Application Notes

Elo Device Management® Remote Management: Elo Displays

Touchscreen Signage and Large Format Open Frames

Overview

Elo Interactive Digital Signage products support technology that greatly simplifies remote management and diagnostics. With appropriate software implementation, it will reduce on-premise support calls and help maintain a consistent user experience.

This application note discusses all local interfaces to the IDS display. Two methods are possible: over the video signal using the VESA DDC/CI protocol and over USB using the MDC protocol. The VESA protocol enables the full functionality found in the Elo Display Device Client while the MDC protocol provides backward compatibility to the 00 series remote management features.

Elo's Interactive Digital Signage (IDS) products are available in 32" to 70" and include the thinnest (3-3.5") all-in-one commercial touch displays on the market.

Monitor	VESA DDC/Ci			RS232 (Multi-Display Channel "MDC")			
	HDMI	VGA	DisplayPort	Touch USB cable (Virtual Serial)	Y-Cable on VGA	Physical Serial Cable	Serial 3.5mm Cable
	Current IDS Monitors						
5553L	Yes	No	Yes	Yes	No	No	Yes
6553L				Yes	No	No	Yes
3202L	Yes	Yes	Yes	Yes	Yes	No	No
4202L				Yes	Yes	No	
4602L				Yes	Yes	No	
5501LT				Yes	Yes	No	
5551L				Yes	No	Yes	
5502L				Yes	Yes	No	
7001LT				Yes	Yes	No	
	Large Format Open Frame Monitors						
3243L	Yes	Yes	Yes	No	No	No	
4243L							
4343L							
5543L							
	Discontinued Models						
3201L	Yes	Yes	Yes	Yes	No	No	
4201L							
5501L							
7001L							

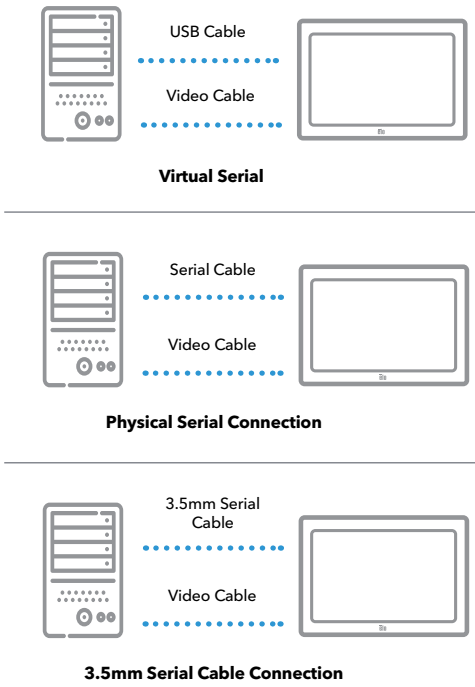
Note: *.NET framework is 4.0 or above is required for Microsoft framework.*

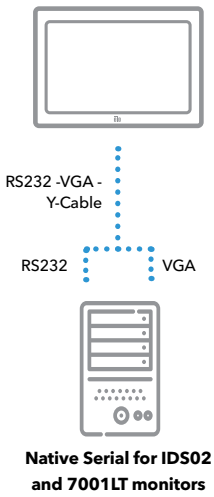
Application Notes

I. MDC Protocol

All Elo Touchscreen Signage support the Eloview MDC protocol. This provides device control/status via the monitor USB interface. For Elo customers who have utilized the IDS 00 series MDC remote management capabilities, this enables seamless backward compatibility with all Elo Touchscreen Signage monitors. Access to the MDC protocol via a virtual com port is provided by the Elo driver. Remote management functions and command set protocols are the same as with the 00 series.

Summary of Functions	Control	Monitor
Brightness	✓	✓
Contrast	✓	✓
Audio	✓	✓
Auto Adjust Video	✓	
Restore Defaults	✓	
Touch Controls On/Off	✓	✓
Display Power On/Off	✓	✓
Power-on Hours		✓
Backlight-on Hours		✓
Serial Number		✓
Command Set Supported by Device		✓
Switch Input Source	✓	✓
Adjust Audio Volume by %	✓	✓
Switch Input Video and Audio Source	✓	✓
Fan Status	✓	✓
System Temperature		✓
Alarm		✓





Connections and Setup

Elo Touchscreen Signage has a USB connector which allows access to touch, MDC functionality and other peripheral devices (e.g., web cam and RFID reader) connected to the unit. This is implemented through an internal USB hub. MDC functions are implemented on a virtual serial port. If you are using an Elo Computer Module you can skip steps 1 through 3.

Step 1: The Elo VCP driver is required to be loaded. This can be downloaded from http://www.elotouch.com/Support/Downloads/dnld.asp (part of driver pack for IDS Computer Modules install CP210x driver for IDS01/02 and PL2303 driver for IDSx3.).

Step 2: Connect the monitor touch USB cable to the host computer.

Step 3: In the On-Screen Display of the IDS monitor, navigate to "MDC Protocol" and select "RS232C" (Only need for IDS01/02).

Step 4: Select the virtual serial port on the Host computer. Procedure for Windows: In Control Panel, open Device Manager. Under the Ports (COM and LPT) group, you will see a "Silicon Labs CP210x USB to UART Bridge (COMXX) or "Prolific USB-to-Serial Comm Port (COMXX)" listed. With XX being the available Serial (COM) port number which the ELO VCP driver has been mapped. The application (e.g., content player) that is managing the device should send hardware control commands to this port.

Application Notes

Command Set Format

All values are big-endian. The required format to send commands is described below.

Format for Host PC Commands:

Position	1	2	3	4	5	6	7	8	9
Description:	Start	Host address	Length	Target Audience	Command R/W Format	Command Type	Write Value	Checksum	Stop

Format for IDS Display Response to a Host PC Read Command:

Position	1	2	3	4	5	6	7	8	9
Description:	Start	Host address	Length	Slave Address	Requested R/W Format	Requested Type	Return Data	Checksum	Stop

Format for IDS Display Response to a Host PC Write Command:

Position	1	2	3	4	5	6	7	8	9
Description:	Start	Host address	Length	Slave Address	Error Code	Requested Command	Checksum	Stop	Stop

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Start

Value: always 02h

Host Address

Value: always 6Eh

Length

Value: variable number that represents the number of bytes between LENGTH and CHECKSUM (non-inclusive). Range of allowable values is between 80h and FFh. 80h means 0 bytes of length, FFh means 127 bytes of length.

Target Audience

Value: Value depends on target.

If the target is all connected IDS displays (for the GET SERIAL NUMBERS command), the value is FFh.

If the target is one specific IDS display (for all other commands), the value is 10 ASCII bytes representing that specific display's 10-character serial number. For example, if the serial number of the target display is G10C987654, then the TARGET AUDIENCE would be: 47h 31h 30h 43h 39h 38h 37h 36h 35h 34h

Write Value

Value: depends if the COMMAND R/W FORMAT is Read or Write.

If the COMMAND R/W FORMAT is Read, this field does not exist.

If the COMMAND R/W FORMAT is Write, this field exists. See the COMMAND TYPE description for details of each COMMAND TYPE's intended/allowable WRITE VALUE.

Return Data

This field reports variable-length data from a Read command (representing things like current brightness, on/off status).

See the COMMAND TYPE description for details of each COMMAND TYPE's RETURN DATA

Error Code

This field reports a 1-byte error code from a Write command:

04h – No Error

01h – COMMAND TYPE not supported by slave

00h, 02h, 03h, or 05h - Error

Application Notes

Slave Address

From Host to IDS:

If the target is all connected IDS systems, the value is FFh.

If the target is one specific IDS system (for all other commands), the value is 10 ASCII bytes representing that specific system's 10-character serial number. For example, if the serial number of the target system is G10C987654, then the TARGET AUDIENCE would be: 47h 31h 30h 43h 39h 38h 37h 36h 35h 34h

From IDS System Response to a Host PC Command:

The value is 10 ASCII bytes representing that specific system's 10-character serial number.

Command R/W Format

Value: Depends if the command will be a Read or a Write.

If command is a Read, then the value is 01h

If command is a Write, then the value is 04h

See the command section for details

Requested R/W Format

Value: depends if the COMMAND R/W FORMAT is Read or Write

If the Host PC's COMMAND R/W FORMAT was Read, the value is the same as the Host PC's COMMAND R/W FORMAT.

If the Host PC's COMMAND R/W FORMAT was Write, this field does not exist.

Requested Command

Value: depends if the COMMAND R/W FORMAT is Read or Write

If the Host PC's COMMAND R/W FORMAT was Read, the value is the same as the Host PC's COMMAND R/W FORMAT.

If the Host PC's COMMAND R/W FORMAT was Write, this field does not exist.

Checksum

Value: the checksum for the data between the START and CHECKSUM fields, non-inclusive.

Stop

Value: always 03h

Command Reference

Value: select from the following options:

Function	Command Type Value	R/W Options	Function (For Writes)	WRITE VALUE (For Write Commands	RETURN VALUE (For Read Commands)
Recall defaults	04h	W	Restores brightness, contrast, volume, and Analog VGA video timing parameters to factory defaults	IDS01/02: 00 01h IDSx3: 01h *Elo Use: Language and Rotation will keep after set this command	00h: Recall function not active: no action taken 01h: All settings recalled
Change Brightness	10h	R/W	For Read commands: slave will return its current brightness setting in RETURN DATA For Write commands: slave will set its brightness setting according to the WRITE VALUE	2 Byte setting: 00h 00h (minimum) FFh FFh (maximum) (High Byte of setting – Low Byte of setting) *Elo Use: The level will increase from a minimum at a value = 01h to a maximum at a value = 0x64h	Returns 4 bytes: 2 bytes for max adjustable value (high byte followed by low byte) Followed by 2 bytes for current value (high byte followed by low byte)
Change Contrast	12h	R/W	For Read commands: slave will return its current contrast setting in RETURN DATA For Write commands: slave will set its contrast setting according to the WRITE VALUE	2 Byte setting: 00h 00h (minimum) FFh FFh (maximum) (High Byte – Low Byte) *Elo Use: The level will increase from a minimum at a value = 01h to a maximum at a value = 0x64h	Returns 4 bytes: 2 bytes for max adjustable value (high byte followed by low byte) Followed by 2 bytes for current value (high byte followed by low byte)
Perform Auto-Adjust	1Eh	R/W	Automatically adjusts input Analog VGA video for optimum display on the display. NOTE: IDS displays with Elo IDS Computer Modules use digital HDMI video	N/A – this field does not exist for this command	00h: auto-adjust not active – no action taken 01h: Auto-adjust performed

Command Reference

Value: select from the following options:

Function	Command Type Value	R/W Options	Function (For Writes)	WRITE VALUE (For Write Commands	RETURN VALUE (For Read Commands)
Switch Input source	60h	R/W	Switch Input source	0x80: External VGA Port 0x40: External DP Port 0x20: External HDMI1 Port 0x10: External HDMI2 Port 0x08: External Type-C DP port 0x04: External HDMI side port 0x02: ECM-HDMI 0x01: ECM-DP	Data size: From PID reply to Host Write = 12 bytes from S1 to CMD Read = 16 bytes from S1 to below Byte' 0
Adjust Audio volume by percentage	61h	R/W	For Read commands: slave will return its current volume percentage and max percentage in RETURN DATA For Write commands: slave will set its volume setting according to the WRITE VALUE	2-byte setting: First byte for volume increase or reduce (00h: increase, 01h: reduce) Second byte for volume percentage, from 1h to 5h	Returns 2 bytes: First byte for max percentage (from 0h up to 64h) Second byte for current percentage (from 0h to 64h)
Change Audio Volume	62h	R/W	For Read commands: slave will return its current volume setting in RETURN DATA For Write commands: slave will set its volume setting according to the WRITE VALUE	2-byte setting: 00h 00h (minimum) FFh FFh (maximum) (High Byte – Low Byte) *Elo Use: The level will increase from a minimum at a value = 01h to a maximum at a value = 0x64h	Returns 4 bytes: 2 bytes for max adjustable value (high byte followed by low byte) Followed by 2 bytes for current value (high byte followed by low byte)
Switch Input Video and Audio source	65h	R/W	Switch Input video and audio source	0x80: External VGA Port 0x40: External DP Port 0x20: External HDMI1 Port 0x10: External HDMI2 Port 0x08: External Type-C DP port 0x04: External HDMI side port 0x02: ECM-HDMI 0x01: ECM-DP	Data size: From PID reply to Host Write = 12 bytes from S1 to CMD Read = 16 bytes from S1 to below Byte' 0
System Temp	B1h	R		0: 0 degree C 32: 50 degree C 64: 100 degree C	
Get Lifetime Information	C0h	R	Requests the slave to report two values: 1. How many accumulated hours the system has been on (includes SLEEP) 2. How many accumulated hours the system's backlight has been on.	N/A – this field does not exist for this command	Returns 4 bytes: 2 bytes for accumulated display power hours (high byte first, maximum of FFh FFH 65025 hrs) Followed by 2 bytes for backlight on hours (high byte first, maximum of FFh FFH 65025 hrs)

Function	Command Type Value	R/W Options	Function (For Writes)	WRITE VALUE (For Write Commands	RETURN VALUE (For Read Commands)
Control Touch Functionality	C7h	R/W	For Read commands: slave will return whether or not touch functionality is turned on For Write commands: slave will turn touch functionality on or off according to the WRITE VALUE	IDS01/02: 00 00h (turn touch off) 00 01h (turn touch on) IDSx3: 00h (turn touch off) 01h (turn touch on)	00h: touch function is off 01h: touch function is on
Control System Power	D6h	R/W	For Read commands: slave will return whether or not the IDS system is turned on. For Write commands: slave will power the system on or off according to the WRITE VALUE NOTE: This function will not work if the Host PC is an Elo IDS Computer Module NOTE: The system can be an IDS monitor by itself or an IDS monitor with integrated Computer Module.	IDS01/02: 00 01h (turn display on) 00 05h (turn display off) IDSx3: 01h (turn display on) 05h (turn display off)	05h: display is off 01h: display is on
Get Serial Numbers	E2h	R	All IDS systems connected to the bus report their serial number. This allows Host PC software to address unique IDS systems.	N/A – this field does not exist for this command	10 ASCII-coded hex bytes representing that specific display's 10-character serial number
Get Command Set	F3h	R	Addressable (by serial number) to only one connected system at a time. The slave reports the list of commands that its hardware supports.	N/A – this field does not exist for this command	A list of COMMAND TYPES supported by the slave, excluding the "Get Command Set" command. For example, if the slave system supports Get Command Set, Get Serial Numbers, Control System Power, and Control Touch Functionality, then this field would return 3 bytes: E2h D6h C7h

Command Reference

The following provides an example transaction between the host PC and IDS display.

Host PC Command:

Get Serial Numbers: 02 6E 83 FF 01 E2 D3 03

IDS Display Response:

Serial Number Response: 02 6E 8D 00 01 E2 48 31 31 43 30 32 31 39 30 32 F9 03

Notes about command timing:

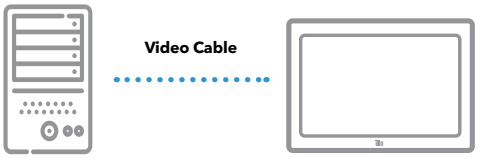
1. After issuing a GET SERIAL NUMBERS command, the Host PC should wait at least 5 seconds before issuing the next command. This should give all slaves on the bus enough time to respond.

2. After issuing any other command, the Host PC should wait at least 50ms before issuing the next command. This should give the addressed slave enough time to respond.

Contact the technical support center nearest you for more information on Elo IDS displays:

http://www.elotouch.com/Support/TechnicalSupport/tech.asp

Application Notes



DDC/Ci can communicate directly over the video channel.

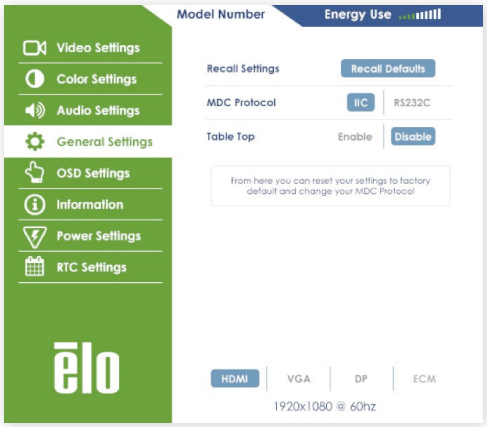
II. VESA DDC/CI Protocol

All EloTouchscreen Signage support the Eloview VESA DDC/ CI protocol. This provides device control/status via the monitor digital video interfaces (HDMI, VGA and DisplayPort). This protocol is employed by the Eloview Device Client but it can also be utilized to provide local custom applications as required.

Summary of Functions	Control	Monitor
Brightness	✓	✓
Contrast	✓	✓
Sharpness	✓	✓
Select Color Temperature	✓	✓
Adjust Red/Green/Blue Gain	✓	✓
Black Level of Red/Green/Blue	✓	✓
Auto Color	✓	✓
Save Color	✓	
Sub Contrast	✓	
Auto Adjustment	✓	✓
Adjust Horizontal/Vertical/Phase Position	✓	✓
Timing Index	✓	✓
Get Timing Request		✓
Adjust Clock	✓	✓
Aspect Ratio	✓	✓
Image Rotation		✓
Horizontal/Vertical Frequency		✓
Volume	✓	✓
Speaker Select	✓	✓
Audio Mute	✓	✓
New Control Value	✓	✓
Restore Factory Defaults	✓	
Power Mode	✓	✓
Touch Switch	✓	✓
Input Source	✓	✓
Ambient Light Sensor	✓	✓

Summary of Functions	Control	Monitor
OSD Enable	✓	✓
OSD Language	✓	✓
OSD Display Switch	✓	
Output Select	✓	✓
Temperature Value	✓	
Load Color Temperature Value	✓	
Factory Menu	✓	
Fan Status	✓	✓
Save User Setting	✓	
Save Monitor SN	✓	
Get Monitor SN		✓
Get/Save Monitor PN	✓	✓
Get/Save Touch SN	✓	✓
Get Serial Number		✓
Get Command Set		✓
System Temperature		✓
CPU Temperature		✓
Display Usage Time		✓
Alarm		✓
Flat Panel Type		✓
Monitor Type		✓
Display Controller Type		✓
Firmware Revision		✓
VCP Version		✓
Panel Name		✓
GPIO Control	✓	✓

Application Notes



OSD Setting

Open the OSD and in the General Settings, select the IIC connection under the MDC protocol in order to use the DDC/Ci commands.

For available commands, refer to the Elo App Note EloView Remote Management:

Any application that can send and receive VESA DDC/Ci commands can be used. Examples are the applications DisplayTune and softMCCS.

Command Set Format

The command set format used follows the VESA (Video Electronics Standards Association) Display Data Channel Command Interface (DDC/CI) Standard Version 2.

Command Reference

The following table provides Command Code definition with Elo defined data referenced in the description column.

Code	Code Name	Elo Usage	Code Type	Description
02h	New Control Value	New Value	R/W	Used to indicate that a display's user control(s) (excluding power control) has been used to change a control value. **Byte: SL** 00h – Reserved, must be ignored 01h – No new control value(s) 02h – One or more new control value(s) has been saved 03h → FEh – Reserved, must be ignored FFh – No user controls are present All changes made using the controls on the display must be reported even if these values have not been saved. The new control value must be reported to a host request for the current control value (i.e. a "GetVCP" command) A value = 02h must only be reset to a value = 01h by a host write operation and not by the display Support of this code is a mandatory requirement for compliance with MCCS standard Version 2 and higher
04h	Restore Factory Defaults	Recall default	W	Restore all factory presets including luminance / contrast, geometry, color and TV defaults. Any non-zero value causes defaults to be restored. A value of zero must be ignored.
05h	Restore Factory Luminance/ Contrast Defaults	Recall Factory Mode	W	Restores factory defaults for luminance and contrast adjustments. Any non-zero value causes defaults to be restored. A value of zero must be ignored.
06h	Restore Factory Geometry Defaults	Geometry Reset	W	Restore factory defaults for geometry adjustments. Any non-zero value causes defaults to be restored. A value of zero must be ignored.
07h	Get Timing Request	Get Timing Request	R	Get H Frequency and V Frequency Value H Frequency's unit : K Hz V Frequency's unit: Hz MHML: H frequency SHSL: V frequency Return 0x00 when no active display

<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>0Eh</td><td>Clock</td><td>Adjust Clock</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the video sampling clock frequency</td></tr>
<tr><td>10h</td><td>Luminance</td><td>Brightness</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the Luminance of the image.</td></tr>
<tr><td>12h</td><td>Contrast</td><td>Contrast</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the Contrast of the image.
Notes:
1) The actual range of contrast over which this control applies is defined by the manufacturer.
2) Care should be taken to avoid the situation where the contrast ratio approaches 0 … this may be non-recoverable since user will not be able to see the image.</td></tr>
<tr><td>14h</td><td>Select Color Preset</td><td>Select Color Temperature</td><td>R/W</td><td>Select a specified color temperature. This is a 2 byte value, the MH byte defines the tolerance associated with any preset … this is fixed by the display manufacturer. If no tolerance level is specified, the presets must be interpreted as relative values supporting a scale which can move to warmer (lower color temperature) or cooler (higher color temperature).

<table><tr><th colspan="2">Byte: MH</th></tr><tr><td>00h</td><td>No tolerance is specific, treat as relative scale.</td></tr><tr><td>01h</td><td>A tolerance of 1% is specified</td></tr><tr><td>02h</td><td>A tolerance of 2% is specified</td></tr><tr><td>03h</td><td>↓</td></tr><tr><td>09h</td><td>No user controls are present</td></tr><tr><td>0AH</td><td>A tolerance of 10% is specified</td></tr><tr><td>≥ 0Bh</td><td>Reserved, must be ignored</td></tr></table>
<table><tr><th colspan="3">SL</th></tr><tr><td></td><td>If MH byte ≠ 00h</td><td>If MH byte = 00h</td></tr><tr><td>00h</td><td>Reserved, must be ignored</td><td>Reserved, must be ignored</td></tr><tr><td>01h</td><td>sRGB</td><td>sRGB</td></tr><tr><td>02h</td><td>Display native</td><td>Display native</td></tr><tr><td>03h</td><td>4000 K</td><td>Warmer</td></tr><tr><td>04h</td><td>5000 K</td><td>↑</td></tr><tr><td>05h</td><td>6500 K</td><td>↑</td></tr><tr><td>06h</td><td>7500 K</td><td>|</td></tr><tr><td>07h</td><td>8200 K</td><td>|</td></tr><tr><td>08h</td><td>9300 K</td><td>↓</td></tr><tr><td>09h</td><td>10000 K</td><td>↓</td></tr><tr><td>0Ah</td><td>11500 K</td><td>Cooler</td></tr><tr><td>0Bh</td><td>User 1</td><td>User 1</td></tr><tr><td>0Ch</td><td>User 2</td><td>User 2</td></tr><tr><td>0Dh</td><td>User 3</td><td>User 3</td></tr><tr><td>≥ 0Eh</td><td>Reserved, must be ignored</td><td>Reserved, must be ignored</td></tr></table></td></tr>
<tr><td>16h</td><td>Video Gain (Drive): Red</td><td>Adjust Red Gain</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the luminance of red pixels.
The value returned must be an indication of the actual red gain at the current color temperature and not be normalized.
Elo defined: If enter factory menu, maximum value will be 0xFF.</td></tr>
<tr><td>18h</td><td>Video Gain (Drive): Green</td><td>Adjust Green Gain</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the luminance of green pixels.
The value returned must be an indication of the actual green gain at the current color temperature and not be normalized.
Elo defined: If enter factory menu, maximum value will be 0xFF.</td></tr>
<tr><td>1Ah</td><td>Video Gain (Drive): Blue</td><td>Adjust Blue Gain</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the luminance of blue pixels.
The value returned must be an indication of the actual blue gain at the current color temperature and not be normalized.
Elo defined: If enter factory menu, maximum value will be 0xFF.</td></tr>
</table>

Command Reference

The following table provides Command Code definition with Elo defined data referenced in the description column.

<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>1Eh</td><td>Auto Setup</td><td>Auto Adjustment</td><td>R/W</td><td>Perform auto setup function (H/V position, clock, clock phase, A/D converter, etc)
<table><tr><th>Byte: SL</th><th></th></tr><tr><td>00h</td><td>Auto setup is not active</td></tr><tr><td>01h</td><td>Perform / performing auto setup</td></tr><tr><td>02h</td><td>Enable continues / periodic auto setup</td></tr><tr><td>≥ 03h</td><td>Reserved, must be ignored</td></tr></table>Note: A value of ‘02h’ (when supported) must cause the display to either continuously or periodically (event or timer driven) perform an auto setup. Cancel by writing a value of either ‘01h’ or ‘00h’.</td></tr>
<tr><td>20h</td><td>Horizontal Position (Phase)</td><td>Adjust Horizontal Position</td><td>R/W</td><td>Increasing (decreasing) this value moves the image toward the right (left) side of the display.</td></tr>
<tr><td>30h</td><td>Vertical Position (Phase)</td><td>Adjust Vertical Position</td><td>R/W</td><td>Increasing (decreasing) this value moves the image toward the top (bottom) edge of the display.</td></tr>
<tr><td>3Eh</td><td>Clock Phase</td><td>Adjust Phase Position</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the phase shift of the sampling clock.</td></tr>
<tr><td>60h</td><td>Input Source</td><td>Input Source</td><td>R/W</td><td>A one byte write/read (Byte 0), allows the host to set (write) one and only one input as ‘the source’ and identify (read) the current input setting.
<table><tr><th>Byte: SL</th><th></th></tr><tr><td>0x01</td><td>VGA</td></tr><tr><td>0x0F</td><td>External Display Port</td></tr><tr><td>0x10</td><td>ECM-DP</td></tr><tr><td>0x11</td><td>ExternalHDMI-1</td></tr><tr><td>0x12</td><td>External HDMI-2</td></tr><tr><td>0x13</td><td>ECM-HDMI</td></tr><tr><td>0x05</td><td>USB-C</td></tr><tr><td>0x06</td><td>USB-C</td></tr></table></td></tr>
<tr><td>62h</td><td>Audio: Speaker Volume</td><td>Volume Adjust R/W</td><td>R/W</td><td>Allows the volume to be adjusted.
<table><tr><th>Byte: SL</th><th></th></tr><tr><td>00h</td><td>Fixed (default) level</td></tr><tr><td>01h→FEh</td><td>Volume level</td></tr><tr><td>FFh</td><td>Mute</td></tr></table>Note:
The level will increase from a minimum at a value = 01h to a maximum at a value = FEh</td></tr>
<tr><td>63h</td><td>Speaker Select</td><td>Speak Select</td><td>R/W</td><td>Allows a “pair” (may be physically more than two speakers) of speakers to be selected.
<table><tr><th>Byte: SL</th><th></th></tr><tr><td>00h</td><td>Fixed (default) level</td></tr><tr><td>01h</td><td>Volume level</td></tr><tr><td>02h</td><td>Mute</td></tr><tr><td>03h</td><td>Center / Sub woofer</td></tr><tr><td>04h→FFH</td><td>Reserved, must be ignored</td></tr></table></td></tr>
<tr><td>66h</td><td>Ambient Light Sensor</td><td>Ambient Light Sensor</td><td>R/W</td><td>Used to control the action of an ambient light sensor.
<table><tr><th>Byte: SL</th><th>Definitions</th></tr><tr><td>00h</td><td>Reserved, must be ignored</td></tr><tr><td>01h</td><td>Ambient light sensor is disabled</td></tr><tr><td>02h</td><td>Ambient light sensor is enabled</td></tr><tr><td>≥ 03h</td><td>Reserved, must be ignored</td></tr></table></td></tr>
<tr><td>6Ch</td><td>Video Black Level: Red</td><td>Black level of Red</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the black level of the red video.</td></tr>
<tr><td>6Eh</td><td>Video Black Level: Green</td><td>Black level of Green</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the black level of the green video.</td></tr>
<tr><td>70h</td><td>Video Black Level: Blue</td><td>Black level of Blue</td><td>R/W</td><td>Increasing (decreasing) this value will increase (decrease) the black level of the blue video.</td></tr>
<tr><td>87h</td><td>Sharpness</td><td>Sharpness</td><td>R/W</td><td>Allows one of a range of algorithms to be selected to suit the type of image being displayed and/or personal preference.
Increasing (decreasing) the value must increase (decrease) the edge sharpness of image features.</td></tr>
<tr><td>87h</td><td>Sharpness</td><td>Sharpness</td><td>R/W</td><td>Allows one of a range of algorithms to be selected to suit the type of image being displayed and/or personal preference.
Increasing (decreasing) the value must increase (decrease) the edge sharpness of image features.</td></tr>
</table>

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<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>8Dh</td><td>Audio Mute</td><td>Audio Mute</td><td>R/W</td><td>Provides for the audio to be muted or unmuted.
<table><tr><th colspan="2">Byte: SL</th></tr><tr><td>00h</td><td>Reserved, must be ignored</td></tr><tr><td>01h</td><td>Mute the audio</td></tr><tr><td>02h</td><td>Unmute the audio</td></tr><tr><td>≥ 03h</td><td>Reserved, must be ignored</td></tr></table></td></tr>
<tr><td>AAh</td><td>Screen Orientation</td><td>Image Rotation</td><td>R</td><td>Indicates the orientation of the screen. Byte:
<table><tr><th colspan="3">Byte: SL</th></tr><tr><td>00h</td><td>Reserved</td><td>Shall be ignored</td></tr><tr><td>01h</td><td>0 degrees</td><td>The normal landscape mode</td></tr><tr><td>02h</td><td>90 degrees</td><td>Portrait mode achieved by clockwise rotation of the display 90 degrees</td></tr><tr><td>03h</td><td>180 degrees</td><td>Landscape mode achieved by rotation of the display 180 degrees</td></tr><tr><td>04h</td><td>270 degrees</td><td>Portrait mode achieved by clockwise rotation of the display 270 degrees</td></tr><tr><td>05h→FEh</td><td>Reserved</td><td>Shall be ignored</td></tr><tr><td>FFh</td><td>Not applicable</td><td>Indicates that the display cannot supply the current orientation</td></tr></table>Note: “Clockwise rotation” when viewing the display from user’s viewpoint.</td></tr>
<tr><td>ACh</td><td>Horizontal Frequency</td><td>Horizontal Frequency</td><td>R</td><td>Horizontal synchronization signal frequency in Hz as determined by the display.
MH = ML = SH = SL = FFh: Indicates that the display cannot determine the frequency or it is out of range.
Example:
A reported value of 01h, 21h, 10h indicates a Hz frequency of 74.0KHz (nominal for 1920 x 1200 @ 60Hz reduced blanking)</td></tr>
<tr><td>ADh</td><td>FAN Status</td><td>FAN Status</td><td>R/W</td><td>00: Turn off Fan function
01: Turn on Fan function with min Fan speed
02: Turn on Fan function with Max Fan speed
FF: N/A</td></tr>
<tr><td>AEh</td><td>Vertical Frequency</td><td>Vertical Frequency</td><td>R</td><td>Vertical synchronization signal frequency in 0.01Hz as determined by the display.
MH = ML = SH = SL = FFh: Indicates that the display cannot determine the frequency or it is out of range.
Example:
A reported value of 17h, 7Ah indicates a Hz frequency of 60.1Hz.</td></tr>
<tr><td>B0h</td><td>Setting</td><td>Save User Setting</td><td>W</td><td>Store / Restore the user saved values for current mode.
<table><tr><th colspan="2">Byte: SL</th></tr><tr><td>01h</td><td>Store current settings in the monitor</td></tr><tr><td>02h</td><td>Restore factory defaults for current mode. If not factory defaults then restore user values for current mode</td></tr></table>All other values are reserved and must be ignored.</td></tr>
<tr><td>B1h</td><td>System Temp</td><td>System Temp</td><td>R</td><td>Return the temperature of Video board</td></tr>
<tr><td>B2h</td><td>Flat Panel sub-pixel Layout</td><td>Flat Panel Type</td><td>R</td><td>Indicates the type of LCD sub-pixel structure.
<table><tr><th colspan="2">Byte: SL</th></tr><tr><td>00h</td><td>Sub-pixel layout is not defined</td></tr><tr><td>01h</td><td>Red / Green / Blue vertical stripe</td></tr><tr><td>02h</td><td>Red / Green / Blue horizontal stripe</td></tr><tr><td>03h</td><td>Red / Green / Blue vertical stripe</td></tr><tr><td>04h</td><td>Red / Green / Blue horizontal stripe</td></tr><tr><td>05h</td><td>Quad - pixel, a 2x2 sub-pixel structure with red at top left, blue at bottom right and green at top right and bottom left</td></tr><tr><td>06h</td><td>Quad-pixel, a 2x2 sub-pixel structure with red at bottom left, blue at top right and green at top left and bottom right</td></tr><tr><td>07h</td><td>Delta (triad)</td></tr><tr><td>08h</td><td>Mosaic with interleaved subpixels of different colors</td></tr><tr><td>≥ 09h</td><td>Reserved, must be ignored</td></tr></table></td></tr>
<tr><td>B3h</td><td>CPU Temp</td><td>CPU Temp</td><td>W</td><td>Return the temperature of CPU</td></tr>
</table>

<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>B4h</td><td>Sourcing Timing Mode</td><td>Timing Index</td><td>R/W</td><td>Indicates the timing mode being sent by the host.
This command has a 5 byte data structure:
Byte 0: flags for DMT timing modes
Byte 1: flags for DTV timing modes
Bytes 2 – 4: CVT descriptor bytes
Note: Only one Timing Mode must be indicated, any combination with more than a single Timing Mode identified is invalid and must be ignored.
Note: ‘RB’ in following table indicates ‘reduced blanking’ as defined by the VESA CVT standard
Note: The aspect ratio (AR) identified in the following table is the physical aspect ratio of the image.

The following describes the contents of the 3 byte CVT descriptor, this is correct at the time of writing but for complete description and to verify accuracy the user should verify using the latest revision of the VESA VTBEXT standard. If the CVT descriptor is not being used then the three bytes must be set to 00h.</td></tr>
<tr><td>B6h</td><td>Display Technology Type</td><td>Monitor Type</td><td>R</td><td>Indicates the base technology type.
Caution: Care should be taken that the information declared by this code is consistent with that provided elsewhere within the same display by DisplayID or EDID.
<table><tr><th colspan="2">Byte: SL</th></tr><tr><td>00_b</td><td>Reserved, must be ignored</td></tr><tr><td>01_b</td><td>CRT (shadow mask)</td></tr><tr><td>02_b</td><td>CRT (aperture grill)</td></tr><tr><td>03_b</td><td>LCD (Active matrix)</td></tr><tr><td>04_b</td><td>LCoS</td></tr><tr><td>05_b</td><td>Plasma</td></tr><tr><td>06_b</td><td>OLED</td></tr><tr><td>07_b</td><td>EL</td></tr><tr><td>08_b</td><td>Dynamic MEM eg iMOD</td></tr><tr><td>09_b</td><td>Static MEM e.g. iMOD</td></tr><tr><td>$\geq 0A_b$</td><td>Reserved, must be ignored</td></tr></table></td></tr>
<tr><td>B6h</td><td>Display Technology Type</td><td>Monitor Type</td><td>R</td><td>Indicates the base technology type.
Caution: Care should be taken that the information declared by this code is consistent with that provided elsewhere within the same display by DisplayID or EDID.
<table><tr><th colspan="2">Byte: SH Technology Implementation</th></tr><tr><td>00_b</td><td>Reserved, must be ignored</td></tr><tr><td>01_b</td><td>Direct View CRT</td></tr><tr><td>02_b</td><td>Direct View Flat Panel</td></tr><tr><td>03_b</td><td>Projection Rear</td></tr><tr><td>04_b</td><td>Projection Front</td></tr><tr><td>05_b</td><td>Glasses Mono</td></tr><tr><td>06_b</td><td>Glasses Stereo</td></tr><tr><td>$\geq 07_b$</td><td>Reserved, must be ignored</td></tr></table>
<table><tr><th colspan="2">Byte: ML</th></tr><tr><td>$>00_b$</td><td>Reserved, must be ignored</td></tr></table>
<table><tr><th colspan="2">Byte: MH</th></tr><tr><td>$>00_b$</td><td>Reserved, must be ignored</td></tr></table></td></tr>
<tr><td>C0h</td><td>Display Usage Time</td><td>Information</td><td>R</td><td>Returns the current value (in hours) of ‘active power on’ time accumulated by the display in the ML, SH and SL bytes. The MH byte must be set to 00h.
‘Active power on’ time is defined as the period when the emissive elements(s) of the display – cathodes for a CRT, fluorescent lamps for a LCD, etc – are active.
Elo Define:
MH/ML: Total on time, from 0 to 65535 hrs
SH/SL: Back Light on time, From 0 to 65535 hrs</td></tr>
<tr><td>C7h</td><td>Touch Switch</td><td>Touch Switch</td><td>R/W</td><td>00: Turn off Touch function
01: Turn on Touch function</td></tr>
</table>

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<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>C8h</td><td>Display Controller Type</td><td>Display Controller Type</td><td>R</td><td>This VCP code will provide the host with knowledge of the controller type being used by a particular display which will enable a table based approach (by applications) to what features may be available on attached display.
SL byte : Indicates controller manufacturer
ML and SH bytes : Provide a numeric indication of controller type
Notes:
1. Each controller manufacturer supporting this command is required to publish and maintain an equivalence table between the actual product identifier (alpha-numeric marketing identifier) and the simple numerical value here.
2. A host application would use the combination of data from MH, ML and SH bytes to uniquely identify a particular controller.
<table>
<tr><th colspan="2">SL Byte</th></tr>
<tr><td>01h</td><td>Conexant</td></tr>
<tr><td>02h</td><td>Genesis Microchip</td></tr>
<tr><td>03h</td><td>Macronix</td></tr>
<tr><td>04h</td><td>MRT (Media Reality Technologies)</td></tr>
<tr><td>05h</td><td>Mstar Semiconductor</td></tr>
<tr><td>06h</td><td>Myson</td></tr>
<tr><td>07h</td><td>Philips</td></tr>
<tr><td>08h</td><td>PixelWorks</td></tr>
<tr><td>09h</td><td>RealTek Semiconductor</td></tr>
<tr><td>0Ah</td><td>Sage</td></tr>
<tr><td>0Bh</td><td>Silicon Image</td></tr>
<tr><td>0Ch</td><td>SmartASIC</td></tr>
<tr><td>0Dh</td><td>STMicroelectronics</td></tr>
<tr><td>0Eh</td><td>Topro</td></tr>
<tr><td>0Fh</td><td>Trumpion</td></tr>
<tr><td>10h</td><td>Welltrend</td></tr>
<tr><td>11h</td><td>Samsung</td></tr>
<tr><td>12h</td><td>Novatek Microelectronics</td></tr>
<tr><td>13h</td><td>STK</td></tr>
<tr><td>14h→FEh</td><td>Reserved, must be ignored</td></tr>
<tr><td>FFh</td><td>Not defined - a manufacturer designed controller</td></tr>
</table>
Please check the MCCS_UP.pdf document on the VESA website for any extensions to this list.</td></tr>
<tr><td>C9h</td><td>Display Firmware Level</td><td>Firmware Revision</td><td>R</td><td>This VCP code results in two bytes of data being sent by the display.
SH byte: defines the firmware version number
SL byte: defines the firmware revision number
e.g. 03h, 05h defines a firmware level of 3.5</td></tr>
<tr><td>CAh</td><td>OSD</td><td>OSD Enable</td><td>R/W</td><td>Indicates the current state of the display OSD
<table>
<tr><th colspan="2">Byte: SL</th></tr>
<tr><td>00h</td><td>Reserved, must be ignored</td></tr>
<tr><td>01h</td><td>OSD is disabled</td></tr>
<tr><td>02h</td><td>OSD is enabled</td></tr>
<tr><td>7Fh→FEh</td><td>Reserved, must be ignored</td></tr>
<tr><td>FFh</td><td>Indicated that the display cannot supply this information</td></tr>
</table></td></tr>
<tr><td>CCh</td><td>OSD Language</td><td>OSD Language</td><td>R/W</td><td>Allows the display OSD language to be selected.
<table>
<tr><th colspan="2">Byte: SL</th></tr>
<tr><td>00h</td><td>Reserved, must be ignored</td></tr>
<tr><td>01h</td><td>Chinese (traditional / Hantai)</td></tr>
<tr><td>02h</td><td>English</td></tr>
<tr><td>03h</td><td>French</td></tr>
<tr><td>04h</td><td>German</td></tr>
<tr><td>05h</td><td>Italian</td></tr>
<tr><td>06h</td><td>Japanese</td></tr>
<tr><td>07h</td><td>Korean</td></tr>
<tr><td>09h</td><td>Russian</td></tr>
<tr><td>0Ah</td><td>Spanish</td></tr>
<tr><td>0Dh</td><td>Chinese (simplifies / kantai)</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>D0h</td><td>Output Select</td><td>Output Select</td><td>R/W</td><td>
Data size: Write = 4 bytes / Read = 8 bytes
A possible value is selected by setting the corresponding bit = 1.
Note: Setting more than one bit = 1 is invalid and must be ignored by the display.
Used to select the active video output.
<table>
<tr><th colspan="2">Byte 0</th></tr>
<tr><td>Bit 7</td><td>Analog Video (R/G/B) #1</td></tr>
<tr><td>Bit 6</td><td>Analog Video (R/G/B) #2</td></tr>
<tr><td>Bit 5</td><td>Digital Video (TMDS) #1</td></tr>
<tr><td>Bit 4</td><td>Digital Video (TMDS) #2</td></tr>
<tr><td>Bit 3</td><td>Composite Video #1</td></tr>
<tr><td>Bit 2</td><td>Composite Video #2</td></tr>
<tr><td>Bit 1</td><td>S-video #1</td></tr>
<tr><td>Bit 0</td><td>S-video #2</td></tr>
</table>
<table>
<tr><th colspan="2">Byte 1</th></tr>
<tr><td>Bit 7</td><td>Turner - Analog #1</td></tr>
<tr><td>Bit 6</td><td>Turner - Analog #2</td></tr>
<tr><td>Bit 5</td><td>Turner - Digital #1</td></tr>
<tr><td>Bit 4</td><td>Turner - Digital #2</td></tr>
<tr><td>Bit 3</td><td>Component Video (YPrPb / YCrCb) #1</td></tr>
<tr><td>Bit 2</td><td>Component Video (YPrPb / YCrCb) #2</td></tr>
<tr><td>Bit 1</td><td>Component Video (YPrPb / YCrCb) #3</td></tr>
<tr><td>Bit 0</td><td>Reserved, must be ignored</td></tr>
</table>
<table>
<tr><th colspan="2">Byte 2</th></tr>
<tr><td>Bit 7</td><td>Digital Video (DisplayPort) #1</td></tr>
<tr><td>Bit 6</td><td>Digital Video (DisplayPort) #2</td></tr>
<tr><td>Bit 5→0</td><td>Reserved, must be ignored</td></tr>
</table>
<table>
<tr><th colspan="2">Byte 3</th></tr>
<tr><td>Bit 7→0</td><td>Reserved, must be ignored</td></tr>
</table>
</td></tr>
<tr><td>D6h</td><td>Power Mode</td><td>Power Status</td><td>R/W</td><td>
Power Mode – DPM & DPMS standards are supported along with other power function(s).
<table>
<tr><th>SL byte</th><th>DPM</th><th>DPMS</th></tr>
<tr><td>00h</td><td colspan="2">Reserved, must be ignored</td></tr>
<tr><td>01h</td><td>On</td><td>On</td></tr>
<tr><td>02h</td><td>Off</td><td>Standby</td></tr>
<tr><td>03h</td><td>Off</td><td>Suspend</td></tr>
<tr><td>04h</td><td>Off</td><td>Off</td></tr>
<tr><td colspan="3">Item(s) below are not part of the DPM or SPMS Standards</td></tr>
<tr><td>05h</td><td colspan="2">Power off the display - functionally equivalent to turning off power using the "power button"</td></tr>
<tr><td>≤06h</td><td colspan="2">Reserved, must be ignored</td></tr>
</table>
Note 1: Following a MCCS command with a value of 01h 04h, the display must respond to the appropriate DPM(or DPMS) protocols.
Note 2: Following a MCCS command with a value of 05h, user intervention at the display (pressing / toggling the power switch) may be required to restore operation.
Elo Define: 00 or >=6: No actived; 01: Power on; 02: Sleep mode; 04: Power off; 05: BL off (PC box and System still work)
</td></tr>
</table>

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<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>DBh</td><td>Image Mode</td><td>Aspect to Ratio</td><td>R/W</td><td>Controls aspects of the displayed image.
Note: This VCP code is intended for use with TV applications.
<table>
<tr><th>Byte: SL</th><th>Name</th><th>Description</th></tr>
<tr><td>00h</td><td></td><td>No effect</td></tr>
<tr><td>01h</td><td>Full mode</td><td>Linear expansion (compression) of the image on horizontal axis</td></tr>
<tr><td>02h</td><td>Zoome mode</td><td>Linear expansion (compression) of the image on horizontal and vertical axis</td></tr>
<tr><td>03h</td><td>Squeeze mode</td><td>Display all of the image content on visible screen. May result in unused areas a of visible screen... bars at top, bottom or sides.</td></tr>
<tr><td>04h</td><td>Variable</td><td>Display all of the image content by applying non-linear expansion (compression) to the horizontal axis.</td></tr>
<tr><td>≥05h</td><td></td><td>Reserved, must be ignored</td></tr>
</table>
Note: a more complete description of these modes may be found in the VESA DI-EXT standard.</td></tr>
<tr><td>DFh</td><td>VCP Version</td><td>VCP Version</td><td>R</td><td>Defines the version number of the MCCS standard recognized by the display.
SH byte: defines the MCCS version number
SL byte: defines the MCCS revision number
e.g. 03h 00h defines a MCCS level of 3.0 (this standard)
Note: Support of this code is a mandatory requirement for compliance with MCCS standard Version 2 and higher.</td></tr>
<tr><td>EAh</td><td>Alarm</td><td>Alarm</td><td>R</td><td>00: No alarm
01: No support alarm sensor
02: Temp over spec
03: BL breakdown
04: Fan stop</td></tr>
<tr><td>E3h</td><td>Auto Color</td><td>Auto Color</td><td>W/R</td><td>01: Do Auto Color
Return Result Value:
Success :6E_51_E3_02_01_Chksum
Failure: 6E_51_E3_03_01_Chksum</td></tr>
<tr><td>E5h</td><td>Save Color Temperature Value</td><td>Save Color Temperature Value</td><td>W</td><td></td></tr>
<tr><td>E8h</td><td>OSD Display on/off</td><td>OSD Display</td><td>W</td><td>01: On
00: Off</td></tr>
<tr><td>E6h</td><td>Load Color Temperature Value</td><td>Load Color Temperature Value</td><td>W</td><td></td></tr>
<tr><td>F2h</td><td>Factory Menu</td><td>Factory Menu</td><td>W</td><td></td></tr>
<tr><td>F3h</td><td>Get Command Set</td><td>Get Command Set</td><td>R</td><td>Get Command Set</td></tr>
<tr><td>F4h</td><td>Get Monitor SN (1-4bytes) VCP String</td><td>Get Monitor SN (1-4bytes)</td><td>R</td><td>MH & ML : Serial Number 1 byte and 2 byte
SH & SL : Serial Number 3 byte and 4 byte</td></tr>
<tr><td>F5h</td><td>Get Monitor SN (5-8bytes) VCP String</td><td>Get Monitor SN (5-8bytes)</td><td>R</td><td>MH & ML : Serial Number 5 byte and 6 byte
SH & SL : Serial Number 7 byte and 8 byte</td></tr>
<tr><td>F6h</td><td>Get Monitor SN (9-10bytes) VCP String</td><td>Get Monitor SN (9-10bytes)</td><td>R</td><td>MH & ML : Serial Number 9 byte and 10 byte
SH & SL : 20h and 20h (ASCII Code: space)</td></tr>
<tr><td>F9h</td><td>Sub Contrast</td><td>Sub Contrast</td><td>W</td><td></td></tr>
<tr><td>EC</td><td>Panel Name</td><td>Panel Name</td><td>R</td><td>MH ML :0x00 0xFF
SH SL : 0x00 Panel ID</td></tr>
<tr><td>F0h</td><td>Save Monitor SN</td><td>Save Monitor SN</td><td>W</td><td>Save Monitor Serial Number
Write Monitor SN : 6E_51_8F_F0_Chr1_Chr2_Chr3_..._Chr13_Chr14_ Checksum
*The length of command depends on how long the SN is, the Maximum length is 14.</td></tr>
<tr><td>E1h</td><td>Get/Save Touch SN</td><td>Get/Save Touch SN</td><td>W/R</td><td>Get Touch Serial Number
Save:
6E_51_8F_E1_Chr1_Chr2_Chr3_..._Chr14_Checksum + Stop
Read:
// Get VCP: S_6E_51_82_01_(E1)_CHK_P
// Reply: S_6F_6E_90_02_(E1)_Dat1_Dat2_Dat3_Dat4_Dat5_Dat6_Dat7_ Dat8_Dat9_Dat10_ Dat11_Dat12_Dat13_Dat14_Chk
*The length of command depends on how long the SN is, the Maximum length is 14.</td></tr>
<tr><td>E2h</td><td>Get Serial Number</td><td>Get Serial Number</td><td>R</td><td>Get Serial Number
Read:
// Get VCP: S_6E_51_82_01_(E2)_CHK_P
// Reply: S_6F_6E_90_02_(E2)_Dat1_Dat2_Dat3_Dat4_Dat5_Dat6_Dat7_ Dat8_Dat9_Dat10_ Dat11_Dat12_Dat13_Dat14_Chk
*The length of command depends on how long the SN is, the Maximum length is 14.</td></tr>
</table>

<table>
<tr><th>Code</th><th>Code Name</th><th>Elo Usage</th><th>Code Type</th><th>Description</th></tr>
<tr><td>E9h</td><td>Get/Save Monitor PN</td><td>Get/Save Monitor PN</td><td>W/R</td><td>Get Touch Serial Number
Save:
6E_51_8F_E9_Chr1_Chr2_Chr3_..._Chr7_Checksum + Stop
Read:
// Get VCP: S_6E_51_82_01_(E9)_CHK_P
// Reply: S_6F_6E_89_02_(E9)_Dat1_Dat2_Dat3_Dat4_Dat5_Dat6_Dat7_Chk
*The length of command depends on how long the SN is, the Maximum length is 7.</td></tr>
<tr><td>EFh</td><td>GPIO Control</td><td>Control the GPIO</td><td>W</td><td>
<table>
<tr><th colspan="2">Byte 1</th></tr>
<tr><td>Bit 7</td><td>Set GPIO1 as output</td></tr>
<tr><td>Bit 6</td><td>Set GPIO1 as input</td></tr>
<tr><td>Bit 5</td><td>Output GPIO1 as High level</td></tr>
<tr><td>Bit 4</td><td>Output GPIO1 as Low level</td></tr>
<tr><td>Bit 3</td><td>Start to do GPIO1 High to Low detection (It will also clear High to Low records.)</td></tr>
<tr><td>Bit 2</td><td>Start to do GPIO1 Low to High detection (It will also clear Low to High records.)</td></tr>
<tr><td>Bit 1</td><td>Reserve for other function.</td></tr>
<tr><td>Bit 0</td><td>Reserve for other function.</td></tr>
</table>
<table>
<tr><th colspan="2">Byte 2</th></tr>
<tr><td>Bit 7</td><td>Set GPIO2 as output</td></tr>
<tr><td>Bit 6</td><td>Set GPIO2 as input</td></tr>
<tr><td>Bit 5</td><td>output GPIO2 as High level</td></tr>
<tr><td>Bit 4</td><td>output GPIO2 as Low level</td></tr>
<tr><td>Bit 3</td><td>Start to do GPIO2 High to Low detection (It will also clear High to Low records.)</td></tr>
<tr><td>Bit 2</td><td>Start to do GPIO2 Low to High detection (It will also clear Low to High records.)</td></tr>
<tr><td>Bit 1</td><td>Reserve for other function.</td></tr>
<tr><td>Bit 0</td><td>Reserve for other function.</td></tr>
</table>
<table>
<tr><th colspan="2">GPIO1</th></tr>
<tr><td>Bit 15</td><td>Current GPIO1 has been set as output pin</td></tr>
<tr><td>Bit 14</td><td>Current GPIO1 has been set as input pin</td></tr>
<tr><td>Bit 13</td><td>GPIO1 current output pin status is High level</td></tr>
<tr><td>Bit 12</td><td>GPIO1 current output pin status is Low level</td></tr>
<tr><td>Bit 11</td><td>“High to Low” detecting function of GPIO1 is enabled</td></tr>
<tr><td>Bit 10</td><td>“High to Low” detecting function of GPIO1 is disabled</td></tr>
<tr><td>Bit 9</td><td>“Low to High” detecting function of GPIO1 is enabled</td></tr>
<tr><td>Bit 8</td><td>“Low to High” detecting function of GPIO1 is disabled</td></tr>
<tr><td>Bit 7</td><td>Bit7 – Bit4 : to read how many times , the “High to Low” status has ever happened on GPIO1.</td></tr>
<tr><td>Bit 6</td><td>(Value range of record: Max.=15 , Min.=0)</td></tr>
<tr><td>Bit 3</td><td>Bit3 – Bit0 : to read how many times , the “Low to High” status has ever happened on GPIO1.</td></tr>
<tr><td>Bit 2</td><td>(Value range of record: Max.=15 , Min.=0)</td></tr>
</table>
<table>
<tr><th colspan="2">GPIO2</th></tr>
<tr><td>Bit 15</td><td>Current GPIO2 has been set as output pin</td></tr>
<tr><td>Bit 14</td><td>Current GPIO2 has been set as input pin</td></tr>
<tr><td>Bit 13</td><td>GPIO2 current output pin status is High level</td></tr>
<tr><td>Bit 12</td><td>GPIO2 current output pin status is Low level</td></tr>
<tr><td>Bit 11</td><td>“High to Low” detecting function of GPIO2 is enabled</td></tr>
<tr><td>Bit 10</td><td>“High to Low” detecting function of GPIO2 is disabled</td></tr>
<tr><td>Bit 9</td><td>“Low to High” detecting function of GPIO2 is enabled</td></tr>
<tr><td>Bit 8</td><td>“Low to High” detecting function of GPIO2 is disabled</td></tr>
<tr><td>Bit 7</td><td>Bit7 – Bit4 : to read how many times , the “High to Low” status has ever happened on GPIO2.</td></tr>
<tr><td>Bit 6</td><td>(Value range of record: Max.=15 , Min.=0)</td></tr>
<tr><td>Bit 3</td><td>Bit3 – Bit0 : to read how many times , the “Low to High” status has ever happened on GPIO2.</td></tr>
<tr><td>Bit 2</td><td>(Value range of record: Max.=15 , Min.=0)</td></tr>
</table>
</td></tr>
</table>

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