

AR_{duino} SIG_{nal} dcc DEC_{oder}



The DCC decoder for
Arduino UNO/MEGA
for all light signals for everybody
(with a DCC central station)



Author: Nico Teering

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Info: Info@Arcomora.com

WWW: www.Arcomora.com/Arsigdec

Introduction

The use of an Arduino microcomputer in model railroad construction is well known to many.

However, the actual use of the computer is for most people a bridge too far. Programming or making simple adjustments to a program is seen as a big problem.

As a result, the Arduino remains the domain of a very limited group with more technical knowledge.

That is a pity, because with the Arduino you can automate your whole model railway cheaply.

To make the Arduino accessible for everyone, I have made a program for a light signal DCC decoder based on an Arduino (ARSIGDEC). With the ARSIGDEC, all conceivable signals can be applied to your layout. The only limitation is that a maximum of 8 LEDs per signal can be used and also a maximum of 10 signal images per signal.

With ARSIGDEC it is no longer necessary to write just one letter of Arduino code.

There is a version for the MEGA2560 and the UNO.

The Uno version has a maximum of 8 signals or 16 LEDs in total.

The MEGA version has a maximum of 30 signals or 59 leds in total.

The DCC/Powershield can be used for both Arduinos.

As with any other DCC decoder, the ARSIGDEC still has to be configured.

This configuration is usually wrongly called programming. To avoid confusion we use the term programming to write the Arduino code and configure the term to execute the program. In this configuration, the servo's and accessory's are set up.

The ARSIGDEC operates in two different 'states'.

In config mode, the signals can be 'set' using one character commands from the keyboard. The ARSIGDEC communicates with the computer via an USB cable.

No DCC signals are needed for this.

By means of a specific command ('E'), the ARSIGDEC switches to the operating state.

In the operating state, the signals are controlled with the DCC signal. A USB cable is no longer needed.

Why an Arduino?

The main reason is the price. Take a look at the price:

- An (cloned) Arduino doesn't have to cost more than €3,-.
- Additional separate components for processing the DCC signal cost €2.50.

Another reason is the ease with which everything can be configured. This is done interactively and does not require a DCC central unit or any hassle with vague CVs.

The installation of all software is very user-friendly. All the required software is installed at once. Uploading the decoder program to the Arduino is also almost entirely automatic.

See the installation manual for more information.

All ARSIGDEC features one by one:

- Controlling a maximum of 8 signals(UNO) or 30 signals (MEGA) per Arduino.
or
- A maximum of 16 leds (UNO) or 59 leds (MEGA)
- A signal may contain up to 8 leds. Parallel connected leds count for one.
- A signal can have up to 10 different aspects
- A signal can be configured manually. For each aspect and for each led you can specify its action: on , off or flashing.

In this way you can configure almost all signals in the world.

- Support of Dutch 'P-signals' (red<->green change with automatic intermediate yellow)
- Contains a database with the most important signals. You don't need to configure these signals. Just select a signal number from the database.
- Configurable on/off times when flashing.
- Configurable fading time per signal(100-800 ms.)
- Configurable maximum brightness per led. So no more to bright or to weak leds and experimenting with resistors.
- Suitable for signals with common anode and common cathode.
- Interactive, via screen and keyboard, configuring of the signals. That is independent of your DCC Central and no puzzling with complex CV's.
- No need to use the Arduino IDE (development environment)
- Assign a random DCC address (1-2000) for each signal.
- One DCC address controls two different aspects.
- Subsequent addresses are used for more aspects.
- A test option. All signals are showed
- A documentation option shows all settings.
- Assign an alpha numeric administrative note to a signal
- A reset option that clears all settings from memory.
- Option to correct the address offset of a Roco central (MM, z/Z21
- A help options shows all commands.
- A log option in which all configuration sessions are saved.
- Independent of used bus structure (S88, LocoNet, XpressNet)
But in operation mode it uses only DCC.

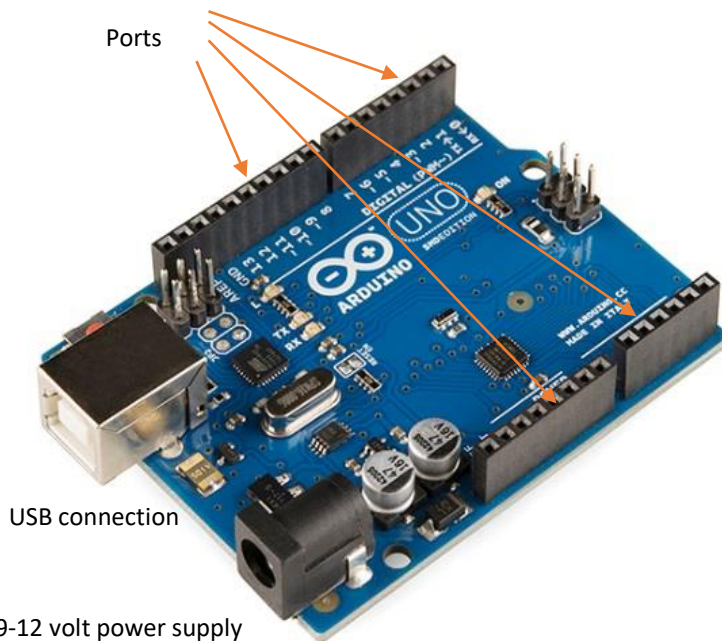
What do you need?

The hardware

Here you have a number of options.

Option 1: An Arduino UNO or Arduino Mega2560

An Arduino is a microcomputer with a lot of (20 or 69) connections. These are called ports. These are numbered on the circuit board.



For the ARSIGDEC decoder we use a maximum of 16 or 65 of these ports. The LEDs (with a 150 ohm resistor) can be connected directly to these ports. An Arduino port has an output voltage of 0 or 5 volts and can process a maximum of 40 mA.

On the left you can see the USB connection. The Arduino is powered by this USB cable. The USB connection is needed to copy the program to the Arduino. It is also needed to communicate with the computer when configuring.

If no USB cable is connected, the power supply must come from the other black socket (power jack). A 7-12 Volt DC voltage source can be connected to this jack. The Arduino itself makes this a stabilized 5 volt voltage. Both connections can be used simultaneously.

On the Arduino we also see some ports with the text Power. Here we find two 5 volt ports (output), two GND connections and a Vin port. Instead of the power jack, the Vin port can also be used to feed the Arduino. Do not connect 5V to the 5V ports.

DCC circuit

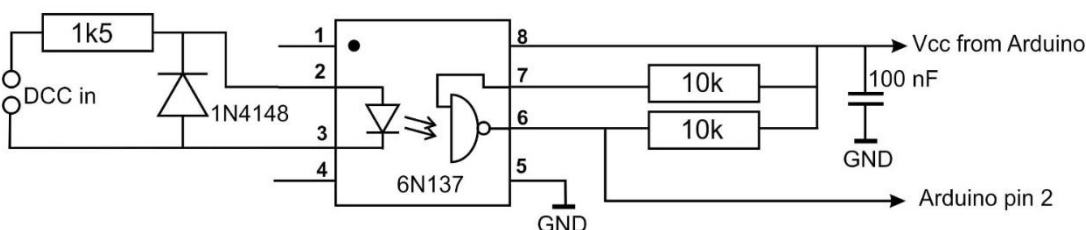
Secondly, a small amount of electronics is needed to make the DCC signal suitable for the Arduino.

The IC 6N137 is a fast optocoupler that transmits the DCC signal to the Arduino.

The necessary 5 volts can be connected directly to a 5V port of the Arduino.

Port 6 of the IC is connected to port 2 of the Arduino.

These extra components have to be soldered on a mounting plate.



For this circuit a shield has been developed for this circuit. The power supply for the Arduino can also be placed on this shield.
The board can be powered by an external power or by the DCC signal.

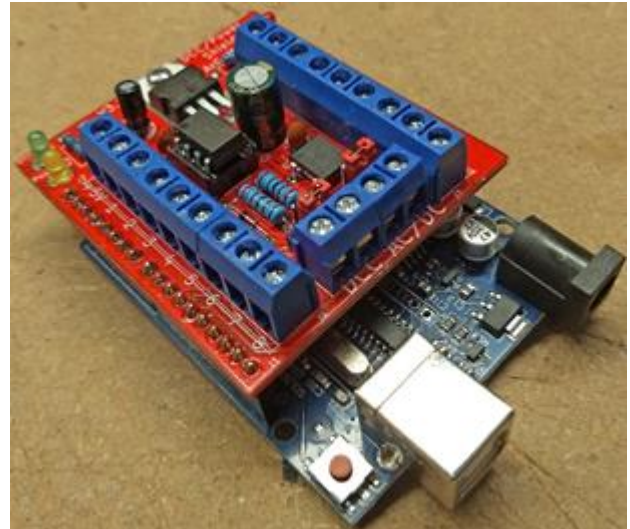
For the MEGA this shield is mandatory.

This board can be ordered with the order form on:

www.Arcomora.com/order.

If not in stock, the delivery time can be a few weeks.

You also have to buy an Arduino yourself.

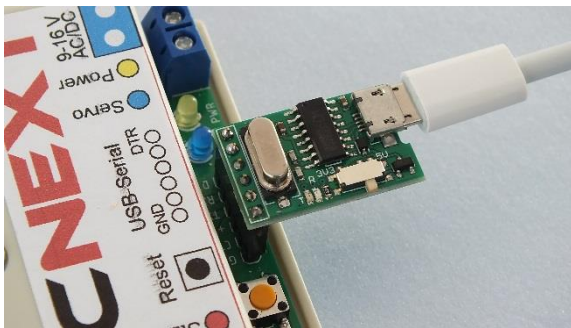


Option 2: The DCCNext decoder

Completely new is the **DCCNext** decoder.

This decoder integrates an Arduino processor (ATMEGA328P) with a power supply and the DCC circuit and is therefore a combination of an Arduino UNO and the DCC shield.

A separate USB interface (CH340) provides the connection to the PC.



This decoder contains 16 screw terminals to which signals can be connected directly.

The presence of a DCC signal is made visible with a LED.

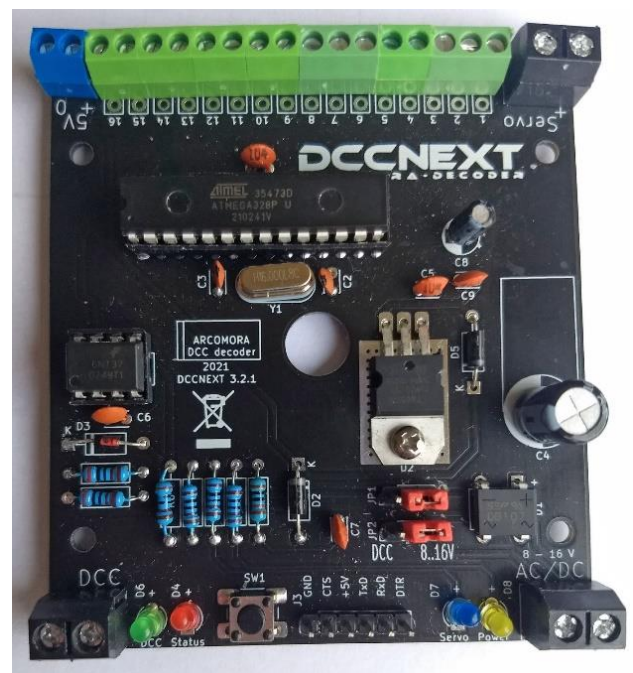
This manual is based on the port numbers of the **DCCNext**.

More information: www.Arcomora.com/DCCNext.

This DCCNext can be ordered with the order form on:

www.Arcomora.com/reservation.

An important difference with the DCC shield is the use of port numbers 1 to 16 instead of the pin numbers.



Software

Of course, software is also required.

1. During the software installation, the ARSIGDEC program is placed on your PC as a pre-compiled binary file: ARSIGDEC.hex (UNO) and ARSIGDECM.hex (MEGA)
2. To get this on the Arduino you need to upload the programs. This means that ARSIGDEC is transferred from your PC to the Arduino via the USB cable. This upload is done automatically with a shortcut on the desktop.
3. A separate 'terminal emulator' is used for communication with ARSIGDEC. (Putty.exe) This is also started with a shortcut. This allows output of the program running on the Arduino to be displayed and also input from your keyboard to ARSIGDEC can be sent.
4. In addition, drivers are required. If you have already installed the Arduino IDE (Integrated Development Environment) you probably already have one. For Chinese clone Arduino's you need special drivers, the so-called CH340 driver.

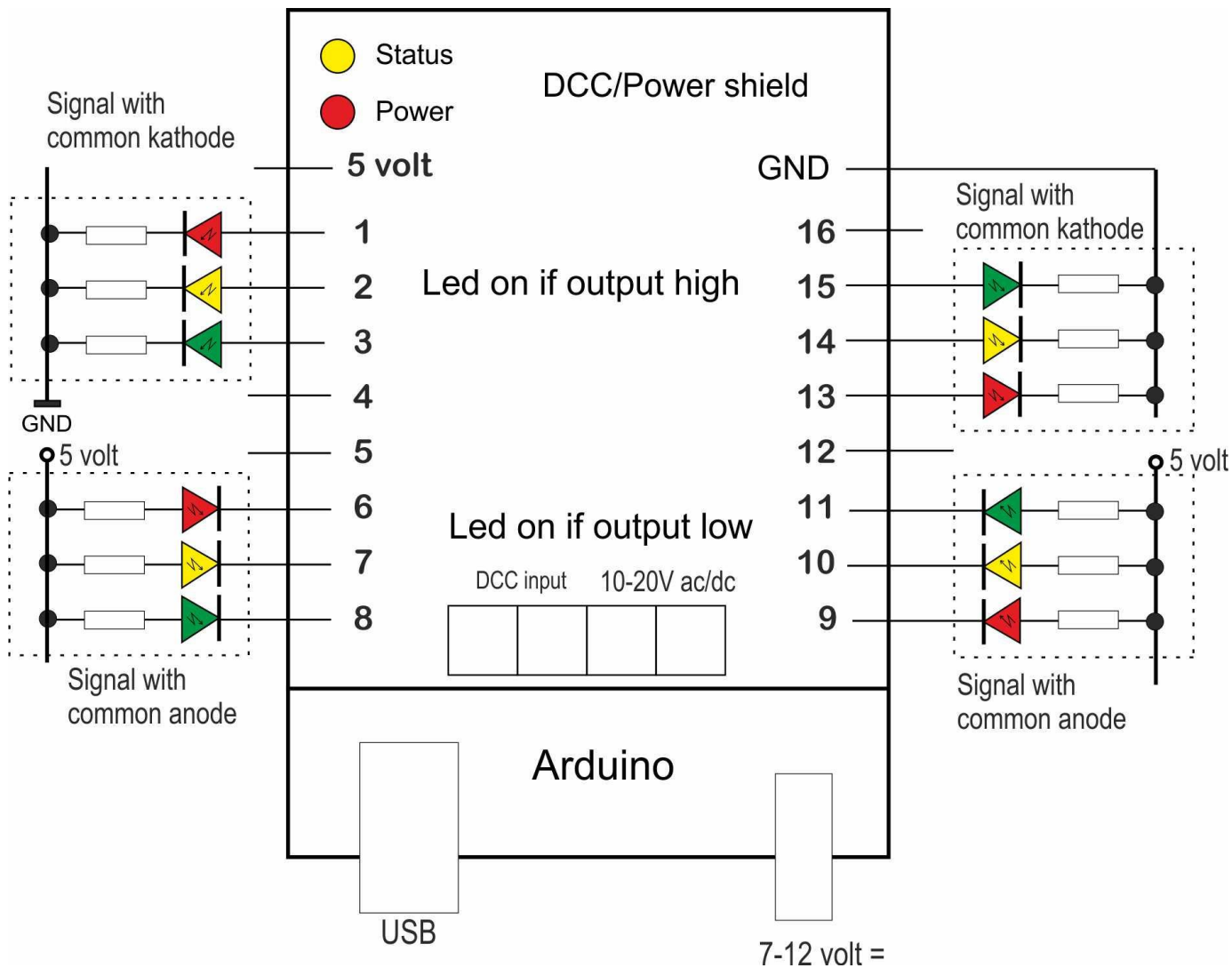
All these four components are placed on your PC in a single installation.

Just click and GO!

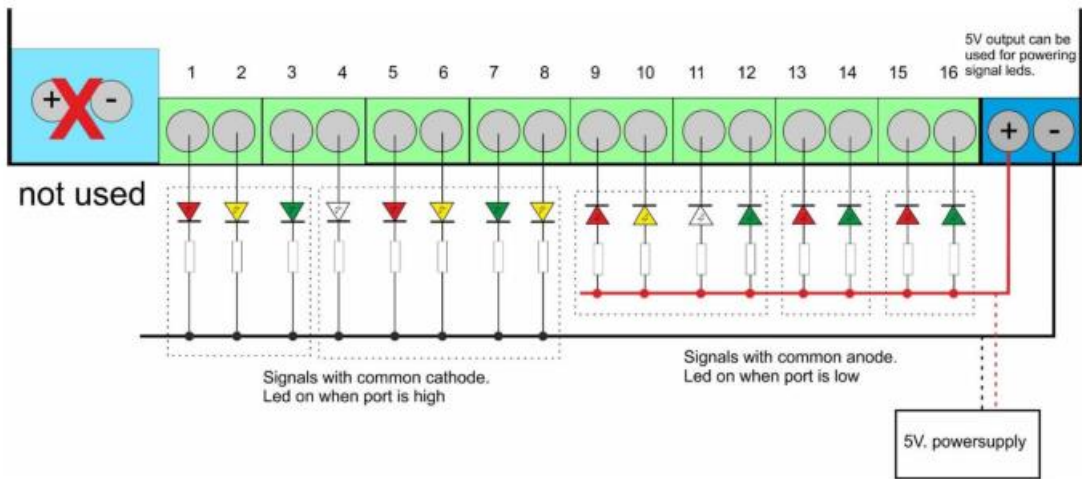
See the installation manual for this.

[DOWNLOAD HERE THE ARSIGDEC SOFTWARE](#)

Connection sample ARSIGDEC



Signals can be connected directly to the shield or the DCCNext with a low ballast resistance. Many factory signals already contain a resistor. These are usually too large because they are intended for 16V. Remove these resistors as well as any existing diode. Replace the resistors with values of 150-220 ohms. The brightness can be adjusted with Arsigdec. On both the shield and the DCCNext you can feed the LEDs with the 5V output.



Configuring your ArSigDec

After the software is installed properly you can start to configure the Arsigdec.

Click on the shortcut *Arsigdec*.

At the very first time you start *Arsigdec*, the drivers will be bound to the USB port to which the Arduino is connected.

Please Note:

- Every numeric input must be closed with <enter>.
- Only one-character commands don't require an <enter>
- For most inputs the current value does not change with only <enter>.
The current value is shown between brackets.
- In configuration mode the yellow led on the DCC shield (or the built-in led on pin 13) is always on.
- In operation mode this led is off.
- Turn on the Numlock key on the numeric keypad.
- You may use lower and upper characters for commands.
- Use **ONLY** **backspace** key to correct a numeric input.

A command can now be entered. The very first time you start the ARSIGDEC, or after a full reset, you have to enter a number of default settings including an administrative number for this ARSIGDEC. This number identifies the decoder.

These are the default values as they can be changed with the I-command. See at I-command.

At each start of the configuration an overview of the configuration will be shown automatically.

You can change these settings later with the I-command.

NOTE: Turn off the function Railcom/Rail communication in the z21!

For configuring with ROCRAIL see: www.youtube.com/watch?v=dic4zqEXa8o=dic4zqEXa8o

The commands

There are two types of commands

- General commands
- Signal specific commands

That's why the configuration has two modes.

By entering a '?' you see the available commands for the current configuration mode.

The configuration mode always starts with the general command mode.

You only see the commands that belong to the current state.

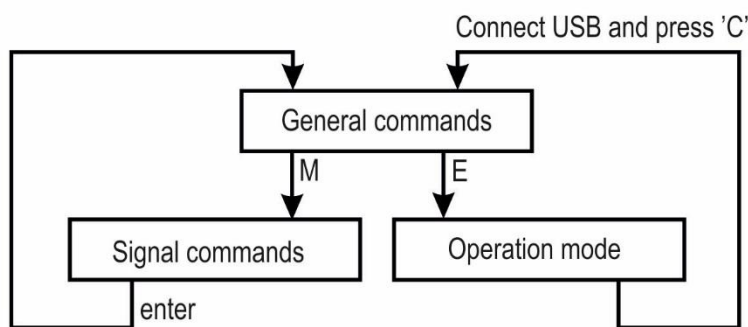
Each command consists of a single letter and does NOT need to be closed with <enter>.

The letters are based on the English description of the function of each command.

Some general commands can also be given in the signal state.

After booting in the configuration state you can only enter general commands.

Signal commands can be entered after the M-command. You will then first be asked to enter a signal to be modified.



Algemene structuur van ARSIGDEC

Adding signals

Basic configuration rules:

- A signal can have 2 up to 8 leds. Parallel connected leds count for 1.
- On an UNO there is a maximum of 16 leds per Arduino. So a maximum of 8 signals with 2 leds or 2 signals with 8 leds.
- On an MEGA there is a maximum of 59 leds per Arduino.
- One signal has a maximum of 10 aspects
- One DCC address can set two different aspects. So for 6 aspects you need 3 DCC addresses.
- The lowest address is called the 'base' address.
- Additional required addresses are one or more higher than the base address. So a signal with 6 aspects might have a base address of 200 (aspects 1 and 2) with additional addresses 201 (aspect 3 and 4) and 202 (for aspects 5 and 6)
- The base address of each signal can be chosen freely.

Adding a signal is part of the general commands.

You can add a signal in two different ways:

1. Configure manually.

You must first specify the number of leds and aspects for a signal. Then Arsigdec asks you for the aspects. For each aspect you must specify the state of each led. The state can be on, off or flashing.

Use the N-command for this configuration type.

2. Signal from the signal database.

Search in the addendum the number of the sign that you want to add. The database contains a number of the commonly used signals. Arsigdec will automatically 'fill in' the required settings for that sign.

Use the S-command for this configuration type.

?-Command

Shows an overview of the available general commands:

N-Command (New, manual configuration)

With the N-command you can configure a signal yourself.
This configuration consists of a number of steps.

```
Specify action (D/E/M/N/R/I/S/T/Y/?): N
Now configuring signal number 3
Type <enter> to cancel the configuration
How many lights do you want for this signal ?
Enter value from 2 to 8: 4
How many aspects do you want for this signal ?
Enter value from 1 to 10: 5
Set DCC base-address for signal 3
Enter value from 1 to 2048: 45
Address range set from 45 to 47 for signal 3 with 5 aspects and 4 lights.

Specify 4 leds for aspect 1: xxxx
Specify 4 leds for aspect 2: xfoX
Specify 4 leds for aspect 3: fxxx
Specify 4 leds for aspect 4: oxff
Specify 4 leds for aspect 5: xxxo

Flash timer (on/off) set to 400/400 msec.

Specify administrative note for this signal: S4
Administrative note set to S4

Fading on, with fade time of 700 msec.

Signal 3, Type: 0, on address 45-47
4 leds on ports: 0(90%) 0(90%) 0(90%) 0(90%)
Admin. note: S4, Flashing: 400/400 msec.
Connection type set to common ANODE
Fading on with fade time of 700 msec.

Aspect 1: xxxx, on address 45-R
Aspect 2: xfoX, on address 45-G
Aspect 3: fxxx, on address 46-R
Aspect 4: oxff, on address 46-G
Aspect 5: xxxo, on address 47-R

Is this configuration OK? Y/N [N]: y

Led 1 is assigned to port 7
Led 2 is assigned to port 8
Led 3 is assigned to port 9
Led 4 is assigned to port 10

Signal 3 succesfully added

Specify action (D/E/M/N/R/I/S/T/Y/?): █
```

1. First Arsigdec asks for the number of leds. Parallel connected leds count for one and must be connected to the same Arduino pin.
THIS NUMBER CAN NOT BE CHANGED LATER.
2. Then the number of aspects is asked. An aspect is a combination of leds that are on, off or flashing. There is a maximum of 10 aspects
THIS NUMBER CAN NOT BE CHANGED LATER

3. As third step Arsigdec asks for the DCC base address. Depending on the number of aspects additional addresses will be reserved automatically. If this address range conflicts with the address range of another signal on the same Arduino you will receive a warning.
4. Now you can specify the several aspects. You do that by specifying for each led whether it should be **on** or **off** or **flashing**.
This is specified by the characters **x** or **o** or **f**
Meaning:
X or x: led is off
O or o: led is on
F or f: led is flashing
 The first character is for the first led, the second for the second led etc. You can only specify x,X,o,O, f or F.
 The number of characters must match the number of leds.
 After the last character you must end with <enter>. Make corrections with <Backspace>.
5. If one or more signal aspects contain a flashing LED, the standard flashing times are automatically assigned.
The default is 400 msec 'on' and 400 msec 'off'.
The default values can be changed with the O command.
The values per signal can be set with the M- and O-command.
6. You can assign an administrative code of 4 characters to a signal. E.g. P12 for P-signal number 12.
This can be changed later with M N-command.
7. ARSIGDEC will automatically apply the default setting for the connection type (common anode or cathode).
You can change the default value with the C command.
The values per signal can be set with the M C command
8. The fading is also automatically set to the default values.
The default value can be changed with the F-command.
The values per signal can be set with the M- F-command or with the M T B-command.
9. The maximum brightness is also set according to the standard values.
The default value can be adjusted with the B command.
The values per led can be set with the M L command or with the M T B command.
10. All questions are now asked. When you are satisfied with the settings you have made, enter 'Y' in the OK question.
11. Now ARSIGDEC will first assign pin numbers to the LEDs. So you have to connect the LEDs to these pins. After this all settings will be stored in the memory of the ARSIGDEC.

NOTE:

The first signal will automatically get the basic address as specified in point 3. So if e.g. the base address is 220, then address 220-R is the address of the first signal. The second signal is then automatically 220-G

S-Command (Standard signal)

With the S-Command you can select a predefined signal from the built-in database.

Look at the last pages for a list of available signals.

```
Specify action (D/E/M/N/R/I/S/T/Y/?): s
Now configuring signal number 2
Type <enter> to cancel the configuration
Which standard signal do you want to add ?
Enter value from 1 to 30: 8
Set DCC base-address for signal 2
Enter value from 1 to 2048: 23
Address range set from 23 to 24 for signal 2 with 3 aspects and 3 lights.
Specify 3 leds for aspect 1: oxx
Specify 3 leds for aspect 2: xoo
Specify 3 leds for aspect 3: xxo

Specify administrative note for this signal: S2
Administrative note set to S2

Fading on, with fade time of 700 msec.

Signal 2, Type: 8, on address 23-24
3 leds on ports: 0(90%) 0(90%) 0(90%)
Admin. note: S2
No flashing
Connection type set to common ANODE
Fading on with fade time of 700 msec.

Aspect 1: oxx, on address 23-R
Aspect 2: xoo, on address 23-G
Aspect 3: xxo, on address 24-R

Is this configuration OK? Y/N [N]: y

Led 1 is assigned to port 4
Led 2 is assigned to port 5
Led 3 is assigned to port 6

Signal 2 succesfully added
Specify action (D/E/M/N/R/I/S/T/Y/?): █
```

Adding a standard signal is the same as with the N-command. However steps 1 and 2 are replaced by a question for the signal number in the database.

Step 3 asks the base address.

In step 4 the aspects are shown automatically. The number of leds and aspects are read from the database.

You can change the aspects via the M-command followed by the A-command.

Steps 5 to 9 are the same as with the N-command.

Two special signals are the Dutch P-signals. Signal numbers 1 and 2 are reserved for two P-signals.

A P-signal is a signal that shows a short yellow light between the red to green and green to red changes.

It is automatically added by Arsigdec and does not require a separate aspect.

The duration of the intermediate yellow light is 700 ms. and can be set with the Y-command.

The aspects of a P-signal can NOT be changed!

Other general commands

I-Command (Initial settings)

With the I-command you can reset basic settings as entered at first startup or after reset.

It concerns the following settings:

- An administrative number for this Arsigdec. This number identifies the Arsigdec
- You'll be asked if you're using a Roco Multimaus, z21 or Z21.
- In this case, the ARSIGDEC will automatically perform an address correction.
- The On and Off times are flashing.
- Separately adjustable from 100-2000 msec.
- The standard brightness of the LEDs. Adjustable from 5 to 100%.
- Do you have signals with common anode or common cathode?

These settings are automatically applied when a new signal is added and can be adjusted later (M-command) by signal.

The brightness even per led.

M-Command (Modify)

With the M-command you change to signal command mode.

In this mode you can change the settings of an individual signal.

Look further at Signal Commands.

D-Command (Document)

The D command gives an overview of how all signals are set.

Make a screenshot of it and save it on your computer and/or print it on your printer.

You always know how the signal

decoder is set. You can also use the log file. Don't forget to write down the colors of the LEDs

```
Specify action (D/E/M/N/R/I/S/T/Y/?): i
Specify number for this ARSIGDEC
Enter value from 1 to 100 (1):
This is your ARSIGDEC #1

Do you use a ROCO MultiMaus or z/Z21 Y/N (N=default):
No Roco address offset

Set default 'ON' flash time in msec. for NEW signals
Enter value from 100 to 2000 (200):
Set default 'OFF' flash time in msec. for NEW signals
Enter value from 100 to 2000 (400):
Default flash timer (on/off) set to 200/400 msec.

Do you want default fading for new signals? (Y/N) [Y]:

Set default fade time for new signals (msec.)
Enter value from 100 to 1000 (300): 600
Fading default ON with default fade time set to 600 msec.

Set default brightness for all signals
Enter value from 5 to 100 (90):
Default brightness set to 90%

Do you use signals with common ANODE or common CATHODE ? A/C: c
Default connection type for NEW signals set to common Cathode

Specify action (D/E/M/N/R/I/S/T/Y/?): i
Specify number for this ARSIGDEC
Enter value from 1 to 100 (1):
This is your ARSIGDEC #1

Do you use a ROCO MultiMaus or z/Z21 Y/N (N=default):
No Roco address offset

Set default 'ON' flash time in msec. for NEW signals
Enter value from 100 to 2000 (200): 400
Set default 'OFF' flash time in msec. for NEW signals
Enter value from 100 to 2000 (400):
Default flash timer (on/off) set to 400/400 msec.

Do you want default fading for new signals? (Y/N) [Y]:

Set default fade time for new signals (msec.)
Enter value from 100 to 1000 (600): 700
Fading default ON with default fade time set to 700 msec.

Set default brightness for all signals
Enter value from 5 to 100 (90):
Default brightness set to 90%

Do you use signals with common ANODE or common CATHODE ? A/C: a
Default connection type for NEW signals set to common Anode

Specify action (D/E/M/N/R/I/S/T/Y/?):
```


T-Command (Test)

Als je alle seinen hebt ingesteld kun je met het T-commando alles testen. Van alle seinen worden alle seinbeelden ongeveer 5 seconden getoond.

Het T-commando kan ook worden ingegeven als sein commando. In dat geval wordt alleen het betreffende sein getest.

Ingave van 'S' beëindigt voortijdig het testen.

```
Specify action (D/E/M/N/R/I/S/T/Y/?): T
Press 'S' to stop testing after current signal/aspect

Signal 1 set to aspect 1: oxx
Signal 1 set to aspect 2: xox
Signal 1 set to aspect 3: xfx
Signal 1 set to aspect 4: xxo
Signal 1 set to aspect 5: xxf
Signal 1 set to aspect 6: fxx
s-----
Specify action (D/E/M/N/R/I/S/T/Y/?): █
```

Y-Command (Yellow)

The Y-command sets the default yellow time for a P-signal. It applies to all P-signals.

The default is 700 ms.

```
Specify action (D/E/I/M/N/O/P/R/S/T/Y/?): Y
Set Yellow time for all P-signals (100=1 sec.)
Enter value from 30 to 250 (70): 80
Yellow time for all P-signals set to 800 msec.
Specify action (D/E/I/M/N/O/P/R/S/T/Y/?): █
```

R-Command (Reset)

The R-command clears all the settings from memory. A confirmation is asked twice.

```
Specify action (D/E/C/F/M/N/O/B/R/I/S/T/Y/?): r
Are you sure you want to clear all values? Y/N (N=default): y
Are you ABSOLUTELY sure? Y/N (N=default): █
```

E-Command (Exit)

With the E-command the operating state will be started. The USB cable is no longer needed.

You can now use your DCC central to control the signals.

Note that the status LED on the Arduino is now off. This will tell you that the Arduino is in the operating state. For each configured DCC address that is received, the LED will give a short pulse.

You can now remove the USB cable and close the control panel.

In the operating state, the decoder will show every activation of a signal image.

This is useful for testing the operating condition.

Normally you don't have the USB cable anymore and you don't see these messages.

Back to Configuration

To return to configuration mode, reconnect the USB cable. Then start the configuration program using the desktop shortcut. This will restart the Arduino as you can see by the 3 times short blinking of the status LED and then stays off. Press the 'C'-key in the configuration program. This will put ARSIGDEC in the configuration state and the status LED will light up continuously again.

IMPORTANT

After each received DCC command, the new signal image is immediately stored in the memory of the ARSIGDEC. When the Arduino is switched on, the stored states are read again and the signals are reset as they were at the time the Arduino was closed.

Signal commands

With the general M-command you can change the settings of an individual signal.

First the number of the signal to change is asked.

The following commands are available now:

?-Command

An overview of the available commands is shown.

B-Command (Base address)

With the B-command you can change the Base address of the signal. The address for the following signal aspects are always subsequent to the base address.

Two different signal aspects are shown with one address

You will receive a warning if it conflicts with the address range of another signal.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: b
Set DCC base-address for signal 1
Enter value from 1 to 2048 (1): 230
Address range set from 230 to 231
```

N-Command (administrative Note)

In your track design you might have numbered the required signals. With the administrative note you can specify this number. It has four alphanumeric characters.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: N
Specify administrative note for this signal (): AUS1
Administrative note set to AUS1
```

A-Command (Aspect)

With the A-command you can change a specific aspect of the selected signal.

The aspects for P-signals can NOT be changed.

If 'flashing' has been added, you will also be asked to set the on/off times.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: a
Which aspect do you want to modify ?
Enter value from 1 to 4: 1
Current aspect: ooxxx
Flashing added for this signal. Set on/off times.
Set 'ON' flash time in msec. for this signal
Enter value from 100 to 2000 (400): 600
Set 'OFF' flash time in msec. for this signal
Enter value from 100 to 2000 (400): 800
Flash timer (on/off) set to 600/800 msec.
```

D-command (Document)

The D command shows an overview of the settings of only the selected signal.

The type indicates which signal from the database has been used...

The value 0 indicates that it is a self-composed signal.

For the pins used, the maximum brightness is shown in brackets.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 2: d
Signal 2, Type: 0, on address 3-4
3 leds on pins: 8(90%) 9(90%) 10(90%)
No admin. note, Flashing: 400/400 msec.
Connection type set to common ANODE
Fading on with fade time of 300 msec.
Aspect 1: oxx, on address 3-R
Aspect 2: xox, on address 3-G
Aspect 3: xxo, on address 4-R
Aspect 4: xfx, on address 4-G
```

C-command (Connection type)

With the C-command you can toggle the connection type of the selected signal between common anode and common cathode.

For more info on connection types see the general C-command.

```
Specify action (B/A/C/O/N/D/T/R/?) for signal 1: C
Connection type of signal 1 set to common CATHODE(-)
```

```
Specify action (B/A/C/O/N/D/T/R/?) for signal 1: c
Connection type of signal 1 set to common ANODE(+)
```

```
Specify action (B/A/C/O/N/D/T/R/?) for signal 1: █
```

T-Command (Test)

The T command can also be entered as a signal command.

You can choose from testing all signal aspects (A) or testing the maximum brightness and fading. (B)

With the **A-command** every signal is displayed for 5 seconds. An aspect with flashing light is displayed for 8 seconds. No yellow transition is shown for P signals.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 2: t
```

```
Test Aspects (A) or Brightness (B) ? a
```

```
Signal 2 set to aspect 1: oxx
```

```
Signal 2 set to aspect 2: xox
```

```
Signal 2 set to aspect 3: xxo
```

```
Signal 2 set to aspect 4: xfx
```

With the **B-command** fading of the signal and brightness of each LED is tested and set interactively.

With 'O' the LED is turned on and off

With 'N' the next LED is tested.

With '+' and '-' the light intensity is adjusted between 5 and 100% in steps of 5%

With 'P' and 'M' the fade time is increased or decreased in steps of 25 ms. Range: 100-800 msec.

So a signal must actually be connected for the B command.

This is in contrast to the 'F' and 'L'-command.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 2: T
```

```
Test Aspects (A) or Brightness (B) ? B
```

```
Press 'O' for toggle on/off or press 'N' for next led
```

```
Press '+' or '-' to change the maximum brightness for current led
```

```
Press P(lus) or M(inus) to change the fade time for current signal
```

```
led 1 on pin 8
```

```
Maximum brightness set to 95%
```

```
Fade time set to 325 msec.
```

```
Maximum brightness set to 90%
```

```
Fade time set to 300 msec.
```

```
led 2 on pin 9
```

R-command (Remove)

With the R-command you can remove a signal from the configuration again.

A signal to be added next will receive the number of the deleted signal (here 2)

The free pins are also used for the new signal first.

```
Specify action (B/A/C/O/I/D/T/R/?) for signal 2: R
```

```
Are you sure you want to remove signal 2 ? Y/N (N=default): y
```

```
Signal 2 has been removed.
```

O-Command (On / Off)

With the O command you can set the flashing times of the selected signal.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: O
```

```
Set 'ON' flash time in msec. for this signal
```

```
Enter value from 100 to 2000 (600): 700
```

```
Set 'OFF' flash time in msec. for this signal
```

```
Enter value from 100 to 2000 (800):
```

```
Flash timer (on/off) set to 700/800 msec.
```

F-Command (Fading)

With the F-command you can set fading of the signal.

Entry of "N" turns off fading.

By entering 'Y' you can switch fading on or change the existing fade time.

The entered time is rounded down to a multiple of 25.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: F
Do you want fading for signal 1 ? Y/N N
No fading for this signal

Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: F
Do you want fading for signal 1 ? Y/N Y

Set fade time in msec.
Enter value from 100 to 600 (300): 400
Fading on, with fade time of 400 msec.
```

L-Commando (Luminosity)

With the L-command the maximum

brightness of each LED can be set separately.

Enter one of the LED numbers of the used signal. The entered percentage is rounded down to a multiple of 5.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: L

Specify led number. <enter>=exit
Enter value from 1 to 5: 1
Specify maximum brightness for led 1 on pin 3
Enter value from 5 to 100 (60): 50
Maximum brightness for led 1 set to 50%

Specify led number. <enter>=exit
Enter value from 1 to 5: 6
Number not valid!
Enter value from 1 to 5: 5
Specify maximum brightness for led 5 on pin 7
Enter value from 5 to 100 (10): 23
Maximum brightness for led 5 set to 20%

Specify led number. <enter>=exit
Enter value from 1 to 5:

Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1: █
```

<enter>-Command

With <enter> you ends the configuration of the selected signal. All changes are stored to memory. (EEPROM).

Arsidec returns now to general command mode.

```
Specify action (L/F/B/A/C/O/N/D/T/R/?) for signal 1:
Signal 1 is changed now.
Specify action (A/D/E/C/F/M/N/O/B/R/S/T/Y/?): █
```

Summary

Default values are set with the general I-command:

Default values are set with the I command:

- Administrative number
- On/Off times for flashing
- Fading
- Maximum brightness
- Connection type (common anode or cathode)

These settings only apply to newly added signals!

Adjustable per signal:

First select a signal with the M command.

B: Basic address

C: Connection type

N: Administrative note

O: On/off times for signal

F: Fade time (no connected signal needed)

L: Maximum light intensity (no connected signal needed)

A: Change aspects

T→A: Show all aspects (requires connected signal)

T→B: Show/set maximum brightness per LED and fading for signal (requires connected signal)

Additional info

Startup

If the Arduino starts up flashes the status led 3 times. This indicates the starting.

The Arsigdec sketch restarts when:

- The Arduino is powered on
- You press the reset button
- Putty restarts when in configuration mode.

There is NO restart when switching between configuration and normal mode.

Logging

The whole configuration dialog is logged in:

My Documents/Arsigdec/ARSIGDEC_<date>_<time>.log;

where date and time are time of closing Putty

Arduino Nano, Mega2560

To upload Mardec to a Nano, use the **Upload** program to Arduino' tool in the Windows start menu.

You cannot use the DCC shield for the Nano either.

To upload Arsigdec to a Mega2560 you also use the tool **Upload** program to Arduino in the Windows start menu.

On the MEGA ports 11 to 16 of the shield are connected to pins 54 to 59 of the MEGA. (=A0-A5)

Arsigdec 4 on a MEGA will drive the pins 54(A0) through 59(A5) as if they were pins 14 through 19.

So you can just use the screw terminals from 14 to 19 as if the shield is on a UNO.

For pins 18 through 59 you just use Dupont cables.

On a MEGA applies:

Ports 1 to 16 are connected to the screw terminals

Ports 18 to 53 are connected to pins 18 to 53.

Ports 54 to 59 are connected to pins 64(=A10) to 69(=A15).

Pin 14, 15, 16 and 17 are NOT used on the MEGA.

They are covered by the DCC-shield.

[DOWNLOAD HERE THE ARSIGDEC SOFTWARE](#)

Poort	UNO pin	MEGA pin
1	3	3
2	4	4
3	5	5
4	6	6
5	7	7
6	8	8
7	9	9
8	10	10
9	11	11
10	12	12
11	A0 (14)	A0 (54)
12	A1 (15)	A1 (55)
13	A2 (16)	A2 (56)
14	A3 (17)	A3 (57)
15	A4 (18)	A4 (58)
16	A5 (19)	A5 (59)
17 (nu)	nu	nu
18 t/m 53		18 t/m 53
54		A10(64)
55		A11(65)
56		A12(66)
57		A13(67)
58		A14(68)
59		A15(69)

Nummer

Nederland

1

P-sein met cijferbak						
kleur / led						
seinbeeld	rood	geel	groen	cijfer		
	1	2	3	4	adres	
rood	1	O	X	X	X	1-R
groen	2	X	X	O	X	1-G
geel	3	X	O	X	X	2-R
geel-cijfer	4	X	O	X	O	2-G

2

P-sein zonder cijferbak					
kleur / led					
		rood	geel	groen	
seinbeeld		1	2	3	adres
rood	1	O	X	X	1-R
groen	2	X	X	O	1-G
geel	3	X	O	X	2-R

3

Hoofdsein met cijferbak						
kleur / led						
		rood	geel	groen	cijfer	
	seinbeeld	1	2	3	4	adres
	rood	1	O	X	X	1-R
	geel	2	X	O	X	1-G
	geel knipperen	3	X	F	X	2-R
	geel+cijfer	4	X	O	X	2-G
	geel+cijfer knipperen	5	X	O	X	3-R
	groen	6	X	X	O	3-G
	groen knipperen	7	X	X	F	4-R
	groen knipperen+cijfer	8	X	X	F	4-G

4

Hoofdsein zonder cijferbak

		kleur / led				
		rood	geel	groen		
seinbeeld		1	2	3	adres	
	rood	1	O	X	X	1-R
	geel	2	X	O	X	1-G
	geel knipperen	3	X	F	X	2-R
	groen	4	X	X	O	2-G
	groen knipperen	5	X	X	F	3-R
	rood knipperen	6	F	X	X	3-G

5

Dwergsein/Verkeerslicht

		kleur / led				
		rood	geel	groen		
seinbeeld		1	2	3	adres	
	rood	1	O	X	X	1-R
	geel	2	X	O	X	1-G
	geel knipperen	3	X	F	X	2-R
	groen	4	X	X	O	2-G

6	Voorsein					adres
	kleur / led					
		geel	groen	cijfer		
	seinbeeld	1	2	3		
	groen	1	X	O	X	1-R
	geel	2	O	X	X	1-G
	geel+cijfer	3	O	X	O	2-R

Deutschland

7

Blocksignal				
farbe / led				
Signalbild	rot	grün		
	1	2	adres	
rot	1	O	X	1-R
grün	2	X	O	1-G

8	Einfahrtssignal				
	farbe / led				
	Signalbild	rot 1	gelb 2	grün 3	adres
	rot 1	O	X	X	
gelb+grün 2	X	O	O	1-R	
grün 3	X	X	O	1-G	
				2-R	

9	Ausfahrtsignal							
				farbe / led				
			rot1	rot2	gelb	grün	weiss	
	Signalbild	1	2	3	4	5	adres	
	rot1+rot2	1	O	O	X	X	X	1-R
	gelb+grün	2	X	X	O	O	X	1-G
	grün	3	X	X	X	O	X	2-R
	rot1+weiss	4	O	X	X	X	O	2-G

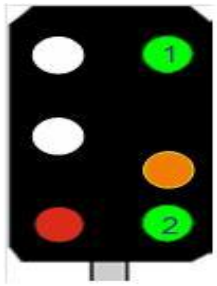
10	Vorsignal						
			farbe / led				
		gelb1	gelb2	grün1	grün2		
	Signalbild	1	2	3	4	adres	
	gelb1+gelb2	1	O	O	X	X	1-R
	gelb2+grün1	2	X	O	O	X	1-G
	grün2+grün2	3	X	X	O	O	2-R
	alles aus	4	X	X	X	X	2-G

11	Rangiersignal				
	farbe / led				
			rot	weiss	
	Signalbild		1	2	adres
	rot	1	O	X	1-R
	weiss	2	X	O	1-G

Österreich

12

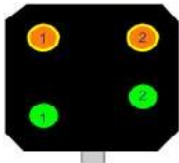
Hauptsignal



aspect		farbe / led					adres
		rood 1	groen 1 2	groen 2 3	geel 4	wit 1/2 5	
halt/fahrverbot	1	O	X	X	X	X	1-R
frei	2	X	O	X	X	X	1-G
frei 60 km	3	X	O	O	X	X	2-R
frei 40 km	4	X	O	X	O	X	2-G
ende fahrverbot	5	X	X	X	X	O	3-R

13

Vorsignal



aspect		farbe / led				adres
		groen 1 1	groen 2 2	geel 1 3	geel 2 4	
vorsicht	1	X	X	O	O	1-R
frei	2	O	O	X	X	1-G
frei 60 km	3	O	O	O	X	2-R
frei 40 km	4	O	X	O	O	2-G

14

Not used

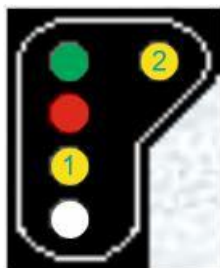
15

Not used

België

16

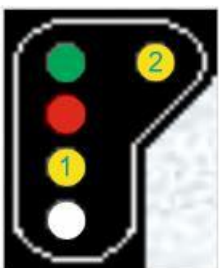
Hoofdsein normaal spoor



seinbeeld	kleur / led					adres
	rood	wit	geel 1	geel 2	groen	
1	2	3	4	5		
rood	1	O	X	X	X	1-R
rood/wit	2	O	X	X	X	1-G
dubbel geel	3	X	X	O	O	2-R
groen/geel1 vert.	4	X	X	O	X	2-G
groen	5	X	X	X	O	3-R
groen/geel2 hor.	6	X	X	X	O	3-G

17

Hoofdsein tegen spoor



seinbeeld	kleur / led					adres
	rood	wit	geel 1	geel 2	groen	
1	2	3	4	5		
rood	1	F	X	X	X	1-R
rood/wit	2	F	X	X	X	1-G
dubbel geel	3	X	X	F	X	2-R
groen/geel1 vert.	4	X	X	F	F	2-G
groen	5	X	X	X	F	3-R
groen/geel2 hor.	6	X	X	X	F	3-G

18

Stopsein normaal



seinbeeld	kleur / led			adres
	rood	wit	groen	
1	2	3		
rood	1	O	X	1-R
rood/wit	2	O	X	1-G
groen	3	X	O	2-R

19

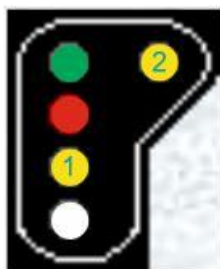
Stopsein tegen



seinbeeld	kleur / led			adres
	rood	wit	groen	
1	2	3		
rood	1	F	X	1-R
rood/wit	2	F	X	1-G
groen	3	X	F	2-R

20

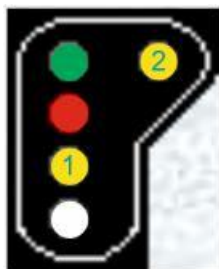
Hoofdsein + Cijfer normaal spoor



seinbeeld	kleur / led						adres
	rood	wit	geel 1	geel 2	groen	cijfer	
1	2	3	4	5	6		
rood	1	O	X	X	X	X	1-R
rood/wit	2	O	X	X	X	X	1-G
dubbel geel	3	X	X	O	O	X	2-R
groen/geel1 vert.	4	X	X	O	X	X	2-G
groen	5	X	X	X	O	X	3-R
groen/geel2 hor.	6	X	X	X	O	X	3-G
dubbel geel+cijfer	7	X	X	O	O	O	4-R
groen+cijfer	8	X	X	X	O	O	4-G
groen/geel2/cijfer	9	X	X	X	O	O	5-R
groen/geel1/cijfer	10	X	X	O	X	O	5-G

21

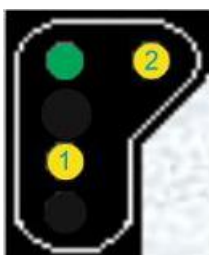
Hoofdsein + Cijfer tegen spoor



	seinbeeld	kleur / led					cijfer	adres
		rood	wit	geel 1	geel 2	groen		
		1	2	3	4	5	6	
rood	1	F	X	X	X	X	X	1-R
rood/wit	2	F	F	X	X	X	X	1-G
dubbel geel	3	X	X	F	F	X	X	2-R
groen/geel1 vert.	4	X	X	F	X	F	X	2-G
groen	5	X	X	X	X	F	X	3-R
groen/geel2 hor.	6	X	X	X	F	F	X	3-G
dubbel geel+cijfer	7	X	X	F	F	X	F	4-R
groen+cijfer	8	X	X	X	X	F	F	4-G
groen/geel2/cijfer	9	X	X	X	F	F	F	5-R
groen/geel1/cijfer	10	X	X	F	X	F	F	5-G

22

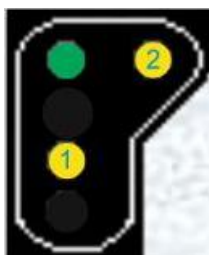
Verwittigungssein+cijfer normaal



	seinbeeld	kleur / led				cijfer	adres
		groen	geel1	geel2			
		1	2	3	4		
dubbel geel	1	X	O	O	X		1-R
groen	2	O	X	X	X		1-G
groen/geel2	3	O	X	O	X		2-R
groen/geel1	4	O	O	X	X		2-G
groen/geel2/cijfer	5	O	X	O	O		3-R
groen/geel1/cijfer	6	O	O	X	O		3-G

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Verwittigungssein+cijfer tegenspoor



	seinbeeld	kleur / led				cijfer	adres
		groen	geel1	geel2			
		1	2	3	4		
dubbel geel	1	X	F	F	X		1-R
groen	2	F	X	X	X		1-G
groen/geel2	3	F	X	F	X		2-R
groen/geel1	4	F	F	X	X		2-G
groen/geel2/cijfer	5	F	X	F	F		3-R
groen/geel1/cijfer	6	F	F	X	F		3-G

24

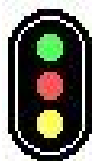
België Cijfer en keper

	seinbeeld	kleur / led	
		cijfer	keper
		1	2
uit	1	X	X
cijfer	2	O	X
cijfer+keper	3	O	O
keper	4	X	O

Dit sein kan worden gecombineerd met één van de seinen 16 t/m 19

25

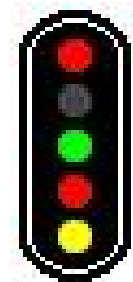
Cible-A



	aspect	couleur / led			adres
		Jaune	Rouge	Vert	
Voie libre	1	X	X	O	1-R
Avertissement	2	O	X	X	1-G
Sémaphore	3	X	O	X	2-R
vert clignotant	4	X	X	F	2-G
rouge clignotant	5	X	F	X	3-R
jaune clignotant	6	F	X	X	3-G

26

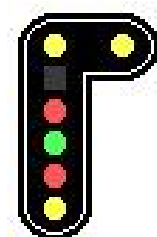
Cible-B



	aspect	couleur / led				adres
		Jaune	Rouge 1	Vert	Rouge 2	
Voie libre	1	X	X	O	X	1-R
Avertissement	2	O	X	X	X	1-G
Sémaphore	3	X	O	X	X	2-R
Carré	4	X	O	X	O	2-G
vert clignotant	5	X	X	F	X	3-R
jaune clignotant	6	F	X	X	X	3-G
rouge clignotant	7	X	F	X	X	4-R

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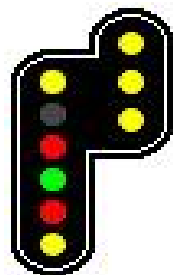
Cible-E




	aspect	couleur / led						adres
		Jaune	Rouge 1	Vert	Rouge 2	2 Jaunes H		
Voie libre	1	X	X	O	X	X		1-R
Avertissement	2	O	X	X	X	X		1-G
Sémaphore	3	X	O	X	X	X		2-R
Carré	4	X	O	X	O	X		2-G
Ralentissement 30	5	X	X	X	X	O		3-R
Ralentissement 30 + avertissement	6	O	X	X	X	O		3-G
Ralentissement 60	7	X	X	X	X	F		4-R
Ralentissement 60 + avertissement	8	O	X	X	X	F		4-G
vert clignotant	9	X	X	F	X	X		5-R
rouge clignotant	10	X	F	X	X	X		5-G

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Cible-G





		couleur / led							
		Jaune	Rouge 1	Vert	Rouge 2	2 Jaunes H	2 Jaunes V		
		aspect	1	2	3	4	5	6	adres
	Voie libre	1	X	X	O	X	X	X	1-R
	Avertissement	2	O	X	X	X	X	X	1-G
	Sémaphore	3	X	O	X	X	X	X	2-R
	Carré	4	X	O	X	O	X	X	2-G
	Ralentissement 30	5	X	X	X	X	O	X	3-R
	Rappel ralentissement 30	6	X	X	X	X	X	O	3-G
	Ralentissement 60	7	X	X	X	X	F	X	4-R
	Rappel ralentissement 60	8	X	X	X	X	X	F	4-G
	vert clignotant	9	X	X	F	X	X	X	5-R
	rouge clignotant	10	X	F	X	X	X	X	5-G

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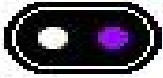
Disque



	aspect	couleur / led					adres
		Jaune 1	Rouge	Vert	Jaune 4	Jaunes 5	
Voie libre	1	X	X	O	X	X	1-R
Avertissement	2	O	X	X	X	X	1-G
Préannonce	3	F	X	X	X	X	2-R
Disque	4	X	O	X	O	X	2-G
Ralentissement 30	5	X	X	X	X	O	3-R
Ralentissement 60	6	X	X	X	X	F	3-G
Ralentissement 60 + Préannonce	7	O	X	X	X	O	4-R

30

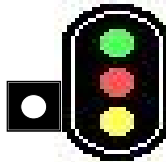
Cible-I



	aspect	blanc	violet	adres
		1	2	
manœuvre	1	O	X	1-R
carré violet	3	X	O	1-G
manœuvre réduite	2	F	X	2-R

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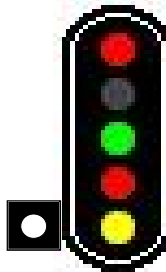
Cible-A avec oeilleton



	aspect	couleur / led				adres
		Jaune	Rouge	Vert	oeil.	
Voie libre	1	X	X	O	O	1-R
Avertissement	2	O	X	X	O	1-G
Sémaphore	3	X	O	X	O	2-R
vert clignotant	4	X	X	F	O	2-G
jaune clignotant	6	F	X	X	O	3-R
rouge clignotant	5	X	F	X	O	3-G

32

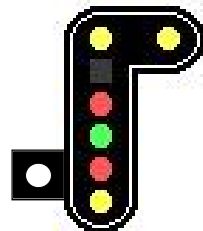
Cible-B avec oeilleton



	aspect	couleur / led					adres
		Jaune	Rouge 1	Vert	Rouge 2	oeil.	
Voie libre	1	X	X	O	X	O	1-R
Avertissement	2	O	X	X	X	O	1-G
Sémaphore	3	X	O	X	X	O	2-R
Carré	4	X	O	X	O	X	2-G
vert clignotant	5	X	X	F	X	O	3-R
jaune clignotant	6	F	X	X	X	O	3-G
rouge clignotant	7	X	F	X	X	O	4-R

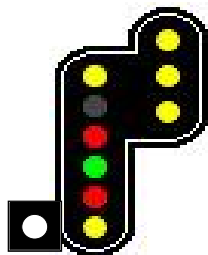
33


Cible-E avec oeilleton



	aspect	couleur / led						adres
		Jaune	Rouge 1	Vert	Rouge 2	2 Jaunes H	oeil.	
Voie libre	1	X	X	O	X	X	O	1-R
Avertissement	2	O	X	X	X	X	O	1-G
Sémaphore	3	X	O	X	X	X	O	2-R
Carré	4	X	O	X	O	X	X	2-G
Ralentissement 30	5	X	X	X	X	O	O	3-R
Ralentissement 30 + avertissement	6	O	X	X	X	O	O	3-G
Ralentissement 60	7	X	X	X	X	F	O	4-R
Ralentissement 60 + avertissement	8	O	X	X	X	F	O	4-G
vert clignotant	9	X	X	F	X	X	O	5-R
rouge clignotant	10	X	F	X	X	X	O	5-G

34 Cible-G avec oeilleton



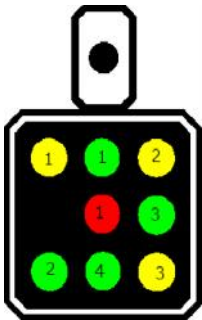


		couleur / led							
		Jaune	Rouge 1	Vert	Rouge 2	2 Jaunes H	2 Jaunes V	oeil.	
	aspect	1	2	3	4	5	6	7	adres
Voie libre	1	X	X	O	X	X	X	O	1-R
Avertissement	2	O	X	X	X	X	X	O	1-G
Sémaphore	3	X	O	X	X	X	X	O	2-R
Carré	4	X	O	X	O	X	X	X	2-G
Ralentissement 30	5	X	X	X	X	O	X	O	3-R
Rappel ralentissement 30	6	X	X	X	X	X	O	O	3-G
Ralentissement 60	7	X	X	X	X	F	X	O	4-R
Rappel ralentissement 60	8	X	X	X	X	X	F	O	4-G
vert clignotant	9	X	X	F	X	X	X	O	5-R
rouge clignotant	10	X	F	X	X	X	X	O	5-G

Switzerland

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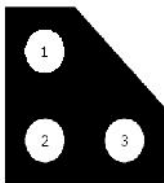
Combined SBB L Signal



		farbe/led								adres
aspect		1 red 1	2 green 1	3 green 2	4 green 3	5 green 4	6 yellow 1	7 yellow 2	8 yellow 3	
Hauptsignal stop	1	O	X	X	X	X	X	X	X	1-R
Hauptsignal go	2	X	O	X	X	X	X	X	X	1-G
Vorsignal 60 km	3	X	O	X	X	O	X	X	X	2-R
Vorsignal stop	4	X	X	X	X	X	O	O	X	2-G
Vorsignal go	5	X	X	O	O	X	X	X	X	3-R
Vorsignal 40 km	6	X	X	X	O	X	O	X	X	3-G
Vorsignal 60 km	7	X	X	O	O	X	O	X	X	4-R
Vorsignal 90 km	8	X	X	O	O	X	X	X	O	4-G

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Shunting Dwarf Signal



		farbe/led			adres
aspect		white 1 1	white 2 2	white 3 3	
Halt	1	X	O	O	1-R
Fahrt	2	O	O	X	1-G
Fahrt mit Vorsicht	2	O	X	O	2-R

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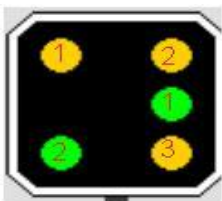
Main SBB N signal



		farbe / led				adres
aspect		red 1 1	green 1 2	yellow 1 3	number 4	
Hauptsignal STOP	1	O	X	X	X	1-R
Hauptsignal go	2	X	O	X	X	1-G
Hauptsignal 80 km	3	X	O	X	O	2-R
Vorsignal STOP	4	X	X	O	X	2-G
Vorsignal 80 km	5	X	X	O	O	3-R

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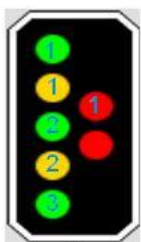
Vorsignal



		farbe/led					adres
aspect		groen 1 1	groen 2 2	geel 1 3	geel 2 4	geel 3 5	
stop	1	X	X	O	O	X	1-R
vrij	2	O	O	X	X	X	1-G
40 km	3	O	X	O	X	X	2-R
60 km	4	O	O	O	X	X	2-G
90 km	5	O	O	X	X	O	3-R

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Hauptsignal



		farbe/led						adres
aspect		rood 1	groen 1 2	groen 2 3	groen 3 4	geel 1 5	geel 2 6	
stop	1	O	X	X	X	X	X	1-R
vrij	2	X	O	X	X	X	X	1-G
40 km	3	X	O	X	X	X	O	2-R
60 km	4	X	O	O	X	X	X	2-G
90 km	5	X	O	O	O	X	X	3-R
40 km	6	X	X	X	X	O	O	3-G

Spain

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Maneuvers

color / led

white red

	aspect	1	2	address
Movement authorized	1	O	X	1-R
Stop	2	X	O	1-G
Authorized override	3	O	O	2-R
Pass authorized	4	F	O	2-G
Off	5	X	X	3-R

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General 1

color / led

green red yellow

	aspect	1	2	3	address
Via Free	1	O	X	X	1-R
Stop	2	X	O	X	1-G
Stop announcement	3	X	X	O	2-R
Caution announcement	4	O	X	O	2-G
Conditional	5	F	X	X	3-R
Immediate stop	6	X	X	F	3-G

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Stations

color / led

green red yellow white

	aspect	1	2	3	4	address
Via Free	1	O	X	X	X	1-R
Stop	2	X	O	X	X	1-G
Stop announcement	3	X	X	O	X	2-R
Caution announcement	4	O	X	O	X	2-G
Conditional	5	F	X	X	X	3-R
Immediate stop	6	X	X	F	X	3-G
Movement authorized	7	X	X	X	O	4-R
Authorized override	8	X	O	X	O	4-G
Pass authorized	9	X	O	X	F	5-R

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General 2

color / led

green red yellow blue

	aspect	1	2	3	4	address
Via Free	1	O	X	X	X	1-R
Stop	2	X	O	X	X	1-G
Stop announcement	3	X	X	O	X	2-R
Caution announcement	4	O	X	O	X	2-G
Conditional	5	F	X	X	X	3-R
Immediate stop	6	X	X	F	X	3-G
Selective stop	7	X	O	X	O	4-R
Conditional Selective stop	8	X	O	X	F	4-G

United Kingdom

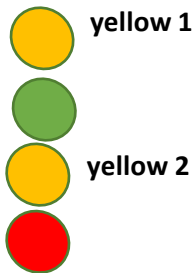
44



3 aspects normal sequence
color / led

		green	yellow	red	
	aspect	1	2	3	address
Proceed	1	O	X	X	1-R
Caution	2	X	O	X	1-G
Danger - Stop	3	X	X	O	2-R

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4 aspects normal sequence
color / led

		yellow 1	green	yellow 2	red	
	aspect	1	2	3	4	address
Proceed	1	X	O	X	X	1-R
Preliminary Caution	2	O	X	O	X	1-G
Caution	3	X	X	O	X	2-R
Danger - Stop	4	X	X	X	O	2-G

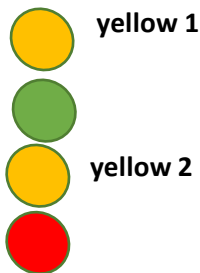
46



3 aspects flashing yellow
color / led

		green	yellow	red	
	aspect	1	2	3	address
Proceed	1	O	X	X	1-R
Caution	2	X	F	X	1-G
Danger - Stop	3	X	X	O	2-R

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4 aspects flashing yellow
color / led

		yellow 1	green	yellow 2	red	
	aspect	1	2	3	4	address
Proceed	1	X	O	X	X	1-R
Preliminary Caution	2	F	X	F	X	1-G
Caution	3	X	X	F	X	2-R
Danger - Stop	4	X	X	X	O	2-G