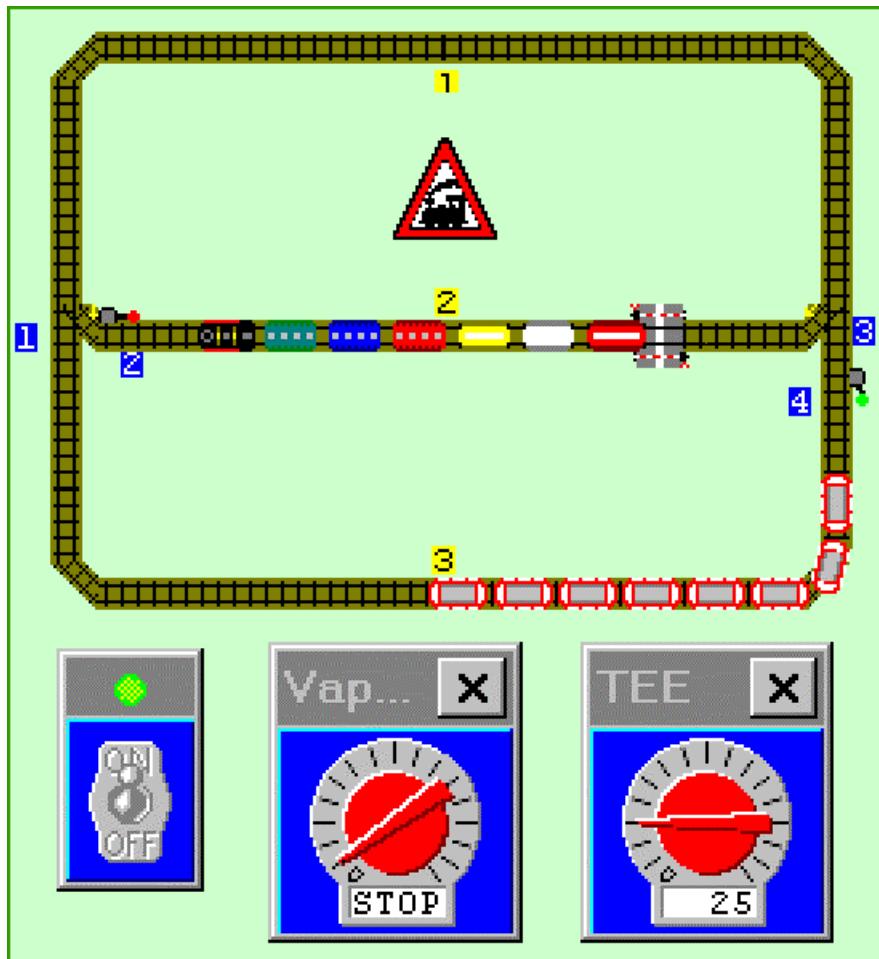


CATrain



(2.5)

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ANNEXE 1 CATRAIN.INI File

1 INTRODUCTION

1.1 Program Identity Map

Program Name:	CATrain
Program Release:	2.5
Date of the Release:	October 2015
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1.2 Overview

CATrain is a tool for designing, simulating and controlling Model Railways.

The "Design" mode allows for the drawing of very simplified schematics of the railroad layout on the P.C. screen, including devices like turnouts, signals and level crossing.

The user can define the characteristics of every device and rail section, using the "Edit" mode.

The "Running" mode permits the checking of the layout by simultaneously running several train models on it. The trains which have been installed on the railway are animated on the screen and the User can observe the traffic simultaneously with the turnout and signal operation.

This is useful to define a good layout topology and to optimize the signal positioning.

When the PC is connected to a dedicated Controller, CATrain can control a real model railway.

The trains can either circulate under the "manual" control of the User or automatically, following user defined itineraries.

In Automatic mode, CATrain controls the journey, the schedule and the track contention for every train.

As far as the motion of the trains is concerned, CATrain simulates gradual acceleration and deceleration for a more realistic effect. The Digitally Controlled trains follow their itinerary while the computer sets the turnouts and the signals as required.

The feed-back information provided by the train presence detectors ensures a good synchronization between the model and the real life version.

Both the devices (turnouts, signals, ...) and the locomotives are under computer control, when they are fitted with a digital remote control.

CATrain chooses the electrical power applied to the locomotive motor, according to a "motion profile curve" specific to each locomotive.

It also takes into account the grade incidence in order to raise or lower the electrical power.

1.3 Legal Status

CATrain has been designed and developed by Joël Bouchat who holds all ownership rights to CATrain and the associated documentation.

CATrain software may be copied and distributed royalty-free subject to the following conditions:

- CATrain software is not to be modified or altered in any way if copied or distributed. No commercial use or distribution of CATrain is allowed
- CATrain software package must be kept as a whole including all executable files, DLL files, help files, related documentation and copyright notice.
- CATrain software must be copied or distributed without any modification or alteration.

The express written permission must be granted by Joël Bouchat prior to any other variations on the use and distribution of this software.

The CATrain software is provided on an "as is" basis without any warranty.

Under no circumstances will Joël Bouchat be liable for damages arising from the use of CATrain.

2 GETTING STARTED

2.1 Language

Two versions of CATrain are available, one in English (or something which closely resembles...) and the other in French.

2.2 Documentation

A HELP file is accessible to the CATrain user. This Help file can be classically accessed by the HELP command on the main menu, or in a contextual way by pushing on "F1" during the selection of a specific menu topic. A "search" function on key words is available while consulting the Help file. This document is the main CATrain documentation. It is almost a reprint of the content of the Help file.

2.3 Required Hardware

CATrain runs on a PC with Microsoft Windows© XP SP3, 7 and 8

To control a "real" railway, the computer must be connected to a dedicated hardware Interface, plugged on a USB port.

Specific **Control Modules** can be build to control a **classical layout**.

The train layout must be split in electrically insulated rail sections, called "Blocks" electrically isolated. CATrain addresses each locomotive by controlling the supply voltage of the block(s) where the loco is located. Special Modules have been developed for driving the blocks (see chapter 3.7.2), using the PWM method (Pulse Width Modulation). There are also modules for controlling the signals and the turnouts. When the communication is established, CATrain automatically discovers the presence of the Interface board and the presence of the Modules connected to this Interface.

A detailed description of the modules can be found in a dedicated technical document present within this package.

An **Uhlenbrock**© IB-COM or Intellibox unit can also be used to control a Märklin HO or a DCC layout (Uhlenbrock, Roco, Arnold, LGB, Lenz, Digitrax,...), with the **decoders inside the locomotives**.

Of course, for a good functioning, the drivers provided by Uhlenbrock for the "USB-LocoNet" interface have to be installed and the IB-COM unit must be powered and connected to the PC.

It is also necessary that the types of layout and locomotives have been perfectly defined (Marklin, Marklin-Motorola, DCC), using the "IB-Util" tool (or another tool) provided by Uhlenbrock.

To let the flexibility for CATrain to settle the solenoid switch-on time, the minimum pulse duration must be set to 100ms.

2.4 DLLs

CATrain is provided with two *Dynamically Linked Libraries* (DLL). One is called "**cblk_32n.dll**", and it must be used to control a layout using the CATrain **Block Modules**. The other is called "**catrulni.dll**" and it must be used to control a layout through the **Uhlenbrock**© unit.

The choice of the DLL is accessible from the "**Parameters**" dialog box. (see 3.1.7).

2.5 Running the Software

To execute CATrain the user must start the application as a standard Windows© application (e.g.: by clicking on the CATrain Icon).

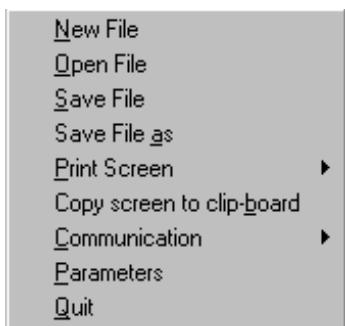
The railway layout file names have a ".TCI" extension. For his facility, the user can make an association between this extension and the "CATrain.exe" executable file.

3 USING CATRAIN

The main CATrain Menu:

Files Mode Display Trains Polarity

3.1 File Access



The **File** menu includes commands that enable you to open and save circuit layout files, establish a new workspace, print the screen and activate the serial communication.

3.1.1 Creating a new work space

Selecting the "New File" item creates a fresh layout space of 32 x 22 rails. It is possible to modify those dimensions in CATrain up to 62 x 44 rails, by re-sizing the main window.

3.1.2 Opening an existing file

Selecting the "Open File" item opens the standard Windows dialogue box to select an existing file. The default file name extension is ".TCI". Only short names are accepted. The file is restored in the mode in which it was saved. That is to say that if the file has been saved in "Design" mode, it will be restored in this mode and only the layout will be restored and displayed. If it has been saved in "Editing" or "Running" mode, it will be restored in "Editing" mode and any Trains, Throttle Controls and so on present on the layout at the saving time will be restored too. The saved context is restored.

3.1.3 Saving a layout to a file

Selecting the "Save File" item saves the layout file on the disk under its current name. Selecting the "Save File As" item opens the standard Windows dialogue box to select a file name in which the layout will be saved. The default file name extension is ".TCI". Only short names are accepted. The file is saved in the current mode. This is to say that if the current mode is the "Design" mode, only the layout will be saved. If the current mode the "Editing" or "Running" mode, every Train, Throttle Control and all the current context will be saved.

3.1.4 Activating the Real Time Communication

Activation:

When CATrain is controlling a Model Train Layout, the communication with the layout Control Modules must be activated
CATrain automatically detects the presence of a USB Interface Board and it displays the following pop-up message:



CATrain USB interface found on virtual port COM7

Next, CATrain checks for the presence of the Block Control Modules. It also notifies their presence through volatile pop-up messages.

Tracing the Communication Dialogue:

This command toggles the tracing On or Off.

This command is only operative when the communication is active.

When a tracing functionality is implemented inside the DLL handler, all the commands sent to the controller and all information received from the controller are logged into a file.

The default name of the trace file is "**ctrl.trc**".

3.1.5 Printing the screen

Print Command:

Using this command, the user can make a print copy of the layout area.

Printer Configuration Command:

For the printer configuration the standard Windows© Printer Selection, a Configuration Dialogue Box is used.

3.1.6 Copying the screen to the clipboard

The layout area is copied inside the clipboard as a bitmap. This bitmap can be opened in another application (e.g. "Paint").

For example, this is useful for creating your own specific background, using the track positioning as a starting point.

The bitmap format and the number of colors are defined by the default Window© screen mode.

3.1.7 Parameters

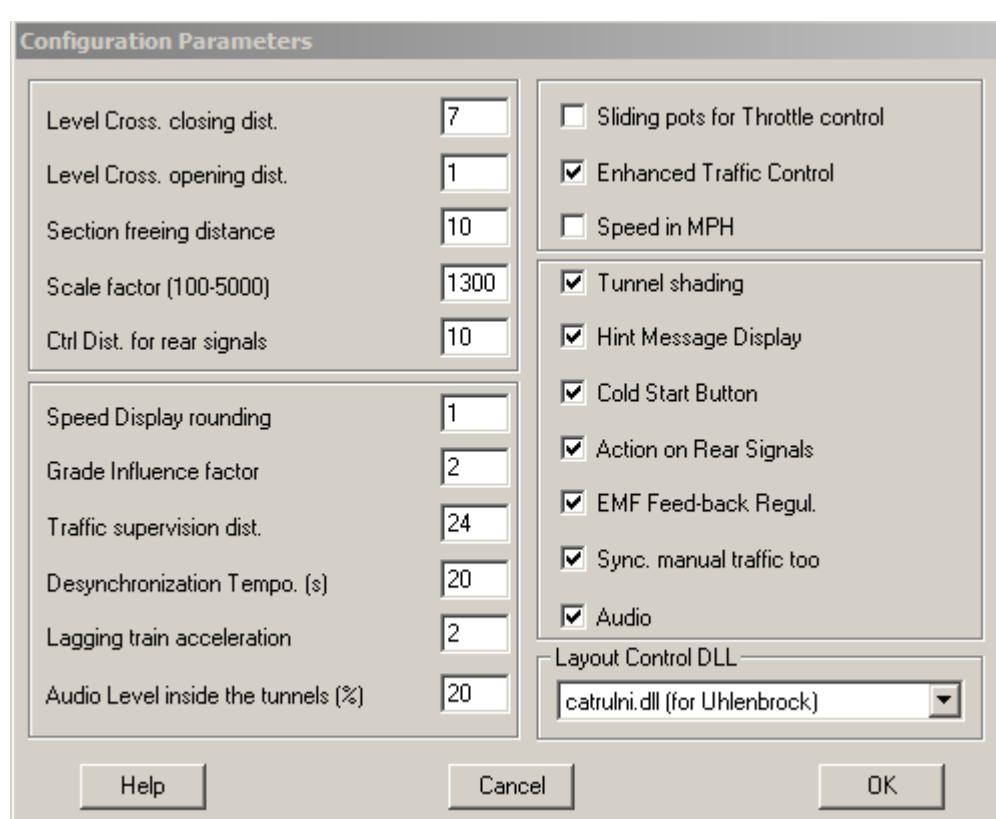
Using this dialogue box, the user can modify most of CATrain configuration parameters.

The parameters located inside the two top frames are local parameters which are stored inside your layout file. The parameters located inside the two bottom frames are global parameters which are common to every layout. They are stored. inside the CATRAIN.INI file.

The general configuration file "catrain.ini" defines the generic parameters and the generic train data base. When you launch CATrain, those parameters are used as defaults.

When you load a layout created with CATrain 1.8, the specific (local) parameters are substituted to the default ones.

Those specific parameters are not erased when you choose to create a "New File".



Here is the field description:

• "Level Cross. closing dist.":

Distance from which a train will lower the level crossing barriers.

default value : 7
 minimum value : 1
 maximum value : 64

• "Level Cross. opening dist.":

Distance after which a train will raise the level crossing barriers after the last car.

default value : 2
 minimum value : 1
 maximum value : 16

• "Section freeing distance":

This is the distance after which a train will free a rail section after that the last car has left the section.

default value : 3
 minimum value : 1
 maximum value : 16

• "Scale factor (100-5000)":

This global value is used to compute the model train motion speed on the screen from the throttle control speed expressed in KM per Hour or in Miles per Hour (MPH)

It must be adjusted to be realistic.

defaults value : 1000
 minimum value : 100

maximum value : 5000

This factor is multiplied by 0.625 when the speed indication is set to MPH.

• "Ctrl Dist. for rear signals":

This is distance from which a train will set to "GREEN" a signal which is opposite to the train moving way (rear turned).

When a bypass relay is present, only this bypass relay is activated.

default value : 10

minimum value : 2

maximum value : 64

• "Speed Display rounding":

Set the throttle display speed step resolution.

It can be adjusted between 1 and 20. A low value is prettier but it leads to heavy CPU load when rotating the throttle knob.

The default value (5) is a good compromise.

• "Grade Influence factor":

Incidence of a grade on the LOCO engine control

It can be adjusted between 1 (weak) and 10 (strong influence).

The default value is 2

• "Traffic supervision dist.":

This is the distance for scanning the resource contention (e.g. rail section occupancy status or speed limit).

A greater value is better for anticipation of accelerating or braking.

Too high a value can cause CPU overload and possible deadlocks.

default value : 14

minimum value : 8

maximum value : 64

• "Desynchronization Tempo.":

This is the Time Out value, in seconds, for train models waiting to be synchronized to a feed-back information from a train detector or from a block occupancy detector.

When this time-out is exhausted, the computer concludes that a mismatch has occurred between the "real" train motion and the PC model.

In this case, all the trains are stopped in emergency, and the main power is switched off.

default value : 10 seconds

minimum value : 0 (no synchronization)

maximum value : 60 seconds

• "Lagging train acceleration":

When controlling a real layout, when a real train is late compared to its model, this real train is accelerated. A value of "0" disable this feature, while a value of "4" causes a strong acceleration.

defaults value : 1

minimum value : 0

maximum value : 5

• "Audio Level inside the Tunnels":

The level of the audio effects assigned to a train is lowered inside a tunnel.

The volume can be set between 0 and 100%

- **Option "Tunnel Shading":**

When this option is active, the tunnels (and the trains inside) are automatically shaded on the screen. This option is enabled by default. Disabling this feature may be needed on slow machines, especially when the PC is used for controlling a real model layout.

- **Option "Hint Message Display":**

Enable the display of small pop-up hint messages.

- **Option "Sliding pots for Throttle control":**

This modifies the look of the throttle control panels. Some people prefer a sliding potentiometer. The choice has no impact on the traffic.

- **Option "Enhanced Traffic Control":**

When the "enhanced" traffic mode is activated, the train motion is more efficient and more fluid. The "alternate" itinerary route search is also activated: a train which is stopped by another train standing downstream, will "look" inside the itinerary map for another possible route. (see 3.2.4). Deactivate this option when some problems are encountered because of the layout topology or because of the lack of CPU power.

- **Option: "Speed in MPH":**

Set this option for displaying speed in Miles per Hour

By default the speed is displayed in Kilometers per Hour.

- **Option "Cold Start Button":**

Enable the "Starter" button for cold starts, when CATrain is used for controlling a real layout.

The purpose of this button is to raise a little the voltage applied to the loco motors.

- **Option "Action on Rear Signals":**

This option must be set when the user wants that the signals opposite to the train motion be set to GREEN to establish the power supply when a train is back-crossing them.

This feature is not necessary when the signals have no electrical action on the train motion, or when by-pass relays are implemented, or when no single track is present.

By default this option is ON.

- **Option "EMF Feed-back Regul.":**

When the "Block" Modules are used to control a real layout, this option activates the back EMF measurement for a better control of the loco motors, especially at low speed.

- **Option "Sync. manual traffic too":**

It is possible to force the synchronization between the models and the "real" trains even when the traffic is manually controlled. To do so, just select this option.

- **Option "Audio":**

To activate the audio effects.

3.1.8 Quit Command

To Quit CATrain: If the layout or context information has been changed a warning message appears on the screen to ask to the user if he wants to save the modified file.

3.2 Mode of Operation

Layout Design
✓ Edit Signals, Turnouts and Rail Sections
Automatic label Assignment
Grades
Itineraries
Run Manual
Run Semi-Automatic
Run Automatic

CATrain is design to be used in several modes of operation corresponding to different stages of CATrain utilization.

The Mode menu includes commands that enable you to go from one stage to another, from the Layout Design to the Edit mode and next to the Running mode.

The "Automatic Label Assignment" feature is very practical for going from the layout "Design" mode to the "Traffic" mode, without having to edit every device to give it a label. The automatic assignment avoids this tedious work.

3.2.1 Layout Design

- **Icons:**

The track layout is designed by assembling track icons together.

Each piece of track has to be picked from the **Symbol Panel** with the mouse and set on the layout area with another click on the left button of the mouse.

During the placement operation, the cursor represents the selected track icon.

While or after setting a rail on the layout, the user can rotate the rail with a click on the right button of the mouse.

The rotation step is 90°

The rail is automatically aligned to a Grid.

The Grid can be displayed or hidden by selecting the **Grid** topic into the Display main menu.

Although the schematic drawing is rather primitive, several types of rails and devices are available.

The standard rails are pieces of track, which include straight rails, curves, bridges, crosses and track ends. The curves are in fact 45° rails, which can also be used to move train in diagonal.

Setting several rails together form a Track Section.

- **Standard Rails:**

Standard Rails								
Straight Rail	Curve	Diagonal	Dual diagonal	Side Track	Diag. Track End.	Rail Cross	Tunnel	Bridge

The "curve" is in fact a simple rail at 45 °. It may be use as a 90° curve or to realize 45° diagonal tracks.

- **Diagonal:**

The Diagonal track is a simple rail at 45°. It may also be use as a 90° curve.

- **Dual Diagonal:**

The dual diagonal track may be used to increase the layout density.

- **Tunnel:**

The tunnel entrance is set on the layout only for information purposes. When the option "tunnel shading" is set, the track between the tunnel entrance and the exit(s) is shaded. The tunnel has no active role on the traffic but a train circulating inside a shaded tunnel is also shaded.

- **Bridge:**

The bridge allows the train circulation on two levels.

- **Devices:**

Devices						
Right Turnout	Left Turnout	Junction	Signals	45° Signals	Level Crossing	Indep. Device
						

- **Signals:**

Two different signals are available; the light signal and the semaphore. Each signal can be placed at the left or at the right side of the track. The 45° signals can only be positioned on the external side of the track. Signals are available for left and right circulation. Some extra national signals are also available. The user has access to these signals by selecting the "signals" menu topic on the symbol panel. Their functioning is identical to the functioning of the generic signals.

- **Level Crossing:**

Assembly of Level Crossing pieces when several tracks have to be protected together is automatic.

When the user sets a Level Crossing on the layout, any adjacent level crossing part is detected and the gates are only drawn on the outside parts.

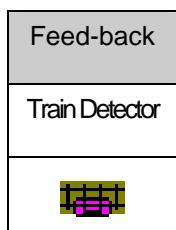
Up to 24 level crossings may be installed.

- **Independent Devices:**

Independent devices are not directly related to the tracks or to the traffic. Those symbols are used to control electromagnetic devices for car unhooking, lighting, crane control, ...

Their position on the layout does not matter

- **Train Detectors:**



The presence of train detectors on the layout is only mandatory when CATrain is used to control a "real" model railway.

Positioning of the train detectors is rather critical since they achieve the synchronization between the computer simulation and the real traffic.

There are also detectors on curves and on 45° tracks.

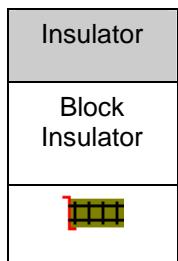
Up to 240 train detectors can be installed.

To detect the presence of a locomotive, several ways can be implemented:

- mechanical contacts closed by a locomotive.
- reed contact sensors closed by magnets attached to each locomotive
- current sensing hardware which detects the power consumption of a locomotive present on an insulated rail. A Module has been developed for implementing this feature (see chapter 3.7.2).
- optical detectors
- ...

When a locomotive is detected the controller reports the identification of the detector which has been activated. Train detectors are not necessary when CATrain is just used for traffic simulation. When CATrain is interfaced to the flexible Block Modules, the detectors are not absolutely needed.

- **Block Insulator**



Rail sections are normally delimited by the presence of switches or signals. When the user wants to split a rail section in several blocks, without using extra signals, he may use the Block Insulator. This is useful to feed the blocks with different power supplies. The block insulators are only useful when CATrain is used for controlling a real layout through the Block Module system. In this case, every block is connected to a separate PWM channel. More PWM channels are used better is the traffic behavior and better is the synchronization with the computer. (See chapter 3.7.2)

There are also insulators on curves and on 45° tracks.

- **Horns**



The first symbol is used to play an audio clip when the locomotive crosses this track element. This can be the whistle or the horn of a train, or any audio clip located inside the "Audio" folder. The second symbol is used to play an audio clip triggered by an external event, when controlling a real layout. It can also be used in simulation mode by referencing a "Train Detector" track element.

- **Erasing:**

It is possible to erase a rail already placed on the layout by replacing it with an Empty box. One or several rails can also be erased together by using the Block editing commands.

When a new rail icon is placed on the layout where another icon is already present, the new icon replaces the existing one.

When a device (turnout, signal,...) is set on the layout where a device of the same family already exists, the attribute of the existing device (label, address, ...) are reused for the new device when applicable.

- **Block Manipulation:**

In the "Layout Design" mode, to select a rectangular bloc, click on the layout with the left button of the mouse and capture the bloc by moving the mouse without releasing the button until the end of the capture. The selected bloc is "highlighted".

When a bloc has been captured, a menu is displayed with the following features:

- **Copy:** to copy the bloc to the clipboard.
When present, the device labels are also copied, but not the section labels.
- **Cut:** same as "copy" but the original bloc is erased.
- **Cancel:** to abort the operation.

To paste the block on its new position, left-click once again and hold the mouse button, WITHOUT MOVING the mouse, until the cursor becomes a cross. When the button is released, the following menu is displayed:

- **Paste:** to copy the bloc from the clipboard to the screen.
- **Abort:** to abort the paste operation.
- **Undo:** to abort the operation and restore the layout when a bloc has been cut.

It is possible to copy and paste a bloc of layout from one CATrain window to another one belonging to a different session of CATrain.

3.2.2 Editing Devices (Signals, Turnouts, ...)

After that the layout has been drawn, the next step is to enter the "Edit" mode to provide more information on the layout for every installed device.

The devices include the **Signals**, the **Turnouts**, the **Junctions** and the **Level Crossings**.

These devices can be controlled by CATrain on the screen and also the "real" railway.

The **Train Detectors** are also part of the device set. They cannot be controlled but they provide feed-back information to CATain on the position of the "real" trains.

CATain accepts up to 242 controllable devices (from which 24 level crossings) and 240 train detectors. Those numbers can be reduced by the capabilities of the control hardware used.

The user must provide all the information necessary for the dynamic control of the devices (turnouts, signals, level-crossing, ...) even when CATain is not used to control a model railway. Some information, like the **Label** is mandatory for a turnout or a signal to be operated manually or automatically.

A device label value should be unique. When the Label value is null, the device is not controllable.

The device labels can be displayed and positioned anywhere on the layout.

The user can also edit a track section to adjust its length and give it also a Label (not mandatory).

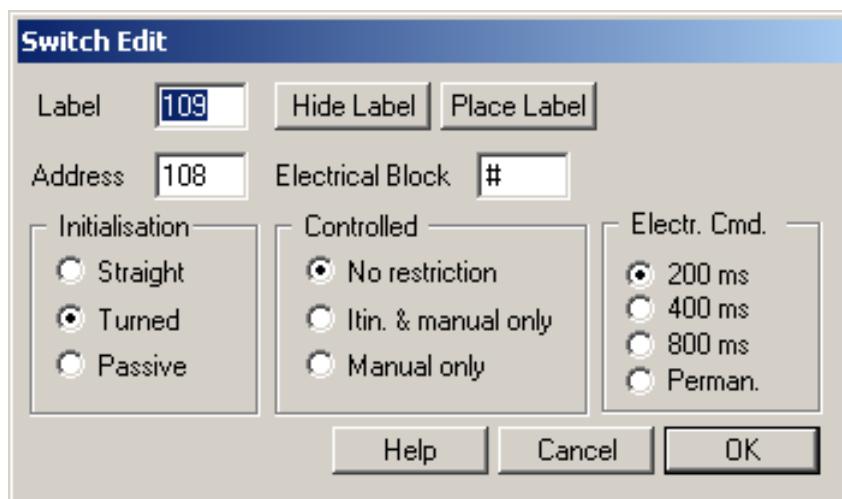
The characteristics of every Device can be edited by a single mouse click when CATain is in "Edit" mode or by a double mouse click when CATain is in "Design" mode.

When currently in the edit mode, the user must click on a device or on a standard rail of the track section with the left button of the mouse to enter the corresponding dialogue box

When currently in the "Design" mode, another way to edit a device is possible, the user must double-click on the device or on a standard rail of the track section with the left button of the mouse.

Here are the features of the available Dialogue Boxes:

- **Switch Edit Dialogue Box**



The Switch is a **turnout** or **rail junction** device for which several parameters must be specified:

- The **Label** field must be filled if the Switch has to be manually or automatically controlled. In this case, giving a valid and unique Label to the switch is mandatory.
- The **Address** field must be filled when CATain is used to control a "real" railway. The default value of the address is equal to the label value minus one.
The address is used to send an electrical command to the device.
Its value is critical when CATain is used to control a "real" Model Railway.
- The **Initialization** of the Switch allows to set the switch to a correct state before running trains.
When CATain is used to control a "real" railway, this initialization state must correspond to the state of the physical switch.
The possible states are:

Straight: for a straight course.

Turn: for a turnout diverting the train from the straight course.

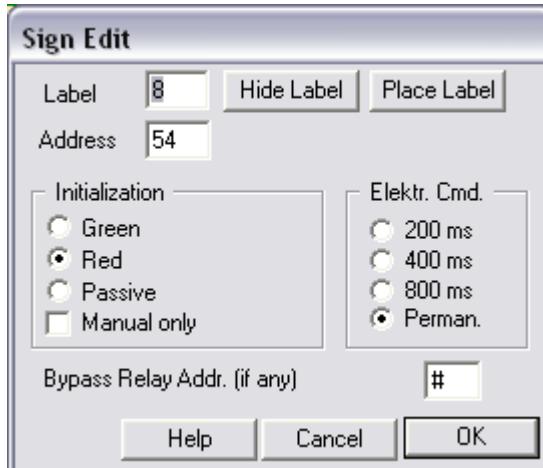
Passive: for an inactive switch

Devices without label are passive and cannot be controlled, but it is possible, in the "Edit" phase, to set a default position to a passive device. This is especially useful for passive switches which are not "branching" turnouts. When a train encounters a passive switch, it considers that this switch is in the straight position. (Straight is the default).

- The **Control** check boxes are used to limit the possible control capabilities on the switch:
No Restriction has to be checked when the user accepts complete automatic control of the switch.
Itin & Manual Only has to be checked when the user accepts automatic control of the switch for Itinerary purposes and for manual control.
Manual Only has to be checked when the user accepts only manual control.
- The "**Electrical Block**" field has to be filled with the physical Address of the block to which the switch belongs, when CATrain is used for controlling a real layout through the Block Module System. The two less significant bits of this address select the device driver into a given module, while the 5 following bits are the module address. The maximum value for the Block Address is 127. (see chapter 3.7.3).
- The "**Electronic Command**" check boxes are used to select a driving pulse duration for the device. This feature is only useful when CATrain is used to control a real layout. This is supported by the Block Modules system only. The permanent action is for devices requiring that the power supply be applied permanently. This is rarely the case for turnouts, most turnouts are "twin coil" devices and they would be "burned out" if a permanent action were selected. When the driving module has been configured for delivering 8 steady state outputs, those outputs are always permanent and any selected pulse duration is not taken into account.
- The "**Hide Label**" and "**Place Label**" buttons have to be used when the user wants to leave the dialogue box with the capability to Hide the existing device label or to place a new device label on the layout. The label color is blue.

• **Signal Edit Dialogue Box**

The Signal is a device for which several parameters must be specified:



- The **Label** field must be filled if the Signal has to be manually or automatically controlled. In this case, giving a valid and unique Label to the switch is mandatory.
- The **Address** field must be filled when CATrain is used to control a "real" railway. The default value of the address is equal to the label value minus one.
The address is used to send an electrical command to the device.
Its value is critical when CATrain is used to control a "real" Model Railway.
- The **Initialization** of the Signal allows to set the signal to a correct state before running trains.
When CATrain is used to control a "real" railway, this initialization state must correspond to the

state of the physical signal, especially when the physical signal is not a dummy one and has an active role on the traffic control.

The possible states are:

- Green:** for a "clear to pass" signal state.
- Red:** for a "halt" signal state.
- Yellow:** for an inactive signal.

- The "**Manual Only**" check box has to be checked when the user wants that CATrain does not automatically change the state of this signal when trains are circulating in automatic traffic mode .

- The "**Bypass Relay Addr.**" is something a bit special:

When the signal has an active role on the traffic control and the signal is located on a single-line track where trains are traveling in both direction, only the signals encountered in the train traffic way are valid. If a train "sees" only the back of a signal, this signal has not to be taken into account.

To avoid that a train be stopped by such a signal set at "Halt", a "Bypass Relay" has to be installed to re-establish the power supply on the insulated track section.

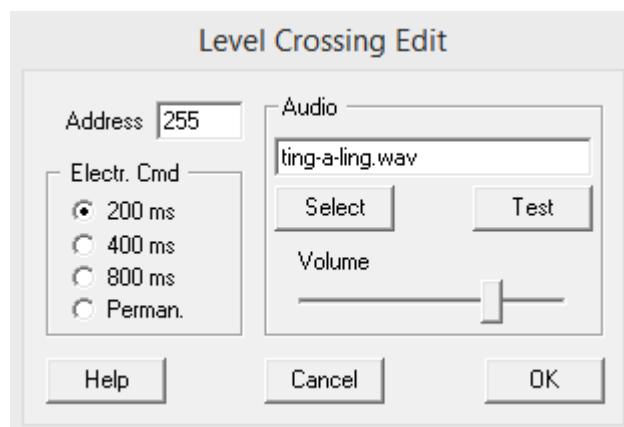
The address to drive this "Bypass Relay" can be specified in this field. CATrain will automatically control this bypass relay to avoid power failures.

When no address or address 0 is given, CATrain will automatically set any backward oriented signal to green when a train is approaching so that the power continue to be supplied to the insulated section.

This is not as realistic as the solution using a bypass relay but this solves the single-line track problem without extra hardware.

- The "**Electronic Command**" check boxes are used to select a driving pulse duration for the device. This feature is only useful when CATrain is used to control a real layout. Even so, not all hardware supports this feature. This is supported by the Block Modules system only. (See chapter 3.7.2). The permanent action is for devices requiring that the power supply be applied permanently. This is often the case for light signals and standard electromechanical relays. Anyway, be careful that the concerned signal is not a "twin coil" electromagnetic device, it would "burn out" if a permanent action were selected. The supply of the bypass relay, when installed, is always defined as "permanent". When the driving module has been configured for delivering 8 steady state outputs, those outputs are always permanent and any selected pulse duration is not taken into account. When the driving module has been configured for delivering 8 steady state outputs, those outputs are always permanent and any selected pulse duration is not taken into account.
- The "**Hide Label**" and "**Place Label**" buttons have to be used when the user wants to leave the dialogue box with the capability to Hide the existing device label or to place a new device label on the layout. The label color is blue.

• Level Crossing Edit Dialogue Box



Assembly of Level Crossing pieces covering several tracks is automatic as explained in the chapter describing the layout facilities. So, there is only a single address for a level-crossing protecting

several parallel tracks. All the parts of a same level crossing share the same address. For the level crossings only their "physical" address is necessary for the electrical control of the "real" level crossing.

A Level Crossing has no label. It is automatically controlled by the traffic of the trains.

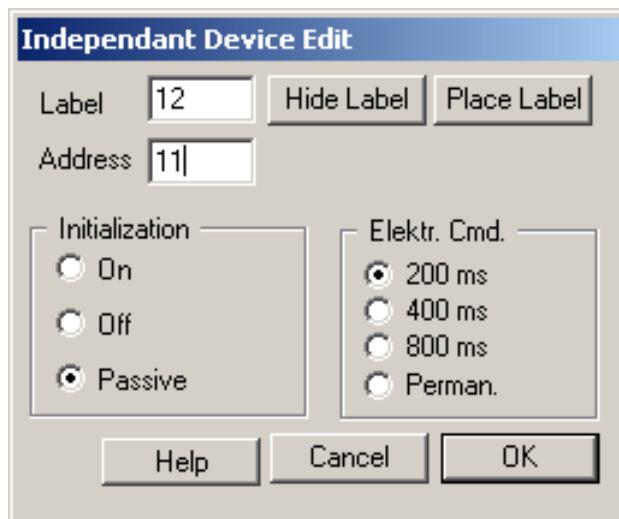
The "Electronic Command" check boxes are used to select a driving pulse duration for the device. This feature is only useful when CATrain is used to control a real layout. Even so, not all hardware supports this feature. This is supported by the Block Modules system only. (See chapter 3.7.2). The permanent action is for devices requiring that the power supply be applied permanently. This is sometime the case for level crossing mechanisms. When the driving module has been configured for delivering 8 steady state outputs, those outputs are always permanent and any selected pulse duration is not taken into account.

Inside the "**Audio**" insert are located the buttons to assign an audio clip to this level crossing. This clip must be located inside the "Audio" sub-folder. Of course you can create your own audio clip! This clip must be in "wav" or "mp3" format with a sampling frequency of 44.1Khz, preferably monaural. The small clip is played in loop and using a ".wav" audio file is recommended, a ".wav" file has more precise beginning and ending.

For easiness, the effect can be immediately tested.

- **Independent Device Edit Dialogue Box**

An Independent Device is a device which is not directly related to the train traffic. For example, it can be a lighting relay, a device to unhook the cars, or a crane. Those elements can only be manually controlled.



As for other device control, several parameters must be specified:

- The Label field must be filled for the control to be operational.
- The Address field must be filled. It is the address of the physical remote controller. By defaults CATrain sets this field to the Label value minus 1.
- The Initialization of the Controller allows setting the device to a correct state before running trains. When CATrain is used to control a "real" railway, this initialization state must correspond to the state of the physical device.

The possible states are:

Active: for an active device (ON).

Inactive: for an inactive device (OFF).

Passive: when the control is not operational.

- The timing check boxes are used to select a driving pulse duration for the device. This feature is only useful when CATrain is used to control a real layout. Even so, not all

hardware supports this feature. This is supported by the Block Modules system only. The permanent action is for devices requiring that the power supply be applied permanently. This is often the case for standard electromechanical relays. When the driving module has been configured for delivering 8 steady state outputs, those outputs are always permanent and any selected pulse duration is not taken into account.

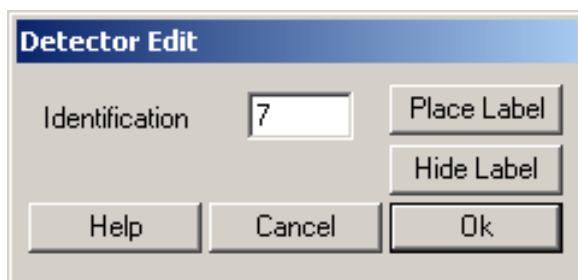
- The "Hide Label" and "Place Label" buttons have to be used when the user wants to leave the dialogue box with the capability to Hide the existing device label or to place a new device label on the layout.

- **Detector Edit Dialogue Box**

The Train Detector is not really given an **address** but rather an **identification** value. Each train detector must be given a specific identification number.

Setting Train detectors on the layout is only mandatory when CATrain is used to control a "real" model railway in an automatic traffic way.

The identification number given to the train detector must correspond to the value sent by the controller when it detects a "real" train on this track. Value 0 is not allowed.



The detector **identification number** can be displayed as a label.

The "**Hide Label**" and "**Place Label**" buttons have to be used when the user wants to leave the dialogue box with the capability to Hide the existing detector label or to place a new label on the layout. The label color is purple.

Using train detectors is not mandatory when the Block Module System is used. The block controller called also PWM controller automatically reports to CATrain the presence of a Train on a given block. So, the synchronization between the layout and the model is performed without the need for train detectors. But they can be used for enhancing the synchronization, and thus, the security and the realism are better. They should be located on long track sections, not far from the ending signal.

- **"Horn" Edit Dialogue Box**

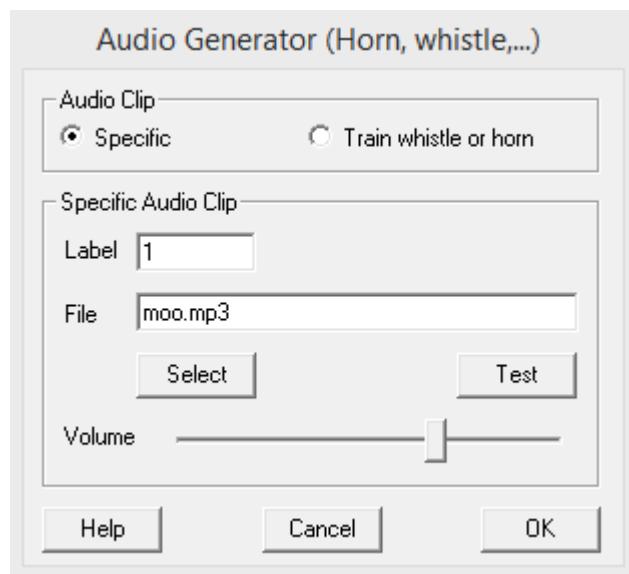
The "Horn" is used to play an audio clip when the locomotive crosses this track element.

This can be a "**Specific**" audio clip located inside the "Audio" folder.

You can create your own audio clip. This clip must be in "wav" or "mp3" format with a sampling frequency of 44.1Khz, preferably monaural.

The audio volume can be adjusted. For easiness, the effect can be immediately tested.

Another possibility is to play the "Horn" or "Whistle" sound assigned to the locomotive.

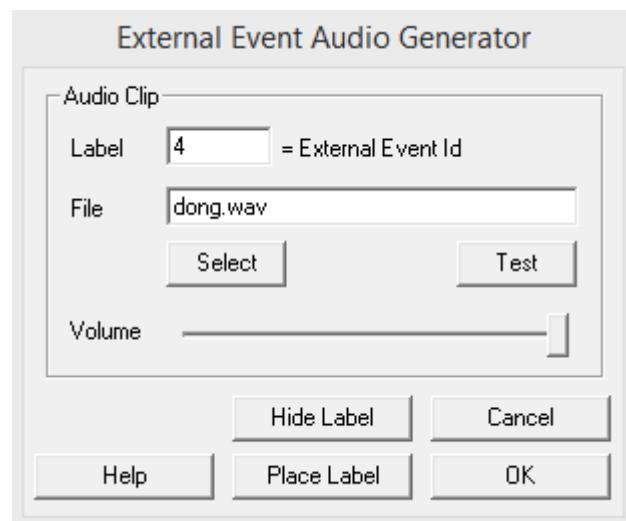


- **"External Event Audio Generator" Edit Dialogue Box**

This dialog box pops up when one clicks on the element showing a small red horn inside a circle. It is used to play an audio clip triggered by an external event. This is only of interest for people who control a real layout, but it can also be experimented in simulation mode by assigning in the "label" field the identifier of a train detector present on the layout. As for the "Horn" associated to a track element, the selected audio clip must be located in the "Audio" sub-folder but you can create your own clip. It must be a file in "wav" or "mp3" format with a sampling frequency of 44.1Khz, preferably monaural.

The audio volume can be adjusted . For easiness, the effect can be immediately tested.

A "floating" label can be placed near the element for an easy identification.



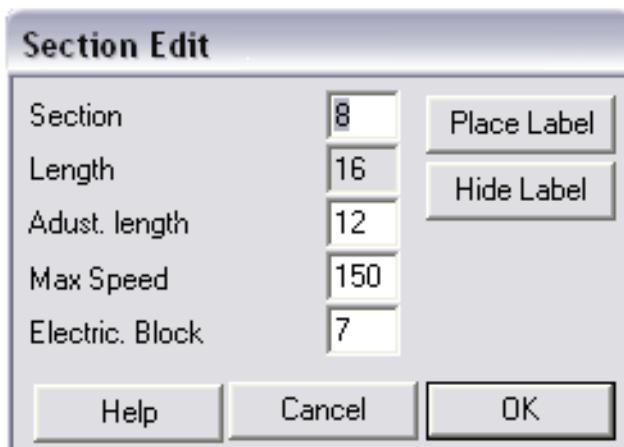
3.2.3 Editing Track Sections

• Track Section Edit Dialogue Box

A track section is terminated by a signal, by a switch (turnout or junction) or by a side track end. A track section is also called a "block" section when a signal is present on it to control the traffic. When a section is terminated by a signal, this device is part of the section and it is possible to stop a train at the end of this section by setting the signal to "halt".

When a section is terminated by a turnout (or a junction), this turnout is not part of the section.

A section can be given a user defined Label. This may be useful for some itinerary purpose.



The Section labels can be displayed on the screen layout.

Giving a section label is not mandatory. It is only useful to ensure the synchronization of trains running on some Itineraries in automatic traffic mode. For example, when establishing an Itinerary, if the operator specifies that a given train must wait until another train arrives on a given track section, this track section must have an explicit label.

If the user does not specify an explicit label, CATrain gives a default "hidden" label to the section. This default label cannot be displayed on the screen.

A track section is also a "Block". The "**Electrical Block**" field has to be filled with the Block physical Address when CATrain is used for controlling a real layout through the Block Module System. The two less significant bits of this address select the device driver into a given module, while the 5 following bits are the module address. The maximum value for the Block Address is 127.

The "**Length**" field is given in "track unit" that is to say about 18 cm in HO scale.

The section length is the length drawn on the layout.

By filling the field "**Adjust. length**", it is possible to adjust the section length to be closer with reality and to better fit with the real model railway.

This ensures a better synchronization between the "real" traffic and the train models on the screen.

This feature must be used with great care!

By default, the value of the adjusted length is equal to the length.

The "**Max Speed**" field has to be specified to limit the speed on this track section. The maximum (default) value is 320 (KM.H or MPH).

The "**Hide Label**" and "**Place Label**" buttons have to be used when the user wants to leave the dialogue box with the capability to Hide the existing section label or to place a new section label on the layout. This is only possible when an address different from 0 is given to the section. The label color is yellow.

3.2.4 Itineraries

An important feature of CATrain is the possibility to create itineraries and to assign an specific itinerary to every train circulating on the layout.

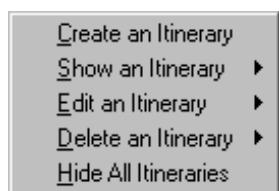
In fact, operating trains automatically would be almost impossible without this feature.

Every Itinerary has to be interactively captured before its use.

An Itinerary can only be used by a train in Automatic Traffic mode.

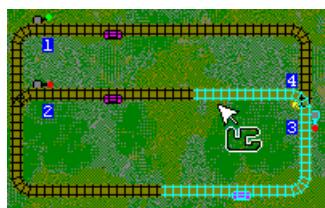
- **Create an Itinerary:**

To Enter the Itinerary capture mode, the user must click on the "**Create an Itinerary**" topic inside the "Itinerary" pop-up menu.



When the Itinerary capture is going on, a specific cursor is displayed.

To start the itinerary capture, the user must click with the left button of the mouse on the railroad where he wants to start the itinerary.

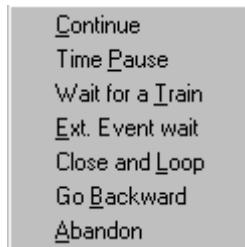


Next, without releasing the left button of the mouse, the user must move the mouse following the track in the same direction than the trains which will circulate on this itinerary.

The itinerary is drawn on the screen by changing the color of the track.

The user can go back on the track to erase what has already been captured and to take another direction.

When the user releases the capture, the following menu appears on the screen:



Here is the meaning of each command:

- **Continue:**

To continue the itinerary capture.

- **Time Pause:**

To make a pause on the current section. This command is only enabled only when the current track section is terminated with a signal. When this topic is selected, the user will be asked for the minimum number of seconds that the train has to wait.

- **Wait for a Train:**

To wait for another train on another rail section. When this topic is selected, the user will be asked for the section label on which the train is awaited and what is the number of the awaited train. Of course, the section on which the train is awaited must already have been given a valid label.

A minimum Time Pause can be added to the train waiting. This command is only enabled when the current track section ends with a signal.

- **Close and Loop:**

An Itinerary must always be a loop.

When the user has already been on the current rail, it is possible to close the loop and to leave the itinerary capture.

In this case, the "Close and Loop" command is enabled.

- **Wait for an external event:**

To wait for an event reported by the real time controller which is in charge to send orders to the "real" railway and which collects the feedback information. When this topic is selected, the user will be asked for the event number for which the train is waiting.

This command is only enabled when the current track section ends with a signal.

- **Go Backwards:**

Reverse the train motion direction. When you have selected this option, the train will automatically continue backwards. Before that you can continue the itinerary capture, the capture menu will appear again. This is the opportunity for adding an extra pause time, or an event synchronization, before that the train restarts its journey in the opposite direction.

- **Abandon:**

To abandon the itinerary capture.

At the end of the itinerary capture, the user is requested a name for this itinerary. The itinerary name can be anything that helps the user to remind what are the trajectory and the specificity of this itinerary.

When an Itinerary is no longer valid because of a modification of the layout topology, it is automatically deleted. An information message appears on the screen.

Remarks:

- **Passive switches:** sometime, it seems impossible to follow a given route! This is due to the fact that you are on a turnout or a junction declared as "passive" or under manual control only: the itinerary cannot be drawn if such a turnout is not oriented in the proper direction. In this case you must abandon the itinerary capture and edit the switch to set it correctly, or allow it to be controlled automatically.
- **Alternate Routes:** when several track choices are possible (e.g. in a station), the user can draw several loops through all possible routes. When the "enhanced traffic" option is selected in the "Parameters" dialog box, a train which is stopped by another train standing downstream, will "look" inside the itinerary map or another possible route.

- **Edit an Itinerary**

Select the name of the Itinerary to Edit from the list of existing itineraries

This functions allows modifying an existing itinerary without needing to create a new capture.

Editing is performed in text mode.

The Itinerary can be examined and slightly modified by the user using classical text editing features. You can add or modify pause delays, add extra event synchronization and so on.

The available menu topics are very classical:

- Inside the "Edit" menu, you will find the common "copy", "cut" and "paste" commands, together with an "undo" capability.

Inside the "Update" menu, you will find, in addition to the "quit" command, the items for "saving" the itinerary or for "reloading" it. The Itinerary table can also be printed

Here is an example of an Itinerary in the Editing Window, with some comments:

Itinerary 4: Front-Rear

- ```

1) Section 5 (17, 5 -> 23, 5), waiting for any train on the section 4
2) Single rail element (24, 5)
3) switch(_/) (25, 5)
4) Section ## (25, 6 -> 25, 9)
5) Section 6 (25,10 -> 17,10), time pause of 6 secs, Reversing
6) Section ## (25, 9 -> 25, 6)
7) switch(--) (25, 5)
8) Single rail element (24, 5)
9) => Loop to 1, Reversing
```

On top, you see the Itinerary Name: "Front-Rear". You can modify it.

The editing window shows every step of the itinerary. The syntax is rather explicit.

**The line 1** shows the starting section coordinates. In this example, this is the track section 5, starting on the grid position (X = 17, y = 5) and ending on (x = 23, y = 5). Before starting, the train must wait for any other train present on the section 4. Although there is no good reason for modifying the section coordinates, you can modify the other parameters. for example, you can write:

- ```
1) Section 5 (17, 5 -> 23, 5), waiting for train 3 on the section 4,  
time pause of 5 secs.
```

This makes the train waiting for another train (3) and an extra delay of 5 seconds is required before that the train can leave the section 5

The editor is very tolerant on the ordering and on the specification of the extra parameters. Writing the following sentence is also correct:

- ```
1) Section 5 (17, 5 -> 23, 5), pause 5, waiting train 3 sect 4
```

**The line 2** indicates that the next itinerary step is a single rail located at (x = 24, y = 5).

**The line 3** indicates that the next itinerary step is a turnout located at (x = 25, y = 5). The sign "\_/" indicates that **this turnout is on the "turned" position**.

**The line 4** shows the coordinate of the next rail section. The sign "##" indicates that this section has no label given by the user.

**The line 5** indicates that the train will reverse its motion direction, after a 6 second stop.

**The line 7** : "--" indicates that **the turnout is straight**

**The line 9** ends the itinerary. The train is on the step 1 again.

If the modified itinerary is incoherent, an error message is displayed when the user tries saving it. The erroneous line is notified. The user can always reload the previous correct version of the concerned itinerary.

- **Delete an Itinerary:**

When the user wants to delete an existing itinerary he must select the "**Delete an Itinerary**" topic inside the Itinerary Pop-up menu. The name of the Itinerary to be deleted has to be selected from the list of existing itineraries

Other commands are available about itineraries both inside the Itinerary menu and the Display main menu:

- **Show an Itinerary:**      Display a specific Itinerary on the screen.

Select the name of the Itinerary to display from the list of existing itineraries. When an itinerary is displayed on the screen, it is possible to **install a train on this itinerary**.

In "Editing" mode and in "Manual traffic mode", you also have the capability to "**initialize**" the **itinerary**. This allows all the turnouts covered by an itinerary to be set to their default positions by a single click.

This is done by displaying the itinerary and left clicking on it. A message window pops-up, which asks if the turnouts should be initialized to this itinerary.

This feature is of interest mostly to those people using CATrain to control a real layout.

- **Hide All Itineraries:** Hide all itineraries from the screen.

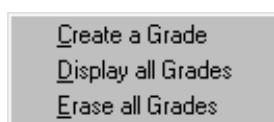
The Itinerary currently displayed on the screen will be hidden.

You can achieve the same result by clicking on the layout with the right button of the mouse.

### 3.2.5 Grades

To fit closer to the real model railroad, grade positions and gradients are set by the user interactively after the circuit design phase.

To mark a grade on the railway, the user must display the "Grades" Pop-up menu into the Mode main menu and select the Create a Grade topic.



When in grade editing mode, the cursor represents a "grade".



To draw a grade, the user must click on the left button of the mouse at the bottom of the rise and move the mouse up to the top of the rise before releasing the left button.

At the end of the capture, a single line dialogue box is displayed to ask for the gradient percentage.

The gradient may be fixed between 1 and 20(!) %. To erase the grade, just enter the value 0%.

Other menu topics are available to **Display all Grades** on the layout and to **Erase all Grades** from the layout. When a new grade is created over an old one, the previous one is erased.

**To erase a single grade**, just re-create a grade of value 0 %.

The electrical power applied to the locomotive depends on the motion profile but also on the defined grade at the current position of the train model on the railway layout.

When a locomotive is going up on grade, CATrain sends an order to the controller to raise the traction electrical power applied to the "real" locomotive motor. The power augmentation is proportional to the gradient value.

Likewise, when the locomotive is going down, the electrical power is lowered.

### 3.2.6 Running the Trains

When the circuit layout is finished and the every active device has been given a label, the user can enter the "**RUN**" mode accessible from the Mode main menu.

The RUN mode is also activated when the Power Switch is set to "On".

Three Running modes are available, the manual mode, the automatic mode and the sem-automatic mode.

Not only the devices, but also the train motion is under the control of CATrain.

The user can modify the maximum speed of a train using the Throttle Panel.

A train will never go faster than the maximum speed which has been assigned by the operator.

When the speed is limited on a track section, the train moving on this section will respect the speed limitation.

In every the control of the Level Crossings is automatic.

- **Manual Mode:**

In the manual mode, the turnouts, junctions and signals (devices) have to be controlled by the user. Only "labeled" devices can be controlled.

The manual device control is done by a simple left button mouse click on the device to toggle its state, or by the use of the *Device Control Panels*.

A Turnout can be set to Straight or Turn, a Signal can be Red (halt) or Green (pass).

The operator must use the Throttle Panel associated to a train to modify its speed, but the train will always respect the signals even in manual mode.

Even in manual mode it is not possible to have a collision, the collision avoidance algorithm is always active.

This is only true for train models on the screen; crashes between "real" trains can occur when the real time synchronization has been lost...

- **Automatic Mode:**

In the automatic mode, the setting of the turnouts and the signals depends on the train automatic circulation.

The turnouts will be correctly positioned before the passage of a train when this train follows a given *itinerary*.

The Signals are automatically set to "halt" or "clear to pass" by the CATrain algorithm which take into account the railway contention.

In "automatic" circulation mode, some train may circulate on a given itinerary while others circulate without a dedicated itinerary. The routes of these last trains is rather random since they will not change any turnout setting and will take the routes selected by the passage of a previous train circulating on an itinerary.

- **Semi-Automatic Mode:**

This mode is identical to the automatic mode, but the manual control of the devices remains possible. The user settings prevail over the automatic circulation algorithm.

When a signal is set to "Red", it will stay red until the user sets it back to green, even if the track is free. However, there is still an automatic protection. The system is "fool proof". When a user sets a signal to green and the track is not free, or has already been allocated to another train, the signal is immediately set to red again, before that the train can start.

When the user changes a turnout in front of a train, the train will follow this direction even if it goes out of its itinerary.

This semi-automatic mode is the default and preferred traffic mode.

- **Power Switch**

When CATrain is in the Edit or Run mode, a Power Switch is displayed on the screen.

This Power switch can be activated by the user to toggle between the "Edit" mode and the "Running" mode. To manipulate this switch, the user must click on the toggle switch with the left button of the mouse and move the mouse to set the tumbler in the desired position, or he can immediately click on the desired position, in this case it is not necessary to move the mouse.

The "**ESCAPE**" key can also be used to switch the power off.

When a User sets the switch to ON, but CATrain cannot determine if the user was previously running traffic in automatic or manual mode, a dialogue box appears to ask the question.



When CATrain is used to control a "real" model railway, the controller receives an order to establish or to cut the main electrical power when the tumbler is manipulated.

A auxiliary red button may be present at the bottom of the icon. This is an "starter" button which can be activated during a cold start. When the user clicks on this flat red button, the electrical power applied to the loco motors is raised. Starting the traffic when the motors are cold is a critical phase and the presence of the "starter" greatly helps.

The locos are started faster and there is far less synchronization problems. Of course, this feature is only present when CATrain is used to control a real model railroad. After 5 minutes or so, the user must stop the "starter" action by clicking again on the red button. To move the position of the Power Switch, just click on the title border of the window and move the mouse while

continuing pushing on the left mouse button. A small hand indicates that the window may be captured.

### 3.3 Display Facilities



#### 3.3.1 Global Information about the layout

This feature is used to list and print all the layout characteristics, (section info, device labels, addresses, train detectors, ... ).

#### 3.3.2 Size ( 640x440 ->1600 x 1120 )

This is for choosing a default layout size. Another way for modifying the size is selecting the window border as classically performed in Windows applications. This menu is useful for people who do not have a large screen on their PC, and who want to edit a layout larger than their screen.

#### 3.3.3 Displaying a Grid

A positioning GRID can be drawn on the *background*. This option is toggled On or Off by using the GRID command inside the **Display** main menu.

The grid color depends on the background color.

The "x" abscissa is horizontally displayed on the top of the window.

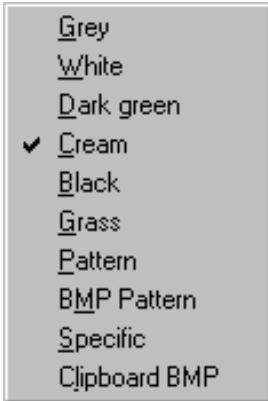
The "y" ordinate is vertically displayed on the left side of the window.

#### 3.3.4 Background

The User can choose between several pre-defined backgrounds for the layout.

The possible selections are :

- A **Gray** background,
- A **White** background,
- A **Dark Green** background,
- A **Creme** background,
- A **Black** background,
- A **Grass pattern** background,
- A **Pattern** background
- A "**BMP Pattern**", defined by the user inside the "bpattern.bmp" file in CATrain directory,
- A **Specific** background, created by the user inside the file "xxx.bmp" associated to the "xxx.tci" layout file.
- A background imported from the **Clipboard** when it contains a valid bitmap drawing. For this feature to be active, a dedicated "XXX.BMP" background file must exist.



The background file must have the same name that the "CIRCUIT" (XXX.TCI) File, but with the .BMP extension. (e.g.: the "decor.bmp" file is associated to the "decor.tci" layout in the provided examples). The presence of a dedicated background file is checked at the "FILE LOADING" time, but the background is not automatically displayed. The user must select the "specific background" topic inside the "display/background" menu to display the newly realized scenery background. There is no specific tool included inside CATrain to create or edit the .BMP background file. A general purpose "painting" tool must be used.

The user can also import, as a background, a bitmap drawing placed inside the clipboard by another application (e.g. "Paint"). When the layout will be saved as a disk file, the user will be asked: "**Do you want to save the new background ?**". If he answers "yes", the imported background drawing will be saved as a "specific" background bitmap file, associated to the layout file.

### 3.3.5 Symbol Panel



In "Design" Mode the Symbol Panel is necessary to fetch a specific rail or device and put it on the layout.

Its display can be toggled on or off by selecting the Symbol Panel item inside the **display** menu.

The symbol panel can be moved anywhere on the layout area. It is never displayed in Edit or Run mode.

Click on the "Signals" topic to toggle between generic signals and signals used in France.

### 3.3.6 Throttle Control

When a train is placed on the railroad, its throttle panel appears on the screen.

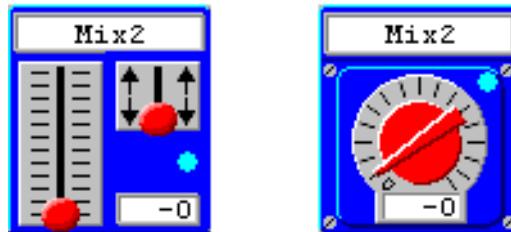
The manual setting of the throttle determines the speed of the train.

The user must set the throttle to the maximum speed at which he wants the train to go.

The train will never go faster than this speed. It can go slower when there is a speed limitation on the current rail section or when it has to stop because of a "halt" signal or because it runs on a side track.

Two types of throttle controls are available with a rotary or a slider button.

The type is selected in the "Parameter" dialogue box. (in "File" menu).



While running trains, the throttle indicates the current train speed in real time.

To modify to speed, the user must click on the speed indication ring around the knob and "turn" the knob by moving the mouse while continuing pushing on the left button of the mouse.

When the user releases the left button on a speed higher than the previous one, the train will accelerate to the new maximum speed chosen by the user.

If the train cannot move because the *power switch* is "off" or because the train is stopped on a "halt" signal, the newly requested maximum speed will be taken into account later.

To avoid abrupt modifications of the train speed, the user must manipulate the throttle control with care. When using the rotary potentiometer, clicking on the center of the knob reverts the train motion direction. To set it back in the main direction just click again on the center of the knob.

A yellow button may be present on the left upper corner of the panel. This button permits to control the special function present on the locomotive (lighting, smoke generation ...).

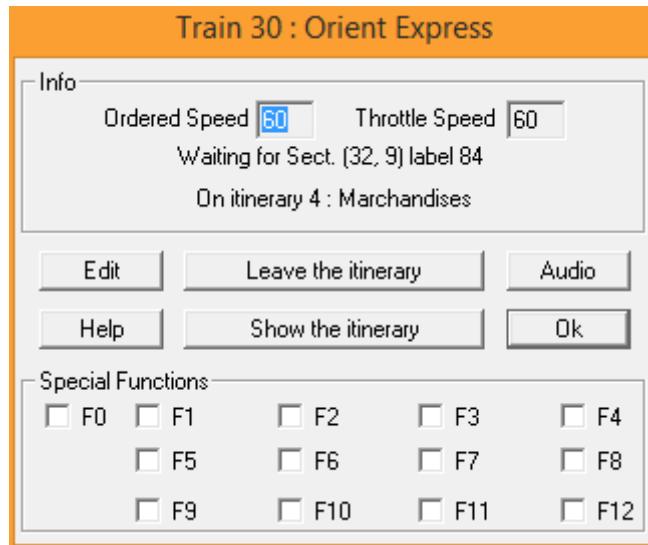
The blue "Led" is the "current train" indicator. It lights when this train is selected as the "current train". This selection is performed by simply moving the mouse over the throttle control window, or by using the keyboard accelerator keys (see paragraph 3.8).

When CATrain is used to control a real layout through an Uhlenbrock unit, with decoders implemented inside the locomotives, an extra "Led" is present to control the "F1" special function. Generally this function is used for to activate the loco lights.

When the user clicks on the box, but outside of the main knob, he gets some practical information about the train status. To move the position of the throttle panel, just click on the title border of the window and move the mouse while continuing pushing on the left mouse button. A small hand indicates that the window may be captured.

The throttle panels can be removed from the screen to gain some computer resource. To remove a single throttle panel, just click on it with the right button of the mouse. They can be displayed again by selected a specific train number into the same pop-up menu or by the Show All selection. To remove all the panels, access to the Throttle Control pop-up menu from the main Display Menu and select the "Hide All" topic.

- Train Information Dialogue Box



**This panel can also be obtained by right clicking on the train.**

The **Ordered Speed** (KM/H or MPH) is the speed assigned to the train as a target.

The maximum value of this "ordered speed" is the "throttle speed" but it can be lower, because of a speed limitation on a rail section, or when the train has to be stopped.

The **Throttle Speed** (KM/H or MPH) is the maximum speed assigned to the train by the user with the throttle knob.

A message is displayed within the dialogue box to give some information about the Train behavior.

When a train is not running, it may be waiting for a given rail section to be free.

The message gives the section number and the identification number of the train still occupying this section or having already reserved this section. When the section number is preceded with the character '#', it means that this section owns an automatically assigned internal number not defined by the user. When the train follows a given itinerary, the reference and the name of this itinerary are written in the dialogue box.

The button "**Edit**" is used to access the "Edit" dialog box for configuring this train. The train is stopped during the configuration process. It is restarted when leaving the "Edit" dialog box.

The button "**Show the itinerary**" is only accessible when the train runs on an itinerary. It may be replaced with "**Hide the Itinerary**" or "**Set train on Itinerary shown**", when another itinerary is displayed on the screen.

It is also possible to **remove** a train from its itinerary when clicking on "**Cancel Itinerary**".

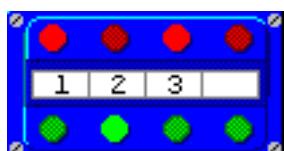
The button "**Audio**" is used to access the audio effect dialog box for this locomotive.

The **Special Functions** are only present when CATrain is used to pilot a real layout using an Uhlenbrock control unit. The function 'F0' is also directly accessible as a small "Led" indicator on the clutch control. Most often it is used for the locomotive headlights.

### 3.3.7 Device Control

The easiest way to manually control devices is to click with the left button of the mouse on the device. This will toggle the device state.

Another way is to use of the Device Control Panels:



Each panel can control four devices. The label associated with the device is displayed on the control label. For each device a red button and a green button are present. A panel owns a total of eight buttons. These buttons are used for the manual control of the devices.

The user must click on the light green or light red button associated to a device to control the device state.

They are also set automatically by CATrain to show the state of a device. A couple of buttons is toggled from dark-red/light-green to light-red/dark-green.

To move the position of a Device Control panel, just click on the center of it on the "label" display and move the mouse while continuing pushing on the left mouse button. A small hand indicates that the window may be captured.

To remove a single Device Control panel, just click on it with the right button of the mouse.

To remove all the Device Control Panels use the "Device Control" command from the "Display" main menu, which toggles the Panels On or Out of the Screen.

### 3.3.8 Show an Itinerary

Clicking on this topic, displays the list of the existing itineraries. The user must then select the itinerary that he wants to be shown on the layout.

When an itinerary is displayed, it is possible to place a train on it.

For more explanations about the itineraries, see the paragraph "Itineraries".

### 3.3.9 Hide all Itineraries

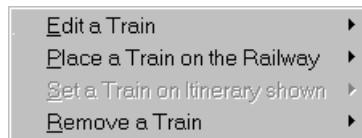
Clicking on this topic, hides the Itinerary currently displayed on the screen.

You can achieve the same result by clicking on the layout area with the right button of the mouse.

### 3.3.10 Refresh Display

Clicking on this topic redraws the entire layout area.

## 3.4 Setting Trains



### 3.4.1 Train Editing

Apart from the railroad layout, the user has to specify all the **Trains** that are available.

A Train consists in a Locomotive and up to 16 attached cars.

From CATrain 1.80, **the train configuration is saved within the ".TCI" layout file**.

Every layout has its own specific train data base. This is useful for exchanging layouts between users. Some traffic parameters are also saved inside the ".TCI" file.

The train data base is not erased when you choose to create a "New File".

Each train has its own throttle control to set its current maximum speed. Up to 80 trains can be defined. Each train can be separately configured and identified and has its own address.

The length of the train, its momentum and its maximum speed may be adjusted. This is especially important for the maximum speed, which has to be chosen in such a way that the movement of the simulated Train on the screen is almost synchronous to the one of the physical train.

The momentum is used to compute the acceleration and deceleration profile.

To ensure a good control and a good synchronization of the "real" model train, a Motion Profile Curve is present for every train. The user can calibrate the applied Voltage relative to the Speed. 14 voltage steps are available.

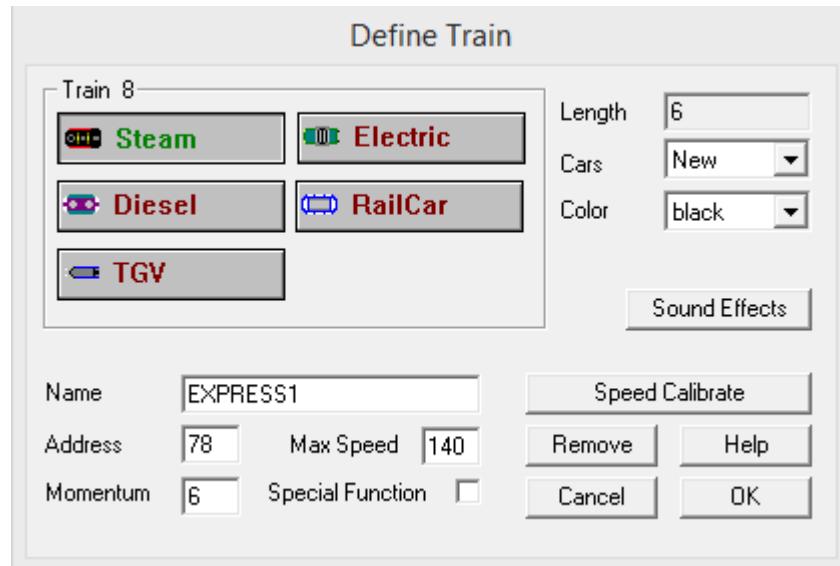
All the characteristics of every train are entered using the Train Definition Dialogue Box and the related other Dialogue boxes: the Car Definition and the Speed Calibration.

The Trains are not related to a specific track layout file; their definition is global to all layouts.

The characteristics of every train are stored in the CATRAIN.INI.

The user enters the **Train Editing Dialogue Box** by selecting an existing train or a new train in the Train menu list.

- **Train Editing Dialogue Box**



A Train is made of a single Locomotive and up to 16 attached Cars.

The Train Definition Dialogue Box is used to choose the characteristics of the Locomotive.

All the relevant parameters of a train are stored into the CATrain Initialization File CATRAIN.INI.  
(See Appendix 1).

Every train is automatically given a **Number** to identify it in the list of trains.

Up to 80 trains can be defined.

The Locomotive Type is selected by four buttons: Steam, Diesel, Electric, Rail-car.

Each type has a different drawing. This drawing is a simplified top view which is useful to recognize the trains on the screen.

Every Train must be given a **Name**: This name is used to identify the throttle associated to a given train. Preferably, the name must be short otherwise it will be truncated when it is displayed on the throttle panel.

The Address of the train is mandatory when the speed of the "real" train is digitally controlled by the computer and every locomotive can be individually addressed.

The address value must be the address selected on the digital decoder inside the locomotive.

The Length of the train is determined by the number of attached cars. The length is given in "car units", this means that the locomotive and each car is accounted as one unit of length when computing the length default value.

The **Special Function** button is used to indicate that a special remote control is present on the locomotive, for example, the lighting or the smoke generator.

The **Color** of the locomotive can be chosen from a list. Not all colors are available for every locomotive Type.

The **Momentum** is a value between 1 and 10. It is used to take into account the loading and inertia of the train. The computer will simulate the acceleration and the deceleration of the train in a gradual natural way. Higher is this value, smoother are the accelerations and the deceleration.

The train **Maximum Speed** is the speed of the train when the throttle is completely opened and the train is running on a section without speed limitation.

This value is very important to achieve a good synchronization between the "real" train and the computer model on the screen. It is used to scale the Speed Calibration.

When the model on screen is slower than the "real" train, the Maximum Speed value must be raised. For convenience, this value is given in KM/H, but this convention can be easily changed, for example, to Miles/Hour by modifying the global Scale Factor in the CATRAIN.INI File.

The **"Sound Effects"** button is used to access the Audio effect dialog box.

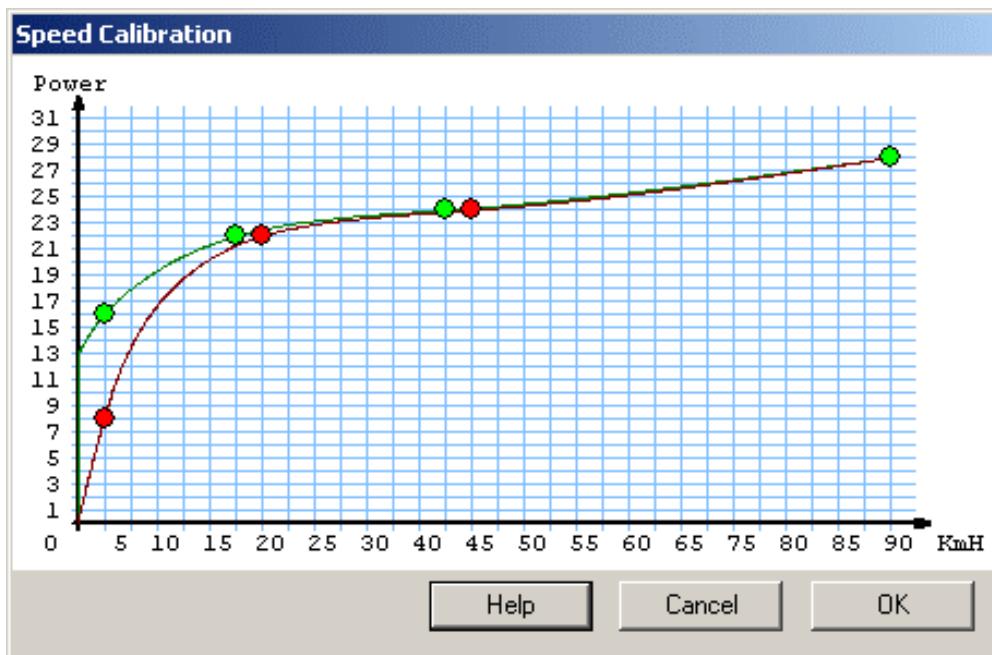
The **Remove** button is for removing the entire train (the locomotive and the attached cars) from the list of trains. When the user asks to remove a train, a confirmation is requested.

The **Speed Calibrate** button is used to access the Speed Calibration window.

The **Car list** is used to select and edit an already defined car, or to attach a new car to the locomotive. The Car is edited by using the Car Definition Dialogue Box.

#### • Speed Calibration Dialogue Box

This window is extremely important when the motor of the locomotive is digitally controlled.



The curves represented on this window can be adjusted by the user to convert a given Speed to an electrical power applied to the Locomotive motor.

There are two curves, the **green** one used when the train is accelerating and the **red** one is used when the train is decelerating. This is mainly useful at very low speed, when the motor performances are far from perfect... At normal running speeds, the two curves must be close together, otherwise the train motion will be "jerky"!

The precision is limited to 31 speed steps.

To adjust a curve, the user has to click the index circles and move them to fit the electrical power requirement for this locomotive.

The most important point is the electrical power applied to start moving the locomotive. Some locomotives will start moving at a very low voltage, others need a high electrical power.

When the starting power has been determined by making the locomotive move as slowly as possible, the user has to run the locomotive at different rates to build the rest of the curve and compensate for the engine non-linearity.

Fine calibration tuning must be done after that the global speed scales factor and the train maximum speed has been adjusted correctly.

A good calibration is important to ensure synchronization between the motion of the "real" train and the computer model on the screen, especially to achieve correct braking at a red signal for trains with a high momentum.

- **The Train Audio Edit Dialog Box**

This dialog box is accessible from the main "Train Editing Dialog Box", accessible from the Train editing menu, and also from the "Train Information Dialog Box" accessible by clicking on the speed controller or on the train itself. This alternative is more practical because it does not stop the train circulation.

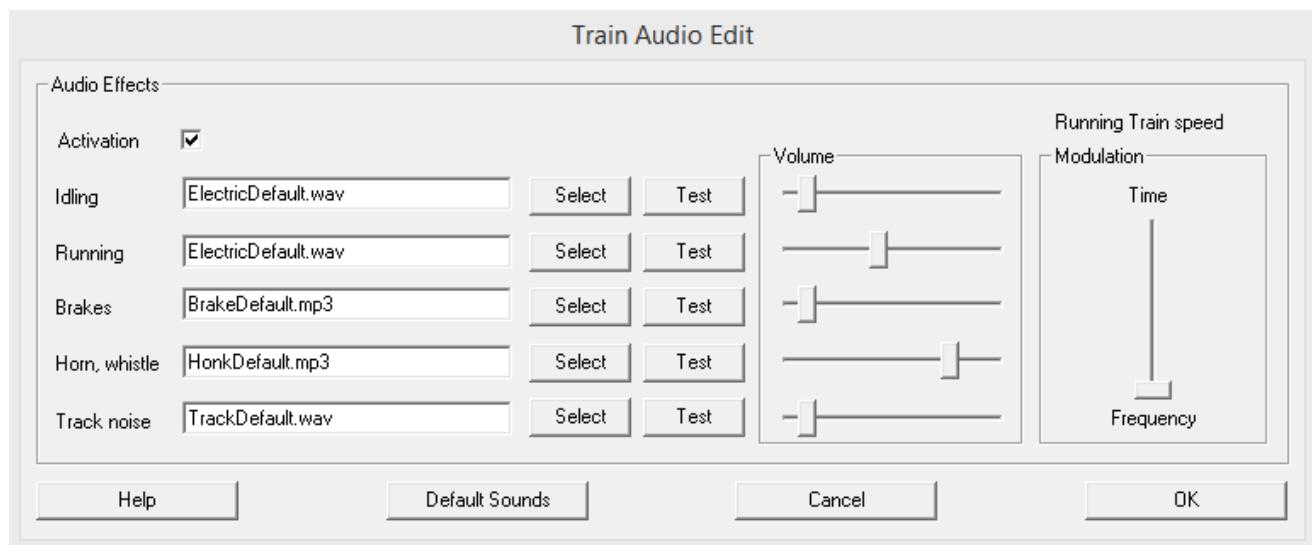
Each loco can be assigned several audio effects.

The button "Default Sounds" can be used to load "standard" sounds, depending on the loco type, (steam, electric, diesel, railcar, tgv), but, of course, you can create your own audio clips for experimenting.

The volume of each audio effects is adjustable. The volume is automatically reduced when the train is inside a tunnel. (see "Parameter Setting").

The audio files must be "wav" or "mp3" files, sampled at 44.1 KHz. Monaural recordings are sufficient.

Once selected, a clip can be immediately tested, but for the "Running Train" effect, it is advisable to experiment the result in real-time on a train running at a moderate speed. (see "Running" audio effect).



There are five types of effects:

- **Idling:**

This is the noise generated by a train when it is stopped inside a station or at a red signal. This clip is played in loop. Therefore it must be rather short, preferably in "wav" format, this format being more precise than the "mp3" format for defining the beginning and end of the clip.

- **Running:**

This is the most important effect. It is generated when the train is running. Its specificity is to be repeated with a periodicity proportional to the train speed. As for the "Idling" sound, a short clip, in "wav" format, with well adjusted beginning and ending is optimal.

The "Modulation" slider plays an important role in the generation of the audio effect: this "modulation" determines how the clip is stretched or shrunk to fit the train speed.

When the cursor is up, the clip duration is modulated without modifying its pitch (audio frequency). More the cursor is pulled down, more the pitch is modified, the tone goes higher when the train speed increases. In practice, for a steam locomotive, it is better not to modify too much the pitch and the cursor must be high, but for an electric locomotive this is the contrary.

- **Brakes:**

Typically this is the squealing noise of the wheels on the track and on the brake pads. This clip is played only once when the train slows down for stopping. The duration can be rather long but nothing is critical. A "mp3" format can do the job.

- **Horn, whistle:**

This is simply the whistle or horn blasting sound of the locomotive. This clip is played when the locomotive crosses a rail element with the little red horn, and when this horn element has been parameterized to generate the train horn sound rather than a specific audio clip. Precision is not required and an "mp3" file is enough. The audio level of the horn or whistle is also lowered when the train is inside a tunnel.

- **Track noise:**

This is a very short clip imitating the clatter of the wheels at each gap between the rails. It is produced each rail element transition. The clattering noise is higher when the train is on a bridge.

- **Car Editing Dialogue Box**



Each car attached to a locomotive has to be individually defined using the Car Editing Dialogue Box.

Up to 32 cars can be attached to one locomotive to form a Train

The Car number and the Train number are displayed for user information only.

The Car Type is selected by four buttons: Rail-car, Car, Truck (wagon), Tank-car.

Each type has a different drawing. This drawing is a simplified top view.

The Color of the car can be chosen from a list. Not all colors are available for every Car Type.

The Remove button is for removing the Car from the train.

When the user asks to remove a car, a confirmation is requested.

### **3.4.2 Installing a Train on the railway**

When the "Edit" or "Running" mode is activated, the operator can place a train on the railway.

To put a train on the railway the user must select the "Place a Train on the Railway" topic.

This command is only enabled when no itinerary is shown on the layout.

The Train has to be selected into the existing train list.

Of course, when CATrain is used to control a "real" model train, the train position must be coherent with the real world and the position of the train model must correspond to the position of the "real" train

At the placement time, the train can be rotated by a click on the right button of the mouse. The rotation step is 90°.

The train must be placed on a section sufficiently long. Care must be taken to set any turnout or junction which is located under the train correctly. Also be careful of other trains.

### **3.4.3 Setting a Train on an Itinerary**

To put a train on an Itinerary, the user must first display this itinerary on the layout and then, select the "Set a Train on an Itinerary shown" topics inside the Train main menu.

This command is only enabled when an itinerary is shown on the layout.

The Train has to be selected into the existing train list.

The user can place the train anywhere on the Itinerary shown on the screen.

Of course, when CATrain is used to control a "real" model train, the train position must be coherent with the real world and the position of the train model must correspond to the position of the "real" train.

At the placement time, the train can be rotated by a click on the right button of the mouse. The rotation step is 90°.

To set a train correctly the user has to rotate it in the good way before setting it on the railroad. The train must be installed on the itinerary in the correct displacement direction.

The train must be placed on a section sufficiently long. Care must be taken to set any turnout or junction which is located under the train correctly. Also be careful of other trains.

To set the Train on the railroad the User must click on the left button of the mouse.

When the train has been correctly installed on its itinerary, it is linked to this itinerary and will follow it when circulating.

To remove a train from the railway, the user must select the corresponding menu topic and he must select a train in the list of existing trains. Only trains already present on the railway are actively proposed into the list.

## **3.5 Polarity**

When CATrain is used to control a real train layout using the "Block", it is important to correctly define the polarity of every rail section and every switch.

- "Polarity" Menu**

Two commands are available inside the "Polarity" Menu:

- Show and Edit Power Supply
- (Re)Set Polarity

- Fixing the electrical "block" polarity**

This function is only useful when CATrain is used to control a real train layout, using the "Block Modules" technology. In this case, it is necessary to correctly set the polarity of every electrical "block".

Typically, a block consists in an insulated rail section. A switch may belong to several sections, so, it is considered as an independent block. CATrain completely manages the polarity of the tracks.

After the realization or the modification of a layout, it is **absolutely necessary to fix the track polarity**.

The order "(Re)Set Polarity", creates a default polarity scheme, defined by the computer, considering the layout topology. This polarity is established by following simple rules of electric continuity, it is not necessarily optimal.

Then, the user must edit the polarity by selecting the item "Show and Edit Power Supply Polarity".

This command displays the polarity as currently defined. The **negative rail is represented in blue**, while **the positive rail is represented in red**. It is necessary that the screen representation precisely correspond to the real layout wiring. To achieve such a coherency, you can modify the wiring of the real network (!), or, more merely, you can modify the screen model!

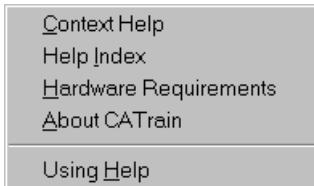
To reverse the polarity of a block on the screen, just click on this block.

To cancel the polarity display, just click on the right button of the mouse.

**REMARK:** Although indispensable, fixing the polarity is not sufficient. Every electric block has to be given an electrical address.

Don't forget to affect block number to every rail section and to every switch.(see Electric. Block Addresses at chapter 3.7.3).

## 3.6 Help Facility



### 3.6.1 Context Sensitive Topics

This Help system includes topics that you can call directly from the CATrain application.

To get context-sensitive help, press Shift+F1 and click on any element of the application menus.



To indicate to the user that the Context Help facility is activated, the mouse cursor includes a question mark.

You can also press the F1 key to get help on the command during a Menu selection.

### 3.6.2 Help Index

The Information of the document that you are reading now is almost completely included into the CATrain help file. It is possible to access to this information while using CATrain, by using the help index and to navigate into the help file by using the hyper-text links and the key word research facilities.

## 3.7 Controlling a "real" Railway

### 3.7.1 Layout Control Modules

A "real" Railway can only be controlled when a Controller hardware interface is present between the PC and the model railway.

Dedicated electronic modules have been developed for electrically controlling a layout using the "block" method.

Every Module is directly connected to the PC through a USB interface board.

The Modules are described in detail in the document "Modules.pdf".  
Here is a short description of the main modules:

- **"Throttle controller" or "PWM Controller" Module**

The main module task of the PWM control modules is to deliver the block power supplies. Each module controls 4 blocks. The technology used for those modules is described hereafter. The block control modules known as "Throttle controller" or "PWM Controller" modules. PWM stands for Pulse Width Modulation in respect to the technology used. This topology makes the voltage modulation very efficient.

A single "PWM controller" module is capable of powering 4 blocks. Those blocks (or track sections) must be totally electrically insulated from each other.

The "PWM" modules also inform CATrain about the block occupation. They detect the presence of a train by its electrical power consumption.

- **Device controller Module**

This module is in charge of controlling the layout devices, like signals and switches.

A single "Device Controller" module is capable of driving 4 dual coil devices or 8 single devices, depending on the chosen mode.

When programmed in the "4 outputs" mode, a module can deliver pulses from 200ms to 800ms, or steady state signals. The pulses are used for driving twin-coil switch machines like turnouts or semaphores

In the "8 outputs" mode only steady state signals are available. Only Permanent activation is possible in this mode. This is enough for controlling standard light signals or classical relays or even turnouts with stall motor drives.

- **Detector Module**

This is an auxiliary module, which can be used to achieve a better synchronization between the trains and the models. The PWM module can detect that a train is present on one block under its supervision but it does not know exactly where. The "Detector Module" is more precise. When a locomotive is detected on a specific piece of track, the "Detector Module" sends this information to CATrain. CATrain synchronizes the model movement on the corresponding detection rail represented on the screen. The train detection is performed by a mechanical switch or by a "current sensing" amplifier.

A single "Detector" module is capable of supervising 8 train detectors.

### **3.7.2 Using Block Modules**

To control a "real" model railway, the user must enter the RUN mode either by selecting the corresponding menu item or by setting the Power Switch "On".

When the communication is active (see paragraph 3.1.4), the computer will send the control information to the physical model through the controller dedicated hardware, otherwise, the computer just simulates the circulation.

**REMARK:**

When automatic traffic mode has been chosen, the CATrain will control all the available semaphore signals to regulate the traffic. When a train is circulating on a dedicated itinerary the correct setting of the turnouts will be automatically done, even for branching turnouts when they have been given a control label.

- **Principle of the "Block" System**

Blocking is used to prevent train collisions. Semaphores or signals protect the access to rail sections.

The access of the train to a block is kept under the control of a signal located at the end of the previous block(s). This signal is "green" when a train can enter the block beyond the signal. When this block is still occupied by another train, the signal remains "red" and the train must stop and wait until the signal turns "green".

There must always be more blocks than trains circulating on the layout, because there must always be at least one unoccupied block to which the train can move.

- **Using CATrain with the block system**

Specific Modules have been developed to be used for controlling a real layout, using the "Block System".

With CATrain, the voltage supplied to the insulated blocks is under computer control.

When the User wants to use the "block" system, he must specify which electrical block the section belongs to. That is to say that he must enter the electrical "address" of the block, in the same way that he has to enter the electrical address of the loco when he uses the Märklin system.

CATrain "knows" which train is on what block(s) and, rather than controlling the train engine, CATrain modulates the voltage supplied to the insulated track segment(s) upon which the train is located.

Doing so, CATrain can modify the speed and the direction of the trains.

With such a solution, it is possible to digitally control the journey of any train at any scale. No decoder is needed inside the loco. No modifications are required to the locomotives.

Of course, you need a separate power supply for every block. Those power supplies must be under computer control. To modify the speed of the train, it is also necessary that the voltage delivered by every block power supply be "modulated" by the computer.

### 3.7.3 Electrical Block Addresses

Setting the correct "block address" must be performed inside the "**section**" and the "**switch**" editing dialogue boxes. It is only useful when CATrain is used to control a real layout, using the "Block Modules" technology (see chapter 3.7.2).

In addition to fixing the correct track polarity (see fixing the electrical "block" polarity), it is necessary that every electrical block has its address defined. For controlling a real network, EVERY section, and EVERY switch must have a valid block number, corresponding to the PWM channel used.

For recall, this number of block is equal to: (PWM Module Address \* 4) + channel number.

Or, said in another way, the two less significant bits of this address select the channel number into a given module, while the 5 following bits are the module address.

The addresses of the PWM modules extend from 0 to 127 or 111 when "Detector Modules" are used.

Every PWM module has 4 channels, numbered 0, 1, 2, 3.

For example, if a track section is powered by the 2nd channel (channel 1) of the 4th PWM module (module 3), its block address is:  $(3*4) + 1 \Rightarrow 13$ .

Be careful to affect a block number, which is coherent with the PWM modules installed. If it is not, the CATrain DLL will try sending an order to a non-existent module and it will vainly wait for an answer. This results in a bad working of CATrain. The addresses affected to all blocks must ABSOLUTELY correspond to **EXISTING ADDRESSES**. If, for a reason or another, you do not want to give an address to some blocks, give them the address **255**.

**REMARK:** Don't forget that, on the real network, the electric blocks powered by different PWM channels must be **completely insulated from each other**. (but all the PWM modules can be connected to a same power supply!).

### 3.7.4 Layout Optimization for Automatic Traffic

CATrain will also try to resolve contentions and to avoid deadlocks. Nevertheless, this is not always possible in case of a poor circuit layout.

Here are some **examples of poor layout**:

- Too short sections on which long trains cannot stay:  
The length of a train is normally determined by the number of attached cars, but since the User can force a longer value, this can lead to situation not easily understandable when looking on the screen at the simulation behavior.
- Not enough signals to allow for train stopping:  
In a track loop, the number of signals must be greater than the number of trains simultaneously circulating in the loop. E.g.: if there can be two trains present in a circuit loop, this loop must be cut in at least three track sections, and three signals must be installed.
- Layout bottlenecks:  
Some part of the layout always crowded because of bad itinerary choices.
- Too many trains running on a crowded circuit.
- Too many "one track" sections where train can circulate in both direction.

### 3.7.5 Real Time Synchronization

The synchronization between the "real" train and its model on the screen is ensured by the "Train Detector" rails, or by the presence detection on blocks when the Block System is used.

When some temporary synchronization problems are encountered, you can **force the synchronization by clicking on the Detector** rail on the screen. The "locked" train will continue without waiting for the real-time event.

In the same way, when using the "block" system, if a train is locked at the entry of a new block, you can **force the synchronization by clicking on the Locomotive**. The train will start without waiting for the block occupancy event.

Here are some ways to improve the "real time" synchronization:

- **Positioning train detectors**

When a "real" train is detected, the Controller sends a feed-back information to the CATrain software on the PC.

This received information is used, in automatic traffic mode to synchronize the running model with the "real" trains.

The Controller does only report that a train has been detected on a given detector, since there is no way implemented to physically identify a specific train. The controller just sends the physical detector number and not the Identity of the train which has been detected.

It is to the CATrain software to discover what train is concerned and to adjust the synchronization.

When the train model is in advance compared to the "real" train, the model on the screen doesn't move anymore "waiting" for the real train to recover.

When the train model is late compared to the "real" train, the model on the screen "jumps" to the train detector rail where the "real" train has been detected.

More train detectors are present, better is the synchronization between the "real" train and its model on the PC screen.

Good practice is to set a detector for every track section, not too far from the Signal at the end of the section.

When trains are circulating on both ways on a single-track line, a single detector may be placed at the middle of the section, or there may be two detectors installed at both ends of the section in front of the signals (but not to close, to allow a progressive deceleration).

When using the Block Module System, the block controller automatically reports to CATrain the presence of a Train on a given block. So implementing extra train Detectors is not mandatory.

- **Train Speed Calibration**

A complementary way to improve the synchronization is to calibrate the maximum speed and the Motion Profile for each train motor. (see paragraph 3.4.1 "Train Editing"). This operation is very important.

- **Improving the layout design**

Of course, to ensure a good synchronization between the "real" train and its model the layout representation must be as perfect as possible. The user has to adjust his drawing to fit as close as possible to the "real" layout. Good positioning of the turnouts and signals is particularly important.

The length of each section can also be slightly adjusted to fit closer with the reality. (see paragraph "Editing Track Sections").

This length adjustment facility should be used when the complete layout drawing has already been optimized. Also the grade setting is important for train motion and synchronization. (see paragraph "Grades").

### 3.8 Using the Keyboard "Accelerators"

When controlling a real layout in manual or semi-automatic mode, it is often necessary to be very prompt for changing a signal or a turnout position.

The classical way is to click on the concerned device, but another way is to use the keyboard:

"Accelerator" keys are available for this purpose.

The Accelerator keys can also be programmed on a programmable Joy Stick (wire connected or wireless), to provide a kind of **remote control** for CATrain. This is specially useful when CATrain is used to control a real layout.

The accelerator keys apply to a **single train**: the **currently selected train**.

You select a train simply by moving the mouse on its throttle control board. The **blue led** will light to indicate that the train is currently selected. You can also use the '**T**' key on the keyboard, followed by the train **ordering** number. (see further).

By selecting the item **Selected train marker** in the display menu, it is also possible to display a small **halo** above the currently selected locomotive.

Here are the accelerator keys and their purpose: (case doesn't matter)

- '**T**' is used to set the current selection to **Trains**.

The following number (1->9) typed on the keyboard designates the train. This number is not the train ID, it is its ordering number in the list of train present on the layout.

For example, if the three trains 2, 4 and 13 are present on the layout, typing '**T**' followed by '**1**' will select the train '**2**'. Next, typing '**2**' will select the train '**4**' and '**3**' will select the train '**13**'.

Notice that it is possible to select a train simply by moving the mouse on its throttle panel as explained above...

- '**I**' is used to set the current selection keys to **Itineraries**

The following number (1->0) typed on the keyboard designates the Itinerary. '**0**' designates the itinerary '**10**'. The selected itinerary will be shown on the screen.

- '**G**' is used to set the current train on the current itinerary. This is only possible when the train is running on a track section which belongs to the itinerary displayed and when it is moving in the good direction.

- '**A**' is used to set the rail switches in concordance with the itinerary shown.

- '**R**' is used to reverse the motion direction of the currently selected train.

- '**S**' to toggle the state of the next signal in front of the current train. This is very practical in "Semi-automatic" traffic mode.

- '**X**' to toggle the state of the next turnout in front of the current train. This is also very practical in "Semi-automatic" traffic mode, but beware that doing so may force the train to leave its itinerary!

- '**PgUp**' is used to raise the current train speed.

- '**PgDown**' is used to lower the current train speed.

## APPENDIX 1

### CATRAIN.INI File

This is the program initialization file where all trains and global parameters are defined.  
Here is a brief description of the parameters which can be configured through the CATRAIN.INI file.

The "DLL" paragraph contains the control DLL name:

```
[DLL]
CTRLCOM="cblk_32m.dll" // for a connection to the USB Interface to the
 // Block System Modules
```

The "PARAMETERS" paragraph contains all the configuration parameters to tune the functioning of CATrain:

```
[PARAMETERS]
MPH=0 // set MPH=1 for speed displayed in Miles per Hour
 // defaults to MPH=0 for speed displayed
 // in Kilometers
 // per Hour.

SPEEDSCALEFACTOR=1000 // This global value is used to compute the model
 // train motion speed on the screen from the
 // throttle control speed expressed in KM per Hour
 // (KM.H) or in Miles per Hour (MPH)
 // It must be adjusted to be realistic.
 // defaults value: 1000
 // minimum value: 100
 // maximum value: 5000
 // the SPEEDSCALEFACTOR is multiplied by 0.625 when
 // the speed indication is set to MPH.

REDRAWMOVE=0 // when REDRAWMOVE is set to 1, the windows
 // (e.g. throttle windows) are
 // continuously redrawn during displacement
 // default: REDRAWMOVE=0

SLOPEINCIDENCE=2 // Incidence of a grade on the LOCO engine control
 // Can be adjusted between 1 (weak) and 10 (strong
 // influence).
 // default value: 2

SPSMOOTH=5 // Speed steps on the throttle display
 // Can be adjusted between 1 and 20.
 // SPSMOOTH=1 leads to heavy CPU load when rotating
 // the throttle knob.
 // default value: 5

SYNCTIMEOUT=10 // Time Out for train models waiting to be
 // synchronized to a feed-back information from a
```

```

 // train detector
 // When this time-out is exhausted, the computer
 // concludes that a mismatch has occurred between
 // the "real" train motion and the PC model.
 // In this case, all the trains are stopped in
 // emergency, and the main power is switched off.
 // default value: 10 seconds
 // minimum value: 0 (no synchronization)
 // maximum value: 60 seconds

SECTFREEDIST=3 // distance after which a train will free a rail
 // section after that the last car has left the sect.
 // default value: 3
 // minimum value: 0
 // maximum value: 16

VISIBILITY=3 // This parameter impacts the distance left between
 // two trains when they are circulating on the same
 // rail section (this situation should normally
 // never occur !).
 // default value: 3
 // minimum value: 1
 // maximum value: 10

FORSEENDIST=14 // distance for scanning of resource contention
 // (e.g. rail section occupancy status or speed limit).
 // A greater value is better for anticipation
 // of accelerating or braking.
 // Too high a value can cause CPU overload and
 // possible deadlocks.
 // default value: 14
 // minimum value: 8
 // maximum value: 64

LCROSSDETECT=7 // distance from which a train will lower the
 // level crossing barriers.
 // default value: 7
 // minimum value: 1
 // maximum value: 64 or FORSEENDIST.

LCROSSLEAVE=2 // distance after which a train will raise the
 // level crossing barriers after the last car.
 // default value: 2
 // minimum value: 1
 // maximum value: 16

OPSIGCTRLDIST=10 // distance from which a train will set to
 // "GREEN" a signal which is opposite to its
 // moving way (rear turned), when no
 // bypass relay is present and SETOPSIGGREEN option
 // is ON.
 // default value: 10
 // minimum value: 2
 // maximum value: 64 or FORSEENDIST.

SETOPSIGGREEN=1 // this flag must be set to 1 when the user wants
 // that the rear turned signals (set opposite to
 // the train motion) be set to GREEN to
 // establish the power supply when a train is back-
 // crossing them. (see OPSIGCTRLDIST).

```

```

 // This feature is not necessary when the signals
 // have no electrical action on the train motion,
 // or when by-pass relays are implemented, or when
 // no single tracks are present.
 // default value: 1 = ON.

COLDSTART=1 // Enable the "Starter" button for cold starts.
 // The purpose of this button is to raise a little the
 // voltage applied to the loco motors.

ENHANCEDTRAF=1 // When the "enhanced" traffic mode is activated, the
 // train motion is more efficient and more fluid.
 // Deactivate this option when some problems are
 // encountered because of the layout topology or because
 // of the lack of CPU power.

BACK_EMF=1 // When the "Block" Modules are used to control a real
 // layout, this option activates the back EMF measurement
 // for a better control of the loco motors, especially
 // at low speed.

```

*The "TRAINx" paragraphs are the Train data-base. The characteristics of every train are issued from the "Train editing" dialogues present in CATrain*

*The content of this paragraph is self explanatory.*

*Here is an example:*

```

[TRAIN1]
ID=2
TYPE=STEAM
LOCOCOLOR=BLACK
MAXSPEED=120
SPEEDCRV=6,7,7,8,8,9,9,10,10,11,11,12,13,14
SPECIAL=OFF
NAME=Vapeur
WFACTOR=5
LENGTH=7
WAG1=CAR
WAG1COLOR=GREEN
WAG2=CAR
WAG2COLOR=BLUE
...
[TRAIN2]
...

```