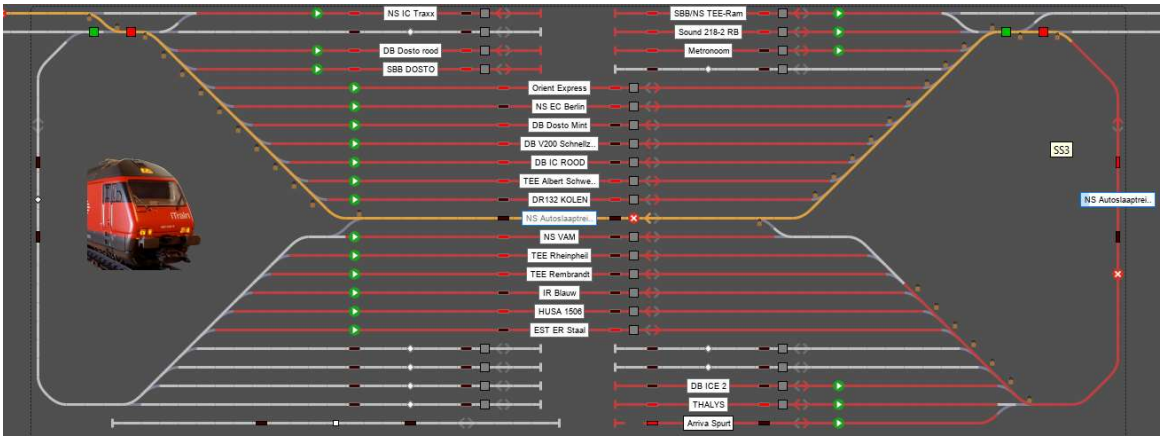
DTS Tutorial:

Relay controlled block

For Dinamo in combination with iTrain



Dinamo is a product from VPEB

iTrain is a product from Berros

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Introduction

Domburg Train Support has been contributing to the development of iTrain for years by carrying out test work and by thinking about new functionalities of the operating software. For example, we have been at the cradle of several solutions that have been incorporated into the software by Berros. One of those functionalities is the relay-controlled blocks for the users of the Dinamo operating system. Thanks to this solution, iTrain has a serious cost-saving feature for Dinamo users. The idea was simple, a shadow station has many set-up tracks where a user would have to provide each track with a block output. This is a pricey issue when you consider that trains are stationary there and do not have to perform functions. By cleverly dealing with relays within iTrain, the program makes it possible to control as many set-up tracks as you want with just a single block output.

We have tested this to the maximum possible, and the operation has proved stable and well applicable. The image used in the title page is an image of our own shadow complex which we use to test iTrain and Dinamo. On the image you can see 31 relay-driven set-up tracks which we control with only 6 block outputs.

In this Tutorial we will talk about the operation of relay-controlled block outputs, how they can be applied physically and how to enter these into iTrain. If you have any questions or comments, you can post them by sending an email to info@domburgtrainsupport.nl

Best regards,

Martin Domburg

The principle of relay-controlled blocks

For the connoisseur of electronics, the principle of a relay is not that hard to fathom. But most of us experience electronics as a challenge. In the following chapter we explain how a relay works and what an alternating circuit is.

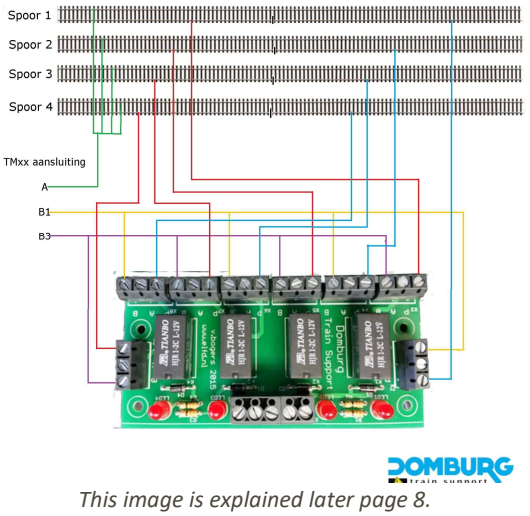
The whole idea of the application is that instead of providing each set-up track with a block output from your Dinamo system, you connect each set-up track to its own relay. This relay may or may not transmit the occupancy detectors of a block output to that set-up track depending on the position of the relay. A relay is nothing else than an on / off switch in this application. The relay switches one of the tracks without current, which means that the present train no longer receives any voltage.

Because we have iTrain arrange this, it can ensure that there is never again as 1 staging track supplied with voltage, and that the other tracks are blocked in the position that they are without voltage. This prevents two tracks from being supplied with voltage at the same time, this could mean that an analogue locomotive would get a digital voltage.

iTrain is so smart in this that it remembers which train has run into that set-up track and after switching off the relay it remembers which occupancy detectors are occupied on that track. If you switch on the next set-up track, he will see which detectors are or are not occupied on that other track. This is because we always switch off the occupancy detectors (B) and not the continuous (A) bar. The relays that are used most often have two changeover contacts, so that you can switch two occupancy detectors per relay. That is why we use two detectors per block as standard for these tracks. More is possible, but that costs you more relays and it is of little or no use to iTrain.

Physical circuit in a nutshell

All continuous rails (A) of the positioning tracks are looped through and connected to the A output of the block on the TM-H or TM44. We take two random occupancy detectors from the block card (to remain compatible with Dinamo Classic we take B1 and B3) and we bring them to the relay where we divide one occupancy detector overall NO contacts (Normally open) of the first changeover contact of all relay, and the second detector across all NO contacts of the second changeover contact of each relay.



This image is explained later page 8.

From the COM of every first changeover contact we feed the first detector of each set-up track, from the second COM of every second changeover contact we feed the second detector of each set-up track. Make sure that the first COM and the second COM of the relay are also wired to the same set-up track. Because that relay physically switches off the line-up track.

In this tutorial we use our own relay module HPP4, here you have 4 relays available with 2 changeover contacts each. We have indicated the connections more simply: COM is represented as P; NC is represented as A and NO is represented as B. More on this later. The image on the right is later displayed in large format. In a later chapter these terms are also explained in understandable language.

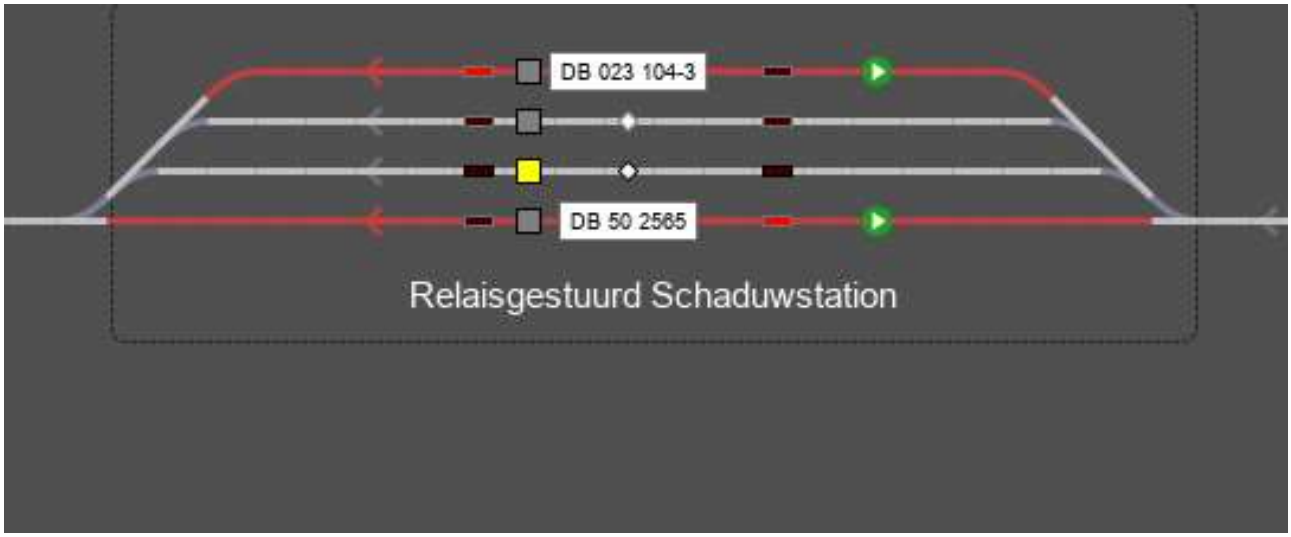
Software in a nutshell

In iTrain you simply draw the number of blocks you want, and each block will have its own relay as an addition.

Each part has its own unique name, whereby all relays are given a unique address because they are also controlled as unique parts. In this case, the blocks are addressed differently, all blocks have the same block address, all first detectors have the same detector address and all second detectors have the same detector address.

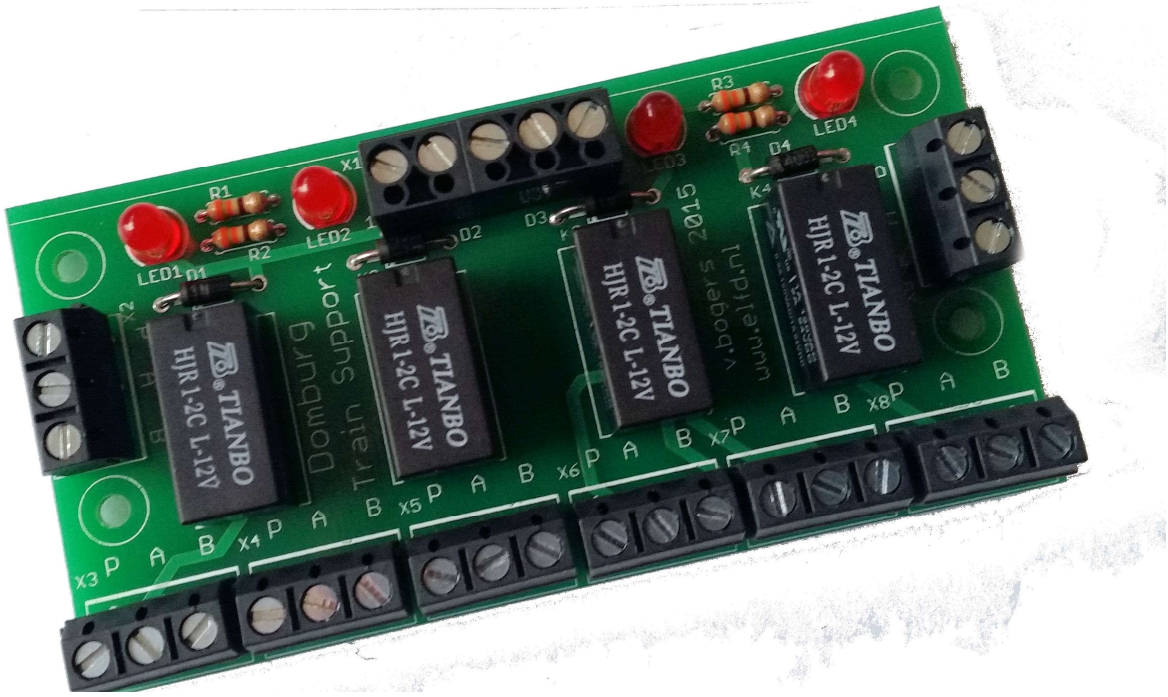
iTrain understands at that moment that these blocks with relays belong to the same grouping and will then see this as a group of relay-controlled blocks. At that moment, only one train movement can be carried out in a group at a time.

And with that we immediately mentioned the disadvantage in addition to the cost-saving benefit, there is a limitation of movements per group. Only when a track is ready for its movement is it released, and another track can be activated. You can solve this by dividing a shadow station into several groups, as I did with my shadow complex. These are 6 groups so that 6 movements can be made at the same time. In fact, there are only 4 movements at a maximum possible due to the limitations of the layout of the shadow complex.



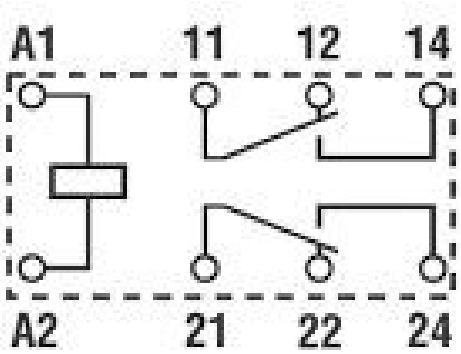
How does a relay work?

We are happy to explain this with our own HPP4 relay board. This is because it is also used in the examples and is most often used as a print for the solution. You can read the entire manual of the HPP4 on our website www.domburgtrainsupport.nl



The HPP4 relay board has a simple but effective operation. The base revolves around the 4 relays. Each relay is equipped with 2 changeover contacts which switch as soon as the relay is energized.

As shown on the right, the relay consists of a coil with two alternating contacts. You will see the coil between contacts A1 and A2, the positive voltage (V +) and the negative voltage (V-), respectively. The contacts 11, 12 and 14 form one changeover contact and the contacts 21, 22 and 24 the other.



As soon as the relay is in “rest”, contacts 11 and 12 are closed as shown. This also applies to contacts 21 and 22. As soon as the relay is energized, the coil attracts a magnet inside, and the oblique leg is pulled from 12 to 14. The same goes for 22 and 24. A connection will then be created between 11 and 14 and between 21 and 24

In these manuals we will use some terms which I will try to clarify with this image with the changeover contact with the numbers 11, 12 and 14

COM

Common or "P" on the relay board. The “P” stands for point piece, we chose this because point piece can be used in several ways in the model track. In the image above the COM is positioned at 11. In the application of this tutorial we connect the section of the set-up track to it.

The COM stands for the common. That means that this pin never changed.

Normally Closed (NC)

Normally Closed is translated "normally closed" in Dutch. This means that this relay is in contact with the COM (pin 11). The NC pin is 12 on the contact.

On the PCB, each NC is indicated with "A" on the 3-fold screw terminals, each relay has two 3-fold screw terminals. In the application that we are going to use here, the NC remains empty, because we want to have the track switched off when the relay is in rest position.

Normally Open (NO)

Normally Open is translated "normally open" in Dutch. This means that this relay is not in contact with the COM (pin 11). Only when the relay is energized does the contact switch from the COM to the NO. The NO pin on the contact is 14.

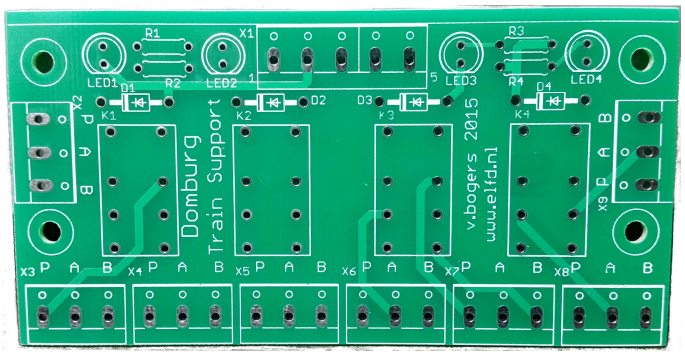
On the printed circuit board, every NO is marked with "B" on the 3-fold screw terminals, each relay has two 3-fold screw terminals.

In our application we connect the detectors coming from the block output to this. The reason that we connect this to this and not to the COM is because if we did, the voltage would be transferred to NC. The chance that you accidentally connect the wire to the section on NC is present, then you get strange notifications because one section would be on and the other off. With this method, the circuit works either or not. That makes it a lot easier.

Note:

The coil of the relay is an ohmic resistor. When this is energized, it induces an induction voltage. This can damage the OC32 drivers. They are therefore protected against induction by an extinguishing diode 1N4001.

If we look at the layout of the HPP4 you can use the following connections per relay:



K1 has the screw terminals X2 and X3
K2 has the screw terminals X4 and X5
K3 has the screw terminals X6 and X7
K4 has the screw terminals X8 and X9

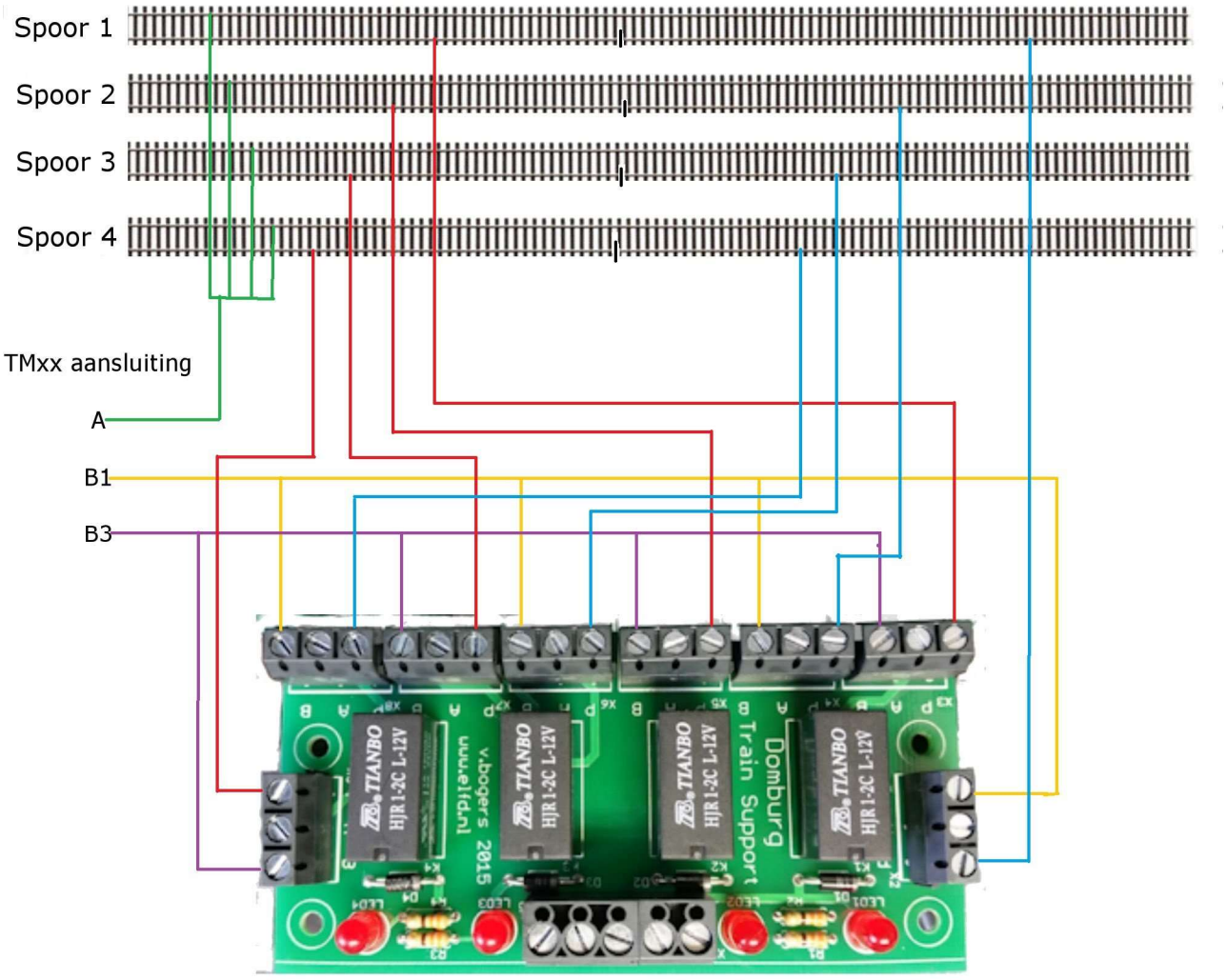
K is the name of the relay and X the terminals to which you connect the wires.

You will see the names on the printed circuit board.

How do I connect the blocks to the relay

It is not difficult, but very logical. You only need to understand the logic of wiring, and that can be tricky. We are aware of this, if you cannot find a solution despite this tutorial, please contact us. We are happy to help you with this.

As written in the beginning, all continuous A bars are connected to each other and connected to the A-terminals of the block output. We choose two occupancy detectors of a block output which we distribute over the relay. To keep it simple, in this tutorial we will make a shadow station of 4 set-up tracks which will be switched with 4 relays. In principle you can expand this yourself to the number that you want to use yourself. In the diagram below we have recorded the wiring for you with colours.



Apply the wiring physically

If you follow the colours exactly as indicated, then you are in the right place. People often only understand how it works when they experience the operation of a circuit after they have wired and connected it themselves. But there are a few steps in the process:

1. Solder a wire (in the diagram green) to each A-bar of each set-up track
2. Bring these together and connect all wires together, this can be done with a terminal block *, a solder pad or a Wago weld clamp
3. From this welding point, bring a wire to the output A of the block output on the TM44 or TM-H.

4. Solder a wire to all left B-sections of each set-up track (red in the diagram)
5. Take a 3-pole change-over contact from each relay, divide the four left-hand sections over the 4 selected change-over contacts, connect them to each P. On the schedule they go to X3, X5 and X7 and X9. Corresponding to the diagram, X3 belongs to relay 1, X5 to relay 2, X7 to relay 4 and X9 to relay 4
6. Now take a busy detector from the block output (which of the four does not matter, the blue line on the diagram) and divide it over the B connections of X3, X5, X7 and X9. You can loop it through on the terminal, making a distribution point is also allowed.

We will repeat the same as points 4, 5 and 6:

7. Solder a wire to all right B-sections of each set-up track (on the diagram blue)
8. Take a 3-pole change-over contact from each relay, divide the four right-hand sections over the 4 selected change-over contacts, connect them to each P. On the schedule they go to X2, X4 and X6 and X8. Corresponding to the diagram, X2 belongs to relay 1, X4 to relay 2, X6 to relay 4 and X8 to relay 4
9. Now take a busy detector from the block output (which of the four does not matter, the yellow line on the diagram) and divide this over the B connections of X2, X4, X6 and X8. You can loop it through on the terminal, making a distribution point is also allowed.

* Only use cores with vein protection, otherwise there is a high risk of vein rupture

> ATTENTION: It is important that the left and right section are connected to the same relay, this is important so that the relay with its two changeover contacts can de-energize both sections of the same set-up track. Would you not do that (Section left, and section right are on different relays) Then only half of the line-up track is switched off or switched on. With all strange malfunctions as a result.
>
> the sets are:
> Relay 1: X2 and X3
> Relay 2: X4 and X5
> Relay 3: X6 and X7
> Relay 4: X8 and X9

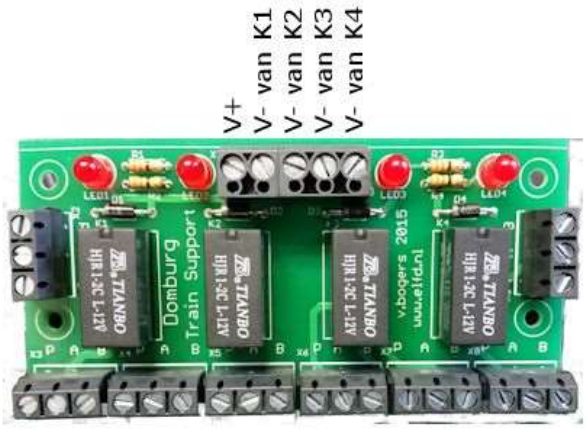
The diagram also shows that a separation has also been drawn between the two detectors of each set-up track. In addition to being logical, this is of course also important for a reporter to function. Nevertheless, for Dinamo on both sides of the block you still must separate both rails to isolate the entire block from the rest.

How to connect the relay to the OC32

It is important that iTrain can later control the relay individually. That is not a difficult job, in fact it is simple. The step-by-step plan below explains the step by step:

Connecting the HPP4 tot the OC32

You can connect the print according to the following example:



V +: Connect this directly to the V + your power source

V- from K1: You can connect this to a pin Q of the OC32

V- of K2: You can connect this to a pin Q of the OC32

V- of K3: You can connect this to a pin Q of the OC32

V- of K4: You can connect this to a pin Q of the OC32

The banks of the pins on the OC32 to which you connect the relay must have a SINK driver. But you can find more about this in the OC32 manual at www.vpeb.nl

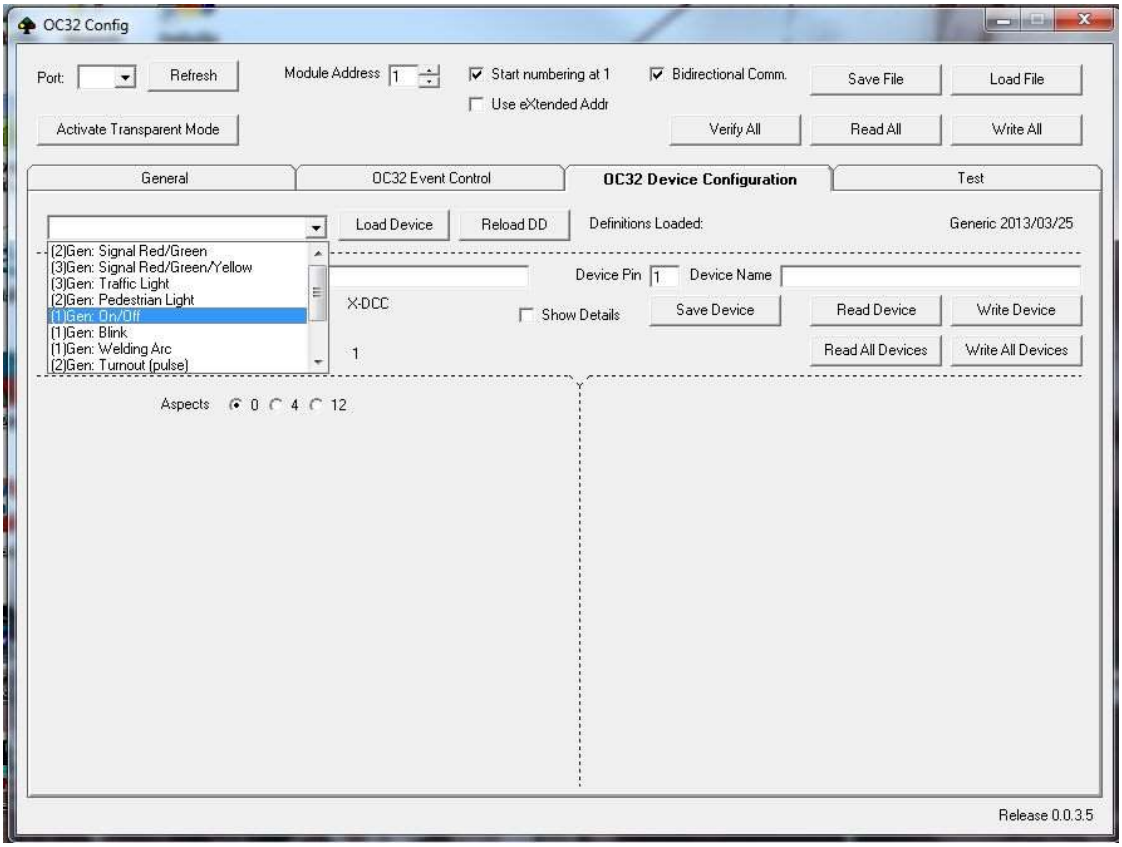
Programming the relay on the OC32

After connecting you still must tell the OC32 that a relay is connected to pin output Q. This way, the OC32 can also control the relay.

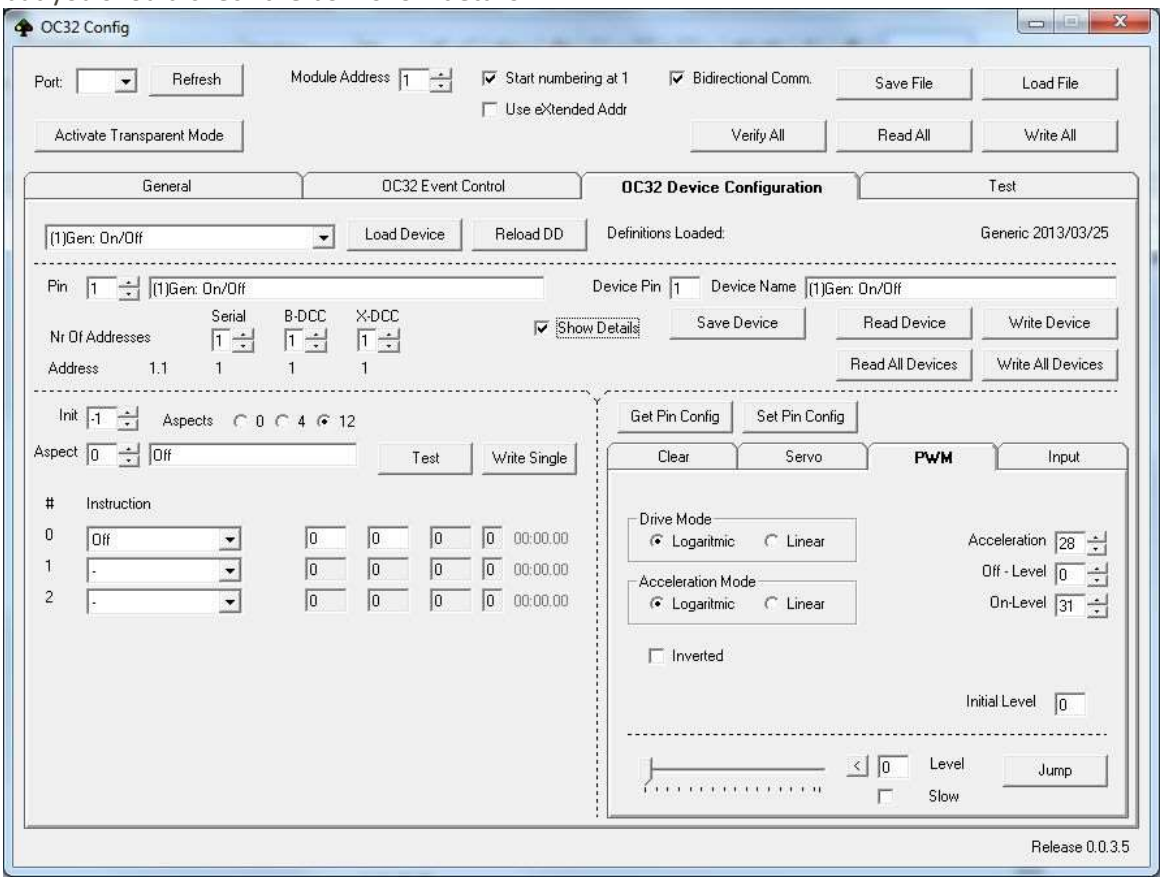
First you open OCConfig, we assume that the OC General tab according to the OC32 manual is already set. If not, do so first before continuing here. The "hardware configuration" is very important. If that is done, then you go to the relevant pin. For the sake of convenience, we call the relevant pin 1.

Small note:

We will here simply set up the OCConfig, if you understand the basics of using this program. If you don't, try the steps below. If you cannot find a solution, please contact us, we can assist you remotely.



As Device Definition, select the Generic file. If device definition loads from the selection list at the relevant pin the (1) GEN; On / Off. After selecting, click on Load Device and you will see the screen below, but you should check the box "show details":



Then click on the “Write Device” button. The orange LED lights up on the OC if the OCConfig needs to write your settings.

Once this is done, test the relay with the "Test" button next to the "aspect" box. If everything went correctly, the relay is switched off at aspect 0 and switched on at aspect 1.

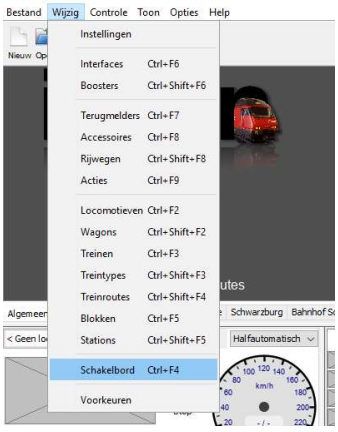
Above the box aspect you will see address 1.1, this depends on which address the OC has and which pin you have used. You use that address to assign the relay element on the switchboard in iTrain.

You repeat this at all 4 relays and note the addresses so that you can use them later in the iTrain configuration.

Drawing the relay-controlled blocks in iTrain

We now come to the part where we will use the application within the iTrain software. Screenshots of the beta version of iTrain 5.0 have been used in this tutorial. It may therefore differ in view from what you see in your screen. That's okay, this feature has been present since version 3.1 of the software.

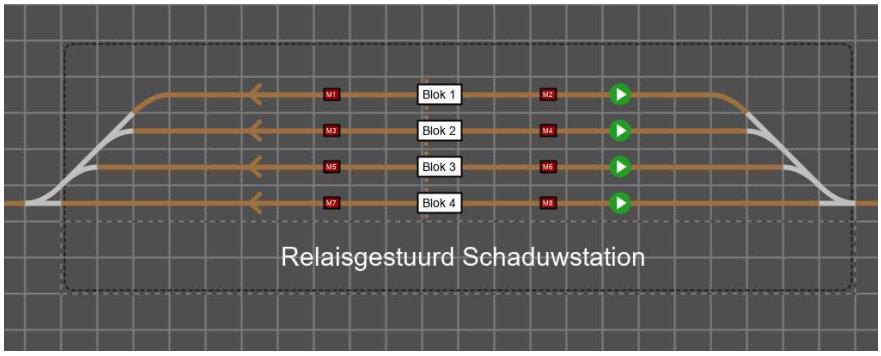
We assume that you master the basics of iTrain, if this is not the case, you can follow a basic workshop with us. In the event of problems, please contact us so that we can assist you further.



First open the switchboard at the menu “Change”

Once you have opened the switchboard, draw your shadow station. In our case it consists of 4 tracks. You draw the set-up tracks like any other block as you are used to, and you name all components and group the blocks as usual. Everything here is just the same as normal.

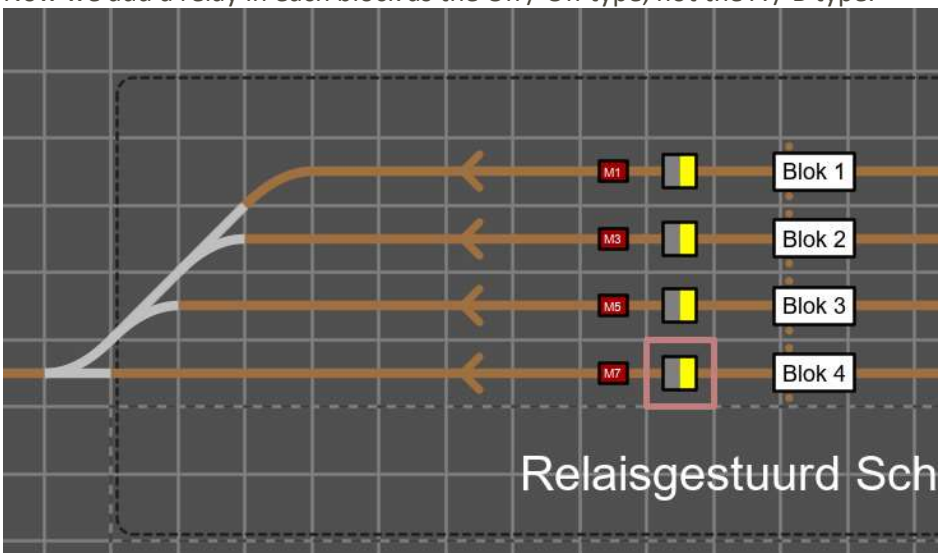
As you can see here, four blocks with two detectors per block. Each block and detector have its own name, a station element around it so that the shadow station is also considered a shadow station during automatic driving. Please note that the correct block type for shadow stations is the block type “set-up track”. The type of "station" is the same but with a physical platform, we don't have that in a shadow station.



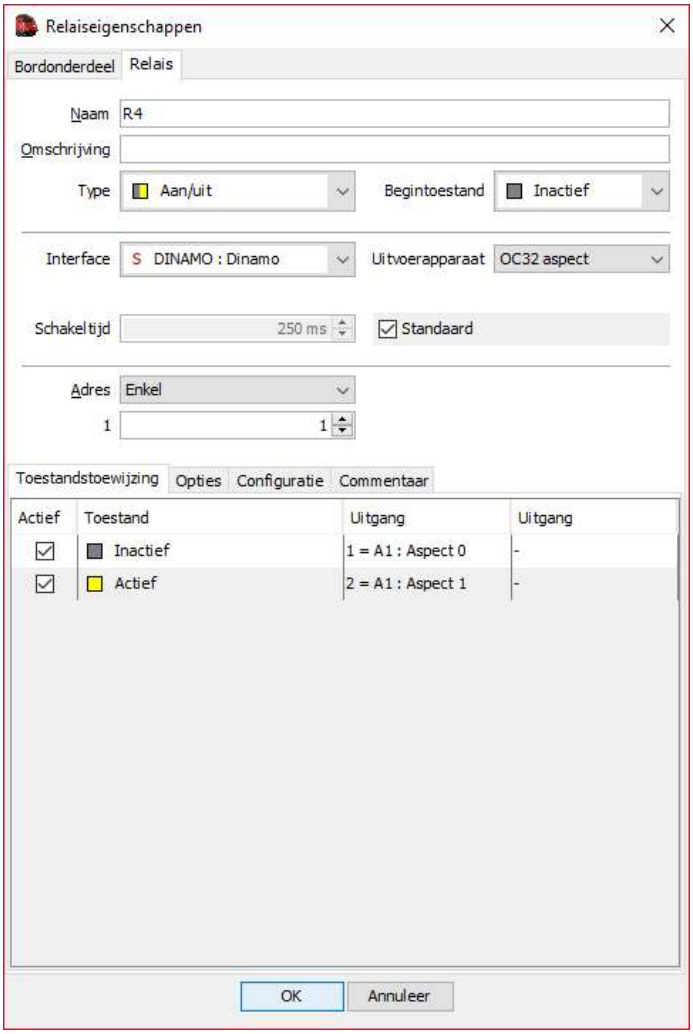
The blocks are furthermore simply adjusted to positions with the correct lengths for the detectors and the block, as well as the stop position in each direction. Here, too, the solution does not differ from an ordinary controlled block. The big difference is only now.

Drawing the relay

Now we add a relay in each block as the On / Off type, not the A / B type.

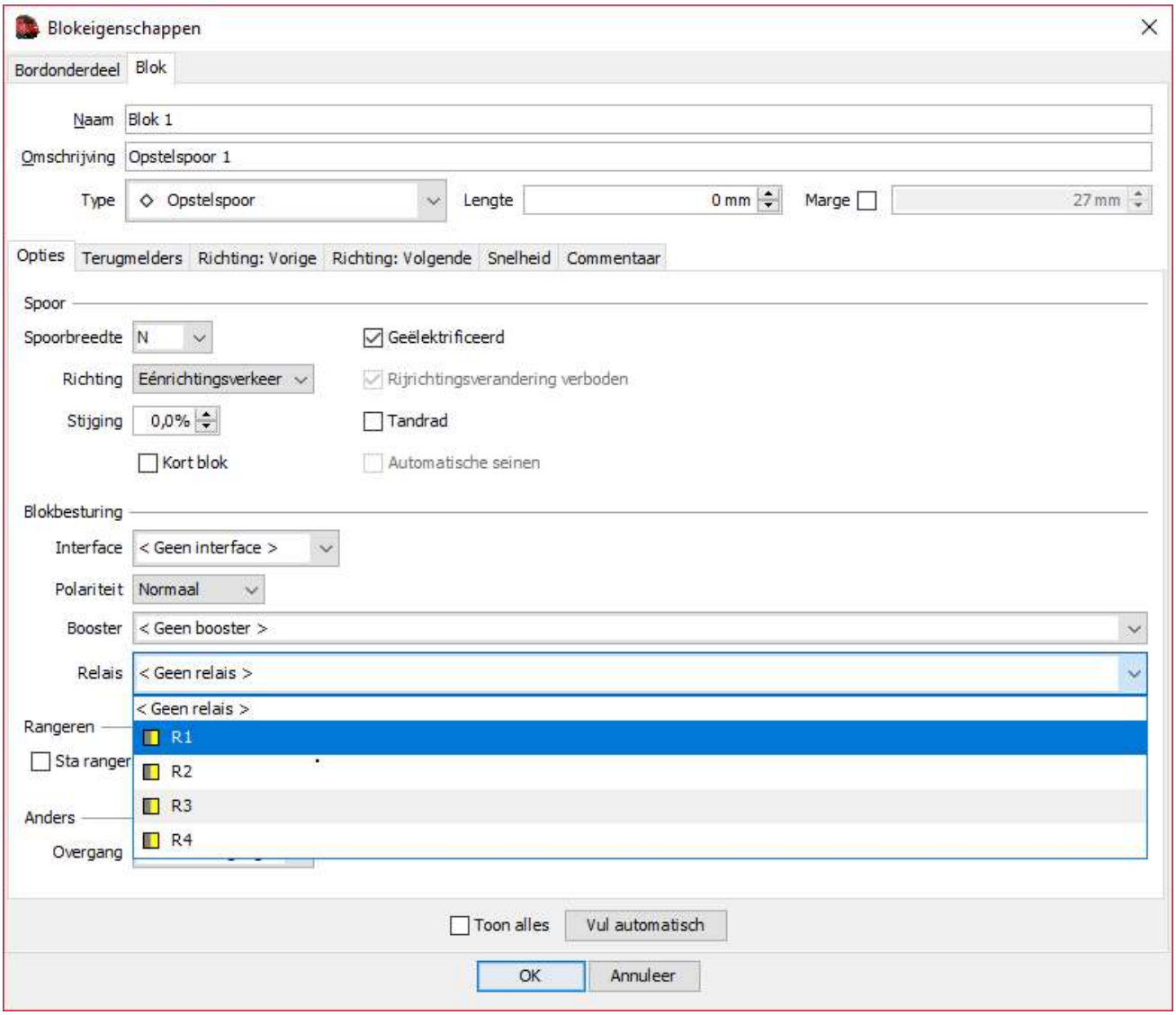


Each relay is given its own unique name, for example R1, R2, R3 and R4. While setting up the relay in the OCConfig, an address was issued for each relay. We assign this address to the correct relay.



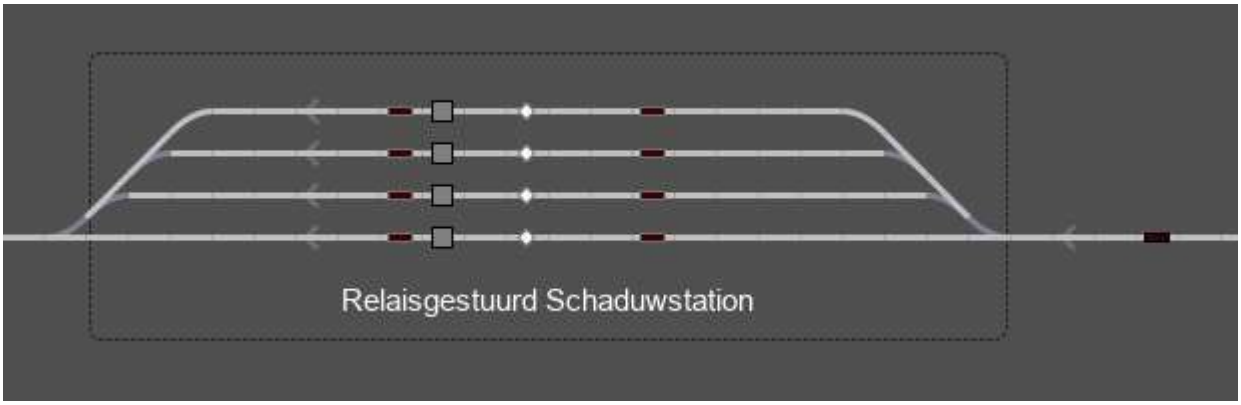
Link the relay to the block

Then we still must specify the relay in the block, now open the properties of the first block and go to the "options" tab

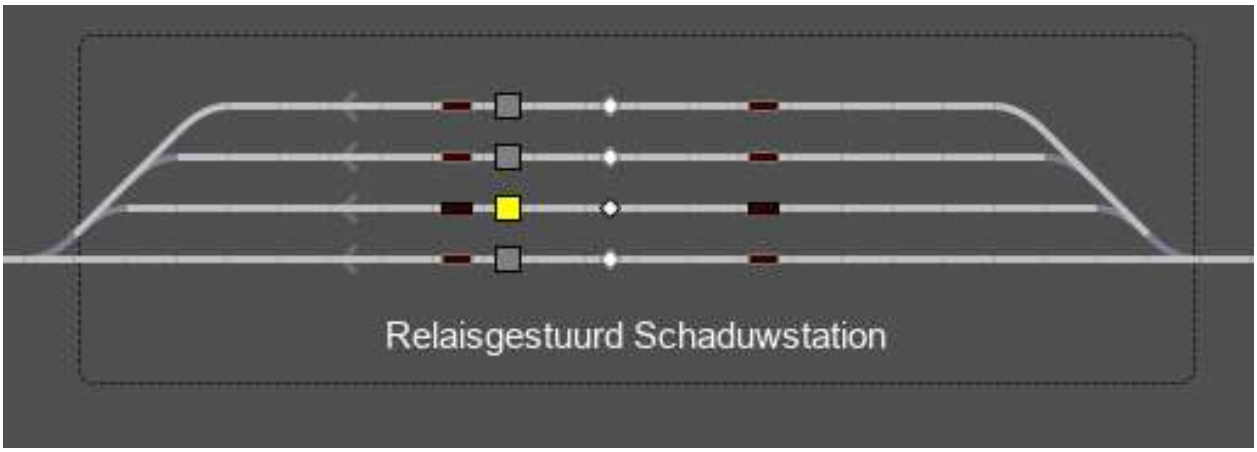


At "Relay", select the relay that is drawn in that block. Then click on "Fill automatically" and now repeat this for all blocks. When you have done this, leave the switchboard editor and go to the regular screen. You will then see this:

Very important:
The relay must be controlled by the same interface that you use to control the blocks.



What is now striking is that all detectors in the station have been given a grey frame, unlike the detector in blocks without a relay (see detector on the right for the shadow station). This indicates that these detectors are part of a relay-controlled block and the block is switched off. Just click as a test on any relay:



You can now see that the block is switched on because in addition to the status of the relay being changed, the detectors have also become active.

However, the whole does not yet work as it should because you can now switch on all relays at the same time, this is of course not intended. For that we need a final step to implement.

Addressing the detectors and the blocks

Before the whole can work as a group, we must first tell iTrain which addresses belong to it. For this we do the following:

The block output that is used has a block address and four detectors with their own address. We only used two detectors of this. We assume that the first block of the first TM44 has been used and the first two detectors of that block have been used. Then we fill in the following:

All 4 blocks will receive address 1.1

All detectors on the left receive address 1.1

All detectors on the right will receive address 1.2

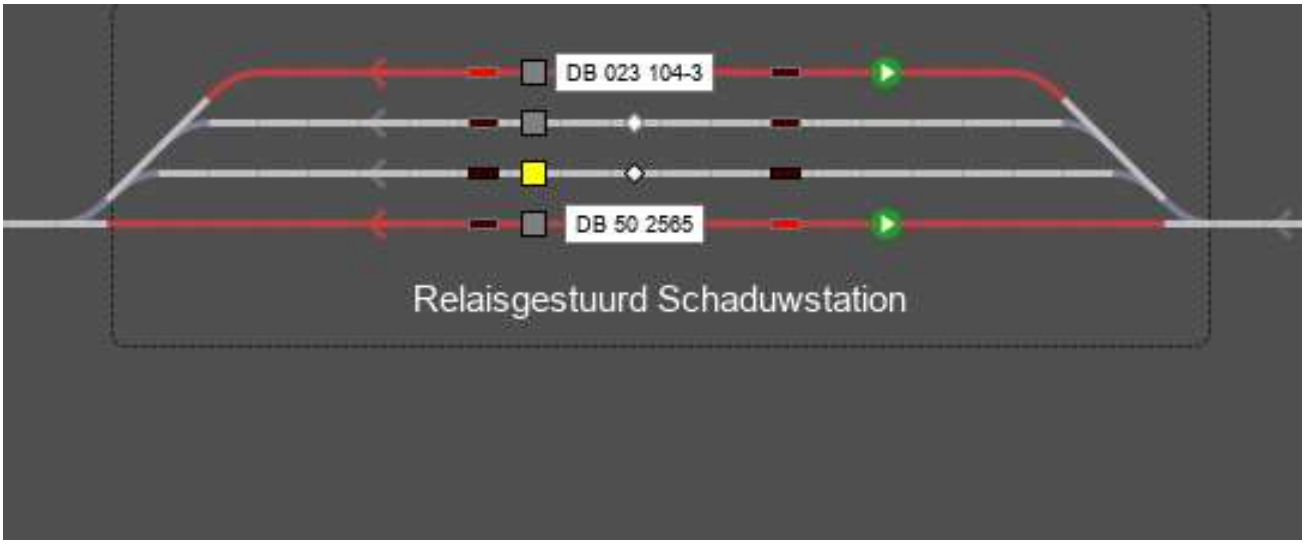
If you have connected the right and left detectors the other way around to the block output, then of course you reverse the two detector addresses. Also don't forget to put the interface on Dinamo for every block and every detector if iTrain has not already done so.

As a final step, click on "fill in automatically" in each block. Also don't forget to click on the red magnet and accept the changes. Click on "Apply" and exit the editor screen.

How do I test the operation?

If you now activate a relay, you will see that the block becomes active, and if you activate another relay, the previous relay will be switched off first. So only 1 block can be active at a time.

Connect and test if this also works physically. You test the detectors by placing a loco on a section and then making the block active. If you then make another block active, iTrain remembers that there is a train in the previous active block.



Here you can see that two trains are already present, that the third track is active without the detectors reporting. Which makes sense, because the relay circuit only allows the detectors to see the sections that are connected by the relay to the block output. In this case the third track seen from above.

This only works if the connection is active!

Your Relay controlled shadow station is ready for use. Have fun testing!!!

FAQ

Can i use two relay groups on after the other?

Yes, you can, but that doesn't mean that you can park long trains over two blocks. iTrain will then keep both blocks active until the train is gone again, then no other movement can take place in the two relay groups.

The blocks of 1 group must be parallel to each other?

Absolutely, otherwise iTrain cannot have a train leave because it cannot make the next block active as it is already occupied by the current train.

What happens if I put the blocks in series with each other?

Very simple, it's not going to work. The train is in block 1 which is active, it wants to go to block 2 of the same group. But it cannot be activated because only a single block can be active in a group.

In the beginning, the detectors turn on spontaneously when I make a block active.

In the past it happened that a change in the program unintentionally affected the functionality of the relay-controlled blocks. You will experience that when a relay group is used for the first time, the detectors are actively taken over when a block is switched on. Report this directly to Berros by creating a topic on the iTrain forum.

If you click on a detector with the combination ctrl-click, it should go out and stay off. If that is not the case, then something else is going on that causes a busy notification. In that case, check your model layout for conductive parts in that section.

Do I have to use two detectors per rail?

No, less may always, but its recommended for reliability, to use 2 detectors. The reason that we use two detectors is threefold. Firstly, because more than two detectors have little or no desire in a shadow station. Secondly, because a relay often only has two changeover contacts. Thirdly, you can use the second detector in the block as a release detector to ensure that a train is completely in the block before it is released.

If you do want to use more detectors, that's no problem, you just need more changeover contacts. You can then use two relays per track or take a relay with more than two changeover contacts or on / off contacts.

Is this solution also suitable for DCC drivers?

Yes, you can, but it is not effective. A relay costs on average 5 euros, an occupancy detector converted 3 euros, then you lose 6 euros per block. This results in a saving of 1 euro per track. In that case, labour does not outweigh the effect of the solution.

Epilogue

I wrote this tutorial for general personal use. You do not have to pay for this manual and it can be downloaded free of charge on our website. If you want to copy the text for private or club use, please contact us.

Domburg Train Support is an official partner of VPEB and Berros and an official reseller of the products. You can also contact Domburg Train Support for advice, support and help at home or via TeamViewer. If you cannot find the solution with this manual, please contact us via our website.

I hope this tutorial will help you connect relay-controlled blocks with Dinamo and iTrain. If you have any comments or remarks, please let me know. I can then process this in a new version. You can report this by sending an email to info@domburgtrainsupport.nl

Thank you for reading and using this manual.

Sincerely,

Martin Domburg