LocGeek

Model trains guides

Understanding digital model trains

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1

WHAT IS DIGITAL?

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Analogue model trains

Before we start on digital, let's rewind and make sure we understand how traditional, or "analogue" model trains used to work (and still do).

In an analogue model train, the principle is as easy as connecting a light bulb to a battery: you connect two wires from the power supply to the bulb, and the bulb lights up. Easy enough.

With a train, it's similar. Two wires to the track, connect the battery, and the locomotive moves.

To drive faster, increase the power (voltage) on the track. To stop, simply cut the power.

It's a concept as old as electricity.

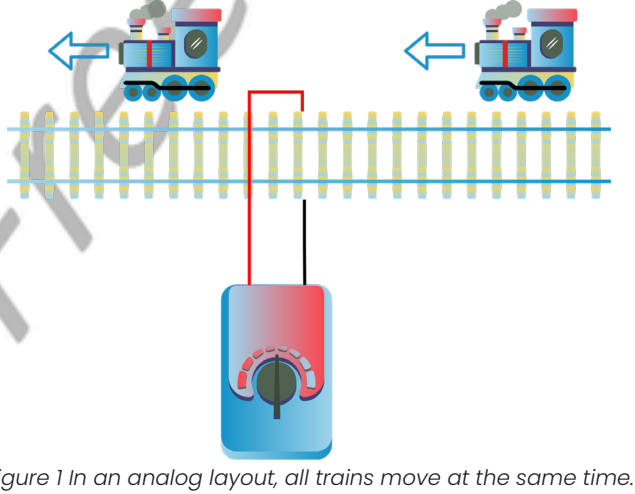

Figure 1 In an analog layout, all trains move at the same time.

There are many drawbacks to analogue train driving:

- All locomotives on the same track will move at the same time
- There is no saying whether they will all move at the same speed (each motor is different)

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7

HOW TO PROGRAM CVS? (CONFIGURATION VARIABLES)

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If you have started reading about digital, or if like me you bought your first digital train set without knowing anything about it, you will encounter an often-used term: **CV or Configuration Variables**.

Let's discover together what CVs are.

What are CVs and how to edit them

Configurations Variables (CVs) are the parameters of an engine, they are stored inside the decoder itself.

They determine everything, from the train's address in order to drive it, to all of its behavior (speed, functions...).

Think of it this way: each CV contains one or more parameters, and makes your locomotive unique (or any other vehicle equipped with a decoder).

When someone talks about "programming" a digital decoder, they mean editing or changing the CVs.

Editing the CVs of a decoder requires a manipulation on your digital command station.

Pretty much all command stations, even the most basic ones, allow for CV editing. That makes sense, because **there is always one CV you will likely always want to change: the locomotive address. The locomotive address, by default in DCC, is usually set at 3 when you buy a new engine**.

Changing the engine address is specifically what allows digital to be so rich: you need each of your locomotives to have a unique address, to be able to control it separately.

The specific procedure on how to edit CVs will be fully dependent on which command station you use. Of course, there is an advantage here to use the fancier screen-equipped command stations: they make CVs editing easier.

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In fact, advanced users will sometimes use computer tools to edit the (hundreds of) CVs of the more advanced decoder, such as the great (and free) tool JMRI Decoder Pro. Refer to the section about programmers (page 94) or computer programming (page 102).

But you shouldn't be scared. If all you want is the change the address of a locomotive, any simple command station that came with a starter set should allow you to do it pretty easily.

The only other important concept is to understand that **CVs are numbered.** Think of them as numbered drawers, where the same information is always stored in the same drawer.

So, for example, **the locomotive address in DCC is always stored in CV number 1** (also written as "CV1"). This does make sense, as the address is of course the most important thing in an engine.

There are however a few special cases, and those who are experts will correct me here. Indeed, CV1 always contains the locomotive short address, not the long (or extended) address. To understand those specific cases, refer to page 60.

The most important CVs in DCC have been standardized by the American NMRA. **What this means is that, in most decoders and with rare exceptions, the same parameters of an engine will be found at the same CV number**.

Here are a few examples of standardized CVs:

- CV 1 Locomotive short address (1 to 254)
- CV 2 Start speed
- CV 3 Acceleration Rate
- CV 4 Deceleration Rate
- And so on...

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But decoders can be extremely powerful these days. They may have hundreds of CVs for an extreme fine tuning of your engines. So if you want to go further, just know that may CVs are manufacturer- or decoder-specific. Each decoder will come with a full technical manual that will indicate exactly which CVs contain which parameter.

What is the programming track?

There is a common concept to all digital systems out there: the notion of a "programming track" or PT.

The programming track is quite simply a short section of track, completely separated from your layout, where you put your engines for programming the decoders.

It has to be fully electrically separated from your layout, and is simply connected by 2 wires to the "programming track" output of your command station.

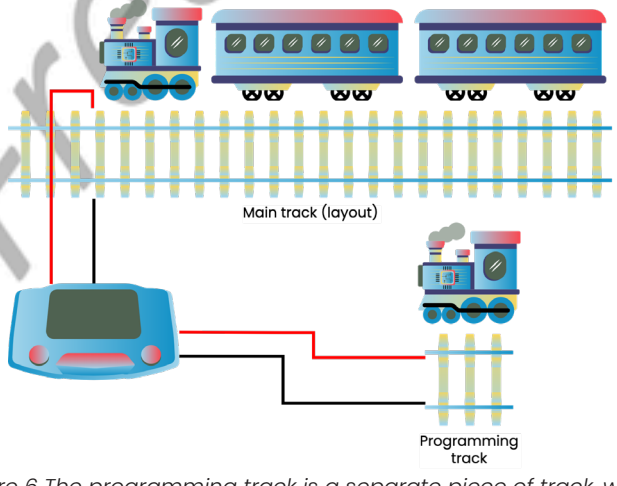

Figure 6 The programming track is a separate piece of track, where you can program your engine decoders.

This track doesn't need to be permanently connected; you can choose to only connect it when you need to change CVs. In fact, it doesn't have to be a "track": it could also be a testing bench.

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This book has already been translated in French and English, to reach as many model railroad fans as possible.

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