

# LED-Coach Lighting

**Digital 8122001**

**Analog 8123001**

Version 1.0 – 01/08

# **! ATTENTION !**

**The factory setting of the light and function outputs is full track voltage!**

**Make sure that the outputs are set to the appropriate value according to the CV list (page 15 and on) before hooking up the lights or other units.**

**We cannot be held responsible for damages if this is disregarded.**

## 1. Brief Description

Illumination circuit board for G-scale passenger cars. Thanks to the mounting holes, the electronic board fits into almost every LGB passenger car and it can also be installed into cars of other manufacturers. Two warm white LEDs provide a consistently pleasant and maintenance-free illumination level. An integrated voltage control circuitry facilitates the operation with digital and analog power between 0 and 27 Volts. The control unit keeps the brightness constant from 8 Volts onwards. The hook-up is accomplished by sturdy C-clamps. The digital version features a digital decoder which enables digital light control and other functions.

### 1.1 Properties of the digital version

- 10239 Loco addresses
- Serial and parallel control for all function outlets
- Straightforward function mapping (serial, parallel), direction sensitive
- Programmable flashing light and short-term function for all outputs
- Special effects as fluorescent tube and oil lamp
- Two function outputs usable for RC servo control
- Dimmable light and function outputs, activatable in analog operation
- Many settings usable in analog operation
- Reset functions for all CVs

### 1.2 Scope of Supply

- LED-Coach Lighting digital resp. analog
- Manual

In case one of the items listed above is damaged or missing, please contact your dealer or the manufacturer directly.

## 2 Hook-Up and Analog Operation

- Install the LED coach lighting board according to the wiring diagram. **A wire mix-up or a short circuit (e.g. function and track power) may lead to severe damage to the board.**
- The factory address setting of the decoder is “3”, function key 1 and parallel operation. CV 29 must be altered in case a high loco address is needed. The operation with LGB MTS I or MTS II requires CV 29 to be set to “4” to facilitate a proper operation with 14 speed steps.
- This module must only be used for operations described in the manual. Any other usage may result in the destruction of the board.
- This module is not a toy.
- Watch the polarization when using both track power connectors at the same time!
- The left and right power connectors are identical and may be used alternatively.

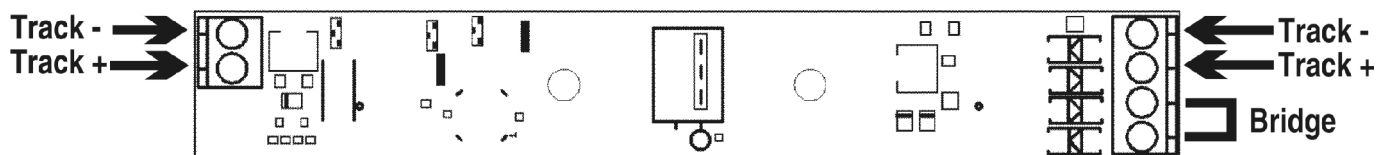


Illustration 1: Hook-up of the analog version. Note the bridge on the right hand side!

### 3 Hook-Up and digital Operation

The following chapters refer to the digital version only (8122001)!

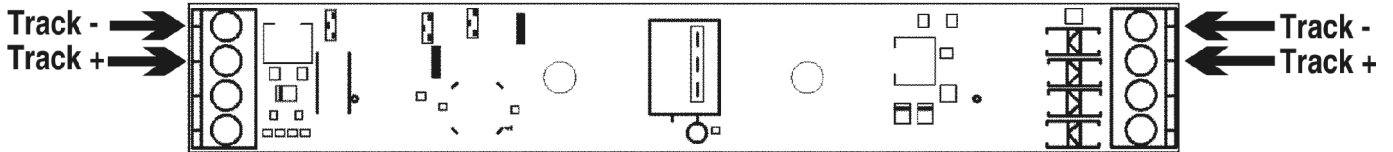


Illustration 2: Hook-up of a single digital version

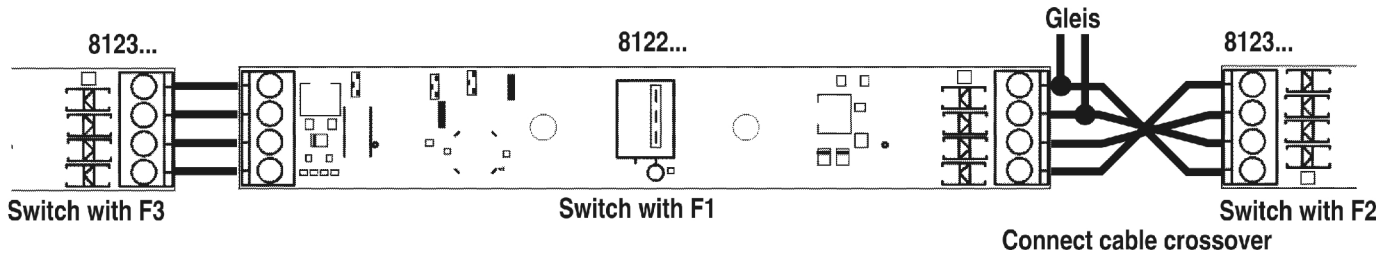


Illustration 3: Hook-up of a digital version connected to two analog units

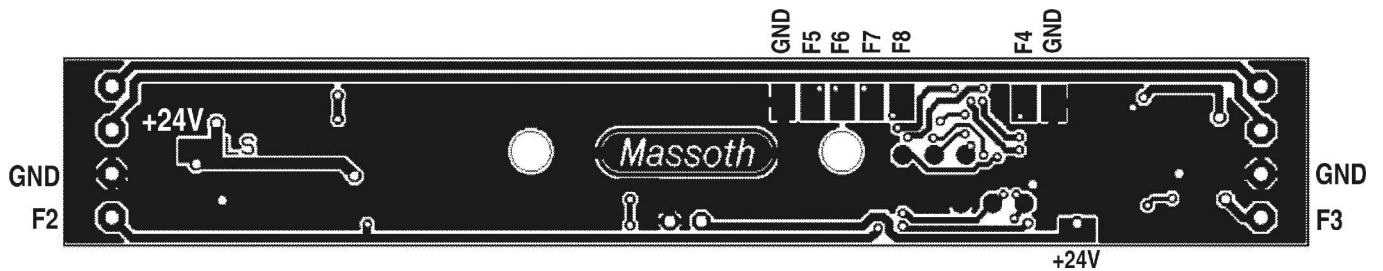


Illustration 4: Additional hook-up options on the flip-side (back-of-panel view)

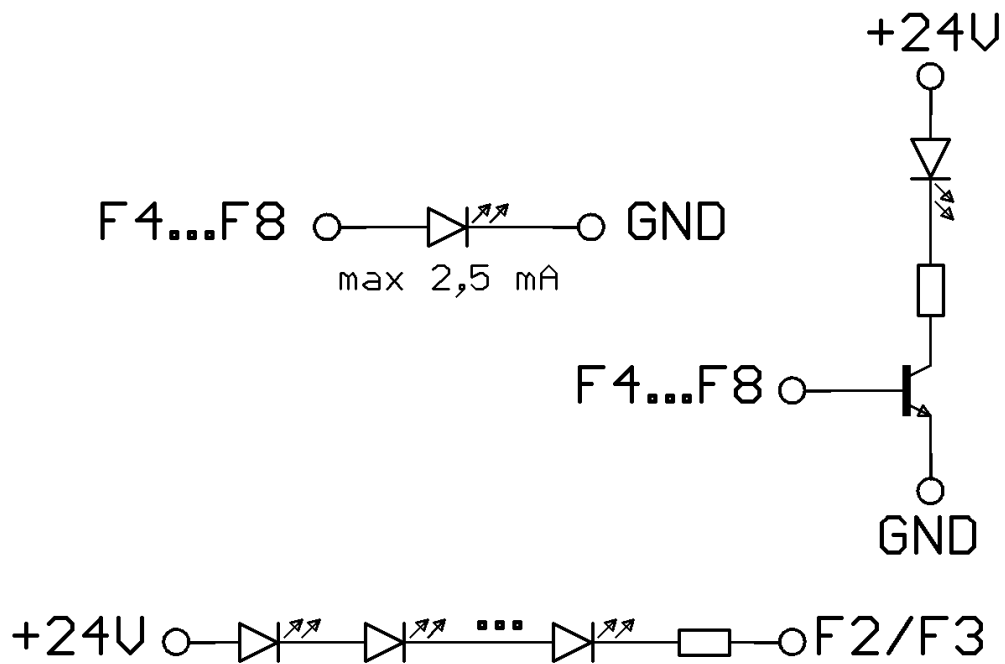


Illustration 5: Additional LED hook-ups

### 3.1 Additional Installation Options

- Additional analog LED light boards may be connected to terminals F2 (right hand side) and F3 (left hand side). The additional boards are switchable with functions F2 resp. F3 (mappable to F1). See Illustration 3.
- Regular bulbs or LEDs (with current limiting resistor) may be connected to F2 and F3 and the +24Volt terminal on the rear side(see Illustration 4+5).
- Low current LEDs or switching amplifiers may be connected to the outputs F4...F8 (+5Volt). An internal protective resistor limits the current to 2.5 mAmps. [Illustration. 4+5]

### 3.2 Loco Address

- Each locomotive running in a digital system need a digital address.
- The NMRA Standard provides two kinds of addresses: Low (short) addresses (1...127) and high (long) addresses (128...10239)  
An address must be stored in the decoder to enable the decoder to recognize the commands that are meant for it.
- The low address is stored in CV1. The maximum value is "127". In addition bit 5 in CV2 must be "off" (value 0).
- The high address is divided into two values and is stored in CV17 and CV18. In addition bit5 in CV29 must be set to "on" (value 1).

The long address must be calculated as follows and stored in CV17 and CV18:

- **CV17 = address/256 + 192 (store only the whole-numbered value) For technical reasons 192 must be added!**
- **CV18 = address – (CV17 – 192 x256)**

Let us calculate address 3005 as an example:  
 $3005 / 256 = 11,74$  this means:  $CV17=11+192=203$   
Step 2:  $3005-(11 \times 256) = 3005-2816 = 189$   
So CV17 must be set to 203 and CV18 to 189

- Current digital systems (e.g. the DiMAX system) feature a comfortable way to program the addresses: all CVs including the CV29 are automatically calculated and programmed.

### 3.3 Function Outputs

- The function outputs are freely programmable (F-keys, function depending on driving direction, flashing and short-term function)
- The outputs may be operated with NMRA-DCC-commands or with LGB serial pulse string commands.
- The outputs F1 – F4 and F7 + F8 are dimmable.
- **Attention:** The light function is dependent on the speed step setting. In case the CV29 setting of the decoder is not the same as the setting of the digital system, the lights will flash or will not work at all.

### 3.4 RC Servo Control

Please find thorough information about the control of RC servos in the eMOTION FL manual on our web site:  
[www.massoth.com](http://www.massoth.com)

### 3.5 Analog Operation

- The decoder may be blocked for analog operation in CV29-bit2.
- The 8 function outputs may be activated for analog operation (CV13). Settings for flashing lights and dimming are available in analog operation too.

### 3.6 Reset mode + Software (Firmware-) Update

- Writing 55 in CV7 resets the basic functions of the decoder to factory setting. Writing 77 in CV7 resets all advanced functions. This can only be achieved with the function CV-Writing.  
See Attachment 7 regarding the allocation of the CVs.
- With the DiMAX PC Module the software (firmware) of the light board may be updated at all times.

### 3.7 Programming Methods

All programming methods mentioned here are performed on a separate programming track, except PoM. See the manual of your digital central station or programming module for the appropriate procedure. A load of at least 60 mAmps must be connected to the F2 output in order to get a programming confirmation. On a programming voltage of apr. 20 Volt use a resistor of 270 Ohm. If the programming voltage is lower you have to adjust the resistor. Use following formula:  $R=U/I$  R = resistor, U = voltage and I = current in Amps! Only then the decoder is able to signal a successful completion of the programming process or send back decoder read outs to the central station.

#### **The base load of the internal LEDs is not sufficient!**

Programming will always be accomplished even though there is no feedback possible.

**Note:** The programming methods shown below are not supported by all digital systems.

Register direct	Program the CVs 1 to 4 direct
CV indirect	Program all changeable CVs by "register direct". First write CV-number in Register 6 , then CV-value in Register 5.
CV writing	Program all changeable CVs.
CV writing bit by bit	Program all changeable CVs except CV1
CV reading	Read all CVs.
Program on Main (PoM)	Program all changeable CVs except CV1. The train should not move during programming to prevent contact problems. After a successful programming the decoder performs a restart to put the new programming into effect.

### 3.8 Programming binary values

Some CV's (e.g. CV29, CV49) consist of binary values. This means that several settings are combined to one single value. Each setting has a bit location and a value. For programming all values must be summed up. A deactivated function always has the value "0" an active function the value shown in the table.

Sum up all active values and program the result in the CV.

Let's have a look at the NMRA configuration register (CV29):  
You want to program normal driving direction, 28 speed steps and digital and analog operation. According to attachment 1 this corresponds to: value  $2+4 = 6$ . So CV29 must be set to 6.

## CV - Table (drive settings)

This table shows the standard settings of the LED coach lighting decoder. (an = analog operation)

CV	Description	Default	an	Range	Notes:
1	Locomotive address (standard short)	3		1 - 127	If CV29, bit5=0
5+6	Register programming: Reg 6 = CV Reg 5 = Wert	---		---	
7	Software Version Number	1.3		---	Read only
7	Dekoder – Reset function (3 Reset ranges available)	---		55 77	Reset basic setting Reset advanced settings (see Attachment 7)
8	Manufacturer's ID	123		---	Read only
13	Funktion outputs in analog mode (On, if function no. set)	15	√	0 ... 255	F1 = 1, F2 = 2, F3 = 4, F4 = 8, F5 = 16, F6 = 32, F7 = 64, F8 = 128 Sum up the desired values!
17	Long loco address (high byte)	128		128 ...	The high loco address is active, if CV29, bit 5 = 1
18	Long loco address (short byte)			10239	
29	NMRA configuration register	4	√		see Attachment 1
49	MASSOTH configuration register	0	√		see Attachment 2
50	F7+8: dim value (PWM – dimmable only combined)	32	√	1 ... 32	32 = full track voltage
51	F7 (front light): command allocation	7			see Attachment 3
52	F8 (rear light): command allocation	8			see Attachment 3
53	F1 + F2 dimming value	32	√		see Attachment 4
54	F1 command allocation	1			see Attachment 3
55	F1 special function	0	√		see Attachment 5 + 5a
56	F2 command allocation	2			see Attachment 3
57	F2 special function	0	√		see Attachment 5 + 5a
106	Type of decoder (needed only for software updates)	204		---	Read only
112	F3 + F4 dimming value	32	√		see Attachment 4
113	F3 command allocation	3			see Attachment 3
114	F3 special function	0	√		see Attachment 5
115	F4 command allocation	4			see Attachment 3
116	F4 special function	0	√		see Attachment 5 + 5a
117	F5 command allocation	5			see Attachment 3
118	F5 special function	0	√		see Attachment 5 + 5a
119	F6 command allocation	6			see Attachment 3
120	F6 special function	0			see Attachment 5 + 5a

CV	Description	Default	an	Range	Notes:
121	F7 special function RC servo control	0			see Attachment 6
122	F7 RC servo lower terminal value	16		ca. 5 .. 50	Must be adjusted to the RC servo
123	F7 RC servo upper terminal value	32		ca. 5 .. 50	Must be adjusted to the RC servo
124	F8 special function RC servo control	0			see Attachment 6
125	F8 RC servo lower terminal value	16		ca. 5 .. 50	Must be adjusted to the RC servo
126	F8 RC servo upper terminal value	32		ca. 5 .. 50	Must be adjusted to the RC servo
127	Time value for RC servo speed	1		1 .. 16	Time base 10ms per increment

#### Attachment 1: (CV29) – NMRA Configuration register

Bit	Off (value=0)	Application	On	Value	Notes:
0	Normal driving direction		Inverse driving direction	1	
1	14 speed steps		28 speed steps	2	Important for light function
2	Digital operation only		Digital + analog operation	4	
3	Not used				
4	Not used				
5	Lower address		Higher address	32	
6	Not used				
7	Not used				

#### Attachment 2: (CV49) – MASSOTH Configuration register

Bit	Off (value=0)	Application	On	Value	Notes:
0	Parallel function data processing only		parallele + serial function data processing	1	Automatic Serial / Parallel detection if „on“
1	Not used				
2	Not used				
3	Not used				
4	Not used				
5	Not used				
6	Not used				
7	Not used				

### Attachment 3: Command allocation (CV51, 52, 54, 56, 113, 115, 117, 119)

Value	Application	Notes:
0 ... 16	0 = Control by light key 1 ... 16 = Control by function key	
+ 64	Output on in reverse only	Please add function key value
+ 128	Output on in forward driving direction only	Please add function key value

### Attachment 4: Dimming function (CV53, 112)

Value	Application	Notes:
1 ... 32	Voltage units on output	1 Unit = ~3% track voltage 1 = 3% track voltage (0,75 Volts) 32 = 100% track voltage (24 Volts)
+ 64	F1 resp. F3 is dimmed only	CV53 contains the F1 value CV112 contains the F3 value Please add the voltage units
+ 128	F2 resp. F4 is dimmed only	CV53 contains the F2 value CV112 contains the F4 value F4 value relates to 5V! Please add the voltage units

### Attachment 5: Special functions F1 + F2 + F3 + F4 + F5 + F6 (CV55, 57, 114, 116, 118, 120)

Value	Application	Notes:
0	0 = Continuous operation (Default function)	
1 ... 15	Continuous flashing (time base 0,25 sec/value)	Output flashes symmetrically
(1 ... 15) + 64	Short term function, monoflop (time base 0,25 sec/value)	Output switches off after programmed time. Please add time value
(1 ... 15) + 128	Flashing asymmetrically 1/3 on – 2/3 off	Short on / long off Please add time value
(1 ... 15) + 192	Flashing asymmetrically 2/3 an – 1/3 aus	long on / short off Please add time value

### Attachm. 5a: Advanced special functions F1+F2+F4 (CV55, 57, 116)

Value	Application	Notes:
16	Inverse coupling with output F1 resp. F3 (Alternating flashing)	CV 57 (F2 with F1) CV 116 (F4 with F3)
17	Start-flicker of fluorescent tubes (F1 + F2)	CV 55 + 57 only
18	Flicker of oil lamp (F1 + F2)	CV 55 + 57 only

## Attachment 6: Special functions F7 + F8 (CV121, 124)

Value	Application	Notes:
0	No special function, regular switching function	
1	RC servo operation with two end positions (function off / function on)	e.g. for decouplers, pantographs, ...
2	RC servo operation with speed steps and F-key activation	e.g. for revolving fire fighter nozzle
+4	inverse operation of RC servo output	Only for RC servos with inverse triggering

## Attachment 7: CV 7 Reset program

Write your desired reset value CV7 (Software version of the decoder) to reset the decoder setting to the factory default setting.

RESET	CV-value after reset programming
55	1=3, 17=0, 18=128, 29=4, 49=0
77	13=15, 50=32, 51=7, 52=8, 53=32, 54=1, 55=0, 56=2, 57=0, 112=32, 113=3, 114=0, 115=4, 116=0, 117=5, 118=0, 119=6, 120=0, 121=0, 122=16, 123=32, 124=0, 125=16, 126=32

## 4 TECHNICAL SPECIFICATIONS

- Power supply: 0 .. 24Volts DC or DCC (momentary up to 27Volts)
- Total load capacity: max. 150mAmps
- Function output 1: internal LEDs. Current approx. 15mA, dimmable
- Function outputs 2+3: 0..27Volts, max. 50mAmps each on continuous mode, dimmable
- Function output 4..8: 5Volts, max. 2,5mAmps each, F4 dimmable.
- Temperature range: -4°F to 113°F

## 5 IMPORTANT NOTICE

Do not expose to shock or pressure. Cables must never be shorted. Avoid squishing or squeezing the cables.

### 5.1 MOISTURE/HUMIDITY

The unit must be operated in a dry environment only. Protect the unit of moisture, humidity, and water. Moisture/humidity may limit the functionality significantly or may destroy the unit.

### 5.2 WARRANTY

Massoth Electronics USA warrants this product for 1 year from the date of purchase. This product is warranted against defects in materials and workmanship. Peripheral component damage is not covered by this warranty. Normal wear and tear, consumer modifications as well as improper use or installation are not covered. Errors and changes excepted.

### 5.3 WARRANTY CLAIMS

Valid warranty claims will be serviced without charge within the warranty period. To initiate a warranty claim please contact your dealer or Massoth Electronics USA for an RMA (return merchandise authorization). Massoth Electronics USA cannot be responsible for return shipping charges to our repair facility. Please include your proof of purchase with the returned goods.

## 5.4 GENERAL AND SAFETY DETAILS

This is not a toy. Not suitable for children under the age of 8 years. This product may have sharp corners and edges and may be harmful if swallowed. Handling the item may cause restraint injuries. If not trained properly do not handle this product; have a professional install this item. Operate this product **only** with products posted in this manual. Electrical data and measurements are subject to change without prior notice.

## 5.5 SUPPORT

Please visit [www.massoth.com](http://www.massoth.com). Here, the latest software and manuals are provided. For further support and detailed technical questions you may contact your dealer or the manufacturer at (email) [sales@massoth.com](mailto:sales@massoth.com).

Hotline hours USA: 9:00 a.m. to 4:00 p.m. EST Mo thru Fr

Phone: 770 – 886 – 6670

FAX: 770 – 889 – 6837



This Decoder conforms to the CE Standards



This Decoder is manufactured according to the latest EG Standards for lead free manufacturing conforming to RoHS Standard.



Please dispose of according to your State regulations.



Do not dispose of in open fire.

## 5.6 Manufacturer Information

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