LUMAWISE Motion Programmable – Changing Parameters

Document Sections

1 INTRODUCTION

The LUMAWISE Motion Programmable includes an option to configure the behavior of the product via the memory bank of the DALI bus. The LUMAWISE Motion Programmable can be configured using an off the shelf DALI-USB product, or a custom-made product. This instruction sheet provides information using the Lunatone DALI-2 USB (Art. Nr: 24138215-30) product. Other available programmers can also be used for configuring the DALI memory banks.

The functionality of the LUMAWISE Motion Programmable has been extended to allow the user to configure behavior of the product via Memory Bank 2 of the DALI bus, using standard DALI commands. These commands can be sent via the DALI bus using an off-the-shelf DALI interface tool (e.g., DALI-2 USB), a DALI-2 certified control device, or any other proprietary DALI interface product.

This instruction sheet has been prepared using one such off-the-shelf product (Lunatone DALI-2 USB 24138215-30), but other DALI programmers may also be used. Using a DALI communication tool which is DALI or DALI-2 certified will ensure compatibility.

This instruction sheet provides direction on the programming of Memory Bank 2 parameters. For more information on the operation of the LUMAWISE Motion Programmable, including other important features and functions, please refer to the Application Specification (114-160511).

PRODUCT INFORMATION 1-800-522-6752

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2 BACKGROUND KNOWLEDGE

The DALI communication protocol is fully standardized by IEC 62386, including the definition of various Memory Banks. These Memory Banks are used for storing information which can be queried by other devices on the DALI bus for the purpose of exchanging information, such as identification, monitoring, or operational parameters.

Memory Bank 0 and Memory Bank 1, as well as Memory Banks 200 through 255, are explicitly defined or otherwise reserved by IEC 62386-102 and other relevant standards.

Memory Banks 2 through 199 are available for proprietary definition by manufacturers of DALI devices such as the LUMAWISE Motion Programmable. IEC 62386-102 Section 9.10.2 provides the basic memory map requirements for all DALI Memory Banks, including proprietary / manufacturer specific Memory Banks in the 2 through 199 range.

The LUMAWISE Motion Programmable stores its programmable parameters in Memory Bank 2. The contents of this memory bank, as well as instructions for interacting with the parameters stored in it, can be found in the following sections.

3 PROGRAMMABLE PARAMETERS

The Memory Bank 2 parameters which can be modified are shown in the table below.

MB2 Address	Content	Default (decimal, hex)
0x14	Light Output % - Low Level *Nighttime light output without motion. 0x64 = 100% (>0x64 is set to 100%. The low level should be lower or equal to this value)*	*20% (20dec, 0x14)*
0x15	Light Output % - High Level *Nighttime light output during motion event. 0x64 = 100% (>0x64 is set to 100%. The high level should be higher or equal to the user defined Low Level)*	*100% (100dec, 0x64)*
0x16	Light Output % - High Temperature Mode *Nighttime light output in High Temperature Mode. 0x64 = 100% (>0x64 is set to 100%. The High Temperature Mode is set at a minimum of 40%)*	*50% (50dec, 0x32)*
0x17	Lamp On Time *Lamp on-time used from 0x0C to 0xFF. (0x01 = 5 seconds increment, each increment equals a 5 seconds increase of the Lamp On Time). The Lamp On Time has a minimum setting of 60s.*	120s (24dec, 0x18)
0x18	Turn On Level *Light level in lux from 0x0A to 0xF5. The minimum Turn On Level is set at 10 Lux and the maximum is set at 245 Lux. Below or above the minimum/maximum levels, the value will be set at the respective minimum/maximum value.*	35 lux (35dec,0x23)
0x19	Turn Off Level *Light level in lux from 0x0A to 0xF5*	18 lux (18dec, 0x12)

Table 1 - Memory Bank 2 contents

i | *NOTE*
See Chapter 27 CONVERTING HEXADECIMAL TO DECIMAL for conversion examples on the Lamp On Time parameters.

4 PROCESS OVERVIEW

4.1 Basic Writing Process

The process starts with enabling the memory bank to be written to. This is described in Figure 1. After the memory writing is enabled, the relevant parameters can be written according to Table 1.
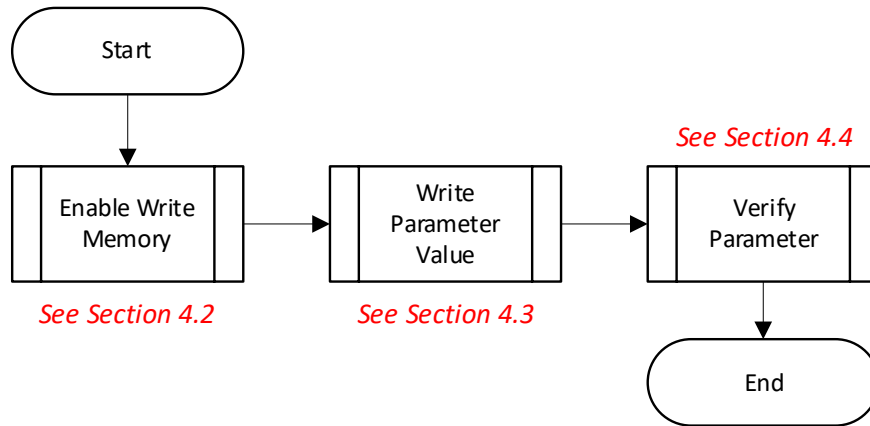
Figure 1 - Basic Writing Process

4.2 Enable Write Memory

DALI Memory Banks, including Memory Bank 2, are locked by default and cannot be overwritten unless the Lock Byte (located at Address 0x02) is appropriately set. The process for Enabling Write Memory, addressing the appropriate location, and setting the Lock Byte is shown below.
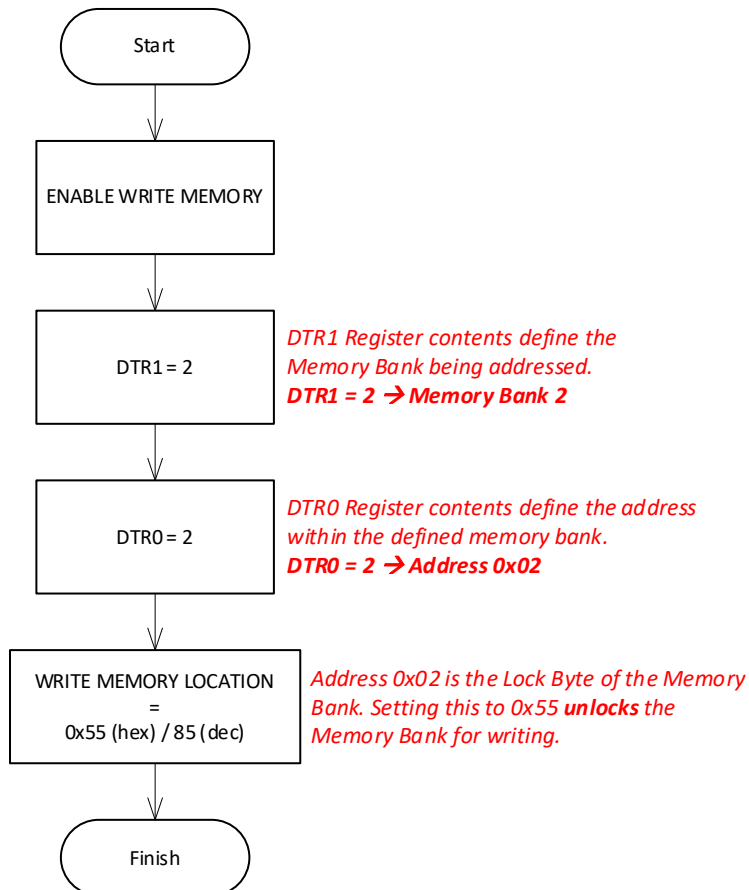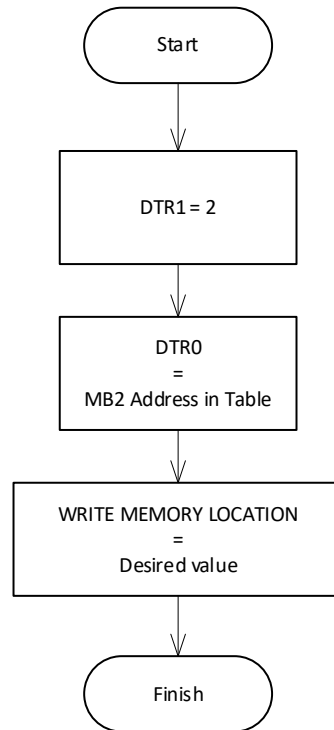

Figure 2 - Memory Bank Lock Byte setting procedure

An example of this lock byte setting process can be found in Section 5.2.

4.3 Write Parameter Value

In order to change the desired operational parameter of the LUMAWISE Motion Programmable, the relevant memory location must be overwritten with a new value. Memory Bank addresses, as well as valid ranges, are described in Table 1.

The process for writing new values to address locations within Memory Bank 2 is shown below.

```
        ┌──────────┐
        │  Start   │
        └──────────┘
              │
              ▼
        ┌──────────┐
        │ DTR1 = 2 │
        └──────────┘
              │
              ▼
     ┌───────────────────┐
     │       DTR0        │
     │        =          │
     │ MB2 Address in Table │
     └───────────────────┘
              │
              ▼
   ┌─────────────────────────┐
   │  WRITE MEMORY LOCATION  │
   │           =             │
   │      Desired value      │
   └─────────────────────────┘
              │
              ▼
        ┌──────────┐
        │  Finish  │
        └──────────┘
```

Figure 3 - Parameter Write process

An example of this parameter writing process can be found in Section 5.4.

5 PROGRAMMING PROCEDURE

This programming procedure uses the LUMAWISE Motion Programmable (PN: 2444029) and the Lunatone DALI-2 USB. Other DALI-USB programming devices may be used. While the user interface applications for various DALI-USB programming devices may differ from the sections below, the underlying DALI command are standardized and should therefor remain the same.

The LUMAWISE Motion Programmable can be easily attached with wires in the Lunatone DALI-2 USB. For connection, the LUMAWISE Endurance S/S2 receptacle can be used.
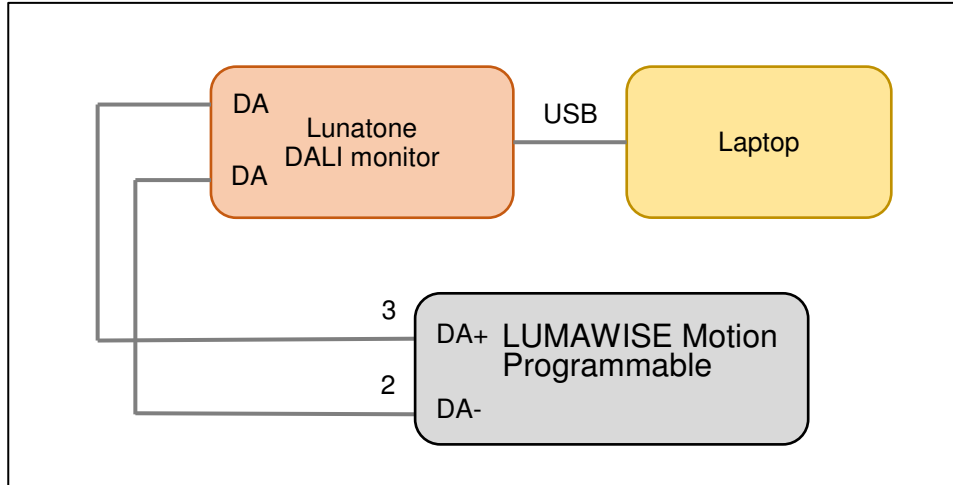
Figure 4 - DALI USB and LUMAWISE Motion Programmable connections

The figure above assumes that the selected DALI-USB device provides power to the bus. If the DALI-USB device does not power the DALI bus, a separate power supply must be used.

> **CAUTION**
> *Like all DALI devices, LUMAWISE Motion - Programmable communicates by applying brief short circuits to the applied power (DALI) bus. It is critical that only DALI-2 certified bus supplies, or other power supplies with current limiting according to relevant DALI standards, be used.* **Use of the LUMAWISE Motion with a non-current limited power supply e.g., a 24V Auxiliary Supply or a Battery, will result in damage to the sensor rendering it inoperable.**

5.1 Start the tool

1. Download and install the Lunatone DALI Cockpit application from the Lunatone website, follow the installation instructions from Lunatone per their device.

2. Connect the Lunatone DALI-2 USB to the pc

3. Connect the LUMAWISE Motion Programmable via Pin 2 (DA-) and Pin 3 (DA+) to the DALI-2 USB. Please note for more connection diagrams, follow 114-160511.

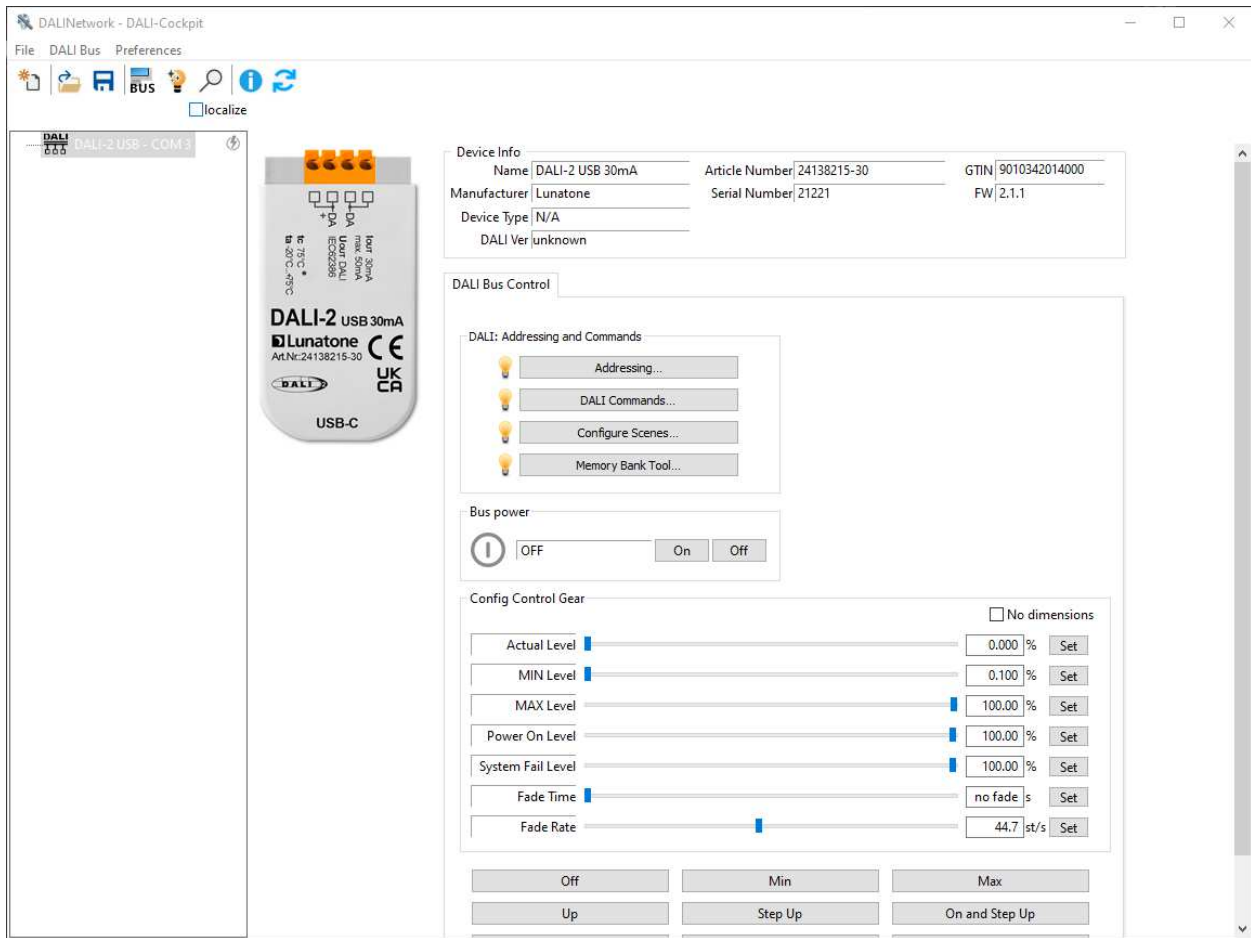4. Open the DALI-Cockpit tool and ensure that the DALI-2 USB is recognized as a COM port

Figure 5

i

NOTE
These steps are Lunatone DALI-2 USB product specific, but the configuration steps are similar using other DALI-2 bus programmers.

5. If the DALI-2 USB is powering the LUMAWISE Motion Programmable, enable Bus Power.

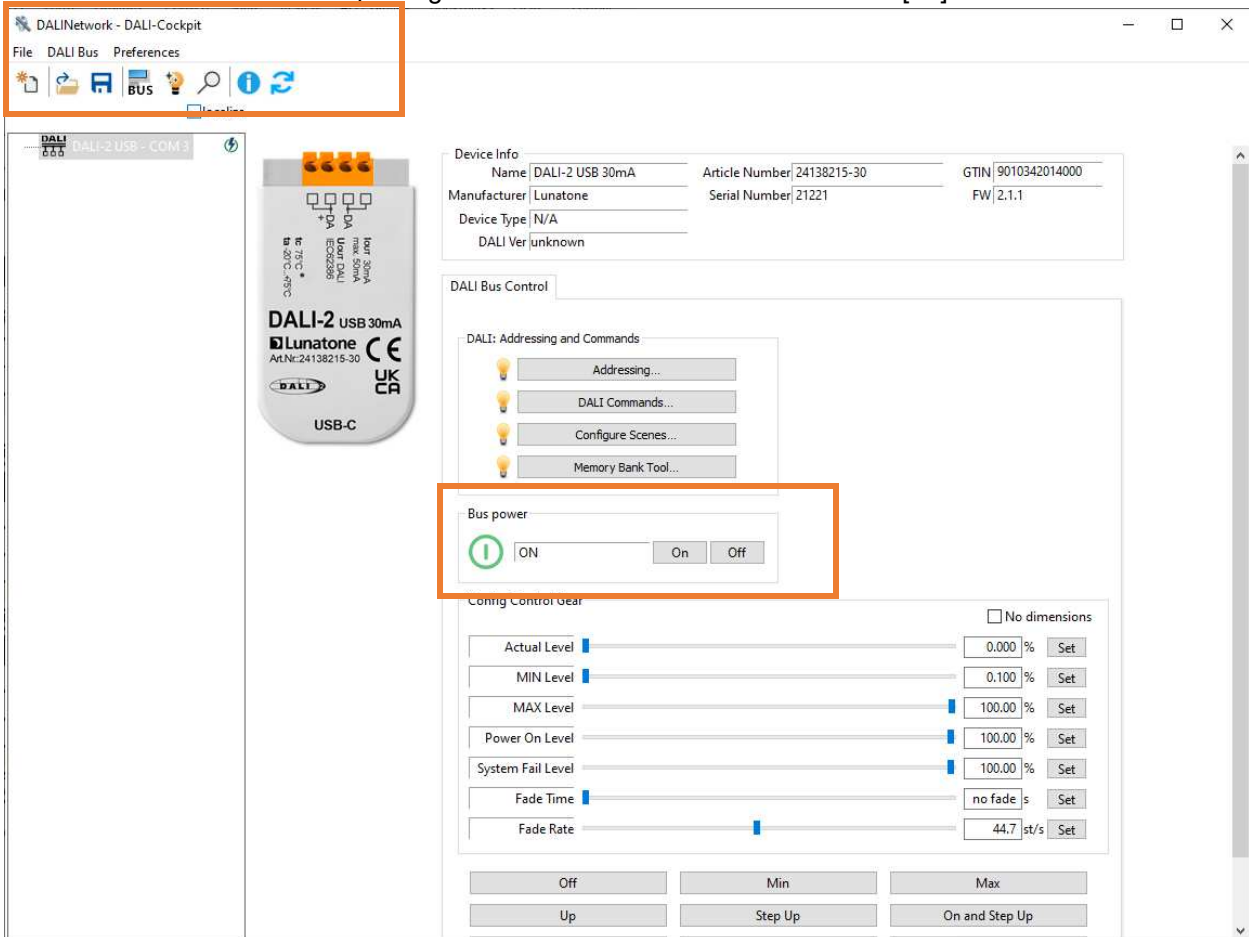6. Click on DALI bus in the top navigation bar and select "DALI Commands [F9]"

Figure 6

7. New screen opens and shows the choice between "Bus Commands" and "Commands Over Time"

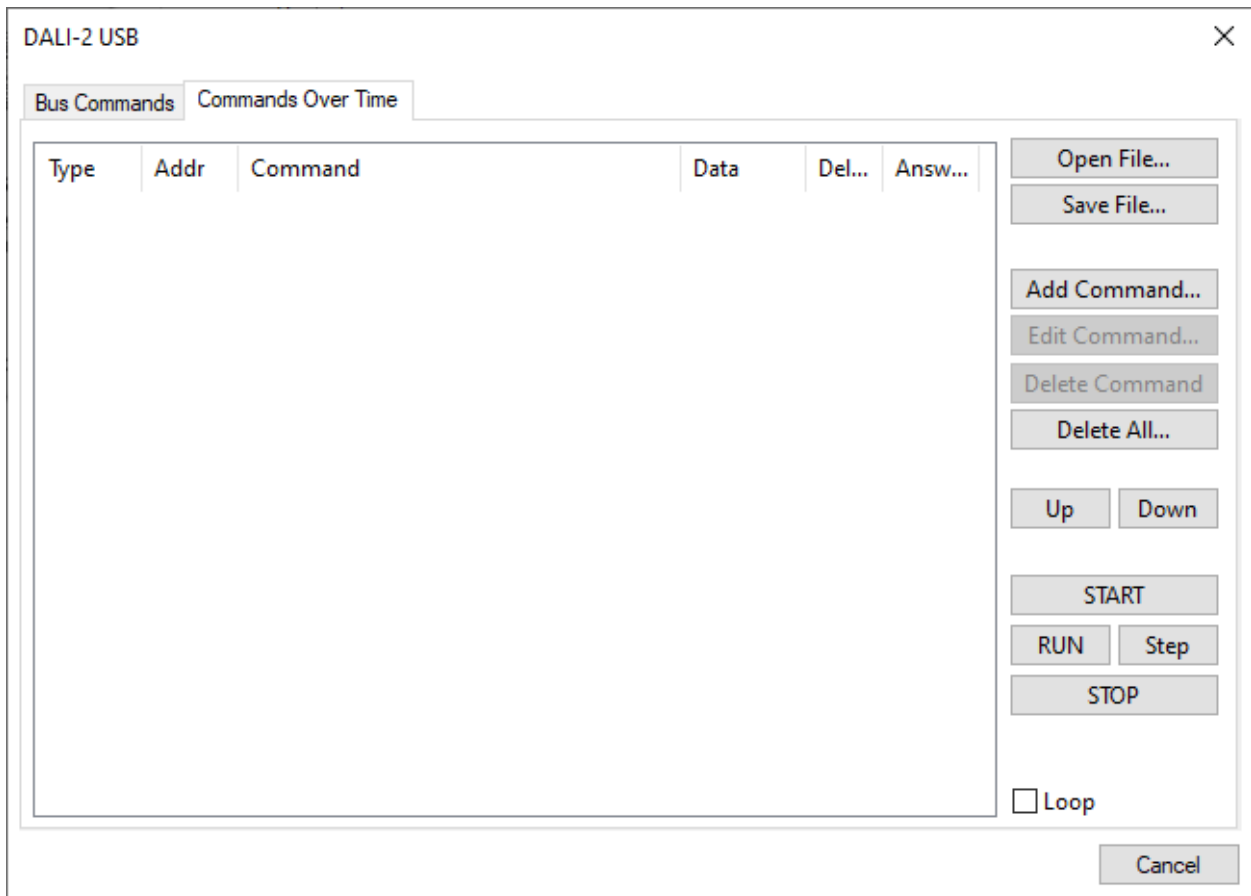8. To send a string of data/commands, select "Commands over Time"

Figure 7

9. Please click "Add Command" on the right side of the selection buttons

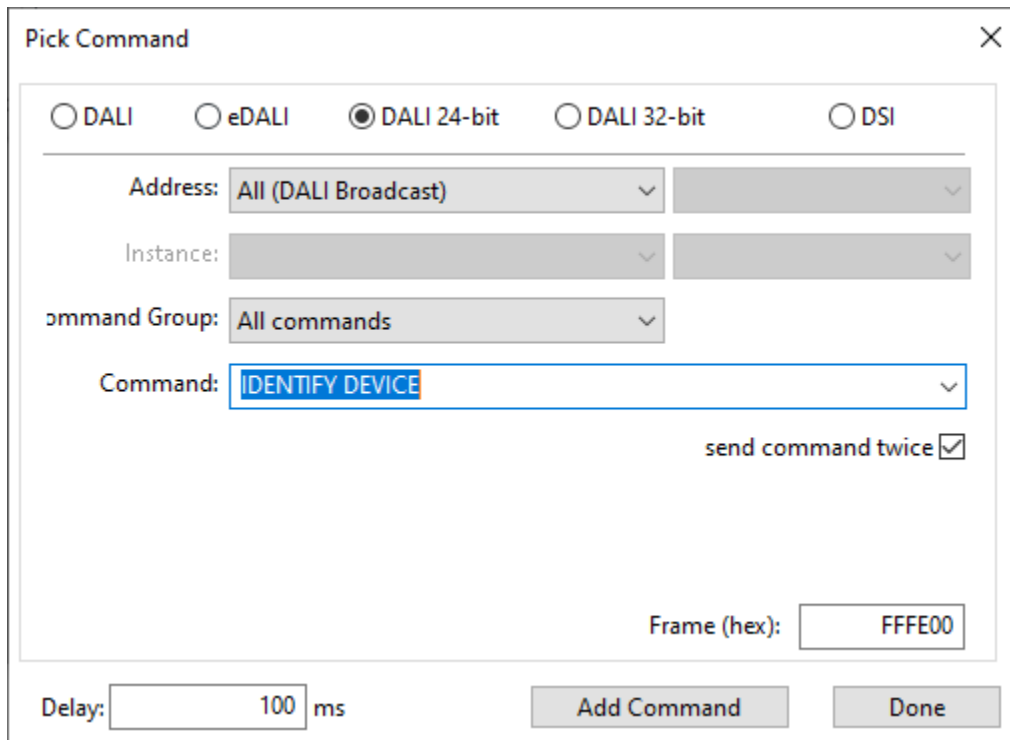10. New screens opens where DALI 24-bit should be selected.

Figure 8

11. In this window, a string of commands can be added to configure the LUMAWISE Motion Programmable
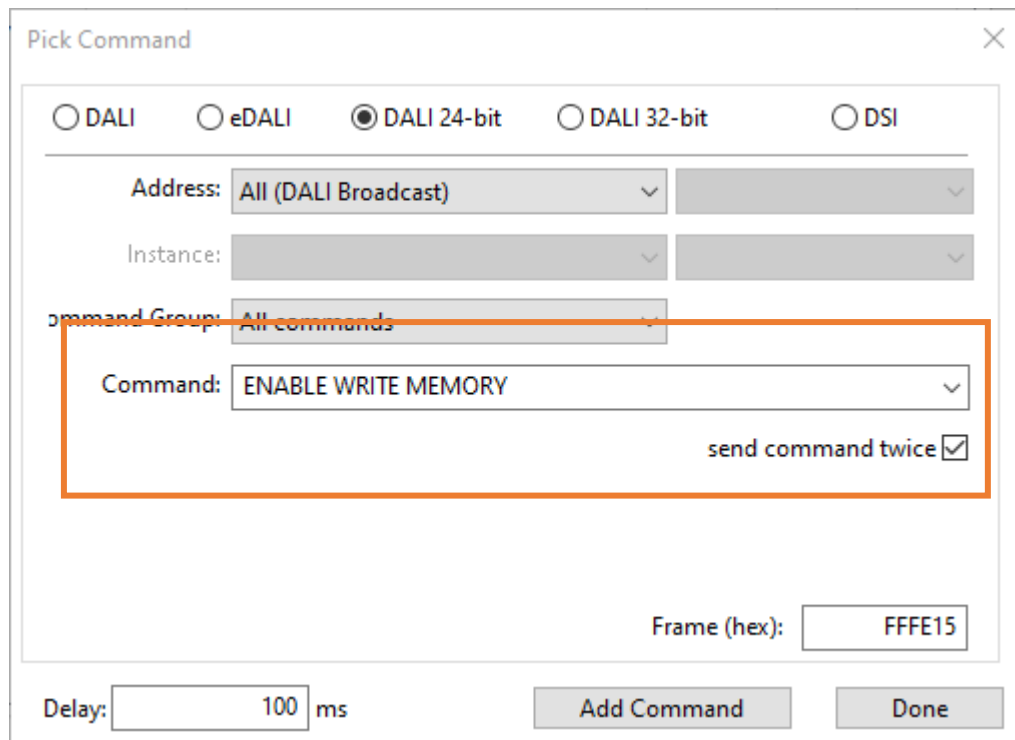
12. Commands can be selected via the Command Selection Drop-down menu

13. As described in paragraph 5.2, the memory bank location must be enabled for write actions

14. If all the addresses on the bus should be programmed, no change in 'Address' is needed and can stay at 'All DALI Broadcast'. This can be an option if multiple LUMAWISE Motion Programmable products are connected to the same DALI-2 bus.

5.2 Enable the memory bank to be written

1. The first command is "ENABLE WRITE MEMORY". This can be found in the drop-down menu, by typing 'Enable..' or by typing hex data FFFE15.

2. The box for "send command twice" should be checked.
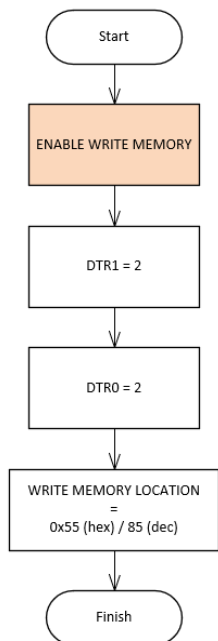
Figure 9

3. This command must be added by clicking "Add Command". It is now visible in the "Commands over Time" list. "Enable Write Memory" will now be shown twice in the "Commands over Time" window.
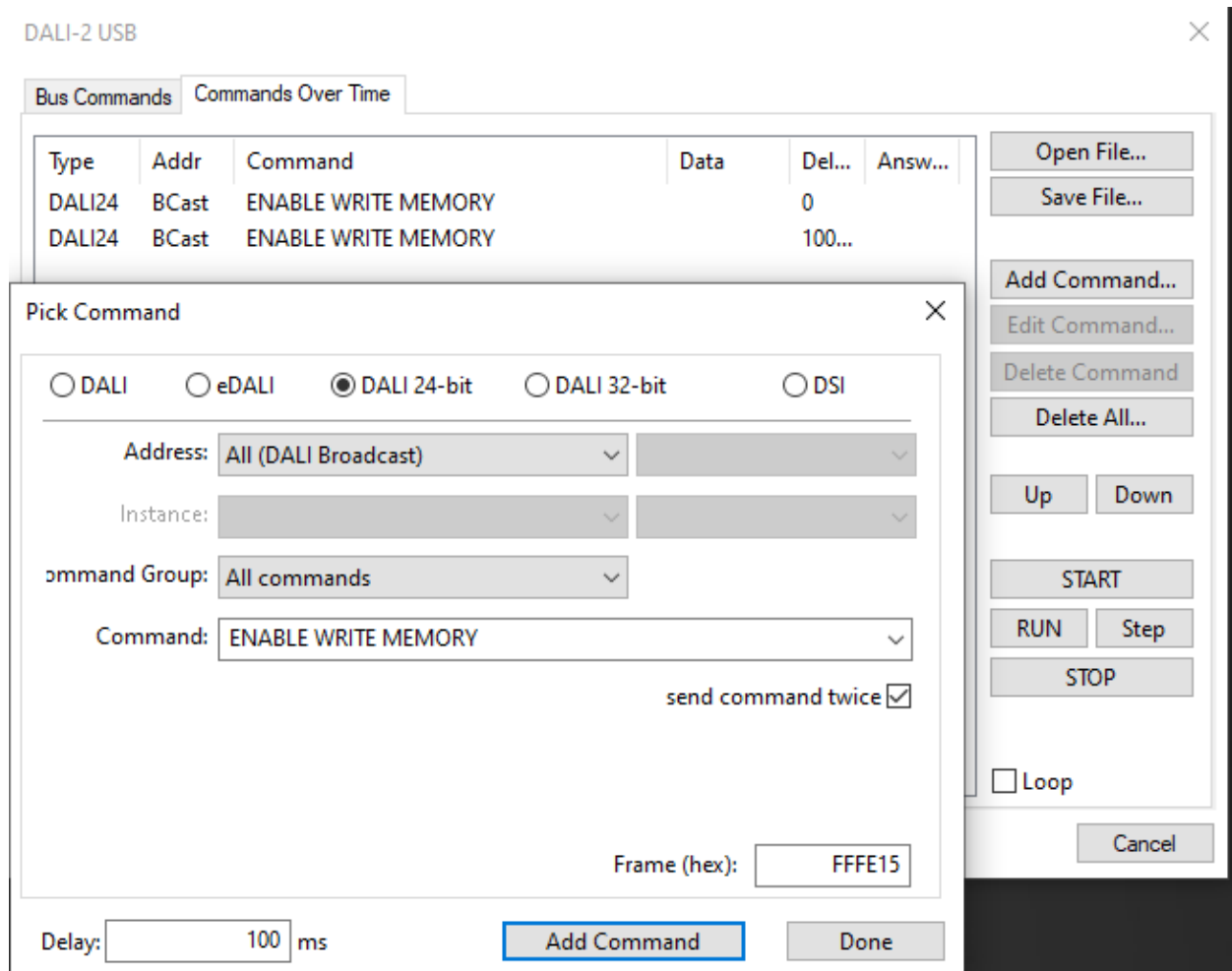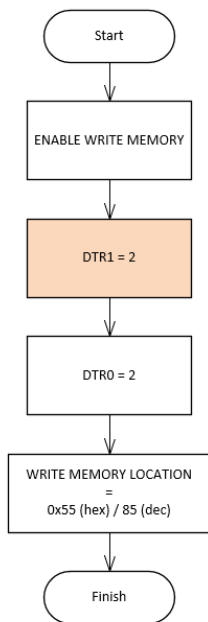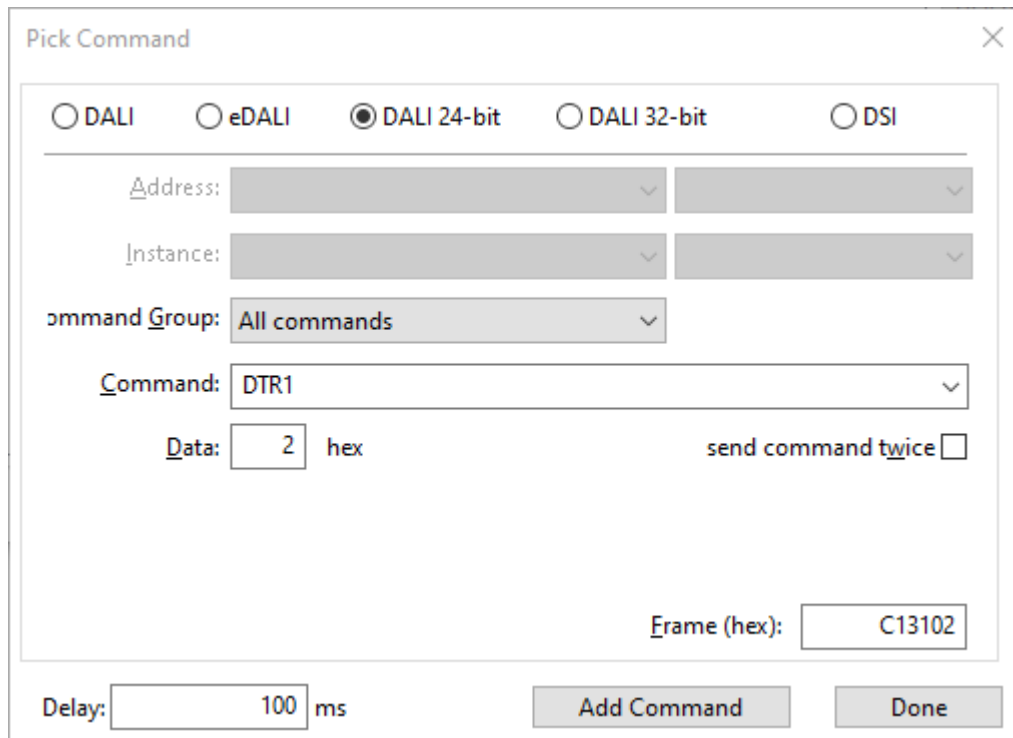

Figure 10

4. Next step is setting the right memory bank for disabling the Lock Byte. In this situation it is memory bank 2, which can be set via command DTR1. Select the command DTR1 and enter 2 in the Data field. This command must also be added to the commands list via 'Add Command'. It does not need to be added twice.
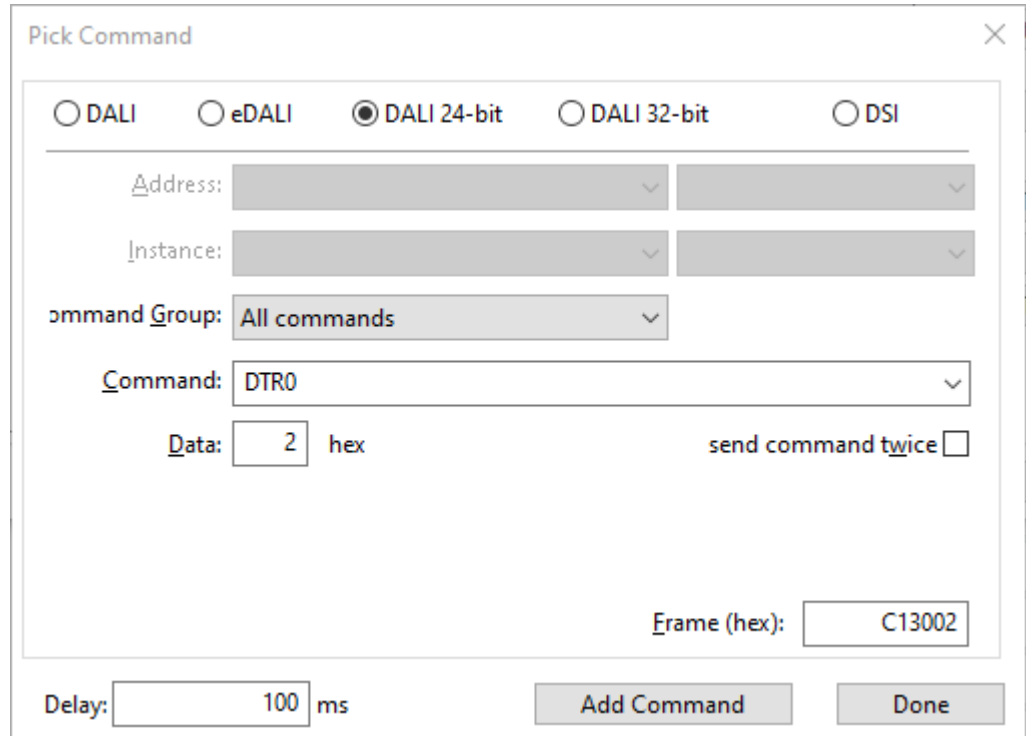
Figure 11

5. After the bank is set to Memory Bank 2, the location in this bank should be set at data location 2. This is the address location for the Lock Byte. This can be done by selecting the command DTR0 and entering 2 in the Data field.

6. This command must also be added to the commands list via 'Add Command'.
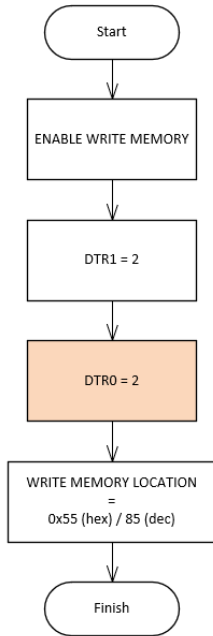
Figure 12

7. Now Memory Bank is set to '2' via DTR1 and memory location is set at '2' via DTR0. With these registers pointing toward the Lock Byte, the command Write Memory Location can be used to set the value.

8. Send a command WRITE MEMORY LOCATION with data decimal '85' (hexadecimal 0x55) to enable the memory bank for write access.

Figure 13

---
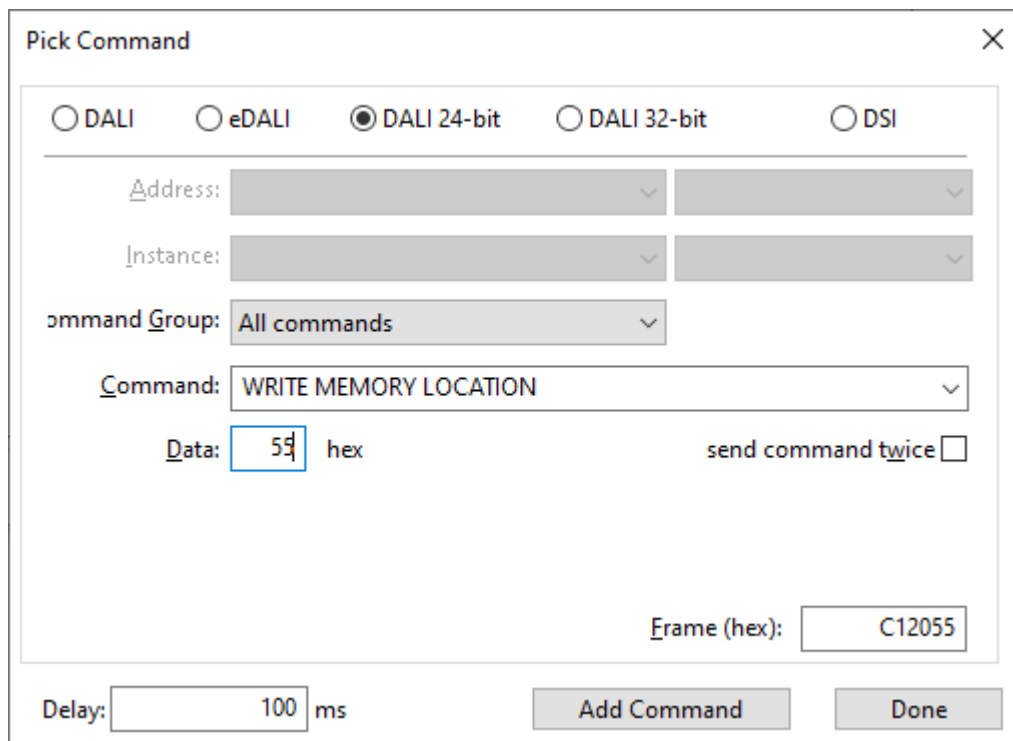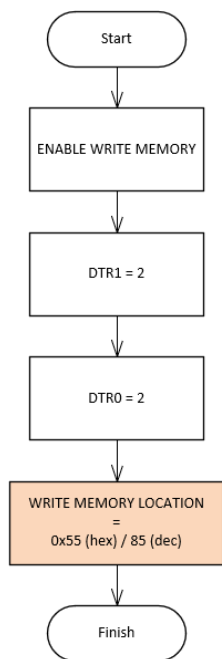
i	NOTE
	To switch between DECIMAL and HEX data format entry, click the "hex" text to the right of the Data entry box.

9. After adding these commands, click the "Done" button on the Pick Command window. The 'Commands over Time' window should show the following.

Figure 14

10. By running START the commands will be executed and the memory bank is enabled for write access. After running, the WRITE MEMORY LOCATION command should show "85" in the Answer column, indicating the desired value (0d85 or 0x55) has been stored.

This file can be saved to easily recover next time by 'Save File'.

5.3 Summary for Enable Write Memory

For writing data to the DALI Memory Bank, the memory bank writing must be enabled first using the process described in Section 5.2. After writing has been enabled, specific parameters in Memory Bank 2 may be overwritten / changed using the command WRITE MEMORY LOCATION (DTR1, DTR0, data).

Table 1 provides a description of the parameters and acceptable value ranges.

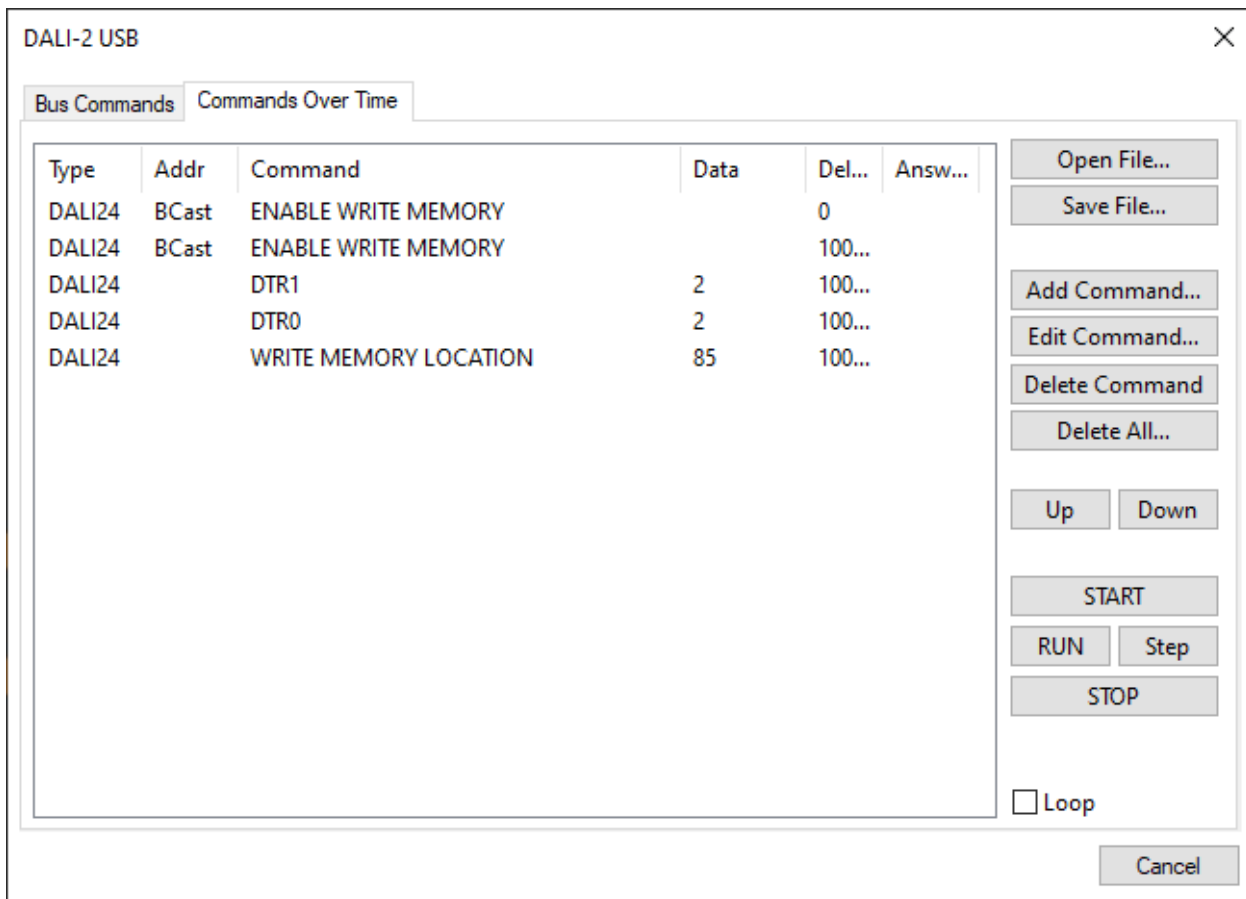| ENABLE WRITE MEMORY		
Command	**Hex**	**Description**
ENABLE WRITE MEMORY	0xFF FE 15	Send twice with a delay of 100ms
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 55	Data hex 0x55 (decimal 85) enables writing to memory bank
Returns **data** as answer		
WRITE COMMAND		
Command	**Hex**	**Description**
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 {##}	Memory Bank Location
WRITE MEMORY LOCATION	0xC1 20 {##}	Data hex 0x##
Returns **data** as answer		

Table 2 – Write Enable and Value Change Summary

An example of changing a parameter value can be found in Section 5.4 below.

5.4 Example Write Command – Set the Light Output % - High Level to 80%

When the memory bank is enabled for writing by following paragraph 5.2, all write actions can be done for configuring settings via the memory banks. Table 1 lists all the addresses and possibilities to configure in the memory bank locations.

In this example, the light output level for "High mode" shall be changed from default 100% to 80%

Use the "Commands Over Time" tab and "Add Command" window as before.

11. After enabling writing to the memory bank (Section 5.2), ensure DTR1 is still pointing toward Memory Bank 2. This is accomplished using the command DTR1. This command must also be added to the commands list via 'Add Command'.
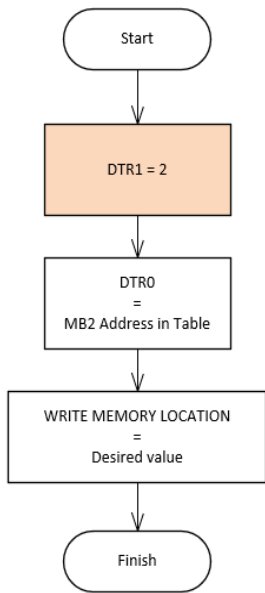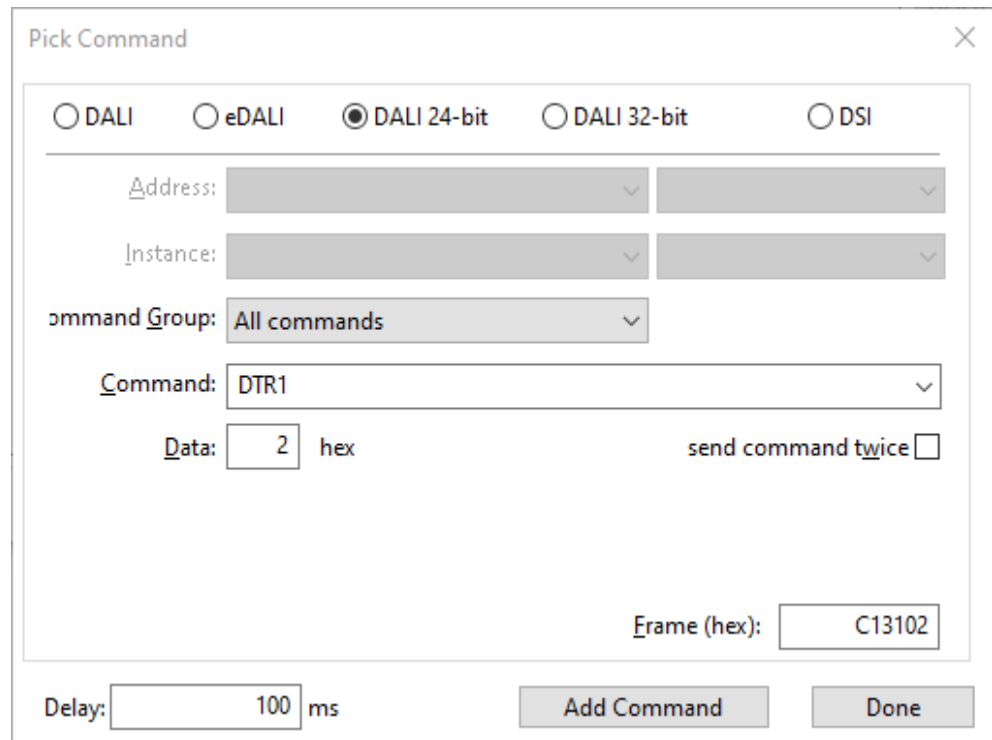
Figure 15

12. After the bank is set to Memory Bank 2, the location in this bank should be set at data location 0x15, which is the location corresponding to "Light Output % High Level" (see Table 1). This can be done by setting DTR0 to 0x15 which is decimal '21'.
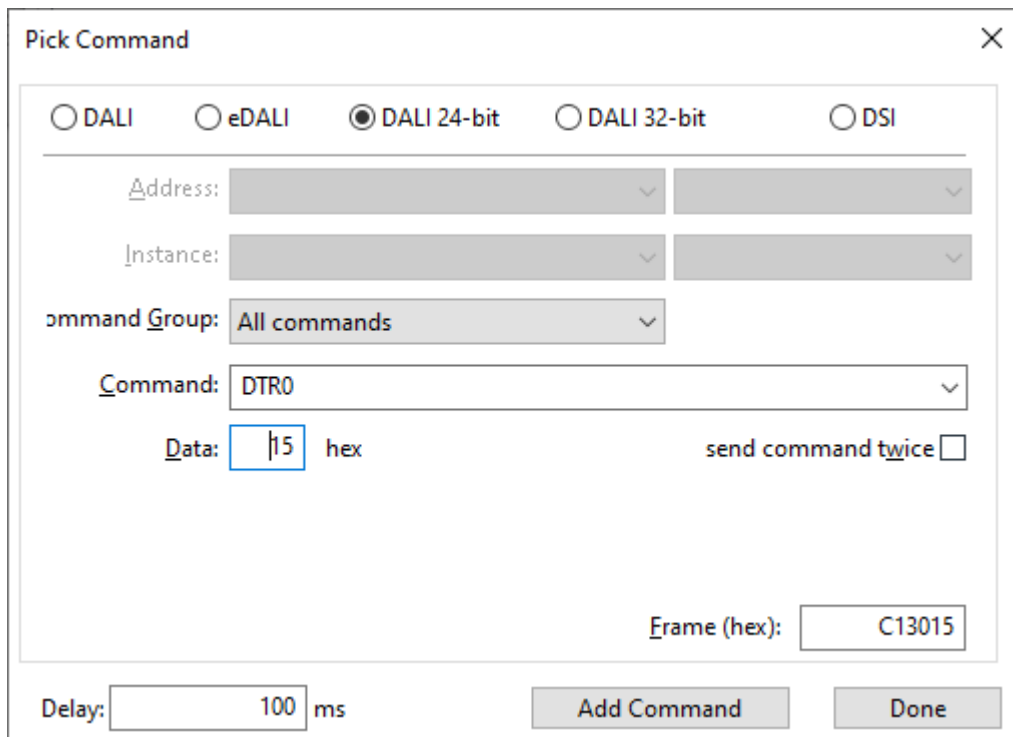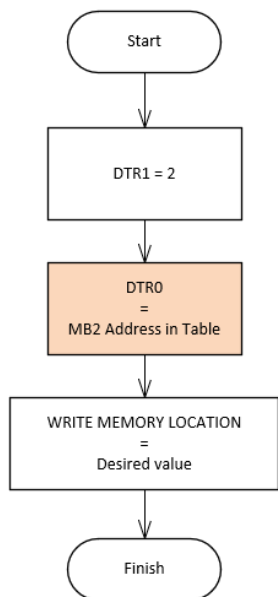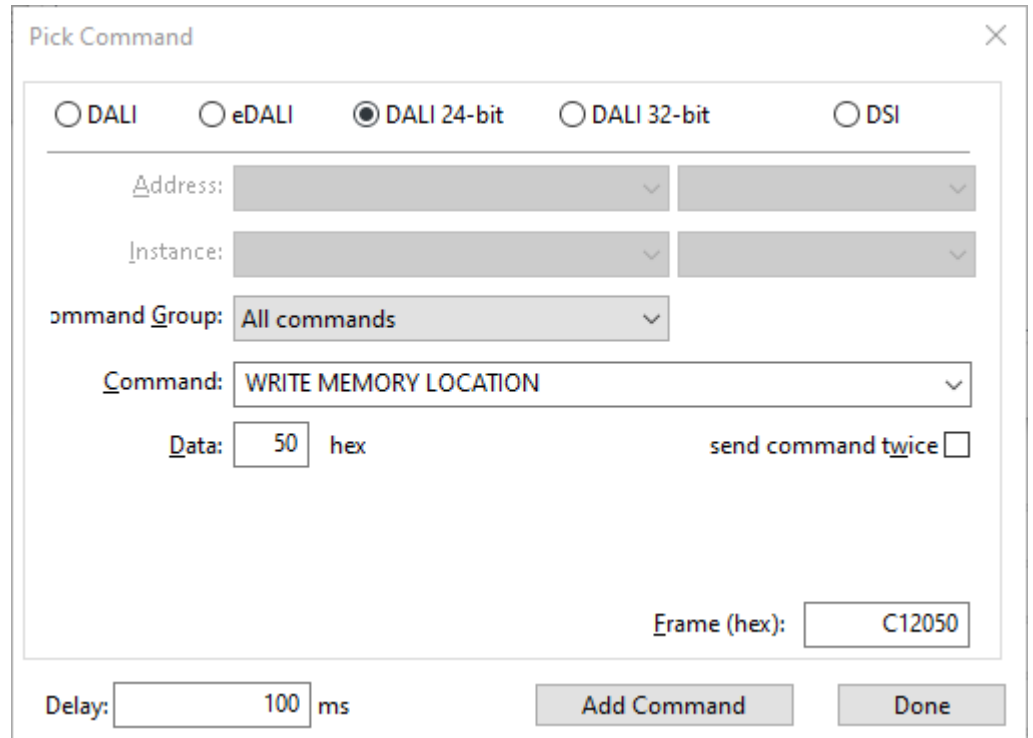
Figure 16

3. This command must also be added to the commands list via 'Add Command'.

4. So, Memory Bank is set to '2' via DTR1 and memory location is set at 0x15 via DTR0. Now the data can be written to the target Memory Location.

13. Send a command WRITE MEMORY LOCATION with data decimal '80' (hexadecimal 0x50) to set the Highest Light Level at 80%
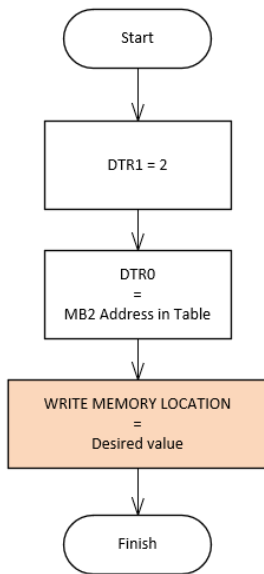
Figure 17

14. This command must also be added to the commands list via 'Add Command'. Click the "Done" button to close the Pick Command window.

15. By running START, the commands will be executed and the memory bank is enabled for write access including a change in High Light Level to 80%. This file can be saved to easily recover next time by 'Save File'. When the .cot file is lengthy, START runs from the top to the bottom through the script, while RUN starts from the command which is selected.
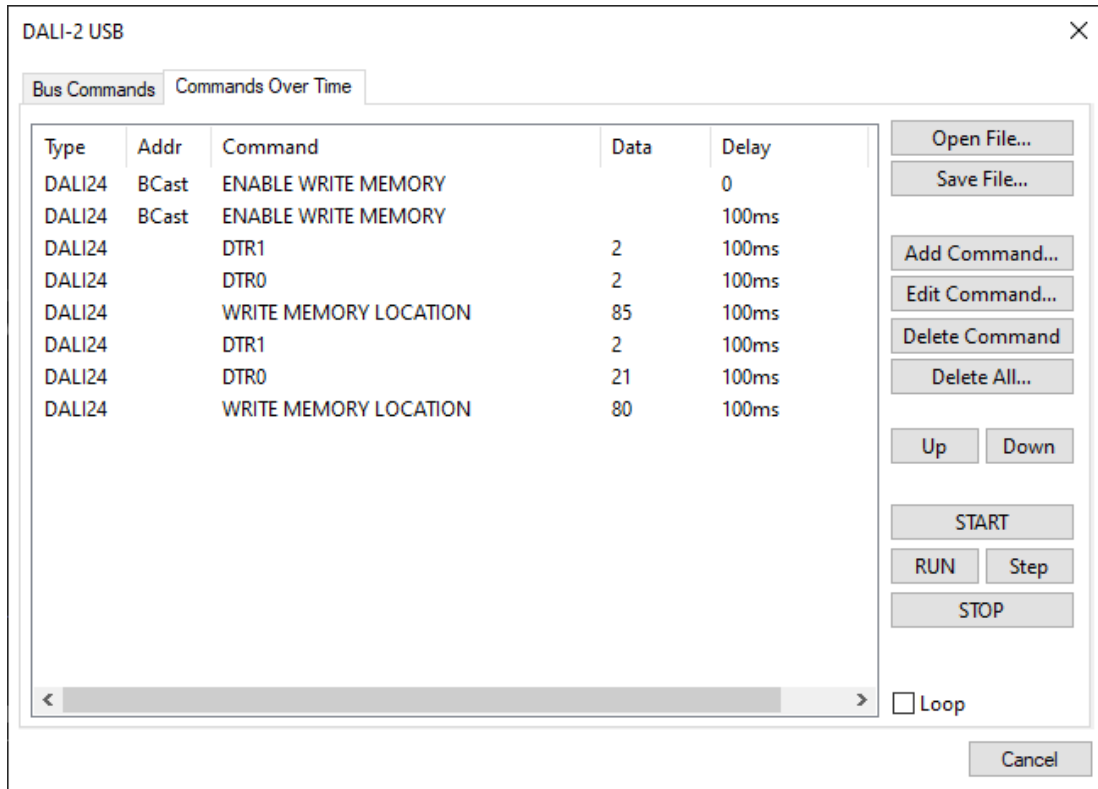
Figure 18

16. After running START, the results of programming are visible in the 'Answer' column as can be seen in the figure below.

DALI-2 USB						
Bus Commands	Commands Over Time					
Type	Addr	Command	Data	Del...	Answ...	
DALI24	BCast	ENABLE WRITE MEMORY		0		
DALI24	BCast	ENABLE WRITE MEMORY		100...		
DALI24		DTR1	2	100...		
DALI24		DTR0	2	100...		
DALI24		WRITE MEMORY LOCATION	85	100...	85	
DALI24		DTR1	2	100...		
DALI24		DTR0	21	100...		
DALI24		WRITE MEMORY LOCATION	80	100...	80	

Open File...
Save File...
Add Command...
Edit Command...
Delete Command
Delete All...
Up   Down
START
RUN   Step
STOP
☐ Loop
Cancel

Figure 19

5.5 Summary of Writing Two Parameters

For example, the following commands needed for a system where the LUMAWISE Motion Programmable acts as a standalone Type B device by having the luminaire on a maximum output level of 80% and an ON Time of 10 minutes.

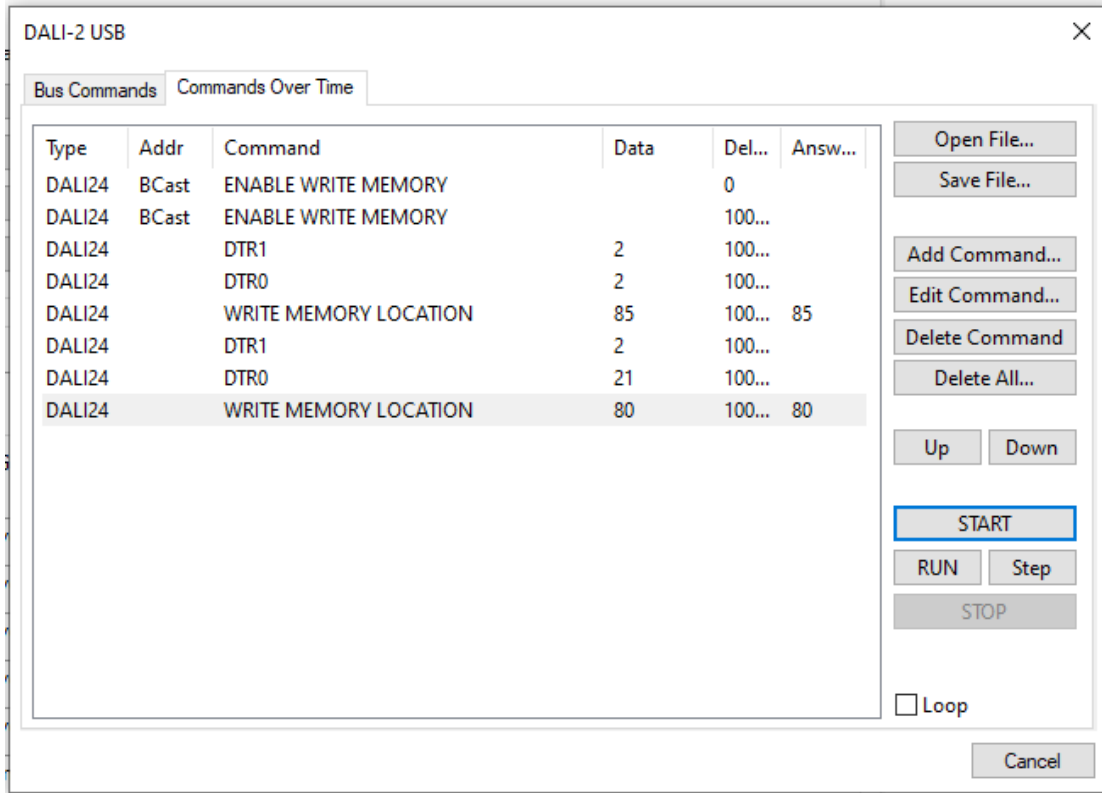| ENABLE WRITE MEMORY		
Command	**Hex**	**Description**
ENABLE WRITE MEMORY	0xFF FE 15	Send twice with delay 100ms
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 55	Data hex 0x55 (decimal 85) enables writing to memory bank location
Returns **0x55 (dec 85)** as answer		
WRITE COMMAND Light Level High to 80%		
Command	**Hex**	**Description**
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 15	Memory Bank Location 0x15
WRITE MEMORY LOCATION	0xC1 20 50	Data hex 0x50
Returns **0x50 (dec 80)** as answer		
WRITE COMMAND Turn ON Level to 10 minutes (600 seconds)		
Command	**Hex**	**Description**
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 17	Memory Bank Location 0x17
WRITE MEMORY LOCATION	0xC1 20 78	Data hex 0x78
Returns **0x78 (dec 120)** as answer		

i	*NOTE*
	Lamp ON level command is available from 60 seconds to 1275 seconds (~21 minutes) in steps of 5 seconds

5.6 Default Operation – Memory Bank Reset

The LUMAWISE Motion Programmable can be used with default parameters by resetting the DALI Memory Bank 2. The command RESET MEMORY BANK (DTR0) must be transmitted. Before resetting the memory bank, it must be ensured that the ENABLE WRITE MEMORY is still valid.

ENABLE WRITE MEMORY		
Command	**Hex**	**Description**
ENABLE WRITE MEMORY	0xFF FE 15	Send twice with delay 100ms
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 55	Data hex 0x55 (decimal 85) enables writing to memory bank location
Returns **0x55 (dec 85)** as answer		
RESET MEMORY BANK (DTR0)		
Command	**Hex**	**Description**
DTR0	0xC1 30 02	DALI Memory Bank 2
RESET MEMORY BANK (DTR0)	0xFF FE 11	Send twice with delay 100ms

After resetting the memory bank, the Memory Bank 2 should be disabled for writing again. The write operation can be disabled by resetting the lock byte back to 0xFF. Example placed below.

DISABLE WRITE MEMORY		
Command	**Hex**	**Description**
ENABLE WRITE MEMORY	0xFF FE 15	Send twice with delay of 100ms
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 FF	Data hex 0xFF (decimal 255) enables writing to memory bank location
Returns **data** as answer		

Now Memory Bank 2 is locked and parameters cannot be overwritten. You can test this by attempting to write to a Memory Bank 2 location; there will be no reply Data, meaning the new data has not been stored.

6 GENERIC DALI COMMANDS

The configuration procedure described in the previous chapters, is LUMAWISE Motion Programmable specific. The DALI-2 standard for application controllers (IEC 62386-103) and DALI-2 Motion Sensors (IEC 62386-303) contains multiple default configuration commands. A variety of important commands can be found below including their function.

6.1 Hold Timer

When the LUMAWISE Motion Programmable is used as a standalone Type B Application Controller, the product can be configured using the commands of the previous chapter. If the LUMAWISE Motion Programmable is used in combination with a Type A device, the product reports Event Messages on the bus. The Event Messages are reported using the movement based sensor description from DALI-2 standard IEC 62386-303. To control the Event Messages, the Hold Timer can be queried, set or canceled.

The Hold Timer is used for movement based sensors to derive occupancy. The default value of the Hold Timer is 15 minutes. After the occupancy state is read, the Hold Timer can be canceled by the host controller using the command 'CANCEL HOLD TIMER'. The Hold Timer can be set at a minimum of 10 seconds. After cancellation or expiring of the Hold Timer, the occupancy state returns Vacant again, thus showing Event Messages on the DALI-2 bus.

SET HOLD TIMER		
Command	**Hex**	**Description**
DTR0	0xC1 30 ##	**Data** to be inserted at ##
SET HOLD TIMER	0xFF 00 21	Send twice with delay 100ms
QUERY HOLD TIMER		
Command	**Hex**	**Description**
QUERY HOLD TIMER	0xFF 00 2D	Query Hold Timer
Returns **data** as answer		
CANCEL HOLD TIMER		
Command	**Hex**	**Description**
CANCEL HOLD TIMER	0xFF 00 24	Cancel Hold Timer

Please see IEC 62386-303 Chapter 9.5.4 for Hold Timer requirements. The Hold Timer minimum value is 1s, includes increments of 10s, and has a maximum of 42.3 minutes. The default value is 15 minutes (90dec).

7 CONVERTING HEXADECIMAL TO DECIMAL

The default values in hexadecimal and decimal can be found in Table 1 - Memory Bank 2 contents. The Lunatone DALI Cockpit has a default hexadecimal input tab. While clicking on the word 'hex', the content switches to decimal. See below picture.
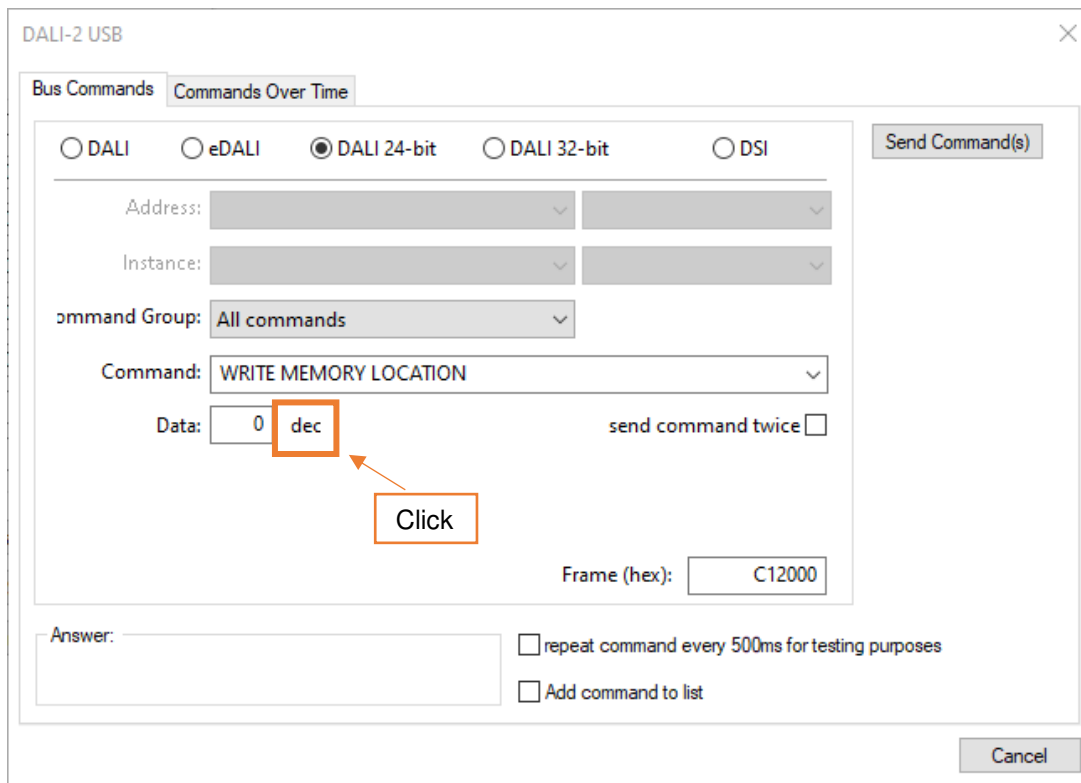
Figure 20

For converting between hexadecimal and decimal, the windows calculator can be used in 'Programmer' mode.
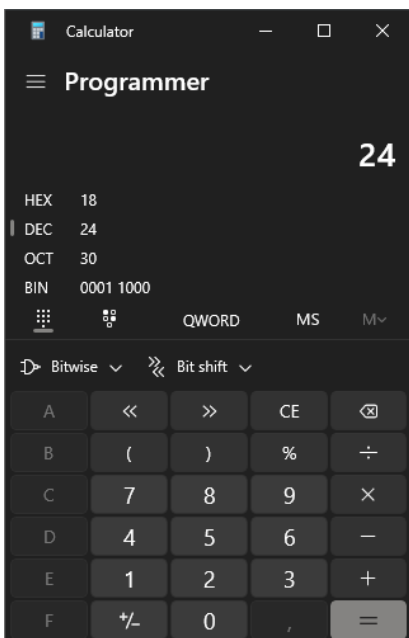
Figure 21

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7.1 Lamp On Time

As described in Table 1 - Memory Bank 2 contents, the Lamp On Time has a 5 seconds increment per 0x01 value. Therefore, the lamp on time must be converted from seconds to decimal/hexadecimal values.

The formula to get the decimal value is:

$$Tdec = \frac{Tmin \times 60}{5}$$

Time in Seconds (T_{sec})	Time in Minutes (T_{min})	Value (hexadecimal) (T_{hex})	Value (decimal) (T_{dec})
60	1	0x0C	12dec
120	2	0x18	24dec
300	5	0x3C	60dec
600	10	0x78	120dec
900	15	0xB4	180dec
1200	20	0xF0	240dec

Table 3

Rev 2

8 REVISION HISTORY

Rev.	Revision Record	Author	Review	Date
1.0	Initial document	M. Keser	S. Teley, A. King	21 November 2023
2.0	Added hex-dec conversions and Lamp On Time Examples	M. Keser	S. Teley	01 February 2024