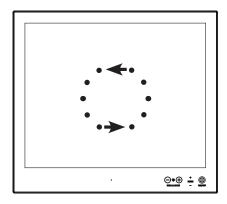


TECHNICAL MANUAL



Serial Communication Control Interface (SCOM)

Applies for Series X Maritime Multi Computer (MMC) Generation 1 (G1):

HD 12T21 xxC-xxx-Fxxx HD 15T21 xxC-xxx-Fxxx HD 17T21 xxC-xxx-Fxxx HD 19T21 xxC-xxx-Fxxx HD 24T21 xxC-xxx-Fxxx HD 26T21 xxC-xxx-Fxxx

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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.

Statement above last revised 31 Jul. 2019

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Introduction

This document defines the electrical interface, serial data format, and communication protocols of the Communication Control Interface (SCOM). The purpose of this interface is to enable a computer application to control the unit. Unit refer to panel computers (Maritime Multi Computer - MMC, Interface configuration done via VCOM and/or BIOS).

Serial Interface Configuration

The serial interface can have different configurations which are defined as follows:

RS-232	One computer controls one unit, no individual address
--------	---

Cables

Serial Mode: No cables needed, internal support.

Panel Computer (Maritime Multi Computer - MMC) based units are by factory default manufactured with: • COM RS-232 : Internal Virtual COM x (VCOM), where x is OS/configuration dependent.

This Virtual COM port enables you to send commands TO the same unit that you are sending FROM, which means there is no need to differentiate between local control or remote control for communicating through physical ports such as RS-232, RS-485/RS-422 towards other units located externally. VCOM requires a specific Hatteland Technology software driver installed prior to use/communcation attempts.

Installing API/VCOM Drivers

In order to access and communicate with the Panel Computer (MMC) units, it may or may not already have preinstalled drivers depending on factory defaults. If you need to install or re-install drivers, please follow the instructions as described below:

1: Available product range hardware drivers on our website (19 inch used as example): - https://www.hattelandtechnology.com/drivers?key=X.X.X.X.X.X.301

"HATTELAND® BD82QM57 API Package" requires Visual C++ Redistributable prerequisites from Microsoft®: - https://www.hattelandtechnology.com/drivers?key=18.10.8.57.X.X.X

Specific API drivers "HATTELAND® BD82QM57 API Package": - https://www.hattelandtechnology.com/drivers?key=17.15.32.X.X.X

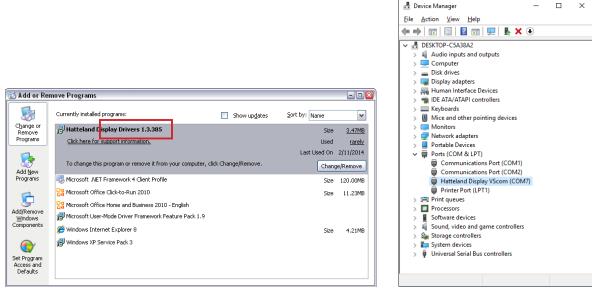
Additional documentation:

https://www.hattelandtechnology.com/hubfs/pdf/misc/doc101163-1_hatteland_display_api_qm57.pdf

How to determine version installed of API/VCOM drivers

If you have previously installed the API/VCOM drivers on a Panel Computer (MMC), here is how you can find version information via several methods (Microsoft® Windows® Operating systems only):

Via "Control Panel / Add or Remove Programs" or "Control Panel / Programs and Features" (OS dependent) and within Device Manager, showing Port Number:



Example above indicates version "1.3.385".

Control Panel + A	All Control Panel Items 👻 Programs and Features	•	Search Pro	grams and Features	
e Edit View Tools Help			,		
Control Panel Home	Uninstall or change a program				
View installed updates	To uninstall a program, select it from the list and th	en click Uninstall, Change, or Rep	pair.		
Turn Windows features on or off	Organize 🔻 Uninstall/Change			:==	- (?
	Name	Publisher	▼ I ▼	Size 🗸 Version	1
	Hatteland Dis lay Drivers 1.3.266	Hatteland Display AS	4/11/2013	1.3.266	
	11 Intel® HD Graphics Driver	Intel Corporation	4/10/2013	74.2 MB 6.14.10.539	4
	🚮 Intel® Management Engine Components	Intel Corporation	4/10/2013	20.4 MB 6.0.0.1179	
	🔁 Intel® Rapid Storage Technology	Intel Corporation	4/10/2013	18.4 MB 10.0.0.1046	
	🚧 Realtek High Definition Audio Driver	Realtek Semiconductor Corp.	3/23/2012	6.0.1.6526	
	Intel(R) Network Connections 16.8.46.0	Intel	3/23/2012	10.6 MB 16.8.46.0	
	Microsoft .NET Framework 4 Extended	Microsoft Corporation	3/9/2012	51.9 MB 4.0.30319	
	🌄 Microsoft .NET Framework 4 Client Profile	Microsoft Corporation	3/9/2012	38.8 MB 4.0.30319	
	Microsoft Visual C++ 2010 x86 Redistributable	Microsoft Corporation	3/2/2012	11.1 MB 10.0.40219	
	Hatteland Display AS Product version:	1.3.266 Supp	port link: http://ww	w.hatteland-display.com	

Example above indicates version "1.3.266".

Via registry (regedit.exe) - Experienced users only!

[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall\Hatteland Display Drivers]

- "DisplayName"="Hatteland Display Drivers x.y.zzz"
- "DisplayVersion"="x.y.zzz"

Where x.y.zzz is version number, example "1.3.266".

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Data Rates

The unit is configured to transmit and receive data at 9600 bits/second (Serial mode).

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	7etc	End Byte
	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).

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 shall send 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.

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

ADDR

Address (ADDR)

This single byte is used to specify a particular unit to receive a Command and to identify the unit responding (ACK or NAK) to a Command. All units will support the broadcast address. The factory default adress is 0x00, while in this manual illustrated throughout as 0xFF.

The Address field shall have the following values:

ADDR	Description
0xFF	Broadcast - Addressed to single unit

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	Page
0x42	0x52	0x49	"BRI"	Backlight Minimum Value	W	10
0x42	0x52	0x4C	"BRL"	Set LED Glass Display Control™ (GDC) Brightness	R/W	10
0x42	0x52	0x4D	"BRM"	Backlight Maximum Value	W	10
0x42	0x52	0x54	"BRT"	User Brightness Control	W	11
0x42	0x5A	0x5A	"BZZ"	Buzzer Control	W	11
0x44	0x4C	0x3F	"DL?"	Query available ECDIS packages	R	12
0x44	0x4C	0x4E	"DLN"	Download ECDIS package table x	R	12-13
0x45	0x54	0x43	"ETC"	Elapsed Time Counter Query	R	13
0x47	0x4D	0x42	"GMB"	Set LED Glass Display Control™ (GDC) Minimum Brightness	W	14
0x4C	0x49	0x53	"LIS"	Read Ambient Light Sensor	R	14
0x53	0x4E	0x42	"SNB"	Serial Number Query	R	14
0x53	0x57	0x49	"SWI"	Main Software (Video Controller) Version Query	R	15
0x53	0x57	0x4B	"SWK"	Glass Display Control™ (GDC) software version Query	R	15
0x54	0x59	0x50	"TYP"	Type/Model Number Query	R	16
0x51	0x44	0x55	"QDU"	QM57 Chipset Duplex Mode	W	16

I/O

= R=Read, W=Write.

= Page number in this manual where command is detailed. Page #

NOTE: Due to firmware revisions, some commands listed above will not be available on earlier units.

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 shall be initialised to 0. The 8-bit sum (without carry) of bytes 0, 1, 2, 3, 4, 5 and 6 shall 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. This does not apply to Broadcast messages in RS-485 mode, in which case there will be no reply.

DATA

Data Field (DATA)

The single byte is the DATA field which shall only be transmitted if LEN is greater than 0. This field depends on the CMD transmitted.

IDCHK

Inverse Data Checksum (IDCHK)

This single byte shall 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 shall be initialised to 0. The 8-bit sum (without carry) of bytes 7 through 7+LEN inclusive shall be 0xFF. The receiver will reply to any message that the checksum has failed with the attention code set to NAK. This requirement does not reply to broadcast messages in RS-485 (for units that support it) mode, in which case there will be no reply. 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.

"BRI" - Backlight Minimum Value

Set the backlight minimum value. Range from 0x00 to 0xFF (0% - 100%).

Example:

(Command to set 50% Brightness:										
	0x07	0xFF	0x42	0x52	0x49	0x01	0x1B	0x80	0x7F		

"BRL" - Set LED Glass Display Control™ (GDC) Brightness

Set the backlight intensity for the Glass Display Control[™] (GDC) LED's on the front glass. From 0x00 to 0x31 (0% - 100%). The brightness value shall be sent as 1 byte in the DATA field. A setting of 0x00 shall indicate off. A setting of 0x31 shall indicate maximum brightness. You can send "?" to retrieve the current value/status of the LED's.

Example:

Command to set 60% intensity:										
0x07	0xFF	0x42	0x52	0x4C	0x01	0x18	0x32	0xCD		

"BRM" - Backlight Maximum Value

Set the backlight maximum value. Range from 0x00 to 0xFF (0% - 100%).

Example:

Command to	o set 60% Bri	ghtness:					
0x07	0xFF	0x42	0x52	0x4D	0x01	0x17	0x99

0x66

"BRT" - User Brightness Control

This command is sent to the unit to command the backlight brightness control setting. The brightness value shall be sent as one byte in the DATA field. A setting of 0x00 will indicate off. A setting of 0xFF (255 in value) will indicate maximum brightness. Intermediate values will control brightness over the range from minimum to maximum luminance. LEN = one data byte.

After any power cycle the BRT will be set to 100%.

If the data checksum is valid and the brightness was set, the unit will reply to this command with an ACK attention code. The DATA field in the reply shall indicate the resulting brightness control setting. If an invalid checksum was received and the message was not Broadcast and RS-485, the unit will reply with an NAK attention code. The DATA field in the reply will indicate the current brightness control setting.

Example:

If BRT is 100%, the user can adjust the brightness from 0-100%. If the BRT is set to 60%, the visual brightness is set to 60%. The user can adjust the brightness from 0-100% within the 60% set by BRT. If the user sets the potensiometer to half, 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%).

Command to set 60% Brightness:

0x07	0xFF	0x42	0x52	0x54	0x01	0x10	0x99	0x66					
Acknowledge was set to 60% Brightness:													
0x06	0xFF	0x42	0x52	0x54	0x01	0x11	0x99	0x66					
Negative Acknowledge 40% Brightness:													
0x15	0xFF	0x42	0x52	0x54	0x01	0x02	0x66	0x99					

"BZZ" - Buzzer Control

This command is sent to the unit to control buzzer on/off if there is a buzzer present. LEN = one data byte.

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

If the data checksum is valid, the unit will reply to this command with an ACK attention code. The DATA field will indicate the buzzer state. If an invalid data checksum was received and the message was not broadcast and RS-485, the unit will reply with a NAK attention code and the current control setting.

Example:

,	Command to set Buzzer Enable: 0xFF												
	0x07	0xFF	0x42	0x5A	0x5A	0x01	0x02	0xFF	0x00				
	Acknowledge Buzzer status was set to Enable: 0xFF												
	0x06	0xFF	0x42	0x5A	0x5A	0x01	0x03	0xFF	0x00				

"DL?" - Query available ECDIS packages

This command will query the unit in order to aquire how many packets (1 packet = 32 bytes) are in the ECDIS memory table (if available) that are available for download. Packet counting starts from 0, so a response of 0x03 is naturally 4 actual packets (4*32 = 128 bytes as ASCII text). If packets end up as example 42.34, it will always be rounded upwards, i.e. 43 packets.

The "DL?" command does not indicate which memory slot was used to store the ECDIS table, so please use SLOT 1 (0x00).

Product Range	Slots Available	OSD ID	OSD Setting
Maritme Multi Computer (MMC)	Internal (DVI/LVDS)	2	No Calibration
	Internal (DVI/LVDS)	0	No OSD setting available to verify/change

Example:

Command for query num of packets:

0x07	0xFF	0x44	0x4C	0x3F	0x00	0x2A
------	------	------	------	------	------	------

Acknowledge: DL? indicates 4 available packets:

	•							
0x06	0xFF	0x44	0x4C	0x3F	0x01	0x2A	0x03	0xFC

"DLN" - Download ECDIS package table x

Before sending this command, use "DL?" to retrieve how many packets are actually available in the ECDIS table. If you request a download package from a empty slot or above the available packets in memory, you will get a NAK response. The "DLN" command shall be sent to the unit to request a specific data packet stored in the unit's memory. 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.

If the data checksum and packet number is valid, the unit 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 74 bytes per message; therefore the DATA field in the reply shall be a maximum length of 74 bytes. The DATA field of the message is not required to be of maximum length (it may be smaller than 74 bytes).

Example:

Command to read package number 1,2,3,4 (0x00, 0x01, 0x02, 0x03) from Slot ID 0x00:

0x07	0xFF	0x44	0x4C	0x4E	0x00	0x1B	0x00	0xFF
0x07	0xFF	0x44	0x4C	0x4E	0x00	0x1B	0x01	0xFE
0x07	0xFF	0x44	0x4C	0x4E	0x00	0x1B	0x02	0xFD
0x07	0xFF	0x44	0x4C	0x4E	0x00	0x1B	0x03	0xFC

.... until the end of available packages.

ECDIS table 0 is stored first and read with only packed nr. To read from other table, another byte is added for table nr. 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 second byte in the DATA represents the table nr from 1-x. If the data checksum and packet number is valid, the unit 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 74 bytes per message; therefore the DATA field in the reply shall be a maximum length of 74 bytes. The DATA field of the message is not required to be of maximum length (it may be smaller than 74 bytes).

Continued on next page ...

Acknow	Acknowledge Example of a successful DLN query (4 first packages illustrated, actual ASCII text begins at WHITE colored cells):																
0x06	0xFF	0x44	0x4C	0x4E	0x20	0xFC	0x00	0x2D	0x56	0x42	0x31	0x30	0x30	0x30	0x31	0x34	0x2D
0x31	0x20	0x42	0x75	0x69	0x6C	0x64	0x20	0x6E	0x75	0x6D	0x62	0x65	0x72	0x3A	0x20	0x56	0x65
0x72	0x73	0x69	0x9A														
0x06	0xFF	0x44	0x4C	0x4E	0x20	0xFC	0x01	0x2D	0x6F	0x6E	0x3A	0x20	0x33	0x2E	0x30	0x2E	0x30
0x2E	0x31	0x20															
0x31	0x38	0x2E	0xB5														
0x06	0xFF	0x44	0x4C	0x4E	0x20	0xFC	0x02	0x2D	0x30	0x39	0x2E	0x32	0x30	0x31	0x34	0x0A	0x48
0x44	0x31	0x39	0x54	0x32	0x31	0x4D	0x4D	0x44	0x4D	0x41	0x31	0x46	0x41	0x47	0x41	0x20	0x2D
0x31	0x30	0x32	0x2F														
0x06	0xFF	0x44	0x4C	0x4E	0x20	0xFC	0x03	0x2D	0x32	0x31	0x0A	0x0A	0x5B	0x47	0x72	0x61	0x70
0x68	0x69	0x63	0x61	0x6C	0x20	0x49	0x6E	0x74	0x65	0x72	0x66	0x61	0x63	0x65	0x5D	0x0A	0x4D
0x61	0x74	0x72	0xC6														

ASCII Contents of package 1,2,3,4 (reference example above) received is, 111 bytes:

VB100014-1 Build number: Version: 3.0.0.1 HD19T21MMCMA1FAGA -10221

18.09.2014

[Graphical Interface] Matr

"ETC" - Elapsed Time Counter Query

The unit features an elapsed time counter which counts the total number of hours that the unit has been operated. No data shall be sent with this command. The unit will reply to this command with an ACK attention code. The DATA field will be set to a 3 byte string, where the most significant byte is transmitted first.

The ETC has a limit on maximum 99999 hours (defined into 5 bytes, numbers 0 to 9 each), equivalent to 11 years. If this number is reached, the ETC will stop counting, and the ETC command will always reply with maximum number of hours (99999).

Example:

Command	Command to Query ETC:												
0x07	0xFF	0x45	0x54	0x43	0x00	0x1D							
Acknowle	Acknowledge "0" + "0" + "5" + "8" = (combined "00058" or 58 hours):												
0x06	0xFF	0x45	0x54	0x43	0x05	0x19	0x30	0x30	0x30	0x35	0x38	0x02	

The ETC value has been hardcoded to 5 bytes, prefixed with "0".

"GMB" - Glass Display Control™ (GDC) Minimum Brightness

Sets the minimum value limit for the backlight of the LED's on the GDC, making sure that the LED's and GDC symbols are still visible if they was previously adjusted down to a very low value by the "BRL" command or via the "LED Drive" function from within the OSD menu (or set via the MCC command). Range from 0x00 to 0x31 (0% - 100%).

Example:

Com	Command to set 50% Minimum Brightness limit:												
0	x07	0xFF	0x47	0x4D	0x42	0x01	0x22	0x19	0xE6				

"LIS" - Read Ambient Light Sensor

Sending this command the light sensor on the Glass Display Control[™] (GDC) will return a value about luminance of environment.

Example:

Command to query Light Sensor:

0x07 0xFF 0x4C 0x49 0x53 0x00 0x11

Acknowledge: LIS value is "0"+"0"+"9"+"9"+"9" = "999":

0x06 0xFF 0x4C 0x49 0x53 0x05 0x0D 0x30 0x30 0x39 0x39 0x39 0x74

"SNB" - Serial Number Query

This query is sent to the unit in order to identify the unit serial number. No data shall be sent with this query.

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: "12345". Note that the length of Serial Number is not limited to 5 characters. It will decrease or increase in length depending on actual Serial Number stored in the unit.

Example:

Command Display Serial Number

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

Acknowledge Type/Model Number "12345":

0x0	0xFF	0x53	0x4E	0x42	0x05	0x12	0x31	0x32	0x33	0x34	0x35	0x00
-----	------	------	------	------	------	------	------	------	------	------	------	------

"SWI" - Main Software Version Query

The SWI command is a legacy command which is backward compatible with already existing customer setups (i.e. product ranges released before Series X). For newer systems and implementations, please use "FWV" command when possible. Any future revisions, such as CMD additions or changes to the software will increment the software version. The unit will reply to this command with an ACK attention code. The DATA field will be a ASCII text string indicating the software version, e.g: "120801V1_M".

Byte	Description	Applies to	Example reply as ASCII text after query
0x00	VCOM (Virtual internal COM) firmware version	MMC	SW101010-0181

Example:

Command Software Version query:

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

Acknowledge GEV software query: "120801V1_M"

0x06 0xFF 0x53 0x57 0x49 0x0A 0xFD 0x31 0x32 0x30 0x38 0x30 0x31 0x56 0x31 0x5F 0x4D 0xA0

"SWK" - Glass Display Control™ (GDC) software version Query

This command indicates the firmware (Cypress) version of the Glass Display Control™ (GDC) software.

Example:

Command Software Version query:

0x07 0xFF 0x53 0x57 0x4B 0x00 0x04

"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. No data shall be sent with this query.

The unit will reply to this command with an ACK attention code. The DATA field should be translated to an ASCII text string which indicate the specified Type/Model Number, e.g: "HD17T21MMCMJDOABA".

FYI: Which translates to "HD 17T21 MMC" with a configuration added to it by using the letters "-MJD-OABA". The meaning of "-MJD-OABA" can only be found in the description field of invoice documents and service documents. In this example the exact description for the unit is:

"17.0" MMC IntelQM57 CEL 1.86GHz 2GBRAM 250GBHDD OSNone ACDC Bonded Black GDC Buzzer"

Example:

Command to retrieve Type/Model Number

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

Acknowledge Type/Model Number "HD17T21MMCMJDOABA":

0x06	0xFF	0x54	0x59	0x50	0x11	0xEC	0x48	0x44	0x31	0x37
0x54	0x32	0x31	0x4D	0x4D	0x43	0x4D	0x4A	0x44	0x4F	0x41
0x42	0x41	0x89								

"QDU" - QM57 Chipset Duplex Mode

This command sets the half or full duplex mode for the external physical RS-422 / RS-485 port on a MMC unit.

0x00	Half Duplex Mode
0xFF	Full Duplex Mode

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

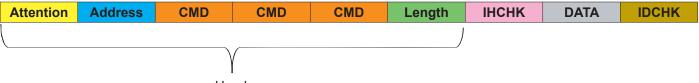
In time, additional commands and corresponding data fields may be defined. These additions will not conflict with the operation of the interface as defined herein in this document.

Appendixes

Calculating Checksums (IDCHK, IHCHK)

Here is a simplified method to calculating checksum. The example is using decimal numbers, for explanation purposes only. The actual values are in hexadecimal throughout the user manual.

Visual representation of the byte:



Header

Number Base Systems mentioned in this section.

Binary	27	2 ⁶	2 ⁵	24	2 ³	2 ²	2 ¹	2º
Decimal	128	64	16	16	8	4	2	1
Hex	80	40	20	10	8	4	2	1

The total value of a byte is represented by 8 bits, all bits have the value of either 0 or 1. One byte can represent a decimal number between 0 and 255 (256 different combinations).

For example: let us convert 55 from decimal to binary. We place in the table below (marked in green) 1 or 0 for the highest available decimal number in that cell and subtract until we reach 0.

So in the case of 55, it is: 55 - 32 - 16 - 4 - 2 - 1 = 0

1 or 0	0	0	1	1	0	1	1	1
Binary	27	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
Decimal	128	64	32	16	8	4	2	1

This results in binary value 0011 0111 based on the input in the table, which in decimal are 55, and HEX 0x37.

IDCHK

Calculating IDCHK require us to find the inverted value of the sum of all data bits. We send a data package with the data value as 55, which we know is 0011 0111. The inverted data value is the inverted of 0011 0111 (55 converted to binary), which is 1100 1000.

If we then convert 1100 1000 to decimal using the conversion table above, we get **200** In simpler terms, you could say we are doing 55 - 255 = -200. Ignore the fact that it is a negative number.

Attention Address CMD CMD Length IHCHK 55 200

Calculating Checksums (IDCHK, IHCHK)

IDCHK with two data fields (2 bytes). DATA1 DATA2 IDCHK Calculating IDCHK while having two data fields (or more) is almost the same as single data field. Sum the two data fields, subtract 1 for every time you exceed 255 and start from 0.

Example of 2 data bytes:

D; D;	ata field 1: 5 ata field 2: 23	5 or as H 30 or as H	EX 0x37 EX 0xE6					
A	dd all the data 230 + 5	fields toget 5 = 285	her.					
Si	ubtract 255 un 285 - 2 8		ned data va	lue is below	255.			
Si	ubtract 1 for e 30 - 1 =		btracted 25	5 above.				
Si	ubtract 29 bas 29 - 16	ed on decin - 8 - 4 - 1 =		om the bina	ry table on p	previous pag	ge until you i	each 0:
in	hich gives us 0001 11 verted is (by u 1110 00 onvert 1110 00	I01 Ising explan)10	ations on pr	revious page	e).	ous page).		
_								
Attentio	n Address	CMD	CMD	CMD	Length	ІНСНК	55	230
IDCHK wi	th three data	fields (3 by	rtes). DA	TA1 DAT	A2 DATA	A3 IDCH	K	
<u>Example ι</u>	<u>ısing 3 data b</u>	<u>ytes:</u>						

<u></u>	
Data field 1: 233 Data field 2: 229 Data field 3: 228 or as HEX 0xE9 or as HEX 0xE5 0xE4	
Add all the data fields together. 233 + 229 + 228 = 690	
Subtract 255 until the summed data value is below 255 . 690 - 255 = 435 435 - 255 = 180	
Subtract 2 for every time subtracted 255 above. 180 - 2 = 178	
Subtract 178 based on decimal values from the binary table on previous page until you reach 0: 178 - 128 - 32 - 16 - 2 = 0	
Which gives us binary number (by using explanations on previous page). 1011 0010	
inverted is (by using explanations on previous page). 0100 1101	
Convert 0100 1101 to decimal is 77 or as HEX 0x4D	

	Attention	Address	CMD	CMD	CMD	Length	ІНСНК	233	229	228	77
--	-----------	---------	-----	-----	-----	--------	-------	-----	-----	-----	----

21

226

ІНСНК

Let us calculate IHCHK. We send the same data package, the data value does not matter for this calculation. Instead, we focus on the following formula that sums all the header values and inverts them. Note that DATA of 55 and IDCHK of 200 is present in table below as described on previous page. Length is set to 1 as there is only 1 byte in the DATA field.

Attention	Address	CMD	CMD	CMD	Length	ІНСНК	Data	IDCHK
7	255	66	82	73	1	ІНСНК	55	200

Add together as indicated below.

Attention field: Address field: CMD 1 field: CMD 2 field:	7 255 66 82 73	or as HEX or as HEX or as HEX or as HEX	0x07 0xFF 0x42 0x52 0x49
CMD 3 field:	73	or as HEX	0x49
Length field:	1	or as HEX	0x01

(Length of 1 indicates only 1 byte 55 is present in DATA field).

Add all the fields together. 7 + 255 + 66 + 82 + 73 + 1 = 484

Subtract 255 until the summed data value is below **255**. 484 - **255** = 229

Subtract 228 based on decimal values from the binary table (marked in green) until you reach 0: 228 - 128 - 64 - 32 - 4 = 0

1 or 0	1	1	1	0	0	1	0	0
Binary	27	2 ⁶	2 ⁵	24	2 ³	2 ²	2 ¹	2 ⁰
Decimal	128	64	32	16	8	4	2	1

Which gives us binary number (by using explanations on previous page).

1110 0100

inverted is (by using explanations on previous page).

0001 1011

Convert 0001 1011 to decimal is 27 or as HEX 0x1B

Attention	Address	CMD	CMD	CMD	Length	ІНСНК	Data	IDCHK
7	255	66	82	73	1	27	55	200

Subtract 1 for every time subtracted **255** above. 229 - 1 = 228

HEX DEC BIN Character/Symbol Description 0x00 0 00000000 NUL Null leminator / character / End of string 0x01 1 00000010 SCH Start of Fext 0x03 3 00000010 ECT End of Transmission 0x04 0 0000100 ECT End of Transmission 0x05 5 00000101 ACK Acknowledgment 0x06 6 00001010 ACK Acknowledgment 0x07 7 00000101 HT Horizontal Tab 0x08 8 0000100 FF Form Feed 0x0C 12 0000110 CF Form Feed 0x0C 12 0000110 CR Carriage Return 0x0F 15 0000110 DC1 Device Control 1 (oft. XON) 0x11 7 00010001 DC2 Device Control 3 (oft. XOFF) 0x13 19 0001010 DC2 Device Control 3 (oft. XOFF) 0x14
Dx01 1 0000001 SOH Start of Heading 0x02 2 00000010 STX Start of Text 0x04 4 0000010 ECT End of Text 0x05 5 0000011 EAX End of Transmission 0x06 6 00000101 ACK Acknowledgment 0x07 7 00000101 ACK Acknowledgment 0x08 8 00001001 HT Horizontal Tab 0x08 8 00001001 LF Line Feed 0x08 10 00001010 LF Form Feed 0x00 12 0000110 CR Carriage Return 0x00 14 0000111 CR Carriage Return 0x01 16 0000100 DLE Data Ine Escape 0x11 17 00010001 DC1 Device Control 1 0x14 00010101 DC2 Device Control 4 Ottal 0x14 000101010 DC4 Device Co
0x02 2 0000010 STX Start of Text 0x03 3 0000011 ETX End of Text 0x05 5 0000010 EOT End of Transmission 0x05 5 0000101 ENQ Enquiry 0x06 6 0000101 ACK Acknowledgment 0x07 7 00000110 LF Line Feed 0x0A 10 00001010 LF Line Feed 0x0A 10 00001011 VT Vertical Tab 0x0A 10 00001101 LF Line Feed 0x0A 10 00001101 FF Form Feed 0x0D 13 00001101 Sift Nut / X-Oft 0x10 16 0001000 DLE Data Line Escape 0x11 17 0001001 DC2 Device Control 2 0x12 18 0010101 DC4 Device Control 2 0x14 20 0001010 DC4 Device Control 4
0x03 3 0000011 ETX End of Text 0x04 4 0000010 EOT End of Transmission 0x05 5 00000101 ENQ Enquiry 0x06 6 00000111 ACK Acknowledgment 0x07 7 0000100 BS Back Space 0x08 8 00001001 LF Line Feed 0x07 1 0000101 VT Vertical Tab 0x08 1 0000101 KF Form Feed 0x0C 12 0000110 CR Carriage Return 0x0D 13 0000110 DE Data Line Escape 0x11 17 0001000 DLE Data Line Escape 0x11 17 0001001 DC2 Device Control 2 0.000101 0x13 19 0001010 DC4 Device Control 4 0.000010 0x14 20 0001010 DC4 Device Control 3 0.01 0x15 21
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Dx05 5 0000101 ENQ Enquiry 0x06 6 0000110 ACK Acknowledgment 0x07 7 00000111 BEL Bell 0x08 8 0000100 BS Back Space 0x09 9 0000101 LF Line Feed 0x00 11 0000110 LF Line Feed 0x00 12 0000110 CR Carriage Return 0x00 13 00001101 CR Carriage Return 0x00 14 0000111 SI Shift Nt /X-On 0x11 17 0001000 DLE Data Line Escape 0x11 17 0001001 DC1 Device Control 1 (oft. XON) 0x12 18 0001010 DC2 Device Control 2 0x14 20 0001010 DC4 Device Control 3 (oft. XOFF) 0x14 20 0001010 SYN Synchronous Idle 0x17 23 0001011 SUB
Dx06 6 0000110 ACK Acknowledgment Dx07 7 00000111 BEL Bell 0x08 8 00001000 BS Back Space 0x09 9 0000101 HT Horizontal Tab 0x0A 10 0000101 LF Line Feed 0x0C 12 0000110 FF Form Feed 0x0C 14 0000110 CR Carriage Return 0x0E 14 0000110 So Shif Out X-On 0x0F 15 0001001 DLE Data Line Escape 0x10 16 0001000 DC1 Device Control 1 (oft. XON) 0x12 18 0001001 DC2 Device Control 2 0x13 19 0001001 DC4 Device Control 4 0x15 21 0001010 DC4 Device Control 4 0x14 20 0001010 SVR Synchronous Idle 0x14 20 0001101 SVK Separator
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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 0010000 Space " " 0x21 33 0010001 ! Exclamation mark 0x22 34 0010010 " Double quotes 0x23 35 00100010 \$ Dollar 0x24 36 0010010 \$ Dollar 0x25 37 0010010 \$ Mapersand 0x27 39 00100111 ' Single quote 0x28 40 0010100 (Open parenthesis (or open bracket) 0x24 42 0010101) Close parenthesis (or close bracket) 0x28 40 0010100 Asterisk Asterisk
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 0010000 Space "" 0x21 33 0010001 ! Exclamation mark 0x22 34 0010010 " Double quotes 0x23 35 0010010 # Number 0x24 36 0010010 \$ Dollar 0x25 37 0010010 & Ampersand 0x27 39 0010011 % Percentage 0x28 40 0010100 (Open parenthesis (or open bracket) 0x28 40 0010100 * Asterisk 0x29 41 0010100 * Asterisk 0x28 43 0010101 + Plus 0x28
0x1D 29 00011101 GS Group Separator 0x1E 30 00011110 RS Record Separator 0x1F 31 00011111 US Unit Separator 0x20 32 0010000 Space " 0x21 33 00100010 ! Exclamation mark 0x22 34 0010010 " Double quotes 0x23 35 00100010 # Number 0x24 36 0010010 \$ Dollar 0x25 37 0010010 & Percentage 0x26 38 0010011 & Ampersand 0x27 39 0010111 ' Single quote 0x28 40 0010100 (Open parenthesis (or open bracket) 0x29 41 0010101) Close parenthesis (or close bracket) 0x2A 42 0010101 + Asterisk 0x2B 43 0010101 + Plus
0x1E 30 00011110 RS Record Separator 0x1F 31 00011111 US Unit Separator 0x20 32 0010000 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 0010111 ' Single quote 0x28 40 0010100 (Open parenthesis (or open bracket) 0x29 41 0010100 * Asterisk 0x2B 43 0010101 + Plus 0x2C 44 00101100 , Comma
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 00100111 K Ampersand 0x27 39 00100111 Single quote Single quote 0x28 40 0010100 \$ Close parenthesis (or open bracket) 0x29 41 0010101 * Asterisk 0x28 43 0010101 * Asterisk 0x28 43 0010101 * Asterisk 0x28 43 0010101 * Asterisk 0x22 44 0010100 , Comma
0x20 32 0010000 Space " " 0x21 33 0010001 ! 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 0010100 \$ Close parenthesis (or open bracket) 0x29 41 0010101 * Asterisk 0x28 43 0010101 + Plus 0x28 43 0010101 + Plus 0x22 44 0010101 , Comma
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 0010101 + Asterisk 0x2B 43 0010101 + Plus 0x2C 44 00101100 , Comma
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 0010100 * Asterisk 0x28 43 0010101 + Plus 0x28 43 0010101 , Comma
0x22 34 00100010 Bouble 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 00101001 * Asterisk 0x2B 43 0010101 , Comma
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 0010101 + Plus 0x2C 44 00101100 , Comma
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
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
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
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
0x29 41 00101001) Close parenthesis (or close bracket) 0x2A 42 00101010 * Asterisk 0x2B 43 00101011 + Plus 0x2C 44 00101100 , Comma
0x2A 42 00101010 * Asterisk 0x2B 43 00101011 + Plus 0x2C 44 00101100 , Comma
0x2B 43 00101011 + Plus 0x2C 44 00101100 , Comma
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

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
0x40	65	01000001	A	Uppercase A
0x41	66	01000010	В	Uppercase B
0x42	67	01000011	C	Uppercase C
0x40	68	01000100	D	Uppercase D
0x45	69	01000101	E	Uppercase E
0x46	70	01000110	F	Uppercase F
0x40 0x47	71	01000111	G	Uppercase G
0x48	72	01001000	H	Uppercase H
0x40 0x49	73	01001000		Uppercase I
0x43 0x4A	74	01001001	J	Uppercase J
0x4A 0x4B	75	01001010	K	Uppercase K
0x4D 0x4C	76	01001011	L	Uppercase L
0x4C 0x4D	77	01001100	M	Uppercase M
0x4D 0x4E	78	01001110	N	Uppercase N
0x4E 0x4F	79	01001111	0	Uppercase O
0x50	80	01010000	P	Uppercase P
0x50 0x51	81	01010000	Q	Uppercase Q
0x52	82	01010001	R	Uppercase R
0x52	83	01010010	S	Uppercase S
0x53	84	01010100	T	Uppercase T
0x55	85	01010101	U	Uppercase U
0x56	86	01010101	V	Uppercase V
0x50 0x57	87	01010111	W	Uppercase W
0x58	88	01011000	X	Uppercase X
0x50	89	01011000	Y	Uppercase Y
0x53	90	01011010	Z	Uppercase Z
0x5A 0x5B	90	01011010	1	Opening bracket
0x5C	92	01011100		Backslash
0x5C	92	01011101	1	Closing bracket
0x5E	93	01011110]	Caret - circumflex
0x5E	94	01011111		Underscore
0x5F	96	01100000	<u>,</u>	Grave accent
			2	
0x61 0x62	97 98	01100001 01100010	a b	Lowercase a
			b	Lowercase b
0x63	99	01100011	C	Lowercase c
0x64 0x65	100 101	01100100	d	Lowercase d
COXO	101	01100101	e	Lowercase e

HEX	DEC	BIN	Character/Symbol	Description
0x66	102	01100110	f	Lowercase f
0x67	102	01100111	g	Lowercase g
0x68	100	01101000	h	Lowercase h
0x69	105	01101001	i	Lowercase i
0x6A	106	01101010		Lowercase j
0x6B	107	01101011	k	Lowercase k
0x6C	108	01101100		Lowercase I
0x6D	109	01101100	m	Lowercase m
0x6E	110	01101110	n	Lowercase n
0x6F	111	01101111	0	Lowercase o
0x70	112	01110000		Lowercase p
0x70	113	01110000	p q	Lowercase q
0x71 0x72	114	01110010	r r	Lowercase r
0x72	115	01110010	S	Lowercase s
0x73 0x74	116	01110100	t	Lowercase t
0x74	117	01110100	u	Lowercase u
0x75 0x76	118	01110101	V	Lowercase v
0x70	119	01110111	W	Lowercase w
0x78	120	01111000	X	Lowercase x
0x70	120	01111000		Lowercase y
0x79 0x7A	121	01111010	y z	Lowercase z
0x7A 0x7B	122	01111011	2	Opening brace
0x7C	123	01111100	<u> </u>	Vertical bar
0x7C	124	01111101	}	Closing brace
0x7D 0x7E	125	01111110	}	5
0x7E 0x7F	120	01111111	~	Equivalency sign - tilde Delete (no visible character)
0x7F	127	10000000	€	
0x80 0x81	120	10000001	£	Euro sign (no visible character)
0x81	130	10000010		
0x82	131	10000010	f	Single low-9 quotation mark Latin small letter f with hook
0x83 0x84	132	10000100	J	
0x85	132	10000100		Double low-9 quotation mark
0x85 0x86	133		····	Horizontal ellipsis
		10000110 10000111	†	Dagger
0x87	135		‡ ^	Double dagger
0x88	136	10001000	0/	Modifier letter circumflex accent
0x89	137	10001001	% Č	Per mille sign
0x8A	138	10001010	Š	Latin capital letter S with caron
0x8B	139	10001011	< Œ	Single left-pointing angle quotation
	140	10001100	UC	Latin capital ligature OE (no visible character)
0x8D	141	10001101	Ž	
0x8E	142	10001110	۷	Latin captial letter Z with caron
0x8F	143	10001111		(no visible character)
0x90	144	10010000	6	(no visible character)
0x91	145	10010001	3	Left single quotation mark
0x92	146	10010010	"	Right single quotation mark
0x93	147	10010011	33	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

25

HEXDECBINCharacter/SymbolDescription $0x99$ 15310011001TMTrade mark sign $0x9A$ 15410011010šLatin small letter S with caron $0x9B$ 15510011011>Single right-pointing angle quotation mark $0x9C$ 15610011100 ce Latin small ligature oe $0x9D$ 15710011101(no visible character) $0x9E$ 15810011111 Y $0x9F$ 15910011111 Y $0x40$ 16010100000Non-breaking space (no visible character) $0xA4$ 16110100001i $0xA4$ 1631010001 ξ $0xA5$ 1651010010 φ $0xA4$ 1641010010 π $0xA5$ 1651010011 F $0xA4$ 1641010010 π $0xA7$ 1671010011 ξ Section sign $0xA4$ 1681010100 $0xA7$ 1671010111 S Section sign $0xA4$ 1681010100 $0xA5$ 1681010100 $0xA6$ 1681010101 $0xA7$ 1010101 $Registered trade mark sign0xA816810101000xA710101100xA81681010100\neg0xA81681010101Registered trade mark sign0xA41731010101r0xA6175$	
$0x9A$ 15410011010šLatin small letter S with caron $0x9B$ 15510011011>Single right-pointing angle quotation mark $0x9C$ 15610011100 ce Latin small ligature oe $0x9B$ 15710011101(no visible character) $0x9E$ 15810011110žLatin small letter z with caron $0x9F$ 15910011111 Y Latin capital letter Y with diaeresis $0xA0$ 16010100000Non-breaking space (no visible character) $0xA1$ 16110100001 ϕ $0xA2$ 16210100010 ϕ $0xA4$ 16410100001 f $0xA5$ 1651001011 f $0xA4$ 1641010010 π $0xA5$ 1651010101 Y $0xA7$ 1671010010 π $0xA7$ 1671010101 $0xA8$ 1681010100 $0xA4$ 1701010101 $0xA5$ 1681010100 $0xA4$ 1701010101 $0xA7$ 1671010101 $0xA8$ 1681010100 $0xA4$ 1701010101 $0xA5$ 1711010101 $0xA6$ 1721010101 $0xA7$ 1671010101 $0xA8$ 1731010101 $0xA8$ 1741010101 $0xA6$ 1751010110 $0xA7$ 1731010101 $0xA6$ 1741010110 $0xA7$ 175101	
$0x9B$ 15510011011 \rightarrow Single right-pointing angle quotation mark $0x9C$ 15610011100 ∞ Latin small ligature oe $0x9D$ 15710011101(no visible character) $0x9E$ 15810011110 \mathring{Z} Latin small letter z with caron $0x9F$ 15910011111 \mathring{Y} Latin capital letter Y with diaeresis $0xA0$ 16010100000Non-breaking space (no visible character) $0xA1$ 16110100001 \mathring{I} $0xA2$ 16210100010 \oiint $0xA3$ 16310100011 \pounds $0xA4$ 16410100100 \blacksquare $0xA5$ 16510100101 \oiint $0xA4$ 16610100101 \oiint $0xA7$ 16710100101 \oiint $0xA8$ 16810101001 \circlearrowright $0xA4$ 16810101001 \circlearrowright $0xA4$ 16910101001 \circlearrowright $0xA4$ 16910101001 \circlearrowright $0xA4$ 16910101001 \circlearrowright $0xA4$ 1691010101 \blacksquare $0xA5$ 16810101001 \blacksquare $0xA6$ 16910101001 \blacksquare $0xA7$ 1671010011 \blacksquare $0xA8$ 16810101001 \blacksquare $0xA4$ 1701010101 \blacksquare $0xA4$ 1701010101 \blacksquare $0xA6$ 1711010101 \blacksquare $0xA7$ 1751010110 \blacksquare $0xA6$ 1741010110 \bigcirc	
$0x9C$ 15610011100 ∞ eLatin small ligature oe $0x9D$ 15710011101(no visible character) $0x9E$ 15810011110 \tilde{z} Latin small letter z with caron $0x9F$ 15910011111 \tilde{Y} Latin capital letter Y with diaeresis $0xA0$ 1601010000Non-breaking space (no visible character) $0xA1$ 16110100001 i $0xA2$ 1621010010 ϕ $0xA3$ 1631010001 ϕ $0xA4$ 1641010010 μ $0xA4$ 1651010010 μ $0xA4$ 1661010010 μ $0xA4$ 1661010010 μ $0xA4$ 1661010010 μ $0xA5$ 1651010010 μ $0xA4$ 1661010011 ξ $0xA4$ 1671010011 ξ $0xA4$ 1681010000 π $0xA4$ 1681010100 π $0xA4$ 1691010101 Θ $0xA4$ 1701010101 π $0xA4$ 1711010101 π $0xA4$ 1721010110 π $0xA4$ 1741010110 Θ $0xA4$ 1751010110 π $0xA4$ 1741010110 π $0xA4$ 1741010110 $0xA4$ 1741010100 $0xA4$ 1741010100 $0xA5$ 1751011010 $0xA6$ 1731010101	
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 i Inverted exclamation mark 0xA2 162 10100010 ¢ Cent sign 0xA3 163 10100010 ¢ Cent sign 0xA4 164 1010010 ¤ Currency sign 0xA5 165 1010011 ¥ Yen sign 0xA6 166 1010110 I Pipe, Broken vertical bar 0xA7 167 1010011 § Section sign 0xA8 168 1010000 ° Spacing diaeresis - umlaut 0xA8 168 1010100 ° Spacing diaeresis - umlaut 0xAA 170 1010101 © Copyright sign 0xAA 170 1010101 Soft hyphen NoxAE 0xAC <t< td=""><td></td></t<>	
$0x9E$ 158 10011110 ž Latin small letter z with caron $0x9F$ 159 10011111 Y Latin capital letter Y with diaeresis $0xA0$ 160 10100000 Non-breaking space (no visible character) $0xA1$ 161 10100001 i Inverted exclamation mark $0xA2$ 162 10100010 ¢ Cent sign $0xA3$ 163 10100011 £ Pound sign $0xA4$ 164 10100100 π Currency sign $0xA5$ 165 10100101 ¥ Yen sign $0xA6$ 166 10100101 ¥ Yen sign $0xA7$ 167 10100111 § Section sign $0xA8$ 168 10101000 "Spacing diaeresis - umlaut OxA9 $0xA8$ 168 1010101 © Copyright sign $0xAA$ 170 1010101 # Left double angle quotes $0xAA$ 171 1010100 ¬ Not sign	
$0x9F$ 159 10011111 \ddot{Y} Latin capital letter Y with diaeresis $0xA0$ 160 10100000 Non-breaking space (no visible character) $0xA1$ 161 10100001 i Inverted exclamation mark $0xA2$ 162 10100010 ϕ Cent sign $0xA3$ 163 10100011 \pounds Pound sign $0xA4$ 164 10100100 \blacksquare Currency sign $0xA5$ 165 10100101 ψ Yen sign $0xA6$ 166 10100110 \downarrow Pipe, Broken vertical bar $0xA7$ 167 10100111 \S Section sign $0xA8$ 168 1010100 \Box Spacing diaeresis - umlaut $0xA9$ 169 1010101 \bigcirc Copyright sign $0xAA$ 170 1010101 $@$ Currency sign $0xAA$ 170 1010101 $@$ Copyright sign $0xAA$ 170 1010101 $@$ Left double angle quotes $0xAA$ 171 10101010 \neg Not sign	
$0xA0$ 160 10100000 Non-breaking space (no visible character) $0xA1$ 161 10100001 i Inverted exclamation mark $0xA2$ 162 10100010 ¢ Cent sign $0xA3$ 163 10100011 £ Pound sign $0xA4$ 164 1010010 \blacksquare Currency sign $0xA5$ 165 1010010 \blacksquare Currency sign $0xA6$ 166 1010010 \blacksquare Pipe, Broken vertical bar $0xA7$ 167 10100111 § Section sign $0xA7$ 167 1010010 \bigcirc Spacing diaeresis - umlaut $0xA9$ 169 1010100 \bigcirc Copyright sign $0xAA$ 170 1010101 $@$ Ceft double angle quotes $0xAA$ 170 1010101 $@$ Left double angle quotes $0xAC$ 172 1010100 \neg Not sign $0xAA$ 173 1010111 Soft hyphen $0xAF$	
$0xA1$ 161 10100001 i Inverted exclamation mark $0xA2$ 162 10100010 ¢ Cent sign $0xA3$ 163 10100011 £ Pound sign $0xA4$ 164 10100100 \blacksquare 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 1010101 © Copyright sign $0xAA$ 170 1010101 © Copyright sign $0xAA$ 170 1010101 a Feminine ordinal indicator $0xAA$ 170 1010101 Not sign Not sign $0xAC$ 172 1010110 \neg Not sign $0xAE$ 174 1010110 Soft hyphen $0xAE$ 174 1010111 Spacing macron - overline $0xB0$ 176 1011000 Plus-or	
$0xA2$ 162 10100010 ϕ Cent sign $0xA3$ 163 10100011 \pounds Pound sign $0xA4$ 164 10100100 \blacksquare Currency sign $0xA5$ 165 10100101 $¥$ Yen sign $0xA6$ 166 1010010 $↓$ Pipe, Broken vertical bar $0xA7$ 167 10100111 \S Section sign $0xA8$ 168 10101000 $¨$ Spacing diaeresis - umlaut $0xA7$ 167 10100110 \blacksquare Perminine ordinal indicator $0xA8$ 168 10101001 \boxdot Copyright sign $0xAA$ 170 10101010 \blacksquare Feminine ordinal indicator $0xAA$ 170 1010101 \ll Left double angle quotes $0xAC$ 172 1010110 \neg Not sign $0xAE$ 174 1010110 \neg Not sign $0xAA$ 173 1010110 \neg Soft hyphen $0xAE$ 174 1010111 \neg Spacing macron - overline	
$0xA3$ 163 10100011 \pounds Pound sign $0xA4$ 164 10100100 \blacksquare Currency sign $0xA5$ 165 10100101 $¥$ Yen sign $0xA6$ 166 10100110 $ $ Pipe, Broken vertical bar $0xA7$ 167 10100111 \S Section sign $0xA8$ 168 1010000 $_$ Spacing diaeresis - umlaut $0xA8$ 168 1011000 $_$ Spacing diaeresis - umlaut $0xA4$ 170 1010101 $©$ Copyright sign $0xA4$ 170 1010101 $@$ Reminine ordinal indicator $0xA4$ 170 1010101 a Feminine ordinal indicator $0xA4$ 170 1010101 a Left double angle quotes $0xAC$ 172 1010100 \neg Not sign $0xAE$ 174 1010110 \bigotimes Registered trade mark sign $0xAF$ 175 1010111 $_$ Spacing macron - overline $0xAF$ 176 10110000 $^$ Degr	
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 1010101 a Left double angle quotes 0xAC 172 10101100 ¬ Not sign 0xAD 173 1010110 Soft hyphen 0xAE 174 10101110 Soft hyphen 0xAF 175 10101111 T Spacing macron - overline 0xAB 176 1011000 ° Degree sign 0xAF 175 1010111 T Spacing trade mark sign 0xB1 177 10110000 Y	
0xA5 165 10100101 ¥ Yen sign $0xA6$ 166 10100110 ↓ Pipe, Broken vertical bar $0xA7$ 167 10100111 § Section sign $0xA8$ 168 1011000 ° Spacing diaeresis - umlaut $0xA9$ 169 10101001 © Copyright sign $0xAA$ 170 10101010 a Feminine ordinal indicator $0xAA$ 170 10101010 a Left double angle quotes $0xAC$ 172 1010100 ¬ Not sign $0xAE$ 174 1010110 © Registered trade mark sign $0xAE$ 174 1010110 ® Registered trade mark sign $0xAF$ 175 1010111 T Spacing macron - overline $0xAF$ 176 10110000 ° Degree sign $0xB1$ 177 10110011 ± Plus-or-minus sign $0xB2$ 178 10110010 ² Superscript two - squared $0xB3$ 179 10110011 ³ Superscript three - cubed	
$0xA6$ 16610100110 $ $ Pipe, Broken vertical bar $0xA7$ 16710100111§Section sign $0xA8$ 16810101000"Spacing diaeresis - umlaut $0xA9$ 16910101001©Copyright sign $0xAA$ 17010101010aFeminine ordinal indicator $0xAA$ 17010101011«Left double angle quotes $0xAC$ 17210101100¬Not sign $0xAC$ 17210101101§Soft hyphen $0xAE$ 17410101110©Registered trade mark sign $0xAF$ 17510101111TSpacing macron - overline $0xB0$ 17610110000°Degree sign $0xB1$ 17710110011 \pm Plus-or-minus sign $0xB3$ 179101100113Superscript two - squared $0xB4$ 18010110100'Acute accent - spacing acute	
0xA716710100111§Section sign $0xA8$ 16810101000"Spacing diaeresis - umlaut $0xA9$ 16910101001©Copyright sign $0xAA$ 17010101010aFeminine ordinal indicator $0xAA$ 17010101010aLeft double angle quotes $0xAA$ 17110101011«Left double angle quotes $0xAC$ 17210101100¬Not sign $0xAC$ 17310101101§Soft hyphen $0xAE$ 17410101110®Registered trade mark sign $0xAF$ 17510101111TSpacing macron - overline $0xB0$ 17610110000°Degree sign $0xB1$ 17710110001±Plus-or-minus sign $0xB2$ 17810110010²Superscript two - squared $0xB3$ 17910110011³Superscript three - cubed $0xB4$ 18010110100'Acute accent - spacing acute	
0xA816810101000"Spacing diaeresis - umlaut $0xA9$ 16910101001©Copyright sign $0xAA$ 17010101010aFeminine ordinal indicator $0xAA$ 17010101011«Left double angle quotes $0xAB$ 17110101011«Left double angle quotes $0xAC$ 17210101100¬Not sign $0xAD$ 17310101101©Soft hyphen $0xAE$ 17410101110®Registered trade mark sign $0xAF$ 17510101111TSpacing macron - overline $0xB0$ 17610110000°Degree sign $0xB1$ 17710110001±Plus-or-minus sign $0xB2$ 178101100102Superscript two - squared $0xB3$ 179101100113Superscript three - cubed $0xB4$ 18010110100'Acute accent - spacing acute	
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 10101100 ¬ Not sign 0xAE 174 10101101 Soft hyphen 0xAE 174 10101110 ® Registered trade mark sign 0xAF 175 10101111 T Spacing macron - overline 0xAF 176 10110000 ° Degree sign 0xB1 177 10110001 ± Plus-or-minus sign 0xB1 177 10110001 2 Superscript two - squared 0xB3 179 10110010 Acute accent - spacing acute 0xB4 180 10110100 Acute accent - spacing acute	
OxAA17010101010aFeminine ordinal indicatorOxAB17110101011«Left double angle quotesOxAC17210101100¬Not signOxAD17310101101Soft hyphenOxAE17410101110®Registered trade mark signOxAF17510101111¯OxAF17510101111¯OxAB17610110000°OxB017610110001±OxB117710110010²OxB317910110011³OxB418010110100′Acute accent - spacing acute	
$0xAB$ 171 10101011 "Left double angle quotes $0xAC$ 172 10101100 "Not sign $0xAD$ 173 10101101 Soft hyphen $0xAE$ 174 10101110 ® $0xAF$ 175 10101111 " $0xAF$ 175 10101111 " $0xB0$ 176 10110000 " $0xB1$ 177 10110001 \pm $0xB2$ 178 10110010 2 $0xB3$ 179 10110011 3 $0xB4$ 180 10110100	
OxAC 172 10101100 ¬ Not sign 0xAD 173 10101101 Soft hyphen 0xAE 174 10101110 ® Registered trade mark sign 0xAF 175 10101111 ¬ Spacing macron - overline 0xAB 176 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	
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0xB2178101100102Superscript two - squared0xB3179101100113Superscript three - cubed0xB418010110100´Acute accent - spacing acute	
0xB3 179 10110011 3 Superscript three - cubed 0xB4 180 10110100 Acute accent - spacing acute	
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 ° Masculine ordinal indicator	
0xBB 187 10111011 » Right double angle quotes	
0xBC 188 10111100 1/4 Fraction one quarter	
0xBD 189 10111101 1/2 Fraction one half	
0xBE 190 10111110 ³ / ₄ Fraction three quarters	
0xBF 191 10111111 ¿ Inverted question mark	
0xC0 192 11000000 Å 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	
0xC719911000111ÇLatin capital letter C with cedilla0xC820011001000ÈLatin 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 E Latin capital letter E with diaeresis	

	DEC	DIN	Character/Cumbel	Description
HEX	DEC	BIN	Character/Symbol	
0xCC	204	11001100	Í	Latin capital letter I with grave
0xCD	205	11001101	<u> </u>	Latin capital letter I with acute
0xCE	206	11001110	l Y	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	11111000	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
0xFC	252	11111101	ý	Latin small letter y with acute
0xFD 0xFE	253	11111110		Latin small letter thorn
0xFE	254	11111111	þ Ÿ	Latin small letter y with diaeresis
	200		У	Laun shian leuer y wur diaciesis

Glass Display Control[™] (GDC) LED & Button operations:

Prior to the procedure below, it is required you understand the terms and have the nesseccary knowledge how to interpret the functions in order to successfully use them as described below.

To be able to change GDC buttons and LED functions for the Panel Computers (Maritime Multi Computer - MMC) Series X product range, the VCOM (Virtual COM port visible in the Operating System (OS) device list as "COM x:", where x is OS/configuration dependent number; such as 1, 3 or other) needs to be installed and accessible from within your system.

The following commands referenced below are only available from GDC Firmware* version **"130225R1"** and up. To determine your unit's GDC Firmware version, send the command **"SWK"** via VCOM.

Excerpt from "Message Commands and Queries (CMD) Contents" section in this manual:

0x53 0x57 0x50 "SWK" Glass Display Control™ (GDC) software version Query R

*Reference Engineering Change Notification (ECN): https://www.hattelandtechnology.com/product-notifications/series-x-firmware-updates

Note: It is important to read the GDC LED register (step 1) before you change the bit for your function (Step 3)

Step 1 - Read register GDC LEDs:

- Send Query command: "RBY"
- Data (HEX): 0x93, 0x00

Step 2 - Read register GDC buttons:

- Send Query Command: "RBY"
 - Data (HEX): 0x93, 0x07

Step 3 Address <u>only</u> the bit for the function you need to change as illustrated in tables below.

Step 3A - Disable / Enable GDC LEDs:

- Command: "WBY"
- Data (HEX): 0x92, 0x00, 0xYY

Where "YY" is one of the following bits (in a byte):

		. (• •				
BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Reserved	ON / OFF Text	Brilliance Text	Reserved	Reserved	Brilliance < * > LED symbols	Power ON/OFF LED Symbol	All off
0	0 = Off 1 = On	0 = Off 1 = On	0	1 = Normal (reserved) 0 = Reserved	0 = Off 1 = On	0 = Off 1 = On	1 = active 0 = Reserved

Step 3B - Disable / Enable GDC Buttons:

- Command: "WBY"
 - Data (HEX): 0x92,0x07,0xZZ

Where "ZZ" is one of the following bits (in a byte):

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Reserved	Reserved	Reserved	Reserved	Power ON / OFF Button	Outdoor Mode*	Reserved	Brilliance Button
0	0	0	0	0 = Enable 1 = Disable	0 = Enable 1 = Disable	0	0 = Enable 1 = Disable

*Outdoor mode (Command "MCC - OSD Outdoor Mode") adds 5 seconds to the brilliance buttons before they react.

Appendix

Revision History

Rev.	By	Date	Notes
00_01	AK SE	14 Sep 2012	Internal draft
00_02	AK BU SE	12 Oct 2012	Revised and improved after input. Added Ethernet specification.
01	BU AK SE	06 Nov 2012	Release for internet
02	BU SE	07 Jan 2013	Added new command "GMB", page 14 Added new command "OSD Lock Mode (full)" to MCC command, page 21 Added new command "OSD Key Outdoor" to MCC command, page 25 - Reference to ECN: http://www.hatteland-display.com/mails/01_2013_ecn.html Added note "not all command available", page 8,19
03	BU SE	12 Jun 2013	Revised wrong example in MCC Contrast Control, ref: QAR/118774, page 19 Revised "periodic messages" and added note to table "xx", page 28 Added note/procedure for GDC LED/Buttons, page 38 - Reference to ECN: http://www.hatteland-display.com/mails/05_2013_ecn.html Revised BRL,GMB max range values, page 10,14 Revised Glass Display Control™ (GDC) LED & Button operations, bit table, page 38
04	BU SE	23 Sep 2013	Added command "MAN", page 8,15
05	BU AK SE	19 Feb 2014	Added "API/VCOM Drivers" installation / version information, page 6,7 Revised DL?, DLN commands to differentiate between Calibrated DVI/VGA slots, page 14,15 Revised FWV, table overview for MMD/STD/MMC units, page 16 Revised SWI, table overview for MMD/STD/MMC units, page 19 - Reference QAR/120762
06	BU SE	06 Mar 2014	Revised DL? text description with reference to using MCC command, page 14-15
07	ME WJ SE	30 Oct 2014	Removed "Note: DC power only" notice for "Power Down / Up" command. Works with AC & DC, page 26
08	MS SE	11 Dec 2014	Added note for XON/XOFF flow control, page 9 Improved description of DLN command, page 16
09	AK SE	03 Jun 2015	Added "Sending Multiple Commands / Command Queue" delay information, ref: QAR/126502, page 33
10	ME SE	04 Sep 2015	Removed "?" from BRU commmand, not supported (ref: QAR/130439), page 13
11	VM WJ SE	28 Jan 2016	BRU command also available for certain Customized Industrial Standard Displays (STD) units, page 10
12	ME SE	13 May 2016	BRU example malformed, corrected now (from 09 to 0F), page 13
13	JE MJ SE	21 Dec 2016	Added details for Buzzer pins, page 8
14	VM WJ SE	18 Jan 2017	Removed "Set Runtime Counter" in the MCC list (command reserved for service partners only), page 27 Reference: QAR/135613
15	VM SE	28 Mar 2019	Revised text for GDC button definitions, page 31 Removed "max 16" limit for Ethernet, page 5
16	VM JE WJ SE	04 Jun 2019	General updated throughout the manual based on latest company profile Added link to Support Document (Linux OS drivers etc. DOC101163-1), page 6 Removed limitation of 16 units, page 6, 9 ref: https://www.hatteland-display.com/mails/12_2019_ecn.html
17	WJ WM SE	27 Aug 2019	Revised max 16 units to 255, page 9 Added new SCOM command "RS Address (extended), page 31
18	SE	05 May 2020	General maintenance performed throughout the entire manual
19	YR WJ VM SE	20 Aug 2021	Performed maintentance throughout entire manual regarding text, commands, company profile/layout etc.

Revision History

	20	YR VM SE	02 Nov 2021	This INB100018-10 manual is based on rev 19 of INB100018-4, but extracted to new version to only cover MMC models due to EOL, ref: https://www.hattelandtechnology.com/product-notifications/panel-computers-series-x-hd-xxt21-mmc-with-qm57-chipset-eol-12_2021_eol Revised "Calculating Checksums (IDCHK, IHCHK)" chapter, page 20-22
ſ	21	VM SE	10 May 2022	Replaced drivers links and removed reference to obsolete "menu_run.exe" software, page 5

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