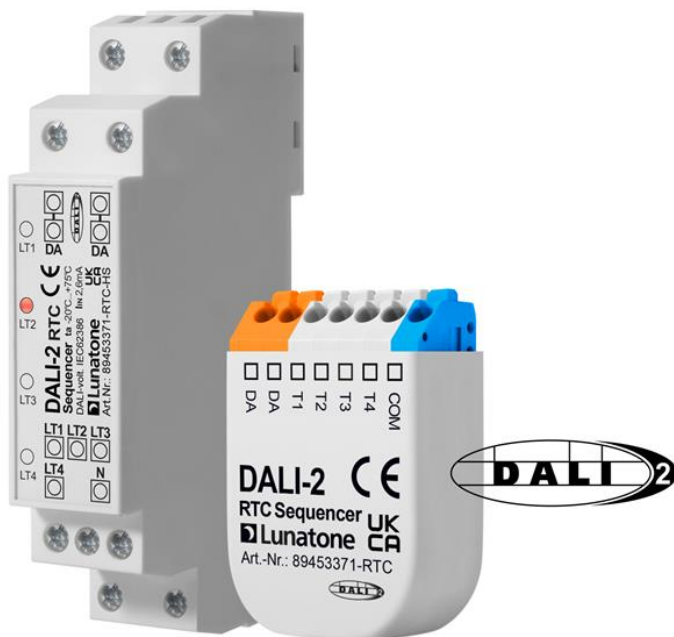# Lunatone

DALI-2 RTC Sequencer

Datasheet

Control Device

DALI Real Time Clock
with Scheduler

Art. Nr. 89453371-RTC
Art.Nr. 89453371-RTC-HS

DALI-2 RTC Sequencer Control Device

Overview

- Control device for automatically running DALI command sequences

- DALI Real Time Clock

- Time can be set and queried via DALI instance (type 0 generic – real time clock)

- Scheduler Function with up to 32 schedule entries.

- Entries can be defined wit DALI Macros / Sequences (multiple DALI commands in a row), in total over all macros up to 200 DALI commands.

- An entry can contain up to 200 DALI commands (single entry then reaches max. overall commands).

- Astro-clock function

- For each scheduler job: weekday, day of month, months, time stamp and DALI commands can be defined

- periodic repetitions can be easily realized by entering multiple time stamps

- Supports sending of DALI control commands as well as multiple command sequences (macros) – thereby including DT8 and Tc control and configuration-commands (twice).

- Allows simple enabling and disabling scheduler entries via DALI scene commands or device switching inputs.

- The DIN-rail version has 4 switching inputs for mains voltage to start/stop the sequences or timer entries and LED to display running sequences / active entries.

- The version for installation-boxes has 4 potential-free inputs for starting/stopping the sequences or timer entries

- Daylight saving mode

- Easy schedule configuration via DALI-Cockpit Software tool and suitable DALI PC interface

- No additional power supply needed, the DALI RTC Sequencer module is supplied directly via the DALI line

- Time and date settings are retained for approximately 3 days once fully charged.

- Types for backbox installation and DIN rail mounting, suitable for installation in protection class II devices

- Multi-master capable: Several modules can be installed within a DALI circuit.

Specification, Characteristics

type	DALI-2 RTC Sequencer	
article number	86457142-RTC	86457142-RTC-HS

DALI-Interface, supply: DA, DA

input type	DALI
marking terminals	DA, DA
input voltage range	9,5Vdc … 22,5Vdc (acc. to IEC62386)
typ. current consumption DALI	4mA
max. current consumption DALI	6mA
number of DALI addresses	none
DALI-2 addresses	1

inputs

input type	Potential free switching input	Switching input for mains voltage
number of inputs	4	4
marking input terminals	T1, T2, T3, T4, COM	LT1, LT2, LT3, LT4, N
input voltage range	sole connection with COM	230Vac
tolerance of input voltage	sole connection with COM	+10%/-15%
frequency of a.c. voltage	sole connection with COM	50Hz … 60Hz
control impulse length min.	40ms	40ms
input resistance	sole connection with COM	660kΩ
max voltage between inputs	sole connection with COM	230V ac
galvanic isolation	no	Yes (switching inputs/ DALI)
wire length max.	5m (depending on interference of environment)	10m (up to 50m in an interference-free environment i.e. no parallel power lines)

insulation data

impulse voltage category	II
pollution degree	2
rated insulation voltage	250V
insulation DALI / housing	reinforced isolation
Insulation test voltage DALI / housing	3000Vac

environmental conditions

storing and transportation temperature	-20°C … +75°C
operational ambient temperature	-20°C … +60°C
rel. humidity, none condensing	15% … 90%

general data

dimensions (l x w x h)	40mm x 28mm x 14mm dimensions page 4	98mm x 18mm x 56mm dimensions page 5
mounting	back box integration in class II devices	DIN rail mounting integration in class II devices
rated max. temperature tc	75°C	
protection class	II in intended use	
protection degree housing	IP40	
protection degree terminals	IP20	
real time clock (accuracy)	quartz based (~20ppm)	

terminals

connection type	spring terminal connector	screw connector
wire size solid core	0,5 … 1,5 mm² (AWG20 … AWG16)	0,5 … 2,5 mm² (AWG20 … AWG14)
wire size fine wired	0,5 … 1,5 mm² (AWG20 …AWG16)	0,5 … 2,5 mm² (AWG20 …AWG14)
wire size using wire end ferrule	0,25 … 1 mm²	0,25 … 1,5 mm²
stripping length	8,5 … 9,5 mm / 0,33 … 0,37 inch	7 mm / 0,27 inch
locking torque	-	0,5Nm
release of wire	push button	open screw

standards:

DALI	IEC62386-101:2014 IEC62386-103:2014
EMC	EN 61547 EN 50015 / IEC CISPR15
safety	EN 61347-2-11 EN 61347-1
markings	DALI-2, CE, UKCA
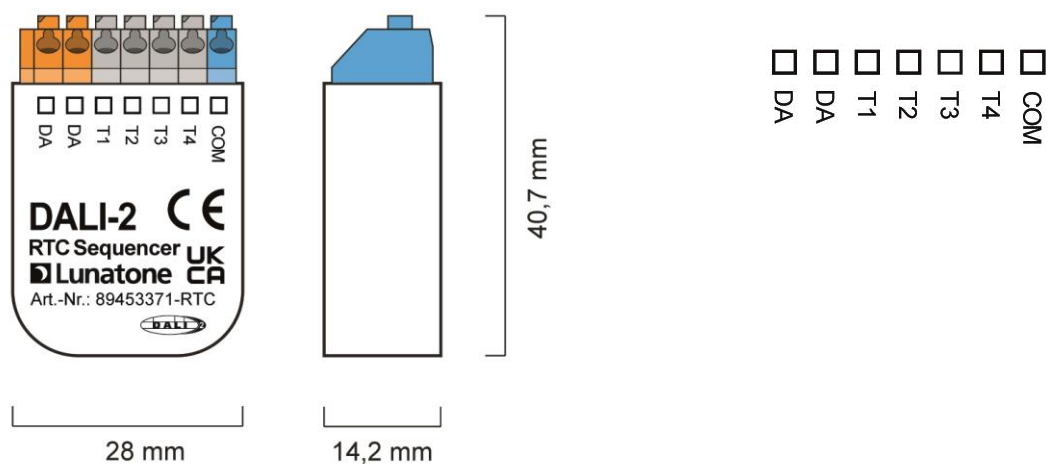
Dimensions, installation-box version

connection plan, installation-box version
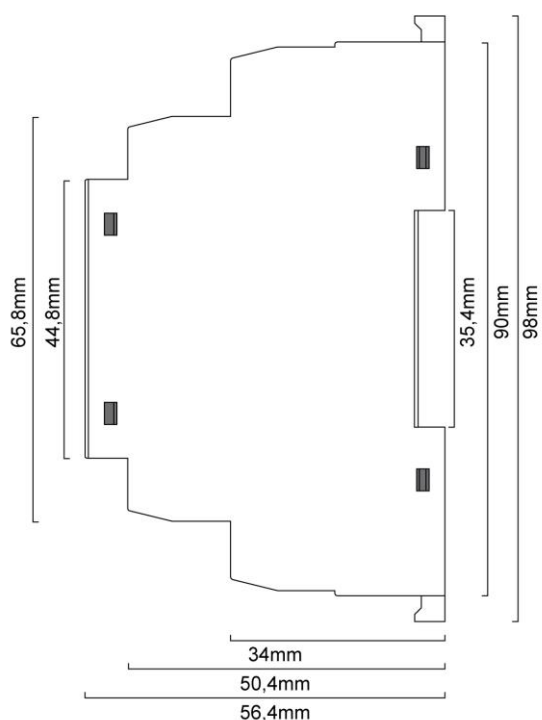
dimension, DIN rail version
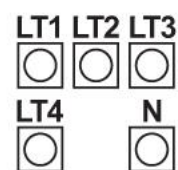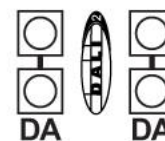
connection plan, DIN rail version

Factory Default Settings

A basic configuration is already implemented on delivery (factory default setting), this can be changed and adapted.

application controller	active
Instance – event message	inactive
Scheduler entries	4 example sequences (see below)
device switching inputs	Start of sequences (see below)

Entry	Nr. 1	Nr. 2	Nr. 3	Nr. 4
Effective range	Broadcast			
Power up behaviour	none			
Start with scene commands	Scene 0	Scene 1	Scene 2	Scene 3
Start with switching input	LT1	LT2	LT3	LT4
DALI command	M3 dynamic scene			
Dynamic scenes used	Scene 0-15			
Delay between scenes	1 second	2 seconds	4 seconds	8 seconds
Fade time	1 second	2 seconds	4 seconds	8seconds

Application Example
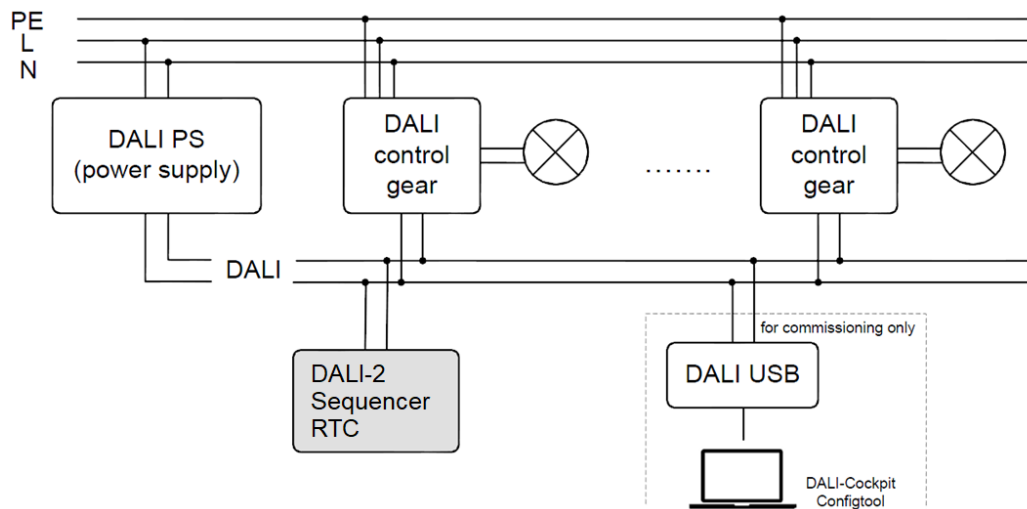
Figure 1 Typical Application

Installation

- The DALI-2 RTC Sequencer is intended for back box installation or integration in protection class II devices.

- The DALI-2 RTC Sequencer HS is suited for DIN rail mounting, protection against electric shock has to be ensured by an appropriate enclosure. 4 LEDs show if selected entries are active.

- The device is directly connected and supplied by the DALI bus. A DALI bus power supply (e.g. DALI PS) is required, an additional power supply is not necessary.

- The connection to the DALI terminals can be made regardless of polarity. The bus input is protected against overvoltage (mains voltage).

- The wiring should be carried out as a permanent installation in a dry and clean environment.

- Installation may only be carried out in a voltage-free state of the system and by qualified specialists.

- National regulations for setting up electrical systems must be followed.

- The DALI wiring can be realised with standard low-voltage installation material. No special cables are required.

- Wiring topology of the DALI-line: Line, Tree, Star

- Only 1 wire may be connected to each terminal. When using double wire end ferrules, the connection capacity of the terminal must be considered.

- DALI-2 RTC Sequencer HS behaviour of the LEDs on the device

- **LED1**: flashes on identify (localize) **LED2**: flashes while one or more entries with a sequence (M3, M5) are running **LED3**: flashes when the timer entry of one or more entries is activated **LED4**: flashes when the "presence simulation" is active for one or more entries

Attention: The DALI-signal is not classified as SELV circuit (Safety Extra Low Voltage). Therefore, the installation regulations for low voltage apply

The voltage drop on the DALI line must not exceed 2V at maximum length (300m) and maximum bus load (250mA).

Commissioning

- After installation the DALI RTC Sequencer is ready for use

- The configuration can be done with the help of the DALI Cockpit Software. The PC must be connected to the DALI bus via a suitable interface module (DALI-2 USB; DALI USB, DALI-2 WLAN, DALI-2 Display, DALI-2 IoT, DALI 4Net, DALI SCI RS232).

- The DALI-2 RTC Sequencer is automatically recognised by the DALI Cockpit during the addressing process and listed in the device overview.

- The addressing is done according to the DALI-2 specification and the device receives a corresponding address.

- Selecting the device in the list, opens the device page where date and time can be set, and the scheduler entries can be configured, see section "Functionality" below.

- For localisation of the device the installation box variant includes a buzzer, the DIN rail version LEDs, which can be activated with the button "Localize" in the DALI Cockpit. Alternatively, the allocation can be done via the serial number of the device (comparison DALI Cockpit device info and sticker on the device).
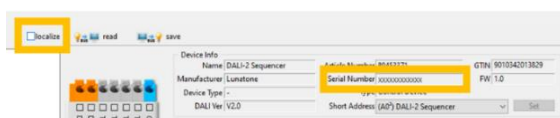
Functionality

The DALI RTC Sequencer sends out DALI commands to the DALI-line based on the entries defined in the scheduler.

The command sent can be a DALI command or a sequence of DALI commands (macro). The schedules can be defined as active for different months, weekdays or days of the month.

Alternatively, it is also possible to define Commands and Sequences without a time stamp and start the entry via a scene command or the device's switching input.
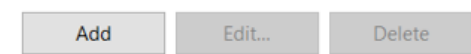
The following settings are made via the DALI Cockpit, see also Figure 2 on page 8 for configuration.

General time settings

The current time and date can be set, as well as the time zone and the automatic daylight saving.
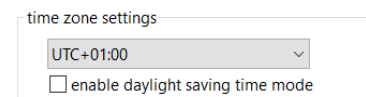
Create and edit entries

Via "Add" new entries can be created.

Figure 2 DALI Cockpit application settings – creating a schedule

Scheduler entries overview

In the scheduler up to 32 scheduler jobs can be defined. Each entry consists of:

- **effective range**: the destination address: Broadcast, DALI group or DALI address
- **DALI command:** selection of a DALI command or command sequence
- **External Control**: selection of a scene and control address, and/or switching input via which the entry can be activated and/or deactivated. As well as the option of a scene via which the time-switching of the entry can be activated/deactivated
- **Timer Function**
  - **Status**: active/inactive
  - **active months**
  - **active days of the month**
  - **active days of the week**
  - **time:** as absolute time input or as astroclock (see section "Timer Function - Time", page 11)

Effective Range

The effective range of a command can be selected as Broadcast (All), DALI group, or DALI address.

Commands

In addition to the standard DALI commands (light level (DAP), OFF, MIN, MAX; LAST ACTIVE, SCENES, …), following DALI command sequences are also available: sequential scenes, dynamic scenes and macros (see also Figure 3). The number of entries with macros is not limited, but a maximum of 200 commands are possible in total for all macros' DALI commands, after which no further entries with macros can be created. Entries with standard DALI commands are still possible (limit: 32 entries).
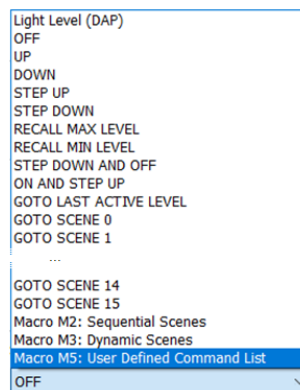

Figure 3 available commands

Macro M2 – Sequential Scenes: with each occurrence of the scheduled entry the next scene in the list is recalled. The scene numbers in the sequential scene list can be customized. The selection "common scene list" allows the entries with M2 and this selection to continue switching the same scene list

Macro M3 – Dynamic Scenes: A dynamic sequence of up to 16 scenes can be defined. The fade time and the delay (0sec up to max. 3hours) between scenes are adjustable.

Example: to all devices (broadcast) after 1 second start delay got to Scene 5. Fade time 1 second, wait 2 seconds, go to scene 4 with fade time 2 seconds, wait 3 seconds and go to Scene 1 with fade time 0.7 seconds:
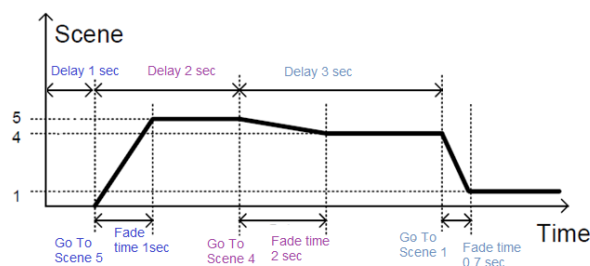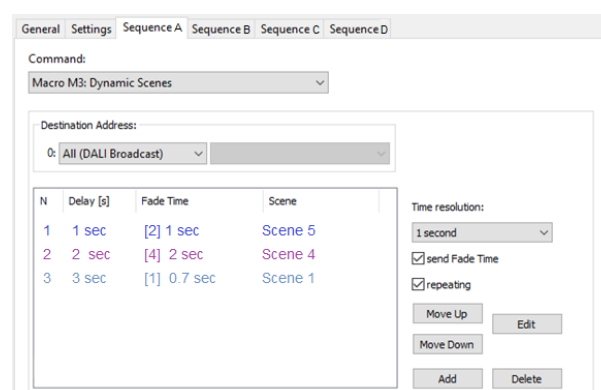
Macro M5- User defined Command List: A custom macro script with up to 200 commands can be executed. Thereby it is possible to send any command to any DALI address. Delays between commands can be set from 0 seconds to a maximum of 3 hours. With the option "loop" the sequence can be carried out in an eternal loop.

For Macro M5 the entry's global effective range is disabled and only the effective range(s) within the macro will be referenced.

An existing file with the extension *.cot can be imported with "Load...". A created command list can be exported with "Save..."

Example: scenes 0-2 sent to A0 and A1 with 1min delay between each command:

External Control

In section "External Control" different options are available to activate or deactivate actively running sequences (M3, M5) and/or the timer function of the entry.

The following options are available:

Switching inputs: For each entry, the DALI command of the entry can be executed via one or more switching inputs; a button press during a running DALI command (e.g. if it is a longer sequence (M3, M5)) will interrupt and stops the execution.

External control address: For each entry, a DALI control address can be specified, on which the DALI-2 sequencer listens and activates/deactivates entries depending on the following settings.

Manual start/stop of an entry:

Start: One or more scenes can be specified for each entry. The DALI command of the DALI-2 RTC sequencer entry is executed immediately by sending the respective scene command to the set control address.

Stop: If the DALI command is a longer sequence of commands (M3, M5), it can be stopped using one of the following DALI commands to the control address: OFF, RECALL MAX, RECALL MIN, any DAP (direct arc power = light level) command, as well as all GOTO SCENE commands that have not already been selected for starting under "Scene Selection".

Activate/deactivate timer function: Different scene commands can be selected for each entry; the scheduler entry is activated or deactivated using the respective scene command to the set control address.

Timer Function

The timer function of an entry can be set active or inactive on creation. If an entry's timer is deactivated, the command is only executed via external control such as button presses or scene calls. The timer can be activated or deactivated via DALI scene commands as described in section "External Control" above.

Timer Function - Date

In tab "Date Selection" it can be set at which months, days of the month and weekdays the scheduler entry will be executed. Any combinations can be entered.

For selection of active days of the month, the row defines the first digit and the column the second digit of the date. e.g.26:

Timer Function - Time

In tab "Time Selection" the time can be specified, either as absolute time input or as offset in relation to sunrise or sunset (astroclock functionality).

For selection of the time, the hour and minute need to be set. For entering the Minute: the row defines the first digit and the column the second digit of the minute. e.g. 12

The input allows multiple selection, so the command can be sent periodically, for example every 15 minutes, using just one DALI-2 RTC Sequencer entry.

Using the Astro-clock functionality, a time delay (minutes and hours) relative to sunrise or sunset can be set. For this functionality, information about the GPS-coordinates in decimal degree format is required.

Please note that it is not possible to postpone actions based on sunset/sunrise beyond midnight.

Time queries

Date and time can be queried via the DALI-2 Instance nr. 0 (QUERY INPUT VALUE & QUERY INPUT VALUE LATCH) see section "Instance 0 – Real Time Clock"

Behaviour on DALI Reset

With a DALI reset command, the device's entries are not changed, the DALI-2 group assignment and instance settings are reset according to the DALI-2 standard:

- DALI-2 groups: none
- Event schema: instance addressing
- Instance groups: none
- Event filter: all active
- Instance event messages enabled/disabled: remains unchanged

Import and Export of Device Settings

A complete device configurations can be saved and loaded with a right click on the device in the Cockpit device-tree, selecting: *Export device settings…*" or „*Import device settings…*" respectively.
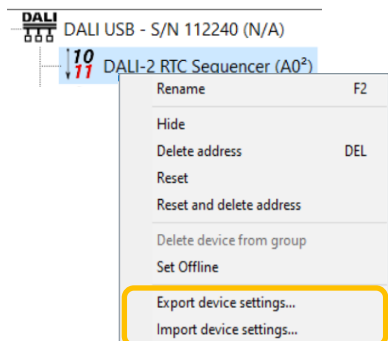
DALI-2 instances

The DALI-2 RTC Sequencer supports 2 instances of type 0 (generic instance):

- **Instance nr. 0 – real time clock:** information about date and time – see section Instance 0 – Real Time Clock
- **Instance nr. 1 – timed jobs:** information about the last recalled scheduler entry – see section "Instance 1 – Timed Jobs"

Parameters of the instance can be configured via the [DALI Cockpit Software](#), see Figure 4 on page 14.

General information on the DALI-2 instance mode and the instance types, event settings, event scheme etc. can be found in the instance guide: https://www.lunatone.com/wp-content/uploads/2021/10/DALI-2_Instance-Guide_EN_M0024.pdf

Instance 0 – Real Time Clock

Date and time can be determined using queries or the event message.

Available event filters are: second, minute, hour, day, month, year, day of the week.

The events are sent on change of each value, *Table 2* below shows how the event data can be evaluated, in summary the value is received by:

Second	event value - **0**
Minute	event value - **64**
Hour	event value - **128**
Day of the month	event value - **192**
Month	event value - **256**
Year	event value - **320**
Weekday*	event value – **384**

*0: Mon, 1: Tue, 2: Wed, 3: Thu, 4: Fri, 5: Sat, 6: Sun

e.g. at new year 01.01.2025 00:00:00 received events are:

Event 0	- 0 = 0	→ sec: 00
Event 64	- 64 = 0	→ min: 00
Event 128	- 128 = 0	→ h: 00
Event 193	- 192 = 1	→ day: 1
Event 257	- 265 = 1	→ month: 1
Event 345	- 320 = 25	→ year: 25
Event 386	- 384 = 2	→ weekday: 2 = Wednesday

To query the instance, "Query Input Value" and 6x "Query Input Value Latch" are sent to the DALI-2 address and instance number 0 and can then be evaluated using the information *Table 1* below.

Below is an example for query and evaluation:

Type	Hex Data	Address	Command
DALI24 Inst Query	01 00 8C	A0, iN0	QUERY INPUT VALUE
DALI8 Answer	24		= 36 (0x24)
DALI24 Inst Query	01 00 8D	A0, iN0	QUERY INPUT VALUE LATCH
DALI8 Answer	28		= 40 (0x28)
DALI24 Inst Query	01 00 8D	A0, iN0	QUERY INPUT VALUE LATCH
DALI8 Answer	11		= 17 (0x11)
DALI24 Inst Query	01 00 8D	A0, iN0	QUERY INPUT VALUE LATCH
DALI8 Answer	75		= 117 (0x75)
DALI24 Inst Query	01 00 8D	A0, iN0	QUERY INPUT VALUE LATCH
DALI8 Answer	09		= 9 (0x09)
DALI24 Inst Query	01 00 8D	A0, iN0	QUERY INPUT VALUE LATCH
DALI8 Answer	17		= 23 (0x17)
DALI24 Inst Query	01 00 8D	A0, iN0	QUERY INPUT VALUE LATCH

hex	bits							
	7	6	5	4	3	2	1	0
0x24	0	0	1	0	0	1	0	0
0x28	0	0	1	0	1	0	0	0
0x11	0	0	0	1	0	0	0	1
0x75	0	1	1	1	0	1	0	1
0x09	0	0	0	0	1	0	0	1
0x17	0	0	0	1	0	1	1	1

1	0	0	1	0	0	= 36	seconds
1	0	1	0	0	0	= 40	minutes
0	1	0	0	0	1	= 17	hours
	1	0	1	0	1	= 21	day of the month
			0	1	1	= 3	weekday*
0	0	1	0	0	1	= 9	month
0	1	0	1	1	1	= 23	year

*0: Mon, 1: Tue, 2: Wed, 3: Thu, 4: Fri, 5: Sat, 6: Sun

→ **Thursday 21.09.2023 17:40:36**

*Table 1 Evaluation of Instance nr. 0 – real time clock – **for Query data***

Bits								data type	
query answer data									
7	6	5	4	3	2	1	0		
		value						0	seconds
								1	minutes
								2	hours
								3	0-5: day of the month 5-7: weekday
								4	month
								5	year

*Table 2 Evaluation of Instance nr. 0 – real time clock – **for Event data***

event source information	Bits										event data type	
	event data											
23…10	9	8	7	6	5	4	3	2	1	0		
Depends on event scheme settings according to the DALI-2 standard	0	0	0	0	value						0	seconds
	0	0	0	1							1	minutes
	0	0	1	0							2	hours
	0	0	1	1							3	day of the month
	0	1	0	0							4	month
	0	1	0	1							5	Year
	0	1	1	0							6	weekday

Instance 1 – Timed Jobs

Instance 1 sends an event message when an RTC entry is executed (Event filter selection: Timed job).

The returned value corresponds to the number of the DALI RTC entry (0-31).

For queries, the answer corresponds to the number of the last RTC entry sent.

Table 3 *Evaluation of Instance nr. 1 – timed jobs*

Bits											Event Data Types
Event Source information	Event Data										
23…10	9	8	7	6	5	4	3	2	1	0	
Depending on Event Scheme settings, according to the DALI-2 standard	0	0	0	0	Value						Nr. Of the timer entry

Figure 4 DALI Cockpit instance settings

Purchase Information

Art.Nr. 89453371-RTC: DALI-2 RTC Sequencer, DALI real time clock with timer function and control unit for executing sequences, back box installation and class II device integration

Art.Nr. 89453371-RTC-HS: DALI-2 RTC Sequencer, DALI real time clock with timer function and control unit for executing sequences, DIN rail mounting

Additional Information and Equipment

DALI-Cockpit – DALI system configuration tool, free when using a Lunatone interface device
https://www.lunatone.com/en/product/dali-cockpit/

Lunatone DALI products
https://www.lunatone.com/en

Lunatone datasheets and manuals
https://www.lunatone.com/en/downloads-a- z/

Contact

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Requests: sales@lunatone.com

www.lunatone.com

Disclaimer

Subject to change. Information provided without guarantee. The datasheet refers to the current delivery.

The compatibility with other devices must be tested in advance to the installation.