



F-track

Modelauto Collectief Haarlem e.o..
Modulesystemstandard for Faller Car System

Concept

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H1 General and version management**1.1 Version management**

Version	Change	Date
1	start	August 1997
2	Diverse	36534
3	Diverse + pictures added	36688
4	Diverse + results of discussion added	36717
5	Content redirected	36731
6	Changed name in F-Track	36957
7	Translation in English + corrected error in measurement	December 2001
8	Corrected errors in block system, remarks about diodes and tightening of M10-bolt added. Experiences of test driving processed. Block diagram extended.	38290

1.2 Target

Getting a unambiguous standard for a modular system in which the Faller Car System is the guide. The standard needs to be set up as open as possible, to accept as many variations as possible.

1.3 Terms:

Faller Car System: the system, made by Faller, to guide cars along a wire hidden in the road to imitate normal traffic at scale. Most important features are a steel wire in the road and a guidance magnet under the vehicle to 'steer' the vehicle.

administrator: Person(s) administrating and changing the standard, and in cases of doubt or unforeseen cases make a forced decision to close the case and take the solution into the standard. (At this moment 3 administrators are active: Arnold Tamminga, Hans



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Filius and Pim van Leeuwen). Administrators can be reached by
Email: info@f-track.org

Module: Element showing a part of a landscape in scale. In this standard especially the element at which Faller Car System vehicles can drive, that meets the arrangements settled in this standard.(2 different types of modules are defined: the connection module and the scenery module, both with its own function)

1.4 Arrangements

All measurement are millimetres (unless otherwise noted)

1.5 Distribution

This standard may be distributed freely without any kind of changing, adding and/or other modification of any kind. All ideas, supplements and other remarks have to be send to the administrators. They will evaluate the proposals and if it is suitable for the standard, it will be published as a supplement of the standard.

1.6 Word of thanks

Many thanks to:

Mr. Toine Dusée, Netherlands, for making the concept standard of M-track in the area of Faller Car System (MTN900 en MTN910). These concept standards were the basis of the F-Track standard.

Mr. Marcel Estadelle, Spain, for sharing his experience and ideas with us. Many of them were introduced in the F-Track standard.

Mr. Nico Meininger for the idea the use diodes for the Emergencystop.

H2 Modules

2.1 Dimensions of the modules

The width of all parts is 600. The length of the scenery modules is 1200 and the length of the connection modules is 600. Height of all modules (without legs) is 120.

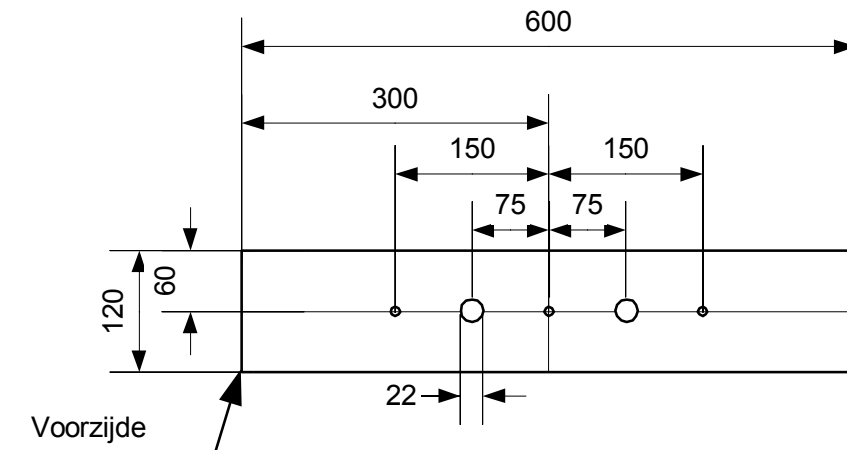
Connection module (l_xw_xh): 600x600x120
Scenery module (l_xw_xh): 1200x600x120

2.2 Material

9 till 12 triplex, multiplex or MDF
head sides 12 thick
Sides and ribs 9
Top 12

2.3 Connection

In the sides of the modules connection holes are made with a diameter of 10. In the scenery modules they exist at least at the head sides and at the place where a connection is needed. For the head side is the pattern: 60 from top, and 150, 300 and 450 from the frontside (see picture 1)



Picture 1: hole pattern for connecting

For the connectionmodules the holes are located at all sides where a connection is possible. Between the holes for connecting, holes of diameter 22 are made to guide the electrical wiring.

To connect the modules tight, connection sets are needed. All holes are fitted with a set. (so you do not need to search for it when building, and no one is missing one, with all holes filled). A set consists of:

- 1 piece of threaded end, i 8, lenght . 60

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- 2 accompanying wingnuts
- 2 suitable terminating ring with outside diameter 20

2.4 Construction

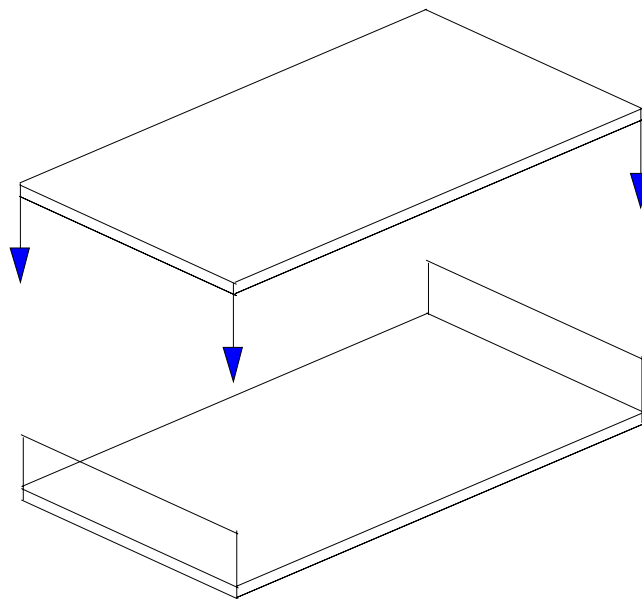
The construction of the modules consist of 2 sidepanels, 2 headpanels and 1 transverse ribs at ½ of the sidepanel at a scenery module. No transverse rib are necessary at a connection module.

2.5 Legs

All legs need to be telescopic, fitted with adjusting mechanism. The telescopic part need to be fixed every 50. The adjusting mechanism must at least be able to compensate 75.

2.6 Transport

Buildings, trafficlights and signs, etc. must be made removable because of transportation, so the modules can be stacked together easily for transport. Transport takes place by adding 2 sidepanels to 1 module and hanging another



Picture 2: Transportationposibility

module upside-down between the 2 panels (see picture 2) Attention! Mind the weight! The sidepanels contain an opening large enough to be used as handle.

H3 Roads**3.1 Position of the road:**

The road can end at 3 different positions. Only at one of these 3 positions a connection can be made with the next module. The left and the right side of a module do not need to be the same.

The 3 positions are: front, middle and back. (Front is the side where the visitors are standing)

The distance from the front till the centre of the road is:

front :	150
middle:	300
back :	450

Position of the wire in the road:

Both sides of the centerline: 27,5

Width of the road at the connection: 106

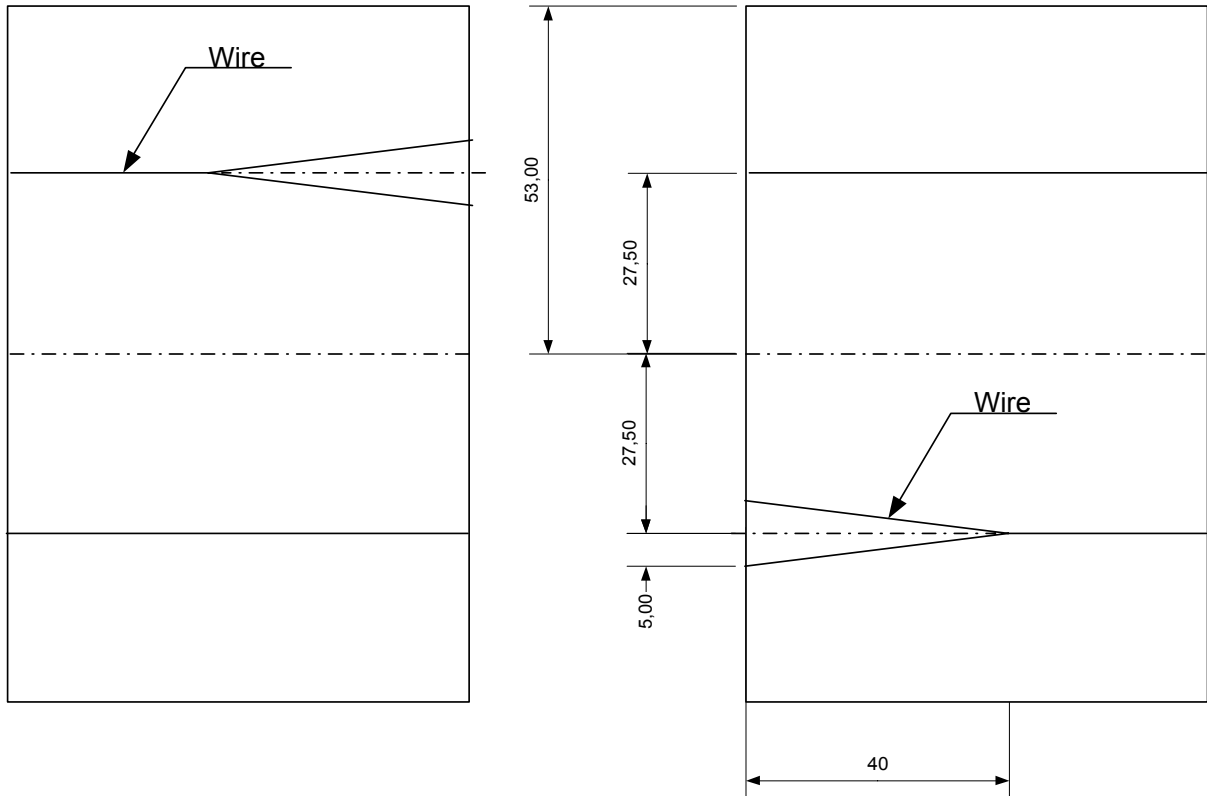
(Exclusive parking places, roadside, etc.; only 2 lanes, one in both directions)

3.2 Construction of the road:

- Width of the straight road at least: 50 per lane.
- Radius of turns at least: 150
use preferably transitional archs (?).
- S-curves as gradually as possible.
- Distance between the wires at straight ways, at least: 55
- Distance between the wires at sharp archs, at least: 65
- Crossingangle of the wires, at least 45,0°
- Vertical clearance at least: 52 (4,5m / 87)
When this clearance is not possible, a detection is needed to take care that vehicles that are too high are stopped in time; ie. with a tetetectiondevice that activates a soppingmagnet.
- It must be impossible for a vehicle to drive of the module -- this can be done with:
 - syntheticglas (mandatory at all outside edges, 150 above roadlevel, also for grabbing of the visitors)
 - guardrails
 - fences
 - hedges
- Slope at most: 10%
- the road needs to be as horizontal as possible

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- the road may not contain any unnecessary bumps, ruts and other irregularities to prevent derailment.
- Crossings needs to be equipped with as many as possible switches.



Picture 3: Switch over from module to module
(only the roadsections are shown)

3.3 Wire

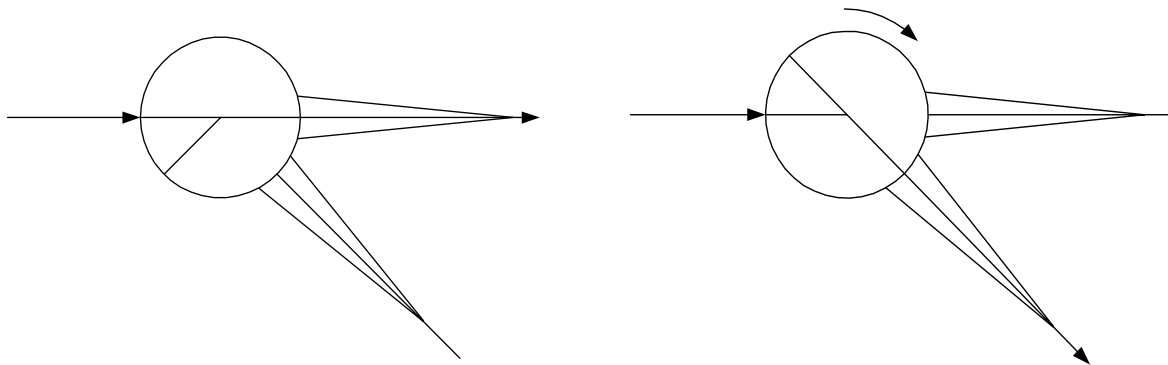
For the guiding of the vehicles only the Faller-wire 1670 is allowed. The wire may be at most 0,5 under the roadsurface.

The use of the Faller-switches 1676 and 1677 is NOT allowed because their unreliability. (Discussion about this is on-going).

3.3.1 Switch

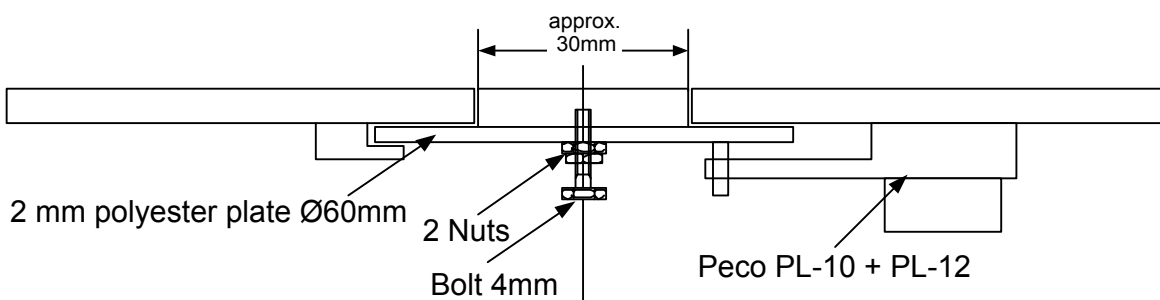
A very simple and good construction of a switch is shown in pictures 4a and 4b. Basically a circle that can turn into the right way. Driven by a switchmotor (Peco PL-10 + PL-12)

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Picture 4a: straight

Picture 4b: turn



Picture 5: Switch mechanism

3.4 Busstop

To be able to use a busstop, first a detectionform is needed. We use a permanent magnet, position at the rightbottomside of the bus.

Example connections can be found in the very good issue of the NVM (Nederlandse Vereniging van Modelbouwer, Dutch Association of Modellers):

Het Faller Car System, by Paul de Groot. (With lot of work outs and connections) only in Dutch

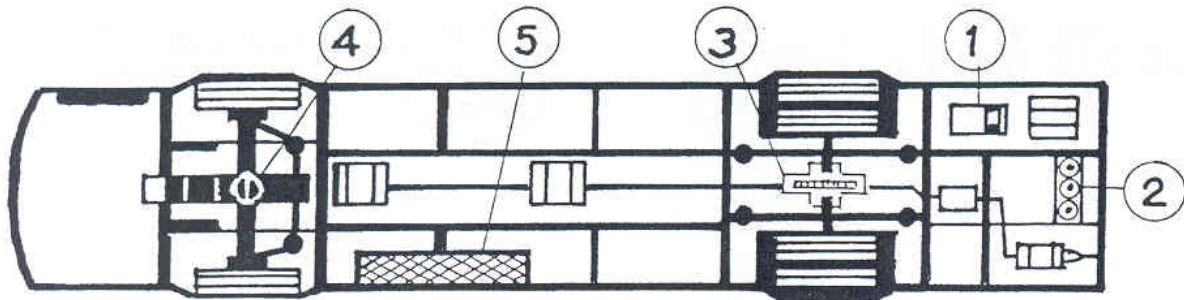
3.5 RailRoad crossings

When nessecary: use MTN900 (M-track norm)

H4 Vehicles

4.1 Allowed vehicles

All vehicles suitable for Faller Car System and that can match the demand for turningcircle, are allowed. It does not matter whether the vehicles is bought or self-made.



Picture 6: Technical layout

4.2 Technical layout

1. on/off switch
2. Rechargeconnection
3. Drivngear
4. Steeringmechanisme
5. Reedcontact

4.3 Vehicle detection and recognition

Vehicle detection and recognition works as follows: with the aid of a permanent magnet at the right- and/or leftbottomside of the vehicle 4 sorts of vehicles can be distinguished:

- normale vehicles: no permanent magnet;
- bus: permanent magnet on the rightbottomside;
- cat3: permanent magnet on the leftbottomside;
- cat4: permanent magnet on the right- and leftbottomside.

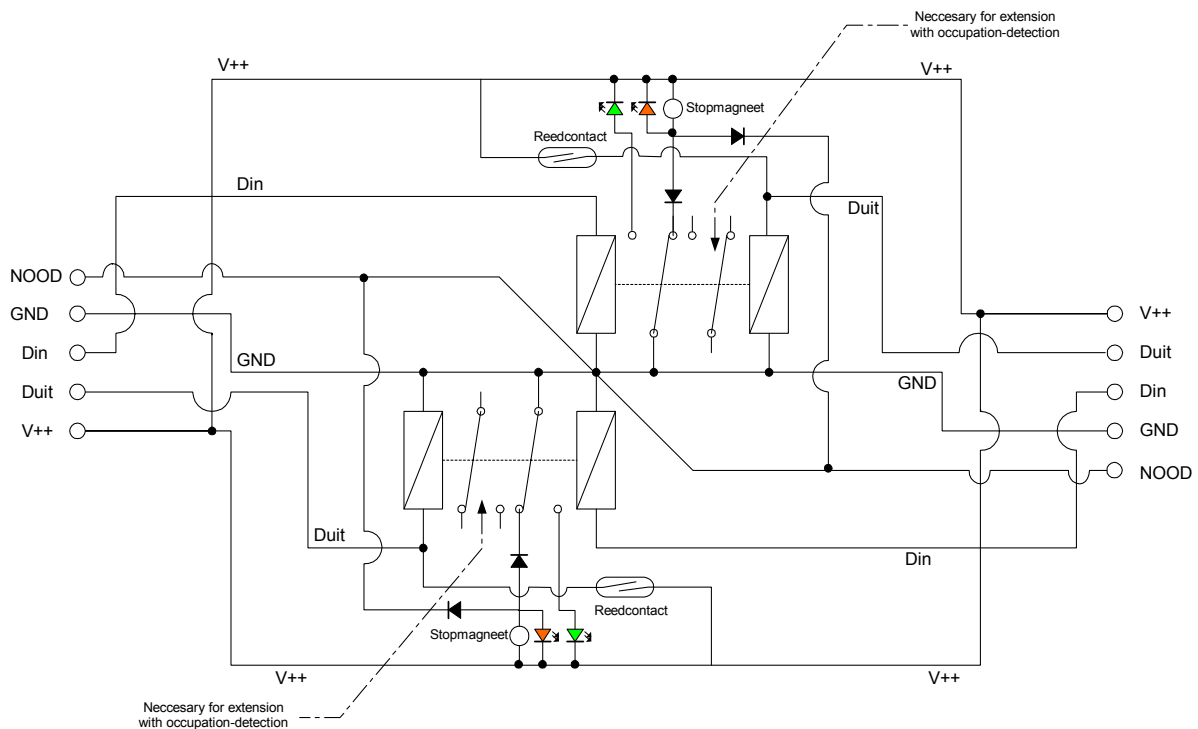
With the aid of the permanent magnet a reedcontact is activated, which is located just below the surface of the road. The permanent magnet may not be too strong, cause otherwise the reedcontact in the wire can be activated.

(Other methods are welcome)

H5 Protection en electrical connection

5.1 Blocksysteem

To prevent faster moving vehicles to collapse with slower vehicles in front of them, a blocksystem is used at the complete track. The blocksystem works as follows: The first vehicle moves over a detection (a reedcontact positioned between the wire). The detection gives a pulse. This pulse is used to set the block behind the vehicle to



Picture 7: blocksystem for 2 directions

unsafe by activating a stopmagnet at the beginning of the block. At the same time will the block before the unsafe block be made safe. This system takes care that the space between 2 vehicles will allways be at least 1 block.

By positioning the stopmagnets at tactical places (crossings, crosswalks, fuelstations, etc), this securitysystem will not be too conspicuous

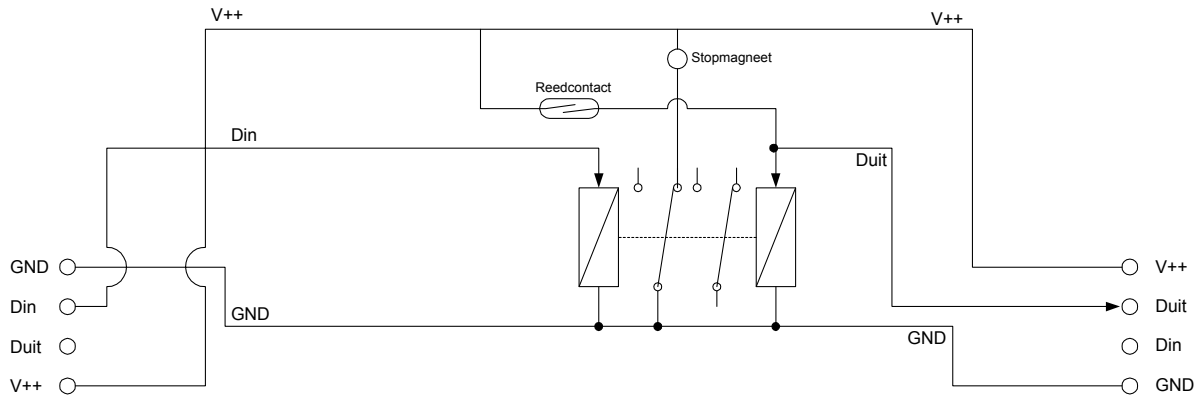
1. Per module at least 1 block
2. blocklenght at least: 230 (20m/87)

The electrical diagrams are in pictures 7 and 8.

In picture 7 the diagram is extended with some facilities:

1. NOOD: Emergencystop, with 1 push at a special buttom all stopmagnets are activated.
2. For control purposes red and green LED are added. So you can see at once in which situationa block is. Green=safe, Red = unsafe = stop.

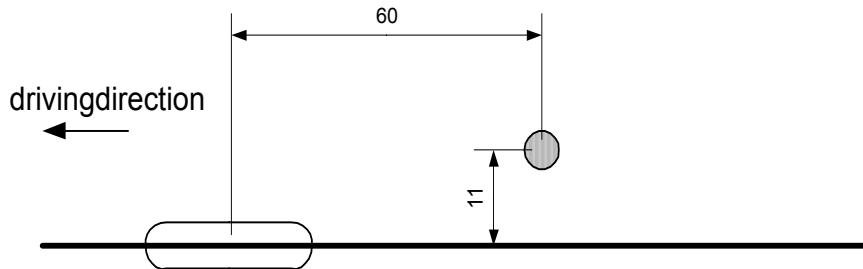
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Picture 8: blocksystem for 1 direction

5.1.1 Reedcontact

The reedcontact needs to switch reliable when activated by the steeringmagnet. The reedcontact offered by Conrad Electronics nr. 503800-xx is suitable in this case. At the place where the contact (vehicledetector) will be seated, a piece of 11mm will be taken out of the wire. After that a hole must be made to put the contact in. The

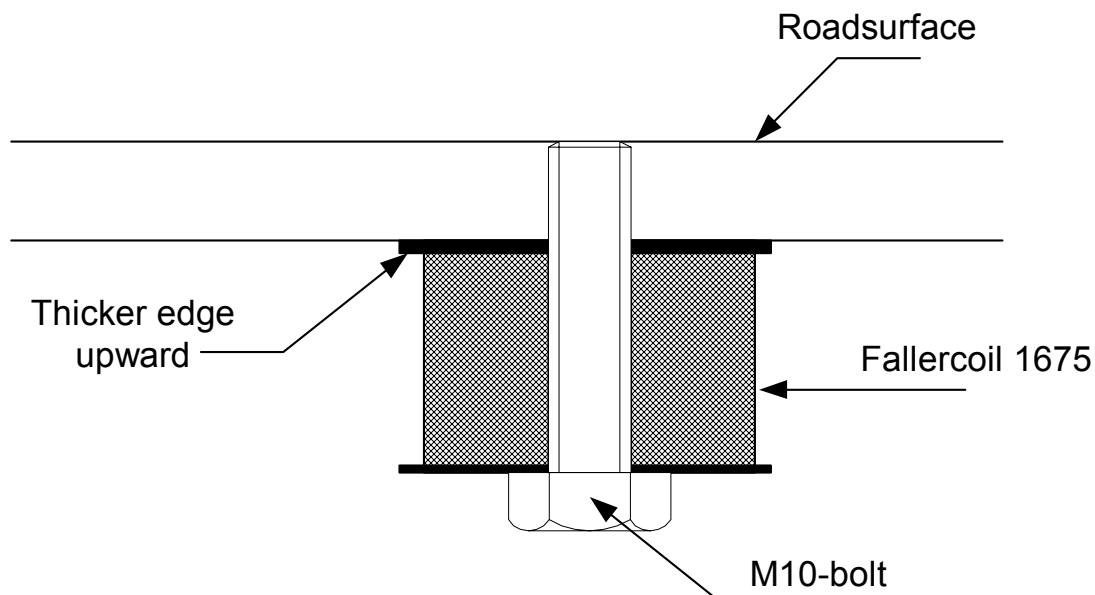


Picture 9: Position of IN-reedcontact and stopmagnet

contact will be part of the wire, so a vehicle will always pass over the contact.

5.1.2 Stopmagnet

The stopmagnet (Faller 1670) is placed, seen from the corresponding IN-reedcontact, 60mm before the contact, with the hart of the magnet 11mm to the right of the wire. The magnet consists of a Faller-spool 1675 with a M10-bolt as core, reaching till just under the surface of the road. The best is to drill a 9mm hole in the foundation of the road, and to turn a made-to-size M10-bolt at right angle into it. In this way the bolt will be fixed very well.



Picture 10: Assembly of the stopmagnet

5.1.3 Relais

The relais can be implemented both conventional as 'solid-state'. In case of a conventional relais, the specifications are: bistable, 12 Volt, 960 S, with 2spools, ie. Conrad 503398-xx.

3. The resistance of the relais may not be under 960S : the reedcontacts can not handle that!

5.2 Supply

The whole carsystem will be supplied with 10V DC (completely smooth) bij the connections V++ and GND. The supply is equiped with a surgeprotector and an emergency powersupply. The last mentioned is necessary, because the vehicles will otherwise run wild when losing the power.

5.3 Emergencystop

On some places an Emergencybutton must be installed. They will activated ALL stopmagnets. (Who knows how this can be done?)

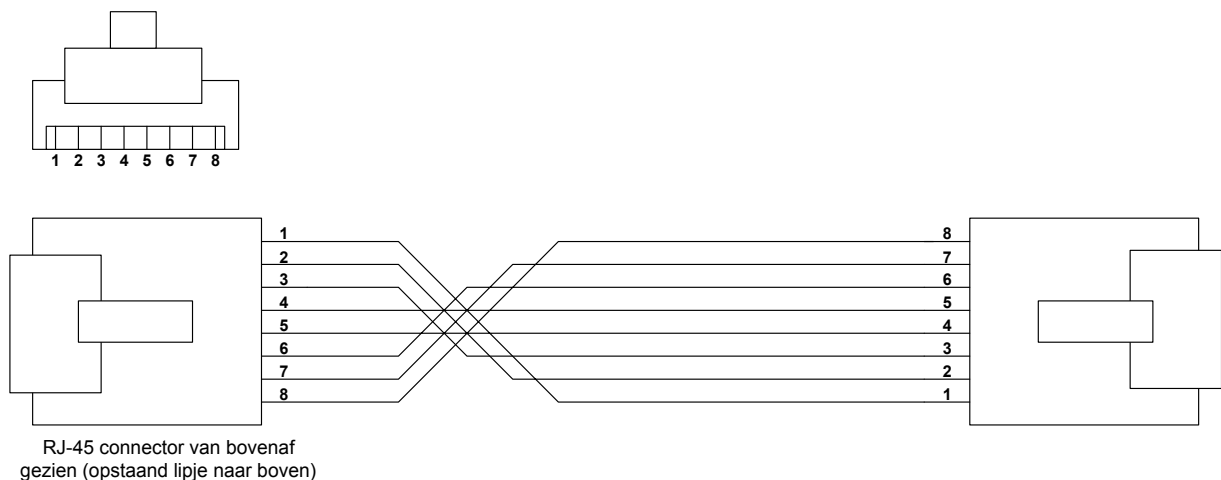
5.4 Electrical connection

The connection between 2 modules consists of a 4-pair flatcable, with a RJ-45 connector at both ends. On the module a contra-RJ-45 connector is installed. The wiring is as follows:

Pin-nr.	Color-code	Code	Function
1	white-orange	NOOD	Activation from the Emergency switch
2	orange		
3	white-green	GND	Ground (=0)
4	blue	Din	Incoming block signal
5	white-blue	Duit	Outgoing block signal
6	green	V++	+14V=
7	white-brown	Vdig1	14-18V• (reserved for digital)
8	brown	Vdig2	14-18V• (reserved for digital)

TABLE 1 Pin-layout RJ-45 contra-connector (=module side)

The connection cable has 1 pair crossed: blue/white-blue (nr. 4 and 5) In the drawing below it looks like the opposite, but that is deception: The connector is turned around and makes all the wires turn with it.



Picture 11: connection cable (schematic)

H6 Other**6.1 Radiocontrolled vehicles**

The use of radio-controlled vehicles is NOT allowed over the road. Radio-controlled vehicles may be used on ones own module, without any influence and obstruction of the vehicles and the block system.

6.2 Automatic charging

Anyone knowing a way to charge the vehicles on the track, (ie. At a gas station) is requested to work it out and send it to one of the administrators of this standard

6.3 Connecting with MTN900

What is possible, what is not, and how does a connection cable look like?
(RJ-45 to PTT-connector)

What can be connected are the signal, described in MTN900:

- GND
- V++
- Din
- Duit

The blocksystem will continue, like the electrical supply. (Who supplies the nessecary current when connected? It is NOT possible to do this on both sides!)

Not connected will be the other signals:

- NOOD
- Vdig1
- Vdig2

This means no emergency stop at the MTN900-part, and no digital-signals at their part. (No feedback, etc.)

Bijlage A: Handige adressen

Conrad electronics (Postorderbedrijf):

Internet: www.conrad.com
Telefoon: 0800-0996600 (gratis)
Telefax: 053-4283075
Postadres: Postbus 12
7500 AA Enschede

Van Meekeren Electronica

Internet: www.meekeren.nl
Telefoon: 0252-370012
Telefax: 0252-370793
Adres: Vinkenstraat 57
2211 LB Noordwijkerhout

NVM Tekeningarchief

Telefoon: 073-6420773
Telefax: 073-6420774
Postbus 790
5201 AT 's Hertogenbosch

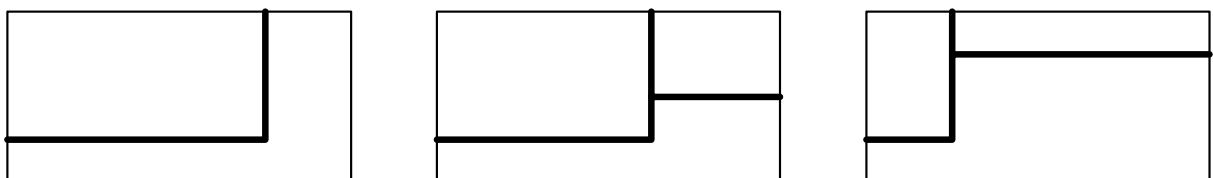
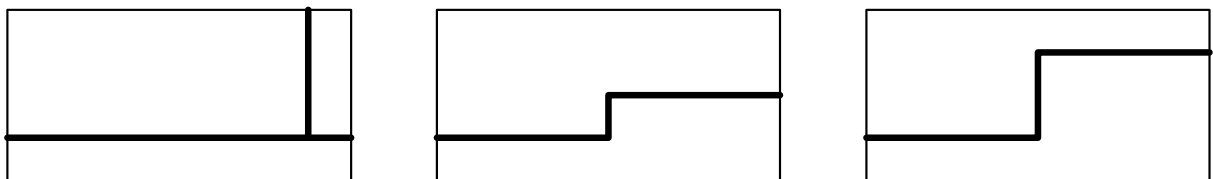
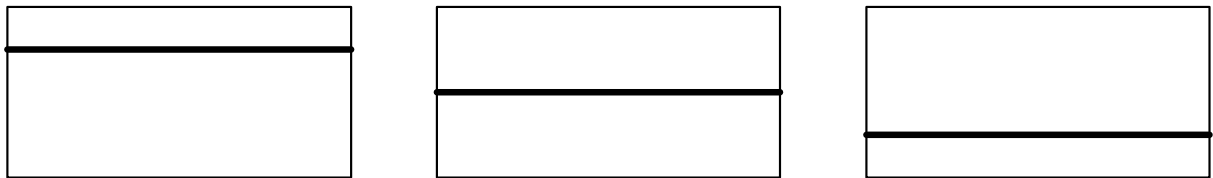
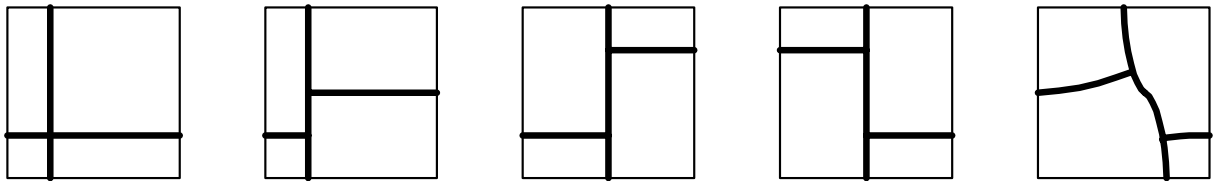
Faller op internet: www.faller.de

Bijlage B: Literatuurlijst

Het Faller Car System, P. de Groot, Uitgave van de Nederlands vereniging van Modelbouwers (NVM), 26 p., A4, 1998

In deze uitgave beschrijft P. de Groot vrijwel alle aspecten die met FCS te maken hebben. (Verkrijgbaar bij het NVM tekeningarchief)

Bijlage C: Modulevormen



Mogelijk modulevormen, waarbij de vierkantjes de koppelmodules zijn (of eindmodules) en de rechthoekige de scenery-modules. De vormen zijn slechts voorbeelden en de wegen mogen alle mogelijke (vloeiende) vormen hebben, zolang er maar op de vereiste plekken aangekoppeld kan worden.