

CDM-Rail

RUN MODE: GETTING STARTED

HOW TO CONNECT TO A COMMAND STATION

DRIVING THE REAL LAYOUT

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1 INTRODUCTION

1.1 CENTRAL UNITS SUPPORTED BY CDM-RAIL

As per June 2014, CDM-Rail supports the following DCC central units.

- All Lenz central units (Xpressnet protocol),
- Intellibox 1 (P50X protocol),
- Fleischmann Twin Center (P50X protocol),
- Roco Multimaus & Power amplifier, through Paco's GenLIS88 or XIS88 (Xpressnet),
- SPROG, together with LDT HSI88 / HSI88-USB for feedback (special protocol),
- ECOS ESU.

1.2 DOCUMENT SCOPE

The goal of this document is to provide the user with all necessary data to:

- Connect the PC to one of the central units listed above.
- Proceed to digital controlling of your railway layout via CDM rail software.

This is a "getting started" type document in which you will only find the basic processes to get control of your trains from your PC running CDM rail.

Details of more complex operations are not discussed here.

For example, this concerns:

- Real signals control,
- Use of actuators,
- Use of single detection per section,
- Enhanced safety control modes,
- Adding or removing trains during RUN mode,
- Recovery process after unexpected events (derailment, uncoupling of cars, ...).
- « On the fly » routes.

These operations are more complex and will be described in another more detailed manual:

CDM-Rail / RUN MODE FOR EXPERIENCED USERS

1.3 STRUCTURE of the DOCUMENT

This document explains the seven main steps required to achieve the digital control of your real layout using CDM Rail. These steps are discussed according to the recommended setup sequence.

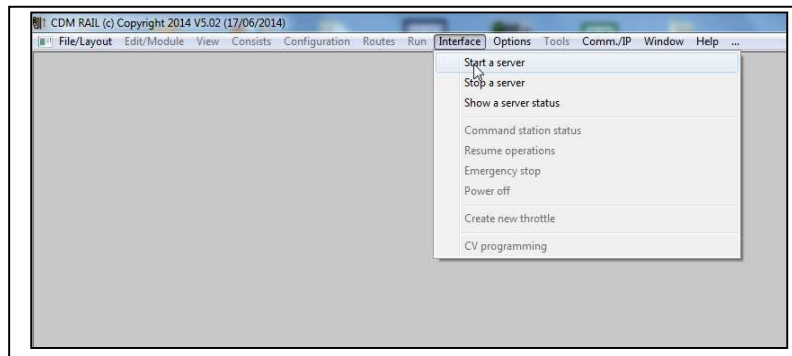
| | |
|-----------------------|---|
| Section 2 - Step n°1: | connect to the central unit (using the server). |
| Section 3 - Step n°2: | first test with the central unit. |
| Section 4 - Step n°3: | configuring turnouts. |
| Section 5 - Step n°4: | configuring detectors. |
| Section 6 - Step n°5: | simple RUN mode. |
| Section 7 - Step n°6: | calibrating train speed. |
| Section 8 - Step n°7: | real train control = Full RUN. |

2 First Step: CONNECTING to the CENTRAL UNIT

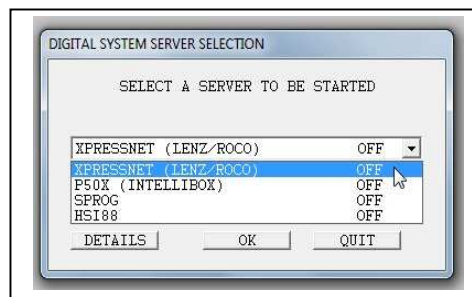
In order to connect to a central unit using CDM rail, select tag « Interface » in the main menu bar:

Interface

--> Start a server

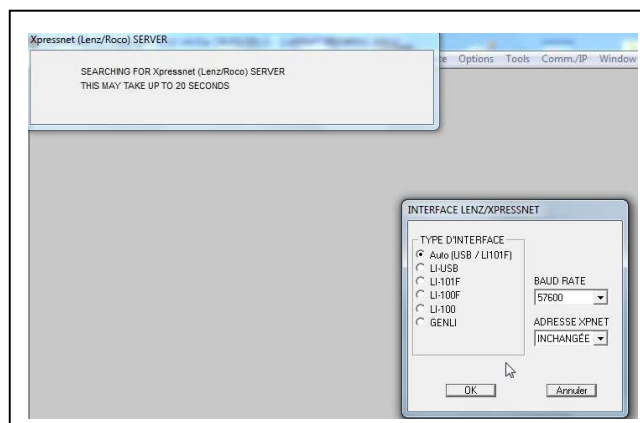


A list of available servers pops up:

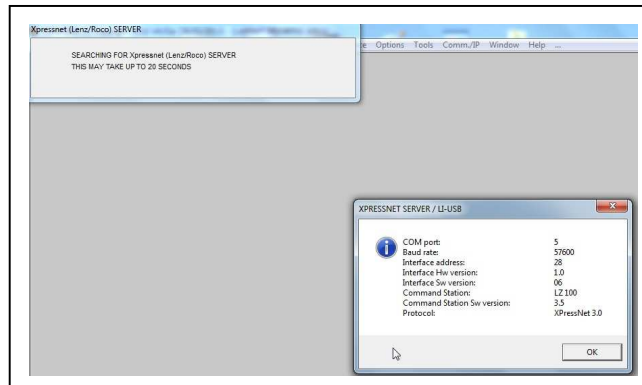


Select the appropriate server in the list, and then click on OK button.

Depending on the server protocol, an additional window with more specific options may appear as in the example below (Xpressnet protocol / USB or LI101F automatic mode).



When using the "COM" or "USB" port, the connection port is automatically detected.
If connection fails, an error message is displayed.
When successful, a new window displays the server type, the speed of serial link, and the server version number.



Click on OK to close this window.

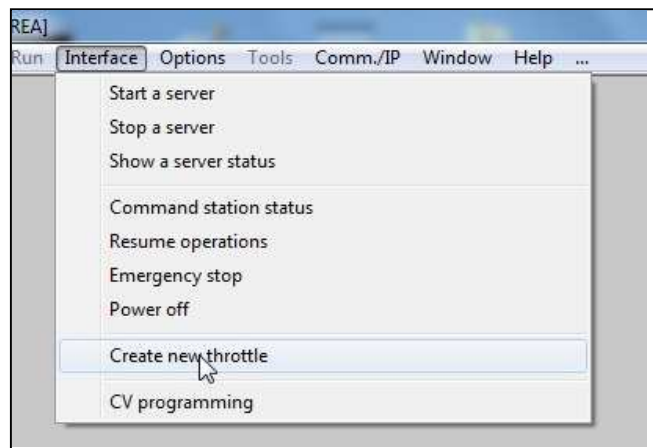
3 Second Step: FIRST TESTS of the CENTRAL UNIT

3.1 CREATING A NEW THROTTLE

To create a throttle, select the following in tag "Interface" of the main menu bar.

Interface

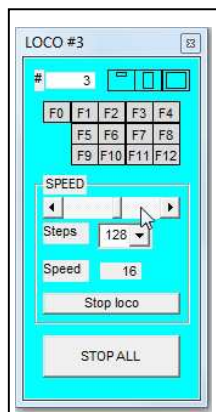
--> Create New Throttle



The throttle is displayed with train address defaulted to « 0 »

Fill in the DCC train address after sign "#" and confirm entry by clicking key "Enter" on the keyboard.

You're now ready to send speed and function commands to the selected train.



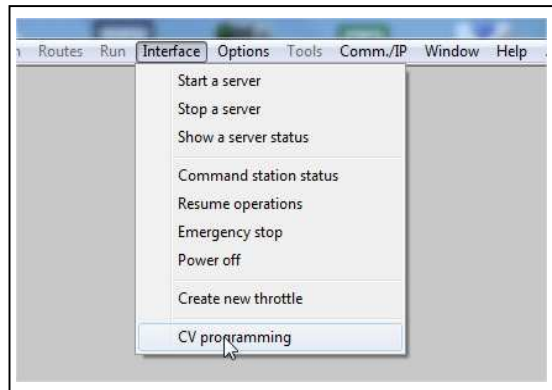
3.2 CV PROGRAMMING

Programming CVs is possible **ONLY** if a loco or car with a decoder is placed on the programming track.

Select the following from tag "Interface" in the main menu bar:

Interface

--> CV programming



If a loco with decoder is found on the programming track, then the window below pops up:



CVs #1 to #29 are displayed. They can be read from or written to the loco decoder. The process can be on a "one at a time" basis, or global. The speed table can also be displayed.

For higher CVs, use the "specific CV" area.

4 Third Step: TESTING TURNOUTS

After getting control of your train on a plain track, the next step is to drive the full layout. In order to achieve this, you must control the accessories and primarily the turnout.

This implies that:

- All turnouts are motor driven,
- Any motor is under control of an accessory decoder.

To be able to switch a turnout from the software, you need to:

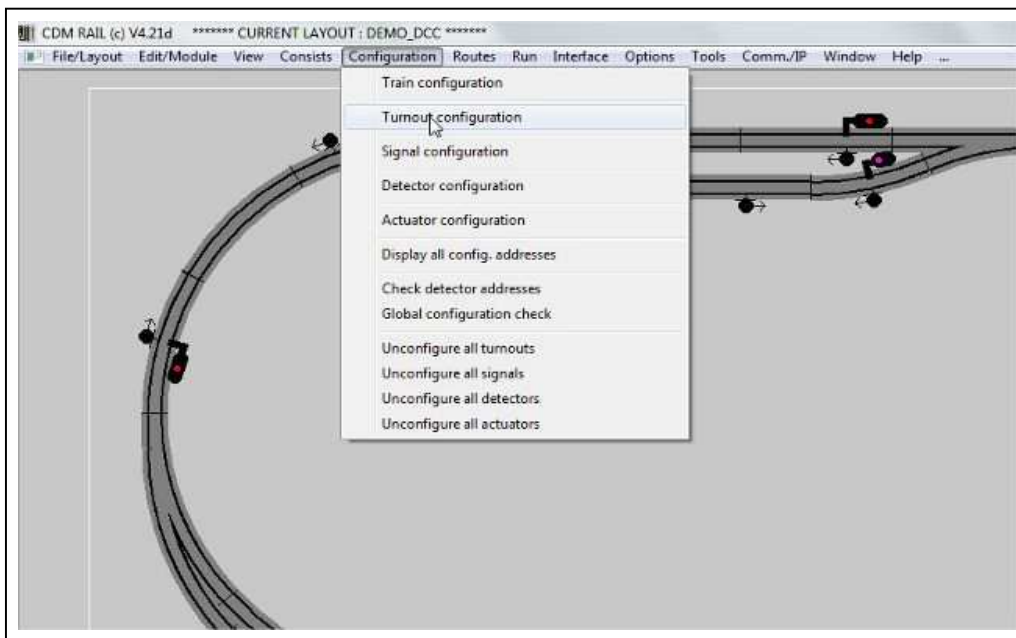
- Program an address into the accessory decoder. Each decoder manufacturer has its own programming rules; please refer to any specific decoder manual and use your central unit to achieve this.
- Allocate **the same address** to the corresponding turnout, on CDM-Rail layout. This operation is detailed in this section.

4.1 CONFIGURING TURNOUTS with CDM-RAIL

Turnout address is allocated from tag "configuration" in the main menu bar.

"Configuration"

--> "Turnout configuration"



A new toolbar appears.

This new configuration window is used for trains, turnouts, signals, detectors and actuators.

In the new toolbar, turnout related operations are handled by the second group of **4 icons** (from left of toolbar).

- The blue turnout icon (on the left) is intended for turnout address capture.
- The green turnout icon (second left) allows to physically switch the turnout.
- The other two turnout icons respectively highlight the turnouts already allocated or not yet allocated, in order to locate them easily on the layout.

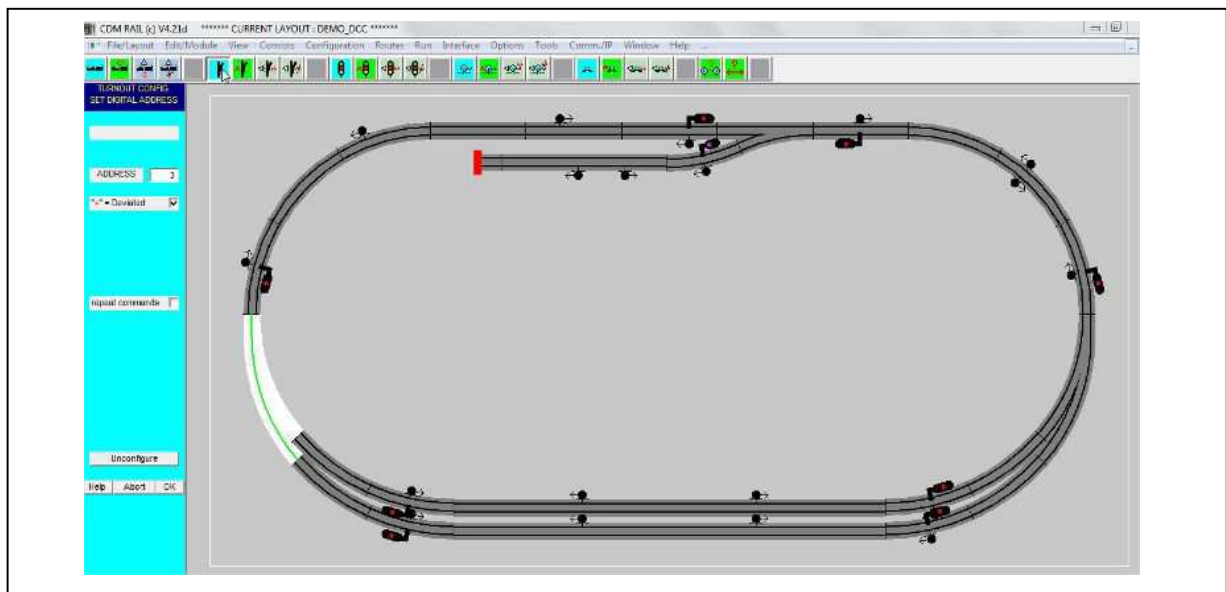
The process starts by selecting the turnout in the layout by clicking on it (it shows as highlighted), and then capturing its address in the left hand menu. **This address must be identical to the one programmed in the accessory decoder driving it.**

Note that checkbox "'+' = Deviated" may be used to match the existing turnout motor wiring, and thus match switch states, both on the real turnout, and on CDM-Rail layout.

After setting and capturing all fields in the menu, don't forget to validate by clicking on button OK, otherwise the captured values will be lost.

Note: the detector symbols are not needed, and not taken into account so far.

In other words, no need to configure detectors, if only turnout control is targeted.

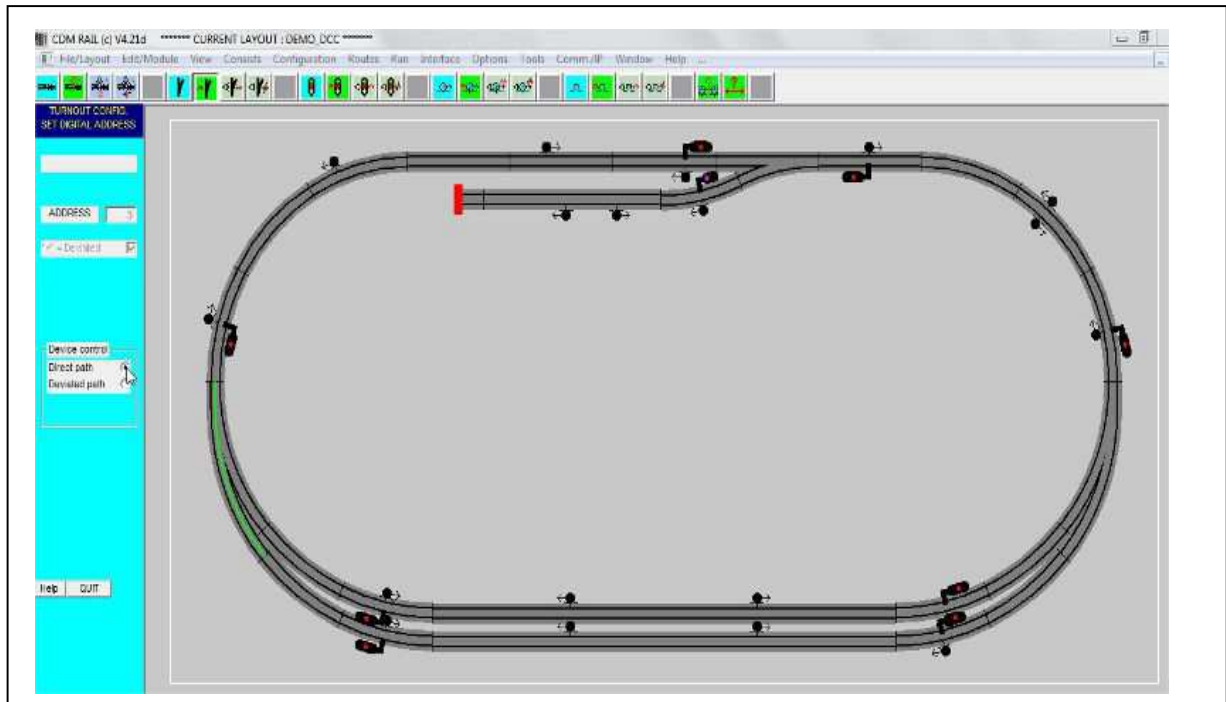


You are now ready to check proper operation of the turnout just configured.

To achieve this, press the green turnout icon. Please note that this icon is active only if a central unit is connected to the PC running CDM Rail (server running).

In this mode, whenever you click on a turnout (on the layout), a parameter menu corresponding to the selected turnout shows up, and in area "device control", a set of radio buttons (2 most of the time: "direct path" and "deviated path") allow to switch the selected turnout.

In case of complex devices (3-way turnouts, double-slip switch, double cross-over), there are as many radio buttons as possible states in the "device control" section.



You can thus check if the turnout operates correctly and if the switch state matches the command sent, and the CDM rail layout display. If not, return to the blue icon and modify the status of ""+" = deviated".

4.2 PROGRAMMING THE DRIVING PULSE WIDTH

CDM Rail allows you to adjust the pulse width sent to the accessory decoders to comply with the « motor/turnout » switching characteristics.

It is also possible to send orders to turnouts in sequence, in order to avoid current surge while driving several turnouts simultaneously. In this mode, turnout commands are sent one at a time, with a delay of 0.5 or 1 second between any two commands.

These two options are described in the Appendix 1; please refer to this appendix for further details.

5 Fourth Step: TRAIN LOCATION FEEDBACK

At this point, you can drive trains, adjust their speeds and directions, and switch turnouts to assign routes.

And so, at this point, you may jump to section 6 and enter the "simplified RUN" mode.

But so far, there is no security control at all, on the layout.

This fourth step (train location feedback), is the key for block automation and overall layout security.

The goal is to send back the real location of the train to the software, so that it can display it on the PC screen, and handle the location information for block automation.

This is one of the touchiest tasks on a real layout control, since all automation and safety control of the software relies on it.

Any error in this process will jeopardize the synchronization between displayed train and real train.

The approach for placing detectors is described in a specific document. In this section, we only discuss the detector configuration and test.

This section discusses the three following points:

- Feedback mode selection,
- Detection area address allocation / detection symbol configuration,
- Detector configuration test.

5.1 FEEDBACK MODE SELECTION

5.1.1 FEEDBACK BUSES

The two feedback modes most widely used in Europe are:

- S88 bus (and the new S88N),
- RS bus from Lenz.

CDM-Rail is able to manage both modes and busses.

Please note that these two modes differ completely in terms of addressing.

5.1.1.1 S88/S88N feedback

Standard S88N is an evolution of S88, based on Ethernet standard cables (RJ45 plugs). Wiring S88N modules is thus easier and safer since more protected against spurious surges.

Prefer S88N to S88 whenever possible.

S88/S88N is based on a sequential addressing, starting from 1 allocated to the first module (closest to the PC), and increasing from module to module along the bus.

S88/S88N detector addresses are INDEPENDENT from the turnout. In other words, both a turnout and a detector may have the same address, while representing different objects.

5.1.1.2 RS LENZ feedback

Unlike S88/S88N, modules on RS Lenz bus are wired in parallel. Thus any module can have an address independent from its wiring.

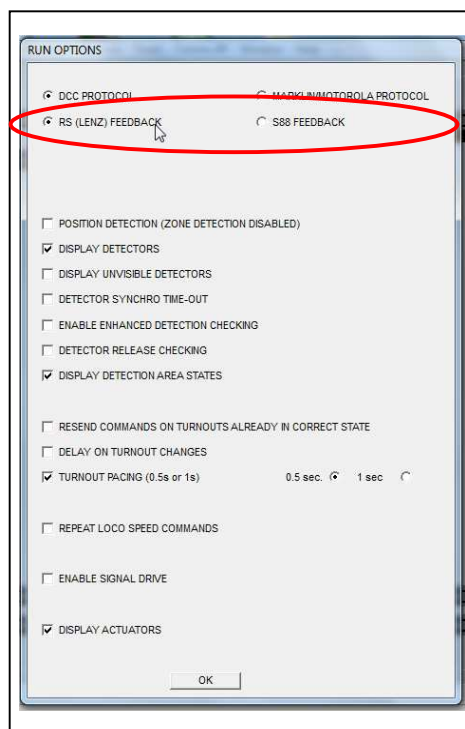
In addition, RS Lenz Detectors addresses are in the same space as the turnout addresses. **You cannot give the same address to a detector and a turnout.**

For this reason, Lenz suggest to allocate turnout addresses from 1 to 512, and detector addresses from 513 upwards.

5.1.1.3 Where should the feedback type be specified, in CDM-Rail?

Through "Options" --> "RUN" (from the main menu bar).

In the "RUN Options" window, the second line allows to select either S88 or RS.



5.1.1.4 Specific interfaces GenLIS88 (Paco) and XIS88 (CDM)

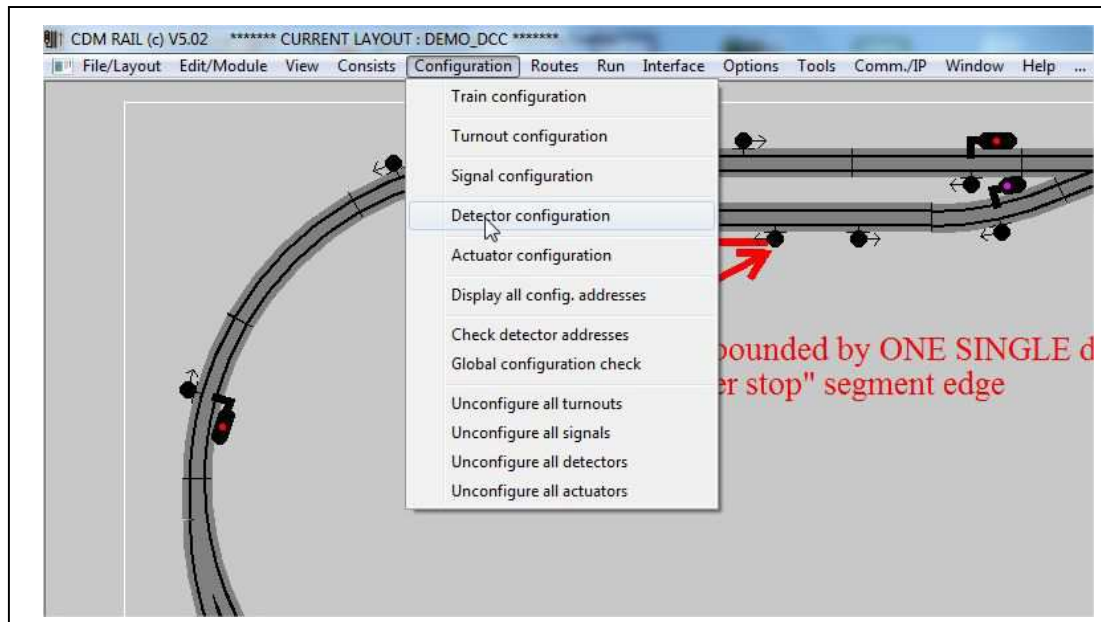
These 2 interfaces are bridging Xpressnet bus to S88/S88N buses.

This allows to use S88 detectors while using an Xpressnet central unit (Lenz, or Multimaus Roco).

However, since addresses are translated to RS-Lenz space, **you need to comply with Lenz recommendation**: the feedback detector address range starts from 513 instead of 1.

5.2 DETECTION AREA ADDRESS ALLOCATION/ DETECTION SYMBOL CONFIGURATION

Detector address allocation is accessible through tag "Configuration" in the main menu bar. "Configuration" --> "Detector configuration"



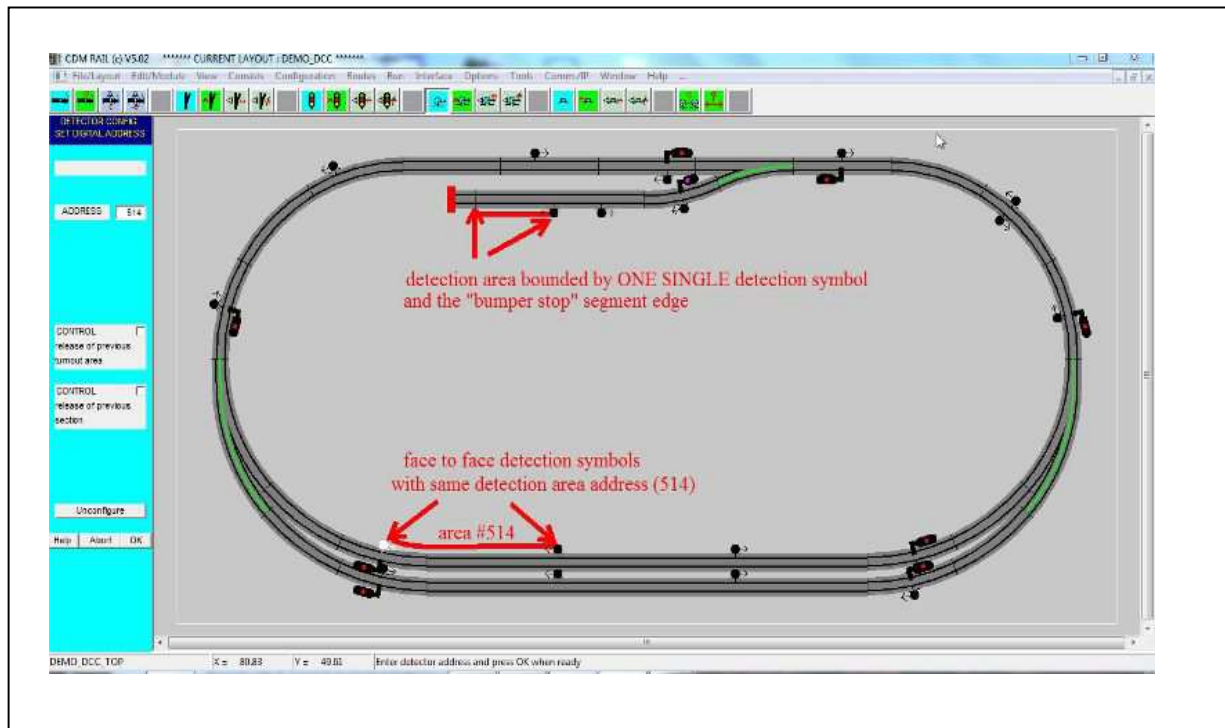
In the configuration tool bar (the same as for turnouts), the fourth set of **4 icons** (starting from the left) corresponds to detector configuration.

- The blue detector icon (leftmost in this group) allows entering the detector address.
- The green detector icon (second icon in this group) is intended for detector test.
- The other two detector icons respectively highlight already allocated detectors and unallocated detectors.

NOTE: whenever an address is allocated to one detection symbol (for instance 514 in the figure below, allocated to the highlighted detection symbol), CDM-rail automatically gives the same

address to the detection symbol facing the first symbol: as a matter of fact, the address is the address of the **area**, bounded by the two symbols.

Specific case: in the case of sidings, the last detection area before the buffer stop is bounded by one single detection symbol. The other bound of the detection area is the edge of the buffer stop segment. See appendix 2 of this document.



Once all detectors have been granted an address, the following additional checks are recommended:

- View and check all addresses, by clicking on the third icon (detector group).
- Start the detector address consistency check (last but one green icon, on the left of the toolbar).

IMPORTANT HINTS for EXPERIENCED USERS

- The purpose of the two "CONTROL..." checkboxes, in the configuration menu (left of screen), is beyond the scope of this document. Their functions will be explained in another document: **CDM-Rail / RUN MODE FOR EXPERIENCED USERS**.
- In case of opposite signals, at the same location, the detectors implicitly imbedded in signals may be used. This feature is described in Appendix 3.

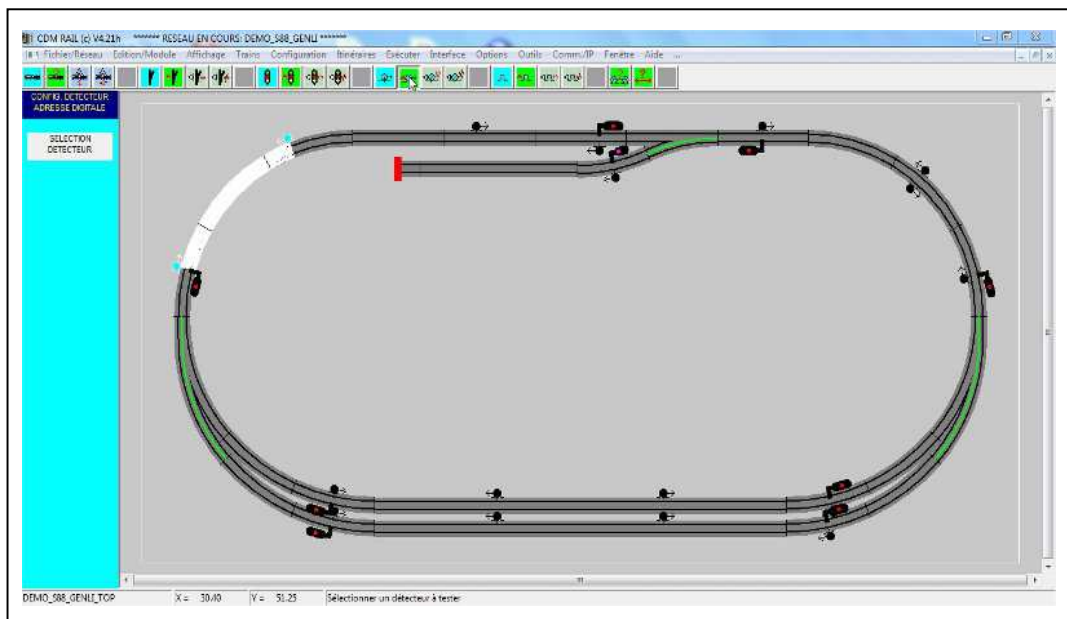
5.3 DETECTOR CONFIGURATION TEST

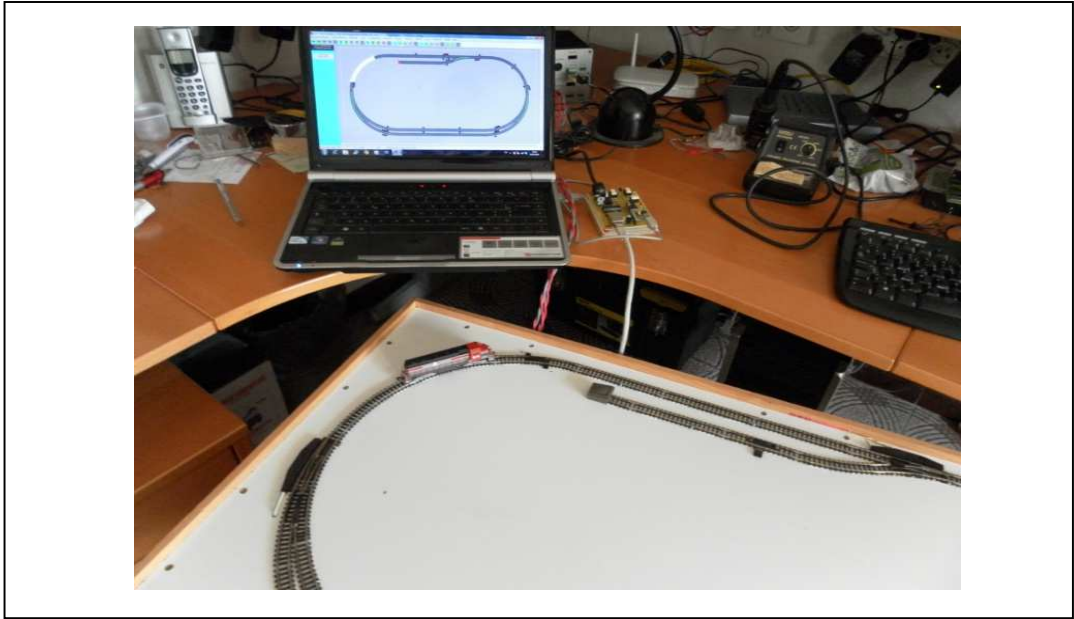
The detector configuration test is accessible by clicking on the second (green) icon, in the detector group (in the configuration toolbox). **This operation is allowed only after a connexion to a server has been established.**

In this mode, CDM rail checks all detection areas and highlights the track sections where detections occur. This is further illustrated by the two figures below:

- Screen shot of a layout with a train detected on the upper left side of layout.
- Picture of the real layout with the train in front of the PC running CDM rail. You can check the identical location of the train on the layout and the detection on the screen.

This test can also be carried out using a simple 4,7 KOhm resistor, inserted between the 2 rails, on any detection area to be checked.





6 Fifth step: "Simplified RUN" MODE

Within CDM-Rail, driving the real layout is named "RUN mode".

There are two RUN modes:

- the one at hand, described here, is the "**Simplified Mode**", when the RUN mode is initiated with **no trains placed on screen**.
- the other mode is the "**Normal RUN**" mode (see section 8), where trains to be driven are primarily placed on screen (as for simulation).

The "simplified RUN" allows for:

- **Changing turnout states by simple on-screen mouse click,**
- **Visualizing in real time the track sections occupied by trains,**
- **Controlling trains using on-screen throttles or real throttles connected to the central unit.**

The "simplified RUN" thus allows "at sight" control of trains, together with friendly interactive control of turnouts. In addition, if the feedback network is installed and configured, you may easily locate trains on-screen, thanks to highlighted detection areas (provided the corresponding option is checked in the RUN options menu).

Starting "Simplified RUN" is thus the logical next step after the configuration operations discussed earlier. The on-screen display is similar to what has been seen in section 5.3 (detection configuration test).

WARNING: this mode doesn't provide any safety (no block control, no turnout locking). CDM rail only transfers your commands to the real world.

Only the "Normal RUN" mode provides this safety.

To enter the "Simplified RUN" mode, select "**Run**" -> "**Enter run mode (drive real layout)**".

The RUN toolbar pops up on top of screen. It will be described in more details in section 8 ("Normal RUN"). This toolbar is moveable.

It is the same toolbar as in simulation mode except for replacement of icon "**Simu**" by icon "**Run**" (blue button).



As far as "Simplified RUN" is concerned, only three buttons are used:

- "PWR OFF" (2nd button) switches the track power supply off.
- "STOP" (3rd button) immediately stops all trains (while maintaining track power supply).
- "stop RUN" (4th button) ends the RUN mode, and stops all trains.

7 Sixth step: LOCO SPEED TABLES

7.1 SPEED TABLES: WHY? WHAT IS IT?

CDM-Rail is the only existing software able to precisely map on screen the exact location of the real train. As a matter of fact, this is achieved by the simulation executed on all trains initially placed on screen. The simulation sends speed commands to trains, according to their locations, and turnout commands.

But in order to do that, the requirement is that the real train must take the same speed as the virtual train on screen, so that the offset between real train and virtual (simulated) train is minimized.

This re-synchronization between real and virtual train is achieved thanks to the feedback information. On entry of any detection area, CDM-Rail performs an update of the virtual (simulated) train, in order to make it match the real train location:

- If the virtual train is ahead of the real train, it waits for detection at the edge of the detection area. When detection occurs, this means that the real train has reached that same detection area edge on the real layout.
- Conversely, if the virtual train is late compared to the real one, then it jumps to the next detection symbol as soon as the real train triggers the detection information.

The goal of speed calibration is precisely to minimize this "jerks" (stops or jumps) of the virtual train. When calibration is OK, the virtual train should travel smoothly.

The classical way of adjusting the train speed is through programming CVs (CV5, CV6, & CV2) within the loco decoder. Of course, one may still use this approach.

However, CDM rail offers another way, avoiding the need to reprogram the CVs, through the use of SPEED TABLES (see image below). One of the main benefits of this approach is to be able to use the same loco on different layouts, with different speed profiles, and not need to reprogram CVs.

This is the recommended approach, described in this section.

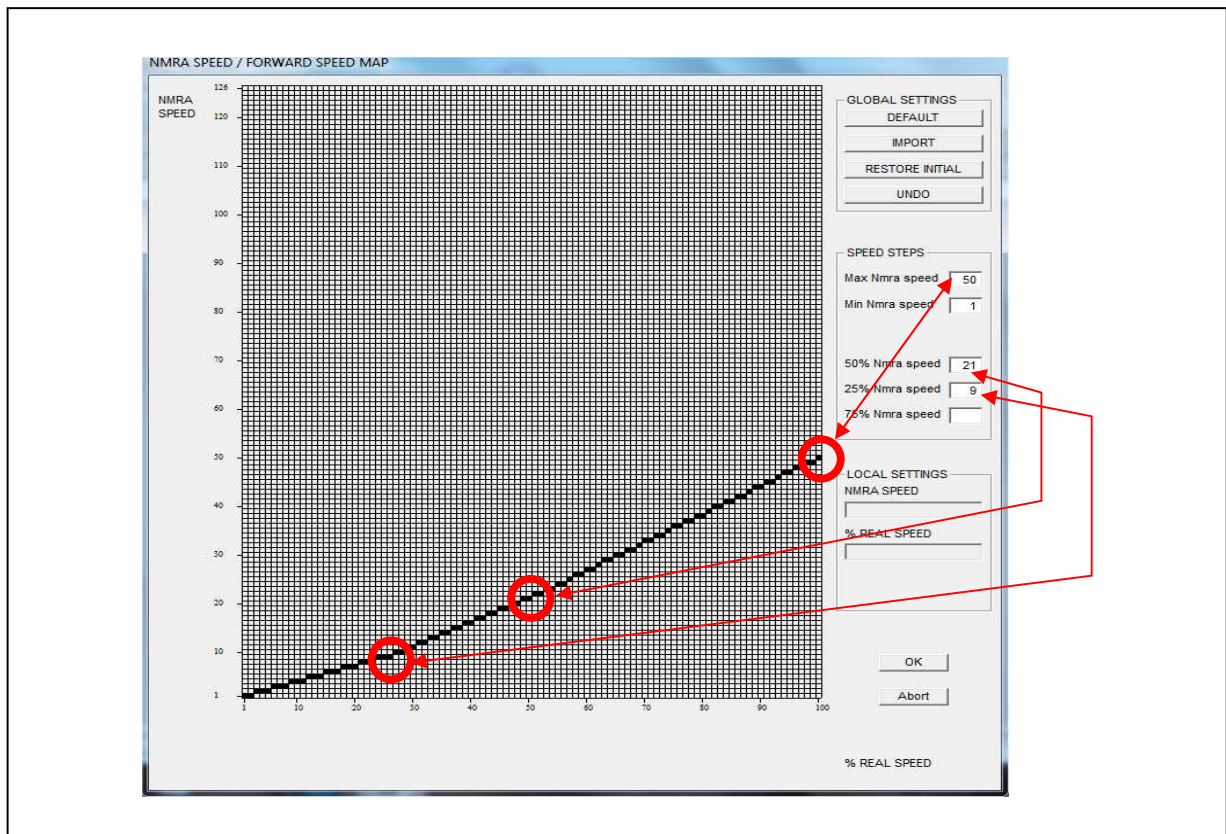
The principle of these (software) speed tables is to define the DCC/NMRA steps (ranging from 1 to 126) corresponding to 5 characteristic points:

- 100% of train maximum speed,
- 75% of train maximum speed,
- 50% of train maximum speed,
- 25% of train maximum speed,
- The minimum step which allows the engine to start moving (usually 1 with back EMF decoders)

The speed table is displayed as shown below, where X axis is the % of maximum speed and Y axis is the "DCC/NMRA" step.

As an example, the following table (resulting from a calibration procedure) corresponds to the following values:

- NMRA max (100% of max speed): 51
- NMRA 50%: 21
- NMRA 25%: 9
- NMRA min: 1



Any table speed defaults to a straight line from (1% = step 1) to (100% = step 126).

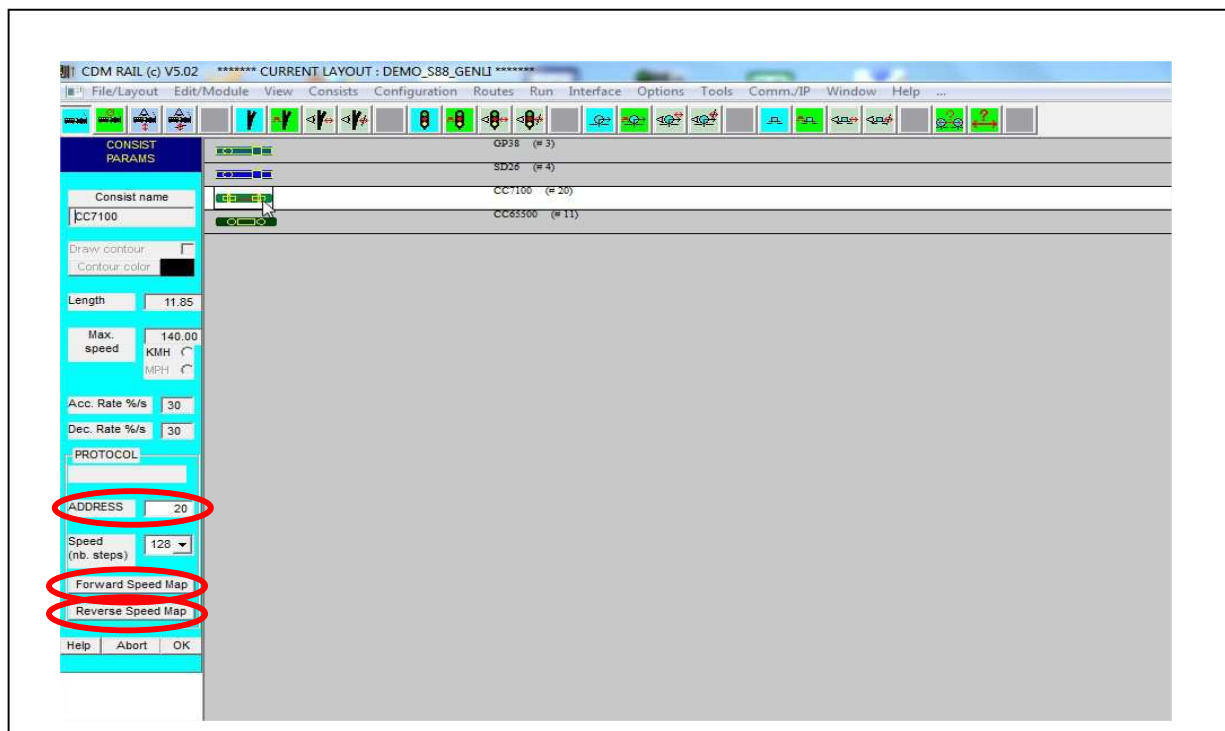
7.2 TRAIN CONFIGURATION: ALLOCATING LOCO ADDRESS

Any loco decoder has a specific address which may be programmed through the command station (CV #1). And of course, the same address must be allocated to the same loco in the software. Defining the address for a loco is done by selecting "Configuration" -> "Train" in the main menu bar.

The icon group for train configuration is the first set of **4 (train) icons** on the left, in the familiar configuration toolbar.

Train configuring is as follows:

- Click on the (leftmost) blue icon
- Then select the train within the train gallery.



The address field is located in the lower half of the configuration menu (left of screen). This address is set to 20 in the example above.

Also notice the two buttons "Forward Speed Map" and "Reverse Speed Map", for speed map modification.

7.3 SPEED CALIBRATION

Speed calibration consists of running the loco or train to be calibrated, on a route looped on itself, in order to be able to travel at **constant** speed (thus without direction changes, and with a maximum specified speed limit greater than the train max speed).

The calibration process measures the "time + distance gap", between virtual (on-screen) train and real train, and makes the average on 36 detection points.

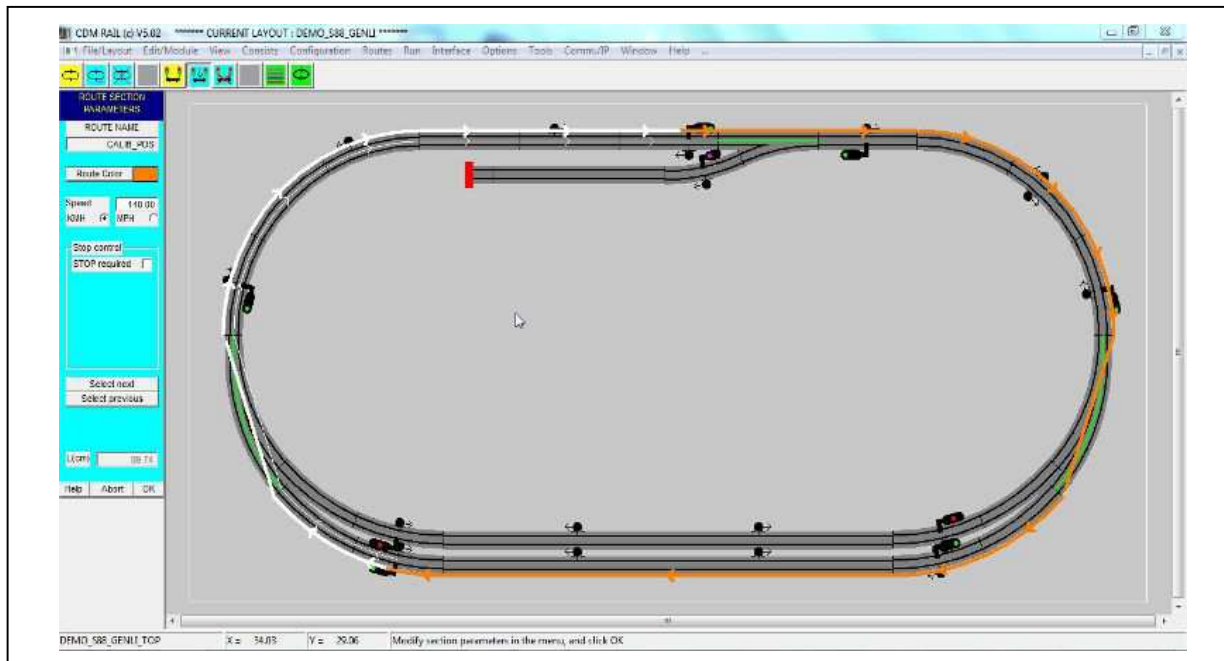
The process is repeated for the 6 following speeds:

- 100% max forward speed
- 50% max forward speed
- 25% max forward speed
- 100% max reverse speed
- 50% max reverse speed
- 25% max reverse speed

7.3.1 CALIBRATION ROUTES

To allow a proper calibration, it is mandatory to define two looped routes which can be run in both directions (forward and backward) at full train speed (check that no speed limits are defined on any section of this route lower than the train maximum speed).

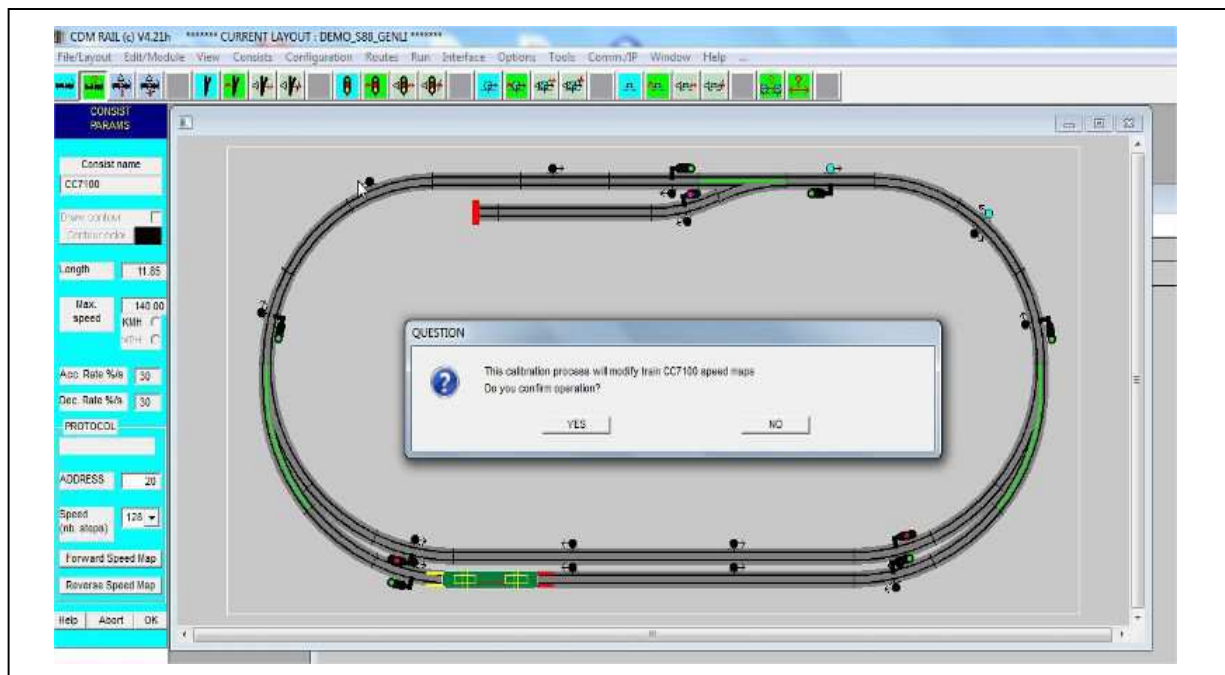
These two routes **must** be named CALIB_POS (see next figure) and CALIB_NEG (same but reversed).



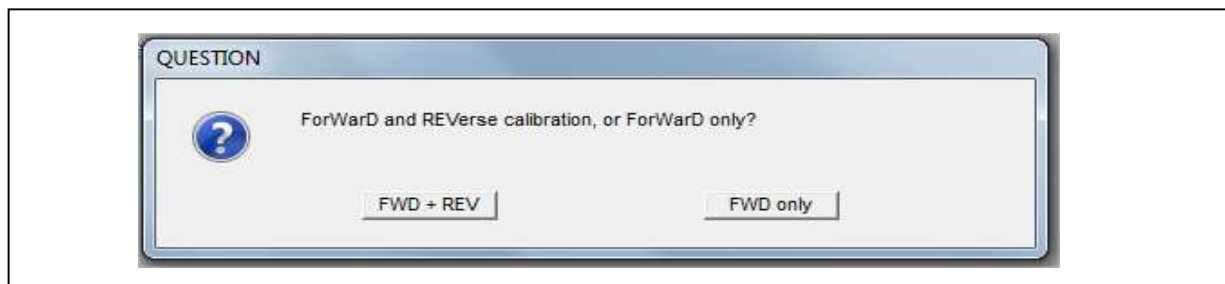
7.3.2 STARTING THE CALIBRATION PROCESS

The calibration process can be launched as follows:

- Display the configuration screen ("Configuration" -> "Train"),
- Connect to your central unit (launch the server) and click on the second (green) train icon of the toolbar.
- Select the train to be configured in the train gallery.
- A window pops up and prompts for confirm (check if the train and track are ready to go). Click on the OK button.



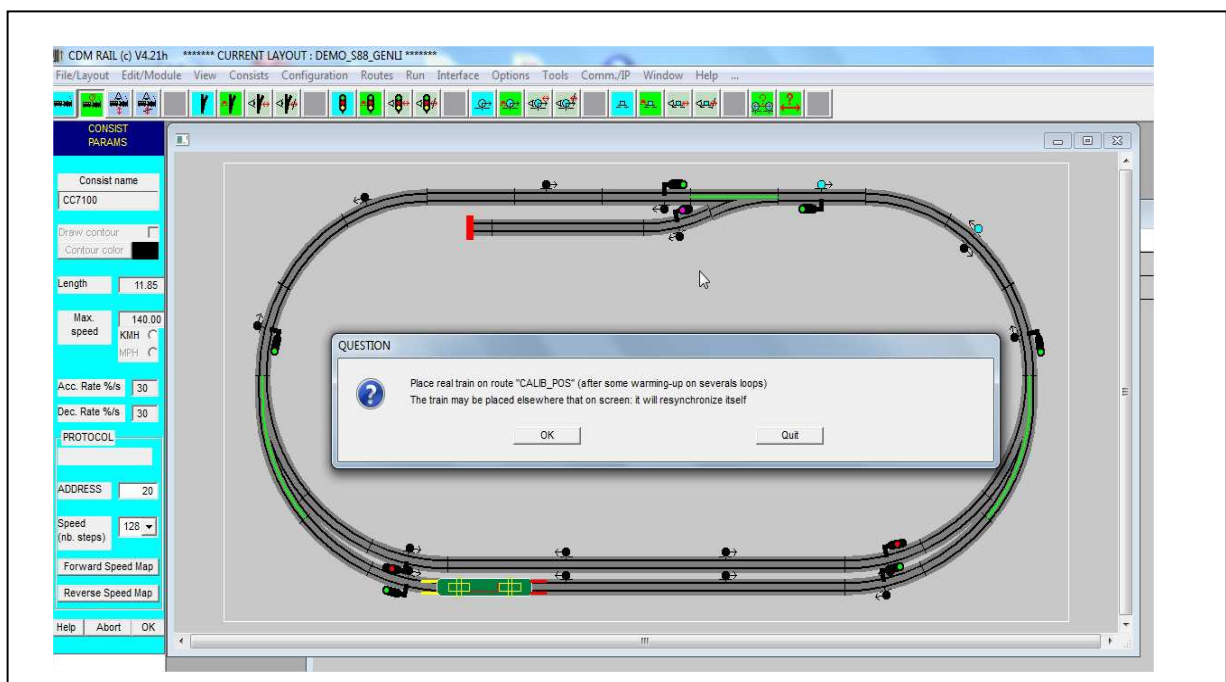
The another popup window prompts for direction: Forward and Reverse or Forward only. Note that reverse direction can often cause unexpected events like derailments; thus you can make the calibration only in forward mode. In that case, the reverse map speed should be (manually) cloned from the forward map speed.



The next popup window allows entering the minimum DCC/NMRA step which makes the train start moving. Usually, for decoders with back EMF (load compensation), this value is defaulted to 1.

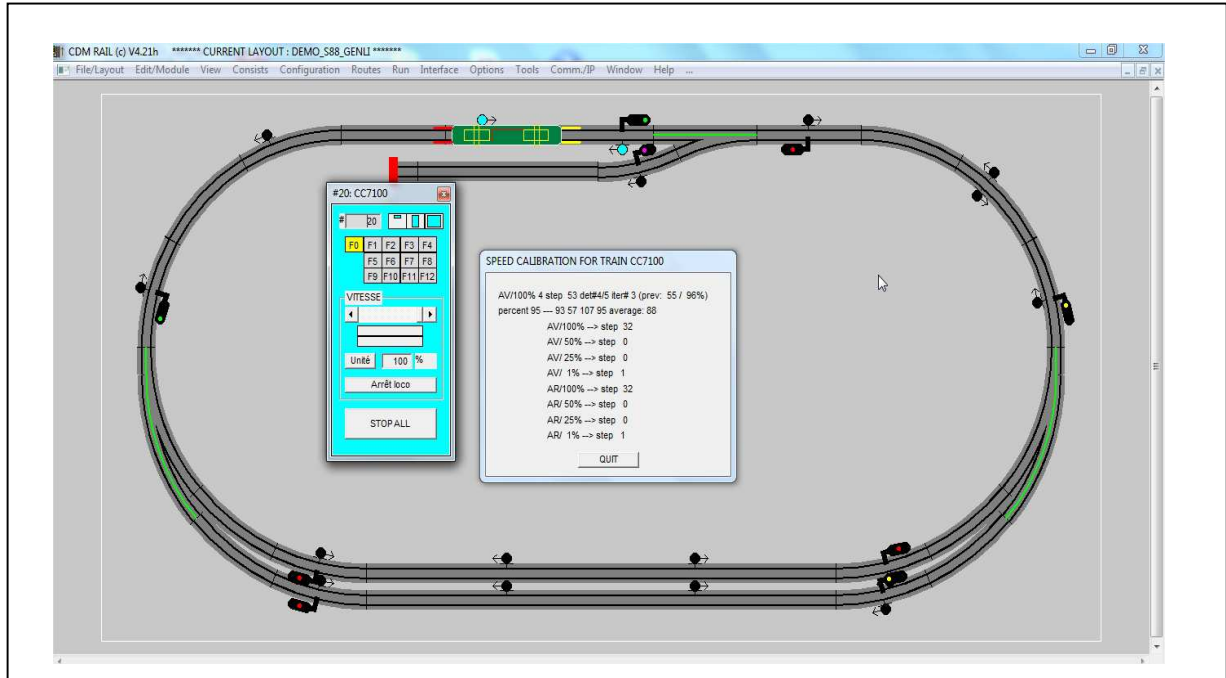


The next (and last) popup window prompts you to put the train under calibration on route CALIB_POS in the correct direction. It is advisable to manually run the train for 2 or 3 minutes, in order to warm it up before the calibration process.



When clicking on the OK button, the calibration process automatically starts. The train starts very slowly (DCC/NMRA step 32) until about 7 synchronizations on detectors occur. Beyond this initial phase, the proper DCC/NMRA is updated at any step, in order to optimize the real train / virtual train synchronization.

A popup window displays the operations in progress.



When the process terminates, a popup window notifies it.

Then you can (and should) check the speed tables just generated, using the train configuration parameters menu, as explained in section 7.2, using the speed map buttons below the address box.

7.4 ACCELERATION / DECELERATION RATES

The calibration process handles only steady speeds and not ramp up or braking.

In current version (V5.0) CDM-Rail handles inertia in simulation, but not in RUN mode.

This tuning is done using your decoder's CVs (acceleration: CV3; deceleration: CV4).

CDM Rail uses two parameters ("Acc. Fact." and "Dec. Fact") defined as follows:

speed variation over a time delay of one second, expressed as a percentage of maximum speed.

During simulation, these two factors default to 20%. This means that trains are supposed to change speed by 20% of maximum speed per second. This also means that the trains brake from maximum speed to complete stop in 5 seconds.

The following table indicates values to be written in CV3 and CV4, according to values of CDM-Rail acceleration and deceleration factors.

| Acc. / Dec. Factor | CV3 (acceleration) | CV4 (deceleration) |
|--------------------|--------------------|--------------------|
| 20% | 6 | 5 |
| 25% | 5 | 4 |
| 30% | 4 | 3 |

IMPORTANT NOTE: Better results are observed if the inertia of the real train is HIGHER than the virtual train's inertia (rather than LOWER).

8 Seventh step: CONTROLLING THE REAL TRAINS

Now you're ready for computer control of your layout.

You can now launch the real trains "RUN" on your layout with benefits of computer controlled safety.

The procedure consists of the three following steps:

- First connect to your central unit (launch the server),
- Place the virtual trains on screen in accordance with the real trains locations on the layout **AND with THE SAME DIRECTION**. Here, it is highly advisable to use simulation contexts for that purpose.
- Click on "RUN" button to let CDM-Rail bring your trains to life.

8.1 PRELIMINARY HINTS

When starting to use "RUN" mode, please take the following hints into account:

- Start with one train, then two, three and more. Avoid starting with 6 trains, since it would be very difficult to diagnose, in case of problem.
- To locate your trains safely, it is recommended to use simulation contexts which have already been used successfully in Simulation mode. A simulation context which does not work in Simulation mode, will certainly NOT work in Run mode.
- When stopping a "RUN", a specific simulation context is automatically created (named `_RUN_CTXT`) which contains the exact location of all trains. This context can be used to restart the "RUN" mode safely as long as you didn't modify the real trains' locations on the real layout.

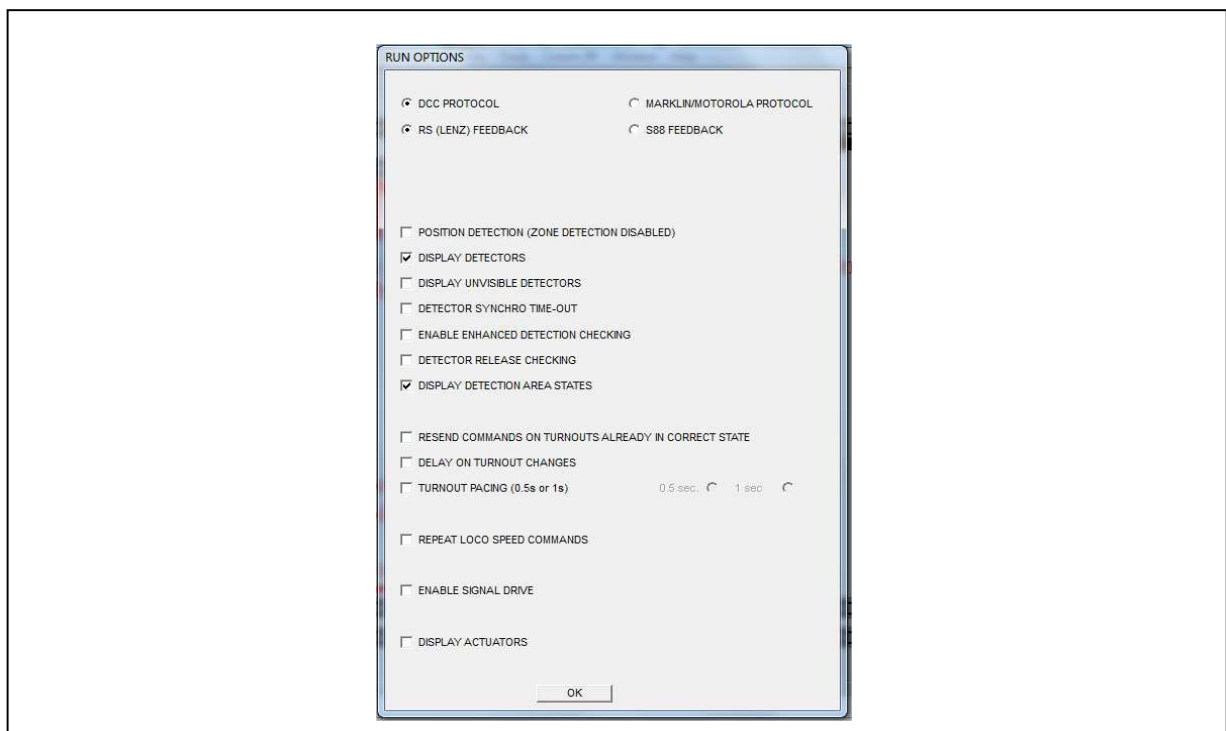
8.2 RUN OPTIONS MENU

There are many options available in "RUN" mode. These options may be customized through the RUN options menu:

Options (main menu bar)

---> Run (in the scrolling window)

The RUN options window pops-up.



The details of these options are beyond the scope of this document, and will be detailed in the next step manual: *CDM-Rail / RUN MODE FOR EXPERIENCED USERS*

For a first approach of "RUN mode", only check the following options:

- **Line 2: Select the feedback network: RS (Lenz) or S88**
- **Line 4: Check "Display detectors"**
- **Line 9: Check "Display detection area states"**

NOTE: The Marklin/Motorola protocol (line 1), still appears, but is no more supported: only the DCC mode is supported.

8.3 RUN LAUNCH: "RUN" MENU

When all (virtual and real) trains are placed on both screen and real layout, the RUN menu pops up, with one single button.



As soon as the RUN button is clicked, the simulation (and hence the simulation driven "RUN") starts, driving all trains placed both on the real layout, and on screen.

The first action of CDM-Rail is to set turnouts to their initial states. This may take some time, especially when turnout pacing (or sequencing) is activated.

While a turnout is being set, it is displayed in orange until the central unit acknowledges the state change. Then it turns back to green.

Note that during the RUN, if a train is waiting for access to a turnout, it will be stopped ahead of the signal protecting this turnout.

After turnout initialization, the RUN menu looks as follows:

Base menu:



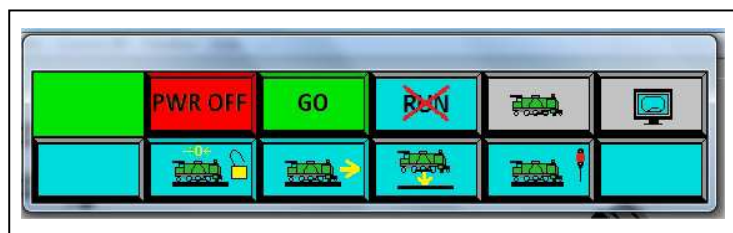
The RUN menu now consists of 6 buttons, from the left to the right:

- **State indicator** (green = GO (running); orange = STOP (trains stopped); red = POWER OFF (power is removed from the track),
- **PWR OFF:** This emergency button immediately switches power off the track. When you click on this button, all train cruise speeds are reset to 0, meaning that the trains will not restart from themselves after recovery. "STOP" button display is changed to "GO" for restart, but you will need to set all trains speed manually. Note that whenever a short circuit occurs on track (derailment, ...), the command station automatically sends a POWER-OFF, which brings the RUN menu into this state.
- **STOP:** This emergency button stops all trains. When you click on "STOP", the button display is changed to "GO", allowing you to restart. When pressing on "GO", all trains will restart with their previous speed.

- **Exit "RUN" mode:** when clicking on this button, the "RUN" mode halts and CDM rail returns to the train setup window; allowing you to add/remove trains.
Clicking again on this button restarts the "RUN" mode for all trains from their previous locations.
- **Train Operations** (loco icon): when clicking on this button, a second submenu row appears, allowing for additional operations on trains (see below).
- **Display Operations** (display icon): when clicking on this button, a second submenu row appears, allowing for additional operations on display modes (see below)

Trains operations sub-menu

When clicking on the loco icon (5th icon of the first row of RUN menu), a second row appears.



In this second row (train menu bar), four buttons are available, from left to right:

- **Stall all trains.** This first button has an intermediate effect, between the STOP and POWER OFF commands. When you click on this button, all trains are required to immediately stop,
 - But the DCC signal is still applied to the track.
 - The trains target speeds are set to 0; thus to restart you need to:
 - Either use the throttle to set the speed again, train after train,
 - Or globally restart all trains using the next button (**trains restart**).
- **Trains restart.** When you click on this 2nd button, all trains are required to return at their target speed. This button is intended for use after a **POWER OFF**, or after a "**Stall all Trains**". **IMPORTANT NOTE:** All trains will restart instantly, even those with scheduled restart.
- **Place and insert train.** When you click on this 3rd button you can place a new train on the layout without the need for stopping the RUN mode, which is highly useful during shows. The details of this operation is beyond the scope of this document. For detailed description of this feature, refer to the next step manual: *CDM-Rail / RUN MODE FOR EXPERIENCED USERS*.
- **Clean stop of all trains:** This button forces all trains to stop smoothly, in a clean manner, at the end of the next block, in front of the corresponding ending signal. This allows to "park" trains on clean locations, before stopping RUN mode, ready for restart.
- You may switch back to the Base RUN menu (one single row) at any time, by clicking on the indicator state (first icon of first row).

Display operations sub-menu

When clicking on the display button (6th icon of the first row of RUN menu), a second row appears, for managing the layout viewing modes.



In this new second row (display modes menu bar), six buttons are available. These buttons allow to invoke operations on view contexts (if already defined). These operations are definitely useful on large layouts, where the global view is not sufficient.

However, these operations are also beyond the scope of this document, and will be discussed in the next step manual: *CDM-Rail / RUN MODE FOR EXPERIENCED USERS*

To make it short, here are the functions of these 6 buttons, from left to right:

- **Scenery display ON/OFF** (equivalent to keys Insert / Del),
- **Back to layout global view.**
- **Display next view context** (equivalent to Ctrl F1).
- **Display previous view context** (equivalent to Ctrl F1).
- **Sequential display of all (level 1) view contexts**, (every other 5th second).
- **Current train tracking mode.**
- You may switch back to the Base RUN menu (one single row) at any time, by clicking on the indicator state (first icon of first row).

9 APPENDIXES

9.1 APPENDIX 1: SEQUENCING TURNOUT OPERATIONS

In default mode, for any turnout to be switched, CDM-Rail sends the proper state activating command, **immediaetly** followed by the deactivating command. Since most accessory decoders are able to generate a pulse with minimum duration (and even often programmable), this approach works OK in most cases.

However, some issues may arise, at least in the two following cases:

- **If turnouts are equipped with "solenoid type" motors, with high current consumption.**
This is the case for PECO and SEEP motors, for instance, but also for most motors offered by track manufacturers (Roco, Fleischmann, Trix, Marklin, ...). The reason is that the transient current surge, generated by the many simultaneous turnout state changes, may cause an important voltage drop on the motor power supply, which may jeopardize the switching.
- **If accessory decoders rely on capacitive discharge.**
In that case, there must be a delay in the order of 0.5 second between two commands, to let the capacitor charge again.

This is why the "turnout pacing" option has been introduced. This option allows to set the delay between two commands, to either 0.5 second or 1 second.

By default, when this option is selected, CDM-Rail waits for 0.1 second between turnout state activation and deactivation.

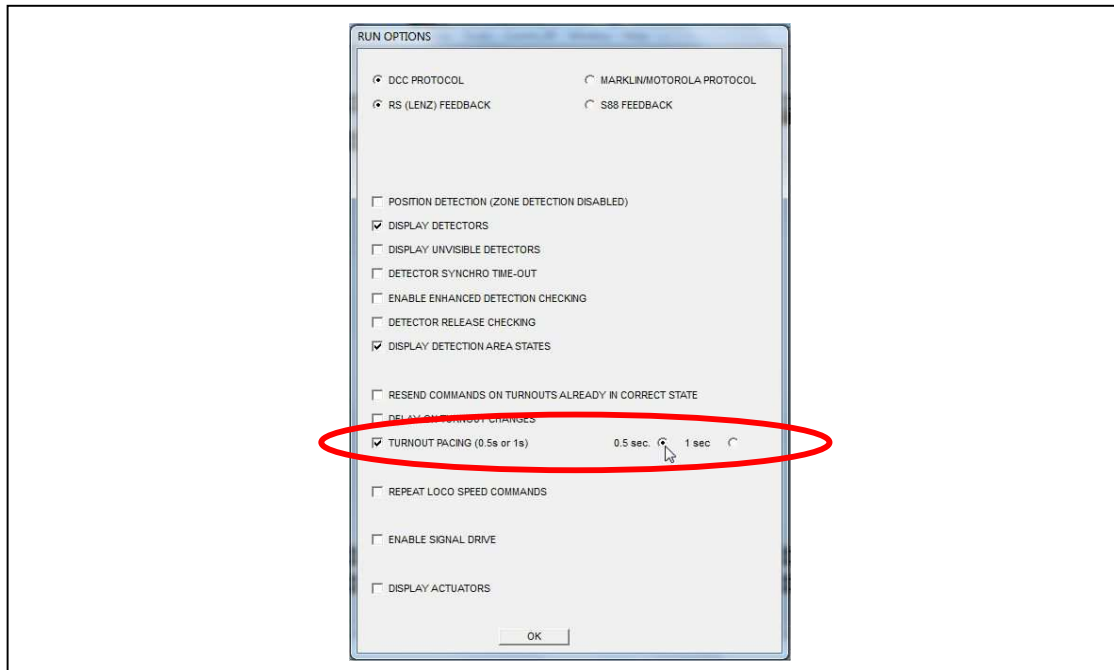
Whenever this option is selected, as soon as CDM-Rail sends a command to a turnout, this turnout immediately changes state on screen, **but this new state is displayed in orange**, meaning that it is merely a request, so far. Only after acknowledgment by the command station, after the command has effectively been taken into account, will the turnout state color turn to green. And as long as the turnout is in its temporary state (orange), the train waiting for access to this turnout is blocked ahead (by the protecting signal).

9.1.1 TURNOUT PACING OPTION

The "turnout pacing" option is accessible through the RUN Option menu.

"Options" (Main menu bar)
---> "RUN" (pop-up menu)

To activate this option, check box
"Turnout pacing (0.5s ou 1s)"
and select proper value (0.5 second or 1 second).

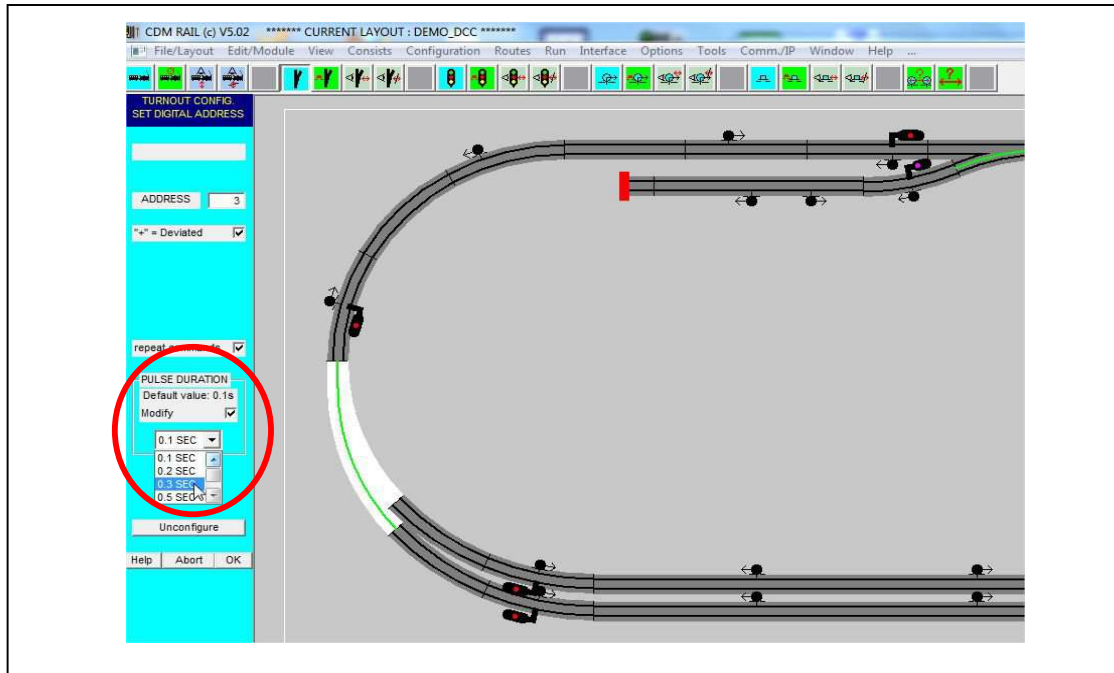


9.1.2 PULSE WIDTH PROGRAMMING

In addition, whenever this option is selected, for any turnout, it is possible to tune the pulse width (that is the delay between state activation and state deactivation commands).

This is done through the turnout configuration menu (see section 4)

"Configuration" (Main menu bar)
---> "Turnout Configuration" (Pop-up menu)



If the "turnout pacing" option is checked, a new group "PULSE DURATION" appears in the configuration menu.

If box "Modify" is checked, then it becomes possible to select a pulse duration value different from the default value (0.1 second). The possible values are:

- 0.1 s
- 0.2 s
- 0.3 s
- 0.5 s
- 0.7 s
- 1 s
- 1.5 s
- 2 s
- 3 s
- 4 s
- 5 s

If the pulse duration value exceeds the turnout pacing value (0.5 s ou 1 s), then this pulse duration is taken into account before sending the next turnout command (instead of the pacing value).

IMPORTANT NOTE:

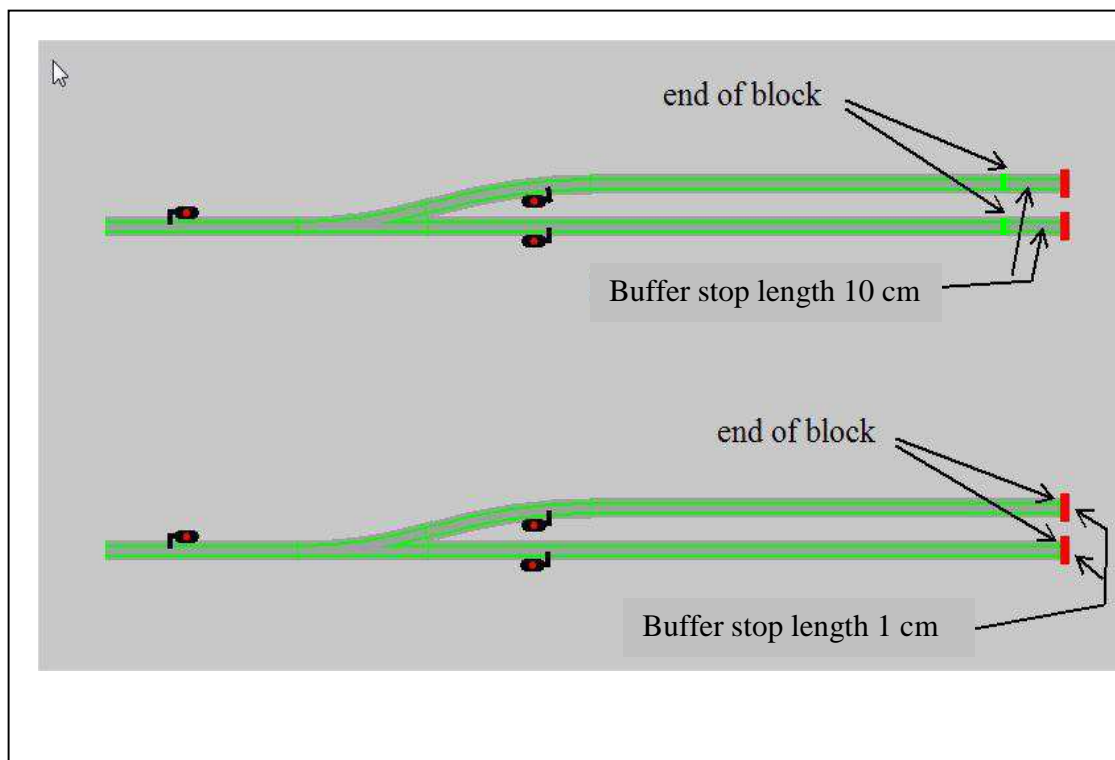
These modified pulse durations are intended for use with slow motion motors, like CONRAD, FULGUREX, TORTOISE. Do not exceed 0.3 second with "solenoid type" motors.

9.2 APPENDIX 2: SPECIFIC RULES FOR SIDINGS

9.2.1 BLOCK ON SIDING: BRIEF REVIEW

It is important to keep in mind that, in CDM-Rail, what is taken into account as end of block, on a siding, is NOT the red bar terminating the buffer stop, but the origin of the "buffer stop" track item (segment).

This is sketched by the figure below. The sidings, on the top piece of layout, use buffer stop items which are 10 cm long, whereas those of the lower piece of layout use buffer stop items 1 cm long. Though the tracks have the same overall length, those of the lower circuit allow to increase the block length by 9 cm.

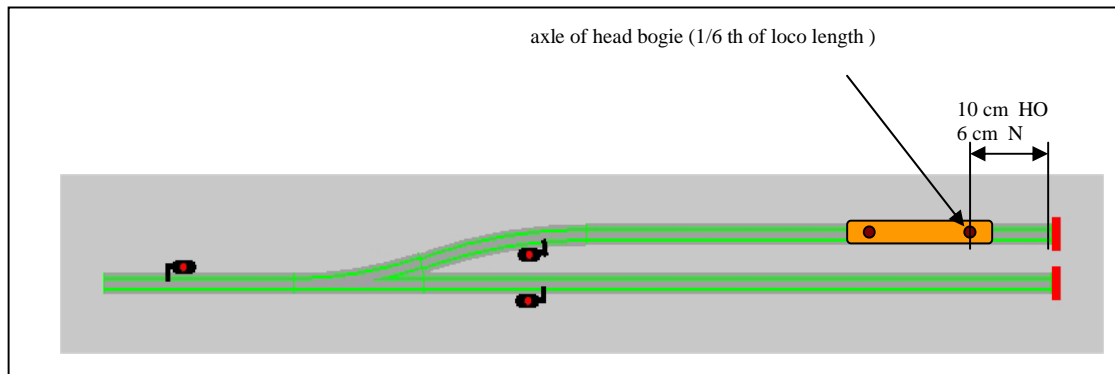


In summary, even if buffer stops from an "off-the-shelf" track system are used (and hence with a length of several centimeters), it is better (if you wish to drive your layout with CDM-Rail), to replace these buffer stops by generic buffer stops (instanciated from the edition toolbar), 0.5 cm or 1 cm long, and add an extra straight item to bridge the gap.

9.2.2 STOP DISTANCE FROM BUFFER STOP

The stop distance from buffer stop is the same as the (default) stop distance ahead of a signal at STOP. This distance is roughly 10 cm for HO scale, and 6 cm for N scale.

However, the stop distance ahead of signal is programmable, whereas the stop distance from buffer stop is not yet, in current CDM-Rail version (V5.02).



More precisely, this distance is the distance between buffer stop (or signal), and the axle of the front bogie of the loco, which is estimated to be located at 1/6 th of loco length.

It is important to take this stop distance into account, in order to fully understand the stop area determination approach.

9.2.3 SETTING DETECTION AREAS ON SIDINGS

The biggest issue with sidings, is that the train stop location is highly dependent on the deceleration CV (CV4). The following hints aim at allowing correct operation, even if these CVs are not perfectly tuned.

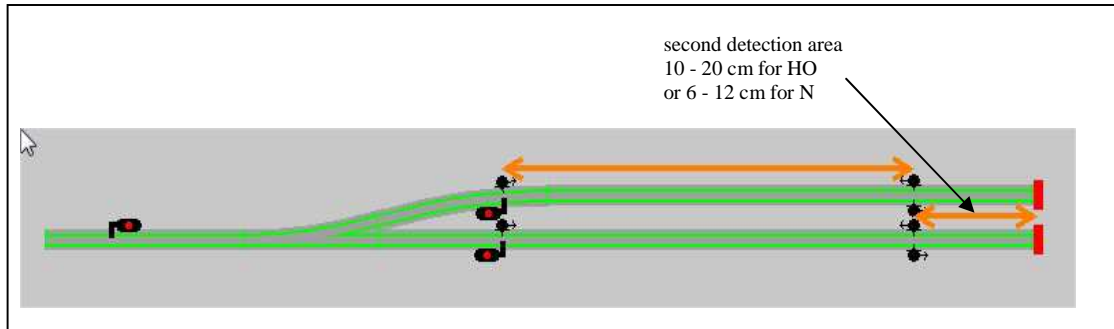
For long sidings (quite longer than the longest train intended to travel on it), the standard approach with 2 detected stop areas and a neutral (undetected) area in between, may be used. In this case, the detected (stop) areas may keep standard values:

- 45-50 cm for HO
- 25-30 cm for N

On the other hand, for shorter sidings, the detected area closer to the buffer stop should rather be shortened to between 10 and 20 cm for HO scale, and between 6 and 12 cm for N scale.

CDM-Rail make sure that the train will go at least as far as the second (and last) expected detection. This avoids that the train could stop with its tail still striding over the siding turnout.

This is illustrated on the figure below. Remind: for the detection area next to the buffer stop, the single end of the "buffer stop" item (or segment) is implicitly taken into account as the ending detection symbol.



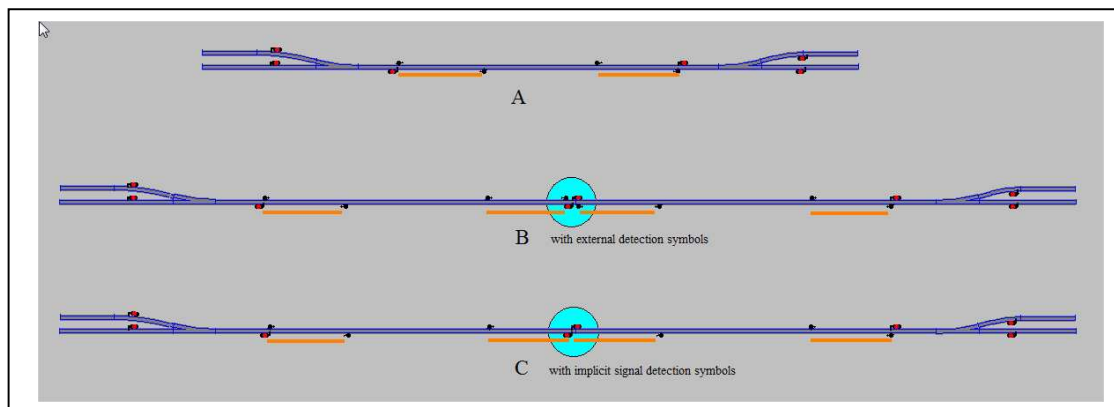
- If the train stops too early (ahead of the detection area), then CDM-Rail is going to restart it, at slow speed, until it reaches the detection area.
- If the real train is faster, or has more inertia than the virtual (simulated) train, then it will bump the buffer stop: in that case, either the speed calibration has to be rerun, or the CV4 value (deceleration rate) should be reduced.

If only one single detection area is used, the best choice is to maintain only the second detection area (closer to the buffer stop), in order to guarantee a good train stop location. But obviously, the CV4 tuning is even more critical.

9.3 APPENDIX 3: IMPLICIT DETECTION SYMBOLS ATTACHED TO SIGNALS

The figure below shows three configurations of pieces of layout.

- Configuration A shows a single block, between two turnout areas. This simple case uses the classical scheme with two detected stop areas (45-50 cm for HO, 25-30cm for N), one on both ends of the block, with a neutral area in between. Since the detected stop area must end at the same location as the block boundary signals, there is a detection symbol at the same location as each signal, but in opposite direction.
- Configuration B corresponds to the case where there is enough space between both turnout areas, to hold two blocks. In that case, at the boundary between these two blocks (light blue circle), there should be two signals in opposite directions. And, hence, it is necessary to add two detection symbols at this same location, so as to delimit the ends of both stop areas, on both sides of this block.
But CDM-Rail does not allow for setting detection symbols at the same place as the signals (due to the implicit related detectors). This is why configuration B shows detection symbols a bit apart, from the signals.
- Configuration C is identical to configuration B, but uses the detection symbols implicitly related to signals. **This is the recommended approach.**



Thus, it is necessary:

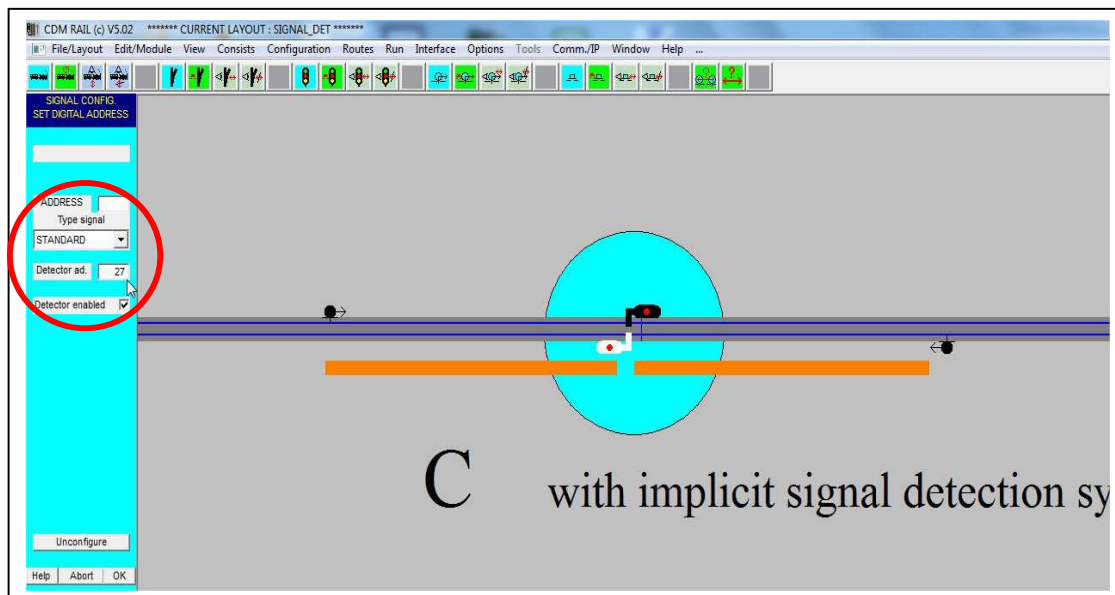
- to enable the detector related to each of both signals,
- for each implicit detector, allocate a detection area address, exactly as for any standard detection symbol.

This is done through signal configuration

Configuration (Main menu bar)

---> Signal configuration (Pop-op menu)

- Click on blue icon of the third 4 icon group (signal group), in the configuration toolbar.
- Click on the signal to be configured.
- Check box "Related detector". Do not mind the pop-up warning.
- Capture the detection area address, in field "Detector Ad." (27 in the example below).
- And finally click OK.



IMPORTANT NOTE:

The detector address is totally independent from the signal address (field "ADDRESS"). The signal address needs to be captured ONLY if a real (physical) signal is to be driven (with an accessory decoder). But most of the time, there is no physical signal to drive, and in that case, the ADDRESS field should be left empty.