

The DIGITAL plus by Lenz LF101XF function decoder is suitable for use in all scales. Features include:

- \* Six function outputs rated at 200mA each with advanced function mapping.
- \* Designed to allow control of external circuits that are polarity sensitive.
- \* Directional or independent lighting with dimming and special effects.
- \* Support for Advanced Consist Control and Extended Addressing.
- \* Short circuit protection.
- \* Support for programming on the mainline (operations mode programming).
- \* Support for all form of programming as described in NMRA RP-9.2.3
- \* Supports service mode decoder lock.
- \* Size: L 0.85" x W 0.47"x H 0.12" L 21.6 mm x W 12.0 mm x H 3.0 mm

## LF101XF Six Function DCC Function Only Decoder

Art. No. 10104  
February 2007

*Digital*  
— *plus*  
by Lenz®



**Important safety instructions**

The function decoder LF101XF is to be used only with Lenz DIGITAL plus or other standard digital controls with an NMRA-conformance seal. If in doubt, ask the system supplier.  
The maximum current-carrying capacity of the decoder outputs must not be exceeded as this will destroy the decoder! The parts of the decoder must not be allowed to touch the metal components of the chassis or the body of the locomotive as this will cause a short-circuit within the decoder resulting in its destruction.

**Never wrap the decoder in insulating tape** as this prevents the necessary air circulation around the decoder. Instead, use insulating tape or something similar around the metal components of the vehicle to avoid unintentional short-circuits without depriving the decoder of air. Use double-sided adhesive tape to affix the decoder.

**Technical data:**

Total current-carrying capacity:	0.4 A
Current-carrying capacity of the outputs:	200 mA each
Settable locomotive addresses:	1 - 9999

By default, the decoder is set as follows

(Of course, these default settings can be changed as desired):

Locomotive address: 3

Speed-step mode: 28 steps

Outputs A and B: controlled by F0, polarity-dependent

Output C: controlled by Function 3

Output D: controlled by Function 4

Output E: controlled by Function 5

Output F: controlled by Function 6

## Features of the function decoder LF101XF

The LF101XF is a DCC function decoder used to control functions in locomotives or coaches. (In analogue mode, the decoder functions are inactive). A total of six outputs are available.

A typical application is the switching of coach lights or the direction-dependent front light of control cars. The LF101XF has a special drive for diode-equipped control cars. The LF101XF also supports numerous lighting effects:

### Dimming:

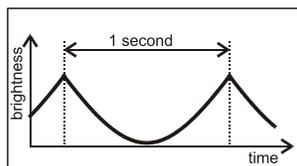
Setting the brightness of bulbs or luminous diodes.

### Flashing:

Individual outputs or alternating flashing with two outputs (ditch light). The flashing frequency is settable.

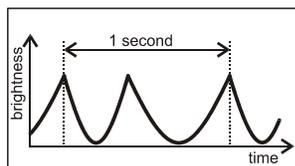
### Marslight:

Rising and dimming of the light, 1x:

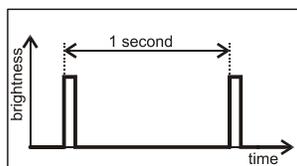


### Gyrolight:

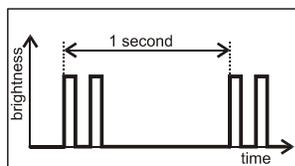
Rising and dimming of the light, 2x:



### Strobe: Flash of light



### Double strobe: Double flash of light



The individual outputs A, B, C, D, E and F can be configured individually have individual effects and to be controlled by various functions of the Digital System. This allocation is carried out by programming the CVs

<b>Outputs A and B:</b>	<ul style="list-style-type: none"> <li>- Use F0 to activate/deactivate the direction-dependent function (output A forward and output B reverse),</li> <li>- Configurable for polarity-dependent lighting (default setting of CV49)</li>   <li>- Output A and B can optionally be configured (CV49=0) to be controlled by function key F0 to F8, In this case the default for A is F1, and the default for B is F2.</li> <li>- Dimming with settable brightness (an individual dimming value can be set for each output),</li> <li>- Dimming can be controlled by a separate function</li> <li>- Various lighting effects</li> <li>- Effects can be activated through a separate function</li> <li>- Integrated diodes facilitate direct connection of relays</li> </ul>
<b>Outputs C, D:</b>	<ul style="list-style-type: none"> <li>- Output C can be configured to be controlled by function key F0 to F8, default F3</li> <li>- Output D can be configured to be controlled by function key F0 to F12, default F4</li> <li>- Dimming with settable brightness (an individual dimming value can be set for each output),</li> <li>- Dimming can be controlled by a separate function</li> <li>- Various lighting effects</li> <li>- Effects can be activated through a separate function</li> <li>- Integrated diodes facilitate direct connection of relays</li> </ul>
<b>Output E:</b>	<ul style="list-style-type: none"> <li>- Can be configured to be controlled by function key F0 to F12, default F5</li> </ul>
<b>Output F:</b>	<ul style="list-style-type: none"> <li>- Can be configured to be controlled by function key F4 to F12, default F6</li> </ul>

## Connections of the LF100XF

The LF100XF has a total of 10 connecting wires:

Wire color	Meaning	Wire color	Meaning
Red	Connection to right hand rail		
White	Function output A	Pink	Function output F
Yellow	Function output B	Brown	Function output E
Blue	Common connection for functions	Blue	Common connection for functions
Green	Function output C		
Purple	Function output D		
Black	Connection to left hand rail		
Blue	Common connection for functions		

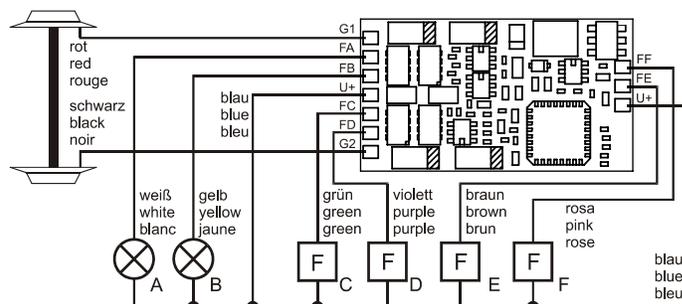
### Basic connection of functions

The individual functions are all connected in accordance with the same principle: From the decoder output to one function pole, and from the other function pole to the blue decoder wire. Alternatively, the blue wire can be substituted by a connection to a track connection (red or black wire).

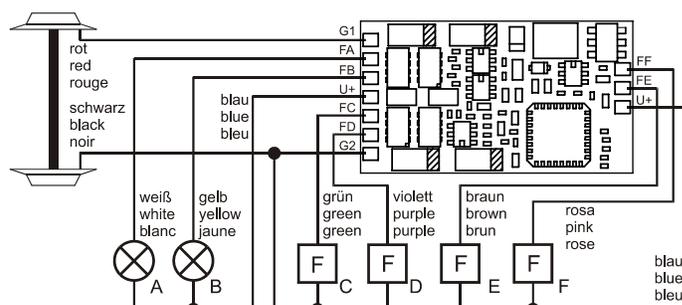
**If a track connection is used instead of the blue wire for Outputs A and B, then CV49 must be set to polarity-independent lighting (CV 49 = 0)!**

Please note that LEDs are polarity dependent. If a function output is to be connected to an LED, note that the function output is negative and that the blue wire is the positive. If you want to connect LEDs to the LF101XF, do not forget voltage limiting resistors as the Blue wire is one volt less than full track voltage.

You can install several LF101XFs in the same vehicle or you can use the LF101XF in the same locomotive as a locomotive decoder. If you install multiple decoders in the same locomotive, make sure that you program the decoders separately; before installation.



The figure above shows the basic connection of the functions to the LF101XF. Here, all functions are connected to the blue wire (positive pole).

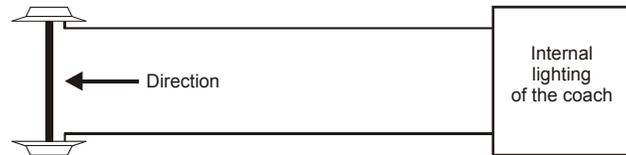


In this figure above the C and D functions outputs are connected to the black track connection:

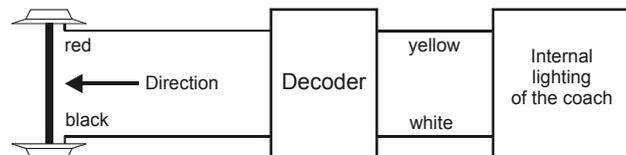
### Installation in a control car with polarity-dependent lighting

Control cars with direction-dependent light changes are normally designed so that in analogue mode the direction-dependent switching of the lighting (white/red) is done automatically via the track polarity. Depending on the track voltage polarity, the white or red light is activated: In the forward direction the positive pole is located on the right rail and the white light is activated. In the reverse direction, the red light is activated.

To facilitate conversion of these types of control cars, outputs A and B of the LF101XF are designed so that you can simply insert the LF101XF between the wheels and the electronics of the control car. Outputs C, D, E and F are then available for other functions, e.g. the internal lighting of the coach. CV49 = 1 (the default) is used to set this mode of operation.



The above diagram illustrates the connection before conversion:



The diagram above illustrates the connection after conversion:

### Programming the locomotive address and the function settings of the LF101XF

The locomotive address and all other settings of the locomotive decoder can be changed as often as desired by *PROGRAMMING*. The settings of the function decoder are 'stored' permanently in several 'storage' locations even when the operational voltage is switched off. In DCC parlance these locations are called '**C**onfiguration **V**ariables' or simply '**CV**'. The writing/reading of values is done electronically; therefore it is not necessary to reopen the locomotive after the decoder has been installed. Some features are activated/deactivated by entering a decimal value, others simply by setting or deleting bits in a CV. The table below lists the meanings of bits wherever features are changed by setting or deleting individual bits.

**To program the locomotive decoder you need a command station such as a LZ100/LZV100 with a handheld such as a LH100, a LH90 or a computer Interface. For detailed information on programming, please refer to the operating manuals of the respective devices.**

#### ***Resetting the decoder***

If you wish to reset all the decoder CVs to the factory default setting, enter value 33 or a value of 8 in CV 8.

### List of CVs supported by the LF101XF

The left column shows the CV number. The second column lists the permissible range of values or provides a list of the individual bits supported (decimal values are given in square brackets). The column 'Description' describes the CV or effect of individual bits and the last column the default setting.

C V	Value / Bit	Description	Default setting
<b>1</b>	1-127	Basic locomotive address. This number is used to address locomotives in the Digital plus by Lenz <sup>®</sup> system. The permissible value range for Digital plus by Lenz <sup>®</sup> devices is 1-99. When writing this CV, CV19 (consist address) in the decoder and Bit 6 (extended address) in CV29 are both automatically cleared.	3
<b>7</b>	-	Version number	80
<b>8</b>	-	Manufacturer's ID	99
<b>17</b>	192-231	Extended locomotive address, high-order byte	192
<b>18</b>	0-255	Extended locomotive address, low-order byte	100
<b>19</b>	1-99	Consist address	0
<b>29</b>		Decoder Configuration	2 (dec)
	1 (0)	Locomotive direction of travel: 0 = normal, 1 = reversed	
	2 (1)	Headlight mode: 0 = 14 or 27 speed step systems. 1 = 28, 55 or 128 speed steps.	
	3 (2)	Extended Addressing 0= 2 digit, 1= Four digit	
<b>30</b>	Bit	Fault display	0 (dec)
	1 (0)	1 Short-circuit	0
<b>C</b> <b>V</b> <b>33</b> <b>-</b> <b>46</b>	Value range	Function mapping for function outputs: To allocate a function of the Digital System to a function output, look for the section where the row of the desired function intersects with the column of the desired function output. Write the number found into the relevant CV. For clarification, the table shows the default settings in bold print. Example 'Function output C is to be activated with function 3'. Where row CV37/Function 3 intersects with column Function output C, you will find number 32.	Default setting

C V	Value / Bit	Description							Default setting
C V		Function output:	A	B	C	D	E	F	
33	0-255	F0 forward	8	16	32	64	128		0
34	0-255	F0 backward	8	16	32	64	128		0
35	0-255	Function 1	8	16	32	64	128		8
36	0-255	Function 2	8	16	32	64	128		16
37	0-255	Function 3	8	16	32	64	128		32
38	0-255	Function 4	1	2	4	8	16	32	8
39	0-255	Function 5	1	2	4	8	16	32	16
40	0-255	Function 6	1	2	4	8	16	32	32
41	0-255	Function 7	1	2	4	8	16	32	0
42	0-255	Function 8	1	2	4	8	16	32	0
43	0-255	Function 9				1	2	4	0
44	0-255	Function 10				1	2	4	0
45	0-255	Function 11				1	2	4	0
46	0-255	Function 12				1	2	4	0
		<p>If a function is to have an effect on several function outputs, the values found at the intersections must be added up and the result written into the CV.</p> <p><b>Example:</b> Function outputs C and D are to be switched with function 1. You must add up the two values found at the intersections of row CV35/Function 1 and the columns Function output D and C and enter the result in CV35: <math>32+64=96</math>.</p>							
49	Bit 1 (0)	<p>Polarity-dependent lighting for outputs A and B</p> <p>1 Outputs A and B change their polarity depending on the direction of motion. In the forward direction, output A is the negative pole, in the backward direction, output B is the negative pole.</p> <p>0 Outputs A and B do not change their polarity and act as normal functions activated by the values in CVs 33-42.</p>							1

C V	Value / Bit	Description	Default setting	
50 - 53		Dimming values for function outputs A to D. An individual value can be set for each output. Value 255 corresponds to maximum brightness. Technically, the brightness is set via a so-called pulse-width control, i.e. <b>the voltage at the output is not reduced</b> . This is why setting the brightness is no adequate way of adapting to low-volt bulbs!		
50	0-255	Dimming value for function output A	255	
51	0-255	Dimming value for function output B	255	
52	0-255	Dimming value for function output C	255	
53	0-255	Dimming value for function output D	255	
54 - 56		Function mapping for dimming: If value 10 is entered in the CV (no bit set), the corresponding output is permanently dimmed. If an allocation is entered (value greater than 0, at least one bit set), the dimming can be activated/deactivated with the selected function. Each bit of the CV stands for a function of the Digital System: Bit 1(0) for function 1, Bit 2(1) for function 2 and so on up to Bit 8(7) for function 8. If you want to allocate a function to the dimming, the respective bit must be set.		
54	0-255	Dimming mapping for output A	0	
55	0-255	Dimming mapping for output B	0	
56	0-255	Dimming mapping for output C	0	
57	0-255	Dimming mapping for output D	0	
58	0-255	Lighting effects at function outputs A and B The tens digit of the value stands for function output B: 0 No effect 1 Marslight 2 Gyralight 3 Strobe 4 Double strobe Examples: '00' - No effect on outputs A and B. '01' - Marslight at output A, no effect on output B '23' - Gyralight at output B, Strobe at output A	The units digit of the value stands for function output A: 0 No effect 1 Marslight 2 Gyralight 3 Strobe 4 Double strobe	0

C V	Value / Bit	Description	Default setting
<b>59</b>	0-255	Lighting effects at function outputs C and D. The tens digit of the value stands for function output D: 0 No effect 1 Flashing simultaneously with function output C 2 Flashing alternately to function output C (used for Ditch Light control) 3 Flickering Type 2 (less sooth) 4 Flickering Type 3 (excitedly) The units digit of the value stands for function output C: 0 No effect 1 Flashing 2 Flickering Type 1 (smooth)	0
<b>60</b> - <b>63</b>		Function mapping for effects: If value 10 is entered in the CV (no bit set), the corresponding output is permanently dimmed. If an allocation is entered (value greater than 0, at least one bit set), the dimming can be activated/deactivated with the selected function. Each bit of the CV stands for a function of the Digital System: Bit 1(0) for function 1, Bit 2(1) for function 2 and so on up to Bit 8(7) for function 8. If you want to allocate a function to the dimming, the respective bit must be set.	
<b>60</b>		Effect mapping for output A	0
<b>61</b>		Effect mapping for output B	0
<b>62</b>		Effect mapping for output C	0
<b>63</b>		Effect mapping for output D	0
<b>64</b>		Flashing frequency for function outputs C and D: Default approx. 1 sec, $f = 1 / (0,016 * (1 + CV64))$	32
<b>105</b>		User Identification #1	255
<b>106</b>		User Identification #2	255
<b>128</b>		Service number (Please read out the number)	1

## North American Warranty

Lenz GmbH does everything it can do to ensure that its products are free from defects and will operate for the life of your model railroad equipment. From time to time even the best engineered products fail either due to a faulty part or from accidental mistakes in installation. To protect your investment in Digital plus products, Lenz GmbH offers a very aggressive 10 year Limited Warranty.

This warranty is not valid if the user has altered, intentionally misused the Digital Plus product, or removed the product's protection, for example the heat shrink from decoders and other devices. In this case a service charge will be applied for all repairs or replacements. Should the user desire to alter a Digital Plus Product, they should contact Lenz GmbH for prior authorization.

**Year One:** A full repair or replacement will be provided to the original purchaser for any item that has failed due to manufacturer defects or failures caused by accidental user installation problems. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturer's discretion. The user must pay for shipping to an authorized Lenz GmbH warranty center.

**Year 2 and 3:** A full replacement for any item will be provided that has failed due to manufacturer defects. If the failure was caused by accidental user installation or use, a minimal service charge may be imposed. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturer's discretion. The user must pay shipping to and from the authorized Lenz GmbH warranty center during this portion of the warranty period.

**Year 4-10:** A minimal service charge will be placed on each item that has failed due to manufacturer defects and/or accidental user installation problems. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturer's discretion. The user must pay shipping to and from the authorized Lenz GmbH warranty center during this portion of the warranty period.

Please contact your dealer or authorized Lenz GmbH warranty center for specific instructions and current service charges prior to returning any equipment for repair.

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This equipment complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**CE** Please save this manual for future reference!

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