

# SignalPilot

## Instruction manual

1. Edition, January 2021

From decoder firmware 1.0.4

51840 SignalPilot

 **SIGNAL PILOT**



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# Declaration of Conformity

## 1. Declaration of Conformity

The manufacturer, ESU electronic solutions ulm GmbH & Co. KG, Edisonallee 29, D-89231 Neu-Ulm, hereby declares under its sole responsibility that the product

**Product name:** SignalPilot

**Type:** 51840

complies with all relevant provisions of the Electromagnetic Compatibility Directive (2004/108/EC). The following harmonised standards have been applied:

EN 55014-1:2006 + A1:2009: Electromagnetic compatibility - Requirements for household appliances, power tools and similar electrical appliances - Part 1: Interference emission

EN 55014-2:1997 + A1:2001 + A2:2008: Electromagnetic compatibility - Requirements for household appliances, power tools and similar electrical appliances - Part 2: Immunity.

## 2. WEEE Declaration

Disposal of old electrical and electronic equipment (valid in the European Union and other European countries with separate collection system).



This symbol on the product of the packaging or in the documentation means that this product must not be treated as household waste. Instead, this product is to be taken to the appropriate disposal point for recycling electrical and electronic equipment. If the product is disposed of correctly, you help to prevent negative environmental influences and damage to health that could be caused by improper disposal. Recycling material will preserve our natural resources. For more information about recycling this product, please contact your local citizens' office, household waste collection service or the store where you purchased this product.

## 3. Important Notes

Congratulations on your purchase of an ESU SignalPilot decoder. This manual wants to introduce you step by step to the possibilities of the decoder. Therefore, a request:

Please carefully work through this manual before commissioning. Although all SignalPilot decoders are very robust, a wrong connection could destroy the device. If in doubt, avoid „expensive“ experiments.



- The SignalPilot is intended exclusively for use with electric model railway systems. It may only be operated with the components described in this manual. Any use other than that described in this manual is not permitted.
- All connection work may only be carried out when the operating voltage is switched off.
- The power sources must be secured in such a way that in the event of a short circuit, there can be no cable fire. Use only commercially available model train transformers manufactured according to the VDE/EN, bearing the CE mark.
- Never operate the SignalPilot unattended. The SignalPilot is not a (children's) toy.
- Follow the principles of this manual when connecting the external components. The use of other circuitry may cause damage to the decoder.
- The SignalPilot is not waterproof: Outdoor use is not intended and is done at your own risk.
- Do not attempt to open your SignalPilot module. Improper treatment may destroy it.

## 4. Features

The ESU SignalPilot decoder is a multi-protocol decoder designed primarily for switching daylight signals. It has 16 outputs to which micro lamps or LEDs (with series resistors) can be connected directly. Because all outputs are designed as push/pull output stages, both daylight signals with common anode as well as daylight signals with a common earth connection (common cathode) are suitable, as is the case with Viessmann® signals.

Motorised semaphore signals and turnout drives can also be operated with the SignalPilot.

### 4.1. General Features

The SignalPilot has 16 transistor outputs in push-pull configuration. Each output can be operated individually as continuous light, flashing light or pulse light. Here, the brightness or flashing frequency can be adjusted as well as fade-in and fade-out times. Various prototypical lighting effects such as soft dimming, fluorescent tube effect, defective fluorescent tube, gas lantern simulation, or flicker light ensure a realistic result. Randomly controlled switching on/off as well as an on/off delay can also be activated. A night service extension can dim down the outputs together if so desired.

The outputs of the SignalPilot are combined into signal aspects during configuration. In principle, two-, three-, four- or multi-aspect signals are conceivable. Depending on the number of outputs involved, one or more turnout numbers (accessory addresses) are assigned to each signal, with the help of which you can later switch the individual signal aspects. Up to 16 turnout numbers are available for this purpose.

The configuration of the signal aspects is carried out exclusively with the aid of the ESU LokProgrammer software. You select the desired signal aspects, then write them to the decoder and finally wire the signals as configured.

All signal aspects predefined in the LokProgrammer software can be changed individually. The description of the signal aspects themselves is done with the help of XML files, which on the one hand are regularly extended by ESU or can be created and exten-

ded by you at your own discretion. In this way, „exotic“ signals can also be supported.

The SignalPilot is multi-protocol capable and can be used with digital command stations operating the Märklin® Motorola® system (e.g.: 6021, Central Station® or Mobile Station®) as well as DCC enabled command stations. The configuration can be done by Programming on the Main (POM) and on the programming track. Thanks to RailCom®, CVs can also be read out.



Operation with the Roco® Lokmaus 2 is not possible: The Lokmaus 2 sends only DCC locomotive commands instead of the required accessory commands.

Optionally, a SwitchPilot Extension relay module can be docked to the SignalPilot. This facilitates setting up brake chapters or turnout frog polarisation.

## 4.2. Technical Data

	SignalPilot
Input voltage	12V - 20V DC power supply 12V - 16V AC power supply Digital track voltage
Outputs	16 Transistor outputs Rated at 1.5A (2.5A for 100ms) Short-circuit and overload-protected
Maximum output	Total maximum current 2A (2.5A for 100mS)
Feed-back inputs	Not available
Operating modes	DCC „Accessory Decoder“ with RailCom® (addressing according to RCN-213). Turnout numbers 1 - 2048. Märklin® Motorola® Turnout numbers 1 - 256. Up to 16 turnout numbers (SANs) for signal aspects. Separate turnout number for global blanking. Separate turnout number (address) for POM programming.
Configuration	With ESU LokProgrammer and LokProgrammer software
Dimensions	86mm x 86mm x 25mm

## 4.3. Scope of delivery

The SignalPilot is supplied with 5 removable terminal blocks (1x 4-pole for the track connection, 2x 8-pole for the outputs, 1x 2-pole for GND and 1x 4-pole for U+) as well as this operating manual. A pack of replacement terminal blocks is available from ESU under the part number 50095.SP.01.

## 5. Connection to the digital system

We recommend that you first configure the SignalPilot decoder completely and only then install it in the layout.

### 5.1. Terminals

Fig. 1 shows the SignalPilot with all terminals.

- Daylight signals, motorised turnout-drives or similar loads shall be connected to the terminals labelled 1 to 16 for outputs 1 to 16. Each output can be set by software as a „pull“ level (against U+) or „pull“ level (against ground).
- The **terminals PW A** and **PW B** serve as the power supply connecting pints of the SignalPilot. You can either use the digital track voltage or use an external power supply. An external power supply is particularly recommended for larger layouts, because the electric energy does not have to be taken from the command station or booster.
- Connect the **Terminals Trk A** and **Trk B** to the track output of the command station (or boosters) from which the SignalPilot should receive its commands.
- Terminals **U+**. The return wire of the connected accessories (lamps, LEDs, solenoids, etc.) can be connected to these terminals. The voltage is equal to the supply voltage (i.e.: track voltage).
- Terminals **GND**. Alternatively the return wires of the connected loads can be connected to these terminals, provided that the output has been configured as a „pull“ output stage.
- The „PROG“ LED serves together with the
- Programming button for setting the POM address of the SignalPilot. This process is described in chapter 9.
- Power LED. Is turned on as soon as the SignalPilot receives power.
- Extension socket for the SwitchPilot Extension relay module.

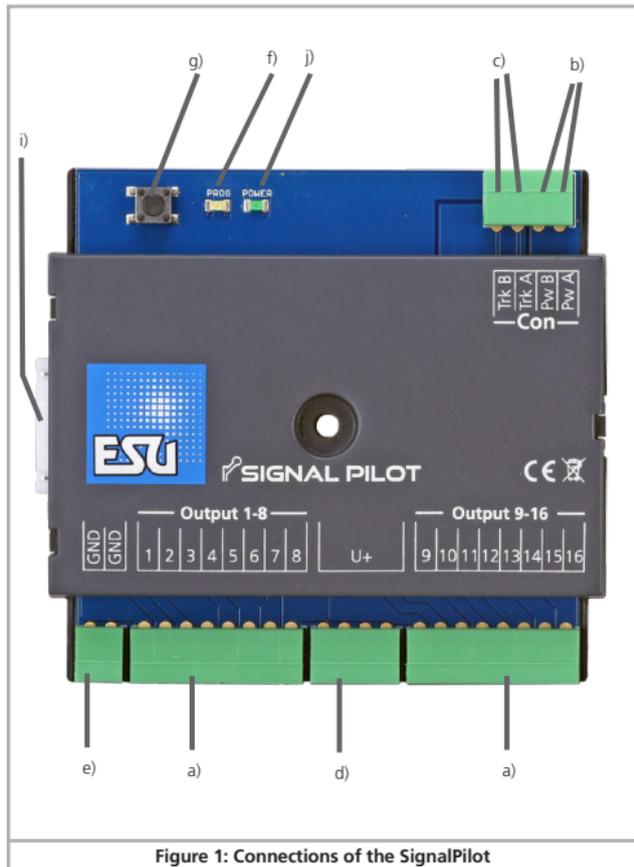


Figure 1: Connections of the SignalPilot

# Connection to the digital system

## 5.2. Power supply from the digital system

For smaller layouts with a only a few loads connected at the same time, the SignalPilot can be supplied directly from the command station. The terminals Pw A and Pw B are connected parallel to the terminals Trk A and Trk B.



This type of wiring must be used if you want to configure the SignalPilot on the programming track of your command station. For more information, see chapter 9.

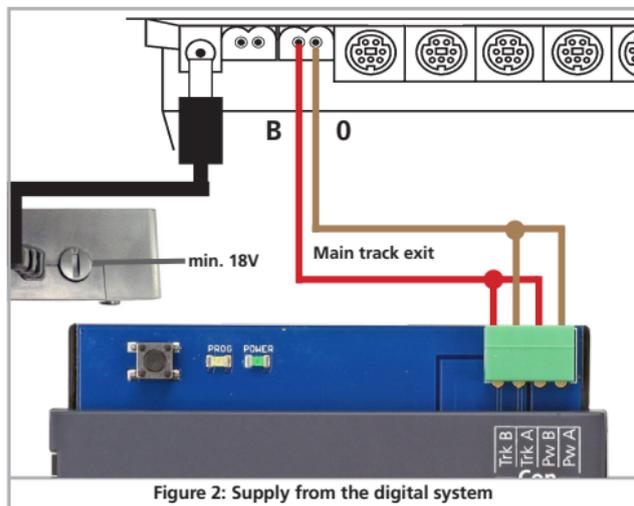


Figure 2: Supply from the digital system

## 5.3. External power supply

For larger layouts with many electric loads, we recommend the use of an external power supply. DC and AC power supplies are suitable with the specifications specified in chapter 4.2. We recommend the use of a stabilized DC power supply with at least 18V DC and at least 3A output power (e.g.: ESU part number 50119).



This type of connection cannot be used for programming on the programming track. In this case, a connection must be established (temporarily) as shown in chapter 5.2.

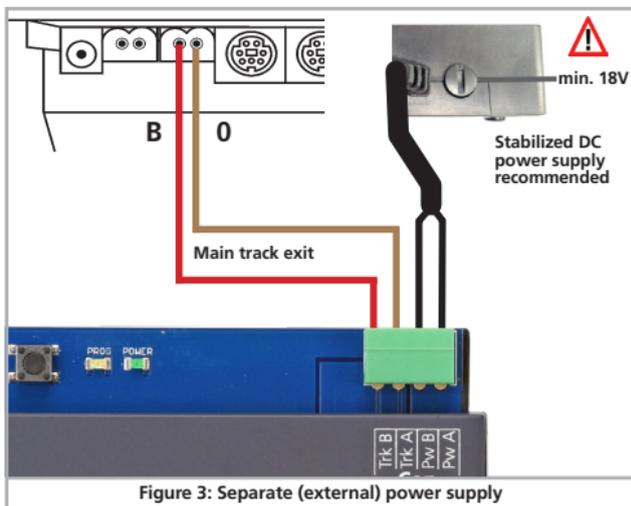


Figure 3: Separate (external) power supply

# Wiring the outputs

## 5.4. Wiring the outputs

Consumer loads can be connected to the SignalPilot very flexibly. However, it is important that in addition to the correct terminal, the configuration must also match. Otherwise, consumer loads may not switch properly or the SignalPilot may be damaged in a worst-case scenario.

### 5.4.1. General connection of lamps (light bulbs)

As shown in Fig. 4, outputs 15 and 16, incandescent lamps can be connected directly to the SignalPilot. Ideally, use lamps rated 16V or higher with a maximum of 50mA rated current. Always observe the rated voltage of the lamps to avoid damage.

### 5.4.2. Daylight signals with LEDs, common anode

Most daylight signals available on the market are equipped with LEDs with common anode (e.g.: Busch). This means that the anodes of all LEDs are wired together and must be connected to a positive potential („+” pole). The minus poles of the individual LEDs („cathode”) are connected to the respective output. Fig. 4 shows the wiring for outputs 9 and 10.

If LEDs are used, a series resistor must be used to limit the current. The resistance value depends to a large extent on the type of LED, so no exact statement is possible here. Values between 1 kOhm and 10 kOhm are common. If in doubt, start with a higher value.

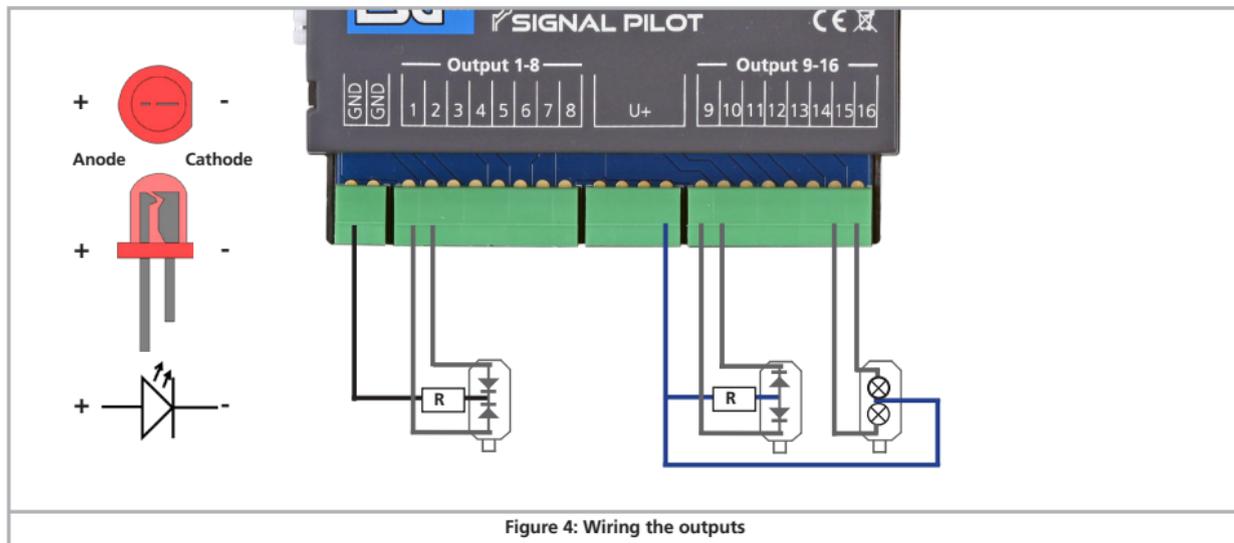


Figure 4: Wiring the outputs

## Wiring the outputs

### 5.4.3. Daylight signals with LEDs, common cathode

For some daylight signals (especially those by Viessmann®) the minus poles („Cathode“) of the individual LEDs are connected. These must be wired to a negative potential („GND“). The plus pole of the single LEDs („Anode“) is connected to the respective output, as shown in Fig. 4 for output 1 and 2. Here, too, it is essential to use resistors.

**i** The corresponding output must be configured as a „pull“ stage on the software side, otherwise the LEDs will not light up.

### 5.4.4. Motorised turnout drives

Thanks to the push-pull stages of all outputs, the SignalPilot can be used to operate motorized turnout drives without further measures. Motorised turnout drives have a small, geared motor, the direction of which can be reversed by reversing the motor voltage. Often, limit switches are installed to prevent the motor from burning through when it has arrived at the end position.

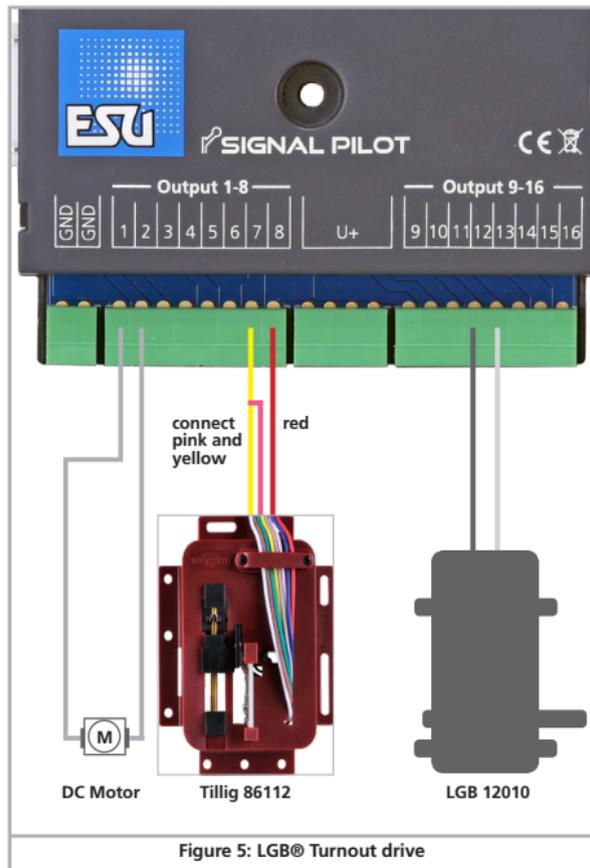
**i** If the direction of rotation is incorrect, simply swap the two outputs on the SignalPilot.

#### 5.4.4.1. LGB® Turnout drive

The LGB® turnout drive part number 12010 has no limit switch. It is connected as shown in Fig. 5 and should be programmed by means of the software for turning it off after 2 seconds, thus avoiding overheating of the drive and excessive load on the SignalPilot.

#### 5.4.4.2. Tillig® turnout drive

The well-known Tillig® turnout drives (e.g.: Tillig 86112 under-floor drive) can also be operated directly with the SignalPilot as shown in Fig. 5. The pink and yellow wires must be connected. Here, too, the software configuration must match the wiring connection.



# Connecting the SwitchPilot Extension

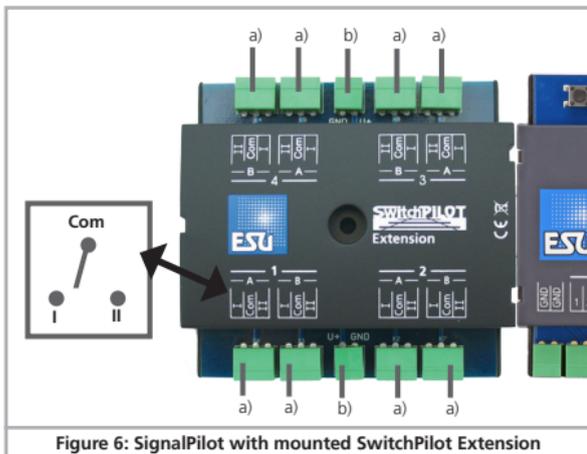
## 5.5. Connecting the SwitchPilot Extension

The SwitchPilot Extension module is docked to the SignalPilot at the side; push the two modules with the 8-pin plug/socket connectors against each other until the retaining clips of the connectors snap in. The internal logic and the power for the relay coils of the SwitchPilot Extension module are supplied by the SignalPilot.

### 5.5.1. Relay outputs

Fig. 6 shows the connections

- The outputs 1 to 4 indicate one each of two relay outputs, namely A and B, which are switched together (2 x changeover, bistable). The software configuration determines when the respective relay output is switched.
- Terminals for ground and „U+“ (rectified track voltage supplied by the SignalPilot).



### 5.5.2. Turnout frog polarisation

Turnout frogs can be polarized very easily with the SwitchPilot Extension.

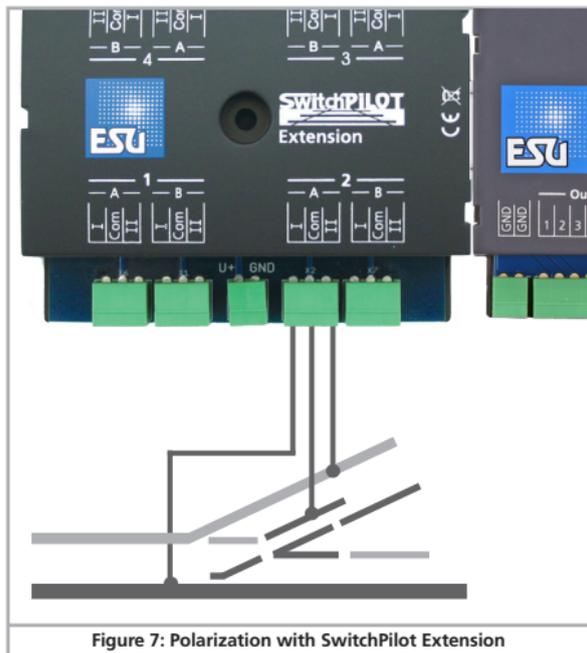


Figure 7: Polarization with SwitchPilot Extension



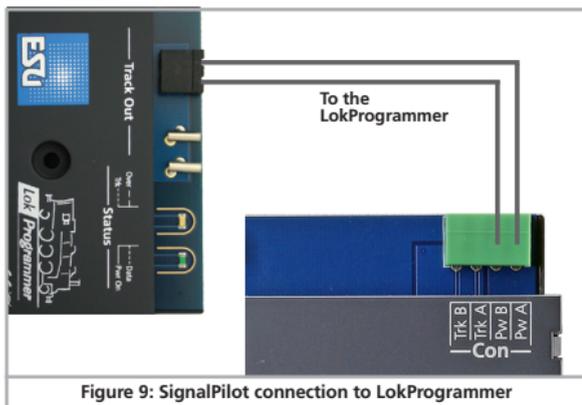
## 6. Configuration with LokProgrammer

The SignalPilot must be configured with the LokProgrammer and the appropriate software. Although all settings would also be accessible via CV programming, this procedure is not recommended or documented due to its complexity.

### 6.1. Procedure

A new SignalPilot should first be configured with the aid of the LokProgrammer before connecting the signals. Afterwards, the wiring of the signals can be started. Finally, the SignalPilot is then installed on the layout.

The configuration made with the help of the LokProgrammer software should always be saved on the hard disk of the computer so that changes can be made later.



After the configuration has been transferred to the SignalPilot, it can no longer be read out. For processing, therefore, the saved project file (in the „.esux“ format) is required.

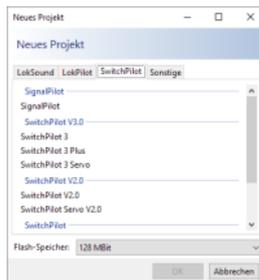
### 6.2. Connecting to the LokProgrammer

Please always use the latest LokProgrammer software, but at least version 5.1.1. Connect the SignalPilot as shown in Fig. 9 (**Pw A** and **Pw B**) to assure that programming works perfectly.

### 6.3. Basic configuration

First, start the LokProgrammer software and commence creating a new project.

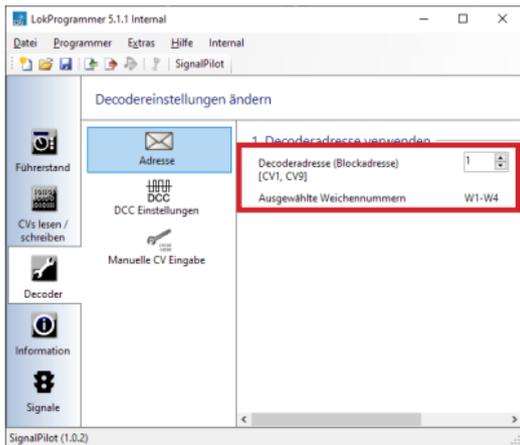
- To do this, select „New Project...“ from the „File“ menu and select the SignalPilot from the SwitchPilot tab:



# Configuration with LokProgrammer

## 6.3.1. Basic address

- Click on the „Decoder“ icon on the left column. As a second step, select the Address group from the centre column.



You can now set the base address of the SignalPilot. The basic address is used for programming CVs on the main (POM), but otherwise has no influence on switching the signals. These use different addresses (resp. turnout numbers).

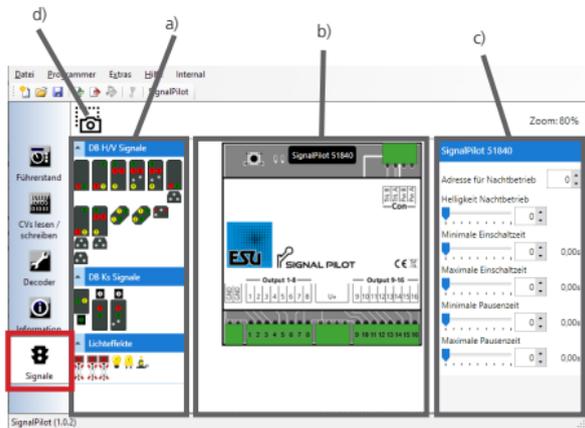


The SignalPilot always applies the methods as per the RCN-213 standard to address turnout numbers and turnout addresses. Older ROCO® command stations (e.g.: multiMouse) use a different address calculation method. Here, the turnout numbers can deviate by the value of „4“.

## 6.4. „Signals“ register

No further relevant settings can be made in the „Decoder“ register. All settings for the SignalPilot and the connected signals are made in the „Signals“ register.

- Click on the “Signals” icon in the left column of the screen. You will now see the main window, which is structured as follows:



- Choice menu for predefined signal aspects, thematically grouped.
- Work area with SignalPilot and connected signals.
- Detail area for setting options of the selected element.
- Screenshot button for saving the detail area as an „electronic wiring plan“.

The appearance of the detail area (box) on the right changes depending on whether an item is selected, and if so, which item is displayed the detail box.

# Configuration with LokProgrammer

- If no item is selected, the detail box is empty.
- If the SignalPilot itself is marked (clicked), the detail area displays the setting options of the SignalPilot itself (see 6.4.1 or 6.4.2).
- If a signal is selected, the setting option of the signal is displayed in the detail area.
- If an output (e.g.: lamp/LED – called light(s) hereafter) of a signal is marked, the setting options of the light itself are displayed in the detail area.

## 6.4.1. Night service extension

On request, lights can be dimmed across-the-board to simulate night operation. A separate address (turnout number) is used to activate night operation, which can be activated with your command station or control panel. As soon as this feature is active, the respective, configured lights are dimmed to the brightness value defined in the „Night mode brightness“ slider.

SignalPilot 51840

Adresse für Nachtbetrieb 397

Helligkeit Nachtbetrieb 128

Minimale Einschaltzeit 10 10,00s

Maximale Einschaltzeit 30 30,00s

Minimale Pausenzeit 120 120,00s

Maximale Pausenzeit 240 240,00s

## 6.4.2. Random Operation Settings

Lights can also be switched on and off randomly, if so desired. This is useful e.g.: for the lighting of buildings. With the help of 4 parameters, "Random" can be determined more precisely:

- The minimum "Time on" determines how long the light remains on at a minimum, if it is in fact activated.
- The maximum "Time on" determines after which time the light is turned off at the latest.
- The "Minimum pause" determines the minimum time that must elapse before a light that has been turned off, is switched on again.
- The "Maximum pause" determines the maximum time after which the light is switched on again.

Within these parameters, the SignalPilot determines when lights are switched on and off and how long they are on or off.



If the minimum and maximum pause times are set to the same value, the triggering will take place in an even cycle. If the minimum and maximum power-on times are set the same, the random function will always be triggered for the same duration.

## 6.5. Placing signals

Signals can be connected directly to the SignalPilot via „Drag and Drop“ with the mouse. This process is called „placing“.

- Select the desired signal from the choice menu on the left. As soon as you hover with the cursor over a signal image, a more detailed description of the signal is displayed.
- Click on the signal you want with the left mouse button and drag the signal to the work area below the SignalPilot, while holding down the button.
- As soon as you release the mouse button, the signal is automatically placed and connected to the SignalPilot.

The software automatically connects all the lights of the signal to the outputs of the SignalPilot. The next free outputs are used from left to right. If you want to wire the outputs in a different order, you can, of course, also change the outputs. This will be shown later in chapter 6.8.4.

# Moving Signals

In this way, you can connect as many signals as you want to the SignalPilot.



If there are not enough free function outputs for the desired signal, you cannot place the signal on the work area.

## 6.6. Moving Signals

You can move signals on the work area at any time.

- Move the mouse directly over the signal until the cursor changes as follows:



- Click with the left mouse button and slide the signal to the desired position. The connecting lines to the outputs are automatically moved along.

## 6.7. Deleting Signals

If a signal is no longer needed, it can be deleted from the work area as follows:

- Select the signal by clicking on the text area below the signal. The name of the signal then becomes darker.
- Press right-click and select „Delete“ from the menu. Alternatively, you can press the „Delete“ key on the keyboard.
- The signal is deleted without further consultation. The connections to the outputs are deleted.



All settings programmed for this signal will be irretrievably deleted. Any „gaps“ in the function outputs are ignored when automatically assigning further function outputs. However, they can be assigned manually.

## 6.8. Configuring Signals

The properties of each placed signal can be changed after it has been selected.

- Click the name of the signal to mark the signal itself. The details area on the right side of the screen now displays the properties of the signal itself.

Signal

Name:  
H/V Blocksignal HP0/HP1

Zubehöradresse #1 (1) 5

Ausgang gegen Masse schalten

Signalbilder

Hp0 #1 (5) (r)  
Hp1 #1 (5) (g)

### 6.8.1. Signal name

A new name should be determined for the signal. It is useful to provide information about the location of the signal.

### 6.8.2. Turnout numbers and signal aspects

At least one turnout number is assigned to each signal, with the help of which the signal can be controlled later. After placing, the turnout numbers are usually assigned automatically, starting with number 1.

Each turnout number can always be in the „Straight“ (g) or „Diverging/Odd“ (r) state. Each state can be associated with a signal aspect.

# Configuring signals

## Example 1: 2-aspect block signal

In our first example, the signal displays the signal aspects „Hp0“ for „Stop“ and „Hp1“ for „Proceed“. One turnout number is sufficient to represent these two signal aspects. The following figure contains all the information:

The screenshot shows the SignalPilot 51840 interface. On the left, a physical signal unit is shown with two lights (red and green) and a turnout number '5' in a circle. On the right, the software configuration window is open. The 'Signal' section shows the name 'H/V Blocksignal HP0/HP1' and 'Zubehöradresse #1 (1)' set to '5'. The 'Ausgang gegen Masse schalten' checkbox is unchecked. The 'Signalbilder' section shows two aspects: 'Hp0 #1 (5) (r)' and 'Hp1 #1 (5) (g)'. Below this, a diagram shows the signal unit with labels 'a' pointing to the red light, 'b' to the green light, 'c' to the turnout number '5', and 'd' to the turnout number '5' in the software window.

- The signal aspect „Hp0“ is shown when the assigned turnout number (here: 5) indicates the state „r“ i.e.: „Red/Odd“.
- The signal image „Hp1“ is displayed when the assigned turnout number (here: 5) indicates the state „g“ i.e.: „Green/Straight“.
- The figure „#1“ indicates that this signal uses the first of a total of 16 turnout numbers of the SignalPilot. The turnout numbers used for signals are internally referred to as „SAN“.
- The currently assigned turnout number (here: 5) is displayed in round brackets after the signal name.

If you hover the mouse on one of the signal images, you will see which lights are turned on:

Two signal images are shown side-by-side. The left one is labeled 'Hp0 #1 (5) (r)' and shows a red light lit (indicated by a red '1' in a circle) and a black light. Below it is a label 'Ausgang: 1 [1]'. The right one is labeled 'Hp1 #1 (5) (g)' and shows a black light and a green light lit (indicated by a green '2' in a circle). Below it is a label 'Ausgang: 2 [1]'.

To switch the two signal aspects, the „red“ or „green“ buttons of the corresponding turnout number must now be pressed at the control panel:

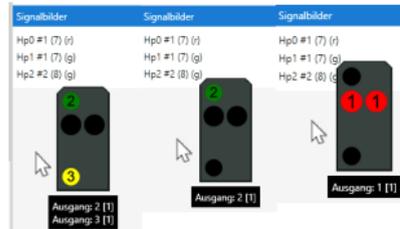
A diagram shows a keyboard control panel with 16 buttons arranged in two rows of eight. The top row is red and the bottom row is green. A yellow circle highlights button 5 in the top row, with an arrow pointing to a signal unit on the left labeled 'HP0 switch 5 red' which has a red light lit. Another yellow circle highlights button 5 in the bottom row, with an arrow pointing to a signal unit on the right labeled 'HP1 switch 5 green' which has a green light lit. The keyboard is labeled 'keyboard' at the bottom.

# Turnout numbers and signal aspects

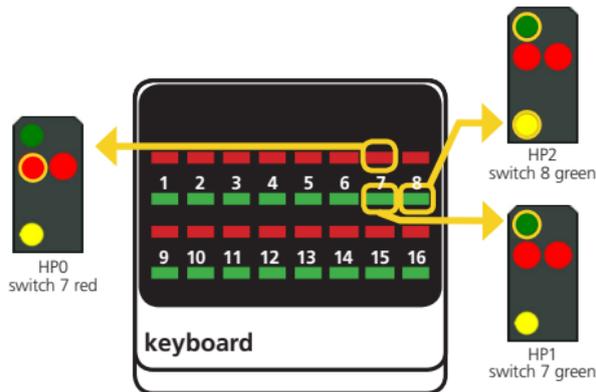
## Example 2: 3 aspect H/V exit signal

- The signal aspect „Hp0” is shown when the assigned turnout number (here: 7) indicates the state „r” i.e.: „Diverging/Odd”.
- The signal image „Hp1” is displayed when the assigned turnout number (here: 7) indicates the state „g” i.e.: „Green/Straight”.
- The signal image „Hp2” is displayed when the assigned turnout numbers (here: 7 and 8) indicate the state (g) i.e.: „Green/Straight”.
- The figures „#1” or „#2” indicate that this signal uses the first two out of a total of 16 turnout numbers of the SignalPilot. The turnout numbers used for signals are internally referred to as „SAN” (“Signal Address Number”).
- The currently assigned turnout numbers (here: 7 and 8) are displayed in square brackets after the signal name.

If you hover the mouse on one of the signal images, you will see which lights will be on:



To switch the two signal aspects, the „red” or „green” buttons of the corresponding turnout number must now be pressed at the turnout console:



# Changing turnout numbers

**!** Each signal always shows exactly one signal image until a different signal image is to be shown. The SignalPilot saves the current signal image permanently, so that even after a power failure or on the next operating day, the last signal image shown is automatically displayed again.

**i** Example 2 also shows that not all combinations need to be used. No signal image is assigned to the „button“ turnout number 8 „red/odd“; therefore nothing will happen if this button is pressed.

## 6.8.3. Changing turnout numbers

If you want to use a different turnout number, enter the desired number(s) directly in the input field.

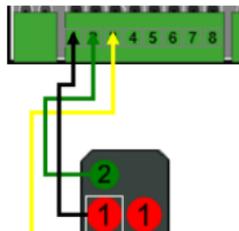
Signal	
Name:	
H/V Ausfahrtsignal HP0/HP1/HP2	
Zubehöradresse #1 (1)	7
Zubehöradresse #2 (2)	8

**!** You can also assign the same turnout number to multiple signals. These will then be switched simultaneously. If a signal requires several turnout numbers (starting with three aspects), different turnout numbers must be assigned. The turnout numbers do not have to be continuous, but we recommend this, as most digital command stations (e.g.: ESU ECoS) assume this.

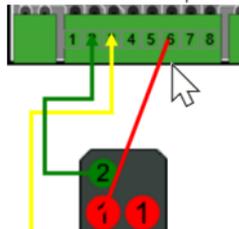
## 6.8.4. Assign outputs

You can change the assignment of the outputs manually at any time if the automatic procedure does not meet your requirements.

- Click the line for the output you want to change to select the output. The line is now shown black and bold.



- Point and click the arrow directly above the output of the SignalPilot currently connected.
- While holding down the mouse button, drag the arrowhead to the new desired output.



- Release the mouse. The output is automatically connected to the new position.

# Switch all outputs to GND

## 6.8.5. Switch all outputs to GND

If you use Viessmann signals, all outputs used must receive the „Pull“ configuration. This is done quickly but may not be overlooked.

- Select the signal so that the detail area shows the signal properties.
- Click in the control field „Switch output against ground“ to give the „Pull“ configuration to ALL outputs used in this signal.

**Signal**

Name:  
H/V Ausfahrtsignal HP0/HP1/HP2

Zubehöradresse #1 (1)

Zubehöradresse #2 (2)

Ausgang gegen Masse schalten



The return wires of the signal LEDs must be connected to one of the two „GND“ terminals (see chapter 5.4.3). Although the return wires are not displayed in the software, they must nevertheless not be forgotten.

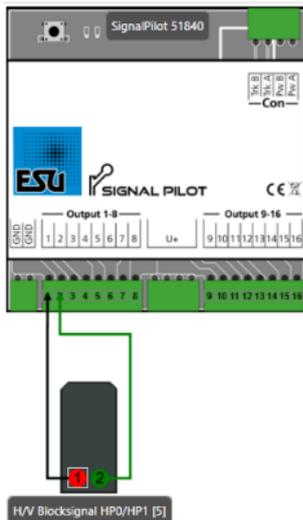
## 6.9. Configuring outputs

The properties of all outputs used in a signal can be customised. Thus, for instance, the brightness of the LEDs as well as flash and fade effects can be adjusted.



The conditions that cause the output to be switched cannot be changed in this way. The „logic“ of the signal, i.e.: how the individual lights are related, is described in XML. For more information, see chapter 11.

- To view the properties of the output, select the desired output with the mouse. A white rectangle around the light indicates that it is marked.



**Ausgang: 1**

1	2
Verzögerung beim Einschalten	20 0,33s
Verzögerung beim Ausschalten	0 0,00s
<input type="checkbox"/> Ausgang automatisch ausschalten	
Zeit bis der Ausgang automatisch ausgeschaltet wird	1 0,52s
<input type="checkbox"/> Ausgang gegen Masse schalten	
Modus (Effekt) des Ausgangs	Dimmbares Licht (Ein- und Ausblenden)
Helligkeit wenn eingeschaltet	64
<input type="checkbox"/> Verlängerte Einblendzeit	
Einblendzeit	16 0,13s
<input type="checkbox"/> Verlängerte Ausblendzeit	
Ausblendzeit	24 0,20s
<input type="checkbox"/> Zufällig Ein- und Ausschalten	
<input type="checkbox"/> Nachtschaltung befolgen	
Ausgänge am SwitchPilot Extension	
<input type="checkbox"/> Relais 1 Pos I	<input type="checkbox"/> Relais 1 Pos II
<input type="checkbox"/> Relais 2 Pos I	<input type="checkbox"/> Relais 2 Pos II
<input type="checkbox"/> Relais 3 Pos I	<input type="checkbox"/> Relais 3 Pos II
<input type="checkbox"/> Relais 4 Pos I	<input type="checkbox"/> Relais 4 Pos II

# Switch output to GND

## 6.9.1. Switch output to GND

Here, the „Pull“ configuration of the output can be activated if this is not to be done simultaneously for all outputs of the signal.

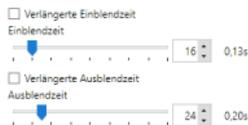
## 6.9.2. Lighting effects

Various lighting effects can be assigned to each individual output. The following lighting effects (modes) are available:

- Dimmable Light (fade-in and fade-out): Here the output is slowly dimmed up and simulates the slow beginning of the glow of oil lamps or old incandescent lamps.
- Fire Box: A fire box is simulated here that can also be used as flickering light for campfires or candles.
- Single Strobe: This mimics a single flash played repeatedly. The frequency can be set.
- Double Strobe: This mimics a double flash played repeatedly. The frequency can be set.
- Blinking Light: The „classic“ blinking light. The frequency can be set. The „Swapping phases“ option inverts the on and off phase to represent an alternating blinking beacon.
- Fluorescent Light: Simulates the typical flickering of fluorescent lamps.
- Single Strobe Random: Like Single Strobe, but the exact time of the flash is randomly chosen.
- Defective Fluorescent Light: A defective fluorescent lamp that never turns on.
- Motorised Turnout: Effect for motorised turnout drives. The revs of the motor can be reduced if it turns too fast.

## 6.9.3. Fade-in and fade-out times

Every light can be faded-in and -out if so desired. The change-over time can be set with the two sliders.

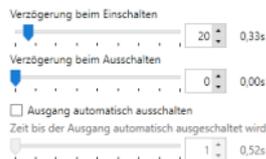


The checkboxes „Extended fade-in time“ respectively „Extended fade-out time“ change the scale to allow for the setting of longer change-over times e.g.: for street lighting.

## 6.9.4. Delay times

Upon request, every light can also be turned on or off with a certain delay. The times can be set separately with the sliders. Especially with daylight signals in combination with fade-in and fade-out times, switch-on delays can ensure that two lights are not (inadmissibly) briefly active at the same time.

The output can also be switched off automatically after a certain delay. This is useful e.g.: for subsidiary signals, which are generally displayed only for a short time.



## 6.9.5. Assign SPE relays

Each active output can control one of the four relays of a connected SwitchPilot Extension module, if required. This may be useful for activating a braking sector or the polarisation of a turnout frog (see chapter 5.5). Select the relay(s) as well as its status (i.e.: which contacts should be active) when the corresponding output is turned on. Each relay can be set to position I (normally closed contact) or position II (normally open contact) and retains its position (status) until it is switched to the other status.

Ausgänge am SwitchPilot Extension

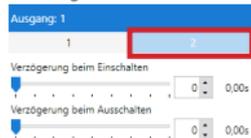
- |   |  |
|---|--|
| <input type="checkbox"/> Relais 1 Pos I | <input type="checkbox"/> Relais 1 Pos II |
| <input type="checkbox"/> Relais 2 Pos I | <input type="checkbox"/> Relais 2 Pos II |
| <input type="checkbox"/> Relais 3 Pos I | <input type="checkbox"/> Relais 3 Pos II |
| <input type="checkbox"/> Relais 4 Pos I | <input type="checkbox"/> Relais 4 Pos II |



Make sure that the assignments make sense. Assuming that two outputs are active at the same time, the settings for the relay must not contradict each other.

## 6.9.6. Use alternative output configuration

In addition to its basic configuration „1“, each function output also has an alternative output configuration „2“. You can change the display by clicking on the corresponding digit in the detail area to change the alternative output configuration.



The alternative output configuration is used, for example, for signals where individual lights (e.g.: green light of the DB KS signal) can either light up continuously or flash, depending on which other signal lights are still turned on. In these cases, the SignalPilot can switch over to the alternative configuration.



You cannot define which signal aspect uses the basic or alternative output configuration with the LokProgrammer software. This is set when defining the signal aspect.

## 6.10. Save the project file to the hard drive

If you have placed all signals as desired and completed all settings, you should save the project file to the hard drive, so that it is available for later changes.

- Select the command „Save under...“ in the „File“ menu and assign a meaningful name to the project file.

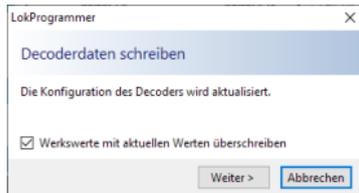
## 6.11. Write settings to the SignalPilot

The next step is to transfer the settings to the SignalPilot. Make sure that the connection is exactly as shown in chapter 6.2.

- Select the command „Write decoder data...“ in the „Programmer“ menu or click on the icon in the toolbar.



- Then select „Next“ in the dialog box.



The decoder data are transmitted to the SignalPilot. If you receive an error message, check the connection and unplug the SwitchPilot extension module for programming.

The SignalPilot is now ready for wiring.

## 6.12. Wiring the SignalPilot

We recommend that you first establish the wiring with the signals, test the functions and only then install the SignalPilot on the layout.

### 6.12.1. Save the wiring diagram



To make it easier for you to install the wiring, you can save the work area as an image and print it out, if desired. To accomplish this, click the „Screenshot“ button at the top left of the work area. A file dialog window opens.

Assign a meaningful name to your image and remember where you saved it. The PNG image can now be opened and printed with Windows Image View.

## 6.13. Testing Settings

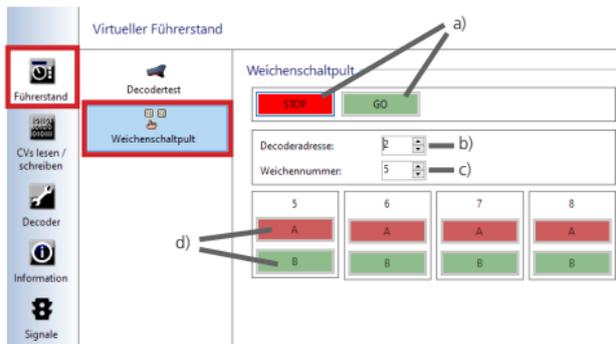
Of course, you may use your command station for testing the signal aspect settings. Alternatively, you can use the integral „Virtual Cab“ of the LokProgrammer software.

### 6.13.1. Virtual Cab

The virtual cab of the LokProgrammer software can also be used for testing signal aspects, provided that the power consumption does not exceed the capability of the LokProgrammer. This should not be a problem for daylight signals.

For testing(!) the connection to the LokProgrammer must be made as shown in Fig. 5.2.

- Select the „Virtual Cab“ function from the tab in the left column.
- Select the Switch “Turnout Control Panel” from the centre column.



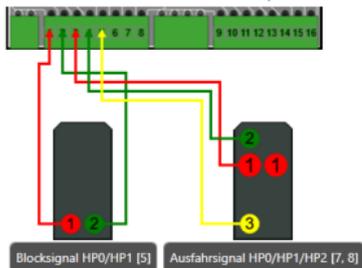
The turnout control panel resembles a „real“ keyboard.

- Stop and Go buttons to control the power supply
- Decoder address: Set the desired decoder address here. This also influences the turnout numbers.
- Turnout number: Alternatively, you can enter the desired first turnout number here.
- “RED” and “GREEN” buttons for the respective turnout numbers.

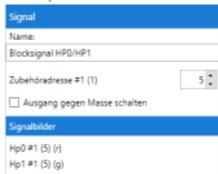
# To understand Signal aspects

## 6.13.2. Signal aspects and the assignment to turnout numbers

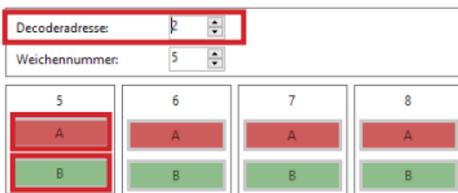
As already shown in the examples in chapter 6.8.2., the turnout numbers must correspond to the associated signal aspects. Let's take another look at an example:



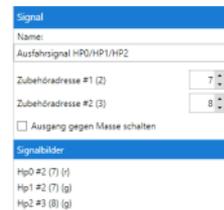
In this configuration, the block signal can be switched with the turnout number 5. „RED“ (1) turns on Hp0, „GREEN“ (1) turns on Hp1:



On the virtual cab, these would be the buttons „5 A“ for „Hp0“ and „5 B“ for Hp1:



The exit signal requires turnout numbers seven and eight. „RED“ (7) turns on Hp0, „GREEN“ (7) turns on Hp1, „GREEN“ (8) turns on the yellow light for Hp2.



On the virtual cab, these would be the buttons „7 A“ for „Hp0“, „7 B“ for Hp1, „8 B“ for the yellow light for Hp2.



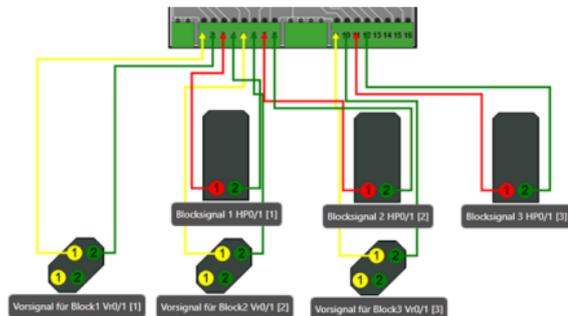
## 6.14. Distant signals at the same mast of a main signal

A particular challenge are combinations of distant signals and main signals on a common mast in block control operation. Here, the distant signal displays the aspect of the following main signal. For this to work, two conditions must be met:

- The turnout numbers of the distant signal must be the same as those of the corresponding (following) main signal.
- The distant signal must “know” the turnout number (address) of the main signal on whose mast it is mounted, because it must be switched off (blanked) if the main signal on the same mast displays Hp0 or Hp00.

# Distant signals

All this is possible with the SignalPilot. Let's have a look at an example of how this can be accomplished.



In our example there are three block signals, each with its own turnout number, namely one, two and three. In our example, the wiring is irrelevant, only the turnout numbers count.

- The distant signal for the block signal 2 is mounted on the mast of the first block signal. Therefore, it also is assigned the turnout number of the following block signal (here: 2) to assure the identical signal aspect.
- The distant signal for the block signal 3 is mounted on the mast of the second block signal. Therefore, it also is assigned the turnout number of the following block signal (here: 3) to assure the identical signal aspect.

With these settings it is already ensured that the distant signals always display the signal aspect of their corresponding main signal.

## 6.14.1. Blanking

Now the distant signal must be configured to be blanked (dark) if the main signal on the SAME MAST(!) displays Hp0. To do this, we first configure the distant signal for block 2.

- Select the main signal on whose mast the distant signal for block 2 is located. This is block signal 1 in our example. Remember its address and, above all, which SAN sets this block signal to Hp0. In our example, this is SAN #2 (r).

Signal	
Name:	Blocksignal 1 HP0/HP1
Zubehörsadresse #1 (1)	1
<input type="checkbox"/> Ausgang gegen Masse schalten	
Signalbilder	
Hp0 #1 (1) (r)	
Hp1 #1 (1) (g)	

- Now select the distant signal that is mounted on the same mast and look at its properties:

Signal	
Name:	Vorsignal für Block 2 Vr0/1
Zubehörsadresse #1 (2)	2
<input type="checkbox"/> Ausgang gegen Masse schalten	
Signalbilder	
Vr0 #2 (2) (r)	
Vr1 #2 (2) (g)	
Extern	
Dunkel	
<input checked="" type="radio"/> Rot	
<input type="radio"/> Grün	

- In the „External“ box, you now specify which other turnout numbers must be active to BLANK this signal. Select SAN 1 „red“:

# Distant signals

This setting corresponds to the main signal on the same mast.

**Extern**

Dunkel

San 1 1 ▾

Rot  
 Grün

▾

Rot  
 Grün



Do not enter the turnout number of the main signal here, but its SAN (Signal Address Number). The currently set turnout number for the corresponding SAN is displayed on the right for your information.

- Now select block signal 2 and check which SANs will cause this signal to display Hp0. In our example, this is SAN #4 (r).

**Signal**

Name:

Blocksignal 2 Hp0/Hp1

Zubehöradresse #1 (4) 2 ▾

Ausgang gegen Masse schalten

**Signalbilder**

Hp0 #4 (2) (r)  
Hp1 #4 (2) (g)

- Now select the distant signal mounted on the same mast and enter the corresponding SAN in the “External” box:

**Signal**

Name:

Vorsignal für Block 3 V0/1

Zubehöradresse #1 (5) 3 ▾

Ausgang gegen Masse schalten

**Signalbilder**

Vr0 #5 (3) (r)  
Vr1 #5 (3) (g)

**Extern**

Dunkel

San 4 2 ▾

Rot  
 Grün

▾

Rot  
 Grün

Now all signals should work correctly. Please also observe the following notes:

- The blanking of the distant signal can also respond to several SANs. This is important if, in addition to Hp0 another signal aspect can be displayed on the main signal, e.g.: Hp00. As soon as you enter a SAN, another selection box for the next SAN will automatically open.
- The blanking feature only responds to main signals connected to the same SignalPilot. In case of complex blocks, it may therefore be possible that some outputs cannot be utilised.

## 7. POM Configuration (Programming on the Main)

The SignalPilot may remain installed on your layout during programming. For POM to work, your digital system must support „Programming on the Main (POM)“ for accessory decoders (!). Thanks to RailCom® ECoS users can even read out the values (see chapter 11).

### 7.1. Connection to the digital system

The SignalPilot does not require any special connection. It may remain connected as shown in Chapter 5.2. or 5.3.

### 7.2. Reading and writing CVs via POM

Select the „Programming on the Main“ as well as „Accessory decoder“ on your command station. Make sure that you have selected the correct accessory address. You can write all CVs of the SignalPilot decoder and, subject to the type of command station, you can read out CVs as well. With the ECoS, this is done as follows:

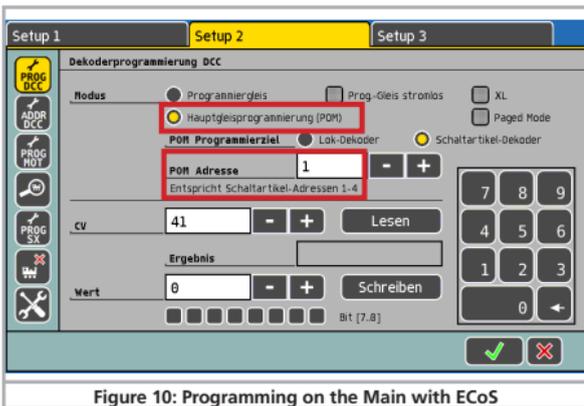


Figure 10: Programming on the Main with ECoS

- Go to the ECoS main menu.
- Select „Programming on the Main“ (POM), „DCC“ and „Accessory decoder“.
- Select the „POM address“ of the SignalPilot. The corresponding turnout numbers are displayed as an additional aid.
- Select the CV that you want to read or write.
- Push the „Read“ or „Write“ button.



For reading CVs, RailCom® must be active on the SignalPilot. Please refer to chapter 9.

Unfortunately, many command stations only support POM mode for mobile decoders (locomotive decoders) but not for accessory decoders.

## 8. Configuration via programming track

In some cases, it may be desirable to change the properties of the SignalPilot via the programming track. There, the CVs can not only be written, but also read. This is conveniently done before the final installation on the layout.

### 8.1. Connection to the digital system

Connect the SignalPilot as described in chapter 5.2. The power supply must be provided by the digital system.

### 8.2. Read & Write CVs

Reading should work with all DCC compliant command stations. However, some command stations do not provide enough voltage at the programming track output or sometimes report an over-current. In such a case, POM (Programming on the Main) should be used.

## 9. Learning POM address from the command station

The POM address can also be assigned directly by the command station. To achieve this, the SignalPilot must be put into ADDRESSING mode:

- Press and hold the **PROG** button until (after about two seconds) the LED flashes as follows: Short, Pause, Short, Pause, etc.
- Now you can release the button: The decoder is now ready to „learn“ an address as soon as an accessory of the desired group of 4 is activated at the command station.
- Now activate an accessory of your choice with the command station. You will find more information on how to do this in the manuals of the command station respectively the throttle.
- If the decoder has understood the address, it acknowledges this by lighting the LED continuously for about 1 second.
- The SignalPilot then switches to normal operating mode and the LED is extinguished.

## 10. RailCom®

RailCom® is a technique for transferring information from the decoder back to the command station. When RailCom® is switched on, the CV values of the SignalPilot can be read out directly on the main. Ex works, RailCom® is active on the SignalPilot.

### 10.1. RailCom® Configuration

To switch off RailCom, please delete Bit 3 in CV 29 and set CV 28 to 0.

## 11. Reset to factory default values (decoder reset)

You can restore the decoder's ex works settings at any time.

### 11.1. With the programming button

- Disconnect the power supply to the SignalPilot decoder. The power LED must be extinguished.
- Press and hold the **PROG** button.
- Turn on the power supply for the decoder again. The PROG LED will light up continuously.
- Release the **PROG** button. The decoder will be reset to factory default values, the PROG LED will go out.

### 11.2. With DCC systems

Write the **value 8 into CV 8** on the main (wiring as per chapter 8) or on the programming track (wiring as per chapter 9). After that, the default values are restored.

Writing into CV 8 is a special case; some command stations may display an error „err02“ or similar. Nevertheless, the SignalPilot will accept the command.

## 12. User-defined Signals

ESU will continuously expand the number of signal aspects. However, you do not necessarily have to wait for ESU to enter your desired signal type: With a little patience and practice you will be able to define your own signals. We will publish a detailed description of how to accomplish this on our website.

Go to [www.esu.eu](http://www.esu.eu), click on "Support", then on „Tips & Tricks“ and finally on „SignalPilot“.

Aktuell Über uns Produkte Download Support Forum Vertrieb Händler Websseite durchsuchen

Support - Tipps & Tricks

### Tipps Et Tricks

Hier finden Sie anschauliche Tipps, die Ihnen beim Einbau und Betrieb von ESU Produkten helfen.

Diese Anleitungen sind im Laufe der Zeit entstanden und decken Fragestellungen ab, die mit einem einfachen FAQ-Eintrag alleine nicht zu beantworten sind.



**LokProgrammer Software 5.0.x.**  
Hier finden Sie wichtige Informationen für die neue Version 5.0.x.. Software



**SignalPilot**  
Hier finden Sie Ergänzungen zum Handbuch und zum Erstellen von Signalbildern



**ECO5**  
Hier erklären wir neue Funktionen, die nach



**Mobile Control II**  
Hier erklären wir wichtige Funktionen zum Mobile

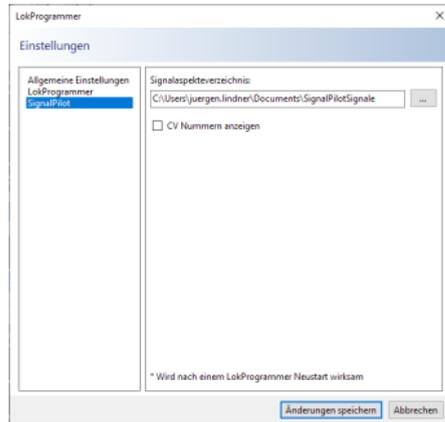
### 12.1. XML files

User-defined signals are stored in so-called XML files. XML is an markup language used to depict structured data in the format of a text file that is readable by both people and computers.

### 12.2. Directory for user-defined signal aspects

Every time the program starts or creates a new project file for the SignalPilot, the LokProgrammer software checks whether XML description files for customised signals are contained in a directory you define on your hard drive. If so, the software tries to import them and will display the signals in the selection area to the left below the installed signals. You can tell the LokProgrammer where the signal files are located. From the menu, click on „Extras“ and then on „Program Settings“. Then select „SignalPilot“ from the column on the left.

The signal aspects directory can be entered or selected there:



## 13. Support

Should you have questions regarding your SignalPilot to which you have not found the right answer in this manual please first contact your hobby shop. The people there are your competent contact for all questions relating to model trains. In difficult cases, you can contact us directly. Look first on our website under «Support / FAQ» to see whether the question has already been answered. If this is not the case, we ask you to make these available to us either in our support forum or to contact us by e-mail. We also provide a telephone hotline, which should only be used in the case of really special requests.

### For Germany

by phone: +49 (0) 731 - 1 84 78 - 106  
Tuesday & Wednesday  
from 10.00 to 12.00 o' clock

by Fax : +49 (0) 731 - 1 84 78 - 299

by E-Mail: [www.esu.eu/kontakt](http://www.esu.eu/kontakt)

by mail: ESU GmbH & Co. KG  
Edisonallee 29  
D-89231 Neu-Ulm

**[www.esu.eu](http://www.esu.eu)**

### For USA, Canada, Australia

by phone: +1 570-980-1982  
Tuesday & Thursday  
from 8am to 4pm (EST)

by Fax : +1 866-591-6440

by E-Mail: [support@loksound.com](mailto:support@loksound.com)

by mail: ESU LLC  
1304 Jordan Ave  
Montoursville PA 17754

**[www.loksound.com](http://www.loksound.com)**

## 14. Change history

### 1. EDITION DEZEMBER 2020

- Initial document

## 15. Warranty certificate

### **24 Monate Gewährleistung ab Kaufdatum**

Dear customer,

Congratulations on purchasing this ESU ECoS command station. This quality product was manufactured applying the most advanced production methods and processes and was subject to stringent quality checks and tests.

Therefore ESU electronic solutions ulm GmbH & Co. KG grants you a warranty for the purchase of ESU products that far exceeds the national warranty as governed by legislation in your country and beyond the warranty from your authorised ESU dealer.

### **Manufacturer's warranty of 24 months from date of purchase.**

#### **Warranty conditions:**

This warranty is valid for all ESU products that have been purchased from an authorised ESU dealer.

Any service, repair or replacement under this warranty requires proof of purchase. The filled in warranty certificate together with the receipt from your ESU dealer serves as proof of purchase. We recommend keeping the warranty certificate together with the receipt.

In case of a claim please fill in the enclosed failure report card as detailed and precise as possible and return it with your faulty product.

Please use the appropriate postage when shipping to ESU.

#### **Extend of warranty / exclusions:**

This warranty covers free of charge repair or replacement of the faulty part, provided the failure is demonstrably due to faulty design, manufacturing, material or transport. Any further claims are explicitly excluded.

The warranty expires:

- In case of wear and tear due to normal use.
- In case of conversions of ESU – products with parts not approved by the manufacturer.
- In case of modification of parts.
- In case of inappropriate use (different to the intended use as specified by the manufacturer).
- If the instructions as laid down in the user manual by ESU electronic solutions ulm GmbH & Co. KG were not adhered to.

There is no extension of the warranty period due to any repairs carried out by ESU or replacements.

You may submit your warranty claim either with your dealer or by shipping the product in question with the warranty certificate, the receipt of purchase and the fault description directly to ESU electronic solutions ulm GmbH & Co. KG at:

ESU GmbH & Co. KG  
- Guarantee Section -  
Edisonallee 29  
D-89231 Neu-Ulm

# Trouble shooting sheet

## 1. Personal data

(Please write in BLOCK LETTERS)

Name: ..... \_\_\_\_\_  
Street: ..... \_\_\_\_\_  
ZIP/City: ..... | | | | |  
Country: ..... \_\_\_\_\_  
Email: ..... \_\_\_\_\_  
Phone: ..... \_\_\_\_\_  
Date: ..... \_\_\_\_\_  
Signature: ..... \_\_\_\_\_

## 2. Error

- |   |   |
|---|---|
| <input type="checkbox"/> Transistor outputs | <input type="checkbox"/> Short circuit              |
| <input type="checkbox"/> Servo outputs      | <input type="checkbox"/> No function from the start |
| <input type="checkbox"/> No Function        | <input type="checkbox"/> Programming on the Main    |

## 3. Error description

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## 4. Receipt

Please enclose your receipt / invoice. Otherwise no warranty possible!

## 5. Additional information:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## 6. Your retailer:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Retailer's stamp or address

