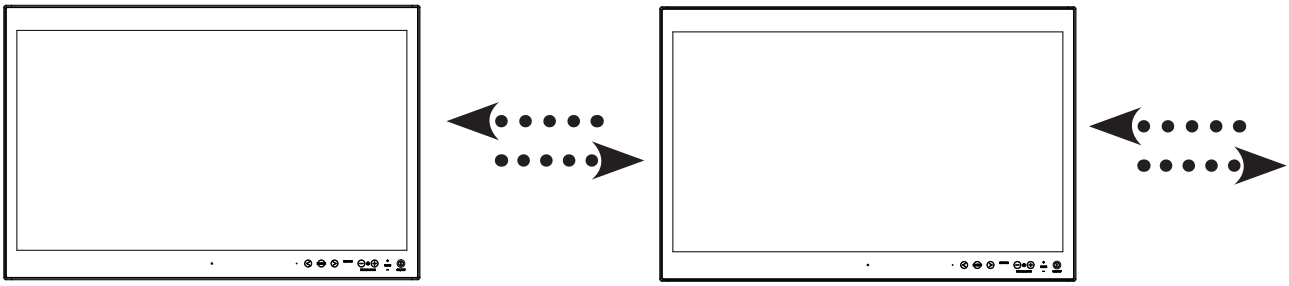
HATTELAND®
DISPLAY
an EMBRON Company

TECHNICAL MANUAL



Serial/Ethernet/USB Communication Control Interface (SCOM)

Applies for Series X G2 Maritime Multi Display (MMD) product range:

HD 15T22 MMD-xxx-xxxx
HD 17T22 MMD-xxx-xxxx
HD 19T22 MMD-xxx-xxxx
HD 24T22 MMD-xxx-xxxx
HD 26T22 MMD-xxx-xxxx

Series X Multi Vision Display (MVD) product range

HD 32T22 MVD-xxx-xxxx
HD 55T22 MVD-xxx-xxxx

Technical Manual SCOM Series X MMD G2 & MVD Series	
Updated: 08 Jan 2018	Doc Id: INB100018-6 (Rev 04)
Created: 6644/363 Approved: 6644	

Please visit www.hatteland-display.com for the latest electronic version of this manual.

Hatteland Display AS, Eikeskogvegen 52, N-5570 Aksdal, Norway
Tel: (+47) 4814 2200 - mail@hatteland-display.com - www.hatteland-display.com

WARNING: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Last revised 6 Jan 2015

Contents

Contents

Serial/Ethernet/USB Communication (SCOM) Interface

Introduction

This document defines the electrical interface, serial data format, and communication protocols of the Serial Communication Control Interface (SCOM). The purpose of this interface is to enable a computer application to control one or more units. Unit refer to display product.

Serial / USB Interface Configuration

The serial / USB interface can have different configurations, selected by the OSD menu. The configurations is defined as follows:

RS-232	One computer controls one unit, no individual address
USB	One computer controls one unit, no individual address
4-wire RS-485/RS-422	One computer controls max 16 units, each with individual address.
2-wire RS-485	One computer controls max 16 units, each with individual address.

Each unit will be assigned with an address value before it is connected to a shared RS485/422 network. The user application (PC) can send the message to the specific unit by marking the message with corresponding address number. The unit which has the matching address will respond immediately, while the others keep silent.

Broadcast commands will be processed by all linked units simultaneously once the last byte of the message is received. In order to avoid confliction on bus, each unit should respond back at different times. As the units are working independently, they can hardly know how many units are linked in the same bus. In this case, the interval between receiving message and responding back should be calculated in the base of their own address. The lowest addressed unit will respond first.

To calculate the address based interval, there is a formula to calculate the interval (Te):

Te = (Tr +Lr) * N, where
Lr = length of the ACK/NAK message response
Tr = Response time
N = the total number of monitors

Response time Tr is a fixed value which are calculated to make sure there is no conflict on the bus. Principally, Tr is equivalent to 2.5 byte periods after the last byte of a command message is received. However, due to the difference in microcontroller clock, all the units may not finish the message receive at the same timing point. So the Tr should be calculated based on the jitter changes.

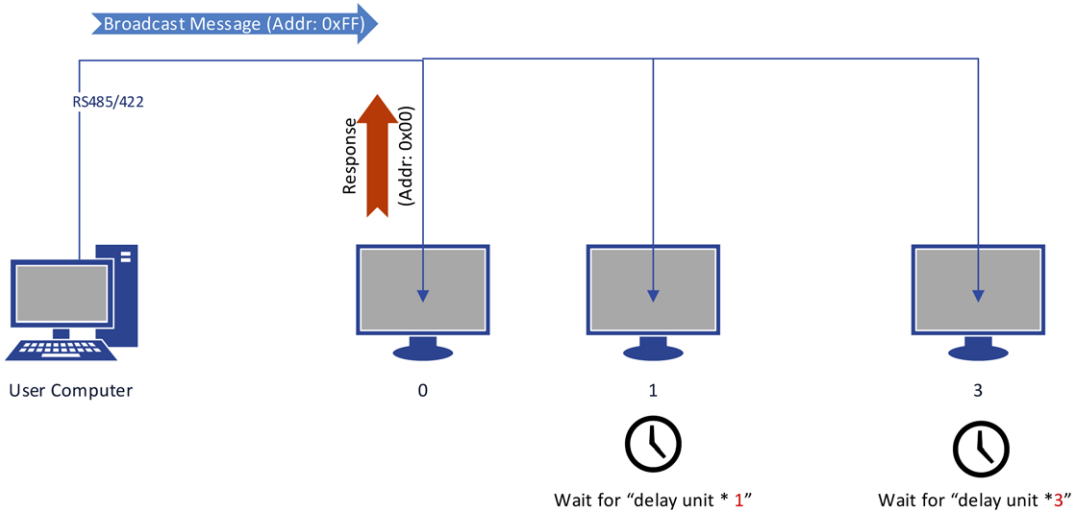


Illustration: Broadcast Message: Timing 1

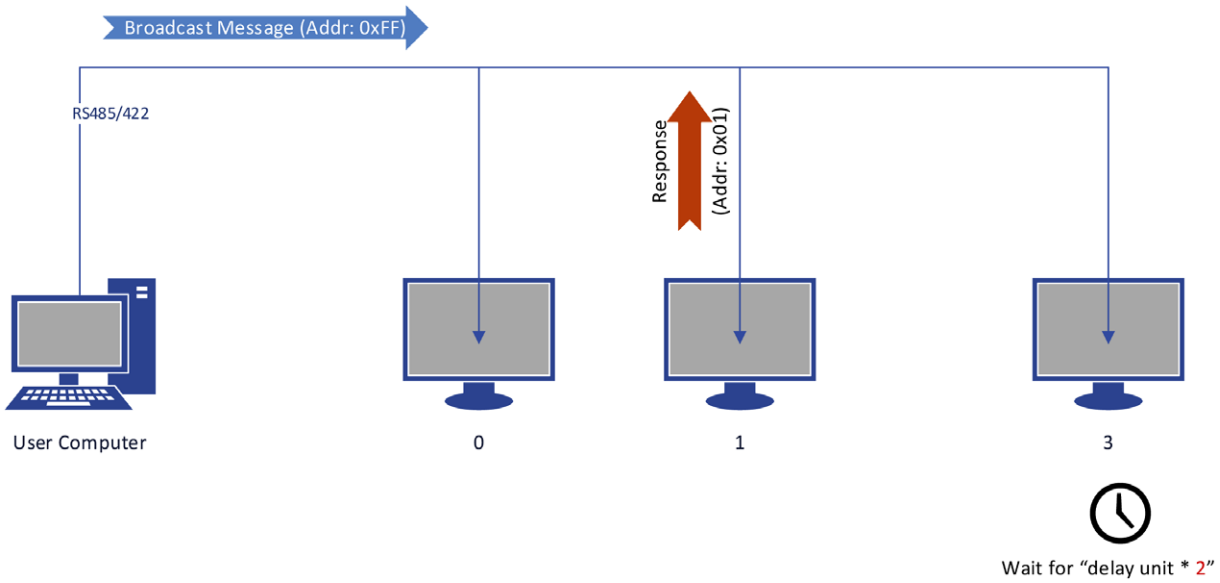


Illustration: Broadcast Message: Timing 2

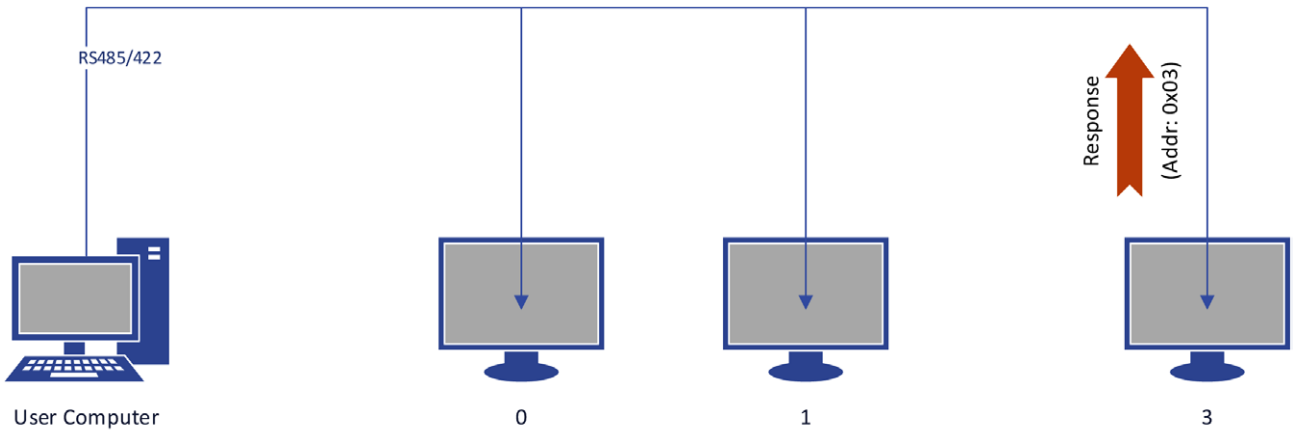


Illustration: Broadcast Message: Timing 3

User computer is linked with three units via the RS485 bus. These three units are assigned in address: 0, 1, 3. At the beginning, User computer broadcast a message to all connected units. Assuming all of them finish receiving at the same time, then the address '0' unit will respond with no latency. The other two units with higher address, stay silent until the calculated delay expires.

For the user computer, there is also a formula to calculate the interval between broadcast message. After the previous message was sent, the next message should not be issued until:

Tc =Te_max + Tg, where
Te_max = Max(Te)
Tg = the receiving time of 5 bytes.

For example, a test computer connects 8 units on bus, the interval between broadcast messages is calculated as:

Tc = (Tr + Lr) * 8 + Tg.

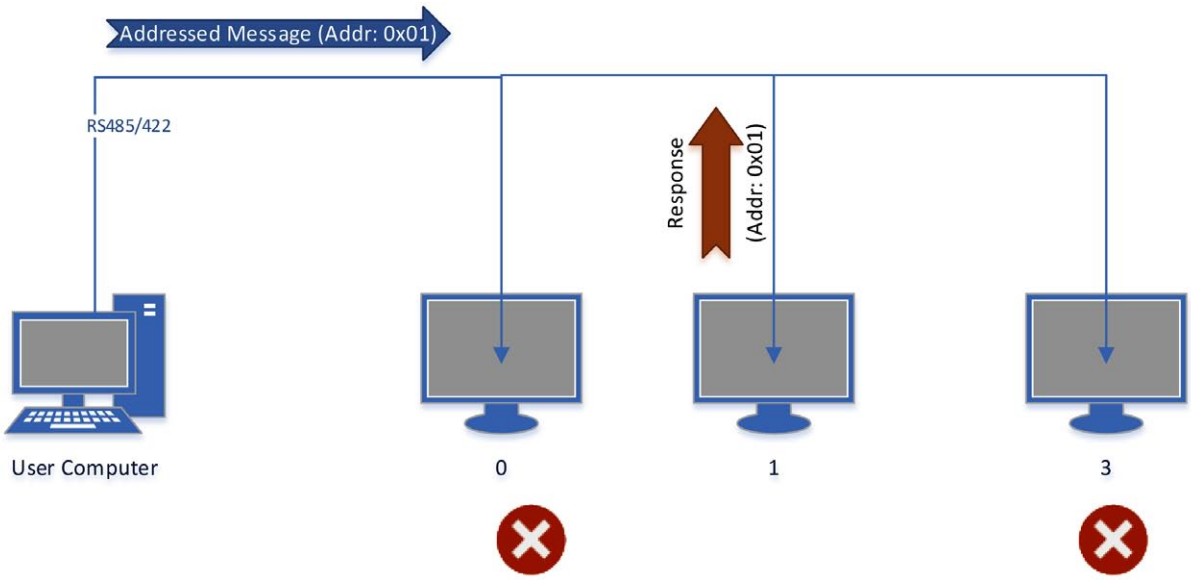


Illustration: Addressed Message

In the scenario that user computer sends out the message to specific address, the unit which owns the matching address will respond immediately, while the other keep silent.

Ethernet Interface Configuration

The Ethernet/LAN/Network interface are selected by the OSD menu. The configuration is defined as follows:

Ethernet	One computer controls max 16 units via Automatic IP or Fixed IP through port 10001. IP address for the computer must be on the same subnet as the internal set IP of the unit. The local software firewall on computer, router or network system must accept communication in/out on port 10001 (open port).

The SCOM message contained in TCP is the same as the one used in RS232/485/422.

Check the section later in this manual “C# / Pseudo Ethernet/TCP Code example”.

Cables

Serial Mode: A cable with an overall shield terminated at the back shell should be used.
Ethernet Mode: A CAT-5, CAT-6 cable capable of 10/100/1000Mbps bandwidth transmissions.
USB Mode: A USB Type B-B cable, less than 5meters is recommended.

Electrical Interface

Electrical signals shall conform to RS-485, RS-422, RS-232, USB or Ethernet standards. Only Receive Data, Transmit Data, and Signal Ground are used. The same conditions apply for both Serial mode 4-wire (Full Duplex) and 2-wire (Half Duplex), and will just be referred to as RS-485 in this document. Hardware handshake is only supported by loopback handshake for RS-232.

Serial/Ethernet/USB Communication (SCOM) Interface

- Compatible connectors:

- SCOM RS-422/485 : Terminal Block Connector 3.81, non-isolated
- SCOM RS-232 : D-SUB 9P (female), non-isolated
- Ethernet : RJ45 (female)
- USB : USB 2.0 (Type A, female)

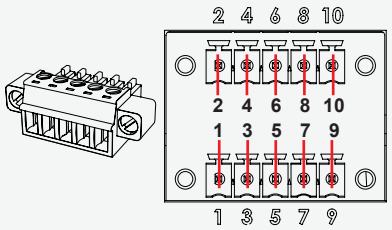
Only one communication port is active. The selection of active communication is determined by OSD menu setting item.

For Pin Out assignments, please review the following diagrams that covers all units and connector types:

Connectors illustrated here are either standard by factory default or may be available (through factory customization). Note that some combinations may not be possible due to space restrictions. List also valid for customized models. All pin out assignments are seen from users Point of View (POV) while looking straight at the connector. Please review the dedicated datasheet or technical drawings for your actual unit to identify and determine the presence of desired connector.

10-pin RS-422 / RS-485 Module

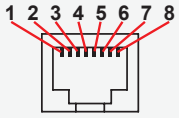
"RS-422/RS-485 SCOM + Buzzer"
(Internal Buzzer can be controlled externally)



PIN 01*	RxD+	Receive Data Positive
PIN 02	GND	Ground
PIN 03*	RxD-	Receive Data Negative
PIN 04	+5V	+5V Out
PIN 05*	TxD+	Transmit Data Positive
PIN 06**	BUZ-	Buzzer Control Negative
PIN 07*	TxD-	Transmit Data Negative
PIN 08**	BUZ+	Buzzer Control Positive
PIN 09	GNDR	Ground 100Ω
PIN 10	GND	Ground

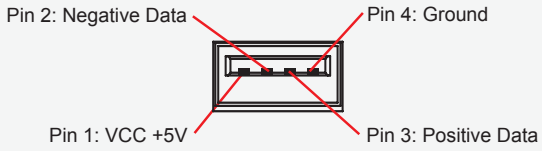
*Pin 1,3,5,7 = RS-485 Full Duplex (4-wire)
*Pin 5,7 = RS-485 Half Duplex (2-wire)
**See notes in blue.

8-pin RJ45 10/100/1000Mbps LAN/Ethernet

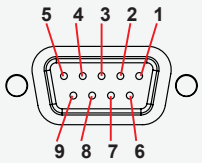


PIN 01	D0P+	Differential Pair 0 (Positive)
PIN 02	D0N-	Differential Pair 0 (Negative)
PIN 03	D1P+	Differential Pair 1 (Positive)
PIN 04	D2P+	Differential Pair 2 (Positive)
PIN 05	D2N-	Differential Pair 2 (Negative)
PIN 06	D1N-	Differential Pair 1 (Negative)
PIN 07	D3P+	Differential Pair 3 (Positive)
PIN 08	D3N-	Differential Pair 3 (Negative)

4-pin USB2.0 TYPE A



Serial COM RS-232 non-isolated, 9-pin DSUB Female



PIN 01**	BUZ+	Buzzer Control Positive*
PIN 02	TxD	Transmit Data
PIN 03	RxD	Receive Data
PIN 04	DTR	Data Terminal Ready
PIN 05	GND	Ground
PIN 06	DSR	Data Set Ready
PIN 07	RTS	Request To Send
PIN 08	CTS	Clear To Send
PIN 09**	BUZ-	Buzzer Control Negative*

*Wake On Ring is not enabled
**See notes in blue.

Series X (G2 - Generation 2) / MVD Series:

- Display Unit needs external power connected to turn buzzer on. (Any logic power state).

Serial/Ethernet/USB Communication (SCOM) Interface

SCOM Introduction
The SCOM commands specified in this document are of the same structure as older versions of Hatteland Display SCOM commands for other products. This format will be explained in the following sections.

Data Rates
The unit is configured to transmit and receive data at 9600 bits/second (Serial mode) or via standard Ethernet 10/100/1000Mbps connection through port 10001.

Data Format Serial Mode
Data shall be transmitted with no parity, 8 data bits, one start bit and one stop bit. XON/XOFF flow control should be switched off/disabled.

Message Format
The basic message format shall be as follows:

Byte #	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8 or 7+DATA=END**
	ATTN	ADDR	CMD	CMD	CMD	LEN	IHCHK	DATA	IDCHK

The minimum message size is 7 bytes (0x07). The maximum message size is 82 bytes (0x52), consistent with the EN61162-1 standard. Colors will be used throughout this manual to indicate byte positions. Every byte sent are viewed in this document as HEX values and are based on standard characters in the ASCII table (0 to 255) to send or receive messages in a human readable input/output. No further decoding or decrypting functionality is needed or required. Every command sent and received are always ended with a 0x00 (null byte terminator).

Byte 0 is sent first then the rest of the bytes follow, there is no handshake during this transmissions. Bytes are sent as fast as possible.

ATTN

Attention (ATTN)
This single byte is used to identify a start of message. 3 values are possible:

ATTN	**Description**
0x07	Command, also known as ASCII BELL
0x06	Acknowledge, also known as ASCII ACK
0x15	Negative Acknowledge, also known as ASCII NAK

A device sends a command using the 0x07 Attention Code. The unit will respond to the command with either an ACK if the command completed successfully, or a NAK if the command failed. The unit also replies with a NAK if the command was not understood, invalid or unsupported. If a command description doesn't state differently then with NAK attention code the unit will return received data. The unit will ignore any message that doesn't start with Command attention code.

NOTE: A complete HEX, ASCII, BIN and Character table overview are available in the APPENDIX chapter.

ADDR

Address (ADDR)

The address byte is not used in this implementation of the SCOM protocol and is ignored. I.e. all possible bytes are accepted.

CMD

Message Commands and Queries (CMD) Contents

The command can be one of the following values and consists always of 3 bytes in positions 2,3,4:

Byte 2	Byte 3	Byte 4	ASCII	Description	I/O	Non-Volatile / Volatile	Page
0x42	0x52	0x49	BRI	Minimum Brightness	R/W	NV	13
0x42	0x52	0x4D	BRM	Maximum Brightness	R/W	NV	14
0x42	0x52	0x54	BRT	Brightness Control	R/W	V	15
0x42	0x52	0x4C	BRL	GDC Backlight Brightness Control	R/W	NV	16
0x42	0x52	0x55	BRU	User Brightness Control	R/W	NV	17
0x47	0x4D	0x42	GMB	GDC minimum brightness	R/W	NV	18
0x47	0x42	0x46	GBF	GDC brightness auto follow	R/W	NV	19
0x4C	0x49	0x53	LIS	Read Light Sensor	R		22
0x4F	0x44	0x4D	ODM	Outdoor Mode	R/W	NV	23
0x52	0x45	0x43	REC	Recall GDC	W		24
0x50	0x4F	0x54	POT	Potential Meter Control	R/W	NV	25
0x42	0x5A	0x5A	BZZ	Buzzer Control On/OFF	R/W	V	26
0x53	0x57	0x49	SWI	Read NXP Firmware Version	R		27
0x53	0x57	0x56	SWV	Read Video Scalar Firmware Version	R		27
0x54	0x59	0x50	TYP	Read Type Number	R		28
0x53	0x4E	0x42	SNB	Read Serial Number	R		28
0x53	0x43	0x49	SCI	Write Customer Service ID	W	NV	28
0x43	0x53	0x49	CSI	Read Customer Service ID	R		29
0x45	0x54	0x43	ETC	Elapsed Time Counter Query System	R		29
0x4D	0x41	0x4E	MAN	Read Manufacture ID Code	R		29
0x54	0x4D	0x50	TMP	Read Temperature Sensor	R		30
0x56	0x45	0x52	VER	Inquiry specific Type Number	R		31
0x46	0x57	0x56	FWV	Inquiry Frimware Versions	R		31
0x43	0x42	0x52	CBR	COM1&2 Port Baudrate	R/W	NV	32
0x42	0x41	0x4B	BAK	Turn on/off acknowledge on broadcast command	R/W	NV	33
0x44	0x4C	0x4E	DLN	Download ECDIS Package	R		34
0x44	0x4C	0x3F	DL?	Request Number of available ECDIS Pack	R		35
0x43	0x41	0x4C	CAL	ECDIS calibrated brightness inquiry	R		36
0x52	0x43	0x46	RCF	Recall Factory default	W		37
0x50	0x57	0x52	PWR	Power On/Off/Sleep unit	W		38
0x56	0x55	0x52	VUR	Read User Configuration from Video Scalar	R		39
0x56	0x55	0x53	VUS	Write User Configuration to Video Scalar	W		40
0x4D	0x43	0x43	MCC	OSD Menu Control Commands	R/W		41

I/O = R=Read, W=Write.
Non-Volatile / Volatile = V=The variable values controlled by these commands are cleared at power restart).
= NV=The variable values controlled by these commands are stored even after power restart.
Page # = Page number in this manual where command is detailed.

*MCC
OSD Menu Control Commands. "MCC" command also features a Query "?" mode, "R" or "r" reset mode to factory default, increase +1 from current value "+" and decrease -1 from current value "-". Details and usage of these commands are available later in this manual.

LEN

Data Length (LEN)

This single byte defines the length of DATA in the message in bytes. The maximum value for this field is 74 bytes (0x4A in HEX). The minimum value is 0 bytes (0x00 in HEX).

IHCHK

Inverse Header Checksum (IHCHK)

This single byte is a simple 8-bit checksum of the header data, message bytes 0 to 5 on which a bit-wise inversion has been performed. The checksum will be initialised to 0. The 8-bit sum (without carry) of bytes 0, 1, 2, 3, 4, 5 and 6 will be 0xFF (255 in value). If the unit receives a message with an incorrect checksum, the unit will reply with the attention code set to NAK and no data field.

DATA

Data Field (DATA)

The bytes is the DATA field which will only be transmitted if LEN is greater than 0. This field depends on the CMD transmitted.

IDCHK

Inverse Data Checksum (IDCHK)

This single byte will only be transmitted if LEN is greater than 0. This is a simple 8-bit checksum of the data field, message bytes 7 to 7+(LEN-1) on which a bit-wise inversion has been performed. The checksum will be initialised to 0. The 8-bit sum (without carry) of bytes 7 through 7+LEN inclusive will be 0xFF. The receiver will reply to any message that the checksum has failed with the attention code set to NAK. Basically this byte is located at the very end of a received stream.

NOTE: A complete HEX, ASCII, BIN and Character table overview are available in the APPENDIX chapter.

SCOM Section: Brightness

In SCOM protocol, there are five brightness related commands, which define the backlight/LED brightness value and their adjustable range.

LCD Brightness : Full range of LCD backlight.
System Brightness : Full range of system level brightness.
User Brightness : Variation range of User level.

- BRI: Minimum backlight brightness.
- BRM: Maximum backlight brightness.
- BRT: Backlight brightness.
- BRU: User backlight brightness.

BRI and **BRM** value define the min & max boundary of the visual backlight brightness. **BRT** gives the global backlight brightness value. However, **BRT** should be the value between **BRI** and **BRM**.

BRU is the user backlight control which presents the user controlled brightness value. This value is linked with potentiometer (when POT is valid). The adjustable scale for BRU value is 0 ~ 255. The corresponding PWM steps behind BRU, is framed by BRI and BRT. The visual variation range for BRU is from BRI to BRT. The BRU steps are scaled down into 255 by the value between BRI and BRT.

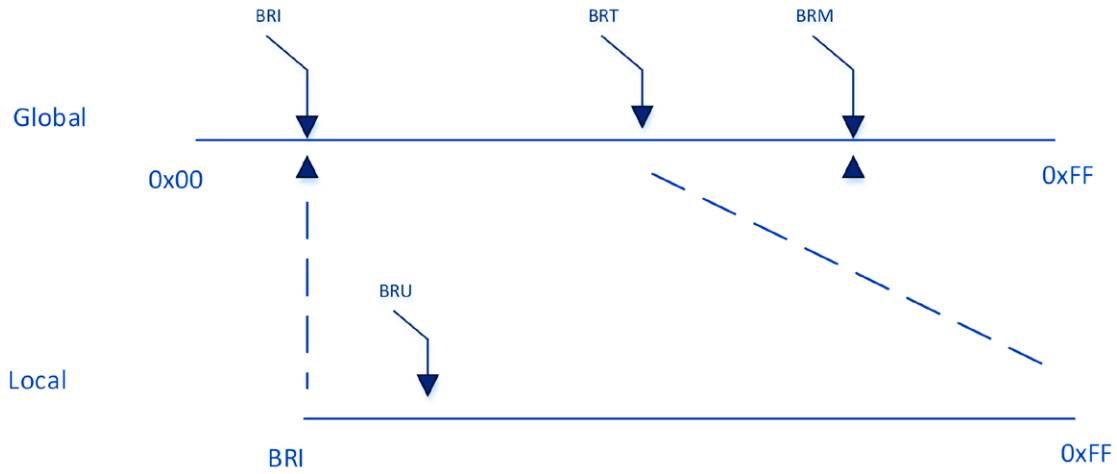


Illustration: Brightness Logic

"BRI" - Minimum Backlight Brightness

The command is used to set the minimum brightness of backlight. It defines the lower bound of the visual brightness range. For example, if we set BRI to 10%, the minimum achievable brightness is 10% in PWM step curve.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x42	0x52	0x49	0x01	IHCHK	Min Brightness	IDCHK

Minimum Brightness: A value describing the minimum backlight brightness.

Range: [0x00-0xFF]
0x00: is off.
0xFF: is max brightness.

After computer reset the value is set to: last stored value.
After uC reset the value is set to: last stored value. (0xFF if no stored value).

Write:
Sets the minimum backlight brightness. The brightness value shall be sent as 1 byte in the DATA field.

Example:
Set 60% BRI:

0x07	0xFF	0x42	0x52	0x49	0x01	0x1B	0x99	0x66

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x49	0x01	0x1C	0x99	0x66

Read:
Read the minimum backlight brightness. The length of data shall be zero.

Example:
Get BRI:

0x07	0xFF	0x42	0x52	0x49	0x00	0x1C

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x49	0x01	0x1C	0x99	0x66

"BRM" - Maximum Backlight Brightness

The command is used to set the maximum brightness of backlight. It defines the upper bound of the visual brightness range. For example, if we set BRM to 90%, the maximum achievable brightness is 90% in PWM step curve.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x42	0x52	0x4D	0x01	IHCHK	Max Brightness	IDCHK

Maximum Brightness: A value describing the maximum backlight brightness.

Range: [0x00-0xFF]
0x00: is off.
0xFF: is max brightness.

After computer reset the value is set to: last stored value.
After uC reset the value is set to: last stored value. (0xFF if no stored value).

Write:
Sets the maximum backlight brightness. The brightness value shall be sent as 1 byte in the DATA field.

Example:
Set 60% BRM:

0x07	0xFF	0x42	0x52	0x4D	0x01	0x17	0x99	0x66

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x4D	0x01	0x18	0x99	0x66

Read:
Read the minimum backlight brightness. The length of data shall be zero.

Example:
Get BRM:

0x07	0xFF	0x42	0x52	0x4D	0x00	0x18

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x4D	0x01	0x18	0x99	0x66

"BRT" - Brightness Control

This command controls the display backlight brightness setting. If BRT is 100%, the user can adjust the user brightness (BRU) from 0-100%. If the BRT is set to 60%, the visual brightness is set to 60%. The user can adjust the user brightness (BRU) from 0-100% within the 60% set by BRT. If the user sets the user Brightness to half (BRU=50%), the visual brightness will be 30% (half of 60%). If BRT is set back to 100%, the visual brightness will be 50% (half of 100%).

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x42	0x52	0x54	0x01	IHCHK	BRT	IDCHK

BRT: A value describing the brightness.
This command can only be set using SCOM and can not be adjusted directly by press of a button etc.

Range: [0x00-0xFF]
0x00: is off.
0xFF: is max brightness.

After computer reset the value is set to: Load BRT value from factory configuration file.
After uC reset the value is set to: Load BRT value from factory configuration file.

Write:
The brightness value shall be sent as one byte in the DATA field. Intermediate values will control brightness over the range from minimum to maximum luminance.

Example:
Set 60% BRT:

0x07	0xFF	0x42	0x52	0x54	0x01	0x10	0x99	0x66

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x54	0x01	0x11	0x99	0x66

Read:
Get the BRT variable. To trigger a BRT read command, the length of the DATA field must be zero. The DATA field in the uC reply will indicate the current brightness control setting.

Example:
GET BRT value:

0x07	0xFF	0x42	0x52	0x54	0x00	0x10

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x54	0x01	0x11	0x99	0x66

"BRL" - Brightness LED

The command is used to set the keypad's LED brightness manually. This can only control the Brightness LED if the GBF command is set to not follow backlight.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x42	0x52	0x4C	0x01	IHCHK	Brightness LED	IDCHK

Brightness LED: A value describing the front button LED brightness.

Range: [0x00-0xFF]
0x00: is off.
0xFF: is max brightness.

After computer reset the value is set to: last stored value.
After UC reset the value is set to: last stored value. (0xFF if no stored value)

Write:
Sets the button LED brightness. The brightness value shall be sent as 1 byte in the DATA field.

Example:
Set 60% BRL:

0x07	0xFF	0x42	0x52	0x4C	0x01	0x18	0x99	0x66

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x4C	0x01	0x19	0x99	0x66

Read:
Gets the button LED brightness. The length of data shall be zero.

Example:
Get BRL:

0x07	0xFF	0x42	0x52	0x4C	0x00	0x19

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x4C	0x01	0x19	0x99	0x66

"BRU" - User Brightness Control

This command controls the user brightness control (BRU). If BRT is 100%, the user can adjust the user brightness (BRU) from 0-100%. If the BRT is set to 60%, the visual brightness is set to 60%. The user can adjust the user brightness (BRU) from 0-100% within the 60% set by BRT. If the user sets the user brightness to half (BRU=50%), the visual brightness will be 30% (half of 60%). If BRT is set back to 100%, the visual brightness will be 50% (half of 100%).

Note: BRU read is also open to VS for user brightness inquiry.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x42	0x52	0x55	0x01	IHCHK	BRU	IDCHK

BRU: A value describing the brightness. This command can be directly adjusted using buttons.

Range: [0x00-0xFF]
0x00: is off.
0xFF: is max brightness.

After computer reset the value is set to: last stored value.
After UC reset the value is set to: last stored value. (0xFF if no stored value)

Write:
Set the BRU variable. The brightness value shall be sent as 1 byte in the DATA field.

Example:
Set 60% Brightness:

0x07	0xFF	0x42	0x52	0x55	0x01	0x09	0x99	0x66

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x55	0x01	0x0A	0x99	0x66

Read:
Get the BRU valuable. To trigger a BRU read command, the length of the DATA field must be zero. The DATA field in the uC reply will indicate the current brightness control setting.

Example:
Get BRU value:

0x07	0xFF	0x42	0x52	0x55	0x00	0x09

ACK reply from uC:

0x06	0xFF	0x42	0x52	0x55	0x01	0x0A	0x99	0x66

SCOM Section: Glass Display Control™ (GDC)

Commands related to configure and control the GDC behaviour.

"GMB" - Buttons Minimum Brightness

This command controls the minimum brightness level of the button LEDs of keypad and GDC system. The BRL level can never be lower than this limit no matter which "GBF mode" it is in.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x47	0x4D	0x42	0x01	IHCHK	Buttons Minimum Brightness	IDCHK

Buttons Minimum Brightness: A value describing the minimum allowed LED brightness level.

Range: [0x00-0xFF]
0x00: is "No minimum limit".
0xFF: is "Buttons will always be at max brightness".

After computer reset the value is set to: last stored value.
After UC reset the value is set to: last stored value. (0x00 if no stored value)

Write:

This command will set the minimum brightness level of the button LEDs. The brightness value shall be sent as 1 byte in the DATA field. If the current level of the button brightness (BRL) is lower than the new GMB value, BRL level must be raised to the GMB level.

Example:

Set GMB 0x01:

0x07	0xFF	0x47	0x4D	0x42	0x01	0x22	0x01	0xFE

ACK reply from uC:

0x06	0xFF	0x47	0x4D	0x42	0x01	0x23	0x01	0xFE

Read:

If the current BRL level is smaller than the GMB level, this command will return the GMB level. If the current BRL level is bigger than the GMB level, this command will return the BRL level. The length of DATA shall be zero.

Example:

Get GMB:

0x07	0xFF	0x47	0x4D	0x42	0x00	0x22

ACK reply from uC:

0x06	0xFF	0x47	0x47	0x4D	0x42	0x01	0x23	0x99*	0x66

*In this example, BRL was bigger than GMB level and thus BRL was returned.

"GBF" - Keypad Brightness auto follow

This command controls if the keypad brightness level will follow the LCD backlight brightness, follow the brightness sensor, or if the keypad brightness shall be manually set by BRL command. If the GBF command is set to follow the LCD backlight brightness, or the light sensor brightness, the result is scaled by the BRL.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x47	0x42	0x46	0x01	IHCHK	Follow LCD	IDCHK

Follow LCD: A value describing if the Keypad LED brightness will follow the LCD backlight level, brightness sensor or need to be manually updated through BRL command.

Range: Valid levels in table:

0x00	Keypad brightness will be set manually.
0xAA	Keypad brightness will follow brightness sensor.
0xFF	Keypad brightness will follow LCD backlight level.

After computer reset the value is set to: last stored value.
After UC reset the value is set to: last stored value. (0xFF if no stored value)

Write:
Set value of GBF. The Length of DATA is 1.

Example:
GBF set to follow backlight:

0x07	0xFF	0x47	0x42	0x46	0x01	0x0E	0xFF	0x00

ACK reply from uC:

0x06	0xFF	0x47	0x42	0x46	0x01	0x0F	0xFF	0x00

Read:
To trigger the Read GBF command, the length of DATA must be zero.

Example:
GBF Read Command:

0x07	0xFF	0x47	0x42	0x46	0x00	0x0E

ACK reply from uC:

0x06	0xFF	0x47	0x42	0x46	0x01	0x0F	0xFF	0x00	0x66

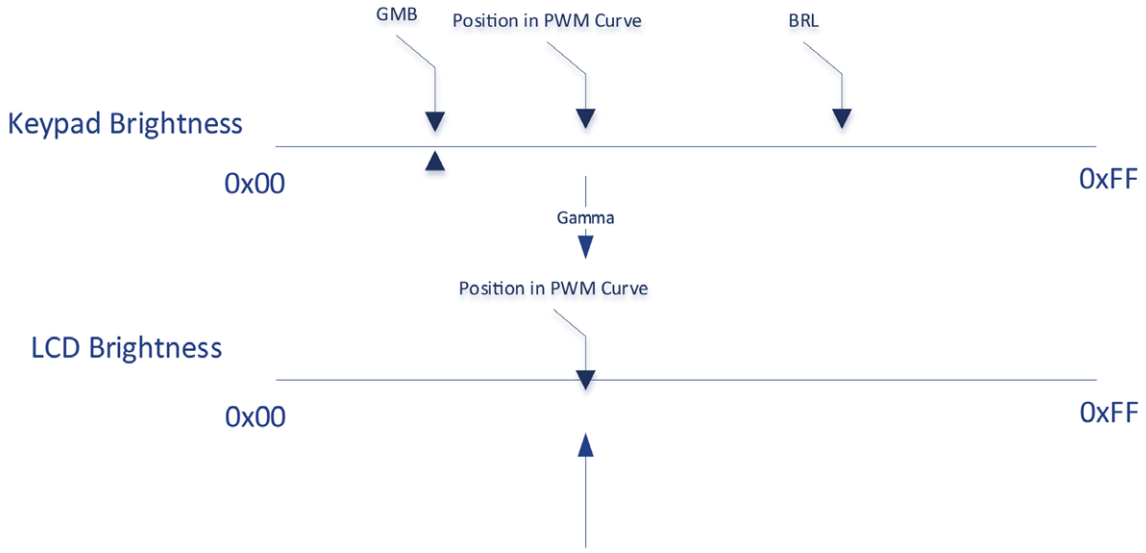
*In this example, BRL was bigger than GMB level and thus BRL was returned.

The following 2 pages are notes for the **GBF** command.

Notes for the "GBF" command

1: Auto Follow LCD backlight level

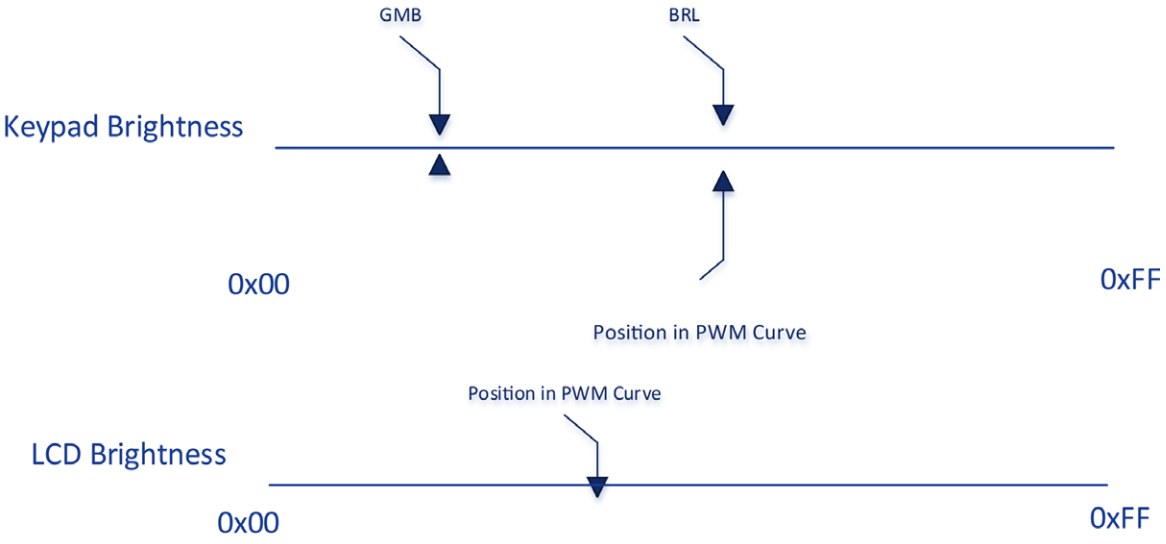
- Use System brightness (BRI, BRM, BRT) and User Brightness (BRU) to calculate the LCD Brightness Step.
- Find the position in LCD brightness PWM curve and generate proper PWM to LCD.
- Convert the position of LCD PWM curve to Keypad PWM Curve based on gamma.
- Use the converted value to generate proper PWM to keypad.
- GMB defines the low-end saturated value of keypad brightness. BRL defines the high-end saturated value of keypad brightness.



Logic: Keypad brightness (Auto follow LCD brightness)

2: BRL Only

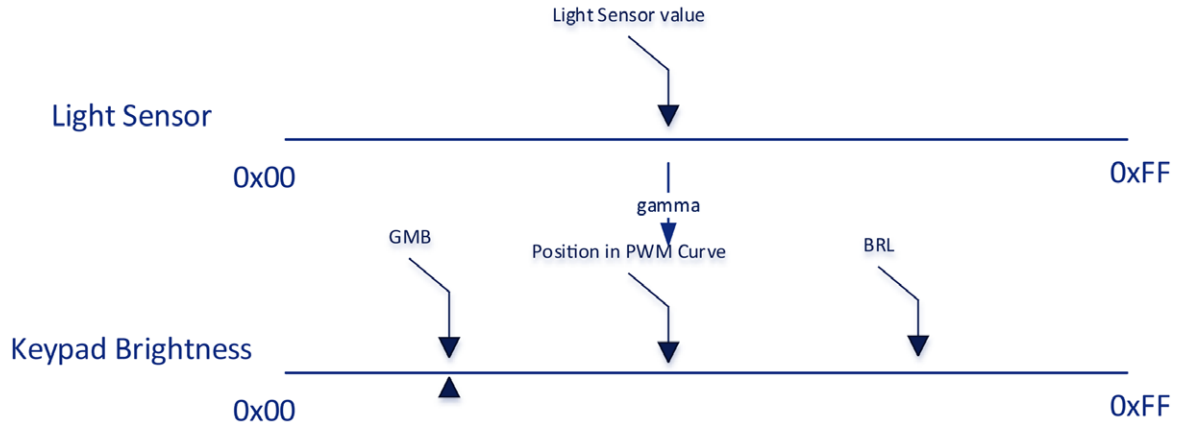
- Use System brightness (BRI, BRM, BRT) and User Brightness (BRU) to calculate the LCD Brightness Step.
- Find the position in LCD brightness PWM curve and generate proper PWM to LCD.
- Keypad brightness is independent with LCD brightness.
- Use the BRL value to generate proper PWM to keypad.
- GMB defines the low-end saturated value of keypad brightness. BRL takes effect.



Logic: Keypad Brightness (BRL only)

3: Auto follow Light Sensor

- Use System brightness (BRI, BRM, BRT) and User Brightness (BRU) to calculate the LCD Brightness Step.
- Find the position in LCD brightness PWM curve and generate proper PWM to LCD.
- Convert the position of Light sensor value to Keypad PWM Curve based on gamma.
- Use the converted value to generate proper PWM to keypad.
- GMB defines the low-end saturated value of keypad brightness. BRL defines the high-end saturated value of keypad brightness.



Logic: Keypad Brightness (Light sensor follow)

4:

If Light sensor is failing and GBF is set as "Light sensor follow", the position of PWM Curce is set at 0xFF.

"LIS" - Read Ambient Light Sensor

This command is used to read the value of the ambient light sensor. This value reads the Channel 0 of the ambient light sensor in system with keypad and embedded light sensor of GDC in GDC system.

Example:

Read Light Sensor:

0x07	0xFF	0x4C	0x49	0x53	0x00	IHCHK

Reply from uC:

0x06	0xFF	0x4C	0x49	0x53	0x02	IHCHK	DATA0	DATA1	IDCHK

DATA0 = Most Significant Byte.
DATA1 = Least Significant Byte.

Read:

When the LIS command is sent with the data 0x4C, it returns an estimated luminance in lux.

Example:

Read luminance in Lux from Light Sensor:

0x07	0xFF	0x4C	0x49	0x53	0x01	IHCHK	0x4C	IDCHK

Reply from uC:

0x06	0xFF	0x4C	0x49	0x53	0x02	IHCHK	DATA0	DATA1	IDCHK

"ODM" - Outdoor Mode

This command shall set the GDC outdoor mode. The outdoor mode will add 5 second delay to the GDC buttons. However this 5s press is not needed again if 5s does not elapse since last button usage (If one button has been held for more than 5s, any button will respond instantly. If there is user absence for more than 5s ODM is activated again).

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x4F	0x44	0x4D	0x01	IDCHK	OUT	IDCHK

OUT: Describes the status of the OUT variable

Range: Valid levels in table:

0x00	Turn off the outdoor mode
0xFF	Turns on the outdoor mode

After computer reset the value is set to: Nothing is stored.
After UC reset the value is set to: Nothing is stored.

Write:
Sets the outdoor mode to on or off.

Example:
Deactivate Outdoor Mode:

0x07	0xFF	0x4F	0x44	0x4D	0x01	0x18	0x00	0xFF

ACK reply from uC:

0x06	0xFF	0x4F	0x44	0x4D	0x01	0x19	0x00	0xFF

"REC" - Recall GDC

This command will recall the GDC registers to default values.
BRL = Restored to value in Factory Configuration file.
GMB = Restore to value in Factory Configuration file.
ODM = Restore to value 0x00.
POT = Restore to value 0xFF.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x52	0x45	0x43	0x01	IHCHK	Recall	IDCHK

RECALL:

Range: Valid levels in table:

0xFF	Recalls GDC

After computer reset the value is set to: Nothing is stored.
After UC reset the value is set to: Nothing is stored.

Write:
Sets the outdoor mode to on or off.

Example:
Activate GDC Recall:

0x07	0xFF	0x52	0x45	0x43	0x01	IHCHK	0xFF	0x00

ACK reply from uC:

0x06	0xFF	0x52	0x45	0x43	0x01	IHCHK	0xFF	0x00

"POT" - Backlight Control Interface selection

This command is used to select which HW control method will be used in user backlight control (BRU).
The available control methods: SCOM command, GDC keypad and analog potentiometer.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x50	0x4F	0x54	0x01	IHCHK	DATA	IDCHK

DATA: The data field length is only 1.

Range: Valid levels in table:

0x00	Backlight Controlled by SCOM only (Brightness Button on GDC is disabled.).
0xFF	Backlight controlled by SCOM and GDC keypad.
0x0F	Backlight Controlled by POT meter only.
0xF0	Backlight controlled by SCOM, GDC keypad and POT meter.

Write Example:

Write POT configuration:

0x07	0xFF	0x50	0x4F	0x54	0x01	0x05	0x00	0xFF

Reply from uC:

0x06	0xFF	0x50	0x4F	0x54	0x01	0x06	0x00	0xFF

Read Example:

Read POT configuration:

0x07	0xFF	0x50	0x4F	0x54	0x00	IHCHK

Reply from uC:

0x06	0xFF	0x50	0x4F	0x54	0x01	0x06	0x00	0xFF

Note: If POT is set 0x0F, any BRU write will return NACK.

SCOM Section: Buzzer

Commands to control the internal Buzzer, or External Buzzer (if available). If External Buzzer is available, commands apply for both internal and external Buzzer at the same time.

"BZZ" - Buzzer Control

This command is used to control buzzer on/off signal. Length of DATA is 1.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x42	0x5A	0x5A	0x01	IHCHK	Buzzer	IDCHK

Buzzer: Describes the status of the Buzzer.

Range: Valid levels in table:

0x00	Turn the buzzer off.
0xFF	Turn the buzzer on.

After computer reset the value is set to: 0x00.
After UC reset the value is set to: 0x00.

Write:
Set the buzzer status.

Example:
Activate Buzzer:

0x07	0xFF	0x42	0x5A	0x5A	0x01	0x02	0xFF	0x00

ACK reply from uC:

0x06	0xFF	0x42	0x5A	0x5A	0x01	0x03	0xFF	0x00

Note: The Buzzer on / off command will also activate the external buzzer output.

Read:
Get the buzzer status. Length of DATA must be zero.

Example:
Get Buzzer Status:

0x07	0xFF	0x42	0x5A	0x5A	0x00	0x02

ACK reply from uC (Buzzer is on):

0x06	0xFF	0x42	0x5A	0x5A	0x01	0x03	0xFF	0x00

SCOM Section: Service

Commands to review Service related information available for the unit.

"SWI" - Main Software Version Query

This query is sent to the unit in order to get the uC software version ID. Length of DATA must be zero. The DATA field will be an ASCII text string indicating the software version. The Maximum length of DATA is 13 bytes.

Example:

Get Software Version:

0x07	0xFF	0x53	0x57	0x49	0x00	0x06

Reply from uC:

0x06	0xFF	0x53	0x57	0x49	0x13	0x07	0x??	0x??	0x??	0x??
0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??	IDCHK	

0x?? = Where **??** are HEX value (ASCII chars A-Z, 0-9 + symbols).

"SWV" - Video Scalar Software Version Query

This query is sent to video scalar in order to get the video scalar firmware version ID. Length of DATA must be zero. The DATA field will be an ASCII text string indicating the software version. The Maximum length of DATA is 13 bytes.

The SWV command will be forwarded to the video scaler. The uC does not need to process this data other than forwarding request and reply.

Example:

Get Software Version:

0x07	0xFF	0x53	0x57	0x49	0x00	0x06

Reply from uC:

0x06	0xFF	0x53	0x57	0x49	0x13	0x07	0x??	0x??	0x??	0x??
0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??	IDCHK	

0x?? = Where **??** are HEX value (ASCII chars A-Z, 0-9 + symbols).

"TYP" - Type/Model Number Query

This query is sent to the unit in order to identify the unit type by its model number / part number. Length of DATA shall be zero. The unit will reply to this command with an ACK attention code. The DATA field should be translated to an ASCII text string which indicates the specified Type/Model Number, e.g: "HD55T22MVDMA1TOGP". The maximum length of the Type Number is 21 bytes. The command should not return bytes with value 0xFF.

Example:

Read Type/Model Number:

0x07	0xFF	0x54	0x59	0x50	0x00	0xFC

Reply from uC:

0x06	0xFF	0x54	0x59	0x50	0x??	0x??	0x??	0x??	0x??	0x??
0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??	0x??
0x??	0x??	IDCHK								

0x?? = Where **??** are HEX value (ASCII chars A-Z, 0-9 + symbols).

"SNB" - Serial Number Query

This query is sent to the unit in order to identify the unit serial number. Length of DATA shall be zero. The unit will reply to this command with an ACK attention code. The DATA field will be set to an ASCII text string to indicate the specified Serial Number, e.g: "123456". The maximum length of DATA is 6 bytes. The command should not return a byte which is 0xFF.

Example:

Command Unit Serial Number:

0x07	0xFF	0x53	0x4E	0x42	0x00	0x16

Acknowledge Type/Model Number example "123456":

0x06	0xFF	0x53	0x4E	0x42	0x06	0x12	0x31	0x32	0x33	0x34
0x35	0x36	IDCHK								

"SCI" - Store Customer Service ID

This command is used to program the Customer Service ID. The maximum length of the DATA field is 16 bytes. All ASCII characters are allowed.

After computer reset the value is set to: last stored value.
After uC reset the value is set to: last stored value. (All Bytes = 0xFF if not previously stored).

Example:

Write SCI:

0x07	0xFF	0x53	0x43	0x49	0x02	IHCHK	0x30	0x31	IDCHK

ACK Reply from uC:

0x06	0xFF	0x53	0x43	0x49	0x02	IHCHK	0x30	0x31	IDCHK

"CSI" - Read Customer Service ID

This command is used to read the Customer Service ID. The length of DATA is zero bytes.
The command should not return bytes with value 0xFF.

Example:

Read "CSI" from LPC:

0x07	0xFF	0x43	0x53	0x49	0x00	IHCHK

ACK Reply from uC:

0x06	0xFF	0x43	0x53	0x49	0x02	IHCHK	0x30	0x31	IDCHK

"ETC" - Elapsed Time Counter

This command will return the hours the video scalar has been on. The DATA field should be translated to an ASCII text string which shows the elapsed hours.

Example:

Get ETC:

0x07	0xFF	0x45	0x54	0x43	0x01	0x19

ACK reply from uC "00004" hours:

0x06	0xFF	0x45	0x54	0x43	0x05	0x19	0x30	0x30	0x30	0x30
0x34	0x0B									

"MAN" - Read Manufacturer data

This command is used to read the Manufacturer ID. The length of DATA is zero bytes. The command always returns "JHD".

The purpose of defining this command is to be compatible with old SCOM command.

Example:

Read "MAN" from LPC:

0x07	0xFF	0x4D	0x41	0x4E	0x00	IHCHK

ACK Reply from uC:

0x06	0xFF	0x4D	0x41	0x4E	0x03	IHCHK	0x4A	0x48	0x44	IDCHK

"TMP" - Read Temperature Sensor

The unit features temperature sensor that measures the temperature inside. The TMP command can be used to read the current sensor temperature. The length of DATA shall be 1 or 2 and contain the following:

Data length is 1, return the value from temperature sensor 0x00

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x54	0x4D	0x50	0x01	IHCHK	TMP	IDCHK

Data length is 2, return the value from assigned temperature sensor

Byte #	0	1	2	3	4	5	6	7	8	9
	0x07	0xFF	0x54	0x4D	0x50	0x02	IHCHK	TMP	NUM	IDCHK

TMP: A value describing the Read Temperature Type.

Range: Valid levels in table:

0x52 = 'R'	Read Current Temperature from on-board Sensor

NUM: Index of Temperature Sensors

0x00	On-board main sensor
0x01~0x0F	Remote sensor

Read Current Temperature:

The unit will reply to this command with an ASCII string indication the temperature in °C, e.g.: "+027.5°C". Read accuracy is ±0.5°C.

Example:

Get Current Temperature:

0x07	0xFF	0x54	0x4D	0x50	0x02	0x07	0x52	0x00	0xAD

ACK reply from uC ": +036.5ºC":

0x06	0xFF	0x54	0x4D	0x50	0x08	0x01	0x2B	0x30	0x33	0x36
0x2E	0x35	0xBA	0x43	0xDD						

"VER" - Read Specific Type

This command is used to read the specific Type segment in Type Number. The returned value is the three characters from pos 8 to 10 in stored Type Number. If there is no type number stored, return 0 byte.

For example, if the type number is "HD55T22MVDMA1AAAAAAA", VER should return "MVD"

The purpose of defining this command is to be compatible with old SCOM command.

Example:

Read "Ver" from LPC:

0x07	0xFF	0x56	0x45	0x52	0x00	IHCHK

ACK Reply from uC:

0x06	0xFF	0x56	0x45	0x52	0x03	IHCHK	0x4A	0x48	0x44	IDCHK

"FWV" - Read Firmware information

This command will be used to read various firmware versions.
The purpose of defining this command is to be compatible with old SCOM command.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x46	0x57	0x56	0x01	IHCHK	FW Type	IDCHK

FW TYPE: Specify the firmware type.

Range: Valid values in table

Device Type	Value	Comment
uC Firmware	0x00	Same as SWI
Video Scalar	0x01	Same as SWV
uC Config File	0x02	

Example:

Get uC Firmware :

0x07	0xFF	0x46	0x57	0x56	0x01	0x19	0x00	0xFF

ACK reply from uC "00004" :

0x06	0xFF	0x46	0x57	0x56	0x05	0x19	0x30	0x30	0x30	0x30
0x34	0x0B									

SCOM Section: Interface

Commands to control the global settings that affects communication/protocol behaviour.

"CBR" - COM Ports Baudrate Configuration

This command is used to configure the baudrate on COM ports. The command will select between RS232 and RS485 port. There are two available options for baudrate: 9600 and 115200.

This command to configure baudrate on:

Byte #	0	1	2	3	4	5	6	7	8	9
	0x07	0xFF	0x43	0x42	0x52	0x02	IHCHK	COM	BAUD	IDCHK

COM: Define the COM Port.

Range: Valid levels in table:

0x00	RS232 Port
0xFF	RS485/422 Port

Baudrate: Define the COM Port's baudrate.

Range: Valid levels in table:

0x00	9600 bps
0xFF	115200 bps

After display reset the value is set to: last stored value.
After display reset the value is set to: last stored value. (All bytes = 0x00 if the type number is not yet programmed)

Write:
Set the COM Baudrate.

Example:
Set RS232 Port to 9600 bps:

0x07	0xFF	0x43	0x42	0x52	0x02	0x20	0x00	0x00	0xFF

ACK reply from uC:

0x06	0xFF	0x43	0x42	0x52	0x02	0x21	0x00	0x00	0xFF

Read:
Get the COM port baudrate status. Length of DATA must be 1.

Example:
Get RS232 Baudrate:

0x07	0xFF	0x43	0x42	0x52	0x01	0x21	0x00	0xFF

ACK reply from uC:

0x06	0xFF	0x43	0x42	0x52	0x02	0x21	0x00	0xFF	0x00

"BAK" - Broadcast Acknowledgement

This command is used to set turn on/off broadcast acknowledgement of the received message on RS485/422 port. The purpose of adding this command is to simplify the message processing on computer side.

Setting will be changed after sending an answer.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x42	0x41	0x4B	0x01	IHCHK	ONOFF	IDCHK

ONOFF: Enable/Disable ACK on Broadcast messages.

Range: Valid levels in table:

0x00	Broadcast ACK OFF
0xFF	Broadcast ACK ON

After display reset the value is set to: last stored value.
After display reset the value is set to: last stored value. (All bytes = 0xFF if the type number is not yet programmed)

Write Example:

Enable Broadcast ACK:

0x07	0xFF	0x42	0x41	0x4B	0x01	0x2A	0xFF	0x00

ACK reply from uC:

0x06	0xFF	0x42	0x41	0x4B	0x01	0x2B	0xFF	0x00

Read Example:

Get Broadcast ACK status:

0x07	0xFF	0x42	0x41	0x4B	0x00	0x2B

ACK reply from uC ACK is off):

0x06	0xFF	0x42	0x41	0x4B	0x01	0x2B	0x00	0xFF

SCOM Section: ECDIS

Commands for downloading ECDIS Color Table files (if stored in memory and performed by factory).

"DLN" - Download package

This command shall be sent to request a specific data packet stored in the microcontroller. The DATA field shall contain the packet number being requested; the byte in the DATA field represents a hexadecimal word (00 to FF) identifying the block of data to be downloaded. The total number of packets available is found by issuing the "DL?" command.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x44	0x4C	0x4E	0x01	IHCHK	DATA	IDCHK

DATA: The packet number being requested.

If the data checksum and packet number is valid, the uC shall reply to this command with an ACK attention code, the hexadecimal packet number, a separator ('-'), and the ASCII packet data. The maximum DATA field size for a packet of data shall be 32 bytes per message; therefore the DATA field in the reply shall be a maximum length of 32 bytes. The DATA field of the message is not required to be of maximum length (it may be smaller than 32 bytes).

Example:

Requesting package 80 (active ECDIS table):

0x07	0xFF	0x44	0x4C	0x4E	0x1	IHCHK	0x50	IDCHK

Reply from uC:

0x06	0xFF	0x44	0x4C	0x4E	0x06	IHCHK	0x50	'-'	'T'	'E'
'S'	'T'	IDCHK								

Active ECDIS table is stored first and can be read with only specifying the packed nr. To read from the other tables, another byte is added for table nr. Active ECDIS table is determined by Calibration mode.
The DATA field shall contain the packet number being requested and table nr; the first byte in the DATA field represents a hexadecimal word (00 to FF) identifying the block of data to be downloaded. The total number of packets available is found by issuing the "DL?" command. The second byte in the DATA represents the table nr from 0-x.

Example:

Requesting package 80 of table 1:

0x07	0xFF	0x44	0x4C	0x4E	0x2	IHCHK	0x50	0x01	IDCHK

Reply from uC:

0x06	0xFF	0x44	0x4C	0x4E	0x06	IHCHK	0x50	'-'	'T'	'E'
'S'	'T'	IDCHK								

"DL?" - Request Number of packages available

This command is used to request the number of packets available for download. The DATA field of the command shall contain no data when requesting size of active ECDIS.

Byte #	0	1	2	3	4	5	6
	0x07	0xFF	0x44	0x4C	0x3F	0x00	IHCHK

The uC shall reply to this command with an ACK attention code. The number of packets shall be sent as 1 byte in the DATA field of the response. This byte shall indicate the resulting number of packets; a value of 0x00 shall indicate zero packets, while a value of 0xFF shall indicate that there are 255 packets to download.
If there are more tables the DATA field shall contain the table nr from 0-X.
If the Calibration mode is set to "Calibration VGA", the Data field will contain table nr 0.
If the Calibration mode is set to "Calibration DVI", the Data field will contain table nr 1.
If the Calibration mode is set to "Calibration DP", the Data field will contain table nr 2.
If the Calibration mode is set to "Calibration HDMI", the Data field will contain table nr 3
If the Calibration mode is set to "No Calibration", or if the Data table is not present for the selected calibration mode, the uC will reply with a nak.

The number of packets necessary to deliver the entire block of data is defined as:
Packets = (Size of Data / (32 bytes per packet - 2 overhead bytes per packet)) rounded up to the nearest whole number.

Examples:
Packets = 3049 bytes / 32 data bytes per packet = 96.6 rounded up to 97 Packets

Example:
Requesting size of table 0:

0x07	0xFF	0x44	0x4C	0x3F	0x00	IHCHK

Reply from uC:

0x06	0xFF	0x44	0x4C	0x3F	0x01	IHCHK	0x01	IDCHK

"CAL" - Calibration brightness level

This command inquire the GDC calibration Level. For units that are ECDIS calibrated from factory, the LED pattern (ECDIS) indicates that the backlight/brightness is at calibrated level.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x43	0x41	0x4C	0x01	IHCHK	CAL	IDCHK

CAL: Inquiry Mark.

0x3F	Inquiry the active CAL value

Read:
Get the calibration level. The length of DATA should be is 1 and DATA0 = 0x3F ('?').

Example:

Get calibration level:

0x07	0xFF	0x43	0x41	0x4C	0x01	IHCHK	0x3F	IDCHK

ACK reply from uC (CAL level is 0xAA):

0x06	0xFF	0x43	0x41	0x4C	0x01	IHCHK	0xAA	0x55

SCOM Section: Factory

Commands related to configuration of global Factory preset.

"RCF" - Recall Factory Configuration

This command will recall the original copy of factory configuration. The user copy of configuration will be replaced and overwritten completely.

Affected Configuration Type:

1: Brightness.
2: Backlight & GDC & FAN PWM lookup table.
3: Buzzer Configuration.
4: GDC configuration.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x52	0x43	0x46	0x01	IHCHK	Recall	IDCHK

Recall:

Range: Valid levels in table:

0xFF	Recalls factory configuration

After computer reset the value is set to: Nothing is stored.
After UC reset the value is set to: Nothing is stored.

Example:

Activate Factory Configuration Recall:

0x07	0xFF	0x52	0x43	0x46	0x01	IHCHK	0xFF	0x00

ACK reply from uC:

0x06	0xFF	0x52	0x43	0x46	0x01	IHCHK	0xFF	0x00

SCOM Section: Power

Commands related to configuration of global Power settings.

"PWR" - Power On/Off/Sleep unit

This command is used to power on/off the unit or put the unit in sleep mode.

Byte #	0	1	2	3	4	5	6	7	8
	0x07	0xFF	0x50	0x57	0x52	0x01	IHCHK	Power	IDCHK

Power:

Range: Valid levels in table:

0x00	Power Off
0x0F	Sleep Mode (Stand by)
0xFF	Power On

After computer reset the value is set to: Nothing is stored
After UC reset the value is set to: Nothing is stored

Write Example:

Power unit:

0x07	0xFF	0x50	0x57	0x52	0x01	IHCHK	0xFF	0x00

ACK reply from uC:

0x06	0xFF	0x50	0x57	0x52	0x01	IHCHK	0xFF	0x00

Read Example:

Ask for power state

0x07	0xFF	0x50	0x57	0x52	0x00	IHCHK

ACK reply from uC:

0x06	0xFF	0x50	0x57	0x52	0x01	IHCHK	0xFF	0x00

Note:

1: PWR will give response right after the power state change is started. But due to the latency of power up sequence, the new power state may be activated after the command is sent.

2: Change to the current power state, always return ACK.

SCOM Section: Video Scaler

Commands related to configuration of the internal Video Controller logic and behaviour including function related to the On Screen Display Menu (OSD).

"VUR" - Read User Configuration from Video Scalar

The command reads the user saved configuration from video scalar. The configuration saves OSD settings. The user configuration table size is 256 bytes.

The read process will be divided into 4 packets (64 bytes in each).

Byte #	0	1	2	3	4	5	6	7	8	9
	0x07	0xFF	0x56	0x55	0x52	0x02	IHCHK	Bank	Packet Number	IDCHK

Bank:
Defines which user-saved configuration are in request. Range: 0~7.

Packet Number:
Defines which packet to be downloaded. Range: 0~3.

Write Example:

Requesting package 0 and bank 0:

0x07	0xFF	0x56	0x55	0x52	0x02	IHCHK	0x00	0x00	0xFF

Reply from uC:

0x06	0xFF	0x56	0x55	0x52	0x65	IHCHK	Bank	Packet number	Data[0]
…	Data[61]	Data[62]	Data[63]	IDCHK					

"VUS" - Store User Configuration to Video Scalar

The command write the user configuration to video scalar. The user configuration table size is 256 bytes.

Note: the command is passed to VS only.
The read process will be divided into 4 packets (64 bytes in each).

Byte #	0	1	2	3	4	5	6	7	8	9	10	...	72	73
	0x07	0xFF	0x56	0x55	0x53	0x42	IHCHK	Bank	Packet Number	0xFF	0x02	…	0x00	IDCHK

Bank:
Defines which user-saved configuration are in request. Range: 0~7.

Packet Number:
Defines which packet to be downloaded. Range: 0~3.

Write Example:

Write package 0 to bank 1

0x07	0xFF	0x56	0x55	0x53	0x42	IHCHK	0x00	0x01	0x00	0x02
...	0x00	0xFF								

Reply from uC:

0x06	0xFF	0x56	0x55	0x53	0x02	IHCHK	0x00	0x00	IDCHK

SCOM Section: OSD Control Functionality

This command is used to provide remote access to OSD menu and handle the internal communication towards the video scalar.

"MOD" - Operation Mode Selection

This global command is used to select the operation mode of the firmware and affects the commands listed in the "MCC" section on next page. The aim of this function is to provide backwards compability for the Series X MMD Generation (G2) models which enables them to receive and respond to SCOM commands and queries like the previous Series X MMD Generation 1 (G1) models. By factory default (unless customer specificed) is set to Series X MMD Generation 2 (G2) - GEV2 mode.

Note: Review the differences in the "MCC Commands List" on the following pages for details.
Reference: Engineering Change Notification (ECN): http://www.hatteland-display.com/mails/31_2017_ecn.html

GEV1 = Reference to Series X Maritime Multi Display (MMD) - Generation 1 (G1) - HD xxT21xxD models.
GEV2 = Reference to Series X Maritime Multi Display (MMD) - Generation 2 (G2) - HD xxT22xxD models and Multi Vision Displays (MVD) - HD xxT22 MVD models.

Format:

Byte #	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	0x07	0xFF	0x4D	0x4F	0x44	0x01	IHCHK	DATA	IDCHK

DATA:

The data field length is only 1.
Range: Valid levels in table:

0x00	GEV2 Mode
0x01	GEV1 compatible mode

After display reset the value is set to: last stored value.
0x00 is the default value.

Write Example:
Write MOD configuration "GEV1 compatible mode"

0x07	0xFF	0x4D	0x4F	0x44	0x01	0x18	0x01	0xFE

Reply from uC:

0x06	0xFF	0x4D	0x4F	0x44	0x01	0x19	0x01	0xFE

Read Example:
Read MOD configuration:

0x07	0xFF	0x4D	0x4F	0x44	0x00	0x19

Reply from uC:

0x06	0xFF	0x4D	0x4F	0x44	0x01	0x19	0x00	0xFF

"MCC" - OSD Control Functionality

Each MCC command will specify a OSD Command ID in the first data byte. The OSD Command ID represents an OSD menu setting item or internal function.

Byte #	0	1	2	3	4	5	6	7	8	...	7+LEN	8+LEN
	0x07	0xFF	0x4D	0x43	0x43	LEN	IHCHK	Command ID	Data1		Datax	IDCHK

Command ID:
Supported Command ID in video scalar Command list.

Data:
Defines the data of option numbers, inquiry, reset and so on.

Write Example:
MCC Command 0x81 reset

0x07	0xFF	0x4D	0x43	0x43	0x03	0x24	0x81	0x52	0x2C

Reply from Video scalar:

0x06	0xFF	0x4D	0x43	0x43	0x03	0x25	0x81	0x52	0x00

The following 7 pages are available commands for the MCC command.

MCC Commands List

NOTE: A char between the ' ' indicate an ASCII value. Example '1' = 0x31.
A complete HEX, ASCII, BIN and Character table overview are available in the APPENDIX chapter.

Some commands have footnotes, see references at the end of this table.

Function	Data	Description	GEV2	GEV1	Differences
Brightness control Important: Not to be confused with "BRT" (Backlight) command.	0x81, nn | '+' | '-' | 'r' | 'R' | '?'	Set brightness = value / increment / decrement / reset / query	Brightness Range='0''0'~'2''5''5' Default = '1''2''8'	Brightness Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255
Contrast control	0x82, 'a' | 'A' , nn | '+' | '-' | 'r' | 'R' | '?'	Set contrast = value / increment / decrement / reset / query	Contrast Range='0''0'~'2''5''5' Default = '1''2''8'	Contrast Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255 Remove the option to configure all input source. All individual input has own settings.
Saturation control	0x83, nn | '+' | '-' | 'r' | 'R' | '?'	Set Saturation = value / increment / decrement / reset / query	Saturation Range='0''0'~'2''5''5' Default = '1''2''8'	Saturation Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255
Hue control	0x84, nn | '+' | '-' | 'r' | 'R' | '?'	Set Hue = value / increment / decrement / reset / query	Hue Range='0''0'~'2''5''5' Default = '1''2''8'	Hue Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255
Manual Phase control	0x85, nn | '+' | '-' | '?'	Set dot clock phase = value / increment / decrement / query	Phase Range='0''0'~'2''5''5'	Phase Range='0''0'~'3''F' Default = '3''2'	Value Range changed from 0-100 to 0-255
Image H position	0x86, nn | '+' |'-' | 'r' | 'R' | '?'	Set image Hpos = value / increment / decrement / reset / query	Hpos Range='0''0'~'2''5''5' Default = '1''2''8'	Hpos Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255
Image V position	0x87, nn | '+' | '-' | 'r' | 'R' | '?'	Set image Vpos = value / increment / decrement / reset / query	Vpos Range='0''0'~'2''5''5' Default = '1''2''8'	Vpos Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255
Auto source	0x88, n | 'r' | 'R' | '?'	Set auto source = disable / enable / reset / query	'0' - disable '1' - enable (default)	'0' – disable '1' – enable (default)	Same as GEV1
OSD mode	0x89, n | 'r' | 'R' | '?'	Set OSD mode = full / simple / reset / query	'0' - Advanced (default) '1' - Basic '2' - Service	"0" = Full (default) "1" = Simple	Same as GEV1 Add new option of service menu
Sharpness	0x8A, nn | '+' | '-' | 'r' | 'R' | '?'	Set sharpness = value / increment / decrement / reset / query	Sharpness Range='0''0'~'2''5''5' Default = '1''2''8'	Sharpness Max Range: "0"'0' to "F"'F' Default: "0" "7"	Value Range changed from 0-15 to 0-255
Manual Frequency control	0x8B, nn | '+' | '-' | '?'	Set dot clock frequency = value / increment / decrement / query	Clock Range='0''0'~'2''5''5'	Clock Range ='0''0' to '6''4'	Value Range changed from 0-100 to 0-255
Scaling Mode	0x8C, n | 'r' | 'R' | '?'	Set image scaling mode = value / reset / query	'0' - Full (default) '1' - 1:1 '2' - Fill to aspect ratio	'0' – Full (default) '1' – 1:1 '2' – Fill to aspect ratio	Same as GEV1

Function	Data	Description	GEV2	GEV1	Differences
OSD lock mode	0x8D, n | 'r' | 'R' | '?'	Set OSD mode = normal / lock / reset / query	'0' - normal (default) '1' - FULL Protect '2' - Menu Protect	‘0’ – normal (default) ‘1’ – FULL Protect ‘2’ – Menu Protect	Same as GEV1
Auto adjustment	0x8F, n | 'r' | 'R' | '?'	Set auto adjust = on / off / reset / query	'0' - off '1' - on (default)	‘0’ – off ‘1’ – on (default)	Same as GEV1
OSD H position	0x90, nn | '+' | '-' | 'r' | 'R' | '?'	Set OSD Hpos = value / increment / decrement / reset / query	OSD Hpos Range='0"0'~'2"5"5' Default = '2"5"5'	OSD Hpos Range=‘0’’0’~’6"4' Default = ‘3"2'	Value Range changed from 0-100 to 0-255
OSD V position	0x91, n | '+' | '-' | 'r' | 'R' | '?'	Set OSD Vpos = value / increment / decrement / reset / query	OSD Vpos Range='0"0'~'2"5"5' Default = '2"5"5'	OSD Vpos Range=‘0’’0’~’6"4' Default = ‘3"2'	Value Range changed from 0-100 to 0-255
OSD Transparency	0x92, nn | '+' | '-' | 'r' | 'R' | '?'	Set OSD transparency = value / increment / decrement / reset / query	OSD transparency Range = '0'~'7' Default = '0'	Range = ‘0’~’7’ Default = ‘0’	Same as GEV1
Select OSD menu timeout	0x93, nn | '+' | '-' | 'r' | 'R' | '?'	Set OSD menu timeout = value / increment / decrement / reset / query	OSD menu timeout Range = '0"0'~'1"E' Default = '0"A'	OSD menu timeout Range = ‘0’’0’~’1’’E’ Default = ‘0’’A’	Same as GEV1
Select OSD language	0x95, n | 'r' | 'R' | '?'	Select language = value / reset / query	Language '0' - English (default) '1' - French '2' - German '3' - Italian '4' - Spanish '5' - Japanese '6' - Simplified Chinese '7' - Norwegian	Language ‘0’ – English (default) ‘1’ – French ‘2’ – German ‘3’ – Italian ‘4’ – Spanish ‘5’ – Japanese ‘6’ – Simplified Chinese ‘7’ – Norwegian	Same as GEV1
RGB_ input filter	0x96, n | 'r' | 'R' | '?'	Select RGB_ input filter = on / off / reset / query	'0' - Off (default) '1' - On	‘0’ – Off (default) ‘1’ – On	Same as GEV1
Main input select	0x98, n | 'r' | 'R' | '?'	Select input main = value / reset / query	0x00 - DVI-I_1 (default) 0x01 - DVI-I_2 0x02 - DVI3 0x03 - DVI4 0x10 - RGB_1 0x11 - RGB_2 0x12 - RGB_3 0x13 - RGB_4 0x20 - CVIDEO1/HDMI1 0x21 - CVIDEO2/HDMI2 0x22 - CVIDEO3/HDMI3 0x23 - CVIDEO4/HDMI4 0x30 - DP1 0x31 - DP2 0x32 - DP3 0x33 - DP4	0x30 - DVI1-1 0x31 - DVI1-2 0x32 - RGB_1 0x33 - RGB_2 0x34 - CVIDEO1 0x35 - CVIDEO2 0x36 - CVIDEO3	Different Input ID between GEV1 and GEV2

Function	Data	Description	GEV2	GEV1	Differences
Communication mode	0x99, n | 'r' | 'R' | '?'	Select Communication mode = value / reset / query	'0' - RS232 (Default) '1' - Ethernet '2' - 2wire RS485 '3' - 4wire RS422 '4' - USB '5' - Enable RS232 FW Download	'0' – RS232 (Default) '1' – Ethernet '2' – 2wire RS485 '3' – 4wire RS422 '4' – Download	Only difference is add new communication mode "USB"
Source Layout	0x9A, n | 'r' | 'R' | '?'	Select source layout = value / reset / query	'0' - No PIP (default) '1' -PIP Child '2' - PIP Wide '3' - PIP Split '4' - PIP Triple '5' - PIP Quad	'0' – No PIP (default) '1' –PIP Child '2' – PIP Wide '3' – PIP Split	Add new options for triple and quad PIP
Gamma value select	0x9D, n | 'r' | 'R' | '?'	Select Gamma value = value / reset / query	Gamma value '0' - No Calibration (default) '1' - Calibration DVI '2' - Calibration RGB '3' - Calibration DP '4' - Calibration CVideo/HDMI	Gamma value '0' – Calibration RGB '1' – Calibration DVI '2' – No Calibration (default)	Different remap of option ID
Power on	0x9F, n |'?'		'0' - OFF '1' - ON Map PWR command	'0' - Power Off '1' - Power On	Same as GEV1
Direct Access	0xA0, '1' | '2', n | 'r' | 'R' | '?'	Set direct access = value / reset / query '1' for hot key 1 '2' for hot key 2	'0' - Brightness '1' - PIP size '2' - Main source '3' - Second source '4' - PIP mode '5' - Scaling '6' - Swap '7' - Test pattern '8' - Language '9' - No function (default)	'0' – Brightness '1' – PIP size '2' – Main source '3' – Second source '4' – PIP mode '5' – Scaling '6' – Swap '7' – Test pattern '8' – Language '9' – LED drive 'A' – No function (default)	Remove LED drive option in GEV2 Option ID for "No function" is changed to '9' Remove LED drive option in GEV2 Option ID for "No function" is changed to '9' Remove LED drive option in GEV2 Option ID for "No function" is changed to '9' Remove LED drive option in GEV2 Option ID for "No function" is changed to '9' Remove LED drive option in GEV2 Option ID for "No function" is changed to '9'
PIP brightness control	0xA2, nn | '+' |'-' | 'r' | 'R' | '?'	Set PIP brightness = value / increment / decrement / reset / query	PIP window brightness Range='0''0'~'2''5''5' Default = '1''2''8'	PIP window brightness Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255
PIP contrast control	0xA3, nn | '+' |'-' | 'r' | 'R' | '?'	Set PIP contrast = value / increment / decrement / reset / query	PIP window contrast Range='0''0'~'2''5''5' Default = '1''2''8'	PIP window contrast Range='0''0'~'6''4' Default = '3''2'	Value Range changed from 0-100 to 0-255
PIP H position	0xA4, nn | '+' |'-' | 'r' | 'R' | '?'	Set PIP H pos = value / increment / decrement / reset / query	PIP H pos Range='0''0'~'2''5''5' Default = '1''2''8'	PIP H pos Range='0''0'~'6''4' Default = '6''4'	Value Range changed from 0-100 to 0-255
PIP V position	0xA5, nn | '+' |'-' | 'r' | 'R' | '?'	Set PIP V pos = value / increment / decrement / reset / query	PIP V pos Range='0''0'~'2''5''5' Default = '2''5''5'	PIP V pos Range='0''0'~'6''4' Default = '6''4'	Value Range changed from 0-100 to 0-255
PIP window size select	0xA6, n | '+' |'-' | 'r' | 'R' | '?'	Set PIP window size = value / increment / decrement / reset / query	PIP V window size Range = '1'~'7' Default = '7'	PIP V window size Range = '1'~'7' Default = '7'	Same as GEV1

Function	Data	Description	GEV2	GEV1	Differences
Second source select	0xA7, n | 'r' | 'R' | '?'	Select input second = value / reset / query	0x00 - DVI-I_1 0x01 - DVI-I_2 0x02 - DVI3 0x03 - DVI4 0x10 - RGB_1 0x11 - RGB_2 0x12 - RGB_3 0x13 - RGB_4 0x20 - CVIDEO1/HDMI1 (default) 0x21 - CVIDEO2/ HDMI2 0x22 - CVIDEO3/ HDMI3 0x23 - CVIDEO4/ HDMI4 0x30 - DP1 0x31 - DP2 0x32 - DP3 0x33 - DP4	0x30 - DVI1-1 0x31 - DVI1-2 0x32 - RGB_1 0x33 - RGB_2 0x34 - CVIDEO1 0x35 - CVIDEO2 0x36 - CVIDEO3	Different Input ID between GEV1 and GEV2
3rd Picture brightness control	0xA8, nn | '+' |'-' | 'r' | 'R' | '?'	Set 3rd Picture brightness = value / increment / decrement / reset / query	3rd Picture window brightness Range='0''0'~'2''5''5' Default = '1''2''8'	N/A	New command in GEV2. Only applicable for HD 32 inch and HD 55 inch
3rd Picture contrast control	0xA9, nn | '+' |'-' | 'r' | 'R' | '?'	Set 3rd Picture contrast = value / increment / decrement / reset / query	3rd Picture window contrast Range='0''0'~'2''5''5' Default = '1''2''8'	N/A	New command in GEV2. Only applicable for HD 32 inch and HD 55 inch
3rd source select	0xAB, n | 'r' | 'R' | '?'	Select input third = value / reset / query	0x00 - DVI-I_1 0x01 - DVI-I_2 0x02 - DVI3 0x03 - DVI4 0x10 - RGB_1 0x11 - RGB_2 0x12 - RGB_3 0x13 - RGB_4 0x20 - CVIDEO1/HDMI1 0x21 - CVIDEO2/HDMI2 0x22 - CVIDEO3/HDMI3 0x23 - CVIDEO4/HDMI4 0x30 - DP1 0x31 - DP2(Default) 0x32 - DP3 0x33 - DP4	N/A	New command in GEV2. Only applicable for HD 32 inch and HD 55 inch
4th Picture brightness control	0xAC, nn | '+' |'-' | 'r' | 'R' | '?'	Set 4th Picture brightness = value / increment / decrement / reset / query	4th Picture window brightness Range='0''0'~'2''5''5' Default = '1''2''8'	N/A	New command in GEV2. Only applicable for HD 32 inch and HD 55 inch
4th Picture contrast control	0xAD, nn | '+' |'-' | 'r' | 'R' | '?'	Set 4th Picture contrast = value / increment / decrement / reset / query	4th Picture window contrast Range='0''0'~'2''5''5' Default = '1''2''8'	N/A	New command in GEV2. Only applicable for HD 32 inch and HD 55 inch

Function	Data	Description	GEV2	GEV1	Differences
4th source select	0xAE, n | 'r' | 'R' | '?'	Select input fourth = value / reset / query	0x00 - DVI-I_1 0x01 - DVI-I_2 0x02 - DVI3 0x03 - DVI4 0x10 - RGB_1(Default) 0x11 - RGB_2 0x12 - RGB_3 0x13 - RGB_4 0x20 - CVIDEO1/HDMI1 0x21 - CVIDEO2/HDMI2 0x22 - CVIDEO3/HDMI3 0x23 - CVIDEO4/HDMI4 0x30 - DP1 0x31 - DP2 0x32 - DP3 0x33 - DP4	N/A	New command in GEV2. Only applicable for HD 32 inch and HD 55 inch
Graphic horizontal resolution enquiry	0xB7	Horizontal resolution (in pixels) in 3 digital hex number	'nnn' = horizontal resolution	'nnn' = horizontal resolution	Same as GEV1
Graphic vertical resolution enquiry	0xB8	Vertical resolution (in pixels) in 3 digital hex number	'nnn' = vertical resolution	'nnn' = vertical resolution	Same as GEV1
Graphic horizontal sync frequency	0xB9	Horizontal sync frequency (in units of 100Hz) in 3 digit hex number	'nnn' = horizontal frequency	'nnn' = horizontal frequency	Same as GEV1
Graphic vertical sync frequency	0xBA	Vertical sync frequency (in units of 0.1Hz) in 3 digit hex number and 1char	'nnnc' = vertical frequency c = 'i' or 'p' Interlace or progressive	'nnnc' = vertical frequency c = 'i' or 'p' Interlace or progressive	Same as GEV1
Set Address RS	0xBB, n|'?'	Set Address RS = value	Address RS Range -'0'~'F'	Address RS Range –'0'~'F'	Same as GEV1
Set IP address	0xBC, n.n.n.n | 'a' | 'A'|'?'	Set fix IP and IP = n.n.n.n (each n range is from '0' to '2"5"5') / Set auto IP, after send this command do AC on/off	'0' - fail '1' - success	'0' – fail '1' – success	Same as GEV1
Auto Position	0xC3	Auto set image position	'0' - fail '1' - success	'0' – fail '1' – success	Same as GEV1
Auto Color Balance	0xC5	Auto set image Color balance	'0' - fail '1' - success	'0' – fail '1' – success	Same as GEV1
Out Door mode	0xCA, '0' | '1' | 'R' | 'r' | '?'	Set the key is delay 5 second/ reset / query	'0' - OFF (default) '1' - ON	'0' - OFF (default) '1' - ON	Same as GEV1
Burn in	0xCC, '0' | '1' | 'R' | 'r' | '?'	Set burn in mode / reset / query	'0' - normal mode (default) '1' - burn in mode	'0' - normal mode (default) '1' - burn in mode	Same as GEV1
Test pattern	0xCD, '0' | '1'	Display test pattern / Go to default state	'0' - normal display '1' - display built in test pattern	'0' - normal display '1' - display built in test pattern	Same as GEV1
Reset Factory default	0xCE	Reset all parameter to default value	'0' - fail '1' - success	'0' - fail '1' - success	Same as GEV1
Saving the user default	0xD7, n	Saving all parameter to user default value (n = '1' to '5' correspond to User1 to User5)	'0' - fail '1' - success	'0' - fail '1' - success	Same as GEV1

Function	Data	Description	GEV2	GEV1	Differences
Loading the user default	0xD8, n	Loading all parameter to user default value (n = '1' to '5' correspond to User1 to Uesr5, and '0' is read Default)	'0' - fail '1' - success	'0' - fail '1' - success	Same as GEV1
Swap Main & PIP	0xE3	Swap main and second source	'0' - fail '1' - success	'0' – fail '1' – success	Same as GEV1
Gamma reset	0xE5	Reset Gamma table value, after send this command do AC on/off	'0' - fail '1' - success	'0' – fail '1' – success	Same as GEV1
Menu Button press	0xF7	Physical button press equivalent	No Data: Single press+release 0x00: Press and hold 0xFF: Release	No Data: Single press+release	Same as GEV1 Add new options to hold and release Same as GEV1 Add new options to hold and release
Navigation '<' Button press	0xFA	Physical button press equivalent	No Data: Single press+release 0x00: Press and hold 0xFF: Release	No Data: Single press+release	Same as GEV1 Add new options to hold and release Same as GEV1 Add new options to hold and release
Navigation '>' Button press	0xFB	Physical button press equivalent	No Data: Single press+release 0x00: Press and hold 0xFF: Release	No Data: Single press+release	Same as GEV1 Add new options to hold and release Same as GEV1 Add new options to hold and release
Brightness '+' press	0xFC	Physical button press equivalent	No Data: Single press+release 0x00: Press and hold 0xFF: Release	No Data: Single press+release	Same as GEV1 Add new options to hold and release
Brightness '-' Press	0xFD	Physical button press equivalent	No Data: Single press+release 0x00: Press and hold 0xFF: Release	No Data: Single press+release	Same as GEV1 Add new options to hold and release
Power Plan - VGA buffer and USB in off mode	0x71, n | 'r' | 'R' | '?'	***[1] - See comment**	'0' - Disable **'1' - Enable (Default)**	N/A	New command in GEV2.
Power Plan - LAN in off/sleep mode	0x72, n | 'r' | 'R' | '?'	***[2] - See comment**	'0' - Disabled **'1' - Enabled (Default)**	N/A	New command in GEV2.

Function	Data	Description	GEV2	GEV1	Differences
Touch Power Mode	0x73, n | 'r' | 'R' | '?'		**0xFF - "Always Active" (Default)** 0xFE - "Only active when unit is on and has a valid input signal" 0x00 - "Only active if selected source has a valid input signal" AND Selected Source= "DVI-I_1". 0x01 - "Only active if selected source has a valid input signal" AND Selected Source= "DVI-I_2". 0x02 - "Only active if selected source has a valid input signal" AND Selected Source= "DVI3". 0x03 - "Only active if selected source has a valid input signal" AND Selected Source= "DVI4". 0x10 - "Only active if selected source has a valid input signal" AND Selected Source= "RGB_1". 0x11 - "Only active if selected source has a valid input signal" AND Selected Source= "RGB_2". 0x12 - "Only active if selected source has a valid input signal" AND Selected Source= "RGB_3". 0x13 - "Only active if selected source has a valid input signal" AND Selected Source= "RGB_4". 0x20 - "Only active if selected source has a valid input signal" AND Selected Source= "CVBS1/HDMI1". 0x21 - "Only active if selected source has a valid input signal" AND Selected Source= "CVBS2/HDMI2". 0x22 - "Only active if selected source has a valid input signal" AND Selected Source= "CVBS3/HDMI3". 0x23 - "Only active if selected source has a valid input signal" AND Selected Source= "CVBS4/HDMI4". 0x30 - "Only active if selected source has a valid input signal" AND Selected Source= "DP1". 0x31 - "Only active if selected source has a valid input signal" AND Selected Source= "DP2". 0x32 - "Only active if selected source has a valid input signal" AND Selected Source= "DP3". 0x33 - "Only active if selected source has a valid input signal" AND Selected Source= "DP4".	N/A	New command in GEV2

Function	Data	Description	GEV2	GEV1	Differences
External Power Button	0x74, n | 'r' | 'R' | '?'	***[3] - See comment**	**'0' - Disabled (Default)** '1' - Enabled	N/A	New command in GEV2
Picture Direction	0x75, n | 'r' | 'R' | '?'		**'0' - 0 degrees (default)** '1' - 180 degrees	N/A	New command in GEV2
DDC / CI Settings	0x76, n | 'r' | 'R' | '?'		0xFE - Disabled 0xFD - Active Main Source **0xFF - All Active Sources (default)** 0x00- Follow DVI-I_1 0x01- Follow DVI-I_2 0x02- Follow DVI3 0x03- Follow DVI4 0x10- Follow RGB_1 0x11- Follow RGB_2 0x12- Follow RGB_3 0x13- Follow RGB_4 0x20 - Follow CVIDEO1/HDMI1 0x21 - Follow CVIDEO2/HDMI2 0x22 - Follow CVideo3/HDMI3 0x23 - Follow CVIDEO4/HDMI4 0x30 - Follow DP1 0x31 - Follow DP2 0x32 - follow DP3 0x33 - Follow DP4	N/A	New command in GEV2
GDC Button Sensitivity	0x78, nnn | 'r' | 'R' | '?'		Range='0''0''0'~'2''5''5'	N/A	New command in GEV2
DVI-I 1 Port Mode	0x7B, n | 'r' |'R' | '?'		'0' - Auto '1' - DVI-D '2' - DVI-A/VGA	N/A	New command in GEV2
DVI-I 2 Port Mode	0x7C, n | 'r' |'R' | '?'		'0' - Auto '1' - DVI-D '2' - DVI-A/VGA	N/A	New command in GEV2

Comments to MCC Command table

***[1] Power Plan - VGA buffer and USB in Off Mode:**

Enabled:
When this setting is selected and computer is turned off is must enter "Completely off" mode

Off:
When this setting is selected and computer is turned off is must enter "Off" mode.

***[2] Power Plan - LAN in off/Sleep mode:**

Enabled:
When this setting is selected and computer is turned off (in "Off", "Completely Off" and "Low Power Mode") the LAN is powered.

Off:
When this setting is selected and computer is turned off (in "Off", "Completely Off" and "Low Power Mode") the LAN is unpowered

***[3] External Power button:**

The command is used to enable or disable the power ON/Off input on User interface.

Operational Requirements

The following sections define the operational requirements.

Serial Message Failure
If serial messages stop being transmitted or are corrupt, the unit will remain at the last commanded brightness.

Periodic Messages
Commands shall be transmitted to the unit at a repetition no faster than 4 Hz.

Sending Multiple Commands / Command Queue
To ensure all commands are transmitted and executed successfully on the unit, a delay between each command in the queue shall be at least 500ms. Some internal commands require slightly longer to process internally in the unit, than others.

Keep-alive Alarm
The "SWI" query can be used for keep-alive alarm logic in the application software on the computer. It is recommended to limit this function to once a second (1000ms).

Individually Addressed Command Response Time
The unit will output the required response within Tr = 2.5 character periods after the last byte of a command message is received (2.6ms at 9600 bit/sec for Serial Mode only), except as specified herein.

Broadcast Command Response Time
In response to Serial mode RS-485 broadcast command messages, after the last byte of the command message is received, all units will reply within the time period defined for Te, below. Further more, any gap between these individual responses will be less than the Intermessage Gap, defined below.

Te = (Tr + Lr) * N, where
Lr = length of the ACK/NAK message response
Tr = response time
N = the total number of units*

*) As the units reply in order to their address, the units must be given subsequent addresses, starting at zero, for N to equal the total number of units. If not, N = the highest unit address + 1.

The maximum Lr for a selected command set are shown in the table below:

Command	BRT	BZZ	ETC	POT	SNB	SWI	SWK	TYP	MCC
Lr	9	9	11	9	13	19	11	28	xx**

**)This command will vary in size, and response time is longer. Make sure ACK is received from all units before sending a new command.

Example:
For the BRT command, and 8 units, this corresponds to Te = (2.5 * 10 + 9 * 10) * 8 / 9600 = 95.8 ms

Intermessage Gap - Serial Mode
Following an individually addressed command, the next command shall not be issued until at least Tg = 5 character periods after the ACK or NAK message received. At 9600, that is 5 * 10 / 9600 = 5.2ms.

Following the issue of a broadcast command message, the next command shall not be issued until at least Tc = Te + Tg, where Te is as defined for Broadcast Command response and Tg is defined above.

Unit Response and Addresses

When individual unit addressing is supported by an installed configuration of units in a RS-485 (for units that support it) system, a separate ACK or NAK message for each unit will be transmitted providing each unit's individual address in response to any broadcast addressed Command.

NAK messages will not be generated when an error in a Broadcast message is detected. When individual unit addressing is not supported, the unit will only respond to the broadcast address and will include the broadcast address in the ACK and NAK messages. NAK messages will not be generated when an error in a Broadcast message is detected.

When a unit receives an incomplete message and the next byte is not received until after a time equal to the Intermessage Gap, the next bytes received shall be processed to check for the start of a new command (0x07, ASCII Bell).

If the header checksum is valid, but the first byte of the command message is not 0x07, as specified, the unit may wait until after the next inter-message gap to resume checking. A NAK message shall not be generated.

If the header checksum is valid, but the value of the CMD field does not equal one of the defined commands, the unit shall reply by generating a NAK message as though a VER command had been received.

If the header checksum is valid, but the value of the LEN field is greater than the maximum allowed, the unit shall ignore the message. A NAK message shall not be generated.

If the data checksum is valid, but the value in the DATA field associated with a command is invalid (out of range, undefined, etc.), the unit shall generate a NAK message indicating the current data value in the DATA field.

Additional Commands

In time, additional commands and corresponding data fields may be defined. These additions will not conflict with the operation of the interface as defined herein in this document.

This page left intentionally blank

Appendixes

HEX, ASCII, BIN and Character table

HEX	DEC	BIN	Character/Symbol	Description
0x00	0	00000000	NUL	Null terminator / character / End of string
0x01	1	00000001	SOH	Start of Heading
0x02	2	00000010	STX	Start of Text
0x03	3	00000011	ETX	End of Text
0x04	4	00000100	EOT	End of Transmission
0x05	5	00000101	ENQ	Enquiry
0x06	6	00000110	ACK	Acknowledgment
0x07	7	00000111	BEL	Bell
0x08	8	00001000	BS	Back Space
0x09	9	00001001	HT	Horizontal Tab
0x0A	10	00001010	LF	Line Feed
0x0B	11	00001011	VT	Vertical Tab
0x0C	12	00001100	FF	Form Feed
0x0D	13	00001101	CR	Carriage Return
0x0E	14	00001110	SO	Shift Out / X-On
0x0F	15	00001111	SI	Shift In / X-Off
0x10	16	00010000	DLE	Data Line Escape
0x11	17	00010001	DC1	Device Control 1 (oft. XON)
0x12	18	00010010	DC2	Device Control 2
0x13	19	00010011	DC3	Device Control 3 (oft. XOFF)
0x14	20	00010100	DC4	Device Control 4
0x15	21	00010101	NAK	Negative Acknowledgement
0x16	22	00010110	SYN	Synchronous Idle
0x17	23	00010111	ETB	End of Transmit Block
0x18	24	00011000	CAN	Cancel
0x19	25	00011001	EM	End of Medium
0x1A	26	00011010	SUB	Substitute
0x1B	27	00011011	ESC	Escape
0x1C	28	00011100	FS	File Separator
0x1D	29	00011101	GS	Group Separator
0x1E	30	00011110	RS	Record Separator
0x1F	31	00011111	US	Unit Separator
0x20	32	00100000		Space " "
0x21	33	00100001	!	Exclamation mark
0x22	34	00100010	"	Double quotes
0x23	35	00100011	#	Number
0x24	36	00100100	$	Dollar
0x25	37	00100101	%	Percentage
0x26	38	00100110	&	Ampersand
0x27	39	00100111	'	Single quote
0x28	40	00101000	(	Open parenthesis (or open bracket)
0x29	41	00101001	)	Close parenthesis (or close bracket)
0x2A	42	00101010	*	Asterisk
0x2B	43	00101011	+	Plus
0x2C	44	00101100	,	Comma
0x2D	45	00101101	-	Minus / Hyphen
0x2E	46	00101110	.	Period, dot or full stop
0x2F	47	00101111	/	Slash or divide
0x30	48	00110000	0	Zero
0x31	49	00110001	1	One
0x32	50	00110010	2	Two

HEX, ASCII, BIN and Character table

HEX	DEC	BIN	Character/Symbol	Description
0x33	51	00110011	3	Three
0x34	52	00110100	4	Four
0x35	53	00110101	5	Five
0x36	54	00110110	6	Six
0x37	55	00110111	7	Seven
0x38	56	00111000	8	Eight
0x39	57	00111001	9	Nine
0x3A	58	00111010	:	Colon
0x3B	59	00111011	;	Semicolon
0x3C	60	00111100	<	Less than (or open angled bracket)
0x3D	61	00111101	=	Equals
0x3E	62	00111110	>	Greater than (or close angled bracket)
0x3F	63	00111111	?	Question mark
0x40	64	01000000	@	At symbol
0x41	65	01000001	A	Uppercase A
0x42	66	01000010	B	Uppercase B
0x43	67	01000011	C	Uppercase C
0x44	68	01000100	D	Uppercase D
0x45	69	01000101	E	Uppercase E
0x46	70	01000110	F	Uppercase F
0x47	71	01000111	G	Uppercase G
0x48	72	01001000	H	Uppercase H
0x49	73	01001001	I	Uppercase I
0x4A	74	01001010	J	Uppercase J
0x4B	75	01001011	K	Uppercase K
0x4C	76	01001100	L	Uppercase L
0x4D	77	01001101	M	Uppercase M
0x4E	78	01001110	N	Uppercase N
0x4F	79	01001111	O	Uppercase O
0x50	80	01010000	P	Uppercase P
0x51	81	01010001	Q	Uppercase Q
0x52	82	01010010	R	Uppercase R
0x53	83	01010011	S	Uppercase S
0x54	84	01010100	T	Uppercase T
0x55	85	01010101	U	Uppercase U
0x56	86	01010110	V	Uppercase V
0x57	87	01010111	W	Uppercase W
0x58	88	01011000	X	Uppercase X
0x59	89	01011001	Y	Uppercase Y
0x5A	90	01011010	Z	Uppercase Z
0x5B	91	01011011	[	Opening bracket
0x5C	92	01011100	\	Backslash
0x5D	93	01011101	]	Closing bracket
0x5E	94	01011110	^	Caret - circumflex
0x5F	95	01011111	_	Underscore
0x60	96	01100000	`	Grave accent
0x61	97	01100001	a	Lowercase a
0x62	98	01100010	b	Lowercase b
0x63	99	01100011	c	Lowercase c
0x64	100	01100100	d	Lowercase d
0x65	101	01100101	e	Lowercase e

HEX, ASCII, BIN and Character table

HEX	DEC	BIN	Character/Symbol	Description
0x66	102	01100110	f	Lowercase f
0x67	103	01100111	g	Lowercase g
0x68	104	01101000	h	Lowercase h
0x69	105	01101001	i	Lowercase i
0x6A	106	01101010	j	Lowercase j
0x6B	107	01101011	k	Lowercase k
0x6C	108	01101100	l	Lowercase l
0x6D	109	01101101	m	Lowercase m
0x6E	110	01101110	n	Lowercase n
0x6F	111	01101111	o	Lowercase o
0x70	112	01110000	p	Lowercase p
0x71	113	01110001	q	Lowercase q
0x72	114	01110010	r	Lowercase r
0x73	115	01110011	s	Lowercase s
0x74	116	01110100	t	Lowercase t
0x75	117	01110101	u	Lowercase u
0x76	118	01110110	v	Lowercase v
0x77	119	01110111	w	Lowercase w
0x78	120	01111000	x	Lowercase x
0x79	121	01111001	y	Lowercase y
0x7A	122	01111010	z	Lowercase z
0x7B	123	01111011	{	Opening brace
0x7C	124	01111100	|	Vertical bar
0x7D	125	01111101	}	Closing brace
0x7E	126	01111110	~	Equivalency sign - tilde
0x7F	127	01111111		Delete (no visible character)
0x80	128	10000000	€	Euro sign
0x81	129	10000001		(no visible character)
0x82	130	10000010	‚	Single low-9 quotation mark
0x83	131	10000011	*ƒ*	Latin small letter f with hook
0x84	132	10000100	„	Double low-9 quotation mark
0x85	133	10000101	…	Horizontal ellipsis
0x86	134	10000110	†	Dagger
0x87	135	10000111	‡	Double dagger
0x88	136	10001000	ˆ	Modifier letter circumflex accent
0x89	137	10001001	‰	Per mille sign
0x8A	138	10001010	Š	Latin capital letter S with caron
0x8B	139	10001011	‹	Single left-pointing angle quotation
0x8C	140	10001100	Œ	Latin capital ligature OE
0x8D	141	10001101		(no visible character)
0x8E	142	10001110	Ž	Latin captial letter Z with caron
0x8F	143	10001111		(no visible character)
0x90	144	10010000		(no visible character)
0x91	145	10010001	‘	Left single quotation mark
0x92	146	10010010	’	Right single quotation mark
0x93	147	10010011	“	Left double quotation mark
0x94	148	10010100	”	Right double quotation mark
0x95	149	10010101	•	Bullet
0x96	150	10010110	–	En dash
0x97	151	10010111	—	Em dash
0x98	152	10011000	˜	Small tilde

HEX, ASCII, BIN and Character table

HEX	DEC	BIN	Character/Symbol	Description
0x99	153	10011001	™	Trade mark sign
0x9A	154	10011010	š	Latin small letter S with caron
0x9B	155	10011011	›	Single right-pointing angle quotation mark
0x9C	156	10011100	œ	Latin small ligature oe
0x9D	157	10011101		(no visible character)
0x9E	158	10011110	ž	Latin small letter z with caron
0x9F	159	10011111	Ÿ	Latin capital letter Y with diaeresis
0xA0	160	10100000		Non-breaking space (no visible character)
0xA1	161	10100001	¡	Inverted exclamation mark
0xA2	162	10100010	¢	Cent sign
0xA3	163	10100011	£	Pound sign
0xA4	164	10100100	¤	Currency sign
0xA5	165	10100101	¥	Yen sign
0xA6	166	10100110	¦	Pipe, Broken vertical bar
0xA7	167	10100111	§	Section sign
0xA8	168	10101000	¨	Spacing diaeresis - umlaut
0xA9	169	10101001	©	Copyright sign
0xAA	170	10101010	ª	Feminine ordinal indicator
0xAB	171	10101011	«	Left double angle quotes
0xAC	172	10101100	¬	Not sign
0xAD	173	10101101		Soft hyphen
0xAE	174	10101110	®	Registered trade mark sign
0xAF	175	10101111	¯	Spacing macron - overline
0xB0	176	10110000	°	Degree sign
0xB1	177	10110001	±	Plus-or-minus sign
0xB2	178	10110010	²	Superscript two - squared
0xB3	179	10110011	³	Superscript three - cubed
0xB4	180	10110100	´	Acute accent - spacing acute
0xB5	181	10110101	µ	Micro sign
0xB6	182	10110110	¶	Pilcrow sign - paragraph sign
0xB7	183	10110111	·	Middle dot - Georgian comma
0xB8	184	10111000	¸	Spacing cedilla
0xB9	185	10111001	¹	Superscript one
0xBA	186	10111010	º	Masculine ordinal indicator
0xBB	187	10111011	»	Right double angle quotes
0xBC	188	10111100	¼	Fraction one quarter
0xBD	189	10111101	½	Fraction one half
0xBE	190	10111110	¾	Fraction three quarters
0xBF	191	10111111	¿	Inverted question mark
0xC0	192	11000000	À	Latin capital letter A with grave
0xC1	193	11000001	Á	Latin capital letter A with acute
0xC2	194	11000010	Â	Latin capital letter A with circumflex
0xC3	195	11000011	Ã	Latin capital letter A with tilde
0xC4	196	11000100	Ä	Latin capital letter A with diaeresis
0xC5	197	11000101	Å	Latin capital letter A with ring above
0xC6	198	11000110	Æ	Latin capital letter AE
0xC7	199	11000111	Ç	Latin capital letter C with cedilla
0xC8	200	11001000	È	Latin capital letter E with grave
0xC9	201	11001001	É	Latin capital letter E with acute
0xCA	202	11001010	Ê	Latin capital letter E with circumflex
0xCB	203	11001011	Ë	Latin capital letter E with diaeresis

HEX, ASCII, BIN and Character table

HEX	DEC	BIN	Character/Symbol	Description
0xCC	204	11001100	Ì	Latin capital letter I with grave
0xCD	205	11001101	Í	Latin capital letter I with acute
0xCE	206	11001110	Î	Latin capital letter I with circumflex
0xCF	207	11001111	Ï	Latin capital letter I with diaeresis
0xD0	208	11010000	Đ	Latin capital letter ETH
0xD1	209	11010001	Ñ	Latin capital letter N with tilde
0xD2	210	11010010	Ò	Latin capital letter O with grave
0xD3	211	11010011	Ó	Latin capital letter O with acute
0xD4	212	11010100	Ô	Latin capital letter O with circumflex
0xD5	213	11010101	Õ	Latin capital letter O with tilde
0xD6	214	11010110	Ö	Latin capital letter O with diaeresis
0xD7	215	11010111	×	Multiplication sign
0xD8	216	11011000	Ø	Latin capital letter O with slash
0xD9	217	11011001	Ù	Latin capital letter U with grave
0xDA	218	11011010	Ú	Latin capital letter U with acute
0xDB	219	11011011	Û	Latin capital letter U with circumflex
0xDC	220	11011100	Ü	Latin capital letter U with diaeresis
0xDD	221	11011101	Ý	Latin capital letter Y with acute
0xDE	222	11011110	Þ	Latin capital letter THORN
0xDF	223	11011111	ß	Latin small letter sharp s - ess-zed
0xE0	224	11100000	à	Latin small letter a with grave
0xE1	225	11100001	á	Latin small letter a with acute
0xE2	226	11100010	â	Latin small letter a with circumflex
0xE3	227	11100011	ã	Latin small letter a with tilde
0xE4	228	11100100	ä	Latin small letter a with diaeresis
0xE5	229	11100101	å	Latin small letter a with ring above
0xE6	230	11100110	æ	Latin small letter ae
0xE7	231	11100111	ç	Latin small letter c with cedilla
0xE8	232	11101000	è	Latin small letter e with grave
0xE9	233	11101001	é	Latin small letter e with acute
0xEA	234	11101010	ê	Latin small letter e with circumflex
0xEB	235	11101011	ë	Latin small letter e with diaeresis
0xEC	236	11101100	ì	Latin small letter i with grave
0xED	237	11101101	í	Latin small letter i with acute
0xEE	238	11101110	î	Latin small letter i with circumflex
0xEF	239	11101111	ï	Latin small letter i with diaeresis
0xF0	240	11110000	ð	Latin small letter eth
0xF1	241	11110001	ñ	Latin small letter n with tilde
0xF2	242	11110010	ò	Latin small letter o with grave
0xF3	243	11110011	ó	Latin small letter o with acute
0xF4	244	11110100	ô	Latin small letter o with circumflex
0xF5	245	11110101	õ	Latin small letter o with tilde
0xF6	246	11110110	ö	Latin small letter o with diaeresis
0xF7	247	11110111	÷	Division sign
0xF8	248	11111000	ø	Latin small letter o with slash
0xF9	249	11111001	ù	Latin small letter u with grave
0xFA	250	11111010	ú	Latin small letter u with acute
0xFB	251	11111011	û	Latin small letter u with circumflex
0xFC	252	11111100	ü	Latin small letter u with diaeresis
0xFD	253	11111101	ý	Latin small letter y with acute
0xFE	254	11111110	þ	Latin small letter thorn
0xFF	255	11111111	ÿ	Latin small letter y with diaeresis

```
{
        // Create SCOM package
                byte[] cmd = enc.GetBytes("BRT");
                byte[] data = new byte[1] { 0x99 };  // 60% brightness
                COMMessage message = new COMMessage(cmd, data);

        // Transmitting SCOM package to TCP
                SendTCPCommand(message);
}


private Byte[] SendTCPCommand(COMMessage commessage)

{
        // Creating new TCPclient
                TcpClient tcpClient = new TcpClient();

        // Byte version of the SCOM package
                byte[] byteMessage = (byte[])commessage.Message.ToArray(typeof(byte));

        //Display IP adresse
                IPAddress displayAddr = IPAddress.Parse(DisplayIPAddress);
                Int32 port = 10001; //constant

        //Connecting
                tcpClient.Connect(displayAddr, port);

        // Create a stream from TCPClient
                NetworkStream stream = tcpClient.GetStream();

        //Write the SCOM package into stream
                stream.Write(byteMessage, 0, byteMessage.Length);

        // Wait for response
                Thread.Sleep(GlobalWaitTime);

        // Read Response
        // To be compliant with SCOM package (ATTN, ADDR, CMD, CMD, CMD, LEN, IHCHK, DATA, IDCHK)
                stream.Read(data, 0, data.Length);
}
```

Revision History

Rev.	By	Date	Notes
01	WJ SE	21 Dec 2016	First release for internet (based on DOC102051)
02	WJ SE	03 Jan 2017	Added Series X MMD (Maritime Multi Display) G2 typenumbers ref: http://www.hatteland-display.com/mails/16_2016_ecn.html
03	ME SE	11 Jan 2017	Revised grammar errors, page 5,6,7
04	VM JE WJ SE	08 Jan 2018	Revised wrong command example (TYP), page 28 Revised wrong command example (TMP), page 30 Revised wrong command example (CBR), page 32 Revised wrong command example (VUS), page 40 Added new command “MOD”, page 41 Revised MCC table (added note to Brightness Control) and added Differences GEV1 vs GEV2, page 43-51 - reference: http://www.hatteland-display.com/mails/31_2017_ecn.html