LUNATONE UNIVERSAL BUILDING AND AUTOMATION PROTOCOL

(LUBAP)

Table of Contents

1. Interface

1.1. RS232 / USB VCOM

1.1.1. Configuration

Transfer rate	38400 Baud
Number of data bits	8
Parity bit	No
Stop bit	1
Directionality	halfduplex

1.1.2. Command Structure

Protocol Header				
SYNC	CMD	LEN	DATA	CHECKSUM

Field	Field length	Description
SYNC	1 Byte	Synchronization Symbol → ASCII: 'Y' (0x59)
CMD	1 Byte	Command Number
LEN	1 Byte	Number of Data Bytes
DATA	0 – 255 Bytes	Data Bytes (optional)
CHECKSUM	1 Byte	Checksum of the Frame

Synchronization Symbol (SYNC)

Each frame starts with the synchronization symbol. This field must contain the ASCII character 'Y' (0x59).

Command Number (CMD)

This field indicates the type of frame. For a complete list of possible frames see chapter Commands.

Data Length (LEN)

Specifies the number of data bytes in the frame.

Data (DATA)

This field contains the actual data. The size is variable and is indicated by the LEN field. The interpretation of the data depends on the frame, i.e. the meaning of the data depends on the command number. Unless stated otherwise, all data is unsigned and in little-endian format.

Checksum

This field is used for transmission error detection. To form the checksum, bytes of the frame are XORed, not including the synchronization character and the checksum itself.

Example:

$$CHECKSUM = CMD\ xor\ LEN\ xor\ DATA[\ 0]\ \ xor\ DATA[\ 1]\ \ xor\ ...\ xor\ DATA[\ LEN-1]$$

1.2. Bluetooth Low Energy

1.2.1. Service Description

A service with two characteristics is used to map the protocol via BLE.

Service Name	Lunatone universal building and automation Service
Service UUID	87300001-64FE-4BB8-95AB-7FF263162727

Characteristic Name	LUBA Receive
Characteristic UUID	87300002-64FE-4BB8-95AB-7FF263162727
Properties	write
Length	Up to 247 Bytes
Data order	Little endian

Characteristic Name	LUBA Transmit
Characteristic UUID	87300003-64FE-4BB8-95AB-7FF263162727
Properties	notify
Length	Up to 247 Bytes
Data order	Little endian

LUBA Receive Characteristic

This characteristic is of the “Write” type. Commands can be written in this characteristic to communicate with the LUBAP interface.

LUBA Transmit Characteristic

This characteristic is of the "Notify" type. To activate "Notifications", the Client Characteristic Configuration Descriptor (CCCD) must be set to 1. If CCCD remains at 0, notifications are deactivated and there is no communication from the LUBAP interface to the BLE client.

1.2.2. Command Structure

Protocol Header				
SYNC (N/A)	CMD	LEN (N/A)	DATA	CHECKSUM (N/A)

Field	Field length	Description
CMD	1 Byte	command number
DATA	0 – 246 Bytes	data bytes (optional)

Command Number (CMD)

This field indicates the type of frame. For a complete list of possible frames see chapter Commands.

Data (DATA)

This field contains the actual data. The size is variable and is indicated by the LEN field. The interpretation of the data depends on the frame, i.e. the meaning of the data depends on the command number. Unless stated otherwise, all data is unsigned and in little-endian format.

Further Fields (SYNC, LEN, CHECKSUM)

The other fields of the frame are not used in the protocol variant for the Bluetooth Low Energy interface.

2. Commands

2.1. DALI Command List

2.1.1. ADD DALI FRAME TO TX BUFFER

Adds a variable number of DALI frames of any length to the internal send-buffer.

	Command	Response
Command Number	50 (0x32)	51 (0x33)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
sizeof(Frame) * n + 1	6 Bytes	Frame n	see parameter description

Response Data:

Index	Length	Parameter	Description
0	1 Byte	FirstID or Error	**FirstID:** ID of the first frame, the IDs are increased by 1 for further frames. **Error:** if an error occurs the response contains only one data byte: 1 = transmission not possible (bus voltage error) 2 = transmission not possible (device in DALI Initialize mode) 3 = transmission not possible (device in DALI Quiescent mode) 4 = transmission not possible (send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = transmission not possible (macro running)
1	1 Byte	NrOfFrames (optional)	Number of DALI frames added to the buffer.

Parameter Description:

Parameter	Subparameter	Subparameter length	Description
Frame	NrOfBits	1 Byte	Number of bits in the DALI frame
	Mode	1 Byte	**Bit 7:** 1 = send twice **Bit 6:** 1 = wait for response **Bit 3-5:** reserved **Bit 0-2:** DALI priority (1 - 5)
	Data	4 Bytes	DALI Frame to be sent (big-endian Format) examples see page 9

2.1.2. ADD 16-BIT DALI FRAME TO TX BUFFER

Adds a variable number of 16-bit DALI frames to the internal send-buffer.

	Command	Response
Command Number	52 (0x34)	53 (0x35)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
sizeof(16BitFrame) * n + 1	3 Bytes	16BitFrame n	see parameter description

Response Data:

Index	Length	Parameter	Description
0	1 Byte	FirstID or Error	**FirstID:** ID of the first frame, the IDs are increased by 1 for further frames. **Error:** if an error occurs, the response contains only one data byte: 1 = transmission not possible (bus voltage error) 2 = transmission not possible (device in DALI Initialize mode) 3 = transmission not possible (device in DALI Quiescent mode) 4 = transmission not possible (send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = transmission not possible (macro running)
1	1 Byte	NrOfFrames (optional)	Number of DALI frames added to the buffer.

Parameter Description:

Parameter	Subparameter	Subparameter length	Description
16BitFrame	Mode	1 Byte	**Bit 7:** 1 = send twice **Bit 6:** 1 = wait for response **Bit 3-5:** reserved **Bit 0-2:** DALI priority (1 - 5)
	Data	2 Bytes	DALI Frame to be sent (big-endian Format) examples see page 9

Subparamter: **Data**

for Direct Arc Power (DAP) commands

	Address byte								Direct Arc Power Command							
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Short Address	0	short address (0-63)						0	DAP value (0-254)							
Group	1	0	0	group address (0-15)				0	DAP value (0-254)							
Broadcast unaddressed	1	1	1	1	1	1	0	0	DAP value (0-254)							
Broadcast	1	1	1	1	1	1	1	0	DAP value (0-254)							

for other commands

	Address byte								Command byte							
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Short Address	0	short address (0-63)						1	Command from List below							
Group	1	0	0	group address (0-15)				1	Command from List below							
Broadcast unaddressed	1	1	1	1	1	1	0	1	Command from List below							
Broadcast	1	1	1	1	1	1	1	1	Command from List below							

Command	**dec**	**hex**
OFF	0	0x00
UP	1	0x01
DOWN	2	0x02
STEP UP	3	0x03
STEP DOWN	4	0x04
RECALL MAX	5	0x05
RECALL MIN	6	0x06
STEP DOWN and OFF	7	0x07
ON and STEP UP	8	0x08
enable DAP Sequence	9	0x09
GO TO LAST ACTIVE LEVEL	10	0x0A
GO TO SCENE 0	16	0x10
GO TO SCENE 1	17	0x11
...	...	...
GO TO SCENE 15	31	0x1F
RESET	32	0x20

Command	**dec**	**hex**
REMOVE Address FROM SCENE 0	80	0x50
REMOVE Address FROM SCENE 1	81	0x51
...	...	...
REMOVE Address FROM SCENE 15	95	0x5F
ADD Address TO GROUP 0	96	0x60
ADD Address TO GROUP 1	97	0x61
...	...	...
ADD Address TO GROUP 15	111	0x6F
REMOVE Address FROM SCENE 0	112	0x70
REMOVE Address FROM GROUP 1	113	0x71
...	...	...
REMOVE Address FROM GROUP 15	127	0x7F

2.1.3. ADD 24-BIT DALI FRAME TO TX BUFFER

Adds a variable number of 24-bit DALI frames to the internal send-buffer.

	Command	Response
Command Number	54 (0x36)	55 (0x37)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
sizeof(24BitFrame) * n + 1	4 Bytes	24BitFrame n	see parameter description

Response Data:

Index	Length	Parameter	Description
0	1 Byte	FirstID or Error	**FirstID:** ID of the first frame, the IDs are increased by 1 for further frames. **Error:** if an error occurs, the response contains only one data byte: 1 = transmission not possible (bus voltage error) 2 = transmission not possible (device in DALI Initialize mode) 3 = transmission not possible (device in DALI Quiescent mode) 4 = transmission not possible (send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = transmission not possible (macro running)
1	1 Byte	NrOfFrames (optional)	Number of DALI frames added to the buffer.

Parameter Description:

Parameter	Subparameter	Subparameter length	Description
24BitFrame	Mode	1 Byte	**Bit 7:** 1 = send twice **Bit 6:** 1 = wait for response **Bit 3-5:** reserved **Bit 0-2:** DALI priority (1 - 5)
	Data	3 Bytes	DALI Frame to be sent (big-endian Format)

2.1.4. ADD eDALI FRAME TO TX BUFFER

Adds a variable number of eDALI frames to the internal send-buffer.

	Command	Response
Command Number	56 (0x38)	57 (0x39)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
sizeof(24BitFrame) * n + 1	4 Bytes	24BitFrame n	See parameter description

Response Data:

Index	Length	Parameter	Description
0	1 Byte	FirstID or Error	**FirstID:** ID of the first frame, the IDs are increased by 1 for further frames. **Error:** In the event of an error, the response contains only one data byte: 1 = transmission not possible (bus voltage error) 2 = transmission not possible (device in DALI Initialize mode) 3 = transmission not possible (device in DALI Quiescent mode) 4 = transmission not possible (Send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = transmission not possible (macro running)
1	1 Byte	NrOfFrames (optional)	Number of DALI frames added to the buffer.

Parameter Description:

Parameter	Subparameter	Subparameter length	Description
24BitFrame	Mode	1 Byte	**Bit 7:** 1 = send twice **Bit 6:** 1 = wait for response **Bit 3-5:** reserved **Bit 0-2:** DALI priority (1 - 5)
	Data	3 Bytes	DALI frame to be sent (big-endian format)

2.1.5. CONFIG AUTO ANSWER

Configures an automatic answer to a given DALI frame. Up to four different frame-answer combinations are supported.

	Command	Response
Command Number	82 (0x52)	83 (0x53)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	IdxAndNrOfBits	**Bit 7-6:** Index of Frame-Answer combination **Bit 0-5:** Number of bits of DALI frame to be answered (write only)
2	4 Bytes	Frame (write only)	DALI frame to be answered (little-endian Format)
3	1 Byte	Answer (write only)	DALI answer to be sent

Without “Frame” and “Answer” this command is interpreted as a read command. In this case the Number of bits in the second byte will be ignored.
With “Frame” and “Answer” this command is interpreted as a write command.

By setting the number of bits to zero („IdxAndNrOfBits“ Bit 0-5), an automatic Anwser can be deleted again.

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	IdxAndNrOfBits	**Bit 7-6:** Index of Frame-Answer combination **Bit 0-5:** Number of bits of DALI frame to be answered
2	4 Bytes	Frame	DALI frame to be answered (little-endian Format)
3	1 Byte	Answer	DALI answer to be sent

2.1.6. SHORT BUS

Shorts the DALI bus for the specified duration. This command is only supported by Devices that are capable of Bus Shorts. This capability can be queried using QUERY DEVICE DESCRIPTOR.

	Command	**Response**
Command Number	84 (0x54)	85 (0x55)

Command Data:

Index	**Length**	**Parameter**	**Description**
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	2 Bytes	Duration	Bus short duration in milliseconds (big-endian Format)

Response data:

Index	**Length**	**Parameter**	**Description**
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	2 Bytes	Duration	Bus short duration in milliseconds (big-endian Format)

2.2. Event Command List

2.2.1. EVENT MESSAGE

An event message is generated on: status changes, sent and reception on the DALI bus.

Command Data						
Event Header				Event Data		
TICK (optional)	TICK (optional)	LINE (optional)	STATUS (type & info)	EVENT DATA 0	. . .	EVENT DATA N

	Command	**Response**
Command Number	49 (0x31)	-

Command Data:

Index	**Length**	**Parameter**	**Description**
0	2 Bytes	Tick (optional)	Time Tick
2	1 Byte	Line (optional)	Index of the DALI line (0 for devices with only one DALI line)
3	1 Byte	Status	**Bit 6-7:** Event type **Bit 0-5:** Event info Details see parameter description
4	n Bytes	Event Data, see 2.2.1 Parameter Combinations	Dependent on the status

With the event filter settings certain parameters in an event message can be suppressed. The index is adjusted accordingly when the event filter is activated.

Parameter Description:

Parameter	**Subparameter**	**Subparameter length**	**Description**
Status	Eventtype	2 Bit	0 = DALI-Frame was sent 1 = Response to the sent DALI frame was received 2 = DALI-Frame was received 3 = other events
	Eventinfo	6 Bit	See parameter combinations

Parameter Combinations:

Eventtype	Eventinfo	Event Data	Description
0	1-32	**Byte 1-4:** DALI Frame **Byte 0:** ID of the associated DALI frame	Sent successfully
	61	**Byte 0:** ID of the associated DALI frame	Send error (collision)
	62	**Byte 0:** ID of the associated DALI frame	bus error
	63	**Byte 0:** ID of the associated DALI frame	timeout
1	0	**Byte 0:** ID of the associated DALI frame	DALI answer: NO
	8	**Byte 1:** Answer DALI Frame **Byte 0:** ID of the associated DALI frame	DALI answer: 8-Bit
	63	**Byte 1:** fix on 255 **Byte 0:** ID of the associated DALI frame	DALI answer: YES (255)
2	1-32	**Byte 0-3:** received DALI Frame	received successfully
	62	-	received only star / stop bit combination
	63	-	framing error
3	0	-	Bus error (Bus low ~42,5ms)
	1	-	System error (Bus low 500ms)
	2	-	Bus restored (Bus high ~2ms)
	3	-	Send buffer full
	4	-	Send buffer empty
	5	-	Bus supply warning (Bus low ~22,5ms)
	60	**Byte 0:** macro command number, see 2.3.x Command	Macro stopped by timeout or user
	61	**Byte 1-4:** dependent on macro, see 2.3.x Macro Event Data (Intermediate) **Byte 0:** macro command number	Macro Event - Intermediate
	62	**Byte 1-4:** dependent on macro, see 2.3.x Macro Event Data (Error) **Byte 0:** macro command number	Macro Event - Error
	63	**Byte 1-4:** dependent on macro, see 2.3.x Macro Event Data (Success) **Byte 0:** macro command number	Macro Event - Success

2.3. Extended DALI Command List

Note: Not all macro commands may be implemented on the device. Implemented macros can be checked by reading the subparameter “ImplementedMacros” by sending a “QUERY DEVICE DESCRIPTOR” command, see chapter 2.4.6 QUERY DEVICE DESCRIPTOR.

After sending a macro command, Event messages with the following structure are sent back:

Command Data			
Event Header		Event Data	
(Tick, Line)	Status (Event Type 3, Event Info 60 .. 63)	Macro Command Number	Macro Event Data

2.3.1. MACRO: FADE TO LEVEL / COLOR

Fading of the light level and / or color to a target value.

	Command	Response
Command Number	158 (0x9E)	159 (0x9F)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 127 = broadcast 126 = broadcast not addressed (only DALI-2) 96-125 = reserved 80-95 = group address 16-31 (only 24-Bit devices) 64-79 = group address 0-15 0-63 = short address 0-63
2	1 Byte	Level	0 … 254: light level 255: stop or no fading
3	13 Bytes	DT8_Color (optional)	see parameter description

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	Status	0 = macro execution started 1 = macro execution not possible (bus error) 2 = macro execution not possible (device in DALI Initialize mode) 3 = macro execution not possible (device in DALI Quiescent mode) 4 = sending not possible (send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = sending not possible (macro running)

Event Data (Success):

Macro Command number: 158 (0x9E)

Macro Event Data Length: 0

Event Data (Error):

Macro Command number: 158 (0x9E)

Macro Event Data Length: 0

Parameter Description:

Parameter	Parameter length	Subparameter	Subparameter length	Description
DT8_Color	13 Bytes	ColorType	1 Byte	color type: 0 = XY 1 = Tc 2 = Primary N 3 = RGBWAF
		ColorValue	12 Bytes	see parameter combinations

Parameter Combinations:

ColorType	ColorValue	Parameter length	Value	Description
0	XValue	2 Bytes	0-65535	X-value
	YValue	2 Bytes	0-65535	Y-value
	Reserved	8 Bytes	-	reserved
1	TcValue	2 Bytes	100-1000	color temperature in Mirek (1000000/Kelvin)
	Reserved	10 Bytes	-	reserved
2	PrimNValues	12 Bytes	6x 0-65535	Primary N values
3	RGBWAFValues	6 Bytes	6x 0-255	red, green, blue, white, amber, freecolor
	RGBWAFControl	1 Byte	0-255	
	Reserved	5 Bytes	-	reserved

2.3.2. MACRO: READ / STORE SCENE

Read or save a light level and / or color value as a scene.

	Command	Response
Command Number	160 (0xA0)	161 (0xA1)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 0-63 = short address 0-63 64-79 = group address 0-15 80-95 = group address 16-31 (only 24-Bit devices) 96-125 = Reserved 126 = broadcast not addressed (only DALI-2) 127 = broadcast
2	1 Byte	Mode	**Bit 7:** 0 = read scene values 1 = write scene values **Bit 6:** 0 = write/read only light level 1 = write/read light level and color values **Bit 5:** 0 = use the command parameters as scene values 1 = use the current light level and color values as scene values **Bit 0-4:** 0-15 = Scene 0-15 16 = PowerOn Level 17 = SystemFailure Level
3	1 Byte	Level / BufIndex (optional)	**Level:** 0 … 254: light level 255: stop or no fading **BufIndex:** Index for TEMPORARY MACRO BUFFER ACCESS
4	13 Bytes	DT8_Color (optional)	See parameter description (MACRO: FADE TO LEVEL / COLOR)

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the specified DALI line
1	1 Byte	Status	0 = Macro execution started 1 = Macro execution not possible (bus error) 2 = Macro execution not possible (device in DALI Initialize mode) 3 = Macro execution not possible (device in DALI Quiescent mode) 4 = sending not possible (Send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = sending not possible (macro running)

Parameter Combinations:

Mode	Level	BufIndex	DT8_Color	Data Length	Description
1x1xxxxxb	-	-	-	3 Bytes	Write command to accept the current light level or color values
100xxxxxb	x	-	-	4 Bytes	Write command containing only light levels
110xxxxxb	x	-	x	17 Bytes	Write command containing light levels and color values
0xxxxxxxb	-	x		4 Bytes	Read command: BufIndex = light level BufIndex + 1 = DT8_Color (optional)

2.3.3. MACRO: DEVICE SEARCH

Search for devices that have already been addressed.

	Command	Answer
Command Number	132 (0x84)	133 (0x85)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Protocol	See parameter description

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Status	0 = Macro execution started 1 = Macro execution not possible (bus error) 2 = Macro execution not possible (device in DALI Initialize mode) 3 = Macro execution not possible (device in DALI Quiescent mode) 4 = sending not possible (Send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = sending not possible (macro running)

Event Data (Intermediate):

Macro Command number: 132 (0x84)

Macro Event Data Length: 2

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	Protocol	See parameter description
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 0-63 = short address 0-63 64-79 = group address 0-15 80-95 = group address 16-31 (only 24-Bit devices) 96-125 = reserved 126 = Broadcast not addressed (only DALI-2) 127 = Broadcast

Event Data (Success):

Macro Command number: 132 (0x84)

Macro Event Data Length: 1

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	NrOfFoundDevices	Number of found devices

Event Data (Error):

Macro Command number: 132 (0x84)

Macro Event Data Length: 0

Parameter description:

Parameter	Parameter bit	Subparameter	Subparameter length	Description
Protocol	7	Format	2 Bit	0 = reserved 1 = DALI 16-Bit 2 = DALI 24-Bit 3 = reserved
	6			
	5	-	6 Bit	reserved
	4			
	3			
	2			
	1			
	0			

2.3.4. MACRO: FIND DUPLICATES

Find devices with the same DALI short address.

	Command	Response
Command Number	134 (0x86)	135 (0x87)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Protocol	See parameter description

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Status	0 = Macro execution started 1 = Macro execution not possible (bus error) 2 = Macro execution not possible (device in DALI Initialize mode) 3 = Macro execution not possible (device in DALI Quiescent mode) 4 = sending not possible (Send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = sending not possible (macro running)

Event Data (Intermediate):

Macro Command Number: 134 (0x86)

Macro Event Data Length: 2

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	Protocol	See parameter description
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 0-63 = short address 0-63 64-79 = group address 0-15 80-95 = group address 16-31 (only 24-Bit devices) 96-125 = reserved 126 = broadcast not addressed (only DALI-2) 127 = broadcast

Event Data (Success):

Macro Command Number: 134 (0x86)

Macro Event Data Length: 1

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	NrOfFoundDuplicates	Number of found address conflicts

Event Data (Error):

Macro Command Number: 134 (0x86)

Macro Event Data Length: 1

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	NrOfFoundDuplicates	Number of found address conflicts

Event Data (Error):

Macro Command Number: 10/11 (0x0A/0x0B, DALI16/DALI24)

Macro Event Data Length: 0

Parameter description:

Parameter	Parameter bit	Subparameter	Subparameter length	Description
Protocol	7	Format	2 Bit	0 = reserved 1 = DALI 16-Bit 2 = DALI 24-Bit 3 = reserved
	6			
	5	-	6 Bit	reserved
	4			
	3			
	2			
	1			
	0			

2.3.5. MACRO: ADDRESSING

Starts DALI addressing in the selected mode.

	Command	Response
Command Number	138 (0x8A)	139 (0x8B)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Protocol	See parameter description
2	1 Byte	Mode	0 = system extension 1 = new installation
3	1 Byte	Errorhandling (optional)	This parameter is optional (interpreted as 0 if not present) 0 = stop if an error occurs 1 = ignore not responding devices

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Status	0 = Macro execution started 1 = Macro execution not possible (bus error) 2 = Macro execution not possible (device in DALI Initialize mode) 3 = Macro execution not possible (device in DALI Quiescent mode) 4 = sending not possible (Send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = sending not possible (macro running)

Event Data (Intermediate):

Macro Command Number: 132 (0x84)

Macro Event Data Length: 2

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	Protocol	See parameter description
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 0-63 = short address 0-63 64-79 = group address 0-15 80-95 = group address 16-31 (only 24-Bit devices) 96-125 = reserved 126 = broadcast not addressed (only DALI-2) 127 = broadcast

Event Data (Intermediate):

Macro Command Number: 10 / 11 (0x0A/0x0B, DALI16/DALI24)

Macro Event Data Length: 2

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	Protocol	See parameter description
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 0-63 = short address 0-63 64-79 = group address 0-15 80-95 = group address 16-31 (only 24-Bit devices) 96-125 = reserved 126 = broadcast not addressed (only DALI-2) 127 = broadcast

Event Data (Intermediate):

Macro Command Number: 134 (0x86)

Macro Event Data Length: 2

Macro Event Data			
Index	**Length**	**Parameter**	**Description**
0	1 Byte	Protocol	See parameter description
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 0-63 = short address 0-63 64-79 = group address 0-15 80-95 = group address 16-31 (only 24-Bit devices) 96-125 = reserved 126 = broadcast not addressed (only DALI-2) 127 = broadcast

Event Data (Success):

Macro Command Number: 138 (0x8A)

Macro Event Data Length: 0

Event Data (Error):

Macro Event Data Length: 0

Macro Command Number	Description
138 (0x8A)	Macro Failed
1/2 (DALI16/DALI24)	Start Quiescence Failed
13/14 (DALI16/DALI24)	Stop Quiescence Failed
10/11 (DALI16/DALI24)	Addressing Failed
132 (0x84)	Device Search Failed
134 (0x86)	Find Duplicates Failed
144 (0x90)	Recognize Device Failed
150 (0x96)	Read Memory Bank Failed

Parameter description:

Parameter	Parameter bit	Subparameter	Subparameter length	Description
Protocol	7	Format	2 Bit	0 = DALI 16-Bit and DALI 24-Bit 1 = DALI 16-Bit 2 = DALI 24-Bit 0 = reserved
	6			
	5	-	6 Bit	reserved
	4			
	3			
	2			
	1			
	0			

2.3.6. MACRO: READ / WRITE MEMORY BANK

Read and write access to the Memory Banks.

	Command	Response
Command Number	150 (0x96)	151 (0x97)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Address	**Bit 7:** reserved **Bit 0-6:** 0-63 = short address 0-63 64-79 = group address 0-15 80-95 = group address 16-31 (only 24-Bit devices) 96-125 = reserved 126 = Broadcast not addressed (only DALI-2) 127 = Broadcast
2	1 Byte	MembankNr	Number of the Memory Bank (1 … 255)
3	1 Byte	MBMode	See parameter description
4	1 Byte	FirstMBAddr	First Memory Bank address for read- / write access
5	1 Byte	LastMBAddr	Last Memory Bank address for read- / write access
6	1 Byte	BufIndex	Index for the TEMPORARY MACRO BUFFER ACCESS

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI Line (0 for devices with only one DALI line)
1	1 Byte	Status	0 = Macro execution started 1 = Macro execution not possible (bus error) 2 = Macro execution not possible (device in DALI Initialize mode) 3 = Macro execution not possible (device in DALI Quiescent mode) 4 = sending not possible (Send-buffer full) 5 = DALI line not available 6 = Syntax error in parameters 7 = sending not possible (macro running)

Event Data – Normal Read/Write (Success):

The following layout is used when a normal Read/Write is performed (MBMode bits 0-2 ≠ 5):

Macro Command Number: 150 (0x96)

Macro Event Data Length: 0

Event Data – Direct Read (Success):

The following layout is used when a direct read is performed (MBMode bits 0-2 = 5)

Macro Command Number: 150 (0x96)

Macro Event Data Length: 4

Index	Length	Parameter	Description
0	1 Byte	Read Byte 1	-
1	1 Byte	Read Byte 2	-
2	1 Byte	Read Byte 3	-
3	1 Byte	Read Byte 4	-

Event Data (Error):

Macro Event Data Length: 0

Command Number	Description
150 (0x96)	Macro Failed
16 (0x10)	Read/Write/Unlock/Lock Failed

Parameter Description:

Parameter	Parameter length	Description
MBMode	1 Byte	**Bit 7:** 0 = DALI 16-Bit 1 = DALI 24-Bit **Bit 6:** 1 = unlock before the Memory Bank access **Bit 5:** 1 = lock after the Memory Bank access **Bit 4:** 1 = ignore response to read- / write commands **Bit 3:** reserved **Bit 0-2:** 0 = no action 1 = read access 2 = write access 3 = fast write access, no response (only DALI-2) 4 = reset the Memory Bank 5 = direct read without buffer (limited to a maximum of 4 Bytes)

2.3.7. TEMPORARY MACRO BUFFER ACCESS

Read and write access to the 256-byte temporary macro buffer.

The Macro buffer is a circular buffer. If a read/write extends past the 256 byte boundary, the read/write is continued from address 0.

	Command	Response
Command Number	128 (0x80)	129 (0x81)

Command Data (Read):

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line, highest Bit(7) has to be cleared for reading. (0 for devices with only one DALI line)
1	1 Byte	StartAddr	Start offset within the macro buffer
2	1 Byte	NrOfData	Number of bytes to be read

Response Data (Read) – Failed:

If the response does not contain any data, the command was incorrect (Line index out of bounds or invalid command data format).

Response Data (Read) - Success:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	StartAddr	Start offset within the macro buffer
2	up to 256 Bytes	Data	Read data for the macro buffer.

Command Data (Write):

Index	Length	Parameter	Description
0	1 Byte	Line | 0x80	Index of the specified DALI line, highest Bit(7) has to be set for writing. (128 for devices with only one DALI line)
1	1 Byte	StartAddr	Start offset within the macro buffer
2	up to 256 Bytes	Data	data to be written for the macro buffer

Response Data (Write) – Failed:

If the response does not contain any data, the command was incorrect (Line index out of bounds or invalid command data format).

Response Data (Write) – Macro Buffer Busy:

Write access failed because a macro is still running.

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)

Response Data (Write) - Success:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	StartAddr	Start offset within the macro buffer.

2.3.8. MACRO STATUS

Read the current macro status or stop a running macro.

	Command	Response
Command Number	130 (0x82)	131 (0x83)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	Mode	0 = read status 1 = stop running macro

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	Status	0 = no running macro 1 = running macro

If the response does not contain any data, the command received was incorrect.

2.4. Interface Command List

2.4.1. READ / WRITE SETTINGS

Read or write of settings related to the interface.

	Command	Response
Command Number	42 (0x2A)	43 (0x2B)

Command Data:

Index	Length	Parameter	Description
0	3 Bytes	Settings (optional)	see parameter description

Without data this command is interpreted as a read command.
With data this command is interpreted as a write command.

Response Data:

Index	Length	Parameter	Description
0	3 Bytes	Settings	see parameter description

Parameter Description:

Parameter	Subparameter	Subparameter length	Description
Settings	Mode	1 Byte	**Bit 7:** 1 = activates the DALI ping **Bit 6:** 1 = deactivates sending of DALI frames during "Initialize" mode **Bit 5:** 1 = deactivates sending of DALI frames during "Quiescent" mode **Bit 0-4:** reserved
	EventFilter	1 Byte	**Bit 7:** 1 = deactivates all events **Bit 6:** 1 = deactivates events for successfully sending a DALI frame **Bit 5:** 1 = deactivates events for receiving a DALI frame **Bit 4:** 1 = deactivate events for the send-buffer (full / empty) **Bit 3:** 1 = deactivates including the tick in events **Bit 2:** 1 = deactivates including the line number in events **Bit 1:** 1 = deactivates events for macros **Bit 0:** reserved
	HardwareSettings	1 Byte	**Bit 7:** 1 = turn on bus power supply (may not be supported by hardware, see parameter description of 2.4.6 QUERY DEVICE DESCRIPTOR, “HardwareFeatures”, bit 7)

2.4.2. READ STATUS

Read the status of a DALI line.

	Command	Response
Command Number	44 (0x2C)	45 (0x2D)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line)
1	1 Byte	Action (optional)	1 = delete all DALI frames in the buffer 2 = reset the frame ID to NextID
2	1 Byte	NextID (optional)	Only for Action = 2: Manual setting of the next frame ID used (valid range of values: 0… 254)

Response Data:

Index	Length	Parameter	Description
0	1 Byte	Line	Index of the DALI line (0 for devices with only one DALI line) *Error case: If the specified DALI line is not available in terms of hardware, the response only contains the corresponding index of the DALI line as data.*
1	2 Bytes	Tick (optional)	Time Tick
3	1 Byte	ID (optional)	Next free ID
4	1 Byte	NrOfEntries (optional)	Number of DALI frames in the buffer
5	1 Byte	Status (optional)	Status of the selected line **Bit 7:** 1 = bus voltage error **Bit 6:** 1 = sending blocked due to "Initialize" mode **Bit 5:** 1 = transmission blocked due to "Quiescent" mode **Bit 0-4:** reserved

2.4.3. QUERY DEVICE INFO

Read the device information.

	Command	Response
Command Number	32 (0x20)	33 (0x21)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	SelectSet	Requests device information. 0 = Set 0 of the DeviceInfoData 1 = Set 1 of the DeviceInfoData

Response Data:

Index	Length	Parameter	Description
0	up to 20 Bytes	DeviceInfoData	See parameter combinations

Parameter Description:

Parameter	Set	Subparameter	Subparameter length	Description
DeviceInfoData	0	GTIN	6 Bytes	According to the DALI definition, MSB first
		ID	8 Bytes	According to the DALI definition, MSB first
		PCBVersion	1 Byte	PCB Version
		AssemblyVersion	1 Byte	Assembly Version
		ArtNr	4 Bytes	Article Number
	1	Info	16 Bytes	Part of the article number (zero-terminated string)
		ProdYear	1 Byte	Production year (= year - 2000)
		ProdWeek	1 Byte	Production week

2.4.4. IDENTIFY SELF

Starts the identification method of the device.

	Command	Response
Command Number	36 (0x24)	37 (0x25)

Command Data:

Index	Length	Parameter	Description
0	1 Byte	StopIdentify (optional)	0 = Stop Identify process

If this command is sent without data, the standard DALI, 10-second identify process of the interface starts.

Response data:

The response to this command does not contain any data.

2.4.5. READ / WRITE DEVICE NAME

Read or write the user-definable device name.

	Command	Response
Command Number	38 (0x26)	39 (0x27)

Command Data:

Index	Length	Parameter	Description
0	29 Bytes	DeviceName (optional)	User-defined device name as a zero-terminated string

Without data: this command is interpreted as a read command
With data: this command is interpreted as a write command

Response Data:

Index	Length	Parameter	Description
0	29 Bytes	DeviceName	Returns the user-definable device name as a zero-terminated string

2.4.6. QUERY DEVICE DESCRIPTOR

Reading the device descriptor

	Command	Response
Command Number	40 (0x28)	41 (0x29)

Command Data:

This command is only valid without data.

Response Data:

Index	Length	Parameter	Description
0	19 Bytes	DeviceDescriptor	Contains information about the functionality of the interface (for details see parameter description)

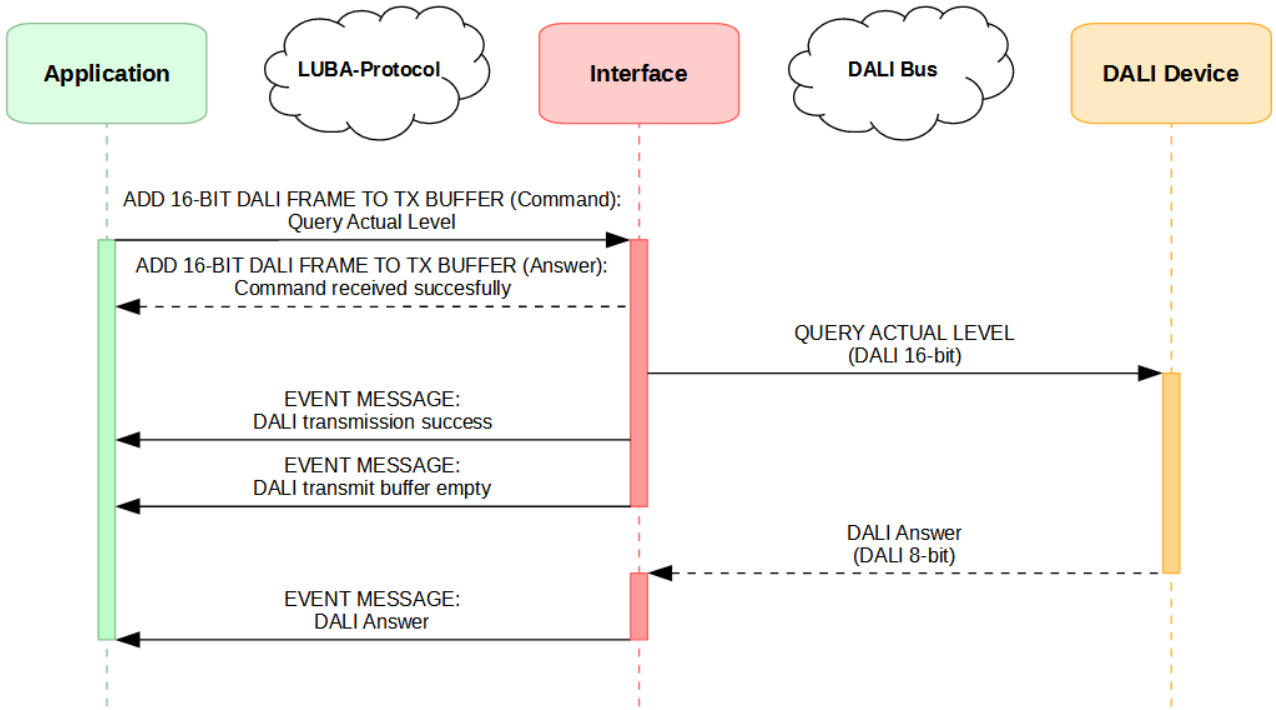
Parameter Description:

Parameter	Subparameter	Subparameter length	Description
DeviceDescriptor	NrOfLines	1 Byte	Number of implemented DALI lines
	BufferSize	1 Byte	Maximum number of DALI send-buffer entries
	Tick_us	4 Bytes	Resolution of the tick values in microseconds
	NrOfDataBytes	1 Byte	Maximum number of data bytes in a frame
	ImplementedMacros	8 Bytes	Bit n (Zero-based indexed) corresponds to the command number 2n + 132 (range is 132 ... 256). Bit n = 0: Macro is not implemented Bit n = 1: Macro is implemented
	DeviceListSpecifier	1 Byte	0 = no device list implemented 1 =device list of Type 1 is implemented
	ProtocolVersionMajor	1 Byte	Protocol version major number
	ProtocolVersionMinor	1 Byte	Protocol version minor number
	HardwareFeature	1 Byte	**Bit 7:** 1 = device has integrated, switchable bus power supply **Bit 4:** 1 = device has Bus-short Capability

2.5. Example Sequence diagrams

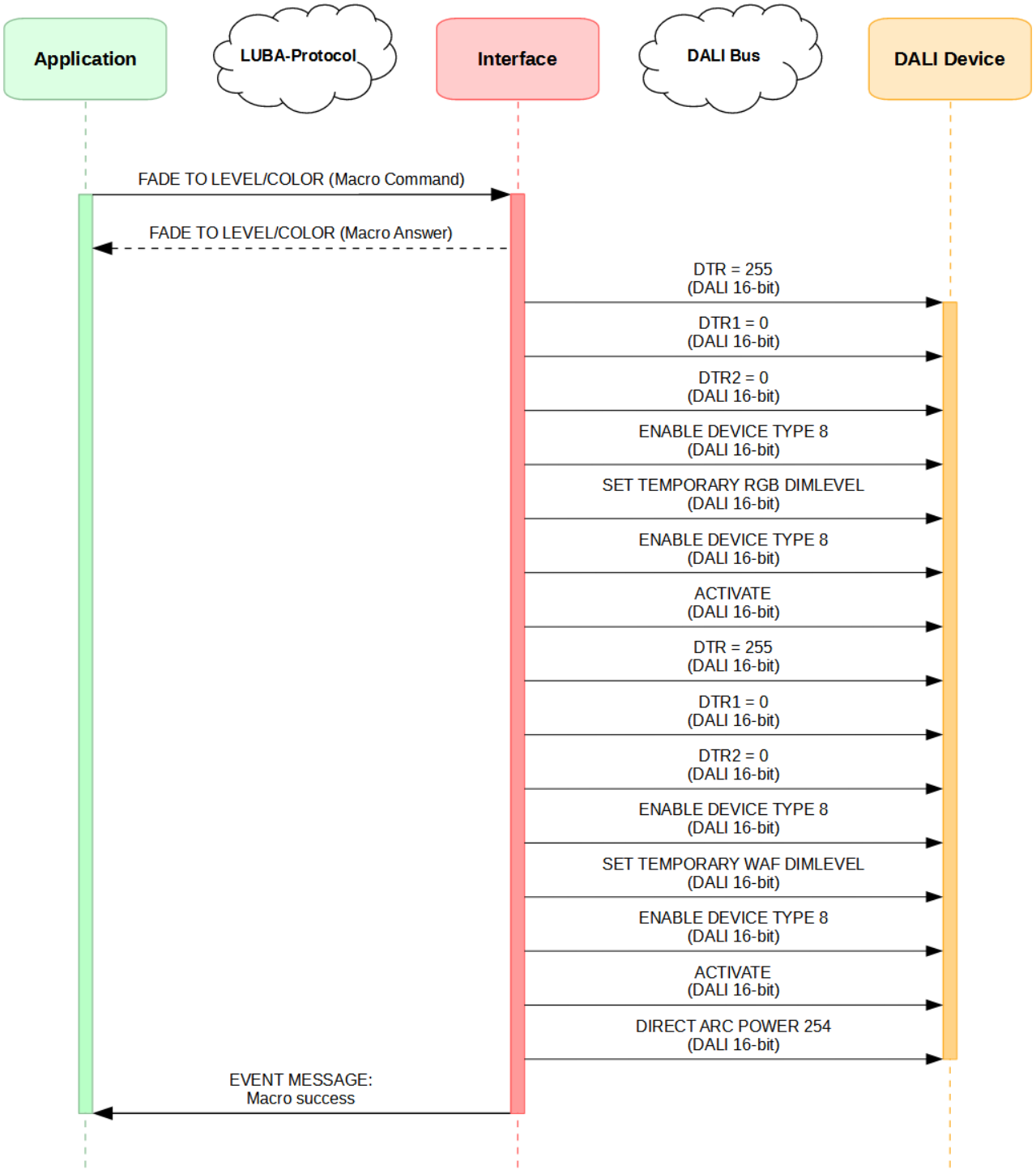
2.5.1. Query the current light level

Data		
Line	16BitFrame (Mode)	16BitFrame (Data)
0	0x41	0xFFA0



2.5.2. Set the light level and color

Data					
Line	Address	Level	DT8_Color (RGBWAFValues)	DT8_Color (RGBWAFControl)	DT8_Color (reserved)
0	0x7F	0xFE	0xFF0000000000	0	0x0000000000



3. Example Code

A Python example project can be found here: www.lunatone.at/projects/LUBA/lubadevkit.zip

4. Disclaimer

Subject to changes. All statements without guarantee.

5. Document Change History

Revision	chapter	description of changes	date
1.0		Initial release	April 2021
1.1	1.1, 2.4.1, 2.4.6	Add USB, add switchable bus power supply	August 2022
1.2	3	Example code	September 2022
1.3	1.2.2	Update color coding	March 2023
1.4	2.3.7	Add write bit	April 2023
1.5	2.1.5, 2.1.6	Add commands	February 2024
1.6	2.1.5, 2.1.6, 2.4.6	Clarify Read of “CONFIG AUTO ANSWER”, Add “Busshort Capable” Flag	February 2024
1.7	2.3.3-2.3.5	Add event data (Intermediate) for Macros: Device Search, Find Duplicates and Addressing	August 2024
1.8	2.2.1, 2.3.1-2.3.7, 2.4.1, 2.4.6	Add picture for macro event message structure, add note mentioning that not all macros may be implemented on device, clarify event data and macro event data, add event data (intermediate/error/success), add protocol description for different uses of “protocol” parameter, correct german words to english (reserviert → reserved), Correct length of macro event data (5→4), Clarify encoding of “implementedMacros” for “QUERY DEVICE DESCRIPTOR” command, Split different Command/Response formats to seperate tables, Remove “eDALI” from “protocol” parameter descriptions, Add note that switching on/off power supply is not supported by all devices, clarify in 2.4.7 what happens at an address overflow	February 2025