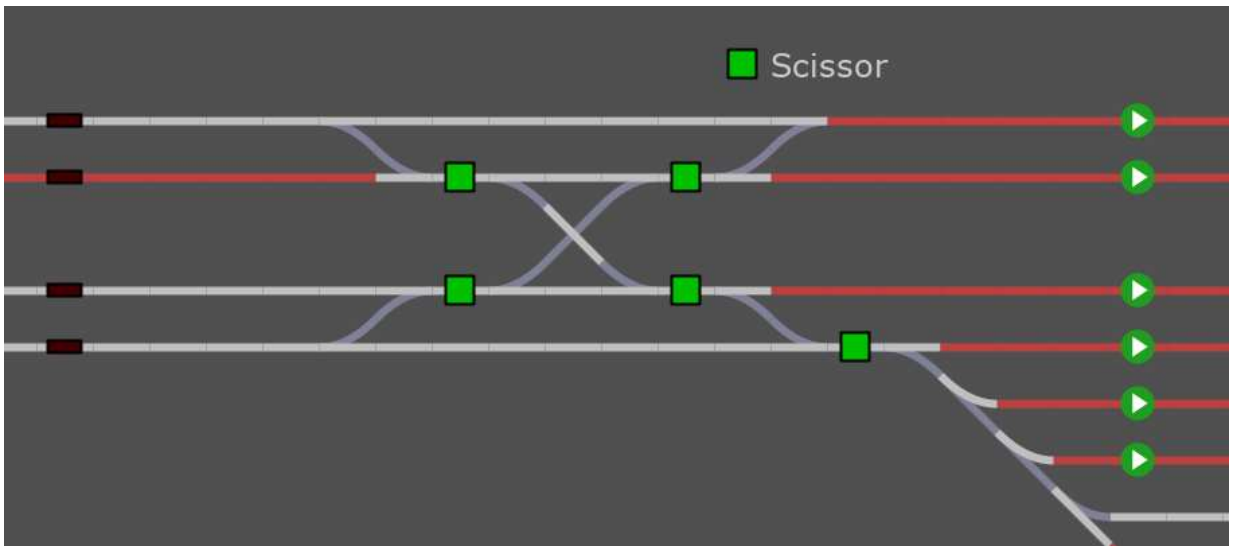
DTS Tutorial:
Switching turnout groups

for Dinamo in combination with iTrain



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Content

Introduction

Dinamo users absolutely come across this, switching turnout groups. Without the use of relays to supply complex turnout groups with block voltage, we would have lost a lot of money on extra blocks. On our own model railroad, we have proven that no turnout group is too complex by dividing everything into small projects.

In this Tutorial we will talk about how relays work and how to apply them in switching these turnout groups, how they can be applied physically and how to enter them 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

Switching turnout groups explained

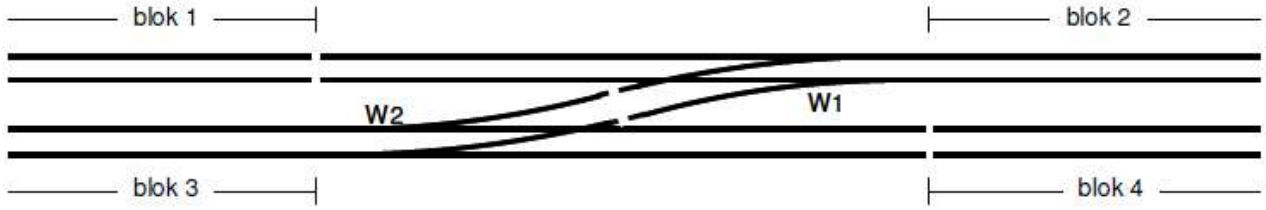
For the connoisseur of electronics, the principle of a relay is not that hard to fathom. But most of us experience electronics as a challenge. In the following chapter we explain how a relay works and what an alternating circuit is.

Brief explanation of the terms used:

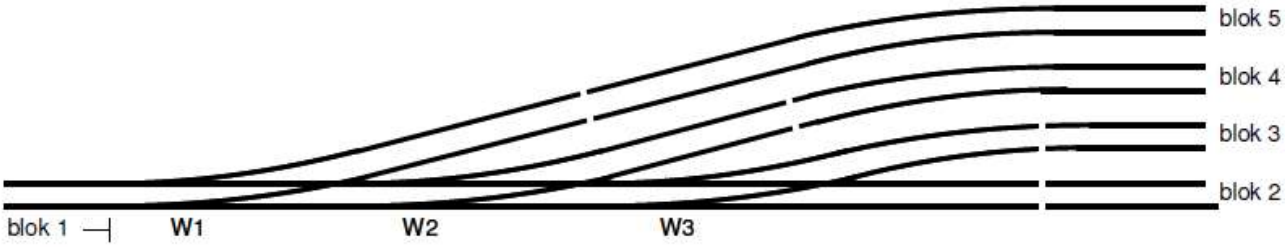
Foot of the switch: The narrow side where the tongues lie

Head of the switches of exchange: In fact, after the switches of exchange once the split has occurred.

In a normal situation, points are fed by the blocks against which they are placed, as can be seen in both images below. After the head of the last switch, when it changes to another block, the two rails are separated from the rest.



Switches are normally fed from a block and are separated after the head



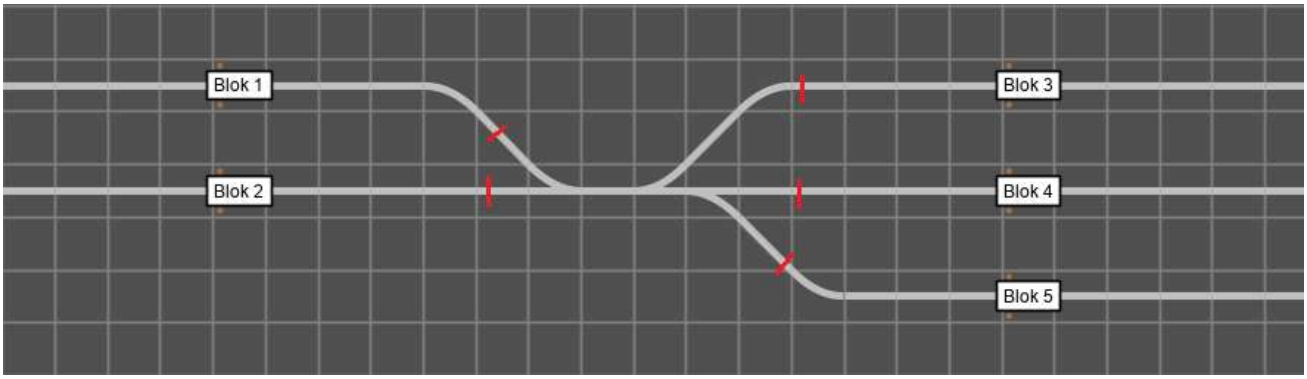
After the head of the first switch you can just feed another switch.

But there are also situations in which a point with the footrests against another switch. Then he is not fed by a block and both points are de-energized. Now it is an expensive solution to use a block output for that. In addition, software uses a turnout group to drive from block to block, so a block in a turnout group is also highly undesirable.

One of the many complex turnout groups on the Stadt Schellenbach (N-scale) layout

So a way must be found to feed those points with the Dinamo system. Where one can put a rough digital voltage on dcc use, this does not apply to Dinamo use because a turnout group could be fed by several blocks.

How are we solving this problem?



A most common situation, the red dashes indicate the block separations.

The above image is perhaps the easiest way to clarify the above explanation. On the image we see a turnout group where the two head switches are placed against each other with their feet. The red lines indicate the block separations which immediately tells us that the turnout group is completely isolated in the track.

To provide this turnout group with the correct block voltage, we will work with a relay. A relay has two changeover contacts with which we, as it were, can have the track between the points fed through two different blocks. If the relay is off, one block feeds the turnout group, if the relay is on, the voltage of the other block is passed on to the turnout group.

So, we have the choice of two blocks. If we look at the picture on the right, we see that we have a choice of Block 3, 4 and 5. That is 1 block too much so that you should use 2 relays. Looking to the left we see 2 blocks which is just right to solve with 1 relay.

Physical installation in a nutshell

We divide the two rails between the two points between the two COM contacts of the relay. Every changeover contact has a Com, NO (open) and NC (closed) contact. Then from one of the two blocks, we bring the two rails to the two NC contacts. We bring the two rails of the other block to the two NO contacts of the relay.

If the relay is off, the COM will be connected to NC, which means that the voltage of that block will be passed on to the turnout group, the relay will disconnect this connection and a connection will be created between COM and NO causing the turnout group to continue the other block is fed.

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.

Software in a nutshell

In iTrain you draw the points as you are used to, you create a relay of the type A / B and you give the address with which you control the physical address. With the switch that makes the choice for the train between the two blocks, on the picture the leftmost switch, open the properties. In the relay tab you assign that relay to the two positions of the switch. If iTrain then converts the switch, it will automatically switch the relay to the correct position. You are then always assured of the correct block voltage on the turnout group.

The power can be obtained in several ways

The simplest way is to simply obtain the power supply directly from the rails just before the turnout group. The disadvantage is that the turnout group participates in that block detector and the train already registers in that block as soon as it enters the turnout group.

The most efficient is to get the wires directly from the block output. The A-wire can simply be connected under the existing A-wire, the B-wire can be connected to one of the free B detectors. You usually only use 2 detectors per block, perhaps an extra for a switch detector. If you detect the turnouts separately from the block then the block physically just feeds the turnout group, only iTrain does nothing with it in the block from which you feed it. This has a positive effect on positioning.

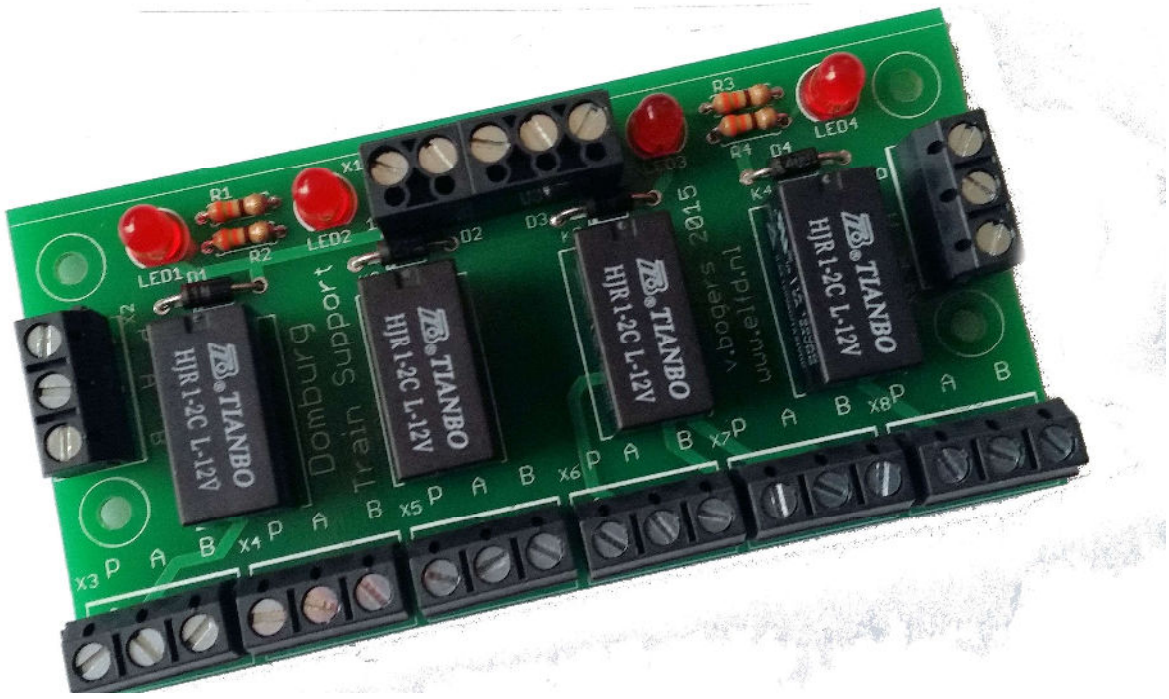
Project thinking

Thinking in projects makes the application easier, especially if you must make several circuits. Start with the simplest turnout group, and remember that the "result" of this, so the power on the turnout group can also be used as a power choice for the next turnout group.

You can view each turnout group circuit separately from other circuits in the entire complex, you do not have to make all the circuits simultaneously!

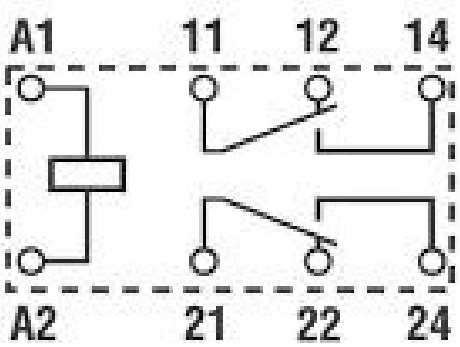
How does a relay works

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.

Normally Open (NO)

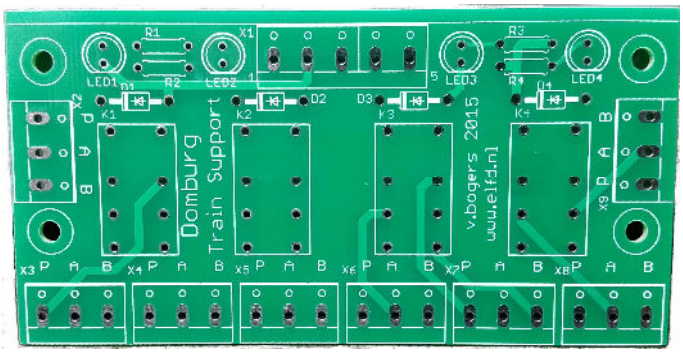
Normally Open is translated "normally open" in Dutch. This means that this relay is not in contact with the COM (pin 11). Only when the relay is energized does the contact switch from the COM to the NO. The NO pin on the contact is 14.

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.

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:



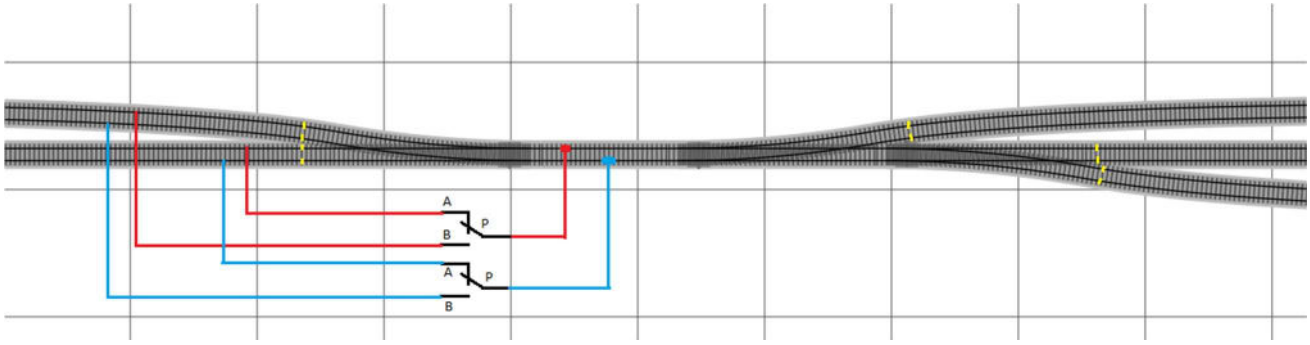
K1 has the screw terminals X2 and X3
K2 has the screw terminals X4 and X5
K3 has the screw terminals X6 and X7
K4 has the screw terminals X8 and X9

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 relay to the turnout group

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.

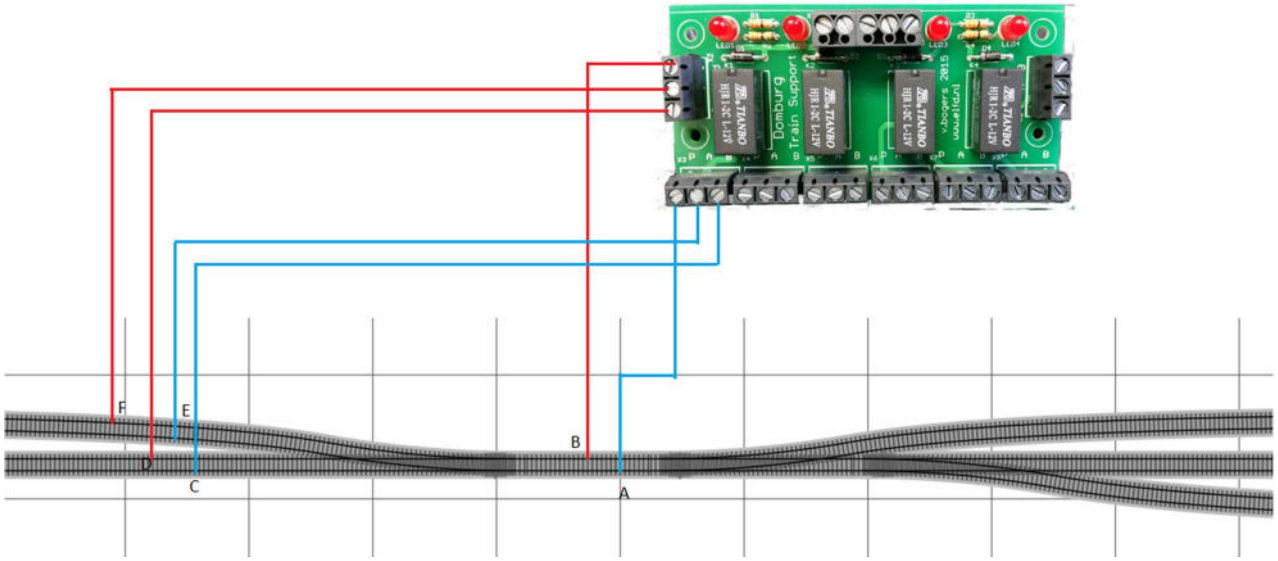
The traditional way



This is the best-known way to do this, especially for the Classic users most interesting. You can see the two changeover contacts of 1 relay on the HPP4 here. The P contacts connect to the two bars between the points. The Two A contacts get the power from the lower block and the two B contacts get the power from the upper block.

The order of the blocks on A and B is not interesting, but it is important that the two rails of the one block end up on the two A contacts and the two rails of the other block on the two B contacts.

Physically wiring the traditional way



On this image you can see that the top block now goes to A and the bottom block to B, so the other way around as the image from the explanation above. To indicate that this does not matter for the operation.

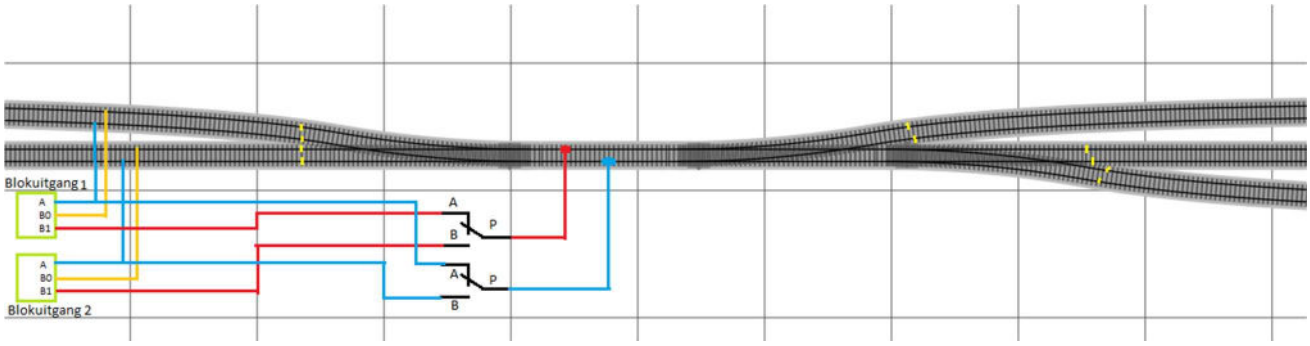
If you follow the colours exactly as indicated, then you are in the right place. People often only understand how it works when they experience the operation of a circuit after they have wired and connected it themselves. But there are a few steps in the process:

1. Solder a wire (in the diagram blue) to point A and bring it to the P of X3
2. Solder a wire (in the diagram blue) to the point E and bring it to the A of X3
3. Solder a wire (in the diagram blue) to the point C and bring it to the B of X3

4. Solder a wire (red in the diagram) to point B and bring it to the P of X2
5. Solder a wire (red in the diagram) to point F and bring it to the A of X2
6. Solder a wire (red in the diagram) to point D and bring it to the B of X2

The diagram also shows that the block separations are indicated with a yellow line.

The ideal way of wiring for iTrain

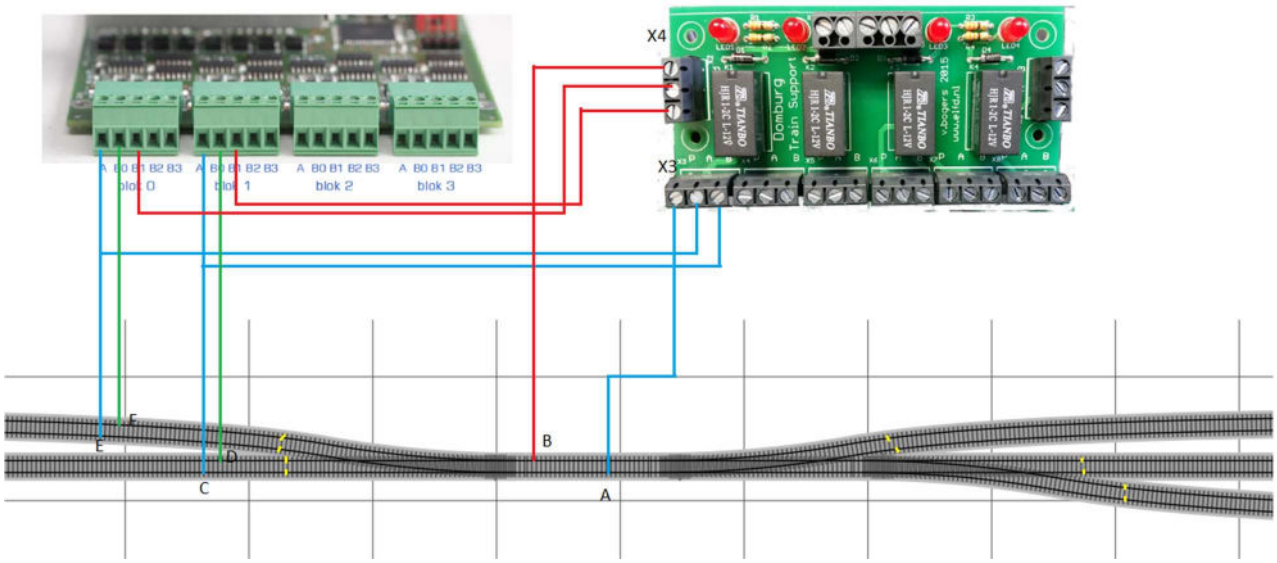


Because we now have 4 detectors per block output, we can make it easier for iTrain by feeding the turnout group via a free block detector. In this way, he does get power from the block, but iTrain only notifies the locomotive in the block if it drives that block physically. In the traditional way, logging in already took place when the train passed the turnout group. As a result, the position calculation lagged reality. No more in this way, you don't have to do anything special with this free detector in iTrain. iTrain does not need to know about the existence of this detector.

Then it can be even better:

You could possibly use this free detector as a switch detector for the switch that makes the choice between the two feeding blocks. Then he reports the turnout group occupied as soon as a locomotive drive over the turnout group.

Physical wiring the ideal way



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 blue) to point A and bring it to the P of X3
2. Place a wire (in the diagram blue) on the A of X3 and bring it to the output A of Block 0 on the TM44
3. Place a wire (in the diagram blue) on the B of X3 and bring it to the output A of Block 1 on the TM44

4. Solder a wire (red in the diagram) to point A and bring it to the P of X2
5. Place a wire (in the diagram red) on the A of X2 and bring it to the output B1 of Block 0 on the TM44
6. Place a wire (in the diagram red) on the B of X2 and bring it to the output B1 of Block 1 on the TM44

We have also drawn the physical block supply on the A and B0 of each block on the diagram. This is part of the basic knowledge regarding Dinamo.

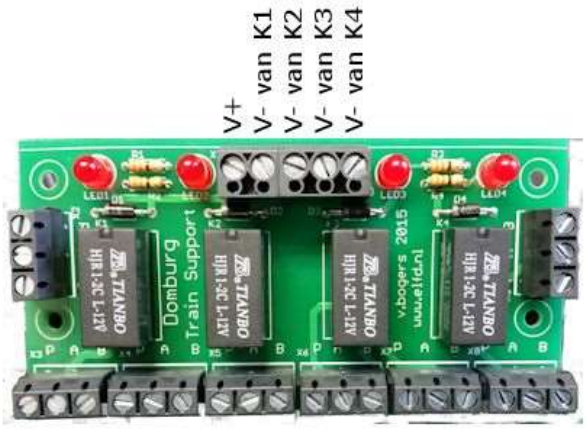
The diagram also shows that the block separations are indicated with a yellow line.

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 step by step:

Connecting the HPP4 to the OC32

You can connect the print according to the example below:



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 out about this in the OC32 manual www.vpeb.nl

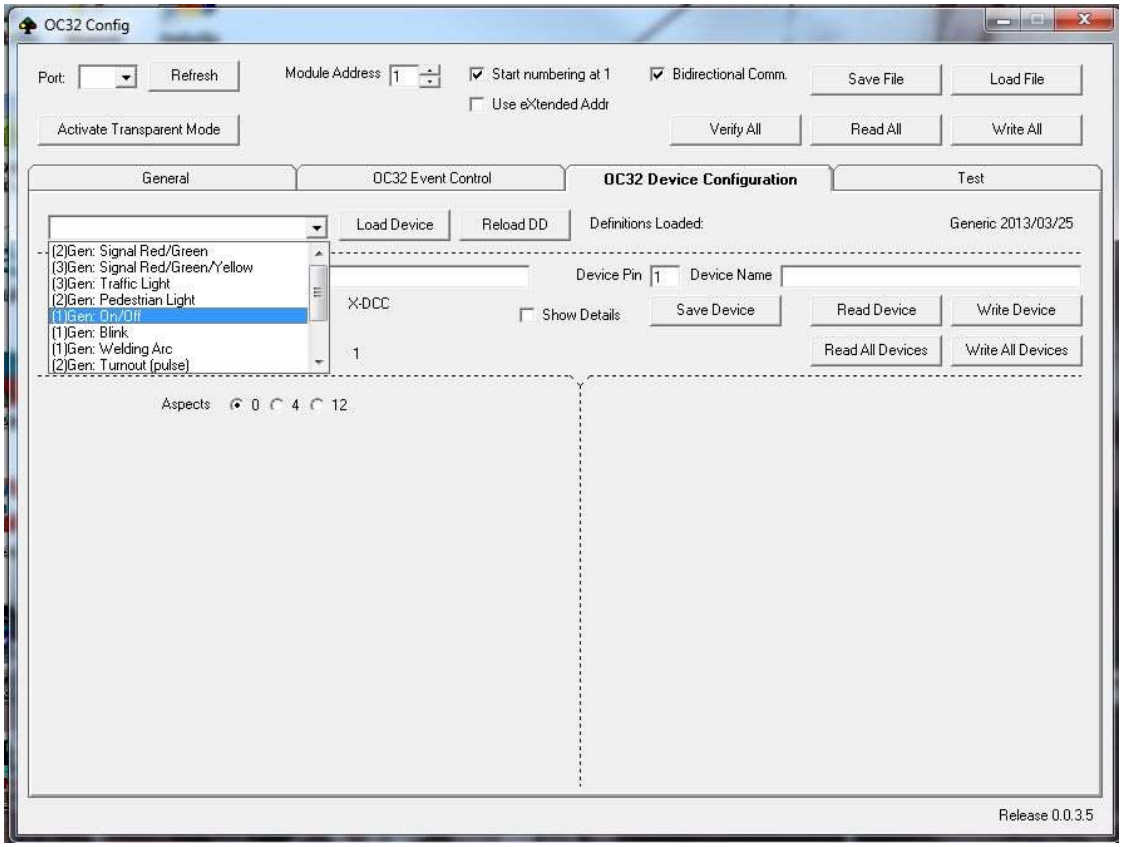
Pre-setting the relay in the OC32

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.

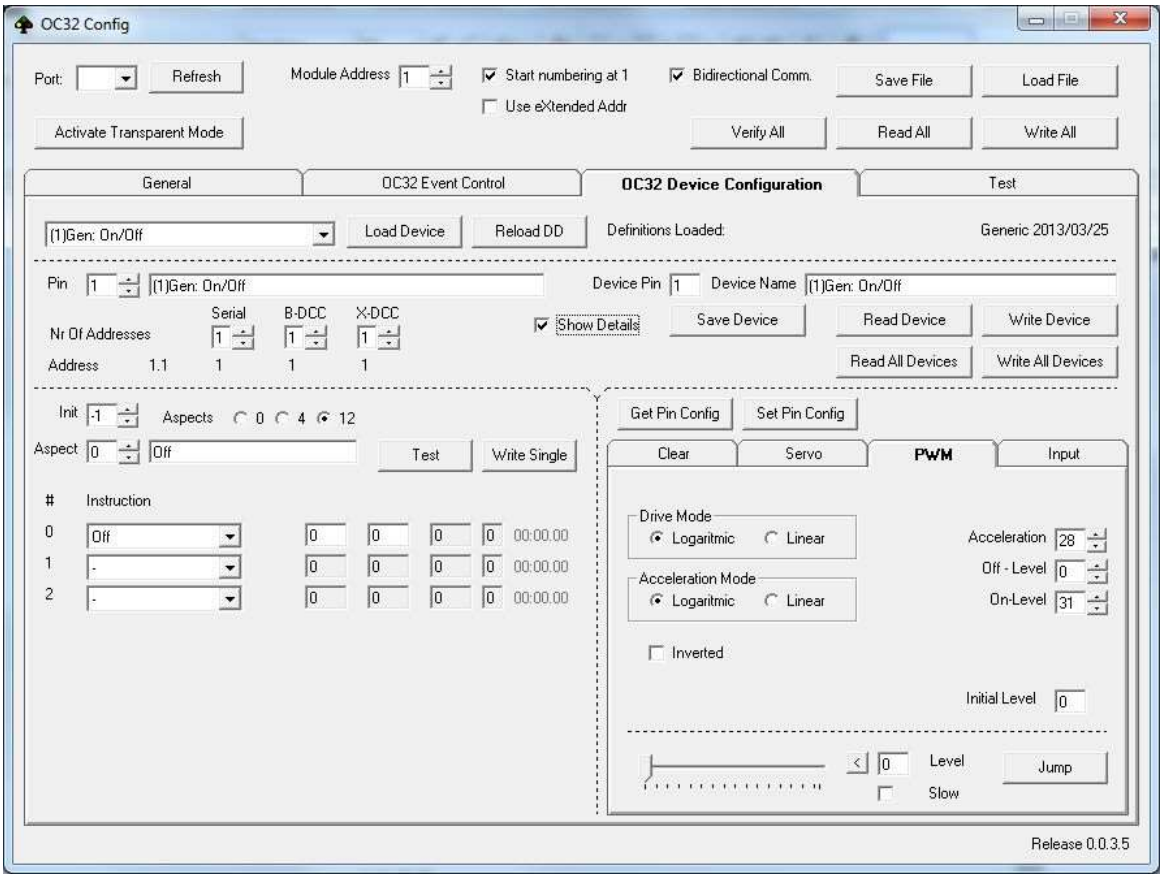
First you open OCConfig, we assume that the OC General tab according to the OC32 manual is already set. If not, do so first before continuing here. The "hardware configuration" is very important. If that is done, then you go to the relevant pin. For the sake of convenience, we call the relevant pin 1.

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 must 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.

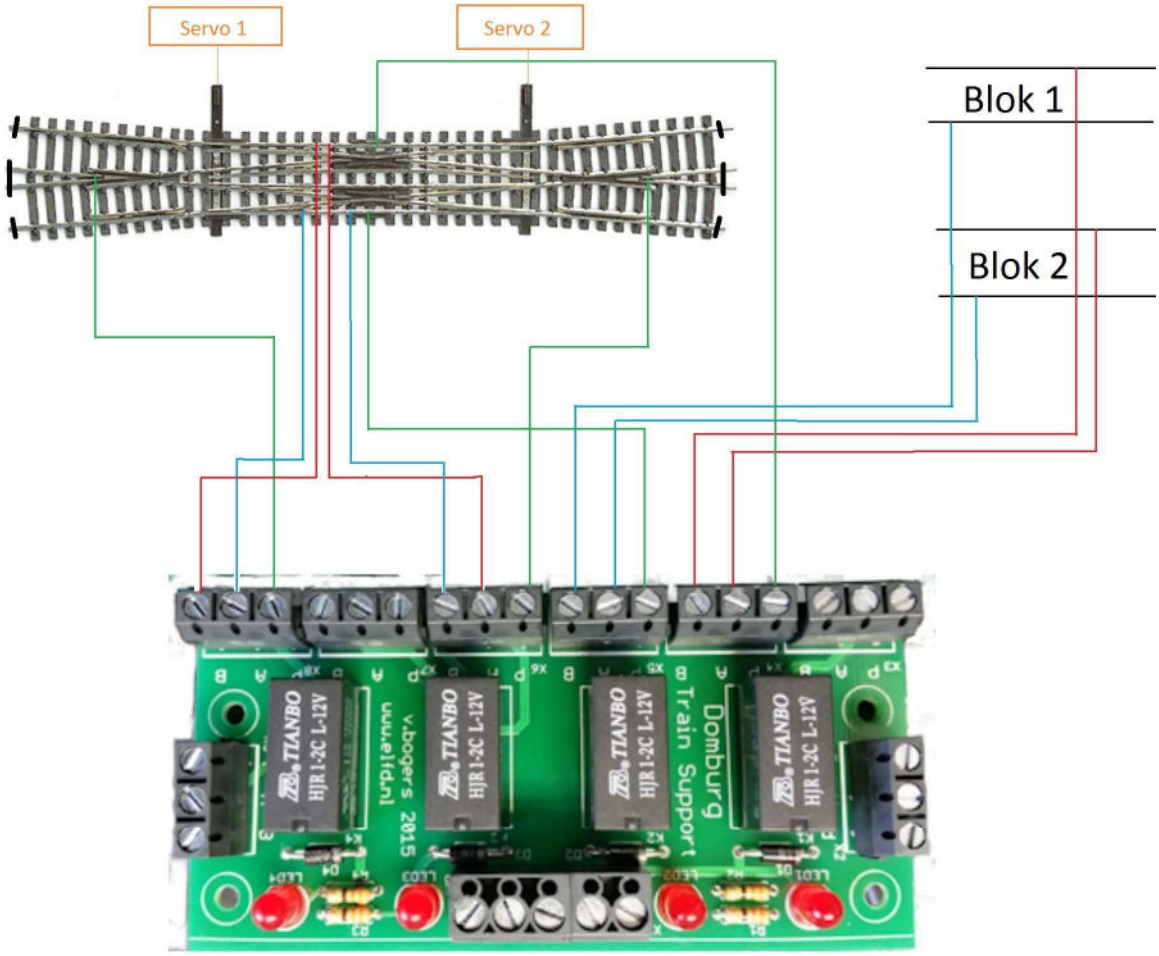
You repeat this at all 4 relays and note the addresses so that you can use them later in the iTrain configuration.

Variations to this scheme

There are several variations on this that you can come across, all of which demand the same as described above. I explain them here in the simple form, but the method with free detectors is also applicable here.

Double slip

You can compare a double slip with the two points without the piece of rails between them, thinking that they have been pushed into each other than you might understand that it is just two points in one.

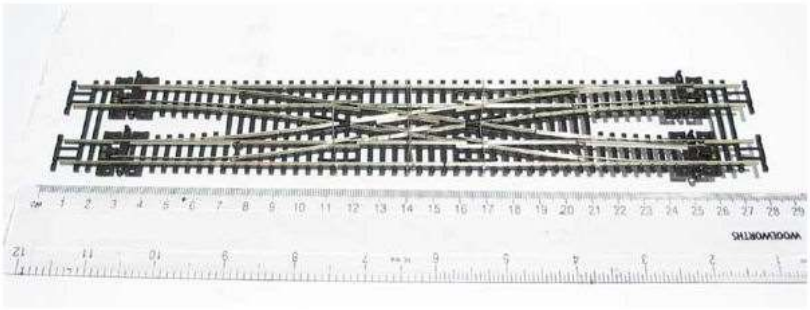


Because it also occurs that the points also have conductive point pieces that need to be connected, I have also signed this directly here. The left two relays are charged with this. If you do not have any connecting point pieces, you can omit that part of the diagram.

For the switching of this tutorial you only must look at the right two relays. The terminals X2, X3, X4 and X5 are for feeding the double slip from the two blocks.

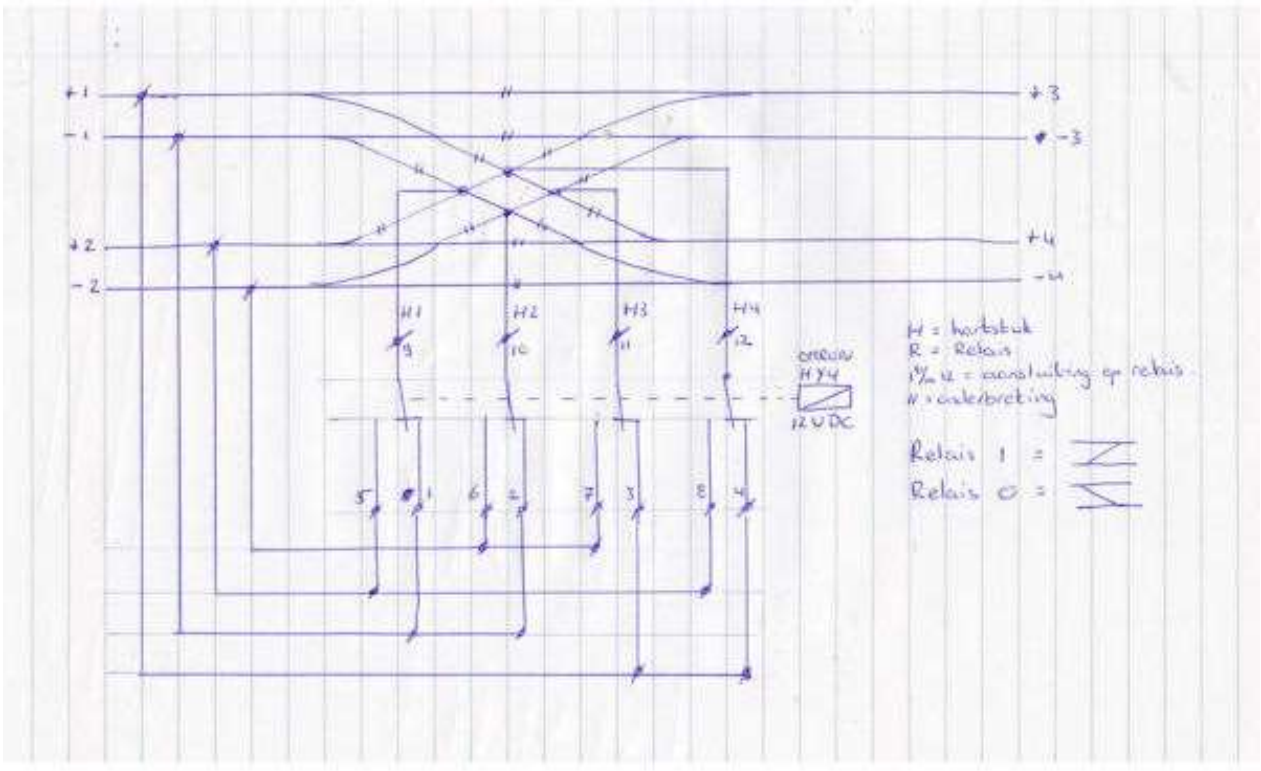
The double slip is therefore also completely separated from the rest. You may extend the double slip with switches on one of the exits. Then you install the insulation after those points.

Peco code 55 Scissor (N-Scale)

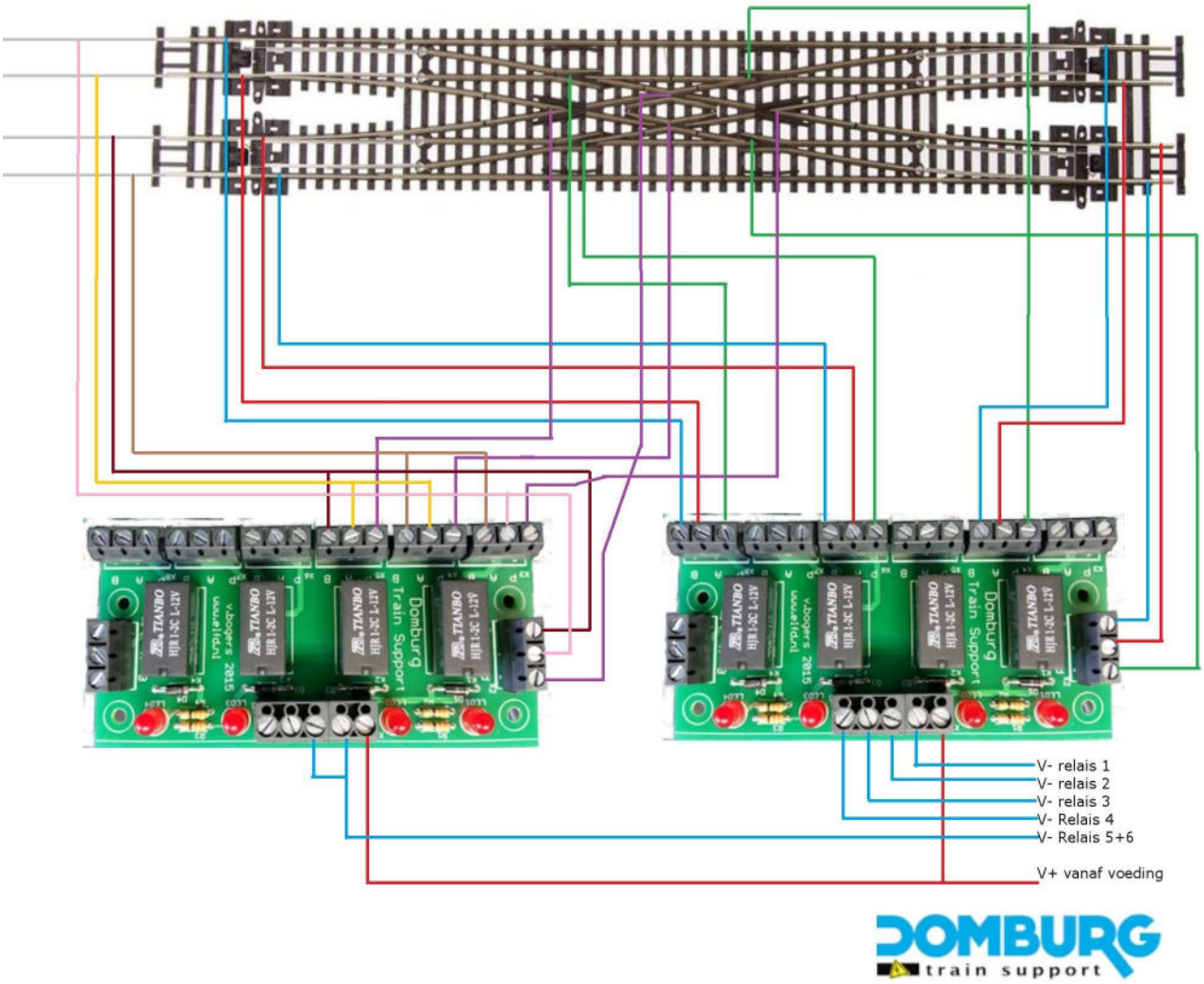


Peco introduces a scissor in finescale code55 which requires five circuits with six relays. 4 relays are to provide the four points with the correct polarization, these are switched with the servo that controls the points. See for this the Tutorial "Polarized polarization with relay". The other two relays are needed to provide the four heart pieces of the cross with the correct power supply.

To connect the cross of the scissor it looks like this schematically:



If we connect it to the HPP4 together with the switch polarization, then you need one for the switches and half an HPP4 for the cross, because as you can see above, four switch contacts are needed.



The left HPP4 is for the cross, the right is for the points of the points. It looks very complicated, but if you follow the lines and connect exactly that way, it will work well.

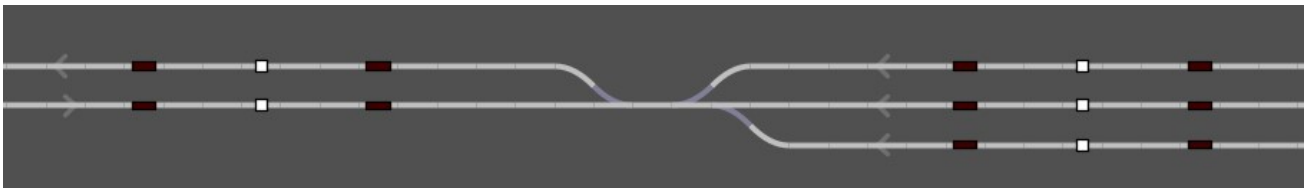
Drawing the relay in iTrain

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 4.1 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 “Edit”

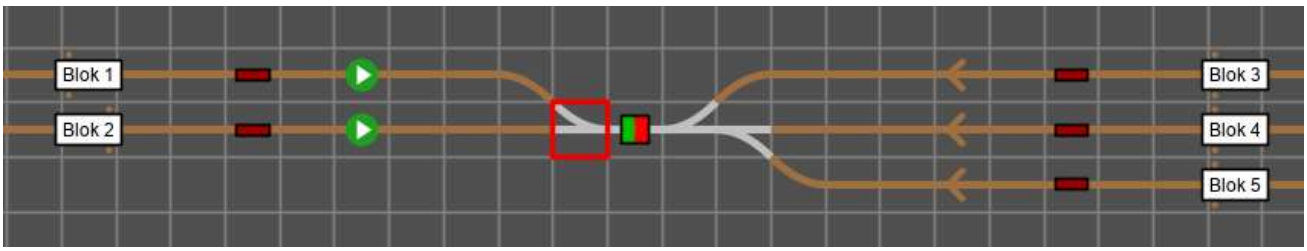
When you open the switchboard, we see a turnout group drawn as used ion this tutorial, this can of course be different than on your screen, but the principle remains the same.



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. All points simply get their name and address, but as you can see, I have left a space between the two points that it is about. The big difference is only now.

Drawing the relay:

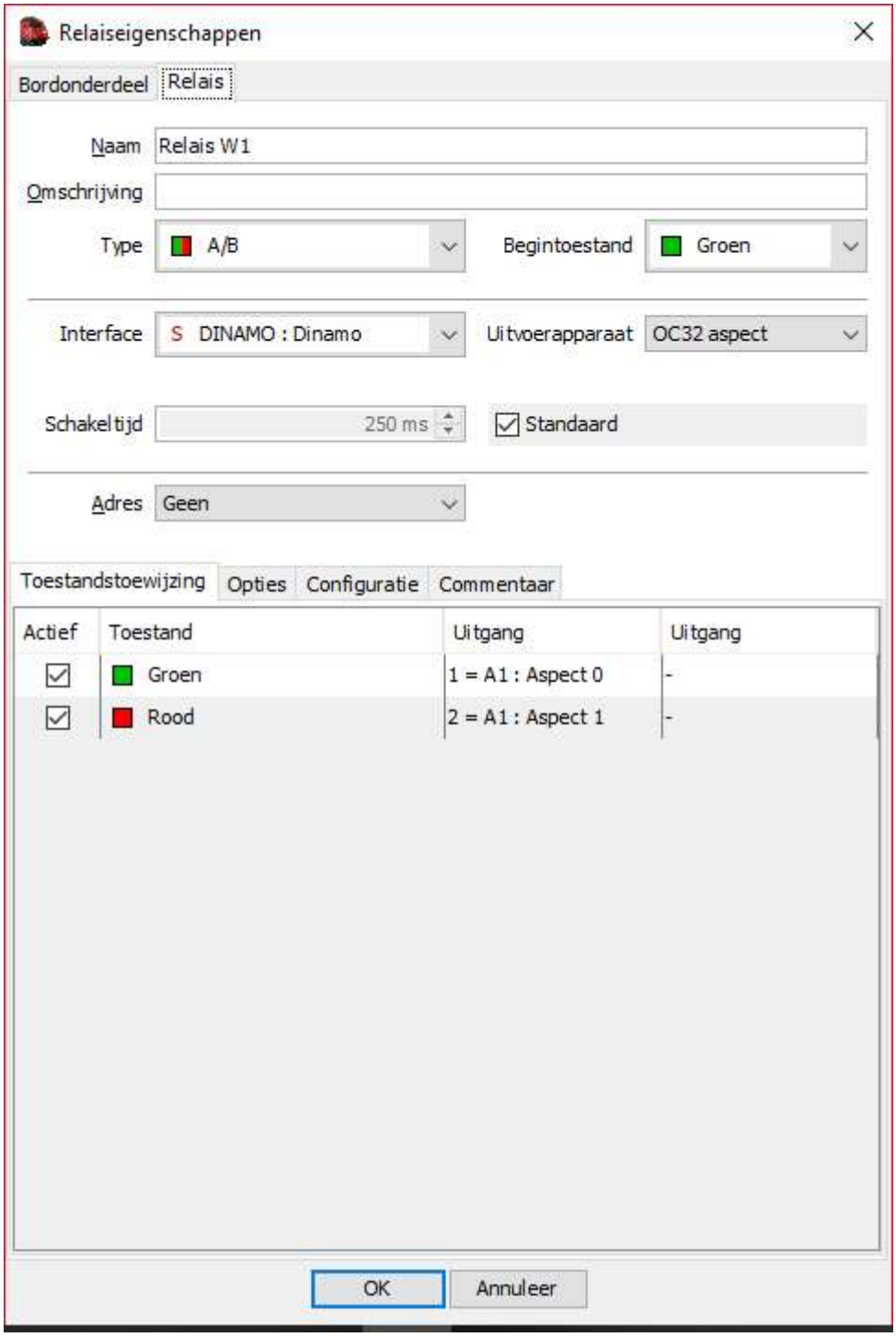
Now we add a relay in each block as type A/B, not the On/Off type. We draw this over the element between the points. You can also place it next to it, this is entirely up to you to choose. Choose a location that is convenient and well-arranged for you.



On this image you can also see that I have framed the left switch. This will be the switch to which we will link the relay. This must be because this switch is the only one to choose between the two blocks that the relay switches between.

When creating the relay, I name the relay after the name of the switch. The switch here is called W1, so I call the relay "Relay W1". That way you can easily find the relay later.

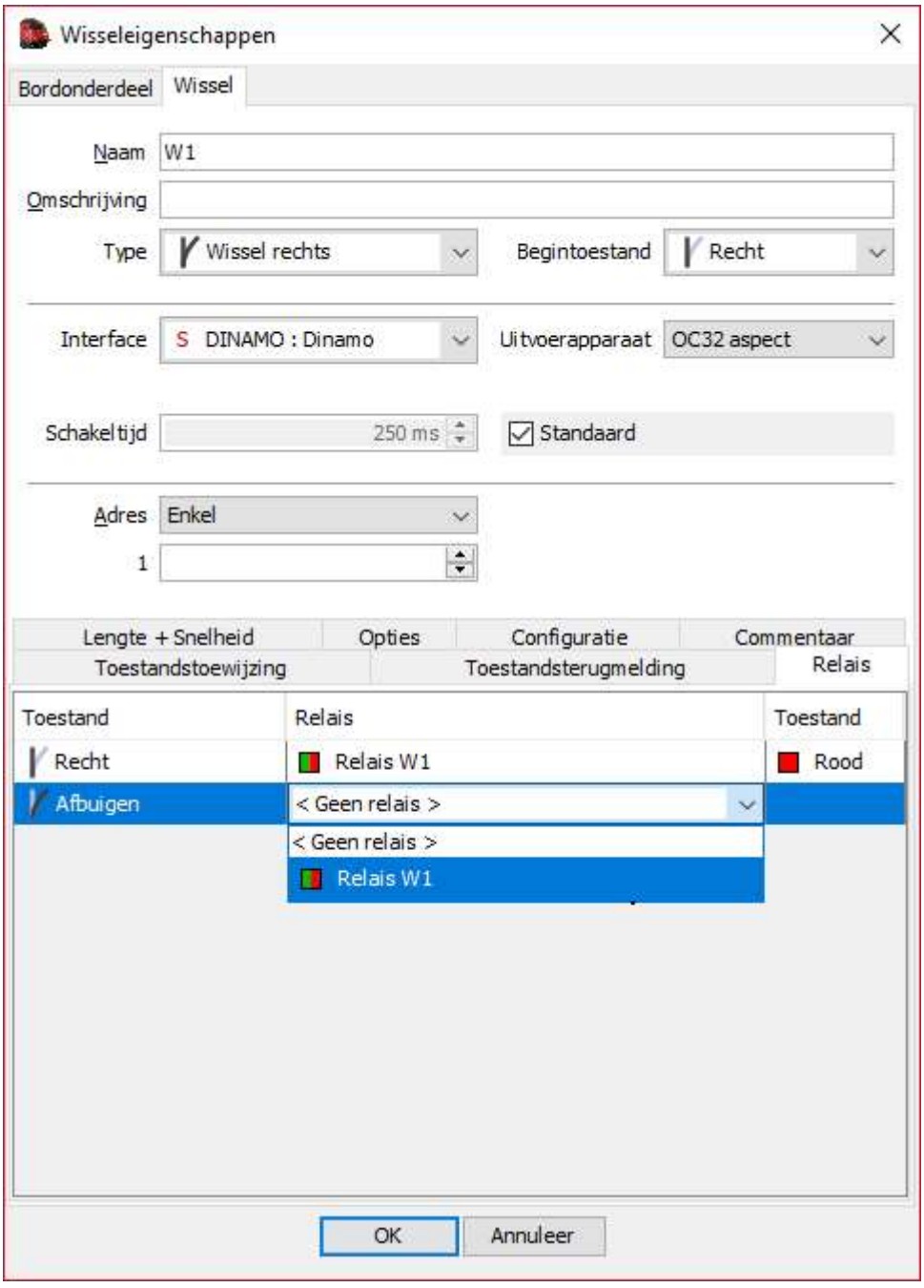
We set the relay like this:



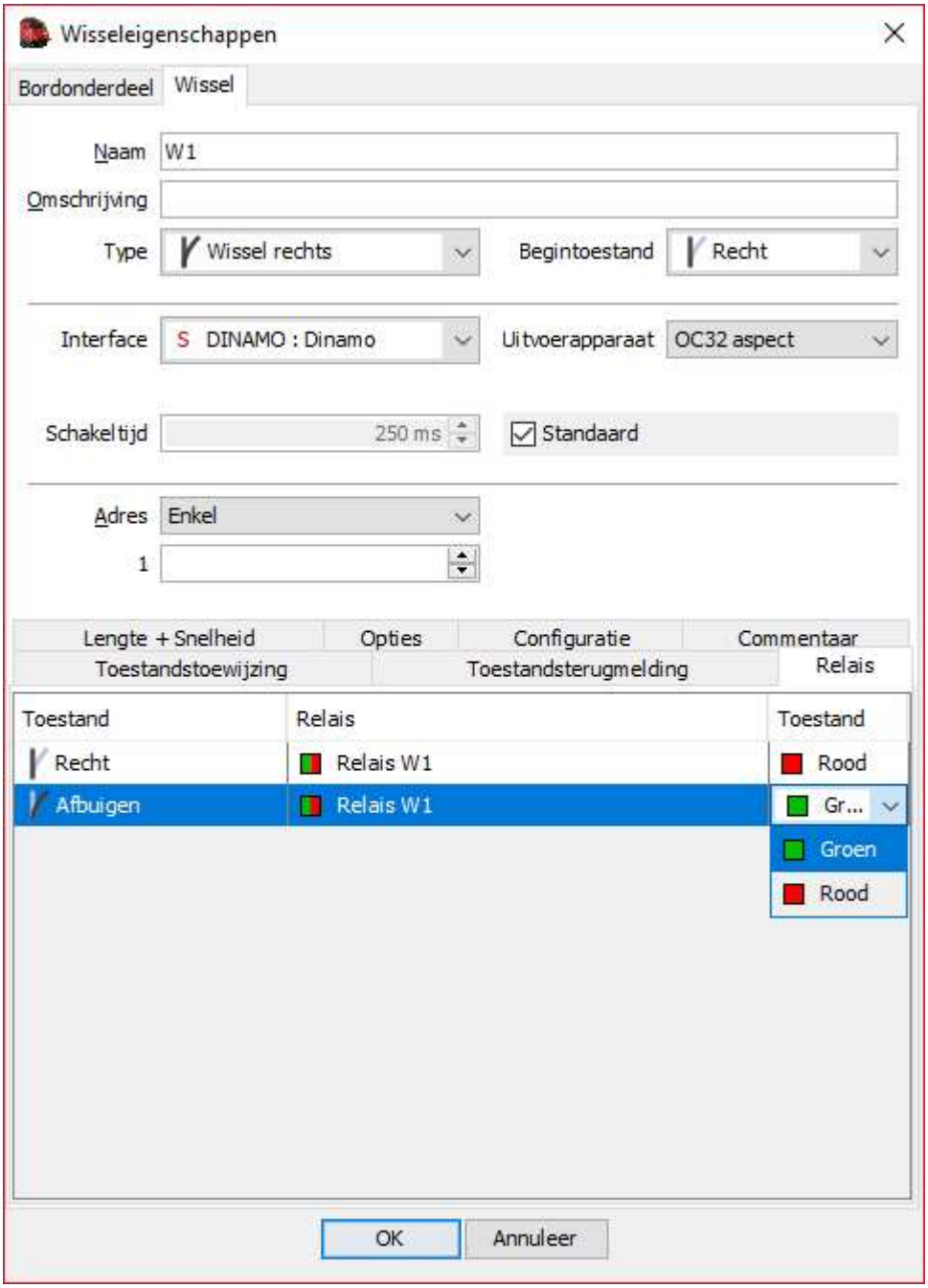
We choose relay as type A / B and provide the address with which we have set it up in OCConfig. Note output device: OC Aspect

Connecting the relay to the turnout

That is the final step, linking the switch and the relay. To do this, open the properties of the switch, in this case W1. You then go to the relay tab and select the relay that you have created in both positions.



Then we must state the condition of the relay at the position of the switch. There is only 1 position red and 1 position green:



By clicking on the status, you can select one. Remember this action because there is a chance that you will need to swap these two (red and green) during testing.

How do I test the application

Testing is simple, make sure you are connected, and the blocks are set up and work correctly!! Be the first to test whether the relay switches when you switch positions in iTrain. If the relay does not switch, first check whether you have connected the circuit correctly.

Alternative way

1. Place a locomotive on the switch in the straight-ahead position
2. In the block to which the switch assigns (in our block 2), the detector must become active for that block
3. Remove the locomotive, the detector must go out again.
4. Set the switch to deflecting and place the locomotive again
5. In the block to which the switch assigns (in our block 1), the detector must become active for that block
6. Remove the locomotive and the detector must go out.

If you see the detector light up in the wrong block, you only must reverse the status of the relay (red / green) in the characteristics of the switch. Then repeat the steps.

Improved way with free detectors:

1. Open the feedback monitor and look up the two addresses of the free callers.
2. Place a locomotive on the switch in the straight-ahead position
3. The free detector of the block to which the switch assigns (in our block 2) must become active
4. Remove the locomotive, the detector must go out again.
5. Set the switch to deflecting and place the locomotive again
6. The free detector of the block to which the switch assigns (in our block 1) must become active
7. Remove the locomotive and the detector must go out.

If you see the detector light up in the wrong block, you only must reverse the status of the relay (red / green) in the characteristics of the switch. Then repeat the steps.

FAQ

Is it that easy with complex turnout groups?

Absolutely, if you just understand the principle, you will really come out of it. Just see it as very often these circuits separate from each other. Start with the easiest and then work through the exchange complex.

May i use the result from a turnout group to feed another turnout group?

Absolutely, a turnout group may well be fed from a block and the result of a circuit. iTrain ensures that the relays are set to the correct positions.

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. The HPP4 is a DTS product itself. 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-driven turnout groups 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