

## *To be a Digital-Professional!*

### American Color Light signals digital controlled by the Light-Signal Decoder LS-DEC-USA

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.

All this advantages will be offered within our Light-Signal Decoder *LS-DEC-USA*. The Light-Signal Decoder *LS-DEC-USA* supports 2- and 3-aspect American Color Light Signals.

The read-in of the directly assigned decoder addresses is possible via the programming key S1 as on all our other accessory decoders.

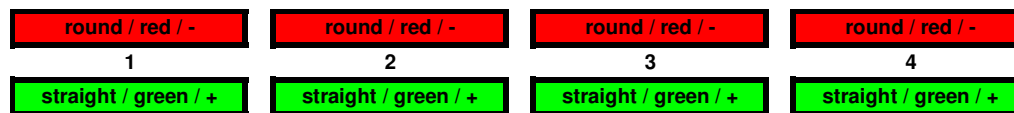
#### BASICS

Four light signals can be controlled by one light signal-decoder module. Two signals on each 11-poles clamp. 2 signal aspects can be assigned to each decoder address and 8 signal aspects can be controlled by each clamp bar.

Therefore are for each clamp bar 4 and for each decoder module 8 decoder addresses required.

The 8 key-combinations on one clamp bar (4 addresses with **red** / **green**) provide 8 signal aspects. The LS-DEC-USA requires maximal 6 of those.

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!

 LED – Light Emitting Diode

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 has to be 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 10mA. The brightness of the light emitting diodes should be sufficient. If individual LED's will be too 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 2- and 3-aspect American Color Light Signals 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*.

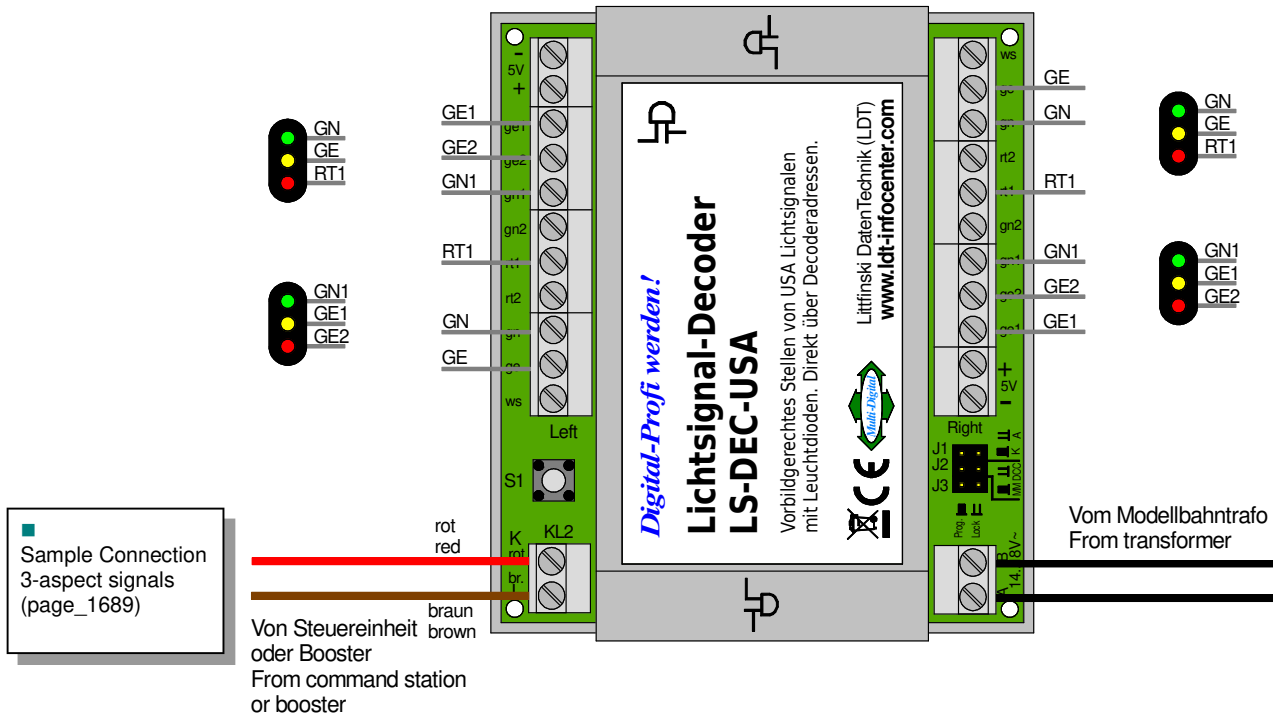
Please notice that the Light-Signal Decoder does not simply switchover the signal aspects but is dimming the light emitting diodes realistic up- and down. Additionally there will be a dark phase of about 0.4 sec. between the signal aspects. During the dark phase is it not possible for the decoder to 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 2- and 3-aspect American Color Light Signals. Within our delivery range we offer as well Light-Signal Decoders for signals of the signals of the German Railway (DB and KS), the Austrian Federal Railways (OEBB), the Swiss Federal Railways (SBB), the Nederlandse Spoorwegen (NS), the National Maatschappij 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.

## CONNECTION OF 3-ASPECT SIGNALS

At the first sample there are four 3-aspects color light signals connected to the decoder LS-DEC-USA. On each clamp bar two signals:



The two signal connection at the left side occupy e.g. the decoder addresses 1 to 4. The addresses 5 to 8 will be used for both right signals.

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 “train stop”. The green key of the address 3 has to be activated for switching the Signals (at the picture below left side) to “proceed”. The following table shows the relation of keys to the corresponding digital addresses:

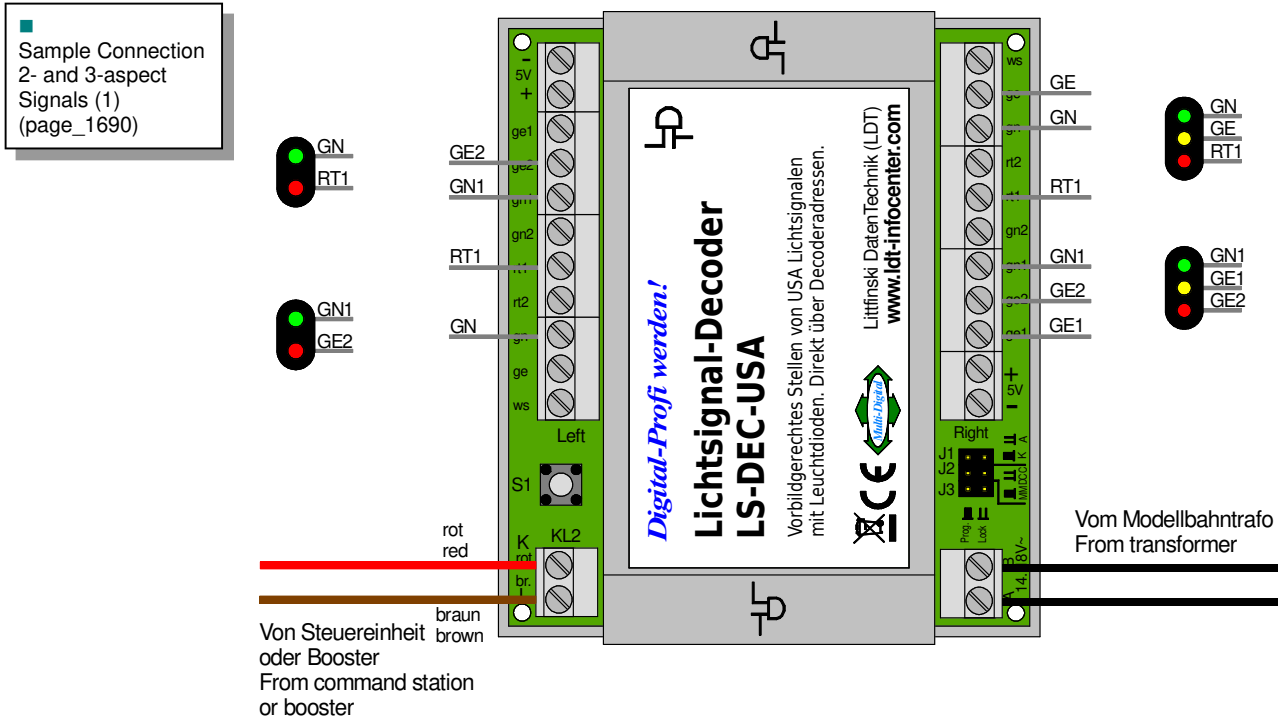
3-aspect Signal (above)		3-aspect Signal (below)	
train stop	train stop	train stop	train stop
round / red / -	round / red / -	round / red / -	round / red / -
1	2	3	4
straight / green / +	straight / green / +	straight / green / +	straight / green / +
proceed	slow approach	proceed	slow approach

To switch the signal (at the picture at the above right side) to “slow approach”, you have to activate the green key with the address 6. The following table shows the setting of keys and the assignment of digital addresses:

3-aspect Signal (above)		3-aspect Signal (below)	
train stop <div style="background-color: red; color: white; padding: 2px;">round / red / -</div> 5	train stop <div style="background-color: red; color: white; padding: 2px;">round / red / -</div> 6	train stop <div style="background-color: red; color: white; padding: 2px;">round / red / -</div> 7	train stop <div style="background-color: red; color: white; padding: 2px;">round / red / -</div> 8
<div style="background-color: green; color: white; padding: 2px;">straight / green / +</div> proceed	<div style="background-color: green; color: white; padding: 2px;">straight / green / +</div> slow approach	<div style="background-color: green; color: white; padding: 2px;">straight / green / +</div> proceed	<div style="background-color: green; color: white; padding: 2px;">straight / green / +</div> slow approach

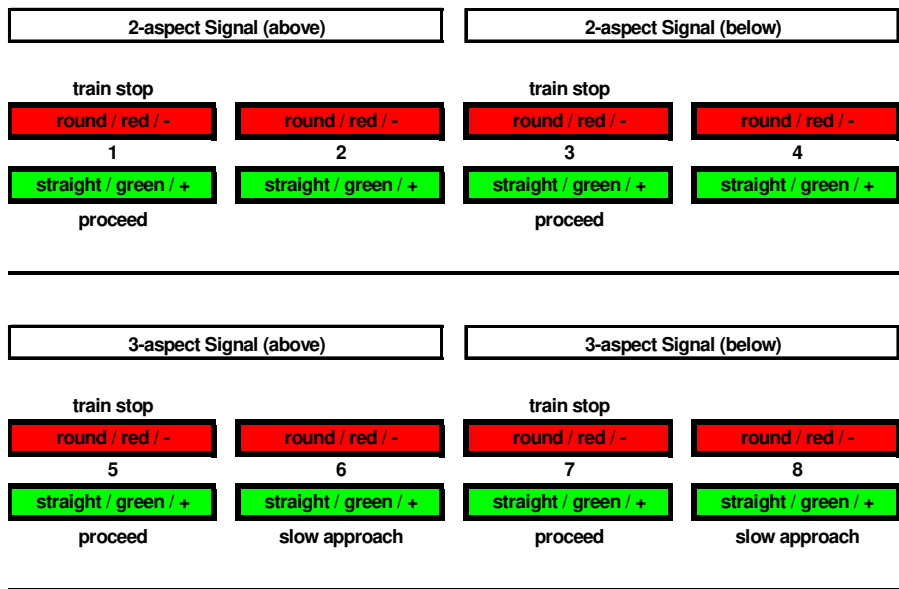
## CONNECTION OF 2- AND 3-ASPECT SIGNALS (1)

At the second sample connection are on the left clamp bar two 2-aspect signals and on the right clamp bar two 3-aspect signals connected:



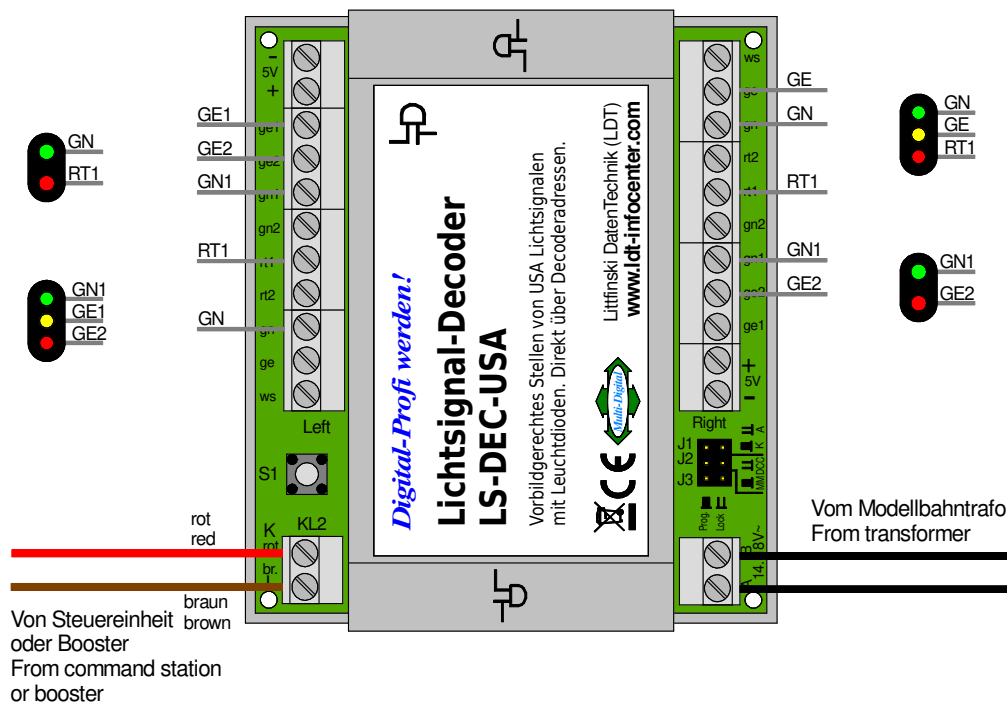
The two 2-aspect signals on the left side have been assigned at this sample to the decoder addresses 1 to 4.

The addresses 5 to 8 are assigned to the 3-aspect signals of the right side. The 2-aspect signals assign only one decoder address. The 3-aspect signals assign two decoder addresses. All signals can be controlled independently.



## CONNECTION OF 2- AND 3-ASPECT SIGNALS (2)

The third sample shows how 2- and 3-aspect signals can be mixed connected onto the LS-DEC-USA.



■ Sample Connection  
 2- and 3-aspect  
 Signals (2)  
 (page\_1691)

The two signals at the left side are assigned the decoder addresses 1 to 4.

The two signals at the right side are assigned to the addresses 5 to 8.

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

2-aspect Signal (above)		3-aspect Signal (below)	
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	slow approach

3-aspect Signal (above)		2-aspect Signal (below)	
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	

## 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-USA* 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](http://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\\_1689.pdf](#)) and printed at an A4 format.

**Author: Harry Kellner / Peter Littfinski**

Subject to technical changes and errors.  
© 01/2020 by LDT