Accessory decoders are the link between your NMRA DCC system and your *function devices* (that is turnouts, signals, uncouplers, etc.) on your model train layout.

Accessory decoders receive commands sent from the command station via the power station and activate the drives of turnouts or other *switching devices*. For DIGITAL plus systems these switching commands are activated from *input devices*, such as, hand held controller LH100, tower cab LW100, interface LI100 or translation module LC100 (in connection with another, compatible digital system).

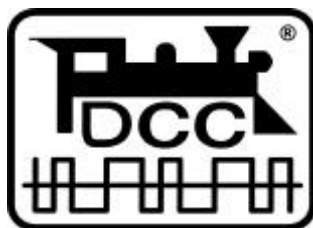+Dimensions: approximately 3.5 x 3.5" (90 x 90 mm)

LS100/110
Accessory DCC Decoder

Art. Nr. 11100 / 11110
January 1999

upgraded version 2.2

Digital
plus
by Lenz ™

Submitted for NMRA
Conformance testing

Whats new in the upgraded LS100/110?

A **push button** and an **LED** have been added to the LS100/110 to make programming easier. Direct CV mode is now supported in service mode and a selectable flashing rate has been added.

LED:

Whenever the LS100/110 has received information destined for it, the LED will light up for a certain amount of time. This allows you to very easily verify that your LS100/110 is receiving information, and thus is correctly connected. If you, for instance, have called up the turnout address on the hand held controller and press the + or - keys, and keep them pressed, then the LED will flicker or stay lit. If you release the key, then the LED will also go out again. If this is not the case, then you may have selected the wrong address on the LH100, or the connection from the LV101 to the LS100/110 is not correct.

The LED is also used as a display during programming with the push button.

Push button:

The push button allows you to reprogram the address of an installed LS100/110. You can also reset it to the factory settings. The LED here serves to indicate the programming process.

Selectable flashing rate:

In the previous version, the flashing rate was permanently preset to 2 Hz. Now you have a range of 4 to 0.5 Hz. available.

Special note

Accessory decoders LS100 and LS110 share this operation manual. Unless noted, the text applies to the LS100 as well as LS110. When describing features, connections, operational steps, etc. that apply to only one of the accessory decoders, only the decoder in question is named.

Specifications of LS100/LS110

Up to 4 function devices each with a twin output can be connected to each LS100/LS110. Power for these function devices can by supplied by the track power or through an external power supply. Each function device output can have its characteristics individually set (by programming). In this way you can program each output with a variable pulse duration, a variable flashing operation or to a constant operation,. This allows the direct connection of lightbulbs or LEDs without additional relays.

The LS100 also has a connection for the feedback bus of the DIGITAL plus system. If the feedback bus is connected, then the position of turnouts can be sent back to the system when using suitable turnout drives. It is then possible to display a turnout being thrown by either DCC or by hand.

Electrical specifications:

> **Supply voltage:**
> 8 - 18V   AC or pulsing DC
> 8 - 25V   pure DC (battery, lab power supply).
>
> **Current load capacity:**
> individual   1.7A continous,
> output: 3 A   peak (max. 20 sec.)
> whole   1.7A continous, as the sum of all
> decoder: outputs.
>   3A   peak (max. 20 sec.)

More about settings the outputs

Pulse output:

Pulse output means that the output is on (active) for at least as long as a switching command is sent to LS100/LS110. The switching command is for example sent to LS100/LS110 as long as you keep the '+' or '-' key pressed on LH100.

The time that the function device output remains active after releasing the key—*the pulse duration*—is determined by a programmed numeric value. If during the activation time of this

pulse duration a new switching command is received by the LS100/110, the output remains active for another pulse duration.

Constant output:

By pressing the '+' key on the LH100, the function device output + is activated and remains active until the '-' key is pressed at which time the - output is activated. Thus either the + or - terminal of an output is active, the output operates as a toggle switch:

For example, if you were to connect a red lightbulb of a signal to an output's + terminal, and the green lightbulb to the - terminal, then when you press the '+' key, the red lightbulb will be on (the signal shows 'stop'). If you press the '-' key, then the green lightbulb is on (the signal shows 'go'). This avoids the need to use an additional relay on light signals.

Flashing:

In this mode an output's + and - terminals are activated alternatingly.
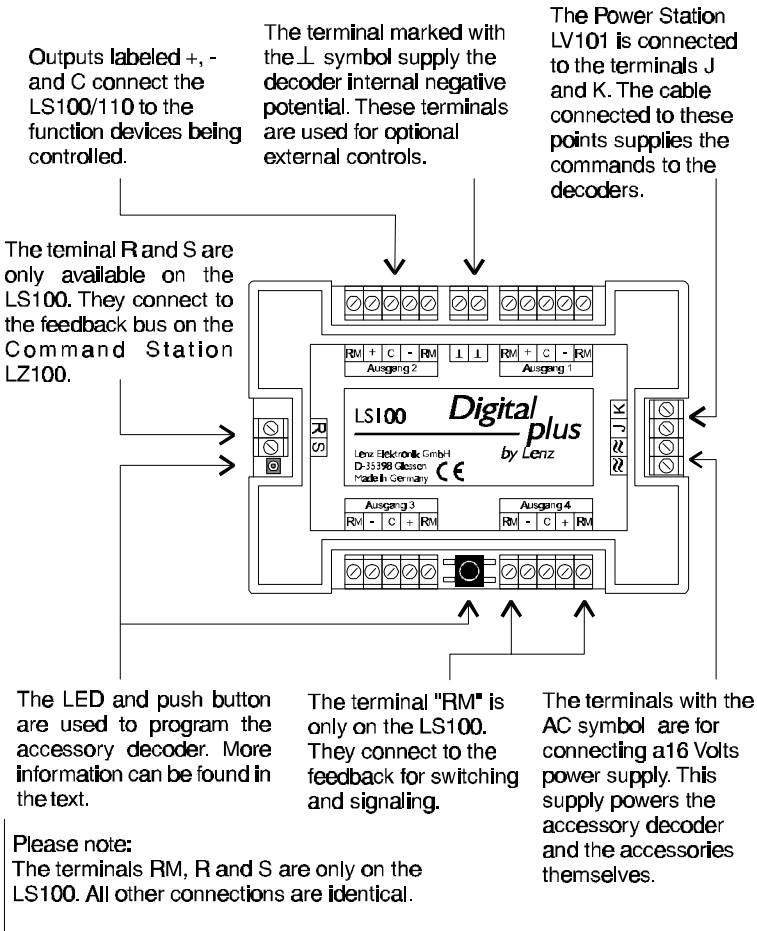
This mode of operation is suited for connecting the flashing lights at a train crossing or signal. The flashing rate is programmable; see the section "Programming the settings of an output" for more information.

General notes: Only one of the output pairs on an LS100/110 is active at any one time. For example if during pulse or constant operation the + terminal is active and the - output is activated, then the + terminal goes inactive, regardless of whether the pulse duration time is up or not. This applies in the corresponding manner when the - terminal is activated first and the + terminal is then activated.

Caution!

When programming the outputs, please note that depending on pulse duration, or with constant operation, several outputs may be active at the same time. With all the connected power users, you must then not exceed the maximum total current load capacity of 3A for the accessory decoder.

Installing the accessory decoder LS100/LS110

Outputs labeled +, - and C connect the LS100/110 to the function devices being controlled.

The terminal marked with the ⊥ symbol supply the decoder internal negative potential. These terminals are used for optional external controls.

The Power Station LV101 is connected to the terminals J and K. The cable connected to these points supplies the commands to the decoders.

The teminal R and S are only available on the LS100. They connect to the feedback bus on the Command Station LZ100.

The LED and push button are used to program the accessory decoder. More Information can be found in the text.

The terminal "RM" is only on the LS100. They connect to the feedback for switching and signaling.

The terminals with the AC symbol are for connecting a16 Volts power supply. This supply powers the accessory decoder and the accessories themselves.

Please note:
The terminals RM, R and S are only on the LS100. All other connections are identical.

Connecting the LS100/LS110 to a power station and/or separate power supply line

Before you connect your LS100/LS110 to your NMRA DCC system or the power supply line, you must turn off your DCC system and disconnect the power supply (unplug the transformer from wall outlet). There are two options for connecting your LS100/LS110: The first option uses the power supplied by your

DCC system and does not use a separate power supply line to power the LS100/110. The second option uses an external power supply to power the LS100/110. Illustrations 1 and 2 show the connection using the LS110. The LS100 is connected in the same way, using the same terminals.
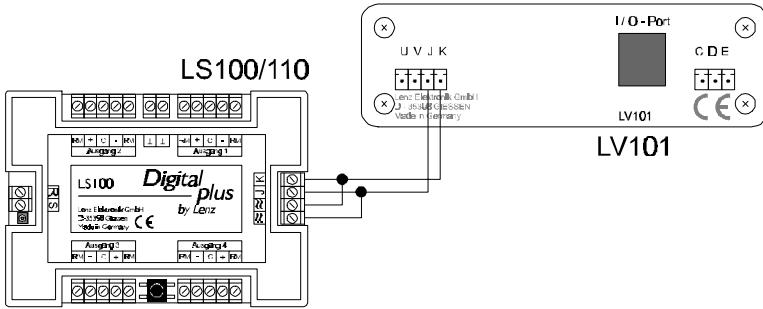

Illustration 1: Connecting an LS100/110 to an LV100/101 using a separate power supply line (LS100 shown)

Illustration1 demonstrates the method of connecting an LS100/LS110 to the track outputs of a power station. Terminals '≈' are here connected in parallel with terminals J and K to LV100/101. With this option all the power required to operate the devices connected to the LS100/110 is supplied by the DCC power station.
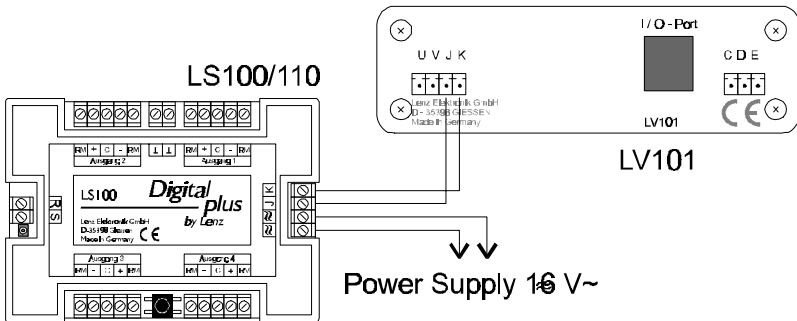

Illustration 2: Connecting an LS100/110 to an LV100/101 (LS100 shown)

Illustration 2 shows how to conect the LS100/110 to an external power supply. Terminals K and J of the LS100/LS110 are
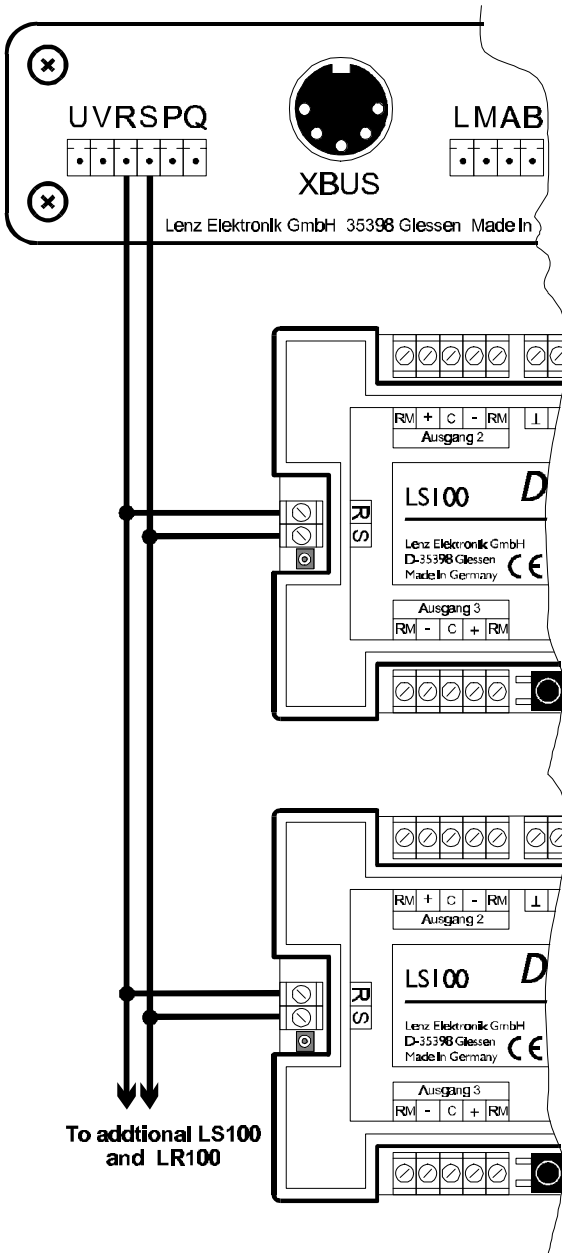
Illustration 3: Connecting the feedback bus on LS100

connected to the corresponding terminals on a power station LV100/LV101. Terminals '≈' are connected to a transformer with 16V AC.

Connecting the LS100 to the feedback bus of LZ100 (LS110 only)

Terminals R and S are connected to the corresponding terminals on command station LZ100. Please refer to Illustration 3.

All feedback capable devices are connected in parallel to the feedback bus, as shown. Since each device has its own address, it does not matter in what order the devices are connected.

Of course you can use accessory decoder LS100 and feedback encoder LR100 in any combination. You just need to make sure that you do not assign any address twice. Information about shared addresses is found in the sections "Programming address and settings of the outputs" and "Shared addresses of LS100/110/120 and LR100" later on in this manual.

Connecting devices to the function outputs

Connecting various devices to the function outputs is shown in illustration 4. Here are some additional explanations:

Connecting twin-coil turnout drives

The common wire of the two coils (2) is connected with terminal 'C'. The wire from coil 1 (1) is connected with terminal '+'; the one from coil 2 (3) with terminal '-'. Depending on the design of the turnout drive, activating the '+' terminal will result for instance in the turnout going to the 'diverge' position. If that is not how you planned it, then switch the connections at terminals '+' and '-'.

In the following table the common wire colors from some track manufacturers, is matched to the wire numbers in Illustration 4.

Wire #:	1	2	3
ROCO	red	black	green
Arnold	blue	grey	purple
Fleischmann	beige	black	brown
Trix	yellow	black	green
Märklin	blue	yellow	blue

Connecting light signals with lightbulbs or LEDs

If you wish to connect the outputs to lightbulbs or LEDs, then program the corresponding outputs on LS100/LS110 to constant on. You can then connect the lightbulbs or LEDs (using a resistor) directly to the outputs of LS100/LS110. If you use the separate AC supply, the digital current will not be used.

Information on programming settings is found in the section "Programming the settings of an output" later on in this manual.

In Illustration 4 the connection of a signal's lightbulbs is shown in the upper left and the connection of LEDs in the lower left.

Important:

When connecting a LED, please remember that terminal 'C' is positive. You must therefore connect the cathodes of the LEDs in the signal with terminals '+' and '-'.

When using LEDs, a current limiting resistor is necessary. Please determine if this resistor is already installed in your LED signal.

If that is not the case, then with a supply voltage of 16V AC you need to use a current limiting resistor of 1.5 kOhm. If the LED is not bright enough with that, then try lowering the resistor value (1kOhm). If the LED is too bright, use a larger resistor value. In the illustration this resistor is indicated with 'R'.
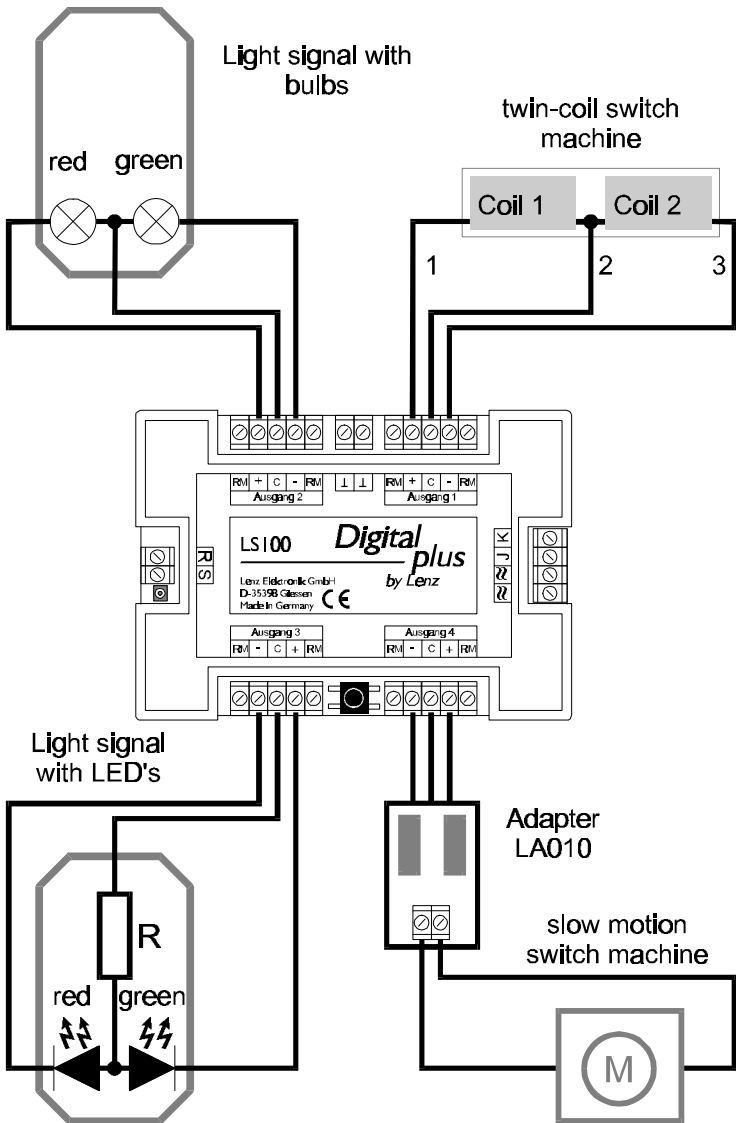
Illustration 4: Connecting devices to the LS100/LS110 function outputs

Connecting a motorized turnout drive

To connect motorized turnout drives, you need adapter LA010 (Illustration 4 lower right). This adapter changes the polarity of the motor connections to the required direction as needed.

By using this adaptor, you avoid complicated relay set-ups for controlling a motorized drive.

For motorized drives program the outputs to pulse operation and set the pulse duration such that the motor remains on until it reaches the end of its stroke. With stall current turnout motors the pulse duration can be set to constant on.

Information about programming settings is found in the section "Programming the address and settings" later on in this manual.

Connecting the function devices to the feedback inputs of LS100

If you use twin-coil turnouts with end-of-stroke disconnect, or a stall current turnout motor then the connection to the feedback input is very simple: Connect each terminal + and - with the RM terminal next to it. For details, see illustration 5 on the left.

If your drive has separate feedback contacts, then connect it as shown in illustration 5 on the right.
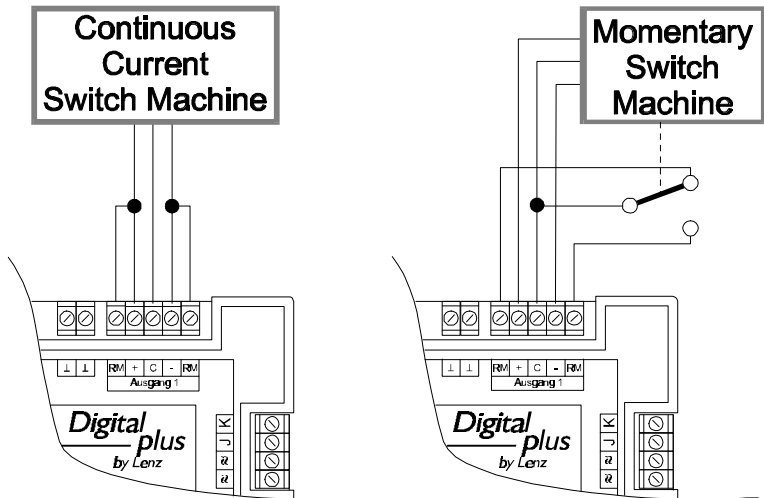

Illustration 5: Connecting the feedback inputs

For information on how to read the turnout position on hand held controller LH100 or another device, please refer to the manual for that device.

Using external control on conjunction with the LS100/110

The LS100/LS110 version 2 provides the ability to control the function devices connected to LS100/LS110 either digitally or with an external push button (or REED switch). This is done using the terminal marked '⊥'. Illustration 6 shows you how to wire the external push buttons and/or REED switches.
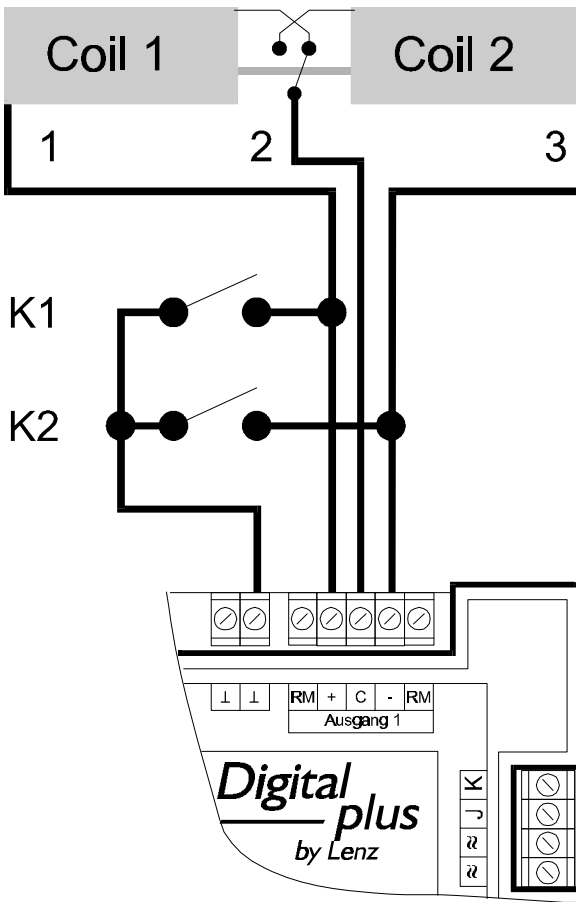

Illustration 6: Connecting external controls

It is required that the output to be optionally controlled by an external push button not be set to flashing or constant operation and that the function device being controlled is equipped with end-of-stroke disconnect.

Shown is the typical twin-coil drive for signals or turnouts. The two coils are connected with the + and - terminals on the accessory decoder. The illustration shows LS100, on LS110 connections are made in the same manner to the same terminals. In addition both buttons K1 and K2 are connected. If you press button K1, then coil 1 is activated; if you press button K2, then coil 2 is activated. This way, you can throw the turnout (or switch the signal) digitally using LS100/LS110, or with the buttons K1 and K2.

IMPORTANT:
The ⊥ terminals of different LS100/LS110's must not be connected with each other. This is not a common ground! You must only use potential free (isolated) contacts (for instance REED switches). The ROCO control track 42518 is another suitable example.

Programming address and settings of outputs

First you must determine which numbers the function devices that will be connected are to 'listen' to; you must program the address of the accessory decoder. In the second step, you determine the settings of the outputs.

Standard settings of accessory decoder LS100/LS110

From the factory LS100/LS110 is programmed to turnout numbers 1 to 4. The outputs are set to pulse operation with the shortest pulse duration. These settings are referred to as *standard settings*.

Explanations of the turnout addresses

Note that LS100/LS110 is always programmed to a group of 4 turnout addresses. This is for example the numbers 1 to 4, 5 to 8, 9 to 12 and so on up to 253 to 256. It is not possible to program a LS100/LS110 to the turnout numbers 3, 4, 5 and 6, since these turnout numbers belong to two different groups.

The shared address area of LS100/LS110/LS120 and LR100

Information about the positions of turnouts and signals from accessory decoder LS100/LS110 and feedback encoder LR100 occupies the same memory locations in the command station. Information from the feedback encoder with addresses 1 to 63 overlaps information from turnouts 1 to 256.

Even non-feedback capable LS110 turnout positions have the last command sent stored in this address area. Since no positive feedback is available, this information may not match the actual turnout position.

For each turnout address there are 2 feedback positions in the command station; for each feedback encoder, there are 8 feedback positions in the command station. The overlap is displayed in table 5.

Example:

If you have programmed an accessory decoder LS100 to addresses 5, 6, 7 and 8, then it occupies the feedback positions 9 to 16 in the command station. You can therefore not use a feedback encoder with address 2, since this would occupy the same feedback numbers in the command station.

Programming the address of LS100/LS110 using the programming button

This is a process where you can program LS100/LS110 to a turnout address without using the programming output .

This process is suitable whenever you do not need any particular settings for the outputs and/or the accessory decoder is already installed and needs to be reprogrammed to another address. You can use any device that can send a acessory decoder command such as a LH100 hand held controller or LW100 Tower Cab.

For these instructions we assume that command station, power station and hand held controller or tower cab all are correctly connected with each other, and in operation (see manuals of the devices).

Press the programming button on the LS100/LS110 and keep it pressed until the LED lights up and stays lit (this takes a few seconds). Now release the button. The LED stays on. The LS100/LS110 now will take its new address from the first DCC accessory decoder command it receives.

To correctly program the LS100/LS110 at this point ensure that no device is sending commands without your knowledge. These commands could for instance come via the interface from a computer program that is running, a switching chain from tower cab LW100 or even from another operator on the layout.

Now intentionally generate the switching command needed for programming:

with hand held controller LH100:
  Switch LH100 over to operation mode 'Throw turnout' (Key sequence F, 5). Enter one of the 4 turnout addresses in the group that you want to program LS100/LS110 to. Confirm the entry with the 'enter' key. Now press the '+' or '-' key on the hand held controller and thereby send a switching command.

with tower cab LW100:
  Press the red or green key of one of the 4 turnouts in the group that you want to program LS100/LS110 to. You may need to first set LW100 to the needed group (see the manual for LW100). With each pressing of the red or green key, you cause a switching command to be sent.

The turnout address sent in the switching command is now permanently stored in the LS100/LS110. Verify that the programming took place by observing the LED goes out and the correct turnout is thrown (if connected). The LS100/LS110 is now back in normal operation mode.

Programming LS100/LS110 to the standard settings using the programming button

Press the programming button and keep it pressed. After approximately 5 seconds the LED is lit constantly. Continue to press the button. After another 5 seconds the LED starts flashing. Continue to press the button pressed until the LED turns off again. When this ocurs the operation is completed

Programming address and settings through the programming output of LZ100

Address and other settings of LS100/LS110 are stored in so called "registers", abbreviated "R". These registers can be imagined as a sort of notepad that can have new entries put on them again and again. The written entries remain stored even after the power is turned off.

Assignment of registers

LS100/LS110 has 6 registers, that are used as follows:

Reg	CV	AltCV	used for	allowed range of values
1	1	513	address	1 - 256
2	3	515	settings output 1	0 - 15; 32; 33 - 47
3	4	516	settings output 2	0 - 15; 32; 33 - 47
4	5	517	settings output 3	0 - 15; 32; 33 - 47
5	6	518	settings output 4	0 - 15; 32; 33 - 47
7	7	519	version number	2.2
8	8	520	manufacturer ID	99
-	29	541	Configuration	128

Table 1: Assignment of registers

The value stored in R1 thus determines the address, the 'number' with which the connected function devices are addressed.

R†2†to†5 behave the same: The values stored here determine the settings of the outputs. From table 2 you see the values that need to be entered for a desired setting of an output:

Value	Setting
0 - 15	Pulse output, variable pulse duration
32	Constant output
33 - 47	Flashing, variable rate

Table 2: Settings of the outputs

Values other than the ones listed are not allowed and will lead to random results.

The pulse duration is determined by the following values:

value	pulse duration (seconds)	value	pulse duration (seconds)
0	0.1	8	2.0
1	0.2	9	3.0
2	0.3	10	4.0
3	0.5	11	6.0
4	0.6	12	8.0
5	0.8	13	10
6	1.0	14	12
7	1.5	15	15

Table 3: Setting pulse duration

The flashing rate is determined by the following values:

Value	flashing rate (Hz)	Value	flashing rate (Hz)
33	4	41	2.0
34	3.75	42	1.75
35	3.5	43	1.5
36	3.25	44	1.25
37	3.0	45	1.0
38	2.75	46	0.75
39	2.5	47	0.5
40	2.25		

Table 4: Setting the flashing rate

The decoder version number is contained in R7. R8 contains the manufacturer ID, which for Lenz Elektronik is 99. Both registers can only be read, and can not be overwritten.

Connecting the LS100/LS110 to the programming output of a command station

When the accessory decoder is to be programmed using the programming output of the command station, we recommend that you do all the programming before installation. For the command station to be able to recognize successful programming, please connect a turnout motor or a lightbulb (not an LED!) to an output that is not set to constant on or flashing operation. If you do not do this, you will get an error message "ERR02" (decoder not found) on the LH100.
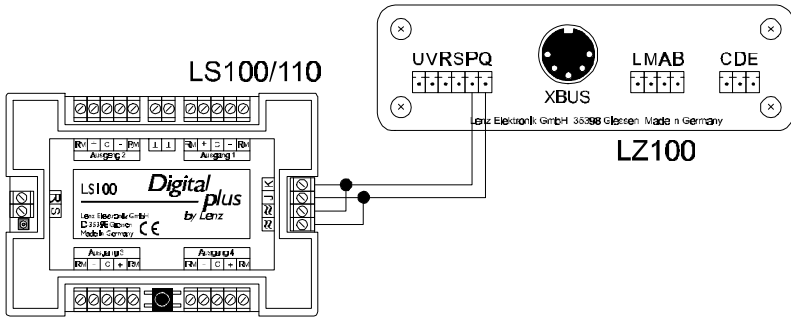
**Illustration 7: Connecting LS100/LS110 to the
programming output of LZ100**

To program address and settings you need your command station LZ100, hand held controller LH100 and a transformer with 16V AC output to supply power for LZ100. The LS100/LS110 is programmed using the programming output of command station LZ100. (Note any other system capable of Direct CV mode or Register mode programming can also sucessfuly program an LS100/LS110.)

To do this, connect terminals J and K, as well as the terminals for the AC supply (•) of the LS100/LS110 to the programming output (terminals P and Q) of the LZ100 command station.

Enter programming mode, as described in the manual for the LH100.

Programming using LH100 with software version 2.1

Please proceed as follows:
Key   On the display you see

(flashes)

Confirm again with the 'Enter' key.

Next LH100 will show you the most recently chosen programming mode. Press the '+' key repeatedly until the display shows

$$RE\;G$$

Confirm this display with the 'Enter' key.

Now you must indicate which register you want to program. In table 1 you can see which register is responsible for which function.

Note: There is an error in the LH100 to be aware of
If you select the "CV" mode, the LH100 starts an address search . At its completion, you receive the display "LENZ -d". After pressing any key the address is displayed "SAD xx", where xx is the decoders address. If you now again press any key other than the 'CL" key, the LH100 will show "R*_" which is in error as the LH100 is actually still in CV mode and not in REG mode as the display indicates. To return to REG mode, please press the "Esc" key repeatedly until the display again shows "PROG", press enter and then choose the "REG" mode using the "+" key.

Programming the turnout address

Proceed to programming mode as described above.

Let's assume that you want to program LS100/LS110 to turnout addresses 9, 10, 11 and 12.

Select register 1 as the register to program, since the address is stored at this position (see table 1).

On LH100 enter one of the four turnout addresses, to which you want to program LS100/LS110. In this example that is 9, 10, 11 or 12.

Start the programming by pressing the 'enter' key. LS100/LS110 will now be programmed to turnout numbers 9 to 12. Output 1 will be addressed with turnout address 9, output 2 with address 10 and so on. On the hand held controller you get the message

"ERR 02". Ignore this message, since LS100/LS110 is not able to confirm successful programming to the command station. Neither can you read out the values stored in the memory locations.

Programming the settings of an output

In the following examples the settings of output 1 of LS100/LS110 are programmed. Outputs 2, 3 and 4 are programmed in the same manner, only with the corresponding change of the storage location.

First connect the accessory decoder to the programming output of the command station, as described above, and change into programming mode with the hand held controller.

Select register 3. In this position the settings of output 1 are stored (see Table 1).

Example 1: Setting pulse operation with shortest pulse duration.

As you see from tables 2 and 3 above, you must enter the number 1 on hand held controller LH100 as the value to be programmed. Then start the programming with the 'Enter" key.

Example 2: Setting to constant on:

Enter 32 as the value to be programmed on hand held controller LH100 (see Table 2). Start the programming sequence with the 'Enter' key.

By entering other values from table 3, you can choose to define the other settings.

Table 5 Feedback addresses / turnout addresses: F-Feedback address; T-Turnout address, FE-Feedback information in the command station

F	FE	T	F	FE	T
1	1 to 8	1 to 4	33	257 to 264	129 to 132
2	9 to 16	5 to 8	34	265 to 272	133 to 136
3	17 to 24	9 to 12	35	273 to 280	137 to 140
4	25 to 32	13 to 16	36	281 to 288	141 to 144
5	33 to 40	17 to 20	37	289 to 296	145 to 148
6	41 to 48	21 to 24	38	297 to 304	149 to 152
7	49 to 56	25 to 28	39	305 to 312	153 to 156
8	57 to 64	29 to 32	40	313 to 320	157 to 160
9	65 to 72	33 to 36	41	321 to 328	161 to 164
10	73 to 80	37 to 40	42	329 to 336	165 to 168
11	81 to 88	41 to 44	43	337 to 344	169 to 172
12	89 to 96	45 to 48	44	345 to 352	173 to 176
13	97 to 104	49 to 52	45	353 to 360	177 to 180
14	105 to 112	53 to 56	46	361 to 368	181 to 184
15	113 to 120	57 to 60	47	369 to 376	185 to 188
16	121 to 128	61 to 64	48	377 to 384	189 to 192
17	129 to 136	65 to 68	49	385 to 392	193 to 196
18	137 to 144	69 to 72	50	393 to 400	197 to 200
19	145 to 152	73 to 76	51	401 to 408	201 to 204
20	153 to 160	77 to 80	52	409 to 416	205 to 208
21	161 to 168	81 to 84	53	417 to 424	209 to 212
22	169 to 176	85 to 88	54	425 to 432	213 to 216
23	177 to 184	89 to 92	55	433 to 440	217 to 220
24	185 to 192	93 to 96	56	441 to 448	221 to 224
25	193 to 200	97 to 100	57	449 to 456	225 to 228
26	201 to 208	101 to 104	58	457 to 464	229 to 232
27	209 to 216	105 to 108	59	465 to 472	233 to 236
28	217 to 224	109 to 112	60	473 to 480	237 to 240
29	225 to 232	113 to 116	61	481 to 488	241 to 244
30	233 to 240	117 to 120	62	489 to 496	245 to 248
31	241 to 248	121 to 124	63	497 to 504	249 to 252
32	249 to 256	125 to 128	64	505 to 512	253 to 256

Trouble shooting

Problem	Cause	Solution
Turnout does not throw, the **LED does not flicker** while a switching command is being sent (a switching command is always sent when you press the '+' or '-' key on LH100 while in switching mode, or when on LW100 one of the red or green keys is pressed).	Wrong turnout address entered.	Enter the correct turnout address.
	Connection between command station and power station or between power station and accessory decoder is broken.	Check and correct the connections.
	A power station has turned off due to a short circuit or user initiating an EMERGENCY OFF.	Remove cause of the short circuit, in case of an overload, divide the layout into several supply sections.
	External power supply is not connected (terminals '≈' are not connected).	Connect the power supply (see illustrations 2 and 1).
Turnout does not throw, but the **LED flickers** while a switching command is being sent.	Turnout or signal drive is not correctly connected, or is defective.	Test and correct the connections.
A called up LS100 is not shown as a feedback capable decoder (no R shows in the LH100 display).	Feedback bus is not connected or the wires R and S are switched.	Connect the feedback bus, or correct the wires.
When calling up a LS100/LS110 on LH100, the following display shows: ▾ R * 1 13 $-$ $-$ F	The entered address is not occupied by an accessory decoder, but by a feedback encoder.	Enter the correct turnout address. Check if you accidentally programmed overlapping addresses (see "The shared address area of LS100/LS110/LS120 and LR100) earlier in this manual.
When programming from the programming output of the command station, you get the message "ERR 02" on the hand held controller.	The command station cannot test for successful programming, since no load is connected to the output of LS100/LS110.	Connect a turnout drive or lightbulb to one of the outputs of LS100/LS110. See the section "Programming address and settings through the programming output of LZ100" earlier in this manual.
When programming from the programming output of the command station, you get the message "ERR 02" on the hand held controller.	Connection between the programming output of the command station (terminals P and Q) and LS100/LS110 is not correct.	Test and correct all connections.

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 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 manufacturers 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 manufacturers 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 manufacturers 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.

Lenz Elektronik GmbH

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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!