[R] Uhlenbrock Elektronik

LocoNet Switch module 63410
Lamp, Turnout and multipurpose Light signal switching

1. Operation
The LocoNet Switch module can be used for switching turnouts, lamps and signals. It receives the switching commands from the control centre or control devices via the LocoNet. The loads (Turnouts, lamps etc.) are connected directly to the module and are energized by a transformer that is connected to the LocoNet module. That way the devices that are supplied by the module don't load the digital driving current from the control centre or booster.

The LocoNet Switch module has 20 output terminals for 20 different devices. Each of the 20 outputs can be individually configured for operating mode:
· which solenoid - or feedback command switches the output on
· which solenoid - or feedback command switches the output off
· if the output is to be continuous
· if the output is on for only a limited time
· if the output is to blink
· the blinking cycle it to use
· if the output is controlled by one or two blink generators
· if the output is to be fast or slow switched

Furthermore it is possible to switch main and warning light signals with various operating patterns. Four signal pattern systems are supported. Up to 4 outputs are used for connecting the individual lamps in these signals.

The module is configured using LocoNet programming. A programming tool makes it possible to configure the module as pure turnout or switching decoders.
Details for this are in chapter 5 "Programming Tool".

2. Connection

2.1 LocoNet Connection

Using the supplied LocoNet cable connect the Switch module to LocoNet T or LocoNet B output of the Intellibox or TwinCenter or a LocoNet of another Digital centre. If the supplied cable is insufficient you can find a variety of cables and couplings and distributors for constructing your LocoNet in our catalog.
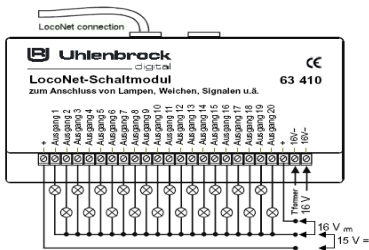
2.2 Transformer Connection

Connect the transformer to the two terminals labeled "16V ~". The transformer which powers the switch module must not be connected to the transformer from the digital centre. However it may be used to power other switch modules.

2.3 Connection of switched devices

All switched devices whether lamps, turnouts or LED's with limiting resistor are connected to "output 1" to "output 20" with one connection and the other side to one

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of the terminals labeled "+". Take care that polarized devices (LED's) are connected the right way around.

The two terminals labeled "+" provide different potentials. The left terminal outputs a DC voltage of 15V and the right terminal outputs 16V half wave rectified (100Hz). (Both depend on the use of a 16V transformer e.g. 20070). Use the left terminal (15V DC) when used in conjunction with LED's and limiting resistors and the slow on/off switching mode. For lamps use the right terminal (half wave rectified 16V).

3. Configuring the Switch module

LocoNet devices are configured using LocoNet Configuration variables (LNCVs). These LNCVs can be programmed with the Intellibox (from Software Version 1.3), the IB-Control (from Version 1.55) or TwinCenter (from Version 1.1). Since the switch module can only be used when sensibly programmed we will describe programming of the LNCV's next.

3.1 Selecting a LocoNet Switch module

· Connect the module to the LocoNet.
· On the Intellibox (from Software version 1.3) press the [menu]-key and the [mode]-key to go to Basic Settings menu.
· Use the [↓]-key till you come to the "LocoNet Prog." menu.
· Press the [→]-key:

```
LocoNet Prog.:
Art.-Nr.:  .....
```

· Enter the part module number (here 63410) and press the [↵]-key.

```
LN Prog.:  63410
Modul Adr.:.....
```

· Enter the module's address (a new module is address 1) and press the [↵]-key.
  The module's part number and valid module address are shown on the top line.
  The bottom row shows LocoNet-CV (here 0, for the module address) and its
  current value (here 1).

```
LNPr 63410-00001
LNCV:....0=....1
```

NOTE: Every module uses a module address for programming so the digital controller
knows which module is to be programmed. The factory default address of the switch
module is 1. If further Switch modules are to be connected to the centre, they must
be given different module addresses. The valid address range is 1 to 65534. To
indicate that the LocoNet Switch module is being addressed correctly, the device on
A1 is continually switched on and off, if the module is in the programming mode.

3.2 Reading and Programming a LocoNet Module

Like DCC locomotive decoders the configuration of LocoNet Switch modules is set up
in various Configuration variables (CV). Unlike locomotive decoders these are not
programmed via the track but via the LocoNet and are therefore referred to as
LocoNet CV's or in short LNCV's.

· After calling up the module (see Chapter 5.1) the Intellibox display shows:

```
LNPr 63410-00001
LNCV:....0=....1
```

The cursor blinks under the 0.
· At the cursor position enter the number of the LocoNet CV to be programmed and
· Press the [↵]-key.
· The Intellibox reads the LNCV.
  The value is displayed on the lower line of the display.

- Using the [→]-key move the cursor to the right and enter the desired value for the LNCV using the number keys.
- Press the [←]-key to program the value.
- Use the [←]-key to return to select another LNCV.
- Use the [←]-key to return to select another Switch module.
- Or the [menu]-key to exit programming.

As you are already used to with you Intellibox, you can also change the numbers indicated by the blinking cursor by pressing the [+] and [-] key to increment or decrement the value.

3.3 The Universal Address 65535

As the name suggests you can use the universal address to call up all LocoNet switch modules. As the universal address is not an address with which LocoNet Switch modules can be identified it can only be used to call up modules whose real address is not known. When doing this only the particular module can be connected to the LocoNet. If the module is then called up LNCV 0 is read to determine the programmed address.
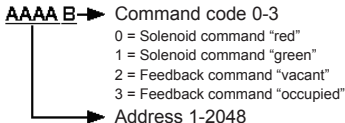
Procedure:
- Press the [menu]-key
- Press the [mode]-key
- Using the [↓]-key cycle to the "LocoNet Prog." menu.
- Continue with the [→]-key
- Enter the part number (for the Switch module 63410)
- Enter the universal address 65535
- Press the [←]-key
- The module's address is read from LNCV 0 and displayed.

4. Various Application Possibilities
4.1 Switching of Lamps or other Devices
The device is connected to the desired output terminal as outlined in Chapter 2.3.
So the load can be switched on and off using the digital system you must first decide which digital command is to be used. This can be setup via one LNCV per output for how it is to be switched on and another to determine how it is to be switched off. The 'on' configuration is determined by LNCV's 21 to 40 for output 1 to output 20 and the 'off' configuration by LNCV's 41 to 60.

The programmed values for LNCV's 21 to 60 for on/off switching are worked out as follows:

AAAA B � Command code 0-3
- 0 = Solenoid command "red"
- 1 = Solenoid command "green"
- 2 = Feedback command "vacant"
- 3 = Feedback command "occupied"
➤ Address 1-2048

Example: Output 1 is to be a switching output to turn switch house lights.

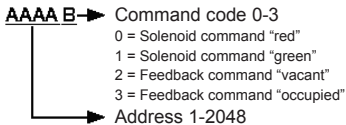| LNCV	Function
21 = 1001	Output 1 is switched on using a 'green' solenoid command for address 100
41 = 1000	Output 1 is switched off using a 'red' solenoid command for address 100

Important: For the configuration described, the LNCV which affects the switching type of the output must contain a value 0. (LNCV 61-80 for the outputs 1-20).

4.2 Switching of Turnouts or other Solenoids

The double solenoid of a turnout or signal has the common return line connected to the "+" terminal. The switching lines are connected to the desired output terminals.

So that the solenoid can be switched by the digital system you must decide which command is to be used for the switching it. This can be setup via one LNCV per output for how the output is to be switched on and another LNCV determines how it is to be switched off. This can be achieved by configuring LNCV's 21 to 40 for output 1 to output 20.

The values to be programmed into LNCV's 21 to 40 are determined as follows:

AAAA B → Command code 0-3
- 0 = Solenoid command "red"
- 1 = Solenoid command "green"
- 2 = Feedback command "vacant"
- 3 = Feedback command "occupied"

→ Address 1-2048

Next the switching type for output must be setup so that the output remains on for a specific time. LNCV's 61 to 80 for output 1 to output 20 are setup to determine the switching type.

The values for LNCV's 61 to 80 are determined as follows:

ZZZZ S → Switching type 0-3
- 0 = Permanent Output/Timed Output
- 1 = Blink generator 1
- 2 = Blink generator 2
- 3 = Blink generator 1 and 2

→ Switching time 0-255 (value x 0.05 seconds)
- 0 = Permanent Output
- 1-255 = Timed Output

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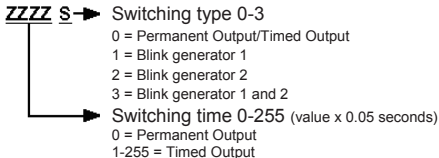
Example: A turnout is to be connected to outputs 1 and 2 and switched by address 10. In this instance output 1 is to turn the turnout to branch (red) and output 2 to straight (green).

LNCV	Function
21 = 100	Output 1 is turned to red by solenoid command for address 10
22 = 101	Output 2 is turned to green by solenoid command for address 10
61 = 100	Output 1 is switched on for a duration of 0.5s
62 = 100	Output 2 is switched on for a duration of 0.5s

4.3 Blinking Outputs

The load is connected to the desired output terminal as described in chapter 2.3.

The switch output is programmed as described in chapter 4.1.

For the lamp connected to the output to blink the switching type must be programmed. This is done for outputs 1 to 20 using LNCV's 61 to 80.

The values for programming LNCV's 61 to 80 are determined as follows:

ZZZZ **S** → Switching type 0-3
  0 = Permanent Output/Timed Output
  1 = Blink generator 1
  2 = Blink generator 2
  3 = Blink generator 1 and 2
→ Switching time 0-255 (value x 0.05 seconds)
  0 = Permanent Output
  1-255 = Timed Output
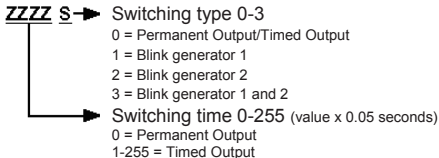
Depending on the output which is used and which blink generator is assigned to the output, the flashing rate can be adjusted using the following LNCV's:

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Generator	For Output	LNCV		Generator	For Output	LNCV
1	1-8	2		2	1-8	5
1	9-16	3		2	9-16	6
1	17-20	4		2	17-20	7

The programmed value specifies the time delay for a level change at the output in tenths of seconds.

Example: Output 1 is to blink once per second using Generator 1.

LNCV	Function
61 = 1	Output 1 is connected to blink generator 1
2 = 10	Blink generator 1 blinks 1 x per second

4.4 Slow switching Outputs

LNCV 8 (output 1 to 16) and 9 (output 17 to 20) can be used to set each output to 'slowly' switch on and off. This applies to light signal and level crossing prototypes.

The following table should help to determine the value to program into LNCV 8 and 9. The sum of the values in the individual columns gives the value for LNCV 8 and/or 9 so that one or more outputs are slowly switched on and off.

Output	Switch fast	Switch slow	Value
1	0	1	
2	0	2	
3	0	4	
4	0	8	
5	0	16	
6	0	32	
7	0	64	
8	0	128	
9	0	256	
10	0	512	
11	0	1024	
12	0	2048	
13	0	4096	
14	0	8192	
15	0	16384	
16	0	32768	
Sum = Value for LNCV 8			

Output	Switch fast	Switch slow	Value
17	0	1	
18	0	2	
19	0	4	
20	0	8	
Sum = Value for LNCV 9			

LNCV 10 is used to specify the ramping time common to all the outputs for the slow on and off switching. The overlap time is specified in steps of 0.032 s.

Example: Output 1, 16 and output 20 are to be slowly switched on and off with an overlap time of 0.5 seconds.
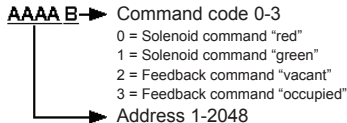
LNCV	Function
8 = 3276	Output 1 and 16 are slowly switched on and off
9 = 8	Output 20 is slowly switched on and off
10 = 16	Overlap time 16 * 0.032s = 0.512s

4.5 Connecting Light Signals
4.5.1 Light Signals with 2 States

Light signals with two states "stop" and "go" are connected to two outputs of the Switch module. The common wire for the signal is connected to the right "+" terminal. So the signal can be switched on and off using the digital system you must first decide which digital command is to be used. This can be setup via one LNCV per output to set how the output is to be switched on and another to determine how it is to be switched off. The switch-on configuration is setup in LNCV's 21 to 40 for output 1 to output 20 and the switch-off configuration is setup in LNCV's 41 to 60.

The values to be programmed into LNCV's 21 to 60 to specify the on and off switching commands are determined as follows:

AAAA B━▶ Command code 0-3
            0 = Solenoid command "red"
            1 = Solenoid command "green"
            2 = Feedback command "vacant"
            3 = Feedback command "occupied"
     ━▶ Address 1-2048

Example: The signal's red LED is connected to output 5 and the green LED to output 6. It is to be switched by solenoid address 20. The following programming is required:
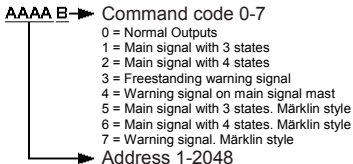
LNCV	Function
25 = 200	Output 5 switches the red on by solenoid command to address 20
45 = 200	Output 5 switches the red off by solenoid command to address 20
26 = 201	Output 6 switches the green on by solenoid command to address 20
46 = 200	Output 6 switches the green off by solenoid command to address 20
65 = 0	Output 5 is a permanent output
66 = 0	Output 6 is a permanent output

4.5.2 Light signals with more than 2 States

To control signals with more than 2 states using the switch module, 5 groups each with 4 outputs, have been setup:

Group	1	2	3	4	5
Output	1-4	5-8	9-12	13-16	17-20
LNCV	11	12	13	14	15

As indicated in the table, the groups are configured by LNCV's 11 to 15. The codes programmed in these LNCV's specify the type of signal to be connected and if wanted the solenoid address to be used. The code is determined as follows:

AAAA B ► Command code 0-7
- 0 = Normal Outputs
- 1 = Main signal with 3 states
- 2 = Main signal with 4 states
- 3 = Freestanding warning signal
- 4 = Warning signal on main signal mast
- 5 = Main signal with 3 states. Märklin style
- 6 = Main signal with 4 states. Märklin style
- 7 = Warning signal. Märklin style

► Address 1-2048

The programming of LNCV's 11 to 15, sets the particular output group for the desired signal functionality and also automatically programs the appropriate LNCV's from the range 21 to 80, in order to realize the switching pattern for the selected signal type. If, for example, the signal is not to use two successive addresses, after the programming of LNCV's 11 to 15, the specific LNCV's from range 21 to 60 can be altered.

Warning: 4 state main light signals use 5 connecting wires from the module to the signal. The fifth wires from groups 1-4 are connected to terminals 17-20 in Group 5. Subsequently Group 5 cannot control another signal.

4.5.2.1 Main Light Signals with 3 states

Main light signals with 3 states "Stop", "Go" and "Proceed slowly" are connected as follows:

Group	LNCV	LED Ed	LED Green	LED Yellow	Not used
1	11	Output 1	Output 2	Output 3	Output 4
2	12	Output 5	Output 6	Output 7	Output 8
3	13	Output 9	Output 10	Output 11	Output 12
4	14	Output 13	Output 14	Output 15	Output 16
5	15	Output 17	Output 18	Output 19	Output 20

For each used group, one of the LNCV's 11 to 15 is programmed with the code AAAA1. Where, AAAA represents the solenoid address. The signal states "Stop" and "Go" are controlled via this solenoid address, the third state "proceed slowly" is controlled by the following address (AAAA+1).

This results in the following switching scheme:

Solenoid status		Outputs			
address AAAA	address AAAA+1	1,5,9,13,17 Red	2,6,10,14,18 Green	3,7,11,15,19 Yellow	4,8,12,16,20 Not used
Red	Red	On	Off	Off	-
Green	Red	Off	On	Off	-
Red	Green	On	Off	Off	-
Green	Green	Off	On	On	-

By programming LNCV 11 to 15, the following LNCV's are automatically programmed:

Group	LNCV							
1	21	22	23	24	41	42	43	44
2	25	26	27	28	45	46	47	48
3	29	30	31	32	49	50	51	52
4	33	34	35	36	53	54	55	56
5	37	38	39	40	57	58	59	60
Value	AAAA0	AAAA1	(AAAA+1)1	-	AAAA1	AAAA0	(AAAA+1)0	-

The fourth output of each group,, that is outputs 4,8,12,16,20 are not used in this operating mode and can be otherwise used buy programming LNCV (24,28,32,36,40 and 44,48,52,56,60).

Example: A main signal with "Stop" (red LED), "Go" (green LED) and "Proceed slowly" (yellow LED) are be controlled using solenoid addresses 50 and 51, using group 3 (outputs 9-12). LED connections:

Group	LNCV	LED Red	LED Green	LED yellow	Not Used
3	13	Output 9	Output 10	Output 11	Output 12

LNCV	Function
13 = 501	Outputs 9, 10, 11 are used for main signals with 3 states. The signal operated with address 50 and 51.

4.5.2.2 Main Light Signals with 4 States

Connection of main light signals "Stop", "Go", "Proceed Slow" and "Shunting":

Group	LNCV	LED red 1	LED green	LED yellow	LED white	LED red 2
1	11	Output 1	Output 2	Output 3	Output 4	Output 17
2	12	Output 5	Output 6	Output 7	Output 8	Output 18
3	13	Output 9	Output 10	Output 11	Output 12	Output 19
4	14	Output 13	Output 14	Output 15	Output 16	Output 20

Note: Main light signals with 4 states require 5 connections from module to signal. The fifth line from the signals in group 1-4 are connected to terminals 17-20 of group 5. Subsequently no other signal can be connected to the terminals in group 5.

According to the groups used LNCV's 11 to 14 must be programmed with code in the AAAA2 format, where AAAA is a solenoid address. The "Stop" and "Go" signal states are switched by this solenoid address, the "Proceed Slowly" is switched by the following address (AAAA+1) and the "Shunting" state by address (AAAA+2). This results in following switching scheme:

Solenoid State			Outputs				
Address	Address	Address	1,5,9,13,17	2,6,10,14,18	3,7,11,15,19	4,8,12,16,20	17,18,19,20
AAAA	AAAA+1	AAAA+2	Red 1	Green	Yellow	White	Red 2
Red	Red	Red	On	Off	Off	Off	On
Green	Red	Red	Off	On	Off	Off	Off
Red	Green	Red	On	Off	Off	Off	On
Green	Green	Red	Off	On	On	Off	Off
Red	Red	Green	On	Off	Off	On	Off
Green	Red	Green	Off	On	Off	Off	Off
Red	Green	Green	On	Off	Off	Off	On
Green	Green	Green	Off	On	On	Off	Off

The programming of LNCV 11 to 14 uses successive addresses for the signal. If this is not desirable, the LNCV's that were automatically programmed as a result of programming LNCV 11 to 14 can be altered. The following LNCV's are programmed automatically to values in the table when LNCV 11 to 14 are programmed:

Group	LNCV								
1	21	22	23	24	41	42	43	44	37, 57
2	25	26	27	28	45	46	47	48	38, 58
3	29	30	31	32	49	50	51	52	39, 59
4	33	34	35	36	53	54	55	56	40, 60
Value	AAAA0	AAAA1	(AAAA+1)1	(AAAA+2)1	AAAA1	AAAA0	(AAAA+1)0	(AAAA+2)0	0

Example: A main signal with "Stop" (red LED), "Go" (green LED), "Proceed Slowly" (yellow LED) and "Shunting" (white) is to be switched by solenoid addresses 60, 61 and 62. It is to be driven by group 2 (outputs 5-8). Connection of the LED's:

Group	LNCV	LED Red	LED Green	LED Yellow	LED White
2	12	Output 5	Output 6	Output 7	Output 8

LNCV	Function
12 = 602	Outputs 5,6,7,8 are used for the main signal with four states. The signal is controlled using addresses 60 (Stop, Go), 61 (Proceed Slowly) and 62 (Shunting).

4.5.2.3 Free standing Light Warning Signals

Free standing warning signals are connected as follows:

Group	LNCV	LED yellow top	LED yellow bottom	LED Green top	LED Green bottom
1	11	Output 1	Output 2	Output 3	Output 4
2	12	Output 5	Output 6	Output 7	Output 8
3	13	Output 9	Output 10	Output 11	Output 12
4	14	Output 13	Output 14	Output 15	Output 16
5	15	Output 17	Output 18	Output 19	Output 20

The group to be used must be configured with one of LNCV's 11 to 15 with code AAAA3, where AAAA represents a solenoid address. The signal states "Stop" and "Go" are switched by this solenoid address, the third state "Proceed Slowly" is switched by the following address (AAAA+1).

This results in the following switching scheme:

Solenoid States		Outputs			
Address AAAA	Address AAAA+1	1,5,9,13,17 Yellow top	2,6,10,14,18 Yellow bottom	3,7,11,15,19 Green top	4,8,12,16,20 Green bottom
Red	Red	On	On	Off	Off
Green	Red	Off	Off	On	On
Red	Green	On	On	Off	Off
Green	Green	Off	On	On	Off

When programming LNCV 11 to 15 the following LNCV's are automatically programmed:

Group	LNCV							
1	21	22	23	24	41	42	43	44
2	25	26	27	28	45	46	47	48
3	29	30	31	32	49	50	51	52
4	33	34	35	36	53	54	55	56
5	37	38	39	40	57	58	59	60
Value	AAAA0	(AAAA+1)0	AAAA1	(AAAA+1)1	AAAA1	(AAAA+1)1	AAAA0	(AAAA+1)0

Example: A free standing warning signal with "Stop", "Go" and "Proceed Slowly" states is to be switched using solenoid addresses 20 and 21. It's to be switched using group 1 (outputs 1-4). LED connections:

Group	LNCV	LED Yellow top	LED Yellow bottom	LED Green top	LED Green bottom
1	11	Output 1	Output 2	Output 3	Output 4

LNCV	Function
11 = 203	Outputs 1,2,3,4 are used for the warning signal with 3 states. The signal is switched by addresses 20 and 21.

4.5.2.4 Light Warning Signal on the Mast of a Main Signal

Warning signals on the mast of a main signal are connected as follows:

Group	LNCV	LED Yellow top	LED Yellow bottom	LED Green top	LED Green bottom
1	11	Output 1	Output 2	Output 3	Output 4
2	12	Output 5	Output 6	Output 7	Output 8
3	13	Output 9	Output 10	Output 11	Output 12
4	14	Output 13	Output 14	Output 15	Output 16
5	15	Output 17	Output 18	Output 19	Output 20

The group to be used must be configured with one of LNCV's 11 to 15 with code AAAA4, where AAAA represents a solenoid address. The signal states "Stop" and "Go" are switched by this solenoid address, the third state "Proceed Slowly" is switched by the following address (AAAA+1).

This results in the following switching scheme:

Solenoid State		Output			
Address AAAA	Address AAAA+1	1,5,9,13,17 Yellow top	2,6,10,14,18 Yellow bottom	3,7,11,15,19 Green top	4,8,12,16,20 Green bottom
Red	Red	On	On	Off	Off
Green	Red	Off	Off	On	On
Red	Green	Off	Off	Off	Off
Green	Green	Off	On	On	Off

The difference from the previous free standing warning signal is here in the switching scheme. The combination of solenoid and address AAAA in the red state and solenoid with address AAAA+1 in green state switch the warning signal to "dark" variant.

When programming LNCV 11 to 15, the following LNCV's are automatically programmed:

Group	LNCV							
1	21	22	23	24	41	42	43	44
2	25	26	27	28	45	46	47	48
3	29	30	31	32	49	50	51	52
4	33	34	35	36	53	54	55	56
5	37	38	39	40	57	58	59	60
Value	AAAA0	(AAAA+1)0	AAAA1	(AAAA+1)1	AAAA1	(AAAA+1)1	AAAA0	(AAAA+1)0

Example: A warning signal on a mast of a main signal with states "Stop", "Go" and "Proceed Slowly" is to be switched using solenoid address 20 and 21. It is to be driven by group 1 (outputs 1-4). LED connections:

Group	LNCV	LED Yellow top	LED Yellow bottom	LED Green top	LED Green bottom
1	11	Output 1	Output 2	Output 3	Output 4

LNCV	Function
11 = 204	Outputs 1,2,3,4 are used for the warning signal with 3 states. The signal is switched by addresses 20 and 21.

4.5.2.5 Main Light signal with 3 States and Märklin type switching

Main light signal with 3 states "Stop", "Go" and "Proceed Slowly" are connected as follows:

Group	LNCV	LED Red	LED Green	LED Yellow	Not Used
1	11	Output 1	Output 2	Output 3	Output 4
2	12	Output 5	Output 6	Output 7	Output 8
3	13	Output 9	Output 10	Output 11	Output 12
4	14	Output 13	Output 14	Output 15	Output 16
5	15	Output 17	Output 18	Output 19	Output 20

The group to be used must be configured with one of LNCV's 11 to 15 with code AAAA5, where AAAA represents a solenoid address. The signal states "Stop" and "Go" are switched by this solenoid address, the third state "Proceed Slowly" is switched by the following address (AAAA+1). The difference in operation from Chap. 4.5.2.1 is that the signals indication is not determined by the status of solenoid used but by the key pressed last. This emulates the operation of Märklin light signal 76394 and 76397. This results in the following switching scheme:

Solenoid State		Outputs			
Solenoid address and Status		1,5,9,13,17 Red	2,6,10,14,18 Green	3,7,11,15,19 Yellow	4,8,12,16,20 Not Used
Address AAAA	Red	On	Off	Off	-
Address AAAA	Green	Off	On	Off	-
Address AAAA+1	Green	Off	Off	On	-

When programming LNCV 11 to 15 the following LNCV's are automatically programmed:

Group	LNCV							
1	21	22	23	24	41	42	43	44
2	25	26	27	28	45	46	47	48
3	29	30	31	32	49	50	51	52
4	33	34	35	36	53	54	55	56
5	37	38	39	40	57	58	59	60
Value	AAAA0	AAAA1	(AAAA+1)1	-	0	0	0	-

The fourth output of each group, that is outputs 4,8,12,16,20 remain unused in this operating mode and may be used for other purposes by programming the relevant LNCV's directly (LNCV 24,28,32,36,40 and 44,48,52,56,60).

Example: Main light signal with states "Stop" (red LED), "Go" (green LED) and "Proceed Slowly" (yellow LED) is to be switched by solenoid address 50 and 51, in Märklin. It is to be driven by group 3 (outputs 9-12).
LED connections:

Group	LNCV	LED Red	LED Green	LED Yellow	Not used
3	13	Output 9	Output 10	Output 11	Output 12

LNCV	Function
13 = 505	Outputs 9, 10, 11 are used for the warning signal with 3 states. The signal is switched by addresses 50 and 51.

4.5.2.6 Main Light signal with 4 States and Märklin type switching

Main light signal with states "Stop", "Go", "Proceed Slowly" and "Shunting" are connected as follows:

Group	LNCV	LED Red 1	LED Green	LED Yellow	LED White	LED Red 2
1	11	Output 1	Output 2	Output 3	Output 4	Output 17
2	12	Output 5	Output 6	Output 7	Output 8	Output 18
3	13	Output 9	Output 10	Output 11	Output 12	Output 19
4	14	Output 13	Output 14	Output 15	Output 16	Output 20

Note: This type of signal can only be used by groups 1-4. If it is used then no further signal can be connected to group 5.

The group to be used must be configured with one of LNCV's 11 to 15 with code AAAA6, where AAAA represents a solenoid address. The signal states "Stop" and "Go" are switched by this solenoid address, the third state "Proceed Slowly" is switched by the following address (AAAA+1). The difference in operation from Chap. 4.5.2.2 is that the signals indication is not determined by the status of solenoid used but by the key pressed last. This emulates the operation of Märklin light signal 76394 and 76397. This results in the following switching scheme:

Solenoid State		Outputs			
Solenoid address and State		1,5,9,13,17 Red	2,6,10,14,18 Green	3,7,11,15,19 Yellow	4,8,12,16,20 White
Address AAAA	Red	On	Off	Off	Off
Address AAAA	Green	Off	On	Off	Off
Address AAAA+1	Green	Off	Off	On	Off
Address AAAA+1	Red	Off	Off	Off	On

The programming of LNCV 11 to 14 uses sequential addresses for the signal. If this is not desirable, the LNCV's that are automatically programmed by configuring LNCV

11 to 14 can be changed. The following LNCV's are automatically programmed to values in the table when LNCV 11 to 14 are programmed:

Group	LNCV								
1	21	22	23	24	41	42	43	44	37, 57
2	25	26	27	28	45	46	47	48	38, 58
3	29	30	31	32	49	50	51	52	39, 59
4	33	34	35	36	53	54	55	56	40, 60
Value	AAAA0	AAAA1	(AAAA+1)1	(AAAA+1)0	0	0	0	0	0

Example: Main signal with states "Stop" (red LED), "Go" (green LED), "Proceed Slowly" (yellow LED) and "Shunting" (white) is to be switched by solenoid addresses 60 and 61 using Märklin switching. It is to be driven by group 2 (outputs 5-8). LED connections:

Group	LNCV	LED Red	LED Green	LED Yellow	Not used
2	12	Output 5	Output 6	Output 7	Output 8

LNCV	Function
13 = 606	Outputs 5,6,7,8 are used for the warning signal with 4 states. The signal is switched by addresses 60 (Stop, Go) and 61(Proceed Slowly, Shunting)

4.5.2.7 Warning Light signal with Märklin type Control
Warning signals are connected as follows:

Group	LNCV	LED Yellow top	LED Yellow bottom	LED Green top	LED Green bottom
1	11	Output 1	Output 2	Output 3	Output 4
2	12	Output 5	Output 6	Output 7	Output 8
3	13	Output 9	Output 10	Output 11	Output 12
4	14	Output 13	Output 14	Output 15	Output 16
5	15	Output 17	Output 18	Output 19	Output 20

The group to be used must be configured with one of LNCV's 11 to 15 with code AAAA7, where AAAA represents a solenoid address. The signal states "Stop" and "Go" are switched by this solenoid address, the third state "Proceed Slowly" is switched by the following address (AAAA+1). The difference in operation from Chap. 4.5.2.3 is that the signals indication is not determined by the status of solenoid used but by the key pressed last. This emulates the operation of Märklin light signal 76394 and 76397. This results in the following switching scheme:

Solenoid State		Outputs			
Solenoid address and Status		1,5,9,13,17 Yellow top	2,6,10,14,18 Yellow bottom	3,7,11,15,19 Green top	4,8,12,16,20 Green bottom
Address AAAA	Red	On	On	Off	Off
Address AAAA	Green	Off	Off	On	On
Address AAAA+1	Green	Off	On	On	Off
Address AAAA+1	Red	Off	Off	Off	Off

When programming LNCV 11 to 15 the following LNCV's are automatically programmed:

Group	LNCV							
1	21	22	23	24	41	42	43	44
2	25	26	27	28	45	46	47	48
3	29	30	31	32	49	50	51	52
4	33	34	35	36	53	54	55	56
5	37	38	39	40	57	58	59	60
Value	AAAA0	(AAAA+1)0	AAAA1	(AAAA+1)1	0	0	0	0

Example: A free standing warning with states "Stop", "Go" and "Proceed Slowly" is to be switched with solenoid addresses 20 and 21 using Märklin switching. It is to be driven by group 1 (outputs 1-4). LED connections:

Group	LNCV	LED Yellow top	LED Yellow bottom	LED Green top	LED Green bottom
1	11	Output 1	Output 2	Output 3	Output 4

LNCV	Function
11 = 207	Outputs 1,2,3,4 are used for the warning signal with 3 states. The signal is switched by addresses 20 and 21 using Märklin mode.

5. Programming Assistance

Via LNCV 1 the module has programming assistance. This allows easy programming of all the module's outputs to the same functionality. The following functions can be setup this way:

1. All outputs switch turnouts
2. All outputs switch light signals with 2 states (Stop/Go)
3. All outputs switch individual loads (lighting etc.)
4. Reset the module to factory defaults
5. Erase LNCV's 11-15, 21-80 so no output are active

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The codes for programming LNCV 1 are as follows:

LNCV 1	Description
= AAAA1	Results in paired outputs for turnout control with a switching time of 0.5s Output 1: address AAAA red / Output 2: address AAAA green ... to Output 19: address AAAA+9 red / Output 20: address AAAA+9 green
= AAAA2	Results in paired outputs for on/off switching e.g. signals with 2 states (Stop/Go) Output 1: address AAAA red / Output 2: address AAAA green ... to Output 19: address AAAA+9 red / Output 20: address AAAA+9 green
= AAAA3	Results in outputs being individual On/Off switches e.g. for address AAAA red = Off/ green = On ... to Output 20: address AAAA+19 red = Off/ green = On
= 8	Factory reset Results in outputs being individual On/Off switches e.g. lighting Output 1: address 199 red = Off/ green = On ... to Output 20: address 218 red = Off/ green = On
= 9	Deactivates all outputs. LNCV's 11-15 and 21-80 are erased

6. More Application Examples

6.1 Feedback notification switching Crossing On/Off and Stop directly from train.

Output A10 will be used as output for this operation. A feedback module with address 10 will be employed to monitor the track in the vicinity of the level crossing. If the track is occupied the crossing lights are to blink. The light is also to realistically turn slowly on and off. The following programming is required:

LNCV	Function
30 = 203	Feedback address 20 occupied switches output 10 On
50 = 202	Feedback address 20 vacant switches output 10 Off
70 = 1	Output 10 is driven by blink generator 1
3 = 20	For output 9 to 16 blink generator 1 blinks 1x every 2 seconds
8 = 512	Output 10 is set to damped switching
10 = 26	Overlap time is 0.5 seconds

6.2. Signal functions with damped light transitions

All signal functions can be linked with the function of the damped on/off switching. For this the desired signal function is programmed as described in chapter 4. The outputs used by the signal function can be linked with this function using LNCV's 8 and 9.

Example: Output Group 1 was connected to a main signal with 3 states. The signal connection to outputs 1, 2, 3 are to use damped on/off switching.

LNCV	Function
8 = 7	Sets outputs 1,2,3 to function with damped on/off switching
10 = 16	Sets the overlap time to 0.5 seconds

7. List of LNCV's

LNCV	Description	Value Range	Default Value
0	Module address	0-65534	1
1	Programming Assistant	11-20483	0
2	Blink rate generator 1 for outputs 1-8	1-255	10
3	Blink rate generator 1 for outputs 9-16	1-255	10
4	Blink rate generator 1 for outputs 17-20	1-255	10
5	Blink rate generator 2 for outputs 1-8	1-255	10
6	Blink rate generator 2 for outputs 9-16	1-255	10
7	Blink rate generator 2 for outputs 17-20	1-255	10
8	Outputs 1 – 16 damped on/off switching	0-65535	0
9	Outputs 17 – 20 damped on/off switching	0-15	0
10	Overlap time in 32ms increments	0-255	16
11	Light signal configuration for outputs 1 to 4	11-20487	0
12	Light signal configuration for outputs 5 to 8	11-20487	0
13	Light signal configuration for outputs 9 to 12	11-20487	0
14	Light signal configuration for outputs 13 to 16	11-20487	0
15	Light signal configuration for outputs 17 to 20	11-20487	0
16	Not used		
17	Restart time after short circuit in 600µs increments	Do not alter	32
18	Short circuit detection threshold	Do not alter	25
19	Switch on delay in 0.5 second increments	1-255	1
20	Software Version	-	-
21 to 40	Switch on command for output 1 to Switch on command for output 20	10-20483 to 10-20483	1991 to 2181
41 to 60	Switch off command for output 1 to Switch off command for output 20	10-20483 to 10-20483	1990 to 2180

61	Switching mode for output 1		0
to	to		
80	Switching mode for output 20		0

Appendix

Description of Signal Images

Description of Main Signal Images for signals with 3 States

| Hp0		**Appearance** A red light or two side by side **Meaning** Stop for train and shunting traffic	Hp1		**Appearance** Green **Meaning** Go
Hp2		**Appearance** Green above yellow **Meaning** Go with reduced speed			

Description of Main Light Signals with 4 States

Hp0		**Appearance** A red light or two side by side **Meaning** Stop for train and shunting traffic	Hp1		**Appearance** Green **Meaning** Go

Hp2		Appearance Green above yellow **Meaning** Go with reduced speed		Sh1		Appearance A red light and two small white slanted to the right **Meaning** Go for shunting traffic

Description of Warning Signals

Vr0		Appearance Yellow right above Yellow **Meaning** Expect to stop		Vr1		Appearance Green right above green **Meaning** Expect to go ahead
Vr2		Appearance Green right above yellow **Meaning** Go with reduced speed				

📞	**0 20 45** **85 83 - 27**	If you have any questions call us. Hotline times are: Mon - Tue - Thu - Fri., 14:00-16:00 and Wednesdays 16:00-18:00

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