Track detection

Note, the instruction is still being processed and updated.

Check from time to time www.mollehem.se/doc/instruktioner/instruction_Trackdetection.pdf for the latest version.

1 TRACK DETECTION

Track detection is used when you want to know if a track is occupied by locomotives and carriages. This knowledge can then be used e.g. to adjust the signals.

The detection can take place in several ways such as light beams that are disturbed when things pass or by detection of power consumers on the track.

MGP switch decoders and signal decoders have inputs for track detection. Via these inputs, detections can be transformed to LocoNet messages and used in the MGP system.

1.1 CURRENT DETECTION

These detectors are connected to the wires that supply the track with current and then current is detected when it flows to the track.

A locomotive draws power, a lot when it moves and when when standing still, its decoder draws enough current to be detectable.
Carriages with lights also draw power.
Carriages without power consumption cannot be detected in this way, but if they are equipped with conductive wheel axles (resistance on existing axles) these can also be detected.

Current detection detects a train regardless of where it is on the track fed with the detected wire.

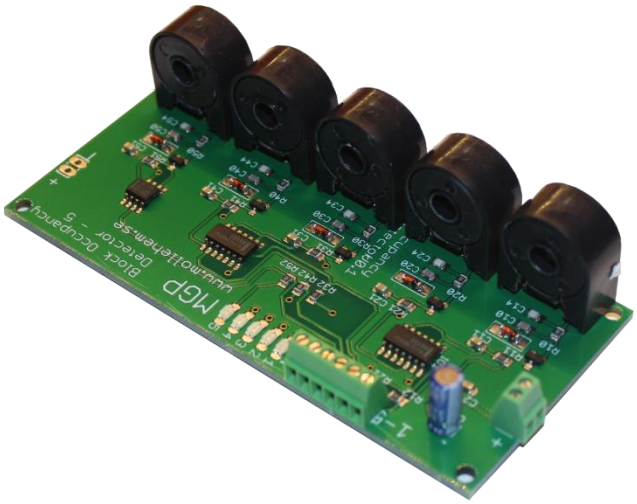
1.2 OPTICAL DETECTORS

A detector can also work with a light beam, either when it is refracted or if you let the beam be reflected towards the locomotive and carriages.

The light used is usually infrared, IR, which is invisible to humans.

A detection with light takes place at a point along the track, i.e. you can detect a locomotive that is passing or is just standing in front of the detector, but not just before or after.
A light detector, on the other hand, works on both locomotives and wagons without these having to be power consumers.

2 CURRENT DETECTOR, TRANSFORMER TYPE, 2 AND 5



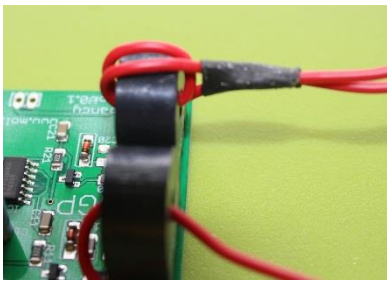
MGP's track sensing card detects current going to the track. This is done by passing the track current through small coils (transformers).
The picture to the right shows a card with five coils and this card can then detect five tracks.

Cards to detect 2 or 5 tracks are available from MGP.

The coils have holes in the middle and you let the wire that leads current to the track pass through that hole.

The output from the detection card is connected to the inputs on signal or switch decoders.

The detection cards have LEDs that light up when the card detects current.



The sensitivity, i.e. how much current is needed to be interpreted as occupied track, can be controlled by putting the wire for the track current one or more turns through the coil.
In the picture to the right, the upper coil has a track wire drawn two times through the coil, while the lower coil has the wire passing only once.

The cards for detection are powered by a 5 volt voltage connector. This can be taken from the corresponding connection of the connected decoder.

If the detection cards have their own power supply, the cards and connected detector must have "common ground", which means that "-" on the voltage terminals on both cards must be connected.

2.1 POWER SUPPLY FOR THE CARDS

The cards need power to work. Input for this is in the top and bottom of the card. At the top, the connection is provided with a screw terminal, while the lower edge is the solder connection.

On switch and signal cards, there are 5 volt sockets and this can be conveniently used to supply power to the card.

If a separate power supply is used, the cards must still be connected to their switchboard / signal cards but only on minus side.

The card is normally used with 5 volts, but can also be used with higher voltages, up to 12 volts.
However, it is always 5 volts that must be used together with MGP's other cards!

2.2 OUTPUT

To the right of the picture is the output which must be connected to the turnout or signal card.
Normally an output is used which gives 1 (4-5 volts) when the detector indicates that locomotives are on the track.
In case of free track, the output is 0 (0 volts).
MGP decoders use these levels.

As an alternative, the detectors can be used with the output in the form of an "open collector".
When the track is occupied, the output is "floating", i.e. does not affect the connected device.
In that case, the output will reduce ("lower") the connected unit to 0 volts when the track is free.

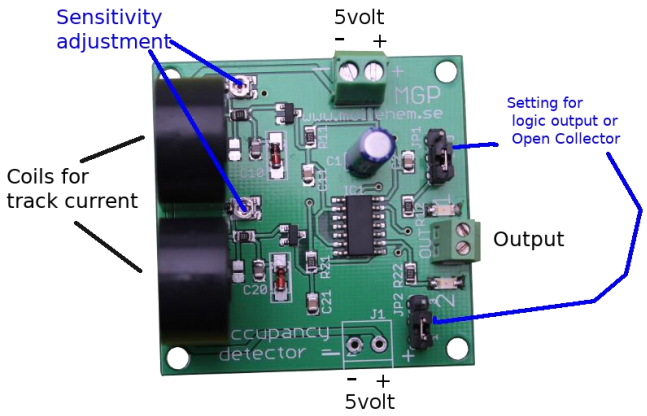
This case can be used when connected cards of other brands require it - see the manuals for used cards.

2.2.1 OUTPUT ON DETECTOR CARD 2

The board has a screw terminal for two connections.
Output from the card can be changed between normal one / zero and “Open collector (“OC”).

If the jumper place as in the picture, on the "lower" two pins, the output works with two states 1/0.

If the jumpers are moved, the output will be of the type "open collector”.

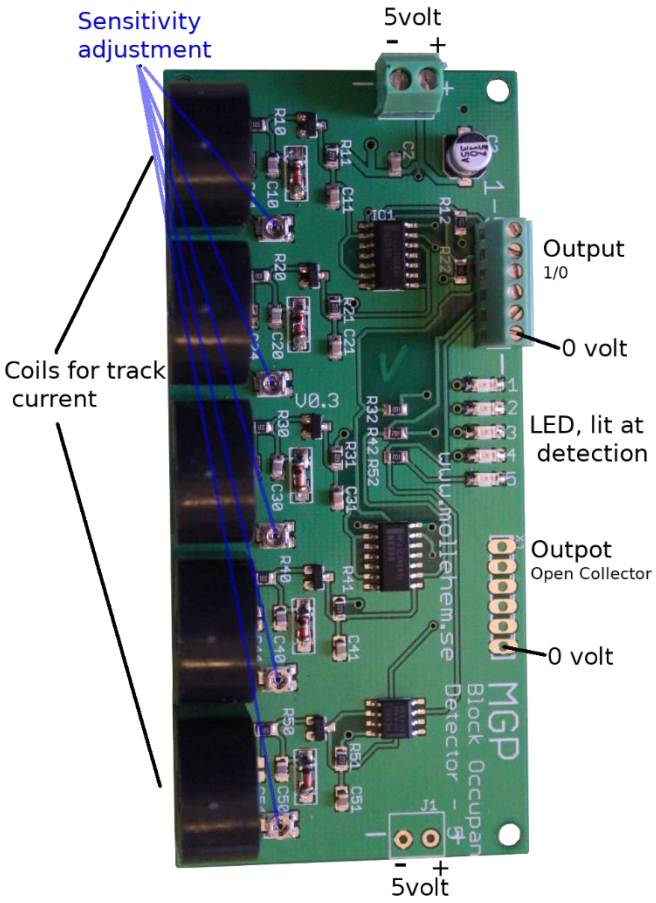


2.2.2 OUTPUT ON DETECTOR CARD 5

On the card there is a screw terminal with 6 connections.
Connections are. from top in the picture, detector 1-5 and the bottom connection is common gnd to the decoder cards.

Further down on the card in the picture, there are solder points without screw terminal.
These can be used in those cases the card must be connected to something that requires "Open Collector".

NOTE, starting with year 2021, the pre mounted screw terminal will change to the second place, so from 2021 the default output for the cards will be as "Open Collector".

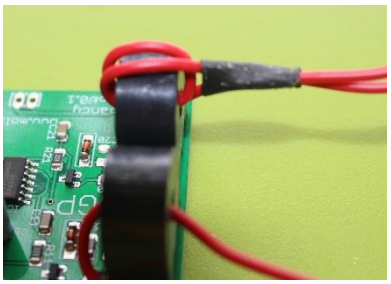


2.3 SENSITIVITY

A wire that only have one passage through the hole in the coil will provide detection when the current is approx. 3-4mA or more.

If the wire is pulled once more through the coil, the current level is halved to approx. 1.5-2mA.

If the wire is pulled through the hole a third time, the detection level is down to 1mA or even less.



The card has a trim potentiometer with which you can fine-tune the sensing. If it is turned clockwise, the sensitivity increases and counter clockwise it decreases.

Note that the track also draws power to some extent.
The DCC signal is an "alternating current" and there will be "inductive connections" between the two sides of the track or two wires that is close to each other. This means that with long tracks or feeder wires to the track, there will be a certain current and the sensitivity of the detector may thus need to be adjusted depending on the length of the track.
Always keep the wires between the detector and the track as short as possible. With longer tracks and wires, the detector will always detect trains even without any real trains present.

3 CURRENT DETECTOR, DIODE TYPE, 8

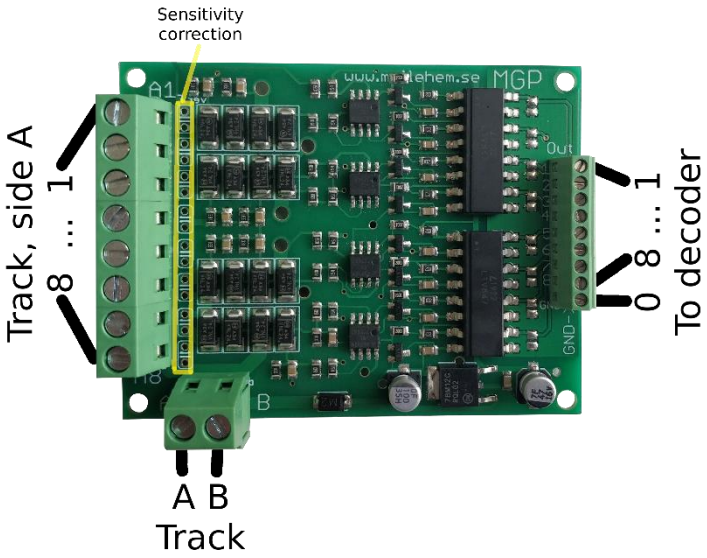
This detector card detects current through a voltage drop over diodes and has connections for 8 tracks.

The voltage drop over the diodes are around 0.3 volt which is taken from the track voltage.

The card takes it's power from the track power and need no extra power.

Sensitivity is around 1.5mA.

The decoder side of the detector is isolated from the track side, through opto couplers.



3.1 OUTPUT

Output is of the type "open Collector", which means that the output is either "unconnected" ("floating") or connected to GND (0 volt).

When connected to the MGP decoders, the input setting "Input unconnected state" should be set as "Normal, always high".

The output state for "occupancy" is low, 0 volt, and when the track is "free", the output will be "floating". Note, that GND (0 volt) on both the detector card and the decoder must be connected.

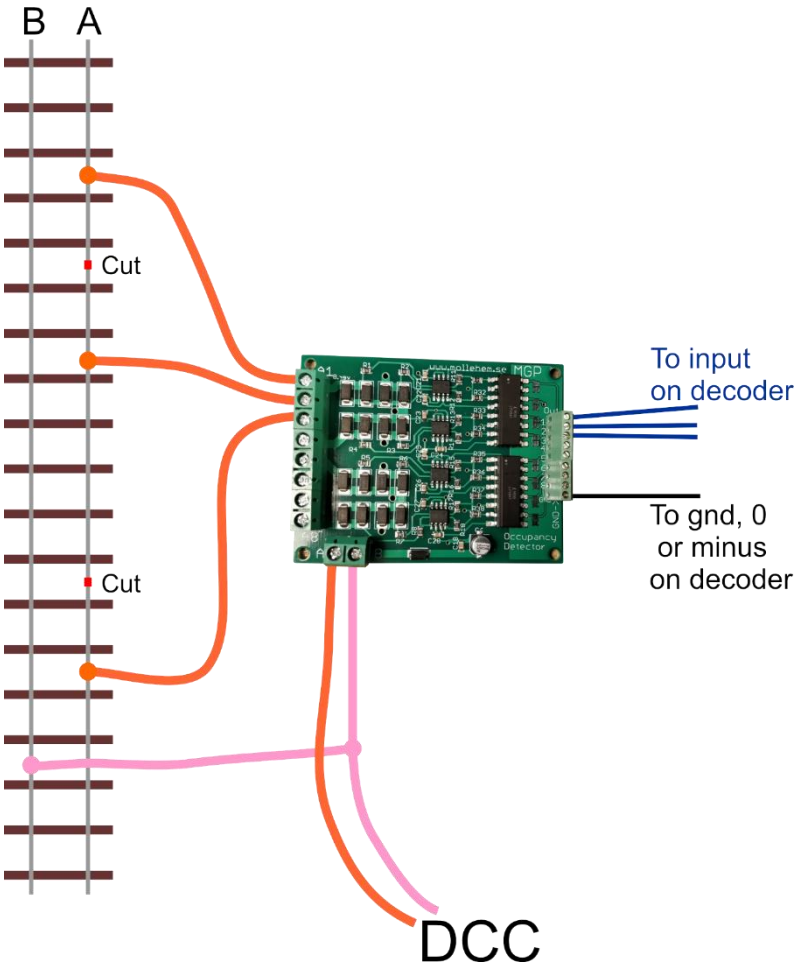
3.2 CONNECTIONS

The smaller terminal to the right in the picture is the output to be connected with the decoder.

The bottom pin “0” is GND and should be connected to the “minus”/”0 volt”/”gnd” pin on the decoder.

Both sides of the DCC supply (track “A” and “B”) should be connected to the Track terminal.
The “B” side is also connected to the track.

The A side of the track is connected to one of the connections in the “Tracks, side A” terminal.



3.3 SENSITIVITY

Long detected tracks and/or long cables between the detector card and track can give troubles like false detections, detections that will not let go when the train leaves the track, or interference between cables to close to each other.

Try to keep the cables between the detector and the tracks as short as possible.

If there is trouble with false detection on a track, the sensitivity of that track can be lowered. This is done by adding a suitable capacitor.

On the detector card, behind each track connection, there are two holes where this capacitator can be soldered.
Suitable values for the capacitator are in the range of 100nF up to perhaps 600nF. A larger value gives less sensitivity.