

A revolutionary MPDP

# Infinitely Expandable **MPDP**

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**ORION CO., LTD.**  
[www.oriondisplay.net](http://www.oriondisplay.net)

Address: 257-6, Gongdan-dong, Gumi-si, Gyeongsangbuk-do, Korea  
Tel : +82-2-6678-8533, Fax: +82-2-6678-8599



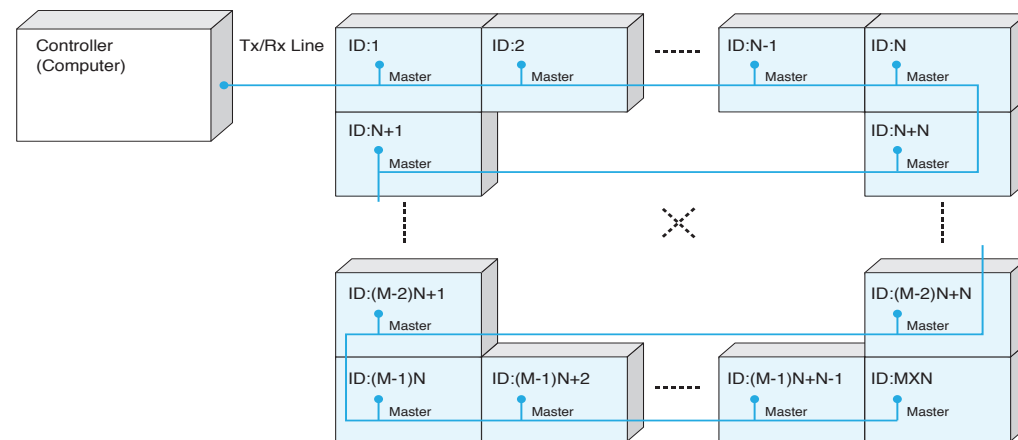
## **MSCS Protocol** **OPM-4260 | OPM-4260R**

Thank you for purchasing our MPDP.  
Please read through this user's manual for safety before installing this product.  
This product is manufactured for Multi Plasma display model only.

# 1. MSCS Protocol

## 1. Introduction

This chapter contains the communication protocol between PDP and its control devices such as computer for better use of the product. However, it does not include detailed technical matters. It rather focuses on the brief functional explanation and communication protocol.



※ The connection can be variable based on environment or the users' intention.  
< Communication connection diagram >

### 1.1. Communication Setting

- Transmission & Reception type: Asynchronous Serial Communication
- Connection type: Daisy Chain
- Baudrate : 115200
- Data Bits : 8
- Parity : None
- Stop Bits : 1
- Flow Control : None

## 2. Protocol Format

### 2.1. Send To PDP

STX	Command	Length	Data	ETX
1 byte	1 byte	1 byte	Variable	1 byte

ID	Master	Other Data
1 byte	1 byte	N byte

- This is how to send commands to PDP. Only the set of the designated ID is working according to the "Command." But, if the "ID" value is "0", all MPDP sets are working according to command as "Broadcast".
- STX(0x02): The initial code. It means the beginning of Protocol. (Fixed value)
- Command: Code for actual operation. (Variable)
- Length: the length of "Data" area. (Variable: 0~255)
- Data: the areas for "ID" and the other Data (Variable)
- ID: It is a code to distinguish PDP sets. Its range is "0" to "255". If the ID is "0," it means Broadcast command.(variable)
- Master(0x01) : This is the scaler code.
- ETX(0x03): The end of the code. (Fixed value)

## 2.2. Receive From PDP

STX	CMD	Length	Data	Check Sum	ETX
1 byte	1 byte	1 byte	Variable	1 byte	1 byte

ID	Master	Other Data
1 byte	1 byte	N byte

- Response by a certain command from the designated set among MPDP sets. The difference from "Send to PDP" is "Check sum".
- STX(0x02): The initial code. It means the beginning of Protocol. (Fixed value)
- Command: Code for actual operation. (Variable)
- Length: the length of "Data" area. (Variable: 0~255)
- Data: the areas for "ID" and the other Data (Variable)
- ID: Set identification (0~255) (Variable)
- Master(0x01) : This is the scaler code.
- Check sum: execute "Not" operation after adding all the values in "STX-Data" area.
- ETX(0x03): The end of the code. (Fixed value)

### - Communication Sequence

- \* Wait for 50msec for response after sending the command. If there is no response, it is recommended to resend the command.
- \* It is recommended that not sending the other command or changing input resolution during command transmission.



## 3. Command

### 3.1. Power On

- Command for Power On: Operative status
- CMD : 0x40
- It is available only during Power Off(Stand-by) status.
- Send to MPDP

A. Normal command

	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	0x40	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast command

	STX	CMD	Length	Data: ID	ETX
Value	0x02	0x40	0x01	0x00	0x03

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

### - Receive from MPDP

	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	0x40	0x02	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check sum: execute "Not" operation after adding all the values in "STX-Data" area.

### 3.2. Power Off

- Command for Power Off : Stand-by status
- CMD : 0x41
- It is available only during Power On (Operative) status.
- Send to MPDP

A. Normal command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	0x41	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast command

Value	STX	CMD	Length	Data: ID	ETX
	0x02	0x41	0x01	0x00	0x03

\* All PDP will do the same operation simultaneously. But, there will be no return communication. (One way command)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	0x41	0x02	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check sum: execute "Not" operation after adding all the values in "STX~Data" area.

### 3.3. Power off for Afterimage Mitigation

- Command for Power Off : Stand-by status
- CMD : 0x89
- It is available only during Power On (Operative) status.
- Send to MPDP

A. Normal command

Value	STX	CMD	Length	Data				ETX
				ID	Master	Mode	Time Duration	
	0x02	0x89	0x04	Variable	0x01	Variable	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Mode : Full White Pattern(0x01), White Bar Scan(0x02), Default(0x00)

\* Time Duration : 0x00 : No Display, 0x01: 5 Minute , 0x03: 15 Minute, 0x06: 30 Minute, 0x0C : 1 Hour...0xF0: 20 Hour)

B. Broadcast command

Value	STX	CMD	Length	Data			ETX
				ID	Mode	Time Duration	
	0x02	0x89	0x03	0x00	Variable	Variable	0x03

\* All PDP will do the same operation simultaneously. But, there will be no return communication. (One way command)

\* Mode : Full White Pattern(0x01), White Bar Scan(0x02), Default(0x00)

\* Time Duration : 0x00 : No Display, 0x01: 5 Minute , 0x03: 15 Minute, 0x06: 30 Minute, 0x0C : 1 Hour...0xF0: 20 Hour)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	0x89	0x02	Variable	Variable	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Execute "Not" operation after adding all the values in "STX~Data" area.

### 3.4. Multi-Scale

- Command for expanding the screen of MPDP.
- It is available only on Power On (Operative) status.
- CMD: 0xDD (DVI), 0xDE(PC), 0XE2(VIDEO)
- Send to MPDP

A. Normal command

Value	STX	CMD	Length	Data				ETX
				ID	Master	XY	P	
	0x02	Variable	0x04	Variable	0x01	Variable	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* XY: The number of horizontal axis (X)/ the number of vertical axis(Y); upper 4 bits -X (Max:15), Lower 4bits - Y (Max: 15)

\* P: the location of expanded screen

B. Broadcast command

Value	STX	CMD	Length	Data				ETX
				ID	XY	S	X	
	0x02	Variable	0x04	0x00	Variable	Variable	Variable	0x03

\* ID: 0x00

\* XY: The number of MPDP sets in horizontal line(X), the number of MPDP sets in vertical line(Y)

The top 4bits - X (Max: 15), the bottom 4bits - Y (Max: 15)

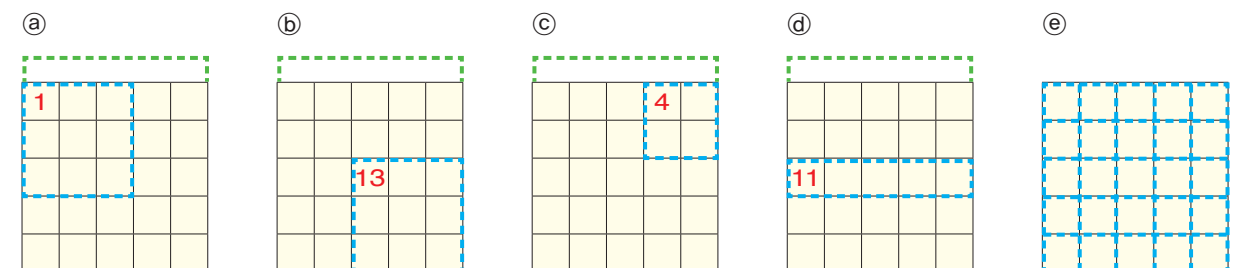
1:1 screen ratio (Full screen) is "0x11"

\* S: The ID of MPDP to be expanded in top left position, 1:1 screen ratio (Full screen) is "0x00"

\* X: The number of all X axis line, 1:1 screen ratio (Full screen) is "0x01"

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

Broadcast command: e.g.) In case of 5x5 MPDP formation



a	0x02(STX)	0xDD(CMD)	0x04(Length)	0x00(ID)	0x33(XY)	0x01(S)	0x05(X)	0x03(ETX)
b	0x02(STX)	0xDD(CMD)	0x04(Length)	0x00(ID)	0x33(XY)	0x0D(S)	0x05(X)	0x03(ETX)
c	0x02(STX)	0xDD(CMD)	0x04(Length)	0x00(ID)	0x22(XY)	0x04(S)	0x05(X)	0x03(ETX)
d	0x02(STX)	0xDD(CMD)	0x04(Length)	0x00(ID)	0x41(XY)	0x0B(S)	0x05(X)	0x03(ETX)
e	0x02(STX)	0xDD(CMD)	0x04(Length)	0x00(ID)	0x11(XY)	0x00(S)	0x01(X)	0x03(ETX)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	Variable	0x02	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area.

### 3.5. Infomation

- Command for displaying the information on the screen (Input source and resolution by OSD)
- CMD : 0x42
- It is available only on Power On (Operative) status.
- Send to MPDP

A. Normal command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	0x42	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast command

Value	STX	CMD	Length	Data: ID	ETX
	0x02	0x42	0x01	0x00	0x03

\* All PDP will do the same operation simultaneously. But, there will be no return communication. (One way command)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	0x40	0x02	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area.

### 3.6. Input-Mode Change

- Command for changing input mode without screen scaling
- It is available only on Power On (Operative) status.
- CMD: 0xDD(DVI), 0xDE(PC), 0XE2(Video)
- Send to MPDP

A. Normal Command

Value	STX	CMD	Length	Data				ETX
				ID	Master	XY	X	
	0x02	Variable	0x04	Variable	0x01	0x11	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast Command

Value	STX	CMD	Length	Data				ETX
				ID	XY	S	X	
	0x02	Variable	0x04	0x00	0x11	0x00	0x01	0x03

\* All PDP will do the same operation simultaneously. But, there will be no return communication. (One way command)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	Variable	0x02	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area.

### 3.7. Global Offset

- Command for removing the image data in seam area (On) or displaying all the data on the screen (Off)
- It is available only on Power On (Operative) status.
- CMD: 0x74(On), 0x73(Off)
- Send to MPDP

A. Normal Command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	Variable	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast Command

Value	STX	CMD	Length	Data: ID	ETX
	0x02	Variable	0x01	0x00	0x03

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	Variable	0x02	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area.

### 3.8. Auto-Power Mode

- Configuration for automatic power on by AC power connection.
- It is available only on Power On (Operative) status.
- **CMD: 0x62(On), 0x63(Off)**
- **Send to MPDP**

A. Normal Command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	Variable	0x02	Variable	0X01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast Command

Value	STX	CMD	Length	Data: ID	ETX
Value	0x02	Variable	0x01	0x00	0x03

\* All PDP will do the same operation simultaneously. But, there will be no return communication. (One way command)

- **Receive from MPDP**

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	Variable	0x02	Variable	0X01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area..

### 3.9. DTV Over-Scan On/Off

- Users can select Over-scan when input is DTV resolution from DVI. It is only available with DVI mode.
- **CMD: 0xE4(On), 0xE5(Off)**
- It is usable only at Power on status.
- **Send to MPDP**

A. Normal Command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	Variable	0x02	Variable	0X01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast Command

Value	STX	CMD	Length	Data: ID	ETX
Value	0x02	Variable	0x01	0x00	0x03

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

- **Receive from MPDP**

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	Variable	0x02	Variable	0X01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Execute "Not" operation after adding all the values in "STX-Data" area.

### 3.10. Over-Temperature Shut-down Control

- **Commands for automatic power off making MPDP set stand-by and OSD warning method, if IP board temperature is 95°C or higher.**

- **CMD**

\* 0x64(Over Temperature Shut-down Enable)

: In case IP board temperature is 95°C or higher, display warning signal "High Temperature" in red for 1 minute at the lower left corner of MPDP and power off automatically (Stand-by mode.)

\* 0x65(Over Temperature Shut-down Disable)

: In case IP board temperature is 95°C or higher, display warning signal "High Temperature" in red for 3 seconds at the lower left corner of MPDP and repeat the warning every 60 seconds. (No automatic power off)

- **It is available only on Power On (Operative) status.**

- **The initial configuration is "Over Temperature Shut-down Enable."**

- **Send to MPDP**

A. Normal Command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	Variable	0x02	Variable	0X01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast Command

Value	STX	CMD	Length	Data: ID	ETX
Value	0x02	Variable	0x01	0x00	0x03

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

- **Receive from MPDP**

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	Variable	0x02	Variable	0x01	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Add the sum from STX to Data and execute "Not" operation.

### 3.11. Test Pattern

- **Command for checking the operating status with internal patterns**
- **It is available only on Power On (Operative) status.**
- **CMD: 0x57 (Red), 0x58 (Green), 0x59 (Blue), 0x5A (White), 0x5B (Screen)**
- **Send to MPDP**

A. Normal Command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	Variable	0x02	Variable	0X01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast Command

Value	STX	CMD	Length	Data: ID	ETX
Value	0x02	Variable	0x01	0x00	0x03

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	Variable	0x02	Variable	0X01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area.

### 3.12. Elapsed Time

- Command for informing the elapsed time of each PDP set. (Basic unit: hour)
- It is available only on Power On (Operative) status.
- CMD : 0x77 (Get), 0x7B (Initial)
- Send to MPDP

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	Variable	0x02	Variable	0X01	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* It is not applicable as "Broad-cast" command

- Receive from MPDP

Value	STX	CMD	Length	Data			Check Sum	ETX
				ID	Master	Elapsed Time		
	0x02	Variable	0x08	Variable	0X01	...	Variable	0x03

Hundred thousands	ten thousands	thousands	hundreds	ten	one
Variable	Variable	Variable	Variable	Variable	Variable

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Execute "Not" operation after adding all the values in "STX-Data" area.

\* Elapsed Time

- Hundred thousands, ten thousands, thousands, hundreds, tens, ones: 0(0x00)~9(0x09) range value.

### 3.13. IP Serial Number

- Command for assigning and identifying the serial numbers of each IP board. (8 digit)
- CMD: 0x75 (Get S/N), 0x76 (Set S/N)
- Send to MPDP

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	Variable	0x02	Variable	0X01	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* "Get/Set IP Serial Number"(0x75/0x76) command is not applicable as "Broad-cast" command, because each PDP should have an unique serial number.

- Receive from MPDP

Value	STX	CMD	Length	Data			Check Sum	ETX
				ID	Master	S/N		
	0x02	Variable	0x0A	Variable	0x01	...	Variable	0x03

0	1st	2nd	3rd	4th	5th	6th	7th
Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Execute "Not" operation after adding all the values in "STX-Data" area.

\* Elapsed Time

- 0, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th: 0(0x00)~9(0x09) range value

### 3.14. Get Current Status

- Command for obtain the current PDP (IP) information
- CMD: 0x87
- It is available only on Power On (Operative) status.
- Send to MPDP

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	0x87	0x02	Variable	0X01	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* It cannot be used as "Broad-cast" command.

- Receive from MPDP

Value	STX	CMD	Length	Data			Check Sum	ETX
				ID	Master	Status		
	0x02	0x87	0x23	Variable	0X01	...	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Execute "Not" operation after adding all the values in "STX-Data" area.

\* Status (32 byte)

No.	Data	Length	Explanation
1	PWR Status	1 byte	0: Power Off (Stand-by), 1: Power On (Working)
2	Input Source	1 byte	0x0C: PC, 0x0E: DVI, 0x0D: DTV, 0x07: DVD, 0x05: S-Video, 0x02: Video
3	Resolution	1 byte	The value of "Displayed Resolution at the time of detection"
4	Not Used		
5	Global Offset	1 byte	0: Global Offset Off, 1: Global Offset On
6	Color Temp.	1 byte	0: Normal mode, 1: Studio mode
7	Auto-Power Mode	1 byte	0: Auto-Power Off, 1: Auto-Power On
8	FAN Mode	1 byte	0: Auto, 1: Full
9	Temperature0	1 byte	0(0x00): 0°C~ 127(0x7F): 127°C / 128(0x80): -1°C ~ 254(0xFE): -127°C 0xFF: Temp. Sensor Error
10	Temperature1	1 byte	0(0x00): 0°C ~ 127(0x7F): 127°C / 128(0x80): -1°C ~ 254(0xFE): -127°C 0xFF: Temp. Sensor Error
11	FAN Status	1 byte	0x30: Good, 0x31: Error
12~18	F/W Version	7 byte	Year: 2 byte, Month: 2byte, Day: 2byte, Rev.(0~9):1byte Ex) December 29th, 2012 Rev. 2 → 0x01 0x02 0x01 0x02 0x02 0x09 0x02
19	Not Used		
20~27	S/N	8 byte	123456 → 0x00 0x00 0x01 0x02 0x03 0x04 0x05 0x06 1 → 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x01



28~33	Elapsed Time	6 byte	54321 → 0x00 0x05 0x04 0x03 0x02 0x01 10 → 0x00 0x00 0x00 0x00 0x01 0x00
34	Afterimage Mitigation Status(Mode)	1 byte	Default(No Display) : 0x00 Full White : 0x01 White Bar Scan : 0x02
35	Afterimage Mitigation Time(Time Duration)	1 byte	Ex)0x01: 5 Minute , 0x03: 15 Minute, 0x06: 30 Minute, 0x0C :1 Hour... 0xF0: 20 Hour

< Displayed Resolution at the time of detection (It is different from the supporting Resolution) >

Resolution	Value	Resolution	Value	Resolution	Value
640x480x60	0(0x00)	720Px50	29(0x1D)	1360x768x60	25(0x19)
<b>640x480x85</b>	<b>1(0x01)</b>	576Px50	30(0x1E)	<b>640x350x85</b>	<b>46(0x2E)</b>
<b>800x600x56</b>	<b>2(0x02)</b>	480Px60	31(0x1F)	<b>640x480x75</b>	<b>47(0x2F)</b>
800x600x60	3(0x03)	1920x1080ix60	32(0x20)	<b>640x480x72</b>	<b>48(0x30)</b>
<b>800x600x75</b>	<b>4(0x04)</b>	1920x1080ix50	33(0x21)	<b>1152x864x75</b>	<b>49(0x31)</b>
<b>800x600x85</b>	<b>5(0x05)</b>	1280x720Px60	34(0x22)	1280x720x60	50(0x32)
853x480x60	6(0x06)	1280x720Px50	35(0x23)	<b>1280x768x75</b>	<b>51(0x33)</b>
1024x768x60	7(0x07)	PAL	36(0x24)	<b>1280x1024x75</b>	<b>52(0x34)</b>
<b>1024x768x70</b>	<b>8(0x08)</b>	SECAM	37(0x25)	1366x768x50	53(0x35)
<b>1024x768x75</b>	<b>9(0x09)</b>	PALP	38(0x26)	1400x1050x50	54(0x36)
<b>1024x768x85</b>	<b>10(0x0A)</b>	NTSC	39(0x27)	1440x900x60	55(0x37)
1280x768x60	11(0x0B)	NTSCP	40(0x28)	576ix50	56(0x38)
1280x960x60	12(0x0C)	Unknown	42(0x2A)	480ix60	57(0x39)
1280x1024x60	13(0x0D)	No-Signal	43(0x2B)	1080px60	58(0x3A)
1366x768x60	14(0x0E)	853x480x50	18(0x12)	1080px50	59(0x3B)
1600x1200x60	15(0x0F)	1280x1024x50	19(0x13)	1920x1080px60	60(0x3C)
1400x1050x60	16(0x10)	1360x768x50	20(0x14)	1920x1080px50	61(0x3D)
1706x960x60	17(0x11)	1600x900x50	21(0x15)	1024x576x50	62(0x3E)
1080ix60	26(0x1A)	1600x900x60	22(0x16)	1024x576x60	63(0x3F)
1080ix50	27(0x1B)	1600x1200x50	23(0x17)		
720Px60	28(0x1C)	800x600x50	24(0x18)		

※ The resolutions written in red or italic letters can be detected, but they are not supporting resolutions.

### 3.15. Graphic User Mode Control

- Command for controlling Brightness, Contrast, Sharpness
- CMD: 0x8A (Brightness), 0x8B (Contrast), 0x8C (Sharpness)
- It is available only on Power On (Operative) status.
- The adjusted value is not applied during Stand-by or No-signal status.
- Send to MPDP

A. Normal Command

Value	STX	CMD	Length	Data			ETX
				ID	Master	Control	
Value	0x02	Variable	0x03	Variable	0X01	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Control: Brightness ("0" ~ "100"), Contrast ("0" ~ "100"), Sharpness ("0" ~ "28")

B. Broadcast Command

Value	STX	CMD	Length	Data		ETX
				ID	Value	
Value	0x02	Variable	0x02	0x00	Variable	0x03

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

\* Control: Brightness ("0" ~ "100"), Contrast ("0" ~ "100"), Sharpness ("0" ~ "28")

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	Variable	0x02	Variable	0X01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Execute "Not" operation after adding all the values in "STX-Data" area.

### 3.16. Color Temperature

- Studio mode is 3600 (Default: Normal Mode).
- Normal mode is applicable for general purpose and Studio mode is designed for broadcasting purpose.
- It is available only on Power On (Operative) status.
- CMD: 0xB3 (Normal), 0xB4 (Studio: broadcasting purpose)
- Send to MPDP

A. Normal Command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	Variable	0x02	Variable	0X01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

B. Broadcast Command

Value	STX	CMD	Length	Data: ID	ETX
Value	0x02	Variable	0x01	0X00	0x03

\* Make all PDP do the same operation. But, there will be no return communication. (One way command)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	Variable	0x02	Variable	0X01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area.

### 3.17. Tracking Mode

- A command for adjusting alignment manually or automatically or loading the predetermined values at PC RGB mode only.
- CMD: 0x4A (Auto-tracking), 0x4B (Get Tracking Values), 0x4C (Frequency- tracking), 0x4D (Phase-tracking), 0x4E (Line-Start tracking), 0x4F (Pixel-Start tracking)
- It is available only on Power On (Operative) status.
- Send to MPDP

A. Normal Command

	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	Variable	0x02	Variable	0X01	0x03

B. Broad-Cast Command

	STX	CMD	Length	Data: ID	ETX
Value	0x02	Variable	0x01	0x00	0x03

C. Frequency/Phase/Line-Start/Pixel-Start -tracking (Normal Command): Adjusting PC (RGB) screen manually.

	STX	CMD	Length	Data			ETX
				ID	Master	Tracking Value	
Value	0x02	Variable	0x03	Variable	0X01	Variable	0x03

D. Frequency/Phase/Line-Start/Pixel-Start -tracking (Broad-Cast Command): Adjusting PC (RGB) screen manually.

	STX	CMD Value	Length	Data		ETX
				ID	Tracking Value	
Value	0x02	Variable	0x02	0x00	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Broad-cast: All PDP sets will execute the same command, when the ID is 0x00. No response (One way command)

\* "Get Tracking Value" command cannot be used for "Broad-cast" command.

- Frequency value range: 77(0x4D) ~ 177(0xB1) / Real Value(-50 ~ +50) / Real Value + 127(0x7F)
- Phase value range: 127(0x7F) ~ 190(0xBE) / Real Value(0 ~ +63) / Real Value + 127(0x7F)
- Line Start value range: 104(0x68) ~ 137(0x89) / Real Value(-23 ~ +10) / Real Value + 127(0x7F)
- Pixel Start value range: 77(0x4D) ~ 167(0xA7) / Real Value(-50 ~ +40) / Real Value + 127(0x7F)

- Receive from MPDP

A. Auto-tracking, Frequency/Phase/Line-Start/Pixel-Start-tracking

	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	Variable	0x02	Variable	0X01	Variable	0x03

B. Get Tracking Values

	STX	CMD	Length	Data			Check Sum	ETX
				ID	Master	Tracking Value		
Value	0x02	Variable	0x06	Variable	0X01	...	Variable	0x03

Frequency	Phase	LineStart	PixelStart
Variable	Variable	Variable	Variable

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Tracking Value

- Frequency value range : 77(0x4D) ~ 177(0xB1) / Real Value(-50 ~ +50) / Real Value + 127(0x7F)
- Phase value range : 127(0x7F) ~ 190(0xBE) / Real Value(0 ~ +63) / Real Value + 127(0x7F)
- Line Start value range : 104(0x68) ~ 137(0x89) / Real Value(-23 ~ +10) / Real Value + 127(0x7F)
- Pixel Start value range : 77(0x4D) ~ 167(0xA7) / Real Value(-50 ~ +40) / Real Value + 127(0x7F)

\* Check Sum: execute "Not" operation after adding all the values in "STX-Data" area.

3.18. Sync Correction

- It is the command for reducing the flashing effect.

1) Sync Correction Mode

- User can select or switch the Sync Control mode; "Auto" or "Manual."
- CMD: 0xC9
- It is functioning only for Power On status.
- Send to MPDP

A. Normal command

	STX	CMD	Length	Data			ETX
				ID	Master	Mode	
Value	0x02	0xC9	0x03	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Mode: Manual (0x00), Auto (0x01)

B. Broadcast command

	STX	CMD	Length	Data		ETX
				ID	Mode	
Value	0x02	0xC9	0x02	0x00	Variable	0x03

\* Execute the same command for all PDP sets. No response will be made. (One-way command)

\* Mode : Manual(0x00), Auto (0x01)

- Receive from MPDP

	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	0x89	0x02	Variable	0x01	Variable	0x03

\* ID range (Program) : 0x01(1) ~ 0xFF(255)

\* Check Sum : Add the values from STX to Data and execute the "NOT" operation.

2) Sync Correction Time Write

- Sync Correction Time for MPDP can be configured. It is only available for Manual mode.
- CMD : 0x6A
- Send to MPDP

A. Normal command

	STX	CMD	Length	Data			ETX
				ID	Master	Control Data	
Value	0x02	0x6A	0x09	Variable	0X01	Variable	0x03

BIT Mode	Read/Write Mode	Address	TimeData(4 Bytes)
0x04	0x00	0xA2	Variable

\* ID range (Program) : 0x01(1)~ 0xFF(255)

\* Control Data

-Time Data : 0x00000000 ~ 0x000000FF (0~255, 4Bytes)



B. Broadcast command

	STX	CMD	Length	Data		ETX
				ID	Control Data	
Value	0x02	0x6A	0x08	0x00	Variable	0x03

BIT Mode	Read/Write Mode	Address	TimeData(4 Bytes)
0x04	0x00	0xA2	Variable

\* Execute the same command for all PDP sets. No response will be made. (One-way command)  
 \* Control Data  
 -Time Data : 0x00000000 ~ 0x000000FF (0~255, 4Bytes)

- Receive from MPDP

	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	0x6A	0x02	Variable	0x01	Variable	0x03

\* ID range (Program) : 0x01(1) ~ 0xFF(255)  
 \* Check Sum : Add the values from STX to Data and execute the "NOT" operation

### 3) Sync Correction Read

- The information for Sync Control related configuration and changes can be read.

- CMD : 0x6A

- Send to MPDP

A. Normal command

	STX	CMD	Length	Data			ETX
				ID	Master	Control Data	
Value	0x02	0x6A	0x05	Variable	0x01	Variable	0x03

BIT Mode	Read/Write Mode	Address
0x04	0x01	0xA2

\* ID range (Program) : 0x01(1)~ 0xFF(255)  
 \* It is not available for Broadcast command.

- Receive from MPDP

	STX	CMD	Length	Data			Check Sum	ETX
				ID	Master	Control		
Value	0x02	0x6A	0x0A	Variable	Variable	Variable	Variable	0x03

BIT Mode	Read/WriteMode	Address	Time Data(4 Bytes)	Manual/ Auto Mode
0x04	0x01	0xA2	Variable	Variable

\* ID range (Program) : 0x01(1) ~ 0xFF(255)  
 \*Slave / Master : Master(0x01)  
 \*Control  
 - Time Data : 0x00000000 ~ 0x000000FF (0~255, 4Bytes), In case of Auto Mode, the response will be 0x00000000(0).  
 - Manual /Auto Mode : 0(0x00) for Manual , 1(0x01) for Auto  
 \*Check Sum : Add the values from STX to Data and execute the "NOT" operation

### 3.19. White Balance Control

- Command for adjusting Gain R/G/B and Offset R/G/B for White balance
- CMD: 0xAC (Gain R), 0xAD (Gain G), 0xAE (Gain B), 0xB0 (Offset R), 0xB1 (Offset G), 0xB2 (Offset B)
- The adjusted value is not applied during Stand-by or No-signal status. MPDP must be operating status and there must be the input signal of each mode.
- To apply the same configuration to all MPDP sets, the "ID" area value can be set as "0x00." However, considering differences between sets, individual adjustment for white balance is recommended.

- Send to MPDP

A. Normal Command

	STX	CMD	Length	Data			ETX
				ID	Master	Control	
Value	0x02	Variable	0x03	Variable	0x01	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)  
 \* Control: "0 (0x00)" ~ "255 (0xFF)"

- Receive from MPDP

	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	Variable	0x02	Variable	0x01	Variable	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)  
 \* Check Sum: Execute "Not" operation after adding all the values in "STX--Data" area.

### 3.20. Firmware Default Set (Picture Control Data)

- Initialize the PDP set. All the settings will be returned to the initial condition prior to the adjustment in the factory. Pre-programmed value will be applied.
- CMD : 0x81
- It is available only on Power On (Operative) status.
- Since previous Picture Control Data will be lost with this command. High caution is required.
- Send to MPDP

	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	0x81	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)  
 \* It is not applicable as "Broad-cast" command.

- Receive from MPDP

	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
Value	0x02	0x81	0x02	Variable	0x01	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)  
 \* Check Sum: Execute "Not" operation after adding all the values in "STX--Data" area.

### 3.21. Get Picture Control Data

- Command for acquiring the current Picture Control Data(User Mode, White Balance, Graphic, Video)
- CMD: 0x88
- It is available only on Power On (Operative) status.
- The values based on current Color Temp. (Normal Mode / Studio Mode) will be displayed.
- Send to MPDP

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	0x88	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* It is not applicable as "Broad-cast" command.

- Receive from MPDP

Value	STX	CMD	Length	Data			Check Sum	ETX
				ID	Master	Control		
	0x02	0x88	0x34	Variable	0x01	...	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Control (50 byte)

No.	Data	Length	Explanation
1	User Mode – Brightness	1 byte	Range: 0(0x00) ~ 100(0x64)
2	User Mode – Contrast	1 byte	Range: 0(0x00) ~ 100(0x64)
3	User Mode – Sharpness	1 byte	Range: 0(0x00) ~ 28(0x1C)
4	Not Used		
5	Not Used		
6	White Balance – Gain R	1 byte	Range: 0(0x00) ~ 255(0xFF)
7	White Balance – Gain G	1 byte	Range: 0(0x00) ~ 255(0xFF)
8	White Balance – Gain B	1 byte	Range: 0(0x00) ~ 255(0xFF)
9	White Balance – Offset R	1 byte	Range: 0(0x00) ~ 255(0xFF)
10	White Balance – Offset G	1 byte	Range: 0(0x00) ~ 255(0xFF)
11	White Balance – Offset B	1 byte	Range: 0(0x00) ~ 255(0xFF)
12, 13	RGB - Gain R	2byte	Range : 0(0x000) ~ 1023(0X3FF)
14, 15	RGB - Gain G	2byte	Range : 0(0x000) ~ 1023(0X3FF)
16, 17	RGB - Gain B	2byte	Range : 0(0x000) ~ 1023(0X3FF)
18, 19	RGB - Offset R	2byte	Range : 0(0x000) ~ 1023(0X3FF)
20, 21	RGB - Offset G	2byte	Range : 0(0x000) ~ 1023(0X3FF)
22, 23	RGB - Offset B	2byte	Range : 0(0x000) ~ 1023(0X3FF)
24 ~ 47	Not Used	24byte	
48	Video Brightness	1byte	Range : 0(0x00) ~ 255(0xFF)
49	Video Contrast	1byte	Range : 0(0x00) ~ 255(0xFF)
50	Video Color	1byte	Range : 0(0x00) ~ 255(0xFF)

### 3.22. Auto Calibration

- Command for synchronizing the ADC Gain and Offset for 16-Gray input. It is available only for PC.
- It is available only on Power On (Operative) status.
- CMD : 0x80
- Send to MPDP

A. Normal Command

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	0x80	0x02	Variable	0x01	0x03

B. Broadcast Command

Value	STX	CMD	Length	Data: ID	ETX
	0x02	0x80	0x01	0x00	0x03

\* ID range (Program): 0x01(1) ~ 0xFF(255)

\* Broadcast: All PDP sets will execute the same command, when the ID is 0x00. No response (One way command)

- Receive From MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	0x80	0x02	Variable	0x01	Variable	0x03

### 3.23. Factory Data (Picture Control Data)

- Command for loading the Picture Control data (User Mode / White Balance / RGB Data / VIDEO Data) adjusted in the factory.
- CMD : 0x82(Save), 0x83(Load))
- It is usable only at Power on Operative
- It shows the value based on current Color Temp. (Normal Mode / Studio Mode.)
- Data can be checked with "Get Picture Control Data" after executing the command
- Send to MPDP

Value	STX	CMD	Length	Data		ETX
				ID	Master	
	0x02	Variable	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

- Receive from MPDP

Value	STX	CMD	Length	Data		Check Sum	ETX
				ID	Master		
	0x02	Variable	0x02	Variable	0x01	Variable	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* Check Sum: Execute "Not" operation after adding all the values in "STX--Data" area.

### 3.24. Get Temperature Status

- Command for acquiring temperature information.
- CMD : 0x7F
- It is usable only at Power on status.
- Send to MPDP

	STX	CMD	Length	Data		ETX
				ID	Master	
Value	0x02	0x7F	0x02	Variable	0x01	0x03

\* ID range(Program): 0x01(1) ~ 0xFF(255)

\* It is not applicable as "Broad-cast" command.

- Receive from MPDP

	STX	CMD	Length	Data			Check Sum	ETX
				ID	Master	Temperature Values		
Value	0x02	0xF7	0x04	Variable	0x01	...	Variable	0x03

Temp.0	Temp.1
Variable	Variable

\* Temperature Values (Temp.0, Temp.1)

- 0(0x00): 0°C ~ 127(0x7F): 127°C

- 128(0x80): -1°C ~ 254(0xFE): -127°C

- 0xFF: Temp. Sensor Error

\* Check Sum: Execute "Not" operation after adding all the values in "STX-Data" area.

### ※Attachment : ASCII to HEX Conversion Table

ASCII	HEX	ASCII	HEX	ASCII	HEX	ASCII	HEX	ASCII	HEX	ASCII	HEX	ASCII	HEX
STX	02	*	2A	9	39	H	48	W	57	f	66	u	75
ETX	03	+	2B	:	3A	I	49	X	58	g	67	v	76
Esc	1B	,	2C	;	3B	J	4A	Y	59	h	68	w	77
CR	0D	-	2D	<	3C	K	4B	Z	5A	i	69	x	78
LF	0A	.	2E	=	3D	L	4C	[	5B	j	6A	y	79
Space	20	/	2F	>	3E	M	4D	\	5C	k	6B	z	7A
!	21	0	30	?	3F	N	4E	]	5D	l	6C	{	7B
"	22	1	31	@	40	O	4F	^	5E	m	6D		7C
#	23	2	32	A	41	P	50	-	5F	n	6E	}	7D
\$	24	3	33	B	42	Q	51	`	60	o	6F	~	7E
%	25	4	34	C	43	R	52	a	61	p	70	DEL	7F
&	26	5	35	D	44	S	53	b	62	q	71		
'	27	6	36	E	45	T	54	c	63	r	72		
(	28	7	37	F	46	U	55	d	64	s	73		
)	29	8	38	G	47	V	56	e	65	t	74		

## MEMO