To be a Digital-Professional!

SBB Light-Signals digital controlled by the Light-Signal Decoder LS-DEC

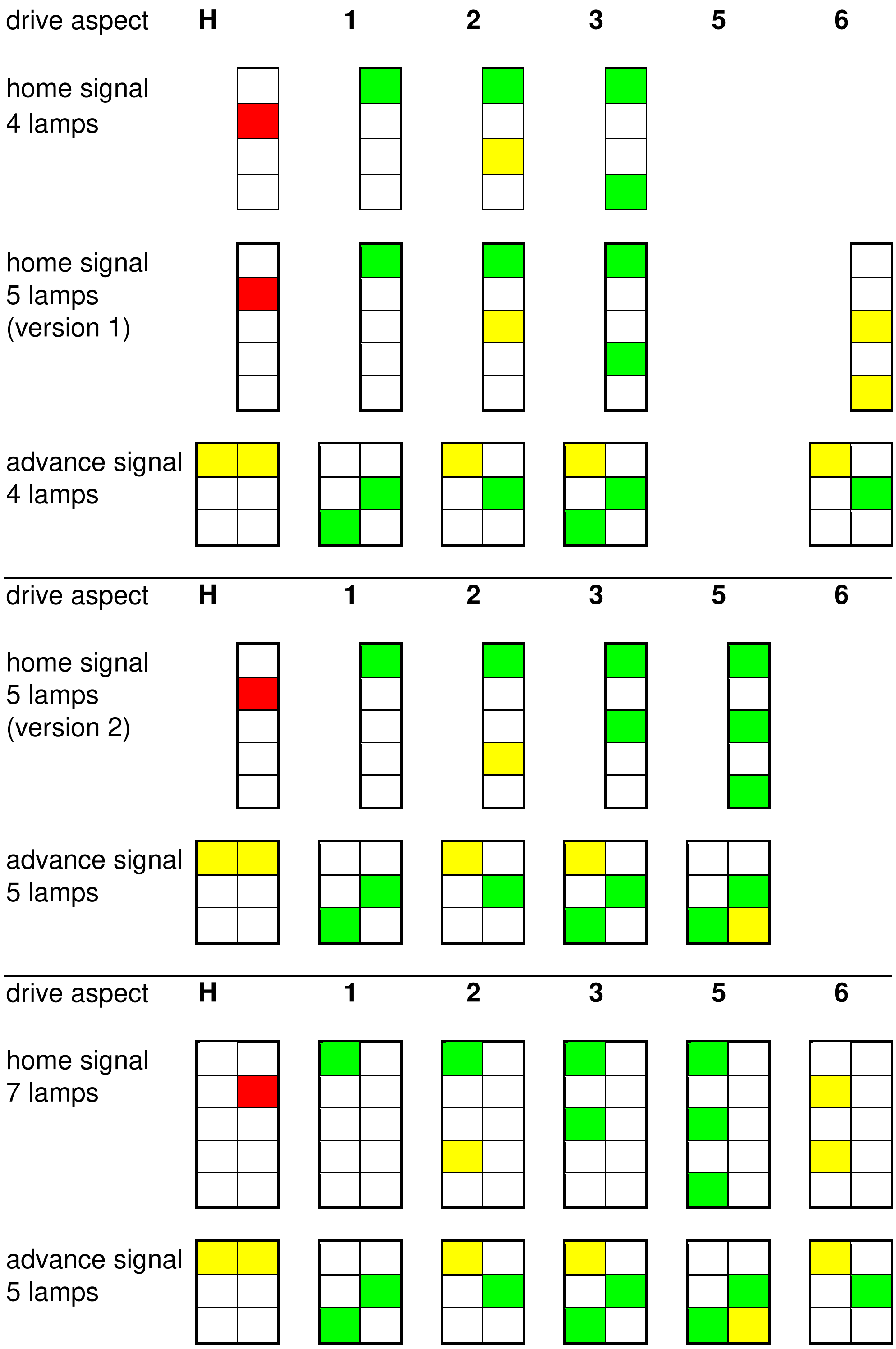
Detailed constructed light signals with a realistic digital control are a real eye-catcher not only on digital model railway layouts. Particularly whenever light-emitting diodes will be switched with up- and down-dimming including a short dark phase as in reality. If a home- and an advance signal will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

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

Signals containing 3 and 4 lamps as well as dwarf signals can be connected to the Light-Signal Decoder *LS-DEC-DB.*

If you use signals with 5 or 7 lamps you can connect the signals to the decoder *LS-DEC-SBB*.

Signal Aspects of SBB-Light Signals



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).

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.

■ Adjusting the correct data format!

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.

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).

■ **Booster**

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 can not 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

LED – Light Emitting Diode

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 <u>not</u> be inserted!

General Note

On all our Light-Signal Decoders 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 <u>has to be</u> inserted!

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 10 mA. 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 SBB-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 explanations 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.*

Important Tip

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.

The following sample connections refer to the different light signals of the Swiss Federal Railways (SBB). Within our delivery range we offer as well Light-Signal Decoders for signals of the German Railway (DB and KS), German National Railways (DR), Austrian Federal Railways (OEBB), the Dutch National Railways (Nederlandse Spoorwegen – NS), the Belgian National Railways (National Maatschappig of the Belgian Sporwegen – NMBS) and furthermore. The connection of these signals will be explained within separate pages of our Digital-Compendium.

Basics to SBB-Signals with 3 and 4 Lamps as well as Dwarf-Signals at the *LS-DEC-DB*

If you want to control light signals with 3 and 4 lamps you should use the Light-Signal Decoder *LS-DEC-DB*.
Up to 4 light signals can be controlled by one Light-Signal Decoder *LS-DEC-DB*. Two signals on each identical wired 11-poles clamp. Sample connections explained for one clamp bar will correspond to the other side as well.

The 4 addresses (**red** / **green**) 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.

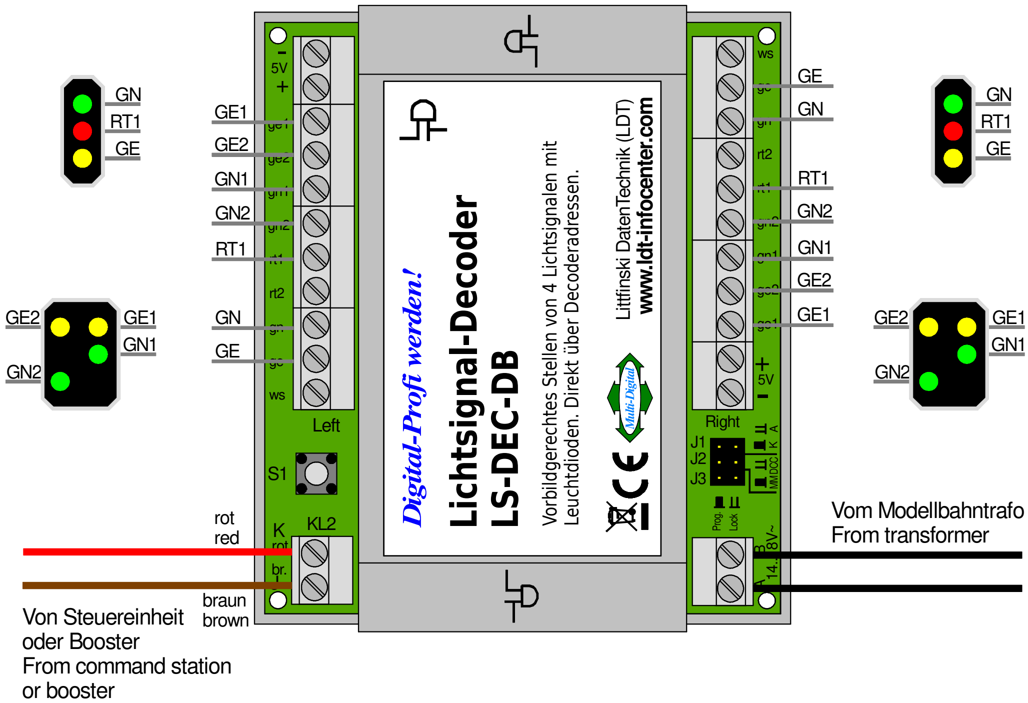
round / red / -	round / red / -	round / red / -	round / red / -
1	2	3	4
straight / green / +	straight / green / +	straight / green / +	straight / green / +

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.

Two Home Signals with 3 Lamps and two Advance Signals with 4 Lamps

The Light-Signal Decoder *LS-DEC-DB* will be used for signals with 3 and 4 lamps. At our sample connection is one home signal with 3 lamps and one advance signal connected to each side:



Sample Connection of Home- and Advance Signals (page_286)

The home signal at the left side occupies e.g. the decoder addresses 1 and 2. The left advance signal occupies addresses 3 and 4. The addresses 5 to 8 will be used by the right signals (home- and advance signal). Each signal occupies therefore 2 decoder addresses (at a total of 8) and all signals can be switched independently.

When switching-on the layout the light signal decoder will switch at first all signals to red. The **green** key of the address 1 has to be activated for switching the home signal (at the picture left side) to green. The following table shows the relation of keys to the corresponding digital addresses and signal aspects:

home signal		advance signal	
H		H	
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	slow approach	proceed	slow approach
1	2	1	2

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 at 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 has been 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 (proceed or slow approach).

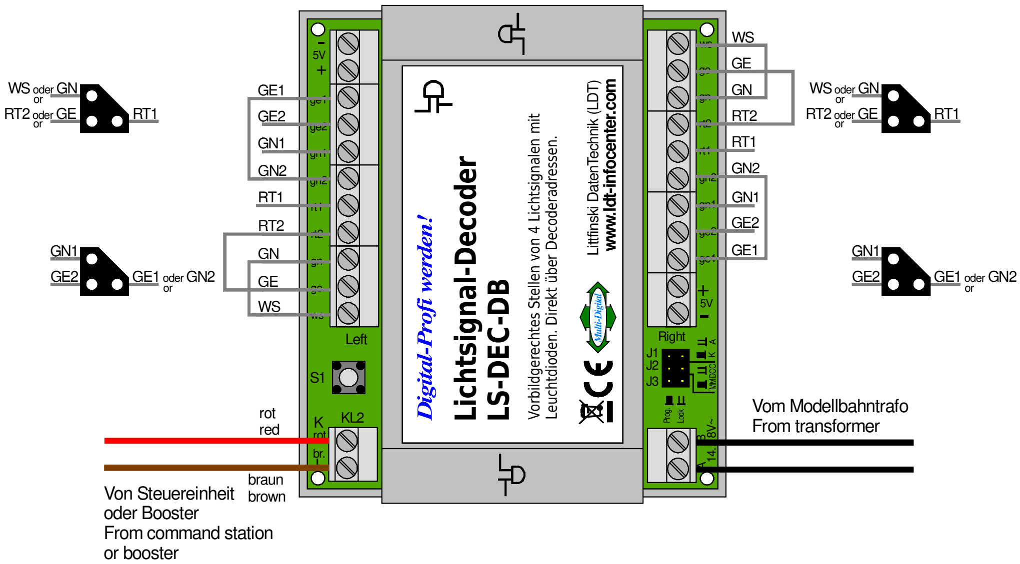
To switch the advance signal (at the above picture at the right side) to **green** (proceed) you have to activate the **green** key with the address 7. The following table shows the setting of keys and the assignment of digital addresses:

home signal		advance signal	
H		H	
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
1	2	1	2

The setting of the dark switching of the advance signal at the same post of the home signal is equal as described for the left signals.

Switching of 4 SBB-Dwarf Signals

Up to 4 SBB-Dwarf signals can be digital controlled by one Light-Signal Decoder*LS-DEC-DB*. On each clamp bar can be two dwarf signals connected.
On each clamp bar are 3 jumper required. The jumper have to be connected between terminal GE1 and GN2, between RT2 and GE and between GN and WS. The relevant light emitting diode of the dwarf signal has to be connected to one of the two clamps as per sample connection.



Sample Connection of Dwarf Signals (page_340)

Each dwarf signal occupies 2 decoder addresses. The address occupancy will not be according to the standard by switching with the first address always train-stop and train-proceed and with the second address slow-approach. The following table shows the keys and the related digital addresses respectively the signal aspects of the left clamp bar, which will occupy e.g. the addresses 1 to 4:

dwarf signal (above)		dwarf signal (below)	
H	2	H	
train stop	slow approach	train stop	
round / red / -	round / red / -	round / red / -	round / red / -
1	2	3	4
straight / green / +	straight / green / +	straight / green / +	straight / green / +
	proceed	slow approach	proceed
	1	2	1

As both clamp bars are wired identically also the addresses and signal aspects of the right clamp will be identical to the left side except by using the addresses 5 to 8:

dwarf signal (above)		dwarf signal (below)	
H	2	H	
train stop	slow approach	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
	1	2	1

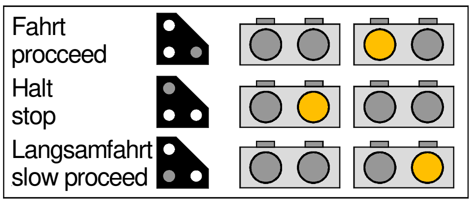
There will be no problem if a keyboard or a hand-held remote control will manually switch dwarf signals.

But if dwarf signals shall be controlled by a PC-model railway software it is required that the **address occupancy** can be separate selected within the program.

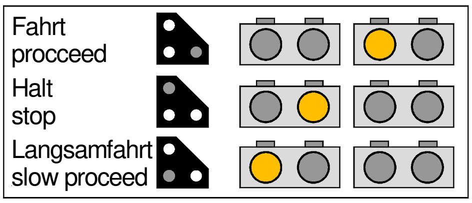
The PC-Program TrainController is offering this advantage.

The first image at the following pictures shows the adjustment within the TrainController for the upper dwarf signal. The second image shows the adjustments for the lower dwarf signal as per sample connection.

dwarf signal (upper)



dwarf signal (lower)



Basics about SBB-Signals with 5 and 7 Lamps at the *LS-DEC-SBB*

2 light signals can be connected to one Light-Signal Decoder *LS-DEC-SBB.* Each of the two identical wired 11 poles clamp bars could control one signal. The following sample connections will apply therefore for both clamp bars.

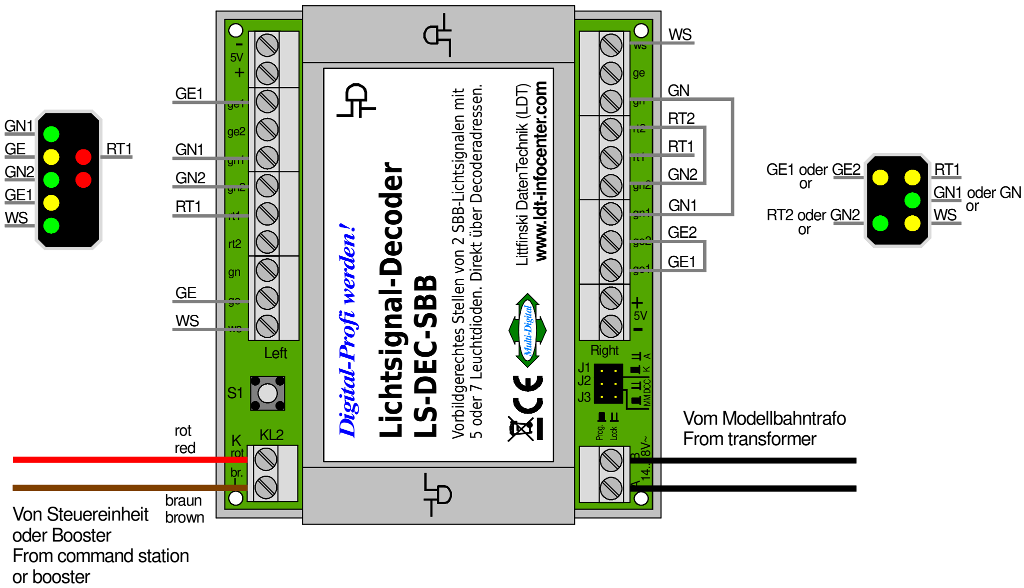
It is possible to select two operation modes at the Light-Signal Decoder *LS-DEC-SBB*: “Single Function” and “Master/Slave-Function”.

Within the operation mode “Single Function” is it possible to switch the two signals connected to the left and the right side separately. For this option will be a total of 8 decoder addresses required.
Contrary to the above will the operation mode “Master/Slave” switch both signals simultaneous (home- and advance signal with one command) by using a total of 4 decoder addresses.

The operation mode shall be adjusted together with the decoder address.

Home Signal with 7 Lamps and Advance Signal with 5 Lamps

The first sample shows the connection of one home signal with 7 lamps at the left side and one advance signal with 5 lamps at the right side:



Sample connection Home- and Advance Signal (page_287)

The home signal at the left side has been e.g. assigned to the decoder addresses 1 to 4. The addresses 5 to 8 will be assigned to the advance signal at the right side. Therefore will be four decoder addresses used by each signal (with a total of 8 addresses for both signals). Both signals can be switched separately within the operation mode “Single Function”.

Operation Mode
"Single Function"

home signal with 7 lamps

H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
1	**2**	**3**	**4**
straight / green / +	**straight / green / +**	**straight / green / +**	**straight / green / +**
proceed		**90km/h**	**40km/h**
1		5	6

advance signal with 5 lamps

H	2	3	
train stop	**40km/h**	**60km/h**	**dark switching**
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
5	**6**	**7**	**8**
straight / green / +	**straight / green / +**	**straight / green / +**	**straight / green / +**
proceed		**90km/h**	**40km/h**
1		5	6

For the setting of the dark switching of the advance signal you have at first to switch the home signal on this post to red (at our sample key 1 **red**). If you now activate the key 8 **red** you can switch the advance signal on- or off with each keystroke. If the advance signal has been switched off has been 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 phase will be stored and correctly indicated when the home signal of the same post will be switched to green.

Within the operation mode "Master/Slave" will be the home- and the advance signal switched with one command. There will be 4 decoder addresses required.

Operation Mode
"Master/Slave-Function"

home signal with 7 and adance signal with 5 lamps

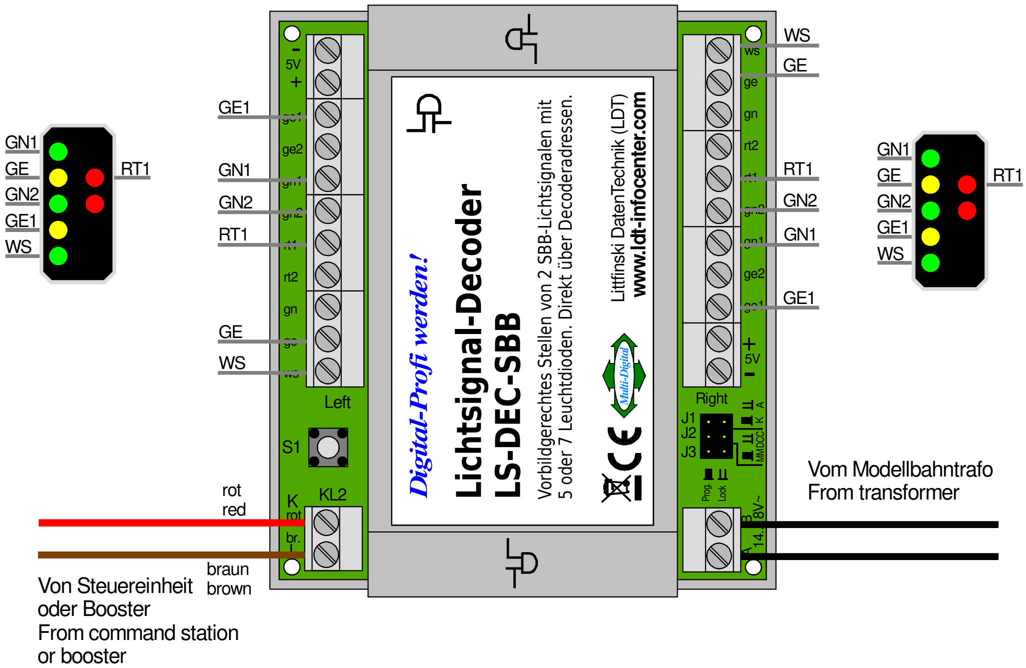
H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
1	**2**	**3**	**4**
straight / green / +	**straight / green / +**	**straight / green / +**	**straight / green / +**
proceed		**90km/h**	**40km/h**
1		5	6

Important Tip

The operation mode shall be adjusted together with the decoder address. If the decoder address will be programmed for the command "turnout **straight**" or "signal **green**" the operation mode "Single Function" shall be selected. For programming the command "turnout **round**" or "signal **red**" the mode "Master/Slave" should be selected.

Two Home Signals with 7 Lamps

The second sample shows the connection of two home signals with 7 lamps each.



■ Sample Connection two Home Signals (page_288)

The home signal at the left side has been e.g. assigned to the decoder addresses 1 to 4. The addresses 5 to 8 will be assigned to the home signal at the right side. Therefore will be four decoder addresses used by each signal (with a total of 8 addresses for both signals). Both signals can be switched separately.
The following tables show the keys and the related digital addresses:

■ Operation Mode "Single Function"

	home signal with 7 lamps		
H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
1	**2**	**3**	**4**
straight / green / +	**straight / green / +**	**straight / green / +**	**straight / green / +**
proceed		**90km/h**	**40km/h**
1		5	6

	home signal with 7 lamps		
H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
5	**6**	**7**	**8**
straight / green / +	**straight / green / +**	**straight / green / +**	**straight / green / +**
proceed		**90km/h**	**40km/h**
1		5	6

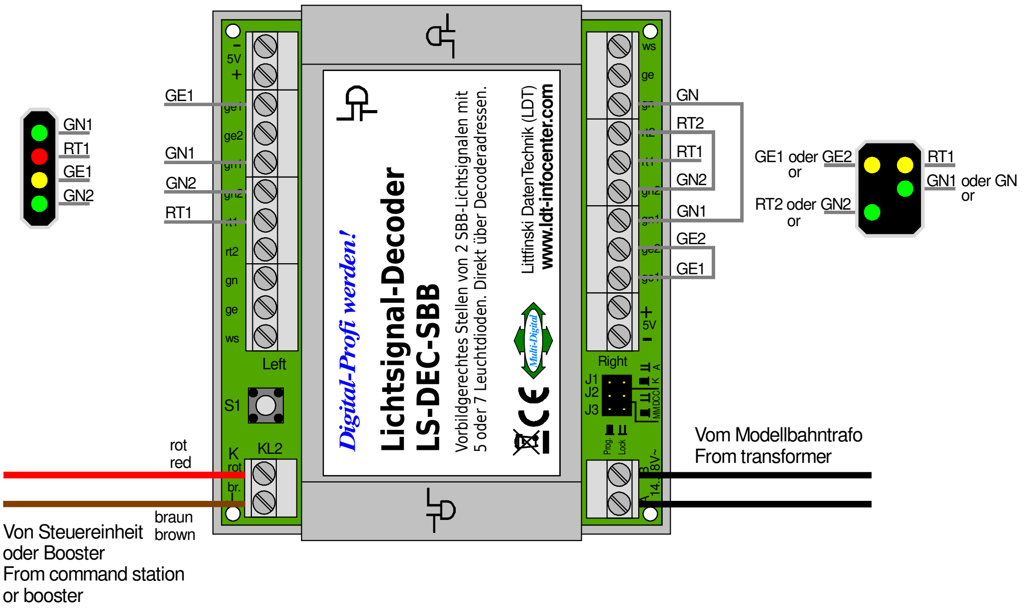
A dark-switching is not required at this sample. The operation mode has to be done within the "Single-Function". (programming with the command turnout **straight** or signal **green**.)

■ Important Tip

HOME SIGNAL WITH 4 LAMPS AND ADVANCE SIGNAL WITH 4 LAMPS

The third sample shows one home signal and one advance signal with 4 lamps each. Here are both operation modes possible (“Single-Function” and “Master/Slave-Function”).

Sample Connection Home- and Advance Signal (page_289)



The home signal at the left side has been e.g. assigned to the decoder addresses 1 to 3. The addresses 5 to 8 will be assigned to the advance signal at the right side. Therefore will be 7 decoder addresses required. Both signals can be switched separately.

The following tables show the keys and the related digital addresses:

Operation Mode “Single-Function”

home signal with 4 lamps

H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
1	**2**	**3**	**4**
straight / green / +	**straight / green / +**	**straight / green / +**	**straight / green / +**
proceed			
1			

advance signal with 4 lamps

H	2	3	
train stop	**40km/h**	**60km/h**	**dark switching**
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
5	**6**	**7**	**8**
staight / green / +	**staight / green / +**	**staight / green / +**	**staight / green / +**
proceed			
1			

If there is a home signal and an advance installed onto one signal post the dark switching mode should be set into function. For the setting of the dark switching of the advance signal you have at first to switch the home signal on this post to red (at our sample 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 has been 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 phase will be stored and correctly indicated when the home signal of the same post will be switched to green (proceed or slow approach).

The operation mode of “Single-Function” will be set within the programming of the commands turnout **straight** or signal **green**.

Important Tip

The home- and the advance signal will be switched simultaneous by one command within the “Master/Slave-Function“ – the *LS-DEC-SBB* requires only 4 decoder addresses for this option.

Operation Mode “Master/Slave-Function”

home- and advance signal with 4 lamps each			
H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	round / red / -	round / red / -	round / red / -
1	**2**	**3**	**4**
straight / green / +	straight / green / +	straight / green / +	straight / green / +
proceed			
1			

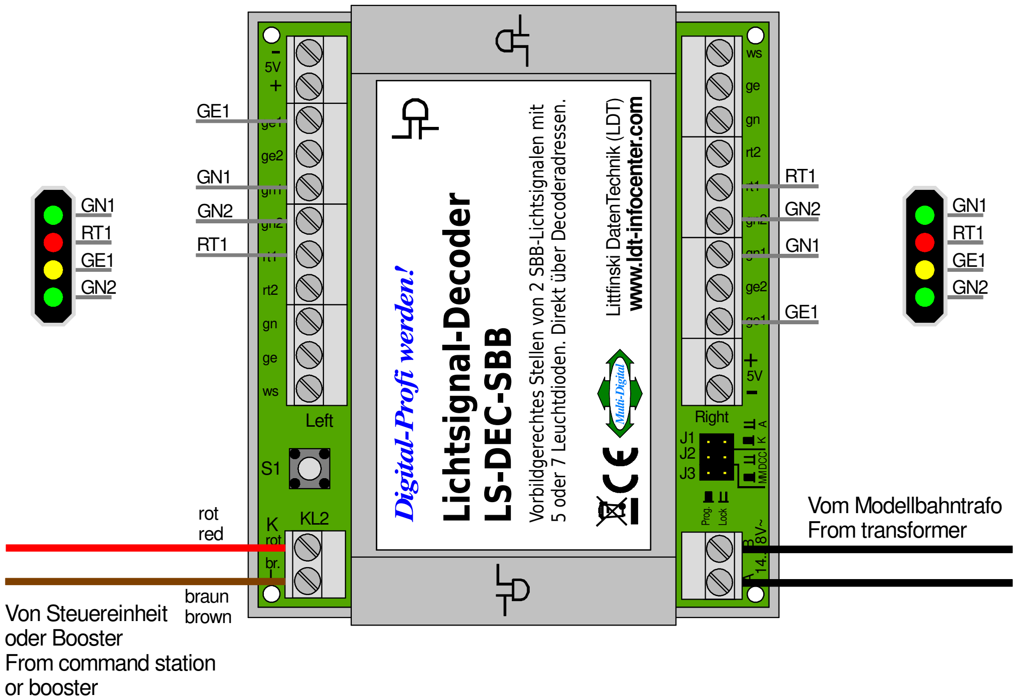
The operation mode of “Master/Slave-Function” will be set within the programming of the commands turnout **round** or signal **red**.

Important Tip

Two Home Signals with 4 Lamps

Important Tip

The fourth sample shows the connection of one home signal with 4 lamps on each side. The operation mode “Single Function” should be used. The programming has to be done with the command turnout **straight** or signal **green**.



Sample Connection two Home Signals (page_290)

The home signal at the left side has been e.g. assigned to the decoder addresses 1 to 3. The addresses 5 to 7 will be assigned to the home signal at the right side. Therefore each signal requires 3 decoder addresses (a total of 6 addresses). Both signals can be switched separately.

The following tables show the keys and the related digital addresses:

Operation Mode “Single Function”

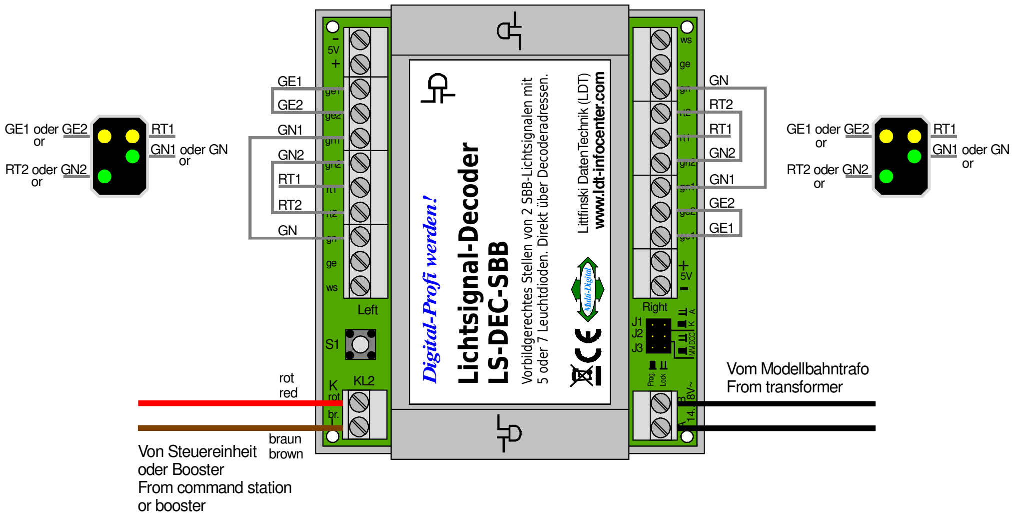
	home signal with 4 lamps		
H	2	3	
train stop	40km/h	60km/h	
round / red / -	round / red / -	round / red / -	round / red / -
1	2	3	4
straight / green / +	straight / green / +	straight / green / +	straight / green / +
proceed			
1			

	home signal with 4 lamps		
H	2	3	
train stop	40km/h	60km/h	
round / red / -	round / red / -	round / red / -	round / red / -
red	6	7	8
straight / green / +	straight / green / +	straight / green / +	straight / green / +
proceed			
1			

Two Advance Signals with 4 Lamps

Sample five shows one advance signal with 4 lamps connected to each side. The operation mode “Single Function” should be used. The programming has to be done with the command turnout **straight** or signal **green**.

Important Tip



Sample Connection two Advance Signals (page_291)

The advance signal at the left side has been e.g. assigned to the decoder addresses 1 to 3. The addresses 5 to 7 will be assigned to the advance signal at the right side. Therefore each signal requires 3 decoder addresses (a total of 6 addresses). Both signals can be switched separately.

The following tables show the keys and the related digital addresses:

Operation Mode “Single Function”

	advance signal with 4 lamps		
H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
1	**2**	**3**	**4**
straight / green /+	**straight / green /+**	**straight / green /+**	**straight / green /+**
proceed			
1			

	advance signal with 4 lamps		
H	2	3	
train stop	**40km/h**	**60km/h**	
round / red / -	**round / red / -**	**round / red / -**	**round / red / -**
5	**6**	**7**	**8**
straight / green / +	**straight / green / +**	**straight / green / +**	**straight / green / +**
proceed			
1			

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-SBB* 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.

Important Tip

The selection of the operation mode has to be done together with the programming of the decoder addresses. For programming the decoder address with the command of turnout **straight** or signal **green** the operation mode “Single Function” has to be selected. For the programming of the command of turnout **round** or signal **red** is the selection of the operation mode “Master/Slave-Function” required.

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

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_286.pdf) and printed at an A4 format.

- Internet: www.ldt-infocenter.com

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