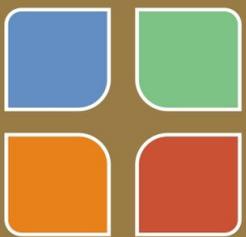


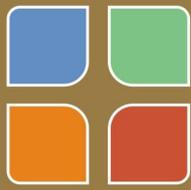
User Manual

Function Module
FB-SW



DC
Car

Digital Controlled
Digitale Steuerung
für Car-Systeme



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Car

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Congratulations on your purchase of this Function Module.

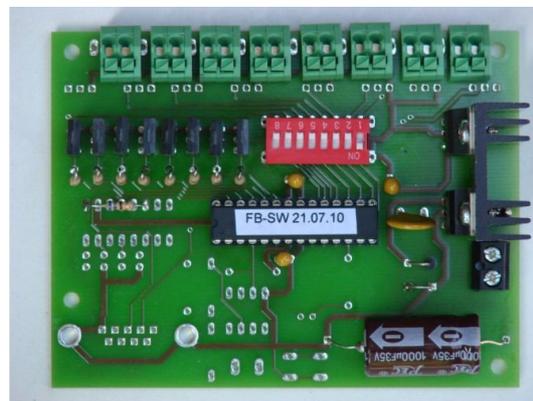
With this module, you are able to simply control the functions in DC-Car Decoders. This is done by short range infrared LED's.

Operation:

With this module, the DC-Car vehicles can be controlled without using a DCC command station or a personal computer.

The operation is briefly as follows: The chip on the board sends a continuous command to the connected Infrared LED's which, in turn, transfer the command to a car that comes within the range of the infrared LED (approximately 0-25cm). The broadcast command is used by all cars with a DC Car decoder with Anti Collision System. The decoder receives and processes this, and thus it is independent of the DC-Car decoder address. By now you can connect the infrared LED's via switch to the function module. Doing so you can control functions without a DCC command station or computer software, yet the cars carried out certain functions like: light on / off, speed up / slow down, stop, etc.

The Function module SW has a DIP switches with which you can select groups of 8 different commands, called group A – H. In addition, the SW function module has two abilities: all dip switches open: all 8 outputs transmit a Stop command and all dipswitches closed: Remote control mode



Each module has eight outputs (channels) for connection of infrared LED's, with which the several functions in the cars are controlled. The LED's are placed along the side of the road, on places where a particular function has to be switched on or off. With the function module, in combination with the standard anti collision system, you generate a very natural behaviour of the cars without the use of a DCC command station and/or a PC.

On transmitting a infrared stop command the brake lights of the cars will automatically light up. The cars have a built-in acceleration and deceleration so will slowly go up when the stop command is cancelled. The features of functions are so divided over the various groups A-H that most meaningful combinations are combined.

With an extension of the print it is possible to control the Function module by a DCC command station, the module is then called a Function Decoder.

Choice of 10 Job Opportunities

With the dipswitches the following options are available:

Possibility	Dipswitch	Function group
1	All closed	8 fold Stop command
2	1	FB-A
3	2	FB-B
4	3	FB-C
5	4	FB-D
6	5	FB-E
7	6	FB-F
8	7	FB-G
9	8	FB-H
10	Alle open	Remote control mode

Properties of the function outputs

Following overview shows which function group contain what commands:

1. 8 Fold Stop command:

Connection 1: Speed to driving position 0 (thus acts as the faller stop coil)
Connection 2: Speed to driving position 0 (thus acts as the faller stop coil)
Connection 3: Speed to driving position 0 (thus acts as the faller stop coil)
Connection 4: Speed to driving position 0 (thus acts as the faller stop coil)
Connection 5: Speed to driving position 0 (thus acts as the faller stop coil)
Connection 6: Speed to driving position 0 (thus acts as the faller stop coil)
Connection 7: Speed to driving position 0 (thus acts as the faller stop coil)
Connection 8: Speed to driving position 0 (thus acts as the faller stop coil)

2 General functions, Switch 1 to ON, Group A:

Connection 1: Speed to speed step 0 (thus acts as the faller stop coil)
Connection 2: Lighting 1 ON
Connection 3: Lighting 1 OFF
Connection 4: Indicator left ON
Connection 5: Indicator right ON
Connection 6: Indicator light OFF
Connection 7: Speed to speed step 14
Connection 8: Speed to speed step 28

3 Emergency Services, Switch 2 to ON, Group B:

Connection 1: Speed to speed step 0 (thus acts as the faller stop coil)
Connection 2: Alarm Lights ON
Connection 3: Indicators OFF
Connection 4: Flashing lights ON
Connection 5: Flashing lights OFF
Connection 6: Flashes ON
Connection 7: Flashes OFF
Connection 8: Speed to driving position 28

4 More light and speed functions, Switch 3 to ON, Group C:

Connection 1: Light output 2 ON
Connection 2: Light output 2 OFF
Connection 3: Light output 3 ON
Connection 4: Light output 3 OFF
Connection 5: Increase speed with 2 speed steps
Connection 6: Speed reduced by 2 speed steps
Connection 7: Speed to speed step 10

Connection 8: Speed to speed step 21

5 Parking functions, Switch 4 to ON, Group D:

- Connection 1: Temporary stop and switch off lights (Stop Time set by CV 108)
- Connection 2: Temporary stop and Left indicator on (Stop Time set by CV 108)
- Connection 3: Temporary Stop and Right indicator on (Stop Time set by CV 108)
- Connection 4: Stop and Hazard lights (Stop Time set by CV 108)
- Connection 5: Driving/pull with speed as specified in CV 110 and indicators turned OFF
- Connection 6: Driving/pull with speed as specified in CV 110 and indicator left ON (flash time selectable by CV 109)
- Connection 7: Driving/pull with speed as specified in CV 110 and indicator right ON (flash time selectable by CV 109)
- Connection 8: Driving/pull with speed as specified in CV 110 and hazard lights ON (flashing time adjustable with CV 109)

6 Automatic bus functions, Switch 5 to ON, Group E:

- Connection 1: Speed to speed step 0 (thus acts as the faller stop coil)
- Connection 2: Bus stop, Indicator OFF, Interior light OFF (Stop Time adjustable with CV103)
- Connection 3: Bus stop, Indicator OFF, Interior light ON (Stop Time adjustable with CV103)
- Connection 4: Bus stop, Indicator right ON, Interior light ON (Stop Time adjustable with CV103)
- Connection 5: Bus stop, Hazard lights ON, Interior light ON (Stop Time adjustable with CV103)
- Connection 6: Bus departs with speed as specified in CV 105, indicator left ON (Flash time adjustable with CV106)
- Connection 7: Bus arrives with speed as specified in CV 102, indicator right ON (Flash time adjustable with CV101)
- Connection 8: Speed to speed step 0 (thus acts as the faller stop coil)

! Features E2 - E7 only be conducted by vehicle type 13, 14 and 15 as specified in CV 100!

7 Technical functions, Switch 6 to ON, Group F:

- Connection 1: Disable Anti Collision System
- Connection 2: Enable Anti-Collision System
- Connection 3: Reed contact ignore
- Connection 4: Reed contact reading
- Connection 5: Light sensor OFF (only with decoder DC0 * XF)
- Connection 6: Light sensor ON (only decoding DC0 * XF)
- Connection 7: IR LED on the back OFF
- Connection 8: IR LED on the back ON

8 Rotating lights, strobes and indicators, Switch 7 to ON, Group G:

- Connection 1: Speed to speed step 0 (thus acts as the faller stop coil)
- Connection 2: Rotating lights and flashers ON
- Connection 3: Rotating lights and flashers OFF
- Connection 4: Indicators left ON
- Connection 5: Indicators right ON
- Connection 6: Indicators OFF
- Connection 7: Speed to speed step 14
- Connection 8: Speed to speed step 28

9 Compact, Switch 8 to ON, Group H:

- Connection 1: Speed to speed step 0 (thus acts as the faller stop coil)
- Connection 2: Lighting 1, direction indicators, and rotating lights and flashers OFF
- Connection 3: Lighting 1 ON
- Connection 4: Indicators left ON
- Connection 5: Indicators right OFF
- Connection 6: Rotating lights and flashers ON
- Connection 7: Speed to speed step 14

Connection 8: Speed to speed step 28

10. Remote control mode, all switches OFF:

Connection 1: Temporary stop and switch off lights (Stop Time set by CV 108)

Connection 2: Driving/pull with speed as specified in CV 110 and indicators turned OFF

Connection 3: Increase speed with 2 speed steps

Connection 4: Lighting 1, direction indicators, and rotating lights and flashers OFF

Connection 5: Indicator left ON

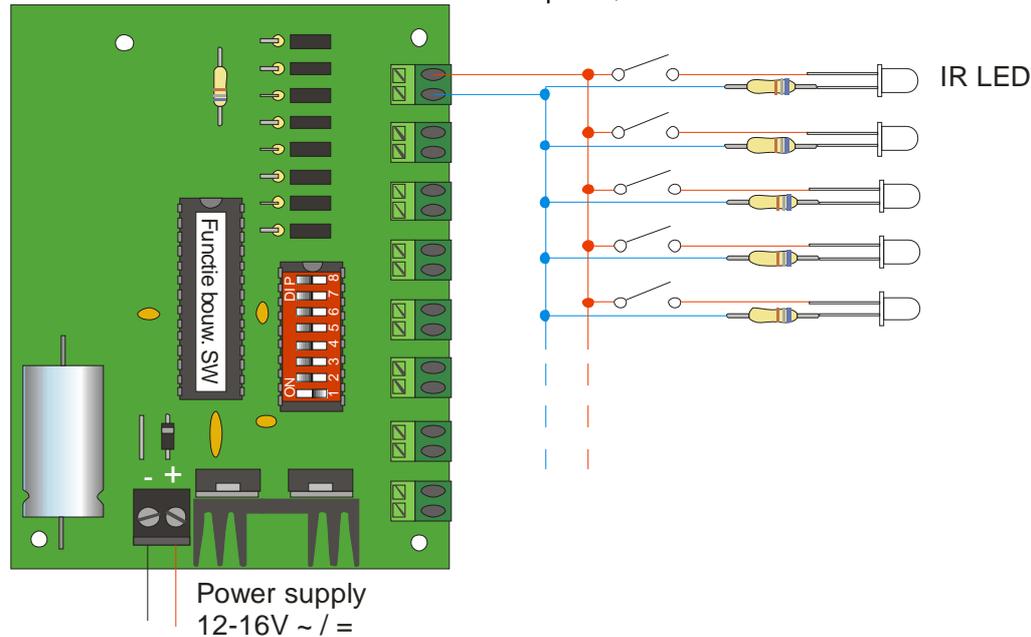
Connection 6: Indicator right ON

Connection 7: Lighting 1 ON

Connection 8: Rotating lights and flashers ON

Connecting the Function Module:

The standard connection without DCC option, looks like this:



The function module transmits a coded infrared signal to all the cars that have a DC Car decoder with anti-collision system (infrared receiver available). Each output transmits a code that activates the corresponding function. The output is connected to IR LED and a serial resistor. Bear in mind that (IR) LED's never may be connected to the output directly, a serial resistor is always needed!

With the serial resistors you are able to determine the IR range of the LED. The values are between 100 and 2000 Ohms also depending on the maximum current that the applied IR LED may have.

A low serial resistor give a higher current and thus a longer range. However, beware: a too high current will damage the LED!

When using a serial switch or relay contact, as shown in the diagram, the function can be switch ON or OFF.

The IR LEDs are available in several sizes: 5mm, 3mm, and the tiny 0603 version which can be nearly invisible built in the layout. Also there are road marking poles available with build in IR LED.

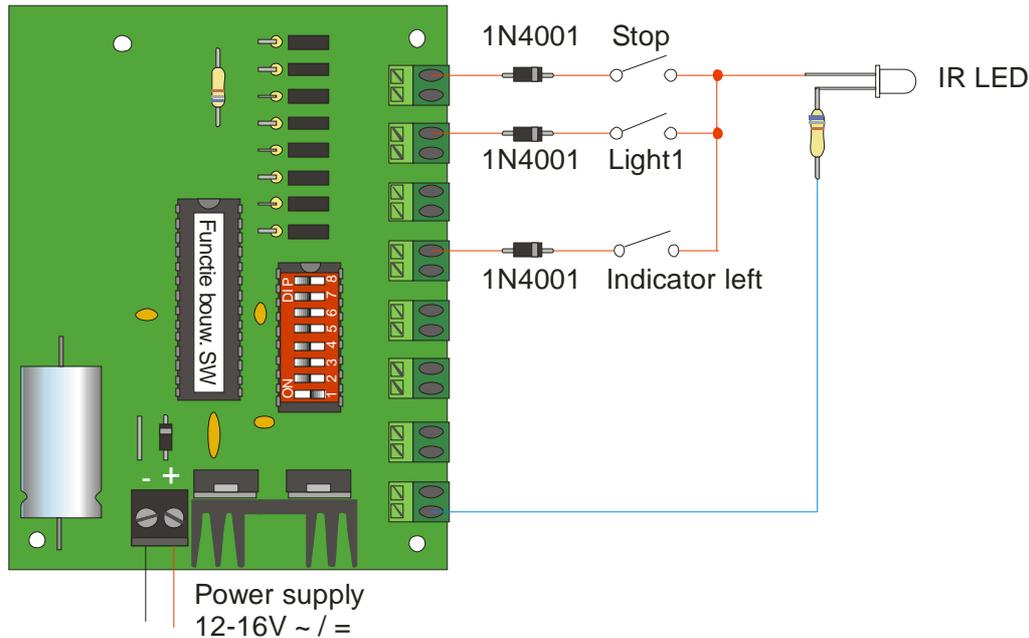
Ability to use standard 1K resistors:

1x 1 Ohms: average range

2x 1 Ohms parallel: long-range

2x 1 kOhm in series: short-range

It is also possible to simultaneously activate multiple functions via one IR LED. The schedule looks like this:



This can only be done if command signals are from one and the same function module, it's not allowed to mix commands from various modules.

Automatic functions with other DC-Car products:

Having noticed the above mentioned methods it is easy to generate automatic traffic control. For instance combining a function module with our S4-Car servo decoder can generate automatic indicator functions combined with a servo turn out. The relays belonging to the servo switches the indicator command from the function module. F.i. if the turn out is to the left, the left indicator is switched ON. Don't forget to place a indicator OFF command after the turn out!

An other example is our traffic light decoder. Cars will stop in front of a red light. Only the first car is stopped by the Stop command from the function module all following cars are automatically stopped by the anti collision system of the DC-Car decoders it self so no further hardware is required.

The same can be done with the railroad crossing. The switch or relais from the crossing connects a IR LED to the STOP function of the function module and again no hardware is required to stop following cars.

The function module and a digital DCC command station:

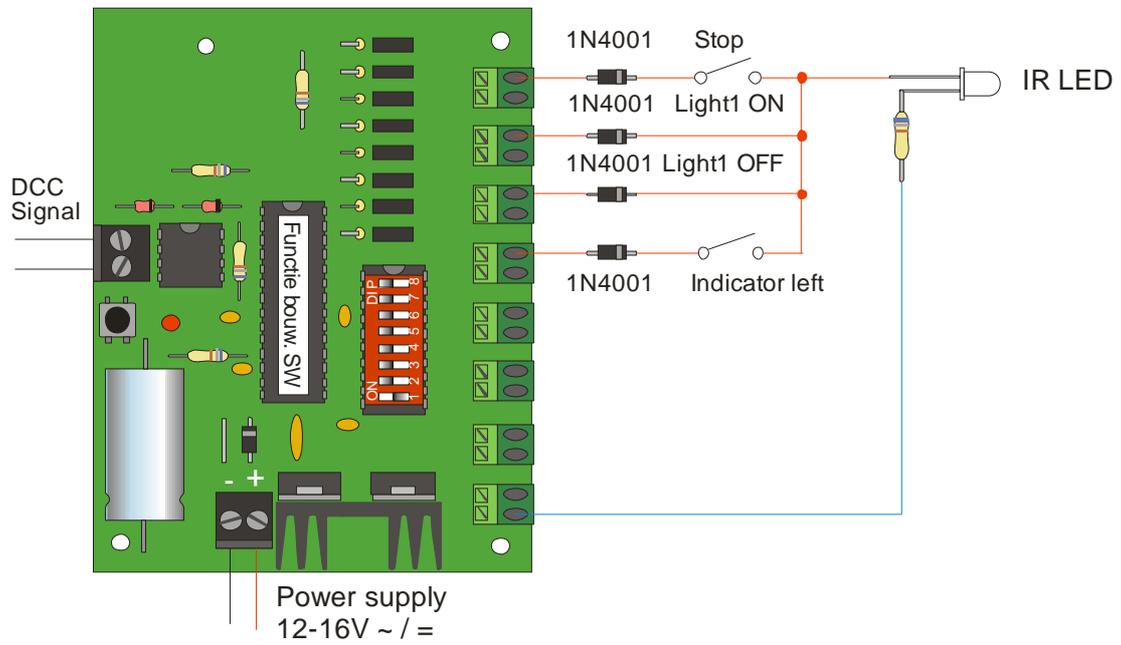
The function module can also be equipped with a DCC input. In addition to the properties as mentioned above, it is therefore possible to operate the module with a DCC command station and and a connected PC.

The 8 outputs are coupled to 8 addresses that change over the corresponding functions. This of course works for all the LEDs on the same output simultaneously.

Examples:

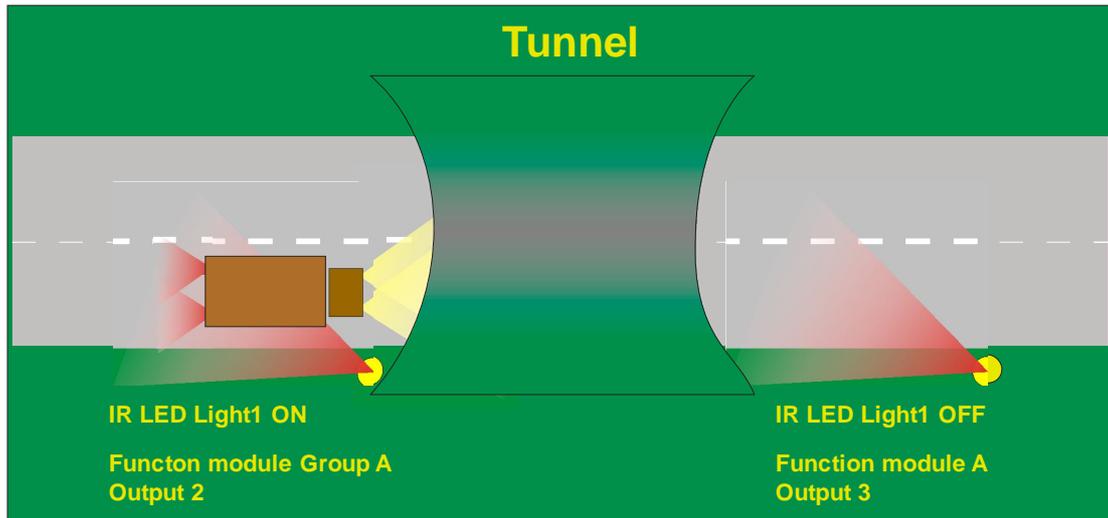
The DCC command station switches the STOP function in case of an emergency
 The DCC command station switch lighting in the event of day / night operation

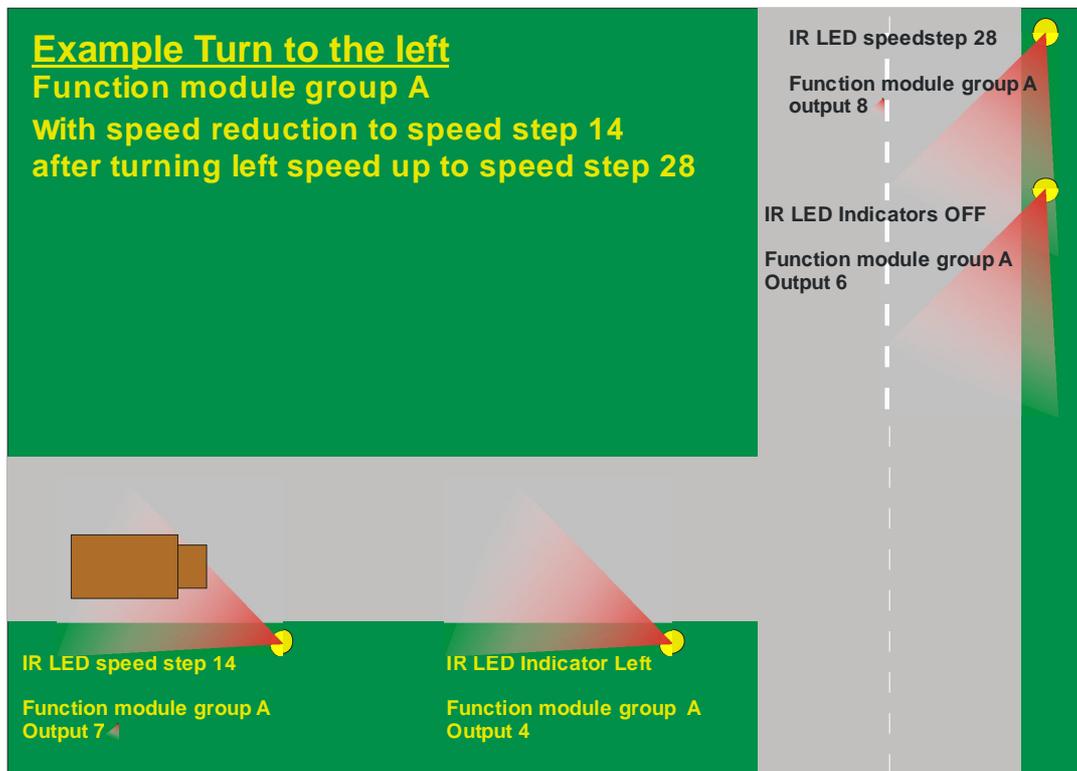
Mixed method is also possible: the indicator is switched by the signal contacts, lighting is operated by the DCC control. See the diagram below.



Placing the IR LEDs on the layout:

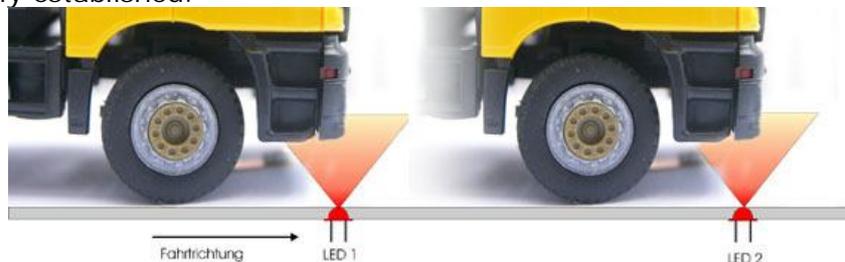
Infrared LEDs are next to or in the roadway such that the cars can receive the IR light in the desired location to perform a function (see pictures below).





In any case, the infrared LED should be noted that an oncoming vehicle can "see" it. So on the straight roads the cars perform the function within a distance of 5-25 cm from the LED.

It sometimes happens that parallel moving vehicles which turns to the left also are affected by the IR LED. In this case, the series resistor can be increased a bit so the range decreases slightly. Another possibility is to incorporate the LED into the road so that they only radiate upwards (see picture below). In this case use IR LEDs with a wide beam angle. The distance from the LED's should be about 5 - to be 10 cm and can be experimentally established.



By passing the first LED the car decelerates and at the second it stops. On vehicles increased stopping distances multiple LEDs can be desirable. Each LED has its own series resistor connected to the corresponding output.

Specifications:

Supply voltage: 9-12 volts AC or 10-14 V DC (mind the position of the plus cable)
 Max. current: 1A. This is OK for 20 pcs LED with 20mA LEDs or 50 Low current LEDs connected.

Testing IR light:

To check if an IR output is working a normal LED, with resistor, can be used. IR light can be seen by a digital photo camera with a display feature, the IR light is shown as a white spot. Our Remote control 24PLUS also has the capability of testing IR functions. In addition, it is possible to make a test device with our IR receiver module.

More information: See the DC-Car WiKi at:
<http://wiki.dc-car.de/index.php?title=Hauptseite>

Or visit our website: www.miniatuura.nl



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