Content

MGP offers a set of components to build a powerful and cost-effective solution for control of the model railroad.

A model railway consists of a track system with turnouts, signals, turntables, etc.
Trains run on the model railway.

MGP's system is used to control the devices on and around the track.
*In this document we call it Track Control.g*Controlling trains

Today the train is often controlled "digitally" and the most common standard for this is DCC.

DCC manages the connection between a Control Central and the locomotive on the tracks.

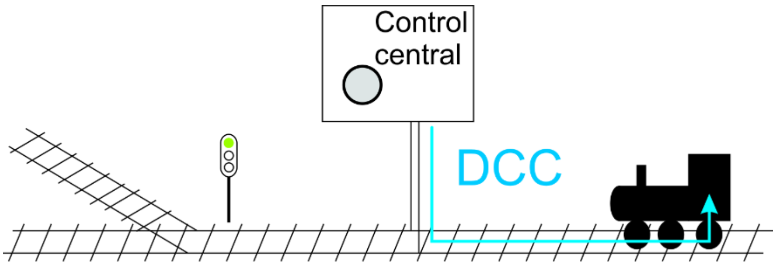

Figure 1 Train control with DCC

With DCC, the trains get their own addresses and can then run independently of each other on the same track. The central manages orders for speed and direction to respective locomotive.

The DCC system is essentially unidirectional and goes from the central to the trains on the track.

1 Control of the track

On the model railway there are turnouts and other devices that we also want to control.

These can be controlled by hand or different variants of direct switches, which we often refer to as "analogue" control.

The following describes how to build, with the MGP's system, what we often call "digital control", ie we control switches, signals, etc. via a data bus.

1.1 Decoders and Network

On a model railroad there are a variety of things like turnouts, signals, turntables, etc.

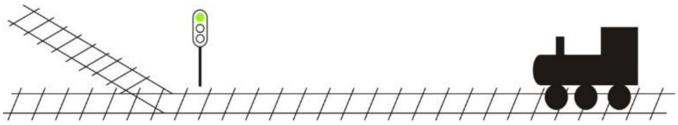

Figure 2 Some devices on the railway

The various devices on the railway are controlled by decoders of different kinds, for example Turnouts operated by “Turnout decoder”.

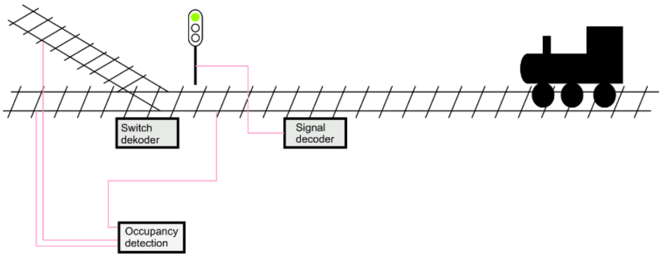

Figure 3 Decoders control devices around the track

For the different decoders to cooperate and to be remotely controlled by e.g. control panels and/or computers, the different decoders are connected to a "network" using a "message bus".

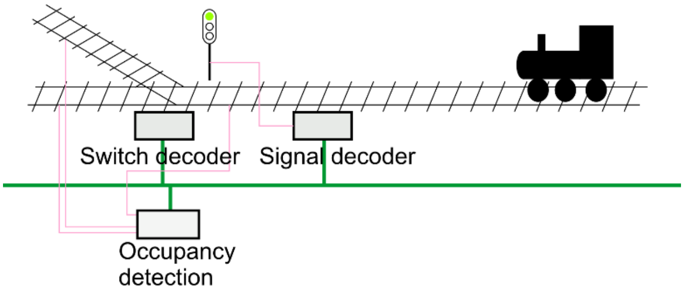

Figure 4 Network between decoders

To change turnouts, you can have local buttons on the decoders and/or use remote control in the form of control panels and computers.

The message bus, used by MGP decoders, is called LocoNet and was developed by the company Digitrax.

There are many manufacturers that offer decoders for LocoNet and these can be used together regardless of brand.

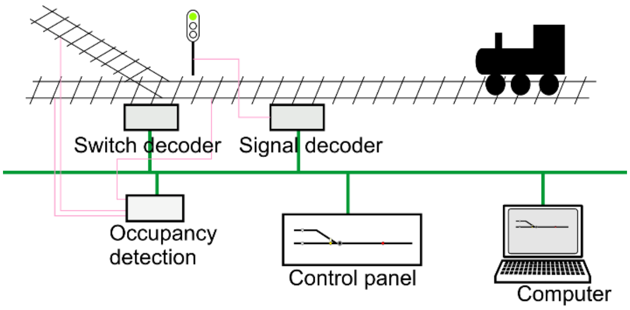

Figure 5 Remote control of devices around the track

Note that no form of central train control unit shown in Figure 5! LocoNet used for track control requires no compatible “Control Central” and thus can be used independently.

1.2 Messages

On the message bus, the various devices send out messages. These messages are heard by everyone and can be used by those who are interested.

So, if we, from the control panel, want to set the turnout in the figure (turnout 12, we call it), then the control panel sends the message "*Set turnout 12 to thrown*" (thrown = "to the side").

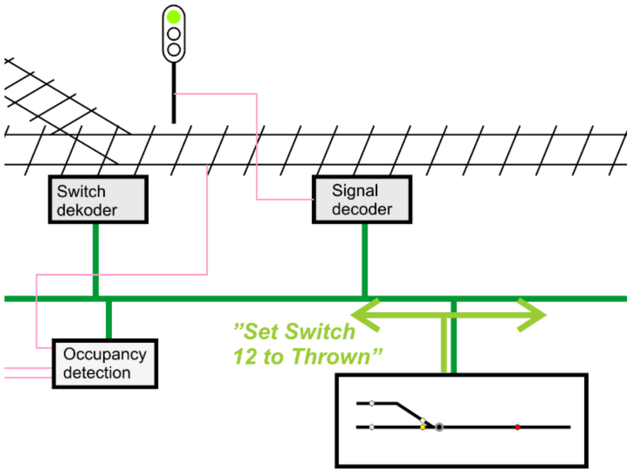

Figure 6 Order to the turnout

The decoder that manages "turnout 12" reacts to the message and set the turnout. When the turnout is ready, it sends the message "Turnout 12 is now thrown".

This message is heard by the control panel and the corresponding LEDs on the panel can be set to show the new state.

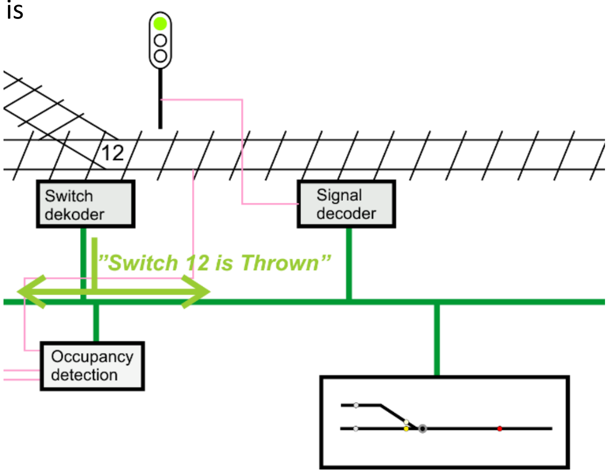

Figure 7 Answer from the turnout

1.2.1 All can listen, and all can send

A central feature of the network is that all devices can listen to messages and all can send messages.

This means, for example, that multiple control panels and computer displays can display the correct position on the track, regardless of who sent the order to turnout 12.

It is therefore no problem to have a small local control panel covering only a small shunting yard within a larger station, while having a larger panel somewhere else covering the whole station. Both control panels will always be synchronized and display correct information!

This feature, "everyone can listen and everyone can send", is the single most important feature and is the reason why track control based on this network becomes so easy to build and to expand over time, as is also the base to allow the use of "intelligent decoders".

1.2.1.1 "Intelligent" decoders

The feature that everyone sends and listens, also means that the decoders can be made "intelligent", i.e. they can set to respond intelligently to messages that are being heard.

So, for example, the signal decoder can use state messages the turnouts, so the signal in the previous figures, can adapt to the state of turnout 12, by showing "GO Normal speed" when 12 is in straight position and show "GO Slow" when 12 is in curved position!

When the signal changes between "GO Normal speed" and "GO Slow", the signal can then inform other devices though a state message. This makes it possible for a "Distant signal" to adapt to this.

MGP decoders utilize these possibilities for "intelligent".
With the MGP decoders, we can build a very high degree of automation in the track control, without the use of computer-based control programs.

This does not mean that the "intelligence" must be used - of course, it is also possible to let the decoders be "stupid" and let everything, or parts, be controlled by a central computer, if desired.

1.3 Settings – complicated?

The decoders have many options and, to make it easy, an App on a phone or a tablet is used.
In the following description we looked at how some settings work for a "control panel".

The example below is based on a control panel where a button controls a turnout (turnout 40) and we use two LEDs to display the state of the turnout.

When the app is started, it asks the network which decoders are available. These can be named, and it may look like this:

Figur 8 Appen visar inkopplade dekodrar

In the figure to the right we see the decoders at the station "Sältan", which have two turnout decoders (Servo5), one Panel decoder, a Signal decoder, a Turntable and an LocoNet interface.

The decoder we used for the control panel is a panel decoder which has the address 20 and has been named "Sältan Ställverk".

If we click on the line for the Panel decoder, we open the decoder and can view and change the settings.

Changing setting in a decoder

Each MGP Panel decoder handles 16 buttons and up to 64 LEDs (LEDs).

For each button, you can set the message to be sent and for each LED, set the type of event that will make it light up.

In our control panel, we have a button for the southern turnout, turnout 40.
Two LEDs show the gear position when it is "Closed" (straight) and "Thrown" (curved) respectively.

To the right we have opened the panel decoder and looked under "Input", which is the settings for connected buttons.

"Input 1: Type" indicates what should happen when we press the button connected to input 1.

The setting there is "Switch toggle" which means that we will change the mode of a turnout (switch) at each push of the button. "Switch toggle" comes from a selection list of possible values, which appears if you click "edit".

In the row below is "Input 1: Address", which has got the value 40, i.e. the address of our southern turnout.

With these settings, the button connected to input 1 will change the state of turnout 40 with each press of the button.

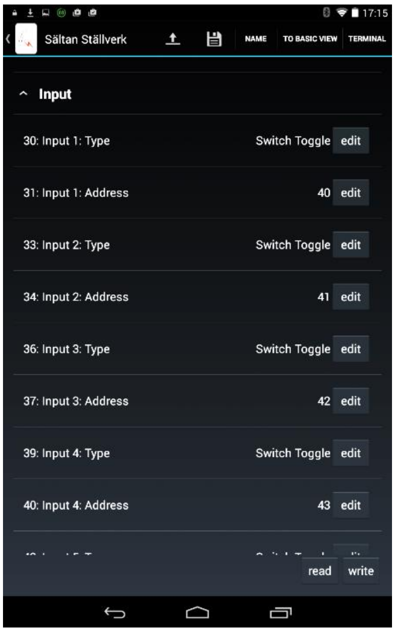

Figure 9 Basic settings for a panel input

The setting to make two LEDs showing the state of turnout 40 is found under section “LED”.

LED 1 lights up for "Switch Thrown" (turnout is in curved position) and the address of the turnout is specified in "Led 1 Address".

LED 2 should be lit for the "Switch Closed" (turnout is in straight position).

The address for both is given to 40 which was the southern turnout.

The fact that some values in the image are red means that they have been changed and but not yet saved to the decoder. To place the values in the decoder, press the "write" button in the lower right corner.

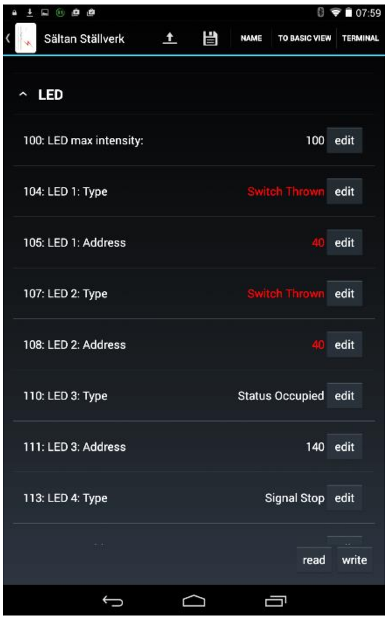

Figure 10 Basic settings for connected LEDs

2 But how about using DCC for track control?

There is a lot of decoders for turnouts that is controlled through the DCC bus, that is the same as the trains.

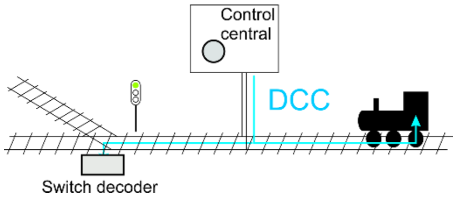

Figure 11. DCC for both train and track control

Track control can of course be built using this type of components but there are disadvantages and problems.

Some examples of such problems are:

- The DCC signal turns off at short circuit (can be solved by pulling DCC into track control in its own threads from its own booster),
- DCC requires a Control Center, which can be a disadvantage with, for example, modular railway where you want independent control of each module.
- DCC is basically one-way, which means e.g. turnouts cannot report back when state when changed.
- DCC decoders rarely have any higher level of "intelligence". They are built for a centralized e.g. a main computer that controls everything.

2.1 Feedback

As mentioned, DCC is essentially one-way and it means that the turnouts cannot report back their state.

This also applies to track indication, i.e. that electronics can detect a track being occupied and report it back to the control panel.

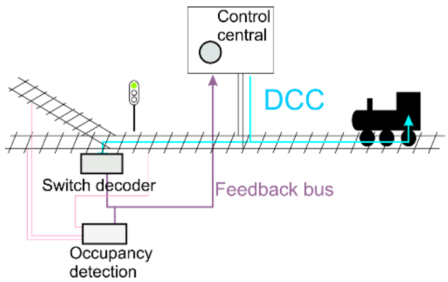

Figure 12. Extra feedback bus

So if DCC is to be used for track control, DCC needs to be complemented with a so-called feedback bus, a channel for the devices around the track to report state changes.

Unlike the DCC standard, the type of feedback bus is strongly linked to the manufacturers of control centers.
If you have chosen a control center, it will only handle its own type of feedback standard and you can only choose among decoders that applies to that standard.
A system where the track control is built on DCC and with a separate feedback bus is linked to the manufacturer of the control center.
In the event of a changing the control in the future, the control of the track must probably also be replaced, or alternatively, you could use two control centers, the old for the track control and the new one for the train control.

2.2 Recommendation

The recommendation from MGP is to separate the systems for train control and track control.

Build the track control with a system designed for track control, thus providing great features and easy handling.

In the future, if you want to introduce computer control that controls both the track and the train, that's no problem. The computer control programs can to handle separate systems for trains and track.