5]	End time minute		0 to 59 of the end time minute 60: NULL
DATA[6]	Video source		0 to 100 (%) of the user selectable range of the display. For video source: 0x00 = NULL 0x01 = VIDEO 0x02 = S-VIDEO 0x03 = COMPONENT 0x04 = CVI 2 (not applicable) 0x05 = VGA 0x06 = HDMI 2 0x07 = Display Port 2 0x08 = USB 2 0x09 = Card DVI-D 0x0A = Display Port 0x0B= Card OPS 0x0C = USB 0x0D= HDMI 0x0E= DVI-D 0x0F = HDMI3 0x10= BROWSER 0x11= SMARTCMS 0x12= DMS (Digital Media Server)

			0x13= INTERNAL STORAGE 0x14= Reserved 0x15= Reserved 0x16=Media Player 0x17=PDF Player 0x18=Custom
DATA[7]	Working day(s)		To set the scheduling working days. Bit0 = 1: every week Bit1 = Monday Bit2 = Tuesday Bit3 = Wednesday Bit4 = Thursday Bit5 = Friday Bit6 = Saturday Bit7 = Sunday
DATA[8]	Bookmark/Playlist/File Tag(s)		To set the set Tag from 1 through 7. 0x00 = none 0x01 = Tag 1 0x02 = Tag 2 0x03 = Tag 3 0x04 = Tag 4 0x05 = Tag 5 0x06 = Tag 6 0x07 = Tag 7

Example: Report page 1 with DisplayPort starts at 06:30 and ends at 22:00 every day.

Header	Monitor ID	Category	Page	Length	Data Control	Data (0)	Data (1)	Data (2)
0x21	0x01	0x00	0x00	0x0B	0x01	0x5B	0x00	0x06
Data (3)	Data (4)	Data (5)	Data (6)	Data (7)	DATA[8]	Checksum		
0x1E	0x16	0x00	0x0A	0xFF	0x00	0x8A		

### 9.1.3 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0x5A = Scheduling Parameters – Set</b>		Command to change the current Scheduling parameters
DATA[1]	Page		BIT 7-BIT4: 1 to 7 of the scheduling pages BIT 3-BIT0: 0: Page disable 1: Page enable
DATA[2]	Start time hour		0 to  23 of the start time hour 24: NULL
DATA[3]	Start time minute		0 to 59 of the start time minute 60: NULL
DATA[4]	End time hour		0 to 23 of the end time hour 24: NULL
DATA[5]	End time minute		0 to 59 of the end time minute 60: NULL
DATA[6]	Video source		0 to 100 (%) of the user selectable range of the display. For video source: 0x00 = NULL 0x01 = VIDEO 0x02 = S-VIDEO 0x03 = COMPONENT 0x04 = CVI 2 (not applicable)

			0x05 = VGA 0x06 = HDMI 2 0x07 = Display Port 2 0x08 = USB 2 0x09 = Card DVI-D 0x0A = Display Port 0x0B= Card OPS 0x0C = USB 0x0D= HDMI 0x0E= DVI-D 0x0F = HDMI3 0x10= BROWSER 0x11= SMARTCMS 0x12= DMS (Digital Media Server) 0x13= INTERNAL STORAGE 0x14= Reserved 0x15= Reserved 0x16=Media Player 0x17=PDF Player 0x18=Custom
DATA[7]	Working day(s)		To set the scheduling working days. Bit0 = 1: every week Bit1 = Monday Bit2 = Tuesday Bit3 = Wednesday Bit4 = Thursday Bit5 = Friday Bit6 = Saturday Bit7 = Sunday
DATA[8]	Bookmark/Playlist/File Tag(s)		To set the set Tag from 1 through 7. For Video sources, Media Player, Browser and PDF, only 1~7 are valid and 0 will get error ack. For the reset of video sources like HDMI, DVI and so on, the byte is useless. 0x00 = none 0x01 = Tag 1 0x02 = Tag 2 0x03 = Tag 3 0x04 = Tag 4 0x05 = Tag 5 0x06 = Tag 6 0x07 = Tag 7

Example: Set page 1 with DisplayPort starts at 06:30 and ends at 22:00 every day.

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data (0)	Data (1)
0xA6	0x01	0x00	0x00	0x00	0x0B	0x01	0x5A	0x10
Data (2)	Data (3)	Data (4)	Data (5)	Data (6)	Data (7)	Data (8)	Checksum	
0x06	0x1E	0x16	0x00	0x0A	0xFF	0x00	0x1C	

## 10. Language

### 10.1 Language Parameters

The following commands are used to get/set scheduling parameters as it is defined below.

#### 10.1.1 Message-Get

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0xC0 = Language – Get</b>		Command requests the display to report its current Language

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0xC0	0x65

#### 10.1.2 Message-Report

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0xC0 = Language – Report</b>		Command report to the host controller the current language of the display.
DATA[1]	Language		0x00 = ENGLISH 0x01 = GERMAN 0x02 = SIMPLIFIED_CHINESE 0x03 = FRENCH 0x04 = ITALIAN 0x05 = SPANISH 0x06 = RUSSIAN 0x07 = POLSKI 0x08 = TURKISH 0x09 = TRADITIONAL_CHINESE 0x0A = JAPANESE 0x0B= PORTUGUESE 0x0C = ARABIC 0x0D= DANISH 0x0E= SWEDISH 0x0F = FINNISH 0x10= NORWEGIAN 0x11= DUTCH

Example: Current Language is SIMPLIFIED\_CHINESE (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0xC0	0x02	0xE7

#### 10.1.3 Message-Set

Bytes	Bytes Description	Bits	Description
DATA[0]	<b>0xC1 = Language – Set</b>		Command requests the display to set the specified language

DATA[1]	Language	0x00 = ENGLISH 0x01 = GERMAN 0x02 = SIMPLIFIED_CHINESE 0x03 = FRENCH 0x04 = ITALIAN 0x05 = SPANISH 0x06 = RUSSIAN 0x07 = POLSKI 0x08 = TURKISH 0x09 = TRADITIONAL_CHINESE 0x0A = JAPANESE 0x0B= PORTUGUESE 0x0C = ARABIC 0x0D= DANISH 0x0E= SWEDISH 0x0F = FINNISH 0x10= NORWEGIAN 0x11= DUTCH
---------	----------	---

*Example: Set Language to ENGLISH (Display address 01)*

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0xC1	0x00	0x63

## 11. Pixel Shift

The command is used to set/get the Pixel Shift value.

### 11.1.1 Message-Get Pixel Shift

Bytes	Bytes Description	Bits	Description
DATA[0]	0xB1 = Pixel Shift – Get		Command requests the display to report its current Pixel Shift value

Example: (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x03	0x01	0xB1	0x14

### 11.1.2 Message-Report Pixel Shift

Bytes	Bytes Description	Bits	Description
DATA[0]	0xB1 = Pixel Shift – Report		Command reports Pixel Shift Setting
DATA[1]	Off /secs		0x00 = Off 0x01 = 10 secs 0x02 = 20 secs 0x03 = 30 secs 0x04 = 40 secs ... 0x5A = 900 secs 0x5B = AUTO

Example: Current Display settings: Off and ?? secs (Display address 01)

Header	Monitor ID	Category	Page	Length	Data Control	Data[0]	Data[1]	Checksum
0x21	0x01	0x00	0x00	0x04	0x01	0xB1	0x00	0x94
0x21	0x01	0x00	0x00	0x04	0x01	0xB1	0x03	0x97

### 11.1.3 Message-Set Pixel Shift

Bytes	Bytes Description	Bits	Description
DATA[0]	0xB2 = Pixel Sensor – Set		Command to change the Pixel Shift setting of the display
DATA[1]	Off /mins		0x00 = Off 0x01 = 10 secs 0x02 = 20 secs 0x03 = 30 secs 0x04 = 40 secs ... 0x5A = 900 secs 0x5B = AUTO

Example: Set the Display to the following: Pixel Sensor off and 50 secs (Display address 01)

Header	Monitor ID	Category	Code0	Code1	Length	Data Control	Data[0]	Data[1]	Checksum
0xA6	0x01	0x00	0x00	0x00	0x04	0x01	0xB2	0x05	0x15

## 12. Command summary

Command name	Set Command	Get Command	Command Code	Remarks
Communication Control	√	√	0x00	Generic report
Platform and version labels		√	0xA2	
Power state get		√	0x19	
Power state set	√		0x18	
User Input Control get		√	0x1D	
User Input Control set	√		0x1C	
Power state at cold start	√		0xA3	
Input Source	√		0xAC	
Current Source		√	0xAD	
Video parameters get		√	0x33	Brightness, etc.
Video parameters set	√		0x32	
Color temperature get		√	0x35	
Color temperature set	√		0x34	
Color parameters get		√	0x37	
Color parameters set	√		0x36	
Picture Format get		√	0x3B	
Picture Format set	√		0x3A	
Volume get		√	0x45	
Volume set	√		0x44	
Volume limits	√		0xB8	
Audio parameters get		√	0x43	
Audio parameters set	√		0x42	
Miscellaneous info		√	0x0F	Operating hours
Auto Adjust	√		0x70	VGA only
Serial Code Get		√	0x15	
Scheduling get	√		0x5B	
Scheduling set		√	0x5A	
Language get	√		0xC0	
Language set		√	0xC1	
Pixel Shift get			0xB1	
Pixel Shift set			0xB2	

## 13. Revision History

Version	Date	Description
V1		<ol style="list-style-type: none"> <li>1. Modify example commands in 6.1.7/6.1.8</li> <li>2. Remove Auto Signal Detecting Get/Set and Temperature Get in command summary.</li> <li>3. Add color temperature get/set and color parameters get/set in command summary.</li> </ol>
V2		<ol style="list-style-type: none"> <li>1. Modify command of Color parameters get/set(6.1.7/6.1.8)</li> </ol>
V3.0	2017.12.29	<ol style="list-style-type: none"> <li>1. Add new chapter 9 “Scheduling” and chapter 10 “Language”</li> </ol>
V3.1	2018.01.04	<ol style="list-style-type: none"> <li>1. Add new chapter 11 “Pixel Shift”</li> </ol>