# *To be a Digital-Professional!*

## DB Light-Signals digital controlled by the Light-Signal Decoder LS-DEC-DB

Detailed constructed light signals with a realistic digital control are a real eye-catcher not only on digital model railway layouts. Particularly whenever light-emitting diodes will be switched with up- and down-dimming including a short dark phase as in reality. If a home- and an advance signal will be installed onto one post is it possible to switch the advance signal to dark by Hp0 (train stop) or Sh1 (proceed shunting).

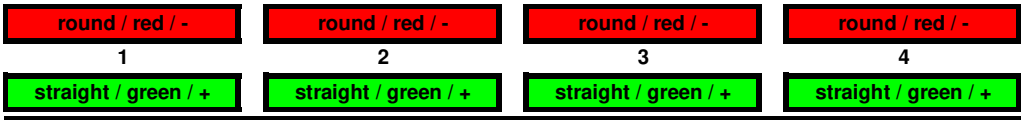
All this advantages will be offered within our Light-Signal Decoder *LS-DEC-DB*. The read-in of the directly assigned decoder addresses is possible via the programming key S1 as on all our other accessory decoders.

## BASICS

Up to 4 light signals can be controlled by one light signal-decoder. Two signals on each identical wired 11-poles clamp. 2 signal aspects can be assigned to each decoder address because it is possible to switch one turnout- or one semaphore-signal into two positions with one address. A complete light signal decoder occupies therefore 8 decoder addresses (4 addresses on each clamp bar indicated with **red** / **green**).

The 4 addresses and 8 adjustment possibilities on each clamp bar can control 7 signal aspects. The eighth switch possibility will be used for the dark switching.

The following sample connections show how the fourfold address-group can be set by use of 8 keys of the push button panel for setting the turnouts or signals.




The centerline between two keys indicates the decoder address. The two keys **red** and **green** of each address are assigned to the turnout position **round** and **straight** or the signal aspect **red** and **green**.

If you use a remote control LH100 of Company Lenz Elektronik then **red** will be the minus key and **green** the plus key.

## THE DIGITAL SYSTEM

All Light-Signal Decoders "*LS-DEC"* are suitable for the DCC data format (e.g. Lenz-, Roco-, LGB-Digital, Intellibox, TWIN-CENTER, PIKO Digi-Power-Box and Smartbox, DiCoStation, ECoS, EasyControl, RedBox, Commander, KeyCom-DC, ZIMO, Märklin Digital= or Central Station 1, 2 and 3) as well as for the MOTOROLA-format (e.g. Märklin Digital~ [Control Unit, Central Station 1, 2 and 3] Intellibox, DiCoStation, ECoS, EasyControl, RedBox, Commander, KeyCom-MM).

■ Adjusting the correct data format!

The data format will be selected via the jumper J2. If there is no jumper J2 inserted the DCC-format has been adjusted. By an inserted jumper has been the MOTOROLA-Format adjusted.

Please switch-off the model railway layout whenever connection work has to be carried out (switch-off the transformers or unplug the mains supply)!

The digital voltage will be supplied via the 2-poles clamp KL2. The colored marks **red** / **brown** next to the clamp are usually used by MÄRKLIN-Motorola. Other systems such as Lenz Digital are using the letters "J" and "K".

The external alternated voltage supply of 14 ...18 Volt ~ (e.g. light-output of a model railway transformer) will be supplied to the decoder via the two poles clamp KL1. It is possible to supply power to the decoder by the digital current (directly connection of clamp KL1 to clamp KL2). But this will be recommended by small layouts only because in this case will be "valuable" and "expensive" digital current wasted for the supply of the modules and for switching the drives.

■ **Booster**

If the digital current intensity will not be sufficient (command stations with included integrated booster supply mostly 2.5 to 3 Ampere) for the driving and operation of the layout it is required to use additional digital amplifiers (=booster e.g. "DB-2" or "DB-4"). This will certainly require additional wiring and further cost (therefore "expensive" digital current).

As well for the Light-Signal Decoder is it recommended to install a separate second ring conductor for the digital current as by the turnout decoders and a third ring conductor for the supply voltage.

The digital information for the accessory decoders should never be taken directly from the rails. The traveling locomotives can influence the digital signal by producing continually a kind of loose contact signal. This can result to the problem that the decoder cannot understand the transmitted signal. For this reason will be the loc commands continually repeated. Especially for the switch commands, which will not be transmitted several times, as done by the loc commands is it possible that commands will be getting lost if the digital information has been taken directly from the rails.

## SIGNAL TECHNIQUE

The most LED equipped light signals available on the market contain a common anode connection (positive terminal) and integrated serial resistors at the colored LED-wires. The common wire shall be connected at the light signal decoder to the "+" terminal and the jumper J1 shall not be inserted!

On all our Light-Signal Decoder is a connection of light signals with common cathode (negative terminal) possible. For this assembly shall the common wire connected to the "-"terminal and the jumper J1 has to be inserted!

**LED – Light Emitting Diode**

All our decoder modules contain an integrated serial resistor of 330 Ohm on each output. The light emitting diode will take then a current of about 10mA. The brightness of the light emitting diodes should be sufficient. If individual LED`s will be to bright is it possible to match the brightness to your requirement by assembly of additional external resistors within the LED connection wire. The actual resistor value of some 100 Ohm has to be determined by test.

The different DB-signal types allow various connection possibilities. The following paragraphs shall explain exemplary these connection samples. As the two 11-poles connection clamps at the decoder are wired identical the following explanation of the corresponding signal aspects refer mostly to one clamp bar only.

To assure that you are able to assign the wires of the light emitting diodes of the light signals correctly to the clamps of the light signal-decoder you should attend to the markings (e.g. *RT1* or *GE1*) at the following signal images.
The marks next to the light emitting diodes of the signals do not always correspond to the real signal colors but refer to the connection at the Light-Signal Decoder *LS-DEC.*

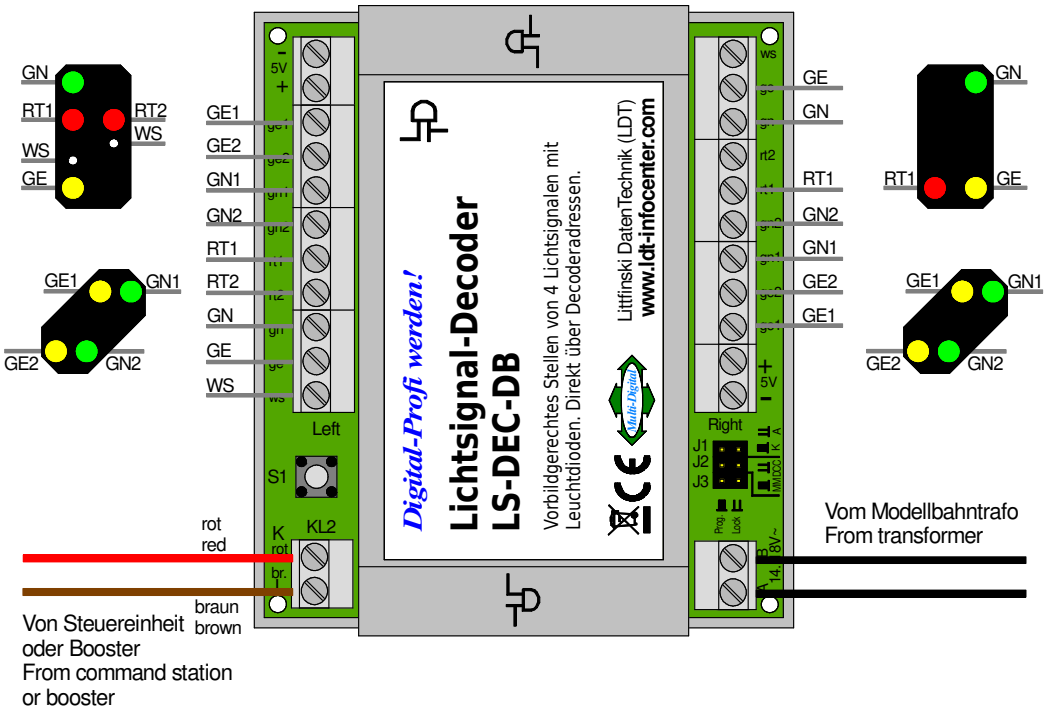
Please notice that the Light-Signal Decoder does not simply switchover the signal aspects but is dimming the light emitting diodes realistic up- and down. Additionally there will be a dark phase of about 0.4 sec. between the signal aspects. During the dark phase is it not possible for the decoder to process incoming digital commands. Therefore you should not send switch commands at a very fast sequence. In any case it will be more realistic if the commands will be released with a little delay.

Important Tip

The following sample connections refer to the different light signals of the German Federal Railways (DB). Within our delivery range we offer as well Light-Signal Decoder for signals of the German National Railways (DR), the Austrian Federal Railways (OEBB), the Swiss Federal Railways (SBB), the Nederlandse Spoorwegen (NS), the National Maatschappig of the Belgium Spoorwegen (NMBS), the Governmental Railway Corporation of Italy (FS), the British Railway (BR) and furthermore. The connection of these signals will be explained within separate pages of our Digital-Compendium.

## ENTRY- AND EXIT-SIGNALS WITH ADVANCE-SIGNAL

Mainly entry- and exit-signals with advance signals will be installed within a railway station area. At the below picture you will find at the left side the connection of an exit- and an advance signal. The right side shows the connection of an entry- and an advance signal:




Sample Connection for Entry- and Exit-Signals (page_073)

The signal connection at the left side (exit- and advance signal) occupies e.g. the decoder addresses 1 to 4. The addresses 5 to 8 will be used by the right signals (entry- and advance signal). Each signal occupies therefore 2 decoder addresses and can be switched independently.

When switching-on the layout the Light-Signal Decoder will switch at first all signals to red (Hp0, Hp00 or Sh1). The green key of the address 1 has to be activated for switching the exit-signal (at the picture left side) to green (Hp1). The following table shows the relation of keys to the corresponding digital addresses:

| exit signal | | advance signal | |
|---|---|---|---|
| Hp00 | Sh1 | Vr0 | |
| **train stop** | **shunting** | **train stop** | **dark switching** |
| round / red / - | round / red / - | round / red / - | round / red / - |
| **1** | **2** | **3** | **4** |
| straight / green / + | straight / green / + | straight / green / + | straight / green / + |
| **proceed** | **slow approach** | **proceed** | **slow approach** |
| Hp1 | Hp2 | Vr1 | Vr2 |

If there is a home signal and an advance signal assembled on one post you should activate the dark switching for the advance signal. For the setting of the dark switching you have at first to switch the home signal on this post to red (at our sample again key 1 red). If you now activate the key 4 red you can switch the advance signal on- or off with each keystroke. If the advance signal has been switched off is the dark switching activated. This setting will be permanently stored at the decoder – as well as the programmed decoder addresses- and can be changed at any time to your requirement. Commands addressed to the advance signal sent during the dark switching phases will be stored and correctly indicated when the home signal of the same post will be switched to green (Hp1 or Hp2).

To switch the entry signal (at the above picture at the right side) to green (Hp1) you have to activate the green key with the address 5. The following table shows the setting of keys and the assignment of digital addresses:

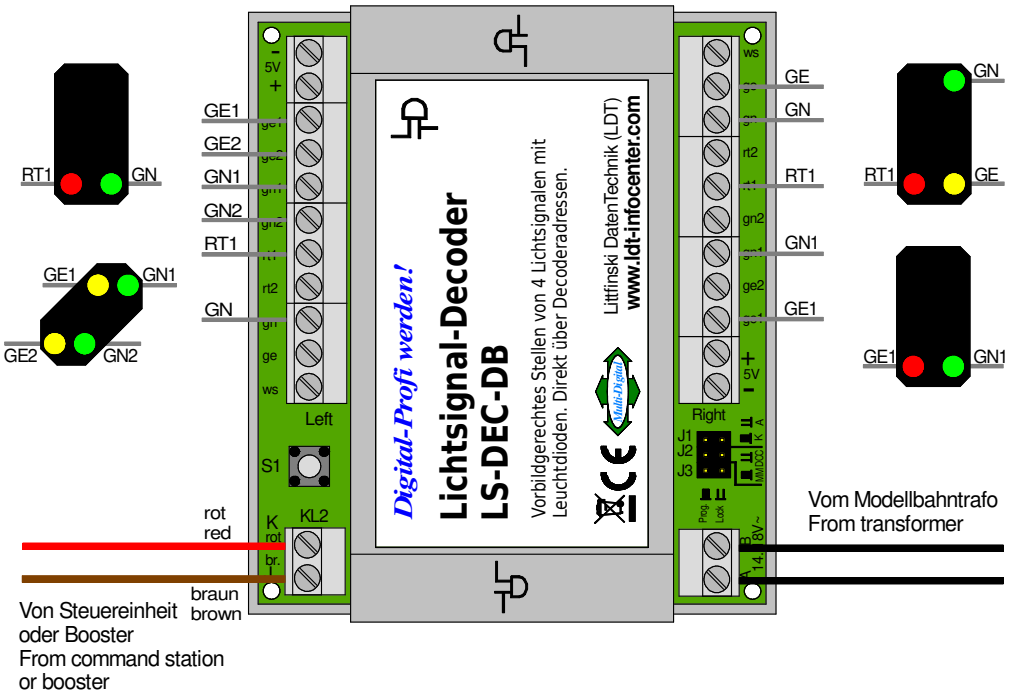
| entry signal | | advance signal | |
|---|---|---|---|
| Hp0 | | Vr0 | |
| train stop | | train stop | dark switching |
| round / red / - | round / red / - | round / red / - | round / red / - |
| 5 | 6 | 7 | 8 |
| straight / green / + | straight / green / + | straight / green / + | straight / green / + |
| proceed | slow approach | proceed | slow approach |
| Hp1 | Hp2 | Vr1 | Vr2 |

The setting of the dark switching of the advance signal at the same post of the entry signal is equal as described for the exit signal.

## ENTRY- AND BLOCK-SIGNALS WITH ADVANCE-SIGNAL

At the second sample connection is one block- and one advance signal connected to the left side and one entry- and one block signal connected to the right side:

Sample connection of Block- und Entry-signals (page_074)




The signals on the left side (block- and advance signal) have been assigned at this sample to the decoder addresses 1 to 4. The addresses 5 to 8 are assigned to the signals of the right side (entry- and block signal). Each signal occupies therefore 2 decoder addresses (the block signal requires only one decoder address). All signals can be switched independently.

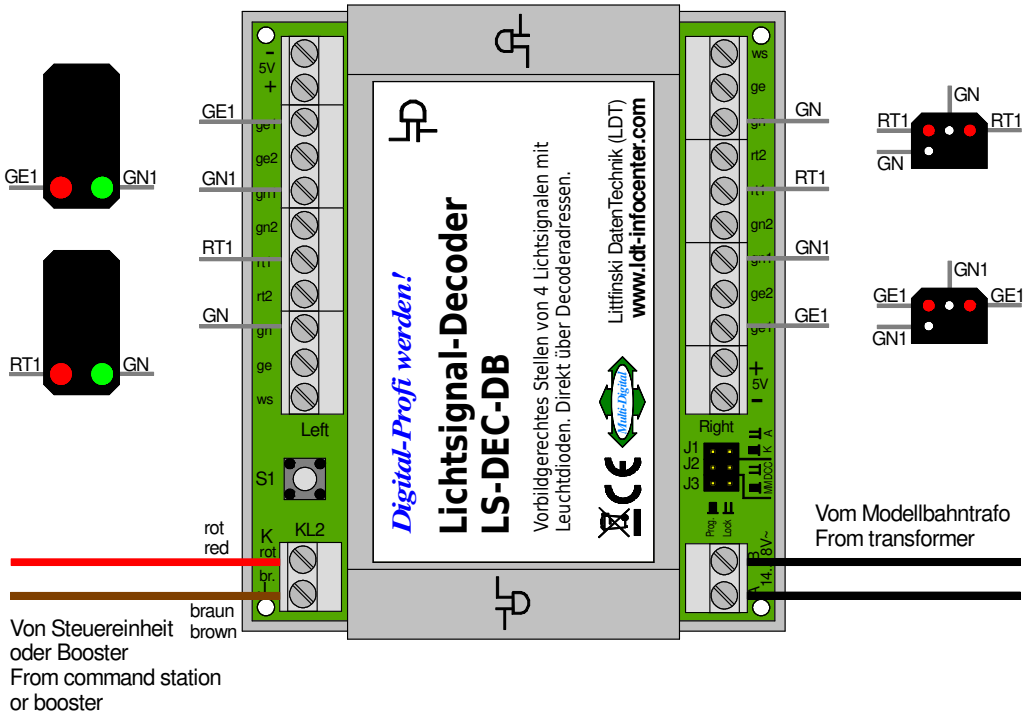
| block signal | | advance signal | |
|---|---|---|---|
| Hp0 | | Vr0 | |
| train stop | | train stop | dark switching |
| round / red / - | round / red / - | round / red / - | round / red / - |
| 1 | 2 | 3 | 4 |
| straight / green / + | straight / green / + | straight / green / + | straight / green / + |
| proceed | | proceed | slow approach |
| Hp1 | | Vr1 | Vr2 |

| entry signal (above) | | block signal (below) | |
|---|---|---|---|
| Hp0 | | Hp0 | |
| train stop | | train stop | |
| round / red / - | round / red / - | round / red / - | round / red / - |
| 5 | 6 | 7 | 8 |
| straight / green / + | straight / green / + | straight / green / + | straight / green / + |
| proceed | slow approach | proceed | |
| Hp1 | Hp2 | Hp1 | |

The setting of the dark switching function for the left advance signal will be the same as described for the exit-signal.

## BLOCK- AND LINE CLOSED SIGNALS

The third sample shows at the left side the connection of two block signals and at the right side two line closed signals.




Sample connection of block- and Line-Closed Signals (page_075)

The signals at the left side (block signals) are assigned again to the decoder addresses 1 to 4. The addresses 5 to 8 will be occupied by the signals at the right side (line closed signals). Each signal occupies therefore 1 decoder address. All signals can be switched independently. A dark switching will not be required.

The relevant keys and decoder addresses are indicated at the following tables:

| block signal (below) | | block signal (above) | |
|---|---|---|---|
| Hp0 | | Hp0 | |
| train stop | | train stop | |
| round / red / - | round / red / - | round / red / - | round / red / - |
| 1 | 2 | 3 | 4 |
| straight / green / + | straight / green / + | straight / green / + | straight / green / + |
| proceed | | proceed | |
| Hp1 | | Hp1 | |

| line closed signal (above) | | line closed signal (below) | |
|---|---|---|---|
| Sh0 | | Sh0 | |
| shunting stop | | shunting stop | |
| round / red / - | round / red / - | round / red / - | round / red / - |
| 5 | 6 | 7 | 8 |
| straight / green / + | straight / green / + | straight / green / + | straight / green / + |
| proceed shunting | | proceed shunting | |
| Sh1 | | Sh1 | |

## PROGRAMMING

From version 4 the Light-Signal Decoder contains a third Jumper (J3) which has to be inserted for programming the unit.
The Jumper J3 can be removed after successful programming. This action will protect the memory of the Light-Signal Decoder *LS-DEC-DB* against overwriting.

The assigning (learning) of digital addresses has to be done for each module individually. After activating the decoder programming key S1 two light emitting diodes at the left clamp bar will lighten-up at a 1.5 sec. interval. The module has now been set into the learning mode. Now is it required to activate one key of the wanted group of four (1 - 4, 5 – 8 etc.) at the command station. The module takes over those four addresses and confirms this by flashing the light emitting diodes a little faster. By activating again the programming key S1 the two light emitting diodes will flash at the right clamp bar of the module. Again is it required to activate a key of a group of four at the command station. The decoder will confirm again the addressing by a faster flashing. The third activation of the programming key S1 will complete the learning process. The addresses are now being stored permanently at the decoder and all signals will be switched automatically to red.

■ General Note

Our recommendation at this point: Carry out the programming of decoder addresses before you install the decoder module below your layout. It is obvious that it is much easier to handle the module with all the connection on a workbench instead overhead below the layout. After completing the programming please mark the particular module with the assigned digital addresses (e.g. label with pencil letters “5 – 8” for the second group of four).

A first functional test of the decoder has now already been completed. Eventually possible failures (e.g. module defect) excluded in advance. After complete assembly of the module at the layout it would be very difficult to undertake this procedure.

## ADDITIONAL INFORMATION

■ Internet: www.ldt-infocenter.com

Additional Information about installation and operation of our digital components and various helpful sample connections are available with-in our operation instructions, which will be supplied with each module and are available at our Internet Site. All shown sample connections can be loaded down as PDF-files (e.g. page_073.pdf) and printed at an A4 format.

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