LISSY

Locomotive Individual Steering System

Handbook

Uhlenbrock digital

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1. LISSY - the Locomotive - individual control system

Finally, your digital layout can have all the things that have been possible on analog layouts for a long time. LISSY fulfills the demands of railway modelers, who wanted to have simple automatic control of their layout, with block systems and auto-reversing, a digital system which up till now needed the aide of a computer.

1.1 LISSY performs the following functions on a digital layout:

- Train recognition
- Shuttle train control
- Locomotive-dependent shadow-station control
- Digital one Block control
- Speed measurement
- Starting and brake delay at signals
- Automatic control of locomotive auxiliary functions
- Locomotive-dependent switching from solenoids and routes
- Locomotive-dependent Speed influence
- Works without track isolation

LISSY consists of an Infrared sender, which is installed under a vehicle and one receiver module with its two Infrared sensors built into the track. The locomotive address, train category, speed and travel direction are detected by the infrared receiver and conveyed via the LocoNet. Additionally, without the use of a computer, some automatic control functions are possible.

- LISSY recognizes the locomotive and indicates which train has pulled into a track at the station.
- LISSY steers a shuttle train into the terminus of a single-railed branch line.
- LISSY administers your shadow-station, finds an independent track for each individual train and if necessary automatically dispatches it again from the shadow-station.
- LISSY is a new style of block system for digital layouts and controls the blocks on the layout automatically, without the necessity of a computer.
- LISSY brakes and stops each digital locomotive at a red signal with the decoder's internal brake.
- LISSY measures the true-to-scale speed of passing locomotives.
- LISSY switches on the situation-dependent sound of locomotives, e.g. the whistle before entering a tunnel or the horn at a level crossing.
- LISSY turns OFF the sound of locomotives equipped with "IntelliSound" while they travel in invisible areas (shadow-station, tunnel).
- LISSY switches the light of a particular locomotive ON or OFF after a specified time, e.g. if the engine driver has turned the locomotive OFF
- LISSY controls the speed of locomotives, e.g. on entry to a station or along slow sections of track.

- LISSY works without insulated sections of track and can therefore be easily retrofitted to a model railway layout.

1.2 How LISSY operates

The LISSY transmitter under the vehicle uses an address in the same way as a locomotive decoder. This address, together with some further information is transmitted downward to the track by infrared Light (invisible to the human eye, just like a remote control for Television). The sensors in the track receive that infrared information which is forwarded to the receiver module, which then reacts according to the programming.

The LISSY receiver can have different instructions to change speeds, to switch locomotive functions (e.g. Sound) or to switch from turnouts, signals or entire routes, that are stored in the Intellibox. The instructions are implemented or not, depending upon the recognized address. Furthermore, the LISSY receiver can switch routes in the IB-SWITCH, or control a PC program, through track occupation reporting. The LISSY receiver recognizes a locomotive's address, and scans all stored instructions to determine if there is one to do for that address. If an appropriate instruction is found, it is sent to the Intellibox over the LocoNet. This is called a "locomotive-specific" operation. This operation is what gave the system its name: **L**ocomotive-**I**ndividual **S**teering **SY**stem - LISSY.

The Intellibox translates the received LocoNet instruction to a command in the appropriate digital data format, e.g. a DCC locomotive gets the instruction in DCC Format, a Motorola locomotive gets the instruction in Motorola format and a Selectrix Locomotive in Selectrix data format. Solenoid decoders for switches and signals get instructions in DCC- or Motorola data format, depending on setting of the Intellibox, i.e. LISSY is independent from data format of the locomotive and from the solenoid decoder up to the Intellibox. The central controller translates LocoNet instructions to instructions in the appropriate data format of the locomotive or solenoid decoder.

The LISSY receiver can also be set up for different kinds of complex automatic operations, e.g. shuttle-track or Block-section. In this instance it implements functions without being programmed for a special vehicle. Thus it becomes a terminus for shuttle trains, which stop and after a waiting period, pull out again in the opposite direction, independent of the train's address. It is also suitable for monitoring or setting of signals. In a section block all trains will drive through on a green signal, stop on a red signal.

Each LISSY receiver has a clear receiver address (base address). It can be identified by this address by the Intellibox at any time. It is also possible to read or reprogram this address.

2. Quick Installation

The following steps explain how you can very simply fit your LISSY transmitter and LISSY receiver and obtain your first results. Preferably these steps are carried out with the help of a small test track, which is separate from the layout.

IMPORTANT!

- Read through the manual step by step to familiarize yourself with all functions and capabilities of the LISSY system. After each section work through the small example, in order to complete your understanding of the operation of LISSY.

Conditions:

In order to work through the examples listed in the following section, you need the following:

- Intellibox 65 000 with from firmware Version 1.3 or later
- Transformer 20 070
- Locomotive decoder e.g. 76 500
- LISSY set consisting of two LISSY transmitters 68 300, a LISSY receiver 68 600 (with 2 sensors) and a LocoNet cable 2.15 m.

NOTE

- You can work through the examples with any Intellibox without problems. However, should you wish to program your LISSY receivers later, you will need an Intellibox with a firmware version 1.3 or later.
- You will find the version of the Intellibox system firmware in the basic menu under *software version.* Firmware updates are available for download from our InterNet site - www.uhlenbrock.de

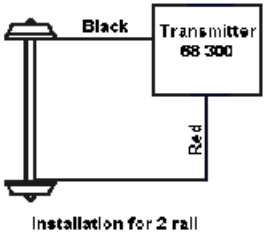
2.1 Installation of the LISSY transmitter 68 300

Attach the LISSY transmitter to the underside of the digital locomotive with the enclosed double-sided tape. The tape is attached to the smooth side of the LISSY transmitter (without electronic components). The component side of the LISSY transmitter must face downward (towards the track). If you do not have space under a locomotive for the LISSY transmitter (particularly in N gauge) the LISSY transmitter can be mounted under a wagon, in which case that wagon and locomotive *must* be used as a unit.

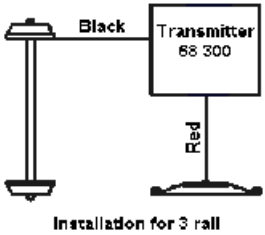
Height is important: With the installation ensure that the lowest place of the LISSY transmitter does not lie lower than the rail's upper surface or any items that project above the top of the rail, e.g. a contact rail. On the other hand the LISSY transmitter should not be higher than 12 mm from the rail upper edge. Ensure that the LISSY transmitter can radiate to all sides, i.e. the surrounding vehicle parts should not form "channel".

The installation **orientation** is important: When fitting the LISSY transmitter to the underside of the locomotive or wagon, ensure that it is along the center line of the vehicle, thus it illuminates the center of the track. Take into consideration however, that mounting in the middle of the vehicle, e.g. with long coaches, when swinging out in curves, the center of the track will no longer be illuminated! In this case, mount the LISSY transmitter in, or as near as possible, to the bogies.

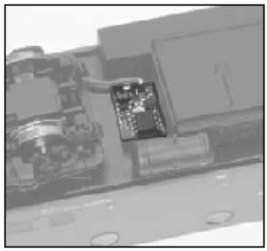
Keep in mind that the LISSY transmitter which you attached under the vehicle is like a flashlight that illuminates the sensors which have been installed between the rails, so that the transmission functions. During the installation, be aware that the infrared LED, which illuminates the sensors, is in the center of the transmitter's circuit board. Connect the wires of the LISSY transmitter to the power pickup of your locomotive: the red wire with the right (isolated) pickup of its locomotive, the black wire with that left (non-isolated) pickup.



Installation for 2 rail

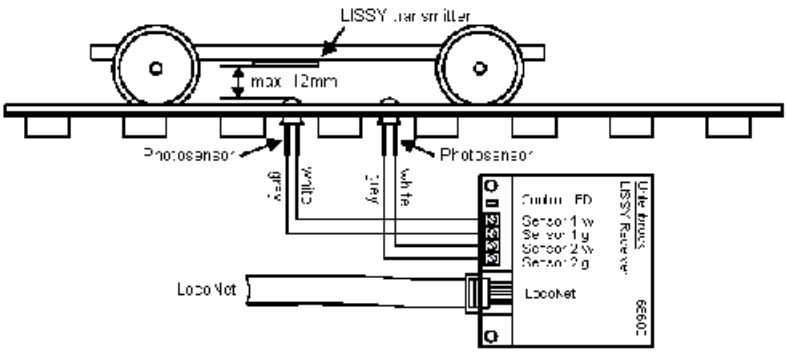


Installation for 3 rail

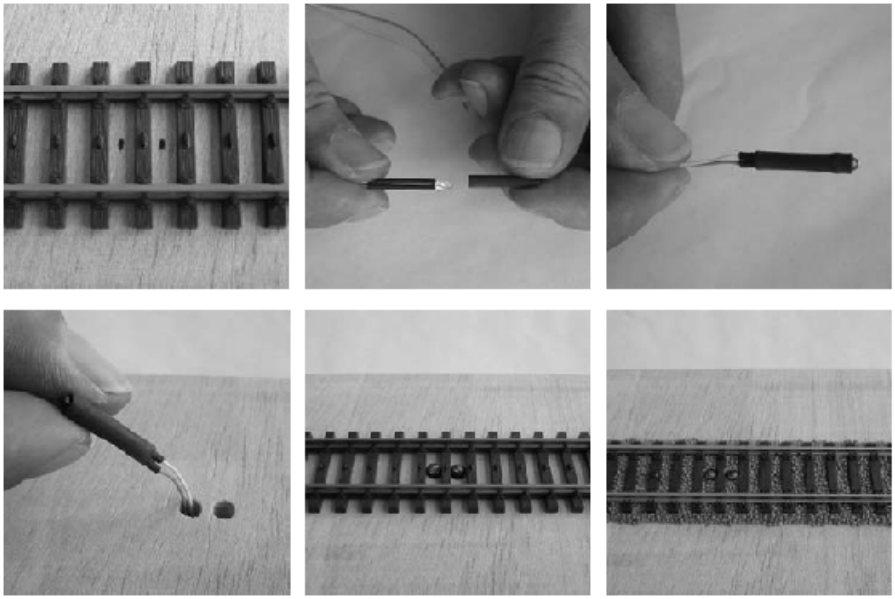


2.2 installation of the LISSY receiver 68 600

Each LISSY receiver requires two small sensors with one gray and one white wire lead. The two sensors are installed in the center of the track, between the sleepers, one after the other. The typical separation is one or two sleepers. Refer to chapter 8.5.7 for sensor separation for other specialized operations.

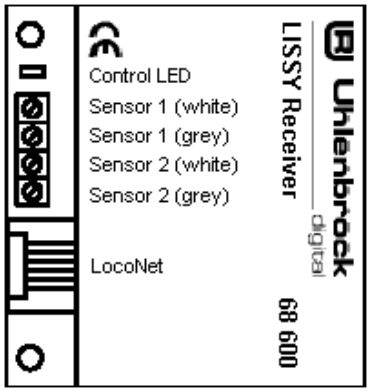


Select the place, where the receiver is to be installed (more detailed information can be found in the following chapters). Use a 4.5mm drill to drill the holes through which the sensors will be inserted. Insert the sensors into the tubing provided so that the dome of the sensor just protrudes from the tube. Thread the sensors' leads from above through the drilled holes and finally press the sensors with the tube into the drill holes.



Take note of the following points when installing the sensors:

- The sensors must be in the track center. Make a suitable drilling jig for the track gauge you are using. The distance between sensors is one to or two sleepers.
- The sensors must not extend above the rail's upper surface. They are best installed with the top of the sensor approx. 0.5 mm below than the rail's upper surface. This protects it from accidental damage e.g. by rail cleaning rubbers etc.
- In the installed location under the layout there should not be any structural props and the leads should be free from risk of being damaged by further drilling.



Fasten the LISSY receiver in the proximity of the sensors under your layout. For this you position the LISSY receiver under the layout board and mark the mounting holes of the module. Turn two screws (round head screws . 2.5 x 10) into the board, so they will still push into the slots of the LISSY receiver. Then tighten them firmly.

Connect the white and grey leads of both sensors according to the labels on the terminals of the LISSY receiver.

Connect the enclosed LocoNet cable between the module and the LocoNet socket on the Intellibox. When correctly connected, the control LED of the LISSY receiver will light up briefly.

NOTE

- With larger distances you must eventually extend the LocoNet cable to the Intellibox. You will find accessories for the LocoNet in our catalog.

2.3 First test drive

Each freshly inserted LISSY transmitter has a digital address just like a locomotive. The preset address is 3. As the locomotive and the LISSY transmitter must have the same address, place the locomotive on the programming track of the Intellibox and program the locomotive address with a DCC Programming (DCC byte or register programming).

If the locomotive has a Motorola decoder, then program the locomotive address using DCC Program mode in the same way. In this case only the LISSY transmitter's address will be adjusted.

The LISSY receiver has the factory set module address of 1 and has two switching functions programs. For each recognized locomotive it switches the front light ON when running in one direction and OFF when running in the other direction. When driving the locomotive or wagon past the sensors, the control LED of the LISSY receiver should light up briefly.

Call up the just programmed locomotive address on the Intellibox, in keyboard mode using the [ok] key. When driving the locomotive or wagon past the sensors, the control LED of the LISSY receiver should light up briefly. When passing the sensors, the locomotive's front light should change state. It switches ON when driving from sensor 1 to sensor 2 and/or OFF when driving from sensor 2 to sensor 1. If testing with a wagon (thus without front lighting), observe the state of the indicator LED of the "function" key on the Intellibox. The yellow indicator changes when over driving the sensors. If nothing happens, examine the individual steps of the instructions again. Did the control LED of the LISSY receiver briefly light up, as it was being attached to the LocoNet? Are the sensors correctly attached to the receiver?

3. LISSY transmitter

The LISSY transmitter is a high-quality, electronic circuit, coated with a transparent protective lacquer. This lacquer protects the LISSY transmitter against contamination due to the open installation under a vehicle; it does however allow the infrared light through for sending digital information.

3.1 Technical Specification

- Weight: 13.5 x 9 x 2.5 mm
- Short address, preset: 3
- Long address, preset: 2000
- Locomotive addresses 1-9999
- Wagon addresses 10000-16382
- Four category markings 1-4
- Programmable with DCC direct mode (CV programming) of bit and byte by byte
- Programmable in the DCC register mode
- Programmable with a Motorola digital center
- Distance of the receiver to the rail upper edge max. 12 mm

3.2 Installation of the LISSY transmitter 68 300

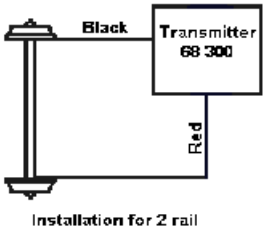
Attach the LISSY transmitter to the underside of the digital locomotive with the enclosed double-sided tape. The tape is attached to the smooth side of the LISSY transmitter (without electronic components). The component side of the LISSY transmitter must face downward (towards the rail). If there is not enough space under a locomotive for the LISSY transmitter (particularly in N gauge) the LISSY transmitter can be mounted under a wagon, in which case that wagon and locomotive *must* be used as a unit.

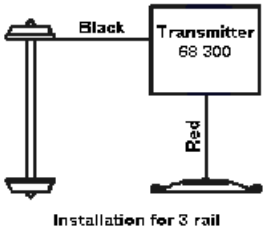
Height is important: With the installation ensure that the lowest place of the LISSY transmitter does not lie lower than the rail's upper surface or any items that project above the top of the rail, e.g. a contact rail. On the other hand the LISSY transmitter should not be higher than 12 mm from the rail upper edge. Ensure that LISSY transmitter can radiate to all sides, i.e. the surrounding vehicle parts should not form a "channel".

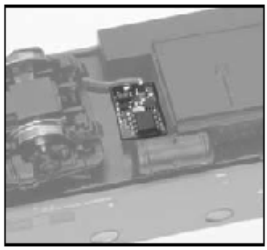
The installation **orientation** is important: When fitting the LISSY transmitter to the underside of the locomotive or wagon ensure that it is along the center line of the vehicle, thus illuminating the center of the track. Take into consideration however, that mounting in the middle of vehicle, e.g. with long coaches swinging out in curves, the center of the track will no longer be illuminated! In these cases mount the LISSY transmitter in, or as near as possible to, the bogies.

Keep in mind that the LISSY transmitter attached under the vehicle is like a flashlight that illuminates the sensors, which have been installed between the rails for the transmission to function. During installation, ensure that the infrared LED, which is to illuminate the sensors, is in the center of transmitter circuit board.

Connect the wires of the LISSY transmitter to the power pickup of your locomotive: the red wire with the right (isolated) pickup of its locomotive, the black wire with that left (non-isolated) pickup.







3.3 Programming and Reading

The LISSY transmitter can be programmed, on the programming track, with the Intellibox in either CV programming byte by byte and bit by bit mode (Direct Programming mode in accordance with DCC) or also with the DCC register programming (see also "Programming of DCC decoders" in the Intellibox manual). Programming is also possible with a Motorola digital center.

The LISSY transmitter stores its information exactly like a DCC locomotive decoder in CVs and/or registers as in the following table:

CVs Loco	CVs LISSY	Register	CVs Mot	Meaning	Value Range	Factory default
1	116	1	1	Short address	0-127	3
17	117		17	Long address High byte		256
18	228		18	Long address Low byte		
29	129		29	Short address valid Long address valid	0-32	0
-	115	5	15	Train category (2 bits)	1-4	0
		8		Manufacturer identification	-	155

If the LISSY transmitter is installed, it will be programmed at the same time as the locomotive via the CVs in accordance with the “CVs Loco” column or via numbers in register programming mode. The locomotive decoder *must* have the same programming mode. Uhlenbrock decoders recognize both the CV- and register programming. The LISSY transmitter can however be programmed separately from the locomotive decoder, if the CVs in the "CVs LISSY" column are used.

NOTE

- There are some locomotive decoders, which also use CVs from the column "CVs LISSY", but with a completely different meaning. In this case the LISSY transmitter can only be programmed together with the locomotive.

The LISSY transmitter can also be used together with decoders that don’t use DCC programming control, e.g. locomotives with Motorola or Selectrix decoders or also under wagons with power pickup, and completely without locomotive decoders. It

must then be programmed to the address of the locomotive or the wagon address using another procedure.

The Intellibox can read the CVs or registers of the LISSY transmitter also (see Intellibox manual). If it is installed in a locomotive with decoder, it is then always read simultaneously with the locomotive decoder. This can lead to error messages, in particular if locomotive decoders and the LISSY transmitter have different values in the CVs or registers. In this case one of the power leads of the locomotive decoder should be disconnected from the power and/or the locomotive decoder removed from its socket if the locomotive has one. The reading of the values of LISSY transmitters attached under cars is likewise possible.

NOTE

- For decoder programming the vehicle must always be alone on the Intellibox programming track. If several vehicles are on the programming track, then all locomotive decoders and all LISSY transmitters are programmed identically!
- For programming of a long address use the appropriate Menu in your Intellibox. Using this Menu the same programming procedure is followed for locomotive decoders and the LISSY transmitter, if it is built into a DCC locomotive. Separate programming is not then required.

3.4 Train categories

The LISSY receiver does not only perform the stored instructions according to the address of the recognized locomotive but also the train category.

Locomotives/rolling stock can be placed into a maximum of four categories, the characteristics of which are determined by you, e.g. Passenger trains, goods trains, express trains, regional trains, special trains. For rolling stock categories such as mineral oil vehicles, beer wagon, refrigerated vehicle, ore wagon can be used.

3.5 Programming with a Motorola center

To program the LISSY transmitter with a Märklin Central, follow the steps below:

1. Position the locomotive with the IR transmitter directly over a sensor of the LISSY receiver 68600, so that the control LED of the receiver is on continuously to confirm receipt of IR receipt signals. Ensure that LISSY receiver's LED is in your field of vision during the entire programming procedure, as this will provide your feedback during the procedure.
2. Reset the Märklin center, by pressing the [stop] - and [go] key simultaneously for approx. 3 seconds. The display of the center will become dark, and then it will change briefly to locomotive address 99. The center is then ready.
3. After the RESET, enter the address 80 and with the [stop] key turn the track power off.
4. Put the controller into the direction-switching position and hold it there. Now turn the track power back on by pressing the [go] key.
5. Move the controller to the zero speed position. The control LED on the receiver module will flash briefly once.
   If the LISSY receiver is connected with the LocoNet display 63450 or with an IB control 65400 (with firmware - Version 2.0 or higher), the display will show the address and the train category of the LISSY transmitter. Refer to manuals of

the earlier mentioned devices to see how to use them to monitor a LISSY receiver.

CVs Loco	Meaning	Value Range	Factory default
1	Short address	0-127	3
17	Long address Highbyte		256
18	Long address Lowbyte		
29	Short address valid Long address valid	0-32	0
15	Train category (2 bits)	1-4	0

6. Now enter the number of the CV which you want to program, such as a locomotive addres, and switch the driving direction over briefly. The control LED on the LISSY receiver will give two brief flashes and the monitoring display will indicate contents of the CV in the same way as a locomotive address. The train category will now display the value 1.
   Note: If an invalid CV number is entered here, then the control LED on the LISSY receiver will flash only once and the monitor shows the address 9999. Proceed by entering a valid CV number.
7. Now enter the desired locomotive address value for the CV and briefly change the driving direction. The control LED on LISSY receiver will flash once briefly and the monitoring display will show the new value of the CV as the locomotive address. The train category of the monitoring display will now indicate a value of 2.
8. Program further CVs by repeating steps 6 and 7 for each CV you wish to program.
9. Once all the desired CVs are programmed, switch the track power OFF using the [stop] key. The next time the track power is switched on, the IR transmitter will run with the newly programmed values.

IMPORTANT

- To use a Märklin center to program a CV with a value of 0, you must use the address 80. All CVs can only be programmed to values from 0 (80) to 79.

Long address programming with a Motorola center

If a long address is to be used, then CV 29 must be set to a value of 32. The long address is computed using the following equation:

Long address = CV 17 * 256 + CV 18

Since Märklin centers only accept input in the range of 0-79, not all addresses can be programmed.

4. LISSY receiver

The LISSY receiver is a high-quality, electronic circuit in a small housing. Do not remove electronics from the housing, as this could cause damage.

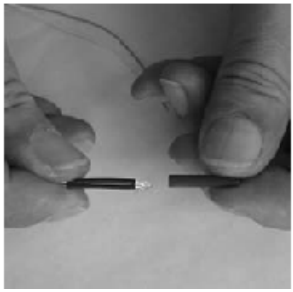
4.1 Technical Specification

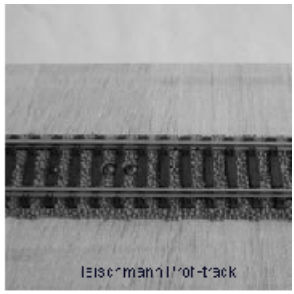
- Weight: 53 x 50 x 21 mm
- Power input: approx. 25 mA at the LocoNet
- Module address, factory setting: 1
- Address range 1-4095
- Programmable with the Intellibox LocoNet programming with version 1.3 and higher.
- Instruction set of 10 instructions, for speeds, functions and solenoids
- 7 modes of operation
- Functions: travel direction dependent or travel direction independent
- Simple installation without insulated track sections
- Independent of digital formats
- Data communication via LocoNet

Two sensors go with the LISSY receiver. If the sensors are installed directly behind one another (double sensor), the LISSY receiver can execute travel direction dependent instructions, i.e. different instructions can be executed in one direction than in the other direction. The two sensors can also be mounted in different sections of the layout (2 single sensors). This way one can perform different direction independent instructions in each position.

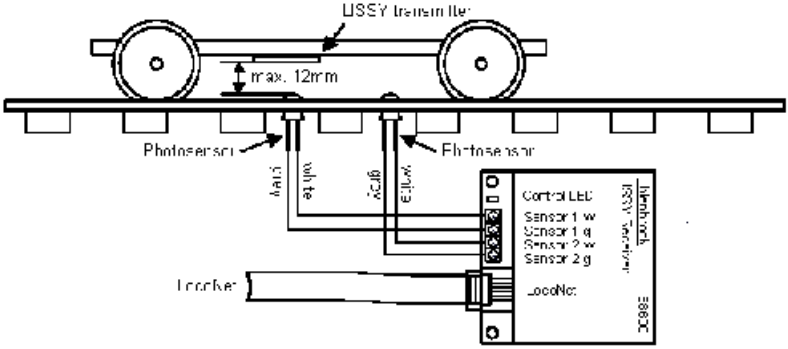
4.2 Installation and connection of the sensors

The two sensors are mounted into the track between the sleepers. Drill one or two 4.5 mm holes on the centerline of the track. So that the holes are neat and clean it is a good idea to pre-drill them with a smaller drill. Then place a piece of supplied tubing over each sensor so that the 'dome' of the sensor slightly protrudes from the tube.





Thread the leads of the sensors through the drill hole and press the sensors into the holes. Insert the two, one behind the other, between the tracks. Sensors mounted in this fashion will from here on be referred to as a "double sensor". Take note of the following points when installing the sensors:



- The sensors must be in the track center. Make a suitable drilling jig for the track gauge you are using. The distance between sensors is one to or two sleepers.
- The sensors must not protrude above the rail's upper surface. The top of the sensor must be approx. 0.5 mm below than the rail's upper surface. Like that it is protected from accidental damage e.g. protected from damage by rail cleaning rubbers etc.
- In the installed location under the layout there should be no structural props and the wires should be free from risk of being damage by further drilling.
- The leads of the sensors are 25 cm long. Ensure that it is possible to install the LISSY receiver under the layout within 25 cm of the sensors under.

NOTE

- Lay the sensor leads away from supply leads to the track and solenoids in order to avoid electrical interference.

4.3 Installation of the LISSY receiver

Fasten the LISSY receiver in the proximity of the sensors under your layout. Position the LISSY receiver under the layout board and mark the mounting holes of the module. Turn two screws (round head screws 2.5 x 10) so far into the board that they will still push into the slots of the LISSY receiver. Then tighten them firmly.



Connect the white and gray leads of both sensors according to the labels on the terminals LISSY receiver.

4.4 Connection to the LocoNet

Connect the enclosed LocoNet cable between the modules with the LocoNet socket on the Intellibox. With larger distances you may need to extend the LocoNet cable to the Intellibox. In our catalog you will find suitable accessories.

Once correctly connected the control LED of the LISSY receiver will always light up, when a vehicle passes a sensor fitted with a LISSY transmitter.

IMPORTANT

- Before installing the LISSY receiver it is important to set the decoder to another address in accordance with Chapter 6. The receiver is factor set to address 1. If several LISSY receivers are attached to the LocoNet with same address, it will no longer be possible to access them individually.

5. LISSY receiver configuration

After installing and connecting the LISSY receiver, but prior to configuring it, it is important to check if it is functioning correctly, and that the Intellibox is able to communicate with it.

As described in chapter 4.4, the LISSY receiver signals it's recognition of a passing vehicle by flashing its control LED. If this occurs, the LISSY receiver and sensors are connected correctly.

To verify correct installation the LISSY receiver can perform a few preset instructions. These are factory preset and switch the front light of a locomotive (irrespective of its address) as it passes the sensor 'ON' in one direction and 'OFF' in the other direction. If a locomotive drives over a double sensor the headlights turn ON or OFF. If a car fitted with a LISSY transmitter is pushed over a double sensor you can see the feedback on the Intellibox display which will show the transmitter's address and the 'special function' LED will turn ON and OFF.

If everything operates as described, begin configuring the receiver.

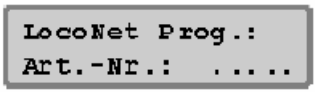
5.1 LISSY receiver selection

For programming the LISSY receivers you need an Intellibox with a software Version 1.3 or greater.

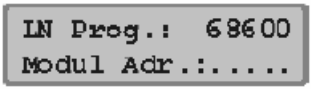
The version information of the Intellibox software is accessed via the basic adjustment menu. If necessary you can download an update from our InterNet site www.uhlenbrock.de

Programming the LocoNet CV's

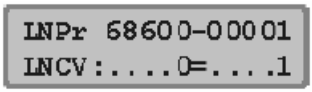
- Ensure that the receiver is correctly connected to the LocoNet.
- Press the Intellibox [menu]-key followed by the [mode]-key.
- Step through the menu options with the [↓]-key to locate "LocoNet Prog.".
- Step into the submenu with the [→]-key.



- Enter the part number of the receiver (here 68 600) and press the [↵]-key.



- Enter the address of the receiver (in this case e.g. 1) and press the [↵]-key.



The top line will display the part number of the receiver and its address.

The lower line will indicate LocoNet CV (in this case "0" as the module address) and its present value (here 1). The cursor will flash under the "0" on the lower line. The

top line will remain unchanged during entire programming period. To confirm that the LISSY receiver is communicating correctly, the control LED will flash.

5.2 Programming and Reading

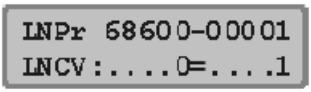
The LISSY receivers are configured with the Intellibox in a similar way to the locomotive decoders, i.e. by adjusting various configuration variables (CV), e.g. the instructions called up as a LISSY transmitter passes the sensors. In order to differentiate LISSY receiver CVs from Locomotive decoder CVs, receiver CVs will be referred to as LNCVs, because the receivers are connect to the LocoNet and not the track.

If the cursor flashes in the LNCV area, the number of your LISSY receiver LNCV can be entered. Then press the [↵]-key and the value of the selected LNCV will be read from the receiver.

With the [←]-key move back to the LNCV number for the next LNCV you wish to configure. Pressing the [←]-key will take you back to input another receiver address, if a further LISSY receiver is to be configured. The [menu]-key will take you out of LocoNet programming mode

Method:

- After calling up the desired LISSY receiver you see the following display:



LNCV 0 (module address) is displayed, with value is 1, and the cursor flashes under the 0.

- Press the [↵]-key display the value of the LNCV.
- Press the [→]-key to move to the value.
- Enter the desired value for this LNCV.
- Press the [↵]-key and the changed value is programmed.
- Press once [←]-key to select of another LNCV.
- Press twice [←]-key to select of another LISSY receiver.
- To terminate programming mode the press the [menu] key.

As you become accustomed to the Intellibox, numerical values at the cursor position can also be changed by using the [+] and [↓] keys to count up or down respectively.

WARNING

- When programming a LISSY receiver all previous programming will be erased from memory.

5.3 Broadcast address

As you saw above, a LISSY receiver can only have its configuration read if it is selected under its module address (LNCV 0). It can thereby by be differentiated from all other LISSY receivers on the layout.

If you have forgotten the address of a LISSY receiver you can no longer read its configuration. To overcome this problem connect LISSY receiver to the LocoNet

alone, i.e. without any other LISSY receivers. Now you can use the broadcast address.

The broadcast address for LISSY receivers is the 65535.

The LISSY receiver will react to this and immediately shows its actual address in LNCV 0. This can then be changed or kept, and the LISSY receiver can be re-attached to the layout.

Calling the broadcast address

- Attach only the LISSY receiver with the unknown module address to the LocoNet
- Press the [menu] key
- Press the [mode] key
- With the [↓]-key move to the menu "LocoNet Prog." option
- Press the [→]-key
- Input the LISSY receiver part number 68,600
- Press the [↵]-key
- Input of the broadcast address 65,535
- Press the [↵]-key
- The display will indicate LNCV 0 with the programmed module address.

6. LISSY receiver's basic functions

After learning how to program and read an individual LNCV, this chapter will acquaint you with some basic functions and how to adjust these by configuring LNCVs.

6.1 Receiver address

The LISSY receiver has two addresses. The first address is the more important, because the LISSY receiver is addressed for programming and reading using this address and also because it is used for all functions with double sensors (direction recognition).

LNCV	Description	Value Range	Factory default
0	Module address and first sensor address	1-4095	1
1	Second sensor address, is used when the sensors are used individually	1-4095	2

If the sensors are inserted in two independent locations on the layout and used as a double sensor, then each location needs its own address, by which it is identified in the system later. While sensor 1 is identified by the module address (first sensor address) in LNCV 0, sensor 2 is identified by the address in LNCV1. The second sensor address is only used in this application. If the LISSY receiver is used with double sensors, the second address used, and its value, have no meaning.

Programming the receiver address

- Reading of the LISSY receiver is described in chapter 5.1

  LNCV:....0=....1
- Enter the number 0 to select the LNCV for the address Sensor 1.
- Move the cursor to right input field by pressing the [→]-key.
- Enter the value of the module address using Intellibox keypad.
- Press the [↵]-key to effect the changed value.
- Press the [←]-key to move cursor to the left input field.
- Enter the number 1 to select the LNCV for the address of Sensor 2.
- Press the [→]-key the cursor into the right input field.
- Enter the value for the address of Sensor 2.
- Press the [↵]-key so that the changed value takes effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

6.2 Selection of the different functions

LNCV	Description	Value Range	Factory default
2	Selection of the different functions of the module: Basic function, switching operation, mechanism function, delete function	0-10, 20-26, 96-99	2

Detailed information to the different functions and how they are adjusted are outlined in chapter 9.

7. First applications

In this chapter we will use 2 examples to demonstrate how easily LISSY can be configured with the Intellibox.

Before you try the examples out, delete all current LNCV values in the LISSY receiver, by programming the LNCV 2 with the value 98.

LNCV	Description	Value
2	All LNCVs to the value 0 sets, except LNCV 0 and 1 (module and sensor address)	98

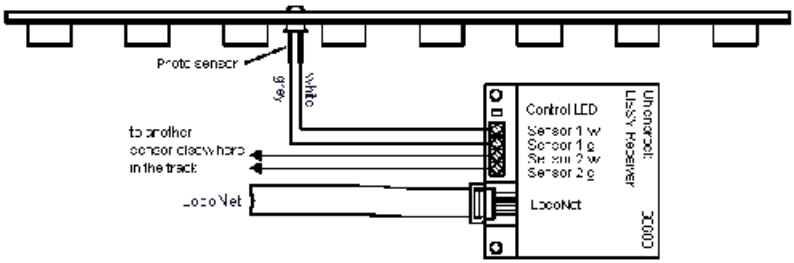
After this all LNCVs are set to a value 0 and thus no functions are programmed. LNCV 0 (module and 1st sensor address) and LNCV 1 (2nd sensor address) are not deleted.

Flushing the module

- Selection of the LISSY receiver, is described in chapter 5.1
  `LNCV:....0=....1`
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98, (which is the function code to delete all values, except the Address values).
  `LNCV:....2=... 98`
- Press the [↵]-key for the operation to take effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

7.1 To switch a turnout

Install a sensor at the location you wish to switch the turnout and attach it to the LISSY receiver as follows:



Program the LNCVs as indicated in the table:

LNCV	Description	Value
2	Switching operation with 2 single sensors in 2 different places of the layout, without direction recognition	3
80	Address the locomotive that is to trigger the switch 20000 means that any locomotive can trigger the switch	20000
90	Instruction for switching the solenoid with address 20 into the green/straight position	201

If the LNCVs are configured as indicated above, every locomotive, which passes over the sensor, will switch turnout 20 into the straight (green) position.

Method:

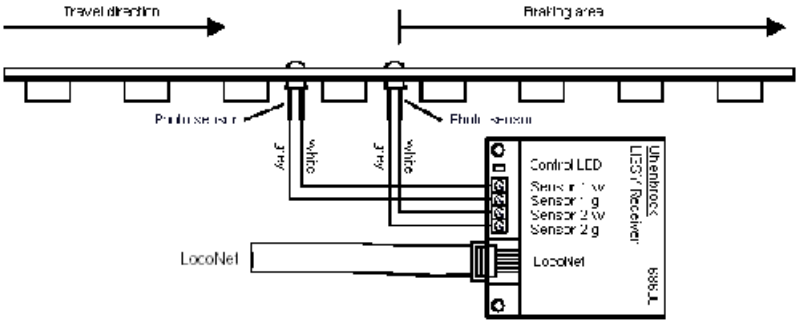
- Selection of the LISSY receiver, is described in chapter 5.1
  LNCV:....0=....1
- Enter the number 2 in the left input field to select LNCV 2.
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 98.
  LNCV:....2=... 98
- Press the [↵]-key for the operation to take effect.
- Press the [←]-key to move the cursor to the left input field.
- Enter the number 2 in the left input field to select LNCV 2. (to set switching operation).
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 3 (2 single sensors without direction recognition).
  LNCV:....2=....3
- Press the [↵]-key to store the new value.
- Press the [←]-key to move the cursor to the left input field.
- Enter the number 80 to select LNCV 80 (locomotive address for switching function).
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 20000 (any locomotive).
  LNCV:... 80=20000
- Press the [↵]-key to store the new value.
- Press the [←]-key to move the cursor to the left input field.
- Enter the number 90 to select LNCV 90 (command ID of the switching function).
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 201 (solenoid 20 is to switch to green (straight)).
  LNCV:... 90=..201
- Press the [↵]-key to store the new value.
- Exit programming with [menu] key or return for further programming with the [←]-key

If the LNCVs 80 and 90 are changed as follows, then only the locomotive with the address 10 switches the solenoid with the address 30 to red (round).

LNCV	Description	Value
2	Switching operation with 2 single sensors in 2 different places of the layout, without direction recognition	3
80	Recognition of locomotive address 10 only to activate the switch	10
90	Instruction for switching the solenoid with address 30 into the red/round position	300

7.2 Setting up a Shuttle train terminus

Install the two sensors in the desired place as shown in the diagram, after which the trains are to pause and reverse back out, and install the LISSY receiver as close to the sensors as possible.



Program the following LNCVs as indicated in the table:

LNCV	Description	Value
2	Set function for shuttle train terminal, with timed departure	4
4	Waiting time at terminus, 20 seconds	20
6	Address of exit signal at which the shuttle will wait. In this example the signal that is to be switched by the LISSY receiver is operated by a solenoid decoder with address 10	10
10	Block option: only after 5 seconds after the train has left on a green signal, is the track regarded as clear by the LISSY receiver. Only then can a new train enter into the terminus.	5

If the LNCVs indicated above are programmed as described below, then the LISSY receiver implements the following automatic sequence:

- A locomotive passes over the double sensor, driving in the direction from sensor 1 then sensor 2. The locomotive will be stopped by the decoder's-internal brake system. At the same time the signal, with address 10 will be set to red, using it's solenoid.
- The locomotive stops 20 seconds.
- Subsequently, the driving direction is reversed.
- The signal with address 10 will have its solenoid activated and switched to green.
- The locomotive drives off using the decoder's internal starting delay.
- 5 seconds after the locomotive drives off, the shuttle train terminus is ready for the entry of the next locomotive.

Method:

- Selection of the LISSY receiver, is described in chapter 5.1
  `LNCV:....0=....1`
- Enter the number 2 in the left input field to select LNCV 2.
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 98.
  `LNCV:....2=... 98`

- Press the [↵]-key for the operation to take effect.
- Press the [←]-key to move the cursor to the left input field.
- Enter the number 2 in the left input field to select LNCV 2 (automatic operation).
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 4 (automatic timed shuttle train terminus operation).

LNCV:....2=....4

- Press the [↵]-key for the operation to take effect.
- Press the [←]-key to move the cursor to the left input field.
- Enter the number 4 in the left input fieldd to select LNCV 4 (time delay).
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 20 (Train waits for seconds).

LNCV:....4=... 20

- Press the [↵]-key for the operation to take effect.
- Press the [←]-key to move the cursor to the left input field.
- Enter the number 6 in the left input field to select LNCV 6 (address of the exit signal).
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 10 (switch solenoid at address 10).

LNCV:....6=... 10

- Press the [↵]-key for the operation to take effect.
- Press the [←]-key to move the cursor to the left input field.
- Enter the number 10 in the left input field to select LNCV 10 (section block option).
- Press the [→]-key to move the cursor to the right input field.
- Enter the value 5 (switch track condition after 5 seconds).

LNCV:... 10=....5

- Press the [↵]-key for the operation to take effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

If the LNCV 10 is changed as follows, then automatically 10 seconds after the Locomotive's shuttle train drives off, the signal at address 10 will have its solenoid switched to red.

LNCV	Description	Value
10	Block option: 10 seconds after the train has left on a green signal, the LISSY receiver will regarded the track as clear. Only then can a new train enter into the terminus. Also the signal will be switched to red.	266

How to calculate the value 266, to program this operation, is described in chapter 8.5.5 "Automatic operation - occupancy detection".

NOTE

- In order a completely automate a shuttle train two receivers are required, one in each terminus.

8. Functions

This chapter concerning the functions of the LISSY receiver 68,600 is the most important chapter in this book. Please read it thoroughly, so you can derive many hours of pleasure from the automation of your layout.

8.1 Preparation of the LISSY receiver

Before we can start programming, it is important that the LISSY receiver be prepared. As already learned in the previous chapters the LISSY receiver is pre-programmed to facilitate quick testing after installation and connection, to check that everything is functioning correctly.

8.1.1 Deletion of old programming

To program a receiver, pre-programmed data needs to be deleted first, so that your own programming will operate as intended.

The deletion of the LNCVs is done via programming of a special function.

LNCV	Description	Value
2	All LNCVs are set to the value 0, except LNCV 0 and 1 (module and sensor address)	98

Method:

- Select the LISSY receiver, as described in chapter 5.1
  `LNCV:....0=....1`
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98, (which is the function code to delete all values, except the Address values).
  `LNCV:....2=... 98`
- Press the [↵]-key for the operation to take effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

Further details about the deletion or resetting of the receiver can be found in chapter 8.5.1.

8.1.2 Programming table preparation

In the context of programming a LISSY receiver we recommend that you record your programming. This avoids having to flush the programming frequently because you have forgotten which LNCVs have been programmed.

In the appendix you can find two examples of programming tables. You can copy the table, so that can make your own table for every LISSY receiver you program.

The table is explained in detail in this section

8.2 Basic functions

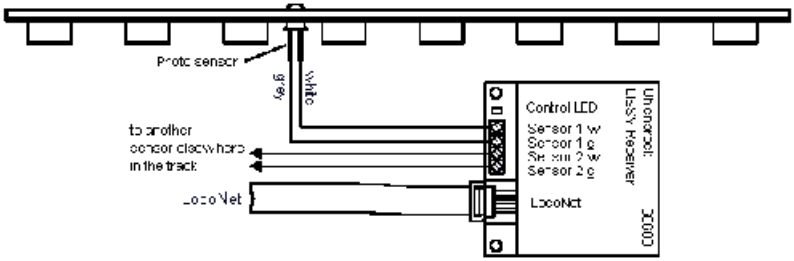
In the basic function a LISSY receiver is to capture a passing locomotive's address and train category. In addition it can, after setting up, also determine the speed and driving direction.

The data sent to the LocoNet can be in different formats. This can be specified in LNCV 15 (module pre-setting). If LNCV 15 is set to 1, the LISSY receiver sends data in a format that can be used by Uhlenbrock LocoNet modules (e.g. LocoNet display 63 450. A value of 2 or 3 sends Digitrax compatible data, which some PC control programs also use.

LNCV	Description
0	Module address and first sensor address
1	Address for sensor 2 (only when using 2 single sensors)
2	*Basic function* 0 = locomotive detection using a double sensor. determines address, category, driving direction and speed. 1 = locomotive detection using 2 single sensors in 2 independent places of the layout. determines address and category
15	*Expenditure of the delivery format* 1 = Uhlenbrock 2 = Digitrax "transponder exit block" 3 = Digitrax "transponder enters block"

8.2.1 Reporting train number and category

The LISSY receiver is only there to register locomotive address and train category of a passing train. An individual sensor in the track is sufficient for this. One LISSY receiver module can therefore supervise two locations on the track.

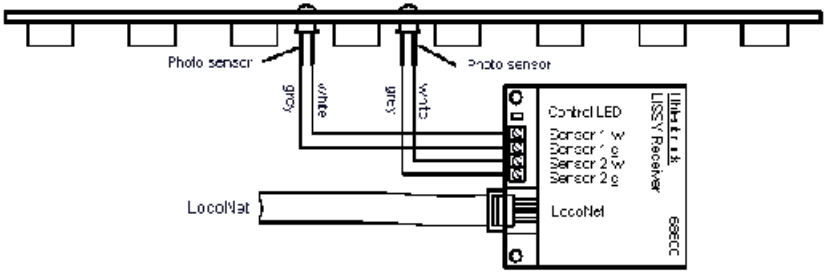


For simple course monitoring in two places with a module the following functions must be programmed:

LNCV	Description	Value
0	Module address and first sensor address	1-4095
1	Address of Sensor 2	1-4095
2	Locomotive detection with 2 single sensors in 2 independent places of the layout To determine address and category	1

8.2.2 Reporting speed and direction

If the locomotive's speed and driving direction are to be reported in addition to locomotive address and train category, then you must install the two sensors to work as a double sensor.



In addition the following function must be programmed:

LNCV	Description	Value
2	0 = locomotive detection using a double sensor. determine address, category, driving direction and speed	0

Driving direction

To report the driving direction, the module must know which of the two sensors should be passed first. Automatic operations, e.g. how long a train should stop for, can be adjusted, by specifying the active driving.

LNCV	Description	Value
3	*Driving direction, in which the automatic function is active according to LNCV 2* 0 = detection reported when driving direction is from sensor 1 to sensor 2 1 = detection reported when driving direction is from sensor 2 to sensor 1	 0 1

Speed

In order to be able to calculate the speed in Km/h correctly, the module needs the distance between the two sensors on the layout.

LNCV	Description	Value
14	*Reporting of the locomotive speed* With entry of the calculated scaling factor the speed of the locomotive, in Km/h, can be calculated	S[mm]*A

The scaling factor, which can be programmed into LNCV 14, is used to compute the speed in Km/h by multiplying the distance, in mm, with the constant A, which is shown in table below.

Scale	Track gauge	Constant A
1:32	Gauge 1	576
1:87	H0	1566
1:120	TT	2160
1:160	N	2880

Table for constant A, for multiplying with the distance between the two sensors in mm.

Example

The scale is H0 and the sensors separation 'S' is 15 mm.
S[mm] * A = 15 x 1566 = 23490 = enter into LNCV 14.

NOTE

- At high speeds (250 Km/h) it can have inaccuracies of up to 5%.

The smallest measurable speed depends on sensor separation and scale. It is calculated by multiplication of the sensor separation in mm by the constant B, and is calculated using the information from the table below.

Scale	Track gauge	Constant B
1:32	Gauge 1	0.04608
1:87	H0	0.12528
1:120	TT	0.1728
1:160	N	0.2304

Table for constant B, to determine the minimum measurable speed.

Example

The scale is H0 and the sensors separation 'S' is 20 mm.

S[mm] * B = 20 x 0.12528 = 2.5 Km/h

NOTE

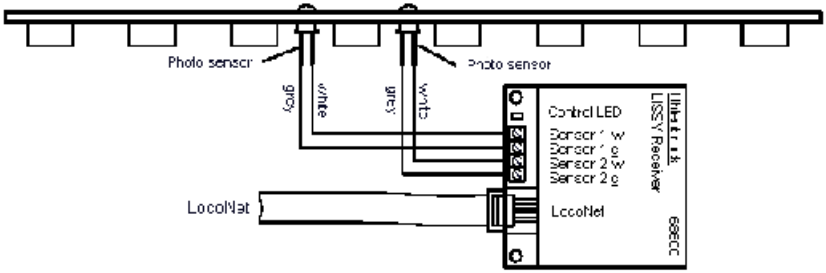
- If LNCV14 have a value of 0 or the sensors are installed too far apart, the train speed cannot be measured when driving over the sensors. Therefore the speed will not be changed after the train has passed the sensors.

8.3 Switching operation

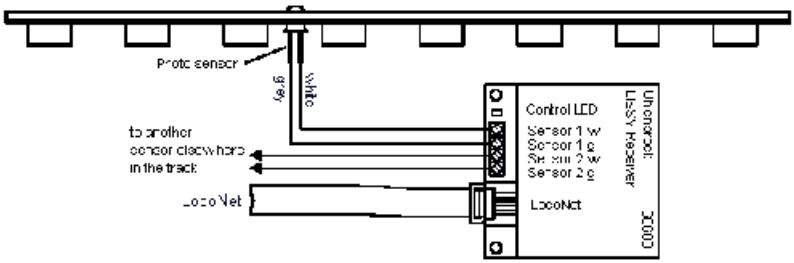
After a LISSY receiver is installed into a layout, you can accomplish a range of diverse controls. This may be a simple *Switching operation* (switching turnout before a station, switch lights on at tunnel entrance) and speed instructions (decrease speed in a speed restriction section), up to complex *operations* (terminus of a shuttle-train, section control with signaling). In LNCV 2 you specify the function the LISSY receiver is to have.

In order to setup a *switching operation*, program LNCV 2 as follows:

LNCV	Description	Value
2	*Switching operation* with 1 double sensor with direction recognition	2



LNCV	Description	Value
2	*Switching operation* with 2 single sensors without direction recognition	3



With *switching operation* individual instructions in 3 groups can be programmed and called into operation later:

- Switch of auxiliary functions (light, telex coupling, smoke, sound, single noises etc..)
- Change speeds (only meaningful with locomotives)
- Switch of turnouts, signals or routes

Each instruction group has 10 instructions that can be programmed. For Double sensors all 10 instructions are available for both sensors. With two single sensors 5 instructions are available for each sensor.

In principle, switching operations apply when processing the functions in the following table:

Sequence	Function	If, then
1.	Are individual speed instructions to be sent?	implement
2.	Are solenoids, route or occupancy instructions to be sent?	implement
3.	Are individual function instructions to be sent?	implement

8.3.1 General instruction description

For the programming of *switching operation* the LISSY receiver has LNCVs 20 to 109 available. By programming certain combinations of value into these LNCVs you can develop executable instructions.

A complete instruction always consists of three entries:

- Vehicle address
- Command value
- Command options

Vehicle addresses

As addresses the following values can be used:

LNCV	Description
0	No instruction is required to be present
1-9999	Locomotive address; should the LISSY receiver recognize this address, the programmed instruction will be sent to this address by the Intellibox
10000-16382	Wagon address; If the LISSY receiver recognizes this address, the Intellibox sends the programmed instruction to this address
20001-20004	Train category: as shown chapter 4.3 as you can assign in LISSY transmitter CV 115. This category value (1-4) becomes part of the vehicle address to be sent. If an instruction is present for a recognized category, if is implemented for the particular vehicle address The address 20001 corresponds to the category 1, address 20002 corresponds to category 2 etc..
20000	Broadcast locomotive address: the programmed instruction is always implemented, independent of Vehicle address or category

Command value and command option

The entries for command value and option depend on whether it is speed, function, or solenoid instructions. While the address is simply taken from the above table, you also need to determine the numerical value for the command, or command option which is to be used.

The advantage of the computed values is that single instructions can operate a number of items at the same time, or with a particular command option, different command variants can be produced.

This is explained further in the following sections.

8.3.2 Priorities in processing instructions

In the respective groups, the programmed actions are sequentially processed in ascending order of LNCV numbers. In each group, instructions can be executed for the recognized address, the recognized category, or broadcast to every vehicle. A specific vehicle can have several instructions programmed.

The different address formats have the following priorities:
1. Highest priority: Address instructions (addresses 1-16382)
2. Middle priority: Category instructions (addresses 20001-20004)
3. Lowest priority: Broadcast instructions (address 20000)

During the processing of a group of instructions in ascending order, every valid instruction is immediately implemented. However, lower priority instructions will only be implemented so long as no suitable instruction of higher priority is found for the vehicle. Further instructions with lower priority after that will not be implemented.

Thus if a category instruction is found, further category instructions will be implemented, but broadcast instructions will not. An address instruction results in further address instructions being implemented, but no further category or broadcast instructions can be implemented.

Example 1
Locomotive 3 with the train category 1 (address 20001) arrives at the sensor. The LNCV entries for the functions are programmed as follows:

Programming of function instructions											
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**2...**	20000	20001	3	20002	103	20001	20000	3	-	-
Value	**3...**										
Option	**4...**										

The actions are implemented as follows:

Command priority of function for the locomotive address 3 and category 1			
LNCV	**value**	**instruction**	**action**
20	20000	Broadcast	Implemented
21	20001	category	Category match: implemented, but no more broadcast instructions
22	3	address	Address match: implemented, but no further instructions with lower priority
23	20002	category	Not implemented, wrong category
24	103	address	Not implemented, wrong address, but priority matches
25	20001	category	Category too low: Not implemented
26	20000	Broadcast	Broadcast not implemented, too low priority
27	3	address	Address matches: implemented

Example 2

Locomotive 3 with the train category 1 (address 20001) arrives at the sensor. The LNCV entries for speeds are programmed as follows:

Programming of speed instructions											
Speed	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**5...**	20002	20001	3	20000	103	20001	3	-	-	-
Value	**6…**										
Option	**7…**										

The actions are implemented as follows:

Command priority of speed instructions for the locomotive address 3 and category 1			
LNCV	**value**	**instruction**	**action**
50	20002	category	Not implemented, wrong category
51	20001	category	Category match: implemented, but no more broadcast instructions
52	3	address	Address match: implemented, but no further instructions with lower priority
53	20000	broadcast	Not implemented, too low priority
54	103	address	Not implemented, wrong address, but priority matches
55	20001	category	Category too low: Not implemented
56	3	address	Address matches: implemented

Example 3

Locomotive 3 with the train category 1 (address 20001) arrives at the sensor. The LNCV entries for solenoid are programmed as follows:

Programming of solenoids and route instructions											
MA/FS	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**8...**	3	2000 2	200 00	2000 1	103	2000 1	3	-	-	-
Value	**9…**										
Option	**10…**										

The actions are implemented as follows:

Command priority of solenoid instructions for the locomotive address 3 and category 1			
LNCV	**value**	**instruction**	**action**
80	3	address	Address match: implemented, but no further instructions with lower priority
81	20002	category	Not implemented, wrong category
82	20000	broadcast	Not implemented, too low priority, but priority matches
83	20001	category	Not implemented, category too low
84	103	address	Not implemented, wrong address, but priority matches
85	20001	category	Category too low: Not implemented
86	3	address	Address matches: implemented

8.3.3 Switching Locomotive auxiliary functions

The 10 instructions for auxiliary functions, such as front lighting (f0) or sound and/or other special functions (f1 to f12) are programmed into LNCVs 20 to 49. The following applies:

LNCV	Description
20-29	Address of vehicle to receive the function instructions
30-39	Values for function
40-49	Options for function

LNCVs belonging to an instruction are always separated by 10. Example: the data for the first instruction are in LNCVs 20, 30, 40, those for the second instruction in LNCVs 21, 31, 41 etc.. The following table clarifies the basics, each column representing an instruction:

Allocation of the LNCVs for function instructions										
For receivers with a double sensor	**double sensor**									
For receivers with two single sensors	**1st Sensor**					**2nd Sensor**				
LNCV for the address	20	21	22	23	24	25	26	27	28	29
LNCV for the value	30	31	32	33	34	35	36	37	38	39
LNCV for the option	40	41	42	43	44	45	46	47	48	49

Switch function LNCV 2 = 2 LNCVs for function instructions with double sensor. All 10 instructions are available for both installed sensors.

Switch function LNCV 2 = 3 LNCVs for function instructions with 2 single sensors. Each of the installed sensors has 5 function instructions available.

Values for switching OFF auxiliary functions

If a locomotive e.g. is to have the light switched ON or OFF, you press [f0]-key or [off]-key on the Intellibox. Should the decoder have further functions (e.g. Sound decoder: On/Off, whistle, pump, inertia etc.), then these further functions are switched with keys [f1] to [f4] also key [loco #] as shift key for the functions [f5] to [f8].

The LISSY receiver can call up functions f0 to f12, provided the locomotive decoder supports them. The meaning of these functions is different from decoder to decoder. Please take note of the operating instructions of your decoder.

Programming a function value into the appropriate LNCV does switching of the function. The function values are shown in the following table:

Computation of the command value for the change of locomotive auxiliary functions														
Auxiliary	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	**F11**	F12	Calculated value for LNCV 30-39
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection														
Sum														

If several functions are to be switched simultaneously, mark them off in the corresponding column in the "selection" row. Then transfer the numerical values of the selected column from the "value" row into the last row. The sum of the values is then programmed into a LNCV within the range 30 to 39.

Example

The light and horn are to be switched on e.g. before a tunnel. The light is turned by function f0 ([function] key on the Intellibox) and the horn is e.g. f2, thus the following example table results:

Computation of the command value for the change of locomotive auxiliary functions														
Auxiliary	**F 0**	**F 1**	**F 2**	**F 3**	**F 4**	**F 5**	**F 6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**	**Calculated value for LNCV 30-39**
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection	X		X											
Sum	**1**		**4**											**5**

In this example the value 5 must be used as the command value.

It is not possible to turn one function ON and another OFF in the same instruction. For this several instructions must be used.

Options for switching of auxiliary functions

The changes to be performed to the auxiliary functions are specified in the LNCV for the command options. Here you specify if the action is to travel direction dependent or not, whether the auxiliary function is be switched ON or OFF, or whether the state of the auxiliary function is to be changed. This means, if the function was OFF before passing the sensor, it will switch ON. If on the other hand it was ON, it will switch OFF after passing the sensor. Finally the auxiliary function can also, for a defined time, switch ON and after a set time automatically switch OFF again.

The following table shows which values specify the various options.

Computation of the command option for the change of locomotive auxiliary functions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Switch auxiliary function off		0	
	Switch auxiliary function on		8	
	Change auxiliary function		16	
4	Auxiliary function timed change		32	
5	Switching duration in seconds * 256 =			
			Calculated value for LNCV 40 to 49	

Setting the time delay for the execution of function instructions

In *the switching operation* the function instructions are executed immediately the sensors are passed. With *automatic operation* the function can be executed upon arrival at the sensor or when the locomotive is departing (see chapter 8.4.1 ff).

Timed auxiliary functions

For switching On and/or OFF (not for toggling) a timer can be set. After this time the instruction is reversed, i.e. the opposite Instruction is followed. e.g. there is a sound decoder, with a sound which only occurs when a particular function is switched ON. When switching the function OFF nothing happens. By use of the timer can you can without further effort and without the necessity for a further LISSY receiver, automatically switch the function off again, so that the vehicle is ready for the next power-on procedure.

Example

The LISSY receiver is programmed according to the following table:

Programming of function instructions											
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**2...**	20000	20002	103							
Value	**3...**	33	1	2							
Option	**4...**	16	11	4130							

What do these instructions mean?

LNCVs 20, 30 and 40 give the following instruction:

With all locomotives (20000 is the locomotive broadcast address), in both driving directions, when over-driving the LISSY receiver sensors, functions f0 (light) and f5 (smoke) are toggled.

The numerical values for the command in LNCV 30 and the command option in LNCV 40 are shown in the following two tables:

Computation of the command value for the change of locomotive auxiliary functions														
Auxiliary	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	**Calculated value for LNCV 30-39**
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection	X					X								
Sum	**1**					**32**								**33**

Computation of the command option for the change of locomotive auxiliary functions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction	X	0	0
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Switch auxiliary function off		0	
	Switch auxiliary function on		8	
	Change auxiliary function	X	16	16
4	Auxiliary function timed change		32	
5	Switching duration in seconds * 256 =			
			Calculated value for LNCV 40 to 49	16

LNCVs 21, 31 and 41 give the following instruction:

All category 2 locomotives (i.e. 20002) switch the light ON (f0) when driving in the direction from sensor 2 to sensor 1.

The numerical values for the command value in LNCV 31 and the command option in LNCV 41 are shown over the following two tables:

Computation of the command value for the change of locomotive auxiliary functions														
Auxiliary	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	**Calculated value for LNCV 30-39**
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection	X													
Sum	**1**													**1**

Computation of the command option for the change of locomotive auxiliary functions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1	X	3	3
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Switch auxiliary function off		0	
	Switch auxiliary function on	X	8	8
	Change auxiliary function		16	
4	Auxiliary function timed change		32	
5	Switching duration in seconds * 256 =			
			Calculated value for LNCV 40 to 49	11

LNCVs 22, 32 and 42 give the following instruction:

The locomotive address 103 switches f1 (e.g. sound), in driving direction from sensor 1 to sensor 2. The function is to be switched off again after 16 seconds have elapsed.

The numerical values for the command value in LNCV 32 and the command option in LNCV 42 arise over the following two tables:

Computation of the command value for the change of locomotive auxiliary functions														
Auxiliary	**F 0**	**F 1**	**F 2**	**F 3**	**F 4**	**F 5**	**F 6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**	**Calculated value for LNCV 30-39**
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection		X												
Sum		**2**												**2**

Computation of the command option for the change of locomotive auxiliary functions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	X	2	2
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Switch auxiliary function off	X	0	0
	Switch auxiliary function on		8	
	Change auxiliary function		16	
4	Auxiliary function timed change	X	32	32
5	Switching duration in seconds * 256 =	X	4096	4096
			Calculated value for LNCV 40 to 49	4130

NOTE

- If detection of the driving direction is switched off, then setting the driving direction of sensor 1 to sensor 2 or in reverse of sensor 2 to sensor 1 has no meaning, i.e. driving direction need not be programmed.
- When using 2 individual sensors in different places of the layout the driving direction cannot be determined. The detection of the driving direction should then be switched off.

Method:

- Selection of the LISSY receiver, is described in chapter 5.1

  `LNCV:....0=....1`
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98, (which is the function code to delete all values, except the Address values).

  `LNCV:....2=... 98`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- Enter the value the LNCV, e.g.:

  `LNCV:...20=20000`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- Enter the value the LNCV, e.g.:

  `LNCV:...30=...33`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the option LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- The value for the option LNCV enter, e.g.:

  `LNCV:... 40=... 16`
- Press the [↵]-key for the operation to take effect.

- Repeat the above steps of LNCV programming for the LNCV groups 21, 31, 41 - 22, 32, 42 etc..
- Exit programming with [menu] key or return for further programming with the [←]-key

8.3.4 Speed changes

The 10 speeds instructions are programmed into LNCVs 50 to 79 as indicated in the following table:

LNCV	Description
50-59	Address of Vehicle for the speed change
60-69	Value for the speed
70-79	Options for changing the speed

LNCVs belonging to an instruction are always separated by 10. Example: the data for the first instruction are in LNCVs 50, 60, 70, those for the second instruction in LNCVs 51, 61, 71 etc. The following table clarifies the basics, each column represents an instruction:

Allocation of the LNCVs for speed instructions										
For receivers with a double sensor	**double sensor**									
For receivers with two single sensors	**1st Sensor**					**2nd Sensor**				
LNCV for the address	50	51	52	53	54	55	56	57	58	59
LNCV for the value	60	61	62	63	64	65	66	67	68	69
LNCV for the option	70	71	72	73	74	75	76	77	78	79

Switch function LNCV 2 = 2 LNCVs for function instructions with double sensor. All 10 instructions are available for both installed sensors.

Switch function LNCV 2 = 3 LNCVs for function instructions with 2 single sensors. Each of the installed sensors has 5 function instructions available.

Values for the speeds

The speed of a vehicle can be programmed with absolute values, percentages or in kilometers per hour.

Absolute speed, values 0-127

The speed is programmed to a particular speed step. The transmitted speed step values range from 0 to 127. Speed step 0 means stopped. Brake application on speed step 0 is implemented by the locomotive decoder's internal delay values. Speed step 1 is an emergency stop without any delays. Speed steps 2-127 converted into the max. possible speed step range of the Locomotive decoder (depending on the respective data format).

For locomotive decoders with 128 speed steps, the value entered corresponds to the desired speed step. If the locomotive decoder uses a different number of speed steps, then its speed value must convert to the range 0-127. To assist, tables for the different data formats are found in the appendix. As a guide the following equation can be used:

$$\text{abs. speed} = \frac{\text{desired speed step}}{\text{max. number of steps for the decoder}} * 126 + 1$$

Example

The decoder has 14 drive positions. The locomotive is to drive with speed step 10.

10/14 * 126 + 1 = 1260/14 + 1 = 90 + 1 = 91

Therefore, in this instance speed value of 91 would be programmed into the LNCV.

Relative speed values 0-255

The speed can also be a percentage, relative to the current speed, within the range of 0% to 255% can be entered. 50% means halving the speed, 200% a speed doubling. The number of speed steps of the decoder is irrelevant in this case.

Speed in kilometers per hour

The speed is implemented in true-to-scale speed in kilometers per hour. This only works in conjunction with a double sensor. The LISSY receiver measures the current speed as the vehicle passes over the double sensor and then sets the speed to the programmed value in Km/h. This is the model speed, which depends on the scale of the layout.

In order to be able to measure the speed, the LNCV 14 must be programmed. This way the speed can be adjusted in Km/h, depending on the sensor separation and the layout scale used. See chapter 8.5.7.

Options for speed

Instructions for one set of LNCV command options are specified here: i.e. how to program a change of speed. The option value to be programmed is calculated by adding the different option priorities. In command options one can select in which direction the speed instruction is to operate, its absolute, or relative velocity value, or a speed in Km/h etc. The following Table shows all speed options:

Computation of the command option for the change of locomotive speed				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Speed specified as absolute value (0-127)		0	
	Speed specified in percent (0-255%)		8	
	Speed specified in Km/h		16	
			Calculated value for LNCV 70 to 79	

Examples

The LISSY receiver is programmed in accordance with the following table:

Programming of function instructions											
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**5...**	20000	20002	103							
Value	**6...**	80	50	100							
Option	**7...**	0	11	18							

What do these instructions mean?

LNCVs 50, 60 and 70 give the following instruction:

All locomotives (20000 is the broadcast address for all locomotives) will be switched to an absolute of 80 when passing the sensors in either direction

The numerical value for the command option in LNCV 70 is determined from the following example table:

Computation of the command option for the change of locomotive speed				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction	X	0	0
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Speed specified as absolute value (0-127)	X	0	0
	Speed specified in percent (0-255%)		8	
	Speed specified in Km/h		16	
			Calculated value for LNCV 70 to 79	0

LNCVs 51, 61 and 71 give the following instruction:

All category 2 locomotives (according to 20002), traveling in direction from sensor 2 to sensor 1 will have its speed reduced to 50%.

The numerical value for the command option in LNCV 71 is computed from the following table:

Computation of the command option for the change of locomotive speed				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1	X	3	3
2	Switching function 2 or 3	X	0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Speed specified as absolute value (0-127)		0	
	Speed specified in percent (0-255%)	X	8	8
	Speed specified in Km/h		16	
			Calculated value for LNCV 70 to 79	11

LNCVs 52, 62 and 72 give the following instruction:

The locomotive address 103, will have its speed set to 100 Km/h after passing the double sensor in the direction from sensor 1 to sensor 2.

The numerical value for the command option in LNCV 72 is computed from the following table:

Computation of the command option for the change of locomotive speed				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	X	2	2
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Speed specified as absolute value (0-127)		0	
	Speed specified in percent (0-255%)		8	
	Speed specified in Km/h	x	16	16
			Calculated value for LNCV 70 to 79	18

NOTE

- If detection of travel direction is turned OFF, then the selection of the travel direction from S1 to S2 or in reverse from S2 to S1 is meaningless, so travel direction need not be programmed.
- When using 2 individual sensors in different locations of the layout, detection of travel direction should be turned OFF.

Method:

- Selection of the LISSY receiver, is described in chapter 5.1
  `LNCV:... 0=.... 1`
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98, (which is the function code delete all values, except the Address values).
  `LNCV:... 2=... 98`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- Enter the value for the address LNCV, e.g.:
  `LNCV:... 50=20000`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- Enter the value for the value LNCV enter, e.g.:
  `LNCV:... 60=... 80`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.

- Enter the value for the options-LNCV e.g.:
- **LNCV:...70=....0**
- Press the [↵]-key for the operation to take effect.
- Repeat the above steps of LNCV programming for the LNCV groups 51, 61, 71 - 52, 62, 72 etc..
- Exit programming with [menu] key or return for further programming with the [←]-key

8.3.5 Solenoid and route switching

The 10 instructions for switching individual solenoids (switches, signals) or entire routes, which are stored in the Intellibox, are set up in LNCVs 80 to 109. Furthermore feedback commands can be set up here as well, like the one sent by LocoNet Feedback modules (e.g. 63340 or 63350). With the feedback it is possible to set up track routes that have been stored in the IB SWITCH or the feedback can be utilized by a PC control program. In the s88-Mode the Intellibox can monitor the feedback. This following table applies to this feature:

LNCV	Description
80-89	Address of Vehicle which triggers the instruction
90-99	Value for switching the solenoid or sending feedback
100-109	Options for the solenoid or feedback function

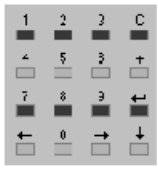
LNCVs belonging to an instruction are always separated by 10. Example: the data for the first instruction are in LNCVs 80, 90, 100, those for the second instruction in LNCVs 81, 91, 101 etc. The following table clarifies the basics, each column represents an instruction:

Allocation of the LNCVs for solenoid instructions										
For receivers with a double sensor	double sensor									
For receivers with two single sensors	1st Sensor					2nd Sensor				
LNCV for the address	80	81	82	83	84	85	86	87	88	89
LNCV for the value	90	91	92	93	94	95	96	97	98	99
LNCV for the option	100	101	102	103	104	105	106	107	108	109

Switch function LNCV 2 = 2 LNCVs for function instructions with double sensor. All 10 instructions are available for both installed sensors.

Switch function LNCV 2 = 3 LNCVs for function instructions with 2 single sensors. Each of the installed sensors has 5 function instructions available.

Command values for solenoids and/or feedback instructions



The keys of the Number pad

With the Intellibox you can switch 1 to 2000 solenoids. In Keyboard mode the Intellibox always has direct access to 8 solenoids with the 16 central keys. Each pair of keys, e.g. Keys 1 and 4, can switch the assigned signal to red (key 1) or green (key 4).

This also happens when switching solenoids from the LISSY receiver, only that the LNCVs cannot specify "red" or "green". The LISSY receiver represents these as numbers thus: "red"=0, "green"=1. If red key 1 is pressed, the command means e.g. "set solenoid 1 to red". Hence the LNCV for this solenoid contains 2 numbers: Solenoid address (1) and

switching direction (0). For programming of the command value of the LISSY receiver, the switching direction and the solenoid address are combined, therefore to set solenoid 1 to red "the instruction value is 10".

If the LISSY receiver is to deliver a feedback command, you proceed in a similar manner. The feedback address has the number 2 added if the track section is free and the number 3 added, if the track section is occupied.

Generally: to switch a solenoid to "red" (signal red, turnout round) the solenoid address number 0 is added; to switch a solenoid to "green" (signal green, turnout straight) the solenoid address number 1 is added.

Sending a feedback with the condition is done the same way. For "vacant" add the number 2 to the feedback address, or for "occupied" add the number 3 to the feedback address.

A few examples: the command value 431 switches the solenoid 43 to green/straight, the command value 4560 switches the solenoid 456 to red/round. the command value 2002 sends feedback for the address 200 with the condition "free", whereas the Command value 5913 sends a feedback for the address 591 with the condition "occupied".

Besides switching individual solenoids, track routes can be implemented. You can switch routes with solenoid commands when using the Intellibox and using feedback commands to switch the routes using the IB-Switch.

To decide which command values to use in order to activate routes in the Intellibox, refer to the following table:

Translation between the route number of the Intellibox and the command value programmed in a LISSY receiver

Group 1				Group 2				Group 3			
Route No.	Solenoid Add	State	LISSY value	Route No.	Solenoid Add	State	LISSY value	Route No.	Solenoid Add	State	LISSY value
1	2001	red	20010	1	2009	red	20090	1	2017	red	20170
2	2001	green	20011	2	2009	green	20091	2	2017	green	20171
3	2002	red	20020	3	2010	red	20100	3	2018	red	20180
4	2002	green	20021	4	2010	green	20101	4	2018	green	20181
5	2003	red	20030	5	2011	red	20110	5	2019	red	20190
6	2003	green	20031	6	2011	green	20111	6	2019	green	20191
7	2004	red	20040	7	2012	red	20120	7	2020	red	20200
8	2004	green	20041	8	2012	green	20121	8	2020	green	20201
9	2005	red	20050	9	2013	red	20130	9	2021	red	20210
10	2005	green	20051	10	2013	green	20131	10	2021	green	20211
11	2006	red	20060	11	2014	red	20140	11	2022	red	20220
12	2006	green	20061	12	2014	green	20141	12	2022	green	20221
13	2007	red	20070	13	2015	red	20150	13	2023	red	20230
14	2007	green	20071	14	2015	green	20151	14	2023	green	20231
15	2008	red	20080	15	2016	red	20160	15	2024	red	20240
16	2008	green	20081	16	2016	green	20161	16	2024	green	20241

Example

Route 13 of Group 2 routes is switched by the command value 20150.

Routes in the IB-Switch are activated over feedback commands. Each key of the IB-Switch can be assigned a feedback instruction with an individual address and one feedback condition (occupied or vacant). For details refer to the IB-Switch manual.

Options for solenoid and feedback instructions

Follow the same method as for speed and function programming. Compute an entry for the LNCV for the command option to execute the solenoid and/or feedback instruction. The following table shows the possible Option values:

Computation of the command option for solenoid and feedback instructions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
			Calculated value for LNCV 100 to 109	

NOTE

- In a normal *switching operation* the solenoid and feedback instructions are implemented immediately the sensor is passed. The use of command option 2 is meaningless in this case. It is only meaningful in *automatic operation*, see chapters 8.4.1 to 8.4.4.

Examples

The LISSY receiver is programmed in accordance with the following table:

Programming of solenoid and route instructions											
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**5...**	94	103	20000							
Value	**6…**	580	20131	1003							
Option	**7…**	2	3	3							

What do these instructions mean?

LNCVs 80, 90 and 100 show the following instruction:

The locomotive address 94 is to switch the solenoid 56 to red/round (LNCV 90 = 560), and when traveling from sensor 1 to sensor 2.

The value for LNCV 100 is computed from the following example table:

Computation of the command option for solenoid and feedback instructions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	X	2	2
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
			Calculated value for LNCV 100 to 109	2

LNCVs 81, 91 and 101 give the following instruction:

The locomotive address 103 is to use route 10 from Group 2 of the Intellibox (LNCV 91 = 20131 (see above table) when traveling from sensor 2 to sensor 1.

The value in LNCV 101 computed from the following table:

Computation of the command option for solenoid and feedback instructions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1	X	3	3
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
	Calculated value for LNCV 100 to 109			3

LNCVs 82, 92, 102 give the following instruction:

All locomotives (LNCV 82 = 20000, broadcast address) announce feedback address 100 with the "occupied" condition (LNCV 92 = 1003). The feedback takes place when the locomotive passes the double sensor when traveling from sensor 2 to sensor 1.

NOTE

- If you turn detection of travel direction OFF, then selection of travel direction from S1 to S2 or in reverse from S2 to S1 is meaningless, so travel direction need not be programmed.
- When using 2 individual sensors in different locations of the layout, detection of travel direction should be turned OFF.

Method:

- Selection of the LISSY receiver, as described in chapter 5.1
  `LNCV:... 0=.... 1`
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98, (which is the function code to delete all values, except the Address values).
  `LNCV:... 2=... 98`
- Press the [↵]-key for the operation to take effect.
- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- Enter the value for the value LNCV enter, e.g.:
  `LNCV:...80=...94`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- Enter the value for the value LNCV enter, e.g.:
  `LNCV:...90=..560`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.

- Enter the number of the LNCV at the left input field.
- With the [→]-key move the cursor into the right input field.
- Enter the value for the value LNCV, e.g.:
  LNCV:..100=....2
- Press the [↵]-key for the operation to take effect.
- Repeat the above steps of LNCV programming for the LNCV groups 81, 91, 101 - 82, 92, 102 etc..
- Exit programming with [menu] key or return for further programming with the [←]-key

8.4 Automatic System

The previous section (8.3 Switching operation) showed how to change the speed, auxiliary functions (light, horn etc..), for each individually recognized vehicle i.e. switch individual turnout, track routes or send feedbacks.

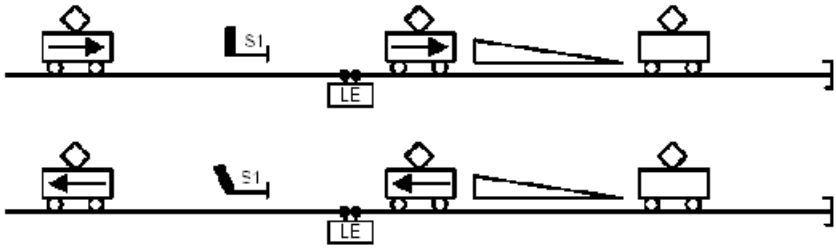
There are also events on your layout which must be reacted to immediately, independently of the vehicle address. e.g. in a sectioned system, every locomotive, irrespective of the address, must stop at a red signal and can proceed with a green signal. It therefore makes no sense for every vehicle to have its own set of instructions programmed.

We refer to sequences, which are executed for all vehicles, as *automated systems*. The various possibilities, which the LISSY receiver offers in an automated layout, are described in the following sections.

8.4.1 Shuttle traffic time-steered

Basic operation

To operate shuttle traffic as shown in the following diagram.



The following sequence is made available by this automatic mode:

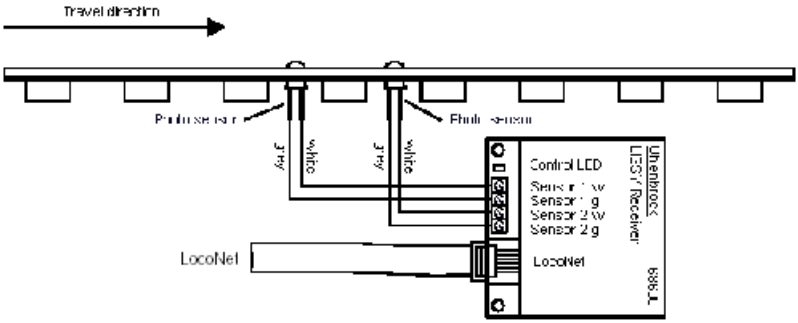
- Any locomotive passes signal S1 in the reverse direction.
- The locomotive over-drives the double sensor of the LISSY receiver.
- The signal S1 is switched to red.
- The locomotive brakes with its inertia and stops.
- An adjustable waiting period, (same for all vehicles).
- During the wait the driving direction is changed (light changes).
- Signal S1 is set to green.
- The locomotive accelerates back to where it came from.

In order to set up this sequence, the following LNCVs need to be programmed:

LNCV	Description	Value
0	Module and first sensor address	1-4095
2	Selection of sequence type, shuttle train with terminus delay time	4
3	Direction, in which the sequence in LNCV 2 is activated Active when traveling from sensor 1 to sensor 2 Active when traveling from sensor 2 to sensor 1	 0 1
4	Waiting time at the terminus in seconds	0-255
6	Address exit signal at which the train at the terminus waits. This is switched by the LISSY receiver and does not have to physically exist on the layout.	S1
10	Block option: the time after which the section is set to vacant again after the train has left on a green signal	0-511

Example

Timed shuttle-service with exit signal (solenoid address10) is programmed into the LISSY receiver with the module address 2. The sensors are connected to the LISSY receiver so that on arrival the train passes over sensor 1 first. All trains are held for 20 seconds before they drive off again. 10 seconds after a train has driven off, the LISSY receiver is ready again for the next shuttle train (block option).



In order to setup the example specified above, the following LNCVs need to be programmed:

LNCV	Description	Value
0	Module and first sensor address	2
2	Selection of sequence type, shuttle train with terminus delay time	4
3	Direction, in which the sequence in LNCV 2 is activated ihen train travels from sensor 1 to sensor 2 If it's traveling in the other direction nothing happens	0
4	Waiting time at the terminus, 20 seconds	20
6	Address exit signal at which the train at the terminus waits. In this case address 10, switched by the LISSY receiver.	10
10	Block option: 10 seconds after the train has left, the LISSY receiver considers the section vacant again and the next train can enter.	10

Method:

- Selection of the LISSY receiver is described in chapter 5.1
  LNCV:... 0=.... 1 (factory default)
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98.
  LNCV:... 2=... 98
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 0 to select LNCV 0.
- With the [→]-key move the cursor into the right input field.
- Enter the value 2 for the module address.
  LNCV:....0=....2
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.

- Enter the number 2 to select LNCV 2 (automated layout).
- With the [→]-key move the cursor into the right input field.
- Enter the value 4 (timed stop shuttle traffic).

LNCV:....2=....4

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- Enter the number 3 to select LNCV 3 (travel direction).
- With the [→]-key move the cursor into the right input field.
- Enter the value 0 (traveling direction sensor 1 to sensor 2).

LNCV:....3=....0

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- Enter the number 4 to select LNCV 4 (waiting time).
- With the [→]-key move the cursor into the right input field.
- Enter the value for the waiting time in seconds.

LNCV:....4=... 20

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- Enter the number 6 to select LNCV 6 (signal address).
- With the [→]-key move the cursor into the right input field.
- Enter the value 10 for the signal address.

LNCV:....6=... 10

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of the LNCV at the left input field.
- Enter the number of 10 to select LNCV 10 (block option).
- With the [→]-key move the cursor into the right input field.
- Enter the value 10 for the signal address.

LNCV:...10=... 10

- Press the [↵]-key for the operation to take effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

Extended operation: Switching solenoids or sending feedback, independent of locomotive address

Once the basics are working, the time delays for shuttle train may need to be modified.

Chapter 8.3.5, shows how to switch solenoids for signals or routes and/or sending feedback. With LNCV 7 and LNCV 8 there are two ways to produce such instructions. These instructions are implemented immediately after the sensors are passed, independent of the recognized vehicle address, i.e. all vehicles switch the same solenoids and/or routes and send the same feedback.

LNCV	Description
7	1. Solenoid, route or feedback

	Address and direction of first solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*
8	2. Solenoid, Route or feedback Address and direction of a second solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*

Extended operation: Switching operation for specific train

Chapter 8.3 is concerned with *switching operations*, how set up a specific vehicle's functions, speeds or solenoid change and/or sending Feedback. All switching functions described can also be programmed individually for automated shuttle train systems.

Chapter 8.3 described adjusting command options, whether the programmed Instruction is executed the instant the sensors are passed or later when the automatic departure is to be implemented. Speed instructions generally are implemented only at departure.

Processing the instructions of the individual switching operation apply as follows:

Sequence	Function	If, then
1.	Are solenoid, routes or feedback instructions to be sent?	implement
2.	Has a waiting period been programmed into LNCV 5?	delayed
3.	Are individual speed instructions to be sent?	implement
4.	Are individual auxiliary instructions to be sent?	implement

Extended operation: Time delayed switching of solenoids

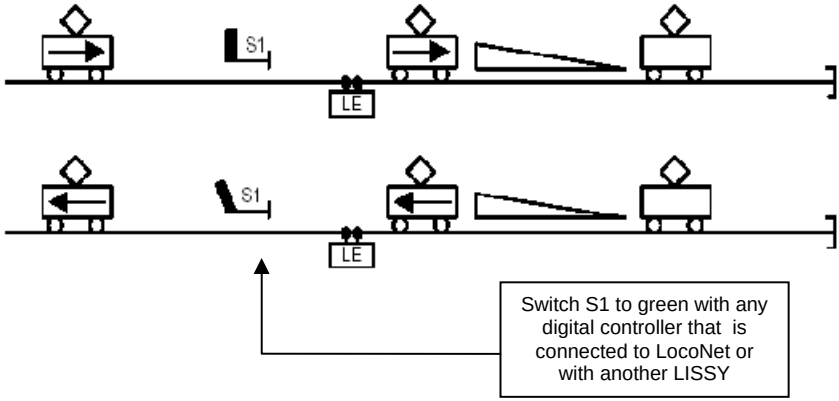
If the switching operation is to switch an entire route for the vehicle, it does not make sense for the vehicle depart immediately after sending the route switching command. The selected route may not have been completely implemented at the time, the individual solenoids could still be changing. In order to prevent this, a waiting period can be set, in LNCV 5, after sending the route or feedback instructions, for which the LISSY receiver waits before it implements the speed instruction.

LNCV	Description	Value
5.	Waiting period for processing solenoids, routes or feedback instructions, in seconds.	0-255

8.4.2 Shuttle traffic manually started

Basic operation

Setting up shuttle traffic in accordance with following illustration:



The following operational sequence is set up by this automated operation:

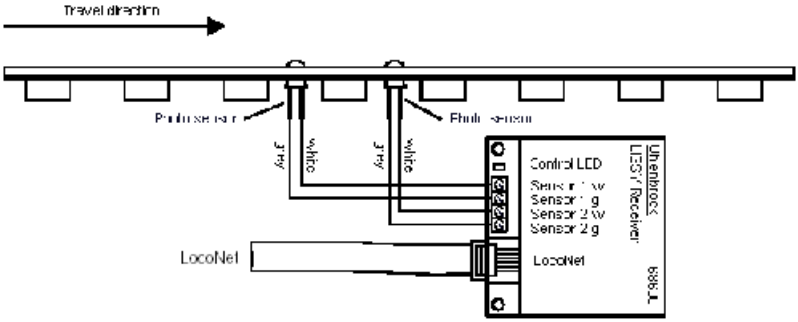
- Any locomotive (which is irrelevant) drives past signal S1 coming from the rear
- The locomotive passes over the LISSY receiver (LE) sensors
- The signal S1 is switched to red
- The locomotive brakes to a stop with its internal system.
- A preset timer function is started. This is the same for all vehicles
- During this time the locomotive's traveling direction is changed (light changes)
- The LISSY receiver monitors signal S1 and waits, till it switches to green by another device that is connected to the LocoNet (Intellibox, IB-control, DAISY, IB-SWITCH or a computer program via the Intellibox), an instruction from a route (Intellibox or IB-SWITCHES) or from another LISSY receiver.
- Once the signal is green, the locomotive is switched into motion in the opposite direction to return to its original location.

In order to setup the example specified above, the following LNCVs need to be programmed:

LNCV	Description	Value
0	Module and first sensor address	1-4095
2	Selection of sequence type, shuttle train with terminus delay time	4
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2 Active when traveling from sensor 2 to sensor 1	 0 1
4	Waiting time at the terminus in seconds	0-255
6	Address exit signal at which the train at the terminus waits. This is switched by the LISSY receiver and does not have to physically exist on the layout.	S1
10	Block option: the time after which the section is set to vacant again after the train has left on a green signal	0-511

Example

The shuttle train is manually started by switching the exit signal at solenoid address 10 with the exit signal connected to the LISSY receiver, with the module address 3. The sensors are connected to the LISSY receiver so that trains entering the terminus pass sensor 1 first and then sensor 2. All trains are to stop 2 seconds before the LISSY receiver monitors the exit signal. If the exit signal with address 10 is on green, it accelerates the train to its original speed. 5 seconds after a train has left, the LISSY receiver is ready for the next shuttle train (block option).



In order to setup the example specified above, the following LNCVs need to be programmed:

LNCV	Description	Value
0	Module and first sensor address	3
2	Selection of sequence type, shuttle train with terminus delay time	5
3	Direction, in which the sequence in LNCV 2 is to be activated when train travels from sensor 1 to sensor 2 If it's traveling in the other direction nothing happens	0
4	Waiting time at the terminus, 2 seconds	2
6	Address exit signal at which the train at the terminus waits. In this case address 10, switched by the LISSY receiver.	10
10	Block option: 10 seconds after the train has left, the LISSY receiver considers the section vacant again and the next train can enter.	5

Method:

- Selection of the LISSY receiver, is described in chapter 5.1
  `LNCV:... 0=.... 1` **(factory default)**
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98.
  `LNCV:... 2=... 98`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 0 to select LNCV 0.
- With the [→]-key move the cursor into the right input field.
- Enter the value 3 for the module address.
  `LNCV:....0=....3`
- Press the [↵]-key for the operation to take effect.

- With the [←]-key move the cursor into the left input field.
- Enter the number 2 to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value 5 (shuttle traffic with manual start).

LNCV:....2=....5

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 3 to select LNCV 3.
- With the [→]-key move the cursor into the right input field.
- Enter the value 0 (traveling direction from sensor 1 to sensor 2).

LNCV:....3=....0

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 4 to select LNCV 4.
- With the [→]-key move the cursor into the right input field.
- Enter the value 2 for the delay time in seconds.

LNCV:....4=....2

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 6 to select LNCV 6.
- With the [→]-key move the cursor into the right input field.
- Enter the value 10 for the signal address.

LNCV:....6=...10

- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 10 to select LNCV 10.
- With the [→]-key move the cursor into the right input field.
- Enter the value 5 for the delay time in seconds, after which the section is available again.

LNCV:...10=....5

- Press the [↵]-key for the operation to take effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

Extended function: Solenoid switching or sending feedback, independent of the locomotive address of the locomotive in the shuttle train

Once the basics are working, the time delays for the shuttle train may need to be modified.

Chapter 8.3.5 showed how to switch solenoids for signals or routes and/or sending feedback. With LNCV 7 and LNCV 8 there are two ways to produce such instructions. These instructions are implemented immediately after the sensors are passed, independent of the recognized vehicle address, i.e. all vehicles switch the same solenoids and/or routes and send the same feedback.

LNCV	Description
7	1. Solenoid, route or feedback Address and direction of first solenoid to be switched, i.e. the address has 0 or 1 added, and/or.address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*
8	2. Solenoid, Route or feedback Address and direction of a second solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*

Extended operation: Switching operation for specific train

Chapter 8.3 is concerned with *switching operations*, how to set up a specific vehicle's functions, speeds or solenoid change and/or sending Feedback. All switching functions described there can also be programmed individually for automated shuttle train systems.

Chapter 8.3 described adjusting command options, whether the programmed Instruction is executed the instant the sensors are passed or later when the automatic departure is to be implemented. Speed instructions generally are implemented only at departure.

In principle processing the instructions of the individual switching operation apply as follows:

Sequence	Function	If, then
1.	Are solenoid, routes or feedback instructions to be sent?	implement
2.	Has a waiting period been programmed into LNCV 5?	delayed
3.	Are individual speed instructions to be sent?	implement
4.	Are individual auxiliary instructions to be sent?	implement

Extended operation: Time delayed switching of solenoids

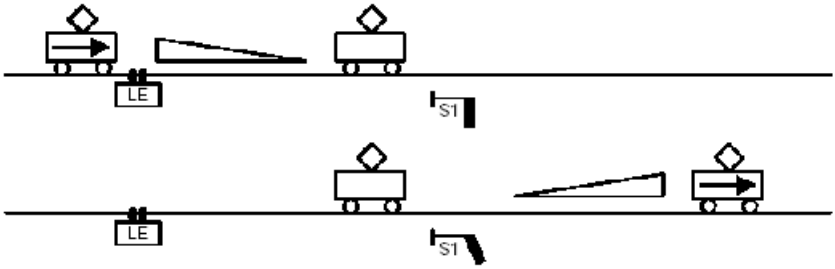
If the switching operation is to switch and entire route for the vehicle, it does not make sense for the vehicle to depart immediately after sending the route switching command. The selected route may not have been completely implemented at the time, the individual solenoids could still be changing. In order to prevent this, a waiting period can be set, in LNCV 5, after sending the route or feedback instructions, for which the LISSY receiver waits before it implements the speed instruction.

LNCV	Description	Value
5.	Waiting period for processing solenoids, routes or feedback instructions, in seconds.	0-255

8.4.3 Holding point

Basic operation

To operate a train automatically as shown in the following diagram:



The following operational sequence is setup by this automated operation:

- The locomotive passes the sensors of the LISSY receiver.
- The signal S1 is switched to red.
- The locomotive brakes with its own inertia (locomotive decoder) and stops.
- An adjustable waiting period, which is the same for all vehicles, expires.
- Signal S1 is set to green.
- The locomotive accelerates again back to its original speed.

In order to achieve this sequence, the following LNCVs must be programmed:

LNCV	Description	Value
0	Module and first sensor address	1-4095
2	Selection of sequence type, shuttle train with terminus delay time	4
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2 Active when traveling from sensor 2 to sensor 1 Active in both traveling directions (holding point only)	 0 1 2
4	Holding time at the terminus in seconds	0-255
6	Address exit signal at which the train at the terminus waits. This is switched by the LISSY receiver and does not have to physically exist on the layout.	S1
10	Block option: the time after which the section is set to vacant again after the train has left on a green signal	0-511

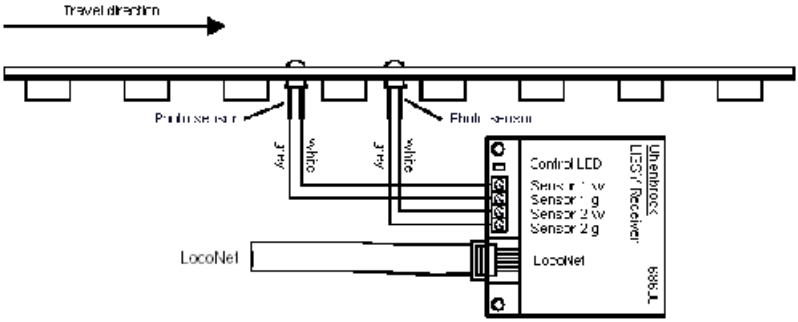
Holding point for both driving directions

LNCV 6 contains the address of the directional signal that is located at the programmed holding point. Especially with the holding points it is possible to automate it in both directions. In this case (LNCV 3 = 2), it is also necessary to install two signals at the location. In LNCV 6, address S1 is the signal in driving direction from sensor 1 to sensor 2. In driving direction sensor 2 to sensor 1, the signal S1+1 then automatically switches. Neither signal need be physically present on the layout.

Example

A LISSY receiver with the module address 4 is installed at the holding point with the exit signal with solenoid address 12. The sensors are connected to the LISSY receiver so that the sequence is triggered when the train travels from sensor 1 and

to it the sensor 2. All trains are to stop for 30s. After that the LISSY receiver sets the exit signal to green and then accelerates back up to its original speed. 10 seconds after the departure, the LISSY receiver should be ready to handle a new train (block option).



In order to setup the example specified above, the following LNCVs need to be programmed:

LNCV	Description	Value
0	Module and first sensor address	4
2	Selection of sequence type, shuttle train with terminus delay time	6
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2 Active when traveling from sensor 2 to sensor 1 Active in both traveling directions (holding point only)	 0 1 2
4	Holding time at the terminus in seconds	30
6	Address exit signal at which the train at the terminus waits. This is switched by the LISSY receiver and does not have to physically exist on the layout.	12
10	Block option: the time after which the section is set to vacant again after the train has left on a green signal	10

Method:

- Selection of the LISSY receiver as described in chapter 5.1
  `LNCV:... 0=.... 1` **(factory default)**
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98,
  `LNCV:... 2=... 98`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 0 to select LNCV 0.
- With the [→]-key move the cursor into the right input field.
- Enter the value 4 for the module address.
  `LNCV:....0=....4`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 2 to select LNCV 2 (automated layout).
- With the [→]-key move the cursor into the right input field.

- Enter the value 6 (holding point function).

  LNCV:....2=....6
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of 3 to select LNCV 3 (driving direction).
- With the [→]-key move the cursor into the right input field.
- Enter the value 0 (traveling direction sensor 1 to sensor 2).

  LNCV:....3=....0
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of 4 to select LNCV 4 (residence time).
- With the [→]-key move the cursor into the right input field.
- Enter the value 30 for the holding point in seconds.

  LNCV:....4=... 30
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number of 6 to select LNCV 6 (signal address).
- With the [→]-key move the cursor into the right input field.
- Enter the value 12 for the signal address.

  LNCV:....6=... 12
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 10 to select LNCV 10 (block option).
- With the [→]-key move the cursor into the right input field.
- Enter the value 10, the waiting period in seconds, after which the section is ready for the next train.

  LNCV:... 10=... 10
- Press the [↵]-key for the operation to take effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

Extended function: Solenoid switch or sending feedback, independent of the locomotive at the holding point

Once the basics are working, the time delays for shuttle train may need to be modified.

Chapter 8.3.5 showed how to switch solenoids for signals or routes and/or sending feedback. With LNCV 7 and LNCV 8 there are two ways to produce such instructions. These instructions are implemented immediately after the sensors are passed, independent of the recognized vehicle address, i.e. all vehicles switch the same solenoids and/or. routes and send the same feedback.

LNCV	Description
7	1. Solenoid, route or feedback Address and direction of first solenoid to be switched, i.e. the address has 0 or 1 added, and/or. address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*
8	2. Solenoid, Route or feedback Address and direction of a second solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*

Extended operation: Switching operation for specific train

Chapter 8.3 is concerned with *switching operations*, how set up a specific vehicle's functions, speeds or solenoid change and/or sending Feedback. All switching functions described can also be programmed individually for automated shuttle train systems.

Chapter 8.3 described adjustment of command options, whether the programmed Instruction is executed the instant the sensors are passed or later when the automatic departure is to be implemented. Speed instructions generally are implemented only at departure.

In principle processing the instructions of the individual switching operation apply as follows:

Sequence	Function	If, then
1.	Are solenoid, routes or feedback instructions to be sent?	implement
2.	Has a waiting period been programmed into LNCV 5?	delayed
3.	Are individual speed instructions to be sent?	implement
4.	Are individual auxiliary instructions to be sent?	implement

Extended operation: Time delayed switching of solenoids

If the switching operation is to switch an entire route for the vehicle, it does not make sense for the vehicle to depart immediately after sending the route switching command. The selected route may not have been completely implemented at the time, the individual solenoids could still be changing. In order to prevent this, a waiting period can be set, in LNCV 5, after sending the route or feedback instructions, for which the LISSY receiver waits before it implements the speed instruction.

You can find further examples for the shuttle train operation, including locomotive specific switching commands, in the examples chapter of this manual.

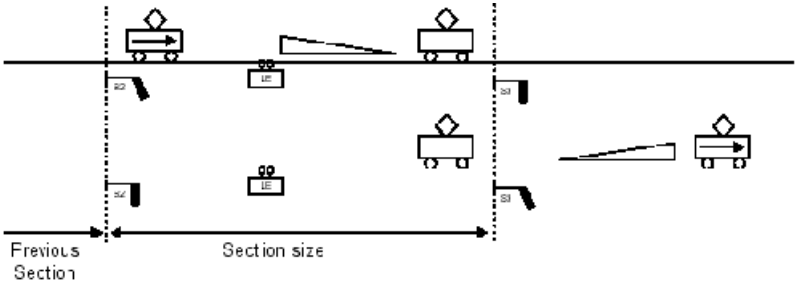
LNCV	Description	Value
5.	Waiting period for processing solenoids, routes or feedback instructions, in seconds.	0-255

8.4.4 Block sections

Basic operation

To protect a section of track with a signal, so that entry signal S2 prevents a subsequent train from entering the block section, if it is already occupied. The train in this block section is affected by exit signal S3. This signal depends on the

condition of the following block section and becomes controlled manually or automatically.



With this basic operation for a block system a longer track distance is divided into several blocks, which can be traversed automatically. For a meaningful automatically controlled block system it must consist of at least 3 blocks. A block system can always control one train less than the number of blocks. The behavior of a locomotive in a block depends on the state of the exit signal at the end of the Block, which is also the entry signal for the next block. For automatic operation one LISSY receiver is needed per block.

The following operational sequence shows how each LISSY receiver, in an automatic block system is programmed. It assumes that the signal at the end of the block is red:

- The locomotive passes the sensors of the LISSY receiver and therefore completely enters the Block with the signal S3.
- The signal S3 at the end of the block is red, the locomotive brakes and stops.
- The signal S2 of the previous block, from which the locomotive came, is also set to red (this happens as a matter of course).
- The signal S1 of the block before, which is now vacant, is set to green (this happens as a matter of course).
- The LISSY receiver monitors the signal S3 and waits for it to be set to green by another device attached to the LocoNet (Intellibox, IB-control, DAISY, IB-SWITCH or a computer program via the Intellibox), an instruction from a route (Intellibox or IB-SWITCH) or another LISSY receiver.
- If the signal turns green S3, e.g. is switched by a LISSY receiver, 2 blocks ahead in the traveling direction, the locomotive accelerates to its original speed again and proceeds into the next block
- As soon as the train is completely in the next block, the signal S3 must be set back to red, e.g. by the LISSY receiver, that controls the following block.

In order to setup this operation, the following LNCVs must be programmed:

LNCV	Description	Value
0	Module and first sensor address	0
2	Automatic mode: block section/station block	7
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2 Active when traveling from sensor 2 to sensor 1	 0 1
6	Exit signal of the controlled block The exit signal S3 is monitored by the LISSY receiver for its status: red signal stops the train, with green signal the train travels through. *Note: The signal does not physically have to be on the layout.*	S3
7	Exit signal red the previous block The exit signal S2 of the now vacant block behind of the train is now automatically switched to red by LISSY receiver. *Note: The signal does not physically have to be on the layout.*	S2-0
8	Entry signal green the previous block The entry signal S1 of the now free, the LISSY receiver switches block before it to green automatically, thus a following train can proceed. *Note: The signal does not physically have to be on the layout..*	S1-1
10	Block option The block status is changed from "occupied" to "vacant", if a train in the block departs or drives through the block's exit signal (LNCV 6) switches to "red".	0

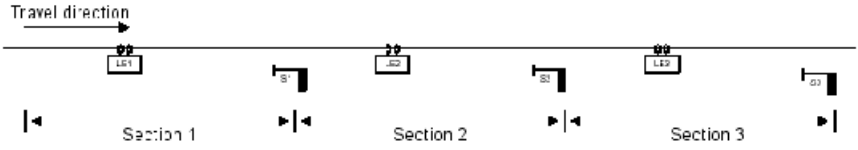
NOTE

- Whilst LNCV 6 contains only the pure signal address, LNCV 7 and LNCV 8 link to the signal addresses depending on the travel direction (0 = red, 1 = green).

If the signal at the end of the block is green, if the locomotive passes over the sensors, it does not change speed. However in all cases signals S2 and S1 of the previous blocks change.

Example block section

We will discuss an individual block, block 3, within a block system of at least three blocks. The solenoid addresses of the signals are: S1=5, S2=6, S3=7.



The LISSY receiver for block 3 in the example is programmed as follows:

LNCV	Description	Value
0	Module and first sensor address	3
2	Automatic mode: block section/station block	7
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2	0
6	Exit signal of the controlled block The exit signal S3 is monitored by the LISSY receiver for its state, red signal stops the train, with green signal the train travels through. *Note: The signal does not physically have to be on the layout.*	7
7	Exit signal red, the previous block The exit signal S2 of the now vacant block behind the train is now automatically switched to red by LISSY receiver. *Note: The signal does not physically have to be on the layout.*	60
8	Entry signal green from the previous block The entry signal S1 of the now free, the LISSY receiver switches the block before it to green automatically, thus a following train can proceed. *Note: The signal does not physically have to be on the layout.*	51
10	Block option The block condition is changed from "occupied" to "vacant", if a train in the block departs or drives through, the block's exit signal (LNCV 6) switches to "red".	0

Method:

- Selection of the LISSY receiver, as described in chapter 5.1
  `LNCV:... 0=.... 1` **(factory default)**
- Enter the number 2 in the left input field (at cursor position) to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value of 98,
  `LNCV:... 2=... 98`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 0 to select LNCV 0.
- With the [→]-key move the cursor into the right input field.
- Enter the value 3 for the module address.
  `LNCV:....0=....3`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 2 to select LNCV 2.
- With the [→]-key move the cursor into the right input field.
- Enter the value 7 for the Block section.
  `LNCV:....2=....7`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 3 to select LNCV 3.
- With the [→]-key move the cursor into the right input field.
- Enter the value 0 for the direction from sensor 1 to sensor 2.
  `LNCV:....3=....0`
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 6 to select LNCV 6.

- With the [→]-key move the cursor into the right input field.
- Enter the value 7 for the signal address.

  LNCV:....6=....7
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 7 to select LNCV 7.
- With the [→]-key move the cursor into the right input field.
- Enter the value 60 for the signal address.

  LNCV:....7=...60
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 8 to select LNCV 8.
- With the [→]-key move the cursor into the right input field.
- Enter the value 51 for the signal address.

  LNCV:....8=...51
- Press the [↵]-key for the operation to take effect.
- With the [←]-key move the cursor into the left input field.
- Enter the number 10 to select LNCV `0.
- With the [→]-key move the cursor into the right input field.
- Enter the value 0 for the waiting time before releasing the block.

  LNCV:...10=....0
- Press the [↵]-key for the operation to take effect.
- Exit programming with [menu] key or return for further programming with the [←]-key

Extended operation: Solenoids or feedback messages, independent of address of the locomotive in the block section

Once the basics are working, the time delays for the shuttle train may need to be modified.

Chapter 8.3.5 showed how to switch solenoids for signals or routes and/or sending feedback. With LNCV 7 and LNCV 8 there are two ways to produce such instructions. These instructions are implemented immediately after the sensors are passed, independently of the recognized vehicle address, i.e. all vehicles switch the same solenoids and/or routes and send the same feedback.

LNCV	Description
7	1. Solenoid, route or feedback Address and direction of first solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*
8	2. Solenoid, Route or feedback Address and direction of a second solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*

Extended operation: Switching operation for specific train

Chapter 8.3 is concerned with *switching operations*, how to set up a specific vehicle's functions, speeds or solenoid change and/or sending Feedback. All switching functions described can also be programmed individually for automated shuttle train systems.

Chapter 8.3 described adjustment of command options, whether the programmed Instruction is executed the instant the sensors are passed or later when the automatic departure is to be implemented. Speed instructions generally are implemented only at departure.

Processing the instructions of the individual switching operation is as follows:

Sequence	Function	If, then
1.	Are solenoid, routes or feedback instructions to be sent?	implement
2.	Has a waiting period been programmed into LNCV 5?	delayed
3.	Are individual speed instructions to be sent?	implement
4.	Are individual auxiliary instructions to be sent?	implement

Extended operation: Time delayed switching of solenoids

If the switching operation is to switch an entire route for the vehicle, it does not make sense for the vehicle depart the immediately after sending the route switching command. The selected route may not have been completely implemented at that time. The individual solenoids could still be changing. In order to prevent this, a waiting period can be set, in LNCV 5, after sending the route or feedback instructions, for which the LISSY receiver waits before it implements the speed instruction.

LNCV	Description	Value
5.	Waiting period for processing solenoids, routes or feedback instructions, in seconds.	0-255

8.4.5 Station administration

With LISSY you can administer an entire station. This can consist of up to 10 parallel tracks with a common entry track.

Each arriving train selects its designated track in the station. If this track is occupied, the train waits at the station entrance at a red signal, until its designated track is vacant. Only then will the train automatically enter its designated track.

A complete station administration is developed as follows: Install a LISSY receiver as the automatic *entry manager* in the block before the station and in the block after the station, install a LISSY receiver as the automatic *exit manager*. The LISSY receivers in the station tracks are automatic *block sections with block feedback message*.

The entry manager ensures that each track in the station is designated to be used for up to 8 different locomotive addresses or categories. The routes from the approach to the station track are automatically switched as track routes. These routes must be stored in the Intellibox or IB-SWITCH. The exit manager provides for automatic departure of the trains from the station. It selects a train for departure and switches the appropriate route, which is stored in the Intellibox or IB-SWITCH.

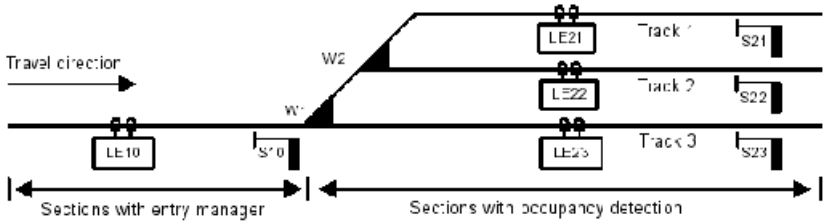
The station can be completely integrated into an automatic block system. It is also possible to use only the entry manager. In this case the station arrivals are controlled automatically and within the station the trains controlled manually. If one uses only the exit manager, i.e. the station departures are automatically controlled and the arrivals are controlled manually.

In addition, it is possible, for the entry and exit manager to operate separately from each other. In this case station entry, and/or exit are automatically controlled, and the remainder controlled manually.

8.4.5.1 Entry managers

Basic operation

You have a station with a number of parallel tracks as in the following diagram:



At the entrance into the station there is a single approach track with the signal S10. The approach track is a block section with a LISSY receiver set up as the automatic *Entry manager*. This regulates the entry of the train to the designated track.

After the signal, the track branches out to the parallel station tracks. Each station track is monitored by a LISSY receiver programmed as an automatic *block section with block status messages*. The LISSY receiver in the station track regulates the deceleration of the individual train ahead of the respective block exit signal, as well as activating auxiliary functions, e.g. switching on Front lighting and calling up sounds.

The allocation of an individual train to the tracks takes place via the entry manager as a function of the vehicle addresses and categories, which are programmed in LNCVs 20 to 119.

NOTE

- The routes to the individual tracks of the station must be setup in the Intellibox or IB-SWITCH. The last instruction of each route must switch the signal at the station, i.e. the exit signal of the entry manager (here S10) to green, so that a waiting train can proceed into the station.

If a train arrives at the entry manager signal, a vacant track, into which this train is permitted enter is selected, and the pertinent route switched.

To set a LISSY receiver as entry manager to a station the LNCVs are programmed as follows:

LNCV	Description	Value
0	Module and first sensor address	1-4095
2	Automatic mode: entry manager	8
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2 Active when traveling from sensor 2 to sensor 1	 0 1
5	Waiting period for processing solenoids - route or feedback instructions. (in seconds.)	0-255
6	Exit signal of the controlled block The exit signal S3 is monitored by the LISSY receiver for its state. red signal stops the train, with green signal the train travels through. *Note: The signal does not physically have to be on the layout.*	S10
10	Block option The block status is changed from "occupied" to "vacant", if a train in the block departs or drives through the block's exit signal (LNCV 6) switches to "red".	0

The administration of the station is done with LNCVs 20 to 119. Each track uses 10 LNCVs for the following purpose:

- The address of the LISSY receiver for the monitoring of the station track
- The instruction for switching a route is setup in the Intellibox or IB-SWITCH. This route must contain switching of all turnouts required to free path to the desired track. The final instruction of the route must always switch the station entry signal to green.
- The addresses of the locomotives, which may enter a particular track. This can be an individual Locomotive address, a train category or the broadcast address for all locomotives. Up to 8 different entries are possible.

LNCV	Description
20	Station track 1 Address (LNCV 0) of the LISSY receiver that supervises track 1 of the station
21	Route to track 1 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 1 of the station (see also ch. 8.2.4)
22	1. Address or train category of the locomotive, which may enter track 1
23	2. Address or train category of the locomotive, which may enter track 1
24	3. Address or train category of the locomotive, which may enter track 1
25	4. Address or train category of the locomotive, which may enter track 1
26	5. Address or train category of the locomotive, which may enter track 1
27	6. Address or train category of the locomotive, which may enter track 1
28	7. Address or train category of the locomotive, which may enter track 1
29	8. Address or train category of the locomotive, which may enter track 1
30	Station track 2 Address (LNCV 0) of the LISSY receiver that supervises track 2 of the station
31	Route to track 2 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 2 of the station (see also ch. 8.2.4)
32-39	Addresses or train categories of the locomotives, which may enter track 2
40	Station track 3 Address (LNCV 0) of the LISSY receiver that supervises track 3 of the station

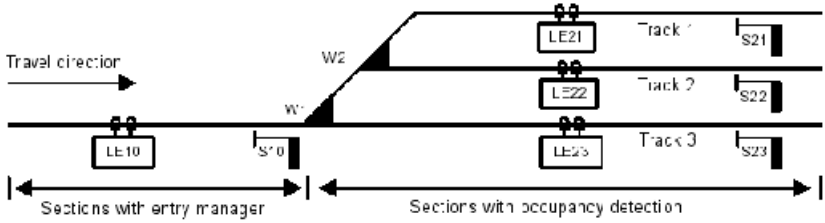
41	Route to track 3 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 3 of the station (see also ch. 8.2.4)
42-49	Addresses or train categories of the locomotives, which may enter track 3
50	Station track 4 Address (LNCV 0) of the LISSY receiver that supervises track 4 of the station
51	Route to track 4 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 4 of the station (see also ch. 8.2.4)
52-59	Addresses or train categories of the locomotives, which may enter track 4
60	Station track 5 Address (LNCV 0) of the LISSY receiver that supervises track 5 of the station
61	Route to track 5 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 5 of the station (see also ch. 8.2.4)
62-69	Addresses or train categories of the locomotives, which may enter track 5
70	Station track 6 Address (LNCV 0) of the LISSY receiver that supervises track 6 of the station
71	Route to track 6 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 6 of the station (see also ch. 8.2.4)
72-79	Addresses or train categories of the locomotives, which may enter track 6
80	Station track 7 Address (LNCV 0) of the LISSY receiver that supervises track 7 of the station
81	Route to track 7 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 7 of the station (see also ch. 8.2.4)
82-89	Addresses or train categories of the locomotives which may enter track 7
90	Station track 8 Address (LNCV 0) of the LISSY receiver that supervises track 8 of the station
91	Route to track 8 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 8 of the station (see also ch. 8.2.4)
92-99	Addresses or train categories of the locomotives, which may enter track 8
100	Station track 9 Address (LNCV 0) of the LISSY receiver that supervises track 9 of the station
101	Route to track 9 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 9 of the station (see also ch. 8.2.4)
102-109	Addresses or train categories of the locomotives, which may enter track 9
110	Station track 10 Address (LNCV 0) of the LISSY receiver that supervises track 10 of the station
111	Route to track 10 Instruction for switching the route in Intellibox or IB-SWITCH, which leads to track 10 of the station (see also ch. 8.2.4)
112-119	Addresses or train categories of the locomotives, which may enter track 10

NOTE

- If a locomotive (train) passes over the sensors of the entry manager, it firstly checks whether the recognized address was programmed for one of the station tracks. If this track is vacant, the appropriate route is switched. The last instruction of the route switches the entry signal to green and the train heads into its destination track.
- If the destination track is occupied, the locomotive waits at the red entry signal, until the destination track becomes vacant.

- A locomotive address can also be programmed for several tracks. Then the locomotive is sent to the first vacant track which is found.
- If the address of the locomotive is not allocated for any track, the entry manager checks if the recognized category is assigned to one of the tracks. If this is the case, it is again checks if the track is vacant. If a vacant track was found, the route is switched for entry to this track. The last instruction of the route must switch the entry signal to the station to green. The train enters the station.
- Categories can also be assigned to several tracks of the station.
- If the entry manager does not find a track for a recognized address or category, it checks if one of the tracks is approved for the entry by all vehicles (address entry 20000). If a track is programmed that way and vacant, the train is moved in there.
- The search for a vacant track starts with LNCV 20 of LISSY receiver. Then, all following LNCV entries are cyclically scanned in ascending order.
- Note: A locomotive, whose address and category are not assigned to a track, does not automatically enter a station without a track for all vehicles (address entry 20000), but stops at the red signal. This locomotive must be then driven into a free track manually.

Example: Entry into a 3-track station



You have a 3-track station with a single approach track. The associated LISSY receiver is programmed as entry manager as follows:

LNCV	Description	Value
0	Module and first sensor address, 1-4095	10
2	Automatic mode: entry manager	8
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2	0
5	Waiting period between switching the track route and starting the waiting locomotive. It applies to all automatic modes setup with LNCV 2 Value is given in seconds.	5
6	Exit signal for the controlled block The exit signal state is monitored by the LISSY receiver. A red signal stops the train, a green signal allows it to drive through. Note: The signal does not physically have to be on the layout.	10

	LE	Route	Locomotive addresses and categories							
LNCV	... 0	... 1	...2	...3	...4	...5	...6	...7	...8	...9
2	21	20010	94	78	86					
3	22	20011	20002	218	100					
4	23	20020	20000							
5										
6										
7										
8										
9										
10										
11										

What do the entries in the previous tables mean?

- The LISSY receiver has the module address 10 (LNCV 0).
- The operating mode is entry manager (LNCV 2 = 8).
- The entry manager works when traveling from sensor 1 to sensor 2 (LNCV 3).
- To enter the station, signal S10 with the address 10 (LNCV 6) is monitored.
- Before entering the station the train waits for of period of 5 seconds (LNCV 5) for switching the routes
- The 3 tracks of the station are monitored by LISSY receivers 21 (LNCV 20), 22 (LNCV 30) and 23 (LNCV 40).
- The routes to the 3 tracks of the station are routes in the Intellibox: Group 1/route 1 (LNCV 21), Group 1/route 2 (LNCV 31), Group 1/route 3 (LNCV 41). All routes must switch the turnouts first and signal 10 to green last.
- For example, the tracks are entered as follows: Steam locomotives BR94, BR78, BR86 drive into track 1, diesel locomotives V100 and BR218 and category 2 locomotives drive into track 2, all other trains drive into track 3.

Extended operation: Solenoids or feedback messages, independent of address of the locomotive in the block section

Once the basics are working, the time delays for the trains may need to be modified.

Chapter 8.3.5 showed how to switch solenoids for signals or routes and/or sending feedback. With LNCV 7 and LNCV 8 there are two ways to produce such instructions. These instructions are implemented immediately after the sensors are passed, independently of the recognized vehicle address, i.e. all vehicles switch the same solenoids and/or routes and send the same feedback.

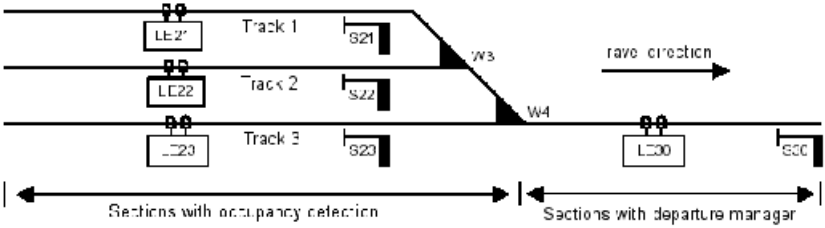
LNCV	Description
7	1. Solenoid, route or feedback Address and direction of first solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*
8	2. Solenoid, Route or feedback Address and direction of a second solenoid to be switched, i.e. the address has 0 or 1 added, and/or. address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*

Further examples for entry managers can be found in the Examples chapter.

8.4.5.2 Exit managers

Basic operation

You have a station with a number of parallel tracks in as shown in the following diagram:



Different trains are located in the station waiting for the exit signals to turn green, which can happen manually. They monitor the state of the section, i.e. the block section following the station. If this block is vacant, i.e. no vehicle is in the block, a train from the station can depart and enter this block. To do this, switch all appropriate turnouts to the exit and lastly the exit signal of the desired station track, to green.

This task can however also be done by a LISSY receiver with the automatic *Exit manager operation* in the first block after the station. The exit manager does nothing different to the example. When the supervised block is vacant, the exit manager selects an occupied track and switches the route from this track to the exit block section. This route then switches the exit signal of the selected track to green.

The routes of the individual station tracks to the exit block must be in the Intellibox or IB-SWITCH. The last instruction of each route must switch the exit signal of the respective station track to green.

NOTE:

- The functions of the switching operation in accordance with chapter 9.2 in the exit manager are no longer possible.
- If a train arrived in the exit block, the exit manager switches a route in the Intellibox or IB-SWITCH, all signals of the station tracks are set back to red.

To set a LISSY receiver as exit manager for a station the LNCVs are programmed as follows:

LNCV	Description	Value
0	Module and first sensor address, 1 4095	9
2	Automatic mode: exit manager The tracks are checked in *chronological* order if they are occupied. That next occupied track is selected for departure. The tracks are checked *randomly* in their occupied state. The next, *randomly* found, occupied track is selected for departure.	10
3	Direction, in which the sequence in LNCV 2 is to activated Active when traveling from sensor 1 to sensor 2 Active when traveling from sensor 2 to sensor 1	 0 1
5	Waiting period for processing switching commands for solenoids and routes. (in seconds).	0-255
6	The state of the exit signal S30 is monitored by the exit manager, red signal causes the train to stop, a green signal permits passing through. *Note: The signal does not have to physically exist on the layout.*	S30
7	Station exit on red Instruction for switching a route in Intellibox or IB-SWITCH, sets all station signals to red again (see also ch. 8.2.4). turnouts do not need to be monitored	

The administration of the station is done with LNCVs 20 to 119. Each track uses 2 LNCVs for the following purpose: Address of the LISSY receiver for monitoring the station track and instruction for switching a route in the Intellibox or IB-SWITCH. This route must contain all turnout-switching instructions, to clear the route from the station track to the station exit. The last instruction in this route must always switch the exit signal of the station to green.

LNCV	Description
20	Station track 1 Address (LNCV 0) of the LISSY receiver that supervises station track 1
21	Route to the exit from track 1 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 1 to the station exit.
30	Station track 2 Address (LNCV 0) of the LISSY receiver that supervises station track 2
31	Route to the exit from track 2 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 2 to the station exit.
40	Station track 3 Address (LNCV 0) of the LISSY receiver that supervises station track 3
41	Route to the exit from track 3 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 3 to the station exit.
50	Station track 4 Address (LNCV 0) of the LISSY receiver that supervises station track 4
51	Route to the exit from track 4 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 4 to the station exit.
60	Station track 5 Address (LNCV 0) of the LISSY receiver that supervises station track 5
61	Route to the exit from track 5 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 5 to the station exit.
70	Station track 6 Address (LNCV 0) of the LISSY receiver that supervises station track 6

71	Route to the exit from track 6 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 6 to the station exit.
80	Station track 7 Address (LNCV 0) of the LISSY receiver that supervises station track 7
81	Route to the exit from track 7 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 7 to the station exit.
90	Station track 8 Address (LNCV 0) of the LISSY receiver that supervises station track 8
91	Route to the exit from track 8 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 8 to the station exit.
100	Station track 9 Address (LNCV 0) of the LISSY receiver that supervises station track 9
101	Route to the exit from track 9 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 9 to the station exit.
110	Station track 10 Address (LNCV 0) of the LISSY receiver that supervises station track 10
111	Route to the exit from track 10 Instruction for switching the route in Intellibox or IB-SWITCH, those that lead from track 10 to the station exit.

Extended function: Coordination with the entry manager

Once the basics are working, the time delays for trains may need to be modified.

The operation of entry and exit managers described so far operate totally independent of one another. Thus the exit manager does not know which locomotive has just arrived at the entry manager and is waiting to enter an occupied track. It can therefore easily happen that the exit manager dispatches a few trains from the station, before the destination track for the waiting train is vacated. In stations with many tracks and block traffic with relatively few blocks the danger therefore exists that the rail traffic becomes grid locked, because no track is being cleared for the waiting train, and due to full blocks under the control of the exit manager will not allow trains to depart.

This problem can be solved by an entering into the exit manager's LNCV 13 the address of the entry manager. Furthermore in LNCVs 22-29, 32-39, to 112-119, make the same entries about locomotive track allocations as in the entry manager. Before the exit manager vacates a track according to one of the procedures described above, (chronological or random), it queries the entry manager about the address and/or category of locomotive that is waiting for a vacant track. If it finds that the destination track is actually occupied its normal track selection is interrupted and first vacates the destination track for the waiting train.

LNCV	Description
13	Link of the exit manager with the entry manager. Enter the address (LNCV 0) of the associated entry manager.
22-29	Locomotive addresses or train categories, which may enter in track 1
32-39	Locomotive addresses or train categories, which may enter in track 2
42-49	Locomotive addresses or train categories, which may enter in track 3
52-59	Locomotive addresses or train categories, which may enter in track 4
62-69	Locomotive addresses or train categories, which may enter in track 5
72-79	Locomotive addresses or train categories, which may enter in track 6
82-89	Locomotive addresses or train categories, which may enter in track 7
92-99	Locomotive addresses or train categories, which may enter in track 8
102-109	Locomotive addresses or train categories, which may enter in track 9
112-119	Locomotive addresses or train categories, which may enter in track10

ATTENTION

- The entry manager, with whom the exit manager is linked, must have LNCV 15 set to Uhlenbrock protocol (see chapter 8.6).

NOTE

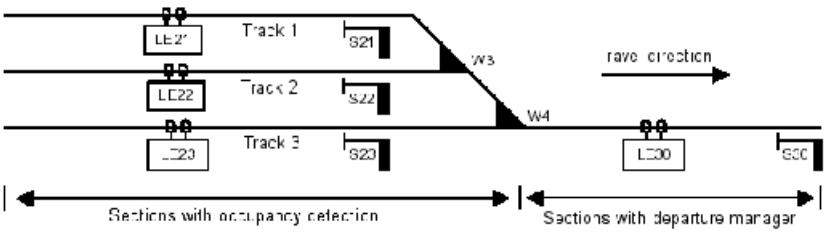
- When searching for a track which can be vacated, the exit manager proceeds in exactly the same way as the entry manager searches for a destination track. It first tries to locate a locomotive in the station under its individual address. If this fails, it searches for an appropriate train category. If this also fails it checks if a track for general traffic was vacated.

Extended function: Switching Solenoids or sending feedback

With LNCV 8 you have a further possibility of sending a switching command. This instruction is implemented immediately after passing the sensors, irrespective of the recognized vehicle address, i.e. all vehicles switch the same solenoid, route or send the same feedback.

LNCV	Description
8	Solenoid, Route or feedback Address and direction of a second solenoid to be switched, i.e. the address has 0 or 1 added, and/or address of a route or address of a feedback with attached Condition 2 or 3. *Note: The signal does not have to physically be on the layout.*

Example: Departure from a 3-track station



You have a 3-track station with a single exit track. The associated LISSY receiver is setup as exit manager and programmed as follows:

LNCV	Description	Value
0	Module and first sensor address, 1-4095	30
2	Automatic mode: exit manager with random selection	10
3	Direction, in which the sequence in LNCV 2 is to activated Active when traveling from sensor 1 to sensor 2	0
6	Exit signal (S30) is monitored by the LISSY receiver. A red signal stops the train, a green signal allows it to drive through. *Note: The signal does not physically have to be on the layout.*	30
7	Station exit on red Instruction for switching a route in the Intellibox or IB-SWITCH, which sets all station signals to red (see also ch. 8.2.4). Turnouts do not need to be considered here.	20051
13	Link of the exit manager to the entry manager	10

	LE	Route	Locomotive addresses and categories							
LNCV	**... 0**	**... 1**	**…2**	**…3**	**…4**	**…5**	**…6**	**…7**	**…8**	**…9**
2...	21	20030	94	78	86					
3...	22	20031	20002	218	100					
4...	23	20040	20000							
5...										

What do the forgoing entries mean?

- The LISSY receiver has the module address 30 (LNCV 0).
- The automatic operation is exit manager (LNCV 2 = 10) with random selection.
- The exit manager operates when passing the sensors from sensor 1 to sensor 2 (LNCV 3).
- For departing from the exit manager's block, signal S30 with the address 30 (LNCV 6) is monitored.
- The exit manager coordinates its behavior with the entry manager with the address 10 (LNCV 13), i.e. the "normal" departure traffic is interrupted, in order to vacate a suitable track for a train, which is waiting for entry into the station. For this function the track allocation rule from the entry manager are used. If this function is not wanted, LNCV 13 is set to value 0. Likewise set LNCVs 22, 23, 24, 32, 33, 34 and 42 to value 0.
- The 3 station tracks are monitored by LISSY receivers 21 (LNCV 20), 22 (LNCV 30) and 23 (LNCV 40).
- The routes from the 3 station tracks to the exit manager's exit track are routes in the Intellibox: Group 1/route 5 (LNCV 21), Group 1/route 6 (LNCV 31), Group 1/route 7 (LNCV 41). All routes must first set the turnouts and lastly switch the exit signal of the corresponding station track to green
- The entry manager's track allocation rules read: Steam locomotives BR94, BR78, BR86 drive into track 1, diesel locomotives V100 and BR218 as well as locomotives of the category 2, drive into track 2. All other trains drive into track 3. If the exit manager is to work independently from the entry manager, LNCVs 22, 23, 24, 32, 33, 34 and 42 are set to the value 0.
- When passing over the exit manager's sensors, group 1/route 10 in the Intellibox (LNCV 7 = 20051) are switched. This sets all exit signals in the station to red.

8.4.5.3 LISSY receivers for station tracks

The individual tracks in the station are monitored by LISSY receivers with the automatic mode of '*Block section with block status message'*. This operates in exactly the same way as the automatic *block section* function, however in addition it reports its status to an entry or an exit manager via the LocoNet. That means that all LISSY receivers supervise the station tracks with the entry into LNCV 7 to set the same signal to red, i.e. the entry signal to the station at the entry manager.

In order to achieve this operation, the following LNCVs are to be programmed:

LNCV	Description	Value
0	Module and first sensor address, 1-4095	
2	Automatic mode: mode: block sensor with status message.	23
3	Direction, in which the sequence in LNCV 2 is to be activated Active when traveling from sensor 1 to sensor 2	0
6	The exit signal, at the end of the track is monitored by the track manager. A red signal stops the train, a green signal allows it to drive through. *Note: The signal does not physically have to be on the layout.*	S2x
7	The station entry signal S10 is automatically set to red by the track manager. *Note: The signal does not have to physically be on the layout.*	S10-0
8	The entry signal into the entry manager's block is automatically set to green by the LISSY receiver, so the next train can the entry manager's vacant block section *Note: The signal does not have to physically be on the layout.*	

As the LISSY receiver with the automatic mode '*block section with block status message' operates* exactly like the automatic mode '*block section'*, for all further programming of basic operation and extended functions refer to chapter. 8.4.4 *Block sections*.

Each LISSY receiver can report its internal state "vacant" or "occupied" over that LocoNet. Status reporting is setup by adding the number 16 to the function code (value 4-10) in LNCV 2 (functions), e.g. Function 4 is a terminus section *without* active block status message and function 20 is the same terminus section *with* active block status message. Function 8 is an entry manager *without* active block status message and function 24 the same entry manager *with* active block status message.

Therefore it is possible to automate e.g. a shuttle terminus controlled by an entry manager which allows trains to enter, or a station with more than 10 tracks is administered as several stations in one.

Automatic modes from LNCV 2	without block status message	with block status message
Shuttle terminus time controlled	4	20
Shuttle terminus signal controlled	5	21
Holding point	6	22
Block section	7	23
Entry manager	8	24
Exit manager cyclically chronologically	9	25
Exit manager *random selection*	10	26

8.5 Special functions

8.5.1 Resetting and deletion

In the course of operating a layout it can be necessary to set a LISSY receiver to a known, defined state.

If you want to program your own functions, then we recommend that you delete the factory installed pre-programmed Functions before you commence programming, otherwise these can interfere with your desired operation.

If you have a LISSY receiver with unknown contents, it is better that you reset it to factory default. In factory default condition you have a number of known pre-programmed functions. Therefore you can simply test the operation.

The delete and/or reset is done via programming a special mode of operation into the LNCV 2 of your LISSY receiver. Four different options exist for deletion and/or resetting:

LNCV	Description	Value
2	*Delete functions*	
	Clear the current operating conditions. Programmed LNCVs is not changed.	96
	Clear all LNCVs for the switching mode (starting from LNCV 20)	97
	Set all LNCVs to 0, except LNCV 0 and 1 (address)	98
	Reset to Factory default, without changing address	99

Factory default settings of a LISSY receiver are:

LNCV	Value	Description
Basic settings		
0	1	Module address, and first sensor address
1	2	Second sensor address
2	2	Direction sensitive switch mode
15	8	Save module operation mode at power off
Function 1		
20	20000	For all trains
30	1	f0 (light)
40	2	Turn off if direction S1 -> S2
Function 2		
21	20000	For all trains
31	1	f0 (light)
41	11	Turn on if direction S2 -> S1

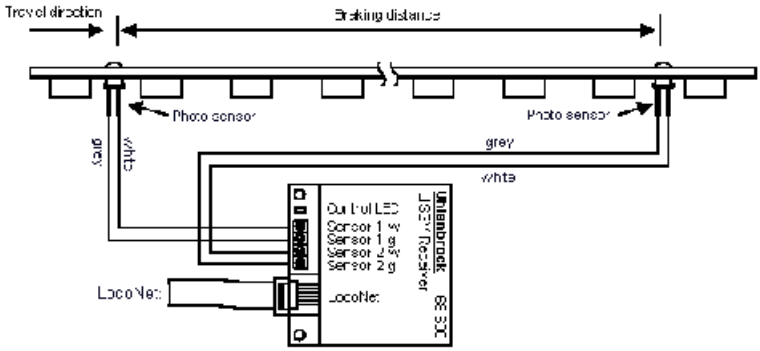
8.5.2 Braking before a signal

Extended function: Precision stop

This Chapter is about shuttle trains, holding point, block section and station block explaining that each vehicle brakes immediately it passes over one of the double sensors by using its internal braking settings. Thus, the point at which a vehicle comes to rest is dependent on its speed when it enters the block and the design of the vehicle. So every locomotive will stop at a different place.

This behavior can now be modified so that the sensors are no longer installed as a double sensor, but further apart. The locomotive brakes after passing the first sensor to an adjustable speed (the programmed speed step applies to all locomotives) and moves forward at this speed to the second sensor, where it finally

stops. By setting a slow speed, a point can be realized at which all vehicles stop, if the mechanical characteristics of the locomotive are not too different.



This can be achieved by programming a block speed in LNCV 9.

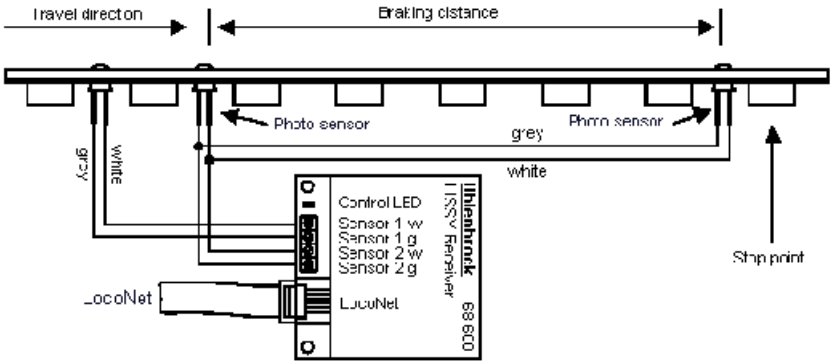
LNCV	Description
9	Block speed If a speed step (2-127) is entered here, then the module in the automatic modes 4-10 and 20-26 (LNCV 2) a 3 Sensor unit. The normal double sensor seizes the train and reduces the speed to the adjusted value. The 3rd sensor is connected parallel to sensor 2 further along the track where the train will stop. 3rd Sensor then brakes the train on the speed step 1 (= emergency stop). 0 = stopping with the decoder-internal delay 1 = emergency stop (stop without delay) 2-127 = speed step for the slow section

The speed step values 2 to 127 are automatically converted by the Intellibox depending on the number of speed steps the individual locomotive is set to (14/27/28/128 with DCC, 14 with Motorola or 31 with Selectrix). The calculated values are rounded to a whole number. After passing over sensor 1 the locomotive will use its decoder-internal deceleration to reduce speed to the programmed speed step for this section and finally stops only after it passes over sensor 2.

The factory default for LNCV 9 = 0, *block speed function* is switched off.

Precision stopping in section with 2-way traffic

With the original placement of the sensors is it not possible, for a locomotive to travel unhindered in the block in the opposite direction, because sensor at the start of block will always react. If a block is to have unhindered traffic in the opposite direction, a 3rd sensor has to be installed, that forms a double sensor with the first sensor with small separation (approx. 1 sleeper). This is connected in parallel with the sensor at the end of the block. Therefore in the block driving direction sensor 1 is for deceleration and sensor 2 for stopping, sensor 3 is inserted after sensor 1, but parallel to Sensor 2.



NOTE

- With the parallel connection of two sensors you must ensure that the sensor that was not passed is not strongly lit. This 'foreign' lighting may prevent data recognition at the active sensor.

8.5.3 Deactivating the automatic mode via solenoid address

Sometimes, e.g. when manually shunting within tracks with LISSY receivers, it can be useful to switch *an automated* LISSY receiver off and to restart it on completion of the manual process. The LISSY receiver must then have a solenoid address assigned to it in LNCV 11. If this set to "red", the LISSY receiver is deactivated. By switching it to "green" the LISSY receiver is reactivated. When switching the LISSY receiver OFF, the current state values are deleted and it restarts the automatic mode from scratch.

With restarting the automatic mode the LISSY receiver assumes the respective block section is free for a new vehicle. If the reactivated unit acts as an exit manager, then after switching On in the vacant state, a train will automatically be cleared to leave the station. For safety reasons, to avoid collisions, this procedure must be manually started, by setting a station exit signal to green.

LNCV	Description
11	Automatic mode on/off switch, by solenoid address. 0 = automatic operation not influenced by the solenoid address 10-20000 = solenoid red: LISSY receiver is not active 11-20001 = solenoid green: LISSY receiver is active

8.5.4 Train dependent automation

It is possible to affect *the layout automation* by a train's category. For this there is LNCV 12:

LNCV	Description
12	Category-dependent automation = automatic mode switch on or off by train category. For modes 4-10 and 20-26 in accordance with LNCV 2. 0 = automation not influence by categories 1-4 = all train categories other than the indicated one are selected for automation after sensor is passed 11-14 = only the indicated train category activates automation after passing the sensor

This permits interesting operational sequences to be set up e.g. the Valley Station for the shuttle train for the mountain railway, at which the driving direction is reversed. All other trains drive through without direction changes.

8.5.5 Block option "vacant/occupied" in the automated layout

When a vehicle with LISSY transmitter drives over a LISSY receiver programmed for an *automatic mode*, it then implements the program. Internally the LISSY receiver saves the "occupied" state. That means that the LISSY receiver must become "vacant" again before it can accept the next vehicle. As long as the LISSY receiver is "occupied", it cannot handle any further vehicles automatically.

Should a vehicle that entered a block automatically be 'released' manually, the block must be set to "vacant" again before the next vehicle can enter the block.

During the automatic operation the LISSY receivers always switch to the "occupied" state when a vehicle passes the sensors. LNCV 10 can specify how the LISSY receiver can be returned to the "vacant" state.

In particular, for the *shuttle terminus* or *holding point,* it is advisable to switch the abandoned stop back to "vacant" via a timer and also set signal back to "red".

LNCV	Description
10	Block option = options for the block change in state of "occupied" to "vacant", if a train left the block or drove through. 0 = exit signal (LNCV 6) is switched to "red". after the block is vacated 1-255 = if afterwards the indicated number of seconds passed. Value in seconds. 257-511 = like preceding option. Now the exit signal indicated in LNCV 6 is also set to red. Value in seconds + 256.

8.5.6 Block status reporting

Each LISSY receiver can actively report its internal state "vacant" or "occupied" via the LocoNet. Reporting can be activated by adding a value of 16 to the actual automation mode function code (4-10) in the LNCV 2. The messages that can be interpreted by LISSY receivers are if they are operating as entry or exit manager. Thus: Mode 4 is a shuttle terminus *without* active block status message, function 20 the same shuttle terminus *with* active block status message. Function 8 is an entry manager *without* active block status message, function 24 the same entry manager *with* active block status message.

Automatic modes from LNCV 2	without block status message	with block status message
Shuttle terminus time controlled	4	20
Shuttle terminus signal controlled	5	21
Holding point	6	22
Block section	7	23
Entry manager	8	24
Exit manager cyclically chronologically	9	25
Exit manager *random selection*	10	26

8.5.7 Speed calibration

If the LISSY receiver is in an operating mode with a double sensor, it has the capability of determining the "genuine" speed of a passing vehicle in kilometers per hour and send it via the LocoNet. For this the module needs information about the sensor separation and the layout scale used.

The scale factor, which can be programmed into LNCV 14, is computed by multiplying the sensor separation in mm with the constant of A, for the layout scale, in the table below. Scaling factor LNCV 14 = sensor separation [mm] x A

LNCV	Description
14	Reporting of the locomotive speed 0 = no reporting of the locomotive speed 1-65535 = the sensor sends the measured locomotive speed as value within a range from 0 to 511 in km/h. CV contains a scaling factor for the speed measurement, calculated from sensor separation and model train scale.

The scale multiplier is obtained from the following table:

Scale	Track gauge	Constant A
1:32	Gauge 1	576
1:87	H0	1566
1:120	TT	2160
1:160	N	2880

Table for constant A, for multiplying with the distance between the two sensors, in mm.

Example

The scale is H0 and the sensors separation ‘S’ is 15 mm.
S[mm] * A = 15 x 1566 = 23490 = enter into LNCV 14.

NOTE

- At high speeds (250 Km/h) it can have inaccuracies of up to 5%.

The smallest measurable speed depends on sensor separation and scale. It is calculated by multiplication of the sensor separation in mm by the constant B, and is calculated using the information from the table below.

Scale	Track gauge	Constant B
1:32	Gauge 1	0.04608
1:87	H0	0.12528
1:120	TT	0.1728
1:160	N	0.2304

Table for constant B, to determine the minimum measurable speed.

Example

The scale is H0 and the sensors separation 'S' is 20 mm.

S[mm] * B = 20 x 0.12528 = 2.5 Km/h

NOTE

- The LNCV14 have a value of 0 or if the sensors are installed too far apart, the train speed cannot be measured when driving over the sensors. Therefore the speed will not be changed after the train has passed the sensors.

8.6 Module protocol

LNCV 15 defines the LocoNet protocol format that will be used by the module.

Computation of the command option for the module LocoNet protocol format				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Don't send any message		0	
	Send Uhlenbrock format with locomotive address and category		1	
	Send Digitrax format with locomotive address and block vacant		2	
	Send Digitrax format with locomotive address and block occupied		3	
2	Default for digital centers		0	
	Special configuration for Fleischmann LOK-boss		4	
3	Does not save operating status when switching off		0	
	Saves operating status when switching off		8	
			Calculated value for LNCV 15	

With option 1 you can specify whether and which LocoNet protocol format is sent to other LocoNet devices that will use the LISSY receiver's reported data (address, category, driving direction, receiver address of the LISSY receiver). e.g. if a LocoNet display (item No. 63,450) is to Indicate the locomotive address to be used, the LISSY receiver must be set to send Uhlenbrock format.

With option 2 the LISSY receiver can be connected with the Fleischmann Lok-boss. Speed and function instructions can be implemented. Solenoids on the layout cannot be switched. The Shuttle train (function 4) and the holding point (function 6) can be used. All other automatic functions used by Lok-boss are not available, since they are dependent on the monitoring of solenoids. To program an Intellibox, twin center, IB-control or a twin-control, is needed.

With the option 3 you can specify whether the LISSY receiver saves status information when the power is switched off.

9 Tips and Tricks

9.1 Switching off and state saving

In the course of running the layout the LISSY receiver saves different state information such as: Locomotive address, category, speed, occupancy etc. The LISSY receiver is factory set so that these states are retained if the layout power is OFF. When turning the power back ON saved state information is restored. The layout can continue where it left off when it was turn off.

After an erasing process, this function is deactivated. All LNCVs, except the address are deleted during this procedure (LNCV 2 = 98). To activate state saving again LNCV 15 must be set to value 8.

9.2 Commuter trains and multi-traction

As described in chapter 8.5.5, the LISSY receiver uses the first recognized address to set the internal occupied state (block option). Further vehicles, passing the sensors, don't trigger the 'program' again.

Should a commuter train's control cab car be fitted with a LISSY transmitter with the same address as the locomotive, the train will stop correctly at a red signal irrespective of its traveling direction. As soon as the address is recognized, an appropriate speed instruction is sent regardless of whether the address was sent by the locomotive or by the control cab car.

It is similar with multi-traction. The first vehicle identifies itself with its address. This does not have to be the so-called guidance address of the multi-traction. The system recognizes the fact that it concerns multi-traction and sends the appropriate Instructions to all vehicles driving in the traction.

9.3 Command execution time

When processing individual groups of instructions *of the switching operation,* the current instruction must be completed before the next one can be implemented.

The instruction for switching an individual solenoid takes approx. 0.5 seconds. If several solenoids are to be operated in a sequence, processing will take accordingly longer.

In the group of the function instructions it is possible to time the functions, switching them on for a certain time (chapter 8.3.3) and then automatically switching off again. Processing of the sequence can only continue after such an instruction has timed out.

NOTE

- Avoid long times and too many timed functions. Otherwise there is a possibility that instructions at the end of the command string are implemented too late.

9.4 Extended stations

Chapter 8.4.5 showed that with an *entry manager*, *station block* and *exit managers* it is possible to automate simple stations. In the example in the aforementioned Chapter the station block operates (track manager) e.g. as block busy response.

As the LISSY receiver can automatically send an Occupied or Free message, every other function, and not only the block, is suitable for station administration.

The entry and exit supervised tracks do not necessarily have to be in the close range of the station, but in principle can be distributed around the layout. Thereby varied operational sequence can be arranged. This however requires a very good knowledge of the operation of the layout and Documentation of LISSY receiver programming. The possibility of "distributed stations" is therefore for advanced users.

9.5 LISSY and DAISY

The LISSY system is also suitable for use with a DAISY System. Speed and function instructions can be implemented, as well as switching of solenoids. Locomotive or car addresses above 9999 are not accessible with a DAISY System. Solenoids with addresses up to 256 can be switched. Since the DAISY System has no route function, an IB-Switch should be installed to automate switching of routes by feedbacks from the LISSY receivers.

The LISSY transmitters are programmed using the DAISY System CV programming. Please read the appropriate chapter in the DAISY manual. LISSY receivers cannot be programmed with the DAISY hand control.

To program LISSY receivers an IB-Control, (art. No. 65 400) with Software-Version 1.550 or higher is needed. Then the LISSY receivers can be programmed as with the Intellibox, described in the previous chapters. The IB-Control is connected with the DAISY system via the LocoNet.

9.6 LISSY and Control Unit 6021

The LISSY system can be used with a Control Unit 6021 in conjunction with the 6021-LocoNet-Adapter (Item 63 820). Without further accessories, speed and function instructions (f0-f4) for a maximum of 80 locomotives can be processed. Without the use of the Märklin Keyboard, LISSY can switch up to 256 solenoid addresses. For route switching, an IB SWITCH (Item 65 800) must be installed.

To program LISSY receivers the IB-Control (Item 65 400) is with Software-Version 1.550 or higher is necessary. The LISSY receivers are programmed with the IB-Control in the same way as with the Intellibox, as described in the previous chapters. The IB-Control should be connected to the LocoNet with the 6021-LocoNet-Adapter. For this a LocoNet distributor (Item 62 250) is also required.

Programming the LISSY transmitters with the Control Unit 6021, is described in chapter 3.5 (Programming with a Motorola Center).

9.7 LISSY and Fleischmann TwinCenter

In order to use LISSY with the TwinCenter to its full extent, the TwinCenter must have software-Version 1.1 or higher. You will then be able use all the functions described in this Manual, as with the Intellibox.

The software update to the version 1.1 on Fleischmann's InterNet page is found at www.fleischmann.de.

9.8 LISSY and Fleischmann LOK-BOSS

LISSY is suitable for use with LOK-BOSS (Item. 6865). Speed and function instructions can be implemented, solenoids on the layout cannot be switched. Automatic operation necessitates that the switching of solenoids must be set or carefully watched. Shuttle trains and delay sections can be used, but programming by the LOK-BOSS is not possible.

If you want to attach LISSY to the LOK-BOSS, then the LNCV 15 for the module must be changed (see chapter 8.6).

9.9 Installation sensors in Märklin C-track

The following pictures show the installation of the LISSY photo sensors in Märklin C-track.

1. With sturdy side cutter remove a piece of center rail for a length of two sleepers
2. Bore the two 3 mm drill holes for the installation of the sensors. It may be an idea to drill a smaller pilot hole first so that holes will be in the center of the track
3. Insert the sensors into the drill holes. Ensure that the sensors do not tower above the spot contacts. Glue the sensors in place with a rapid setting adhesive. The two tube sections are not needed with this kind of track.
4. Solder in a piece of wire to bridge the interruption that was cut into the center rail. The prepared track with the sensors can now be installed in the layout.

Appendix

A.1 Configuration Variable (CVs) of the LISSY transmitter

CVs Loco	CVs LISSY	Register	CVs Mot	Meaning	Value Range	Factory default
1	116	1	1	Short address	0-127	3
17	117		17	Long address High byte		256
18	228		18	Long address Low byte		
29	129		29	short address valid long address valid	0-32	0
-	115	5	15	Train category (2 bits)	1-4	0
		8		Manufacturer identification	-	155

A.2 LocoNet CVs of the LISSY receiver

LNCV	Description	Value Range	See chapter
0	Module address and first sensor address General address : 65535	1-4095 65535	6.1
1	Second sensor address is used when the sensors are used individually	1-4095	6.1
2	Selection of the different modes *Basic functions* 0 = Receiving locomotive data via a double sensor. Transmission of address, category, driving direction and speed. *Note: Transmission on the LocoNet is activate with LNCV 15.* 1 = Receiving locomotive data over 2 single sensors in 2 independent places of the Layout. *Note: Transmission on the LocoNet is activate with LNCV 15*. *Switching operation* 2 = switching operation with double sensor and direction recognition 3 = switching operation with 2 single sensors in 2 independent places of the layout without direction recognition *Mechanism functions* 4 = time controlled shuttle traffic terminus 20 = time controlled shuttle traffic terminus with block status message 5 = signal controlled shuttle traffic terminus 21 = signal controlled shuttle traffic terminus with block status message 6 = time controlled holding point 22 = time controlled holding point with block status message 7 = block section/station block 23 = block section/station block with block status message 8 = entry manager 24 = entry manager with block status message 9 = exit manager, chronological track sequence 25 = exit managers, chron. track sequence with block status message 10 = exit manager, random track sequence 26 = exit managers, random track sequence with block status message *Delete functions* 96 = delete current operating status. Programmed LNCVs are not changed. 97 = delete all LNCVs starting from LNCV 20 98 = all LNCVs sets 0, except LNCV 0 and 1 (address) to the value 99 = restore factory defaults, without address change	0-10, 20-26, 96-99	6.2 And 8.
3	Driving direction, for activating the automatic function in LNCV 2 0 = function activated when driving from sensor 1 to sensor 2 1 = function activated when driving from sensor 2 to sensor 1 2 = function activated in both directions (only holding point)	0-2	8.4

LNCV	Description	Value Range	See chapter
4	Holding time for shuttle traffic and terminus (automatic functions in set in LNCV 2). Value in seconds.	0-255	8.4.1 8.4.3
5	Delay period between switching the locomotive's route and the departure of the waiting locomotive applies to all modes set in LNCV 2. Value in seconds.	0-255	
6	Solenoid address of the exit signal for the automatic mode set in LNCV 2. In automatic modes 4, 6, 20 and 22 the signal is set by the module; in automatic modes 5, 7-10, 21 and 23-26 the signal is monitored stopping the train. *Note: This signal must always be specified in automatic mode.*	1 2000	8.4.1 8.4.4
7	1. Address for solenoid, routes from Intellibox or feedback for those Automatic modes set in LNCV 2. The appropriate instruction is sent, if the sensor is passed. 0 = no address instruction is sent 20010 - 20241 = switch an Intellibox route 10, 20, 30 - 20000 = solenoid 1, 2, 3 - 2000 set to red/round 11, 21, 31 - 20001 = solenoid 1, 2, 3 - 2000 to green/straight set 12, 22, 32 - 20482 = feedback address 1, 2, 3 - 2048 - vacant 13, 23, 33 - 20483 = feedback address 1, 2, 3 - 2048 - occupied	0-20483	8.4.1 8.4.5
8	2. Address for solenoid, routes in Intellibox or feedback for those automatic mode as set in LNCV 2. See LNCV 7.	0-20483	8.4.1 8.4.5
9	Block speed If a speed step (2-127) is entered here, then the module in the automatic modes 4-10 and 20-26 (LNCV 2) can use a 3 sensor system. The normal double sensor detects the train and reduces its speed to the specified value. Sensor 2 and 3 are connected in parallel - 2. Sensor 3. then brakes the train to speed step 1 (= emergency stop). 0 = stop with the locomotive decoder's-internal delay 1 = emergency stop (stop without delay) 2-127 = speed step for the slow section	0-127	8.5.2
10	Block option = options for reporting the change in block status from "occupied" to "vacant", if a train drives out of or through the block. 0 = exit signal (LNCV 6) is set to "red" after the block is vacated 1-255 = the statue is reported after the specified Value in seconds. 257-511 = like previously. Now the Exit signal in LNCV 6 is set to red. Value in seconds + 256	0-511	8.5.5
11	Automatic operation functions by solenoid address switch on or off. 0 = no mechanism influence by the solenoid address 10-20000 = solenoid red: LISSY receiver is not active 11-20001 = solenoid green: LISSY receiver is active	0-20001	8.5.3
12	Train-dependent mode = automation switched on or off depending on train category. For the modes 4-10 and 20-26 as set in LNCV 2. 0 = operation not influenced by any category 1-4 = the automation is NOT carried out for the specified train category when one passes the sensors. 11-14 = only the specified train category activates the automatic function when one passes the sensors.	0-4 11-14	8.5.4
13	Link the exit and entry managers. 0 = no link between exit and entry manager 1-4095 = the address from LNCV 0 of the associated entry manager, then the exit manager determines if the indicated entry manager has a locomotive waiting to enter. The exit manager vacates a track, so that the waiting train can enter the station. It is necessary for the entries in the LNCVs 20-119 of both managers to be setup the same.	0-4095	8.4.5.2

LNCV	Description	Value Range	See chapter
14	Feedback of locomotive speed 0 = no feedback of locomotive speed 1-65535 = the sensor sends the measured locomotive speed as a value in a range from 0 to 511 in km/h. The LNCV contains a scaling factor for the speed measurement. which is calculated from the sensor separation and layout scale.	1-65535	8.5.7
15	Preset for receiver module 0 = send messages, inquiry possible 1 = send in Uhlenbrock format 2 = send in Digitrax format "transponder exit block" 3 = send in Digitrax format "transponder enters to block" *Note: Only one format can be selected.* 4 = the LISSY receiver is operated with LOK-boss 8 = save current operating status when switching power off *Note: The programmed values is the sum if the values.*	0-15	8.6

A.3 LISSY receiver Factory defaults

Factory default settings of a LISSY receiver are:

LNCV	Value	Description
Basic settings		
0	1	Module address, and first sensor address
1	2	Second sensor address
2	2	Direction sensitive switch mode
15	8	Save module operation mode at power off
Function 1		
20	20000	For all trains
30	1	The light
40	2	Turn off if direction S1 -> S2
Function 2		
21	20000	For all trains
31	1	The light
41	11	Turn on if direction S2 -> S1

All other LNCVs are programmed to the value 0.

You can set the LISSY receiver to the above values with a RESET, by programming the LNCV 2 to 99. The values for the addresses in LNCV 1 and 2 remains unchanged.

A.4 Speed step table

Table for converting speed steps to absolute speed:

Märklin/DCC 14	
1	2
2	10
3	19
4	29
5	38
6	48
7	57
8	67
9	76
10	86
11	95
12	105
13	114
14	124

DCC 27	
1	2
2	8
3	13
4	17
5	22
6	26
7	31
8	35
9	40
10	44
11	49
12	53
13	58
14	62
15	67
16	71
17	76
18	80
19	85
20	89
21	94
22	98
23	103
24	107
25	112
26	116
27	121

DCC 28	
1	2
2	7
3	11
4	16
5	20
6	25
7	29
8	34
9	38
10	43
11	47
12	52
13	56
14	61
15	65
16	70
17	74
18	79
19	83
20	88
21	92
22	97
23	101
24	106
25	110
26	115
27	119
28	124

Selectrix 31 step	
1	2
2	8
3	12
4	16
5	20
6	24
7	28
8	32
9	36
10	40
11	44
12	48
13	52
14	56
15	60
16	64
17	68
18	72
19	76
20	80
21	84
22	88
23	92
24	96
25	100
26	104
27	108
28	112
29	116
30	120
31	124

A.5 Copying templates

Following this you will find two tables, that you can copy to record the programming for each of your LISSY receivers. Naturally you can create your own tables if you wish, in order to document your layout. We would like to recommend that you thoroughly document your layout, so that after some time you are still able determine what each receiver is programmed to do and that you can full enjoy your layout.

- ○ **Switching operation**
- ○ **Shuttle train**
- ○ **Holding point**
- ○ **Block section**

No.

Basic programming of the LNCVs 0-15

LNCV	value	Type
0		1. Address (module address)
1		2. Address
2		Function (mode)
3		Driving direction
4		Holding time
5		Delay for solenoid switching
6		Signal to sets
7		1. Solenoid/feedback address

LNCV	value	Type
8		2. Solenoid/feedback address
9		Speed before stopping
10		Block option
11		Solenoid address for on/off Op.
12		Category option
13		Address entry manager
14		Scale factor/scaling
15		Module configuration

Programming of function instructions											
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**2...**										
Value	**3…**										
Option	**4…**										

Programming of speed instructions											
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**5...**										
Value	**6…**										
Option	**7…**										

Programming of solenoid and route instructions											
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**8...**										
Value	**9…**										
Option	**10..**										

- **Entry managers**
- **Exit managers**

No.

Basic programming of the LNCVs 0-15

LNCV	value	type
0		1. Address (module address)
1		2. Address
2		Function (mode)
3		Driving direction
4		Holding time
5		Delay for solenoid switching
6		Signal to sets
7		1. Solenoid/feedback address

LNCV	value	type
8		2. Solenoid/feedback address
9		Speed before stopping
10		Block option
11		Solenoid address for on/off Op.
12		Category option
13		Address entry manager
14		Scale factor/scaling
15		Module configuration

	LE	Route	Locomotive addresses and categories							
LNCV	**... 0**	**... 1**	**…2**	**…3**	**…4**	**…5**	**…6**	**…7**	**…8**	**…9**
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

Computation of the command value for the change of locomotive auxiliary functions

Auxiliary	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	Calculated value for LNCV 30-39
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection														
Sum														

Computation of the command option for the change of locomotive auxiliary functions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Switch auxiliary function off		0	
	Switch auxiliary function on		8	
	Change auxiliary function		16	
4	Auxiliary function timed change		32	
5	Switching duration in seconds * 256 =			
			Calculated value for LNCV 40 to 49	

Computation of the command option for the change of locomotive speed				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Speed specified as absolute value (0-127)		0	
	Speed specified in percent (0-255%)		8	
	Speed specified in Km/h		16	
			Calculated value for LNCV 70 to 79	

Computation of the command option for solenoid and feedback instructions				
Opt No.	**Description**	**selection**	**value**	**sum**
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
			Calculated value for LNCV 100 to 109	

Translation between the route number of the Intellibox and the command value programmed in a LISSY receiver

Group 1				Group 2				Group 3			
Route No.	**Solenoid Add**	**State**	**LISSY value**	**Route No.**	**Solenoid Add**	**State**	**LISSY value**	**Route No.**	**Solenoid Add**	**State**	**LISSY value**
1	2001	red	20010	1	2009	red	20090	1	2017	red	20170
2	2001	green	20011	2	2009	green	20091	2	2017	green	20171
3	2002	red	20020	3	2010	red	20100	3	2018	red	20180
4	2002	green	20021	4	2010	green	20101	4	2018	green	20181
5	2003	red	20030	5	2011	red	20110	5	2019	red	20190
6	2003	green	20031	6	2011	green	20111	6	2019	green	20191
7	2004	red	20040	7	2012	red	20120	7	2020	red	20200
8	2004	green	20041	8	2012	green	20121	8	2020	green	20201
9	2005	red	20050	9	2013	red	20130	9	2021	red	20210
10	2005	green	20051	10	2013	green	20131	10	2021	green	20211
11	2006	red	20060	11	2014	red	20140	11	2022	red	20220
12	2006	green	20061	12	2014	green	20141	12	2022	green	20221
13	2007	red	20070	13	2015	red	20150	13	2023	red	20230
14	2007	green	20071	14	2015	green	20151	14	2023	green	20231
15	2008	red	20080	15	2016	red	20160	15	2024	red	20240
16	2008	green	20081	16	2016	green	20161	16	2024	green	20241

A.6 LISSY product overview

Part. No. 68 000 LISSY set
Part. No. 68 300 LISSY transmitters
Part. No. 68 600 LISSY receivers with 2 sensors
Part. No. 68 690 2 sensors, individually
Part. No. 63 450 LocoNet display
Part. No. 62 010 LocoNet cables 0.28 m
Part. No. 62 020 LocoNet cables 2.15 m
Part. No. 62 250 LocoNet distributors 5-fold

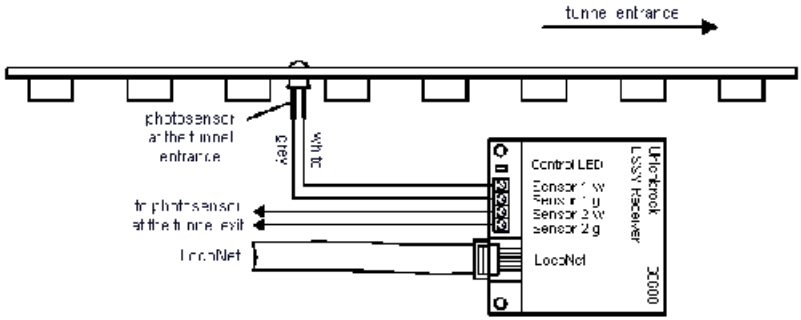
Examples

1. Example

Fading IntelliSound in/out

On the layout is a tunnel that travels in a particular direction. In the tunnel the locomotives do not operate with IntelliSound. At the tunnel exit the sound is to be reactivated. Via the special function f8 the IntelliSound module can fade the sound out, if it is on. If the special function f8 is switched off, then the sound will be faded in audibly.

In order to trigger this operation automatically with each locomotive, sensor 1 is installed just outside the tunnel entrance and sensor 2 is placed just before the tunnel exit.



Programming necessary for this example is:

Basic programming of the LNCVs 0-15

LNCV	value	Type
0	**1**	1. Address (module address)
1	**2**	2. Address
2	**3**	Function (mode)
3	**0**	
4	**0**	
5	**0**	
6	**0**	
7	**0**	

LNCV	value	Type
8	**0**	
9	**0**	
10	**0**	
11	**0**	
12	**0**	
13	**0**	
14	**0**	
15	**0**	

Programming of function instructions

		Sensor 1					Sensor 2				
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**2...**	20000	0	0	0	0	20000	0	0	0	0
Value	**3…**	256	0	0	0	0	256	0	0	0	0
Option	**4...**	8	0	0	0	0	0	0	0	0	0

Computation of command value to change the locomotive special functions

Auxiliary	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	Calculated value for LNCV 30/35
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection									X					
Sum									256					256

Computation of command options to change the locomotive special functions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction	X	0	0
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Switch auxiliary function off		0	
	Switch auxiliary function on	X	8	8
	Change auxiliary function		16	
4	Auxiliary function timed change		32	
5	Switching duration in seconds * 256 =			
			Calculated value for LNCV 40	8

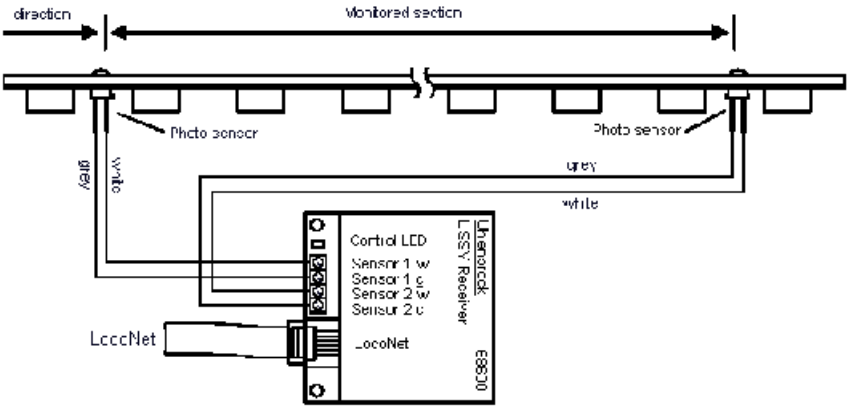
Computation of command options to change the locomotive special functions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction	X	0	0
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
3	Switch auxiliary function off	X	0	0
	Switch auxiliary function on		8	
	Change auxiliary function		16	
4	Auxiliary function timed change		32	
5	Switching duration in seconds * 256 =			
			Calculated value for LNCV 45	0

2. Example

Solenoid switching and feedback

In the example, a track section will be traveled in only in one direction, and reports as occupied, if a train is in the section. The feedback for the track section is to use an address over 50. Furthermore upon entry to the section, route 3 from group 2 in the Intellibox to be enabled, if a train from category 3 enters the section. Locomotive 100 is to set the exit signal for the track with the solenoid address 30 to "green".



Basic programming of the LNCVs 0-15

LNCV	value	Type
0	1	1. Address (module address)
1	2	2. Address
2	3	Function (mode)
3	0	
4	0	
5	0	
6	0	
7	0	

LNCV	value	Type
8	0	
9	0	
10	0	
11	0	
12	0	
13	0	
14	0	
15	0	

Programming of solenoid and route instructions

		Sensor 1					Sensor 2				
Command	**LNCV**	**... 0**	**... 1**	**...,2**	**... 3**	**... 4**	**... 5**	**... 6**	**... 7**	**... 8**	**... 9**
Address	**2...**	20000	20003				20000	100			
Value	**3...**	503	20100				502	301			
Option	**4...**	8	0				0	0			

Computation of the command option for solenoid and feedback instructions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction	X	0	0
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3	X	0	0
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off		4	
Calculated value for LNCV 100, 101, 105, 106				0

3. Example

Shuttle train terminus in a branch line

In a branch line station as shown in the sketch below, some trains, which come from the left, are to stop in the station, then reverse out over turnout W1 and drive up the branch line.

For this these trains are assigned train category 2. The LISSY receiver LE1 in our example is put into *time delayed shuttle time* operating mode, however this function is only active if a train from category 2 arrives. All other trains drive through without stopping.

If the train stops and drives off again, then the turnout W1 is switched to the branch position. So that the turnout is fully switched over before the train drives off, the train not start till 5 seconds after the turnout switching command is issued. Additionally the motor coach with the locomotive address 96 when driving off will honk (special function F2) and the locomotive with the address 80 will ring its bell for10 seconds (special function F3).

The necessary programming of the LISSY receiver LE1 is:

Allocation of the solenoid addresses

Designation	Solenoid address
W1	10
S1	20

Basic programming of the LNCVs 0-15

LNCV	value	Type
0	**1**	1. Address (module address)
1	**0**	
2	**4**	Function (mode)
3	**0**	Driving direction
4	**60**	Holding time
5	**5**	Delay for solenoid switching
6	**20**	Signal to sets
7	**0**	

LNCV	value	Type
8	**0**	
9	**0**	
10	**2**	Block option
11	**0**	
12	**12**	Category option
13	**0**	
14	**0**	
15	**8**	Module configuration

Programming of solenoid and route instructions

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**8...**	20002									
Value	**9…**	101									
Option	**10..**	6									

Computation of the command option for solenoid and feedback instructions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	**X**	2	**2**
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off	**X**	4	**4**
			Calculated value for LNCV 100 to 109	**6**

Programming of function instructions

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**8...**	96	80								
Value	**9…**	4	8								
Option	**10..**	302	2606								

Horn (F2) switched on for 1 second:

Computation of command value to change the locomotive special functions

Auxiliary	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	Calculated value for LNCV 30/35
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection			**X**											
Sum			**4**											**4**

Computation of command option to change the locomotive special functions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	X	2	2
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off	X	4	4
3	Switch auxiliary function off		0	
	Switch auxiliary function on	X	8	8
	Change auxiliary function		16	
4	Auxiliary function timed change	X	32	32
5	Switching duration in seconds * 256 =	1*256		256
			Calculated value for LNCV 40	302

Bell ringing (F3) switched on for 10 second:

Computation of command value to change the locomotive special functions

Auxiliary	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	Calculated value for LNCV 30/35
Value	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	
Selection				X										
Sum				8										8

Computation of command option to change the locomotive special functions

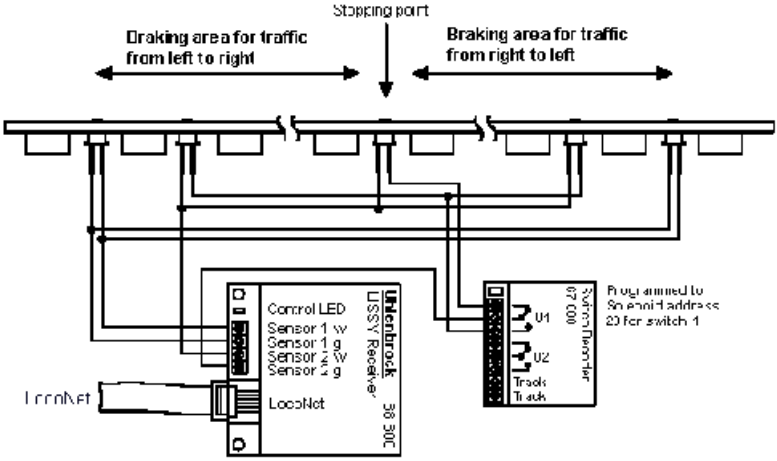
Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	**X**	2	**2**
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off	**X**	4	**4**
3	Switch auxiliary function off		0	
	Switch auxiliary function on	**X**	8	**8**
	Change auxiliary function		16	
4	Auxiliary function timed change	**X**	32	**32**
5	Switching duration in seconds * 256 =	**10*256**		**2560**
			Calculated value for LNCV 41	**2606**

4. Example

Braking at a holding point with two directional traffic

Note: The example described here presupposes that photo sensors cannot be deactivated by the arriving train itself, and cannot be influenced by another strong light source (sunlight, layout lighting etc..).

In order to stop a train in either direction at the same place you must use the ancillary circuit as shown, so no more than 2 photo sensors are attached to the receiver input. Control of two signals with different addresses is however not possible with the circuit indicated here, because in this case the module's operating mode is '*direction dependent holding place*' and the traveling direction is recognized by different sensors.



The LISSY receiver controls only one signal with the solenoid address, which is entered in LNCV6.

Lastly a switching decoder 67 600 is needed, its contacts U1 in the example reacts to solenoid address 20. In a state of rest this Switching decoder should be in the

red position, so the two inner photo sensors are connected to input 2 of the LISSY receiver. If a train arrives, then the switching decoder is switched to “green” by the LISSY receiver (LNCV 80, 90, 100) and connects the innermost photo sensor to the input 2. Now the train can brake up to this photo sensor and stop there. As the train leaves, the switching decoder will be returned to “red” by the LISSY receiver (LNCV 81, 91, 101) and so it is ready for the arrival of next train.

Basic programming of the LNCVs 0-15

LNCV	value	Type
0	**1**	1. Address (module address)
1	**0**	
2	**6**	Function (mode)
3	**0**	Driving direction
4	**60**	Holding time
5	**2**	Delay for solenoid switching
6	**10**	Signal to sets
7	**0**	

LNCV	value	Type
8	**0**	
9	**10**	Speed before stopping
10	**2**	Block option
11	**0**	
12	**0**	
13	**0**	
14	**0**	
15	**0**	

Programming of solenoid and route instructions

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**8...**	20000		-	-	-	-	-	-	-	-
Value	**9…**	201	200	-	-	-	-	-	-	-	-
Option	**10..**	2	6	-	-	-	-	-	-	-	-

Computation of the command option for solenoid and feedback instructions

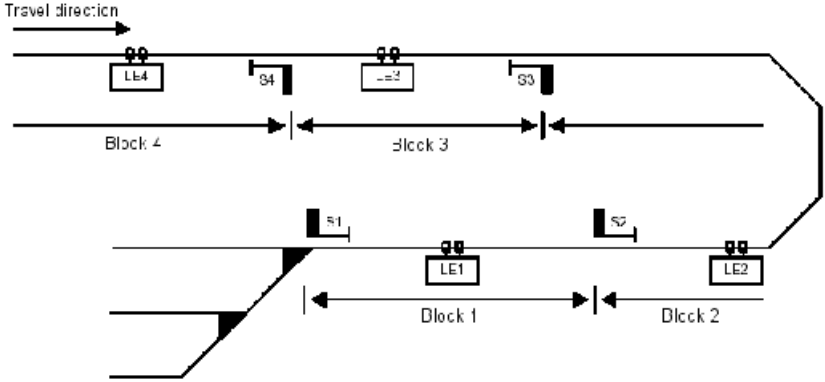
Opt No.	Description	Selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	**X**	2	**2**
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor	**X**	0	**0**
	Automatic operation 4-10, 20-26: when driving off		4	
			Calculated value for LNCV 100	**2**

Computation of the command option for solenoid and feedback instructions

Opt No.	Description	Selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	**X**	2	**2**
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off	**X**	4	**4**
			Calculated value for LNCV 101	**6**

5. Example

Block section control



Operating mode

In the above example the one-way traffic block is at entrance to a station entry, which is protected by signal S1 (entry signal). As is normal, in our example, a train, which enters a vacant block, sets the block protection signal to "stop" and the block which the train has left, is free for a new train. In our example, if a train enters block 2, because signal S3 is on "green", signal S3 is switched to "red", as soon as the train reaches the sensor LE2. At the same time signal S4 can be set to "green", since block 3 is vacant again.

Signal S1 is the entry signal for the station and in our example is switched manually.

Allocation of the solenoid addresses

Designation	Solenoid address
S1	11
S2	12
S3	13
S4	14

Basic programming for LNCVs 0-15, of LISSY receiver LE 1-4

LNCVs		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LE	Function																
1	Block section	1	0	7	0	0	0	11	120	131	0	0	0	0	0	0	0
2	Block section	2	0	7	0	0	0	12	130	141	0	0	0	0	0	0	0
3	Block section	3	0	7	0	0	0	13	140	0*	0	0	0	0	0	0	0
4	Block section	4	0	7	0	0	0	14	0*	0*	0	0	0	0	0	0	0

* This LNCV can be used, to control block sections, which lie before track section "block 4".

If the modules LE1 to LE4 are not to implement any further switching functions, LNCVs 20-110 are set to zero.

Extension of the example: All trains with the train category 2 that enter the Station, i.e. if signal S1 is switched to green, the track route 10/group 1 in the

Intellibox is selected. For this route the turnouts to the station are switched so that the trains of the category 2 can enter track 1.

So that all turnouts have time to move to their new position before the train proceeds, LISSY receivers LE1 waits 5 seconds before it allows the train to depart. The route can be switched during this time. The more items that have to be switched for the route the more time that has to be allow for the process to finish.

Basic programming for **LNCVs 0-15**, of **LISSY receiver LE 1-4**

LNCVs		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LE	Function																
1	Block section	1	0	7	0	0	5	11	120	131	0	0	0	0	0	0	0

Programming of solenoid and route instructions

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**8...**	20002	-	-	-	-	-	-	-	-	-
Value	**9...**	20051	-	-	-	-	-	-	-	-	-
Option	**10..**	6	-	-	-	-	-	-	-	-	-

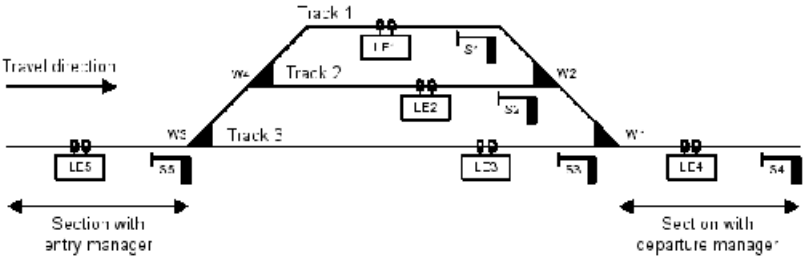
Computation of the command option for solenoid and feedback instructions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	X	2	**2**
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor		0	
	Automatic operation 4-10, 20-26: when driving off	X	4	**4**
			Calculated value for LNCV 100	**6**

6. Example

Shadow station

The shadow station in our example should have the following track plan:



Functionality:

Trains, which enter the entry manager's track section in the travel direction, will always be stopped at signal S5. LISSY receiver LE5 then determines into which track the arriving train may go and switches the route which leads to that track. These route instructions must switch all the turnouts and as the last instruction the command switches signal S5 to "green". Thus the route to the track is prepared

and entry signal S5 is set to "green", and LISSY receiver LE5 allows the train into the selected track.

As soon as the exit manager's track section is vacant, this seeks out an occupied track in the station and switches the route, from this track to Station exit track. In this route the switching commands must switch all of the turnouts and as a last instruction, the switch of that track's exit signal to "green", for each train in tracks S1 to S3. This way the exit from a station track to the exit is prepared for the appropriate train. That train is then set in motion by the appropriate LISSY receiver LE1 to LE3.

The station control if necessary can also be accomplished with entry manager or Exit manager, if entry or exit is controlled manually. In this case the appropriate routes or turnouts and Signals are to be operated manually.

Solenoid address 20 is used in the example to deactivate the exit manager. If the solenoid with the address 20 switched to "red", then the exit manager is switched OFF and train will not depart the station automatically. Should the layout that has the shadow station be switched OFF, then the solenoid 20 is set to "red". The automatic train departures from this station are thereby stopped. Seeing the entry track to the station with trains is controlled automatically, you must wait until all the tracks are fully occupied. Now the layout can be switched off. The data: which train is on which track, is stored and after restarting the layout, automatic traffic can again commence. For this only, a train needs to be manually driven out of the shadow station, by e.g. switching one of the signals S1 to S3 to green or switch an appropriate route for a train to exit.

Allocation of the solenoid addresses

Designation	Solenoid address
W1	1
W2	2
W3	3
W4	4
S1	11
S2	12
S3	13
S4	14
S5	15

Basic programming for **LNCVs 0-15**, of **LISSY receiver LE 5**

LNCVs		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LE	Function																
1	Block section	1	0	23	0	0	0	11	150	0	0	0	0	0	0	0	9
2	Block section	2	0	23	0	0	0	12	150	0	0	0	0	0	0	0	9
3	Block section	3	0	23	0	0	0	13	150	0	0	0	0	0	0	0	9
4	Entry manager	4	0	9	0	0	0	14	20040	0	0	0	20	0	9	0	9
5	Exit manager	5	0	8	0	0	2	15	0	0	0	0	0	0	0	0	9

Programming of the LISSY receiver LE 5 (entry managers)

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	2...	1	20010	20000	0	0	0	0	0	0	0
Value	3...	2	20011	20000	0	0	0	0	0	0	0
Option	4...	3	20020	20000	0	0	0	0	0	0	0

Programming of LISSY receiver LE 4 (exit managers)

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	2...	1	20021	20000	0	0	0	0	0	0	0
Value	3...	2	20000	20000	0	0	0	0	0	0	0
Option	4...	3	20031	20000	0	0	0	0	0	0	0

Programming of the routes in the Intellibox

Routes Number	Function	Solenoid Number	2		3		5	
			Add	RG	Add	RG	Add	RG
1	entry track 1	2001 - red	3	R	4	G	15	G
2	entry track 2	2001 - green	3	R	4	R	15	G
3	entry track 3	2002 - red	3	G	15	G		
4	exit track 1	2002 - green	2	G	1	R	11	G
5	exit track 2	2003 - red	2	G	1	R	12	G
6	exit track 3	2003 - green	1	G	13	G		
7	S1/S2/S3 red	2004 - red	11	R	12	R	13	R

Note: All not specified LNCVs are to be set to zero, if the LISSY receiver is to carry no other switching tasks.

Note: So that this example functions error free, your Intellibox needs to be equipped with the software should Version 1.55 or more higher.

Extension of the example

The trains with the locomotive address 3 and 10 are to be brought in only in track 1 and the train category 1 only into track 2. These tracks can be also occupied by other trains.

Programming of the LISSY receiver LE 5 (entry managers)

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	2...	1	20010	20000	3	10	0	0	0	0	0
Value	3...	2	20011	20000	20001	0	0	0	0	0	0
Option	4...	3	20020	20000	0	0	0	0	0	0	0

Programming of LISSY receiver LE 4 (exit managers)

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	2...	1	20021	20000	3	10	0	0	0	0	0
Value	3...	2	20000	20000	20001	0	0	0	0	0	0
Option	4...	3	20031	20000	0	0	0	0	0	0	0

Realization with Intellibox and IB SWITCHES

The routes for the example are switched with the IB SWITCH.

Basic programming for **LNCVs 0-15**, of **LISSY receiver LE 5**

LNCVs		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LE	Function																
1	Block section	1	0	23	0	0	0	11	150	12	0	0	0	0	0	0	9
2	Block section	2	0	23	0	0	0	12	150	22	0	0	0	0	0	0	9
3	Block section	3	0	23	0	0	0	13	150	32	0	0	0	0	0	0	9
4	Entry manager	4	0	9	0	0	0	14	73	72	0	0	20	0	5	0	9
5	Exit manager	5	0	8	0	0	2	15	0*	0*	0	0	0	0	0	0	9

* These two LNCV can be used, to control the block section, which before the track section with the entry manager.

Note: All not specified LNCVs must be set to zero, if the LISSY receiver is not switching any other devices.

Programming of the LISSY receiver LE 5 (entry managers)

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**2...**	1	13	20000	0	10	0	0	0	0	0
Value	**3…**	2	23	20000	0	0	0	0	0	0	0
Option	**4...**	3	33	20000	0	0	0	0	0	0	0

All dependencies between the routes should be deleted and the IB-Switch should be so setup that routes are restored, if they contain solenoids to be switched (special option 5 = 7). The LISSY receivers 1-3 have the following programming for switching of solenoids:

Programming of LISSY receiver LE 4 (exit managers)

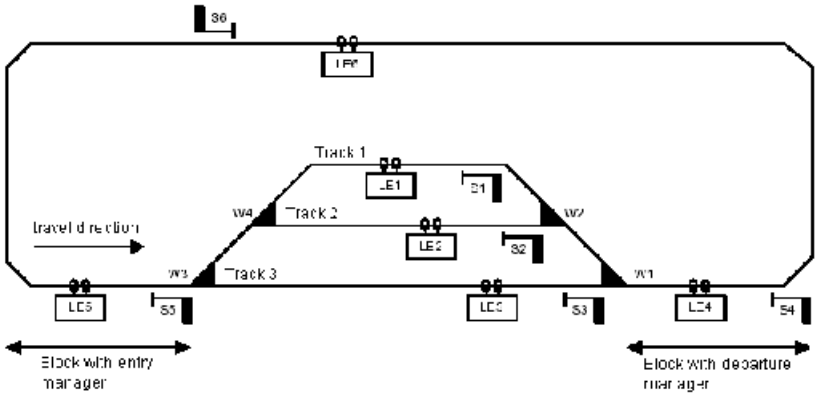
Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**2...**	1	43	20000	0	10	0	0	0	0	0
Value	**3…**	2	53	20000	0	0	0	0	0	0	0
Option	**4...**	3	63	20000	0	0	0	0	0	0	0

Programming of the routes in the IB SWITCH

Routes Number	Function	Route set/release Via feedback		Section 1		Section 2		Section 3	
				Ad.	RG	Ad.	RG	Ad.	RG
1	entry track 1	**Set:**	**1. red**	3	R	4	G	15	G
		Release:	**1. green**						
2	entry track 2	**Set:**	**2. red**	3	R	4	R	15	G
		Release:	**2. green**						
3	entry track 3	**Set:**	**3. red**	3	G	15	G		
		Release:	**3. green**						
4	exit track 1	**Set:**	**4. red**	2	G	1	R	11	G
		Release:	**7. green**						
5	exit track 2	**Set:**	**5. red**	2	G	1	R	12	G
		Release:	**7. green**						
6	exit track 3	**Set:**	**6. red**	1	G	13	G		
		Release:	**7. green**						
7	S1/S2/S3 red	**Set:**	**7. red**	11	R	12	R	13	R

Extension to an automatically controlled oval track with 3-track station

If the entry and exit managers are interconnected by the track, as in the small example, an automatically controlled layout with a 3-track station can be made.



The connecting track has yet another LISSY receiver LE6 to manage that block section. This results in three block sections between the stations entry and exit. The automation is done by means of the following programming:

Basic programming of LNCVs 0-15 of LISSY receiver LE 1 to 6 using the Intellibox for route control

LNCVs		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LE	Function																
1	Block section	1	0	23	0	0	0	11	150	161	0	0	0	0	0	0	9
2	Block section	2	0	23	0	0	0	12	150	161	0	0	0	0	0	0	9
3	Block section	3	0	23	0	0	0	13	150	161	0	0	0	0	0	0	9
4	Exit manager	4	0	9	0	0	0	14	20040	0	0	0	20	0	5	0	9
5	Entry manager	5	0	8	0	0	2	15	160	141	0	0	0	0	0	0	9
6	Block section	6	0	7	0	0	0	16	140	0	0	0	0	0	0	0	9

Finally LISSY receivers 1 to 3 have the following programmes for switching of solenoids:

Programming of solenoid and route instructions

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**8...**	20000	0	0	0	10	0	0	0	0	0
Value	**9...**	161	0	0	0	0	0	0	0	0	0
Option	**10..**	2	0	0	0	0	0	0	0	0	0

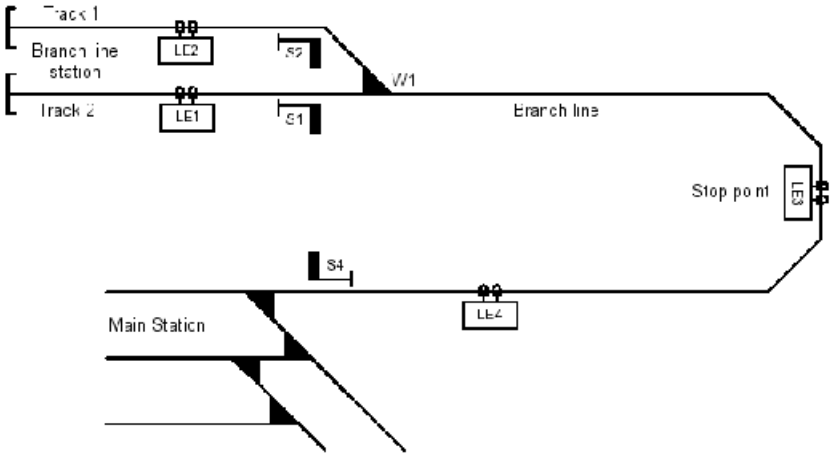
Computation of command option for solenoid and Feedback instructions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	**X**	2	**2**
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor	**X**	0	**0**
	Automatic operation 4-10, 20-26: when driving off		4	
			Calculated value for LNCV 100	**2**

7. Example

Automatic control of a small branch line

Shown below is a sketch of Branch line, which is to be controlled automatically.



In the example above two motor coaches with the addresses 60 and 61 are to drive into the Branch line. The motor coach with the number 60 is to use track 1 of the Branch line and the motor coach with the number 61 is to use track 2. For this turnout W1 is switched accordingly, when the motor coaches arrive at the holding point. Both motor coaches always do an intermediate stop at the holding point before they continue. Both wait in the Branch line station and at the holding point for 3 minutes and eventually go back.

On the return trip from the branch line yard to the main station, the motor coaches wait automatically at the entry signal into the main station S4. Signal S4 is set to “red” by either motor coach as it arrives at the holding point on its return trip, thus the motor coaches will wait at the station entrance before they enter the station. The signal can then be operated manually set to “green” after turnouts have been set for entry into the appropriate track for the motor coach.

All other trains only enter the Branch line with manual control and are not automatically controlled. For this the motor coaches are assigned to train category 1. LISSY receivers LE 1-3 are programmed so that only trains with from category 1 are automatically controlled. The LISSY receiver at the station entry LE 4 stops every train, if that signal S4 is on red.

Allocation of the solenoid addresses

Designation	Solenoid address
W1	1
S1	11
S2	12
S4	14

Basic programming of the LNCVs 0-15 the LISSY receiver LE 1 to 4

LNCVs		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LE	Function																
1	Timed shuttle train	1	0	4	0	180	2	11	0	0	0	10	0	11	0	0	8
2	Timed shuttle train	2	0	4	0	180	2	12	0	0	0	10	0	11	0	0	8
3	Holding point	3	0	6	2	180	2	0	0	0	0	10	0	11	0	0	8
4	Block section	4	0	7	0	0	0	14	0	0	0	0	0	0	0	0	8

Programming of LISSY receiver LE 3

Command	LNCV	... 0	... 1	...,2	... 3	... 4	... 5	... 6	... 7	... 8	... 9
Address	**8...**	20001	60	61	0	10	0	0	0	0	0
Value	**9...**	140	11	10	0	0	0	0	0	0	0
Option	**10..**	3	2	2	0	0	0	0	0	0	0

Computation of command option for solenoid and Feedback instructions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2		2	
	Driving direction from S2 to S1	X	3	3
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor	X	0	0
	Automatic operation 4-10, 20-26: when driving off		4	
			Calculated value for LNCV 100	3

Computation of command option for solenoid and Feedback instructions

Opt No.	Description	selection	value	sum
1	Do not evaluate driving direction		0	
	Driving direction from S1 to S2	X	2	2
	Driving direction from S2 to S1		3	
2	Switching function 2 or 3		0	
	Automatic operation 4-10, 20-26: on arrival at the sensor	X	0	0
	Automatic operation 4-10, 20-26: when driving off		4	
			Calculated value for LNCV 100	2

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Translated by Wolfram Steinke

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