Scripts and icons for the Swiss (SBB) signals – version 1.0 – 01/05/2014

This zipped archive contains all the icons and the scripts needed to simulate in Traindir 3[1] the Swiss signals used in the SBB – CFF – FFS network (they work only with version 3.8s or later).

Both System L and System N are simulated, shunting dwarfs included. In the older System L aspects are shown by fixed lights in specific positions, so only 3 speed limits are supported, while the newer System N is able to support every speed limit between 30 and 140 km/h (in 10 km/h steps). Some auxiliary signals are also simulated – speed and departure indicators, dead ends – together with some fake signals needed to simulate the quite complicated System N. I had to invent part of the algorithms, as the official rulebook[2] doesn't specify which speed is to be enforced depending on the distance of the next signal and on the speed it enforces.

Here are some fundamental rules, quite different from the Italian ones you may be used to:

1) Diverging or straight routes are not distinguished: the signals just enforce a speed whenever a speed lower than line speed is needed. The System N can enforce every speed between 30 and 140 km/h (in 10 km/h steps), so it can control a train speed depending on the distance from the train ahead. I simulated this feature considering the distance from the next red signal and the speed required by the switches position[3].

2) Signals must warn in advance against a speed limit lower than the current one, while higher limits may be enforced without warning (the driver can accelerate as soon as he sees them). This isn't a problem with the System L, as it features distant and main signals that can be distinguished by the shape and can be combined on the same mast, so every speed restriction is usually warned by a distant (standalone or combined with the previuos main signal). On the other hand the System N can give only one speed indication, so if a signal has to warn against a lower speed at the next signal, that same signal cannot show the speed restriction enforced from itself on. The latter restriction is implicitly enforced, so the driver must remember the speed indication given by the distant of that signal[4]. If the distant is not able to warn aginst the next signal's aspect, as the latter is still unclear when the train passes the distant, the driver will immediatley reduce the speed to the one warned, as if it were also enforced from that signal on. Previous signals will enforce the speed restriction needed to allow the driver to reduce its speed safely. In the same way a distant may warn against a speed lower than the one that is implicitly enforced when the train passes the next signal, as in the meantime the train ahead may have freed another block, but the driver must obey the distant. This last rule cannot be simulated: the train will set its speed to the implicitly enforced one, even if the distant indicated a lower one when the train passed it.

3) Shunting dwarfs must always be obeyed, also when normal signals are clear (the latter take the former into account). Shunting signals feature the Expect Stop aspect, requiring to stop by the next signal, be it another dwarf or even a normal signal.

4) Block signals are quite new and were introduced to raise the capacity of high traffic lines. They are always lit for both tracks and usually show Stop. They are cleared only when a train has to pass, early enough to give the train enough free line ahead to be able to travel safely at line speed. This means that typically they are cleared together with the exit signal towards the line they protect (in Traindir, set the "Intermediate" option).

Rule 2 has a particular effect when sector and exit signals are concatenated: as they cannot warn against any speed (they only enforce one), all the signals before the one enforcing the lowest speed must enforce that

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[1] A software by Giampiero Caprino, who designed an eccellent and very versatile simulator. I must thank him for all the adjustments he did to allow the implementation of this package.

[2] At the moment I'm writing these intructions, this is the link to the German version the rulebook: http://www.bav.admin.ch/grundlagen/03514/03533/03649/index.html?download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ah2oZn4Z2qZpnO2Yuq2Z6gpJCDeYJ7fGym162epYbg2c_JjKbNoKSn6A--&lang=de

[3] Switches set for the diverging route still remain the main reason to enforce a speed limit.

[4] There is no "rappel" in this system.

lowest speed too, up to the first that can be warned. Signals beyond the one enforcing the lowest speed may enforce a higher speed without warning.

The rulebook says that System L and System N signals may be mixed in any combination, to allow the upgrading of the lines to the System N starting with only those signals where limits other than the standard ones (40, 60 and 90 km/h) are required. In the scripts I couldn't take every possible combination into account, so I implemented for every signal the possibility to force its aspect – and enforced speed – by inserting a specific fake station just beyond it.

In Switzerland there are no specific signals for level crossings, as these usually don't prevent the signals from clearing; when they do, the affected normal signals feature a level crossing sign under the head.
Block occupancy and train announcement indicators are not implemented yet, as I wasn't able to find any information about how they look like, nontheless I expect they exist.

In both the simulated systems each light can show only one colour, so when using the System L the correct combination of lights must be chosen, considering all the desired aspects. The rulebook allows a light of a certain colour to be in different positions on the head – as the aspect is given by the order/pattern of the lights, not by their position in the signal head – so there are quite a lot of possible signal "shapes".

In Switzerland there are no automatic signals that try to clear themselves as soon as possible. Block signals are typically cleared together with the exit signal towards the line they protect, so they are suitable for the "Intermediate" option.

Installation

Open the .zip file, select all files and copy/extract them in their specific folder, considering the following.

At the moment Traindir permits only one folder to keep all the signals and icons in, the one specified in the "Environment" tab of the Edit | Preferences command. I made the Swiss package compatible with the Italian one, so the same folder can be used (typically `C:\Program Files\Traindir3\Signals`) and mixed scenarios can be designed.

However, more and more packages will hopefully be available in the future (France, Japan, USA, etc.), so it could be a good option to use a separate folder for each package (for example `C:\Program Files\Traindir3\Signals_SBB`) and modify the folder the program points to whenever the signal system changes.

Summary of the available signals

- Repeaters and standalone distants with 5 lights (System L) .
- Exit and sector signals (without combined distant) with 2, 3, 4, 5, or 6 lights in all the useful combinations (System L).
- Entry signals (with combined distant) with 2, 3, 4, 5, or 6 lights in all the useful combinations (System L).
- Square (40 or 60 km/h limits) or rectangular (40, 60 o 90 km/h limits) block signals (System L).
- Standalone distants with a square outline, with or without speed indicator (System N).
- Main signals with round outline, always featuring the speed indicator (System N).
- Block signals with round outline, with or without speed indicator (System N).
- Shunting dwarfs (to be alwyas obeyed) commanding the track to the right or to the left.
- Departure signal for tracks where the exit signal is common to more tracks.
- A special signal that looks like a dead end; it prevents trains form exiting the scenario and forces the previous signals to show the Expect Stop aspect.
- Fake signal to be placed hidden when shunting dwarfs are mixed with normal signals. It detects speed limits and switches positions, so that normal signals can show the correct aspect.

All main signals support the Shunt aspect for shunting: if cleared with Ctrl-click this aspect means "Proceed by sight, track may be busy". The track becomes white to allow shunting, and particularly joining.

You'll find more details later on and in the Glossary at the end of this document.

Script description

The script name for normal signals follows this scheme: "sbb" (the network manager company), underscore, signal type, undescore, light combination or extra type specification, `.tds` extension. Script names for special signals also start with “sbb”, but they follow their own scheme (see the details signal by signal). All the scripts have comments explaining how they work and how to use them; all the signals are to be placed in the scenario using the single head tool of the editor, as in Switzerland there are no automatic signals.

System L signals

`sbb_avv_L.tds` `sbb_rip_L.tds`	Distant and repeater with 5 lights. The distant may be standalone or coupled with a main signal, and in this case it can show the “Busy track” indication. The repeater is used when the next signal is not visible from a long distance. Thus the repeter is too close to the next signal (less than 500 m) to be considered its distant by the previous signals. Both signals go off if the track is clear only for shunting or if the next unclear signal is a dwarf. Only one “real” distant is allowed for each signal, followed eventually by one or more repeaters (all showing the same aspect).
`sbb_part_**.tds` `sbb_prot_**.tds`	Exit (or sector) and entry signals; exit (or sector) signals are always standalone, while entry signals are always to be coupled with a distant `sbb_avv_L.tds`. ** describes the lights combination: 2 = 2 lights (green/red); 3gg, 3vg, 3vv = 3 lights (yellow/red/yellow or green/red/yellow or green/red/green); 4gg, 4vv = 4 lights (green/yellow/red/yellow or green/red/green/yellow); 5gg, 5vvv = 5 lights (green/red/yellow/green/yellow or green/red/green/yellow/green); 6 = 6 lights (green/yellow/red/green/yellow/green, with the red light shifted to the right).
`sbb_blocco_L*.tds`	Block signals, capable to show distant or main aspects, but not at the same time; the two kind of aspects alternate along the line, so every main aspect is warned against whenever possible. * = 6: square signal supporting only 40 or 60 km/h speed limits. * = 9: rectangular signal supporting also 90 km/h speed limits. These signals are not automatic, but they’re suitable for the “Intermediate” option, so that they clear together with the exit signal towards the line they protect.
`sbb_ind_par.tds`	Departure indicator for the track it commands, to be used when the exit signal is common to more tracks. If you want the two signals to clear together, use itineraries or mark the common signal as “Intermediate”.

System N signals

`sbb_avv_N.tds` `sbb_avv_Ni.tds`	Distant signal to be used alone or coupled with the speed indicator `sbb_ind_vel.tds` respectively. Only the latter can warn against speed limits, while the former can only tell if the next signal is clear or unclear.
`sbb_blocco_N.tds` `sbb_blocco_Ni.tds`	Block signal to be used alone or coupled with the speed indicator `sbb_ind_vel.tds` respectively. Neither signal can enforce a speed limit, and only the latter can warn aginst one or show “Advanced warning”[5]. These signals are not automatic, but they can be marked as “Intermediate”, so that they clear together with the exit signal towards the line they protect.
`sbb_prot_N.tds`	Main signal, to be used as entry, exit or block signal when all the aspects are needed, both the warning and the enforcing ones. It must always be coupled with the speed indicator `sbb_ind_vel.tds`.
`sbb_ind_vel.tds`	Speed indicator, to be coupled with the previuos signals to show the speed they warn or enforce (numbers from 3 to 14, meaning tens of km/h) or other indications: – means busy track – flashing means “short run” i.e. expect stop at short distance v means “Advanced warning”[5].

[5] The next signal shows “Expect Stop” but it’s at a distance lower than the normal one from the next signal.

As there is quite a big number of possible combinations of speed limits, switches positions and other signals' aspects, I'm not confident that the algorythm is able to determine the correct aspect to be shown in every case. Therefore I implemented for all the signals the possibility to force the aspect (unless the signal can't show it) by inserting a fake ***snn*** station just ahead of the signal, as follows:

s00: Forces a "Clear" aspect. No limits are enforced, even if limits are set on the track or forced by the switches positions, provided there is enough distance to the next unclear signal[6].

s03: "Short run": expect a "Stop" at short distance, so a 30 km/h speed limit is enforced.

s04 … **s14**: Enforce a speed limit between 40 a 140 km/h. With the System L signals only s04, s06 and s09 are allowed, depending on the aspects the signal can show.

s99: Enforces for a straight route the same limit that would be enforced if that route were a diverging one, i.e. consider the limits set on the tracks and / or forced by the switches positions ahead of the signal (90 km/h is enforced if no limits are detected).

Dwarfs

`sbb_marm_a.tds` `sbb_marm_ad.tds`	Irrelevant dwarf that acts as a repeater of the normal signal to which it must be coupled and to which it adds the "Expect Stop" aspect that maybe the normal signal doesn't feature. It must be placed just before a normal signal, at less than 50 m, otherwise the previous signal won't show the correct aspect. It always clears together with the normal signal, even when the latter is clear only for shunting. The two scripts are used to the left or to the right of the track they command, respectively.
`sbb_marm_i.tds` `sbb_marm_id.tds`	Commanding dwarf that stops a train if unclear and can warn of an unclear signal, be it another dwarf or a normal signal. This signal must always be immediately followed by a hidden `sbb_avv_dev.tds` signal, so that the previous normal signal can know what follows the dwarf and show the correct aspect[7]. The two scripts are used to the left or to the right of the track they command, respectively.
`abb_avv_dev.tds`	Fake signal to be hidden just after the commanding dwarf described above, so that the previous normal signal can know what follows the dwarf and show the correct aspect[7]. This signal is mandatory if you want the normal signals to show the correct aspects when dwarf(s) are present before the next normal signal.

Dead end

`sbb_tronc.tds`	This always red signal (mark the specific option in the properties) looks like a dead end. It should be linked to the last track element of an exit point to block the trains, that would otherwise exit the scenario. Previous signals will show the correct aspect ("Prepare to stop" or "Short run", depending on the distance).

Important notes about the L and N Systems

In the System L main signals (those who can enforce something) and distants (those who can never enforce anything) are actually completely different signals, with different shapes and no aspect in common. Both can appear standalone or combined on the same mast. A main signal cannot tell anything about the next signal aspect, unless it can show Y/Y ("Short Run"), which is the only exception. If Y/Y is not showable and an unclear signal follows, the only allowed aspect for a main signal is "Permissive Stop" (flashing red). In practice this case is avoided by forcing the two signals to clear together, enforcing not decreasing speed limits if needed.

The System N has overcome this strong limitation allowing the "Expect Stop" (Y) aspect in all signals. This is the only warning aspect that doesn't require the speed indicator, so simple block signals can be realized with just one head (with round border) and three lights, corresponding to the R, Y, G aspects.

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[6] Speed limits needed to allow the train to stop by the next unclear signal are always enforced.

[7] Normal signals must always consider all the speed limits that are set on the tracks or forced by the switches positions up to the next normal signal, but dwarfs may be present in between and their aspect needs to be considered too.

The System N signal is compact, and has always the same two components: a head with 2 or 3 lights and an optional speed indicator, nothing else. Therefore it's easy to mount it anywhere obtaining the full set of aspects, which in the System L requires a signal featuring a top head with 6 lights and a lower head with 5, for a grand total of 11 lights!

There is no difference between the signals pleced to the left and to the right of the track, as the latter are allowed only along single track lines or to the right of the rightmost track (the other tracks have the signals to the left, middle tracks usually on a gantry).

Icons naming scheme

Icons follow this naming scheme: 2 uppercase letters for the type, underscore, numbers and letters for the number of lights and colour sequence, undescore, one uppercase letter for the orientation, `.xpm` extension.

Type

AV:	Distant or repeater (Sytem L), to be used alone or coupled with an entry signal
BL6, BL9:	Square or rectangular block signals (System L)
IV:	Speed indicator (System N)
MA:	Dwarf
NA, NI:	Distant signal with or without speed indicator (System N)
NB:	Block signal without speed indicator (System N)
NP:	Main or block signal with speed indicator (System N)
PA2 … PA6:	Exit or sector signals with 2 to 6 lights, to be used alone (System L)
PR2 … PR6:	Entry signals with 2 to 6 lights, to be coupled with a distant (System L)
SP:	Departure indicator for a track when the exit signal is common to more tracks
TR:	Dead end, to prevent trains from exiting the scenario

Aspects

b,r,y,g:	Colour of the lights (top to bottom): off, red, yellow, green.
–, =, |:	Dwarf aspects: stop, expect stop, proceed.
_, –, v, 3 … 14	Speed indicator aspects: off, busy track or short run, advanced warning, speed indication (in tens of km/h).
--	Only for coupled dustants (System L): busy track.

Orientation

N,S,W,E,X:	For trains going up, down, to left, to the right, in any direction.

Signal aspects

Aspect	Meaning
R	"Stop". The signal cannot be passed until it changes aspect or the driver receives specific instructions to do so.
R_x	"Permissive stop". The signal can be passed by sight (at 30 km/h max), expecting an obstacle (a train to join) or an unclear dwarf. In the first case the signal was cleared with Ctrl-click and if present the distant (System L) or speed indicator (System N) shows busy track (–); in the second case the coupled distant goes off, if present.
Y/Y	"Short Run" in the System L. If the signal features a coupled distant the aspect means that the next signal is unclear and at a very short distance. If the signal doesn't feature a coupled distant this is the only aspect that can preceed an unclear signal. If the signal doesn't feature 2 yellow lights that case shoudn't occur (the two signal would be forced to clear together), as the only allowed aspect would be Permissive Stop.
$Y/–_x$	"Short Run" in the System N. The speed indicator is needed to show the flashing – that distinguishes this aspect from "Expect Stop".
G	"Clear". Proceed at line speed.

Aspect	Meaning
G/Y G/G G/G/G	"Speed limit enforced" in the system L. Proceed at 40, 60, 90 km/h respectively from this signal until the last switch or the next signal, whichever comes first.
G/3 … G/14	"Speed limit enforced" in the system N. Proceed at the indicated speed (from 30 to 140 km/h) from this signal until the last switch or the next signal, whichever comes first. If the next signal enforces another speed limit, it can only be higher.
Y/3 … Y/14	"Expect speed limit" in the system N. The next signal enforces a speed limit from 30 to 140 km/h. If the previous signal also showed one of these aspect, that limit is implicitly enforced.
Y/v	"Advanced warning". Next signal shows Expect Stop and it's at a distance shorter than normal from the next (unclear) signal. If the previuos signal showed "Expect speed limit" the limit is implicitly enforced. Only System N signals can show this aspect, and the speed indicator is needed to show the v that distinguishes this aspect from "Expect Stop".
Y	"Expect Stop" in the System N. If the previuos signal showed "Expect speed limit" the limit is implicitly enforced.
Y Y	"Expect Stop" in the System L.
Y G	"Expect speed limit 40" in the System L. Next signal enforces a 40 km/h speed limit.
Y G G	"Expect speed limit 60" in the System L. Next signal enforces a 60 km/h speed limit.
G G Y	"Expect speed limit 90" in the System L. Next signal enforces a 90 km/h speed limit.
G G	"Expect Clear", this aspect exists only in the System L.

R, Y, G = Red, Yellow, Green; the slash / means that the lights are vertically aligned.

Glossary

Entry signal
A main signal protecting the entrance to a station or a junction; in the System L it always features a coupled distant. It must be preceded by a signal capable of showing distant aspects.

Exit signal
A main signal protecting the exit from a station or junction towards the main line. In the System L it never features a coupled distant, so a standalone distant must follow. In the System N it may or may not show distant aspects. It must be preceded by a sector signal or by a signal capable of showing distant aspects, and in the System L it can be also preceded by a repeater signal.

Sector signal
A main signal used to divide a station track in sectors, so that more trains can occupy the track (one per sector). They are identical to exit signals, and can never show distant aspects, so they are all forced to open up to and together with the exit signal (see also the notes a few pages above).

Block signal
Signal that protect just a line section, and can use the speed enforcing aspects to control the distance between trains. In the System L this is the only signal that can show both distant and enforcing aspects, but not at the same time. Usually these two types of aspects appear alternately: one block signal enforces something or is Clear and the previous block signal acts as the distant of the next.

Block signals are quite new and were designed to increase line capacity in recent times. As the exit signals of the System L cannot act ad distants of the first block signal, the latter is linked to the exit signal so they are cleared together, or a pure distant is placed after the last switch of the station/junction.

Block signals of the System L are very similar to the distants, so a white sign with a black dot in the center is mounted over the head. The dot represents the red light in the center of the signal, so if the signal is unlit (faulty) the sign tells the driver to stop the train as if the red light were lit.
These signals are almost always mounted on gantries over the tracks, so I drew them without mast.

Distant signal
This signal cannot enforce anything on a train, it just tells something about the next signal aspect. As this signal doesn't force a train to stop even when unlit, it must be distinguished from the normal signals when a fault occurs, so the head has always a different (square) shape. There are however signals that can show both enforcing and distant aspects, e.g. System L block signals or complete System N signals.

Repeater signal
This signal is identical to the distant signal (same square head) it "repeats". It repeats the information given by a previuos distant about the next signal aspect, as this next signal is not visible from the needed distance, typically because of curves, tunnels, or station elements. The repeater is always too near to the next signal to act as the only distant of that signal, so there must always be a "real" distant before, at such a distant that the driver can safely obey to the aspect shown. A signal can have more than one repeater before, but each repeater cannot show an aspect more restrictive than the one shown by the "real" distant.